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Using FlashCopy

**To perform backups
Or create test environments**

In a CLONE partition

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Reference Document

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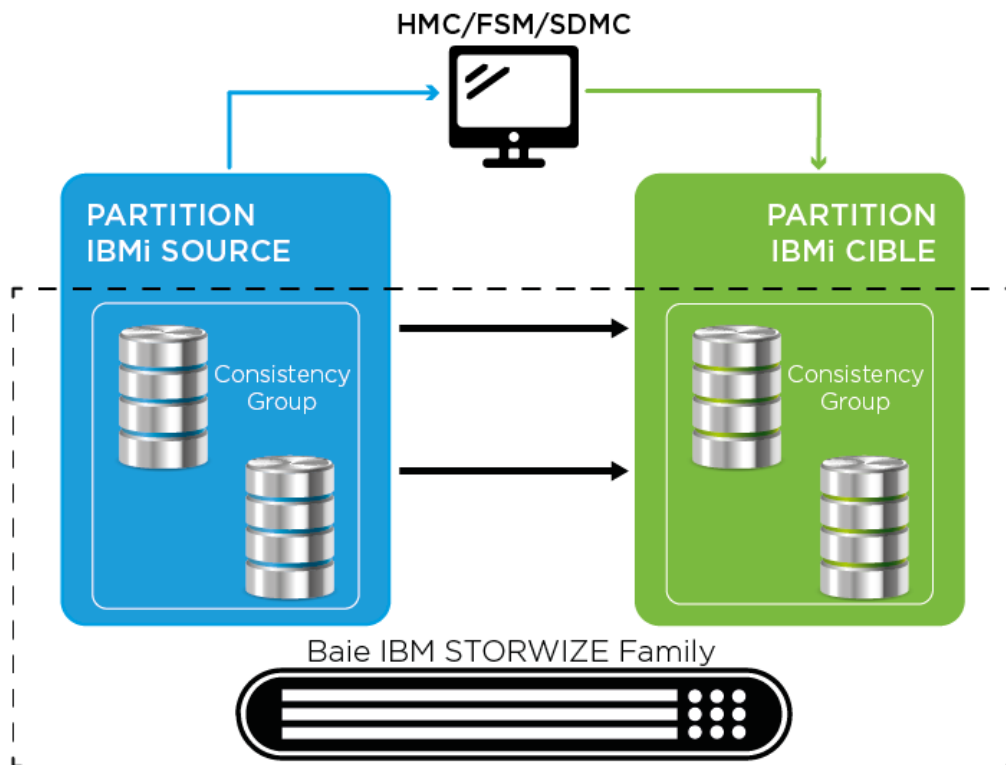
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1 Product description

The purpose of the Flash For i product is to facilitate certain operations by duplicating an IBM I partition to perform operations such as backup, application testing or data extraction without disrupting production. For instance, users can remain active on the production partition while a full save (SAVE21) is being carried out on its clone.

1.1 Principles

The Flash For i product manages the various hardware and software components involved in the IBM i production partition cloning process with the aim of making backups with a minimal impact on production, for example.



All operations are managed from the Production partition (also called the "source partition").

The source partition is cloned in 4 steps:

- Stop the clone partition if necessary.
 - The source partition sends the HMC/FSM an instruction to immediately stop the clone partition.
- Quiesce the source partition.
 - Using the CHGASPACT command, the source partition writes all the data contained in the memory to the disk.
- Start or restart the FlashCopy consistency group, or the Snapshot.
 - The source partition sends an instruction to the disk array.
 - At that point, the volumes presented to the target partition are an exact copy of the source partition volumes.
 - The source and target volumes now can change independently.
- Start the clone partition.
 - The source partition sends the HMC an instruction to start the clone partition.

When it starts after cloning, the clone partition adjusts several of its configuration parameters:

- Change of system name
- Network/IP configuration
- Start-up program
- All scheduled jobs (WRKJOBSCDE, JS1) are suspended

If the system name has been changed (parameter in the environment), the clone partition then restarts in order to apply the new settings. Otherwise, the backup starts immediately.

The Flash For i product also maps/unmaps volumes in the VIOS before stopping or after starting FlashCopy in order to avoid numerous error messages in the VIOS(es) (unless NPIV-type configuration has been performed).

1.2 Automation and monitoring

All processing is fully automatic and conducted from the production partition.

Several commands can be used to view the status of FlashCopy on the disk bay, the Clone partition and the progress of the requested function.

Several commands can be used to automatically monitor the smooth running of operations. These commands can be integrated into a monitoring tool such as Nagios.

It is possible to configure alerts by email. E-mails will then be sent automatically in case of errors detected by the product.

1.3 Possible operations on the Clone partition

The partition for which the disks are created by FlashCopy is called the "Clone Partition".

The Flash For i product makes it possible to use this partition for several types of operation. The function to perform is specified when defining the environment.

The following functions are possible:

- ***HOLD** No automatic actions on the Clone partition
The purpose of this function is to create a clone of the Production partition for safety reasons. The Clone partition will not be started. It will only be started if there is a major problem on the Production partition and it needs to be rolled back to the situation at the start of cloning. No data is changed on the partition before cloning.
NB: if the clone partition needs to be started, it must be done in "Manual" mode by selecting console start-up only in order to avoid causing conflicts with the production partition (same IP address, etc.)
- ***BRMS** Backup using BRMS
The purpose of this function is to perform a backup using the BRMS product. The control group and all the elements required for the backup are defined in BRMS as though it were going to be performed directly on the Production partition. During FlashCopy, Flash For i changes the Clone partition environment to ensure that no operation from the production partition starts automatically, then automatically trigger backup. At the end of the process, every BRMS data are transferred to the production partition, and reintegrated it into BRMS.
- ***BRMS21** Backup using BRMS, without to change the system configuration

The purpose of this function is to perform a backup using the BRMS product, as if it were the Production partition. When the backup is performed, no system configuration element is changed on the clone partition in relation to the source partition (except the system value QCTLSBSD, due to a BRMS limitation).

The control group and all the elements required for the backup are defined in BRMS as though it were going to be performed directly on the Production partition.

At the end of the process, every BRMS data are transferred to the production partition, and reintegrated it into BRMS.

- ***SAVE** Perform user-defined backup, without BRMS
The purpose of this function is to enable the user to choose the operations he/she wants to perform on the clone partition. The user can, for example, choose to perform a backup without using BRMS, create an application testing partition or perform any other operation for which a production clone is necessary.
The log of what has been performed is sent to the Production partition so it can still be consulted after stopping the clone.
- ***SAVE21** Perform SAVE21, without BRMS
The purpose of this function is to perform a full save of the clone partition as if it were the Production partition. When the backup is performed, no system configuration element is changed on the clone partition in relation to the source partition.
The performed full save is the equivalent of the SAVE21 system function.
At the end of the backup, the backup log is transferred to the production partition so it can still be consulted after stopping the clone.
- ***USER** Run a user-defined program to create a test (or other usage) partition
The purpose of this function is to enable the user to create an application testing partition or perform any other operation for which a production clone is necessary.
The Flash for I product creates the new partition and changes it's the configuration. Then the new partition may become independent from the production.
The log of what has been performed is sent to the Production partition so it can still be consulted after stopping the clone.
- ***NEWCFG** Automatically change the system configuration of the Clone partition
The purpose of this function is to create a test, pre-production, education, ... partition from a production clone. In this case, the database content of this partition would be automatically updated with all the production data.
On the other hand, the system configuration (name, IP configuration, relational database configuration, ...) has to be modified to become completely independent of the production.

Several environments can be defined, making it possible to perform several different types of action according to the circumstances or requirements. For example, it is possible to perform:

- backup FlashCopy in the morning and at midday without starting the Clone partition
- FlashCopy to make daily backups on weekday evenings
- FlashCopy to perform SAVE21 on Sundays

it's possible to configure and start several clone partitions simultaneously. For example:

- Start a clone partition that will be used to run backups (without to lock the users)
- Start a second clone partition that will be used to send data to a data ware house during the night, then could be used during the day, in case of incident on production applications, for testing and debugging on fresh data, without to take any risk on real production data.
- When necessary (once a moth for example), create a third clone partition which configuration will be changed to become an independent and permanent partition, used for long term testing for example.

2 Description of Flash For i operation

This section provides details on the different constituent parts of the product and how it is used.

2.1 Accessing the product

All the constituent parts of the product are contained in the FLASH4I library. This library needs to be online (EDTLIBL) beforehand.

The FLMENU menu displays the main commands that will be used. To access it, the user can type the GO FLMENU command or create a user profile and assign it the FLMENU menu as a start menu.

Each command can also be used directly from a command line or integrated into specific programs. The commands the user can use are described in this document.

2.2 Configuration changes of the Clone partition

This chapter explains the changes made to the Clone partition configuration during the first IPL to make sure it is different from the Production partition, and avoid that an automatic production job start, and the operations to process to restore.

2.2.1 Standard configuration changes of clone partition

The changes indicated below do not concern the *HOLD function, for which all operations performed on the Clone partition are the user's responsibility. It is advisable to start the Clone partition in "Manual" mode, to avoid any IP address conflict, or a production job to start on the clone partition.

For the *SAVE21 and *BRMS21 functions, these changes are made at the end of the backup so that the content of the cartridge is as close as possible to the Production partition content.

For the *USER function, these changes are only made if parameter "Reconfig LPAR Flash for I" in the Environment definition is set to *YES.

For the μ NEWCFG function, look at chapter 9 "Add-on module: Reconfigure the Clone partition"

During the very first IPL of the Clone partition (just after activating FlashCopy), its configuration will be changed so that it does not conflict with the Production partition. The following changes are made:

- The control subsystem name is changed to FL_CLONE
- Scheduled jobs (JOBSCDE) are backed up in SAVF FLASH4I/FLJOBSCD, then suspended
- IBM JS1 (IBM Advanced Job Scheduler for i) jobs are disabled (the auto starting job QIJSSCD is removed from subsystem QSYSWRK)
- The BRMS Network option is disabled so that the Clone partition is not known in the BRMS network (Subsystem Q1ABRMNET is renamed to Q1ABRMNETX).
- Print writer start-up is disabled with command CHGIPLA STRPRTWTR(*NO)
- Automatic start of TCP/IP is disabled with command CHGIPLA STRTCP(*NO)
- The name (DSPNETA) is changed for the 4 parameters SYSNAME, LCLCPNAME, LCLLOCNAME and NWSDOMAIN.
- All Communication line descriptions are changed to assign them a resource name that does not exist. This ensures that the Clone partition will have no access to the network

- A new specific Ethernet line called ETHFLASH is created. It will be the only link between the Clone partition and the network
- A new IP address is defined that will use the ETHFLASH line
- The name FLASH4I is added to the Host table.
- All tape library and LTO reader resources are analyzed to check that they use the same physical unit as on the Production partition.

If the system name (DSPNETA SYSNAME) is changed, a second IPL is done to activate this new name. Otherwise, the backup or user program is started immediately.

2.2.2 *Recovering the configuration*

It may be necessary to recover the configuration, for example in the following cases:

- If the partition must be restored from a backup, including the system configuration
- If, after the end of the backup, the clone partition must be used for another purpose (test, ...)

Use the command FLRSTCFG to restore automatically some parameters:

- Start TCP/IP at IPL STRTCP
 - o Recover automatic start of TCP/IP using command CHGIPLA
- Start print writers at IPL . . . STRPRTWTR
 - o Recover automatic start of print writers using command CHGIPLA
- Start Advanced Job Scheduler . . STRJS
 - o Reconfigure auto starting job QIJSSCD in subsystem QSYSWRK
- Start BRMS Network STRBRMSNET
 - o Rename subsystem Q1ABRMNET
- Control subsystem QCTLSBSD . . . QCTLSBSD
 - o Change system value QCTLSBSD with original subsystem name
- Restore JOBSCDE RSTJOBSCDE
 - o Restore scheduled jobs from SAVF FLASH4I/FLJOBSCD

The other changes must be recovered manually:

- Change the system name with command CHGNETA
- Change the communication lines resource name
- Remove the new IP address
- Remove the FLASH4I entry in host table

2.2.3 *Restoring a complete partition*

If a backup made on a Clone partition using Flash for i is to be used to restore a full partition (RESTORE21), then there are several scenarios to consider.

Restoring from a *SAVE or *BRMS type backup

In case a partition has been restored from a *SAVE or *BRMS backup, then part of the system configuration (on the Clone partition) has been changed before performing the backup.

After restoration, the configuration can be recovered using the FLRSTCFG command shown above.

Special considerations when restoring from a *SAVE21 or *BRMS21

In the case of a partition fully restored from a *SAVE21 backup type, there is no additional operation to do to recover the configuration. On the clone partition, nothing is changed on the configuration before to run the backup. The tape content is exactly the same as if the backup would have been done on the Production partition. The configuration changes on the clone partition are only made after the end of the backup to enable the transfer of history to the production partition.

In the case of a partition fully restored from a *BRMS21 backup type, the situation is the same, EXCEPT for the controlling subsystem name (system value QCTLSBSD) that must be changed. A limitation in BRMS prevents to change this value on the Clone partition before to run the SAVSYS.

Using Flash for i after restoration

Since the backup was made on a Clone partition, part of the product configuration was also changed to match the role of a Clone partition.

If the Flash for i product is to be used again on the restored partition, its role must be changed back to that of a Production partition. To do this, the FLCHGROL command must be used, with the following parameters:

```
FLCHGROL OLDROLE (*CLONE) NEWROLE (*PROD) CONFIRM (*NO)
```

2.3 Environment description

The 3 following elements are the base of a cloning configuration:

- A storage definition, containing every necessary information about virtual disks on the disk bay, and information to connect to the bay.
- A clone partition definition, containing every necessary information about the HMC and the Clone partition.
- An environment definition

The environment is the central element to be used for cloning and starting the required actions. It contains all the definitions required for the correct operation of Flash For i.

The environments are managed via the FLWRKENV command. See section "6.4 FLWRKENV, Work with Environment" for details on using this command.

2.3.1 Environment name

An environment is characterized by the following three items of information:

- Environment name
- Server serial number
- Partition number

When starting cloning (FLCLONE) or using the different available commands (FLSTRFC, FLSTRLPAR, etc.), only the environment name will be requested.

The other information (serial number and partition number) is compared with the information from the Production partition to determine which definition should be used.

This enables several definitions to be created with the same name but different characteristics (HMC and Storwize IP address, Power server name, etc.) for the infrastructures onto which a production partition can be migrated (by LVM for example) from one server to another or for infrastructures including high availability.

Example 1: Infrastructure with a single server

On a configuration with a single server, a single environment can be defined without specifying the serial number (*ANY) or partition number (0).

This environment definition will contain information from the HMC and Storwize.

Example 2: Infrastructure including a High-Availability server

In a configuration including 2 servers:

- A server containing the Production partition and whose disks are managed by Storwize A
- A server containing a backup partition and whose disks are managed by Storwize B
- Backup may be performed by a high-availability product or by Remote Copy from one Storwize to another.

In this case, 2 environments with the same name will be defined.

In the first one, the Production server serial number and IP address of Storwize A will be specified. In the second one, the Backup server serial number and IP address of Storwize B will be specified. In this way, if the backup plan is triggered, there will be no need to change the environment name in the automatic jobs that call the FLCLONE command. The Flash For i product will use the environment corresponding to the server on which the command is called.

2.3.2 Information about Ethernet card and TCP/IP

IP configuration

The IP configuration specified in the environment (address, mask, gateway) must enable the Clone partition to access the Production partition to transfer its information to it. The Production partition's IP address must be specified in the environment definition. This is necessary in order to be sure that the information is sent to the correct IP address. It also makes it possible, for example, to use an IP address on a dedicated virtual LAN that is only accessible to the 2 Production and Clone partitions.

Position of Ethernet port

The Flash For i product must be able to identify the Ethernet card that will be used to connect to the network. Precise information enabling it to be identified is therefore required. It is made up of 3 elements:

- Bus number
- Adapter number
- Port number

The method for finding these 3 elements is as follows:

Case 1: use of a virtual resource

A "virtual adapter" was defined on the HMC to define the Ethernet card:

Type	ID adaptateur	Partition serveur/client	Adaptateur partenaire
Ethernet	2	N/A	N/A

This adapter was defined with an "adapter ID"

In this case, the information will be:

- Bus = always the value 208
- Adapter = the adapter ID of the virtual resource
- Port = always the value 0

Case 2: use of a physical Ethernet card

Start the Clone partition for the first time, in manual mode, taking care to only start the console.

Once the command line is accessible, type the following command:

```
WRKHDWRSC *CMN
```

Find the resource that will be used for the Ethernet connection and type option 7

```

                                Display Resource Detail
                                System:      IT
Resource name . . . . . : CMN03
Text . . . . . : Ethernet Port
    
```



```
Type-model . . . . . : 268C-002
Serial number . . . . . : 00-00000
Part number . . . . . :

Location : U8286.41A.21F036V-V4-C2-T1

System card                2
Communications:
I/O bus                    208
Adapter                    2
Port                       0
```

Bottom

Then use the "page down" key to move to the end.

The sought information is in the "Communications" section:
Bus, Adapter and Port

2.3.3 Clone action at the end of the operation

It is important to define what will happen to the Clone partition once the scheduled operation (backup for example) is completed.

The partition can remain active so that the user can subsequently connect in order to search for specific information or check how the operations were performed. But this means that as the Clone partition is active, it is consuming power and memory and FlashCopy is still active, generating a (slight) increase in activity on the disk bay.

The following procedure is recommended:

- When implementing the product, leave the Clone partition active to enable manual verification during the initial runs
- Then, after several days of validation, change the parameters to stop the partition and FlashCopy automatically at the end of the operation.

The product enables these operations to be performed automatically. The following options are possible:

***KEEP:**

FlashCopy remains active and the Clone partition remains started.

This means that the partition can continue to be accessed after the scheduled operation has ended.

In general, only access via the console will be possible. This depends on the system configuration.

This option consumes power, memory and disk access resources.

***END_LPAR:**

The Clone partition will be stopped at the end of the operation but FlashCopy remains active.

This makes it possible to release processor- and Memory-type resources.

The partition data is kept. The partition can therefore be restarted by the user if required.

No specific action will be performed when restarting. The Clone partition will be started in near restricted mode (only the control subsystem and TCP/IP).

***END_FC:**

The Clone partition and FlashCopy will be stopped.

All the resources will be de-assigned.

All Clone partition data will be lost. It will no longer be possible to access it.

In all cases, when the FLCLONE command is next used, the Clone partition will be stopped and FlashCopy reinitialized to enable cloning.

2.3.4 Exit programs

Flash for i allows to use:

- 10 Exit programs in the environments
- 3 Exit programs in the reconfiguration definitions

These programs enable the user to integrate their own processing into certain key stages of cloning or when reconfiguring a clone partition.

The user is responsible for writing these programs and for their stability (ensure that they do not disrupt operations).

Those programs must accept one or two parameters.

The exit programs used in the environments (numbered from 1 to 9) must accept 1 parameter:

- 10 characters, that will contain the Environment name.

The exit programs used in the reconfiguration definitions (numbered from 11 to 13) must accept 2 parameters:

- 10 characters, that will contain the Environment name.
- 10 characters, that will contain the configuration definition name.

An Exit Program example associated to an environment is delivered with the product, in source file FLASH4I/FLEXAMPLES, source member EXAMPLE03.

These programs are triggered by the product at the following stages:

Programs associated to an environment

Exit program 1:

Used on Production Partition

Called just before FlashCopy is triggered.

Allows the user to put in place changes that will be taken into account by the Clone partition during its first IPL.

Exit program 2:

Used on Production Partition

Called just after FlashCopy is triggered.

Allows the changes made by Exit program 1 to be removed.

Exit program 3:

Used on Clone Partition

Called during the very first IPL.

Allows the user to place elements on the Clone partition that could be necessary during subsequent IPLs.

Exit program 4A:

Used on Clone Partition only in *BRMS or *BRMS21 type environments

Called just before the beginning of the BRMS control group.

Exit program 4B:

Used on Clone Partition only in *BRMS or *BRMS21 type environments

Called just after the end of the BRMS control group and before the transfer of QUSRBRM library to the Production.

Exit program 5:

Used on Clone Partition only in *BRMS or *BRMS21 type environments
Called just after the transfer of library QUSRBRM to the Production.

Exit program 6:

Used on Clone Partition only in *SAVE21 or *BRMS21 type environments
Called just after the end of restricted mode (restart of controlling subsystem FL_CLONE).

Exit program 7:

Used on Production Partition only in *BRMS or *BRMS21 environments
Called by job FL_AUTO (in subsystem FLASH4I) when the library QUSRBRM has been transferred from the Clone partition, before to restore this library.

Note that this program may be called several times if there are jobs locking files of library QUSRBRM.

Exit program 8:

Used on Production Partition only in *BRMS or *BRMS21 environments
Called by job FL_AUTO (in subsystem FLASH4I) after library QUSRBRM has been restored.
For example, this program can be used to start the BRMS maintenance.

Exit program 9:

Used on Production Partition
Called when the status END is reached by the cloning (*SAVE_END, *SAV21_END, *BRMS_END, *BRM21_END et *USER_END). This status indicates that the operation (bakup or partition preparation for type *USER) is finished on the Clone partition.

Programs associated to an environment**Exit program 11:**

Used on Clone Partition
Called during the very first IPL, after the Exit program 3.
Allows the user to place elements on the Clone partition that could be necessary before the automatic reconfiguration.

Exit program 12:

Used on Clone Partition
Called after the automatic reconfiguration process, and before to restore elements (if there are).
Allows the user to place elements on the Clone partition that could be necessary after the automatic reconfiguration.

Exit program 13:

Used on Clone Partition
Called after the end of restore elements.
Allows the user to place elements on the Clone partition that will use some of the elements that have been restored.

After this exit program Nb13 has been called, the following operations will be processed (if indicated in the definition):

- Send the last logs to the production partition
- Change the role of the partition (FLCHGROL)
- IPL

2.3.5 Checking operating times

When defining an environment, the maximum permissible time to achieve a specific status can be specified.

This makes it possible to check the following 2 times:

1/ The time between starting cloning and achieving the *RUN status on the Prod partition.

- This status is achieved when the Clone partition has responded the first time, just after starting.
- This check is available for *BRMS, *SAVE, *USER and *NEWCFG functions.
- For the *HOLD function, the Clone partition is not started automatically. There is therefore no reason for this check
- For the *BRMS21 and *SAVE21 functions, the Clone partition performs the backup directly, without changing the configuration. It does not therefore make initial contact before the end of the backup.

2/ The time between starting cloning and the end of operations on the Clone partition. The end of operations is characterized by reaching one of the following statuses:

- *BRMS_END Backup with BRMS ended. The partition remains active
- *BRM21_END Full system backup with BRMS ended. The partition remains active
- *SAVE_END End of specific backup. The partition remains active
- *SAV21_END Full save (SAVE21) ended. The partition remains active
- *USER_END End of specific processing. The partition remains active
- *NEWCF_END Clone partition has been reconfigured. The partition remains active
- *END_LPAR Processing ended on the Clone partition. Partition stop is requested, FlashCopy will remain active.
- *END_FC Processing ended on the Clone partition. Partition and FlashCopy stop were requested.

When estimating the time to enter for these 2 checks, the suggested operating procedure is as follows:

- Start by performing cloning several times to obtain a log with the times of each event
- Display the log with the FLDSPLOG command
- Search for the FLA0201 message (Cloning performed for the xxx environment) which indicates that Cloning has started, and make a note of the time of this message
- Search for the FLA1101 message (automatic controller start-up) from the Clone partition.
 - o The transfer of data from Clone to Production starts approximately 1 minute after this message.
 - o The time elapsed since the start of cloning corresponds to the time indicated for the first check.
- Search for the FLA0910 message (Change of status: xxx) from the Clone partition, which indicates the transition to one of the statuses defining the end of the operation (See list above).
 - o The time elapsed since the start of cloning corresponds to the time specified for the second check.
- In all cases, several minutes need to be added to the time allocated for the check to allow for minor variations in operation times.

These times are checked by the FLASH4I subsystem jobs. This must therefore be constantly started-up.

If the time is exceeded, the following messages are generated:

Message ID	Severity	Message text
FLA0530	40	The Clone partition did not start within the specified time. Env = &1
FLA0531	40	The Clone partition did not end within the specified time. Env = &1

2.4 The different operating steps

The progress of operations can be tracked using status, which are automatically modified by the product (cloning request, initial Clone start-up, start and end of backup, etc.). But status change information can also be changed by the user on the Clone partition, using the FLUPDSTS command.

2.4.1 Available statuses

On the Clone partition, the status is usually automatically changed by the product, but the FLUPDSTS command can be used to indicate the step the product is performing. This status or step will be automatically transferred to the production partition, where it will be visible with commands FLDSPHST and FLDSPSTS.

The available statuses are as follows:

Specific status for *HOLD type environment

- *HOLD The *HOLD function has been requested. The Clone partition will not be started by the Flash For i product.

Status indicating the beginning of cloning

- *INIT Process initialization.
- *STR_FC FlashCopy started
- *STR_LPAR Clone partition starting
- *FIRST_STR First IPL of the clone partition. The first messages have been transferred to the Production partition.

Intermediate status

- *BRMS_TFR Backup with BRMS in completed. Logs transfer in progress

Status indicating that the Backup or *USER function are running

- *BRMS Backup with BRMS in progress
- *BRM21 Full system backup with BRMS in progress
- *SAVE Backup using a user program in progress
- *SAV21 Full system save (SAVE21) in progress
- *USER Specific processing managed by the User
- *NEWCFG Reconfiguration of Clone partition

Status indicating that the Backup or *USER function are finished

- *BRMS_END Backup with BRMS ended.
- *BRM21_END Full system backup with BRMS ended.
- *SAVE_END Backup using a user program ended.
- *SAV21_END Full system save (SAVE21) ended.
- *USER_END End of specific processing.
- *NEWCF_END End of reconfiguration of Clone partition

Status indicating that the Clone Partition role has changed

- *CHG_PROD The Clone partition role has changed (command FLCHGROL). The partition is now independent from the Production partition (from a Flash for I product point of view) and will no more send messages or history to the production. New clones can be created based on this partition.
- *CHG_NONE The Clone partition role has changed (command FLCHGROL). The partition is now independent from the Production partition (from a Flash for I product point of view) and will no more send messages or history to the production.

Status indicating that the Clone partition or Flashcopy are stopped

- *END_LPA_W Processing ended on the Clone partition. Partition stop is requested, FlashCopy will remain active.
- *END_LPAR Processing ended on the Clone partition. Partition is stopped, FlashCopy will remain active.

- *END_FC_W Processing ended on the Clone partition. Partition and FlashCopy stop were requested.
- *END_FC Processing ended on the Clone partition. Partition and FlashCopy are stopped.

Miscellaneous Status

- *ERROR An error occurred on the Clone partition

2.4.2 Changing statuses for the *BRMS function

For the *BRMS function (specified in the environment definition), processing is fully handled by Flash For i. The user does not need to intervene. The list below is therefore given for information purposes only.

- Start cloning with the FLCLONE command on the Production partition
 - o Automatic transition to *STR_LPAR status
- First Clone partition start-up
 - o Automatic transition to *FIRST_STR status
 - o Configuration of the partition is changed partition (Hold scheduled jobs, add new IP address, reconfigure tape units, ...)
 - o Exit program 3 is called
 - o If the system name has been changed, a second IPL is done
 - o The Clone partition contacts the production partition and starts to send information to it
 - o Check that the time difference is less than 5 minutes between Clone and production partition
 - o Automatic transition to *BRMS status
- The following statuses are used on the Clone partition:
 - o *BRMS, Start of *BRMS function processing
 - o *BRMS, TCP/IP start-up
 - o *BRMS, automatic controller start-up
 - o Exit program 4A is called
 - o *BRMS, INZBRM *FLASHCOPY *STRBKU command
 - o If defined in the environment, System is placed in restricted mode
 - o *BRMS, Start backup with BRMS
- When backup is completed
 - o Exit program 4B is called
 - o *BRMS, INZBRM *FLASHCOPY *ENDBKU command
 - o *BRMS, TCP/IP restart
 - o If IBM product ICC is installed, wait for the last volume to be transferred to the Cloud
 - o *BRMS_TFR, QUSRBRM library backup (and QUSRICC if product installed)
 - o *BRMS_TFR, QUSRBRM library transfer (and QUSRICC if product installed)
 - o Exit program 5 is called
 - o Data about journal receivers are collected
 - o End of backup with BRMS on Clone partition
- FLUPDSTS and FLADDLOG commands can be added by the user to the BRMS control group to add intermediate messages relating to operation progress. These messages will be sent to the production partition.
- On the Production partition, the QUSRBRM (and eventually QUSRICC) library is received.
 - o Exit program 7 is called
 - o Check that library QUSRBRM (and eventually QUSRICC) is not used
 - If it is used, wait 1 minute, then go back to previews step (Exit 7)
 - After the number of tries indicated in the environment, the jobs using QUSRBRM are ended.
 - o Restore QUSRBRM (and eventually QUSRICC) library
 - o Exit program 8 is called
 - o *BRMS, Re-establishment of BRMS after FlashCopy performed
 - o *BRMS_END, End of backup with BRMS
 - o Exit program 9 is called on Production partition
- According to the environment configuration ("Clone action at end of operation " parameter) the partition and/or FlashCopy can be stopped. This operation is performed by the FLASH4I subsystem.

- *KEEP: FlashCopy and the partition remain active. The clone partition remains active without any job.
- *END_LPAR: The partition is stopped but FlashCopy remains active. The partition can be manually restarted by the user if required.
- *END_FC: The partition and FlashCopy are stopped. Access to this partition is no longer possible.

Note: If the if the partition has been places into restricted mode, the transfer of status and messages to the Production partition depends on the value of “Real time logs transfer” in the environment definition.

- If value is *NO, the first messages telling that the clone partition has started will be sent from Clone to production, then no more message will be sent before the end of the backup. The cloning status will remain *STR_LPAR or *BRMS until the backup is finished.
- If value is *YES, messages and status will be sent to the Production at every important step (after first IPL, before and after tape initialization, after every step in the control group, and at the end of the backup)

2.4.3 Changing statuses for the *BRMS21 function

For the *BRMS21 function (specified in the environment definition), processing is fully handled by Flash For i. The user does not need to intervene. The list below is therefore given for information purposes only.

The user is responsible to use a BRMS control group that will operate a Full system backup. No other operation must be performed by the control group (specifically no subsystem start).

- Start cloning with the FLCLONE command on the Production partition
 - Automatic transition to *STR_LPAR
- First (and only) Clone partition start-up.
 - Automatic transition to *FIRST_STR status
- The job that will perform the SAV21 is submitted to the control subsystem
 - Automatic transition to *BRM21 status
 - System configuration of the partition is returned to identical to production, Except the system value QCTLSBSD (limitation in BRMS)
 - If the parameter “Real time logs transfer” is set to *YES, an IP address is configured
 - Reconfigure tape units
 - Exit program 3 is called
 - Exit program 4A is called
 - INZBRM *FLASHCOPY *STRBKU command
 - System restricted mode request
 - *BRMS, Start backup with BRMS
- When backup is completed
 - Configuration of the partition is changed (Hold scheduled jobs, add new IP address, reconfigure tape units, ...)
 - Exit program 4B is called
 - INZBRM *FLASHCOPY *ENDBKU command
 - Restart TCP/IP
 - The Clone partition contacts the production partition and starts to send information to it
 - Check that the time difference is less than 5 minutes between Clone and production partition
 - If IBM product ICC is installed, wait for the last volume to be transferred to the Cloud
 - *BRM21_TFR, QUSRBRM library backup (and QUSRICC if product installed)
 - *BRM21_TFR, QUSRBRM library transfer (and QUSRICC if product installed)
 - Exit program 5 is called
 - Exit program 6 is called
 - Data about journal receivers are collected
 - End of backup with BRMS on Clone partition
- FLUPDSTS and FLADDLOG commands can be added by the user to the BRMS control group to add intermediate messages relating to operation progress. These messages will be sent to the production partition.

- On the Production partition, the QUSRBRM (and eventually QUSRICC) library is received.
 - o Exit program 7 is called
 - o Check that library QUSRBRM (and eventually QUSRICC) is not used
 - If it is used, wait 1 minute, then go back to previews step (Exit 7)
 - After the number of tries indicated in the environment, the jobs using QUSRBRM are ended.
 - o Restore QUSRBRM (and eventually QUSRICC) library
 - o Exit program 8 is called
 - o *BRM21, Re-establishment of BRMS after FlashCopy performed
 - o Automatic transition to *BRM21_END status
 - o Exit program 9 is called on Production partition
- According to the environment configuration ("Clone action at end of operation " parameter) the partition and/or FlashCopy can be stopped. This operation is performed by the FLASH4I subsystem.
 - o *KEEP: FlashCopy and the partition remain active. The clone partition remains active without any job.
 - o *END_LPAR: The partition is stopped but FlashCopy remains active. The partition can be manually restarted by the user if required.
 - o *END_FC: The partition and FlashCopy are stopped. Access to this partition is no longer possible.

Note: The transfer of status and messages to the Production partition depends on the value of "Real time logs transfer" in the environment definition.

- If value is *NO, the first messages telling that the clone partition has started will be sent from Clone to production, then no more message will be sent before the end of the backup. The cloning status will remain *STR_LPAR or *BRMS until the backup is finished.
- If value is *YES, messages and status will be sent to the Production at every important step (after first IPL, before and after tape initialization, after every step in the control group, and at the end of the backup)

2.4.4 Changing statuses for the *SAVE function

For the *SAVE function (specified in the environment definition), processing will be as decided by the user. But the partition status is automatically managed by the product.

The recommended use is as follows:

- Start cloning with the FLCLONE command on the Production partition
 - o Automatic transition to *STR_LPAR
- First Clone partition start-up
 - o Automatic transition to *FIRST_STR status
 - o Configuration of the partition is changed partition (Hold scheduled jobs, add new IP address, reconfigure tape units, ...)
 - o Exit program 3 is called
 - o If the system name has been changed, a second IPL is done
 - o The Clone partition contacts the production partition and starts to send information to it
 - o Check that the time difference is less than 5 minutes between Clone and production partition
 - o Automatic transition to *SAVE status
 - o If defined in the environment, System is placed in restricted mode
 - o Call of program provided by the user in the environment
- The FLADDOG command can be used to add information messages about the progress of operations. These messages will be sent to the production partition.
- At the end of user program, when all the operations have been completed
 - o TCP/IP restart
 - o Data about journal receivers are collected
 - o Automatic transition to *SAVE_END status
 - o Exit program 9 is called on Production partition
- According to the environment configuration ("Clone action at end of operation " parameter) the partition and/or FlashCopy can be stopped. This operation is performed by the FLASH4I subsystem.

- *KEEP: FlashCopy and the partition remain active. The clone partition remains active without any job.
- *END_LPAR: The partition is stopped but FlashCopy remains active. The partition can be manually restarted by the user if required.
- *END_FC: The partition and FlashCopy are stopped. Access to this partition is no longer possible.

2.4.5 Changing statuses for the *SAVE21 function

For the *SAVE21 function (specified in the environment definition), processing is fully handled by Flash For i. The user does not need to intervene. The list below is therefore given for information purposes only.

- Start cloning with the FLCLONE command on the Production partition
 - Automatic transition to *STR_LPAR
- First (and only) Clone partition start-up.
 - Automatic transition to *FIRST_STR status
- The job that will perform the SAV21 is submitted to the control subsystem
 - Automatic transition to *SAV21 status
 - System configuration is returned to identical to production
 - If the parameter "Real time logs transfer" is set to *YES, an IP address is configured
 - Reconfigure tape units
 - Exit program 3 is called
 - Call program to get volume or volumes name if *EXITPGM is defined in the Environment
 - Tape initialization (if asked in the environment)
 - *SAV21, System restricted mode request
 - *SAV21, System in restricted mode. Start of SAVSYS
 - SAVSYS command performed
 - SAVLIB *NONSYS command performed
 - SAVDLO *ALL command performed
 - SAV (/*) command performed
 - If iASP have been defined in the environment, they are varied on and saved
- Partition reconfiguration to be able to send data to Production
 - Configuration of the partition is changed (Hold scheduled jobs, add new IP address, reconfigure tape units, ...)
 - The Clone partition contacts the production partition and starts to send information to it
 - Check that the time difference is less than 5 minutes between Clone and production partition
 - Exit program 6 is called
 - Data about journal receivers are collected
 - Automatic transition to *SAV21_END status
 - Exit program 9 is called on Production partition
- According to the environment configuration ("Clone action at end of operation " parameter) the partition and/or FlashCopy can be stopped. This operation is performed by the FLASH4I subsystem.
 - *KEEP: FlashCopy and the partition remain active. The clone partition remains active without any job.
 - *END_LPAR: The partition is stopped but FlashCopy remains active. The partition can be manually restarted by the user if required.
 - *END_FC: The partition and FlashCopy are stopped. Access to this partition is no longer possible.

Note: If the if the partition has been places into restricted mode, the transfer of status and messages to the Production partition depends on the value of "Real time logs transfer" in the environment definition.

- If value is *NO, the first messages telling that the clone partition has started will be sent from Clone to production, then no more message will be sent before the end of the backup. The cloning status will remain *STR_LPAR or *SAV21 until the backup is finished.
- If value is *YES, messages and status will be sent to the Production at every important step (after first IPL, before and after tape initialization, after every step in the backup, and at the end of the backup)

2.4.6 Changing statuses for the *USER function

For the *USER function (specified in the environment definition), a part of processing will be done by the product, but most of them must be decided by the user.

FLUPDSTS and FLADDLOG commands can be added by the user to his program to add intermediate messages relating to operation progress. These messages will be sent to the production partition.

- Start cloning with the FLCLONE command on the Production partition
 - o Automatic transition to *STR_LPAR status
- First Clone partition start-up
 - o Automatic transition to *FIRST_STR status
- The job that will perform the function is submitted to the control subsystem
 - o Automatic transition to *USER status
 - o If the parameter "Reconfig LPAR Flash for i" is set to *YES, Configuration of the partition is changed (Hold scheduled jobs, add new IP address, reconfigure tape units, ...)
 - o Start TCP/IP
 - o Exit program 3 is called
 - o If the parameter "Restricted mode" is set to *YES, System is placed in restricted mode
 - o Call of program provided by the user in the environment in parameter "Reconfig LPAR user" to reconfigure the partition
 - o Change the control subsystem (QCTLSBSD) and startup program (QSTRUPPGM)
 - o Data about journal receivers are collected
 - o Automatic transition to *USER_END status
 - o Change the role of the Clone partition
 - o If the parameter "IPL after set up" is set to *YES, IPL the partition
- At the end of processing, when all the operations have been completed
 - o If the Clone partition has to remain active (Value *KEEP in the environment) the clone partition remains active without any active job.
 - o If the partition and/or FlashCopy need to be stopped, Clone partition and FlashCopy end will be automatically triggered from the Production partition.

2.4.7 Changing statuses for the *NEWCFG function

For the *NEWCFG function (indicated in the environment definition), the goal is to change the configuration of the Clone partition so that it has another role, often with a longer duration of activity than for a backup (a few days to a few months).

The FLWRKCFG* commands are used to define the future configuration.

It is possible to add 3 Exit programs (11, 12 and 13) to perform more specific operations that would not be automatically supported.

The FLUPDSTS and FLADDLOG commands can be added by the user in his program to add intermediate messages about the progress of the operations. These messages will be transmitted to the production partition.

- Start cloning with the FLCLONE command on the Production partition
 - o Automatic transition to *STR_LPAR status
- First Clone partition start-up
 - o Automatic transition to *FIRST_STR status
- The job that will perform the function is submitted to the control subsystem
 - o Control the license key of the reconfiguration module
 - o Automatic transition to *NEWCFG status
 - o If the parameter "Restricted mode" is set to *YES, System is placed in restricted mode
 - o Change the configuration part to allow to start TCP/IP securely (Hold scheduled jobs, TCP/IP configuration, reconfigure tape units, ...)
 - o Exit program 3 is called

- Exit program 11 is called
- Start TCP/IP if not in restricted mode
- Change other elements of configuration
- Exit program 12 is called
- Restore user profiles defined in FLWRKCFGUS
- Restore libraries defined in FLWRKCFGLI
- Restore directories defined in FLWRKCFGDI
- Exit program 13 is called
- Start TCP/IP
- Update time
- Automatic transition to *NEWCF_END status
- Change the role of the Clone partition
- If the parameter "IPL after set up" is set to *YES, IPL the partition
- At the end of processing, when all the operations have been completed
 - If the Clone partition has to remain active (Value *KEEP in the environment) the clone partition remains active without any active job.
 - If the partition and/or FlashCopy need to be stopped, Clone partition and FlashCopy end will be automatically triggered from the Production partition.

2.4.8 Changing statuses for the *HOLD function

For the *HOLD function (specified in the environment definition), the Clone partition will not be automatically started and no infrastructure is put in place by Flash For i to carry out status changes.

This means that if the Clone partition is started, even if the FLUPDSTS command is given, the status will not be sent to the Production partition.

2.5 Use of independent ASP (iASP)

The Flash For i product allows users to use iASP at 3 places :

- During the Quiesce function (flush memory to disk), the CHGASPACT command is systematically called for each iASP entered in the Environment definition, then for System ASP (*SYSBAS).
- During the Clone partition IPL, the defined iASP are automatically varied on
- If function *SAVE21 is selected in the environment, then the defined iASP will be saved, with the same logic used in the system SAVE21 function.

The *SAVE21 function will automatically save the iASP defined in the environment. For the other functions, (*BRMS, *BRMS21 and *SAVE) It is the user's responsibility to ensure the content of the iASP will be effectively saved.

If an iASP is varied off while using the FLCLONE command, the quiesce will not be realized for this iASP, but it will be taken by the SAVE21 function (if this function is used).

If an iASP is part of a cluster and is in used by an other partition, it will be considered as varied off by the partition running the FLCLONE command. When the Clone partition will start, the vary on of the iASP will be done as an abnormal IPL, and the files that were open at the time of FLCLONE command will have an automatic access path rebuild

It is possible to define up to 30 iASP in an environment. The standard screen definition displays only 3 iASP names. Press F10 to see/change the list of 30 iASP.

If the production partition has more than 30 iASP, or if at least one iASP of the production partition is not defined in the environment, then the quiesce function will not be done for those not defined iASP, they will not be varied on during the IPL of the clone partition, and they will not be saved by the *SAVE21 function.

If the production partition has no iASP, leave the value *NONE for the 30 iASP name in the environment definition.

2.6 Quiesce the memory, function CHGASPACT

The notion of Single Level Storage used by the IBM i system means that the user never knows whether the data is in the memory or on disk. Before copying the disks (with the FlashCopy function or the Snapshot), it is important to ensure that data located in the memory is copied onto disk.

This operation is performed by the CHGASPACT command (also known as Quiesce).

The operation is automatically performed by Flash For i when using FLCLONE and FLSTRFC commands on the *SYSBAS ASP, and on all iASPs whose name is indicated in the environment definition.

The choice of the method to perform the Quiesce is indicated in the environment definition and correspond to the OPTION parameter of the CHGASPACT command. The 2 possible values are *FRCWRT and *SUSPEND.

In both cases, the data for the specified ASP will be written to disk. This refers to data that has been written by the programs, but which the system has not yet copied to disk.

*FRCWRT

The data for the specified ASP will be written to disk.

The ASP will remain active during this operation. That is, there is no impact on the users' jobs.

This option can be used without stopping any job.

*SUSPEND

The data related to the specified ASP will be written to disk.

ASP activity will be interrupted, and all jobs attempting to write data to disk will be suspended. They will resume to normal activity as soon as all data has been written to disk.

Only jobs running a program with Commitment control remain active to allow them to complete their validation cycle. A timeout (in seconds) indicates the maximum time that these jobs are allowed to complete their transactions. At the end of the timeout, the quiesce ends even if transactions are still in progress.

In the big majority of cases, the *FRCWRT option is sufficient.

In all cases, it is strongly advised to use the FLCLONE command at a time when there is the least possible activity on the Production partition. Either by having stopped all jobs beforehand, or at a time when there are very few users who could write to the database.

The option *SUSPEND is only supported for IBM disks arrays Storwize, FlashSystem and SVC. It is not supported for the other types of disks arrays.

2.7 Automatic operations: FLASH4i subsystem

The FLASH4i subsystem must be active on both partitions (Production and Clone) in order to handle the various automated components the product requires.

It contains an automatic start-up job (FL_AUTO) which will perform these operations.

If the email alert module has been configured, the FL_ALERT job is also present, and supports this part.

The following commands are used to manage it:

FLSTRSBS	Start the subsystem
FLEND SBS	End the subsystem
FLCHKSBS	Check if the subsystem and job it contains are active

The FL_AUTO and FL_ALERT jobs are executed under the FL_USER user profile which is created during installation.

This profile can be changed by specifying its name in the parameters (see FLPARAM command). The specified profile must have a password and be active.

The FL_AUTO job performs the following functions:

- On the Production partition:
 - o Receives messages from the Clone partition
 - o Receives and updates the Clone partition status
 - o Updates the Production partition status
 - o Checks operation execution times
 - o Receives and restores the BRMS log
- On the Clone partition
 - o Sends messages to the Production partition
 - o Checks the presence of jobs in MSGW status

The FL_ALERT job performs the following functions:

- On the Production score:
 - o Searches for new Flash For i errors
 - o Sends emails in case new errors have been found
 - o Sends an email when a new status occurs for a cloning.

2.7.1 Check that operations are not too long

In the environment definition, the maximum permissible time for 2 important steps can be specified:

- The time between starting cloning and the retrieval of the first messages from the Clone partition
- The time between starting cloning and the end of the operation on the Clone partition

These checks are performed by the FLASH4I subsystem

If one of these time limits is exceeded, an error message is generated in the log

The FLDSPLOG command displays these error messages

The FLCHKLOG command can be used in an automatic check (in a monitoring tool such as Nagios for example) to generate an alert.

2.7.2 Check jobs with errors on the Clone

On the Clone partition, the automated component will check for jobs with errors at regular intervals, i.e. in MSGW status.

An error message will be generated for each job in MSGW status found. This will be sent to the Production partition.

It is therefore possible to know from the Production partition whether a problem has occurred on the Clone partition.

The FLDSPLOG command displays these error messages

The FLCHKLOG command can be used in an automatic check (in a monitoring tool such as Nagios for example) to generate an alert.

This check is automatic and does not require any configuration.

2.8 The FL_CLONE subsystem

The FL_CLONE subsystem is supplied with the product.

It is used on the Clone partition as a start-up subsystem.
For the product to function correctly, it is recommended that this subsystem is not changed.

The FL_CLONE subsystem has never to be started on Production partition.

2.9 The information coming from the Clone partition

The goal of the Flash For i product is to move a part of the exploitation to a Clone partition, in order to gain available time for the production partition. But the disks of Clone partition will be erased and reused every day. It is then important that a maximum of information generated on the Clone partition are transferred to the Production partition. To do that, several mechanisms are used:

2.9.1 Internal log of the product

The product generates an internal log for every operation.
Every message generated on the Clone partition is automatically transferred to the production partition.
Use the command FLDSPLOG to see this log.

2.9.2 System log of the Clone partition

The system Log (DSPLOG command) generated on the Clone partition is automatically transferred to the Production partition.
Use the command FLDSPHST to see this system log.

2.9.3 Information of BRMS and ICC

When the Environment type is *BRMS or *BRMS21, all information managed by BRMS on the Clone partition are automatically transferred to the Production partition at the end of the backup. That information is available with usual BRMS command on the Production partition.

- Library QUSRBRM
- Directory /tmp/brms and/or /QIBM/UserData/BRMS/logs

If the IBM product 5733-ICC "IBM Cloud Storage Solutions for I" is installed, the library QUSRICC containing this product data will be transferred and restored too.

2.9.4 Joblog of the Backup job

When the backup is finished on the Clone partition, the Job log of the job that realized the backup is generated on a spool file, and transferred to the production partition in OUTQ FLASH4I.

In the FLMENU menu, option 5 can be used to access to this OUTQ.

In the command FLDSPHST, option 8 on the line corresponding to the cloning displays this spool.

2.9.5 FLCPYOBJ command

The FLCPYOBJ command can be used on the Clone partition to transfer object with type *FILE, *DTAARA and *OUTQ, or an entire library.

2.9.6 Real time logs transfer

This option defined in the environment allows to send information from Clone partition to Production partition at certain steps when the Clone partition is in restricted mode.

The transferred elements are:

- Internal product log
- System log of the Clone partition
- The BRMS steps are included in the internal log.

The information is transferred at the following steps:

- Before beginning of restricted mode
- Before beginning of BRMS control group, or beginning of backup if *SAVE21
- For *BRMS and *BRMS21, after each item from the control group
- For *SAVE21, after each backup command
- At the end of the backup

ATTENTION:

For *BRMS21 and *SAVE21 environments, it is necessary define a minimum configuration for TCP/IP to enable the real time transfer. The configuration saved will be exactly the same as the production partition's one, except:

- Resource name of every communication line changed
- A new Ethernet line ETHFLASH created
- A new IP address defined for the clone partition
- A new entry FLASH4I added in the host table

No other element is changed.

2.9.7 Unavailability of the production partition

Sometimes the production partition is stopped, for example to perform exceptional maintenance or a weekly IPL.

If a clone partition is active during this period, it cannot send any information to production, and this generates the following error messages:

FLA6012	Error while transferring the product state to the system xxx
CPE3447	A remote host did not respond within the timeout period.
FLA6011	Error while transferring a message to the system xxx
CPE3447	A remote host did not respond within the timeout period.

To avoid these error messages, it is possible to define time periods during which the production partition will be unavailable. No information will be sent from the clone partition, which avoids unnecessary error messages.

Use the FLPARAM command, then select the PLANNING parameter to define these time slots.

It is possible to define a regular time slot occurring every week, or to indicate one or more specific dates.

This entry must be made before to start the cloning.

Attention, during this period, no information will be sent from the clone partition. So, the monitoring commands from the production partition will appear frozen until the end of the defined period.

This concerns the status and messages, but also the QUSRBRM library, or the email module.

At the beginning of an unavailability period, the following message will indicate that no information will come from the clone partition and will give the expected end date and time.

FLA2320	PLANNING: Production partition unavailable until &1 to &2.
---------	--

2.10 Role change of a clone partition

When a clone partition is only used to run backups, it permanently remains with a role of “clone”, until it is stopped, then started again for backups the next day.

But it is possible to use the Clone partitions for other purposes than backups. For example, it can be used for:

- Use as a test partition, with data actualized from the production partition
- Get frozen production data, which will not change for a few hours, to feed a Data Warehouse
- Get real and new production data to anonymize them, then clone the partition again to get test partitions.
- And many other cases.

In those cases, the clone partition may keep its role of “clone” (history will continue to be transferred to the production partition, and it will not be possible to create other clones from itself) or change its role.

This role only applies to the Flash for I product.

2.10.1 Keep a role of “Clone”

The clone partition remains in its role of clone; That is, it continues to send logs to the Production partition (the one from which it was cloned).

This is usually the case for temporary clone partitions, used to perform backups, for example, or regenerated every day.

2.10.2 Change the role to *NONE

The Clone partition will stay active longer (from a few days to several months). It is therefore useless for it to continue sending logs to the Production partition.

The *NONE role breaks the link between the 2 partitions. The clone partition is now autonomous. It no longer sends history to the original Production partition.

When a partition has taken the *NONE role, it is not possible to use the FLCHGROL command again to change the *PROD role or return to the Clone role. If this was necessary, the Flash for i product should be reinstalled.

Example of use:

The Production partition was cloned to provide the software management team access to a partition containing the updated production data, with the aim of performing tests over a period of a few weeks. Once created and its configuration modified, the new test partition does not need to continue sending its logs to the Production partition.

2.10.1 Change the role to *PROD

The Clone partition must be used to serve as a base for generating other clones. It must therefore change its role to become Production partition (regarding the product Flash for i only).

The *PROD role breaks the link between the 2 partitions. The clone partition is now autonomous. It can be used to create other clone partitions using the Flash for i product.

When a partition has taken the role *PROD, it is not possible to use again the command FLCHGROL to modify the role in *NONE or to return to the role of Clone.

Example of use:

The IT department needs a partition containing data close to the production data, but this data must be anonymized to be in good standing with the GDPR.

The production partition will be cloned once.

On the Clone partition, a process will anonymize the entire contents of the database. This treatment is usually resource intensive.

Then it is this partition containing anonymized data that will be cloned again to generate one or more test partitions.

2.11 Specific information about BRMS

2.11.1 Warning about the use of BRMS

When the system is in FlashCopy mode, a BRMS synchronization job will not run on the production system. BRMS activity should not be performed on the production system until all steps in post FlashCopy steps are completed.

Any update to the BRMS database on the production system via any BRMS activity such as save, restore, BRMS maintenance will be lost.

When the system is in FlashCopy state, all BRMS incoming communication from the BRMS networked system will be blocked.

BRMS backup information about the current system might be outdated when backup is being performed on the clone system.

Source: https://www.ibm.com/support/knowledgecenter/ssw_ibm_i_71/brms/flashcpy.htm

PTF

It is also imperative not to apply PTFs on BRMS if a backup is in progress in a Clone partition.

The PTFs applied could modify some tables of the QUSRBRM library on the production.

When restoring this library from the Clone partition, old versions of these tables would be restored.

Before restoring the QUSRBRM library to the production partition, Flash for i checks that the BRMS tables have the same format as those from the clone partition. If there is a difference, the QUSRBRM library will not be restored and the error message FLA2271 will be added in the log.

2.11.2 BRMS control groups

Backup on the Clone partition will be performed using a control group.

Existing control groups do not need to be modified for use with Flash for i. But it is important to observe the following few rules:

- It should contain only the backup commands, or commands that will be executed on the Clone partition.
- It must not start a sub-system that activates a function that should only be found on the Production side.
- It must not stop the partition at the end of the backup. This would prevent the transfer of QUSRBRM to production.

2.11.3 BRMS Network option

The BRMS Network option (product 5770BR1, option 1: "BRMS - Network Feature" is not mandatory.

If it is installed, the configuration as described in chapter "3.7 Authorize the *FLASHCOPY function in BRMS" must be carried out.

When starting the cloning (FLCLONE or FLSTRFC command), the BRMS status is changed to *STRPRC for FlashCopy. This state can be seen by using the following commands:

```
WRKPCYBRM TYPE(*SYS)
```

Option 4

Information at the top of the page :

```
FlashCopy state . : *STRPRC
```

When the FlashCopy status is *STRPRC, the Q1ABRMNET subsystem is automatically stopped. It must not be restarted.

It will be automatically restarted after the QUSRBRM library is restored from the Clone partition, and returning the FlashCopy state to *ENDPRC.

2.11.4 Starting BRMS maintenance

BRMS maintenance must be performed on the Production partition after the *BRMS_END or *BRM21_END status has been reached. If it is done before, the data it has modified will be overwritten by restoring the QUSRBRM library.

It is possible, for example, to trigger maintenance by the Exit 9 program, which will be automatically called when the *BRMS_END or *BRM21_END state is reached.

2.11.5 Product 5733-ICC IBM Cloud Storage Solutions for i

The IBM 5733-ICC product "IBM Cloud Storage Solutions for i" is a product associated with BRMS that allows volumes to be exported to the Cloud, or to an FTP server.

Flash for i is compatible with this product.

Backups can be performed on the Clone partition with BRMS, and then the volumes exported to the Cloud from the Clone partition.

At the end of the BRMS backup, Flash for i waits until all volumes have been transferred to the Cloud before considering the backup complete.

The data for this product is stored in the QUSRICC library.

If it is present, it will be automatically transferred to the Production partition at the same time as QUSRBRM.

2.11.6 Transferring and restoring QUSRBRM

The QUSRBRM library (and possibly QUSRICC) should not be used on production until it has been restored. BRMS commands should therefore not be used.

The data it contains may be obsolete because

- The data related to the backup made on the Clone partition is not yet available.
- The BRMS network being stopped, the data from the other partitions are not valid.

At the end of the backup on the Clone partition, the QUSRBRM library (and QUSRICC eventually) will be automatically sent to the production partition, and restored.

Before restoring the library, the Flash for i product will check that it is not in use. If it is:

- Error messages will be sent to the Flash for i internal log,
- For interactive jobs, a break message will be sent to the workstation

After a certain number of attempts (configurable), the jobs using it will be stopped.

During a *BRMS or *BRMS21 backup, the contents of the QUSRBRM library are backed up on the clone partition, transferred to the production partition, and then restored.

To reduce the size of the backup, and thus the transfer time, the access paths are not saved by default.

Once the QUSRBRM library is restored, the system will automatically recreate these access paths.

In the case of large BRMS files, this operation can use a lot of CPU, and have a bad effect for users.

The QUSRBRM parameter is used to tell the product to save the access paths before transferring them to Production.

As a result, if *YES is entered, the transfer time will be longer, but there will be no more CPU overhead on Production after restoration.

2.11.7 Reserving volumes (medias) for a partition

If the media class used by the control group is shared by several partitions, there is a risk that the Clone partition will choose a volume, and another partition in the BRMS network will choose the same volume. The following operating procedure explains why.

When the Clone partition is IPLed, the BRMS network is disabled (the subsystem is renamed, to make sure it does not start). So when the Clone partition is active, it has no way of knowing the volumes movements made by the other partitions.

To avoid this problem, it is better to

- Either define different media classes for each partition
- Or dedicate a certain number of volumes to a specific partition if it uses Flash for i for its backups with the STRBALBRM command.

The STRBALBRM command must be used long enough before the FLCLONE so that the BRMS network has time to propagate the information to other partitions.

2.11.8 If the library QUSRBRM is very large

If a large amount of historical data is stored in BRMS, the QUSRBRM library can use a lot of disk space. This is not really an issue, except that at the end of the backup on the Clone partition, transferring and then restoring QUSRBRM can take a very long time.

An option in the environment definition (on the last definition screen) allows you to choose to delete the history.

If the transfer time is not a problem for the operation, it is strongly advised to leave the default values, and to keep the BRMS history.

If the transfer time is a real problem for the operation, the option to delete the logs can have a significant effect on the transfer time.

Example found for the size of the QUSRBRM library:

- With logs: 1.8 TB
- Without logs: 34 GB

By specifying *YES for the "reduce BRMS history size" setting, some files containing BRMS histories will be cleared on the Clone partition before the backup is performed.

This only affects 10 files where information is simply added by BRMS. The list of affected files is shown below.

Translated with www.DeepL.com/Translator (free version)

QA1ADI	BRMS - Directory Detail
QA1ADI2	BRMS - Directory Detail (Unicode)
QA1AFD	BRMS - Folder Save History
QA1AHS	BRMS - Save History Details
QA1ALG	BRMS - Log Information
QA1ALI	BRMS - QIFS link data
QA1ALI2	BRMS - QIFS link details (Unicode)
QA1AMB	BRMS - Save History - Save Statistics by Object
QA1AOD	BRMS - Object Detail
QA1AZCG	BRMS - Control groups status

These tables contain the BRMS log messages, and the list of backed up objects or directories.

All data prior to the current backup will be cleared.
Only the information corresponding to the current backup will be present on the Clone partition.

The consequences are as follows:

- On the Clone partition, only the historical data (BRMS log, list of backed up objects or directories, ...) of the current backup will be present.
- On the backup tape, only today's history will be present. Older logs will not be present.
- On the Production partition, historical data are not deleted. When the QUSRBRM library is returned, today's history data will be added to the current history data. There is therefore no difference on the Production partition. All BRMS data will be identical to normal operation

Tip:

When using this option, it is strongly advised to set up a parallel backup of the QUSRBRM library. For example, during the day, on the Production partition, back up the QUSRBRM library to a SAVF.

2.11.9 Parallel backups with BRMS

In some cases, the backup takes too long to be performed on a single drive. It becomes necessary to perform backups in parallel on several drives. In this case, several jobs must be submitted.
The return of the QUSRBRM library (containing all BRMS histories) to the Production partition should only be done when all batches are completed.

To perform parallel backups, the following technique is recommended.

First, there must be a different control group for each backup that will be performed in parallel.
Create a control group whose role will be to submit all the others and then wait until they are all finished. We will call this group MASTER for example.

The MASTER control group must use the FLMULTBRMS command for each control group to be used in parallel.
This command will perform the following operations:

- Submit the backup with the control group indicated in the JOBQ FLASH4I/FL_MULTI. The name of the submitted job will be the name of the control group.
- Add messages in the Flash for i history to indicate the start and end of the control group, or if any errors have been detected.
- Generate the joblog of the job performing the backup. This joblog will be transferred to the production partition at the end of backup.

The last operation contained in the MASTER group must be the call to the program:

CALL PGM(FLWAITMULT) PARM(FLASH)

This program will check for active jobs in the subsystem, and will only return control to the MASTER group when all other batch jobs are finished.

The MASTER control group can look like this:

```

                                Edit Backup Control Group Entries                                PROD
Group . . . . . : MASTER
Default activity . . . . . FFFFFFFF
Text . . . . . *NONE

Type information, press Enter.

      Backup
Seq  Items      Exit command

```

```

10 *EXIT
20 *EXIT      FLMULTBRMS CTLGRP (DAY1)  OMITs (*PROCESS)
30 *EXIT      FLMULTBRMS CTLGRP (DAY2)  OMITs (*PROCESS)
40 *EXIT      CALL PGM (FLWAITMULT)  PARM (FLASH)
50 *EXIT

```

Once an hour, a FLA1029 message will indicate the number of batch jobs remaining active in the subsystem.

2.12 Examples of source programs

The Flash For i product is delivered with a source file: FLEXAMPLES

This file contains examples of programs that the users may want to use as a base for their own programs.

2.12.1 EXAMPLE01: Exit Program for the name of ONE volume

This program can be used to return the name of ONE volume that will be used for the function *SAVE21, if the value *EXITPGM is entered for the parameter "Volume" and the value 1 in parameter "Nb vol. returned by Exitpgm".

If the number of volumes is higher than 1, use the program EXAMPLE01B as a model.

In this example, the returned volume name is formed with 3 characters for the name of the day (MON, TUE, WED, THU, FRI, SAT, SUN) followed by 01 if the week number is an even number, or 02 if it is an odd week.

The user may use this example as a model to create it's own program.

```

/*****
/*          Example program for Flash4i          */
/*          -----          */
/* Program   : Example01          */
/* Description : Exit program that returns the name of volume          */
/*              to use for the SAVE21          */
/*              The environment must be defined with value 1 for          */
/*              parameter "Nb vol. returned by Exitpgm".          */
/*              Use EXAMPLE01B for more volumes returned.          */
/*              This program will be called on CLONE partition          */
/*              at the beginning of SAVE21 operation.          */
/*          */
/* Parameters : &ENV      (In ) Environment name.          */
/*              &DEV      (In ) Device name          */
/*              &VOL      (Out) Volume name to use for backup          */
/*          */
/* In this example, the program will return a volume name calculated*/
/* with the name of the day, and the value 01 if the week number */
/* is odd, 02 if the week number is even.          */
/*          */
/*          */
/* Copyright M81, 2016-2019          */
/*****

          PGM          PARM(&ENV &DEV &VOL)

          DCL          VAR (&ENV) TYPE (*CHAR) LEN (10)

```

```

DCL          VAR (&DEV) TYPE (*CHAR) LEN (10)
DCL          VAR (&VOL) TYPE (*CHAR) LEN (6)

DCL          VAR (&DAY) TYPE (*CHAR) LEN (4)
DCL          VAR (&WEEKNBR) TYPE (*DEC) LEN (2 0)
DCL          VAR (&TMP1  ) TYPE (*DEC) LEN (2 0)
DCL          VAR (&TMP2  ) TYPE (*DEC) LEN (2 0)

/*****/
/*  Get the name of the day (3 chars)          */
/*****/
RTVSYSVAL   SYSVAL (QDAYOFWEEK) RTNVAR (&DAY)
CHGVAR      VAR (&VOL) VALUE (%SST (&DAY 2 3))

/*****/
/*  Get the number of the week                */
/*****/
CALL        PGM (FLWEEKNBR) PARM (&WEEKNBR)

/*****/
/*  Generate volume number                    */
/*****/
CHGVAR      VAR (&TMP1) VALUE (&WEEKNBR / 2)
CHGVAR      VAR (&TMP2) VALUE (&TMP1 * 2)
IF          COND (&TMP2 = &WEEKNBR) THEN (DO)
  CHGVAR    VAR (&VOL) VALUE (%SST (&DAY 2 3) *cat '02')
ENDDO
ELSE        CMD (DO)
  CHGVAR    VAR (&VOL) VALUE (%SST (&DAY 2 3) *cat '01')
ENDDO

ENDPGM

```

2.12.2 EXAMPLE01B: Exit Program for the name of 2 to 5 volumes

This program can be used to return the name of several volumes that will be used for the function *SAVE21, if the value *EXITPGM is entered for the parameter “Volume” and a value between 2 and 5 in parameter “Nb vol. returned by Exitpgm”.

The number of parameters for this program depends on the value entered for “Nb vol. returned by Exitpgm”.

In this example, the returned volume name is formed with 3 characters for the name of the day (MON, TUE, WED, THU, FRI, SAT, SUN) followed by 01 if the week number is an even number, or 02 if it is an odd week, and finally followed by the letter A to E.

The user may use this example as a model to create it’s own program.

```

/*****/
/*          Example program for Flash for i          */
/*          -----          */
/* Program   : Example01B          */
/* Description : Exit program that returns the name of 5 volumes          */
/*            to use for the SAVE21          */
/*            The environment must be defined with value 5 for          */
/*            parameter "Nb vol. returned by Exitpgm".          */
/*          */

```

```

/*          The number of parameters of this program depends */
/*          on the value entered for "Nb vol. returned by */
/*          Exitpgm". */
/*          */
/*          This program will be called on CLONE partition */
/*          at the beginning of SAVE21 operation. */
/*          */
/* Parameters : &ENV      (In ) Environment name. */
/*              &DEV      (In ) Device name */
/*              &VOL1     (Out) Volume 1 name to use for backup */
/*              &VOL2     (Out) Volume 2 name to use for backup */
/*              &VOL3     (Out) Volume 3 name to use for backup */
/*              &VOL4     (Out) Volume 4 name to use for backup */
/*              &VOL5     (Out) Volume 5 name to use for backup */
/*          */
/* In this example, the program will return 5 volume names */
/* calculated with the name of the day, and the value 01 if the */
/* week number is odd, 02 if the week number is even, and a */
/* letter from A to E at the end. */
/*          */
/* Copyright M81, 2016-2019 */
/*****/

/* Example if "Nb vol. returned by Exitpgm" = 5 */
PGM          PARM(&ENV &DEV &VOL1 &VOL2 &VOL3 &VOL4 &VOL5)

/* ***** */
/* If "Nb vol. returned by Exitpgm" = 1, use this first instruction */
/* PGM          PARM(&ENV &DEV &VOL1) */
/*          */
/* If "Nb vol. returned by Exitpgm" = 2, use this first instruction */
/* PGM          PARM(&ENV &DEV &VOL1 &VOL2) */
/*          */
/* If "Nb vol. returned by Exitpgm" = 3, use this first instruction */
/* PGM          PARM(&ENV &DEV &VOL1 &VOL2 &VOL3) */
/*          */
/* If "Nb vol. returned by Exitpgm" = 4, use this first instruction */
/* PGM          PARM(&ENV &DEV &VOL1 &VOL2 &VOL3 &VOL4) */
/*          */
/* If "Nb vol. returned by Exitpgm" = 5, use this first instruction */
/* PGM          PARM(&ENV &DEV &VOL1 &VOL2 &VOL3 &VOL4 &VOL5) */
/*          */
/* ***** */

DCL          VAR(&ENV) TYPE(*CHAR) LEN(10)
DCL          VAR(&DEV) TYPE(*CHAR) LEN(10)
DCL          VAR(&VOL1) TYPE(*CHAR) LEN(6)
DCL          VAR(&VOL2) TYPE(*CHAR) LEN(6)
DCL          VAR(&VOL3) TYPE(*CHAR) LEN(6)
DCL          VAR(&VOL4) TYPE(*CHAR) LEN(6)
DCL          VAR(&VOL5) TYPE(*CHAR) LEN(6)

DCL          VAR(&DAY) TYPE(*CHAR) LEN(4)
DCL          VAR(&WEEKNBR) TYPE(*DEC) LEN(2 0)
DCL          VAR(&TMP1 ) TYPE(*DEC) LEN(2 0)
DCL          VAR(&TMP2 ) TYPE(*DEC) LEN(2 0)
DCL          VAR(&WEEK) TYPE(*CHAR) LEN(2)

/*****/

```

```

/* Get the name of the day (3 chars) */
/*****
RTVSYVAL SYSVAL(QDAYOFWEEK) RTNVAR(&DAY)

/*****
/* Get the number of the week */
/*****
CALL PGM(FLWEEKNBR) PARM(&WEEKNBR)

/*****
/* Generate volume number */
/*****
CHGVAR VAR(&TMP1) VALUE (&WEEKNBR / 2)
CHGVAR VAR(&TMP2) VALUE (&TMP1 * 2)
IF COND(&TMP2 = &WEEKNBR) THEN (DO)
    CHGVAR VAR(&WEEK) VALUE ('02')
ENDDO
ELSE CMD(DO)
    CHGVAR VAR(&WEEK) VALUE ('01')
ENDDO

CHGVAR VAR(&VOL1) VALUE (%SST(&DAY 2 3) *cat &WEEK *cat 'A')
CHGVAR VAR(&VOL2) VALUE (%SST(&DAY 2 3) *cat &WEEK *cat 'B')
CHGVAR VAR(&VOL3) VALUE (%SST(&DAY 2 3) *cat &WEEK *cat 'C')
CHGVAR VAR(&VOL4) VALUE (%SST(&DAY 2 3) *cat &WEEK *cat 'D')
CHGVAR VAR(&VOL5) VALUE (%SST(&DAY 2 3) *cat &WEEK *cat 'E')

ENDPGM

```

2.12.3 EXAMPLE02: Backup program for *SAVE

This program can be used as backup program for the *SAVE function.

In this function, the user places himself the instructions that will run the backup, or any other operation, on the Clone partition. The EXAMPLE02 program runs a backup on an internal virtual tape. It can be used to run a first test to validate that the partition cloning is running correctly.

```

/*****
/*
Example program for Flash4i */
/*
----- */
/* Program : Example02 */
/* Description : Backup program that can be used for the function */
/* *SAVE. */
/* This program will be called on CLONE partition */
/* after the IPL to run a backup, or any other */
/* operation. */
/*
/* Parameters : None */
/*
/*
/* Copyright M81, 2016-2018 */
/*****

PGM

```



```

/*****/
/* Before this program to be called, the product has already */
/* done the following things: */
/* - Start TCP/IP (base only, no services, only 1 interface) */
/* - Update the Status to *USER */
/*****/

/*****/
/* Add library FLASH4I on line */
/*****/
      ADDLIB   LIB(FLASH4I)
      MONMSG   MSGID(CPF0000)

/*****/
/* The user may add information messages */
/* Those messages will be transferred to Production partition*/
/* and will help the user to know which step is running */
/* Parameter MSGID can be *NONE, or FLA9898 */
/*****/
      FLADDLOG TYPE(INF) MSGID(FLA9898) MSGDTA('Beginning of +
              a simple backup')

/*****/
/* Place here the specific instructions for running the */
/* backup. */
/*****/

/* INZTAP      DEV(TAP01) NEWVOL(TEST) VOL(*MOUNTED) + */
/*             CHECK(*NO) */
/*             */
/*             */
/* SAVLIB      LIB(QGPL) DEV(TAP01) VOL(*MOUNTED) */
/*             */

/*****/
/* As an example, and to help running a first test, the */
/* following instructions will backup QGPL library to */
/* a virtual tape. And send to Production the output file */
/* resulting from the SAVLIB command. */
/*****/

      FLADDLOG TYPE(INF) MSGID(FLA9898) MSGDTA('TEST: +
              Create a structure for virtual save')
      CRTIMGCLG IMGCLG(TESTSAVE) DIR('/testsave') TYPE(*TAP) +
              CRTDIR(*YES)

      ADDIMGCLGE IMGCLG(TESTSAVE) FROMFILE(*new) +
              TOFILE(vol01) IMSIZ(100000) TEXT('For +
              test only') VOLNAM(VOL01)
      CRTDEVTAP DEVD(TESTTAP) RSRNAME(*VRT)
      VRYCFG    CFGOBJ(TESTTAP) CFGTYPE(*DEV) STATUS(*ON)
      LODIMGCLG IMGCLG(TESTSAVE) OPTION(*LOAD) DEV(TESTTAP)

      FLADDLOG TYPE(INF) MSGID(FLA9898) MSGDTA('TEST: +

```

```

                Initialize virtual tape')

                INZTAP      DEV(TESTTAP) NEWVOL(TEST01) VOL(*MOUNTED) +
                           CHECK(*NO)

                FLADDLOG   TYPE(INF) MSGID(FLA9898) MSGDTA('TEST: Save +
                           QGPL library')
                SAVLIB     LIB(QGPL) DEV(TESTTAP) VOL(*MOUNTED) +
                           OUTPUT(*OUTFILE)
OUTFILE(FLASH4IUSR/OUTFILE)
                MONMSG     MSGID(CPF0000) EXEC(DO)
                FLADDLOG   TYPE(ERR) MSGID(FLA9898) MSGDTA('TEST: Error +
                           durring QGPL Backup') GRAV(40)
                GOTO       CMDLBL(NEXT)
                ENDDO

NEXT:

                /*****
                /* As this test may be very fast:
                /* we add a 1 minute delay to make sure that the
                /* communication job had the time to start
                /*****
                DLYJOB      DLY(120)

                /*****
                /* Now we can transfer the output file
                /*****
                FLADDLOG   TYPE(INF) MSGID(FLA9898) MSGDTA('TEST: +
                           Transfer output file to Production')
                FLCPYOBJ   OBJ(FLASH4IUSR/OUTFILE)

                FLADDLOG   TYPE(INF) MSGID(FLA9898) MSGDTA('TEST: End +
                           of QGPL backup')

                /*****
                /* After the end of this program, the product will
                /* automatically update the status to *SAVE_END. If the
                /* "Action on Clone at end" is *END_LPAR or *END_FC, the
                /* product will run this action.
                /*****
                ENDPGM

```

2.12.4 EXAMPLE03: Exit Program

This program is an example of exit program defined in the environments.
It can be used as an Exit Program Number 3 (right after the first IPL on the clone partition)
This example creates a virtual tape device.

```

/*****

```

```

/*          Example program for Flash for i          */
/*          -----          */
/* Program      : Example03          */
/* Description  : Exit program that will be used on Clone partition */
/*                during the first IPL.          */
/*                This program is defined in the Environment as          */
/*                the EXIT3 program.          */
/*          */
/* Parameters   : &ENV      (In ) Environment name.          */
/*          */
/* In this example, the program will          */
/* - Recreate the definition for virtual OPT and TAP          */
/* - Add a message to the Product log          */
/*          */
/*          */
/* Copyright M81, 2018          */
/*****/

          PGM          PARM(&ENV)

          DCL          VAR(&ENV) TYPE(*CHAR) LEN(10)

          DCL          VAR(&DEV) TYPE(*CHAR) LEN(10)
          DCL          VAR(&VOL) TYPE(*CHAR) LEN(6)

          /*****/
/* When the clone partition starts for the first time          */
/* virtual devices are not operational. They have to be          */
/* recreated.          */
/* In this example, we assume that there is an Optical device*/
/* OPTVRT, and a tape device TAPVRT.          */
/*****/
          VRYCFG      CFGOBJ(OPTVRT) CFGTYPE(*DEV) STATUS(*OFF)
          MONMSG      MSGID(CPF0000)
          VRYCFG      CFGOBJ(TAPVRT) CFGTYPE(*DEV) STATUS(*OFF)
          MONMSG      MSGID(CPF0000)

          DLYJOB      DLY(5)

          DLTDEVD     DEVD(OPTVRT)
          MONMSG      MSGID(CPF0000)
          DLTDEVD     DEVD(TAPVRT)
          MONMSG      MSGID(CPF0000)

          CRTDEVTAP   DEVD(OPTVRT) RSRcname(*VRT)
          MONMSG      MSGID(CPF0000)
          CRTDEVTAP   DEVD(TAPVRT) RSRcname(*VRT)
          MONMSG      MSGID(CPF0000)

          VRYCFG      CFGOBJ(OPTVRT) CFGTYPE(*DEV) STATUS(*ON)
          MONMSG      MSGID(CPF0000)
          VRYCFG      CFGOBJ(TAPVRT) CFGTYPE(*DEV) STATUS(*ON)
          MONMSG      MSGID(CPF0000)

          DLYJOB      DLY(5)

```

```

/*****/
/* Add a message in log */
/*****/
      FLADDLOG   TYPE(INF) CLONENBR(*LAST) MSGID(*NONE) +
                MSGDTA('Description of OPTVRT and TAPVRT +
                        recreated')
      MONMSG     MSGID(FLA0000)

      ENDPGM

```

2.12.5 EXAMPLE04: Program to start 5250 functions

In some cases, the user wants to allow some users to have an interactive access to the clone partition after the backup., or in a *USER environment.

