Quick-install of the PowerHA Full System Flashcopy Manager

Version 4.6

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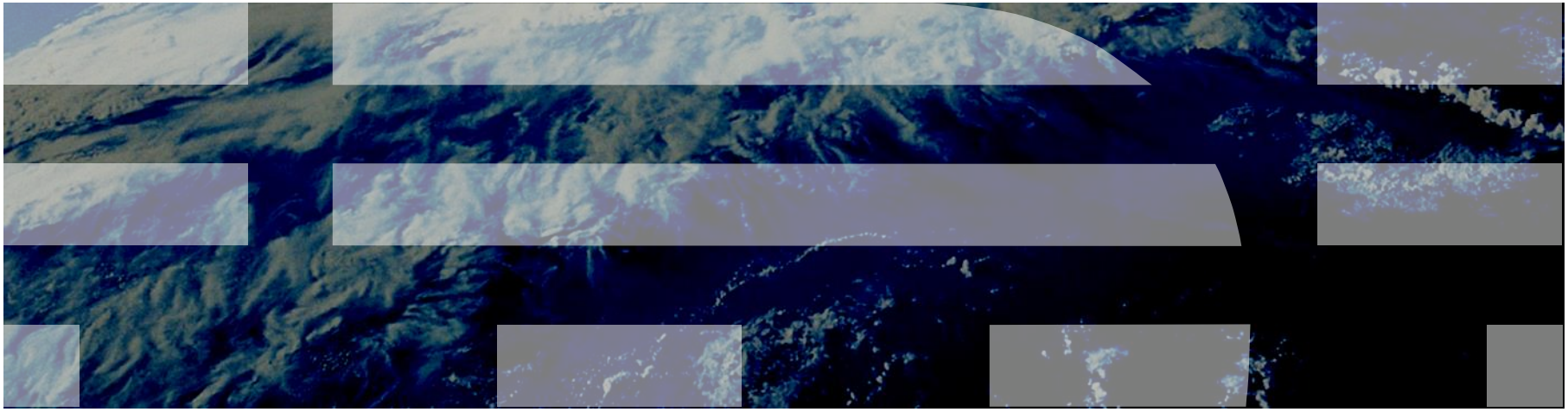
Thursday, April 27, 2023



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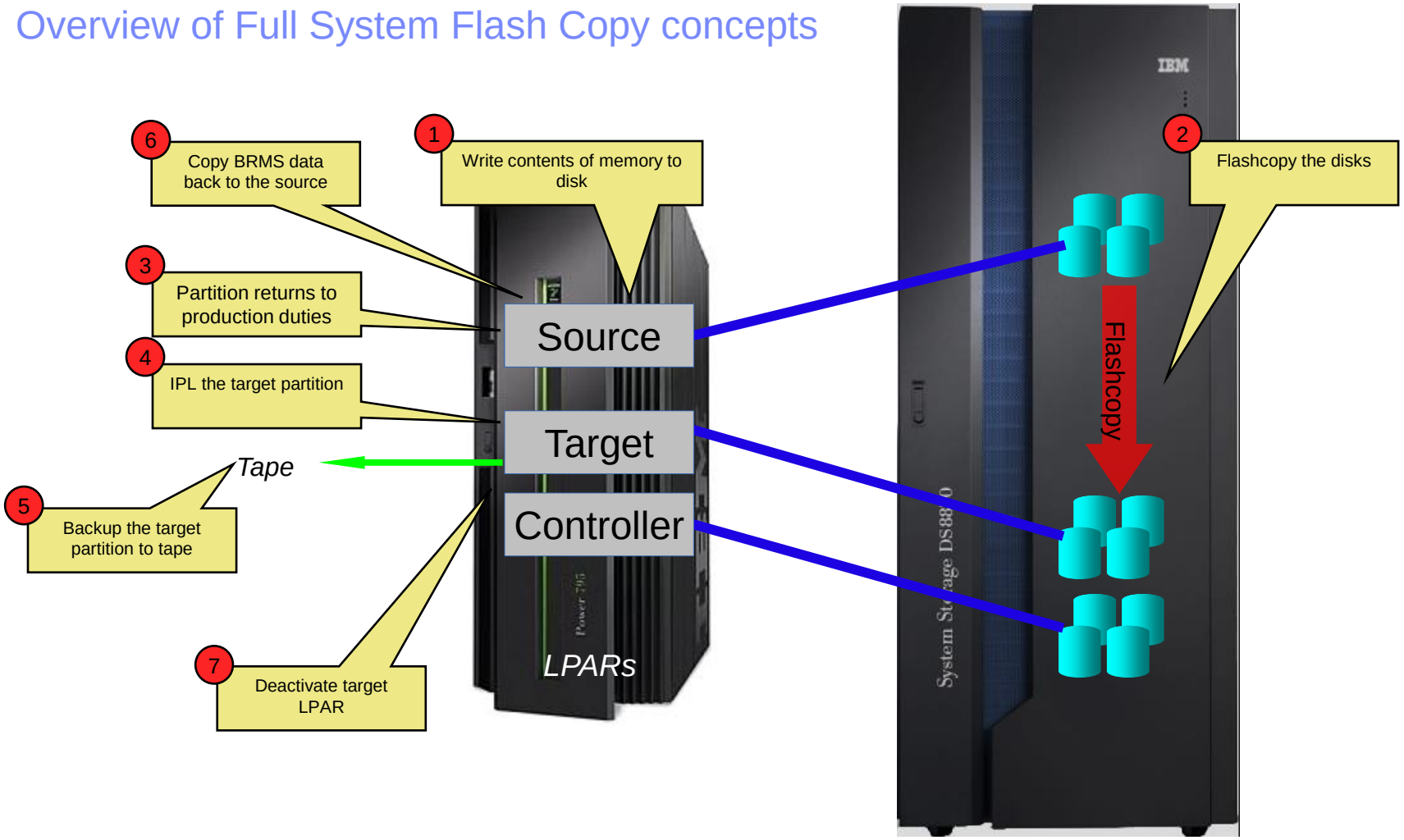
ibm.com/systems/services/labservices

What the heck is this document for?