This program shows the minimal instructions to allow 5250 access to the partition.

It can be used for example as an exit program number 5, after an BRMS control group.

```

/*****/
/*          Example program for Flash for i          */
/*          -----          */
/* Program   : Example04          */
/* Description : This program start the subsystems and services          */
/*              necessary for users to connect to the partition          */
/*              using 5250 sessions.          */
/*              it can be used for example at the end of a          */
/*              backup program, or as Exit 5 (after BRMS backup)          */
/*              or Exit 6 (after SAVE21).          */
/*          */
/* Parameters : &ENV          (In) Environment name          */
/*          */
/* In this example, the program will          */
/* - Start QSYSWRK subsystem          */
/* - Start QSERVER subsystem          */
/* - Start QINTER subsystem          */
/* - Start Telnet service          */
/* - Start Host services          */
/*          */
/*          */
/* Copyright M81, 2019          */
/*****/

      PGM          PARM(&ENV)

      DCL          VAR(&ENV) TYPE(*CHAR) LEN(10)

/*****/
      STRSBS       SBSD(QSYSWRK)
      MONMSG       MSGID(CPF0000)

      STRSBS       SBSD(QSERVER)
      MONMSG       MSGID(CPF0000)

```

```

STRSBS      SBSDB(QINTER)
MONMSG      MSGID(CPF0000)

STRTCPSVR   SERVER(*TELNET)
MONMSG      MSGID(CPF0000)

STRHOSTSVR  SERVER(*ALL)
MONMSG      MSGID(CPF0000)

/*****/
/*  Add a message in log                                */
/*****/
      FLADDLOG  TYPE(INF) CLONENBR(*LAST) MSGID(*NONE) +
              MSGDTA('Services and subsystems started +
                    to allow 5250 sessions')
      MONMSG    MSGID(FLA0000)

ENDPGM

```

2.12.6 EXAMPLE05: Program for *SPECIF storage type

It is possible to define storage (command FLWRKSTG) with type *SPECIF in order to use disk bays other than IBM SVC, Storwize or DS8000, or to secure the access to the bay by managing the FlashCopy functions by another way than the product or the IBM I partition. The user must give 3 programs to start and stop the FlashCopy or Snapshot, and to get information about status.

This program is an example for this function. The real specific instructions for the disk bay must be added. In this example, the same program can be used for all 3 operations *START, *END and *GETINFO.

```

/*****/
/*          Example program for Flash for i            */
/*          -----                                     */
/* Program   : Example05                               */
/* Description : Program that will be used for storage type *SPECIF */
/*             to communicate with the disk bay.       */
/*             - Start or end the snapshot             */
/*             - Get status of the snapshot            */
/*             */
/* Parameters : &OPERATION (In)  Type of operation asked */
/*             &RESULT      (Out) */
/*             &MESSAGE     (Out) */
/*             &STATUS      (Out) */
/*             &SPACE_USED  (Out) */
/*             */
/* The possible values for the parameters are:         */
/* &OPERATION : *START      : Request to start the Snapshot */
/*             *END        : Request to stop the Snapshot  */
/*             *GETINFO    : Request to start the Snapshot */
/*             */
/* &RESULT     : OK if the operation has completed successfully */
/*             ER if there was an error                       */
/*             required for every operation                  */
/*             */
/* &MESSAGE    : A message (50 characters) giving additional */

```

```

/*          information on the operation.          */
/*          25 car required for *GETINFO operation */
/*          Optional for *START and *END          */
/*          */
/*          &STATUS      : Status of the Snapshot or FlashCopy */
/*          1 if snapshot is active                */
/*          2 if snapshot is inactive             */
/*          Required for *GETINFO operation       */
/*          */
/*          &SPACE_USED: % of disk space used     */
/*          Required for *GETINFO operation       */
/*          */
/*          */
/*          In this example, the program will only call an other program */
/*          that is supposed to contact the disk bay */
/*          */
/*          */
/*          Copyright M81, 2019                    */
/*****/

          PGM          PARM(&OPERATION &RESULT &MESSAGE &STATUS +
                          &SPACE_USED)

          DCL          VAR(&OPERATION)  TYPE(*CHAR)  LEN(10)
          DCL          VAR(&RESULT)     TYPE(*CHAR)  LEN(2)
          DCL          VAR(&MESSAGE)    TYPE(*CHAR)  LEN(50)
          DCL          VAR(&STATUS)     TYPE(*CHAR)  LEN(1)
          DCL          VAR(&SPACE_USED) TYPE(*DEC)   LEN(5 0)

          DCL          VAR(&RETURN)     TYPE(*CHAR)  LEN(1)

/*****/
/* Start Snapshot */
/*****/
          IF          COND(&OPERATION = '*START') THEN(DO)
          /* Call the program or run the procedure */
          /* that will start the snapshot */
          CALL        PGM(STARTXXXX) PARM(&RETURN)
          MONMSG      MSGID(CPF0000) EXEC(DO)
          CHGVAR      VAR(&RESULT) VALUE('ER')
          CHGVAR      VAR(&MESSAGE) VALUE('Connexion error to the +
          bay')
          GOTO        CMDLBL(ENDPGM)
          ENDDO
          IF          COND(&RETURN = 'Y') THEN(DO)
          CHGVAR      VAR(&RESULT) VALUE('OK')
          CHGVAR      VAR(&MESSAGE) VALUE('Snapshot has been +
          started successfully')
          ENDDO
          ELSE        CMD(DO)
          CHGVAR      VAR(&RESULT) VALUE('ER')
          CHGVAR      VAR(&MESSAGE) VALUE('Error while starting +
          Snapshot')
          ENDDO
          ENDDO
  
```

```

/*****
/* Stop Snapshot */
/*****
      IF          COND(&OPERATION = '*END') THEN(DO)
          /* Call the program or run the procedure */
          /* that will stop the snapshot */
          CALL          PGM(STOPXXXX) PARM(&RETURN)
          MONMSG        MSGID(CPF0000) EXEC(DO)
              CHGVAR    VAR(&RESULT) VALUE('ER')
              CHGVAR    VAR(&MESSAGE) VALUE('Connexion error to the +
              bay')
              GOTO      CMDLBL(ENDPGM)
          ENDDO
      IF          COND(&RETURN = 'Y') THEN(DO)
          CHGVAR    VAR(&RESULT) VALUE('OK')
          CHGVAR    VAR(&MESSAGE) VALUE('Snapshot has been +
          stopped successfully')

          ENDDO
      ELSE          CMD(DO)
          CHGVAR    VAR(&RESULT) VALUE('ER')
          CHGVAR    VAR(&MESSAGE) VALUE('Error while stopping +
          Snapshot')

          ENDDO
      ENDDO

/*****
/* Get information about the Snapshot */
/*****
      IF          COND(&OPERATION = '*GETINFO') THEN(DO)
          /* Call the program or run the procedure */
          /* that will stop the snapshot */
          CALL          PGM(INFOXXXX) PARM(&RETURN &SPACE_USED)
          MONMSG        MSGID(CPF0000) EXEC(DO)
              CHGVAR    VAR(&RESULT) VALUE('ER')
              CHGVAR    VAR(&MESSAGE) VALUE('Connexion error to the +
              bay')
              GOTO      CMDLBL(ENDPGM)
          ENDDO
      IF          COND(&RETURN = 'S') THEN(DO)
          CHGVAR    VAR(&RESULT) VALUE('OK')
          CHGVAR    VAR(&STATUS) VALUE('1')
          CHGVAR    VAR(&MESSAGE) VALUE('Snapshot active')

          ENDDO
      ELSE          CMD(DO)
          CHGVAR    VAR(&RESULT) VALUE('OK')
          CHGVAR    VAR(&STATUS) VALUE('2')
          CHGVAR    VAR(&MESSAGE) VALUE('Snapshot not active')

          ENDDO
      ENDDO

ENDPGM:      ENDPGM

```

2.13 Special case for journal receivers (*JRNRCV)

When we try to delete a journal receiver (object type *JRNRCV), the system first checks if this object has been saved.

If it has been saved (after being detached from the journal), then it can be deleted.

If it has not been saved after being detached from the journal, the system sends a CPA7025 message to ask confirmation before to delete.

With the Flash For i product, the backup is done on another partition, then the journal receivers are never marked as saved on the production partition. This changes the way to cleanup them.

The product gives a solution for this issue :

- In the environment definition, enter *YES for the parameter “Extract JRNRCV info” (last screen of the environment definition)
- On the clone partition, at the end of the backup, the product will make a list of all journal receivers on the system, and calculate if they were effectively detached from the journal before to clone the partition, and if they have been saved on the clone partition.
- The generated table is transferred to the production partition
- On production partition
 - o The command FLDSPJRNSA shows the list of JRNRCV that have been saved in a specific cloning.
 - o The command FLJRNUPDSA can then be used to change, for every journal receiver identified, to change their attribute saying that they have been saved.

2.14 Exploiting Flash for i

The aim of this chapter is:

- Describe the operations that must be performed regularly to monitor the proper operation of Flash For i

In this chapter, reference is made to several commands. The description of these commands can be found in the chapter “5 Checking and monitoring commands”

2.14.1 Checking the general operating status of Flash for i

Use the FLDSPHST command to see, at a glance, the general operating status of the cloning.

Use the FLDSPSTS command to see the operating status of the current cloning.

It is possible to write a specific CLP program, which will be used to track the evolution of the clone state, using the FLRTVSTS command. This command returns in real time the state of several elements participating in the cloning (Flash copy active or not, Clone partition started or stopped, Flash For i internal states, ...).

2.14.2 Check that there is no error message

Use the FLDSPLOG command to search for error messages.

It is possible to obtain the same information using

- FLDSPLOG command
- FLDSPHST command, then option 6 on the line of a cloning
- FLDSPSTS command, then F10

FLCHKLOG command to automate the search for error messages, in Nagios for example.

Consideration of error messages is important because it allows you to know if an incident occurred on the Clone partition during the backup.

3 Installing the product and/or upgrading version

This section is about installing the product on the system (object restore) or changing Flash For i version.

For a version upgrade, only the "3.1 Flash For i product version upgrade" section is applicable.

For initial product installation, start at the "3.2 Prerequisites" section.



Important note about the license key

The format of the product license key has changed between version 3 and version 4.
The old 15-digit keys are no longer valid.

It is imperative to obtain a new key (on 42 characters) from M81 before you can use this product in Version 4.
It is recommended that you obtain a new key BEFORE upgrading the version.

It is possible to obtain a temporary key in emergency by logging on to www.m81.eu, then select Intranet / Temporary Key.

A key valid for 4 days will be sent by email. It will then be necessary to make an official request to M81 at support@m81.eu to obtain a permanent key, or a temporary key with a longer delay.

This operation requires a user account and a password to be able to identify oneself.

3.1 Flash For i product version upgrade

This section describes the operations to perform to change the Flash For i product version.

Use the FLDSPINF command to find out the installed version, then F1 on the resulting message (If it's not already fully displayed). The message indicates the version installed, as well as the date of generation of the product (in the format yyyy/mm/dd).

See chapter "3.2Prerequisites for installation" for the prerequisites.

3.1.1 If the product is installed in version 4

Apart from setting up user authorities on product objects (see below), there are no restrictions or specific operations to be carried out to change the version of Flash for i from V4 to V5. All configuration and history data will be retained, as will the licence keys.

See the evolutions tracking document for details of changes To this version.

It is nevertheless advisable to make a security backup of the FLASH4I library by specifying the SECSAVE(*YES) parameter in the FLRSTPRD command.

Authority to access objects

Migration to V5 will automatically set up these authorisations and block access for users with no special authority.

We strongly advise you to

- Make an inventory of the user profiles with access to the product
- For each profile, determine what operations it performs.

- Enroll in the FLASH_USE list the profiles that perform operational monitoring (FLDSP* commands) or checks (FLCHK* commands).
- Enroll the profiles that use action commands (FLCLONE, FLSTR*, FLEND*, etc.) in both lists FALSH_SECU and FLASH_USE.

See chapter “14 Authorisations to access the Flash for i product” for more details.

3.1.2 If the product is installed in version 3

This chapter describes the prerequisites or precautions for migrating the product from version 3 to version 4 or 5. It is possible to upgrade directly to version 5 by following the same steps as for upgrading to version 4.

Get a new license key

The format of the license key has changed between version 3 and version 4.

It is imperative to obtain a key in the new format (42 characters instead of 15) before changing versions.

Without this new key, the product will no longer work.

If the "Email Alert" module is installed and used, it is also necessary to obtain a new key for this module.

Clean up the internal historical data

Sometimes, log files may be very large.

Before to upgrade product Flash for i, it is advised to clean up the internal data.

Use command FLCLEAR (using default values or changing them according to customer needs).

In some cases, this command may run for a long time. It is better to submit it.

Stop every Clone partition

Before to change the version of Flash for I, it is advised to stop all clone partitions. Indeed, the transfer mode of certain information has changed between both versions. Feedback may not work anymore.

The only impact is about data transfer from Clone to Production partition.

Upgrading the version doesn't stop a clone partition

Upgrading the histories

The FLUPGRADE job will be submitted in FLASH4I JOBQ at the end of the migration. Its role is to update some internal tables whose format has changed.

Previous backup

It is recommended to save the configuration of the product in version 2 before migrating.

This is possible by saying *YES to the SECSAVE parameter of the FLRSTPRD command.

3.1.1 If the product is installed in version 2

In this case, it is strongly advised to install version 3 of the product beforehand, before being able to install version 5.

3.1.2 Transfer the SAVF file to IBM i via FTP for example

The supplied SAVF containing the product must be transferred to the production partition.

Place this SAVF in the QGPL library for example.

Do not restore its content at this stage. Follow the operating procedure below.

Use FTP for example to perform the transfer:

On the IBM i partition:

```
CRTSAVF QGPL/FLASH4I
```

On the PC, using a DOS command line:

```
FTP Partition_Address  
Enter profile and password  
bin  
put c:\xxxx\FLASH4I.savf qgpl/FLASH4I  
  
quit
```

3.1.3 Stop automatic jobs

Stop automatic jobs beforehand and check that no-one is using it (display commands)

To stop the product:

```
ADDLIBLE FLASH4I  
  
FLEND SBS
```

If one of the Menu of Flash For i product is used on current session, leave this menu.

To check that no-one is using it:

```
WRKOBJLCK OBJ(FLASH4I) OBJTYPE(*LIB)
```

If jobs appear in the list given by this command, it means that they are at least using the product library (FLASH4I). These jobs must be stopped or must no longer use the library.

For interactive jobs, type the EDTLIBL command and remove the FLASH4I library from the list.

3.1.4 Restore the objects in QTEMP

```
RSTOBJ OBJ(*ALL) SAVLIB(QTEMP) DEV(*SAVF) SAVF(*LIBL/FLASH4I)
```

3.1.5 Upgrade the product

The QALWOBJRST system value must contain *ALL to restore all objects correctly. If not, change this system value to *ALL, and then restore the original value after the FLRSTPRD command is completed.

IMPORTANT: The command below has a parameter SECSAVE that allows to run a security backup of FLASH4I library into a SAVF prior to start the upgrade.

The sequence of commands below is used to restore the product:

- Creation of user profile FLASH4IOWN (object owner)
- If the product is already installed, restore the product with the existing settings, including the license key.

- In the command FLRSTPRD, select the primary language, and the eventual secondary language. Possible values are EN for English and FR for French.

```
RMVLIBLE FLASH4I
```

```
QTEMP/FLRSTPRD MAINLNG (xx) SECSAVE (yyy)
```

At the end of the operation, the following message is displayed (at the bottom of the screen)

```
Product FLASH4I version V03 installation, build xxxxxx completed successfully
```

xxxxxx being the product creation date (in yymmdd format)

3.1.6 Note on control commands

If the M81 Control for i product is installed on the partition, the Flash for i control commands have been automatically copied to the CTL4IUSR library.

The commands concerned are those whose name starts with FLCHK*.

This operation allows the Flash for i controls to be integrated into the monitoring tool.

3.1.7 Enter the new format product key

If the product is already installed in version 4 and already has its new format own license key. This step is not necessary.

If this is the first installation of the product, or **if it is a version change from version 2 or 3** of the product, then a new license key must be obtained and entered.

Type the following command to find out the information required to generate the license key:

```
FLDSPINF
```

The following message appears at the bottom of the screen.

Press F1 on the message to see all the information. Make a note of this information and send it to your contact at M81

```
Additional Message Information

Message ID . . . . . : GEN0005
Date sent . . . . . : 09/11/20      Time sent . . . . . : 19:15:21

Message . . . . . : Flash for i: System name = M81DEV, Serial Nb = 0612345,
Partition = 003, Model = 41A, Version = V4, Generation date = 2020/11/07
```

Obtain a valid license key from M81 then enter this key with the following command.

It is possible to obtain a temporary key in emergency by logging on to www.m81.eu, then select Intranet / Temporary Key.

A key valid for 4 days will be sent by email. It will then be necessary to make an official request to M81 at support@m81.eu to obtain a permanent key, or a temporary key with a longer delay.

This operation requires a user account and a password to be able to identify oneself.

```
FLADDKEY KEY(123456 123456 123456 123456 123456 123456 123456 )
```

3.1.8 Upgrading site histories

If the "Central Management" module is not used, skip this step.

If the partition is defined as primary site, and secondary sites are defined, the tables containing their history must be updated.

This operation can be long. It is advisable to submit the command that will perform it.

```
SBMJOB CMD (FLRSTPRDSE SITE (*ALL) )
        JOB (FL_SITES)
```

During this operation, the FLASH4I subsystem must be shut down to prevent it from attempting to receive data from a secondary site.

3.1.9 Start the monitoring subsystem

Start the FLASH4I subsystem which will be used to monitor the log of operations performed on the Clone partition. To do this, use the command:

```
FLSTRSBS
```

Check that the subsystem is active and contains the FL_AUTO job.

FLASH4I	QSYS	SBS	0,0		DEQW
FL_AUTO	FL_USER	ASJ	0,0	DLY-60	DLYW

This confirms that installation was correctly performed and the license key is valid.

This is the end of the operations to perform to change the product version.

3.2 Prerequisites for installation

3.2.1 IBM i partition

- V7R3 or above
- For systems in V7R1 or V7R2, the evolution of the product Flash for i is stopped. The release 4.14 from 8 August 2023 is the last one compatible and supported for V7R1 and V7R2.
- openssh (5733-SC1 option 1) must be installed and operational
 - o If a Proxy partition is used, this product is not necessary because the ssh connections will be done by the Proxy partition.
- For the disk arrays using http/https (DELL/EMC VMAX, PowerMax and UNITY)
 - o The product 5770-DG1 must be installed
 - o The product 5770-SS1 option 34 (DCM) must be installed
- All ASP disks must be on a single disk system:
 - o No disks must be attached to a native controller (SAS or SCSI)

- The source partition disks can be mirrored on two disks systems using the IBM i mirroring function but Flashcopy/Snapshot will only be performed on one system and the copy partition will not be mirrored.
- If Hyperswap is configured, the FlashCopy will be configured on only one side.
- The disks system volumes can be presented to the VIOS in VSCSI or NPIV

Disclaimer:

If the IBM i partition is configured with IBM i mirror (system-managed mirror) between 2 disk arrays.

- In this case, iASPs are not supported.
- The system does not allow them to be turned on automatically on the Clone partition.

3.2.2 Disks system

The following disk arrays are supported:

An IBM SVC, Storwize or FlashSystem

- Version 7.1 or higher
- Version 8.4.2 minimum to use the SafeGuarded Copy module.
- FlashCopy can be performed on a remote synchronous (Metro-Mirror) copy of the volumes presented to the source partition.
- FlashCopy license.
 - The V3700 has a basic license allowing 64 FlashCopy targets. It is possible to acquire a license removing this limitation.
 - The V5000 does not have the basic FlashCopy function. The license must be acquired.
 - The V7000 has the required license base.
 - On SVC, the license must be paid for according to the volume.
- The protocol used is ssh

An IBM DS8xxx

- Version 8.3 or higher
- Library QDSCSI installed on IBM I partition
- Copy Services license
- The communication is done by DSCLI

A DELL/EMC disk array

- Version 8.4 for the bay
- The IBM I partition must be in 7.2 minimum
- The protocol used is http or https

A PureStorage disk array

- Purity Version 6.0.1
- The protocol used is ssh

3.2.3 POWER management console

The POWER on which the target partition is run must be managed by one of the following consoles:

- Hardware Management Console (HMC)
- Novalink

3.2.4 Network

The Production partition must be able to access the different elements (HMC, Storwize) with the protocols:

Between the source partition and the HMC

- Port 22 (ssh)

Between the source partition and the Storwize, SCV, FlashSystem or PureStorage

- Port 22 (ssh)

Between the source partition and the DELL/EMC VMAX or DELL/EMC Unity

- Port http (80) or https (443)
- Port 8443 for VMAX et PowerMax

Between the source partition and the clone partition(s)

- Ports 449 and 8473

Between each source partition and the Proxy partition

- Port 7358

Between each source partition and the Central (or Primary) partition

- Port 8473

3.2.5 IBM i user profile

The Flash for i product uses the AIX Shell (PASE) for some commands.
PASE retains an old AIX characteristic that limited profile names to 8 characters.

All profiles who will use the product must therefore have a profile name of at most 8 characters.

It is possible to eliminate this limitation by running the following command:

```
ADDENVVAR ENVVAR (PASE_USRGRP_LIMITED) VALUE (N) LEVEL (*SYS)
```

3.2.6 IBM i system PTF

Some system PTFs are necessary

The following PTFs are required:

- Version 7.2 : PTF MF64640
- Version 7.3 : PTF MF64641
- Version 7.4 : PTF SI71939, MF67310

If BRMS is used

The following PTFs are required if BRMS is used:

- Version 7.3 : PTF SI76737
- Version 7.4 : PTF SI76738

If the partition has iASP

The following PTFs are required if the iASP is vary off:

- Version 7.2 : PTF SI71927
- Version 7.3 : PTF SI71928
- Version 7.4 : PTF SI71929

Command FLCHGTIM

The following PTFs are required before to use this command:

- Version 7.1 : PTF SI65116
- Version 7.2 : PTF SI53458

If the disk bay is a VMAX with https access

The following PTFs are required:

- Version 7.2 : PTF SI68347
- Version 7.3 : PTF SI68348

3.2.7 Proxy partition

If a Proxy partition is used, all partitions (the Proxy partition and all partitions that connect to the Proxy) must use at least version 5 of the Flash for i product.

3.3 Installing the FLASH4I library

The operations below are the same for an initial installation or change of version of Flash For i.

3.3.1 Transfer the SAVF file to OS/400 via FTP for example

The supplied SAVF containing the product must be transferred to the production partition. Place this SAVF in the QGPL library for example. Do not restore its content at this stage. Follow the operating procedure below.

Use FTP for example to perform the transfer:

On the IBM i partition:

```
CRTSAVF QGPL/FLASH4I
```

On the PC, using a DOS command line:

```
FTP Partition_Address  
Enter profile and password  
bin  
put c:\xxxx\FLASH4I.savf qgpl/FLASH4I  
  
quit
```

3.3.2 Restore the product

The QALWBJRST system value must contain *ALL to restore all objects correctly. If not, change this system value to *ALL, and then restore the original value after the FLRSTPRD command is completed.

The sequence of commands below is used to restore the product:

- Creation of user profile FLASH4IOWN (object owner)
- If the product is already installed, restore the product with the existing settings, including the license key.
- In the command FLRSTPRD, select the primary language, and the eventual secondary language. Possible values are EN for English and FR for French.

```
RSTOBJ OBJ (*ALL) SAVLIB (QTEMP) DEV (*SAVF) SAVF (*LIBL/FLASH4I)  
  
QTEMP/FLRSTPRD MAINLNG (xx)
```


At the end of the operation, the following message is displayed (at the bottom of the screen)

```
Restoring the product FLASH4I to version V02, build 160927 done properly
```

xxxxxx being the product creation date (in yymmdd format)

3.3.1 Note on control commands

If the M81 Control for i product is installed on the partition, the Flash for i control commands have been automatically copied to the CTL4IUSR library.

The commands concerned are those whose name starts with FLCHK*.

This operation allows the Flash for i controls to be integrated into the monitoring tool.

3.3.2 Enter the product key

If the product is already installed in version 4 and already has its own license key. This step is not necessary.

If this is the first installation of the product, or **if it is a version change from version 2 or 3** of the product, then a new license key must be obtained and entered.

Type the following command to find out the information required to generate the license key:

```
FLDSPINF
```

The following message appears at the bottom of the screen.

Press F1 on the message to see all the information. Make a note of this information and send it to your contact at M81

```
Additional Message Information

Message ID . . . . . : GEN0005
Date sent . . . . . : 09/11/20      Time sent . . . . . : 19:15:21

Message . . . . . : Flash for i: System name = M81DEV, Serial Nb = 0612345,
Partition = 003, Model = 41A, Version = V5, Generation date = 2020/11/07
```

Obtain a valid license key from M81 then enter this key with the following command.

It is possible to obtain a temporary key in emergency by logging on to www.m81.eu, then select Intranet / Temporary Key.

A key valid for 4 days will be sent by email. It will then be necessary to make an official request to M81 at support@m81.eu to obtain a permanent key, or a temporary key with a longer delay.

This operation requires a user account and a password to be able to identify oneself.

```
FLADDKEY KEY(123456 123456 123456 123456 123456 123456 123456)
```

3.4 Initial product configuration

The operations described below must be performed when configuring the product for the first time.

They do not need to be performed when changing the product version.

Use the following command:

```
FLINIT DIR (*DFT)
        USER (*DFT)
        PWD (xxxxx)
        SITETYPE (*STD)
```

Specify the password that must be assigned to the user profile.

If a Proxy partition is used, it is not necessary to generate a rsa key for the protocol ssh. Enter the parameter RSAKEY(*NONE).

The default values are:

The default directory is /Flash4i

The default user profile is FL_USER

This profile will be used by the automatic jobs (FL_AUTO job) as well as for setting up communications between the Production partition and the CLONE partition.

The password must be specified. It is used for configuration but not stored by the product.

The command performs the following operations:

- Initializes content of product's internal elements
- Creates the user profile passed as a parameter (or change if it already exists)
- Adapts product JOBID to use this profile
- Defines rights for this profile to be able to use DDM
- Creates the default directory (if it doesn't already exist)
- Generates the pair of ssh keys in the product directory. If these keys already exist, they are not modified.
- Creates the /home/USER directory (USER being the name passed as a parameter)

3.5 Start the monitoring subsystem

Start the FLASH4I subsystem which will be used to monitor the log of operations performed on the Clone partition. To do this, use the command:

```
FLSTRSBS
```

Check that the subsystem is active and contains the FL_AUTO job.

FLASH4I	QSYS	SBS	0,0		DEQW
FL_AUTO	FL_USER	ASJ	0,0	DLY-60	DLYW

This confirms that installation was successfully performed and the license key is valid. If the module "email alerts" is configured, the job FL_ALERT is also active.

3.6 System start-up program

Change the initial system program (the name of which is specified in the QSTRUPPGM system value) to add the FLSTRSBS command. This systematically starts the subsystem containing the automatic jobs.

3.7 Authorize the *FLASHCOPY function in BRMS

If BRMS will be used for the backups, it is necessary to activate the *FLASHCOPY function in BRMS parameters.

This configuration must be done if the product 5770BR1, option 1: "BRMS – Network Feature" is installed.
Otherwise, disregard this step.

WRKPCYBRM TYPE(*SYS)

Option 1: Display or Change system policy
Enter *YES for the parameter "Enable FlashCopy"

```

V7R1M0                                Change System Policy                                FLASH4I

Type choices, press Enter.

End subsystems wait time . . . . . 01200          1-99999 seconds, *IMMED
End servers wait time . . . . . 0                0-9999 seconds
Controlling subsystem:
  Allow backups in batch . . . . . *NO           *NO, *YES
  Restricted state time limit . . . . . *NOMAX    5-9999 minutes, *NOMAX
Trace . . . . . *NO                             *NO, *YES
Allow alternate input media. . . . . *YES        *NO, *YES
Volume prefix . . . . .                          Prefix
Enable FlashCopy . . . . . *YES                *NO, *YES
-----
BRMS submitted jobs:
  Job description. . . . . *USRPRF              Name, *USRPRF
  Library. . . . .                               Name, *LIBL, *CURLIB
  Job queue. . . . . *JOBD                      Name, *JOBD
  Library. . . . .                               Name, *LIBL, *CURLIB

Bottom

F3=Exit  F4=Prompt  F5=Refresh  F12=Cancel
  
```

3.8 User's access to the product

Starting with version 5 of Flash for i, all the objects contained in the FLASH4I library are protected by an authorisation list, which prevents users from directly accessing the data contained in a table via an SQL query, or from directly calling a product program.

Security officer profiles (class *SECOFR and/or with all special rights) have unrestricted access to everything by default. They are a special case.

Other user profiles must be registered in one of the 2 FLASH_SECU or FLASH_USE authorisation lists to be able to access the product.

We strongly advise you to

- Make an inventory of the user profiles with access to the product
- For each profile, determine what operations it performs.
- Enroll in the FLASH_USE list the profiles that perform operational monitoring (FLDSP* commands) or checks (FLCHK* commands).
- Enroll the profiles that use action commands (FLCLONE, FLSTR*, FLEND*, etc.) in both lists FALSH_SECU and FLASH_USE.

See chapter “14 Authorisations to access the Flash for i product” for more details.

3.9 Configure the environments

The initial configuration phase is complete. This part must only be carried out once during initial product installation. It must not be carried out when updating or changing Flash4i version.

To continue the installation, an environment now needs to be created. Go to the "4 Defining a cloning environment" section to do this.

4 Defining a cloning environment

This section describes the operations to perform to define a new cloning environment.

The Flash For i product needs to have been installed in order to clone a partition. See section "3 Installing the product and/or upgrading version" to install the product and perform initial installation.

The user then needs to define an environment for each function they wish to perform using a Clone partition.

The following environments can be defined, for example:

- An environment for making daily backups with BRMS
- An environment for making weekly backups with BRMS
- An environment to perform a SAVE21
- An environment that will be used occasionally to create a backup copy of the Production partition (when changing the system or application version for example)

Once these 4 environments have been created, they can be used via the FLCLONE command which will clone the Production disks then start the Clone partition so that the requested function is performed.

The following sequence of operations must be performed to define an environment:

- Configure the Clone partition on Storwize, HMC and any VIOSes
- Use the FLWRKENV command to create a new environment
- Configure the Storwize system to accept remote operations
- Configure the HMC to accept remote operations
- Configure any VIOSes to allow virtual disks to be managed by Flash For i

4.1 Information to obtain prior to installation

The following information must be obtained before installing and configuring the Flash For i product.

Environment		Example
Environment name		SAVE_QUOT
Environment description		Daily backup
Source partition name		PROD01
Source server serial number		0612345
Source partition number		3
Information about Storwize		
IP address or name of Controller 1		V7000PROD01.company.com
IP address or name of Controller 2		
User to perform the configuration	Password:	superuser
User to create		prod01
Name of consistency group		GRP_PROD01
Information about HMCs		
HMC1: IP address or name of HMC		HMC.company.com
HMC1: User for configuration	Password:	hscroot
HMC1: User to create	Password:	prod01

HMC2: IP address or name of HMC				
HMC2: User for configuration		Password:		
HMC2: User to create		Password:		
Name of server on the HMC				Power-8203-E4A-SN0612345
Name of partition on the HMC				CLONE01
Name of partition profile				CLONE01
Clone partition				
Name of Clone partition after IPL (DSPNETA)				CLONE
IP address				192.168.225.15
Mask				255.255.255.0
Gateway				192.168.225.254
Ethernet card position: Bus				208
Ethernet card position: Adapter				2
Ethernet card position: Port				0
IP address of the Production partition				192.168.225.1
Action on Clone partition at the end of the operation		*KEEP / *END_LPAR / *END_FC		*END_FC
VIOS 1				
IP address				VIOS01.company.com
Admin user		Password:		padmin
Name of VHOST				vhost14
VIOS 2				
IP address				VIOS02.company.com
Admin user		Password:		padmin
Name of VHOST				vhost14
Function to perform				
Type of function		*BRMS / *USER / *SAVE21 / *HOLD		*BRMS
*BRMS: Control group				SAVDAY
*BRMS: Exclusions		*IGNORE / *PROCESS		*IGNORE
*USER: Backup program				
*SAVE21: Tape library or Drive				
*SAVE21: Name of volume				

*SAVE21: End-of-tape option	*LEAVE / *REWIND / *UNLOAD	
Exit program 1		*NONE
Exit program 2		*NONE
Exit program 3		QGPL/SPECIF01

4.2 Configuring FlashCopy/Snapshot on the Disks system

All volumes of all source partition ASPs must be copied by FlashCopy or Snapshot on the disks system.

The target volumes may be assigned fully or thin provisioned. FlashCopy mapping can be configured with or without data copying according to requirements.

A consistency group must be created to contain the mappings of all the volumes of all source partition ASPs.

The "16 FlashCopy configuration on SVC/Storwize operating procedure" section provides an example of the operating procedure for configuring disks using FlashCopy on an IBM SVC, Storwize or Flash system.

4.3 Configuring the Clone IBM i partition:

The Clone IBM i partition must be configured like a "normal" IBM i partition with the CPU and memory quantities required to perform the assigned function (backup for example).

The FlashCopy target disks must be presented to this partition. If one or two VIOSes are used to present the VSCSI disks, the disks must be accessible to the VIOS in read-write mode for mkvdev to create the mapping. It may be necessary to start FlashCopy on the Storwize system to perform this operation.

Start the Clone partition for the first time in "B Manual" position to check that it starts correctly.

NB: when starting, specify that only the console must start to avoid duplicate address problems when starting the TCP/IP.

This first IPL will be much longer than normal. It is highly likely that there is a warning to indicate that disks are missing. Press F10 to ignore this message.

Check and eventually change the date and time of the Clone partition.

Search for "Ethernet card information" which is required to define the environment. Details of this operation are in section "2.3.2 Information".

Stop the Clone partition straight after checking it starts without trying to use it.

4.4 Create a test environment

In the rest of the installation, it will be interesting to validate as the configuration of the different elements is correct. For this, the following elements can be prepared.

Compile the example program EXAMPLE02

The source of this program is in the source file FLASH4I/FLEXAMPLES.

Compile this program in the FLASH4IUSR library.

This program can be used in a test environment to validate that the configuration is correct and that the sequences are running correctly, initially without using BRMS or drives or tape libraries.

Create a Storage Definition

Use the FLWRKSTG command to create the storage definition that will be used.

The FLCHKSTG command will be able to use this definition to validate that the communication is operational (in step 4.6).

Create a Clone Partition Definition

Use the FLWRKLPAR command to create the Clone partition definition.

The FLCHKLPAR command will be able to use this definition to validate that communication is operational (in step 4.7).

Create the test environment definition

Use the FLWRKENV command to create an initial test environment. It should be as simple as possible, in order to validate that the configuration part is correct.

Only enter a value for the following parameters:

- Storage definition name (definition created with the FLWRKSTG command)
- Partition definition name (definition created with the FLWRKLPAR command)
- IP address
- Mask
- Gateway
- Eth card :Bus, Adap, Port
- Prod IP address on Clone.
- Action on Clone after Op. Enter *KEEP
- Function to be performed on Clone Enter *SAVE
- Backup program Enter EXAMPLE02
- Library Enter FLASH4IUSR

4.5 Defining the VIOSes used

This part must only be performed if the disks are configured as VSCSI on the VIOS(es).

Exception for PureStorage arrays where clone virtual disks are never deleted in the array. Therefore, there is no need to configure VIOS in Flash for i in this case.

If the Storwize system is directly connected to the Production partition or if the VIOS(es) are defined with the NPIV protocol, this step must not be performed. Move to the next step.

VIOS definition can be accessed in 2 ways:

- From the environments list (of the FLWRKENV command), use option 12 opposite the newly created environment to access VIOS definition.
- Use the FLWRKVIO command

See section "6.5 FLWRKVIO, Work with VIOS " for details on defining VIOSes.

Use the F6 key to define a new VIOS then enter the requested information.

If the environment was created by copying from another environment, the VIOS definitions can also be copied. To do this, access the list of VIOSes defined for the source environment then use option 3 to copy them, indicating the name of the new environment.

4.6 Configuring the Storwize system to accept remote operations

This operation must only be performed once per "Production partition <--> Storwize system" pair. If several environments need to be created for a production partition, simply specify the same user profile name for all the environments.

Import the public key (which was created during initial Flash For i installation) from the Production partition to the PC performing the installation. By FTP for example.

The file to transfer is: /Flash4i/id_rsa.pub.Flash4i.Partition-Name

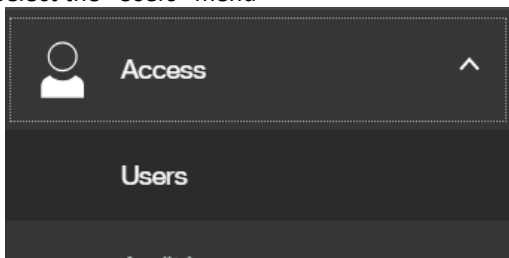
Type the following commands on the PC:

```
ftp Partition-IP-Address

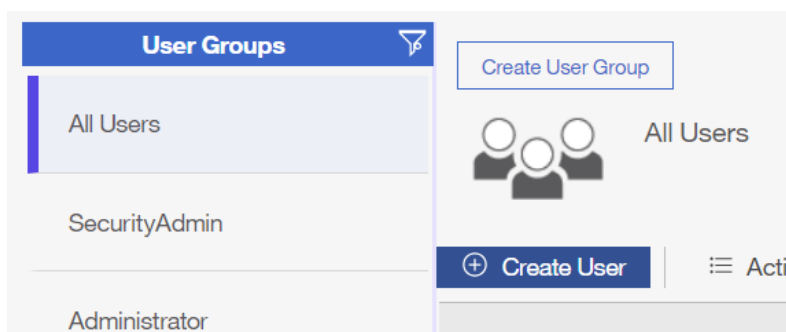
bin
get /Flash4i/id_rsa.pub.Flash4i.Partition-Name
    C:\temp\id_rsa.pub.Flash4i.Partition-Name
```

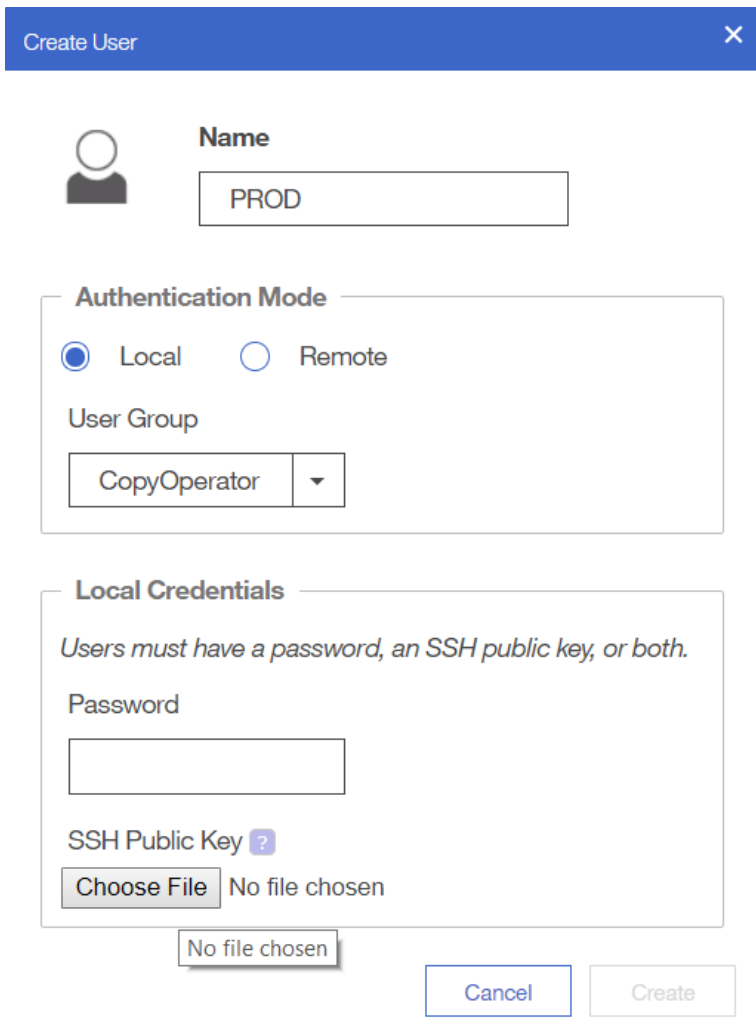
Access the graphical interface on the Storwize with a "Superuser"-type profile:

Select the "Users" menu



Select "Create user"



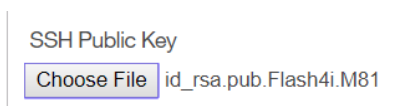


Tip: If there are only one or two production partitions, specify the production partition name as the username. If there are many production partitions, create only one user for all partitions, and use the same ssh public and private key file on every partition.

Choose the user group "CopyOperator".

Do not enter a password

Import the file with the public key that was previously transferred to the PC.



Click "Create" to create the profile.

Check that the connection is working by using the Storage definition created with the command FLWRKSTG:

```
FLCHKSTG STG (xxx)
```

The result should be a message like:

Ok, FlashCopy status : copying

If no storage definition has been created, it's also possible to use the following command, and specify every information:

```
FLCHKSSH CTLTYPE (*STWSTS)  
          IP ('192.168.1.67')  
          USER (IT)  
          DISKGRP (FLASH_IT)
```

The parameters have the following meanings:

- IP IP address or name of Disk array
- USER Newly created profile
- LPAR Name of the consistency group in Storwize

The answer should be a message at the bottom of the screen indicating the FlashCopy status.

If the connection does not work ("Connection error" response when using the FLCHKSTG command):

There may have been an error when entering the rsa key on the disk array, or several keys may have been entered and they may conflict.

In this case, delete the profile created on the disks array and repeat the procedure.

4.7 Configuring the HMC to accept remote operations

This operation must only be performed once per "Production partition <--> HMC console" pair. If several environments need to be created for a production partition, simply specify the same user profile name for all the environments.

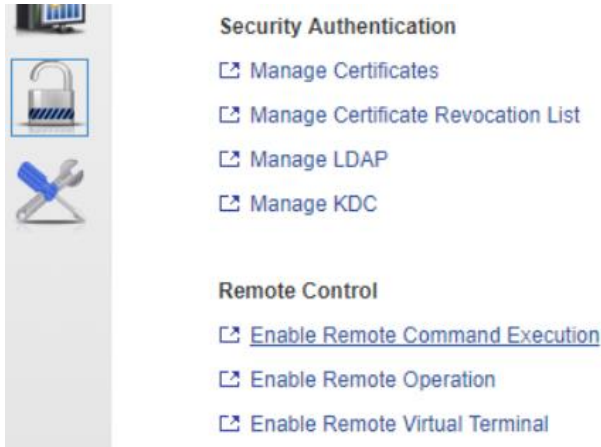
4.7.1 Authorizing remote ssh commands

Connect to the HMC graphical interface

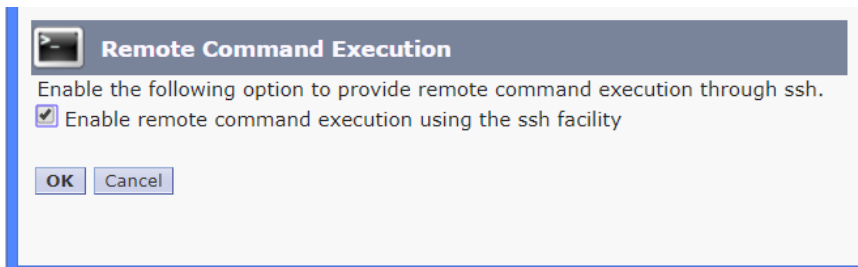
On the left-hand side of the screen, select "Systems and Console Security":



On the left-hand side of the screen, select "Enable Remote Command Execution":



Then check the box enabling remote commands to be executed.



4.7.2 *Creating an HMC user*

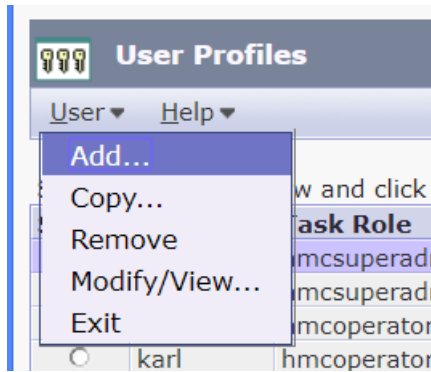
Connect to the HMC graphical interface to create a user profile

On the left-hand side of the screen, select “users and Roles”:

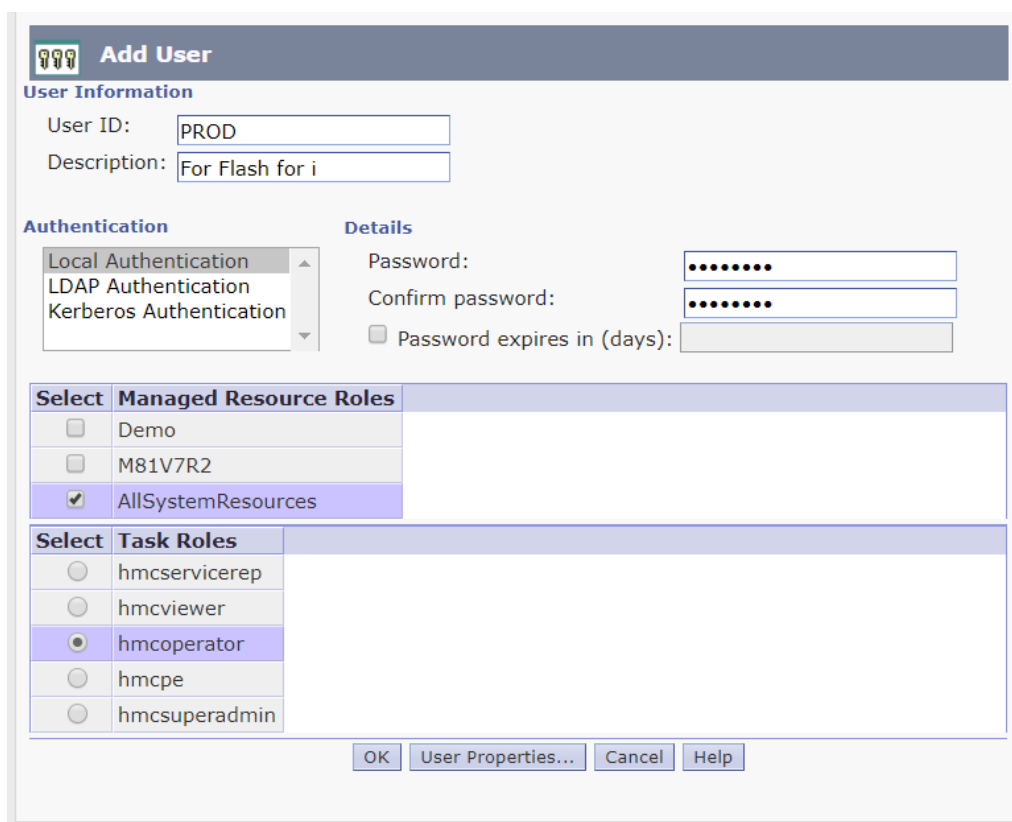


On the left-hand side of the screen, select “Manage User Profiles and Access”:





Select "User" then "Add"



Tip: Specify the production partition name as the username

Enter a password. This will only be used once (in the next step)

Select all resources: "AllSystemResources", or create a specific resource for this user, and select it.
Select the "hmcooperator" role

4.7.3 Adding the SSH key to the HMC

Use putty, or a similar product, to open an ssh connection on the HMC.
DO NOT make this connection from the IBM i partition. The command line will not be long enough to enter all the characters of the key.

Use the profile created above to log on to the HMC.

Run the command:

```
mkauthkeys -a "Public_key"
```

Example :

```
mkauthkeys -a "ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAQDjAHW6SxNixZFlyG5rWdFsReUMbD  
MIU0E4NrKkGSOUJwu+b9kT2gD+iI3g3fikkkjLCby3LcXO9JZuODTeLGAH90H1zWfEq+e90EqCyAp73s56  
6gjEQkHILtRiSu3z7z55Q7ZFsB6I2yTugv0J/i9qyvfsf1HRsoPKKA71Hjt/2aikvGTAj535eYbu7rGrQ  
BdB2zFKT/B0fqoH+fruG6YeLrdr862PO5gTep1WOIihQu6QlBq1NwZVtTKkY1yLmq1W7eAyJYiLPTdWA  
wNccmLlwGxy6DbzOsZFna4GCKmY4QFcy5Qru09cwFQa6FaljCF+pKeiROHneaBNKhprofil@IT.CLIENT  
.IT"
```

- public_key is the content of the /Flash4i/id_rsa.pub.Flash4i.Partition-Name file on the IBM i partition (use the copy/paste function from the file that was transferred to the PC in the previous step).

Disconnect from the HMC

```
exit
```

Check that the connection is working by using the LPAR definition created with the command FLWRKLPAR:

```
FLCHKLPAR LPAR (xxx)
```

The result should be a message like:

Ok, clone partition status: Running, SRC code: 00000000

If no LPAR definition has been created, it's also possible to use the following command, and specify every information:

```
FLCHKSSH CTLTYPE (*LPARSTS)  
IP ('192.168.1.67')  
USER (IT)  
SYSTEM ('Server-8286-41A-PROD')  
LPAR (FLASH_IT)
```

The parameters have the following meanings:

- IP IP address or name of HMC
- USER Newly created profile
- SYSTEM Name of system managed as it is known in the HMC
- LPAR Name of the partition as it is known in the HMC

The answer should be a message at the bottom of the screen indicating the partition status.

If the connection does not work ("Connection error" response when using the FLCHKLPAR command):

There may have been an error when entering the rsa key on the HMC, or several keys may have been entered and they may conflict.

In this case, delete the profile created on the HMC and repeat the procedure.

4.8 Configuring any VIOSes

The operations below must be performed if the Storwize disks are presented to the Production partition via one or more VIOSes using a **VSCSI-type** configuration.

If the configuration on the VIOS(es) is carried out in NPIV mode. No configuration must be carried out on the VIOSes.

Special consideration for

- **PureStorage FlashArrays**
- **Dell/EMC Unity**

Virtual disks from a PureStorage FlashArray and Dell/EMC Unity for the Clone partition are defined in VSCSI, but they are never "deleted" in the array. The VIOS therefore sees these disks all the time. Therefore, there is no need to make a VIOS definition for this type of array.

4.8.1 Adding the SSH public key to the VIOS(es)

Transfer the "id_rsa.pub.Flash4i.Partition-Name" public key from the "/Flash4i" directory of the IBM i partition to the "/home/padmin" directory of the VIOS.

Replace the "Partition-Name" value with the Production partition name.
Use FTP, for example, from the Production partition.

```
FTP VIOS-Address
> padmin

331 Password required for padmin.
230-Last login: Tue Feb 23 15:12:09 CET 2016 on /dev/pts/0 from 192.168.1.1
230 User padmin logged in.
UNIX Type: L8 Version: BSD-44
> bin

200 Type set to I.
> name 1

500 'SITE NAMEFMT 1': command not understood.
Client NAMEFMT is 1.
> put /Flash4i/id_rsa.pub.Flash4i.Partition-Name id_rsa.pub.Flash4i.Partition-
Name

229 Entering Extended Passive Mode (|||65227|)
150 Opening data connection for id_rsa_Partition-Name.pub.
226 Transfer complete.
    405 bytes transferred in 0,013 seconds. Transfer rate 31,902 KB/sec.

> quit
```

Connect to the VIOS via SSH from the Production partition to add the public key to padmin so that a password is not required in the future.

It is important that this connection is made from the Production partition to validate the connection between the 2 systems (automatic registration in the know_hosts file).

If the VIOS version is 2.2.6 minimum, use the file `authorized_keys`
For previous versions, use the file `authorized_keys2`
Use command `ioslevel` to display the VIOS version.

```
STRQSH

$
> ssh padmin@VIOS-Address

The authenticity of host 'VIOS-Address (192.168.1.2)' can't be established.
RSA key fingerprint is 35:32:e8:b3:71:33:52:10:a5:75:22:d6:d4:a5:f7:2b.
Are you sure you want to continue connecting (yes/no)?
> yes

Warning: Permanently added 'flash_vios1' (RSA) to the list of known hosts.
padmin@VIOS-Address 's password: tcgetattr: Invalid argument
Last unsuccessful login: Mon May 18 10:18:22 CEST 2015 on ssh from 192.168.1.1
Last login: Tue Feb 23 15:15:24 CET 2016 on ftp from ::ffff:192.168.1.1
$
> cat id_rsa.pub.Flash4i.Partition-Name | tee -a .ssh/authorized_keys2

cat id_rsa_Partition-Name.pub | tee -a .ssh/authorized_keys
ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAQAC/BuO6o7QXY6EeZbpofb89rIAJzHL9rqZPgThBd/DUN8
XK4VrjUoEYRHcSRt5DtEIuG299UjEeDckFs+oHcy3rg77PpKynNhDlhvpHgBYACKN1ErTzcbB+SbpCkRf
p4sAqgLJMBaTdRlXjtf8N2d6MUIG/BHzLCmnFXie4zifQgNwjDEehB+ZAztaprlmJnhy29tQBere0Dshk
MZoILtsv8wqEaay4SOgqH0o0eiZKyZKCqMv18difgCgiSnWqhdd3IOo3jYE/cFAteLT1kRhKl6z4Sb5zA
TUPahKfz15LWgPl pru@FLASH4I.FR
$
> exit

exit
Connection to VIOS-Address closed.
$

F3 to leave
```

Check that the connection is working:

```
FLCHKSSH CTLTYPE (*CONNECT) IP (VIOS-Address) USER (padmin)
```

Repeat this operation for all VIOSes managing vSCSI disks from the production partition

4.8.2 Installing the `Flash4i_vhost.ksh` script on the VIOS(es)

The `Flash4i_vhost.ksh` script must be transferred to the VIOS(es). It will be called each time FlashCopy is started to map virtual disks on the vhost and each time FlashCopy is stopped to unmap these same disks. The aim is to prevent error messages appearing on the VIOS (`errlog` command) when FlashCopy is stopped.

Transfer the `Flash4i_vhost.ksh` script from the `/Flash4i` directory of the IBM i partition to the `/home/padmin` directory of the VIOS.

Use FTP, for example, from the Production partition.

```
FTP VIOS-Address
> padmin
 331 Password required for padmin.
 230-Last login: Mon Feb 22 16:59:22 CET 2016 on ftp from prod
 230 User padmin logged in.
    UNIX Type: L8 Version: BSD-44
> bin
 200 Type set to I.
> name 1
 500 'SITE NAMEFMT 1': command not understood.
    Client NAMEFMT is 1.
> put /Flash4i/Flash4i_vhost.ksh Flash4i_vhost.ksh
 229 Entering Extended Passive Mode (|||59690|)
 150 Opening data connection for Flash4i_vhost.ksh.
 226 Transfer complete.
    1570 bytes transferred in 0.019 seconds. Transfer rate 84.615 KB/sec.
> quit
```

Connect to the VIOS via SSH then execute the following commands:

```
STRQSH

ssh padmin@VIOS-Address

oem_setup_env

mv Flash4i_vhost.ksh /usr/ios/oem

chmod +x /usr/ios/oem/Flash4i_vhost.ksh

exit

exit

F3 to leave
```

Repeat this operation for all VIOSeS managing vSCSI disks from the production partition

4.9 Checking that the configuration is correct

Use the FLWRKENV command and specify option 8 opposite the created environment

The screen must indicate that everything is working correctly and that there are no errors.

```
FLDSPSTS          Display Flash4i general status          FLASH4I
                                                         16/10/16 19:28:21

Environment
  Product version . . . . V02  16/09/27
  Last Environment started DEMO_BRMS started 7/12/15 à 18:34:58
```

```

    Asked Environment . . . . DEMO_BRMS   Backup with BRMS
    Action to be realized . . *BRMS
Production Partition
    Serial and Partition Nb . 067DAFB   05
    Subsystem status . . . . Active
    Production step . . . . *STRCLONE
Clone Partition
    Power Server Name . . . . LIMVIO05PAP
    Clone Partition Name . . BKP_FLASH
    Disk Consistency group . FLASH
    FlashCopy status . . . . copying           % Disk used . . . . %
    Clone Partition status . Not Activated
    Job step on Clone . . . . *INIT       Initializing Clone partition
                                000
    Last error message . . . 12/09/16 14:25:48
    Errors number last 24h . Nb errors :      0 Nb Valid. :      0 Total :      0

    Press ENTER to continue

F3=Exit   F5=Refresh   F10=Log   F12=Cancel

```

4.10 Checking that the Clone partition is in "B Normal" position

In the environment, if the value *LASTUSED has been entered for the Partition profile, it is essential that the Clone partition on the HMC is in "B Normal" position and has started at least once

If a partition profile name has been entered, the product will manage to start the clone partition in "N Normal" mode.

5 Checking and monitoring commands

The user must regularly check that the product is operating correctly. There are 2 types of tools available for this:

- Commands used to view the status. These show the status of the product's various parts.
- Commands showing the status of a part of the product. These commands can be used by a monitoring tool such as Nagios.

5.1 Information about automatable verification commands

Some commands are used to carry out automatic checks to ensure that the functions of Flash For i are being performed correctly. These command names start with FLCHKxxx for easy recognition.

The operating method for these commands is as follows:

- The command call performs the requested check
- The result is a message sent in return. There is no other return than this message
 - o If the result is correct, the returned message is *COMP type (Completion) with a 0 severity message.
 - o If the result is not correct, an *ESCAPE (Stop program) error message is generated with a severity of 40.
- Certain commands can have 2 error levels:
 - o Critical: Indicates a serious error requiring rapid intervention.
 - o Warning: Indicates an error without requiring urgent action.
 - o The type of error is characterized by the message's level of severity returned by the command: Severity 40 for Critical-type messages. Severity 20 for Warning-type messages.

5.2 FLDSPHST: Display the Cloning history

The command parameters are as follows:

This command has no parameters.

Using the command:

The FLDSPHST command is used to obtain a list of every cloning realized, and display the dates and times, or durations, of the main operations realized by Flash For i product.

Every cloning operation (FLCLONE or FLSTRFC command) is stored with the date and time of every important step (start of Flashcopy, start of partition, start and end of backup, ...). The FLDSPHST command allow to display all those information.

To use this command more effectively, it is advisable to configure a session with 132 columns.

```

FLDSPHST                                     Display Cloning history                                     M81FLASH
                                                                                               10/05/19  11:38:40
Local partition type . . . . .   PROD / *Standard
Subsystem status . . . . .       Active
Errors not related to a cloning since 48h:   1
Position to . . . . .           0/00/00
Enter your options, then press Enter
  
```

```

5=Display  6=Flash for i Logs  8 =Joblog  9=Clone's system Log
----- Elapse time for each phase -----
Cloning  -- Start FLCLONE --
Nb  Nb      Prepa      Prepa      Partition Flashcopy %
Opt Envir.  Number  Date      Time      Status     Msg  Err      on Prod    on Clone    Save    active    active    Disk
DEMO_BRMS   802  10/05/19  02:00:00  *END_LPAR  64   1      1:45      7:23      21:54    34:30                    %
DEMO_BRMS   801  09/05/19  02:00:00  *END_FC    66   1      1:44      7:00      21:56    33:58  16:34:04  14%
DEMO_BRMS   800  08/05/19  02:00:00  *END_FC    66   1      1:42      7:24      22:01    34:25  24:00:06  14%
DEMO_BRMS   799  07/05/19  02:00:00  *END_FC    68   3      1:44      7:19      21:56    34:21  24:00:05  14%
DEMO_BRMS   798  06/05/19  14:46:39  *END_FC    88   6      1:46      6:50      21:58    41:44  11:13:27  14%
DEMO_BRMS   797  06/05/19  02:00:00  *END_FC    64   1      1:45      7:26      20:31   12:46:40  12:46:45  12%
DEMO_BRMS   796  05/05/19  02:00:00  *END_FC    64   1      1:43      7:21      20:21   24:00:01  24:00:08  12%
DEMO_BRMS   795  04/05/19  02:00:00  *END_FC    64   1      1:43      7:00      20:16   24:00:01  24:00:07  12%
DEMO_BRMS   794  03/05/19  12:22:56  *END_FC    84   6      1:49      6:33      20:21   13:37:05  13:37:10  12%
DEMO_BRMS   793  26/04/19  17:39:31  *END_FC    20   0           43          99:99:99  99:99:99  14%
DEMO_BRMS   792  26/04/19  14:37:25  *END_FC     0   0      1:44          3:02:07  3:02:13  12%
DEMO_BRMS   791  25/04/19  17:16:39  *END_FC   310  292    1:45          20:53:15  20:53:25  12%
DEMO_BRMS   790  23/04/19  17:07:44  *END_FC    18   0      1:44          48:08:55  48:09:02  13%
More...
F3=Exit  F5=Refresh  F10=Other errors  F11=Display time  F12=Cancel

```

This screen displays the list of every cloning that have been made, indicating the status in which the cloning is, the date and the start time (execution of the FLCLONE command), and the duration of each step. All durations are displayed at format hhh:mm:ss.

- Local Partition Type Indicates the type of the local partition.
 PROD = Production Partition, or source for Flash for i
 CLONE = Clone Partition
 *Standard = Standard site. The Central Management module is not used.
 *Primary = Primary site of the Central management module
 *Secondary = Secondary site of the central management module
- Subsystem status Indicates if the FLASH4I subsystem and the FL_AUTO job are active.
 Active = FL_AUTO work is active
 The FLASH4I subsystem is stopped = Data from the Clone Partition is no longer processed. Use the FLSTRSBS command to restart the subsystem.
 Wrong status for the automatic job = FL_AUTO job is not in the expected state, probably held.
- Errors not related to a cloning since 48h :
 Indicates the number of error messages that are not associated with any cloning since the last 48h. Use the FLDSPLOG CLONENB(*NONE) command to get the list. They will have no data in the column "Clone Number".

The columns have the following meanings:

- Envir. Name of Environment
- Cloning number Cloning order number
 Every time the FLCLONE or FLSTRFC command is run, the order number is incremented. A cloning number allows to identify every step and every message related with one cloning operation.
- Start FLCLONE
 Date and Time Date and time at which the FLCLONE command (or FLSTRFC) has been running
- Status Indicates the status in which the cloning is. See chapter "2.4.1 Available statuses" for a list and meaning of the statuses.
- Nb Msg Number of messages for this cloning number

Nb Err	Number of error messages for this cloning number. Validated messages are not counted here.
Prepa on Prod	Duration of preparation on Production partition. This step is the time to stop the clone partition and stop the Flashcopy if this was not already made, run the Quiesce operation (copy of the memory to disks, done by the CHGASPACT system command), and start the FlashCopy.
Prepa on Clone	Duration of preparation on Clone partition, before to start the backup. In some cases, this includes a second IPL.
Save Partition active	Duration of the Backup Total time the Clone partition was active. If the Clone partition has been stopped without to use the commands included in Flash For I, this information may be incorrect.
FlashCopy active	Total time the FlashCopy was active. If the FlashCopy has been stopped without to use the commands included in Flash For i, this information may be incorrect.
% Disk	percentage of disks used for Clone on the Storwize right before the end of FlashCopy (If FlashCopy has been stopped by FLENDFC command)

Possible inputs:

Position to :
Specifies from which date Cloning data need to be displayed.

Function keys

F3 = Exit the screen

F5 = Update the values

F10=Other errors

Display errors that are not associated with any cloning. The number of these errors is shown at the top of the screen: " Errors not related to a cloning since 48h".

F11 = Display time

Displays the same list with the Time that each step occurred, instead of the duration of the step

F12 = Exit the screen

5.2.1 F11= Display time

Displays the same list with the Time that each step occurred, instead of the duration of the step

```

FLDSPHST                                Display Cloning history                                M81FLASH
                                                                                               10/05/19  11:47:31
Local partition type . . . . .  PROD / *Standard
Subsystem status . . . . .    Active
Errors not related to a cloning since 48h:  1
Position to . . . . .        0/00/00
Enter your options, then press Enter
  5=Display  6=Flash for i Logs  8 =Joblog  9=Clone's system Log
  
```

Cloning -- Configuration --		----- Time for each operation -----									

Opt Envir.	Number	Par. name	Stor. name	Status	Str LPAR	1st IPL	Str SAV	End SAV	End LPAR	End FC	Disk
DEMO_BRMS	802	M81CLONE1	GRP_1	*END_LPAR	2:01:45	2:06:47	2:09:09	2:31:03	10/02:34:30	1/00:00:00	%
DEMO_BRMS	801	M81CLONE1	GRP_1	*END_FC	2:01:44	2:06:27	2:08:45	2:30:41	9/02:33:58	9/18:34:04	14%
DEMO_BRMS	800	M81CLONE1	GRP_1	*END_FC	2:01:42	2:06:49	2:09:07	2:31:08	8/02:34:25	9/02:00:07	14%
DEMO_BRMS	799	M81CLONE1	GRP_1	*END_FC	2:01:44	2:06:44	2:09:04	2:31:00	7/02:34:21	8/02:00:06	14%
DEMO_BRMS	798	M81CLONE1	GRP_1	*END_FC	14:48:25	14:53:02	14:55:16	15:17:15	6/15:28:24	7/02:00:06	14%
DEMO_BRMS	797	M81CLONE1	GRP_1	*END_FC	2:01:45	2:06:55	2:09:11	2:29:43	6/14:46:40	6/14:46:46	12%
DEMO_BRMS	796	M81CLONE1	GRP_1	*END_FC	2:01:44	2:06:47	2:09:05	2:29:27	6/02:00:02	6/02:00:08	12%
DEMO_BRMS	795	M81CLONE1	GRP_1	*END_FC	2:01:43	2:06:30	2:08:44	2:29:01	5/02:00:01	5/02:00:07	12%
DEMO_BRMS	794	M81CLONE1	GRP_1	*END_FC	12:24:45	12:29:02	12:31:18	12:51:39	4/02:00:01	4/02:00:06	12%
DEMO_BRMS	793	M81CLONE1	GRP_1	*END_FC	17:40:14	0:00:00	0:00:00	0:00:00	3/12:22:58	3/12:23:05	14%
DEMO_BRMS	792	M81CLONE1	GRP_1	*END_FC	14:39:10	0:00:00	0:00:00	0:00:00	26/17:39:33	26/17:39:39	12%
DEMO_BRMS	791	M81CLONE1	GRP_1	*END_FC	17:18:24	0:00:00	0:00:00	0:00:00	26/14:09:54	26/14:10:04	12%
DEMO_BRMS	790	M81CLONE1	GRP_1	*END_FC	17:09:28	0:00:00	0:00:00	0:00:00	25/17:16:40	25/17:16:46	13%

More...

F3=Exit F5=Refresh F10=Other errors F11=Display duration F12=Cancel

This screen displays the list of every cloning realized, with the storage and partition definitions used, and the time the step occurred.

All times are displayed at format hh:mm:ss.

For the columns "End LPAR" and "End FC", the format is dd/hh:mm:ss. The number of day is given in addition because most of the time, the partition and FlashCopy are stopped the day following the cloning.

Local Partition Type

Indicates the type of the local partition.

PROD = Production Partition, or source for Flash for i

CLONE = Clone Partition

*Standard = Standard site. The Central Management module is not used.

*Primary = Primary site of the Central management module

*Secondary = Secondary site of the central management module

Subsystem status

Indicates if the FLASH4I subsystem and the FL_AUTO job are active.

Active = FL_AUTO work is active

The FLASH4I subsystem is stopped = Data from the Clone Partition is no longer processed. Use the FLSTRSBS command to restart the subsystem.

Wrong status for the automatic job = FL_AUTO job is not in the expected state, probably held.

Errors not related to a cloning since 48h :

Indicates the number of error messages that are not associated with any cloning since the last 48h. Use the FLDSPLOG command to get the list. They will have no data in the column "Clone Number".

The columns have the following meanings:

Envir.

Name of Environment

Cloning number

Cloning order number

Every time the FLCLONE or FLSTRFC command is run, the order number is incremented. A cloning number allows to identify every step and every message related with one cloning operation.

Configuration

Par. name

Name of LPAR definition used

Stor. name

Name of storage definition used

Status

Indicates the status in which the cloning is. See chapter "2.4.1 Available statuses" for a list and meaning of the statuses.

Str LPAR	Time the order to start Clone partition has been sent to the HMC
1st IPL	Time of beginning of the first IPL of Clone partition
Str Save	Time the backup starts
End Save	Time the backup ends
End LPAR	Time the clone partition ends. If the Clone partition has been stopped without to use the commands included in Flash For i, this information may be incorrect. The format is dd/hh:mm:ss where dd is the day
End FC	Time the FlashCopy ends. If the FlashCopy has been stopped without to use the commands included in Flash For i, this information may be incorrect. The format is dd/hh:mm:ss where dd is the day
% Disk	percentage of disks used for Clone on the Storwize right before the end of FlashCopy (If FlashCopy has been stopped by FLENDFC command)

Possible inputs:

Position to :
Specifies from which date Cloning data need to be displayed.

Function keys

F3 = Exit the screen

F5 = Update the values

F10=Other errors

Display errors that are not associated with any cloning. The number of these errors is shown at the top of the screen: " Errors not related to a cloning since 48h".

F11 = Display duration

Displays the same list with the duration of each step.

F12 = Exit the screen

5.2.2 Option 5 = Detail

Display every available details for the selected cloning

This option calls the command FLDSPSTS. Refer to chapter "5.3 FLDSPSTS: Display the cloning status" for more information.

5.2.3 Option 6 = Display product log

Flash for i product historical messages related to the selected clone number are displayed.

This option calls the command FLDSPLOG. Refer to chapter "5.4 FLDSPLOG: Display the Flash4i log" for more information.

5.2.4 Option 8 = JobLog

This option displays the list of spool files generated by the job that ran the backup. These spools are transferred automatically from the Clone partition to the Production partition at the end of the Backup.

5.2.5 Option 9 = Display system log of the clone partition

System log (DSPLOG command) of the Clone partition related to the selected clone number are displayed. This option calls the command FLDSPSLOG. Refer to chapter “5.6 FLDSPSLOG: Display the system log of the Clone partition” for more information.

5.3 FLDSPSTS: Display the cloning status

The FLDSPSTS command displays certain information concerning a cloning number or an environment and the different statuses concerned.

The command parameters are as follows:

```

Product general status (FLDSPSTS)

Type choices, press Enter.

Cloning number . . . . . CLONENBR          *LAST
Environment . . . . . ENV                  *LAST
    
```

Description of parameters:

- CLONENBR Indicates the cloning number for which the user wishes to see the status
*LAST = Gives the status of the last cloning started

- ENV Indicates the name of the environment for which the user wishes to see the status
*LAST = Gives the status of the last environment started

Using the command:

The FLDSPSTS command is used to interactively obtain information about the status of the different elements involved in cloning. It is a good indicator of the product's functioning.

To use this command more effectively, it is advisable to configure a session with 132 columns.

The command displays the following 2 screens:

```

FLDSPSTS                               Display an environment general status                               M81FLASH
                                                                                                     6/03/19  15:41:58

Environment

Clone number . . . . .                741 started  3/03/19 at 19:22:56
Environment . . . . . DEMO_BRMS      Demo environment *BRMS   C12-61
Action to perform . . . . . *BRMS    BRMS FlashCopy State : *ENDPRC

Partition definition . . . . . M81CLONE2  clone partition for User program Backups
    
```



```

Storage definition . . . . . INCREMENT Consistency Group incrémental
Serial Nb, N° LPAR PROD . . . . . 7850C5X 005
Serial Nb, N° LPAR CLONE . . . . . 7850C5X 013

Real time status
Cloning status . . . . . *BRMS_END End of function *BRMS
Last update . . . . . 6/03/19 at 15:41:46

Clone partition status . . . . . Running, SRC code: 00000000
FlashCopy status . . . . . idle_or_copied % Disk used . . . 100%
Last error message . . . . . 0/00/00 at 0:00:00
Messages number . . . . . Nb errors : 0 Nb Valid. : 0 Total : 0

Subsystem status . . . . . Active

Press ENTER to continue

More...

F3=Exit F5=Refresh F10=Log F12=Cancel

```

This first screen displays information about configuration, and real time status.
Press page down to see next screen.

Clone number	Order number requested during the FLDSPSTS command call. Information concerning this clone number is indicated on this screen. Date and time of this clone was started.
Environment	Name of the environment requested during the FLDSPSTS command call, or corresponding to the clone number requested. Information concerning this environment is indicated on this screen.
Action to perform	type of function defined in the requested environment
BRMS FlashCopy State	FlashCopy status in BRMS. See chapter “2.11.3 BRMS Network option “ for details. This information is only displayed if the environment type is *BRMS or *BRMS21. *ENDPRC = This indicates that the FlashCopy process is complete *STRPRC = This indicates that the FlashCopy process is active, and data are being backed up on Clone partition.
Partition definition	Name of the clone partition definition as defined with command FLWRKLPAR
Storage definition	Name of the storage definition as defined with command FLWRKSTG
Serial Nb, N° LPAR PROD Serial Nb, N° LPAR CLONE	Serial number and partition number of Production partition Serial number and partition number of Clone partition
Cloning status	Status the selected clone number is at. The possible values are: *HOLD = The *HOLD function was requested. The Clone partition will not be started by the Flash For i product. *INIT = Process initialization. *STR_FC = FlashCopy started *FIRST_STR = The Clone partition has started and sent it’s first message. This validates that the clone partition is up, and that communication is correct. *BRMS = Backup with BRMS in progress

Last error message
Number of messages

Date and time of the last known error message for this clone number
Number of messages for this clone number
No. errors = Number of unvalidated error messages for this clone number
No. validated = Number of validated error messages for this clone number
Total = Total number of messages for this clone number

Subsystem status

Status of FLASH4I subsystem and automatic job. The possible values are:
- Active
- Automatic processing is stopped = use the FLSTRSBS command to start the subsystem.
- Wrong status for the automatic job = The job FL_AUTO is active, but in abnormal status such as HLD or MSGW.

Next page:

```

FLDSPSTS                                Display an environment general status                                M81FLASH
                                                                                                                6/03/19 17:08:14

Environment
Clone number . . . . .                741 started 3/03/19 at 19:22:56
Environment . . . . .                DEMO_SAVE Demo environment Flash4i *SAVE C12-61
Action to be realized . . . . .      *SAVE
Percentage of disk used . . . . .    After Backup . . . . . : 100%
                                       Before end of FlashCopy : %

Operation                               Date           Time           Duration since   Duration since
Cloning start . . . . .                03/03/19      19:22:56      cloning start    previous operation

Quiesce . . . . .                      03/03/19      19:27:12      4:15            4:15
Start FlashCopy Order . . . . .        03/03/19      19:27:15      4:18            2
Start clone partition order . . . . .   03/03/19      19:28:18      5:21            1:02
Beginning of clone partition . . . . .  03/03/19      19:44:03      21:06           15:45
Beginning of Backup / Config. pgm      03/03/19      19:47:06      24:09           3:02
Beginning QUSRBRM transfer . . . . .   03/03/19      21:16:47      1:53:50         1:29:41
End BRMS operations on Clone . . . . .  03/03/19      21:24:20      2:01:23         7:32
End of Backup / Config. pgm . . . . .  03/03/19      21:24:36      2:01:39         16
End clone partition . . . . .           01/01/01      00:00:00
End FlashCopy . . . . .                 01/01/01      00:00:00
Role change . . . . .                   01/01/01      00:00:00

                                                                                                                End

Press ENTER to continue

F3=Exit  F5=Refresh  F10=Log  F12=Cancel

```

Display every available details for the selected cloning
For every operation, the following information are displayed:

- Name of operation
- Date and time the operation occurred
- Time spent between the beginning of cloning and the operation
- Time spent between the operation and the previews one

All times are displayed at format hh:mm:ss.

The disk occupation % is given for 2 different operations:

- Right after the end of backup
- Right before the end of FlashCopy. If the FlashCopy has been stopped without to use the commands included in Flash For i, this information may be incorrect.

Function keys

F3 = Exit the screen

F5 = Update the values

F10 = Display the messages for this clone. Identical to the FLDSPLOG command.

F12 = Exit the screen

5.4 FLDSPLOG: Display the Flash4i log

The command parameters are as follows:

```

                                Display Log (FLDSPLOG)

Type choices, press Enter.

Clone number . . . . . CLONENB          *ALL
```

Description of parameters:

- CLONENBR Indicates the cloning number for which the user wishes to see the messages
Number from 1 to 999999999 = Clone number for witch the user wishes to see the messages.
- *ALL = Every message will be displayed
- *NONE = The messages with no clone number will be displayed. For example, the messages resulting from file cleaning, or sent after an upgrade of the product.

Using the command:

The FLDSPLOG command is used to obtain a list of messages generated by Flash For i.

Each operation performed by the product produces a message which is recorded in the log. The FLDSPLOG command is used to view this log.

Most of the messages have been generated on the production partition when starting a new clone, or on a clone partition. They are associated with a clone number.

But some messages are not associated to a clone number. For example, the messages sent when files are cleaned, or during the upgrade of the product, or for automatic jobs on the production partition.

To use this command more effectively, it is advisable to configure a session with 132 columns.

The command displays the list of messages

```

13/08/18 22:44:53
Clone number . . . . . *ALL      *ALL, *NONE, 1-999999999
Position to   . . . . . 0/00/00 at 0:00:00
Lookup for a text . . . . .                (May be long)

Enter your options, then press Enter
 5=Display  6=Validate

Clone
Opt Date      Time      Type Msg ID  LPAR  Clone Number  Message text
13/08/18 21:18:10 INF FLA0934 PROD    601 Object(s) FLASH4I/FLASH4I Type *OUTQ restored in lib FLASH4I. Transfer N° 221
13/08/18 21:18:09 INF FLA0934 PROD    601 Object(s) FLASH4I/FLJRN Type *FILE restored in lib FLASH4I. Transfer N° 220
13/08/18 21:17:04 INF FLA1101 PROD    601 Starting the Automat
13/08/18 21:10:00 INF FLA1030 CLONE   601 CLONE partition startup while it is in the END state (save has already been done
13/08/18 21:09:54 INF FLA0922 CLONE   601 Objects FLASH4I/FLASH4I Type *OUTQ done. Transfer N° 221.
13/08/18 21:09:51 INF FLA0910 CLONE   601 Changing state : *SAV21_END, End of the SAVE21
13/08/18 21:09:51 INF FLA1322 CLONE   601 Backup information of JRNRCV extracted
13/08/18 21:09:51 INF FLA0922 CLONE   601 Objects FLASH4I/FLJRN Type *FILE done. Transfer N° 220.
13/08/18 21:08:22 ERR FLA0510 CLONE   601 Job 137710/QPM400/QPM400 in status MSGW, in the subsystem QSYSWRK
13/08/18 21:07:14 INF FLA1101 CLONE   601 Starting the Automat
13/08/18 21:07:02 INF FLA0910 CLONE   601 Changing state : *SAV21, Transferring info to Prod
13/08/18 21:07:01 INF FLA1010 CLONE   601 Tape libraries resources and tape drives changed for new partition
13/08/18 21:06:59 INF FLA1007 CLONE   601 IP config changed. New adress :10.43.43.47
13/08/18 21:06:56 INF FLA0682 CLONE   601 Resource name modified for line QTILINE

F3=Exit  F5=Refresh  F10=Errors only  F12=Cancel  F23=Validate all  More...

```

The log of all the operations performed by the product is displayed.
The messages are sorted in reverse chronological order. The message at the top corresponds to the last message generated.

The columns have the following meanings:

Date and Time	Date and time at which the message was generated.
Type	Message type. The possible types are as follows: INF = Information message. These messages are used to monitor the normal operations performed by the product. ERR = Error message. This information appears in reverse image on the screen to make it more noticeable. VAL = Error message which has been validated by the operator (see option 6 further on)
Msg ID	Message ID.
LPAR	Type of partition the message has been generated on PROD = The message has been generated on Production partition CLONE = The message has been generated on a Clone partition
Cloning number	Cloning order number Every time the FLCLONE or FLSTRFC command is run, the order number is incremented. A cloning number allows to identify every step and every message related with one cloning operation.
Message text	Message text

Possible inputs:

Clone number

Enter the cloning number for which the user wishes to see the messages

- Number from 1 to 999999999 = Clone number for which the user wishes to see the messages.
- *ALL = Every message will be displayed
- *NONE = The messages with no clone number will be displayed. For example, the messages resulting from file cleaning, or sent after an upgrade of the product.

Display from

Specifies from which date and time messages need to be displayed.

As messages are sorted into decreasing order, entering a date only and leaving the time as 0 will display the first message from the previous date. For example, entering 170814 in the date field and nothing in the time field will display the last message available for Aug 16, 2014. The user needs to page up to see the first messages from the selected date.

Look up a string

Used to search for a character string in the message text or ID.

NB: the whole log is searched. If the character string looked up is not present in any message, the search may take a long time before the following screen is displayed.

Options:

Option 5 = Display

Displays the detail of a message. See further information below.

Option 6 = Validate

Used to validate an error message.

This option can only be used on error messages (type = ERR) to indicate that an error has been taken into account and must no longer be processed. This enables the operator to concentrate on the remaining errors, without being concerned about the ones he/she has already validated.

This validation only has an effect for the operator. It has no effect on the product itself.

This option may be used for several messages at the same time.

A confirmation screen is displayed. Press Enter to confirm that the messages need to be validated.

Function keys

F3 = Exit the screen

F5 = Update the values

F10 = Display error messages only

F12 = Exit the screen

F23 = Validate all

Allows to validate all error messages within a range of date / time

5.4.1 Option 5 = Display

The detail of the selected message is displayed.

```

FLDSPLOG5                               Display Message Detail                               M81FLASH
                                           13/08/18  22:47:56
System Name . . . . . M81FLASH           Message Date . . . . . 13/08/18           Message Time . . . . . 21:18:10
Partition type . . . . . PROD             Message Type . . . . . INF              Severity . . . . . 00
Message ID . . . . . FLA0934             Message Origin . . . . . 137509/FL_USER/FL_AUTO
Cloning order Nb . . . . . 601           Serial Nb / Lpar . . . . . 7850C5X / 5

Message . . . . . : Object(s) FLASH4I/FLASH4I Type *OUTQ restored in lib FLASH4I. Transfer N° 221

                                           Bottom

Press ENTER to continue

F3=Exit  F12=Cancel
  
```

5.4.2 F23=Validate all

The function key displays the following window:

```

Enter the range of Date/Time inside which every Error message
must be validated. Then press Enter

Start Date and Time           1/01/01    0:00:00
End Date and Time             4/11/16   17:21:45

F12=Cancel
  
```

Enter the date and time of the first message, and date and time of the last message. All error message within this range will be validated.

This operation is equivalent to option 6 in front of every error message in the selected range.

5.5 FLVLDLOG, Validate the errors in internal log

The FLVLDLOG command allows errors to be validated without the need to use an interactive session. It has the same effect as using the FLDSPLOG command, then option 6. This command can be used in a CLP program, or in a user-defined automation.

The command parameters are as follows:

```

                                Validate Log errors (FLVLDLOG)

Indiquez vos choix, puis appuyez sur ENTREE.

Message ID . . . . . MSGID          *ALL
Beginning date and time:          START
  Beginning date . . . . .          *BEGIN
  Beginning time . . . . .          *BEGIN
Ending date and time:            END
  Ending date . . . . .             *END
  Ending time . . . . .             *END

```

Description of parameters:

- MSGID = Indicate the ID of the messages that have to be validated. Only corresponding messages will be validated.
It is possible to indicate generic names containing either the ? sign to replace a character or the * sign at the end to end with any sequence of characters.
*ALL = All messages in the indicated time range will be validated.
- START = Indicate the date and time that constitute the beginning of the time slot. All the errors that have been generated from this date and time until the date and time contained in the END parameter will be validated.
*BEGIN = All errors will be validated from the beginning.
- END = Indicate the date and time that constitute the end of the time range. All errors that have been generated from the date and time contained in the START parameter to the date and time entered here will be enabled.
*END = All errors will be validated until the last one.

This command generates the following messages in return:

Message ID	Severity	Message text
FLA2291	0	&1 Log errors have been validated.

Using the command:

This command allows you to validate errors without having to connect to an interactive session. It has the same effect as using the FLDSPLOG command, then option 6.

5.6 FLDSPSLOG: Display the system log of the Clone partition

The command parameters are as follows:

```

                                Display Log (FLDSPSLOG)

```



```
Type choices, press Enter.

Clone number . . . . . CLONENB          *ALL
```

Description of parameters:

CLONENBR Indicates the cloning number for which the user wishes to see the messages
 Number from 1 to 999999999 = Clone number for witch the user wishes to see the messages.
 *ALL = Every message will be displayed
 *NONE = The messages with no clone number will be displayed. For example, the messages resulting from file cleaning, or sent after an upgrade of the product.

Using the command:

The system messages (DSPLOG) of the Clone partition are extracted and sent to the Production partition. The FLDSPSLOG command is used to display those messages.

This allows to:

- Display the clone partition messages by connecting on Production partition. No need to connect to the Clone partition console.
- Keep a history of the clone system messages

To use this command more effectively, it is advisable to configure a session with 132 columns.

The FLDSPSLOG works the same way as FLDSPLOG command. See chapter “ 5.4 FLDSPLOG: Display the Flash4i log ” for more details.

5.7 *FLDSPJRNSA: Display saved JRNRCV*

The command parameters are as follows:

```
Display saved journals (FLDSPJRNSA)

Type choices, press Enter.

Cloning number . . . . . CLONENBR          *LAST
Environment . . . . . ENV                  *LAST
```

Description of parameters:

CLONENBR Indicates the cloning number for which the user wishes to see the saved journal receivers
 Number from 1 to 999999999 = Clone number for witch the user wishes to see the JRNRCV.
 *LAST = The last cloning number will be used
 ENV Enter the Environment name for which the user wishes to see the saved journal receivers

Using the command:

The FLDSPJRNSA command allows to see the list of journal receivers (JRNRVC) that have actually been saved on a Clone partition.

This command will show a result only if the information about the saved JRNRVCs is collected on the Clone partition. To do this, check that the parameter "Extract *JRNRVC info" contains *YES in the definition of an environment. (see the last screen of the environment creation: FLWRKENV command).

This command must be used on the Production partition when the backup is completed on the Clone partition, and that all the information has been retrieved from the Production (at least, that the message "FLA1322: Backup information of extracted JRNRVCs" has arrived).

All *JRNRVCs that were detached from the journal on the Production partition before cloning, and that were actually backed up to the Clone partition will be displayed, along with the date and time of the actual backup to the Clone partition.

See Chapter "2.13 Special case for journal receivers (*JRNRVC) " for more information.

The command displays the list of journals found on the Clone partition after the backup.

```

FLDSPJRNSA                Display saved journals                PROD
                                                                    10/03/21 10:04:41
Position to . . . . . /
Clone number . . . . . 1360
Date and time of cloning 10/03/21 à 02:00:12
Enter your options, then press Enter
 12=Detail

```

Opt	Lib. JRN	Name JRN	Nb RCV saved	Nb RCV not saved
	*NONE	*NONE	0	2
	\$JOURNAUX	JRN	189	2
	ACTBKP	ACTBKP	3	3
	CTL4I	CTL4I	188	3
	M3FDBW01	QSQJRN	0	1
	M3W01	QSQJRN	0	1
	M3W01MUA	QSQJRN	0	1
	QMGTC	QYPSDBJRN	0	1
	QRECOVERY	QDBJRNCOLM	0	1
	QRECOVERY	QDBJRNFILE	0	1
	QRECOVERY	QDBJRNXRFO	0	1
	QRECOVERY	QSQTJRN	0	1
	QSRVAGT	QSJJRN	0	1
	QSYS	QACGJRN	3	27
	QSYS2	QSQJRN	0	1

More...

F3=Exit F5=Refresh F12=Cancel

The list of every journals found on Clone partition is displayed.

The columns have the following meanings:

- Cloning number Indicates the cloning number to which this list corresponds. This number was indicated as a parameter when calling the command.
- Date and time of cloning Date and time when the cloning was performed.
- Lib. JRN Library containing the Journal
- Name JRN Journal name

Nb RCV saved Number of JRNRCV associated to this journal that have been saved
 Nb RCV not saved Number of JRNRCV associated to this journal that have not been saved

Possible inputs:

Position to
 Specifies from which library / journal need to be displayed.

Options:

Option 12 = Display
 Displays the list of known journal receivers.

Function keys

- F3 = Exit the screen
- F5 = Update the values
- F12 = Exit the screen

5.7.1 Option 12 = Display

Displays the list of receivers for the selected journal.

```

FLDSPJRSA2                               Display list of journal receivers                               PROD
                                                                                               10/03/21 10:12:58

Position to . . . . . /
Clone number . . . . . 1360
Journal . . . . . ACTBKP / ACTBKP
Enter your options, then press Enter

      Lib. RCV   Name RCV   Size   ----- Save -----
      (MB)      (MB)      Date    Time    Volume  Sequence
ACTBKP   ACTBKP      3,8  10/03/21  02:21:57  BAND07      3
ACTBKP   ACTBKP0001   0,5  10/03/21  02:21:57  BAND07      3
ACTBKP   ACTBKP0002   0,5  10/03/21  02:21:57  BAND07      3
ACTBKP   ACTBKP0003   0,5
ACTBKP   ACTBKP1003   2,1
ACTBKP   ACTBKP2003   0,5

                                                                                               End

F3=Exit   F5=Refresh   F12=Cancel
  
```

The columns have the following meanings:

Cloning number	Indicates the cloning number to which this list corresponds. This number was indicated as a parameter when calling the command.
Journal	Name of selected journal.
Lib. RCV	Library containing the Journal receiver
Name RCV	Journal receiver name
Size (MB)	Size of the JRNRCV in MB
Date	Date on which the JRNRCV was saved
Time	Time on which the JRNRCV was saved
Volume	Volume on which the JRNRCV was saved
Sequence	Sequence number on which the JRNRCV was saved

Backup information is only related to the cloning number selected for this view, and for backups made on the Clone partition.

If the JRNRCV was backed up later during another cloning, you must consult the data of this other cloning to get the latest information.

If the JRNRCV was backed up on the Production partition, this information is not known or searched by Flash for i. It is therefore not indicated here.

For a JRNRCV, if no backup information appears in the list, it means that the JRNRCV was not backed up during the selected cloning, or that at the instant the Cloning started, it didn't exist on the production partition or was still attached to the journal.

Possible inputs:

Position to
Specifies from which library / receiver need to be displayed.

Function keys

F3 = Exit the screen

F5 = Update the values

F12 = Exit the screen

5.8 FLCHKLPAR: Check configuration of a Clone partition

The FLCHKLPAR command is used to check that a Clone partition definition (defined with command FLWRKLPAR) is correct, and that the HMC can be reached.

The command parameters are as follows:

```

Check clone partition status (FLCHKLPAR)

Type choices, press Enter.

LPAR definition . . . . . LPAR
HMC to test . . . . . HMC          *DFT
  
```

Description of parameters:

- LPAR = Enter the name of a Clone partition definition.
- HMC = Indicate which HMC described in the definition (entered with the FLWRKLPAR command) should be tested
 - *DFT = The HMC described in parameter HMC1 is tested first. If the connection does not work, the HMC2 is tested if it is defined.
 - *HMC1 = The HMC described in parameter HMC1 is tested
 - *HMC2 = The HMC described in parameter HMC2 is tested

This command generates the following messages in return:

Message ID	Severity	Message text
FLA0332	0	Ok, clone partition status : &1
FLA0172	40	Partition definition &1 not found
FLA0331	40	Error, clone partition status : &1

Using the command:

The command checks that the connection to the HMC is correct and returns the status of the partition defined via the FLWRKLPAR command.

The *HMC1 and *HMC2 values of the HMC parameter are used to select a specific HMC to test.

The *DFT value will indicate the result for the first of the 2 HMCs for which the connection is correct.

This command does not display a screen. The result of this command is a message sent in return indicating the necessary information.

It uses the information contained in the clone partition definition passed as a parameter, connects to the HMC to retrieve the status of the partition, and then returns a message indicating this status.

If the definition type is *PROXY, the request will be sent to the proxy partition, and only the final message will be sent back by the command. Connect to the Proxy partition to obtain more details if necessary.

This command will mainly be used when installing the product, or configuring a new clone partition, to verify that the HMC is being accessed correctly, or that the information entered in the definition is correct.

5.9 FLCHKSTG: Check configuration of a Storage

The FLCHKSTG command is used to check that a storage definition (defined with command FLWRKSTG) is correct.

The command parameters are as follows:

```

                                Check Storage status (FLCHKSTG)

Type choices, press Enter.

Storage definition . . . . . STG
```

Description of parameters:

STG = Enter the name of a Storage definition.

This command generates the following messages in return:

Message ID	Severity	Message text
FLA0332	0	Ok, FlashCopy status : &1
FLA0172	40	Storage definition &1 not found
FLA0331	40	Error, FlashCopy status : &1

Using the command:

This command does not display a screen. The result of this command is a message sent in return indicating the necessary information.

It uses the information contained in the storage definition passed as a parameter, connects to the storage system to retrieve the status of the FlashCopy, and then returns a message indicating this status.

This command will mainly be used when installing the product, or configuring a new storage system, to verify that the connection to the storage system is OK, or that the information entered in the definition is correct.

If the definition type is *SGC (SafeGuarded Copy),

- The following elements will be automatically created on the storage system if they don't already exist:
 - o The SafeGuarded policy
 - o The volume group
 - o The disks of the selected host will be added in the volume group
- The command only checks the infrastructure to allow SafeGuarded copies to be made. Use the FLCHKSGC command to verify that copies are actually made.

If the definition type is *PROXY, the request will be sent to the proxy partition, and only the final message will be sent back by the command. Connect to the Proxy partition to obtain more details if necessary.

5.10 FLCHKCTLSB: Check QCTLSBSD system value

The FLCHKCTLSB command is used to check that there are no errors concerning the control subsystem on the Production partition.

The command parameters are as follows:

This command has no parameters.

This command generates the following messages in return:

Message ID	Severity	Message text
FLA0998	0	No error found for system value QCTLSBSD
FLA0999	99	ATTENTION, The system value QCTLSBSD is incorrect.

Using the command:

If an error occurs when using the FLCLONE or FLSTRFC commands when starting the FlashCopy/Snapshot, e.g. a command stop with a System-request-2, or the job that performs the command is canceled, then there is a risk that the system value QCTLSBSD contains the sub-system name FL_CLONE instead of QCTL or QBASE. This

modification is performed by these commands to allow to IPL the Clone partition correctly, and then restored immediately after the FlashCopy/Snapshot.

In this case, the next IPL on the production partition would use the FL_CLONE subsystem by error.

The FLCHKCTLSB command checks that the content of the QCTLSBSD value is correct.

This command is launched automatically every hour by the FL_AUTO job (in the FLASH4I subsystem).

If an error is detected:

- The error message FLA0999 is added to the product log. The second level of this message gives the commands to be used with the correct values.
- Reset the system value QCTLSBSD
 - o WRKSYSVAL SYSVAL(QCTLSBSD)
- Reset the automatic start of functions at the IPL
 - o CHGIPLA STRPRTWTR(*YES) STRTCP(*YES).

5.11 FLCHKLOG: Check the number of error messages

The FLCHKLOG command is used to count the number of error messages in a specific time and to generate an alert if this number exceeds the quantities passed as parameters.

The command parameters are as follows:

```

                                Check errors (FLCHKLOG)

Type choices, press Enter.

Search period (in h.) . . . . . PERIOD          24
Error message ID . . . . . MSGID              *ALL
                                + for more values
Max error nb.(W) . . . . . MAXERR_W          0
Max error nb. (C) . . . . . MAXERR_C          0
```

Description of parameters:

- PERIOD** = Indicates a number of hours. The command will include the number of error messages occurring since this time.
- MSGID** = Enter the list of error message IDs to consider. Only the messages with type ERROR and which ID is in this list will be counted.
 *ALL = Every error message will be counted.
 *NONE = Messages with no message ID will be counted.
 Message ID = Enter a list of a maximum of 50 message IDs. Only those message IDs will be counted. It is possible to enter generic names.
- MAXERR_W** = Indicates the maximum number of error messages in the period. If the number of errors found is higher than this parameter, a Warning alert will be generated.
- MAXERR_C** = Indicates the maximum number of error messages in the period. If the number of errors found is higher than this parameter, a Critical alert will be generated.

This command generates the following messages in return:

Message ID	Severity	Message text
FLA0660	40	Parameter &1 must be lower than or equal to parameter &2
FLA0661	40	Number of errors &2 higher than the critical limit &1 Err=&2, Val=&3, Total=&4

FLA0662	0	There are &1 error message(s) (under the requested limit) Err=&1, Val=&2, Total=&3
FLA5661	20	Number of errors &2 higher than the warning limit &1 Err=&2, Val=&3, Total=&4

Using the command:

This command does not display a screen. The result of this command is a message sent in return indicating the necessary information.

The messages resulting from this command contain some additional information. They end in |Err=&2, Val=&3, Total=&4. For information, this part gives the following values:

- Err = Number of error messages found in the period
- Val = Number of validated error messages found in the period
- Total = Total number of messages found in the period

This format is specially designed for use in monitoring products such as Nagios.

The second level of these messages Gives the list of the errors found (maximum 20 lignes)

Use this command for example in a monitoring tool to check that there are no errors relating to using Flash For i.

5.12 FLCHKSBS: Check that Flash For i automate is active

The FLCHKSBS command is used to check that the FLASH4I subsystem and FL_AUTO job are active.

The command parameters are as follows:

This command has no parameters.

This command generates the following messages in return:

Message ID	Severity	Message text
FLA0612	0	Automatic processing is active (&3/&2/&1). Flash4i version &4, Build &5/&6/&7
FLA0608	40	Wrong status for the automatic job (&5/&6/&7). Flash4i version &1, Build &2/&3/&4
FLA0609	40	Wrong status for the automatic job.
FLA0610	40	Automatic processing of Flash4i never started. Flash4i version &1, Build &2/&3/&4
FLA0611	40	Automatic processing has stopped. Last active was: &3/&2/&1. Flash4i version &4, Build &5/&6/&7
FLA0613	40	The automatic job is stopped.
FLA0624	40	The subsystem FLASH4I is stopped.

Using the command:

This command does not display a screen. The result of this command is a message sent in return indicating the necessary information.

It checks the following points:

- FLASH4I subsystem is active

- FL_AUTO job is active
- FL_AUTO job is not in status MSGW

Use this command in a monitoring tool, for example, to check that the automatic jobs necessary to Flash For i are active.

5.13 FLRTVSTS, Retrieve the status of elements in a CLP program

The FLRTVSTS command is used to find out the status of the different elements included in Flash For i in a CLP program.

The command parameters are as follows:

```

                                Extract Clone status (FLRTVSTS)

Type choices, press Enter.

Environment . . . . . ENV                *LAST
Cloning number . . . . . CLONENB        *LAST
Variable for Envir.      (10) RTNENV
Variable for clone nb    (9 0) RTNCLONNB
Variable for Action      (10) ACTION
Variable for Prod. status (10) PRODSTS
Variable for Clone Status (10) CLONESTS
Variable for Clone step  (3) CLONESTEP
Variable FlashCopy status (25) FLASHSTS
Variable for LPAR status (25) LPARSTS
Variable for LPAR SRC Code (8) LPARSRC
Variable for start Date  (6) STRDATE
Variable for start Hour  (6) STRTIME
Variable Subsystem Status (10) SBSSTS
Variable for part. name  (10) RTNLPAR
Variable for storage name (10) RTNSTG
Variable for part. type  (5) RTNPARTYPE
Variable for site type   (4) SITETYPE

```

Description of parameters:

- | | |
|------------|--|
| ENV | Name of the environment for which the user wishes to retrieve the statuses
*LAST = The last environment started will be used |
| CLONENB | Cloning number for which the user wishes to retrieve the statuses.
*LAST = The last environment started will be used |
| RTNENV | Name of the environment for which the statuses are retrieved. If *LAST is specified in the ENV parameter, the name of the last environment started will be returned. If not, the content of the ENV parameter will be returned. |
| RTNCLONENB | Cloning number for which the statuses are retrieved. If *LAST is specified in the CLONENB parameter, the number of the last environment started will be returned. If not, the content of the CLONENB parameter will be returned. |
| ACTION | type of action configured for the environment. The possible values are as follows:
*HOLD
*BRMS
*BRMS21 |

	*SAVE
	*SAVE21
	*USER
PRODSTS	Status of the Production partition. Starting with version 3: This status is still used but is no longer significant. Use the status of the Clone partition (CLONESTS parameter) The possible values are: *STRCLONE = Starts cloning with the FLCLONE command *WAIT = Cloning carried out, waiting for return from the Clone partition *RUN = Return obtained from the Clone partition. The Clone partition is operational *FLASHCOPY = FlashCopy is active but partition stopped *STOP = FlashCopy and Partition stopped *ERROR = An error occurred on the Production partition
CLONESTS	Status of the Clone partition. See chapter "2.4.1 Available statuses" for a list and meaning of the statuses.
CLONESTEP	Step the Clone partition is at.
FLASHSTS	Status of FlashCopy, obtained by querying the Storwize system. The possible values are: copying = FlashCopy is active stopping = FlashCopy is stopping stopped = FlashCopy is stopped idle_or_copied = The consistency group has been created but never started. Connection error = An error occurred during connection to Storwize.
LPARSTS	Status of the Clone partition, obtained by querying the HMC. The possible values are: Not activated = The partition has not been started Starting = The partition is in the process of starting Running = The partition is active Could not create directo = Error relating to the profile used. See section "15 Troubleshooting".
LPARSRC	SRC code of the Clone partition, obtained by querying the HMC.
STRDATE	Environment start date in DDMMYY format
STRTIME	Environment start time in HHMMSS format
SBSSTS	Status of FLASH4I subsystem. The possible values are: OK = The FLASH4I subsystem and the FL_AUTO job are active ERROR = The subsystem and/or job are stopped.
RTNLPAR	Name of the partition definition used by the environment.
RTNSTG	Name of the storage definition used by the environment.
RTNPARTYPE	Type of local partition. PROD = The partition is the Production (source of FlashCopy) CLONE = The partition is the Clone (Target of FlashCopy) END = The partition is the Clone (Target of FlashCopy), and the function to process is finished.
SITETYPE	Type of site defined in the Central Management module *PRI = Primary site *SEC = Secondary site *STD = Standard site, or the Central Management module is not used.

This command generates the following messages in return:

Message ID	Severity	Message text
FLA0301	40	Clone Nbr &2 not found, or doesn't correspond to the Environment name
FLA0501	99	No definition found for environment &1.

Using the command:

The FLRTVSTS command is used to find out the status of the different elements of an environment in a CLP program. This is used to carry out specific programs for monitoring changes in this environment.

6 Product management commands

The commands described in this section are used to manage the product.

- Define the environments and the list of VIOSeS.
- Start and stop automatic processing
- Initialize the product
- Add information on the status of a function or add monitoring messages to the log

6.1 FLMENU, Display the product's main menu

The FLMENU command displays the main menu of the Flash For i product. It displays the main available commands.

It's also available thru the command GO FLMENU.

The displayed menu is as follows:

```

FLMENU                               Flash for i general menu

Select one of the following:

  Commands for information and status
    1. Display cloning history          FLDSPHST
    2. Display cloning status          FLDSPSTS
    3. Display Flash for i log         FLDSPLOG
    4. Display clone's system log     FLDSPSLOG
    5. Work with spools                WRKOUTQ  OUTQ(FLASH4I)
    6. Display saved JRNRCV           FLDSPJRNSA

  Related Commands Menus
    10. Menu for Configuration
    11. Menu for Controls
    12. Menu for Actions
    13. Menu for key, authorisation and miscellaneous
    14. Menu for Central Management and DRP
    15. Menu for SafeGuarded Copies

Selection or command

====>

```

This first menu is used to access Flash For i information and status commands.

These are the commands that will be used daily to see information and status of clones.

The commands called by options 1 to 4 are described in previous section.

Option "5. Work with spools" displays the content of the output queue FLASH4I. it contains the spools generated on Clone partition, and specially the job logs of the jobs that ran the backups.

Option 10 displays a menu containing the configuration commands.

```

FLMENUCF                             Flash for i configuration menu

Select one of the following:

  Configuration commands

```

```

1. Work with environments          FLWRKENV
2. Work with storages             FLWRKSTG
3. Work with partitions           FLWRKLPAR
4. Work with VIOS (if vSCSI)     FLWRKVIO
5. Work with tape libraries      FLWRKTAP
6. Work with parameters          FLPARAM

Work with Flash for i eMails
  11. eMail management menu

Reconfiguration
  12. Menu for Reconfiguration of a Clone partition
  13. Menu for HMC resources management

Selection or command
====>

```

Option 10 – submenu 11 displays a menu to work with email module configuration.

```

FLMENUMA          Work with Flash for i eMails

Select one of the following:

Work with Flash for i eMails
  1. Conditions for sending eMails  FLWRKMAIL
  2. List of eMail recipients      FLWRKDST

====>

```

Option 10 – submenu 12 displays a menu to work with reconfiguration module.

```

FLMENURC          Flash for i Reconfiguration menu

Select one of the following:

Definitions commands
  1. Define reconfigurations        FLWRKCFG
  2. User profiles to restore       FLWRKCFGUS
  3. Libraries to restore           FLWRKCFGLI
  4. Directories to restore         FLWRKCFGDI

Commands to use on a Clone partition
  11. Apply new configuration        FLCHGCFG
  12. Restore source system config  FLRSTCFG
  13. Change partition role         FLCHGROL

====>

```

Option 10 – submenu 13 displays a menu to work with HMC resources.

```

FLMENURS          Flash for i, HMC resources menu

```

```

Select one of the following:

Configuration commands
  1. Work with HMC resources          FLWRKHMCRS
  2. Check HMC resources              FLCHKHMCRS
  3. Move HMC resources               FLCHGHMCRS

Commands to use in a program
  11. Retrieve info for HMC resource FLRTVHMCRS

Selection or command

====>

```

Option 11 displays a menu containing the checking commands.

```

FLMENUCT          Flash for i Control Commands

Select one of the following:

Control commands
  1. Add a Log message                FLADDLOG
  2. Validate errors in Log          FLVLDLOG
  3. Check Flash4i Subsystem Status  FLCHKSBS
  4. Check errors in Flash4i Log     FLCHKLOG

  5. Check status via ssh            FLCHKSSH
  6. Check storage status            FLCHKSTG
  7. Check Clone LPAR status        FLCHKLPAR
  8. Test http request              FLTSTHTTP

Commands to use in a program
  11. Extract Clone status           FLRTVSTS

Selection or command

====>

```

Option 12 displays a menu containing the commands performing an action.

```

FLMENUAC          Flash for i Actions commands

Select one of the following:

Actions Commands
  1. Start Partition Cloning        FLCLONE
  2. Stop Partition                  FLENDLPAR

```

```

3. Stop FlashCopy                FLENDFC
4. Start FlashCopy               FLSTRFC
5. Start Partition               FLSTRLPAR

6. Start FLASH4I subsystem       FLSTRSBS
7. Stop FLASH4I subsystem       FLEND SBS

8. Update save info JRNRCV       FLJRNUPDSA
9. Restore system config         FLRSTCFG
10. Change partition role        FLCHGROL
11. Change Clone partition time  FLCHGTIM
Selection or command

====>

```

Option 13 displays a menu containing the commands for keys management, and miscellaneous commands.

```

FLMENUIN      Flash for i key management, and miscellaneous menu

Select one of the following:

Key management commands
  1. Work with license keys      FLWRKKEY
  2. add a license key          FLADDKEY

Miscellaneous commands
  11. Display product information  FLDSPINF
  12. initialize Flash for i      FLINIT
  21. Clean up log                FLCLEAR
  22. Copy an object to Prod      FLCPYOBJ
  23. Copy IFS file to Prod       FLCPYIFS

Work with authorisations
  31. Menu for authorisations

Selection or command

====>

```

Option 13 – submenu 31 displays a menu to work with authorisations.

```

FLMENUAU      Flash for i authorisations menu

Select one of the following:

Work with authorisations
  1. Work with authorisations    FLWRKAUT
  2. Enroll user profiles        WRKAUTL AUTL (FLASH*)

====>

```

Option 14 displays a menu containing the commands for Central management module.

```

FLMENUMN          Centralized management menu

Select one of the following:

Configuration commands
  1. Work with sites          FLWRKSIT
  2. Send definitions to sites FLSNDBASE

Display information from sites
  11. List of current clonings  FLDSPHSTP
  12. data coming from a site  FLDSPSITDT

  21. Clean up log *SEC sites   FLCLRSIT

Menu for DRP assistance
  31. Menu for DRP            GO FLDRP

====>

```

Option 14 – submenu 31 displays a menu for DRP assistance.

```

FLDRP             Flash for i, Work with DRP module

Choisir une des options suivantes :

  1. Work with storages       FLWRKSTG
  2. Work with partitions     FLWRKLPAR
  3. Work with DRP definitions FLWRKDRP

  11. Check storage status    FLCHKSTG
  12. Check Clone LPAR status FLCHKLPAR
  13. Check DRP status        FLCHKDRP

  21. Display DRPs status     FLDSPDRP

  31. Start DRP               FLSTRDRP

  90. Sign off

Option ou commande

```

Option 15 displays a menu containing the commands for SafeGuarded Copy module.

```

FLSGC             SafeGuarded Copy menu

Select one of the following:

Information and status commands
  1. List active Safeguarded copies  FLDSPSGC

Control commands
  11. Check active SafeGuarded copies FLCHKSGC

```



```

Action commands
 21. Start a SafeGuarded Copy          FLSTRSGC

Selection or command

====>
  
```

6.2 FLWRKSTG, Work with Storage definitions

The FLWRKSTG command is used to manage storage definitions that will be used to clone the disks.

The command parameters are as follows:

This command has no parameters.

Using the command:

The command is used to create, modify or delete the storage definitions, i.e.: information that will be necessary to connect to the disk bay and start or stop the FlashCopy. Those definitions will be used in the Environments definitions.

The command displays the following screen:

```

FLWRKSTG                Work with Storage definitions                M81FLASH
                                                                    6/02/19 15:37:24

Position to . . . . .

Enter your options, then press Enter
 2=Change  3=Copy  4=Delete  5=Display  7=Check connection
12=Work with VIOS

Opt Name      Type      Description                                Nb VIOS
GRP_1         *SVC     Consistency Group for BRMS Backup Clone1    0
GRP_2         *SVC     Consistency Group for specific backup Clone2  0
INCREMENT    *SVC     Consistency Group incrémental              0
M81CLONE2    *PROXY   For test only                              0

                                                                    End

F3=Exit  F5=Refresh  F6=Create  F12=Cancel
  
```

This screen provides the list of definitions which have already been defined.
The definitions are sorted by alphabetical order.

The columns have the following meanings:

Name	Definition name
Type	Type of definition
Description	Free text describing the definition
Nb VIOS	Number of VIOSes defined for this storage definition

Possible inputs:

Position to
Used to specify which definition must be displayed first

Options:

Option 2 = Change
Used to change the specified definition.

Option 3 = Copy
Used to copy the specified definition. The resulting screen will be similar to the definition creation screen

Option 4 = Delete
Used to delete the specified definition.

Option 5 = Display
Used to display definition

Option 7 = Check connection
Check the definition with the command FLCHKSTG

Option 12 = Manage VIOSes
Used to manage the VIOSes associated with this storage definition via the FLWRKVIO TYPE(*STG) command.

Function keys

F3 = Exit the screen

F5 = Update the values

F6 = Create a new storage definition

F12 = Exit the screen

6.2.1 Creating, changing, copying or displaying a storage definition

From the main FLWRKSTG command menu, using the F6 key or options 2, 3 and 5 displays the following screen.

If option 5 = display is used, no information can be changed.

If option 3 is used, it is like when creating a definition, but all the fields are initialized with the values of the selected definition.

The information displayed on screen depend on the type of storage selected. The possible types are:

- *SVC: IBM disk bay type SVC or Storwize
- *DS8000: IBM disk bay of DS8000 series
- *SPECIF: the access to the disk bay will be done thru specific programs written by the user.
- *VMAX_HTTP: DELL/EMC VMAX disk array with an http or https access
- *UNITY : DELL/EMC disk array
- *PURESTG : Pure Storage PURITY
- *SGC : SafeGuarded Copy definition
- *PROXY : When a Proxy partition is used

Function keys

F3 = exit the requested function and return to the list of definitions

F5 = Reset the values to what they were at the start.

F12 = Exit the requested function and return to the list of definitions

F22 = For certain screens, the F22 key can be used. It is used to display/change a field containing 250 characters. Only the first part of the field is displayed. Place the cursor on the selected field and press F22. Another screen will be displayed, enabling the user to enter the whole field if necessary. 250-character fields are indicated with the "...' sign.

Screen 1: Select the type of disk array

Enter the definition name, and select the type of disk bay to define

```

FLWRKSTG2                Create Storage definition                M81FLASH
                                                                10/05/19 16:56:19

Enter your options, then press Enter

Storage definition name  . . GRP_1      Name
Storage description    . . . . Consistency Group for BRMS Backup      Clone1
Type of storage        . . . . .      *SVC *DS8000 *SPECIF *VMAX_HTTP
                                                                *SGC *PURESTG *UNITY *PROXY

                                                                End

F3=Exit  F5=Refresh  F12=Cancel  F22=Full area

```

This screen is only displayed to create a new definition (F6 function key)

This first screen is used to specify the name of the storage definition, and to select the type of storage bay.

Storage definition name	Enter the name of the definition to create
Storage description	Enter a text describing this definition
Type of storage	Type of disk bay. *SVC = IBM bay, type SVC or Storwize *DS8000 = IBM bay, DS8xxx series *SPECIF : the access to the disk bay will be done using specific programs given by the user. *VMAX_HTTP: DELL/EMC VMAX disk bay with an http or https access *UNITY : DELL/EMC disk array *PURESTG : Pure Storage PURITY *SGC : SafeGuarded Copy definition

Screen 2: *SVC: IBM bay, type SVC, FlashSystem or Storwize

Enter the necessary information for an IBM SVC, FlashSystem or Storwize.

```

FLWRKSTG2                Change Storage definition                M81FLASH
                                                                10/05/19 17:03:41

Enter your options, then press Enter

Storage definition name . . GRP_1          Name
Storage description . . . . Consistency Group for BRMS Backup      Clone1
Type of storage . . . . . *SVC            *SVC *DS8000 *SPECIF *VMAX_HTTP
                                                *SGC *PURESTG *UNITY *PROXY

Information about storwize
Controller 1:
  IP Address or Name . . . . FLASH_V7000
                                                                ...

Controller 2:
  IP Address or Name . . . .
                                                                ...

User . . . . . M81FLASH
Disk consistancy group . . . M81_CLONE1
Copy type . . . . . *FLASHCOPY *FLASHCOPY,
*REMOTE

                                                                End

F3=Exit  F5=Refresh  F12=Cancel  F22=Full area
  
```

Controller 1:
IP address or Name IP address or DNS name of the first Storwize controller.
Use the F22 key if the name contains more than 120 characters.

Controller 2:
IP address or Name Optional. IP address or DNS name of the second Storwize controller.
Use the F22 key if the name contains more than 120 characters.
Do not enter anything if the Storwize has only one IP address.

User Name of account created on the Storwize which will be used to
communicate from the Production partition.

See section "4.6 Configuring the Storwize system to accept remote operations" to find out how to create this account.

Disk consistency group	Name of consistency group created on Storwize to enable FlashCopy of disks from the Production partition.
Copy type	<p>See section "4.2 Configuring FlashCopy/Snapshot on the Disks system" Specify the type of the consistency group defined on the SVC.</p> <p>*FLASHCOPY = The consistency group is of type FlashCopy. The copy is local and will be used as a clone, for example for backups. This is the default value, which should be used in most cases.</p> <p>*REMOTE = The consistency group is of type Remote (Metro Mirror or Global mirror). In this case, it must be managed in a specific way. In particular, the FLCLONE command cannot be used with this type of definition. Only the FLSTRFC and FLENDFC commands can be used.</p>

Screen 3: *DS8000: IBM bay, DS8xxx series, part 1

Enter the necessary information for an IBM DS8xxx bay using the 2 following screens.

```

FLWRKSTG2                Change Storage definition                M81FLASH
                                                                10/05/19 17:06:54

Enter your options, then press Enter

Storage definition name . . GRP_1          Name
Storage description . . . . Consistency Group for BRMS Backup      Clone1
Type of storage . . . . . *DS8000        *SVC *DS8000 *SPECIF *VMAX_HTTP
                                                *SGC *PURESTG *UNITY *PROXY

Information about DS8000
  IP Address or Name . . . .      Ip_DS8000
                                   ...

  User . . . . .
  Profile file name . . . . .
  Device name . . . . .

Options
  Option 1                        Option 2
  Option 3                        Option 4
                                   More...

F3=Exit  F5=Refresh  F12=Cancel  F22=Full area
  
```

IP address or Name	IP address or DNS name of the DS8xxx. Use the F22 key if the name contains more than 120 characters.
User	User name for connection to the DS8xxx
Profile file name	Enter the name of the file containing the description of the profile and its password. This file can be created using the command "managepwfile -action add ". It must be stored in the IFS, in directory /Flash4i.


```

17:21:23
10/05/19

Enter your options, then press Enter

Storage definition name . . GRP_1      Name
Storage description . . . . Consistency Group for BRMS Backup      Clone1
Type of storage . . . . . *SPECIF    *SVC *DS8000 *SPECIF *VMAX_HTTP
                                   *SGC *PURESTG *UNITY  *PROXY

Start the snapshot
  Program name . . . . . PGM_START    Name
  Library . . . . . QGPL              Name

Stop the snapshot
  Program name . . . . . PGM_END      Name
  Library . . . . . QGPL              Name

Snapshot state and disk occupation
  Program name . . . . . PGM_STS      Name
  Library . . . . . QGPL              Name

End

F3=Exit  F5=Refresh  F12=Cancel  F22=Full area

```

The * SPECIF storage type allows you to define the elements needed to make a FlashCopy or Snapshot on an unsupported disk array (for now).

- Start the snapshot Name of the program that will be called to start the Snapshot. It will be called with the value *START as the first parameter.
- Stop the snapshot Name of the program that will be called to stop the Snapshot. It will be called with the value *END as the first parameter.
- Snapshot state and disk occupation Name of the program that will be called to obtain the status of the Snapshot. It will be called with the value *GETINFO as the first parameter.

The source file FLASH4I/FLEXAMPLES - EXAMPLE05 contains a source example for this type of program.

The programs must have 5 parameters:

- Parameter 1 10 characters
Contains the type of operation requested. The possible values are:
*START = Start the Snapshot
*END = Stop the Snapshot
*GETINFO = the program must return information about status of the Snapshot.
- Parameter 2 2 characters
Value returned by the program to indicate if the operation went well. The possible values are:
OK = The function has ended successfully
ER = There was an error during the operation.
Any other value = Will be considered as an error.
- Parameter 3 50 characters
Value returned by the program containing a message.
For a request of the type *GETINFO, this message is obligatory and must contain 25 characters describing the state of the Snapshot
For *START or *END requests, this message is optional. If filled, it will be added to the product history using FLADDLOG command.

- Parameter 4 1 characters
Value indicating the status of the snapshot. The possible values are:
1 = Snapshot is active
2 = Snapshot is stopped

- Parameter 5 Numeric value of 5 digits
Contains the clone occupancy rate.

Screen 6: *VMAX HTTP: DELL/EMC VMAX in http or https, part 1

Enter the necessary information for a DELL/EMV VMAX array with an access in http or https, using the 2 following screens.

If the protocol used is https (secured), it is necessary to obtain the certificate used by the disk bay, and integrate it into the Digital Certificate Manager (DCM) of the IBM i partition. An operation mode if available in chapter "17 Import an https certificate".

```

FLWRKSTG2                               Change Storage definition                               M81DEV
                                                                                               19/03/20 11:40:27

Enter your options, then press Enter

Storage definition name . . VMAX           Name
Storage description . . . . Configuration for VMAX in https
Type of storage . . . . . *VMAX_HTTP *SVC *DS8000 *SPECIF *VMAX_HTTP
                                                                 *SGC *PURESTG *UNITY *PROXY
Protocol type . . . . . *HTTPS           *HTTP, *HTTPS
Certificate Store (https) . . /Flash4i/CertStore_VMAX.kdb

Cert. Store password . . . .
Cert. Store password confir.
Bay version . . . . . 84                 84, 90
Bay IP/Name . . . . . 10.1.2.3

Port . . . . . 8443
Symetrix ID . . . . . 123456

                                                                                               More...

F3=Exit   F5=Refresh   F12=Cancel   F22=Full area
  
```

- Protocol type Enter the type of protocol used
*http: Non crypted access
*https: Encrypted access

- Certificate Store (https) If the access type is https, enter the path and file name containing the Certificate Store created in the DCM.
- Cert. Store password If the access type is https, enter the password associated to Certificate Store.
- Cert. Store password confir Confirm the password by entering it a second time

- Bay version Enter the version of the array
84 = Version 8.4
90 = Version 9.0
- Bay IP/Name IP address of the bay

Port used for version 8.4 is 8443
Symetrix ID ID of the bay

Screen 7: *VMAX HTTP: DELL/EMC VMAX in http or https, part 2

```

FLWRKSTG2                Change Storage definition                M81DEV
                                                                    19/03/20 11:44:17

Enter your options, then press Enter

Storage definition name . . VMAX                Name
Storage description . . . . Configuration for VMAX in https
Type of storage . . . . . *VMAX_HTTP *SVC *DS8000 *SPECIF *VMAX_HTTP
                                                                    *SGC *PURESTG *UNITY *PROXY

Authorization code (Base64)
Conf. Autho. code (Base64) .
Storage group Disk . . . . . Group_Name
Snapshot name . . . . . Snap_Name
Storage group Target (Host). Host_Name
Retention period . . . . . 1 days
Force snapshot creation . . *NO                *YES, *NO

                                                                    End

F3=Exit   F5=Refresh   F12=Cancel   F22=Full area
  
```

Authorization code (Base64) Convert the profile and password used to connect to the bay to format Base64, then enter the result here.

See hereunder the operation mode to obtain this code

Conf. Autho. code (Base64) Enter the Authorization code a second time to confirm it.

Storage group Disk Enter the Storage group defining the disks in the bay

Snapshot name Enter the snapshot name to use in the bay

Storage group Target (Host) Enter the storage group defining the host in the bay

Retention period Enter the number of days the relink must remain active

Force snapshot Enter *YES if the parameter -force must be used when a new generation of the snapshot is created. This may be necessary if the new snapshot is generated on a Storage Group located on a remote site (SRDF) with an Asynchronous replication for example.

To obtain the code at format Base64, go to web site:

<https://www.base64encode.org/>

Enter the profile and password separated by “:”, like this: smc:smc

Then click “Encode”

The result for default profile/password smc:smc is est c21jOnNtYw==

Encode to Base64 format

Simply enter your data then push the encode button.

smc:smc

i To encode binaries (like images, documents, etc.) use the file upload form a bit further down on this page.

UTF-8 Destination character set

LF (Unix) Destination newline separator.

Encode each line separately (useful for multiple entries).

Split lines into 76 character wide chunks (useful for MIME).

Live mode OFF Encodes in real-time when you type or paste (supports only UTF-8 character set).

> ENCODE < Encodes your data into the textarea below.

c21jOnNtYw==

Screen 8: *UNITY: DELL/EMC UNITY in http or https, part 1

Enter the necessary information for a DELL/EMV UNITY array with an access in http or https, using the 2 following screens.

If the protocol used is https (secured), it is necessary to obtain the certificate used by the disk bay, and integrate it into the Digital Certificate Manager (DCM) of the IBM i partition. An operation mode if available in chapter "17 Import an https certificate".

```

FLWRKSTG2                Create Storage definition                M81DEV
                                                                    29/10/21 14:46:29

Enter your options, then press Enter

Storage definition name  . . UNITY          Name
Storage description     . . . . Configuration for UNITY in https
Type of storage         . . . . . *UNITY    *SVC *DS8000 *SPECIF *VMAX_HTTP
                                                                    *SGC *PURESTG *UNITY *PROXY
Protocol type           . . . . . *HTTPS    *HTTP, *HTTPS
Certificate Store (https). . /Flash4i/Certstore_Unity.kdb
    
```

```

Cert. Store password . . . .
Cert. Store password confir.
IP Address/Name . . . . . 10.1.2.2
                                     ...
Second IP Address/Name . . . 10.11.12.13
                                     ...
Authorization code (Base64)
Conf. Autho. code (Base64) .
                                     More...
F3=Exit   F5=Refresh   F8=Work with disks   F12=Cancel   F22=Full area
  
```

- Protocol type Enter the type of protocol used
 *http: Non crypted access
 *https: Encrypted access

- Certificate Store (https) If the access type is https, enter the path and file name containing the
 Certificate Store created in the DCM.
- Cert. Store password If the access type is https, enter the password associated to Certificate
 Store.
- Cert. Store password confir Confirm the password by entering it a second time

- IP Adress/Name IP address of the array, or DNS name
- Second IP Address/Name second IP address if it's configured in the Unity

- Authorization code (Base64) Convert the profile and password used to connect to the bay to format
 Base64, then enter the result here.
 See hereunder the operation mode to obtain this code
- Conf. Autho. code (Base64) Enter the Authorization code a second time to confirm it.

To obtain the code at format Base64, go to web site:
<https://www.base64encode.org/>
 Enter the profile and password separated by ":", like this: smc:smc
 Then click "Encode"
 The result for default profile/password smc:smc is est c21jOnNtYw==

Encode to Base64 format

Simply enter your data then push the encode button.

smc:smc

i To encode binaries (like images, documents, etc.) use the file upload form a bit further down on this page.

UTF-8 Destination character set

LF (Unix) Destination newline separator.

Encode each line separately (useful for multiple entries).

Split lines into 76 character wide chunks (useful for MIME).

Live mode OFF Encodes in real-time when you type or paste (supports only UTF-8 character set).

> ENCODE < Encodes your data into the textarea below.

c21jOnNtYw==

Screen 9: *UNITY: DELL/EMC UNITY in http or https, part 2

```

FLWRKSTG2                Create Storage definition                M81DEV
                                                                    29/10/21 14:48:30

Enter your options, then press Enter

Storage definition name . . . UNITY          Name
Storage description . . . . Configuration for UNITY in https
Type of storage . . . . . *UNITY          *SVC *DS8000 *SPECIF *VMAX_HTTP
                                                *SGC *PURESTG *UNITY *PROXY

Host name . . . . . VIOS1
Second host name . . . . . VIOS2
Snapshot name . . . . . Snap_Prod1
  
```

```

                                                    End
F3=Exit   F5=Refresh   F8=Work with disks   F12=Cancel   F22=Full area
    
```

Host name Enter the name used for first host. Usually first VIOS
 The host name used here is the one defined in the Unity

Second host name Enter the name used for second host. Usually second VIOS
 The host name used here is the one defined in the Unity

Snapshot name Enter the snapshot name to use in the array

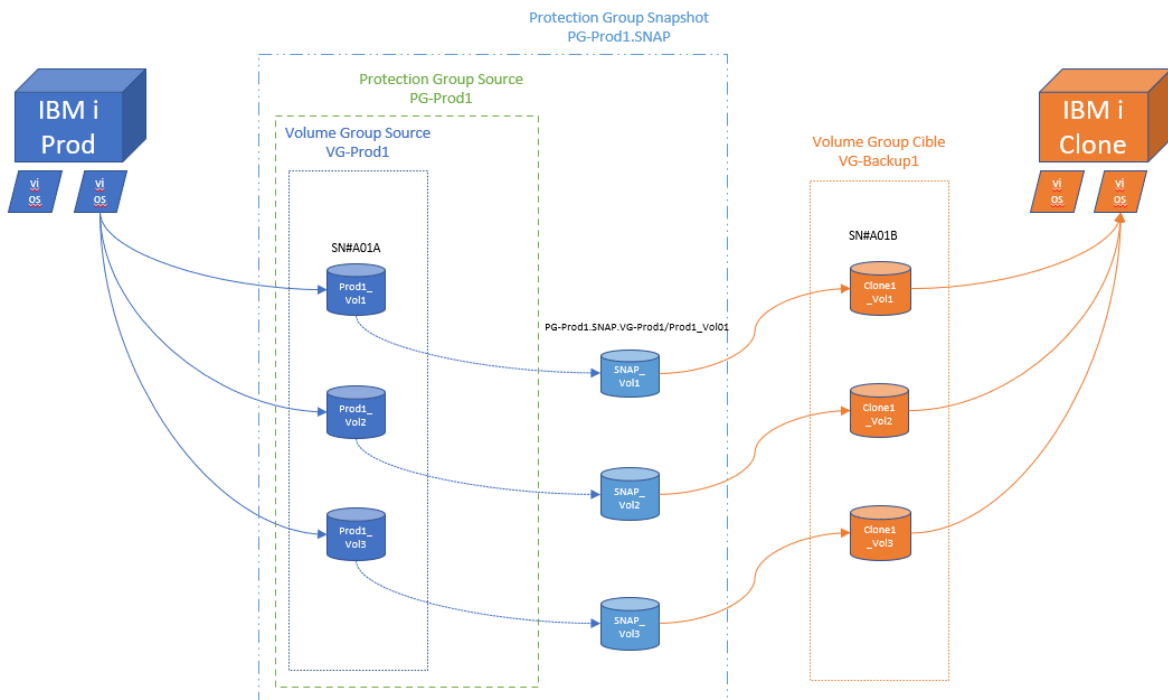
Screen 10: *PURESTG: PureStorage, Part1: Definition

The configuration for a PureStorage need 2 steps
 Step 1: Information that define the Snapshot
 Step 2: List of all disks. Use F8 to go to this screen.

Special consideration about VIOS for PureStorage FlashArrays:

Virtual disks from a PureStorage FlashArray for the Clone partition are defined in VSCSI, but they are never "deleted" in the array. The VIOS therefore sees these disks all the time. Therefore, there is no need to make a VIOS definition for this type of array.

The diagram below describes how the elements are defined in the PureStorage FlashArray.



Enter the necessary information for a PureStorage FlashArray using the 2 following screens.

```

FLWRKSTG2                                      Change Storage definition                                      PROD
                                                    19/07/21 14:26:28
    
```

```

Enter your options, then press Enter

Storage definition name . . . PURE01      Name
Storage description . . . . Pure Storage array
Type of storage . . . . . *PURESTG      *SVC *DS8000 *SPECIF *VMAX_HTTP
                                           *SGC *PURESTG *UNITY *PROXY

IP Address or Name . . . . . 10.1.2.3

User . . . . . Flash4i
Source Protection Group . . . PG-Prod1
Source Volume Group . . . . VG-Prod1
                                           *NONE, Volume Group
Target Volume Group . . . . VG-Backup1
                                           *NONE, Volume Group
Suffix . . . . . SNAP
Number of defined disks . . . . . 4

                                           End
F3=Exit   F5=Refresh   F8=Work with disks   F12=Cancel   F22=Full area
  
```

- User** Name of account created on PURITY which will be used to communicate from the Production partition.
See section "4.6 Configuring the Storwize system to accept remote operations" to find out how to create this account.
- Source Protection Group** Name of the Protection Group corresponding to the disks of the Production partition
- Source Volume Group** Name of the volume group containing all disks in the Production partition
*NONE = Indicated that there is no Volume Group name for the source disks
- Target Volume Group** Name of the volume group containing all disks of the clone partition
*NONE = Indicated that there is no Volume Group name for the target disks
- Suffix** Specify the name used as a suffix for the Snapshot
- Number of disks defined** Specifies the number of disks defined using the F8 key.

Use the F8 key to access the list of disks.
Entering the list of volumes is mandatory.

Screen 11: *PURESTG: PureStorage, Part2: List of disks

Enter the list of source disks, and their correspondent for the Clone partition

```

FLWRKPRDSK          Work with disks for *PURESTG type          PROD
                                                              19/07/21 14:18:44

Display the disk . . . . . Exact value

Type new/changed information, press Enter.

Source disk          Target disk
Prod1-Vol1           Clone1-Vol1
Prod1-Vol2           Clone1-Vol2
  
```

Prod1-Vol3	Clone1-Vol3
Prod1-Vol4	Clone1-Vol4
More...	
F3=Exit F5=Refresh F12=Cancel	

Indicate in the left part all the disks of the Production partition (source partition), and in the right part their corresponding for the Clone partition.

Screen 12: *SGC: SafeGuarded Copy on IBM storage type SVC, FlashSystem or Storwize, part 1

For IBM storage type SVC, FlashSystem or Storwize, it is possible to define immutable copies called SafeGuarded Copy.

Look at chapter "11 Add-on module: SafeGuarded Copy" for more information about this function.

```

FLWRKSTG2                Copy Storage definition                M81DEV
                                                                27/09/22 18:24:53

Enter your options, then press Enter

Storage definition name . . . SG_DEV      Name
Storage description . . . . SGC, Protect M81DEV
Type of storage . . . . . *SGC          *SVC *DS8000 *SPECIF *VMAX_HTTP
                                          *SGC *PURESTG *UNITY *PROXY

Information about storwize for SafeGuarded Copy
Controller 1:
  IP Address or Name . . . . . fs5200
                                                                ...
Controller 2:
  IP Address or Name . . . . .
                                                                ...

User . . . . . M81FLASH
Name host to protect . . . . . M81_Dev

                                                                More...

F3=Exit    F5=Refresh    F12=Cancel    F22=Full area
  
```

Controller 1:
IP address or Name IP address or DNS name of the first SCV, FlashSystem or Storwize controller.
Use the F22 key if the name contains more than 120 characters.

Controller 2: IP address or Name	Optional. IP address or DNS name of the second SVC, FlashSystem or Storwize controller. Use the F22 key if the name contains more than 120 characters. Do not enter anything if the SVC, FlashSystem or Storwize has only one IP address.
User	Name of account created on the SVC, FlashSystem or Storwize which will be used to communicate from the Production partition. See section "4.6 Configuring the Storwize system to accept remote operations" to find out how to create this account. Important note: For the SGC function, the profile must have Administrator rights.
Name host to protect	Name of host for which a Secured copy of the disks will be made using SafeGuarded Copy function. Enter the name used on the storage system.

Screen 13: *SGC: SafeGuarded Copy on IBM storage type SVC, FlashSystem or Storwize, part 2

```

FLWRKSTG2                Copy Storage definition                M81DEV
                                                                27/09/22 18:24:53

Enter your options, then press Enter

Storage definition name . . SG_DEV      Name
Storage description . . . . SGC, Protect M81DEV
Type of storage . . . . . *SGC          *SVC *DS8000 *SPECIF *VMAX_HTTP
                                          *SGC *PURESTG *UNITY *PROXY

Name volume group . . . . . M81_Dev_Group

Name SG pool . . . . . SafeGuard

Retention days . . . . . 1             1 - 365
Host name for restoration . *NONE
                                          Nom, *NONE

                                                                End

F3=Exit   F5=Refresh   F12=Cancel
  
```

Name volume group	Enter the name that will be used for the volume group on the SVC. The volume group will be created when the command FLCHKSTG will be used for the first time.
Name SG pool	Enter the name of the SafeGuarded child pool that has been created on the SVC.
Retention days	Enter the number of days to keep the disks copies available

Host name for restoration Enter the name of the host that will be used by default if a restoration must be done. This name is entered for information. It will be possible to change it when using the disks mapping command FLMAPHOST.
*NONE = No host name is predefined. It will have to be entered when using the disks mapping command FLMAPHOST.
Enter the name used on the storage system.

Screen 14: *PROXY: Using a Proxy Partition

If the disk array is not directly accessible from the partition, a Proxy partition can be used. The *PROXY type is used to specify the information needed to send requests to this Proxy partition. See Chapter "12 Add-on module: Proxy partition" for more information on this function.

```

FLWRKSTG2                Change Storage definition                PROD
                                                                    22/12/22 17:34:45

Enter your options, then press Enter

Storage definition name . . STG_PRX1      Name
Storage description . . . . Disks for backup Clone 1 (*PROXY)
Type of storage . . . . . *PROXY        *SVC *DS8000 *SPECIF *VMAX_HTTP
                                                *SGC *PURESTG *UNITY *PROXY

Storage def. name on proxy . PROD_STG1   Name
IP Address/Name proxy . . . 10.43.43.82

                                                                    End

F3=Exit   F5=Refresh   F12=Cancel
  
```

Storage def. name on proxy Specify the name of the definition that will be used on the proxy partition. This definition must have been defined on the Proxy partition with the FLWRKPROXY command.

IP address/Name Proxy IP address or DNS name of the Proxy partition

6.3 FLWRKLPAR, Work with Clone partition definitions

The FLWRKLPAR command is used to manage HMC and clone partitions definitions that will be used.

The command parameters are as follows:

This command has no parameters.

Using the command:

The command is used to create, modify or delete the Clone partitions definitions, i.e.: information that will be necessary to connect to the HMC and start or stop the Clone partitions. Those definitions will be used in the Environments definitions.

The command displays the following screen:

```

FLWRKLPAR          Work with Clone partition definitions          M81FLASH
                                                            10/05/19 17:37:28

Position to . . . . .

Enter your options, then press Enter
  2=Change  3=Copy  4=Delete  5=Display  7=Check connection

Opt Name      Type      Description
M81CLONE1    *HMC      clone partition for BRMS Backups
M81CLONE2    *HMC      clone partition for User program Backups

End

F3=Exit  F5=Refresh  F6=Create  F12=Cancel
  
```

This screen provides the list of definitions which have already been defined. The definitions are sorted by alphabetical order.

The columns have the following meanings:

- Name = Definition name
- Type = Type of definition
 - *HMC = HMC configuration
 - *NOVALINK = Novalink configuration
- Description = Free text describing the definition

Possible inputs:

Position to
Used to specify which definition must be displayed first

Options:

Option 2 = Change
Used to change the specified definition.

Option 3 = Copy
Used to copy the specified definition. The resulting screen will be similar to the definition creation screen

Option 4 = Delete

Used to delete the specified definition.

Option 5 = Display
Used to display definition

Option 7 = Check connection
Check the definition with the command FLCHKLPAR

Function keys

F3 = Exit the screen

F5 = Update the values

F6 = Create a new partition definition

F12 = Exit the screen

6.3.1 Creating, changing, copying or displaying a partition definition

From the main FLWRKLPAR command menu, using the F6 key or options 2, 3 and 5 displays the following screen.

If option 5 = display is used, no information can be changed.

If option 3 is used, it is like when creating a definition, but all the fields are initialized with the values of the selected definition.

Function keys

F3 = exit the requested function and return to the list of definitions

F5 = Reset the values to what they were at the start.

F12 = Exit the requested function and return to the list of definitions

F22 = For certain screens, the F22 key can be used. It is used to display/change a field containing 250 characters. Only the first part of the field is displayed. Place the cursor on the selected field and press F22. Another screen will be displayed, enabling the user to enter the whole field if necessary. 250-character fields are indicated with the '...' sign.

Screen: Create a clone partition definition for HMC (screen 1)

```

FLWRKLPAR2                Change partition definition                M81FLASH
                                                                    10/05/19 17:41:06

Enter your options, then press Enter
Partition definition name .   M81CLONE1
Partition description  . . .   clone partition for BRMS Backups
Partition type . . . . . *HMC      *HMC, *NOVALINK

Information about HMC1
IP Address or HMC1 name .   m81hmc
    
```

```

...
HMC1 user . . . . . M81FLASH

Information about HMC2
IP Address or HMC2 name .

HMC2 user . . . . .

More...

F3=Exit F5=Refresh F12=Cancel F22=Full area

```

- Partition type** Enter the type of infrastructure used
The following screens describe an HMC type of infrastructure
- IP address or HMC1 name** IP address or DNS name of the HMC/FSM
Use the F22 key if the name contains more than 120 characters.
- HMC1 user** Name of account created on the HMC which will be used to communicate from the Production partition.
See section "4.7 Configuring the HMC to accept remote operations" to find out how to create this account.
- IP address or HMC2 name** If the server is managed by 2 HMCs, specify the IP address or DNS name of the second HMC here.
Use the F22 key if the name contains more than 120 characters.
Leave blank if there is only one HMC
- HMC2 user** If there is a second HMC, specify the account that will be used on the second HMC here.
Leave blank if there is only one HMC

Screen: Create a clone partition definition for HMC (screen 2)

```

FLWRKLPAR2          Change partition definition          M81FLASH
                                                           10/05/19 17:41:06

Enter your options, then press Enter
Partition definition name . M81CLONE1
Partition description . . . clone partition for BRMS Backups
Partition type . . . . . *HMC          *HMC, *NOVALINK

Information about clone partition
POWER name on HMC . . . .

Clone part. name on HMC .

Partition profile . . . .

... *LASTUSED, Name

End

F F3=Exit F5=Refresh F12=Cancel F22=Full area

```

- POWER name on the HMC Specify the name given to the Power server on the HMC. Specify the exact name, paying attention to lowercase/uppercase letters.
Use the F22 key if the name contains more than 120 characters.

- Clone partition name on HMC Specify the name given to the partition on the HMC. Specify the exact name, paying attention to lowercase/uppercase letters.
Use the F22 key if the name contains more than 120 characters.

- Partition profile Specify the partition profile name used on the HMC. Specify the exact name, paying attention to lowercase/uppercase letters.
Use the F22 key if the name contains more than 25 characters.
*LASTUSED : This value is used to start the partition by using the last used configuration of the partition. In this case, it's necessary to check that the partition is in Normal mode, and B type IPL.

Screen: Create a clone partition definition for Novalink

```

FLWRKLPAR2                Change partition definition                M81FLASH
                                                                    10/05/19 17:41:06

Enter your options, then press Enter
Partition definition name .  M81CLONE1
Partition description . . .  clone partition for BRMS Backups
Partition type . . . . . *NOVALINK *HMC, *NOVALINK

Information about Novalink
IP Address/Name . . . . .
User . . . . .

Information about clone partition
clone part. ID on novalink    0          1-99999

                                                                    End

FF3=Exit   F5=Refresh   F12=Cancel   F22=Full area
  
```

- Partition type Enter the type of infrastructure used
The following screens describe a Novalink type of infrastructure

- IP address or name IP address or DNS name of the Novalink
Use the F22 key if the name contains more than 120 characters.

- User Name of account created on the Novalink which will be used to
communicate from the Production partition.

- clone part. ID on novalink Enter the ID of the clone partition as defined on Novalink.

6.4 FLWRKENV, Work with Environments

The FLWRKENV command is used to manage environment definitions.

The command parameters are as follows:

This command has no parameters.

Using the command:

The command is used to create, modify or delete the environments which will be necessary to create a production partition clone and perform the chosen function on the Clone partition.

The command displays the following screen:

```

FLWRKENV                Flash4i, Work with Environments                M81FLASH
                                                                    10/05/19 17:43:22
Position to . . . . .

Enter your options, then press Enter
  2=Change  3=Copy  4=Delete  5=Display  8=Status  12=Work with VIOS

Opt  Environment  Description                                Nb VIOS
BRMS01      Backup with BRMS                                2
DEMO_BRMS   Backup with BRMS      DRP                                2
DEMO_HOLD   Copy without start of Clone partition            2
DEMO_SAV21  Full backup, then stop FC                        2
DEMO_STRUP  Demo, Specific start up program EXAMPLE02        2

                                                                    End
F3=Exit  F5=Refresh  F6=Create  F12=Cancel
  
```

This screen provides the list of environments which have already been defined.
The environments are sorted by alphabetical order.

If the text of an environment says “Environment not valid. Definition is not correct” in red, this means that the definition of the environment is not finished, or has errors. It is not possible to use this environment with the product’s commands. Use option 2 to fix the errors.

The columns have the following meanings:

Environment	Environment name
Description	Free text describing the environment
Nb VIOS	Number of VIOSes defined for this environment

Possible inputs:

Position to
Used to specify which environment must be displayed first

Options:

Option 2 = Change

Used to change the specified environment.

Option 3 = Copy

Used to copy the specified environment. The resulting screen will be similar to the environment creation screen

Option 4 = Delete

Used to delete the specified environment.

Option 5 = Display

Used to display an environment definition

Option 8 = Status

Used to display the status of an environment via the FLDSPSTS command.

Option 12 = Manage VIOSeS

Used to manage the VIOSeS associated with this environment via the FLWRKVIO TYPE(*ENV) command.

Function keys

F3 = Exit the screen

F5 = Update the values

F6 = Create a new environment

F12 = Exit the screen

6.4.1 Creating, changing, copying or displaying an environment

From the main FLWRKENV command menu, using the F6 key or options 2, 3 and 5 displays the following screen.

If option 5 = display is used, no information can be changed.

If option 3 is used, it is like when creating an environment, but all the fields are initialized with the values of the selected environment.

This function is made up of 7 consecutive screens which need to be fully completed without any errors in order to validate the input or change. The user can move from one screen to the next using the PgUp and PgDn keys.

When using options 3 (copy) and 4 (delete), the VIOS or library definitions associated with the chosen environment will also be copied or deleted.

Function keys

F3 = exit the requested function and return to the list of environments

F4 = display list of possible values

F5 = Reset the values to what they were at the start.

F8 = Force to save the environment as it is currently, even with errors.

It will be possible to change it later, to continue the definition.

If the definition was not finished, or if there were errors or missing fields, it will not be possible to use the environment in the other product's commands.

F12 = Exit the requested function and return to the list of environments

Screen 1: Information about Storage and clone partition

Enter the name of the environment and information concerning Storage and clone partition.

```

FLWRKENV1          Change Environment          M81FLASH
                                                10/05/19 18:06:16

Enter your options, then press Enter
Environment name . . . . . DEMO_BRMS          *DFT, Name
Prod : Server serial number 0612345          *ANY, *LCL, Serial number
Prod : Partition number   . . 5              *ANY, *LCL, Number
Description . . . . . Demo using Flash4i *BRMS

Information about storage
Storage name . . . . . GRP_1          GRP_1, GRP_2, INCREMENT, ...
Description . . . . . Consistency Group for BRMS Backup Clone1
Consistency group . . . . . M81_CLONE1

Information about Clone partition
Partition definition name . M81CLONE1 M81CLONE1, M81CLONE2
Description . . . . . clone partition for BRMS Backups
Clone partition name on HMC M81CLONE1

More...

F3=Exit F4=List F5=Refresh F8=Forced save F12=Cancel
  
```

NB:

See section "2.3.1 Environment name" for more information on the rules governing the {Name-Environment; Serial no.; Partition no.} set

Environment name	Specify the environment name in 10 characters
Prod : Server serial number	Serial number of the production partition server *ANY = The server serial number will not be checked when used by FLCLONE. This environment can be used on any server. If this value is entered, *ANY must be entered for the partition number parameter. *LCL = The serial number of the server on which the input is made will be used.
Prod : Partition number	Production partition number. The *ANY value is mandatory if *ANY has been specified for the serial number. *ANY = The partition number will not be checked during use by FLCLONE. This environment can be used on any partition. *LCL = The partition number on which the input is made will be used.

Description Text describing the use that will be made of this environment.

Information about storage

Storage name Enter the name of the storage definition to use. Storage definitions must be managed with the FLWRKSTG command.

Description Information from the selected storage definition

Consistency group Information from the selected storage definition

Information about clone partition

Partition definition name Enter the name of the clone definition to use. Clone partition definitions must be managed with the FLWRKLPAR command.

Description Information from the selected partition definition

Clone partition name on HMC Information from the selected partition definition

Screen 2: Information concerning the Production partition

Input information concerning the Production partition and the parameter for the Quiesce function.

```

FLWRKENV1          Flash4i, Change Environment          FLASH
                                                           4/11/16 17:35:29

Enter your options, then press Enter
Environment name . . . . . DEMO_BRMS          *DFT, Nom
Prod : Server serial number      0612345      *ANY, *LCL, Serial number
Prod : Partition number . .      5            *ANY, *LCL, Number

Information about source partition (Production)
System ASP mandatory . . . . *SYSBAS
iASP to consider . . . . 1  DATA1          2  *NONE          3  *NONE
(*NONE, Nom d'iASP)
Use F10 to select more iASP

Parameters for Quiesce function (CHGASPACT)
Option . . . . . *FRCWRT          *FRCWRT, *SUSPEND
Timeout if *SUSPEND . . . .          Number of seconds
Delay between Quiesce and FC          Number of minutes
(Only if Global Mirror, See Documentation)

More...

F3=Exit F4=List F5=Refresh F8=Forced save F10=iASP F12=Cancel
  
```

System ASP mandatory No enter. This line reminds that the system ASP (*SYSBAS) is necessarily considered by the product.

iASP to consider Specify the name of 30 iASP maximum to be considered by the cloning. Press F10 if there are more than 3 iASP to enter. The full list of 30 iASP names will be displayed. See chapter "2.5 Use of independent ASP (iASP)" for more information about how the product uses the iASP. If there is no iASP defined on the partition, enter value *NONE for all 30 parameters.

Parameters for the Quiesce function (CHGASPACT)

- Option Specify the option to use by command CHGASPACT
*FRCWRT
*SUSPEND
See section "2.6 Quiesce the memory, function CHGASPACT" for more information about how the CHGASPACT command works.
- Timeout if *SUSPEND Specify the timeout to use for the option *SUSPEND. The value correspond the the parameter SSPTIMO of command CHGASPACT.
- Time between Quiesce and FC Specify the waiting time (in minutes) between the Quiesce function and the start of FlashCopy. **This function must only be used in rare cases.** For example if FlashCopy is performed on a remote bay and a delay is required to give the Remote copy function time to replicate the data. By default: leave 0.

Screen 3: Information concerning the Clone partition

Input information concerning the Clone partition.

```

FLWRKENV1          Flash4i, Change Environment          FLASH
                                                           4/11/16 17:36:04

Enter your options, then press Enter
Environment name . . . . . DEMO_BRMS          *DFT, Nom
Prod : Server serial number      0612345      *ANY, *LCL, Serial number
Prod : Partition number . .      5            *ANY, *LCL, Number

Information about Clone partition
Clone part. name after IPL      SAVE          *SAME, Name
IP Address . . . . . 10.123.123.124
Mask . . . . . 255.255.255.0
Gateway . . . . . 10.123.123.1
Eth card :Bus, Adap, Port      208      2      0
Prod IP address on Clone .      10.123.123.123

Action on Clone after Op .      *KEEP          *KEEP, *END_LPAR, *END_FC

More...

F3=Exit  F4=List  F5=Refresh  F8=Forced save  F12=Cancel
  
```

NB:

See section "2.3.2 Information about Ethernet card and TCP/IP" for further information on which information to enter concerning the IP configuration.

- Clone Part. Name after IPL Name that will be given to the Clone partition after its first IPL
If this name is changed, the clone partition will have 2 IPL to activate this new name.
- IP address IP address that will be given to the Clone partition after its first IPL
Mask Network mask
Gateway Gateway that will be used by the Clone partition

- Eth card: Bus, Adap, Port Specify the bus, adapter and port numbers which uniquely identify the Ethernet card that will be used by the Clone partition to connect to the network.
Section "2.3.2 Information about Ethernet card and TCP/IP" provides further information on how to find this information
- Prod IP address on Clone. Specify the IP address of the Production partition. This address must be accessible from the Clone partition.
- Clone action at end of Op. Specify what will happen to the Clone partition once the operation has ended:
*KEEP = The Clone partition and FlashCopy remain active.
*END_LPAR = The Clone partition will be stopped. FlashCopy will remain active.
*END_FC = The Clone partition and FlashCopy will be stopped.
Section "2.3.3 Clone action at the end of the operation" provides more information about these actions.