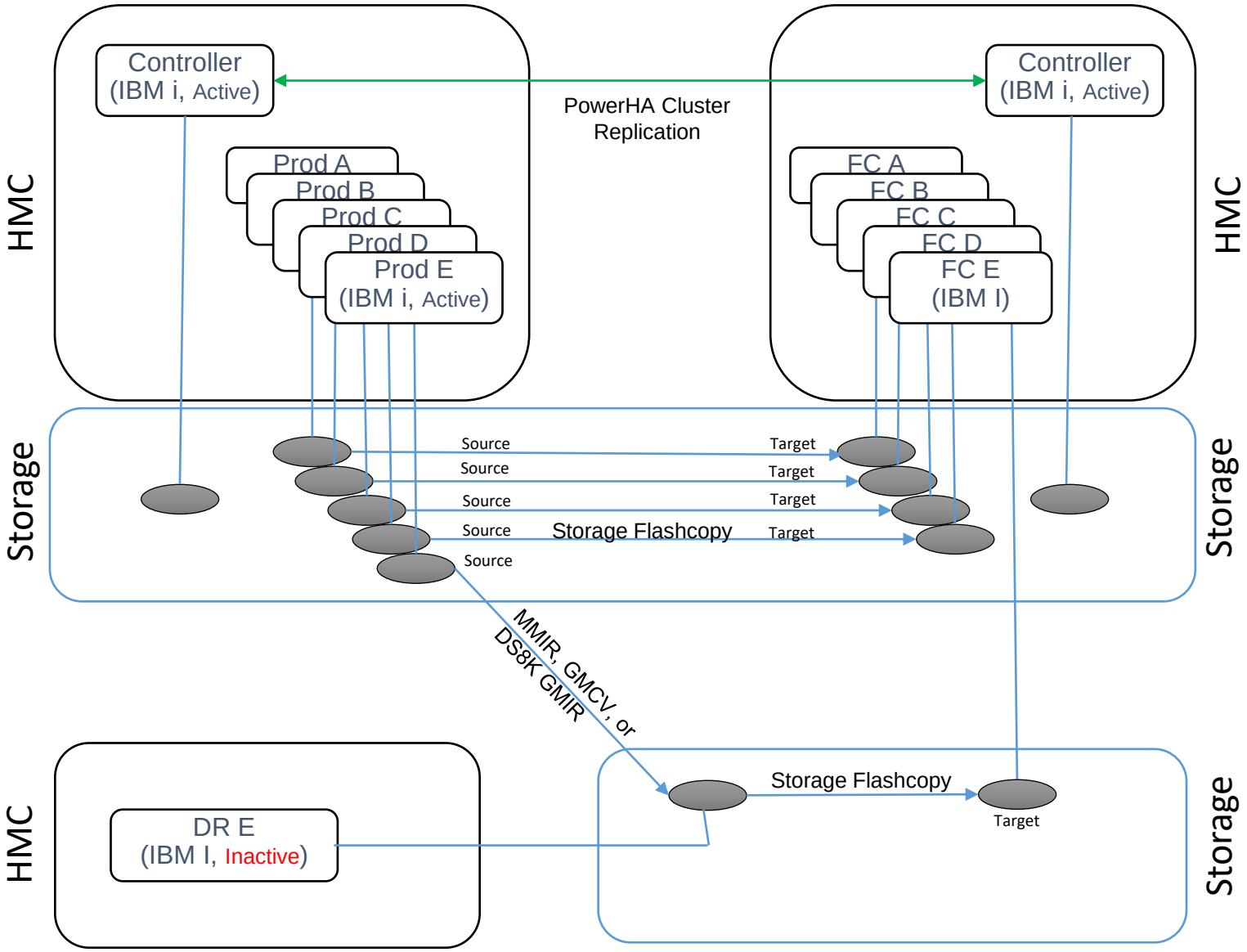
- This is a quick-install guide for configuring the Full System Flashcopy Manager for the following storage products:
  - SVC family (V3700, V5000, V7000, V9000)
  - DS8K family
  - IBM PowerVS [Cloud]
- Customers can have it, but it is designed to be performed by a Lab Services consultant
- It does not explain details or how to handle errors or special/complex situations

- Primary documentation is the FSFC Manager Webpage:
- Has more detail and explanations
  - **http://ibm.biz/PowerHATools**

Overview of Full System Flash Copy concepts



Overview of Full System Flashcopy topography – On-prem



Firewall access (on-prem)

Workstation access required for installation and configuration only

Ping, Telnet (23)

Source

Ping
Toolkit (dft=55920)

BRMS Xfer port *DFT = 55066
Toolkit communications default = 55920

Ping, Telnet (23)

Ping, ssh port 22
Telnet 2300

Ping, ssh port 22

Ping, ssh port 22
DSCLI = port 1751

Controllers

PowerHA ports 5550, 5551 between controllers

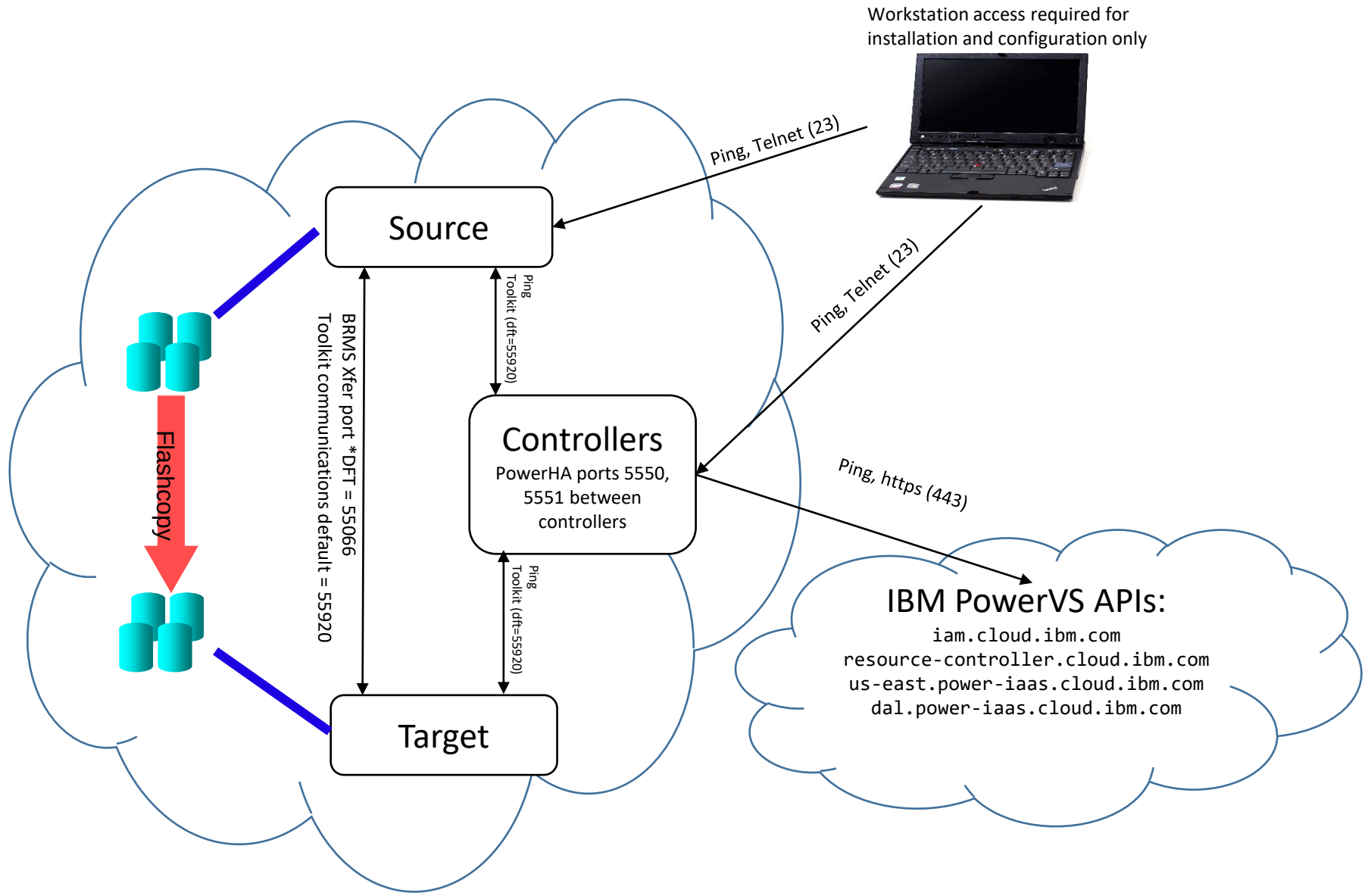
Ping, ssh port 22

Ping
Toolkit (dft=55920)

Target

LPAR HMC (primary and secondary)

Firewall access (cloud)



Customer actions prior to our engagement

- Provide Lab Services with the IBM i serial numbers so we can generate license keys
- Source and Controlling LPARs configured with IBM i OS
  - Install the LPP's and PTF's as listed on our website
    - ***http://ibm.biz/FSFCManager***
    - Expand 'Pre-engagement Requirements'
  - PowerHA (Standard Edition) installed and licensed
    - We will help you set up the clusters
  - Place FSFC Manager savefile PHATOOLS46 in QGPL on the controlling and production LPARs
    - We will send this to you before we arrive
- Get IP addresses, administrative user IDs and passwords for:
  - HMC
  - LPAR's (including the secondary)
  - Storage devices (SVC / DS8K)

SVC setup prior to our engagement

- Configure the storage unit for Primary, Secondary and Controlling LPAR.
  - Firmware level 7.5.0.3 or newer
    - If using FS910 with GMCV and the change volumes are in a data reduction pool (DRP), the SVC must be at firmware level 8.2.1.1 or higher
  - Create or select user profile
    - Must be assigned to CopyOperator (or better) user group
    - If changing host connections, must be Administrator
  - LUNs
    - For source and target LPARs
  - Host connections
  - Licenses (Replication, Thin-provision, etc)
  - If using replication:
    - Partnerships
      - We can remotely help you set this up (also ensures you have communication between the SVC's before we arrive)
    - Start replication
      - Replication should be completed before we're onsite so that won't have to wait for it to catch up