Screen 4: Choosing which function to perform on the Clone partition

```

FLWRKENV1                Flash4i, Change Environment                FLASH
                                                                    4/11/16 17:37:11

Enter your options, then press Enter
Environment name . . . . . DEMO_BRMS          *DFT, Nom
Prod : Server serial number    0612345        *ANY, *LCL, Serial number
Prod : Partition number . .    5              *ANY, *LCL, Number

Enter information for the function to be realized on Clone
Function to realize on Clone    *BRMS          *HOLD *BRMS  *SAVE  *USER
                               *BRMS21    *SAVE21 *NEWCFG

                                                                    More...

F3=Exit  F4=List  F5=Refresh  F8=Forced save  F12=Cancel
  
```

This screen is used to choose which function will be performed on the Clone partition.

- Function to perform on Clone Specify the function that will be performed on the Clone partition.
- *HOLD = No automatic action
 - *BRMS = Backup with BRMS
 - *BRMS21 = Full system backup with BRMS
 - *SAVE = Specific backup by a user program
 - *SAVE21 = Full system save
 - *USER = Specific action other than a backup by a user program
 - *NEWCFG = Automatic reconfiguration of the Clone partition

See section "1.3 Possible operations on the Clone partition" for more information about these types of functions

Additional information will be requested according to the choice made, details of which are provided below.

Screen 4.1: Information for the *BRMS function

Input of information if the *BRMS function was chosen.

```

FLWRKENV1          Flash4i, Change Environment          FLASH
                                                           4/11/16 17:38:14

Enter your options, then press Enter
Environment name . . . . . DEMO_BRMS          *DFT, Nom
Prod : Server serial number      0612345      *ANY, *LCL, Serial number
Prod : Partition number . .      5           *ANY, *LCL, Number

Enter information for the function to be realized on Clone
Function to realize on Clone      *BRMS          *HOLD *BRMS      *SAVE      *USER
                                   *BRMS21 *SAVE21 *NEWCFG

Parameters for *BRMS function
BRMS control group . . . . . WEEK
Omits . . . . . *PROCESS          *PROCESS, *IGNORE
Restricted mode . . . . . *NO          *YES, *NO
End jobs using QUSRBRM . . . *ENDJOB      *ENDJOB, *NO
Number of try before ENDJOB .   4           Number of try (0-100)
Real time logs transfer . . . *NO          *YES, *NO

More...

F3=Exit  F4=List  F5=Refresh  F8=Forced save  F12=Cancel
  
```

BRMS control group Specify the name of the BRMS control group that must be executed on the Clone partition. This control group must have been defined (and tested) beforehand on the Production partition.

Exclusions Specify whether the exclusion elements must be processed or ignored when executing the backup control group. Corresponds to the OMITTS parameter of the STRBKUBRM command.
 *PROCESS = Used to process the exclusion elements during backup.
 *IGNORE = Used to ignore the exclusion elements during backup.
 See BRMS documentation for more details.

Restricted mode Specify *YES if the BRMS control group plans to perform a SAVSYS or any other command requiring the system to be in restricted mode. Specify *NO in all other cases.
 *YES = The partition will be put into restricted mode before executing the control group
 *NO = The partition will not be put into restricted mode

The system Backup will be realized by BRMS in batch. The parameter to allow this must be set in BRMS parameters:

WRKPCYBRM *SYS

Option 1 Display or Change system policy

```

Controlling subsystem:
  Allow backups in batch . . . . . *YES
  
```

```
Restricted state time limit . . . . .
*NO MAX
```

End jobs using QUSRBRM Specify the action if library QUSRBRM (containing definitions and history of BRMS) is used and locked when the product tries to restore it on Production partition.

*ENDJOB = After having tried the number of times indicated in parameter "Number of try before ENDJOB", the jobs using this library are killed with ENDJOB *IMMED

*NO = The jobs using this library are not killed. The production will try to restore the library every minute and add errors messages in the log including who is using the library.

Number of try before ENDJOB

If *ENDJOB is asked at the previous parameter, specify here the number of time the restore must be tried before to end the jobs using QUSRBRM.

0 = The jobs will be ended during the first try.

1 to 100 = Number of times error messages will be logged before to end the jobs.

Real time logs transfer

When the Clone partition is not in restricted mode, the information is transferred to the Production partition, real-time.

When the clone partition is in restricted mode, the product proposes to transfer information to the production partition at certain key moments of the backup.

See section "2.9.6 Real time logs transfer" for more details.

*YES = If the clone partition is in restricted mode, the information will be transferred to the production partition at certain stages.

*NO = If the clone partition is in restricted mode, the information will be sent to the production partition at the end of the backup only.

Screen 4.2: Information for the *BRMS21 function

Input of information if the *BRMS21 function was chosen.

```

FLWRKENV1          Flash4i, Change Environment          FLASH
                                                           4/11/16 17:38:14

Enter your options, then press Enter
Environment name . . . . . DEMO_BRMS          *DFT, Nom
Prod : Server serial number      0612345      *ANY, *LCL, Serial number
Prod : Partition number . .      5            *ANY, *LCL, Number

Enter information for the function to be realized on Clone
Function to realize on Clone      *BRMS21      *HOLD *BRMS  *SAVE  *USER
                                   *BRMS21 *SAVE21 *NEWCFG

Parameters for *BRMS21 function
BRMS control group . . . . . WEEK
Omits . . . . . *PROCESS          *PROCESS, *IGNORE
Restricted mode . . . . . *YES
End jobs using QUSRBRM . . . *ENDJOB      *ENDJOB, *NO
Number of try before ENDJOB .   4            Number of try (0-100)
Real time logs transfer . . . *NO          *YES, *NO

More...

F3=Exit  F4=List  F5=Refresh  F8=Forced save  F12=Cancel
  
```

BRMS control group	Specify the name of the BRMS control group that must be executed on the Clone partition. This control group must have been defined (and tested) beforehand on the Production partition. It must contain the necessary elements to perform a complete backup of the system.
Exclusions	Specify whether the exclusion elements must be processed or ignored when executing the backup control group. Corresponds to the OMITTS parameter of the STRBKUBRM command. *PROCESS = Used to process the exclusion elements during backup. *IGNORE = Used to ignore the exclusion elements during backup. See BRMS documentation for more details.
Restricted mode	Value *YES is required. The system Backup will be realized by BRMS in batch. The parameter to allow this must be set in BRMS parameters: WRKPCYBRM *SYS Option 1 Display or Change system policy <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <pre>Controlling subsystem: Allow backups in batch *YES Restricted state time limit *NOMAX</pre> </div>
End jobs using QUSRBRM	Specify the action if library QUSRBRM (containing definitions and history of BRMS) is used and locked when the product tries to restore it on Production partition. *ENDJOB = After having tried the number of times indicated in parameter "Number of try before ENDJOB", the jobs using this library are killed with ENDJOB *IMMED *NO = The jobs using this library are not killed. The production will try to restore the library every minute and add errors messages in the log including who is using the library.
Number of try before ENDJOB	If *ENDJOB is asked at the previous parameter, specify here the number of time the restore must be tried before to end the jobs using QUSRBRM. 0 = The jobs will be ended during the first try. 1 to 100 = Number of times error messages will be logged before to end the jobs.
Real time logs transfer	When the Clone partition is not in restricted mode, the information is transferred to the Production partition, real-time. When the clone partition is in restricted mode, the product proposes to transfer information to the production partition at certain key moments of the backup. See section "2.9.6 Real time logs transfer" for more details. *YES = If the clone partition is in restricted mode, the information will be transferred to the production partition at certain stages. *NO = If the clone partition is in restricted mode, the information will be sent to the production partition at the end of the backup only.

Screen 4.3: Information for the *HOLD function

Input of information if the *HOLD function was chosen.

```

FLWRKENV1          Flash4i, Change Environment          FLASH
                                                           4/11/16 17:38:49

Enter your options, then press Enter
Environment name . . . . . DEMO_BRMS          *DFT, Nom
Prod : Server serial number    0612345        *ANY, *LCL, Serial number
Prod : Partition number . .    5              *ANY, *LCL, Number

Enter information for the function to be realized on Clone
Function to realize on Clone  *HOLD            *HOLD *BRMS  *SAVE  *USER
                                                           *BRMS21 *SAVE21 *NEWCFG

More...

F3=Exit  F4=List  F5=Refresh  F8=Forced save  F12=Cancel

```

There is no information to enter.

There is no automatic processing for the *HOLD function.

The Clone partition must be started by the user and is their responsibility.

Screen 4.4: Information for the *SAVE function

Input of information if the *SAVE function was chosen.

```

FLWRKENV1          Flash4i, Change Environment          FLASH
                                                           4/11/16 17:39:23

Enter your options, then press Enter
Environment name . . . . . DEMO_BRMS          *DFT, Nom
Prod : Server serial number    0612345        *ANY, *LCL, Serial number
Prod : Partition number . .    5              *ANY, *LCL, Number

Enter information for the function to be realized on Clone
Function to realize on Clone  *SAVE            *HOLD *BRMS  *SAVE  *USER
                                                           *BRMS21 *SAVE21 *NEWCFG

Parameters for *SAVE function
Backup program . . . . . EXAMPLE02
Library . . . . . FLASH4IUSR
Restricted mode . . . . . *YES, *NO

More...

F3=Exit  F4=List  F5=Refresh  F8=Forced save  F12=Cancel

```

Backup program	Name of the program that will be used to run the backup on the Clone partition
Library	Library containing the program
Restricted mode	Specify *YES if the backup program plans to perform a SAVSYS or any other command requiring the system to be in restricted mode. Specify *NO in all other cases. *YES = The partition will be put into restricted mode before executing the backup program *NO = The partition will not be put into restricted mode

This program must already exist on the Production partition.

An example of start-up program is available in file FLEXAMPLES, member EXAMPLE02. See chapter "2.12.3 EXAMPLE02: Backup program for *SAVE " for more information.

Screen 4.5: Information for the *SAVE21 function

Input of information if the *SAVE21 function was chosen.

```

FLWRKENV1                Flash4i, Change Environment                FLASH
                                                                    4/11/16 17:40:14

Enter your options, then press Enter
Environment name . . . . . DEMO_BRMS          *DFT, Nom
Prod : Server serial number    0612345       *ANY, *LCL, Serial number
Prod : Partition number . . . . . 5          *ANY, *LCL, Number

Enter information for the function to be realized on Clone
Function to realize on Clone    *SAVE21       *HOLD *BRMS  *SAVE  *USER
                                                                    *BRMS21 *SAVE21 *NEWCFG

Parameters for *SAVE21 function
Media library or drive . . . . . TAP01
Volume . . . . . *MOUNTED          Name, *MOUNTED, *EXITPGM
Program for volume name . . . . . *NONE          Name, *NONE
Library . . . . .                      Name, *LIBL
Nb vol. returned by Exitpgm    1              1-5
Initialize the media . . . . . *YES          *YES, *NO
End of media option . . . . . *UNLOAD       *LEAVE, *REWIND, *UNLOAD
Real time logs transfer . . . . . *NO        *YES, *NO

                                                                    More...

F3=Exit  F4=List  F5=Refresh  F8=Forced save  F12=Cancel

```

Tape library or Drive Name of the tape unit or tape library on which the backup will be performed.
Specify the name as it is known on the Production partition.

Volume Specify the name of the volume on which the backup must be performed.
*MOUNTED = The volume mounted in the drive will be used
*EXITPGM = The volume name will be given by an exit program written by the customer. The program name must be entered on the following line "program for volume name"

- Program for volume name** Enter the program name (and library) that will give the volume name that will be used for the backup.
An example for this program is given in the file FLASH4I/FLEXAMPLES, member EXAMPLE01. See chapter “2.12.1 EXAMPLE01: Exit Program for the name” for more information.
*NONE = No exit program. The volume name is directly entered in the Volume parameter.
- Nb vol. returned by Exitpgm** Enter the number of volume names that will be returned by the Exit program.
ATTENTION: The number of parameters in the program must correspond to the value indicated here. Refer to the examples of EXAMPLE01 and EXAMPLE01B sources provided.
- Initialize the media** Indicate whether the tape(s) should be initialized before saving.
*YES = The tape(s) will be initialized just before the start of the system backup
*NO = The tape(s) will not be initialized.
- End-of-tape option** Specify the operation to perform on the tape at the end of the backup operation.
*LEAVE = The tape is not rewound or unloaded at the end of the operation. It maintains its position.
*REWIND = At the end of the operation, the tape is automatically rewound but not unloaded.
*UNLOAD = The tape is automatically rewound and unloaded at the end of the operation. Some optical units will eject the volume once the operation has ended.
- Real time logs transfer** When the Clone partition is not in restricted mode, the information is transferred to the Production partition, real-time.
When the clone partition is in restricted mode, the product proposes to transfer information to the production partition at certain key moments of the backup.
See section “2.9.6 Real time logs transfer” for more details.
*YES = If the clone partition is in restricted mode, the information will be transferred to the production partition at certain stages.
*NO = If the clone partition is in restricted mode, the information will be sent to the production partition at the end of the backup only.

Screen 4.6: Information for the *USER function

Input of information if the *USER function was chosen.

```

FLWRKENV1                Flash4i, Change Environment                FLASH
                                                                    4/11/16 17:39:23

Enter your options, then press Enter
Environment name . . . . . DEMO_BRMS          *DFT, Nom
Prod : Server serial number    0612345       *ANY, *LCL, Serial number
Prod : Partition number . .    5             *ANY, *LCL, Number

Enter information for the function to be realized on Clone
Function to realize on Clone    *USER          *HOLD *BRMS  *SAVE  *USER
                                *BRMS21 *SAVE21 *NEWCFG

Parameters for *USER function
Restricted mode . . . . . *NO                *YES, *NO
Standard system protection . *YES           *YES, *NO
  
```

```

Program for LPAR reconfig . NEWCONFIG      Name, *NONE
  Library . . . . . QGPL
New partition role . . . . . *NONE          *PROD, *NONE, *SAME
IPL after set up . . . . . *YES           *YES, *NO
Control Subsystem (QCTLSBSD) QCTL          Name, *PROD, *FLASH4I, *SAME
  Library . . . . . QSYS
Initial program (QSTRUPPGM) QSTRUP_DEV     Name, *PROD, *SAME
  Library . . . . . QGPL
More...
F3=Exit  F4=List  F5=Refresh  F8=Forced save  F12=Cancel

```

- Restricted mode** Specify *YES if the BRMS control group plans to perform a SAVSYS or any other command requiring the system to be in restricted mode. Specify *NO in all other cases.

 - *YES = The partition will be put into restricted mode before executing the control group
 - *NO = The partition will not be put into restricted mode

- Standard system protection** Indicate whether the reconfiguration operation of the clone partition must be performed (change the IP config, hold automatic jobs, setting parameters to return information to the production partition, etc.). The operations are detailed in chapter "2.2 Configuration changes of the Clone partition"

 - *YES = The Clone partition will be reconfigured by security just after its IPL
 - *NO = The clone partition will not be reconfigured. The user is responsible to change this configuration, and to make sure that starting the partition does not disturb the production (IP address, automatic jobs, ...)

- Program for LPAR reconfig** Indicate the name of the program to call to transform the clone partition to its new functions (reconfigure, restore products or libraries, restore or activate user profiles, ...).

- New partition role** Specify what will be the new role of the partition. This new role will be activated when the reconfiguration program is finished. These roles are explained in chapter "2.10 Role change of a clone partition"

 - *PROD = The newly cloned partition will become a partition that can be cloned. It will not send any more information to the original Production partition.
 - *NONE = The newly created clone partition will become independent. It can't be cloned itself. It will not send any more information to the original Production partition.
 - *SAME = The partition retains its role of Clone. It continues to transmit information to the Production partition. It can't be cloned itself.

- IPL after set up** Indicate whether an IPL should be performed when the reconfiguration program is complete.

Note that this IPL is required to take into account the new partition name, or the new control subsystem, if these have been changed.

 - *YES = An IPL with automatic restart will be realized
 - *NO = No automatic IPL will be realized.

- Control Subsystem (QCTLSBSD)** Enter the name of the control subsystem (QCTLSBSD system value) of the new Clone partition. An IPL will be mandatory to activate this change.

Name = Name and library of the new control subsystem.

 - *PROD = The name of the production partition control subsystem will be put back in place

- *FLASH4I = The control subsystem will remain the one of the product Flash for i (FL_CLONE). This value is prohibited if the new role of the partition is *PROD.
- *SAME = QCTLSBSD system value will not be changed

Initial program (QSTRUPPGM) Enter the name and library of the system startup program (QSTRUPPGM system value).
 Name = name and library of the system startup program
 *PROD = The name of the startup program of the production partition will be put back in place
 *SAME = QSTRUPPGM system value will not be changed
 This program must already exist on the Production partition.

Screen 4.7: Information for the *NEWCFG function

Input of information if the *NEWCFG function was chosen.

```

FLWRKENV1          Flash4i, Change Environment          FLASH
                                                           4/11/16 17:39:23

Enter your options, then press Enter
Environment name . . . . . DEMO_BRMS          *DFT, Nom
Prod : Server serial number      0612345      *ANY, *LCL, Serial number
Prod : Partition number . .      5            *ANY, *LCL, Number

Enter information for the function to be realized on Clone
Function to realize on Clone      *USER          *HOLD *BRMS  *SAVE  *USER
                                   *BRMS21 *SAVE21 *NEWCFG

Parameters for *NEWCFG function
Configuration definition . .      PREPROD1      PREPROD1

Part of the environment definition will not be taken into account for the
*NEWCFG function. It will be replaced by the content of the configuration
definition. Refer to the documentation.

More...

F3=Exit  F4=List  F5=Refresh  F8=Forced save  F12=Cancel
  
```

Configuration definition Enter the name of configuration definition to use. The configuration's definitions are created with command FLWRKCFG

The configuration definition contains all the configuration items that will be modified on the Clone partition. Some of these items are identical to those defined in the environment. In this case, the items specified in the configuration definition will be used.

The items are:

- The new name to be given to the Clone partition.

It is likely that in future versions, more elements will be concerned.

Screen 5: Information on the EXIT programs

Input of Exit programs that will be used.

```

FLWRKENV1          Flash4i, Change Environment          FLASH
  
```

```

                                                                    4/11/16
17:40:43

Enter your options, then press Enter
Environment name . . . . . DEMO_BRMS          *DFT, Nom
Prod : Server serial number    0612345      *ANY, *LCL, Serial number
Prod : Partition number . .    5            *ANY, *LCL, Number

Exit programs :
N° Part.  Library    / Program  Description
1  Prod   FLASH4IUSR / TEST_EXIT1 Just before the FlashCopy
2  Prod   FLASH4IUSR / TEST_EXIT2 Just after the FlashCopy
3  Clone  FLASH4IUSR / PREP_BRMS  One time, during the first IPL
4A Clone  FLASH4IUSR / VRY_MLB02  Before control group BRMS/BRMS21
4B Clone  FLASH4IUSR / TEST_EXI4B After control group BRMS/BRMS21
5  Clone  FLASH4IUSR / TEST_EXIT5 After QUSRBRM transfer
6  Clone  FLASH4IUSR / TEST_EXIT6 After end of restricted mode SAVE21/BRMS21
7  Prod   FLASH4IUSR / TEST_EXIT7 Before restore QUSRBRM
8  Prod   FLASH4IUSR / TEST_EXIT8 After restore QUSRBRM
9  Prod   FLASH4IUSR / TEST_EXIT9 At the reception of the state END

                                                                    More...

F3=Exit  F4=List  F5=Refresh  F8=Forced save  F12=Cancel

```

Specify the names of Exit programs that will be used when cloning the partition.

See section "2.3.4 Exit programs" for further information on these Exit programs.

IMPORTANT :

The Exit programs must have 1 entry parameter defined:

- 10 characters, containing the Environment name

Screen 6: Information on operation time control

Input of maximum operation times.

```

FLWRKENV1          Flash4i, Change Environment          FLASH
                                                            4/11/16 17:41:19

Enter your options, then press Enter
Environment name . . . . . DEMO_BRMS          *DFT, Nom
Prod : Server serial number    0612345      *ANY, *LCL, Serial number
Prod : Partition number . .    5            *ANY, *LCL, Number

Control delays for operations on the clone partition
Enter the maximum allowed delay before obtaining the specified status

Maximum delay before first clone messages
Delay in minutes . . . . . 0                0=No control

Maximum delay before *END status
Delay in minutes . . . . . 0                0=No control

```

Bottom

F3=Exit F4=List F5=Refresh F8=Forced save F12=Cancel

Specify the maximum permissible time to perform operations on the Clone partition.

See section "2.3.5 Checking operating times" for more information on time controls performed by Flash For i.

Screen 7: Information on transfers from Clone to Production

Specify which information will be transferred from Clone partition to Production partition

```

FLWRKENV1                Flash4i, Change Environment                FLASH
                                                                    4/11/16 17:41:19

Enter your options, then press Enter
Environment name . . . . . DEMO_BRMS          *DFT, Nom
Prod : Server serial number    0612345        *ANY, *LCL, Serial number
Prod : Partition number . . . . . 5           *ANY, *LCL, Number

Informations about transfers from Clone to Production
Trans. System log . . . . . *YES             *YES, *NO
Trans. Backup JobLog . . . . *YES             *YES, *NO
Extract *JRNRVC info . . . . *YES             *YES, *NO
Stop transfers after backup *NO             *YES, *NO

Reduce size history *BRMS      *NO             *YES, *NO
  (If *YES: Refer to documentation to know the consequences)

                                                                    Bottom

F3=Exit F4=List F5=Refresh F8=Forced save F12=Cancel
  
```

- | | |
|-----------------------------|--|
| Trans. System log | Enter *YES to have the system Log (DSPLOG) to be transferred from Clone to production partition. It will be available thru the FLDSPSLOG command.
*YES = The system Log will be transferred
*NO = The system Log will not be transferred |
| Trans. Backup JobLog | Enter *YES to have the log of the job that realized the backup to be transferred to the OUTQ FLASH4I on Production partition at the end of the backup. It will be available thru option 8 of menu FLMENU.
*YES = The JobLog will be transferred
*NO = The JobLog will not be transferred |
| Extract *JRNRVC info | Enter *YES to have the list of Journal receivers (*JRNRVC) generated on the Clone partition after the backup. The generated table will contain an information saying that the receiver was detached on the production partition before the command FLCLONE was run, and if it has been saved on the clone partition. See details in chapter "2.13 Special case for journal receivers (*JRNRVC)".
*YES = The list twill be generated
*No = The list will not be generated |
| Stop transfers after backup | When the backup is completed on the clone partition, or the changeover program, or generally once the *xxxx_END state is reached, indicate whether or not to continue transmitting information to the production partition. This concerns the following information: <ul style="list-style-type: none"> o Internal Flash for i messages |

- System log messages
- *YES = Information will continue to be sent to the production partition after the *xxxx_END state is reached.
- *NO = No more information will be sent to Production after the *xxxx_END state is reached.

Reduce size history *BRMS Specify whether BRMS histories should be retained or removed when backing up to the Clone partition. This value is only relevant for *BRMS or *BRMS21 environments

*NO = BRMS histories are retained. **This is the default value and is highly recommended.**

*YES = BRMS histories are cleared on the Clone partition just before performing the backup. **This value should only be used in very rare cases**, if the QUSRBRM library is very large and contains a lot of history. The aim is to reduce the transfer and restore time of QUSRBRM very significantly. **See chapter "2.11.8 If the library QUSRBRM is very large" for the consequences of this choice.**

6.5 FLWRKVIO, Work with VIOS

The FLWRKVIO command is used to provide information about the VIOSes.

The command parameters are as follows:

Work with VIOS (FLWRKVIO)

```
Type choices, press Enter.

Display type . . . . . TYPE          *STG
Storage definition . . . . . STG      *ALL
Environment name . . . . . ENV        *ALL
Serial number . . . . . SRLNBR       *ALL
Partition number . . . . . LPAR       *ALL
```

Description of parameters:

TYPE Type of configuration to be used. The configuration will be different depending on the type chosen.

*ENV = The VIOS definition is associated with the environment definitions. This method is still available for compatibility with older versions, but it is advised not to use it anymore. This mode will be removed in a future release

*STG = The VIOS definition is associated with Storage definitions.

If the TYPE(*STG) parameter is used:

STG Name of the storage definition for which the VIOS list will be maintained.

*ALL = Allows you to see the list of all VIOS associated with all storages

If the TYPE(*ENV) parameter is used :

ENV Name of the environment for which the VIOS list will be managed

*ALL = Displays the list of all the VIOSes associated with all the environments

SRLNBR Serial number of the server for which the VIOS list must be managed

*ALL = Displays the list of all the VIOSes for the environment specified in the ENV parameter

*ANY = Displays the list of VIOSes defined for an environment in which
 *ANY was specified as the server serial number
 LPAR Number of the partition for which the list of VIOSes must be managed

Using the command:

The FLWRKVIO command displays the list of defined VIOSes.

Remember that the VIOSes must only be defined if the configuration involves VSCSI disks for the Clone partition.

If the Clone partition disks are defined as NPIV, or for IBM i partitions which have a direct attachment to Storwize, no VIOS definition must be carried out.

Special consideration for

- **PureStorage FlashArrays**
- **Dell/EMC Unity**

Virtual disks from a PureStorage FlashArray and Dell/EMC Unity for the Clone partition are defined in VSCSI, but they are never "deleted" in the array. The VIOS therefore sees these disks all the time. Therefore, there is no need to make a VIOS definition for this type of array.

All the VIOSes managing VSCSI disks for the clone partition must be defined.

If there are several vhosts used in a VIOS, there must be a VIOS definition for each vhost.

This command may be called directly from a command line or by using option 12 in front of an environment definition. In this case, only the VIOS definitions of this environment are displayed.

6.5.1 If parameter TYPE(*STG) is used:

This type of definition allows a VIOS definition to be linked to the storage definition (FLWRKSTG).

The command displays the following screen:

```

FLWRKVIO11                                Work with VIOS                                PROD
                                                                 22/12/22 16:31:20

Position to . . . . .

Enter your options, then press Enter
  2=Change  3=Copy  4=Delete  5=Display

Opt  Storage      VIOS
FTP_CL1  10.43.43.67
FTP_CL1  10.43.43.68

VHOST VIOS
vhost4
vhost4

End
  
```

F3=Exit F5=Refresh F6=Create F12=Cancel

The columns have the following meanings:

Storage = Storage definition name
VIOS = IP address or name of VIOS
VIOS VHOST = Name of Vhost

Possible inputs:

Position to
Used to specify which environment must be displayed first

Options:

Option 2 = Change
Used to change the specified VIOS definition

Option 3 = Copy
Used to copy the specified VIOS definition. The resulting screen will be similar to the VIOS creation screen

Option 4 = Delete
Used to delete the specified VIOS definition

Option 5 = Display
Used to display the specified VIOS definition

Function keys

F3 = Exit the screen

F5 = Update the values

F6 = Create a new VIOS definition

F12 = Exit the screen

Creating, changing, copying or displaying a VIOS

From the main FLWRKVI0 command menu, the F6 key or options 2, 3 and 5 displays the following screen.

If option 5 = display is used, no information can be changed.

If option 3 is used, it is similar to when creating a VIOS but all the fields are initialized with the values of the selected VIOS.

Function keys

F3 = exit the requested function and return to the list of VIOSes

F5 = Reset the values to what they were at the start.

F12 = exit the requested function and return to the list of VIOSes

F22 = The F22 key is used to display/change a field with content of 250 characters. Only the first part of the field is displayed. Place the cursor on the selected field and press F22. Another screen will be displayed, enabling the user to enter the whole field if necessary. 250-character fields are indicated with the '...' sign.

Screen 1: Information concerning the VIOS

Input of information concerning the VIOS

```

FLWRKVIO12                Flash4i, Change VIOS option                PROD
                                                                    22/12/22 16:34:15

Enter your options, then press Enter

Storage definition . . . . . FTP_CL1          FTP_CL1, PURE01, REMOTE, ...

VIOS . . . . . 10.43.43.67

vhost name in VIOS . . . . . vhost4
VIOS user . . . . . M81FLASH

F3=Exit   F4=List   F5=Refresh   F12=Cancel   F22=Full area
    
```

Storage definition	Specify the storage definition name with which the VIOS definition must be associated
VIOS	IP address or DNS name of VIOS Use the F22 key if the name contains more than 120 characters.
Name of vhost in VIOS	Specify the vhost name
VIOS user	Name of account that will be used on the VIOS to communicate from the Production partition.

6.5.2 If parameter TYPE(*ENV) is used:

This type of definition attached to environments will be removed in a future version. It is retained for compatibility.

For a new definition, it is recommended to use the TYPE(*STG) parameter to associate VIOS with storage definitions.

The command displays the following screen:

```

FLWRKVIO                                Gestion des VIOS                                4/11/16
                                           17:46:01

Afficher à partir de . . . . .

Enter your options, then press Enter
  2=Modifier  3=Copier  4=Supprimer  5=Afficher

Opt Envir.      N° série LPAR VIOS                                VHOST VIOS
BRMS01          0612345  5  vios1                                vhost14
BRMS01          0612345  5  vios2                                vhost14
DEMO_BRMS       0612345  5  flash_vios1                       vhost14
DEMO_BRMS       0612345  5  flash_vios2                       vhost14
DEMO_HOLD       0612345  5  flash_vios1                       vhost14
DEMO_HOLD       0612345  5  flash_vios2                       vhost14
DEMO_SAV21      0612345  5  flash_vios1                       vhost14
DEMO_SAV21      0612345  5  flash_vios2                       vhost14
DEMO_STRUP      0612345  5  flash_vios1                       vhost14
DEMO_STRUP      0612345  5  flash_vios2                       vhost14
H2IFLASH        0612345  5  vios1                                vhost14
H2IFLASH        0612345  5  vios2                                vhost14
More...

F3=Exit  F5=Refresh  F6=Create  F12=Cancel

```

The columns have the following meanings:

- Environment = Environment name
- Serial no. = Serial number specified in the environment definition
- LPAR = Partition number specified in the environment definition
- VIOS = IP address or name of VIOS
- VIOS VHOST = Name of Vhost

Possible inputs:

Position to
Used to specify which environment must be displayed first

Options:

Option 2 = Change
Used to change the specified VIOS definition

Option 3 = Copy
Used to copy the specified VIOS definition. The resulting screen will be similar to the VIOS creation screen

Option 4 = Delete
Used to delete the specified VIOS definition

Option 5 = Display

Used to display the specified VIOS definition

Function keys

F3 = Exit the screen

F5 = Update the values

F6 = Create a new VIOS definition

F12 = Exit the screen

Creating, changing, copying or displaying a VIOS

From the main FLWRKVI0 command menu, the F6 key or options 2, 3 and 5 displays the following screen.

If option 5 = display is used, no information can be changed.

If option 3 is used, it is similar to when creating a VIOS but all the fields are initialized with the values of the selected VIOS.

Function keys

F3 = exit the requested function and return to the list of VIOSes

F5 = Reset the values to what they were at the start.

F12 = exit the requested function and return to the list of VIOSes

F22 = The F22 key is used to display/change a field with content of 250 characters. Only the first part of the field is displayed. Place the cursor on the selected field and press F22. Another screen will be displayed, enabling the user to enter the whole field if necessary. 250-character fields are indicated with the '...' sign.

Screen 1: Information concerning the VIOS

Input of information concerning the VIOS

```

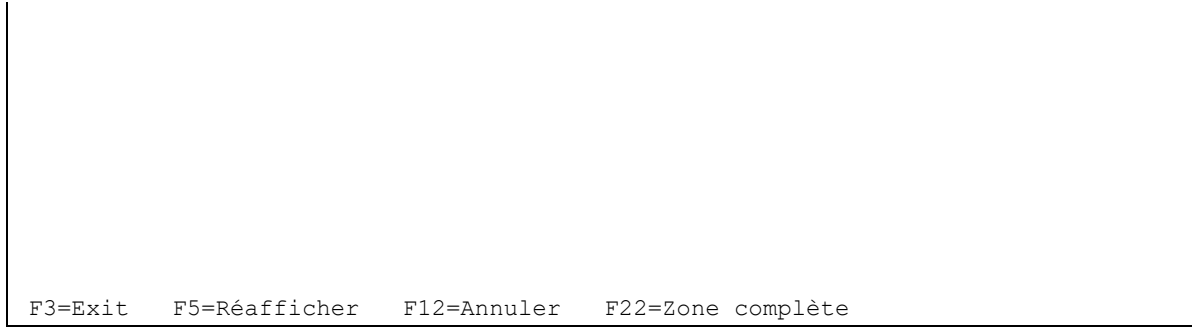
FLWRKVI01          Flash4i, Modification d'un VIOS          Le 20/12/15
                                                           à 13:16:05

Indiquez vos options, puis appuyez sur Entrée.

Nom de l'environnement . . . DEMO_BRMS          Nom
Numéro de série du serveur . 0612345          *ANY, Numéro de série
Numéro de la partition . . . 5

VIOS . . . . . flash_vios2          ...

Nom du vhost dans VIOS . . vhost14
Utilisateur VIOS . . . . . padmin
    
```



Environment name	
Server serial number	
Partition number	Specify the 3 items of information corresponding to the environment with which the VIOS definition must be associated
VIOS	IP address or DNS name of VIOS Use the F22 key if the name contains more than 120 characters.
Name of vhost in VIOS	Specify the vhost name
VIOS user	Name of account that will be used on the VIOS to communicate from the Production partition.

6.6 *FLWRKTAP, Work with tape unit definitions*

The FLWRKTAP command is used to manage the list of tape and tape libraries devices that will have to be automatically created on the Clone partition.

The command parameters are as follows:

This command has no parameters.

Using the command:

The FLWRKTAP command displays the list of defined tape devices.

The goal is to define the list of tape drives (TAPxx) or tape libraries (TAPMLBxx) that will have to be recreated automatically by the Flash for i product on the clone partition during its first IPL.

This definition should only be made in 2 cases:

- A tape device is connected to the Clone partition, but is not connected or has never been recognized by the Production partition (for example, a direct attached SAS unit)
- A tape device is known on the Production partition, but must be renamed before to be used on the Clone partition.

As a reminder, all tape devices or tape libraries that are connected to both the Production Partition and the Clone Partition are automatically checked by the Flash for i product. If the resource name was changed by the system during the IPL of the clone partition, the product automatically reassigns resources so that a device name always points to the same resource, based on the serial number of the unit.
It is not necessary to enter these units here.

The command displays the following screen:

```

FLWRKTAP                Work with tape unit definition                M81FLASH
                                                                    10/05/19 19:11:03

Position to . . . . .

Enter your options, then press Enter
  2=Change  3=Copy  4=Delete  5=Display

Opt Name      Category  Serial number  Environ.  Description
TAPCLONE     *TAPMLB   02-7805539   DEMO_BRMS

                                                                    End

F3=Exit  F5=Refresh  F6=Create  F12=Cancel
  
```

This screen provides the list of definitions which have already been defined. The definitions are sorted by alphabetical order.

The columns have the following meanings:

Name	Name of the device to create
Category	Device category (*TAP or *TAPMLB)
Environ.	Environment name
Description	Free text describing the definition

Possible inputs:

Display from
Used to specify which definition must be displayed first

Options:

Option 2 = Change
Used to change the specified definition.

Option 3 = Copy
Used to copy the specified definition. The resulting screen will be similar to the definition creation screen

Option 4 = Delete
Used to delete the specified definition.

Option 5 = Display
Used to display definition

Function keys

F3 = Exit the screen

F5 = Update the values

F6 = Create a new partition definition

F12 = Exit the screen

6.6.1 Creating, changing, copying or displaying a tape definition

From the main FLWRKTAP command menu, using the F6 key or options 2, 3 and 5 displays the following screen.

If option 5 = display is used, no information can be changed.

If option 3 is used, it is like when creating a definition, but all the fields are initialized with the values of the selected definition.

Function keys

F3 = exit the requested function and return to the list of definitions

F5 = Reset the values to what they were at the start.

F12 = Exit the requested function and return to the list of definitions

Screen : Device information

```

FLWRKTAP2                Change tape unit definition                M81FLASH
                                                                    10/05/19 19:23:23

Enter your options, then press Enter

Environment name . . . . . DEMO_BRMS                Name
Prod : Server serial numb 0612345                *ANY, *LCL, Serial number
Prod : Partition number . 5                        *ANY, *LCL, Number

Category . . . . . *TAPMLB                *TAP, *TAPMLB
Unit name . . . . . TAPCLONE                Name
Unit type . . . . .
Unit model . . . . .
Serial number . . . . . 02-7805123

Replace if exist . . . . . *YES                *YES, *NO
Description . . . . .

F3=Exit   F4=List   F5=Refresh   F12=Cancel
  
```

Environment name	
Prod : Server serial numb	
Prod : Partition number	Enter the 3 information corresponding to the environment to which the unit definition is to be associated
Category	Enter the category of device to create *TAP = Create a simple tape device *TAPMLB = Create a tape library device
Unit name	Enter the name of the device to create
Unit type	Enter the type of device to create Optional and for information
Unit model	Enter the model of device to create Optional and for information
Serial number	Enter the serial number of device to create To obtain the serial number, connect to the clone partition (on which the device is known), use the command WRKHDWRSC * STG, then option 7 in front of the resource.
Replace if exist	If a unit with the same name already exist, should it be deleted? *YES = A unit already present with the same name will be deleted. *NO = If a unit is already present with the same name, it will not be deleted.
Description	Enter a text describing the device

6.7 *FLSTRSBS, Start the product's automatic functions*

The FLSTRSBS function starts the automatic functions necessary to the Flash For i product.

The command parameters are as follows:

This command has no parameters.

This command generates the following messages in return:

Message ID	Severity	Message text
FLA0901	40	Value &1 incorrect as system role. Check product installation
FLA0902	40	Unexpected error when starting up subsystem &1. Consult the job log.
FLA0903	0	Flash For i product starting up
FLA0904	40	Subsystem &1 has already started

Using the command:

The FLSTRSBS command is used to start the FLASH4I subsystem and FL_AUTO automatic job.

It is advisable to add this command to the system start-up program (QSTRUP).

The same command can be used on the production partition and the Clone partition. The automatic jobs will perform the task specific to the type of partition on which they are running.

6.8 *FLEND SBS, Stop the product's automatic functions*

The FLEND SBS command is used to stop the automatic functions of the Flash For i product.

The command parameters are as follows:

This command has no parameters.

This command generates the following messages in return:

Message ID	Severity	Message text
FLA0905	0	Flash4i product stopping, type &1
FLA0906	0	Flash4i product already stopped

Using the command:

The FLEND SBS command stops the FLASH4I subsystem and the jobs it contains

6.9 *FLCLONE, Start partition cloning*

The FLCLONE command starts cloning for the environment whose name is passed as a parameter.

The command parameters are as follows:

```

Partition cloning (FLCLONE)

Type choices, press Enter.

Environment . . . . . ENV

Additional Parameters

Wait for operation to finish . . WAITEND          *NO

```

Description of parameters:

ENV	Name of the environment containing the definition of the cloning to start
WAITEND	Indicates whether the command must wait until the operation on the Clone partition has ended before returning control. *NO = The command starts cloning then returns control to the calling program *YES = The command starts cloning then waits until the operation (*BRMS, *SAVE21, etc.) has ended on the Clone partition before returning control to the calling program. *END = The command starts cloning then waits until the operation (*BRMS, *SAVE21, etc.) has ended on the Clone partition before returning control to the calling program.

For the values below, the command starts cloning then waits until the operation has reached the specified state before returning control to the calling program.

*BRMS
*BRM21
*SAVE
*SAV21
*USER
*NEWCFG
*BRMS_TFR

This command generates the following messages in return:

Message ID	Severity	Message text
FLA8889	90	The license key for product &1 is not valid. Contact M81
FLA0501	99	No definition found for environment &1.
FLA0099	40	Parameter &1 / &2 is not input correctly. Use the FLPARAM command and enter a correct value
FLA0200	0	Start of the partition cloning procedure. Environment &1
FLA0201	0	Cloning carried out for environment &1
FLA0202	40	Problem during cloning of environment &1. Cloning not carried out
FLA0203	40	*HOLD function is incompatible with WAITEND(*YES) wait request.
FLA0204	40	*ERROR status received from CLONE partition. Operation stopped
FLA0205	0	Function &1 ended for environment &2. The Clone status is &3.
FLA0206	0	Cloning carried out for environment &1 but partition not started as *HOLD function requested

Using the command:

The FLCLONE command is used to clone the disks of the production partition and start the partition. The ENV parameter is used to specify the name of the environment to use. This contains all the necessary information.

The FLCLONE command performs start-up by calling the following commands:

- FLENDLPAR, to stop the Clone partition (for safety reasons)
- FLENDFC, to stop FlashCopy (for safety reasons)
- FLSTRFC, to start FlashCopy (Including the memory Quiesce)
- FLSTRLPAR, to start the Clone partition (unless the *HOLD function is defined in the environment)

Warning: if the WAITEND parameter contains the value *BRM21 or *SAV21, the environment must have been configured for the logs to be transferred in real time (parameter " Real time logs transfer" in the environment definition. Otherwise, the clone partition goes into restricted mode immediately after the IPL, and no information is sent to Production. Control would only be returned to the calling program at the end of the backup.

6.10 FLSTRFC, Start FlashCopy

The FLSTRFC command is used to start FlashCopy/Snapshot on the disk bay defined in the environment passed as a parameter.

The command parameters are as follows:

Start FlashCopy (FLSTRFC)

```
Type choices, press Enter.

Environment . . . . . ENV
Storage definition . . . . . STG          *ENV
```

Description of parameters:

- ENV Name of environment containing the definition for which FlashCopy must be started.
 *STG = Specify the name of the storage definition to be used in the STG parameter
- STG Name of the storage definition for which the remote copy (Metro or Global Mirror) should be started. This parameter is only allowed for storage definitions of type *SVC and *REMOTE.
 *ENV = The storage definition defined in the environment specified in parameter ENV is used.

This command generates the following messages in return:

Message ID	Severity	Message text
FLA8889	90	The license key for product &1 is not valid. Contact M81
FLA0501	99	No definition found for environment &1.
FLA0730	40	Impossible to start FlashCopy. Specific program &2/&1 not found.
FLA0731	40	Impossible to start FlashCopy. Specific program &2/&1 returned an error.
FLA0732	0	Request to start FlashCopy for storage &2. Environment &1.
FLA0733	0	Message from specific program: &1
FLA0804	40	Error during FlashCopy start-up for group &2. Environment &1
FLA0805	40	Unable to stop FlashCopy. Neither Storwize controller is responding. Environment &1
FLA0806	0	FlashCopy started for group &2. Environment &1
FLA1221	40	Control group &1 not found
FLA1222	40	Backup program &1/&2 not found
FLA1230	40	Program for QSTRUPPGM &1/&2 not found
FLA1231	40	Preparation program &1/&2 not found
FLA1232	40	Control subsystem &1/&2 not found

Using the command:

The FLSTRFC command is used to start FlashCopy for the consistency group defined in the environment. It is one of the elements used during cloning by the FLCLONE command. It uses the information entered in screen 1 of the environment definition, and in command FLWRKSTG. It performs the following operations:

- Stops FlashCopy for safety reasons
- QUIESCES the memory so that all the data is on a disk
- Starts FlashCopy

The STG parameter is only allowed for storage definitions (FLWRKSTG) of type *SVC and *REMOTE.

6.11 FLENDFC, Stop FlashCopy

The FLENDFC command is used to stop FlashCopy on the Storwize system and for the consistency group defined in the environment passed in as a parameter.

The command parameters are as follows:

```

                                Stop Flashcopy (FLENDFC)

Type choices, press Enter.

Environment . . . . . ENV
Storage definition . . . . . STG          *ENV

                                Additional Parameters

Disks access if *REMOTE (*SVC)  RMTACCESS  *ACCESS

```

Description of parameters:

- ENV Name of the environment containing the definition for which the FlashCopy must be stopped.
- STG *STG = Specify the name of the storage definition to be used in the STG parameter
Name of the storage definition for which the FlashCopy must be stopped
*ENV = The defined storage definition in the environment specified in the ENV parameter is used.
- RMTACCESS If the storage definition (FLWRKSTG) is of type *REMOTE, specify here whether the remote disks must be accessible in order to be mapped to a host, or whether they must remain locked after the metro mirror or global mirror is stopped.
*ACCESS = Remote disks will be released and can be mapped to a host.
*LOCK = Remote disks will remain locked.

This command generates the following messages in return:

Message ID	Severity	Message text
FLA8889	90	The license key for product &1 is not valid. Contact M81
FLA0501	99	No definition found for environment &1.
FLA0619	40	Parameter &1/&2/&3 not found
FLA0637	40	Specific program &2 from library &3 not found. Environment &1
FLA0771	40	Unable to stop FlashCopy. Neither Storwize controller is responding. Environment &1
FLA0774	40	Error when stopping FlashCopy for group &2. Environment &1
FLA0775	0	FlashCopy stopped for group &2. Environment &1
FLA0776	40	FlashCopy already stopped for group &2. Environment &1

Using the command:

The FLENDFC command is used to stop FlashCopy for the consistency group defined in the environment or in the storage definition. It is used automatically if the environment definition involves stopping FlashCopy at the end of the operation on the clone partition.

It can be used if the user wants to stop FlashCopy in operation.

NB: Once FlashCopy has been stopped, the content of the clone partition disks will be erased. It will no longer be possible to retrieve this data.

The RMTACCESS parameter can only be used if the storage definition (FLWRKSTG) is of type *REMOTE, which corresponds to a consistency group for Metro Mirror or Global Mirror.

6.12 FLSTRLPAR, Start the Clone partition

The FLSTRLPAR command is used to start the Clone partition defined in the environment passed as a parameter.

The command parameters are as follows:

```

                                Start partition (FLSTRLPAR)

Type choices, press Enter.

Environment . . . . . ENV
LPAR definition . . . . . LPAR          *ENV

                                Additional Parameters

Keylock position . . . . . KEYLOCK      *LPAR

```

Description of parameters:

- | | |
|---------|--|
| ENV | Name of the environment containing the definition for which the Clone partition must be started.
*LPAR = Specify the name of the clone partition definition to be used in the LPAR parameter |
| LPAR | Name of the clone partition definition to be started
*ENV = The partition definition defined in the environment specified in the ENV parameter is used. |
| KEYLOCK | Indicate whether the partition should start in Normal or Manual mode.
*LPAR = The IPL type depends on the partition configuration in the FLWRKLPAR command. If it is an HMC and the partition profile is *LASTUSED, the partition will IPL in the mode last used on the HMC. It will IPL in Normal mode in all other cases.
*NORMAL = The partition will IPL in Normal mode.
*MANUAL = The partition will IPL in Manual mode. |

This command generates the following messages in return:

Message ID	Severity	Message text
FLA8889	90	The license key for product &1 is not valid. Contact M81
FLA0501	99	No definition found for environment &1.
FLA0619	40	Parameter &1/&2/&3 not found
FLA0702	40	Error when looking up the status of partition &2. Environment &1
FLA0703	0	Partition &2 is already in &3 status. Environment &1
FLA0704	40	Error when stopping partition &2. Environment &1
FLA0706	40	Response from the HMC: &1
FLA0721	40	Unable to start the partition: Neither HMC is responding. Environment &1
FLA0724	40	Error when starting partition &2. Environment &1
FLA0725	0	Partition &2 start-up requested. Environment &1

Using the command:

The FLSTRLPAR command is used to start the clone partition by connecting to the HMC. It is one of the elements used during cloning by the FLCLONE command. It uses the information with the command FLWRKLPAR.

6.13 FLENDLPAR, Stop the Clone partition

The FLENDLPAR command is used to stop the Clone partition defined in the environment passed as a parameter.

The command parameters are as follows:

```

                                Stop partition (FLENDLPAR)

Type choices, press Enter.

Environment . . . . . ENV
LPAR definition . . . . . LPAR          *ENV
    
```

Description of parameters:

- ENV Name of the environment containing the definition for which the Clone partition must be stopped
- LPAR Name of the clone partition definition that should be stopped.
- *ENV = The clone partition defined in the environment specified in the ENV parameter is used.

This command generates the following messages in return:

Message ID	Severity	Message text
FLA8889	90	The license key for product &1 is not valid. Contact M81
FLA0501	99	No definition found for environment &1.
FLA0503	40	LPAR definition &1 not found
FLA0619	40	Parameter &1/&2/&3 not found
FLA0701	40	Unable to stop the partition: Neither HMC is responding. Environment &1
FLA0702	40	Error when looking up the status of partition &2. Environment &1
FLA0703	0	Partition &2 is already in &3 status. Environment &1
FLA0704	40	Error when stopping partition &2. Environment &1
FLA0705	0	Partition &2 stop requested. Environment &1
FLA0706	40	Response from the HMC: &1

Using the command:

The FLENDLPAR command is used to stop the clone partition by connecting to the HMC. It is used automatically if the environment definition involves stopping the partition at the end of the operation on the clone partition. It can be used if the user wants to stop the clone partition in operation.

NB: The partition is stopped from the HMC. It is therefore a sudden stop. If the clone partition needed to be subsequently restarted, an abnormal IPL would be performed.

6.14 FLADDLOG, Add a Log item

The FLADDLOG command is used to add a message to the product log.

The command parameters are as follows:

```

                                Add a log post (FLADDLOG)

Type choices, press Enter.

Message type . . . . . TYPE
Product . . . . . PRODUCT          FLASH4I
Level 1 reference . . . . . REF1
Level 2 reference . . . . . REF2
Level 3 reference . . . . . REF3
Cloning number . . . . . CLONENBR  *LAST
Message ID . . . . . MSGID        *NONE
Message data . . . . . MSGDTA

...

Gravity . . . . . GRAV            00
Message file . . . . . MSGF       *DFT
Library . . . . . LIBL            *LIBL

```

Description of parameters:

- | | |
|----------|---|
| TYPE | Message type:
INF: Information-type message
ERR: Error-type message |
| PRODUCT | Product name in 10 characters. The default value is FLASH4I. This data is indicated for information purposes only. |
| REF1 | 10-character field enabling the user to specify a reference. This data is indicated for information purposes only. |
| REF2 | 10-character field enabling the user to specify a reference. This data is indicated for information purposes only. |
| REF3 | 10-character field enabling the user to specify a reference. This data is indicated for information purposes only. |
| CLONENBR | Cloning number. Enter the cloning number to which this message must be associated.
*LAST = This message will be associated to the last cloning realized. This is the recommended value when this command is used on Clone partition.
*NONE = The message will not be associated with any cloning number. It will not be visible with the FLDSPHST command. The FLDSPLOG command must be used to see it. Used for example for a version upgrade of the product, or for cleanups. |

	*ALLACTIV = The message will be sent for all active cloning numbers (whose status is different from *END_FC)
MSGID	Message identifier. Specify the message ID as it is known in the message file. *NONE: No message ID is used. The text of the message will be fully contained in the MSGDATA parameter. FLA9898: This Message ID is provided as standard and allows the user to specify a 0 severity message (Information). The text of the message will be specified in the MSGDATA parameter. FLA9899: This Message ID is provided as standard and allows the user to specify a severity-40 message (Error). The text of the message will be specified in the MSGDATA parameter.
MSGDTA	Data to associate with the MSGID message
SEV	Level of severity to associate with the message. The value must be between 00 and 99.
MSGF	Name of message file. *DFT: The default message message file will be used (FLMSGF) This parameter is not taken into account if the message ID is *NONE

This command generates the following messages in return:

No message is returned from this command

Using the command:

This command is used to add a message to the product operations log.
It will be possible to consult this message via the FLDSPLOG command.
This same command is used internally by the product to monitor the performed operations.

The following 2 message IDs are used to add generic messages without having to create its own message file (*MSGF)

FLA9898: Can be used as a basis for an information message
FLA9899: Can be used as a basis for an error message

6.15 FLUPDSTS, Update the status of the Clone partition

The FLUPDSTS command is used to change the step cloning has reached on the Clone partition.

The command parameters are as follows:

```

                                Status update on Clone (FLUPDSTS)

Type choices, press Enter.

Flash4i internal status . . . . PRDSTS          *SAME
Processing step . . . . . STEP                *SAME
Message ID showing the step . . MSGID         *PRDSTS
Free text showing status . . . . STATUS       *SAME

```

Description of parameters:

PRDSTS	<p>Specify the name of the step the job has reached on the Clone partition. The possible values are:</p> <ul style="list-style-type: none"> *SAME = No change. *HOLD = The function requested on the Clone partition is *HOLD. No change of status will be made automatically. *FIRST_STR = The Clone partition performs its first IPL *BRMS = The *BRMS function has started *BRMS_END = The *BRMS function has ended *BRM21 = The *BRMS21 function has started *BRM21_END = The *BRMS21 function has ended *SAVE = The *SAVE function has started *SAVE_END = The *SAVE function has ended *SAV21 = The *SAVE21 function has started *SAV21_END = The *SAVE21 function has ended *USER = The *USER function has started *USER_END = The *USER function has ended *END_LPA_W = The requested function has ended and a partition stop request has been made (This status is automatically indicated if the environment is defined with the *ENDLPA_W option) *END_LPAR = The requested function has ended and the clone partition is stopped (This status is automatically indicated if the environment is defined with the *ENDLPA_W option) *END_FC_W = The requested function has ended and a FlashCopy stop request has been made (This status is automatically indicated if the environment is defined with the *ENDFC option) *END_FC = The requested function has ended and FlashCopy has been stopped (This status is automatically indicated if the environment is defined with the *ENDFC option) *CHG_PROD = The role of the clone partition has been changed to *PROD. *CHG_NONE = The role of the clone partition has been changed to *NONE *ERROR = The Clone partition is in error
STEP	Specify a step number the program has reached. This number is not checked. This data is for information only.
MSGID	Specify a message ID contained in the FLMSG message file containing the text describing the step
STATUS	*PRDSTS = The text will be the default text for the status given in parameter PRDSTS

This command generates the following messages in return:

Message ID	Severity	Message text
FLA0520	40	The FLUPDSTS command can only be used on the CLONE partition
FLA0910	0	Change of status: &1, &2

Using the command:

The FLUPDSTS command enables the user to indicate to the product which step its process has reached on the Clone partition.

This status is automatically sent to the Production partition and is visible via the FLDSPSTS and FLRTVSTS commands.

It must be used in the case of a *USER-type environment, i.e. when the operations performed on the Clone partition are managed by a program performed by the user.

At the start of the program, use the command below to indicate that the user program has started:

```
FLUPDSTS PRDSTS (*USER)
```

At each important step in the program (e.g. cartridge initialized, start of SAVLIB, etc.), use the command below to indicate the step:

```
FLUPDSTS PRDSTS (*USER) STEP(010) STATUS('Start of SAVLIB')
```

In the STEP parameter, specify a step number chosen according to what the program is performing

In the STATUS parameter, enter text which clearly indicates the operation in progress

At the end of the program, use the command below to indicate that the user program has ended:

```
FLUPDSTS PRDSTS (*USER_END)
```

This information is automatically sent to the Production partition. The user can monitor the progress of their program in real time (with a maximum delay of 2 minutes).

At the end of the program, using this command with the PRDSTS(*USER_END) parameter indicates to Flash For i that the function has ended. It may act as defined in the environment with the "Clone action at end of Op." value . The possible values are *KEEP, *END_LPAR or *END_FC.

6.16 FLCHGTIM, Change Clone partition system date and time

FLCHGTIM command allows to change the system date and time of the Clone partition, or check the difference with the Production time, and send a message to product log.

The command parameters are as follows:

Change time on clone partition (FLCHGTIM)		
Type choices, press Enter.		
Action	ACTION	*CHGTIME
Delay with prod partition (mn)	DELAY	*NONE
Delay for error (minutes) . . .	DELAYERR	0
New date	FIXEDDATE	*SAME
New time	FIXEDTIME	000000

Description of parameters:

ACTION	Type of action to do *CHGTIME = Change the system date and time . *MSG = Send a message to product log with the time difference with the production partition
DELAY	Enter the difference in minutes between the production time, and the new time on Clone partition. Number between -600 et 600 = Delay in minutes. *FIXED = Date and time will be changed at a fix value. *NONE = No delay. The same time as Production will be used.
DELAYERR	Enter the delay in minutes after which the message generated by the command will be an error message.

FIXEDDAT	Enter the fixed date. *SAME = The same day as the one on Production partition. *PRV = The day before the one on production partition. *NEXT = The day after the one on production partition.
FIXEDTIME	Enter the future time of the Clone partition.

This command generates the following messages in return:

Message ID	Severity	Message text
FLA0305	00	Cfg: Time changed. The new time is &1 at &2. The difference with the production partition was &3:&4.
FLA0307	00	Cfg: FLCHGTIM, Ok, &1 hours &2 minutes difference between production and clone partition.
FLA0920	40	The &1 command is only authorized on the CLONE partition. Command not launched.
FLA0099	40	The parameter &1 / &2 is not properly filled. Use the FLPARAM command and give a correct value.
FLA0302	40	Cfg: Error while connecting to the production partition.
FLA0303	40	Cfg: Error, can't open the remote directory of the production partition.
FLA0304	40	Cfg: Error, can't change the system date.
FLA0306	40	Cfg: FLCHGTIM, Error, &1 hours &2 minutes difference between production and clone partition..

Using the command:

Since the Clone partition is independent, and potentially never automatically time-stamped, a time difference may occur over time.

The FLCHGTIM command allows you to either note this discrepancy by adding a message in the product log, or to correct the time of the clone partition to match the time of the Production partition.

The same command allows you to change the time of the Clone partition by indicating for example:

- The same time as the Production partition
 - o FLCHGTIM ACTION(*CHGTIME) DELAY(*NONE)
- A fixed time, regardless of the current time. For example, indicate that it is 2:00 a.m. so that backup histories start at 2:00 a.m. instead of the actual time.
 - o FLCHGTIM ACTION(*CHGTIME) DELAY(*FIXED) FIXEDDATE(*SAME) FIXEDTIME(020000)
- A time difference of a few minutes or a few hours, for example to create a test partition with a time difference of 2 hours.
 - o FLCHGTIM ACTION(*CHGTIME) DELAY(-120)

This command can only be used on the Clone partition, after the network and TCP/IP configuration has been started. For example, it can be used at the following locations:

- Exit program 4A (Before control group BRMS/BRMS21) of the definition of an environment of type *BRMS
- Specific backup program for an environment of type *SAVE.

CAUTION, the command cannot be used in an exit 3 program of an environment, because this program is called before TCP/IP is started.

It is therefore not possible (in the current version) to use it for environments that need to be in restricted mode, such as *SAVE21 or *BRMS21 for example.

This command does not display any screens. The result of this command is a change of system time or a message in the product log. This message is of informative or error type depending on the delay between the production partition and the clone partition compared to the delay given in the parameter.

Example for an environment of type *SAVE

At the beginning of the program, add the following instructions:

```
/* Wait 60s to make sure that TCP/IP is started */
DLYJOB      DLY(60)
FLCHGTIM    ACTION(*CHGTIME) DELAY(*NONE)
MONMSG      MSGID(FLA0000)
```

Example for an environment of type *BRMS

Add the following lines as BRMS Exit at the beginning of the checking group:

```
20 *EXIT      DLYJOB DLY(60)
30 *EXIT      FLCHGTIM ACTION(*CHGTIME) DELAY(*NONE)
```

Prerequisites for this command:

If the IBM i partition is in version 7.1 or 7.2, the following PTFs are required:

- Version 7.1 : PTF SI65116
- Version 7.2 : PTF SI53458

6.17 FLCPYOBJ, Copy an object from Clone to Prod

The FLCPYOBJ command is used to copy an object (file, data area or output queue) or BRMS historical data (*BRMS) from the Clone partition to the Production partition.

The command parameters are as follows:

```
Copy an object to Prod (FLCPYOBJ)

Type choices, press Enter.

Object to copy . . . . . OBJ
Library . . . . .
Object type . . . . . FROMTYPE      *ALL
Destination library . . . . . TOLIB      *FROMLIB
Confirm if *BRMS . . . . . CONFIRM      *YES
```

Description of parameters:

OBJ	Name of objects to transfer. Specify the name of an object or a generic name and the library in which the object(s) is found. *ALL = Every object of the library will be transferred. *BRMS = The QUSRBRM library containing the BRMS history will be transferred. If the ICC product is installed, the QUSRICC library will also be transferred.
FROMTYPE	Type of object to transfer. This value must not be changed if *BRMS is entered for OBJ parameter. *DTAARA: *DTAARA-type objects will be transferred *FILE: *FILE-type objects will be transferred *OUTQ: *OUTQ-type objects will be transferred with the spools they contain *ALL: All object types contained in the library will be transferred.
TOLIB	Specify the library in which the objects must be restored on the Production partition. This value must not be changed if *BRMS is entered for OBJ parameter.

*FROMLIB: The objects will be restored in the same library as the original one.

CONFIRM Specify whether the request should be confirmed before to run the function.

*YES = message FLA1821 will be sent to job to request confirmation to send QUSRBRM library

*NO = No confirmation will be requested. Use this value to make the function fully automated.

This command generates the following messages in return:

Message ID	Severity	Message text
FLA1821	0	Confirm request to send library QUSRBRM. On the source partition, the content of this library will be replaced (C G)
FLA0922	0	Transfer of Type-&3 objects &1/&2 carried out. Transfer no. &4.
FLA1825	0	*BRMS copied successfully.
FLA0099	40	Parameter &1 / &2 is not input correctly. Use the FLPARAM command and enter a correct value
FLA0920	40	The FLCPYOBJ command is only authorized on the CLONE partition. Command not executed
FLA0921	40	Error when saving Type-&3 objects &1/&2. Transfer no. &4. Consult the log
FLA0923	40	Internal error when saving objects. Transfer no. &4. Consult the log
FLA0924	40	Error when transferring Type- &3 objects &1/&2. Transfer no. &4. Consult the log
FLA1822	40	Can't copy *BRMS from a partition that doesn't have *BRMS or *BRMS21 function. Partition function type : &1.
FLA1823	40	FLCPYOBJ command canceled.
FLA1824	40	Error while copying *BRMS.
FLA1826	40	Library is mandatory if the object to copy isn't *BRMS.

Using the command:

This command can only be used on the Clone partition.

The FLCPYOBJ command is used to back up certain types of objects (*FILE, *DTAARA and *OUTQ) or every type of objects (*ALL) on the Clone partition, and to transfer them to the Production partition.

On the Production partition, the FLASH4I subsystem jobs detect the arrival of new objects and restore them to the library specified in the TOLIB parameter.

Transfer of BRMS history

Using the OBJ(*BRMS) parameter allows the transfer of BRMS histories (QUSRBRM library, and eventually QUSRICC) to the Production partition. In this case, the FROMTYPE and TOLIB parameters must not be used.

Use this setting, for example, if the automatic BRMS data transfer has not been successful, or if data has been lost.

The OBJ(*BRMS) setting can only be used if the Clone partition was generated with a *BRMS or *BRMS21 environment.

CAUTION: If OBJ(*BRMS) is used, then all BRMS information on the Production partition will be overwritten with information from the Clone partition. If operations have been performed on the Production with BRMS (new backup, maintenance, updating information from the network, ...), they will be lost.

6.18 FLCPYDIR, Copy an IFS file from Clone to Prod

The FLCPYDIR command is used to copy an IFS file or directory from the Clone partition to the Production partition.

The command parameters are as follows:

```

Copy IFS object to PROD (FLCPYDIR)

Type choices, press Enter.

Source object . . . . . FROMOBJ

Destination directory . . . . . TODIR          *FROMDIR
    
```

Description of parameters:

- FROMOBJ Name of file or directory to transfer. Specify the name of a file from IFS, or a generic name. The name must include the full path. It must begin with /
- TODIR Specify the destination path name where the file must be restored on production partition.
*FROMDIR: The files will be restored in the same directory as the original one.

This command generates the following messages in return:

Message ID	Severity	Message text
FLA0099	40	Parameter &1 / &2 is not input correctly. Use the FLPARAM command and enter a correct value
FLA0920	40	The FLCPYOBJ command is only authorized on the CLONE partition. Command not executed
FLA0927	40	Error while preparing the transfer of the object &1. Transfer N° &2. Consult the log
FLA0928	0	Transfer of the object &1 done. Transfer N° &2.

Using the command:

The FLCPYDIR command is used to transfer IFS files or directories from the Clone partition to the Production partition.

It can only be used on the Clone partition.

If parameter FROMOBJ contains a directory name, the content of this directory and subdirectory will be transferred.

If the files to transfer already exist on production partition, they will be replaced.

The transfer is made synchronously. The production partition must be active when FLCPYDIR command is used on Clone partition.

6.19 FLJRNUPDSA, Update saved attribute for *JRNRCV

The command FLJRNUPDSA allows to update the saved attribute for the journal receivers (type *JRNRCV) on the production partition.

The command parameters are as follows:

```

Update save info JRNRCV (FLJRNUPDSA)

Type choices, press Enter.

Send msg for every JRNRCV . . . *YES, *NO
  
```

Description of parameters:

SNDDTMSG Enter *YES to add a message in the product log (FLDSPLOG command) for each journal receiver changed
 *YES = For each *JRNRCV changed, a message will be added in the product log, and a recap message at the end
 *NO = Only a recap message will be added.

This command generates the following messages in return:

Message ID	Severity	Message text
FLA1324	0	Save Attribute changed for JRNRCV &1/&2
FLA1325	0	Saved date attribute changed for &1 JRNRCV

Using the command:

This command can only be used after having executed an environment with value *YES for parameter “Extract *JRNRCV info” (last screen in the environment creation, command FLWRKENV).

This command must be used on the production partition, when the backup on clone partition is finished, and that all information have been received on the production partition (at least, when message FLA1322: “Saved attributes for *JRNRCV have been extracted” is there.

Every *JRNRCV that were detached from the journal on the production partition before to start cloning disks, and that have been saved on the clone partition, will be saved in a temporary SAVF. The effect will be to change their “Saved date” attribute.

Then, they will can be deleted on the production partition, without to get the CPA7025 asking a confirmation before to delete.

See chapter “2.13 Special case for journal receivers (*JRNRCV)”for more information.

Use the command FLDSPJRNSA to see the list of JRNRCV that will be saved with this command.

This command can only be used on the Production partition.

6.20 FLRSTCFG, restore system configuration

The FLRSTCFG command can be used on the Clone partition to restore certain elements of the configuration from the Production partition.

This command can only be used on a Clone partition.

The command parameters are as follows:

```

Restore system config (FLRSTCFG)

Type choices, press Enter.

Start TCP/IP at IPL . . . . . STRTCP          *SAME
Start print writers at IPL . . . STRPRTWTR     *SAME
Start Advanced Job Scheduler . . STRJS        *SAME
Start BRMS Network . . . . . STRBRMSNET      *SAME
Control subsystem QCTLSBSD . . . QCTLSBSD     *SAME
Restore JOBSUDE . . . . . RSTJOBSUDE        *SAME
  
```

Description of parameters:

STTCP	Recover automatic TCP/IP startup using CHGIPLA command *SAME = The value remains unchanged *RST = The value is restored as it was on the production at the time of cloning.
STPRTWTR	Recover automatic writers startup using CHGIPLA command *SAME = The value remains unchanged *RST = The value is restored as it was on the production at the time of cloning.
STRJS	Reconfigure the Autostart job QIJSSCD in subsystem QSYSWRK. This job is used to start the IBM Advanced job Scheduler. *SAME = The value remains unchanged *RST = Subsystem QSYSWRK is changed.
STRBRMSNET	Rename subsystem Q1ABRMNET *SAME = The value remains unchanged *RST = The subsystem Q1ABRMNET is renamed to allow the BRMS network function to function again.
QCTLSBSD	Change the QCTLSBSD System Value to Reset the Name of the Original Subsystem *SAME = The value remains unchanged *RST = The value is restored as it was on the production at the time of cloning.
JOBSUDE	Restore Scheduled Jobs from SAVF FLASH4I/FLJOBSUDE *SAME = The value remains unchanged *RST = The system scheduled jobs (WRKJOBSUDE) are restored as they were on the production at the time of cloning.

This command generates the following messages in return:

Message ID	Severity	Message text
FLA0550	0	Cfg: System attribute CHGIPLA STRPRTWTR(&1) restored
FLA0551	0	Cfg: System attribute CHGIPLA STRTCP(&1) restored
FLA0552	0	Cfg: System value CHGSYSVAL QCTLSBSD(&1) restored
FLA0553	0	Cfg: automatic start of IBM Advanced Job Scheduler for i restored
FLA0554	20	Cfg: IBM Advanced Job Scheduler for i not found. Automatic start not restored.

FLA0555	20	Cfg: BRMS Network not found. Automatic start not restored.
FLA0556	0	Cfg: automatic start of BRMS Network restored
FLA0557	40	Cfg: Error while restoring JOBSCDE.
FLA0558	0	Cfg: Automatic jobs JOBSCDE restored'
FLA0559	0	Cfg: FLRSTCFG: &1 configuration elements restored
FLA0920	40	The &1 command is only authorized on the CLONE partition. Command not launched

Using the command:

During the first IPL of the Clone partition, the product Flash for I changes some configuration parts to make sure that no production jobs or communications automatically start. FLRSTCFG command allows to restore some of these elements. See chapter "2.2 Configuration changes of the Clone partition" for more details.

6.21 FLCHGROL, Change clone partition role

The FLCHGROL command can be used on the Clone partition to change the role of the partition, and make it standalone and no longer return any history to the Production partition, or it itself becomes a production partition, allowing Flash for i to be used on this partition to create other clones.

This command can only be used on a Clone partition.

The command parameters are as follows:

```

Change partition role (FLCHGROL)

Type choices, press Enter.

Previous role . . . . . OLDROLE
New role . . . . . NEWROLE
Confirm . . . . . CONFIRM          *YES

```

Description of parameters:

- OLDROLE Enter the current role of the partition
*CLONE = In the current version, the only possible value is * CLONE
- NEWROLE Enter the new role to assign to the partition.
*PROD = The partition becomes autonomous and no longer sends history to the original Production. The partition will have the ability to start new cloning of its own disks with the FLCLONE command. The infrastructure part must have been defined beforehand.
*NONE = The partition becomes autonomous and no longer sends history to the original Production. The FLCLONE command can't be used on this partition.
- CONFIRM Specify whether the request should be confirmed before to run the function.
*YES = message FLA0540 will be sent to job to request confirmation of role change
*NO = No confirmation will be requested. Use this value to make the function fully automated.

This command generates the following messages in return:

Message ID	Severity	Message text
FLA0540	0	Enter G to confirm the role change for partition. Enter C to cancel (G C)
FLA0541	40	Command FLCHGROL canceled
FLA0542	0	Command FLCHGROL used. The new role for the partition is &1
FLA0543	0	Change to new role &1 completed
FLA0544	40	The control subsystem can't be FL_CLONE on a PROD partition
FLA0920	40	The &1 command is only authorized on the CLONE partition. Command not launched
FLA8887	40	Clone partition has been changed to Prod, but no license key is valid

Using the command:

See chapter "2.10Role change of a clone partition" for more details.

6.22 FLMAPHOST, Map disks to a host.

The FLMAPHOST command maps disks resulting from a FlashCopy or SafeGuarded copy to a configured host on the disk array.

The command parameters are as follows:

```

                                Mapping disks to a host (FLMAPHOST)

Type choices, press Enter.

Storage definition . . . . . STG
Target host . . . . . TGTHOST

Action if disks already mapped   TGTUNMAP
Name SGC copy to use . . . . . SGCCOPY          *LAST

```

Description of parameters:

- STG** Specify the name of the storage definition (FLWRKSTG) to be used. This definition must be of type *SVC or *SGC.
- TGTHOST** Specify the name of the host to which the disks should be mapped. Use the host name as it is known in the disk array.
*DFT = Use the host name specified in the storage definition if it is of type *SGC (SafeGuarded Copy)
- TGTUNMAP** Specify the action to take if disks are already mapped to the selected host.
*UNMAP = Disks already mapped to the selected host will be unmapped.
*CANCEL = If disks are already mapped to the destination host, the operation will be cancelled.
- SGCCOPY** If the storage definition is of type SGC (SafeGuarded Copy), there may be several copies available for the same source disks. Indicate here which copy to use. The name of the consistency group used in the disk array must be specified. The consistency group name starts with F4I_SGC_. The FLDSPSGC command displays the list of existing copies.
*LAST = The last copy made will be used.

This command generates the following messages in return:

Message ID	Severity	Message text
FLA2531	0	Mapping disks from consistency group &1 on target host &2 performed properly.
FLA2537	0	Mapping disks from the SGC copy &1 on target host &2 performed properly.
FLA2538	0	Mapping disks on target host performed properly.
FLA2542	0	Mapping disks on target host &1 performed properly.
FLA0171	40	Storage definition &1 not found
FLA2411	40	Error when creating consistency group &1
FLA2412	40	Error when creating clone disk &1
FLA2413	40	Error when defining FlashCopy for clone disk &1
FLA2490	40	Unable to retrieve data for storage &1.
FLA2522	40	Error, *SELECT specified for the name of the SGC copy to use when the job isn't an interactive job.
FLA2523	40	Error, storage &1 is not of type *SGC, *SVC or *PROXY.
FLA2524	40	Error, *DFT specified for the target host when the storage &1 is of type *SVC.
FLA2525	40	Error, copy type *REMOTE specified for storage &1
FLA2526	40	Error, target host not found.
FLA2527	40	Error, unable to found the consistency group &1. Storage &2.
FLA2528	40	Operation cancelled, disks already mapped on target host &1.
FLA2529	40	Error while unmapping disk &1 of target host &2.
FLA2530	40	Error while mapping disk &1 on target host &2.
FLA2532	40	Error, *SELECT specified for the name of the SGC copy to use when the storage is of type *PROXY.
FLA2533	40	Error, *DFT specified for the name of the target host when no value is specified in the storage definition &1.
FLA2534	40	Error, *LAST specified for the name of the SGC copy to use when there is no SGC copy usable for the storage &1.
FLA2535	40	Error, SGC copy &1 not found.
FLA2536	40	Error while starting the FlashCopy.
FLA2539	40	Error while mapping disks on target host.
FLA2540	40	Error, target host &1 not found.
FLA2541	40	Error, unable to found the consistency group. Storage &1.
FLA2543	40	Error while mapping disks on target host &1.

Using the command:

The purpose of the FLMAPHOST command is to be able to automatically present (map) disks to a host, in order to start a partition. The command relies on a storage definition (managed with the FLWRKSTG command) which provides it with much of the necessary information:

- The IP address and profile to ssh to the disk array

For *SVC type definitions

- The name of the consistency group, which will allow to know the list of the target disks

For *SGC type definitions

- The list of SafeGuarded copies that have been generated.

The command is not compatible with other types of definitions.

Why use this command

For *SVC type definitions (usually used to make backups on a clone partition)

In some configurations, there are multiple source (or production) partitions, so multiple consistency groups to perform the FlashCopy, but only one clone partition. The disks from the first consistency group must be mapped to the clone partition to perform the backup, and then unmapped once the backup is complete so that the disks from the second consistency group can be used again.

For *SGC type definitions (SafeGuarded Copy)

Several safe copies are automatically generated at regular intervals. In case of a problem on the source partition (ransomware attack, data corruption, ...), these copies can be used to recover the system as it was a few hours or days before. The FLMAPHOST command allows to choose one of the secured copies, and to present the corresponding disks to a host in order to access the data.

As the disks contained in the SafeGuarded pool cannot be used directly by a partition, a FlashCopy will be created by the command. It is the target disks of this FlashCopy that will be mapped to the host.

This command does not start the partition. The partition must be IPLed either with the FLSTRLPAR command if the definition is of type *SVC, or from the HMC if the definition is of type *SGC.

For the *SGC type, it is strongly advised to do a manual IPL and to start only the console. Indeed, the copies created for SafeGuarded Copy are not prepared to modify the configuration at IPL time. The partition that will be started will have exactly the same characteristics as the production partition (name, IP address, automatic jobs, ...)

6.23 FLINIT, Initialize the product, or change the site type

The FLINIT command is used to initialize or reinitialize the FLASH FOR I product, or to change the type of site in module Central management.