DS8K setup prior to our engagement

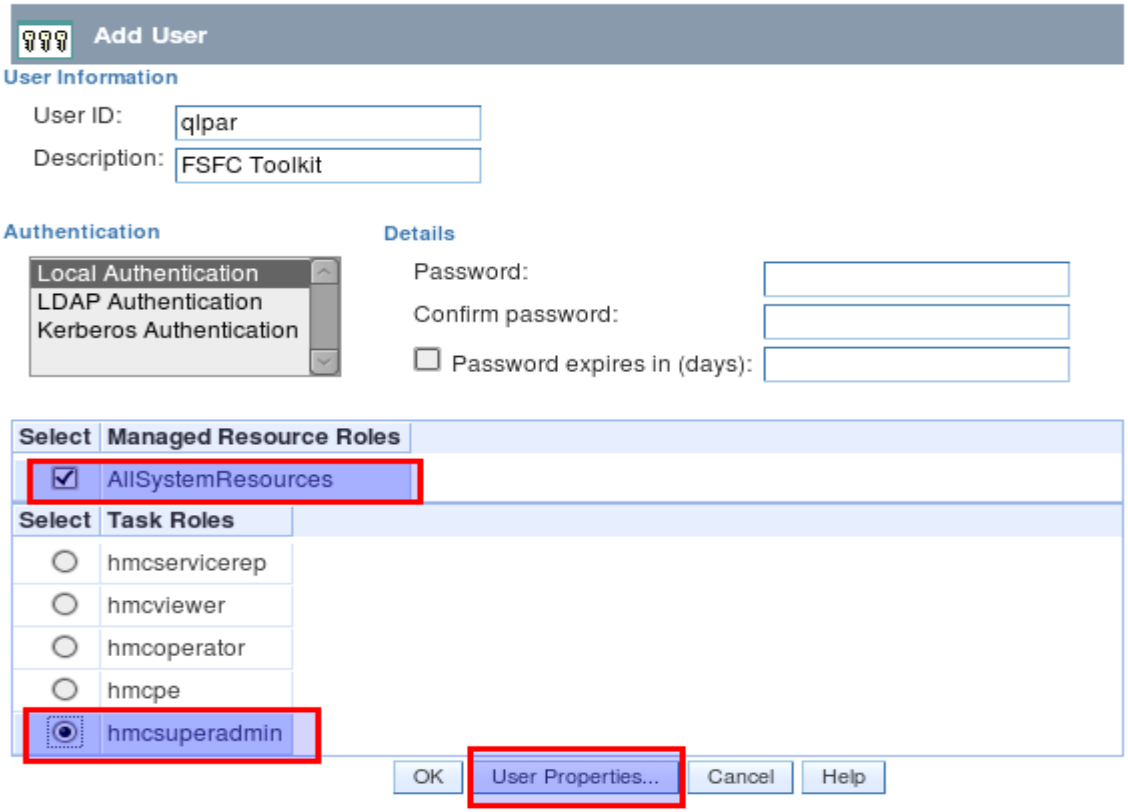
- Create a user profile on the DS8K
  - Can be other than QLPAR, make a member of the admin group
  - Remember the password, set to not expire
    - chpass –expire 0
- Configure the storage unit for Primary, Secondary and Controlling LPAR.
  - Recent firmware level
    - Install DSCLI on the IBM i from the DS8K CD
    - Bundle 87.10.91.0 or newer (required for creating GMIR D-Copy)
  - Create fixed block volumes (requires ranks, arrays, extent pools, space efficient repositories, etc)
    - For source and target LPARs
  - Volume groups, ports and host connections
  - Licenses (Replication, Space Efficient, etc)
  - PPRC Paths
    - We can remotely help you set this up (also ensures you have communication between the DS's before we arrive)
  - Start replication
    - Replication should be completed before we're onsite so that won't have to wait for it to catch up

Cloud setup prior to our engagement

- Create the Cloud environment including
  - Resources
    - One or two persistent controlling PVM instances (IBM i)
      - Access to the PowerVS APIs (i.e. iam.cloud.ibm.com etc)
        - Ping (iCMP), Port 443
    - Production PVM instances
      - The VM should be pinned
      - Network access (IP addresses etc)
      - Storage with OS loaded and configured
      - BRMS (optional)
    - Flashcopy PVM instances
      - The VM should be pinned
      - Storage must be pinned to the same storage pool as the production PVM
      - Network access (IP addresses etc)
      - Backup device connectivity
    - Serial numbers for all the instances
      - DSPSYSVAL QSRLNBR
      - Include potential LPM serial numbers
  - Service ID
    - Access to the resources (instances, storage, etc)
  - API Key
    - The API Key must be retained when created