The command parameters are as follows:

```
Flash4i Initialization (FLINIT)

Type choices, press Enter.

Directory . . . . . DIR *CURRENT

Profile for Clone partition . . USER FL_USER
Profile password . . . . . PWD
ssh key size . . . . . RSAKEY *DFT
Recreate ssh key if exist . . . RENEWSH *NO
Site type . . . . . SITETYPE *SAME
Primary site name . . . . . PRISITE
Primary site IP address . . . . PRISITEIP
```

Description of parameters:

- DIR Name of the directory that will be used by the product
*DFT = The "/Flash4i" default directory will be used
*CURRENT = Indicates that the previously specified directory will be kept. This value cannot be used when installing the product for the first time.
- USER Name of user profile that will be used for automatic jobs (in the FLASH4I subsystem) and for transfers between the 2 partitions.
If it does not exist, this profile will be created.
*DFT = The profile name will be FL_USER
- PWD Password that will be given to the profile specified in the USER parameter
*SAME = The password will not be changed. This value is only supported if the user profile already exist.
- RSAKEY Enter the size of the rsa key for every ssh communications. The size of the rsa key may be changed in order to be compatible with old versions of HMC for example.
*DFT = The default size used the IBM i system is used

2048	= The rsa key will use 2048 bits
3096	= The rsa key will use 3096 bits
*NONE	= No rsa key will be generated. Use this value if a Proxy partition is used.
RENEWSSH	Specify whether the rsa / ssh key should be recreated if it exists. *YES = If an rsa key already exists, it will be replaced. The old key is not deleted. It is renamed by adding the date and time in the name. *NO = If an rsa key already exists, it will not be replaced.
SITETYPE	If the "Central Management" module is used, indicate the type of site. If this module is not used, the default value to be used is *STD During an initial installation, the entry of this parameter is mandatory. *SAME = The site type will not be changed. *PRI = The partition will be used as primary site *SEC = The partition will be used as a secondary site *STD = The "central management" module is not used. The product will be used in a standard mode.
PRISITE	Indicate the name of the Primary site This parameter must only be filled in if the "Central Management" module is used, and the SITETYPE parameter contains *SEC (secondary site).
PRISITEIP	Indicate the IP address of the primary site. This parameter must only be filled in if the "Central Management" module is used. In this case, the IP address must be entered if the SITETYPE parameter contains *PRI or *SEC.

This command generates the following messages in return:

Message ID	Severity	Message text
FLA0846	0	Permissions changed for directory &1
FLA0847	40	Specify a password for profile &1
FLA0848	0	Profile &1 created. It will be used when starting the CLONE partition
FLA0849	0	Profile &1 changed. It will be used when starting the CLONE partition
FLA0851	40	Error when creating the private key
FLA0852	0	Private key created
FLA0853	40	Error when creating directory &1
FLA0854	0	Directory &1 created
FLA0855	0	The private key already exists. It is kept
FLA0856	20	ssh-keygen returned: &1
FLA0857	0	Public key renamed &1
FLA0869	0	Flash4i product correctly installed
FLA1891	40	Command &1 canceled.
FLA1892	0	Known primary site &1 is different from given primary site &2. Confirm replacement of the primary site. (C G)
FLA1893	0	Configuration data entered will be replaced by data from the primary site &1. Confirm the operation. (C G)
FLA1894	40	The primary site IP address is mandatory if the site type is *PRI or *SEC.
FLA1895	40	Error while setting up site &1, type &2.
FLA1896	0	Site &1, type &2, successfully set up.
FLA1897	40	The primary site is mandatory if the site type is *SEC.
FLA1899	40	The primary site IP address is mandatory if the site type is *PRI.
FLA1900	40	The site type has never been initialized. Indicate *STD for a standard installation, *PRI or *SEC if the &1 module is used.
FLA1903	40	Command &1 available only on &2 sites.
FLA1904	40	User profile &1 not found. It must exist if the password is *SAME.
FLA1905	0	Site type *SAME : no operations carried out for the site.

FLA6001	40	Parameter &1/&2/&3 does not exist. Initial installation has not been carried out
FLA6002	40	Error when updating parameter &1/&2/&3

Using the command:

This command is used to initialize the product's internal data and objects. It must be run once when the product is installed. It can be rerun later to reset, or change the following:

- The user profile that will be used by default (USER parameter).
- Generate a new rsa / ssh key
- Initialize or change the type of site if the "Central Management" module is used,

The command performs the following operations:

- Initializes the content of product's internal DTAARA and files
- Creates the user profile passed as a parameter (or change if it already exists)
- Adapts product JOBDB to use this profile
- Defines rights for this profile to be able to use DDM
- Creates the default directory (if it doesn't already exist)
- Generates the pair of ssh keys in the product directory. If these keys already exist, they are not modified.
- Creates the /home/USER directory (USER being the name passed as a parameter)
- Initialize the type of site (for the "Central Management" module)

If the type of site indicated is *SEC, the consequences may be significant, as all configuration data will be replaced by that from the Primary site. For this reason, several precautions are taken.

- It is mandatory to enter the name of the primary partition and its IP address (parameters PRISITE and PRISITEIP) to check that the data comes from this site.
- A confirmation message is sent on the screen, to validate this type of site.

The parameters PRISITE and PRISITEIP allow to authorize the reception of configuration elements from one site and one only (the primary site).

6.24 FLCLEAR, Purge data from the log

The FLCLEAR command is used to purge messages from the Flash For i product log.

The command parameters are as follows:

```

Clean up log (FLCLEAR)

Type choices, press Enter.

Delay for log (d) . . . . . LOG          60
Delay for System log (d) . . . . SLOG     30
Delay for summaries (d) . . . . HST      180
Delay for JRNRCV info (d) . . . JRNRCV   10
```

Description of parameters:

LOG Specifies the number of days after which Product Log messages will be deleted.

SLOG	Specifies the number of days after which System Log of Clone partition messages will be deleted.
HST	Specifies the number of days after which statistic history information will be deleted.
JRNRCV	Specifies the number of days after which information about JRNRCV will be deleted.

This command generates the following messages in return:

Message ID	Severity	Message text
FLA0090	0	Log purging at &1 date. &2 messages deleted
FLA0091	0	Cloning history purging at &1 date. &2 messages deleted
FLA0092	0	System Log of Clone partition purging at &1 date. &2 messages deleted
FLA0093	0	JRNRCV info purging at &1 date. &2 messages deleted

Using the command:

The FLCLEAR command clears the message history. The parameters specify the number of days to keep messages.

By default, the FLCLEAR command is executed every day at 18:00. Use the FLPARAM command for details.

6.25 FLMULTBRMS, Purge data from the log

The FLMULTBRMS command is used to perform parallel BRMS backups on the clone partition. This command should only be used for parallel backups on the clone partition.

The command parameters are as follows:

```

Parallel BRMS backups (FLMULTBRMS)

Type choices, press Enter.

Control group . . . . . CTLGRP
Omits . . . . . OMITS          *PROCESS
  
```

Description of parameters:

CTLGRP	Specify the name of the control group to be used in parallel.
OMITS	Specify whether exclusion items should be processed or ignored when running the backup control group. Corresponds to the OMITS parameter of the STRBKUBRM command. *PROCESS = Allows exclusion items to be processed during backup. *IGNORE = Ignores exclusion items during backup. See BRMS documentation for more details.

This command generates the following messages in return:

Message ID	Severity	Message text
FLA1201	0	Starting BRMS save, Control group &1
FLA1277	0	Submitting &1 control group for parallel backups
FLA1278	0	End of backup, Control group &1

FLA1207 40 Error found during BRMS save, control group &1. Check the log

Using the command:

The FLMULTBRMS command is used to perform BRMS backups in parallel on the clone partition. It must be used as an Exit point in a MASTER type control group to be able to perform several backups in parallel (in separate jobs).

The command performs the following operations:

- Submit the backup with the control group specified in the CTLGRP parameter in the FLASH4I/FL_MULTI JOBQ. The name of the submitted job will be the name of the control group.
- Add messages in the Flash for i history to indicate the start and end of the control group, or if any errors have been detected.
- Generate the joblog of the job performing the backup. This will be transferred to the production partition at the end of processing.

This command should only be used for parallel backups on the clone partition.
See Chapter "2.11.9 Parallel backups with BRMS" for instructions on how to use it.
It must not be used in any other context.

6.26 FLADDKEY, Add a license key

The FLADDKEY command is used to enter the Flash For i product license key

The command parameters are as follows:

```

License key input (FLADDKEY)

Type choices, press Enter.

Key value:
Characters 1 - 6 . . . . . Character value
Characters 7 - 12 . . . . . Character value
Characters 13 - 18 . . . . . Character value
Characters 19 - 24 . . . . . Character value
Characters 25 - 30 . . . . . Character value
Characters 31 - 36 . . . . . Character value
Characters 37 - 42 . . . . . Character value
New key position . . . . . *FIRST 1-10, *FIRST
Replace or add key . . . . . *ADD *ADD, *REPLACE

```

Description of parameters:

KEY	Enter the key that was supplied by the partner. It consist of 7 groups of 6 digits.
POSITION	Enter the position that will take the new key in the list of 10 possible keys. As soon as a key is valid, the product can be used. *FIRST = The new key will be placed at position 1 1- 10 = The new key will be placed at the specified position.
OPTION	Specify what becomes the current key at the position asked, and that will be replaced by the new one. *ADD = The old key that is at the position asked will be moved to the next number. If position 10 has a key, it will be deleted. *Replace = The old key that is at the asked position will be replaced by the new key.

This command generates the following messages in return:

This command does not generate messages in return

Using the command:

The Flash For i product is licensed by M81. Its use is protected by a license key. The FLADDKEY command is used to enter the key provided by M81. This key consists of a total of 42 digits, divided into 7 groups of 6 digits separated by a space.

To confirm that the entered key is correct, use one of the 2 following methods:

1/ Start automatic jobs using the FLSTRSBS command and check that the FL_AUTO job is active. If this is not the case, check the entered key or request another key from M81.

2/ Use FLWRKKEY command to display the list of known keys, and their status.

Note for the migration from Version 3 to Version 4.

The format of the key has changed between these 2 versions.

It is imperative to obtain a new key in the new format to be able to use the product after the version change.

It is possible to obtain a temporary key in emergency by logging on to www.m81.eu, then select Intranet / Temporary Key.

A key valid for 4 days will be sent by email. It will then be necessary to make an official request to M81 at support@m81.eu to obtain a permanent key, or a temporary key with a longer delay.

This operation requires a user account and a password to be able to identify oneself.

6.27 FLWRKKEY, Work with license keys

The FLWRKKEY command is used to work with the list of license keys, and display their status.

The command parameters are as follows:

This command has no parameters.

Using the command:

The command displays the following screen :

```

FLWRKKEY                                Work with license keys                                PROD
                                                                                               8/03/21 19:15:28

Serial nb . . . 7850C5X                Partition nb . . . . 10
Version . . . V04                      Generation date . . 2021/03/04

Enter your options, then press Enter
The following list gives the license keys for product Flash for i.
They will be used in this order for the controls.

Seq.                                     If *TEMP
Num License key                         Type  Option  Val. date
10 123456 123456 123456 123456 123456 123456 *PERM  Base
20 123456 123456 123456 123456 123456 123456 *PERM  eMail
30 042815 444849 820031 737168 969240 371429 198903 *TEMP  Reconfigur 15/12/20
40 149851 653304 570045 511913 583591 300002 194898 *ERROR
    
```



```

50 *NONE
60 *NONE
70 *NONE
80 *NONE
90 *NONE
100 *NONE

F3=Exit   F5=Refresh   F12=Cancel

```

The Flash For i product is licensed by M81. Its use is protected by a license key. This key consists of a total of 42 digits, divided into 7 groups of 6 digits separated by a space. The FLADDKEY command is used to enter the key provided by M81.

The product allows to enter until 10 license keys. This allows for example to enter the key that will be used on the production partition in first position, then to enter the key that will be used on a DRP partition (Metro mirror, High Availability product, ...) in second position. In case of disaster and activation of the switch procedure to the DRP partition, the license key for Flash for I will already be entered and active.

This can also be used when using LPM (Live Partition Mobility), if this option has been subscribed.

When migrating to a new server, the new keys can be entered in advance.

The list displays all known license keys (entered by FLADDKEY command) with the corresponding option name. The first valid key is used to activate the Flash for I product.

The columns have the following meanings:

Sequence number	= Order number for key control
License key	= Value of the license key
Type	= Type of key *PERM = Permanent key for this partition *TEMP = Temporary key for this partition *ERROR = Invalid key for this partition
Option	Option to which this key corresponds. The available options are: Base = Activation of the base product eMail = Email Alert Add-on Module Reconfigure = Clone partition reconfiguration add-on module Central = Centralized management add-on module.
Valid date	= Validity limit date for a temporary key

The type of key indicated is only available for the current partition.
*ERROR means that the key is not valid for the current partition. But it could be valid for another partition.

Possible inputs:

It's possible to change the order for the keys, for them to be controlled in a different order.

Function keys

F3 = Exit the screen

F5 = Update the values

F12 = Exit the screen

6.28 *FLDSPINF*, Display information relating to the license

The *FLDSPINF* command displays a message containing minimal information enabling the license key for the Flash For i product to be generated.

The command parameters are as follows:

```

                                Display product info (FLDSPINF)

Type choices, press Enter.

Product name . . . . . PRD                FLASH4I

```

Description of parameters:

PRD Product name

This command generates the following messages in return:

Message ID	Severity	Message text
GEN0005	0	Flash for i: System name = &1, Serial Nb = &2, Partition = &3, Model = &10, Version = &6, Generation date = 20&7/&8/&9

Using the command:

The Flash For i product is licensed by M81. Its use is protected by a license key. The *FLDSPINF* command is used to display a message (at the bottom of the screen) containing the information required to generate the license key. Send this information to M81 to receive a product key in return.

Example of a message received when using this command (press F1 on the message displayed at the bottom of the screen):

```

                                Additional Message Information

Message ID . . . . . : GEN0005
Date sent . . . . . : 09/11/20      Time sent . . . . . : 19:15:21

Message . . . . . : Flash for i: System name = M81DEV, Serial Nb = 0612345,
                    Partition = 003, Model = 41A, Version = V4, Generation date = 2020/11/07

```

6.29 FLRSTPRD, Product upgrade

The FLRSTPRD command is used to upgrade the Flash for i product. It must be used as part of a change of release or version of the product. The objects provided by M81 must first have been restored in QTEMP, or any other temporary library.

The command parameters are as follows:

```

                                Product upgrade (FLRSTPRD)

Type choices, press Enter.

Product name . . . . . PRDNAME          FLASH4I
Temporary library . . . . . PGMLIB       QTEMP
Main language . . . . . MAINLNG
Secondary languages . . . . . SECLNG     *NONE
                                + for more values
Security backup . . . . . SECSAVE       *NO
  
```

Description of parameters:

PRDNAME	Product name FLASH4I = Only possible value
PGMLIB	Enter the name of the library into which the objects provided by M81 have been restored.
MAINLNG	Enter the main language to use for the product. This value is mandatory. EN = The product will be installed in English language FR = The product will be installed in French language
SECLNG	Indicate if a secondary language needs to be installed for the product. *NONE = No secondary language will be installed. EN = The English secondary language will be installed in library FLASH4I_EN FR = The French secondary language will be installed in library FLASH4I_FR
SECSAVE	Specify whether a security backup of the FLASH4I library is to be performed. *YES = The FLASH4I library (if the product is already installed) will be automatically saved before the upgrade in the SAVF FLASH4IUSR/FLASH4ISV *NO = No security backup will be performed automatically.

This command generates the following messages in return:

Message ID	Severity	Message text
CPF3D95	40	Exit program processing failed.
CPF9898	40	Not possible to do the security backup.
FLA8900	0	Product &1 version &2 installation, build &3 completed successfully
FLA8901	0	Security backup done in SAVF FLASH4IUSR/FLASH4ISV

Using the command:

This command must be used to perform an initial installation or a version or release change of the Flash for i product.

If the product is already installed, the data it contains is retained and migrated to the new tables.

It is advisable to make a backup of the FLASH4I library before making the version change. This can be done by entering *YES to the SECSAVE parameter.

Caution, if the partition is defined as Primary site (central management module), the parameter SECSAVE(*YES) only saves the FLASH4I library. FLASH4xxxx libraries containing site histories will not be saved.

6.30 FLPARAM, Manage product parameters

The FLPARAM command is used to manage the parameters used by the Flash For i product.

The command parameters are as follows:

This command has no parameters.

Using the command:

Some of the commands delivered with this product may call parameters. The FLPARAM command is used to manage these parameters.

It is an interactive command which displays the following screen:

```

FLRADS00                               Select a parameter                               4/11/16
                                                                                               18:01:16

Position to . . . . .

Enter your options, then press Enter
  1=Select

Opt Radical      Description
  ACTIONS        Automatic jobs
  AUTOMATE        delay for automatic operations
  CFGJOBQ         Work with Reconfiguration JOBQ
  DIRECTORY       Product Directory
  FLCHKSSH        Default value for FLCHKSSH
  HLDSPLF         Hold spooled file
  PLANNING        Production unavailability planning
  QUSRBRM         Parameters related to QUSRBRM
  USER           Profile to use on CLONE

                                                                                               End

F3=Exit  F5=Refresh  F12=Cancel
  
```

Type option 1 in front of the parameter to change.

Note on the parameters ALERT ACT and ALERT DST

These parameters were used in version 3 by the email add-on module. Starting with version 4, they have been integrated in the management commands of this module. Refer to the chapter “8 Add-on module: Sending alerts by email or message”

6.30.1 ACTIONS parameter: Automatic jobs

This parameter is used to indicate the list of jobs to perform regularly and automatically.

The list of automatic actions is displayed.

```

FLACTS01                                Work with actions                                M81FLASH
                                           08/01/21 11:20:36

Position to . . . . .

Enter your options, then press Enter
  2=Change   4=Delete   5=Display

Opt Action      Description                                Next start
                                           Date      Time
  CLR_HST       Historical data cleanup                    08/01/21  18:00
  CLR_LOG_VH    Clear EMC/VMAX logs                      09/01/21  11:29
  CLR_SITE      Sites historical data cleanup          08/01/21  19:00

                                           End

F3=Exit   F5=Refresh   F6=Create   F12=Cancel
  
```

The product is delivered with 3 automatic actions:

- CLR_HST : Local history cleaning (FLCLEAR command)
 - o This action cleans up internal tables of the product every day.
 - o This job is very fast and consumes very few resources.
- CLR_LOG_VH: Cleanup of Logs linked to VMAX arrays
 - o This action deletes the log files created in the IFS by the exchanges with the VMAX disk arrays.
 - o If another type of array is used, the program has no effect and stops immediately.
- CLR_SITE : Cleanup of the histories coming from secondary sites (FLCLRSIT command)
 - o This action only has an effect on a primary site if the central management module is used.

The parameters of each action can be modified by the user.

It is also possible to use this action management to define jobs that will be launched automatically.

```

FLACTS03                                Change an action                                M81FLASH
                                           12/05/19 12:40:39

Enter your options, then press Enter

Action name . . . . . CLR_HST                                Name

Action description . . . . . Historical data cleanup

Command to call . . . . . FLCLEAR LOG(60) SLOG(5)
  
```

```

Start time . . . . . 18:00                0001-2400
Type of frequency . . . . . 1                0, 1, 2, 3, 4, 9
Frequency type 1 : Some days, every week. Select the days.
                        M T W T F S S
                        Y Y Y Y Y Y Y

Next start date . . . . . 12/05/19

F3=Exit   F4=Prompt   F12=Cancel
  
```

There are 6 types of trigger frequencies for automatic jobs.
In all cases (except frequency 0), a job will be submitted in the JOBQ FLASH4I at the time indicated in the parameter "Start time"

Frequency type 0: Action held.
The action will not be performed. Only the definition is kept for later use.

```

Type of frequency . . . . . 0                0, 1, 2, 3, 4, 9
Frequency type 0 : Action held.

Next start day . . . . . 99/99/99
  
```

Frequency type 1: Daily.
The action will be performed every day of the week where a Y is entered.

```

Type of frequency . . . . . 1                0, 1, 2, 3, 4, 9
Frequency type 1 : Some days, every week. Select the days.
                        M T W T F S S
                        Y Y Y Y Y Y Y

Next start date . . . . . 12/05/19
  
```

Frequency type 2: One day in the month, at the indicated date.
The action will be performed one day in the month.

```

Type of frequency . . . . . 2                0, 1, 2, 3, 4, 9
Frequency type 2 : The Xth day of every months
                    Choose the day number in the month
                    The job will start the 12 of every month

Next start day . . . . . 12/05/19
  
```

Frequency type 3: One day in the month.
The action will be performed one day in the month the first day that will be Monday, Tuesday, ...

```

Type of frequency . . . . . 3                0, 1, 2, 3, 4, 9
Frequency type 3 : The first XXX of every month (XXX=Monday, Tuesday, ...)
                    Choose the day 1 (1=Monday, 2=Tuesday, ...)
                    The job will start the first Monday of every month

Next start day . . . . . 3/06/19
  
```

Frequency type 4: Last day of the month.

```
Type of frequency . . . . . 4                      0, 1, 2, 3, 4, 9
Frequency type 4 : End of the month. This action will start the last day of
                    every month.

Next start day . . . . . 31/05/19
```

Frequency type 9: Only once.
The action will run only once, at the entered date

```
Type of frequency . . . . . 9                      0, 1, 2, 3, 4, 9
Frequency type 9 : Action to run once. Enter the date to run this action:
                    99/99/99

Next start day . . . . . 99/99/99
```

6.30.2 AUTOMATE parameter: Delays for automated components

Parameters DELAY-CLONE and DELAY-PROD are used to specify the time used by the FL_AUTO job between 2 messages being sent or received by the production and Clone partitions.

Parameter DELAY-ALERT_DLY is used by the add-on module that sends alerts by email.
Look at chapter "8 Add-on module: Sending alerts by email or message"

6.30.3 CFGJOBQ parameter: Work with Reconfiguration JOBQ

In the reconfiguration module, it is possible to define an action for JOBQs on the Clone partition. The *HLDJOBQ action allows you to hold all JOBQs on the partition, to make sure that no job that was submitted on the Production partition runs on the reconfigured partition.

But some JOBQs should never be held, such as system JOBQs.

The CFGJOBQ parameter is used to list the JOBQs that should not be held automatically.

The initial list supplied with the product contains the system JOBQs.

```
FLWRKCFJQ2                      Work with JOBQ

Position to . . . . . /

Enter your options, then press Enter
 1=Add  4=Delete  Hold :  11=*HOLD  12=*SAME

Opt  Library      JOBQ          Hold
-----
  QBRM      Q1ABRMMENT   *SAME        Standard
  QBRM      Q1ABRMNET    *SAME        Standard
  QBRM      Q1ACTLSBS    *SAME        Standard
  QBRM      Q1ASYNTAP    *SAME        Standard
  QGPL      QBASE        *HOLD        Standard
  QGPL      QBATCH       *SAME        Standard
  QGPL      QFNC         *SAME        Standard
  QGPL      QINTER       *SAME        Standard
  QGPL      QPGMR        *SAME        Standard
  QGPL      QSNADS       *SAME        Standard
  QGPL      QSPL         *SAME        Standard
```

QGPL	QS36EVOKE	*SAME	Standard
QGPL	QS36MRT	*SAME	Standard
QGPL	QXTSRCH	*SAME	Standard
QHTTPSVR	QZHBHTTP	*SAME	Standard
QSYS	QCTL	*SAME	Standard
QSYS	QESAUTON	*SAME	Standard
QSYS	QLPINSTALL	*SAME	Standard
QSYS	QNMSVQ	*SAME	Standard
QSYS	QPDAUTOPAR	*SAME	Standard
QSYS	QPWFSEVER	*SAME	Standard
QSYS	QSJINV	*SAME	Standard
QSYS	QSYSNOMAX	*SAME	Standard
QSYS	QSYSSBSD	*SAME	Standard
QSYS	QUSRNOMAX	*SAME	Standard
QSYS	Q1PSCHQ	*SAME	Standard
QSYS	Q1PSCHQ2	*SAME	Standard
QSYS	Q1PSCHQ3	*SAME	Standard
QTCP	QTCP	*SAME	Standard

F3=Exit F5=Refresh F12=Cancel

It is possible to request that certain JOBQs be suspended anyway.

The columns have the following meanings:

- Library = Name of the library containing the JOBQ
- JOBQ = Name of the JOBQ
- Hold = Indicates the action that will be taken for this JOBQ
 - *HOLD = The JOBQ will be held
 - *SAME = The state of the JOBQ will not be changed. It will remain in the same state as it was on Production.

The indication "Standard" means that the name of this JOBQ was delivered with the product as standard. These names cannot be removed from the list.
No indication means that the JOBQ name was added by the user.

Possible inputs:

Position to
Used to specify which library and JOBQ must be displayed first

Options:

Option 1 = Add
Used to add a JOBQ to the list

Option 4 = Delete
Used to remove a JOBQ from the list
This option cannot be used for JOBQs whose name is delivered as standard in the product ("Standard" indication)

Option 11 = *HOLD
Indicates that the JOBQ will be held on the Clone partition during reconfiguration

Option 12 = *SAME
Indicates that the JOBQ state will not be changed on the Clone partition during reconfiguration

6.30.4 **DIRECTORY** parameter: *Product directory*

Specifies the name of the directory used by the Flash For i product
By default, this directory is: /Flash4i

This directory contains the private and public keys required for communication between the IBM i partition and the other elements (Bay, HMC, etc.)
They also contain some temporary files used by the product commands.

6.30.5 **FLCHKSSH** parameter: *Default value to use*

This parameter indicates whether the PING command must be used by the FLCHKSSH command to carry out an initial validation of the connection to the remote element.

6.30.6 **Parameter HLDSPLF: Hold spool files**

At the end of the backup on the clone partition, a spool file is generated with the job log of the job that performed the backup. This is transferred to production in the HLD (suspended) state by default.

The QPJOBLOG sub-parameter is used to indicate whether the job log should be suspended or released. Select QPJOBLOG, and enter *HLD or *RDY (be careful to check the value entered as there is no check when entering)

6.30.7 **PLANNING** parameter: *Production unavailable schedule*

This parameter is used to indicate the periods during which the production partition is not available (IPL, restricted mode, ...) to receive communications from clone partitions. The screens shown here allow you to specify time slots for each day of the week, or a list of specific dates.

During these time slots, the clone partitions will not send any information to production, and no error messages will be generated. The main consequences are that during the defined downtime periods:

- On the production side, the status of operations performed on the clone partition will not be updated anymore
- On the production side, the log messages will not be received before the end of the defined period
- On the clone partition, all messages and status generated during this period will be sent at the end of the period
- The QUSRBRM library will be sent only at the end of the period.

At the beginning of an unavailability period, the following message will indicate that no information will come from the clone partition and will give the expected end date and time.

FLA2320 PLANNING: Production partition unavailable until &1 to &2.

```

FLWRKUNAP2                               Production unavailability planning                               M81DEV
                                                                                               4/07/22 19:35:29
Enter your options, then press Enter

Time slots when the production partition is unavailable

Day      Unavailability (*YES, *NO)  Start time  End time
Monday   *NO                          0:00        0:00
Tuesday  *NO                          0:00        0:00
Wednesday *NO                          0:00        0:00
Thursday *NO                          0:00        0:00
    
```

Friday	*NO	0:00	0:00
Saturday	*NO	0:00	0:00
Sunday	*NO	0:00	0:00

Specific dates

1=Add 4=Delete

Opt	Date	Start time	End time
	0/00/00	0:00	0:00
	28/05/22	0:00	10:00
	31/05/22	0:00	10:00
	1/06/22	0:00	10:00
	2/06/22	0:00	10:00

More...

F3=Exit F5=Refresh F12=Cancel

For each day of the week, enter the following information:

Unavailability	*NO = The production partition is available all day. All communications from the clone partitions will be done in real time *YES = The production partition is unavailable at certain times. No communication will be possible. Indicate the time slot.
Start time	Indicate the start time of the downtime period, in hh:mm format
End time	Indicate the end time of the unavailability period, in the format hh:mm

It is possible to indicate specific dates (May 1st, New Year, ...) of unavailability.
Use option 1 on the first line to add a new date.
Use option 4 to delete a date.

The changes will be taken into account during the next cloning.

6.30.8 PRX_PORT parameter: Port used for exchanges between the source and PROXY partitions

This parameter is only used if a Proxy partition is used. See section "12 Add-on module: Proxy partition" for more information.

This parameter contains the port number that will be used for exchanges between the partition on which Flash for i is used, and the Proxy partition.

The default port is 7358.

If another port is to be used, the PRX_PORT parameter must be changed on all partitions that are associated with the same proxy, and on the proxy partition itself.

After changing this setting, the FLASH4I subsystem must be restarted.

On the proxy partition, the FL_PROXY subsystem must be restarted.

6.30.9 Parameter PRX_RESTR: Restart Time on the Proxy Partition

This parameter is only used on a Proxy partition. See section "12 Add-on module: Proxy partition" for more information.

On the proxy partition, the FL_AGENT job

- Uses threads to process requests sent from different partitions. The number of threads is limited to about 200,000 per job.
- Uses pre-started jobs to call commands to perform operations. The number of pre-started jobs that the agent can call is limited to 50,000.

Once these maximums are reached, the job stops, or the pre-started jobs are no longer started. In most installations, these maximums are reached after several weeks. A stop/restart of the agent (of the FL_PROXY subsystem) once a month is sufficient. But in some cases, with a very large number of incoming requests, these limits can be reached in a few days.

To avoid this problem, the agent will automatically stop and restart after 150,000 threads or 30,000 pre-started jobs. During this restart, it is likely that a request will not be processed because the agent is no longer responding.

The PRX_RESTR parameter must contain the time at which this restart is allowed. It will be allowed for 30 minutes from the time entered.

The time must be specified as 6 digits, in the format hhmmss. Leading zeros are not displayed. For example, the value 20000 means 02h00m00s

6.30.10 QUSRBRM parameter: Parameters related to QUSRBRM

During a *BRMS or *BRMS21 backup, the contents of the QUSRBRM library are backed up on the clone partition, transferred to the production partition, and then restored.

Save access paths

To reduce the size of the backup, and thus the transfer time, the access paths are not saved by default. Once the QUSRBRM library is restored, the system will automatically recreate these access paths. In the case of large BRMS files, this operation can use a lot of CPU, and have a bad effect for users.

The QUSRBRM parameter is used to tell the product to save the access paths before transferring them to Production.

As a result if *YES is entered, the transfer time will be longer, but there will be no more CPU overhead on Production after restoration.

Data compression

To reduce the volume to be transferred, and thus the transfer time, the backup is performed using maximum compression (DTACPR(*HIGH) parameter of the SAVLIB command).

This parameter can be penalizing in some cases and lengthen the backup time of the QUSRBRM library on the Clone partition.

It is possible to choose another value for this parameter.

6.30.11 USER parameter: Profile to be used on CLONE

This profile contains the name of the user profile that will be used by the automatic jobs (in the FLASH4i system) and for transfers between the 2 partitions.

The specified profile must have a password and be enabled.

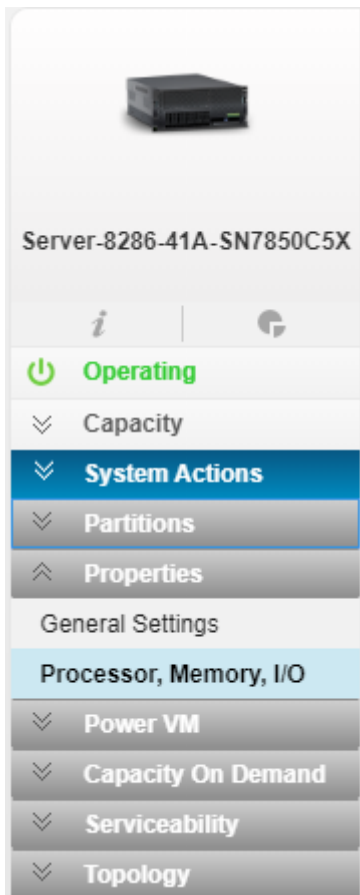
7 Move an HMC resource

The Flash For i product integrates several commands to move, check the status or retrieve information from an HMC resource. To do this, a resource definition must be created beforehand.

The resources considered here are the "Physical I/O Adapters" associated with a Power Server, and which are listed on the HMC.

On the HMC:

- Select the Power server.
- Select the "Properties" tab
- Select the "Processor, Memory, I/O" tab.



On the next screen, select "Physical I/O Adapters".

▼ Physical I/O Adapters

The table displays the physical I/O resources for the managed system.
Click the Adapter Info(i) to view information on the selected I/O device.
Click I/O Pools to display all the I/O pools found in the managed system and the partitions that are participating in the pools.

I/O Pools Expand All

Adapter Description	info	Physical Location Code	Owner	Bus Number
1 Gigabit Ethernet (UTP) 4 Port Adapter PCIE-4x/Short	<i>i</i>	U78C9.001.WZS18G7-P1-C10	Unassigned	30
Empty slot	<i>i</i>	U78C9.001.WZS18G7-P1-C11	M81CLONE1	19
1 Gigabit Ethernet (UTP) 4 Port Adapter PCIE-4x/Short	<i>i</i>	U78C9.001.WZS18G7-P1-C12	VIOS1	20
PCIe3 x8 SAS RAID Internal Adapter 6Gb	<i>i</i>	U78C9.001.WZS18G7-P1-C14	VIOS1	21
Empty slot	<i>i</i>	U78C9.001.WZS18G7-P1-C15	Unassigned	31
PCIe2 16Gb 2-Port Fibre Channel Adapter	<i>i</i>	U78C9.001.WZS18G7-P1-C6	VIOS1	24
Empty slot	<i>i</i>	U78C9.001.WZS18G7-P1-C7	Unassigned	16
Empty slot	<i>i</i>	U78C9.001.WZS18G7-P1-C8	Unassigned	28
PCIe2 16Gb 2-Port Fibre Channel Adapter	<i>i</i>	U78C9.001.WZS18G7-P1-C9	Unassigned	29

Important Note:

The commands provided here allow to move an I/O resource from one partition to another.
It is the user's responsibility to ensure that units using these resources in the IBM i are varied off before being removed from a partition and then varied on at the destination partition.

For example:

A resource on the power server in position C10 corresponds to a SAS card, on which an LTO drive is connected.
This resource is assigned to the LPAR1 partition.

- A resource TAP01 is visible with the command `WRKHDWRSC *STG`
- A TAP01 unit exists and is varied On (command `WRKCFGSTS CFGTYPE(*DEV) CFGD(TAP*)`).

The sequence for transferring this drive from the LPAR1 partition to the LPAR2 partition is as follows:

- On LPAR1
 - o Vary off the TAP01 unit
 - o `VRYCFG CFGOBJ(TAP01) CFGTYPE(*DEV) STATUS(*OFF)`
- On LPAR1 or LPAR2
 - o Transfer the card in C10 from LPAR1 to LPAR2
 - o `FLCHGHMCRS RSCDEF(TAP_C10) FROMLPAR(LPAR1) TOLPAR(LPAR2)`
- On LPAR2
 - o Wait until the resource transfer is effective and taken into account by the system.
 - o Vary on the TAP01 unit
 - o `VRYCFG CFGOBJ(TAP01) CFGTYPE(*DEV) STATUS(*ON)`

Be careful, the unit name can be different on both partitions.

If a unit is varied on in the original partition (LPAR1 in our example), then the transfer of the card cannot be performed.

7.1 FLWRKHMCRS, Work with Resource Definitions

The FLWRKHMCRS command allows to manage resource definitions that can be moved from one partition to another.

The command parameters are as follows:

This command has no parameters

Using the command:

The command allows to create, change or delete resource definitions, that is, the information needed to accurately identify resources on the HMC.

The command displays the following screen:

```

FLWRKHMCRS                                Work with resources                                M81FLASH
                                                                                               5/03/20 20:07:52

Position to . . . . .

Enter your options, then press Enter
  2=Change  3=Copy  4=Delete  5=Display

Opt Name      Type  Part. def  Description
  TAP_C09     *SLOT M81CLONE1 SAS Tape unit on card C09
  TAP_C10     *SLOT M81CLONE1 SAS Tape unit on card C10

                                                                                               End

F3=Exit  F5=Refresh  F6=Create  F12=Cancel
  
```

This screen lists the resource definitions that have already been defined.
The definitions are sorted alphabetically.

The columns have the following meanings:

- Name = Name of the resource definition
- Type = Type of resource corresponding to the definition. Only resources of type *SLOT are currently taken into account.
- Def part. = Name of the partition definition attached to the resource definition
- Description = Free text describing the definition

Possible inputs:

Position to
Used to specify which definition must be displayed first

Options:

Option 2 = Change
Used to change the specified definition.

Option 3 = Copy
Used to copy the specified definition. The resulting screen will be similar to the definition creation screen

Option 4 = Delete
Used to delete the specified definition.

Option 5 = Display
Used to display definition

Function keys

F3 = Exit the screen

F5 = Update the values

F6 = Create a new definition

F12 = Exit the screen

7.1.1 Creating, changing, copying or displaying a resource definition

From the main screen of the FLWRKHMCRS control, using the F6 key, or options 2, 3 and 5 will display the screen below.

If option 5 = display is used, no information can be changed.

If option 3 is used, the result is the same as when creating a definition, but all fields are initialized with the values of the selected definition.

The information displayed on the screen depends on the resource type chosen. The only possible type at the moment is:

*SLOT: A resource of type physical location.

Function keys

F3 = Exit the screen, and return to the list of definitions.

F4 = Display the list of possible elements

F5 = Reset the values to their original values

F12 = Exit the screen, and return to the list of definitions

Screen 1: Choice of resource type

Enter the definition name, partition definition name, and resource type selection.

```

FLWRKHMCR2                Create a resource                M81FLASH
                                                                    5/03/20 20:09:14

Enter your options, then press Enter

Resource name . . . . . TAP_C10      Name
Resource description . . . SAS Tape unit on card C10
    
```

```
Specify a Clone partition definition. It's only used to obtain the POWER server
name, and the information for the connection to the HMC(s). The partition
name itself isn't used.
Partition definition . . . M81CLONE1    M81CLONEX, M81CLONE1, ...
POWER name on HMC . . . .

Resource type . . . . . *SLOT        *SLOT

                                                                    End

F3=Exit   F4=List   F5=Refresh
F12=Cancel
```

This screen is only displayed when creating a new definition (F6 key).

This first screen allows to specify the resource definition name, the partition definition name and to select the resource type.

The "Partition Definition" corresponds to the LPAR definitions that were created with the FLWRKLPAR command. It will only be used to obtain the name of the Power server and the connection information for the HMC(s).

The partition name itself is not used here.

Only one resource type is currently supported, type *SLOT.

Resource name	Indicate the name of the resource definition, up to 10 characters long.
Resource description	Text describing the use that will be made of this definition.
Partition Definition	Indicate the name of a partition definition, up to 10 characters long.
POWER name on HMC	Information from the selected partition definition.
Resource type	Resource type. *SLOT: Resource of type physical location.

Screen 2: *SLOT: Resource of type physical location

Enter the necessary information about the physical location to be moved.

```
FLWRKHMCR2                Create a resource                M81FLASH
                                                                    5/03/20 20:11:34

Enter your options, then press Enter

Resource name . . . . . TAP_C10      Name
Resource description . . . SAS Tape unit on card C10

Specify a Clone partition definition. It's only used to obtain the POWER server
name, and the information for the connection to the HMC(s). The partition
name itself isn't used.
Partition definition . . . M81CLONE1    M81CLONEX, M81CLONE1, ...
POWER name on HMC . . . . Server-8286-41A-SN7850C5X
```



```
Resource type . . . . . *SLOT      *SLOT

Slot . . . . . U78C9.001.WZS18G7-P1-C10

Partition owner . . . . . *NONE
HMC resource description . PCIe3 x8 SAS RAID Internal Adapter 6Gb

End

F3=Exit  F4=List  F5=Refresh  F12=Cancel
```

Slot	Physical location used by the resource. See below how to find the name of this location on the HMC
Partition owner	Partition to which the physical location is currently assigned This information comes from the HMC if it is found.
HMC resource description	Description of the physical location on the HMC. This information comes from the HMC if it is found.

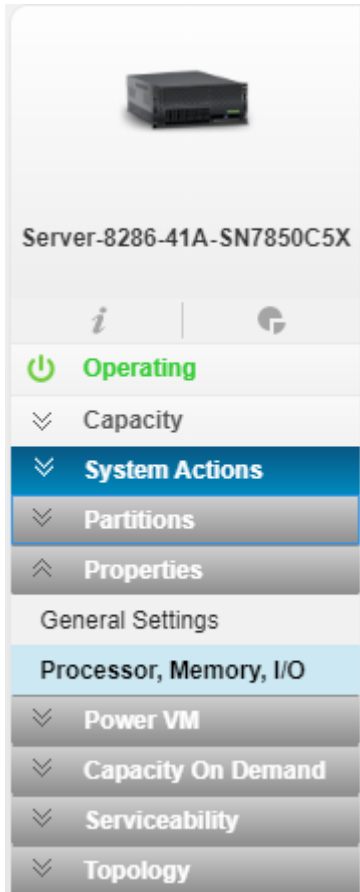
An error message is displayed if the resource cannot be found, or if an error occurred during the search for the resource. This error is not blocking, which means that the definition can be saved for future use, for example.

How to get the name of a physical location.

The resource slot corresponds to the "Physical Location Code" found via the HMC GUI.

On the HMC:

- Select the Power server.
- Select the "Properties" tab
- Select the "Processor, Memory, I/O" tab.



On the next screen, select "Physical I/O Adapters".

The "Physical location code" column lists the resources available on this server.

▼ Physical I/O Adapters

The table displays the physical I/O resources for the managed system.
Click the Adapter Info(i) to view information on the selected I/O device.
Click I/O Pools to display all the I/O pools found in the managed system and the partitions that are participating in the pools.

I/O Pools Expand All

Adapter Description	info	Physical Location Code	Owner	Bus Number
1 Gigabit Ethernet (UTP) 4 Port Adapter PCIE-4x/Short	<i>i</i>	U78C9.001.WZS18G7-P1-C10	Unassigned	30
Empty slot	<i>i</i>	U78C9.001.WZS18G7-P1-C11	M81CLONE1	19
1 Gigabit Ethernet (UTP) 4 Port Adapter PCIE-4x/Short	<i>i</i>	U78C9.001.WZS18G7-P1-C12	VIOS1	20
PCle3 x8 SAS RAID Internal Adapter 6Gb	<i>i</i>	U78C9.001.WZS18G7-P1-C14	VIOS1	21
Empty slot	<i>i</i>	U78C9.001.WZS18G7-P1-C15	Unassigned	31
PCle2 16Gb 2-Port Fibre Channel Adapter	<i>i</i>	U78C9.001.WZS18G7-P1-C6	VIOS1	24
Empty slot	<i>i</i>	U78C9.001.WZS18G7-P1-C7	Unassigned	16
Empty slot	<i>i</i>	U78C9.001.WZS18G7-P1-C8	Unassigned	28
PCle2 16Gb 2-Port Fibre Channel Adapter	<i>i</i>	U78C9.001.WZS18G7-P1-C9	Unassigned	29

7.2 *FLCHKHMCRS, Check a Resource*

The FLCHKHMCRS command is used to check whether a resource defined in the definition passed in parameter exists or to find out to which partition it is assigned.

The command parameters are as follows:

```

                                Check a resource (FLCHKHMCRS)

Type choices, press Enter.

Resource name . . . . . RSCDEF
Partition name . . . . . LPARNAME          *ANY
  
```

Description of parameters:

- RSCDEF Name of the definition containing the resource to be checked.

- LPARNAME Name of the partition on which the resource is to be located.
 Partition Name = Specify a partition name as defined on the HMC
 *ANY = The resource can be anywhere.
 *NONE = The resource must not be on a partition.

This command generates the following messages in return:

Message ID	Severity	Message text
FLA0099	40	The parameter &1 / &2 is not correctly set. Use the FLPARAM command and enter a correct value.
FLA0570	40	No definition found for resource &1.
FLA0571	40	No definition found for partition &1.
FLA0572	40	Error during SSH connection. IP address: &1, user: &2.
FLA0573	40	Unable to access file &1.
FLA0574	40	The resource of definition &1 is not found.
FLA0578	40	Error: The resource from definition &1 is assigned to partition &2.
FLA0579	40	Specify *ANY, *NONE or a partition name.
FLA0592	40	The POWER &1 cannot be found.
FLA0593	40	Error during SSH connection: &1.
FLA0575	0	OK: the resource of the &1 definition is assigned to the &2 partition.

Using the command:

The FLCHKHMCRS command allows to check if the resource exists, but also if it is attached to a partition (or no partition).

By specifying a partition name in the LPARNAME parameter, the command verifies that the resource is actually assigned to that partition. An error message will be sent if the resource is assigned to another partition. The value *NONE means "No Partition".

By setting the LPARNAME parameter to *ANY, the command will give the name of the partition to which the resource is assigned, or *NONE if it is not assigned to any partition.

Messages FLA0578 and FLA0575 contain, in addition to the name of the partition on which the resource is located, various additional information that can be found in the second level of messages:

- Reminder of the definition name
- Name and number of the partition to which the resource is assigned
- DRC index (value used internally by the commands)
- Description provided by the HMC
- Slot location
- Bus ID
- Unit Location
- Possibility to make a dynamic movement.

7.3 *FLCHGHMCRS, Moving a resource*

The FLCHGHMCRS command allows you to move a resource defined in the definition passed as a parameter to another partition, or to no partition.

The command parameters are as follows:

```

                                Move a resource (FLCHGHMCRS)

Type choices, press Enter.

Resource name . . . . . RSCDEF
Source partition name . . . . . FROMLPAR

Source partition number . . . . . FROMLPARNB      *FROMLPAR
Target partition name . . . . . TOLPAR

Target partition number . . . . . TOLPARNB      *TOLPAR
Confirm . . . . . CONFIRM      *YES

```

Description of parameters:

RSCDEF	Name of the definition containing the resource to be moved.
FROMLPAR	Name of the partition on which the resource is located before the move. Partition Name = Specify a partition name as defined on the HMC *ANY = The resource can be anywhere. *NONE = The resource is not assigned to any partition. *FROMLPARNB = The resource is on the partition whose partition number is specified in parameter FROMLPARNB.
FROMLPARNB	Number of the partition on which the resource is located before the move. Partition Number = Specify a partition number as defined on the HMC *FROMLPAR = The resource is on the partition whose name is specified in parameter FROMLPAR.
TOLPAR	Name of the partition on which the resource will be assigned after the move. Partition Name = Specify a partition name as defined on the HMC *NONE = The resource will not be assigned to any partition. *TOLPARNB = The resource will be assigned to the partition whose partition number is specified in parameter TOLPARNB.
TOLPARNB	Number of the partition on which the resource will be assigned after the move.

Partition Number = Specify a partition number as defined on the HMC

*TOLPAR = The resource will be assigned to the partition whose name is specified in the TOLPAR parameter.

CONFIRM Specify whether a confirmation message must be sent to run the function.
 *YES = message FLA0586 will be sent to the job to request confirmation of the move
 *NO = No confirmation will be requested. Use this value to make the function fully automated.

This command generates the following messages in return:

Message ID	Severity	Message text
FLA0099	40	The parameter &1 / &2 is not correctly set. Use the FLPARAM command and enter a correct value.
FLA0570	40	No definition found for resource &1.
FLA0571	40	No definition found for the &1 partition.
FLA0572	40	Error during SSH connection. IP address: &1, user: &2.
FLA0573	40	Unable to access file &1.
FLA0574	40	The resource of definition &1 is not found.
FLA0584	40	The source partition name must be set to *ANY, *NONE, *FROMLPARNB or a name.
FLA0585	40	The target partition name must be *NONE, *TOLPARNB or a name.
FLA0587	40	FLCHGHMCRS command cancelled.
FLA0588	40	The resource in definition &1 is not assigned to the source partition &2.
FLA0591	40	Error, the resource from definition &1 was not moved correctly to the &2 partition.
FLA0592	40	The POWER &1 cannot be found.
FLA0593	40	Error during SSH connection: &1.
FLA0594	40	The &1 partition cannot be found.
FLA0595	40	The partition with ID &1 cannot be found.
FLA0598	40	The resource in definition &1 is not assigned to source partition number &2.
FLA0599	40	Error, the resource of definition &1 was not moved correctly to partition number &2.
FLA0590	0	The move of the resource from definition &1 has been successfully completed.
FLA0597	0	The resource of definition &1 is already on the target partition &2.

Using the command:

The command FLCHGHMCRS is used to move a resource.

Be careful, a resource already belonging to a partition cannot be moved if the resource is in use. You will have to vary off the device using the resource before attempting to move it. See the "important note" on this subject in the chapter "7 Move an HMC resource".

Once the resource is transferred to the destination partition, it may not be visible immediately. It may take some time for the system to recognize it as operational.

The WRKHDWRSC command allows to see the status of the resource.

Messages FLA0575, FLA0578, FLA0588, FLA0590, FLA0591, FLA0597, FLA0598 and FLA0599 contain in addition to the name of the partition on which the resource is located various additional information that can be found in the second level of messages:

- Reminder of the definition name
- Name and number of the partition to which the resource is assigned
- DRC index (value used internally by the commands)
- Description provided by the HMC

- Slot location
- Bus ID
- Unit Location
- Possibility to make a dynamic movement.

7.4 FLRTVHMCRS, Retrieving Information from a Resource

The FLRTVHMCRS command allows to retrieve information from a resource defined in the definition passed as a parameter in a CLP program.

The command parameters are as follows:

```

                                Extract Resource State (FLRTVHMCRS)

Type choices, press Enter.

Resource name . . . . . RSCDEF
Variable for part. name (256) RTNLPAR
Variable for part. id   (5 0) RTNLPARNB
Variable for DRC index  (30)  RTNDRCIDX
Variable for description (50)  RTNDESC
Variable for slot loc.  (10)  RTNSLTLOC
Variable for bus id     (5 0) RTNBUSID
Variable for unit loc.  (50)  RTNUNITLOC
Variable for dyn. assign. (4)  RTNDYNASSI
```

Description of parameters:

RSCDEF	Name of the definition containing the resource whose information is to be retrieved.
RTNLPAR	Name of the partition on which the resource is located. *NONE = The resource is not assigned to any partition.
RTNLPARNB	Number of the partition on which the resource is located.
RTNDRCIDX	DRC index of the resource.
RTNDESC	Description of the HMC resource.
RTNSLTLOC	Location of the resource slot.
RTNBUSID	ID of the resource bus.
RTNUNITLOC	Location of the unit.
RTNDYNASSI	Information about the possibility of dynamic resource movement. The possible values are: *YES = It is possible to move the resource dynamically. *NO = It is not possible to move the resource dynamically.

This command generates the following messages in return:

Message ID	Severity	Message text
FLA0570	40	No definition found for resource &1.
FLA0571	40	No definition found for the &1 partition.
FLA0572	40	Error during SSH connection. IP address: &1, user: &2.

FLA0573	40	Unable to access file &1.
FLA0574	40	The resource of definition &1 is not found.
FLA0592	40	The POWER &1 cannot be found.
FLA0593	40	Error during SSH connection: &1.
FLA0596	40	The resource of slot &1 cannot be found.

Using the command:

The FLRTVHMCRS command allows to obtain several pieces of information about a resource defined by a definition in a CLP program. This makes it possible to run specific programs to track the movements of this resource.

8 Add-on module: Sending alerts by email or message

A Flash for i product add-on module is available, allowing you to send emails or messages, or call a specific program in the following situations:

- In case of errors.
- When the status of a clone changes.

It is possible to choose several different recipients using the FLWRKDST command.

The information can be sent to a recipient by email, or by a message in an MSGQ.

Sending a message in a MSGQ can be used for example for message-based monitoring tools.

Calling a specific program can be used for example to trigger an action directly on the partition.

This module is subject to invoicing, and requires a specific license key.

8.1 Principle

The purpose of this module is to automatically send an email, a message to a MSGQ or call a specific program in the 2 following cases

- As soon as an error occurs in the Flash for i product. Errors taken into account are all ERR type messages visible from the FLDSPLOG command, or option 6 from the FLDSPHST command.
- As soon as a cloning changes state. The list of states that will generate an email is configurable.

These emails, messages or program are only sent or called from the Production partition since all messages are centralized.

The FLASH4I subsystem contains the automatic FL_ALERT job if the module has been activated (by the FLWRKMAIL command) and a valid license key has been entered. This will manage all operations of the add-on module at regular interval configured in the product's parameters.

At regular intervals (parameter AUTOMATED-DELAY-ALERT-DLY) the FL_ALERT job

- Search for the presence of new errors in the product log. In case of new errors, it then sends an email or a message or calls the specific program.
- Checks if one of the clones has changed state and sends an email or a message or calls the specific program if this state is set to generate an email in the FLWRKMAIL command.

The command FLWRKDST allows to give the following information:

- The email addresses to which an email should be sent. It is possible to specify several different email addresses.
- The name of one or more MSGQs to which a message will be sent.
- The name of one or more specific programs to be called.

It is possible to enable or disable the add-on module via the FLWRKMAIL command. If the status of the add-on module changes, the FLASH4I subsystem must be restarted.

If the sending of emails is set up, the production partition must be configured to allow the sending of emails with the command SNDDST.

8.2 Configuration

The following operations must be carried out.

8.2.1 Enter the license key for this specific module

Use the FLADDKEY command to enter the specific key for this module
Use the FLWRKKEY command to check that this key is valid

8.2.2 Configure the emails function

If information are to be made only to one or more MSGQs or using specific programs, proceed to the next paragraph.

The production partition must be configured to allow sending emails with the SNDDST command.
This is a prerequisite for the alert module to work with emails.

Use IBM documentation for this point.

8.2.3 Enroll user profile FL_USER in system distribution directory

If information are to be made only to one or more MSGQs, proceed to the next paragraph.

```
ADDIRE      USRID(FLUSER XXXX)
            USRD('For email module of Flash for i')
            USER(FL_USER)
            SYSNAME(*LCL)
            USRDFNFLD((SMTPPAUSRID SMTP 'flash_for_i')
                    (SMTPDMN SMTP 'company.eu'))
            MSFSRVLVL(*SYSMS)
            PREFADR(*SMTP)
```

- Replace XXXX with the system name (see the usual value with command WRKDIRS)
- Replace "company.eu" with the company domain name.

It is possible to verify that the configuration is correct by starting a job under the FL_USER profile, and sending an email. For example:

```
SBMJOB CMD(SNDDST TYPE(*LMSG) TOINTNET(('myuser@company.eu'
) ) DSTD(TEST1) LONGMSG(TEST3))
JOB(TESTEMAIL)
USER(FL_USER)
```

- Replace "myuser@company.eu" with the email recipient.

8.2.4 Activate the alerts module

Use the commands:

- FLWRKMAIL, to activate the email or message sending function, and to indicate in which cases an email or message will be sent.
- FLWRKDST to indicate the list of email or MSGQ recipients.

8.2.5 Stop / restart the subsystem

For these modifications to be taken into account, the FLASH4I subsystem must be restarted.

FLEND SBS

Wait a few seconds to make sure that the subsystem is stopped.

FLSTR SBS

The FLASH4I subsystem will contain 2 jobs

FL_ALERT

FL_AUTO

To validate that alerts are sent, it's possible to create a fake alert.

FLADDLOG TYPE(ERR) MSGDTA('Fake error, for test')

An email or message will be sent after a maximum of 2 minutes.

8.3 FLWRKDST, Define the list of recipients

The FLWRKDST command allows you to manage the list of recipients.

The command parameters are as follows:

This command has no parameters.

Using the command:

The command displays the following screen:

```

FLWRKDST                                Work with recipients                                PROD
                                                                                               2/12/20 13:51:57

Position to . . . . .

Enter your options, then press Enter
  2=Change  3=Copy  4=Delete  5=Display

Opt  Name      Type      Description
----  ---      -
BACKUPS  *MSGQ      MSGQ for monitoring Backups
KHP      *EMAIL     Karl Heinz
PRU      *EMAIL     Pascal
SUPPORT  *PGM       Create ticket for M81 support

                                                                                               End

F3=Exit  F5=Refresh  F6=Create  F12=Cancel
  
```

This screen gives the list of email recipients.

The meaning of the columns is as follows:

Name	Name given to represent the recipient
Type	type of notification *MSGQ: A message will be sent to a Message Queue *EMAIL : An email will be sent *PGM : Call a specific program
Description	Free text describing the recipient

If the license key specific to this module is not valid, the message "License key not valid for this module." appears in red at the top of the screen.

Possible inputs:

Position to
Used to specify which name must be displayed first

Options:

Option 2 = Change
Used to change the specified definition.

Option 3 = Copy
Used to copy the specified definition. The resulting screen will be similar to the definition creation screen

Option 4 = Delete
Used to delete the specified definition.

Option 5 = Display
Used to display definition

Function keys

F3 = Exit the screen

F5 = Update the values

F6 = Create a new definition

F12 = Exit the screen

8.3.1 Creating, changing, copying or displaying a recipient

From the main FLWRKDST command menu, using the F6 key or options 2, 3 and 5 displays the following screen.

If option 5 = display is used, no information can be changed.

If option 3 is used, it is like when creating a definition, but all the fields are initialized with the values of the selected definition.

Function keys

F3 = exit the requested function and return to the list of definitions

F5 = Reset the values to what they were at the start.

F12 = Exit the requested function and return to the list of definitions

```

FLWRKDST2                Change a recipient                PROD
                                                                2/12/20 13:54:28

Enter your options, then press Enter

Name . . . . . SUPPORT          Name
Description . . . . . M81 support
Recipient type . . . . . *EMAIL    *EMAIL, *MSGQ, *PGM

Email address . . . . . support
                        @ m81.eu

                                                                End

F3=Exit   F5=Refresh   F12=Cancel
  
```

Name	Enter a name
Description	Enter a text describing the recipient
Recipient type	type of notification *MSGQ: A message will be sent to a Message Queue *EMAIL : An email will be sent *PGM : Call a specific program

Email Address	Enter the email address of the recipient. The address must be entered in 2 parts. Each part is separated by the @ sign which must not be entered.
---------------	---

```

Recipient type . . . . . *MSGQ    *EMAIL, *MSGQ, *PGM

Message queue . . . . . BACKUPS   Name
  Library . . . . . QGPL         Name
Message type for errors . *DETAIL  *DETAIL, *SUMMARY
  
```

Message queue	Name of the message queue to send the message
Message type for errors	When errors occur in Flash for I, select if a message must be sent to the MSGQ for each individual error, or only one message summarizing the number of errors. *DETAIL = One message is sent for every error *SUMMARY = One message is sent indicating the number of errors that occurred since the last check. By default, there is a check every minute.

```

Recipient type . . . . . *PGM          *EMAIL, *MSGQ, *PGM

Program for status change
  Program . . . . . EXAMPLE06   Name, *NONE
  Library . . . . . FLASH4IUSR  Name

Program for errors
  Program . . . . . EXEMPLE07   Name, *NONE
  Library . . . . . FLASH4IUSR  Name
  Message type . . . . . *SUMMARY *DETAIL, *SUMMARY
  
```

- Program for status change**

Program/Library Specify the name of the program that will be called when the state of a clone changes.

An example of this type of program is provided in the FLASH4I/FLEXAMPLES source file under the name EXAMPLE06.

*NONE = No program will be called.

- Program for errors**

Program/Library Specify the name of the program that will be called when an error message is generated in the product log.

An example of this type of program is provided in the FLASH4I/FLEXAMPLES source file under the name EXAMPLE07.

*NONE = No program will be called.

- Message type**

Indicate the condition under which the program is called.

*DETAILS: the program will be called for each error message in the product log. The parameters passed to the program will give the information for each message.

*SUMMARY: The program will only be called once per FL_ALERT job cycle (by default 60 seconds). The parameters passed to the program will give the number of error messages only.

The programs to be used here are specific programs.
Example programs are provided in the FLASH4I/FLEXAMPLES source file, under the names EXAMPLE06 and EXAMPLE07.

EXAMPLE06

Example of a program to be used for state changes.
This program will be called when the state of a clone changes. It will be sent the following parameters.

- &NEW_STATUS *Char 10 Value of the new cloning state
- &CLONE_NB *Dec 9 0 Number of the cloning concerned
- &ENV *Char 10 Name of the environment

EXAMPLE07

Example of a program to be used for error messages.
The parameters passed to the program are the same whatever the type (*DETAIL or *SUMMARY).
If the *DETAIL type is used, this program will be called for each error message occurring in the Flash for i log.
If the *SUMMARY type is used, this program will be called once per FL_ALERT job cycle (default 60 seconds).

The following parameters will be sent to it for a *DETAIL type.

- &NB_MSG *DEC LEN(10 0) Always 1
- &DATE_FIRST *CHAR LEN(26) Message Timestamp
- &DATE_LAST *CHAR LEN(26) Message Timestamp (same as &DATE_FIRST)
- &CLONE_NB *DEC LEN(9 0) Cloning number

- &ROLE *CHAR LEN(5) Type of partition where the message has been generated (PROD ou CLONE)
- &MSGID *CHAR LEN(7) Message ID
- &MSGF *CHAR LEN(20) Message file
- &MSGDTA *CHAR LEN(1000) Message data

The following parameters will be sent for a *SUMMARY type.

- &NB_MSG *DEC LEN(10 0) Number of messages
- &DATE_FIRST *CHAR LEN(26) First message Timestamp
- &DATE_LAST *CHAR LEN(26) Last message Timestamp
- &CLONE_NB *DEC LEN(9 0) Always 0
- &ROLE *CHAR LEN(5) Empty
- &MSGID *CHAR LEN(7) Empty
- &MSGF *CHAR LEN(20) Empty
- &MSGDTA *CHAR LEN(1000) Empty

8.4 FLWRKMAIL, Work with email function

The FLWRKMAIL command allows you to activate the sending of emails by Flash for i, and to define in which cases emails will be sent.

The command parameters are as follows:

This command has no parameters.

Using the command:

The command displays the following screen:

```

FLWRKMAIL                                Work with emails processing                                PROD
                                                                                               2/12/20 15:02:47

Active Email module . . . . . *YES *YES, *NO

List of Flash for i statuses:
Enter for every status if an email must be sent or not.
Error messages *SEND *SEND, *NO
*HOLD . . . . . *NO *BRMS_END . . . *SEND
*INIT . . . . . *NO *BRM21_TFR . . *SEND
*STR_FC . . . . . *NO *BRM21_END . . *SEND
*STR_LPAR . . . *NO *SAVE_END . . . *SEND
*FIRST_STR . . *SEND *SAV21_END . . *SEND
*BRMS . . . . . *NO *USER_END . . . *SEND
*BRM21 . . . . . *NO *NEWCF_END . . *SEND
*SAVE . . . . . *NO *CHG_PROD . . . *SEND
*SAV21 . . . . . *NO *CHG_NONE . . . *SEND
*USER . . . . . *NO *END_LPAR . . . *NO
*NEWCFG . . . . *NO *END_FC . . . . *NO
*BRMS_TFR . . . *NO *ERROR . . . . *SEND

                                                                                               End

F3=Exit F5=Refresh F12=Cancel
  
```

This screen allows you to activate the sending of emails by Flash for i, and to define in which cases emails will be sent.

Any modification in this screen requires to stop and restart the FLASH4I sub-system to be taken into account.

The meaning of the columns is as follows:

Activation of email module	Indicate if the email module must be activated or not. *YES = An email will be sent to the list of recipients for each situation set up in the rest of this screen. *NO = The email sending is disabled.
Error messages	Specify whether an email should be sent for each error message that occurs in the Flash for i internal log (FLDSPLOG command). *YES = An email will be sent as soon as an error message is detected. *NO = No email will be sent in case of an error.

The rest of the screen shows all the states that a cloning can take.

For each state	Indicate if an email should be sent when a clone reaches the indicated state. *SEND = An email will be sent when a clone reaches this state. *NO = No email will be sent for this state.
----------------	--

If the license key specific to this module is invalid, the message "Invalid license key for this module." appears in red at the top of the screen.

Function Keys

F3 = exit the screen

F5 = Update values

F12 = Exit screen

8.5 Example of alert email sent

Below is the text of the alert email sent following the test indicated in the previous paragraph.

Error alert emails will contain the following information:

- The number of errors discovered
- The time at which these errors were discovered
- The system from which the email was sent
- The list of the 10 oldest errors discovered

This list of the 10 oldest errors found will also contain several information:

- The date and time of the error
- The cloning number related to the error
- The type of partition on which the error occurred
- Error message identifier
- The first 100 characters of the error message

```
Product Flash for i has detected 2 new error(s) on 05/03/20 at 14:13:47 on the
system M81DEV.
```

```
Product: Flash for i
System: M81DEV
```

```
Date and time: 05/03/20 à 14:13:47  
Number of errors: 2
```

The oldest 10 errors are:

```
Date and time: 04/03/20 at 21:55:35  
Clone number: 705  
Partition type: PROD  
Message id: FLA0501  
Message text: No definition found for environment *STG.
```

```
Date and time : 05/03/20 à 14:09:46  
Clone number: 705  
Partition type: PROD  
Message id: *NONE  
Message text: Fake error, for test
```

8.6 Example of a status change email

Below is the text of the email sent after a cloning status change.

Status change emails will contain the following information:

- The name of the partition
- The new state obtained
- The name of the environment
- The cloning number
- The date and time of the status change

A different email is sent for each status change.

```
Product Flash for i has detected that the clone number 1241, environment  
BRMS_DAY1, has changed status on 01/12/20 at 04:08:02. The new status is  
*BRMS_END.
```

```
Product : Flash for i  
System : PROD  
Environment : BRMS_DAY1  
Clone number : 1241  
Date and time change of status : 01/12/20 at 04:08:02  
New status : *BRMS_END.
```


9 Add-on module: Reconfigure the Clone partition

An add-on module to automate system reconfiguration of the Clone partition is available for the Flash For i product.

This module is subject to invoicing and requires a specific license key.

9.1 Objectives

Before releasing a new version of a program or application, it is advisable to test it, usually on a test or pre-production partition.

Often developers or testers want to perform these tests using data that is as close to reality as possible.

In the same way, some training courses are carried out using data that is close to production data.

For this, most companies have a dedicated partition, called the pre-production partition, with a system installed and configured, and on which the data must be refreshed at regular intervals to match the production data.

This is often a lengthy process. It requires restoring data libraries, which takes a long time and may require manual operations.

Moreover, in this case, the Preproduction partition requires as much disk space (on the disk array) as the Production partition.

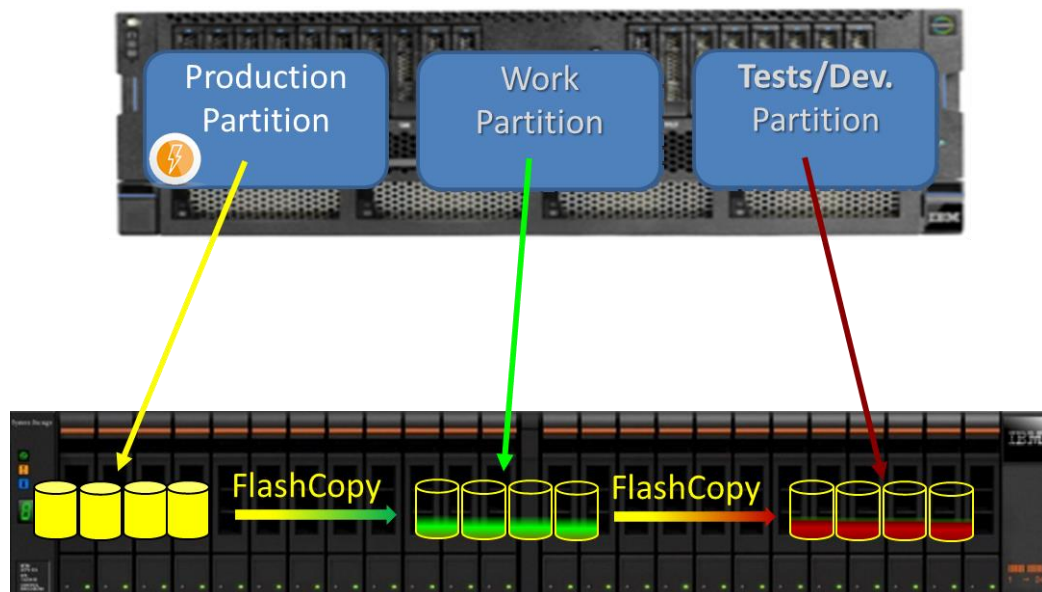
The purpose of this module is to enable the generation of a test or recipe partition (for example) using clones of the Production disks and then automatically changing the system configuration to obtain a Preproduction partition.

This operation has the following advantages (compared to data recovery):

- It is much faster
- It can be automated for almost the entire process
- It requires less physical disk space on the disk array.

Using fewer disks allows, among other things, to have several different preproduction partitions.

It is also possible to perform cascade cloning, i.e. to clone the Production, then to clone this clone again, for example to anonymize the data. The sequence would be as follows:



- The Production partition is cloned.

- Users continue to work normally
- The clone partition (working partition in the schematic) is started.
- Its system configuration is modified to become completely independent of Production.
- Some elements (profiles, libraries, directories) that will be useful to future users are restored from a previous backup.
- The job to anonymize the data is started
 - It can take several hours if needed
 - It has access to data that is stable because there are no users
- ⇒ At this stage, the working partition contains a copy of the production, with all data anonymized.

When developers need to "refresh" their test base, just:

- Stop the current test partition
- Clone the working partition to the disks of the test partition
- Start the test partition
- Automatically modify its configuration
- ⇒ The test partition is accessible again for developers or trainers.
- ⇒ The data is anonymized
- ⇒ This operation only took a few dozen minutes.

If the database is corrupted during the tests, the partition can be recreated very quickly by repeating the second phase above.

9.2 Principle

The purpose of this module is to automate all the operations of modification of the test partition configuration (Name, IP Addresses, IP domain, JOBQ and OUQ, Database name, ...), and to do all this without developing CLP scripts or programs.

The principle is to do the operations in a reverse order compared to what is usually done to update the data on a preproduction partition.

Usually :

- The preprod partition exists
- It is configured (name, IP address, database name, ...)
- Only the data libraries are restored using the Prod's backups

With Flash for i and this reconfiguration module:

- The specific data used by the developers are saved on an external medium.
- The preprod partition is stopped
- Prod disks are cloned. These come to replace the disks of the Preprod partition.
- The Preprod partition configuration is changed automatically.
- Developer's specific elements are restored

Definitions

The reconfiguration module allows you to create a "configuration definition" using the FLWRKCFG command. Each configuration definition contains all the information necessary to reconfigure the clone partition.

Automatic triggering of the reconfiguration

To have the reconfiguration automatically triggered after a cloning, the 2 options below are possible

- Create an environment, and indicate *NEWCFG as the function to be performed. Then indicate the name of the "configuration definition".
 - In this case, the reconfiguration will be started right after the IPL of the Clone partition.
 - Use another type of environment (for example *BRMS or *SAVE to start with a production data backup) to boot a Clone partition, then use the FLCHGCFG command on that Clone partition.

- The FLCHGCFG command can be used at any time on a Clone partition, even long after cloning.
- It must be used on a Clone partition.

Restore developer-specific items

It often happens that developers or testers need some elements that are not on the Prod partition.

- A specific user profile
- Some tool libraries
- A directory

As these elements are not on the Prod partition, they must be restored after cloning.

To do this, the list of these elements must be defined with the commands:

- FLWRKCFGUS for user profiles
- FLWRKCFGLI for libraries
- FLWRKCFGDI for directories

Items to be restored defined with these commands will be included in the "configuration definition", so that the restoration will be performed automatically.

It is likely that the content of the libraries will evolve as the tests are performed. It is therefore necessary to backup these items BEFORE cloning the partition.

Backup of the Preprod partition before cloning is not currently performed by Flash for i.
It is the responsibility of the user to perform it.

Restore user profiles.

If user profiles are restored (defined by FLWRKCFGUS command), the private rights of these users will be restored (RSTAUT command) at the end of restoration of libraries and directories.

If all profiles contained on the tape are to be restored, the reconfiguration definition (FLWRKCFG command) will have to specify that the Clone partition should be placed in restricted mode.
The RSTAUT command will also be run.

Note about BRMS.

After reconfiguration, the new Preprod partition will contain all the data from the Prod. This also applies to BRMS data.

If BRMS is to be used on this Preprod partition, it is necessary to recover its configuration as it was before cloning.

The simplest method is to restore the QUSRBRM library as it was before cloning. The procedure is as follows:

- Define a list of libraries to restore automatically (command FLWRKCFGLI), and add the QUSRBRM library in this list.
- In the configuration definition (command FLWRKCFG), specify the name of the library list created above.
- Before cloning, save the QUSRBRM library on an external media (LTO, VTL, or a SAVF sent via FTP on an external server)
- Clone the partition, and launch reconfiguration (*NEWCFG environment or FLCHGCFG command)
 - The reconfiguration function will automatically restore the QUSRBRM library.
 - BRMS will thus recover its pre cloning configuration.

9.3 FLWRKCFG, Work with configuration definitions

The FLWRKCFG command is used to manage configuration definitions, which will be used to automatically change the system configuration of a Clone partition.

The command parameters are as follows:

This command has no parameters.

Using the command:

The command allows to create, modify or delete configuration definitions, i.e. the information necessary for the configuration modification of a Clone partition to be carried out automatically. These definitions will then be used either in an environment of type *NEWCFG or by the command FLCHGCFG.

The command displays the following screen:

```

FLWRKCFG                                Work with configurations                                PROD
                                                                                               30/11/20 17:33:18

Position to . . . . .

Enter your options, then press Enter
  2=Change  3=Copy  4=Delete  5=Display

Opt  Name          Description
     PREPROD1      Change config for PreProduction 1

                                                                                               End

F3=Exit  F5=Refresh  F6=Create  F12=Cancel
  
```

This screen provides the list of definitions which have already been defined. The definitions are sorted by alphabetical order.

If the text of an environment says “Definition not valid. Definition is not correct” in red, this means that the definition is not finished, or has errors. It is not possible to use this definition with the product’s commands. Use option 2 to fix the errors.

The columns have the following meanings:

Name	Configuration definition name
Description	Free text describing the definition

Possible inputs:

Position to
Used to specify which definition must be displayed first

Options:

Option 2 = Change

Used to change the specified definition.

Option 3 = Copy

Used to copy the specified definition. The resulting screen will be similar to the definition creation screen

Option 4 = Delete

Used to delete the specified definition.

Option 5 = Display

Used to display a definition

Function keys

F3 = Exit the screen

F5 = Update the values

F6 = Create a new definition

F12 = Exit the screen

9.3.1 Creating, changing, copying or displaying a configuration definition

From the main FLWRKCFG command menu, using the F6 key or options 2, 3 and 5 displays the following screen.

If option 5 = display is used, no information can be changed.

If option 3 is used, it is like when creating a definition, but all the fields are initialized with the values of the selected definition.

This function is made up of 7 consecutive screens which need to be fully completed without any errors in order to validate the input or change. The user can move from one screen to the next using the PgUp and PgDn keys.

Function keys

F3 = exit the requested function and return to the list of definitions

F4 = display list of possible values

F5 = Reset the values to what they were at the start.

F8 = Force to save the definition as it is currently, even with errors.

It will be possible to change it later, to continue the definition.

If the definition was not finished, or if there were errors or missing fields, it will not be possible to use this definition in the other product's commands.

F12 = Exit the requested function and return to the list of definitions

F22 = For certain screens, the F22 key can be used. It is used to display/change a field containing 250 characters. Only the first part of the field is displayed. Place the cursor on the selected field and press F22. Another screen will be displayed, enabling the user to enter the whole field if necessary. 250-character fields are indicated with the '...' sign.

Screen 1: Network attributes, scheduled jobs and BRMS

Entry of the definition name, network attributes, and actions to be performed for the scheduled jobs and the BRMS network.

CHGNETA command for network attributes

```

FLWRKCFG2                Change configuration                PROD
                                                                30/11/20 17:36:04

Enter your options, then press Enter
Configuration name . . . . PREPROD1      Name
Description . . . . . Change config for PreProduction 1

Network attributes
System name . . . . . PREPROD          Name, *SAME
Local network ID . . . . . APPN        Name, *SAME
Local control point name . PREPROD     Name, *SAME
Dft local location name . PREPROD     Name, *SAME

Job schedule
Hold JOBSCDE entries . . . *HOLD       *SAME, *HOLD
Hold JS1 . . . . . *SAME              *SAME, *HOLD

BRMS
Deactivate BRMS Network . *SAME       *SAME, *DEACTIV

                                                                More...
F3=Exit   F4=List   F5=Refresh   F8=Forced save   F12=Cancel   F22=Full area
  
```

Configuration name Specify the name of the configuration definition, 10 characters long.

Description Text describing the use that will be made of this definition.

Network Attributes **CHGNETA and DSPNETA Commands Information**

System name New name to be given to the partition (parameter SYSNAME)
*SAME = This value will not be modified

Local network ID New SNA network name (LCLNETID parameter)
*SAME = This value will not be modified

Local control point name New name to be given to the local control point (parameter LCLCPNAME)
*SAME = This value will not be modified

Dft local location name New name to be given to the default local location (parameter LCLLOCNAME)
*SAME = This value will not be modified

Scheduled jobs

Hold JOBSCDE entries All scheduled jobs in the WRKJOBSCDE must be held.
Note that before being held, jobs are saved in the FLASH4I/FLJOBSCD SAVF.

Hold JS1

*HOLD = Work will be held
*SAME = No change for jobs
have IBM JS1 (IBM Advanced Job Scheduler for i) jobs to be disabled (the QIJSSTD auto-start job will be removed from the QSYSWRK subsystem).
*HOLD = Work will be held
*SAME = No change for jobs

BRMS

Disable BRMS Network Has BRMS Network option to be disabled, so that the Clone partition is not known in the BRMS network (The Q1ABRMNET subsystem will be renamed to Q1ABRMNETX).
This option only applies if product 5770BR1 option 1 is installed.
*DEACTIV = BRMS networks will be disabled.
*SAME = No changes will be made

Screen 2: Clone's partition TCP/IP Configuration

TCP/IP configuration for the Clone partition
WRKLIND command for Ethernet line
CFGTCP command options 1 and 12

```

FLWRKCFG2                Change configuration                PROD
                                                                30/11/20 17:36:38

Enter your options, then press Enter
Configuration name . . . . PREPROD1      Name

IP Addresses
Ethernet line name . . . . LINEFLASH     Name
Delete IP addresses source *YES          *YES, *NO

TCP/IP Domain
Host name . . . . . preprod              ... Name, *SAME, *NONE
Domain name . . . . . *SAME              ... Name, *SAME, *NONE
Domain search list . . . . *SAME         ... Name, *SAME, *DFT
Host name search priority *REMOTE        *SAME, *REMOTE, *LOCAL
DNS 1 address . . . . . *SAME            ...
                                                Address, *SAME, *NONE
DNS 2 address . . . . . *SAME            ...
                                                Address, *SAME, *NONE
DNS 3 address . . . . . *SAME            ...
                                                Address, *SAME, *NONE

More...
F3=Exit  F4=List  F5=Refresh  F8=Forced save  F12=Cancel  F22=Full area
  
```

IP Addresses

Ethernet Line Name Name to give to the Ethernet line that will be created on the Clone partition.
ETHFLASH = default name used for environments performing a backup.

Delete Source IP Addresses Specify if the IP addresses coming from the source partition (or Prod partition) must be deleted on the Clone partition.
*YES = All IP addresses from the source partition will be deleted except the address 127.0.0.1 (*LOOPBACK). Only the new IP address assigned to the Clone partition will be left.
*NO = The list of IP addresses will not be changed.

The new IP address assigned to the Clone partition will be added.

TCP/IP Domain

The options below correspond to the information in the CFGTCP command, Option 12.

Host name	New name to be given to the host IP *SAME = This value will not be modified *NONE = no host name will be associated with the Clone partition
Domain name	New IP domain name *SAME = This value will not be modified *NONE = no domain name will be associated with the Clone partition
Domain search list	List of domain names to be used in case of a search. *SAME = This value will not be modified *DFT = The search will be performed using the default domain name
Host name search priority	order to be used in case of search *SAME = This value will not be modified *REMOTE = DNS will be used before searching in the Host table. *LOCAL = The host table will be used before DNS
DNS x address	IP address of the DNS *SAME = This value will not be modified *NONE = no IP address for this DNS

Note 1:

If the IP addresses from the source partition are not deleted, they will not be able to start, because the resource name associated with their Ethernet line will have been changed to a resource name that does not exist (for security reasons).

Note 2:

If the Ethernet line name indicated is one of the lines already existing on the source partition, and to which an IP address is associated, then it is strongly recommended to indicate *YES in the "Delete source IP addresses" parameter. Otherwise, the IP addresses associated with this line could be automatically started when the partition is IPLed.

Screen 3: NetServer and Host table

NetServer configuration for the Clone partition

```

FLWRKCFG2                Change configuration                PROD
                                                                30/11/20 17:36:38

Enter your options, then press Enter
Configuration name . . . . PREPROD1      Name

NetServer
Server name . . . . . *SAME              Name, *SAME
Domain name . . . . . *SAME              Name, *SAME
Description . . . . . *SAME              Description, *SAME

Host table
Add host name and IP . . . *NO   *YES, *NO
    
```


More...

F3=Exit F4=List F5=Refresh F8=Forced save F12=Cancel F22=Full area

The NetServer will not start on the Clone partition if it has the same name as the Production's one. It is necessary to change its configuration.

NetServer

All 3 parameters must be entered, or remain to *SAME.

Server Name Name to give to the NetServer Server name
*SAME = This value will not be modified

Domain Name Name to give to the NetServer domain name.
*SAME = This value will not be modified

Description Enter a description.
*SAME = This value will not be modified

Host table

Add host name and IP Specify if the new IP name of the clone partition must be added in the Host table
*YES = The "Host name" entered on previous page will be added in the Host table
*NO = Host table will not be changed

Screen 4: Configuration of the relational database

Relational database configuration.
WRKRDBDIRE command.

```

FLWRKCFG2                               Change configuration                               PROD
                                           30/11/20 17:37:22

Enter your options, then press Enter
Configuration name . . . . PREPROD1      Name

Relational database (WRKRDBDIRE)
Local name . . . . . PREPROD             Name, *SAME
Remove existing entries . *YES           *YES, *NO

List of entries to add
  2=Add/Change   4=Delete   5=Display
Opt Entry      Alias      Address
  PROD         PROD       10.43.43.70

                                           More...
F3=Exit   F4=List   F5=Refresh   F8=Forced save   F12=Cancel   F22=Full area
    
```

Relational database (WRKRDBDIRE)

Local name Name to be given to the local relational database
 *SAME = This value will not be modified

Remove Existing entries Specify whether database names from the source (or Prod) partition
 should be deleted on the Clone partition.
 *YES = All names from the source partition will be deleted,
 *NO = The list will not be modified.

List of items to be added

Specify the database names to be added. It is possible to add a maximum of 5 names.
 Use option 2 to add or edit a name, option 4 to remove a name, and option 5 to view it.
 Options 2 and 5 will display the following screen:

```

FLWRKCFG3                      Add/Change a database entry                      PROD
                                                                    30/11/20 18:54:15

Enter your options, then press Enter

Entry . . . . . PROD
Alias . . . . . PROD
Address . . . . . 10.43.43.70
  
```

The parameters correspond to the parameters of the ADDRDBDIRE command.
 The 3 parameters indicated are the only values that can be entered.

Screen 5: System values and IPL

System values related to the IPL, and future role of the Clone partition.

```

FLWRKCFG2                      Change configuration                      PROD
                                                                    30/11/20 17:37:35

Enter your options, then press Enter
Configuration name . . . . PREPROD1        Name

System values
Control Sbs (QCTLSBSD) . . *PROD        Name, *PROD, *FLASH4I, *SAME
Library . . . . .
Initial pgm (QSTRUPPGM) . *PROD        Name, *PROD, *SAME
Library . . . . .

Clone operations
Restricted mode . . . . . *NO            *YES, *NO
IPL after reconfiguration *YES        *YES, *NO, *RESTRICT
New partition role . . . . *SAME        *PROD, *NONE, *SAME

                                                                    More...
F3=Exit    F4=List    F5=Refresh    F8=Forced save    F12=Cancel    F22=Full area
  
```

Control Sbs (QCTLSBSD)	<p>Specify the name of the control subsystem (system value QCTLSBSD) of the new Clone partition. An IPL will be mandatory to take into account this change.</p> <p>Name = Name and library of the new control subsystem.</p> <p>*PROD = The name of the control subsystem of the production partition will be used.</p> <p>*FLASH4I = The control subsystem will remain the same as the Flash for i (FL_CLONE) product. This value is forbidden if the new role of the partition is *PROD.</p> <p>*SAME = The system value QCTLSBSD will not be modified.</p>
Initial Pgm (QSTRUPPGM)	<p>Specify the name and library of the system startup program (system value QSTRUPPGM).</p> <p>Name = name and library of the system startup program.</p> <p>*PROD = The name of the production partition startup program will be used.</p> <p>*SAME = The system value QSTRUPPGM will not be changed.</p>
Restricted Mode	<p>Specify *YES if the Clone partition should be set to restricted mode just after the first IPL to allow configuration modification. The restricted mode is mandatory if all user profiles have to be restored (definition with the FMWRKCFGUS command), or if an operation requires it in one of the Exit programs indicated by the user in the following screens.</p> <p>*YES = The partition will be put in restricted mode immediately after the first IPL.</p> <p>*NO = The partition will not be put in restricted mode.</p>
IPL after reconfiguration	<p>Indicate whether an IPL should be performed when the reconfiguration program is completed.</p> <p>Note that this IPL is mandatory to take into account the new partition name, or the new control subsystem, if these have been changed.</p> <p>*YES = An IPL with automatic reboot will be performed.</p> <p>*NO = No automatic IPL will be performed.</p> <p>*RESTRICT = An IPL with automatic reboot will be performed, but the partition remains in restricted mode after the IPL.</p>
New Partition Role	<p>Specify what the new role of the partition will be. This new role will be activated when the reconfiguration program is finished. These roles are explained in chapter "2.10 Role change of a clone partition".</p> <p>*PROD = The newly cloned partition will become a partition that can be cloned. It will no longer transmit any information to the original Production partition.</p> <p>*NONE = The newly created clone partition will become independent. It cannot be cloned itself. It will no longer transmit any information to the original Production partition.</p> <p>*SAME = The partition retains its role as a Clone. It continues to transmit information to the Production partition. It will not be cloned itself.</p>

Screen 6: Queue contents and resources

Operations to be done on the job and output queues.

```

FLWRKCFG2                Change configuration                PROD
                                                                    30/11/20 17:38:35

Enter your options, then press Enter
Configuration name . . . . PREPROD1      Name
  
```

```

Diverse
Set same time as Prod . . *YES          *YES, *NO
Action on JOBQ . . . . . *RMVJOB      *SAME, *RMVJOB, *HLDJOBQ

Action on OUTQ . . . . . *RMVSPL      *SAME, *RMVSPL, *HLDOUTQ

Adapt TAP resources names
Adapt resources names . . *YES          *YES, *NO

More...
F3=Exit  F4=List  F5=Refresh  F8=Forced save  F12=Cancel  F22=Full area
  
```

- Set same time as Prod** Indicate whether the time of the Clone partition must be updated to match the time of the Production partition. This will prevent a time difference on the Clone partition from gradually building up if the system's NTP client is not enabled.

*YES = The time of the Clone partition will be updated with the FLCHGTIM command at the first IPL.

*NO = No changes will be made to the time of the Clone partition.
- Action on JOBQ** Indicate if an operation must be done during the first IPL on JOBQs

*SAME = No operation will be done on the JOBQs.

*RMVJOB = All jobs will be removed from all JOBQs of the system during the first IPL.

*HLDJOBQ = All JOBQs will be held (HLD status) during the first IPL except some JOBQs (mainly those associated to the system) which list is indicated in parameter CFGJOBQ (FLPARAM command).
- Action on OUTQ** Indicate if an operation must be done during the first IPL on the OUTQs.

*SAME = No operation will be done on the OUTQs

*RMVSPL = All spools will be removed from all OUTQs of the system during the first IPL.

*HLDOUTQ = All OUTQs will be held (HLD status) during the first IPL.
- Adapt resource names** Check all tape units and tape libraries to assign them the correct resource name. This operation is based on the serial number of the unit and allows to keep the same unit name on both Prod and Clone partitions.

*YES = The resource names of the tape drives will be checked and adapted.

*NO = No operation will be done on the tape drives.

Screen 7: List of items to restore

Specify whether items should be restored to the Clone partition.

```

FLWRKCFG2                Change configuration                PROD
                                                                30/11/20 17:38:51

Enter your options, then press Enter
Configuration name . . . . PREPROD1      Name
  
```

```

Restoration of elements
Device name . . . . . *NONE          Name, *NONE
Volume identifier . . . . *NONE       Name, *NONE, *MOUNTED, *EXITPGM
Program for volume name . *NONE       Name, *NONE
  Library . . . . .           Name, *LIBL

User profiles list name . *NONE       *NONE, UATST1
Libraries list name . . . *NONE       *NONE, UATST1
Directories list name . . *NONE       *NONE, APP, UATST1

More...
F3=Exit   F4=List   F5=Refresh   F8=Forced save   F12=Cancel   F22=Full area
  
```

If items need to be restored to the Clone partition, the information necessary for this restoration should be specified here.

These items must be available on a tape (physical or virtual) external to the Clone partition.

The most common case is to make a backup of the Clone partition (which was used for test or Preproduction, for example) just before making a new clone.

This backup is the responsibility of the user.

If the first parameter (Unit Name) contains *NONE, then no restore will be performed. All other parameters must contain *NONE.

The same volume will be used to restore all items (user profiles, libraries and directories).

Device name	Specify the name of the tape drive or tape library to be used to restore items. *NONE = No restoration will be performed.
Volume identifier	Specify the volume name of the tape to be used for restoration. *NONE = No restoration will be performed. *MOUNTED = The volume mounted in the drive will be used. *EXITPGM = The volume name will be given by a program provided by the customer. The name of this program must be indicated on the following line in the parameter "Program for volume name".
Program volume name	Specify the program name (and its library) that will provide the volume name to be used for restoration. A sample program is provided with the product in the source file FLASH4I/FLEXAMPLES, source member EXAMPLE01. Refer to the chapter "2.12.1 EXAMPLE01: Exit Program for the name of ONE volume" for more information about this example. *NONE = No program. The volume name is given directly to the "Volume" parameter, or is *MOUNTED.

The list of items to be restored must be defined separately, using the FLWRKCFGUS, FLWRKCFGLI and FLWRKCFGDI commands. The names of these definitions must be indicated in the 3 parameters below.

The FLWRKCFGUS command can also be used to indicate which user profiles should be enabled or disabled.

User profiles list name	Indicate the name of the user profiles definition list to be used. This definition contains the list of profiles that will be restored. *NONE = No user profiles will be restored.
-------------------------	---

Libraries list name	Specify the name of the library definition list to be used. This definition contains the list of libraries that will be restored. *NONE = No libraries will be restored.
Directories list name	Specify the name of the directory definition list to be used. This definition contains the list of directories that will be restored. *NONE = No directories will be restored.

Screen 8: User Exit Programs

In addition to the operations automatically supported by the product, it is possible to add more specific operations that will be performed by Exit programs. These Exit programs must be written and compiled by the user. The user is responsible for their proper operation.

```

FLWRKCFG2                Change configuration                PROD
                                                                30/11/20 17:39:06

Enter your options, then press Enter
Configuration name . . . . PREPROD1      Name

Exit programs
Nb Part.  Library      / Program      Description
11 Clone  / *NONE          Before configuration change
12 Clone  / *NONE          Before restorations
13 Clone  / *NONE          At the end, before CHGROL and IPL

                                                                End
F3=Exit   F4=List   F5=Refresh   F8=Forced save   F12=Cancel   F22=Full area
  
```

Specify the names of Exit programs that will be used when reconfiguring the Clone partition.

Refer to chapter "2.3.4 Exit programs" for more information about these exit programs.

IMPORTANT :

Exit programs used here must have 2 input parameters:

- 10 characters, containing the name of the environment.
- 10 characters, containing the name of the configuration definition.

9.4 9.4 FLWRKCFGUS, Work with definitions of User Profiles to Restore

The FLWRKCFGUS command allows to manage the list of user profiles that will be restored, enabled or disabled when automatically reconfiguring a Clone partition.

These definitions are to be used in the configuration definitions (command FLWRKCFG).

The command parameters are as follows:

This command has no parameters.

Using the command:

The command displays the following screen:

```

FLWRKCFGUS                                     Work with users lists                                     PROD
                                                                                                     30/11/20 17:39:49

Position to . . . . .

Enter your options, then press Enter
  2=Change  3=Copy  4=Delete  5=Display  12=Work with users

Opt  Name      Description
   UATST1     UA Test Partition

                                                                                                     End

F3=Exit  F5=Refresh  F6=Create  F12=Cancel
  
```

This screen provides the list of definitions which have already been defined.
The definitions are sorted by alphabetical order.

The columns have the following meanings:

Name	User profiles definition name
Description	Free text describing the definition

Possible inputs:

Position to
Used to specify which definition must be displayed first

Options:

Option 2 = Change
Used to change the specified definition.

Option 3 = Copy
Used to copy the specified definition. The resulting screen will be similar to the definition creation screen

Option 4 = Delete
Used to delete the specified definition.

Option 5 = Display
Used to display a definition

Option 12 = Work with users
Used to display the list of user profiles, and the action to perform

Function keys

F3 = Exit the screen

F5 = Update the values

F6 = Create a new definition

F12 = Exit the screen

9.4.1 Creating, changing, copying or displaying a user profiles definition

From the main FLWRKCFGUS command menu, using the F6 key or options 2, 3 and 5 displays the following screen.

If option 5 = display is used, no information can be changed.

If option 3 is used, it is like when creating a definition, but all the fields are initialized with the values of the selected definition.

Function keys

F3 = exit the requested function and return to the list of definitions

F5 = Reset the values

F12 = Exit the requested function and return to the list of definitions

```
FLWRKCFGU2                Change users list                PROD
                                                                    30/11/20 17:40:15

Enter your options, then press Enter

Users list name . . . . . UATST1      Name
Description . . . . . UA Test Partition
```



```

                                                                    End
F3=Exit   F4=List   F5=Refresh   F12=Cancel
    
```

Users list name Specify the name of the user profiles definition, 10 characters long.
Description Text describing the use that will be made of this definition.

9.4.2 Work with the list of user profiles to restore

From the main FLWRKCFGUS command menu, using option 12 displays the following screen.

Function keys

F3 = exit the requested function and return to the list of definitions

F5 = Reset the values

F6 = Select existing profiles.

Displays the list of user profiles present on the current partition and allows you to select one or more profiles. The selected profiles will be added to the list of profiles to be restored.

F12 = Exit the requested function and return to the list of definitions

```

FLWRKCFU12                               Work with user profiles to restore                               PROD
                                                                                               30/11/20 17:40:31

User profiles list name .  UATST1
Position to . . . . .

Enter your options, then press Enter
  1=Add   4=Delete   Restore :  11=*RESTORE   12=*OMIT   13=*NONE
                               Status :  21=*ENABLED  22=*DISABLED  23=*SAME

Opt  Profile   Restor.   Status

   *ALL        *NONE     *DISABLED
   LUIS        *RESTORE  *ENABLED
   PASCAL      *NONE     *ENABLED
   RRR         *RESTORE  *ENABLED
   TT*        *RESTORE  *SAME

                                                                    End
F3=Exit   F5=Refresh   F6=Select existing user profiles   F12=Cancel
    
```

The columns have the following meanings:

Profile	User profile name It is possible to enter generic names in the form xxx*.
Restor.	Indicates whether the user profile will be restored *RESTORE = User profile will be restored *OMIT = The user profile will not be restored. This value is only possible if the *RESTORE option is specified for the *ALL profile. *NONE = The user profile will not be restored. This option allows you to indicate in the second parameter that an existing profile on the Production should be activated or deactivated.
Status	Indicates whether the profile should be activated or deactivated. *ENABLED = The profile will be enabled. *DISABLED = Profile will be disabled *SAME = No changes on this profile.

The *ALL profile is permanently indicated and cannot be deleted.
It is used to indicate an action that will be performed on all profiles.
The possible values for the restoration are *RESTORE and *NONE.

If *ALL *RESTORE is indicated
All user profiles will be restored from the tape, excluding those profiles in the list for which it is marked *OMIT.

If *ALL *NONE is indicated
Only the profiles indicated in the list with the *RESTORE option will be restored.

The value *ALL *OMIT is not allowed.

If *ALL *ENABLED is indicated
All profiles will be activated (those restored, and those present on the system, therefore coming from Production).
The profiles present in the list with the option *DISABLED will be disabled afterwards.

If *ALL *DISABLED is indicated
All profiles will be disabled (those restored, and those present on the system, therefore coming from Production).
The profiles present in the list with the option *ENABLED will be activated afterwards.

The options:

Option 1 = Add
Use this option on the first row on the screen, filling in the associated values in the following columns.

Option 4 = Delete
Allows you to remove a profile from the list

Option 11=*RESTORE
Indicates that the user profile must be restored.

Option 12=*OMIT
Indicate that the user profile will not be restored. This value is only possible if the *RESTORE option is specified for the *ALL profile.

Option 13=*NONE
The user profile will not be restored. This option allows you to indicate in the second parameter that an existing profile on Production should be activated or deactivated.

Option 21=*ENABLED
The user profile will be activated

Option 22=*DISABLED
The user profile will be disabled

Option 23=*SAME
No changes will be made to the user profile.

9.5 9.4 FLWRKCFGLI, Work with definitions of libraries to Restore

The FLWRKCFGLI command allows to manage the list of libraries that will be restored when automatically reconfiguring a Clone partition.
These definitions are to be used in the configuration definitions (command FLWRKCFG).

The command parameters are as follows:

This command has no parameters.

Using the command:

The command displays the following screen:

```

FLWRKCFGLI                                Work with libraries lists                                PROD
                                                                                               30/11/20 17:41:06

Position to . . . . .

Enter your options, then press Enter
 2=Change  3=Copy  4=Delete  5=Display  12=Work with libraries

Opt  Name      Description
   UATST1     User Acceptance Test

                                                                                               End

F3=Exit  F5=Refresh  F6=Create  F12=Cancel

```

This screen provides the list of definitions which have already been defined.
The definitions are sorted by alphabetical order.

The columns have the following meanings:

Name	Libraries definition name
Description	Free text describing the definition

Possible inputs:

Position to
Used to specify which definition must be displayed first

Options:

Option 2 = Change
Used to change the specified definition.

Option 3 = Copy
Used to copy the specified definition. The resulting screen will be similar to the definition creation screen

Option 4 = Delete
Used to delete the specified definition.

Option 5 = Display
Used to display a definition

Option 12 = Work with libraries
Used to display the list of libraries and the action to perform

Function keys

F3 = Exit the screen

F5 = Update the values

F6 = Create a new definition

F12 = Exit the screen

9.5.1 Creating, changing, copying or displaying a libraries definition

From the main FLWRKCFGLI command menu, using the F6 key or options 2, 3 and 5 displays the following screen.

If option 5 = display is used, no information can be changed.

If option 3 is used, it is like when creating a definition, but all the fields are initialized with the values of the selected definition.

Function keys

F3 = exit the requested function and return to the list of definitions

F5 = Reset the values

F12 = Exit the requested function and return to the list of definitions

```

FLWRKCFGL2                Change libraries list                PROD
                                                                    30/11/20 17:41:26

Enter your options, then press Enter

Libraries list name . . . UATST1      Name
Description . . . . . User Acceptance Test

                                                                    End

F3=Exit   F5=Refresh   F12=Cancel
  
```

Libraries list name Specify the name of the libraries definition, 10 characters long.

Description Text describing the use that will be made of this definition.

9.5.2 Work with the list of libraries to restore

From the main FLWRKCFGLI command menu, using option 12 displays the following screen.

Function keys

F3 = exit the requested function and return to the list of definitions

F5 = Reset the values

F6 = Select existing libraries.

Displays the list of libraries present on the current partition and allows you to select one or more libraries. The selected libraries will be added to the list of libraries to be restored.

F12 = Exit the requested function and return to the list of definitions

```

FLWRKCFGL12                Work with libraries to restore                PROD
                                                                    30/11/20 17:41:51

Libraries list name . . . UATST1
Position to . . . . .

Enter your options, then press Enter
  1=Add  4=Delete  11=*CLEAR  12=*NONE

Opt Library      Action before restoration
  
```

```
JDS          *NONE
JDS_S        *NONE
UATST1       *CLEAR
UATST2       *CLEAR
VOLUME       *NONE
```

End

F3=Exit F5=Refresh F6=Select existing libraries F12=Cancel

The columns have the following meanings:

Library	Library name It is possible to enter generic names in the form xxx*.
Action before restoration	Indicates whether the library contents should be deleted before being restored. *CLEAR = The content of the library will be deleted before restoration (CLRLIB command). This option allows to delete the objects coming from the Production partition if this library existed. This option has no effect if the library does not exist. *NONE = No action will be performed on the library before restoration.

The options:

Option 1 = Add

Use this option on the first row on the screen, filling in the associated values in the following columns.

Option 4 = Delete

Allows you to remove a library from the list

Option 11=*CLEAR

The library content will be cleared (CLRLIB command) before restoration.

Option 12=*NONE

No action will be performed on this library before to restore it.

9.6 9.4 FLWRKCFGDI, Work with definitions of directories to Restore

The FLWRKCFGDI command allows to manage the list of directories that will be restored when automatically reconfiguring a Clone partition.

These definitions are to be used in the configuration definitions (command FLWRKCFG).

The command parameters are as follows:

This command has no parameters.

Using the command:

The command displays the following screen:

```

FLWRKCFGDI                                Work with directories lists                                PROD
                                                                                               30/11/20 17:42:14

Position to . . . . .

Enter your options, then press Enter
  2=Change  3=Copy  4=Delete  5=Display  12=Work with directories

Opt  Name      Description
   APP      Application Changes
  UATST1    User Acceptance Test

                                                                                               End

F3=Exit  F5=Refresh  F6=Create  F12=Cancel
  
```

This screen provides the list of definitions which have already been defined.
The definitions are sorted by alphabetical order.

The columns have the following meanings:

Name	Directories definition name
Description	Free text describing the definition

Possible inputs:

Position to
Used to specify which definition must be displayed first

Options:

Option 2 = Change
Used to change the specified definition.

Option 3 = Copy
Used to copy the specified definition. The resulting screen will be similar to the definition creation screen

Option 4 = Delete
Used to delete the specified definition.

Option 5 = Display
Used to display a definition

Option 12 = Work with directories
Used to display the list of directories and the action to perform

Function keys

F3 = Exit the screen

F5 = Update the values

F6 = Create a new definition

F12 = Exit the screen

9.6.1 Creating, changing, copying or displaying a directories definition

From the main FLWRKCFGDI command menu, using the F6 key or options 2, 3 and 5 displays the following screen.

If option 5 = display is used, no information can be changed.

If option 3 is used, it is like when creating a definition, but all the fields are initialized with the values of the selected definition.

Function keys

F3 = exit the requested function and return to the list of definitions

F5 = Reset the values

F12 = Exit the requested function and return to the list of definitions

```
FLWRKCFGD2                Change directories list                PROD
                                                                    30/11/20 17:42:42

Enter your options, then press Enter

Directories list name . . UATST1      Name
Description . . . . . User Acceptance Test
```



```

                                                                 End
F3=Exit   F5=Refresh   F12=Cancel

```

Directories list name Specify the name of the directories definition, 10 characters long.
Description Text describing the use that will be made of this definition.

9.6.2 Work with the list of directories to restore

From the main FLWRKCFDI command menu, using option 12 displays the following screen.

Function keys

F3 = exit the requested function and return to the list of definitions

F5 = Reset the values

F6 = Select existing directories.

Displays the list of directories present on the current partition (only the first level directories) and allows you to select one or more directories.

The selected directories will be added to the list of directories to be restored.

F12 = Exit the requested function and return to the list of definitions

```

FLWRKCFD12                               Work with directories to restore                               PROD
                                                                                               30/11/20 17:42:57

Directories list name . . UATST1
Position to . . . . .

Enter your options, then press Enter
 1=Add  2=Full name  4=Delete  11=*CLEAR  12=*NONE
  Action before
Opt Restor.  Directory

*NONE      /backups/localData
*NONE      /dev*
*NONE      /uatst1
*CLEAR     /uatst2

                                                                                               End

F3=Exit   F5=Refresh   F6=Select existing directories   F12=Cancel

```

The columns have the following meanings:

Directory	Directory name It is possible to enter generic names in the form /xxx*.
Action before restoration	Indicates whether the directory contents should be deleted before being restored. *CLEAR = The content of the directory will be deleted before restoration. This option allows to delete the objects coming from the Production partition if this directory existed. This option has no effect if the directory does not exist. *NONE = No action will be performed on the directory before restoration.

The options:

Option 1 = Add

Use this option on the first row on the screen, filling in the associated values in the following columns.

Option 2 = Full name

Allows you to see the full name of the directory if it exceeds the screen size.

Also allows you to change the name of the directory

Option 4 = Delete

Allows you to remove a directory from the list

Option 11=*CLEAR

The directory content will be cleared before restoration.

Option 12=*NONE

No action will be performed on this directory before to restore it.

10 Add-on module: Central management

An add-on module to manage the Flash for i from a central site is available. This module is subject to invoicing, and requires a specific license key.

10.1 Objectives

When the Flash for i product is configured and used on a large number of partitions, it can be tedious to have to log on to each partition individually to enter definitions and then view status or history. The purpose of this module is to define a partition as "Primary". All the definitions will be entered on this partition, and all the histories of the other partitions will be automatically pulled up.

On partitions defined as secondary, it is not possible to enter or modify definitions. It is possible to use the cloning commands, and to view its own history.

The primary partition can be used as a standard partition (definition, cloning, history display).

If the Central Management module is not used, all partitions must be defined using the site type *STD (for Standard).

10.2 Operating principle of the Central Management module

In this module, the partitions will be called "sites".

There are 3 types of sites:

- Primary Site.
 - o This is the partition used to centralize all definitions and information.
 - o There can only be one primary site
- Secondary site.
 - o All partitions will be managed centrally.
- Standard site
 - o These are the partitions that are not taken into account by the central management module.

The operation of the "Central Management" module is as follows:

- A partition is defined as primary site
 - o All definition entries will be made on this partition.
 - o Definitions will be sent to secondary sites
 - o All the histories of the secondary sites are automatically uploaded to the primary site and will be available for consultation.
 - o In addition to the historical data, a new command allows to display the situation of the active cloning of all the secondary sites.
 - o The Flash for i product can be used on the primary site as well as on other sites.
- Partitions that are part of the network are defined as secondary sites.
 - o No definition entry is possible on a secondary site.
 - o All definitions are received automatically from the primary site.
 - o If definitions were entered before defining a site as secondary, these will be overwritten by those from the Primary site.
 - o All histories are automatically forwarded to the Primary site. They remain visible on the secondary sites
 - o Each site remains autonomous for cloning initiation (use of the 5 commands FLCLONE, FLSTRFC, FLENDFC, FLSTRLPAR and FLENDLPAR)

In a network with multiple partitions, it is possible to keep one or a few partitions on which Flash for i will be installed, but which will not participate in the Flash for i network. These partitions will be defined in the classic way with the "Standard" type.

The primary site and all secondary sites must be in Flash for i version 4 or higher.

10.3 Categorization of commands and data

The definition data correspond to the following commands and their associated internal tables.

All these commands are allowed on the primary site, and on all Standard sites (partitions that do not participate in the Flash for i network).

They can be used in read-only on secondary sites. No modification or creation is possible.

- FLWRKENV
- FLWRKSTG
- FLWRKLPAR
- FLWRKVIO
- FLWRKTAP
- FLWRKHMCRS
- FLWRKMAIL
- FLWRKDST
- FLWRKCFG
- FLWRKCFGUS
- FLWRKCFGLI
- FLWRKCFGDI
- FLWRKHMCRS
- FLWRKSIT

The following commands allow you to manage part of the definition, but they remain autonomous on all types of sites. The associated internal tables will not be replaced by data from the Primary site.

- FLPARAM
- FLWRKKEY

The commands for displaying the history, which will be visible on each site, and centralized on the primary site, are as follows.

- FLDSPHST
- FLDSPSTS
- FLDSPLOG
- FLDPSLOG

All other controls remain in the classic operation mode.

10.4 Configuration of the Central Management module

The Flash for i product can be installed and configured autonomously on all partitions (Standard configuration), then the type of site can be changed later to Primary or Secondary.

However, it is preferable, if possible, to configure the primary site first, enter the definitions, and then configure the secondary sites by sending the definitions from the primary site.

If this is not possible, or if the use of the Central management module is decided later, it is advisable to take the following into account from the beginning, or quickly.

10.4.1 Standards and rules used by this module

Version of Flash for i

The primary site, and all secondary sites must be in version 4 of Flash for i minimum.

Site identification

The primary site and all secondary sites are identified only by name (SYSNAME parameter of the DSPNETA). It is therefore imperative that all partitions that are part of the Flash for i network have a different name.

Configuration item names

All the configuration items (Environments, storage definitions, ...) defined will be entered on the Primary site, without indicating the name of the site concerned, and then sent to the secondary sites.

All the secondary sites will have access to all the definitions and will be able to use them.

It is therefore necessary to use a naming convention that allows to know which site each element corresponds to, in order to be able to differentiate them easily.

For environments, it is strongly advised to fill in the serial number and the partition number to which it corresponds, to prevent it from being started (FLCLONE command) by mistake from another partition.

These elements are called "Base data"

User profile name and password

To allow exchanges between the Primary and secondary partitions, it is imperative that the same user profile is used on all partitions (by default FL_USER), and that it has the same password everywhere.

rsa/ssh key

Each partition can have its own rsa key (used for ssh connections). It is created automatically by the FLINIT command. But in this case, if the FLDSPSTS command is used on the primary site, it will not be able to display the status of the FlashCopy/Snapshot or Clone partition. This information is retrieved in real time with an ssh connection.

It may therefore be interesting to use the same rsa key on all partitions.

The key defined on the Primary site can be automatically sent to the secondary sites (setting in FLWRKSIT). In this case, the same account will have to be used on the HMC(s) and on the disk bays for all partitions.

Configuration data overwritten

If a partition has been configured as a Standard site and then changed to a Secondary site, all configuration data that has been entered locally will be deleted the first time the Primary site sends base data.

Before making this modification, the configuration data must be re-entered on the Primary site.

License key

This module requires an additional license key, which must be obtained from M81.

The license key is only needed on the primary site to be able to define site types (FLWRKSIT command) and to view site histories.

No license key is required for this module on the secondary partitions.

10.4.2 Recommended sequence for the configuration of the Central Management module

Primary Site Configuration

- Choose the partition that will become the Primary site, on which all data will be centralized.
- Obtain a license key for the central management module, and enter this key on the Primary site.
- Define the site as primary, using the FLINIT command.
 - o If the product is being installed, the FLINIT command is used during the initial configuration of the product. Specify the value *PRI for the SITETYPE(*PRI) parameter.
 - o If the product is already installed and used, use the command with the following parameters. These parameters allow you to make no other changes to the configuration of the product.
FLINIT DIR(*CURRENT) USER(*CURRENT) PWD(*SAME) RSAKEY(*DFT)
RENEWSSH(*NO) SITETYPE(*PRI) PRISITEIP(XX.XX.XX)
 - o Fill in the PRISITEIP parameter with the IP address that will be used on the site for data transfer from secondary sites. This IP address must exist and be active.
- Use the command FLWRKSIT

- The primary site was automatically added by the FLINIT command.
- If necessary, modify the definition of the primary site to add a description.

Configuration of a secondary site

- Preparation if the product is already installed and used on the future secondary partition
 - All the definitions used (environments, storage, LPAR, TAP, ...) must first be re-entered on the Primary partition. Indeed, once the site has been defined as Secondary, all the definitions it contains will be replaced by those coming from the Primary site.
 - Validate that the FL_USER profile password is the same on the Primary and Secondary partitions.
- On the Primary site,
 - Use the FLWRKSIT command to add the definition of the new secondary site, and fill in all the parameters.
- On the new secondary site
 - Stop the FLASH4I subsystem (FLEND SBS)
 - Define the site as secondary, using the FLINIT command.
 - If the product is being installed, the FLINIT command is used during the initial configuration of the product. Specify the value *SEC for the parameter SITETYPE(*SEC)
 - If the product is already installed and used, use the command with the following parameters. These settings allow you to keep the product configuration unchanged.
FLINIT DIR(*CURRENT) USER(*CURRENT) PWD(*SAME) RSAKEY(*DFT)
RENEWSSH(*NO) SITETYPE(*SEC) PRISITEIP(nnnn) PRISITEIP(XX.XX.XX)
 - Fill in the PRISITE and PRISITEIP parameters with the name and IP address that were set for the primary site with the FLWRKSIT command.
 - Restart the FLASH4I (FLSTRSBS) sub-system.
- From this step on,
 - It is no longer possible to use the FLWRKxxx input commands on this site. All definitions will be received from the primary site.
 - Historical data will be automatically sent to the primary site. Only new information will be sent. The history is not sent.
- On the Primary site
 - Force the sending of base data (command FLSNDBASE, or FLWRKSIT then Option 8)

10.5 Storage of site histories

On the Primary site, when defining a secondary site with the FLWRKSIT command, a library will be automatically created. Its name is calculated automatically and will be in the form FLASHxxxxx, where xxxxx is an automatically incremented number. The tables necessary for the storage of the histories are copied into the library.

When historical data is sent from a secondary site, it is placed in these libraries.

The FLCLRSIT command must be used daily to purge the data contained in these libraries. It must be scheduled by the user.

When a site is deleted (via the FLWRKSIT command), the library associated with it is not automatically deleted. Histories can be kept, or the user can delete this library.

Disk space

All historical data of secondary partitions will be automatically sent to the Primary site.

It is therefore necessary that there is enough free disk space on the primary partition to store this data.

The FLCLRSIT command will have to be run regularly to clear this data, possibly by adapting the number of days to keep according to the secondary site.

10.6 Use of the central management module

From the main menu (FLMENU), option 15 displays the sub-menu specific to this module.

The following commands concern the Central management module, and only this module. They cannot be used on a site that is not of the Primary type.

- FLWRKSIT
- FLSNDBASE
- FLDSPHSTP
- FLDSPSITDT
- FLCLRSIT

FLCLONE, FLSTR... commands continue to be done locally from each SEC partition.
The PRI partition is a partition like any other and can be cloned.

If a partition has been installed at the Standard site and then changed to a Secondary site, all configuration data that has been entered locally will be deleted the first time the Primary site sends master data.
Before making this modification, the configuration data must be re-entered at the Primary site.

10.7 FLWRKSIT, Work with Sites

The FLWRKSIT command allows you to work with the list of sites participating in the Flash for i network.
This command must be used on the Primary site.
It can be used on a secondary site in visualization only.

The command parameters are as follows:

This command has no parameters.

Using the command:

The command allows to add, change or remove a site in the list.

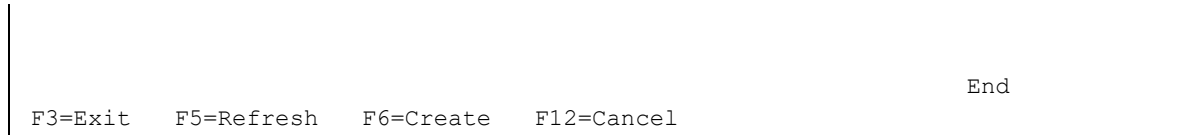
The command displays the following screen:

```

FLWRKSIT                               Work with sites                               PROD
                                           8/01/21 18:04:01

Local partition type . . . . .  PROD / *Primary
Position to . . . . .
Enter your options, then press Enter
  2=Change  3=Copy  4=Delete  5=Display  8=Force data send
 12=Secondary site history

Opt Name      Type State      Lib. rcv  Description
FTP           *SEC *ACTIVE    FLASH40000 Secondary partition
PREPROD      *SEC *ACTIVE    FLASH40002 Pre-production partition
PROD         *PRI                               Generated automatically by Flash for i
TEST         *STD
  
```



This screen gives the list of already defined sites.
The sites are sorted in alphabetical order.

The columns have the following meanings:

Name	Name of the site. This is the name coming from the SYSNAME parameter of the DSPNETA command.
Type	Type of site *PRI = Primary Site *SEC = secondary site *STD = Standard site, displayed here for information only
Status	Status of the site. This value is displayed only for Secondary sites. *ACTIVE = The site is active. The FLSNDBASE command can be used to send configuration data to it, and the history is retrieved from the primary site. *SUSPEND = The site is suspended. The configuration data is no longer sent automatically by the FLSNDBASE command. *REMOVED = This site is no longer in use. The name remains in the list to be able to consult the history.
Lib. Rcv	Name of the library automatically created on the Primary site, and which contains all the histories coming from the Secondary site.
Description	Free text describing the site

Possible inputs:

Position to
Used to specify which site must be displayed first

Options:

Option 2 = Change
Used to change the specified site.

Option 3 = Copy
Used to copy the specified site. The resulting screen will be similar to the site creation screen

Option 4 = Delete
Used to delete the specified site.

Option 5 = Display
Used to display a site

Option 8 = Force data send
Call the command FLSNDBASE to send base data to the selected site.
Press Enter at the confirmation screen.

Option 12 = Secondary site history
Call the command FLDSPSITDT to display logs and history for the selected site

Function keys

F3 = Exit the screen

F5 = Update the values

F6 = Create a new site

F12 = Exit the screen

10.7.1 Creating, changing, copying or displaying a site

From the main FLWRKSIT command menu, using the F6 key or options 2, 3 and 5 displays the following screen.

If option 5 = display is used, no information can be changed.

If option 3 is used, it is like when creating a site, but all the fields are initialized with the values of the selected site.

Function keys

F3 = exit the requested function and return to the list of sites

F5 = Reset the values to what they were at the start.

F12 = Exit the requested function and return to the list of definitions

```

FLWRKSIT2                Change site                PROD
                                                                8/01/21 18:13:41
Enter your options, then press Enter

Site name . . . . . PREPROD      Name
Site description . . . . . Pre-production partition
IP Address . . . . . 10.43.43.71
Site type . . . . . *SEC        *SEC, *STD

Site state . . . . . *ACTIVE     *ACTIVE, *SUSPENDED, *REMOVED

From *PRI to *SEC
  Send and force SSH key . . *YES    *YES, *NO

From *SEC to *PRI
  Log transfer . . . . . *YES      *YES, *NO
  System log transfer . . . *YES    *YES, *NO
  Global state transfer . . *YES    *YES, *NO

Logs library name . FLASH40002      Flash for i version V04 09/12/20
                                                                IBM i version . . . V7R3M0
                                                                End

F3=Exit   F5=Refresh   F12=Cancel
  
```

Site name	Enter the name of the site. This is the name from the SYSNAME parameter of the DSPNETA command.
Site description	Text describing the site.

IP Address	Specify the IP address that will be used to transmit information to this site. The IP address must exist and be active.
Site Type	Specify the type of the site. *PRI = Primary Site *SEC = secondary site *STD = Standard site, shown here for information only

The following information is displayed for Secondary sites only.

Site State	Indicate the status of the secondary site *ACTIVE = The site is active. If the FLSNDBASE command is used with the SITE(*ACTIVE) parameter, the configuration data will be sent to it, and the history is sent back to the primary site. *SUSPEND = The site is suspended. The configuration data is no longer sent automatically by the FLSNDBASE command. *REMOVED = This site is no longer in use. The name remains in the list to be able to consult the history.
Send and force SSH key	Indicate if the rsa / ssh key of the Primary site should be sent to this secondary site. *YES = The rsa key of the primary site will be sent to the secondary site, and restored in the /Flash4i directory. If another key was already present, it will be renamed. It is the key from the primary site that will be used for all ssh connections. The configuration must have been done accordingly. *NO = The rsa key from the Primary site is not sent. The secondary site is independent regarding this key.

The following parameters are used to indicate which information from the Secondary site should be copied to the Primary site. This information will be placed in the Log Library assigned to this site.

Log transfer	Indicate whether the Flash for i internal log (FLDSPLOG command) should be transferred from the Secondary site to the Primary site. *YES = All new messages from the Flash for i internal log are copied to the Primary site. *NO = new messages are not copied
System log transfer	Specify whether the system log of Clone partitions (FLDSPSLOG command) should be transferred from the Secondary site to the Primary site. *YES = All new system log messages are copied to the primary site. *NO = new messages are not copied
Global state transfer	Indicate whether the general cloning status information (FLDSPHST command) should be transferred from the secondary site to the Primary site. *YES = cloning states are copied to the Primary site *NO = cloning states are not copied

The following information is provided for information purposes only and is not subject to change.

Logs library name	Name of the library automatically created on the Primary site, and which contains all the history from the Secondary site.
Flash for i version	Version of the Flash for i product on Secondary site
IBM i version	Version of the IBM i system on Secondary site

10.8 FLSNDBASE, Send configuration to a secondary site

The FLSNDBASE command allows you to send the primary site base data to one secondary site or all active secondary sites.

The actual sending is done in 2 steps. See "Using the Command" below for more details.

The command parameters are as follows:

```

Send to secondary site (FLSNDBASE)

Type choices, press Enter.

Secondary site . . . . . SITE          *ALLACTIVE
  
```

Description of parameters:

SITE Name of the secondary site to which the base data must be sent.
 *ALLACTIVE = The base data will be sent to all secondary sites defined as active in the FLWRKSIT command.

This command generates the following messages in return:

Message ID	Severity	Message text
FLA1865	0	No secondary site active.
FLA1861	40	The &1 command is only authorized on a &2 type site. Command not launched.
FLA1862	40	Site name not correct.
FLA1863	40	Site &1 not found.
FLA1864	40	Site &1 not a secondary site.
FLA1866	40	Error while saving the base configuration of the site
FLA8889	90	The license key for the product &1, Option &2 is no license key is valid

Using the command:

As the base data is only entered on the Primary site, it must be sent to the secondary sites in order to be used. This is the purpose of the FLSNDBASE command.

Base data is all the information defined with the commands below:

- FLWRKENV
- FLWRKSTG
- FLWRKLPAR
- FLWRKVIO
- FLWRKTAP
- FLWRKHMCRS
- FLWRKMAIL
- FLWRKDST
- FLWRKCFG
- FLWRKCFGUS
- FLWRKCFGLI
- FLWRKCFGDI
- FLWRKHMCRS
- FLWRKSIT

Note that the information entered with the commands below is not part of the base data. Their definition remains autonomous on all sites.

- FLPARAM
- FLWRKKEY

The FLSNDBASE command must be used after each change to the base data on the primary site. It can be used to send the data to a specific site (if the modified data only concerns that site for example), or to all active secondary sites.

The sending of data is not done automatically by the Flash for i product. If the user wishes to perform regular automatic sending, it is the user's responsibility to schedule the FLSNDBASE command to be called at an appropriate interval.

The actual sending of the data takes place in 2 steps

When the user calls the command, the data to be sent is prepared (a SAVF is created). Then the actual transfer from the primary partition to the selected site(s) is handled by the FL_AUTO job (in FLASH4I subsystem). It is therefore imperative that this sub-system is permanently active.

If an error occurs during the transfer, an error message will be added to the internal log of the product. Use the FLADDLOG command to check that there are no errors.

FL_USER profile password

The technique used to perform the transfer requires that the FL_USER profile has the same password on all sites (primary and secondary).

If a profile other than FL_USER was used (in the FLINIT command), then the same profile must be used on all sites.

10.9 FLDSPHSTP, List of current clonings

The command parameters are as follows:

This command has no parameters.

Using the command:

The FLDSPHSTP command allows you to obtain the list of cloning in progress for all sites (primary and secondary).

The goal is to get an overview for all sites, by displaying only one line per clone.

The information displayed is identical to that of the FLDSPHST command.

The information displayed comes from the primary site and each secondary site. They are transmitted by the FL_AUTO job at regular intervals (by default 60 seconds).

By default, the list is sorted by cloning date and time.

Press F10 to sort by site name.

For a better use of this command, it is advisable to configure a 132 columns session.

```

FLDSPHSTP1                               Display Cloning history for sites                               PROD
                                                                                               10/01/21  15:57:14

Position to . . . . . 0/00/00 at 0:00:00
Enter your options, then press Enter
 5=Display  6=Flash for i Logs  9=Clone's system Log

----- Elapse time for each phase -----
-- Start FLCLONE --
Cloning      Nb  Nb   Prepa   Prepa           Partition Flashcopy  %
Opt Date    Time  Site  Envir.  Number  Status  Msg  Err on Prod on Clone  Save  active  active  Disk
10/01/21   15:07:10 FTP   FTP_TEST      1 *SAVE_END   42  1   2:47  24:27   6:13                %
10/01/21   02:00:26 PROD  BRMS_WEEK1  1288 *BRMS_END   58  0   5:36  18:58  2:08:17                %
09/01/21   02:00:27 PROD  BRMS_DAY2   1287 *BRMS_END   62  0   5:15  20:41  2:05:08                %
  
```

End

F3=Exit F5=Refresh F10=Sort by site F11=Display time F12=Cancel

This screen shows the list of cloning in progress on all secondary sites and on the primary site.
All durations are shown in hhh :mm :ss format.

The columns have the following meanings:

The information shown here are similar to those of the command FLDSPHST.

Possible inputs:

Position to

If the list is sorted by date and time:

Allows you to indicate from which date the cloning summaries should be displayed.

If the list is sorted by site name:

Allows you to specify from which site the cloning summaries should be displayed.

Function keys

F3 = Exit the screen

F5 = Update the values

F10 = sort by site, or sort by cloning date and time

Allows you to choose the sorting criteria for the display.

F11 = View hours

Allows you to display the same list with the hours of each operation instead of the durations.

F12 = Exit the screen

Options:

The options allow you to view information from the sites.

This information is automatically sent from the secondary sites to the primary site, according to the settings indicated in the definition of the secondary sites (FLWRKSIT command). Only the information for which the transfer from the *SEC site to the *PRI site is requested is visible here.

The information visible using these options is extracted from the history library specific to the selected site. The name of the library can be seen by viewing the site definition in the FLWRKSIT command.

5=Display

Display status details (FLDSPSTS command) of the selected cloning and site

6=Logs of Flash for i

Display the Flash for i Internal Log messages (FLDSPLOG command) for the selected site and cloning.

9=Clone system log

Display System Log messages from the Clone partition (FLDSPSLOG command) for the selected site and cloning.

10.10 *FLDSPSITDT, Display site data*

The FLDSPSITDT command displays historical data from a secondary site. It displays a menu containing the available commands.

The command parameters are as follows:

```

                                Display site data (FLDSPSITDT)

Type choices, press Enter.

Secondary site . . . . . SITE
Command to use . . . . . COMMAND          *SELECT
  
```

Description of parameters:

- SITE Name of the secondary site for which historical data is to be displayed.
- COMMAND Select the command to use to display site's data
 - *SELECT = Displays a menu with the list of available commands
 - FLDSPHST = Select this command
 - FLDSPSTS = Select this command
 - FLDSPLOG = Select this command
 - FLDSPSLOG = Select this command
 - FLDSPJRNSA = Select this command

Using the command:

The cloning histories of the secondary sites are automatically transferred from the secondary sites to the primary site at regular intervals by the FL_AUTO job (by default every 60 seconds) according to the setting indicated in the definition of the secondary sites (FLWRKSIT command).

They are stored in a library specific to each site. The name of the library is indicated in the definition of the secondary site (FLWRKSIT command).

The history data is made up of all the information visible using the commands below:

- FLDSPHST
- FLDSPSTS
- FLDSPLOG
- FLDSPSLOG
- FLDSPJRNSA

The command displays the following screen:

```

FLDSPSITDT                                Display site data

The purpose of this menu is to display data sent by a Secondary site.
Site . . . . : FTP
Library . . . : FLASH40000

Select one of the following:
  
```

```

Commands for information and status
  1. Display cloning history          FLDSPHST
  2. Display cloning status          FLDSPSTS
  3. Display Flash for i log         FLDSPLOG
  4. Display clone's system log      FLDSPSLOG
  5. Display saved journals          FLDSPJRNSA

Selection

F3=Exit  F12=Cancel

```

Select in this menu the data to view (the command to use).
The data displayed will be the data from the selected site.

Site	Name of the selected site.
Library	Name of the library in which the data is stored.

The operation of the commands in this context is the same as for their standard use.

10.11 *FLCLRSIT, Cleanup data from secondary sites*

The FLCLRSIT command allows you to cleanup historical data from secondary sites.

The command parameters are as follows:

```

Clean up log *SEC sites (FLCLRSIT)

Type choices, press Enter.

Secondary site . . . . . SITE          *ALL
Delay for log (d) . . . . . LOG        60
Delay for System log (d) . . . . . SLOG  30
Delay for summaries (d) . . . . . HST   180
Delay for JRNRCV info (d) . . . . . JRNRCV 10

```

Description of parameters:

- SITE Indicate the name of the site for which the data is to be cleaned up.
 *ALL = the data from all secondary sites will be cleaned up, with the same timeframe.
- LOG Specifies the number of days after which Product Log messages will be deleted.
- SLOG Specifies the number of days after which System Log of Clone partition messages will
 be deleted.
- HST Specifies the number of days after which statistic history information will be deleted.
- JRNRCV Specifies the number of days after which information about JRNRCV will be deleted.

This command generates the following messages in return:

Message ID	Severity	Message text
FLA1941	0	No secondary site defined. No cleanup performed.
FLA1942	0	Site &1, cleanup of Log at &2 date. &3 messages deleted.
FLA1943	0	Site &1, cleanup of clone's System Log at &2 date. &3 messages deleted.
FLA1944	0	Site &1, cleanup of cloning history at &2 date. &3 messages deleted.
FLA1945	0	Site &1, cleanup of JRNRCV info at &2 date. &3 messages deleted.
FLA1861	40	The &1 command is only authorized on a &2 type site. Command not launched.
FLA1862	40	Site name not correct.
FLA1863	40	Site &1 not found.
FLA1864	40	Site &1 not a secondary site.
FLA1901	40	Error, can't find the library for the site &1.
FLA1902	40	Error, can't find library &1.
FLA1946	40	Errors during the cleanup of secondary sites.

Using the command:

The FLCLRSIT command cleans up the historical messages coming from the secondary partitions. The parameters indicate the number of days to keep.

It acts only on the primary partition.

The FLCLEAR command must continue to be used on each secondary site to purge its local information.

By default, the FLCLRSIT command is executed every day at 19:00. Use the FLPARAM command for details.

10.12 FLRSTPRDSE, Upgrade secondary sites data

The FLRSTPRDSE command must be used on the primary site after a Flash for i product version upgrade. It allows you to upgrade the tables used for site histories.

The command parameters are as follows:

```

Upgrade secondary site data (FLRSTPRDSE)

Type choices, press Enter.

Secondary site . . . . . SITE          *ALL
  
```

Description of parameters:

- SITE Indicate the name of the site for which the data is to be upgraded.
- *ALL = the data from all secondary sites will be upgraded.

This command generates the following messages in return:

Message ID	Severity	Message text
FLA1863	40	Site &1 not found.
FLA1864	40	Site &1 not a secondary site.
FLA1903	40	Command &1 available only on &2 sites.
FLA1983	40	Error while migrating data from site &1 to version &2, build 20&3/&4/&5.
FLA1984	0	Successfully migrated data from site &1 to version &2, build 20&3/&4/&5.
FLA1985	40	Error while migrating data from secondary sites to version &1, build 20&2/&3/&4. &5 ok, &6 on error.

FLA1986 0 Successfully migrated data from &1 secondary sites to version &2, build 20&3/&4/&5.

Using the command:

When a new version of Flash for i is installed, its internal tables may have been modified. The FLRSTPRDSE command will perform the same upgrade for the tables used for site histories.

On a primary site, it is imperative to use the FLRSTPRDSE command after using FLRSTPRD, and before viewing the site histories again.

If the site is not a primary site, this command should not be used. It will have no effect.

This command may take a long time if there are many secondary sites, or if there are many histories. It is advisable to submit it.

10.13 FLCHKLOGC, Checking the number of error messages on the primary partition

The FLCHKLOGC command is identical to the FLCHKLOG command, but it must be used on the primary (or central) partition and checks for the presence of error messages from all secondary partitions. This makes it possible to automate checks for the presence of error messages centrally.

11 Add-on module: SafeGuarded Copy

IBM offers the SafeGuarded Copy feature on its FlashSystem line of arrays, which provides additional protection against ransomware.

A Flash for i add-on module allows you to manage and automate copies made in a SafeGuard pool from an IBM i partition.

This module is subject to invoicing, and requires a specific license key.

The command GO FLSGC, or option 16 of the menu FLMENU displays the commands related to the SafeGuarded copies.

11.1 Objective

The purpose of this module is to protect the disks of an IBM i type host. For this type of system, all the disks of a partition must be protected at the same time. That's why the definitions made with Flash for i will be based on the name of a host, and all the disks known for this host will be automatically taken into account for the copy.

The configuration has been simplified so that the majority of the elements are created by the Flash for i product, without user intervention.

A volume group will be created, and the disks of the host will be added to it

A disk cannot belong to several groups. If the disks of the host belong to another group, they will be removed from this other group.

The triggering must be programmed by the user with his usual scheduler.

The FLSTRSGC command can for example be used once a day at the same time as the trigger for the backup, but also several times a day at regular intervals.

Use the FLMAPHOST command to be able to restore data using disks generated by the SafeGuarded Copy module. The use of live SafeGuarded disks is not possible (this is one of the protections implemented by this function). The FLMAPHOST command will automatically create a FlashCopy definition and then map the target disks to a host (which must be defined beforehand).

11.2 How the SafeGuarded Copy module works

11.2.1 Relevant hardware

The SafeGuarded Copy function is available on IBM disk arrays with IBM Spectrum Virtualize software 8.4.2 or higher.

It is not supported on the following arrays:

- FlashSystem 5000
- Storwize® V5030E
- Storwize V7000 Gen2
- Storwize V7000 Gen2+ models.

For more information, please visit

<https://www.ibm.com/docs/en/flashsystem-7x00/8.4.x?topic=overview-safeguarded-copy-function>

11.2.2 SafeGuard Pool

SafeGuarded copies must be created in a particular SafeGuard pool. This pool must be a child pool of the pool containing the disks to be protected.

The SafeGuard type pool must be in the same pool as the one containing the disks of the host to be protected.

The SafeGuard pool must be created directly by the user from the SVC interface.
The procedure is provided below.

11.2.3 Number of retention days

When creating a new copy, the number of days for which the copy is stored must be specified. This is entered in the storage definition (FLWRKSTG command)

When this number of days has passed, the copy will be automatically deleted, along with any FlashCopy definitions that were used.

During this time, it will not be possible to delete a copy, except by using a superuser profile. Hence the importance of protecting and not using a superuser profile.

11.2.4 Security: superuser profile

The purpose of SafeGuarded copies is to create copies of disks that are not usable by a hacker, and that cannot be deleted.

BUT, the superuser profile (on the SVC) has the right to delete these copies.

To ensure the security of the copies made, you should no longer use superuser profiles.

This profile has the right to stop the FlashCopy implemented for SafeGuarded Copy, and can delete all items. It must not be used anymore and its password must be protected.

Instead, create another profile of type Administrator, which can perform all other operations, but cannot intervene on SafeGuarded copies.

11.2.5 Security: profile used for the connection to the SVC

In order to create SafeGuarded copies, Flash for i needs to use an Administrator profile on the array, whereas in order to trigger a FlashCopy for backups, the profile only needed to have Copy Operator rights.

For your information, the IBM CSM product also requires an Administrator account to connect to the rack. See the document "REDP-5654-00" chapter "2.1.6 Security and access control

"A normal Administrator level account is also used by IBM Copy Services Manager to complete the following tasks: "

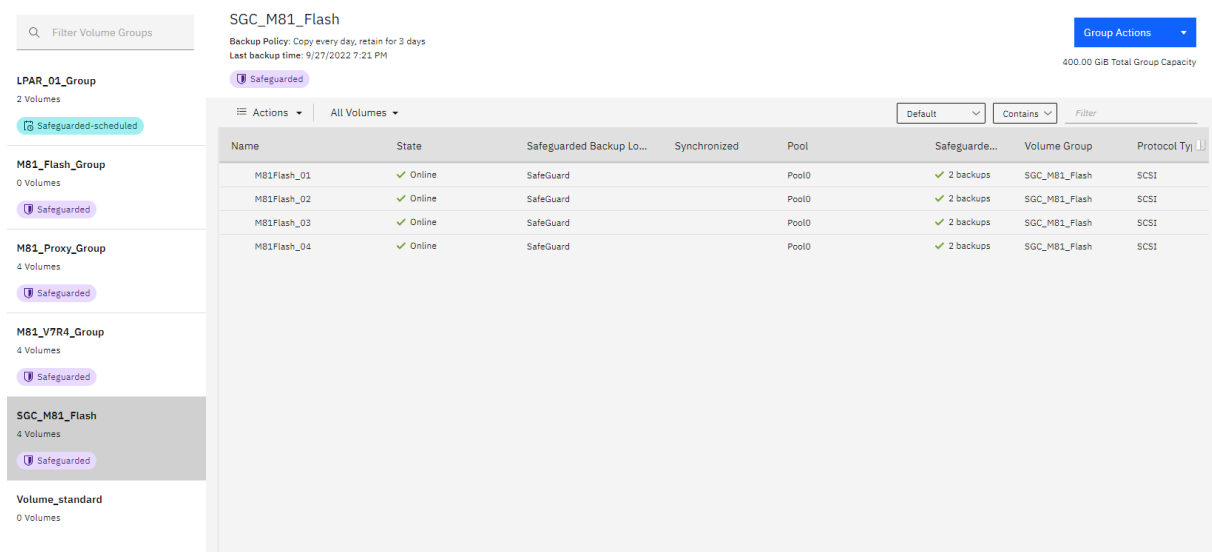
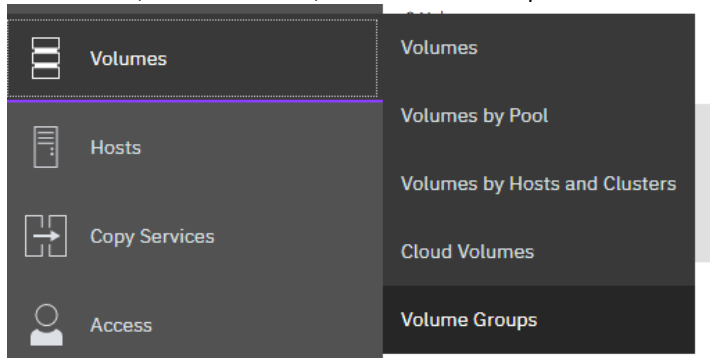
11.2.6 IBM CSM Product Warning

The definition and use of SafeGuarded copies is not possible directly on the SVC interface. IBM recommends using the complementary (and chargeable) product CSM (Copy Services Manager)

Flash for i allows to manage SafeGuarded Copies instead of using CSM
There is no need to purchase or install CSM.

The FLDSPSGC command allows you to view the SafeGuarded Copies from the IBM production partition.

On the SVC interface you can also do this control.
In the menu, select Volumes, then Volume Groups



The information displayed is similar to that available with the FLDSPSGC command.

Caution,

The blue button at the top right "Goup actions" proposes the "Manage SafeGuarded policy" action
This action requires the CSM product to be configured.

Disregard this request. The use of CSM is not necessary and Flash for i performs this function.

11.3 Recovering data from a SafeGuarded copy

If the data on the source disks has been corrupted (Ransomware, data corruption, or any other reason), it is possible to use the data that has been protected with another partition.
Using SafeGuarded disks directly is not possible (this is one of the protections implemented by this function).
The FLMAHOST command will automatically create a FlashCopy definition and then map the target disks to a host (which must be defined beforehand).

Use the FLMAHOST command by specifying the following:

- Parameter STG: Specify the name of the definition of type *SGC. This contains all the information to connect to the disk array, and about the disks that have been protected.
- Parameter TGTHOST: Specify the name of the host (defined on the disk array) to which the new disks will be assigned.
- Parameter SGCCOPY: Specify which copy of the disks should be used. Or *LAST to use the latest generation of protected disks.

The destination (or restore) host must exist beforehand (defined on the disk array, on the HMC, and the necessary zoning).

11.4 Steps to configure SafeGuarded Copy

To use this module, Flash for i must be at least version 4.09, from 26/09/2022.

The operations to be carried out are the following. They are described in the rest of this chapter:

- Enter the license key specific to this module
- On the IBM array, create a SafeGuard child pool
- Change the profile used for the ssh connection to Administrator
- Use the FLWRKSTG command to create a storage definition of type *SGC
- Check that all the elements entered are correct with the FLCHKSTG command
- Schedule the FLSTRSGC command to be called at regular intervals, or at selected times to trigger the secure copy of disks

Check the correct operation with the interactive command FLDSPSGC.

Automatically monitor the correct operation with the FLCHKSGC command.

11.4.1 Specific license key

This module is subject to billing and requires a specific license key.

Ask your dealer or M81 for an activation key for this module.

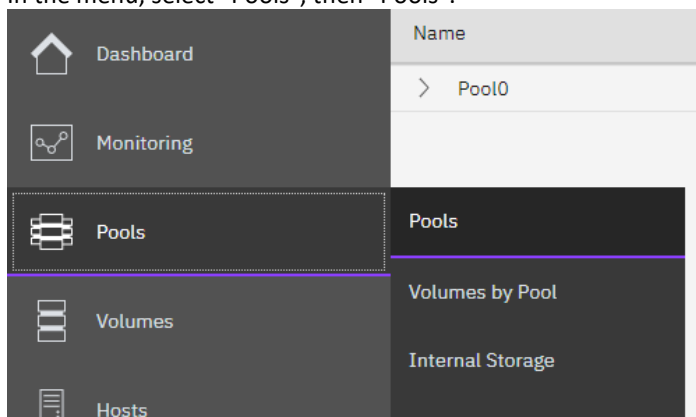
A temporary key can be provided for testing purposes.

11.4.2 Create a SafeGuard child Pool

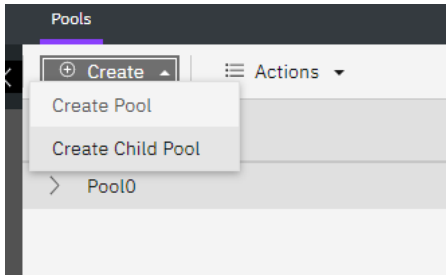
SafeGuarded copies must be made in a specific child pool on the disk array. This child pool must be defined using the array's graphical interface.

Login to the interface using a Superuser profile

In the menu, select "Pools", then "Pools".



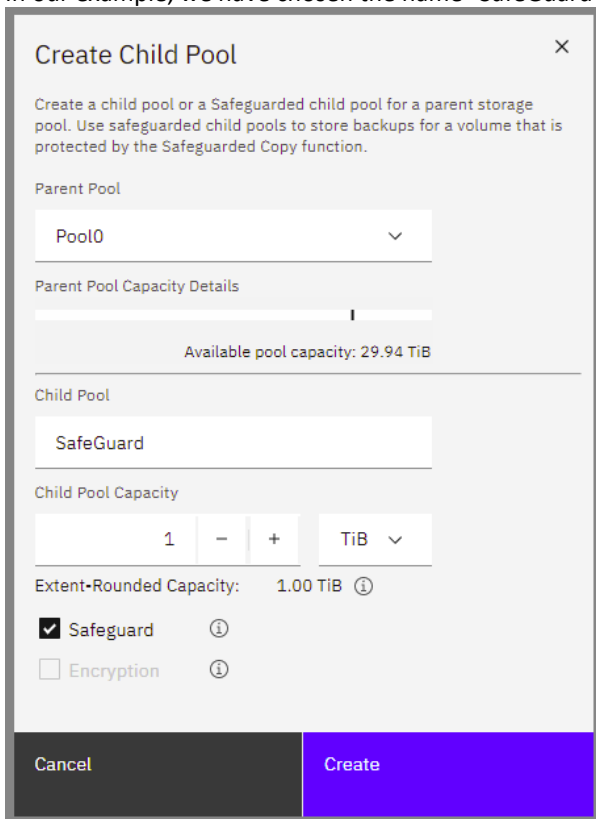
In the upper part of the screen, select "Create Child Pool".



Select the pool in which the child pool dedicated to SafeGuaded Copies should be created. The disks of the partitions to be protected must be in this pool.

Check the "Safeguard" box

In our example, we have chosen the name "SafeGuard", but this name is not mandatory.



Result:

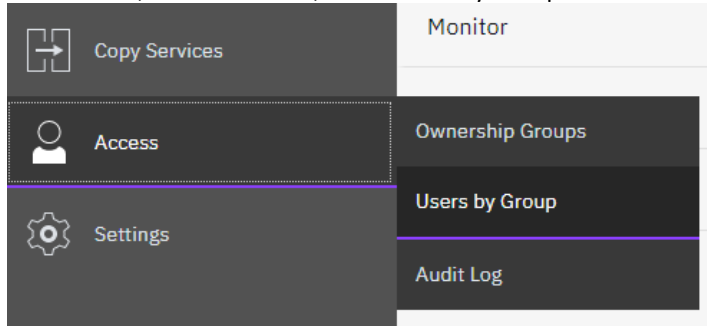
Pools	
Name	State
Pool0	✓ Online
SafeGuard	✓ Online

11.4.3 Modify the ssh connection profile

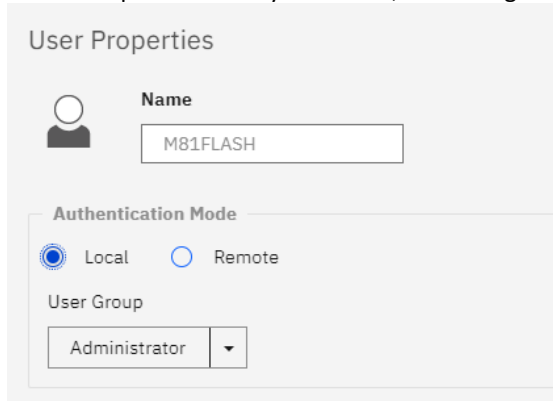
When defining FlashCopy, a profile was defined (in the chapter " 4.6 Configuring the Storwize system to accept remote operations " to allow the partition to access the array to trigger FlashCopies. This profile has been defined in the user group "Copy Operator".

But using the SafeGuard module needs to perform more operations, and requires this profile to be in the "Administrator" group.

In the menu, select "Access", then "Users by Group".



Select the profile used by Flash for i, and change the user group to Administrator.



11.4.4 Create a definition of type *SGC

In Flash for i, use the FLWRKSTG command to create a new *SGC type definition.

This definition contains the elements that will be required:

- IP address and user name to allow connection
- The host name as it is defined on the array (attention, this name is case sensitive)
- The name of the volume group that will be created for the disks of this host
- The name of the SafeGuard child pool
- The number of days of retention

The number of retention days is the number of days the copy will be kept.

The copy will be automatically deleted after this period.

11.4.5 Use the FLCHKSTG command to control

Once the *SGC type definition is created, all elements must be checked to ensure that the copy will go smoothly.

Use the FLCHKSTG command and indicate the name of the definition created.

This command will check or perform the following:

- Check that the SafeGuard Copy policy "Flash_for_i" exists on the array. If it does not exist, it will be created.
- Check that the specified disk group exists on the array. If it does not exist, it will be created
- Check that all disks of the host are in the volume group. If not, the disks will be added to the group.

The end message of the command should be FLA2410: "SafeGuarded Copy for definition XXXX is correct". If not, check the job log to determine where the errors are.

Ignore the messages "Alphanumeric representation of a numeric value in error".

11.4.6 Schedule the copies with the FLSTRSGC command

The triggering of the copies is not done automatically by Flash for i. It must be programmed by the user with the usual scheduler and at the time of his choice.

The command to use is FLSTRSGC. It performs the following operations:

- Check that the configuration is correct (FLCHKSTG command)
- Create a consistency group, and integrate a FlashCopy definition for all disks of the host
- Start FlashCopy for this consistency group.

11.5 FLSGC menu : Display commands for SafeGuarded Copy

Use GO FLSGC or option 16 of the main menu FLMENU to display the menu dedicated to SafeGuarded Copy.

The following menu is displayed:

```

FLSGC                               SafeGuarded Copy menu

Select one of the following:

Information and status commands
  1. List active Safeguarded copies      FLDSPSGC

Control commands
  11. Check active SafeGuarded copies   FLCHKSGC

Action commands
  21. Start a SafeGuarded Copy          FLSTRSGC
  22. Map disks to a host               FLMAHOST

Selection or command

====>

```

11.6 FLSTRSGC : Start a new SafeGuarded copy

The FLSTRSGC command starts a new SafeGuarded copy from the production partition.

The parameters of the command are as follows:

```

Start SafeGuarded Copy (FLSTRSGC)

Type choices, press Enter.

Storage definition . . . . . STG
  
```

Parameter Description:

STG = Specify the name of the storage definition of type *SGC to use

This command generates the following messages in return:

Message ID	Severity	Message text
FLA2421	0	SafeGuarded Copy successfully generated for &1
FLA0171	40	Definition of Storage &1 not found
FLA2401	40	Storage definition &1 is not of type *SGC
FLA2409	40	Errors when checking SafeGuarded Copy for definition &1
FLA2411	40	Error when creating consistency group &1
FLA2412	40	Error while creating clone disk &1
FLA2413	40	Error when defining FlashCopy for clone disk &1
FLA2414	40	Error when starting FlashCopy for consistency group &1
FLA2420	40	Error when generating a SafeGuarded Copy for &1

Use of the command :

This command must be used to trigger a new SafeGuarded copy.

The STG parameter must contain the name of a storage definition of type *SGC, defined using the FLWRKSTG command.

It should be scheduled by the user at the time and frequency of his choice on the partition whose disks are to be copied. For example, once a day at the same time as the FlashCopy backup starts, or every hour during the day. The frequency should be chosen according to the user's disk security goals.

It is important that it is used on the partition itself so that the contents of the memory are copied to disk first.

The command performs the following operations:

- Call the FLCHKSTG command to verify that all elements are present and correctly configured
- Create a consistency group and FlashCopy destination disks for each disk in the production partition
- Quiesce of the memory
- Start FlashCopy

The names of the elements created by this command are all prefixed by "F4i_SGC_".

Several connections to the array are made. The command can take several seconds.

The memory Quiesce (CHGASPACT command) is automatically performed for *SYSBAS and for all active iASPs on the partition, with the *FRCWTR parameter. This option allows not to freeze or block users' jobs.

The command can therefore be used during the day without major impact.

11.7 FLCHKSGC : Check that SafeGuarded copies are correct

The FLCHKSGC command is used to verify that SafeGuarded copies are made and are correct.

The parameters of the command are as follows:

```

Check SafeGuarded Assets (FLCHKSGC)

Type choices, press Enter.

Storage definition . . . . . STG
Minimum nb of active FC . . . . NBFC           1
Max duration since last FC (h)  MAXTIME       24
    
```

Parameter Description:

- STG = Specify the name of the storage definition of type *SGC to be checked
- NBSGC = Specify the minimum number of SafeGuarded Copies that must be active
- MAXTIME = Indicate the maximum number of hours since the last copy

This command generates the following messages in return:

Message ID	Severity	Message text
FLA2443	0	Ok, &1 SGC active for storage &2. Last SGC &3 hours ago on &4 to &5. NbActive=&1sgc LastSgc=&4hours
FLA2121	40	Unable to obtain data from storage &1.
FLA2401	40	The definition of Storage &1 is not of type *SGC
FLA2440	40	Error, &1 disks for SGC when there are &2 mapped to host. Storage &3, host &4, consistency group &5.
FLA2441	40	Error, &1 SGC active for storage &2. Smaller than the limit &3. NbActive=&1sgc LastSgc=&4hours
FLA2442	40	Error, last SGC performed &1 hours ago for &2 storage. Greater than the &3 hour limit. NbActive=&1sgc LastSgc=&4hours

Use of the command :

This command does not display any screen. The result of this command is a message that is sent back with the necessary information.

It uses the information contained in the storage definition passed in parameter, connects to this array to retrieve the necessary information, and then returns a message indicating this state.

Several connections to the array are made. The command can take several seconds.

Use this command to verify that SafeGuarded Copies are generated, that they are active and that the last copy was created recently.

The following items are automatically created on the disk array if they do not exist:

- The SafeGuarded Copy Strategy "Flash_for_i"
- The volume group
- The disks of the selected host are integrated into the volume group.

11.8 FLDSPSGC: Viewing active SafeGuarded copies

The parameters of the command are as follows:

This command has no parameter

Special consideration:

This command starts by searching for a lot of information that it needs to extract from the SVC array. These operations can take several seconds.

A first message is displayed on the screen to make you wait.

```
Please wait, loading data.
```

Using the F5 key will display the same waiting message, and will also last several seconds.

Use of the command :

The FLDSPSGC command provides a list of active SafeGuarded Copies for each storage definition of type *SGC. This allows you to verify that the copies are running and that they do not contain any errors.