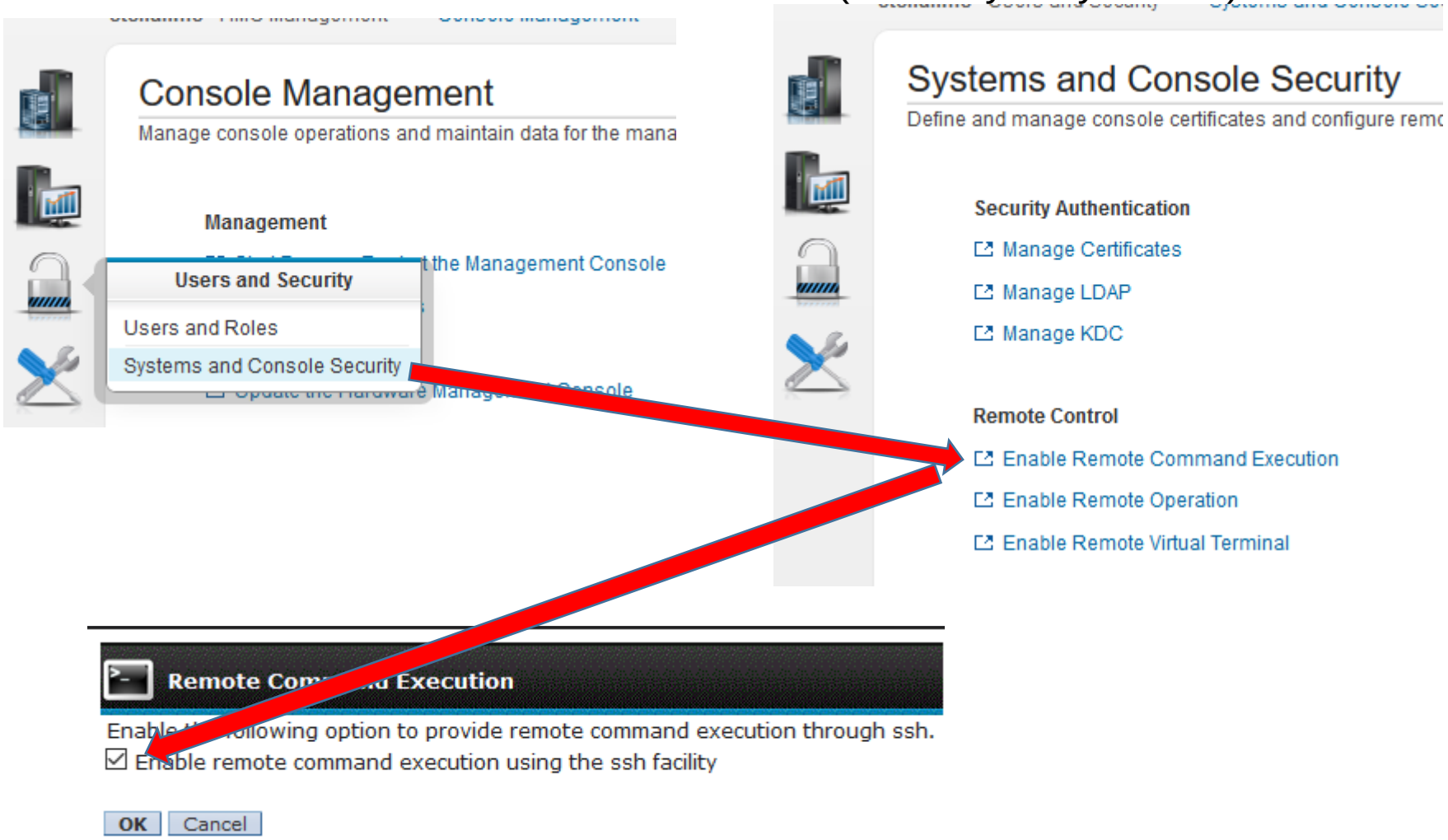
HMC Configuration (non-Cloud)

- Create a user on the LPAR HMCs
- Any user name will do (as long as you remember it)
- Password is required
- Hmcsuperadmin with AllSystemResources