For a better use of this command, it is recommended to configure a session in 132 columns.

```
FLDSPSGCST                               List of active GSCs                               M81FLASH
                                                                                               28/09/22 10:05:51

View from .                               Storage

Enter your options, then press Enter.

Opt  Storage  Host                               Consistency group                               Nb  -Flashcopy start-  Ret.
     Storage  Host                               Consistency group                               Dsk  Date      Time      Dur.
SGC_FLASH  M81_Flash  F4i_SGC_M81_Flash_2022-09-27-19.30  4  27/09/22  19:21:18  3
SGC_FLASH  M81_Flash  F4i_SGC_M81_Flash_2022-09-28-09.29  4  28/09/22   9:19:36  3
```

Bottom
F3=Exit F5=Refresh F12=Cancel

This screen shows a list of all active SafeGuarded copies for each definition of type *SGC.

The meaning of the columns is as follows:

Storage	Name of the *SGC type definition defined with the FLWRKSTG command.
Host	Name of the host as defined on the SVC array.
Consistency group	Name of the consistency group as generated when using the FLSTRSGC command
Nb Dsk	Number of disks belonging to this consistency group. It must correspond to the number of disks mapped on the host. If the number of disks is different from the number of disks mapped to the host, the value will be displayed in red, and an error message will appear at the bottom of the screen.
Start flashcopy	Date and time when the FLSTRSGC command was used.
Ret. Dur.	Number of retention days planned for this consistency group. After this number of days, the copy will be automatically stopped and the FlashCopy definitions will be deleted.

Controls performed :

The command performs several checks to validate that all copies are correct.

Number of disks

If the number of disks taken into account by the SafeGuarded copy is different from the number of disks mapped on the host, this number will be displayed in red and an error message will appear at the bottom of the screen.

Function keys

F3 = exit the screen

F5 = Refresh values

F12 = Exit the screen

11.9 FLMAPHOST, Map disks to a host.

The FLMAPHOST command maps disks resulting from a FlashCopy or SafeGuarded copy to a configured host on the disk array.

The command parameters are as follows:

```

Mapping disks to a host (FLMAPHOST)

Type choices, press Enter.

Storage definition . . . . . STG
Target host . . . . . TGTHOST

Action if disks already mapped   TGTUNMAP
Name SGC copy to use . . . . . SGCCOPY           *LAST
  
```

Description of parameters:

- STG Specify the name of the storage definition (FLWRKSTG) to be used. This definition must be of type *SVC or *SGC.

- TGTHOST Specify the name of the host to which the disks should be mapped. Use the host name as it is known in the disk array.
*DFT = Use the host name specified in the storage definition if it is of type *SGC (SafeGuarded Copy)

- TGTUNMAP Specify the action to take if disks are already mapped to the selected host.
*UNMAP = Disks already mapped to the selected host will be unmapped.
*CANCEL = If disks are already mapped to the destination host, the operation will be cancelled.

- SGCCOPY If the storage definition is of type SGC (SafeGuarded Copy), there may be several copies available for the same source disks. Indicate here which copy to use. The name of the consistency group used in the disk array must be specified. The consistency group name starts with F4I_SGC_. The FLDSPSGC command displays the list of existing copies.
*LAST = The last copy made will be used.

This command generates the following messages in return:

Message ID	Severity	Message text
FLA2531	0	Mapping disks from consistency group &1 on target host &2 performed properly.
FLA2537	0	Mapping disks from the SGC copy &1 on target host &2 performed properly.
FLA2538	0	Mapping disks on target host performed properly.
FLA2542	0	Mapping disks on target host &1 performed properly.
FLA0171	40	Storage definition &1 not found
FLA2411	40	Error when creating consistency group &1
FLA2412	40	Error when creating clone disk &1
FLA2413	40	Error when defining FlashCopy for clone disk &1
FLA2490	40	Unable to retrieve data for storage &1.
FLA2522	40	Error, *SELECT specified for the name of the SGC copy to use when the job isn't an interactive job.
FLA2523	40	Error, storage &1 is not of type *SGC, *SVC or *PROXY.
FLA2524	40	Error, *DFT specified for the target host when the storage &1 is of type *SVC.
FLA2525	40	Error, copy type *REMOTE specified for storage &1
FLA2526	40	Error, target host not found.
FLA2527	40	Error, unable to found the consistency group &1. Storage &2.
FLA2528	40	Operation cancelled, disks already mapped on target host &1.
FLA2529	40	Error while unmapping disk &1 of target host &2.
FLA2530	40	Error while mapping disk &1 on target host &2.

FLA2532	40	Error, *SELECT specified for the name of the SGC copy to use when the storage is of type *PROXY.
FLA2533	40	Error, *DFT specified for the name of the target host when no value is specified in the storage definition &1.
FLA2534	40	Error, *LAST specified for the name of the SGC copy to use when there is no SGC copy usable for the storage &1.
FLA2535	40	Error, SGC copy &1 not found.
FLA2536	40	Error while starting the FlashCopy.
FLA2539	40	Error while mapping disks on target host.
FLA2540	40	Error, target host &1 not found.
FLA2541	40	Error, unable to found the consistency group. Storage &1.
FLA2543	40	Error while mapping disks on target host &1.

Using the command:

The purpose of the FLMAPHOST command is to be able to automatically present (map) disks to a host, in order to start a partition. The command relies on a storage definition (managed with the FLWRKSTG command) which provides it with much of the necessary information:

- The IP address and profile to ssh to the disk array

For *SVC type definitions

- The name of the consistency group, which will allow to know the list of the target disks

For *SGC type definitions

- The list of SafeGuarded copies that have been generated.

The command is not compatible with other types of definitions.

Why use this command

For ***SVC type definitions** (usually used to make backups on a clone partition)

In some configurations, there are multiple source (or production) partitions, so multiple consistency groups to perform the FlashCopy, but only one clone partition. The disks from the first consistency group must be mapped to the clone partition to perform the backup, and then unmapped once the backup is complete so that the disks from the second consistency group can be used again.

For ***SGC type definitions** (SafeGuarded Copy)

Several safe copies are automatically generated at regular intervals. In case of a problem on the source partition (ransomware attack, data corruption, ...), these copies can be used to recover the system as it was a few hours or days before. The FLMAPHOST command allows to choose one of the secured copies, and to present the corresponding disks to a host in order to access the data.

As the disks contained in the SafeGuarded pool cannot be used directly by a partition, a FlashCopy will be created by the command. It is the target disks of this FlashCopy that will be mapped to the host.

This command does not start the partition. The partition must be IPLed either with the FLSTRLPAR command if the definition is of type *SVC, or from the HMC if the definition is of type *SGC.

For the *SGC type, it is strongly advised to do a manual IPL and to start only the console. Indeed, the copies created for SafeGuarded Copy are not prepared to modify the configuration at IPL time. The partition that will be started will have exactly the same characteristics as the production partition (name, IP address, automatic jobs, ...)

12 Add-on module: Proxy partition

When using the Flash for i product, the Production partition sends commands to the disk array (to start and stop the FlashCopy), and to the HMC (to start and stop the clone partition). These operations require that a connection is possible between these different elements.

In most cases, the infrastructure consists of a single network to which users, partitions, and infrastructure elements such as the disk array and HMC are connected.

But in the case of secure infrastructures or for MSPs (Managed Service Providers), it is not possible to give direct access between the partition and the infrastructure elements without creating a security risk.

This is the reason why this Proxy module was created.

12.1 Purpose

The objective is to ensure that users of the production partition (or source partition) have no way of accessing the infrastructure elements, while allowing the Flash for i product to start a FlashCopy or clone partition, without having direct access to the disk array or HMC.

To achieve this, a partition called PROXY will act as an interface between the source partition (the one on which Flash for i is to be used) and the infrastructure network.

12.2 How the Proxy Module Works

12.2.1 Prerequisites

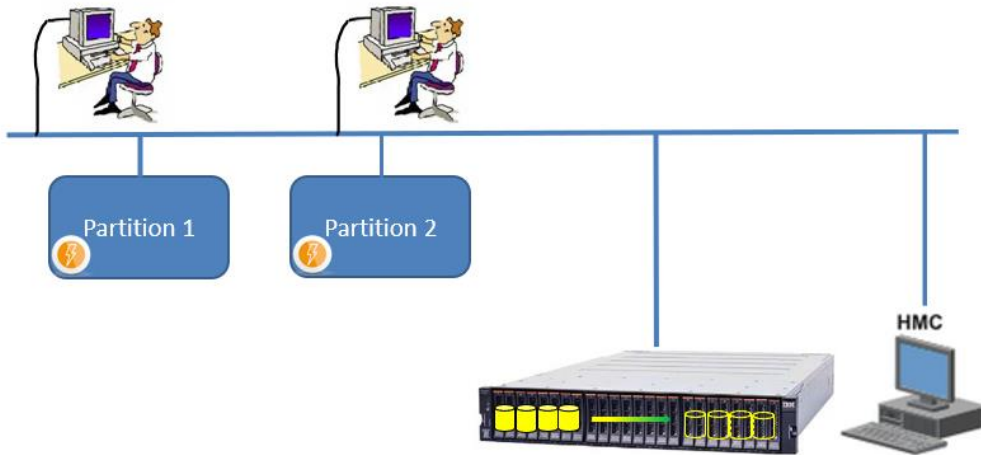
All partitions (the Proxy partition and all partitions that connect to the Proxy) must use at least version 5 of the Flash for i product.

12.2.2 Operation

The diagram below shows a typical network installation in a company.

- There is only one Ethernet network
- Users have access to IBM i partitions
- The infrastructure elements are located on the same network
- Flash for i, installed on the partitions, has direct access to the infrastructure elements

In this type of configuration, users can have direct access to the disk array or the HMC. The only protection for these elements is password protection.

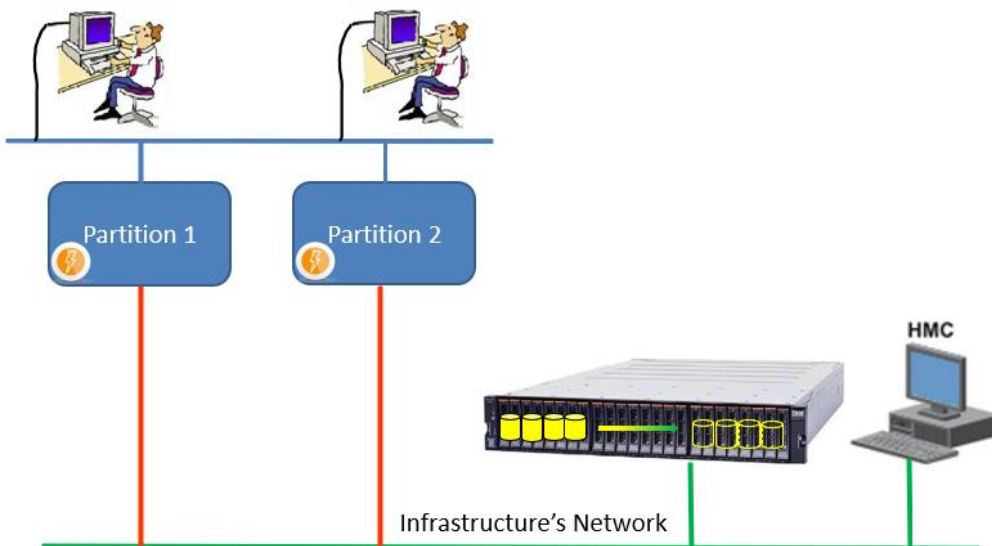


In companies with better security management, there are several networks

- A network to which users are connected (in blue), which gives them access to IBM i partitions
- A network dedicated to the infrastructure (in green) to which the disk array and the HMC are connected, and to which only administrators have access.

But Flash for i needs access to these elements. It is therefore necessary to connect the partitions to this infrastructure network (in red).

This poses a security problem, as an experienced and malicious user could use a session on the IBM i partition to connect to the infrastructure.



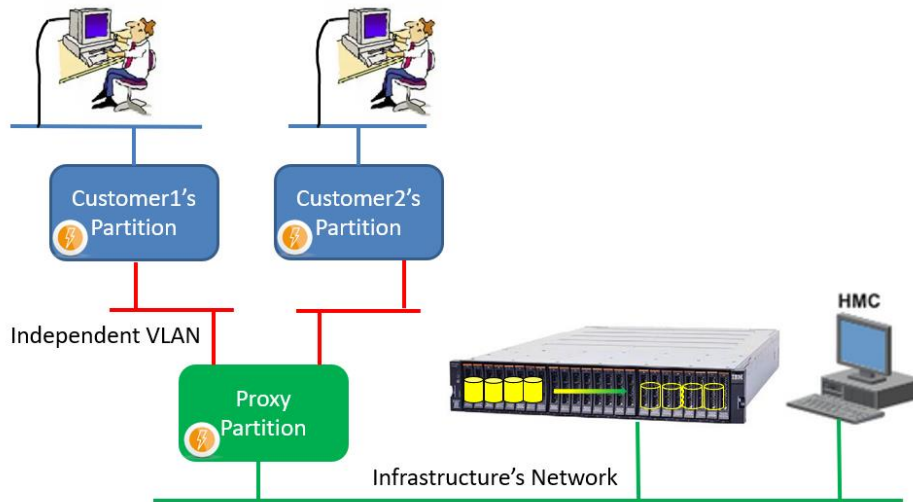
The Proxy module allows the separation of networks to be re-established by inserting an additional IBM i partition, which will be referred to as the "Proxy partition" in the following.

This module is particularly interesting for secure infrastructures or for MSPs (Managed Service Providers) who manage several partitions for several different clients.

In the diagram below:

- Each customer has its own user network (in blue), which has access to its IBM i partition
- The infrastructure network (in green) is completely isolated from the other networks. No user has access to it.
- The proxy partition is connected to this infrastructure network. The Flash for i product is installed on this partition and can start/stop the FlashCopy and Clones partitions.

- A VLAN (in red) connects each customer's partition to the proxy partition. There is one VLAN for each client partition, which ensures that no customer can connect to another customer's partition.
- The Flash for i product installed on the customer's partition sends its commands only to the proxy partition. It is the proxy partition that will perform the function.



12.2.3 Security

For better security, the proxy partition can be in a state close to restricted mode. TCP/IP is started, but only the port used by Flash for i is open.

No usual TCP/IP services (Telnet, FTP, ...) are started or accessible. A user with a session on one of the customer's partitions cannot connect to it.

The protocol used by Flash for i allows to use only the functions that are provided (start and stop FlashCopy and the clone partition), and for which an additional definition has been made on the Proxy partition.

Requests (FLCLONE commands, ...) used from the source partition send the request to the proxy partition, which validates if the requested function is allowed. Permissions must be entered with the FLWRKPROXY command.

At the end of the operation, a completion message is sent to the source partition. This message does not contain any information about the resource (no IP address or name)

12.3 The Proxy Partition

To use the Flash for i Proxy module, a specific partition is required, which will be used as an intermediary between the source partition and the infrastructure elements.

There are relatively few constraints on the characteristics of this partition.

12.3.1 Operating system and products

The IBM i system must be at least version 7.1.

There are no constraints on client partitions. They can be in any version from 7.1 onwards.

The Flash for i product must be installed on this partition, with the same prerequisites as for a classic installation.

No IBM products are required on this partition except those specified in the standard product requirements.

If it is only used for the Proxy function, it does not need many resources.

- Processors: 10% of a core minimum
- Memory: 4 GB minimum
- Disks: a few GB for Flash for i

These specifications can be increased for better response times if a large number of source partitions are using the same proxy partition simultaneously.

The Proxy module has been designed to improve security and ensure that users have no access to the infrastructure. Therefore, it is advisable to dedicate this partition to the Proxy function of Flash for i, and not to use it for other functions.

But this is not a requirement. The proxy partition can be used for other applications. In this case, everyone is responsible for managing the security set up.

Two modes of use and configuration are proposed below.

12.3.2 Usage Mode 1: Proxy Partition in Restricted Mode

This is the most secure mode for the Proxy partition.

In this mode, the Proxy partition is not really in restricted mode, but almost. It is totally dedicated to the Flash for i Proxy function, and the only active subsystems are those of Flash for i:

- QCTL = Control subsystem
- FL_PROXY = Subsystem containing the job that will receive requests from other partitions
- FLASH4I = for the internal processing of the product.

The advantages are as follows:

- The partition configuration is very simple
- This guarantees that no user of the source partitions will have access to the Proxy partition, and therefore no access to the infrastructure either

Disadvantages:

- Interactive access by the operations team can only be done via the console, with a session length of 80 characters instead of 132 characters.
- This limits access to one person at a time.

To configure this type of partition, specify the program FLASH4I/FLPRXSTRUP in the system value QSTRUPPGM.

The source of this program is delivered in the FLASH4I/FLEXAMPLES source file to be adapted if necessary.

If this program is modified, it must be compiled in a library other than FLASH4I. Otherwise, it will be removed in the next product upgrade.

```

/* ***** */
/*
/*      System StartUp program for the PROXY partition
/*
/* This program is an example of StarUp program to use on a
/* PROXY partition, if it must stay in "restricted mode"
/*
/* Enter this program in the system value QSTRUPPGM
/*
/*
/* The goal is to start only the subsystems that are necessary
/* for Flash for i on a PROXY partition.
/*
/* ***** */

```

```

PGM

DCL          VAR(&PRX_ROLE  ) TYPE(*CHAR) LEN(5)

/* ***** */
/*                                               */
/*  Initialisation                               */
/*    Redirect the spools to FLASH4I OUTQ, to get the JOBLOG in  */
/*    case of error.                               */
/* ***** */

ADDLIBLE    LIB(FLASH4I) POSITION(*FIRST)
MONMSG      MSGID(CPF0000)

CHGJOB      JOB(*) OUTQ(FLASH4I)
MONMSG      MSGID(CPF0000)

/* ***** */
/*                                               */
/*  Check that the partition role is "PROXY"      */
/*                                               */
/* ***** */

RTVDTAARA   DTAARA(FLSTS (240 5)) RTNVAR(&PRX_ROLE)

IF          COND(&PRX_ROLE *NE 'PROXY') THEN(DO)
  FLADDLOG   TYPE(ERR) CLONENBR(*NONE) MSGID(FLA8001) +
             MSGDTA('FLPRXSTRUP') GRAV(90)
  SNDPGMMSG  MSGID(FLA8001) MSGF(FLMSGF) +
             MSGDTA('FLPRXSTRUP') MSGTYPE(*ESCAPE)
  GOTO       CMDLBL(ENDPGM)

ENDDO

/* ***** */
/*  The partition type is PROXY                   */
/*  TC/IP started automatically:  CHGIPLA STRTCP(*YES)  */
/*  We force QSYSWRK and QHTTPSVR to stop because they start  */
/*  automatically. The goal is to have no IP services active.  */
/* ***** */
ENDSBS      SBS(QSYSWRK) OPTION(*IMMED)
MONMSG      MSGID(CPF0000)
ENDSBS      SBS(QHTTPSVR) OPTION(*IMMED)
MONMSG      MSGID(CPF0000)

/* Wait to be sure SBS are stopped.                */
DLYJOB      DLY(10)

/* Stop the subsystems again, in case the program would have been
*/
/* too fast, and the previous stop would have been done before the
*/
/* actual start of the SBS.
*/

ENDSBS      SBS(QSYSWRK) OPTION(*IMMED)

```

```

MONMSG      MSGID(CPF0000)
ENDSBS      SBS(QHTTPSVR) OPTION(*IMMED)
MONMSG      MSGID(CPF0000)

/* ***** */
/* Start TCP/IP at minimum. */
/* ***** */
      STRTCP      STRSVR(*NO) STRIFC(*YES) STRPTPPRF(*NO) +
                STRIP6(*NO)
MONMSG      MSGID(CPF0000)

      DLYJOB      DLY(10)

/* ***** */
/* Start both subsystems of Flash for i. */
/*      FL_PROXY and FLASH4I */
/* ***** */
      STRSBS      SBSD(FL_PROXY)
      MONMSG      MSGID(CPF0000)

      STRSBS      SBSD(FLASH4I)
      MONMSG      MSGID(CPF0000)

/* ***** */
/* First message to say we are on a PROXY partition */
/* ***** */
      FLADDLOG    TYPE(INF) MSGID(FLA8002) GRAV(00)
      MONMSG      MSGID(CPF0000 FLA0000)

ENDPGM:

      ENDPGM

```

12.3.3 Usage Mode 2: Proxy Partition in Open Access

The Proxy partition does not have to be dedicated to this function. It can be used for other functions. In this case, specific security management is required, including checking that users connected to the source partitions are not able to connect, for example by using a firewall.

If a firewall is used to secure access between the source partitions and the proxy partition, IP port 7358 must be open.

In this mode, the Proxy partition is configured in the standard way and several subsystems are started, including for example the usual subsystems (QSYSWRK, QSERVER, QINTER, ...). The following subsystems must be added:

- FL_PROXY = subsystem containing the job that will receive requests from other partitions
- FLASH4I = for the internal processing of the product.

The advantages are as follows:

- Any partition with access to the infrastructure network can be used for the proxy function
- Interactive access by the operations team can be done with a classic 5250 session.

Disadvantages:

- There is still a security risk as users on the source partitions can potentially Telnet or FTP into the Proxy partition and then attempt to find a user profile.

- This risk must be managed.

12.3.4 Installing the Flash for i Proxy Function

Regardless of how the proxy partition is used, the installation, configuration and use of the proxy function will be the same.

The Flash for i product must be installed in the usual way and must be activated with a standard license key.

Then perform the following steps.

Indicate that it is a Proxy partition

CHGDTAARA DTAARA(FLSTS (240 5)) VALUE('PROXY')

Specific license key

There must be the base license key for Flash for i, and the specific license key for the 'Proxy' module
Use the FLWRKKEY command to check that these 2 keys are present

```

FLWRKKEY                                Work with license keys                                PROD
                                                                                               29/12/22 19:31:14

Serial nb . . . 7830081                Partition nb . . . . 10
Version . . . V04                      Generation date . . 2022/11/07

Enter your options, then press Enter
The following list gives the license keys for product Flash for i.
They will be used in this order for the controls.

Seq.                                     If *TEMP
Num License key                         Type  Option  Val. date
10 094105 192727 730024 215272 834950 561544 139264 *PERM SafeGuarde
20 188210 385423 660048 426878 510081 123498 278527 *PERM Proxy
30 250947 180395 280064 528946 497501 494464 371369 *PERM Base
40 108809 749666 550032 953584 110170 935896 162706 *ERROR
  
```

Note :

If the SafeGuarded Copy function is to be used on one or more source partitions via the Proxy partition, then a key for this function is required on the Proxy partition as well.

Automatic start of subsystems

Make sure that the FL_PROXY and FLASH4I subsystems are always started.

Setting the allowed operations via the Proxy partition

A specific menu for the proxy function is available:

GO FLPROXY

Define the operations that the source partitions can request:

- Create a Storage (FLWRKSTG command) or LPAR (FLWRKLPAR command) definition
- Test the correct operation of these definitions with FLCHKSTG or FLCHKLPAR
- Specify which source partition will be able to use these definitions with the FLWRKPROXY command

- On the source partition, modify or create the Storage or LPAR definition to indicate that it is of type *PROXY, and indicate the name entered with the FLWRKPROXY command

12.3.5 The rsa key for ssh connections, or certificates

When installing the Flash for i product, the FLINIT command automatically creates an rsa key that will be used for all ssh connections from the partition.

If the proxy function is used,

- The rsa key generated on this partition will be used for the ssh connection on the disk array and the HMC.
- The rsa keys generated on the source partitions are no longer used for storage or LPAR definitions of type *PROXY. When installing Flash for I on the source partitions use the command FLINIT RSAKEY(*NONE)

If the connection to the disk array is made using https, the certificates used will also be those of the Proxy partition.

12.3.6 FL_PROXY Subsystem

The FL_PROXY subsystem must be permanently active on the Proxy partition (only on the Proxy partition). It must contain the FL_AGENT job. It also contains 3 pre-started jobs which are responsible for handling commands sent from the source partitions.

If the FL_AGENT job is not active after the FL_PROXY subsystem has been started, use the FLDSPLOG command to see any error messages.

It is advisable to program an automatic start of this subsystem by adding the STRSBS SBSDFL_PROXY command to the system startup program (system value QSTRUPPGM)

The FL_AGENT job uses threads and pre-started jobs.

- The number of threads is limited to about 200,000 per job.
- The number of pre-started jobs the agent can use is limited to about 50,000.

In most installations, these maximums are reached after several weeks or months. But in some cases with very large numbers of requests, this limit can be reached quickly.

When the number of threads reaches 150,000 or the number of pre-started jobs reaches 30,000, an automatic stop/restart of the FL_AGENT job will be performed at the time specified by the PRX_RESTR parameter. It is advisable to specify a time in this parameter when there is no cloning request.

If the number of threads exceeds 190,000 or the number of pre-started jobs exceeds 49,000 before the time specified in the PRX_RESTR parameter is reached, the job will still stop to restart, regardless of the time.

12.3.7 Communication between the source and proxy partitions

Communication between the source and proxy partitions is done using port 7358. This port must not be blocked by a firewall.

The only data allowed during the exchanges between the 2 partitions are internal commands for:

- Start or stop a Flash Copy
- Start or stop a clone partition
- Get the status of the FlashCopy or the clone partition

- Manage the SafeGuarded Copy function

No other operations are possible using this port.

12.4 Clone partitions

There are no changes regarding the configuration of clone partitions. They remain connected to the source partition for transferring histories

Clone partitions have no contact with the proxy partition.

12.5 Network Configuration

The purpose of the Proxy partition is to act as an intermediary between the infrastructure network (the one on which the disk array and the HMC are connected), and the source partitions.

Access to the infrastructure network

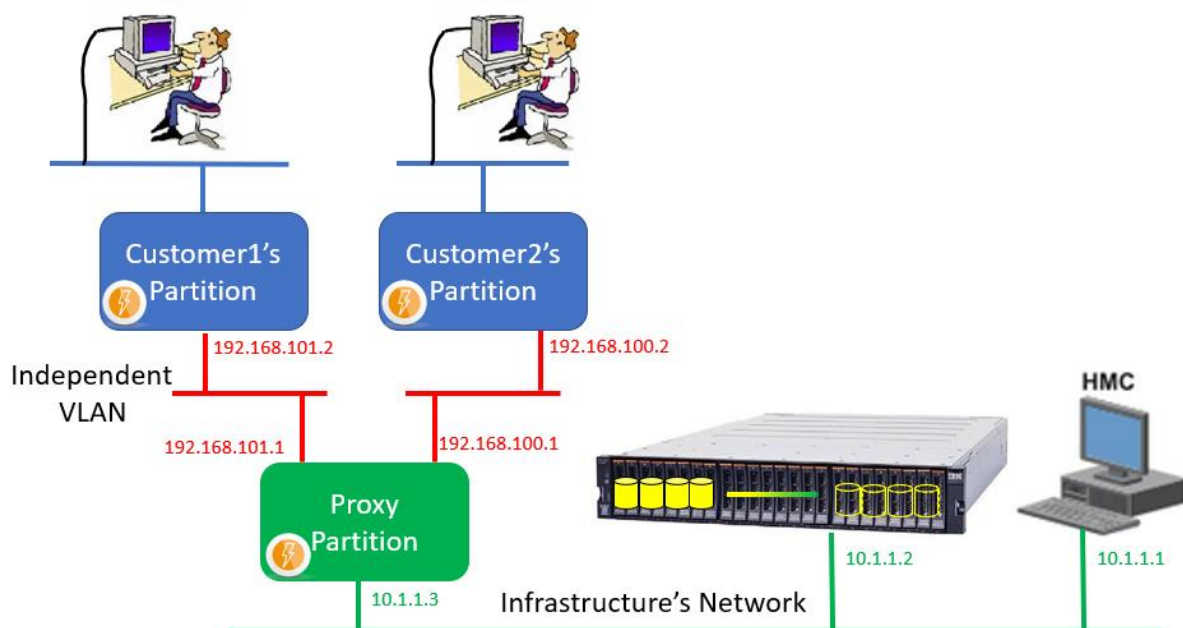
The source partitions must not be connected to the infrastructure network. Only the Proxy partition.

On the Proxy partition, use an Ethernet port to connect the partition to the infrastructure network, and assign it an IP address.

Connecting between the source and proxy partitions

The most secure option is to define a different VLAN for each source partition. This VLAN will only be connected to a source partition on the one hand, and to the proxy partition on the other.

The diagram below shows an example of this type of configuration.



If the source and proxy partitions are on the same Power server, the internal virtual network can be used to create these independent VLANs.

Communication between the source and proxy partitions is done using port 7358 only.

12.6 Using Flash for i with the Proxy Module

When Flash for i is used in the conventional way (without the Proxy function), the following must be done on the source partition:

During product installation (one time only):

- Generate an rsa key for the ssh connection. (Created automatically by the FLINIT command)
- Configure the disk array and the HMC to use this key.

For each clone partition:

- Create a storage definition (FLWRKSTG) and verify that access is operational (FLCHKSTG)
- Create a clone partition definition (FLWRKLPAR) and verify that access to the HMC is operational (FLCHKLPAR)
- Create one or more environment definitions
- Start cloning with the FLCLONE command

With the Proxy function, the source partition no longer has direct access to the disk array and HMC. Some of these elements are deported to the Proxy partition.

The sequence to use is as follows:

On the Proxy partition:

During the installation of the product (only once):

- Generate an rsa key for the ssh connection. (Created automatically by the FLINIT command)
- Configure the disk array and the HMC to use this key.

For each clone partition:

- Create a storage definition (FLWRKSTG) and verify that access is operational (FLCHKSTG)
- Create a clone partition definition (FLWRKLPAR) and verify that access to the HMC is operational (FLCHKLPAR)
- Use the FLWRKPROXY command to specify which source partition will be authorized to use these definitions

On the source partition:

- Create a storage definition (FLWRKSTG) by specifying the *PROXY type, and the name of the definition created above, then verify that access is operational (FLCHKSTG)
- Create a clone partition definition (FLWRKLPAR) by specifying the *PROXY type and the name of the definition created above, then verify that access to the HMC is operational (FLCHKLPAR)
- Create an environment definition
- Start the cloning with the FLCLONE command

How the commands work

The following commands must access the disk array or HMC.

- FLCLONE
- FLSTRFC
- FLENDFC
- FLCHKSTG
- FLSTRLPAR
- FLENDLPAR
- FLCHKLPAR

On the Proxy partition, these commands have direct access to resources. Therefore, they are used in the usual way.

On a source partition that does not have direct access to resources, the STG and LPAR definitions were created with the *PROXY type. The following sequence is performed:

- The command connects to the proxy specified in the STG or LPAR definition using port 7358.
- The Proxy checks that the source partition is allowed to use the definition (entered by the FLWRKPROXY command)
- The same command is used on the Proxy partition
- The resulting messages are sent to the product's internal log, and can be viewed with the FLDSPLOG command
- At the end of the operation, an end message is sent to the source partition. This message does not contain any information about the resource (no IP address or name)

Note that on the Proxy partition, the FLDSPHST command does not contain any information about the commands sent by the source partitions.

12.7 FLPROXY Specific Menu

The GO FLPROXY command displays the menu specific to the Proxy function.

The menu displayed is the following:

```

FLPROXY                Flash for i, Work with Proxy server

Select one of the following:

    1. Work with Proxy authorizations      FLWRKPROXY
    2. Work with storages                   FLWRKSTG
    3. Work with partitions                 FLWRKLPAR

   10. Display Proxy log                   FLDSPLOGPX
   11. Display Flash for i log             FLDSPLOG

   90. Sign off

Selection or command

====>

```

This menu displays the commands that are to be used on the proxy partition.

The FLWRKSTG, FLWRKLPAR and FKDSPLOG commands are the standard Flash for i product commands. They must be used for defining storage or clone partitions that will be used by the proxy partition, or for viewing messages.

The FLWRKPROXY command is specific to the proxy partition, to indicate which source partition is allowed to use the proxy partition.

12.8 FLWRKPROXY, Work with Proxy authorizations

The FLWRKPROXY command allows you to define which source partitions will be allowed to use the Proxy partition, and which resource they will have access to.

The command parameters are as follows:

This command has no parameters.

Using the command:

The command is used to create, modify or delete the Clone partitions definitions, i.e.: information that will be necessary to connect to the HMC and start or stop the Clone partitions. Those definitions will be used in the Environments definitions.

The command displays the following screen:

```

FLWRKPROXY                                Work with Proxy authorization                                PROXY
                                                                                               30/12/22 09:16:25

Position to . . . . .                      Partition name

Enter your options, then press Enter
  2=Change  3=Copy  4=Delete  5=Display

----- Partition -----
Opt  Name      Serial Nb  Nb  Type  Definition  Description
M81FLASH  7830081    5   *LPAR LPAR_CLN  M81FLASH can use this PROXY for
M81FLASH  7830081    5   *STG  SGC_FLASH M81FLASH can use this PROXY for
M81FLASH  7830081    5   *STG  STG_CLN  M81FLASH can use this PROXY for
PROD      7830081   10  *LPAR PROD_LPAR1 M81 Production partition clone
PROD      7830081   10  *LPAR PROD_LPAR2 M81 Production partition clone
PROD      7830081   10  *STG  PROD_STG1 M81 disks backup clone 1
PROD      7830081   10  *STG  PROD_STG2 M81 disks backup clone 2

                                                                                               End

F3=Exit  F5=Refresh  F6=Create  F12=Cancel
  
```

This screen provides the list of definitions which have already been defined. The definitions are sorted alphabetically by source partition name, then by serial number and partition number.

The columns have the following meanings:

- Name = Name of the source definition
- Serial number = Serial number of the source partition
- Nb = Partition number of the source partition

- Type = Type of configuration
 - *STG = Storage type definition (FLWRKSTG command)
 - *LPAR = Clone Partition Type Definition (FLWRKLPAR command)
- Description = Free text describing the definition

Possible inputs:

Position to
Used to specify which partition name must be displayed first

Options:

Option 2 = Change
Used to change the specified definition.

Option 3 = Copy
Used to copy the specified definition. The resulting screen will be similar to the definition creation screen

Option 4 = Delete
Used to delete the specified definition.

Option 5 = Display
Used to display definition

Function keys

F3 = Exit the screen

F5 = Update the values

F6 = Create a new definition

F12 = Exit the screen

12.8.1 Creating, changing, copying or displaying a definition

From the main FLWRKPROXY command menu, using the F6 key or options 2, 3 and 5 displays the following screen.

If option 5 = display is used, no information can be changed.

If option 3 is used, it is like when creating a definition, but all the fields are initialized with the values of the selected definition.

Function keys

F3 = exit the requested function and return to the list of definitions

F5 = Reset the values to what they were at the start.

F12 = Exit the requested function and return to the list of definitions

Screen: Create a proxy authorization definition

Pressing the F6 key displays a first screen.

Enter the information and press Enter.

The next screen depends on the type indicated (*LPAR or *STG)

```

09:34:09
30/12/22

Enter your options, then press Enter

Source partition
Partition name . . . . . PROD          Name
Serial number . . . . . 7830081
Partition number . . . . . 10

Description . . . . . M81 Production partition clone 1
Type . . . . . *LPAR          *LPAR, *STG

End

F3=Exit  F4=List  F5=Refresh  F12=Cancel

```

Source Partition:	Information about the source partition, which will be allowed to send commands to the proxy partition.
Partition Name	Specify the name of the source partition
Serial Number	Specify the serial number of the source partition
Partition Number	Specify the partition number of the source partition
Description	Text describing the definition
Type	Specify the type of resource the partition will be allowed to use. *LPAR = The next entry will contain a clone partition definition *STG = The next entry will contain a Storage type definition.

Screen: Type *LPAR Proxy Authorization Definition

If type *LPAR was specified in the previous screen.

```

FLWRKPROX2          Change a proxy authorization          PROXY
30/12/22 09:34:09

Enter your options, then press Enter

Source partition
Partition name . . . . . PROD          Name
Serial number . . . . . 7830081
Partition number . . . . . 10

Description . . . . . M81 Production partition clone 1
Type . . . . . *LPAR          *LPAR, *STG

Definition on Proxy
Name of partition def . . PROD_LPAR1 LPAR_CLN, PROD_LPAR1, ...
Description . . . . . Partition for Backup
Clone part. name on HMC . Demo_CLONE1

```

End

F3=Exit F4=List F5=Refresh F12=Cancel

Definition on Proxy
Name of partition def Specify the name of the clone partition definition that the source partition will be allowed to use. The definition must have been previously entered on the proxy partition with the FLWRKLPAR command. Press F4 to see a list of existing definitions.

Screen: Type *STG Proxy Authorization Definition

If type *STG was specified in the previous screen.

```

FLWRKPROX2                Change a proxy authorization                PROXY
                                                                    30/12/22 09:34:09

Enter your options, then press Enter

Source partition
Partition name . . . . . PROD                Name
Serial number . . . . . 7830081
Partition number . . . . . 10

Description . . . . . M81 Production partition clone 1
Type . . . . . *STG                *LPAR, *STG

Definition on Proxy
Name of storage definition PROD_STG1     PROD_STG1, PROD_STG2, ...
Description . . . . . Disks for backup
Consistency group . . . . CLONE1

                                                                    End

F3=Exit    F4=List    F5=Refresh    F12=Cancel
  
```

Definition on Proxy
Name of storage definition Specify the name of the storage definition that the source partition will be allowed to use. The definition must have been previously entered on the proxy partition with the FLWRKSTG command. Press F4 to see a list of existing definitions.

12.9 FLDSPLOGPX, Display Proxy Specific Messages

The FLDSPLOGPX command is identical to the FLDSPLOG command, but it displays messages that are specific to the PROXY function.

These messages are those that contain information about operations that have been requested by other partitions, and potentially contain confidential information such as IP addresses or names used on the disk array or HMC. These messages are available on the proxy partition and are not sent to the partition that made the request.

These messages also provide a history of all operations requested via the proxy function.

13 Add-on module: DRP

13.1 Purpose

In cases where a backup infrastructure has been set up with 2 Data Centers, 2 disk arrays, 2 servers, and a Metro or Global mirror link between the 2 sites to replicate data, several operations need to be carried out in the event of a serious incident on the production infrastructure to start up the backup partition.

The aim of the Flash for i DRP module is to automate a large proportion of these operations.

These definitions, and the use of the FLSTRDRP command, must be carried out on an independent partition located on the backup site. If the definitions are made on the production partition, they will not be usable in the event of a serious incident on the production itself.

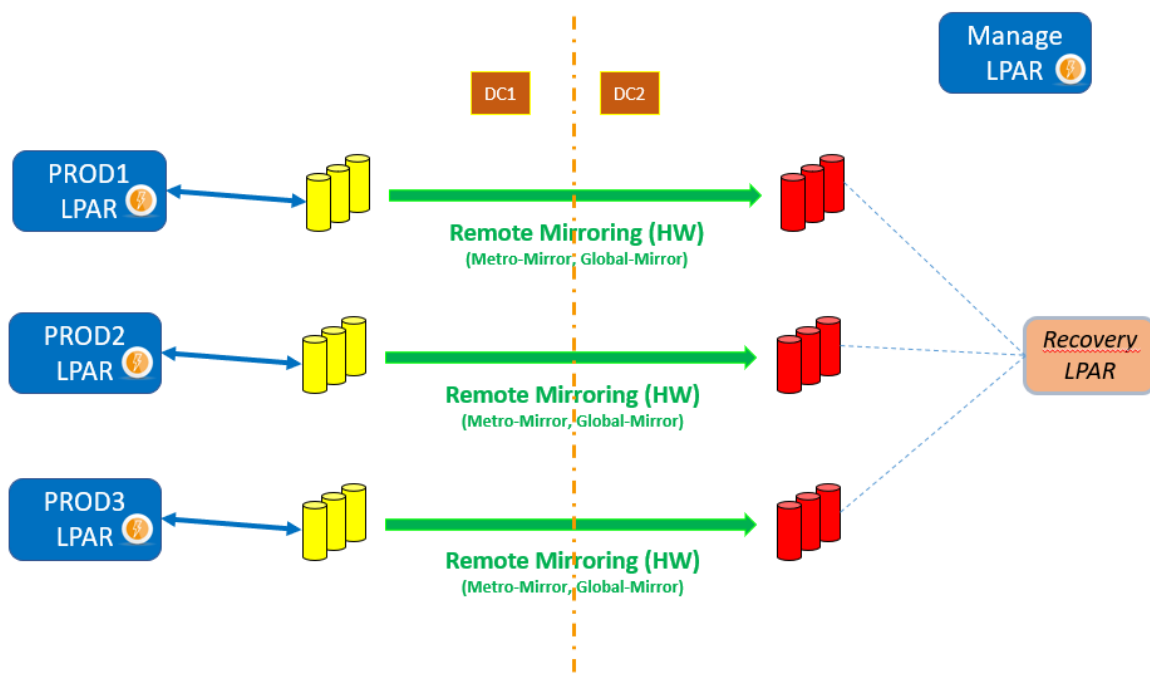
Replication between the 2 sites must be Metro Mirror, Global Mirror or Global Mirror with Change volumes only. Activation of the backup plan with software replication products is based on a different model and is not supported by this module.

This module only supports IBM SVC, Storwize or FlashSystem arrays.

This module requires a specific activation key.

13.2 DRP module operating principle

The diagram below shows an infrastructure containing 2 Data Centers. DC1 hosts the production partitions, and DC2 hosts the backup partitions.



Production partitions

The partitions shown in blue are operational. In normal phase, these are the production partitions and are located in DC1.

The Management partition

An additional partition called "Manage LPAR" is operational and Flash for i is installed. It will drive the DRP. It must be located in DC2 so that it can access the infrastructure elements located there (HMC and disk array) if there is a problem in DC1.

All the definitions seen in this chapter must be made on this partition.

It is advisable to create a user profile with the necessary rights to trigger a DRP, and which directly displays a menu dedicated to the DRP, to enable a DRP to be triggered very quickly. Use for example the menu FLDRP provided with Flash for i. This menu contains only the necessary commands for the DRP module.

Data replication

Data is replicated between the 2 DCs using Metro mirror or Global mirror (green links in the diagram). This link must be in the "Consistent synchronized" state for DRP to be activated.

Virtual disks

The production disks (in yellow on the diagram) are used by the production partitions. They are located in the DC1 disk bay.

Backup disks (in red on the diagram) are managed by replication; they cannot be used as long as replication is active. They are in the DC2 disk array.

Backup disks must not be mapped to a partition, except possibly to the recovery partition.

The recovery partition

This partition is defined in a server located in the DC2. It must be fully defined and ready for use (definition on the HMC, zoning, host definition in the disk array).

It is essential to have tested and validated that this partition can IPL, using a set of test disks in the DC2 disk array.

This partition must not have any mapped disks. It must be stopped before it can be used with the Flash for i DRP function.

13.3 Disclaimers

The purpose of the Flash for i DRP module is to automate the activation of a backup plan based on the use of Metro Mirror or Global Mirror of all the disks in a partition.

It is the user's responsibility to validate that this type of configuration is suitable in terms of RPO and RTO, and in terms of the stability of this type of DRP.

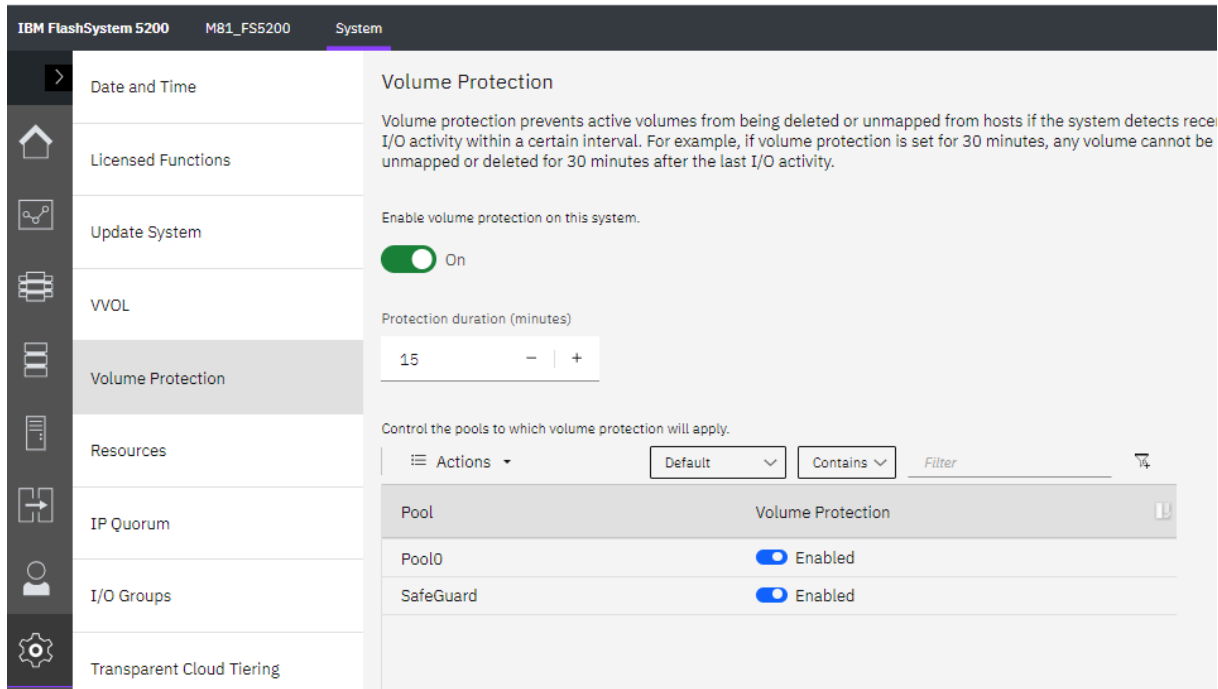
M81 cannot guarantee that the recovery partition can IPL in all cases.

In order to activate a backup plan with this type of configuration, replication must be in one of the following states:

consistent_copying
consistent_stopped
consistent_synchronized
idling
idling_disconnected
consistent_disconnected

Finally, if the recovery partition is being used with other disks when the recovery plan is triggered (to test another partition, for example), these disks will have to be unmapped before the target disks in the consistency group can be mapped. However, depending on the configuration of the disk array, there may be an incompressible delay before this operation can be carried out.

Check the "Volume protection" parameter.



13.4 Definitions to be made

Several elements must be defined in the Flash for i DRP module.

13.4.1 Definition of metro / Global Mirror

FLWRKSTG command

```

FLWRKSTG2                Change Storage definition                M81FLASH
                                                                    10/08/23 16:28:30

Enter your options, then press Enter

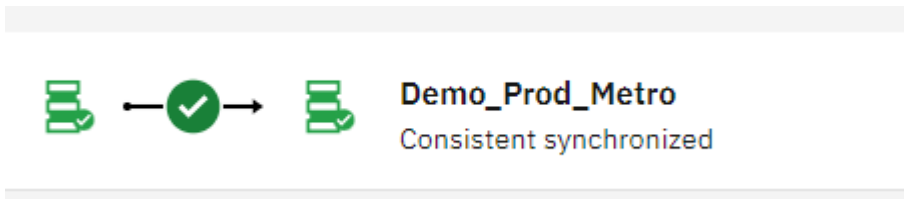
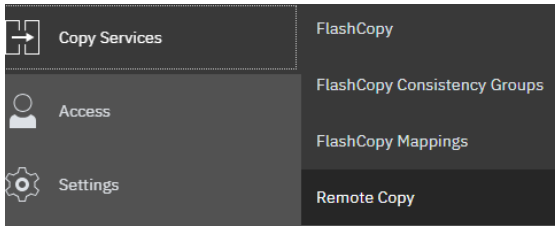
Storage definition name . . . MIROR_PROD Name
Storage description . . . . Metro mirror of PROD form DC1 to DC2
Type of storage . . . . . *SVC *SVC *DS8000 *SPECIF *VMAX_HTTP
                                                                    *SGC *PURESTG *UNITY *PROXY

Information about storwize
Controller 1:
  IP Address or Name . . . . 10.43.43.57 ← 1
Controller 2:
  IP Address or Name . . . .
User . . . . . M81FLASH
Disk consistency group . . . Demo_Prod_Metro ← 2
Copy type . . . . . *REMOTE ← 3 *FLASHCOPY, *REMOTE
                                                                    End

F3=Exit  F5=Refresh  F12=Cancel  F22=Full area
  
```


1: IP address or name of the backup disk array. This must be accessible in the event of a problem in the production DC.

2: Name of the Metro / Global mirror consistency group on the backup disk array.



3: The type must be *REMOTE

13.4.2 Recovery partition definition

FLWRKLPAR command

```

FLWRKLPAR2                Change partition definition                M81FLASH
                                                                    10/08/23 16:34:59

Enter your options, then press Enter

Partition definition name . RECOVERY      Name
Partition description   . . . Recovery partition on DC2
Partition type . . . . . *HMC            *HMC, *NOVALINK, *PROXY

Information about HMC1
  IP Address/Name HMC1 . . . m81hmc ← 4
                                                                    ...
  User HMC1 . . . . . M81FLASH

Information about HMC2
  IP Address/Name HMC2 . . .
                                                                    ...
  User HMC2 . . . . .

                                                                    More...

F3=Exit  F5=Refresh  F12=Cancel  F22=Full area
  
```

```

FLWRKLPAR2                Change partition definition                M81FLASH
                                                                    10/08/23 16:36:38

Enter your options, then press Enter

Partition definition name . RECOVERY      Name
  
```

```

Partition description . . . Recovery partition on DC2
Partition type . . . . . *HMC          *HMC, *NOVALINK, *PROXY

Information about clone partition
POWER name on HMC . . . . Server-9009-41G-SN7830081

Clone part. name on HMC . Demo_Prod_RECOVERY ← 5
Partition profile . . . . default_profile
... *LASTUSED, Name

End

F3=Exit  F5=Refresh  F12=Cancel  F22=Full area

```

4: IP address or HMC name of the backup DC. This must be accessible in the event of a problem in the production DC.

5: Name of the recovery partition as defined on the HMC.

13.4.3 DRP definition

FLWRKDRP command

```

FLWRKDRP2          Change disaster recovery plan definition          M81FLASH
                                                            10/08/23 16:39:20

Enter your options, then press Enter

Definition name . . . . . DRP_PROD      Name
Description . . . . . DRP for PROD partition
Mandatory confirmation . . *YES        *YES, *NO

Remote storage related information
Storage definition . . . . MIROR_PROD  MIROR_PROD, REMOTE, ... ← 6
Map disks . . . . . *YES            *YES, *NO
Destination host . . . . . recovery_Host ← 7

Recovery partition related information
Start Recovery partition . . . . . *NORMAL, *MANUAL, *NO
LPAR definition . . . . . RECOVERY ← LPAR_PRX, M81-CLONE1, ... ← 8

End

F3=Exit  F4=List  F5=Refresh  F12=Cancel

```

6: Name of the storage definition created with the FLWRKSTG command for the Metro /Global Mirror

7: Name of the recovery host as defined in the disk array. If *YES is entered for the parameter “Map disks”, then the target disks will be mapped to this host. If *NO is entered, then the disks must be mapped previously.

8: Name of the recovery partition definition created with the FLWRKLPAR command.

13.5 Operation in "normal" phase

In "normal" phase, i.e. when no DRP is active, the situation should be as follows:

- The production partitions are active in DC1
- The Metro / Global mirror is active and in the "Consistent synchronized" state
- The backup partition is defined in a server in DC2. It is stopped and no disk is mapped to this partition
- The management partition is started in DC2. All definitions are ready.

Warning

Remote Copy must be in one of the following states

- consistent_stopped
- consistent_synchronized
- consistent_copying
- idling
- idling_disconnected
- consistent_disconnected

If the Remote Copy state is in any other state, **it is impossible to stop Remote Copy and use the disks.** The following sequence of messages will be generated in the job log, and in the Flash for i log.

Type	Msg ID	LPAR	Number	Message text
INF	FLA2592	PROD		Stopping Flashcopy. Storage MIROR_PROD.
ERR	FLA0777	PROD		Controller response : CMMVC5977E The operation was not performed because it is not valid given the current consistency group state.
ERR	FLA0787	PROD		Error when stopping Remote Copy for group Demo_Prod_Metro. Environment *NONE.
ERR	FLA2598	PROD		Error while starting disaster recovery plan DRP_PROD.

13.6 Triggering the DRP with Flash for i

13.6.1 Using the FLSTRDRP command

In the event of a serious problem on the production partition, or any other important element in DC1, the DRP must be activated.

The sequence of operations is as follows:

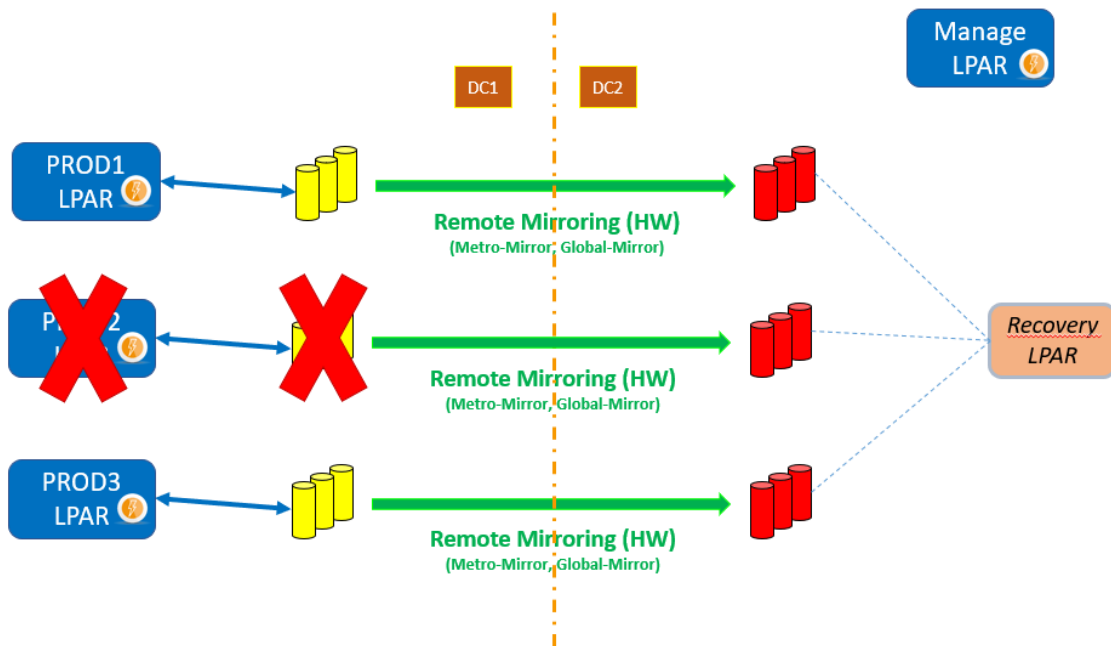
- Open a session on the management partition with a profile that immediately displays a menu dedicated to DRP (for example GO FLDRP)
- Use the FLSTRDRP command, specifying the name of the DRP definition created in the previous steps. This command will automatically perform the following operations:
 - o If the parameter CONFIRM(*YES) is used, send a message to the screen asking for confirmation. Reply G
 - o Stop Remote Copy by forcing the possibility of using the target disks.
 - o If the parameter "Map disks" in the DRP definition is set to *YES, map the disks used in the consistency group to the specified host name.
 - If the disks are already mapped to another host, the function will give an error.

- If other disks are already mapped to this host, they will be unmapped.
- IPL the recovery partition using Normal or Manual mode according to the DRP definition

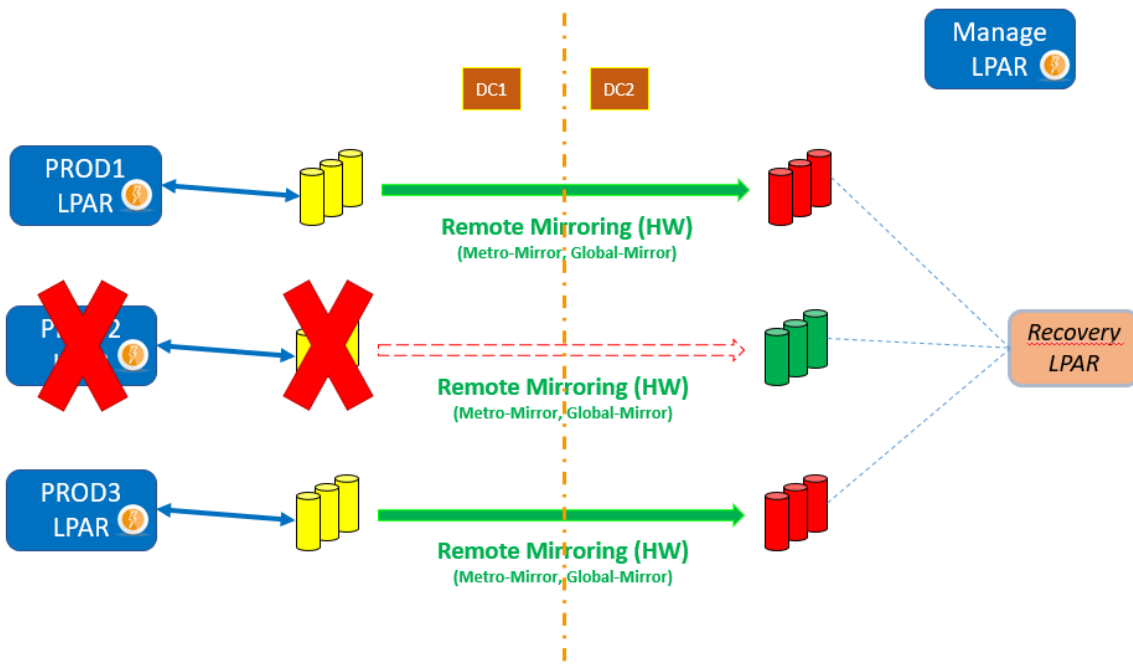
All these operations are performed automatically without human intervention or other confirmation.

13.6.2 The various steps performed by FLSTRDRP.

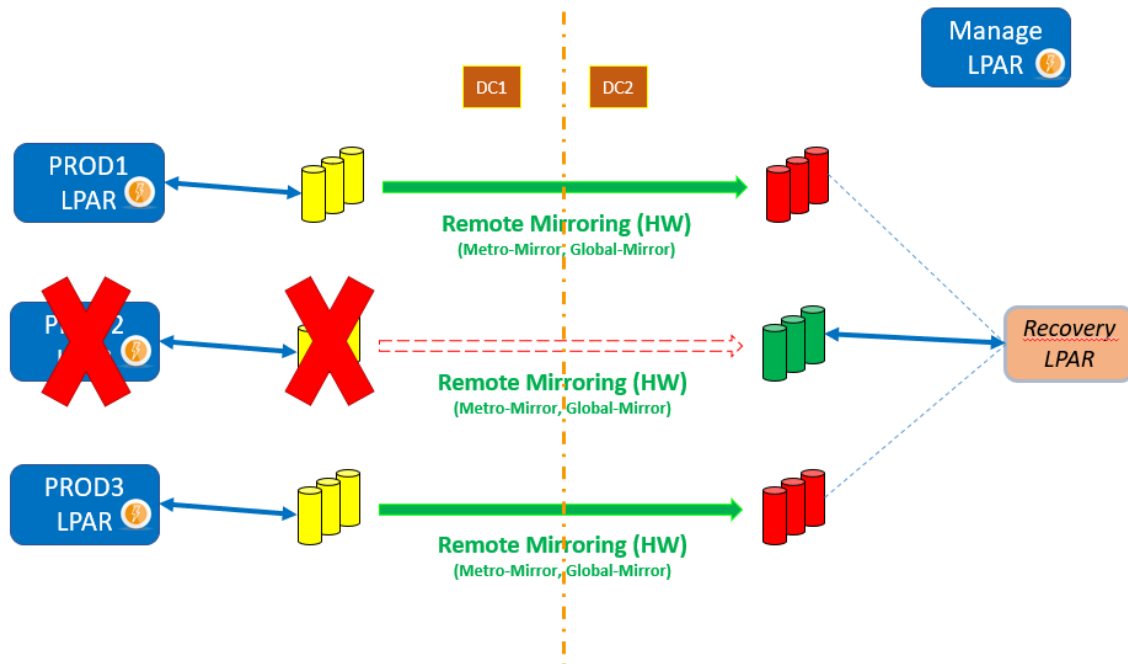
1/ A failure occurs on the production partition or disks on DC1



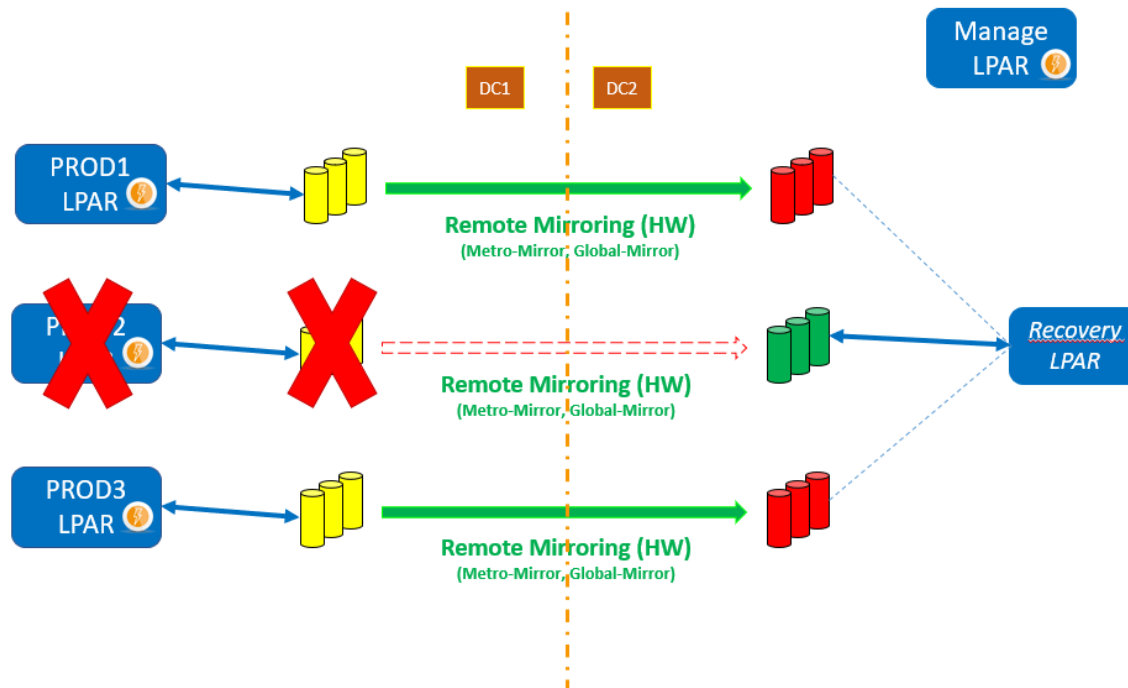
2/ The FLSTRDRP command stops the Metro/Global Mirror and frees the target disks.



3/ The FLSTRDRP command makes an inventory of the disks contained in the consistency group specified in the definition, and maps them to the recovery host if the parameter "Map disks" is set to *YES.



4/ The FLSTRDRP command starts the recovery partition in "Normal" or Manual" mode according to the DRP definition.



13.7 Return to normal situation

The return to normal situation must be done "manually". It can be automated by making the same type of definition from the recovery site to the production site.

13.8 The FLDRP menu

The FLDRP menu supplied with the Flash for i product is used to display only the commands required to set up and activate a DRP.

For example, it can be used as the initial menu for a user profile that would be used if a DRP needed to be activated.

```

FLDRP                               Flash for i, Work with DRP module

Select one of the following:

    1. Work with storages             FLWRKSTG
    2. Work with partitions           FLWRKLPAR
    3. Work with DRP definitions      FLWRKDRP

   11. Check storage status           FLCHKSTG
   12. Check Clone LPAR status        FLCHKLPAR
   13. Check DRP status               FLCHKDRP

   21. Display DRP status             FLDSPDRP

   31. Start DRP                      FLSTRDRP

   90. Sign off
  
```

13.9 FLWRKDRP, Manage DRP definitions

The FLWRKDRP command is used to define the elements required to activate a DRP (Disaster Recovery Plan).

The command parameters are as follows:

This command has no parameters.

Using the command:

The command is used to create, modify or delete DRP definitions, i.e. the information required to activate (using the FLSTRDRP command) a recovery partition following a major incident on the production infrastructure.

These definitions, and the use of the FLSTRDRP command, must be carried out on an independent partition located on the backup site. If the definitions are made on the production partition, they will not be usable in the event of a serious incident on the production itself.

The command displays the following screen:

```

FLWRKDRP                               Work with disaster recovery plan definitions                               M81FLASH
                                                                                                                                           10/08/23 17:57:12

Position to . . . . .                    Definition name

Enter your options, then press Enter
  2=Change  3=Copy  4=Delete  5=Display
  
```

Opt	Name	Storage	LPAR	Description
	DRP_PROD	MIRROR_PROD	RECOVERY	DRP for PROD partition

End

F3=Exit F5=Refresh F6=Create F12=Cancel

This screen provides the list of definitions which have already been defined.
The definitions are sorted alphabetically by definition names.

The columns have the following meanings:

- Name = Name of the DRP definition
- Storage = Name of the storage definition (entered using the FLWRKSTG command) corresponding to the Metro / Global Mirror between the production site and the backup site.
- LPAR = Name of the partition definition (entered via the FLWRKLPAR command) corresponding to the recovery partition.
- Description = Free text describing the definition

Possible inputs:

Position to
Used to specify which name must be displayed first

Options:

Option 2 = Change
Used to change the specified definition.

Option 3 = Copy
Used to copy the specified definition. The resulting screen will be similar to the definition creation screen

Option 4 = Delete
Used to delete the specified definition.

Option 5 = Display
Used to display definition

Function keys

F3 = Exit the screen

F5 = Update the values

F6 = Create a new definition

F12 = Exit the screen

13.9.1 *Creating, changing, copying or displaying a definition*

From the main FLWRKDRP command menu, using the F6 key or options 2, 3 and 5 displays the following screen.

If option 5 = display is used, no information can be changed.

If option 3 is used, it is like when creating a definition, but all the fields are initialized with the values of the selected definition.

Function keys

F3 = exit the requested function and return to the list of definitions

F5 = Reset the values to what they were at the start.

F12 = Exit the requested function and return to the list of definitions

Screen: Create a DRP definition

```

FLWRKDRP2          Change disaster recovery plan definition          M81FLASH
                                                            10/08/23 18:02:50

Enter your options, then press Enter

Definition name . . . . . DRP_PROD      Name
Description . . . . . DRP for PROD partition
Mandatory confirmation . . *YES        *YES, *NO

Storage related information
Storage definition . . . . MIROR_PROD  MIROR_PROD, REMOTE, ...
Map disks . . . . . *YES            *YES, *NO
Destination host . . . . . Demo_RECOVERY

Partition related information
Start recovery partition . *NORMAL    *NORMAL, *MANUAL, *NO
LPAR definition . . . . . RECOVERY    LPAR_PRX, M81-CLONE1, ...

End

F3=Exit   F4=List   F5=Refresh   F12=Cancel
  
```

Definition name Enter the name of the definition to be created or modified. This name will be used by the FLSTRDRP command.

Description	Text describing the definition
Mandatory confirmation	<p>Specify whether confirmation will be requested by default when the DRP is activated by the FLSTRDRP command. The purpose of this confirmation is to prevent the DRP being activated by mistake.</p> <p>This value will be used if the FLSTRDRP command is used with the CONFIRM(*DFT) parameter.</p> <p>*YES = When using the FLSTRDRP command with the CONFIRM(*DFT) parameter, a confirmation message will be sent to the screen.</p> <p>*NO = When using the FLSTRDRP command with the CONFIRM(*DFT) parameter, the operation will be launched directly without a confirmation request.</p>

Storage related information

Storage definition	Indicate the name of the storage definition (entered via the FLWRKSTG command) corresponding to the Metro / Global Mirror between the production site and the backup site. The list of possible values only shows definitions of type *REMOTE
Map disks	<p>Indicate if the remote disks have to be automatically mapped to the recovery host.</p> <p>*YES = The remote disks will be mapped to the recovery host</p> <p>*NO = The remote disks will not be mapped. The operator has to map the disks previously.</p>
Destination host	<p>Specify the host name defined in the disk array corresponding to the recovery partition. This information is mandatory if *YES is entered for the parameter "Map disks"</p> <p>Enter the name as defined in the disk array, case-sensitive.</p>

Partition related information

Start recovery partition	<p>Enter the type of IPL of the recovery partition</p> <p>*NORMAL = The recovery partition will IPL in normal mode</p> <p>*MANUAL = The recovery partition will IPL in manual mode</p> <p>*NO = The recovery partition will not start automatically. The operator will have to start the IPL.</p>
LPAR definition	<p>Name of the partition definition (entered using the FLWRKLPAR command) corresponding to the recovery partition.</p> <p>This value is optional if *NO is specified in the "Start recovery partition" parameter.</p>

13.10 FLCHKDRP: Check that a DRP is in the correct state to be activated.

The FLCHKDRP command is used to check that the elements of a DRP definition are in a state that allows it to be activated.

The parameters of the command are as follows:

```

Check disaster recovery plan (FLCHKDRP)

Type choices, press Enter.

Disaster recovery plan def. . . DRP
```

Parameter Description:

DRP = Specify the name of the DRP definition to be checked

This command generates the following messages in return:

Message ID	Severity	Message text
FLA2490	40	Unable to retrieve data for storage &1
FLA2527	40	Error, unable to find the consistency group &1. Storage &2.
FLA2590	40	Disaster recovery plan definition &1 not found
FLA2600	40	Storage &1 does not correspond to a storage type *SVC with copy type *REMOTE on the proxy partition.
FLA2601	40	Error, storage &1 is not of type *SVC or *PROXY.
FLA2602	40	Error, copy type *FLASHCOPY instead of *REMOTE indicated for storage &1.
FLA2603	40	The storwize on which the operation is requested is not the one where the target disks of consistency group &1 are located.
FLA2604	40	The storwize on which the operation is requested is not the one where the target disks of the coherence group are located.
FLA2605	40	Wrong value for 'map disks' parameter.
FLA2606	40	Wrong value for the parameter "Start recovery partition".
FLA2608	40	Impossible to obtain the stopped state for the partition. Set LPAR &1.
FLA2635	40	Impossible to use disaster recovery plan &1. Storage status: &2, status of target disks in consistency group &3.
FLA2634	0	Possible to use disaster recovery plan &1. Storage status: &2, consistency group target disk status: &3.

Use of the command :

This command does not display any screen. The result of this command is a message that is sent back with the necessary information.

It uses the information contained in the storage definition passed in parameter, connects to this array to retrieve the necessary information, and then returns a message indicating this state.

Several connections to the array are made. The command can take several seconds.

Use this command to verify that SafeGuarded Copies are generated, that they are active and that the last copy was created recently.

The result of the command will be the message "FLA2634: Possible to use disaster recovery plan &1. Storage status: &2, consistency group target disk status: &3.". If the following conditions are met. :

- The state of the consistency group is consistent, and can be stopped by indicating that the target disks are usable. The possible states are :

consistent_copying
consistent_stopped
consistent_synchronized
idling
idling_disconnected
consistent_disconnected

- The target volumes of the consistency group are in one of the following states:

Ready on host = All volumes in the consistency group are mapped to the host specified in the DRP definition.

Free = All volumes are available. They are not mapped to any host.

It uses the information contained in the storage definition used in the DRP definition, connects to this disk array to retrieve the necessary information, and then returns a message indicating this state.

Several connections are made to the disk array. The command may take several seconds.

Use this command to check that the DRP is ready to be activated.

13.11 *FLDSPDRP: Display DRPs statuses*

The parameters of the command are as follows:

```

                                Display DRP (FLDSPDRP)

Type choices, press Enter.

Data . . . . . DATA          *ALL
    
```

Description of parameters:

DATA Indicate the type of information to be displayed
 *ALL = The command displays a list of all DRP definitions and their status. The display may take a long time due to the large amount of information to be retrieved from the disk array.
 *NONE = The command displays a list of all DRP definitions but does not check their status. This display is very fast. Columns with states will display the value "Unknown".

Special consideration:

This command starts by searching for a lot of information that it needs to extract from the SVC array. These operations can take several seconds.

A first message is displayed on the screen to make you wait.

```

Please wait, loading data.
    
```

Using the F5 key will display the same waiting message, and will also last several seconds.

Use of the command :

The FLDSPDRP command provides a list of DRP definitions, and indicates the status of the remote copy and volumes defined in the consistency group.

For a better use of this command, it is recommended to configure a session in 132 columns.

```

FLDSPDRP                                Display disaster recovery plans                                M81FLASH
                                                                                                     14/10/23 17:40:37

Position to . . . . . Disaster recovery plan definition

Enter your options, then press Enter
    
```

8=Refresh data

Opt	Plan	Storage	Remote copy status	Volumes
	DRP_PROD	MIROR_PROD	consistent_stopped	Ready on host
	DRP_PROD2	MIROR_PROD	consistent_stopped	Used
	DRP_PRX	REMOTEPROX	consistent_stopped	Used
	TESTNO	STG_PX1	Unknown	Unknown

End

F3=Exit F5=Refresh F12=Cancel

This screen lists all the DRP definitions.

The meaning of the columns is as follows:

Plan	Name of the DRP definition entered with the FLWRKDRP command.
Storage	Name of the Storage definition indicated in the DRP definition. This definition must be of type *REMOTE
Remote copy status	<p>Indicates the status of the remote consistency group indicated in the Storage column. The value indicated is the one taken from the disk array.</p> <p>The following values allow to start the DRP (these states will appear in green in the list):</p> <p>consistent_copying consistent_stopped consistent_synchronized idling idling_disconnected consistent_disconnected</p> <p>The following values do not allow the DRP to be started (these states will appear in red in the list):</p> <p>inconsistent_stopped inconsistent_copying inconsistent_disconnected empty</p> <p>if the consistency group is not of type *REMOTE, the status displayed will be "Unknown".</p>
Volumes	<p>Indicates whether the volumes used by the consistency group are available or mapped to a host. Possible values are:</p> <p>Ready on host = All volumes in the consistency group are mapped to the host specified in the DRP definition.</p>

Used = At least one of the volumes in the consistency group is mapped to a host other than the one specified in the DRP definition.

Free = All volumes are available. They are not mapped to any host.

if the consistency group is not of type *REMOTE, the status displayed will be "Unknown".

Function keys

F3 = Exit screen

F5 = Update values

F12 = Exit screen

Options

8= Update data

Used to update the data (equivalent to F5) for the selected line only.

13.12 FLSTRDRP: Activate a Disaster Recovery Plan (DRP)

The FLSTRDRP command is used to start one or more Disaster Recovery Plan (DRP) following a major incident on the production infrastructure. It uses a DRP definition created with the FLWRKDRP command.

The parameters of the command are as follows:

```

                                Start disaster recovery plan (FLSTRDRP)

Type choices, press Enter.

Disaster recovery plan def. . . DRP
                                + for more values
Confirm . . . . . CONFIRM          *YES
  
```

Parameter Description:

DRP	Specify the name of the DRP definition to be used. It is possible to specify up to 10 DRP names.
CONFIRM	Indicate whether a confirmation message should be sent to validate the function. *DFT = The value indicated in the DRP definition will be used. *YES = message FLA2591 will be sent to the job requesting confirmation that the DRP must be activated. *NO = No confirmation will be requested. Use this value to make the function fully automated.

This command generates the following messages in return:

Message ID	Severity	Message text
FLA2609	0	Confirm start of given disaster recovery plans (C G)

FLA2531	0	Mappage des disques du groupe de cohérence &1 sur l'host de destination &2 effectué correctement.
FLA2542	0	Mappage des disques sur l'host de destination &1 effectué correctement.
FLA2591	0	Confirmer le démarrage du plan de reprise d'activité &1 (C G)
FLA2592	0	Arrêt du Remote Copy. Stockage &1.
FLA2594	0	Mappage des disques vers l'host &1. Stockage &2.
FLA2596	0	Démarrage de la partition. Définition de LPAR &1.
FLA2597	0	Démarrage du plan de reprise d'activité &1 effectué correctement.
FLA2630	0	Start of disaster recovery plan &1.
FLA2632	0	&1 Error, &1 Disaster Recovery Plan in error. &2 performed successfully
FLA0571	40	Aucune définition trouvée pour la partition &1.
FLA1832	40	Commande &1 annulée.
FLA2490	40	Impossible de récupérer les données pour le stockage &1
FLA2590	40	Définition de plan de reprise d'activité &1 introuvable.
FLA2593	40	Impossible d'obtenir l'état arrêté pour le Remote Copy. Stockage &1.
FLA2595	40	Erreur lors du mappage des disques vers l'host &1. Stockage &2
FLA2598	40	Erreur lors du démarrage du plan de reprise d'activité &1.
FLA2599	40	Erreur, impossible de récupérer les données du stockage &1 sur la partition proxy.
FLA2600	40	Le stockage &1 ne correspond pas à un stockage de type *SVC avec type de copie *REMOTE sur la partition proxy.
FLA2601	40	Erreur, le stockage &1 n'est pas de type *SVC ou *PROXY.
FLA2602	40	Erreur, type de copie *FLASHCOPY au lieu de *REMOTE indiqué pour le stockage &1.
FLA2603	40	La storwize sur laquelle l'opération est demandée n'est pas celle où se trouvent les disques cibles du groupe de cohérence &1.
FLA2604	40	La storwize sur laquelle l'opération est demandée n'est pas celle où se trouvent les disques cibles du groupe de cohérence.
FLA2631	40	Error, &1 starts of disaster recovery plan in error.