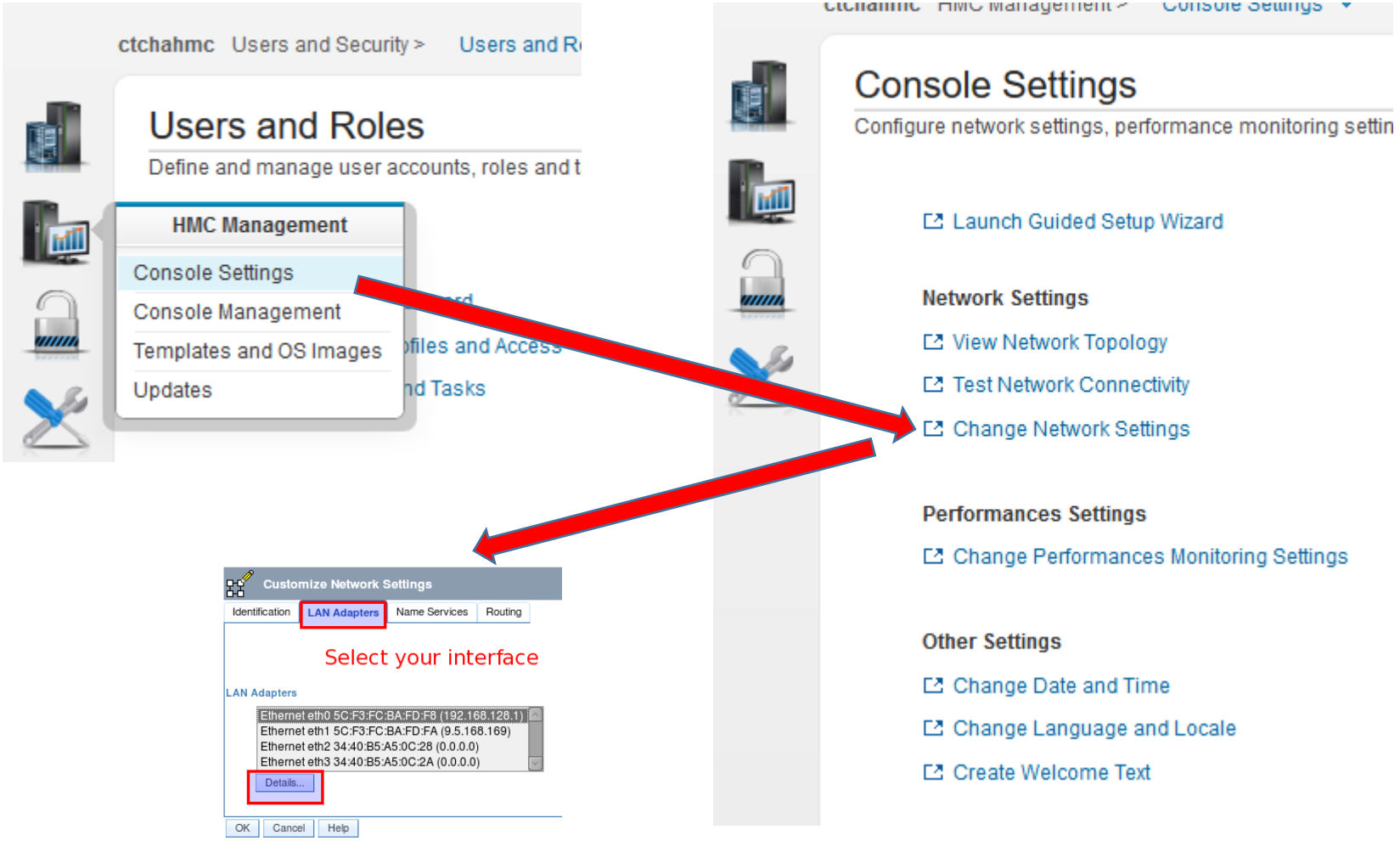
HMC Configuration

Remote command execution must be enabled (It usually is by default)



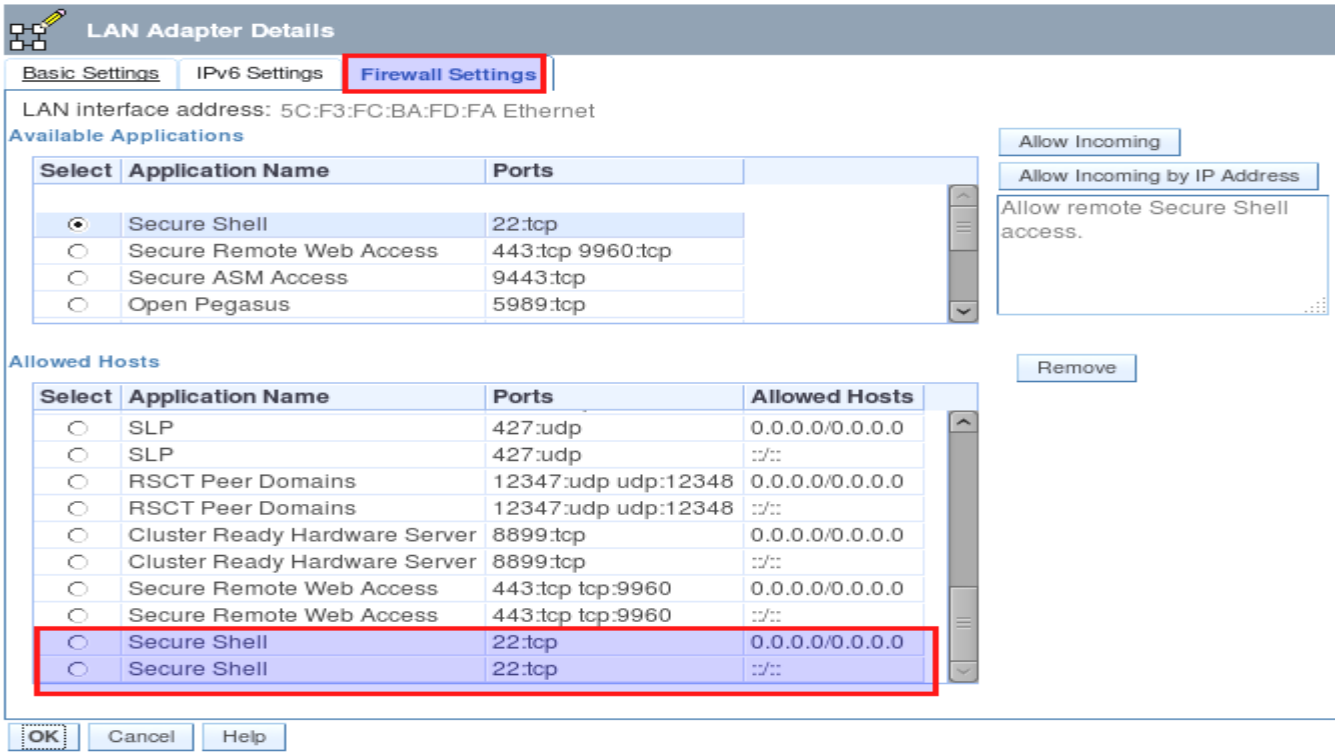
HMC Configuration

Ssh must be enabled through the firewall



HMC Configuration

Secure Shell (port 22:tcp) must be allowed.
- Allow all hosts: 0.0.0.0/0.0.0.0
- Allow specified hosts: at least specify the IP of your controlling LPAR