Use of the command:

This command must be used to trigger a disaster recovery plan on a backup site.

The DRP parameter must contain the name of a DRP definition, entered using the FLWRKDRP command.

It's possible to enter a maximum of 10 DRP name that will be started sequentially in the same order as entered in the parameter.

The aim is to automate the operations required to start a recovery partition, on a backup site, using the target disks of a Metro / Global Mirror.

The command performs the following operations for each DRP definition specified in parameter DRP:

- Send a message to the screen asking for confirmation (if the CONFIRM parameter contains the value *YES). Reply G
- Stop Remote Copy by forcing the possibility of using the target disks.
- Map the volumes used in the consistency group to the specified host name
 - o The FLMAPDRP command is used, with the TGTUNMAP(*UNMAP) parameter.
 - o If the volumes in the consistency group are already mapped to another host, the function will give an error.
 - o If other volumes are already mapped to this host, they are unmapped.
- IPL the recovery partition in Normal mode

All these operations are performed automatically without human intervention or confirmation.

CAUTION:

Remote Copy must be in one of the following states

- consistent_stopped

- consistent_synchronized
- consistent_copying
- idling
- idling_disconnected
- consistent_disconnected

If the Remote Copy is in another state, it is impossible to stop Remote Copy and use the disks. The following sequence of messages will be generated in the job log, and in the Flash for i log.

Type	Msg ID	LPAR	Number	Message text
INF	FLA2592	PROD		Stopping Flashcopy. Storage MIROR_PROD.
ERR	FLA0777	PROD		Controller response : CMMVC5977E The operation was not performed because it is not valid given the current consistency group state.
ERR	FLA0787	PROD		Error when stopping Remote Copy for group Demo_Prod_Metro. Environment *NONE.
ERR	FLA2598	PROD		Error while starting disaster recovery plan DRP_PROD.

Using the FLSTRDRP command generates several information or error messages for each important step. These messages are visible in the job log and in Flash for i messages (FLDSPLOG command).

This command must be used on the partition on which the DRP definitions were entered with the FLWRKDRP command. It is imperative that this definition is made on a partition other than the source partition itself, because if DRP is activated, the source partition is no longer available.

Depending on the value of the CONFIRM parameter, the following operations are performed:

- CONFIRM(*YES): A single confirmation message is sent to the screen (or to QSYSOPR if it is a batch job) once for all the DRP definitions indicated in the DRP parameter.
- CONFIRM(*NO): No confirmation message is sent. DRPs are activated directly
- CONFIRM(*DFT): A confirmation message will be sent for each DRP whose definition indicates that a confirmation must be sent. If several names are specified in the DRP parameter, this message is sent when the DRP in question is processed.

Several connections are made to the array and the HMC. The command may take several seconds.

13.13 FLMAPDRP: Mapping disks for a DRP

The FLMAPDRP command is used to associate (map) the target disks of a consistency group with a host name. This function is performed in the disk array.

The parameters of the command are as follows:

Mapping disks for DRP (FLMAPDRP)
Type choices, press Enter.
Disaster recovery plan def. . . DRP
Action if disks already mapped TGTUNMAP

Parameter Description:

DRP Specify the name of the DRP definition to be used

TGTUNMAP Specify the action to be taken if the destination host already has disks associated with it.
*UNMAP = Disks currently associated with the host will be removed.
*CANCEL = The command will be stopped..

This command generates the following messages in return:

Message ID Severity Message text

Use of the command:

The FLMAPDRP command is used to associate (map) the target disks of a consistency group with a host name. This function is performed in the disk array. It is used by the FLSTRDRP command.

All disks defined as targets in the consistency group specified in the DRP definition are associated with the host specified in the same definition.

If the destination host is already associated with other disks, the action taken will depend on the value of the TGTUNMAP parameter.

If the TGTUNMAP(*UNMAP) parameter is specified, all the disks currently associated with the host will be removed before associating the new disks.

If the TGTUNMAP(*CANCEL) parameter is used, no action will be taken and the command will be stopped with an error message.

The disks to be associated (the target disks indicated in the consistency group) must not already be associated with another partition. If they are, the operation will be cancelled.

If the disks are already associated with the correct host, the operation will finish normally.

All these operations are performed automatically without human intervention or confirmation.

Using the FLMAPDRP command generates several information or error messages for each important step. These messages are visible in the job log and in Flash for i messages (FLDSPLOG command).

This command must be used on the partition on which the DRP definitions were entered with the FLWRKDRP command.

Several connections are made to the bay. The command may take several seconds.

14 Authorisations to access the Flash for i product

In many cases, it is necessary for certain operations to be carried out by users who do not have special rights. For example, daily monitoring of cloning or backup, or start automatically a new clone by technical user profiles.

The Flash for i product allows you to manage access to commands and menus, and to specify exactly what users have access to.

To be able to use these commands and menus, user profiles must either have security officer type authority, or be registered in one of the 2 authorisation lists supplied with the product FLASH_SECU and FLASH_USE.

14.1 Principle used for managing authorisations

14.1.1 Protection of product's objects

Starting with version 5 of Flash for i, all the objects contained in the FLASH4I library are protected by an authorisation list, which prevents users from directly accessing the data contained in a table via an SQL query, or from directly calling a product command or program.

Security officer profiles (class *SECOFR and/or with all special rights) have unrestricted access to everything by default. They are a special case.

Other user profiles must be registered in one of the 2 FLASH_SECU or FLASH_USE authorisation lists to be able to access the product.

14.1.2 Security officers

User profiles with security officer authority (special authority *ALLOBJ and *SECADM minimum) have unrestricted access to all functions.

No special registration is required for this type of user profile. They have unlimited access to menus and commands, as well as to the contents of tables using SQL, for example.

14.1.3 FLASH_USE authorisation list

This authorisation list must be used for user profiles who need to monitor the operation of the Flash for i product, without being able to trigger any operations. The only commands that can be accessed are viewing, control and monitoring commands.

The purpose of the FLASH_USE authorisation list is to register the user profiles that need to have access to certain commands or menus in the Flash for i product, without having any special rights themselves. Profiles included in this list will be able to use all the commands and menus associated with this authorisation list and will not have access to other commands or programs, or direct access to the product database.

By default, a user on this list can access

- All menus
- Monitoring and operating commands, the default list of which is shown below.

This list can be modified using the FLWRKAUT command.

Objet	Type	Default authorisation List
FLMENU	*CMD	*NONE
FLMENU	*MENU	*NONE
FLDRP	*MENU	FLASH_USE

FLMENUAC	*MENU	FLASH_USE
FLMENUCF	*MENU	FLASH_USE
FLMENUCT	*MENU	FLASH_USE
FLMENUIN	*MENU	FLASH_USE
FLMENUA	*MENU	FLASH_USE
FLMENUMN	*MENU	FLASH_USE
FLMENURC	*MENU	FLASH_USE
FLMENURS	*MENU	FLASH_USE
FLPROXY	*MENU	FLASH_USE
FLSGC	*MENU	FLASH_USE

FLADDKEY	*CMD	FLASH_USE
FLADDLOG	*CMD	FLASH_USE
FLCHGHMCRS	*CMD	FLASH_USE
FLCHGTIM	*CMD	FLASH_USE
FLCHKCTLSB	*CMD	FLASH_USE
FLCHKHMCRS	*CMD	FLASH_USE
FLCHKIFS	*CMD	FLASH_USE
FLCHKLOG	*CMD	FLASH_USE
FLCHKLPAR	*CMD	FLASH_USE
FLCHKSBS	*CMD	FLASH_USE
FLCHKSGC	*CMD	FLASH_USE
FLCHKSSH	*CMD	FLASH_USE
FLCHKSTG	*CMD	FLASH_USE
FLCLEAR	*CMD	FLASH_USE
FLCLRSIT	*CMD	FLASH_USE
FLCPYDIR	*CMD	FLASH_USE
FLCPYOBJ	*CMD	FLASH_USE
FLDSPHST	*CMD	FLASH_USE
FLDSPHSTP	*CMD	FLASH_USE
FLDSPINF	*CMD	FLASH_USE
FLDSPJRNSA	*CMD	FLASH_USE
FLDSPLOG	*CMD	FLASH_USE
FLDSPLOGPX	*CMD	FLASH_USE
FLDSPSGC	*CMD	FLASH_USE
FLDPSITDT	*CMD	FLASH_USE
FLDPSLOG	*CMD	FLASH_USE
FLDSPSTS	*CMD	FLASH_USE
FLEND SBS	*CMD	FLASH_USE
FLRTVHMCRS	*CMD	FLASH_USE
FLRTVSTS	*CMD	FLASH_USE
FLSNDBASE	*CMD	FLASH_USE
FLSTRSBS	*CMD	FLASH_USE
FLUPDSTS	*CMD	FLASH_USE
FLVLDLOG	*CMD	FLASH_USE
FLWRKKEY	*CMD	FLASH_USE

14.1.4 FLASH_SECU authorisation list

This authorisation list must be used for user profiles which must have access to all product commands without having any special authority themselves.

Warning:

User profiles entered in the FLASH_SECU list must also be entered in the FLASH_USE list to be able to access the entire product.

This also gives the right to access the Flash for i database directly via SQL or any other tool.

All the objects in the product are protected by the FLASH_SECU authorisation list (except those mentioned in the previous paragraph, which are associated with the FLASH_USE list). This is why the profiles that need access to all commands must be registered in both lists).

In particular, the commands below are protected by FLASH_SECU.
This list can be modified using the FLWRKAUT command.

<u>Objet</u>	<u>Type</u>	<u>Default authorisation List</u>
FLCHGCFG	*CMD	FLASH_SECU
FLCHGCFGQ	*CMD	FLASH_SECU
FLCHGROL	*CMD	FLASH_SECU
FLCLONE	*CMD	FLASH_SECU
FLENDFC	*CMD	FLASH_SECU
FLENDLPAR	*CMD	FLASH_SECU
FLINIT	*CMD	FLASH_SECU
FLJRNUPDSA	*CMD	FLASH_SECU
FLMAPDRP	*CMD	FLASH_SECU
FLMAPHOST	*CMD	FLASH_SECU
FLMULTBRMS	*CMD	FLASH_SECU
FLPARAM	*CMD	FLASH_SECU
FLRSTCFG	*CMD	FLASH_SECU
FLRSTPRD	*CMD	FLASH_SECU
FLRSTPRDSE	*CMD	FLASH_SECU
FLSTRDRP	*CMD	FLASH_SECU
FLSTRFC	*CMD	FLASH_SECU
FLSTRLPAR	*CMD	FLASH_SECU
FLSTRSGC	*CMD	FLASH_SECU
FLTSTHTTP	*CMD	FLASH_SECU
FLWRKAUT	*CMD	FLASH_SECU
FLWRKCFG	*CMD	FLASH_SECU
FLWRKCFGDI	*CMD	FLASH_SECU
FLWRKCFGLI	*CMD	FLASH_SECU
FLWRKCFGUS	*CMD	FLASH_SECU
FLWRKDRP	*CMD	FLASH_SECU
FLWRKDST	*CMD	FLASH_SECU
FLWRKENV	*CMD	FLASH_SECU
FLWRKHMCRS	*CMD	FLASH_SECU
FLWRKLPAR	*CMD	FLASH_SECU
FLWRKMAIL	*CMD	FLASH_SECU
FLWRKPROXY	*CMD	FLASH_SECU
FLWRKSIT	*CMD	FLASH_SECU
FLWRKSTG	*CMD	FLASH_SECU
FLWRKTAP	*CMD	FLASH_SECU
FLWRKVIO	*CMD	FLASH_SECU
FLWRTIFS	*CMD	FLASH_SECU

14.1.5 Users not included in either of the 2 authorisation lists

User profiles which are not registered in these authorisation lists and which have no special rights do not have access to any element of the product.

Despite everything, the FLASH4I library can be added to the job library list for these profiles, to avoid errors in cases where a JOBD uses this library.

14.2 Migration from V4 or earlier.

When the Flash for i product is already installed in Version 4 or earlier, there is no access control to objects.
Migration to V5 will automatically set up these authorisations and block access for users with no special rights.

We strongly advise you to

- Make an inventory of the user profiles with access to the product
- For each profile, determine what operations it performs.
- Enroll in the FLASH_USE list the profiles that perform operational monitoring (FLDSP* commands) or checks (FLCHK* commands).
- Enroll the profiles that use action commands (FLCLONE, FLSTR*, FLEND*, etc.) in both lists FALSH_SECU and FLASH_USE.

14.3 Assigning user authority

To authorise a user profile to access the product, the name of the profile must be entered in the authorisation list(s) selected.

Use the command :

WRKAUTL FLASH*

```

Work with Authorization Lists

Type options, press Enter.
 1=Create   2=Edit   4=Delete           5=Display   8=Display objects in list
 9=Display documents/folders in list 13=Change description

Opt  List      Text
-----
FLASH_SECU  Flash4i,  Objects with restricted access
FLASH_USE   Flash4i,  Any user access objects
  
```

Select the authorisation list in which the profile is to be enrolled

Option 5 to view the list

Option 2 to modify the list of user profiles

```

Edit Authorization List

Object . . . . . : FLASH_SECU      Owner . . . . . : PRU
Library . . . . . : QSYS          Primary group . . . : *NONE

Type changes to current authorities, press Enter.

      Object      List
User   Authority  Mgt
-----
*PUBLIC *EXCLUDE
DEMOEN *ALL           X
FLASH4IOWN *ALL
QSECOFR *ALL
  
```

```

F3=Exit   F5=Refresh   F6=Add new users
F11=Display detail object authorities   F12=Cancel   F24=More keys
(C) COPYRIGHT IBM CORP. 1980, 2015.
Bottom
```

The list of profiles already registered is displayed.
The QSECOFR and FLASH4IOWN profiles are registered by default and must remain so.
The profile that installed the product is also registered.

Use the F6 key to add a user profile.

14.4 FLWRKAUT, Work with authorisation definitions

The FLWRKAUT command is used to manage access authorisations to the menus and commands of the Flash for i product.

The command parameters are as follows:

This command has no parameters.

Using the command:

The command displays a list of all the menus and commands delivered with the Flash for i product and allows you to choose to which authorisation list they should be assigned.

Before displaying the list, the information is extracted from the objects themselves. If any changes have been made to object authorization list using the system commands, these will be displayed in the list.

The command displays the following screen:

```

FLWRKAUT2                                Work with authority definitions                                M81FLASH
                                                                                                     4/10/23 18:03:13

Position to . . . . .                Object name
Enter your options, then press Enter

Possible values: *NONE      : No protection. Every one can use the command
                   FLASH_USE : User profiles doing daily checks can access the command
                   FLASH_SECU: Only user profiles with full access to the product can use the command

Object      Type      Auth. list  Default
FLADDKEY   *CMD      FLASH_SECU FLASH_USE
FLADDLOG   *CMD      FLASH_USE  FLASH_USE
FLCHGCFG   *CMD      FLASH_SECU FLASH_SEC
FLCHGCFGQ  *CMD      FLASH_SECU FLASH_SEC
FLCHGHMCRS *CMD      FLASH_USE  FLASH_USE
FLCHGROL   *CMD      FLASH_SECU FLASH_SEC
FLCHGTIM   *CMD      FLASH_USE  FLASH_USE
FLCHKCTLSB *CMD      FLASH_SECU FLASH_USE
FLCHKHMCRS *CMD      FLASH_USE  FLASH_USE
FLCHKIFS   *CMD      FLASH_USE  FLASH_USE
FLCHKLOG   *CMD      *NONE      FLASH_USE
FLCHKLPAR  *CMD      FLASH_USE  FLASH_USE
FLCHKSBS   *CMD      FLASH_USE  FLASH_USE
```

FLCHKSGC	*CMD	FLASH_USE	FLASH_USE
FLCHKSSH	*CMD	FLASH_USE	FLASH_USE

More...

F3=Exit F5=Refresh F8=Reset F10=Delete authorities F12=Cancel

This screen provides a list of items that can be accessed directly by users (menus and commands) and allows you to indicate which authorisation list will be used to protect them. This is equivalent to indicating which users will be able to access them.

The columns have the following meanings:

- Object = Object name
- Type = Type of object (Menu or Command)
- Authorisation list = Name of the authorisation list to be used for this object.
The value in this column when this screen is displayed corresponds to the currently assigned authorisation list.
This value can be modified.
- Default = Name of the default authorisation list. This is the list proposed as standard when the product is installed.

Possible inputs:

Position to

Used to specify which partition name must be displayed first

Authorisation list" column

In this column, enter the new authorisation list to be used for the object.

The following values can be entered:

- *NONE = The object will not be protected by any authorisation list. All system's users will be able to access it
- FLASH_USE = The object will be protected by the FLASH_USE authorisation list. Only users registered in this list will have access. The purpose of this list is to register people who need to monitor clones or access messages and histories.
- FLASH_SECU = The object will be protected by the FLASH_SECU authorisation list. Only users registered on this list will have access. The purpose of this list is to register people who need to access to every function of the product, like the command FLCLONE, ...
- Other name = You can enter the name of another authorisation list. This must already exist.

Function keys

F3 = Exit the screen

F5 = Update the values

F8 = Reset

Use this function key to reset the authorisation lists to their default values when the product is delivered. This is equivalent to copying the contents of the "Default" column into the "Authorisation list" column.

F10= Delete authorities

Use this function key to remove all the authority associated with the product's commands and menus.

Note that this operation does not remove the protection set up on the product database. Direct access to the database (not recommended) remains limited to the profiles in the FLASH_SECU list.

F12 = Exit the screen

Special case of the FLWRKAUT command

The FLWRKAUT command is used to define authorisations for menus and other commands.

This command is more protected than the others and is always protected by the FLASH_SECU authorisation list.

It is of course possible to change this using the system commands, but this is not recommended, and the next time FLWRKAUT is used, the default configuration will be restored.

15 Troubleshooting

15.1 "Connection error" message when defining an environment

Problem description:

After defining a new environment, option 8 to view the status or the FLDSPSTS command indicates a "Connection error"

Solution 1:

Check that the names of user profiles, server, partition and consistency group are spelled correctly and are in the correct case (upper/lowercase)

Solution 2:

The problem may come from the length of the user profile name.

If the user profile name has more than 8 characters, see chapter "15.8 "No user exists for uid xxx" message".

15.2 "Could not create directory 'xxx/.ssh'." message

Problem description:

1/ When using the FLDSPSTS command, the Clone partition status indicates the value:

```
Status " Could not create directo "
```

2/ When using the FLCLONE, FLENDLPAR or FLSTRLPAR command, the operation is not performed and the following error message is generated (in FLDSPLOG):

```
FLA0706 HMC response: Could not create directory '/\002/.ssh'.
```

Solution:

This problem is related to the profile used.

To avoid this type of problem, it is necessary to:

- Create a "/home/User" directory
- Change the user profile so that this directory is the default directory

For example, for QPGMR, use the following commands:

```
MKDIR      DIR ( '/home/QPGMR' )

CHGUSRPRF  USRPRF (QPGMR)
           HOMEDIR ( '/home/QPGMR' )
```

15.3 The Clone partition does not start after FLCLONE

Problem description:

The use of the FLCLONE command lasts longer than normal and ends with an error with the following messages

FLA0630: Unable to obtain the 'Not Activated' status after a 100-second wait. Environment XXX

FLA0202: Problem when cloning the XXX environment. Cloning not carried out

Solution:

This problem is related to the product used.
To prevent this problem, create a "/home/User" directory

For example, for QPGMR, use the following command:

```
MKDIR DIR ('/home/QPGMR')
```

15.4 "Not authorized to use the QSYS QPMLPMGT service program" message

Problem description:

When using one of the product commands, the following error message appears:

CPD0193: Not authorized to use the QSYS QPMLPMGT service program.

Solution:

This problem occurs when using a profile that does not have the *ALLOBJ special authority

The following 2 options are possible:

1/ Use a user profile with more rights, particularly the *ALLOBJ special authority

2/ Change the user authorities of the QPMLPMGT system object using the following command:

```
GRTOBJAUT OBJ(QSYS/QPMLPMGT) OBJTYPE(*SRVPGM) USER(*public)  
AUT(*use)
```

15.5 "Error found creating file /Flash4i/flchkssh. Permission denied." message.

Problem description:

When using one of the product commands, the following error message appears:

```
qsh: 001-0055 Error found creating file /Flash4i/flchkssh. Permission denied.  
Press ENTER to end terminal session.
```

Solution:

This problem occurs when using a profile that does not have the *ALLOBJ special authority

The following 2 options are possible:

1/ Use a user profile with more rights, particularly the *ALLOBJ special authority

2/ Change the user authorities of the /Flash4i directory to authorize the profile in question by using the following command:

```
CHGAUT OBJ('/Flash4i') USER("User") DTAAUT(*RWX)  
OBJAUT(*ALL) SUBTREE(*ALL)
```

15.6 "Automatic processing has stopped" message

Problem description:

When using the FLCHKSBS or FLDSPSTS command, the message indicates that automatic processing has stopped while the FLASH4I subsystem and FL_AUTO job are active.

Solution:

This problem occurs when using a profile that does not have the *JOBCTL special authority

Change the user profile to give it the *JOBCTL special authority

15.7 Very long Clone partition start-up, with code SRC A6004090, C6004275 or A6005090

Problem description:

The Clone partition takes a long time to start (20 to 40 minutes) and remains with SRC C6004050, C6004275 or A6005090 codes for a long time.

Solution:

This occurs if the partition is configured with mirrored disks managed by IBM i. When starting, the system tries to find the original disks.

Simply wait until the system has finished its checks. It will start eventually.
This time will be the same for all IPLs.

15.8 "No user exists for uid xxx" message

Problem description:

When using the FLINIT, FLCHKSSH, or ssh command, the system returns the "No user exists for uid xxx" message.

Solution:

This usually occurs because PASE carries over an AIX limitation of 8 characters in a profile name. This limitation can be removed by executing the following command:

```
ADDENVVAR ENVVAR(PASE_USRGRP_LIMITED) VALUE(N) LEVEL(*SYS)
```

15.9 Using a specific port other than 22 for ssh

Problem description:

The network configuration requires the use of a port other than port 22 for the ssh protocol.

Solution:

The new port number can be specified when entering the IP address.
On all screens asking for an IP address (HMC, Storwize, VIOS), specify the prefix -p followed by the port number.

For example, if the HMC is the address 10.1.1.50 and the port for the SSH protocol must be replaced by 1250. Enter the following string:
"-p 1250 10.1.1.50"

15.10 Authority error with the FLCPYOBJ command

Problem description:

On the Clone partition, when using the FLCPYOBJ command, a "No authority on the object. The object is /QFileSvr.400/FLASH4i/Flash4i/FLCPY00019.savf. " error message is returned.

Solution:

Change the authorities on the /Flash4i directory on the Production partition.

Use the following command for example:

```
CHGAUT      OBJ (/Flash4i) USER (*PUBLIC) DTAAUT (*RW)
            OBJAUT (*ALL)
```

15.11 Parameter ConnectTimeout not supported

Problem description:

During the ssh connexion, (to VIOS, HMC or Storwize) with FLCHKSSH command, an error occurs.

In the file /Flash4i/flchkssh, there is the following line:

command-line : line 0 : Bad configuration option : ConnectTimeout

Solution:

Check that the product 5733 SC1 (*BASE and Option 1) is correctly installed, and in the same version as the system.

15.12 Messages CPFA0E7, CPE3425, CPE3474 or FLA6012, No information returned from Clone partition.

Problem description:

On the production partition, there is no information coming from the Clone partition (no message displayed by command FLDSPLOG).

On the Clone partition, the FLDSPLOG command displays messages FLA6012, CPE3425 and/or CPE3474.

Solution:

These messages are caused by a communication problem between the 2 partitions. There may be multiple causes. The following tests must be performed in order.

On the console of the Clone partition:

1/ Check that the ETHFLASH line exists and is active

WRKLIND

Option 8 on ETHFLASH line

- If the ETHFLASH line does not exist, the CMNxx resource has not been found. Check in the environment definition the Bus and Adapter information (Eth Card: Bus, Adap, Port) against the partition profile on HMC.
- If the line exists but is not active, check that the indicated resource is operational (WRKHDWRSC *CMN)

2/ Check that the IP address of the clone partition is configured and active
CFGTCP

Option 1, then F11

- If the address is inactive, check that it is not already used by another server on the network, then try to restart it (Option 9)

3/ Check that the communication is operational by making a PING of the gateway address, then a PING FLASH4I.

- If the PING does not respond, check in the partition profile on HMC that the virtual Ethernet adapter is in the right VLAN, and in the same VLAN as the Production.
- The PING FLASH4I must give a correct result, and must show the Production IP address. If the address is not correct, check the environment definition.

4/ Check that the FL_USER profile is in the *ENABLED state, and has a password other than *NONE (on both Prod and clone partitions)

5/ On the Production partition, start the QSERVER subsystem.

If it is already started, start the server mapping function, with the command:
STRHOSTSVR SERVER(*FILE)

6/ To check on the clone partition, if all the above tests are successful, stop and restart the FLASH4I subsystem. Wait at least 1 minute, then type the command below

```
WRKLNK OBJ('/QFileSvr.400/*')
```

A line with the name FLASH4I should appear. Type option 5

The list of directories of the production partition should be displayed.

15.13 Time of messages coming from Clone is not correct

Problem description:

In every element coming from the Clone partition (messages in FLDSPLOG, History in BRMS, ...) the time indicated is not correct.

Solution:

The Clone partition must be initialized at the right time. This operation has to be done manually, only once.

Start the Clone partition in a "B Manual" mode.

ATTENTION: While the partition is starting, make sure to set the parameter to start ONLY the console, to avoid problems with production IP address starting during IPL.

Then, change the system time:

```
WRKSYSVAL QTIME
```

15.14 Messages CPE3401, FLA0924 and FLA6012.

Problem description:

On production and clone partitions, the command FLDSPLOG shows many error messages :

CPE3401 : Permission Denied

FLA0924 : Error while transferring objects FLASH4I/FLSLOGCL Type *FILE

FLA6011 : Error while transferring a message to the system

FLA0612 : Error while transferring the product status to the system

Solution :

Check that the profile FL_USER is *ENABLED, and has a password other than *NONE.

15.15 *Very long time between the end of backup, and the end of FlashCopy*

Problem description:

The delay between the end of the backup on Clone partition, and the automatic stop of the Clone partition and/or the FlashCopy is very long.

Solution:

Check the delay value used by default between 2 automatic operations.

FLPARAM

Option 1 on line AUTOMATE

Option 5 on both lines DELAY

The default value is 60 (seconds)

15.16 *Message FLA0510 about QPM400 job*

Problem description:

At every start of the Clone partition, a job QPM400 has the status MSGW. This generates an error message in the product Log (FLDSPLOG), with the following message:

FLA0510 : Job 002064/QPM400/QPM400 in status MSGW, in the subsystem QSYSWRK

Solution:

This job is generated by the IBM product PM400. It asks if the user wants to activate the performance data collection, and send them to IBM.

The answer to this message, or the configuration of PM400, has to be done on the Production partition.

Option 1:

After an IPL on the Production partition, find the following message in QSYSOPR, and answer it.

CPAB02A : Do you want to send data to IBM by activating PM Agent? (I G C)

Option 2:

If there are no IPL on the Production partition, change the configuration of PM400.

If the product PM400 is not used, use the following operations:

- Use the command CFGPMAGT
- Answer 0 to both parameters on the first screen
- Enter all the necessary informations on the second screen
- Then validate.

15.17 *Message FLA0777 : answer from controller : @@@@*

Problem description:

If a major change has been made on the Storwize or HMC (hardware changed, new version, new ssh key), then the message FLA0777 : answer from controller : @@@@ is sent.

The Flashcopy starts correctly, mais there is an error message in the log.

The full message can be seen in file /Flash4i/flichkssh

```
*****Beginning of data*****
```

```

@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
@   WARNING: REMOTE HOST IDENTIFICATION HAS CHANGED!   @
@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
IT IS POSSIBLE THAT SOMEONE IS DOING SOMETHING NASTY!
Someone could be eavesdropping on you right now (man-in-the-middle attack)!
It is also possible that a host key has just been changed.
The fingerprint for the RSA key sent by the remote host is SHA256:LbEVtq3h08NQ.
Please contact your system administrator.
Add correct host key in /home/QSECOFR/.ssh/known_hosts to get rid of this
message.
Offending RSA key in /home/QSECOFR/.ssh/known_hosts:1
Keyboard-interactive authentication is disabled to avoid man-in-the-middle
attacks.

```

Solution :

If the Storwyze or the HMC have been changed, a new ssh key has been exchanged between the production partition and the elements that has changed. The system keeps a trace of this first connection and records it in file known_hosts (one for each user).

This information must be reinitialized. The operational mode is :

- Know which user profile is used to start cloning. For example : QSECOFR
- WRKLNK '/home/QSECOFR/.ssh'
- Option 2 on the line of file known_hosts
- Option d on the line containing the IP address of the Storwize.

To check and validate, run the command FLCHKSSH *STWSTS, then look at the result in file /Flash4i/flchkssh. There should not have any @@@@ @@@@ @@@@

15.18 *Restricted mode by BRMS*

Problem description:

When the Control group realizes a *SAVSYS, BRMS runs an ENDSBS *ALL that end in error (because the parameter BCHTMLMT is missing).
The SAVSYS with BRMS can't be done because the ENDSBS has not completed. It's replaced by SAVSECDTA and SAVCFG.
Message CPF1052 99 = ENDSBS *ALL not allowed in current environment.

Solution :

To fix this, the parameter of BRMS must be changed to allow the restricted mode in batch.
WRKPCYBRM *SYS
Option 1 Display or Change system policy

```

Controlling subsystem:
  Allow backups in batch . . . . . *YES
  Restricted state time limit . . . . . *NOMAX

```

15.19 *Message FLA0781, VIOS xxxx is not responding.*

Problem description:

After an upgrade of VIOS to version 2.2.6 or later, the ssh connection to VIOS doesn't work any more, and the following message is sent to product log:
FLA0781: VIOS xxxxx is not responding. Impossible to map the disks.

Solution :

Starting with VIOS version 2.2.6, openssh has been upgraded to a more recent version that uses `authorized_keys` instead of `authoreized_keyes2`.
Add again the public ssh key to the VIOS (chapter 4.8.1 Adding the SSH public key to the VIOS(es)) using destination file `./ssh/authorized_keys`

15.20 *Objects not saved on Clone partition*

Problem description:

In a *SAVE Environment definition (call a user defined program to run the backup), if a SAVLIB *ALLUSR is used, error messages occur saying that 2 libraries have been partially saved: QPFRDATA and QUSRSYS.

Solution :

In a *SAVE Environment, logs are sent back to Production partition using TCP/IP, Then QSYSWRK subsystem is started, with some of its automatic jobs.

- Performances data collection uses files in QPFRDATA
- Service agent uses some files in QUSRSYS.

In the beginning of backup program, add the following commands

```
ENDPFRCOL FRCCOLEND (*YES)
MONMSG CPF0000

ENDSRVAGT
MONMSG CPF0000
```

15.21 *Message FLA0683: Cfg: Error while changing resource for line XXXX*

Problem description:

In the messages coming from the Clone partition during the first IPL, the error message FLA0683 is issued when trying to change a communication line configuration.
The system is in version 7.4 or more.

Solution :

Starting with version 7.4, several types of lines are not supported anymore by the system. For example SDLC line types, or PPP type with some specific parameters.
According that those types of line are not supported or usable anymore, delete them.

15.22 *BRMS backup in restricted mode crashes*

Problem description:

A backup in restricted mode abruptly stops and does not transfer any information to the production partition. On the Clone partition, we see that the backup was running normally, but the job abruptly stopped, and the system rebooted.

In the Joblog of the job that was performing the backup, a message indicates that the QSYS user stopped the job, and the CPI096A message indicates, " Batch restricted state ended,"

Solution :

In BRMS, there is a parameter that specifies a maximum duration for the restricted state. The backup took longer than expected.

WRKPCYBRM TYPE(*SYS)

1. Display or Change system policy

```
Controlling subsystem:  
  Allow backups in batch . . . . .  
  Restricted state time limit . . . . .
```

15.23 SRC code B3020001 on the HMC for the Clone partition

Problem description:

During a restricted mode backup on the Clone partition, the SRC code displayed on the HMC is B3020001.

Solution :

This SRC code is for information purposes only.

The backup is running correctly.

The reason is in the definition of the Clone partition on the HMC, in the "General" tab, then "Advanced settings". The box "Enable connection monitoring" is checked, and it requires that the HMC always talks to the partition, which is not the case in restricted mode.

Since this code does not interfere with the backup, it is possible to leave the box checked.

But it is also possible to uncheck it because Flash for i does not use this function.

15.24 Ssh command not found

Problem description:

When installing with the FLINIT command, or later using one of the commands calling ssh, the following error message is displayed

qsh: 001-0019 Error found searching for command ssh. No such path or directory.

Solution :

1/ Check that the product 5733-SC1 option 1 is installed

2/ Check that the path to the Open ssh commands is correctly configured.

Type the commands

```
QSH  
Echo $PATH (be careful: text is case sensitive)  
  
The answer must contain at least:  
/usr/bin:./QOpenSys/usr/bin  
$
```

If it is not the case, contact the administrator to know the reason of the change.

If possible, change the default path to add the directory containing ssh as follows

```
QSH  
$  
export PATH=$PATH:/QOpenSys/usr/bin
```



```
$  
Echo $PATH  
/usr/bin:./QOpenSys/usr/bin  
$
```

If it is not possible to change the default path, you have to add an environment variable before each use of one of the commands calling ssh

```
ADDENVVAR ENVVAR('PATH') VALUE('/usr/bin:./QOpenSys/usr/bin') LEVEL(*JOB)
```

Or modify it :

```
CHGENVVAR ENVVAR('PATH') VALUE('/usr/bin:./QOpenSys/usr/bin') LEVEL(*JOB)
```

16 FlashCopy configuration on SVC/Storwize operating procedure

This section provides an example of an operating procedure for configuring disks using FlashCopy.

16.1 Considerations about FlashCopy parameters

This operating procedure is planned for a simple usage of the function FlashCopy, in an environment containing only one copy per partition to run a backups.

In the case of a more complex environment (several clone partitions for one production, need to keep a clone active for several days or weeks, ...) the parameters must be adapted precisely accordingly to the objective.

16.1.1 The meaning of the parameters

When configuring a FlashCopy, there are 2 parameters

- Copy rate
 - o Says how fast the SVC, Storwize or FlashSystem will copy the data from Source to target
 - o 0 means that NO original data will be copied. That's the value to use for daily backups and for a "No copy" style
 - o Any other value means that the data will be copied from source to target. If FlashCopy remains active long enough, the target disks will be 100% full
- Cleaning rate
 - o Says how fast the SVC will clean the data used by FlashCopy when we stop it

16.1.2 One single FlashCopy

When you configure a single FlashCopy with the default parameters for the daily backup, both rates are 0
When you start first Flashcopy, the SVC uses the first set of target disks to store changes made in source disks and target disks

As there is only 1 Flashcopy, when we stop it, there is nothing to do for the cleaning (only delete the target disks), so it's very fast. The clean rate is not used.

16.1.3 Two FlashCopy of the same source disks

When you start 2 FlashCopy, the SVC mixes the data changed on source and target 1 partitions in the FlashCopy 1 disks, and then also mixes the data changes on source and target 2 partitions in FlashCopy 2 disks.

Result: when you want to stop one of the Flashcopy, the SVC has some work to do to find the data that have to be kept, and the data that must be cleared.

And in some cases, this can take a few hours if the cleaning rate is 0

When the SVC is doing this, the FlashCopy status is "Stopping", and it's not possible to restart it immediately.

To avoid the FLCLONE command to fail because the FlashCopy is stopping, there are 2 options:

1. Change the cleaning rate to the max value (2Gbps). The cleaning is done faster. But you could have some performance issue on the SVC if it's overloaded
2. Set the Clean rate to a middle value, and some time before to use FLCLONE, use FLENDLPAR and FLENDFC to stop the FlashCopy (1 hour before for example). When the FLCLONE command will be used to start FlashCopy again, the FlashCopy will be in a good status.

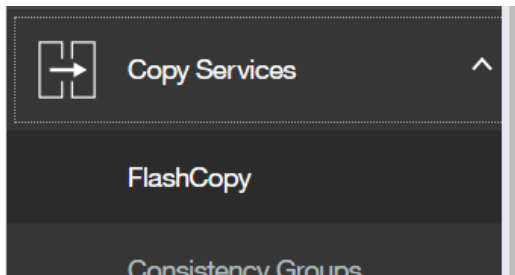
16.1.4 Disk space consideration

If a FlashCopy is set for daily backups, a No Copy definition is fine.

If the target disks must be used for 1 month or more, it may be interesting (but not necessary) to define a full copy.

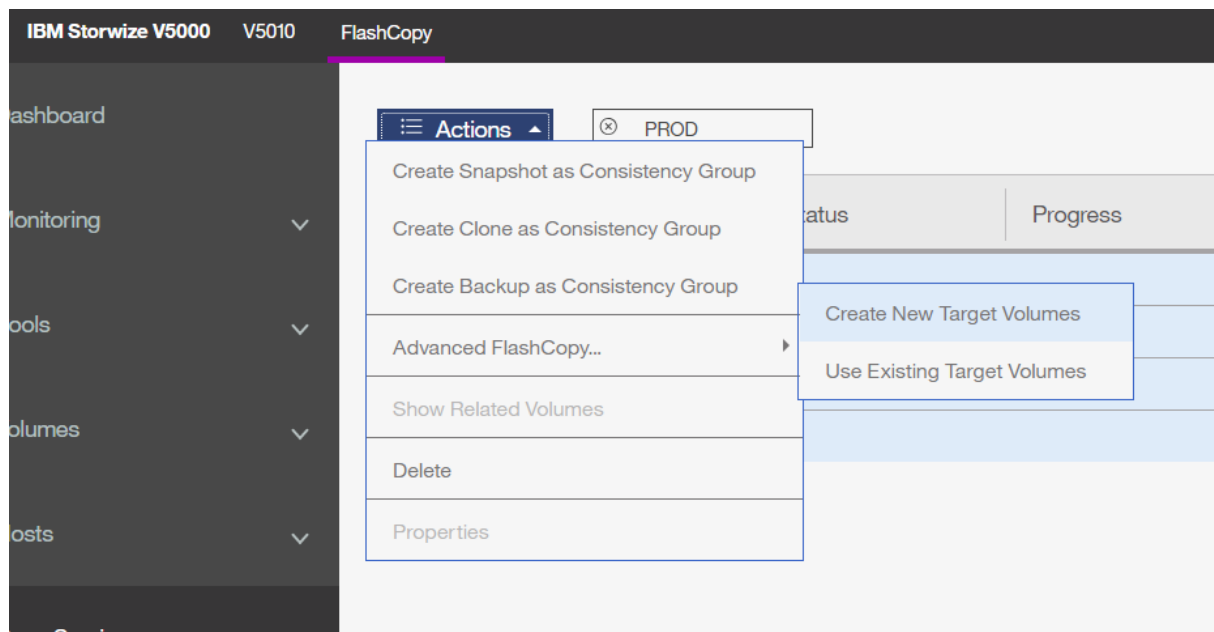
- It takes more disk space
- But there is no risk for someone to stop the Flashcopy by accident (in this case, the target disks would be lost)

16.2 Create disks for FlashCopy with a consistency group



Select all the production partition disks, then select action

- Advanced FlashCopy
- Create new Target Volumes






Choose "Snapshot"

If there is only one clone for the production partition, keep the values "Background Copy Rate" and "Cleaning Rate" to 0 KB/s.

In the case of a more complex environment (several clone partitions for one production, need to keep a clone active for several days or weeks, ...) those values must be adapted precisely accordingly.

Create FlashCopy Mapping ✕

Select a Preset

 *Snapshot*  *Clone*  *Backup*

Background Copy Rate:
0 KB/s ▾

Incremental
 Delete mapping after completion

Cleaning Rate:
0 KB/s ▾

Create FlashCopy Mapping ✕

Select the pool that is used to automatically create new targets:

Use the same pool that is used by the source volume.
 Use the following pool:

Select Thin-provisioned.
Leave the default value for Real capacity (2% of the original disk size).
This value indicates the actual size reserved on the Storwize for the clone disks.
It is advisable to monitor disk space during the first cloning operations.

Create FlashCopy Mapping
✕

How do you want the volumes to manage capacity?

▼
 Deduplicated

Real capacity:

% of Virtual capacity ▼

Automatically expand: Enabled

Warning threshold: Enabled

% of Virtual capacity

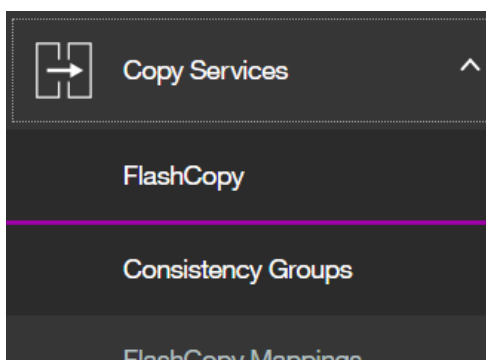
Thin-Provisioned Grain Size: ▼ KiB

Cancel
◀ Back
Finish

☰ Actions ▼
⊗ PROD

Volume Name	Status	Pro
> PROD_1		
PROD_1_01		
> PROD_2		
PROD_2_01		
> PROD_3		
PROD_3_01		
> PROD_4		
PROD_4_01		

16.3 Rename the consistency group



A new consistency group has been created with a default name and the copy has been started.

Check that the names of the disks it contains correspond to the group you have created by clicking on the (>) sign in front of the name.

Consistency Group	Mapping Name	Status	Source Volume	Target Volume	Progress
fccstgrp2		Idle or Copied			
	fcmap31	✓ Idle	PROD_1	PROD_1_01	0%
	fcmap32	✓ Idle	PROD_2	PROD_2_01	0%
	fcmap33	✓ Idle	PROD_4	PROD_4_01	0%
	fcmap34	✓ Idle	PROD_3	PROD_3_01	0%

Select the group and choose the "Rename" action

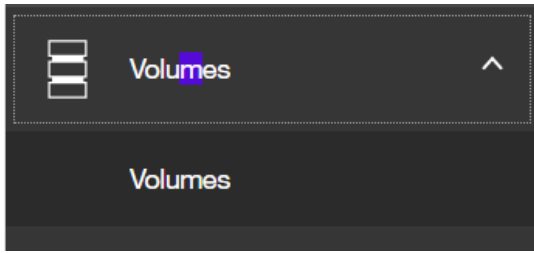
The screenshot shows a table of consistency groups and mappings. An 'Actions' dropdown menu is open over the 'fccstgrp2' group, with 'Rename' selected. The table shows mappings for 'fccstgrp2' to 'PROD_1', 'PROD_2', 'PROD_3', and 'PROD_4'.

Give it an easier name relating to the partition name. This name will be used in the Storage definitions.

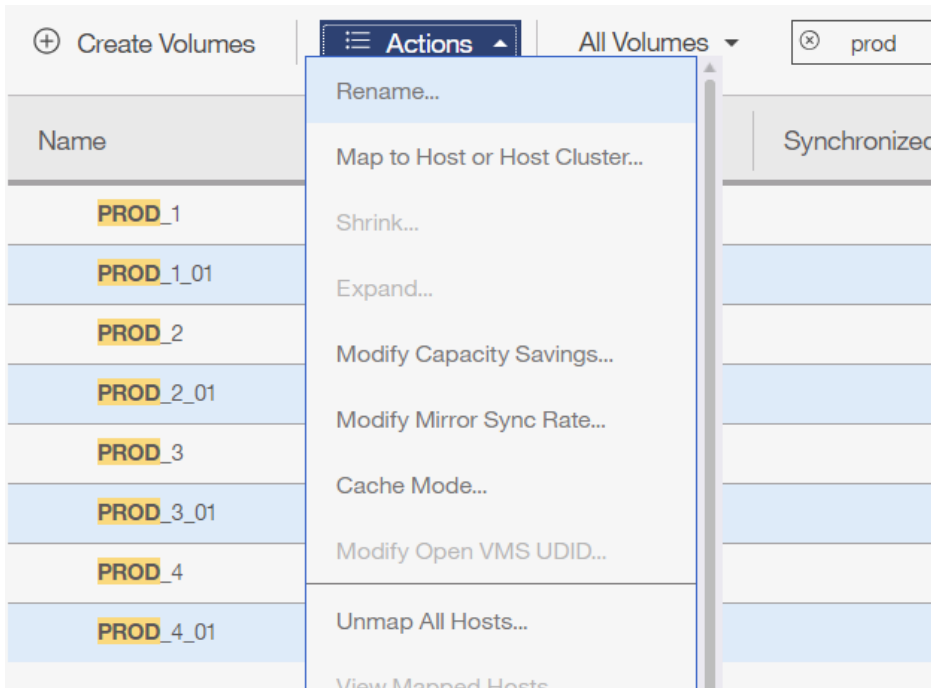
The dialog box is titled 'Rename FlashCopy Consistency Group'. It has a text input field labeled '*New Name' with the value 'PROD_GRP' entered. Below the field are three buttons: 'Reset', 'Cancel', and 'Rename'.

16.4 Rename the clone disks

The created disks can be renamed for better visibility in the future



Select the clone disks (their name is ending with _01) then choose the "rename" action



Rename Volumes
✕

**New Name*

PROD_1_01	<input type="text" value="PROD_CLONE_1"/>
PROD_2_01	<input type="text" value="PROD_CLONE_2"/>
PROD_4_01	<input type="text" value="PROD_CLONE_4"/>
PROD_3_01	<input type="text" value="PROD_CLONE_3"/>

When viewing the volumes, they appear as below:

Name	State	Synchronized
PROD_1	✓ Online (formatting)	
PROD_2	✓ Online (formatting)	
PROD_3	✓ Online (formatting)	
PROD_4	✓ Online (formatting)	
PROD_CLONE_1	✓ Online	
PROD_CLONE_2	✓ Online	
PROD_CLONE_3	✓ Online	
PROD_CLONE_4	✓ Online	

When viewing the FlashCopy function, they appear as below:

Volume Name	Status	Progress	Capacity	Group
▼ PROD_1			50.00 GiB	
PROD_CLONE_1	✓ Idle	<input type="text" value="0%"/>		PROD_GRP
▼ PROD_2			50.00 GiB	
PROD_CLONE_2	✓ Idle	<input type="text" value="0%"/>		PROD_GRP
▼ PROD_3			50.00 GiB	
PROD_CLONE_3	✓ Idle	<input type="text" value="0%"/>		PROD_GRP
▼ PROD_4			50.00 GiB	
PROD_CLONE_4	✓ Idle	<input type="text" value="0%"/>		PROD_GRP
PROD_CLONE_1			50.00 GiB	
PROD_CLONE_2			50.00 GiB	
PROD_CLONE_3			50.00 GiB	
PROD_CLONE_4			50.00 GiB	

17 Import an https certificate

This chapter is for VMAX bays, with https access.

If the access to the VMAX bay is in http only, there is no certificate to import.

17.1 Import the certificate on a PC

First, the certificate must be imported on a PC, before being deposited in an IFS directory of the Production partition.

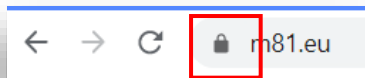
In this example, the browser used is Chrome.

In the browser, access a page of the VMAX bay management site.

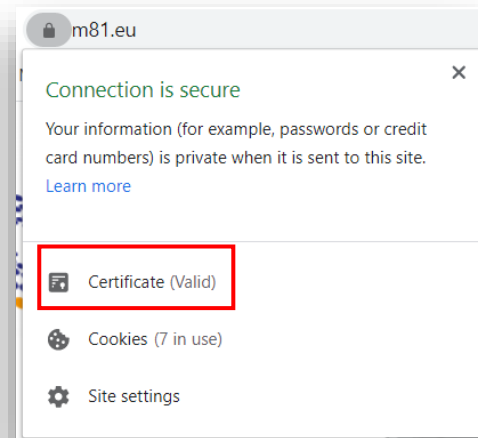
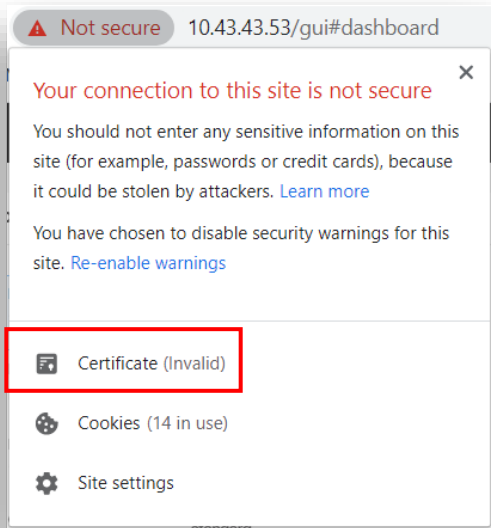
If the certificate used on the bay is a self-signed certificate, the display in the browser will be as below:



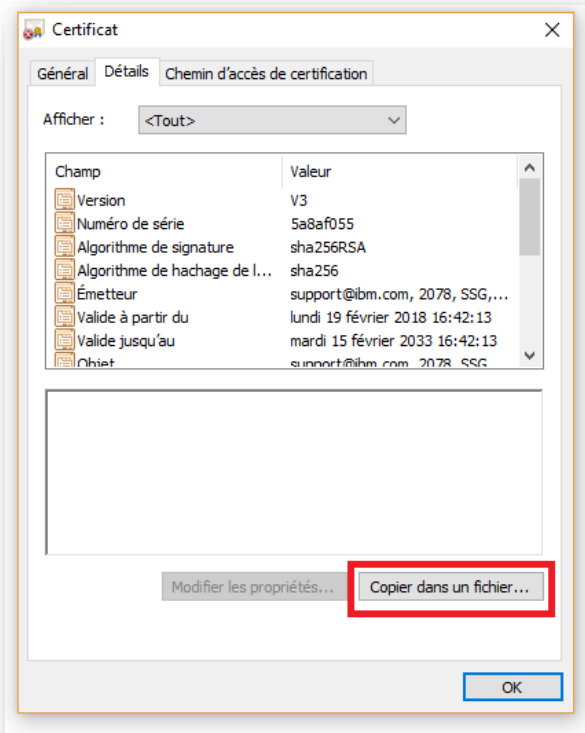
If the certificate is recognized by an official certification authority, the display will be as below:



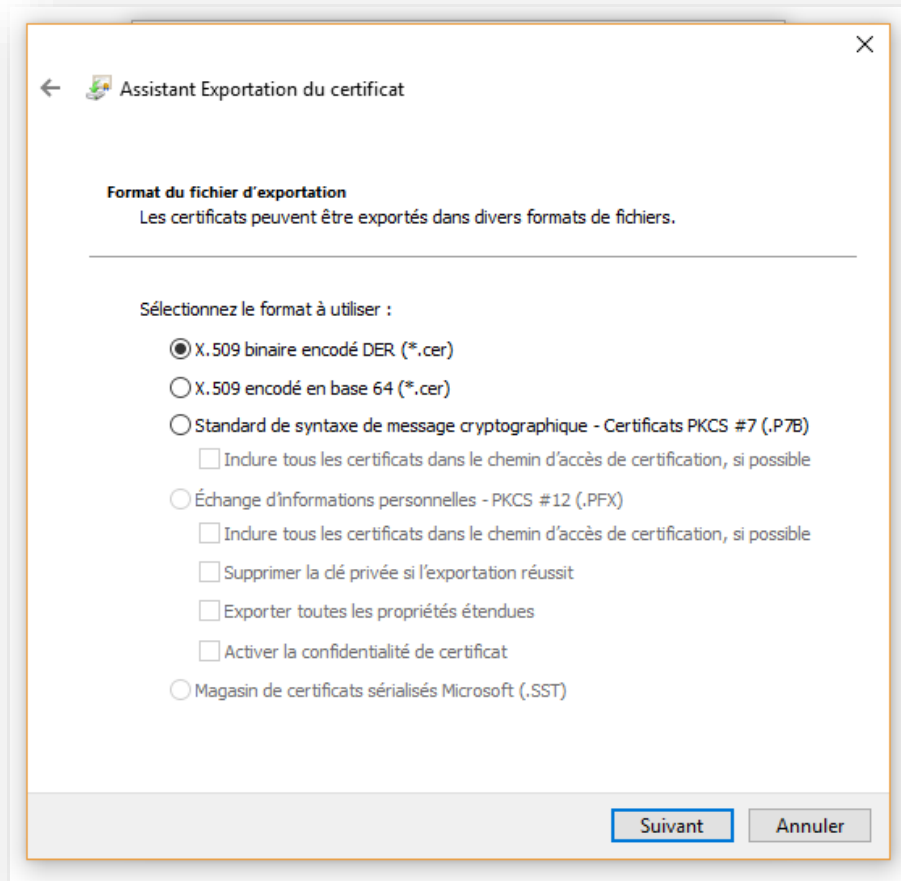
Click on the triangle or padlock to display one of the following menus



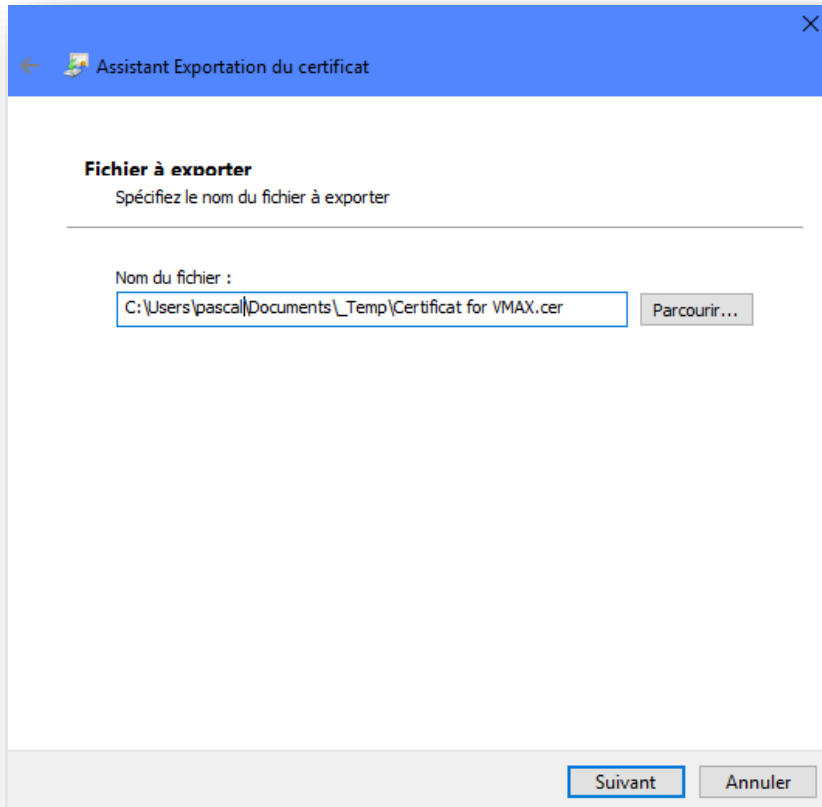
Then click on "Certificate", select the "Detail" tab, then click on "Copy to file".



A Certificate Export Wizard window opens.
Click "Next".



Select the type "X.509 binary encoded DER (*.cer)", then indicate a location where it will be stored temporarily.



Transfer this file to a directory on the IFS of the partition (e.g. using FTP).

It can be placed in any directory on the IFS.

If this certificate is only used for Flash for i, it can be placed in the /Flash4i directory for example.

```

Work with Object Links

Directory . . . . : /Flash4i

Type options, press Enter.
 2=Edit  3=Copy  4=Remove  5=Display  7=Rename  8=Display attributes
 11=Change current directory ...

Opt  Object link          Type  Attribute  Text
-----
Certificate for VM > STMF
    
```

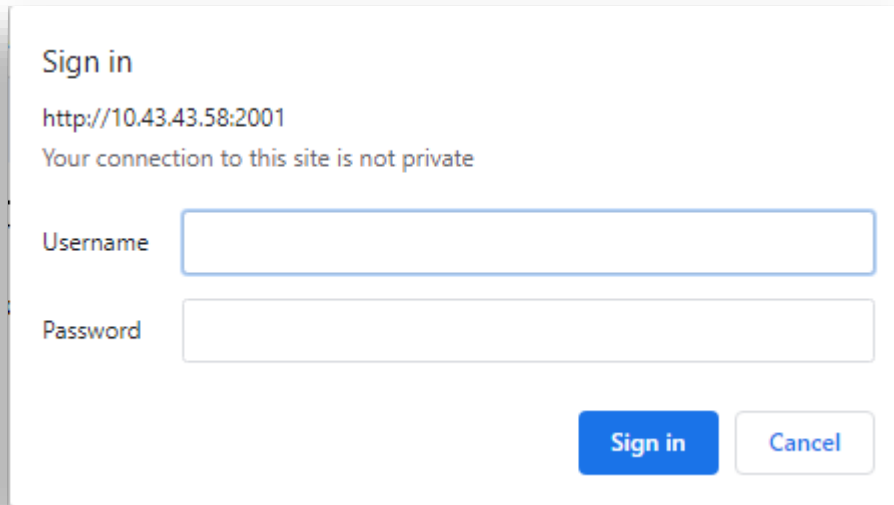
17.2 Create a certificate store in DCM on IBM i partition

The second step is to import the certificate into the DCM (Digital Certificate Manager) of the IBM i partition. This section describes how to create a new "Certificate store".

An existing Certificate Store can be used. In this case, proceed to the next step.

Direct access to the DCM can be done at the following address, replacing XX.XX.XX.XX with the IP address or name of the Production partition.

<http://XX.XX.XX.XX:2001/QIBM/ICSS/Cert/Admin/qycucm1.ndm/main0>



Sign in

http://10.43.43.58:2001
Your connection to this site is not private

Username

Password

Enter an IBM i profile and password to connect to DCM.



Digital Certificate Manager IBM

Select a Certificate Store

Expand All Collapse All

- ▶ [Manage User Certificates](#)
- [Create New Certificate Store](#)
- [Create a Certificate Authority \(CA\)](#)
- ▶ [Manage CRL Locations](#)
- [Manage LDAP Location](#)
- [Manage PKIX Request Location](#)

[Return to IBM i Tasks](#)

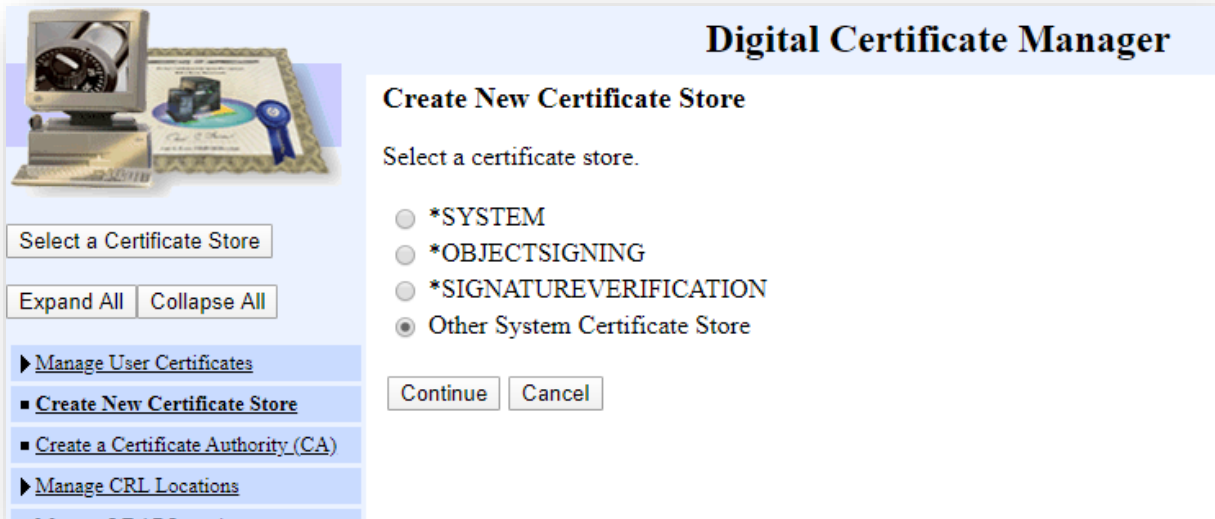
Secure Connection

5769-NC1, 5769-NCE, 5769-SS1, 5722-SS1, 5761-SS1, 5770-SS1 (C) Copyright IBM Corporation 1997, 2014
All rights reserved.
US Government Users Restricted Rights -
Use, duplication or disclosure restricted by GSA ADP Schedule Contract with IBM Corp.
Licensed Materials - Property of IBM

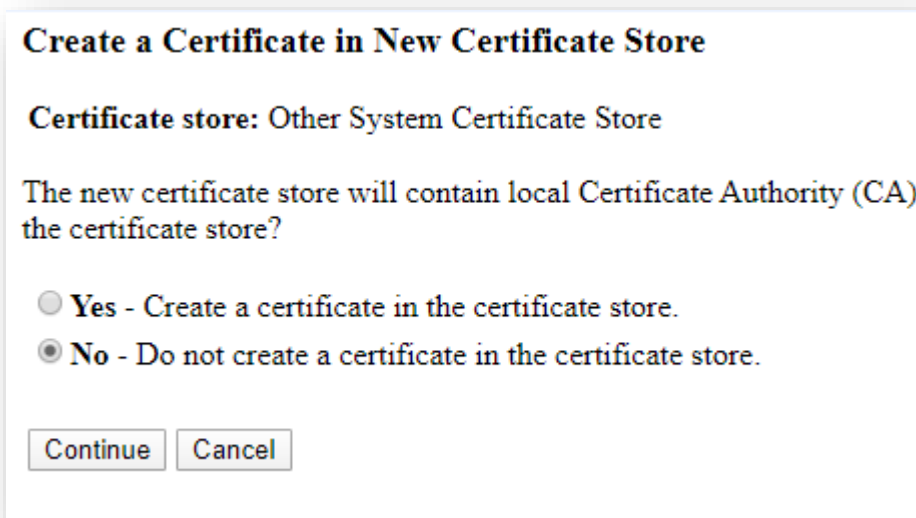
 Contains software from RSA Data Security, Inc.

Select « Create New Certificate Store ».

■ [Create New Certificate Store](#)



Select « Other System Certificate Store »



Select "No" Do not create a certificate. It will be imported later.

Certificate Store Name and Password

Certificate store: Other System Certificate Store

Enter the path and filename for the certificate store you want created. You must also specify a password for the certificate store.

Example certificate store file name: /MYDIRECTORY/MYFILE.KDB

Certificate store path and filename: (required)

Certificate store password: (required)

Confirm password: (required)

Enter the path and file name that will contain the Certificate store.
It can be placed in any IFS directory.
If this Store is only used for Flash for i, it can be placed in the /Flash4i directory for example.

The name of this file must end with .kdb

Also enter the password that will be associated with it.

Certificate Store Created

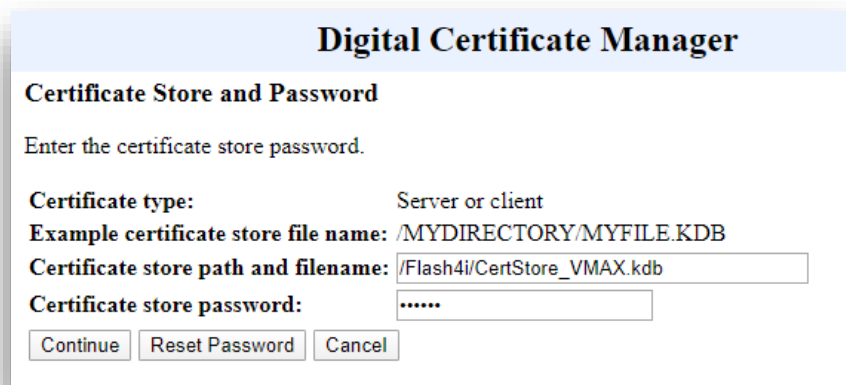
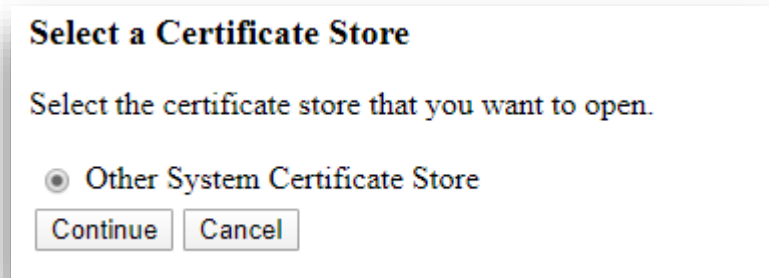
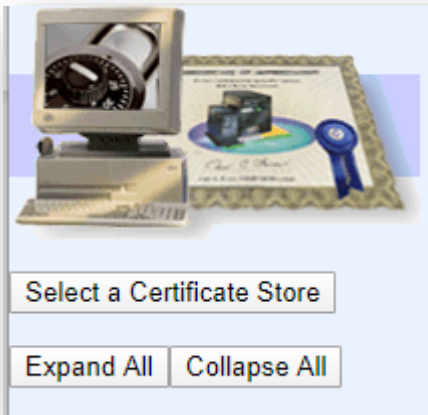
Message The certificate store has been created.
File name: /Flash4i/CertStore_VMAX.kdb

Note: You must click on the Select a Certificate Store button in the left frame to refresh the Digital Certificate Manager (DCM) to work with this new certificate store.

17.3 Import the certificate in DCM on IMB i partition

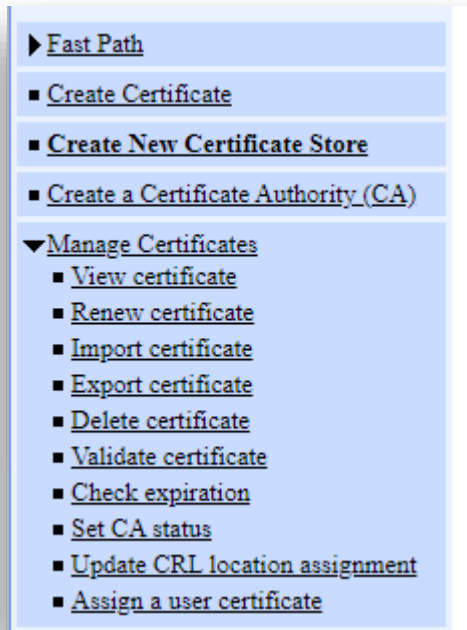
The certificate from the VMAX bay will now be imported into the certificate store created in the previous step.

Select the Certificate Store created in the previous step.

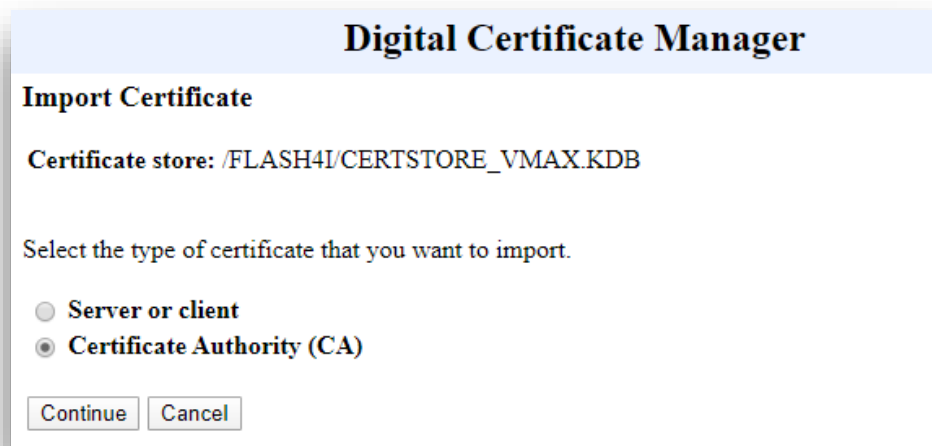


Enter the name of the file containing the Certificate Store, and the associated password.

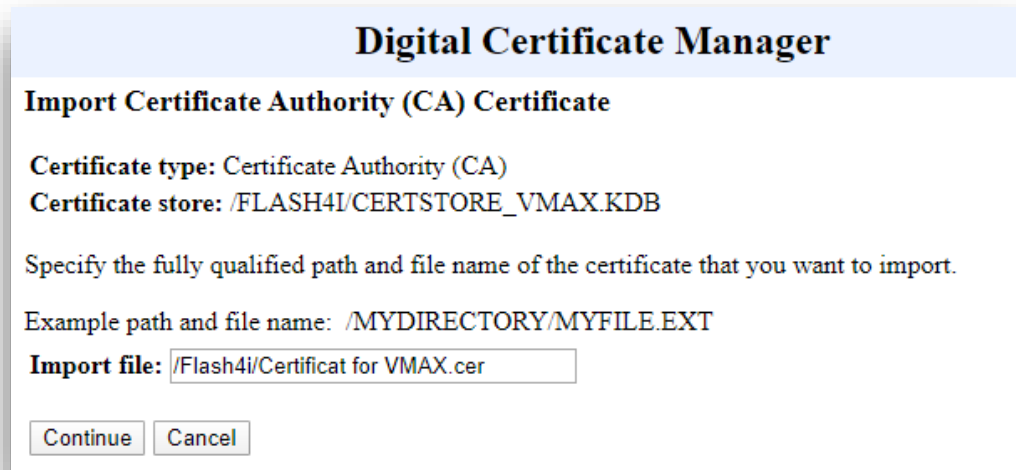




Select « Manage Certificates », then « Import certificate »



Select « Certificate Authority (CA) »



Digital Certificate Manager

Import Certificate Authority (CA) Certificate

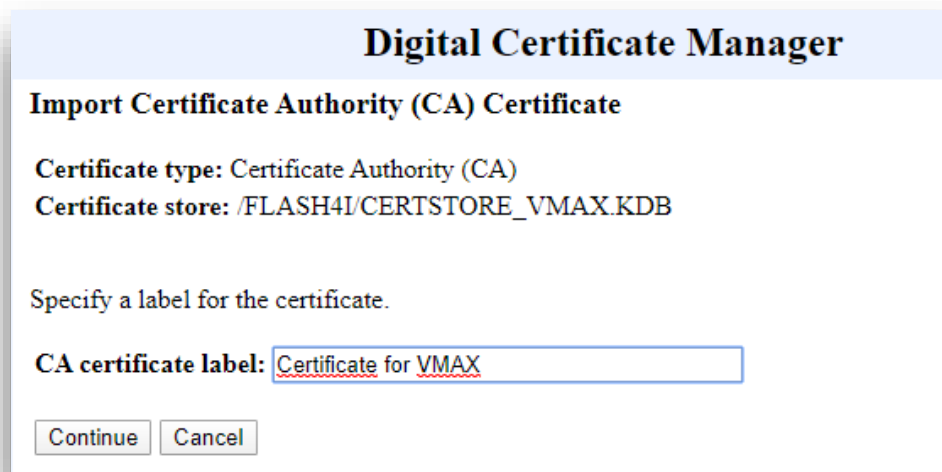
Certificate type: Certificate Authority (CA)
Certificate store: /FLASH4I/CERTSTORE_VMAX.KDB

Specify the fully qualified path and file name of the certificate that you want to import.

Example path and file name: /MYDIRECTORY/MYFILE.EXT

Import file:

Enter the name of the file containing the certificate previously imported into the IFS.



Digital Certificate Manager

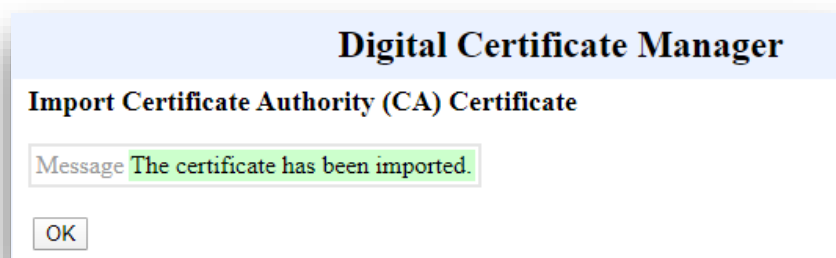
Import Certificate Authority (CA) Certificate

Certificate type: Certificate Authority (CA)
Certificate store: /FLASH4I/CERTSTORE_VMAX.KDB

Specify a label for the certificate.

CA certificate label:

Enter a label that will later allow this certificate to be recognized among the others.



Digital Certificate Manager

Import Certificate Authority (CA) Certificate

Message **The certificate has been imported.**

17.4 Check that a certificate exist

It is possible to verify that a certificate exists and has been recognized.

Using a 5250 screen:

The certificate and the Store certificate have been placed in a directory (or directories). They are visible with the command WRKLNK

In our example, they are placed in the /Flash4i directory.
wrklnk '/Flash4i/Cert*'

```

Work with Object Links

Directory . . . . : /Flash4i

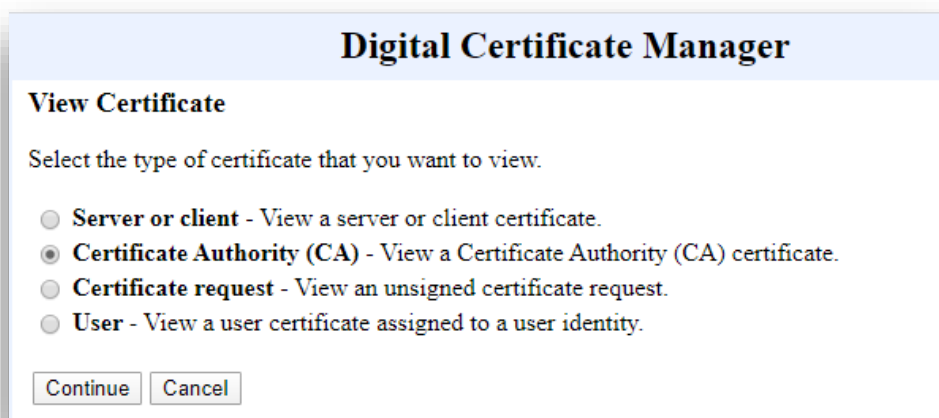
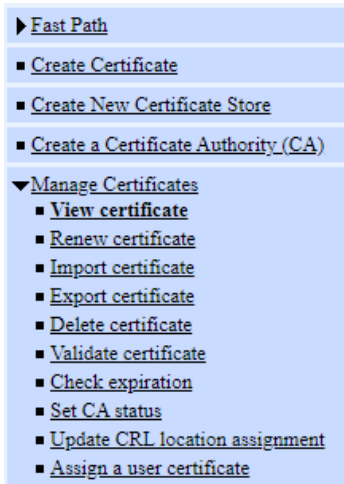
Type options, press Enter.
  2=Edit  3=Copy  4=Remove  5=Display  7=Rename  8=Display attributes
  11=Change current directory ...

Opt  Object link          Type  Attribute  Text
-----
      Certificate for VM > STMF
      CertStore_VMAX.kdb  STMF
      CertStore_VMAX.RDB  STMF
  
```

Using DCM:

Select the Certificate Store, as indicated at the beginning of the previous chapter.

Then select "Manage Certificates" and then "View certificate".



Select « Certificate Authority (CA) »

Digital Certificate Manager

View Certificate Authority (CA)

Certificate type: Certificate Authority (CA)

Certificate store: /FLASH4I/CERTSTORE_VMAX.KDB

Select a certificate, then select View to see the certificate information.

<input type="checkbox"/>	Certificate Authority (CA)	Status
<input checked="" type="checkbox"/>	Certificate for VMAX	Enabled

18 Support

Thank you for your choice to use Flash For i product.

For getting support during installation or use of this product:

Contact your reseller.

Or send your questions to the following address:

support@m81.eu

This support is available at working days and hours (in France), and must be associated with a maintenance contract.