Restoring toolkit library, setup on **Production** LPARs

- Place the toolkit savefile in QGPL (FTP, scp etc)
- Restore the toolkit library:
  - RSTLIB SAVLIB(QZRDHASM) DEV(*SAVF) SAVF(QZRDHASM46)
  - The ‘46' refers to the release and may change
  - ADDLIBLE QZRDHASM
- Run the setup program
  - SETUPFSFC NODEROLE(*SRC) ACSCODE('??')
    - Press PF4 and specify the line description, TCPIP interface and subnet mask to create on the controller for the target to use
  - The port number is used for toolkit communications from the controllers, *DFT is 55920
  - The line description and IP interfaces will be created
  - Will create user profile QLPAR without a password, initialize files etc.
- If additional line descriptions and IP addresses are needed, for example for iSCSI VTL’s, create those manually
- If the target LPAR is on a different serial number:
  - A license key for the target LPAR must be entered.
  - Use ADDPRDACS on the Production LPAR to enter the serial number and license for the target LPAR.

Enter the controller information on the **Production** LPARs

- If using multiple controllers, set up the toolkit so STRFSFLASH can be issued on the production LPAR and connect to the first available controller.
- Use WRKSTRPRSC *CMN and enter the controller information:

```
                        Work with Communications Startup Resources

Type options, press Enter.
  1=Add   2=Change   4=Remove

Opt  Usage  IP Interface     Line Desc   Hardware Resource Location      Port
 _   _____  _______________
 _   *CTL1  1.2.3.4          N/A         PRIMARY CONTROLLER              *DFT
 _   *CTL2  1.2.3.5          N/A         SECONDARY CONTROLLER            *DFT
```

- STRFSFLASH CTLR(*AUTO) will use this information to connect to the first available controller.
- STRFSFLASH can still be run from the controller with CTLR(*LOCAL)

Modifying the Startup Program on **Production** LPARs

- Modify startup program on each node to prevent QSTRUPPGM from running on the target.
  - Not necessary if using CFGSTRPSRC (for Full System Replication)
  - This is optional but adds a layer to safety.
  - QZRDHASM/RUNLPARCMD SRLN(xxxxxxx) LPAR(xx) CMD(CALL + PGM(QZRDHASM/QZRDENDSBS))
    MONMSG MSGID(CPF0000)
    - At the very beginning of the startup program
    - Specify the target LPAR serial and LPAR numbers
    - Review QZRDHASM/QCLSRC QZRDENDSBS for changes
    - Include MONMSG CPF0000 after RUNLPARCMD
  - To view the LPAR id use this command:
    - CALL QSYS/QLZARCAPI

- Modify startup program on each node to start the subsystem:
  - Not necessary if using CFGSTRPSRC (for Full System Replication) (CFGSTRPRSC will start the subsystem)
  - After IP and QSYSWRK start, before applications,
  - STRSBS QZRDHASM/QZRDFSR
    MONMSG MSGID(CPF0000)

PowerVS: Add iSCSI information to the **Production** LPARs

- If the Flash Copy (target) LPAR is going to use a VTL via iSCSI it needs to know the new initiators for the target LPAR to use.
- These are entered using environment variables which the toolkit will look for on the target LPAR. Substitute the values as appropriate.
- Decide on unique client and target initiators
  - iqn.1924-02.com.ibm:ibmi.target-lpar-name
  - vtlname.target-lpar-name
- Create the environment variables for
  - ADDENVVAR ENVVAR(QZ_FSFC_ISCSI_TARGET) VALUE('vtlname.target-lpar-name') LEVEL(*SYS)
  - ADDENVVAR ENVVAR(QZ_FSFC_ISCSI_TARGET_IP) VALUE('<VTL host name or IP address>') LEVEL(*SYS)
  - ADDENVVAR ENVVAR(QZ_FSFC_ISCSI_TARGETPORT) VALUE(3260) LEVEL(*SYS)
  - ADDENVVAR ENVVAR(QZ_FSFC_ISCSI_INIT) VALUE('iqn.1924-02.com.ibm:ibmi.target-lpar-name') LEVEL(*SYS)
- Any existing source initiators are removed when the LPAR/VM UUID changes, i.e. when:
    - Flash Copied
    - Replicated and switched
    - Restored on new hardware
  - The IQN information is not saved (not even *SAVCFG)
  - The new initiators for the target to use.

Creating the cluster on the **controllers**

- If there is only one controller, you must create a single-node cluster. Perform the following steps on the single node only.
- If multiple controllers are to be configured, issue these messages on all of them:
  - STRTCPSVR *INETD
  - CHGTCPSVR *INETD AUTOSTART(*YES)
  - CHGNETA ALWADDCLU(*ANY)
- On the Master controller
  - CRTCLU CLUSTER(FSFC) START(*YES) DEVDMN(*GEN)
    - PF4, fill in Primary and Secondary Controlling node names and IP addresses
- On Auxiliary controller:
  - WRKCLU, validate cluster is started

Restoring toolkit library, setup on both **Controllers**

- Place the toolkit savefile in QGPL (FTP, scp etc)
- Restore the toolkit library:
  - RSTLIB SAVLIB(QZRDHASM) DEV(*SAVF) SAVF(QZRDHASM46)
    - The ‘46' refers to the release and may change
  - ADDLIBLE QZRDHASM
- Run the setup program
  - SETUPFSFC NODEROLE(*CTL) PORT(*DFT) ACSCODE('??')
  - The port is used to receive communications from the production LPARs, *DFT is 55920
  - Will create user profile QLPAR without a password, initialize files etc.

```
        Set up IBM Pwr HA tools - FSFC (SETUPFSFC)

Type choices, press Enter.

Node role  . . . . . . . . . . . . > *CTL          *CTL, *PRD
FSFC communications port . . . .   *DFT          1-65535, *SAME, *DFT
Toolkit access code  . . . . . .   12345
```

Update the startup program on the **controllers**

- Modify the startup program (after IP has been started) on each controller to:
  - Start the subsystem if any process will be initiated from the production LPAR:
    - STRSBS SBSD(QZRDHASM/QZRDFSR)
    - MONMSG MSGID(CPF0000)
  - Start the cluster if there are multiple nodes using the DDD:
    - STRCLUNOD CLUSTER(*) NODE(*ALL)
    - MONMSG MSGID(CPF0000)
      - **This requires *IOSYSCFG so QSTRUPJD should specify a profile like QLPAR so after compiling the startup program issue this command:**
        - **CHGJOBD JOBD(QSTRUPJD) USER(QLPAR)**

Download the Java Secure Channel code (on the **Controllers**)

- Download Java Secure Channel to /QIBM/qzrdhasm/ssh from
  - http://sourceforge.net/projects/jsch/files/jsch.jar/0.1.55/jsch-0.1.55.jar/download
  - Use the latest version, ensure the file /QIBM/Qzrdhasm/ssh/jsch.jar links to what you downloaded.
- The Java Secure Channel is an open-source implementation of ssh
- Because it is open-source, IBM Legal requires that you download it yourself (i.e. we can't bundle it with our toolkit)
- Download to desktop, FTP to both IBM i controllers, place it into directory /QIBM/qzrdhasm/ssh/

```
ftp> bin
200 Representation type is binary IMAGE.
ftp> put jsch-0.1.55.jar /QIBM/qzrdhasm/ssh/jsch-0.1.55.jar
local: jsch-0.1.55.jar remote: /QIBM/qzrdhasm/ssh/jsch-0.1.55.jar
227 Entering Passive Mode (9,5,168,177,167,46).
150-NAMEFMT set to 1.
150 Sending file to /QIBM/qzrdhasm/ssh/jsch-0.1.55.jar
226 File transfer completed successfully.
249282 bytes sent in 0.742 secs (336.12 Kbytes/sec)
ftp>
```

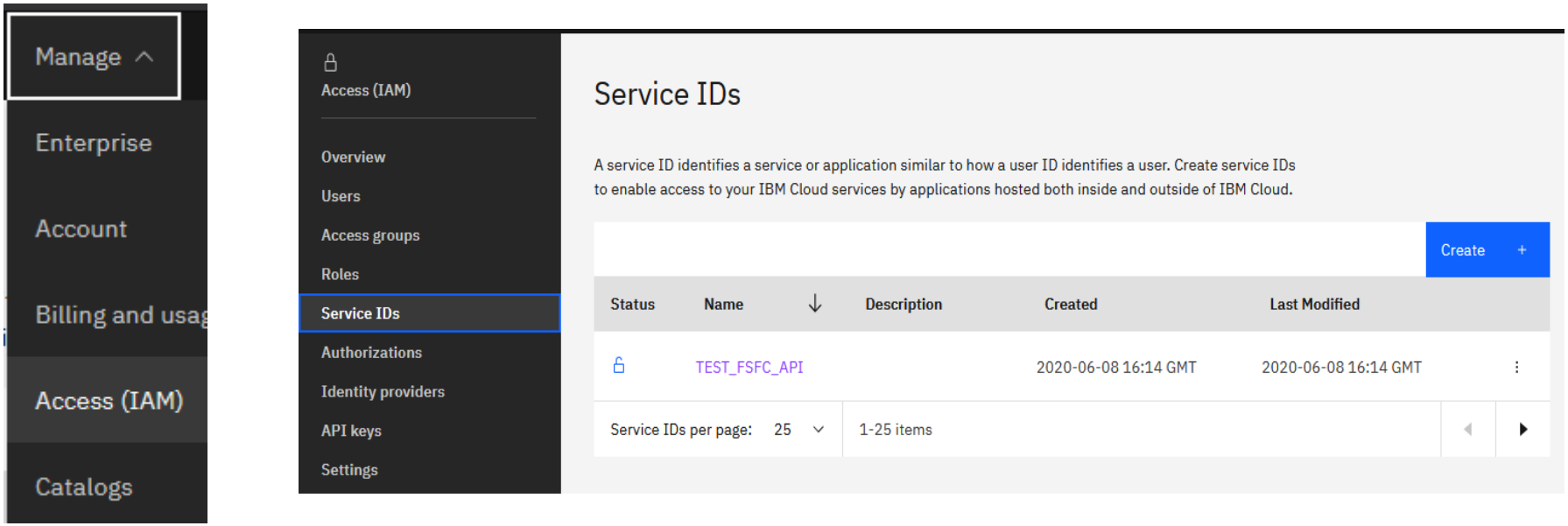
Create the on-prem credentials on either **controller**

- FSFC uses userid/password to log into the HMCs, DS8Ks and SVCs. Use WRKCSECRDL or ADDCSECRDE to manage these credentials.
- The ‘Role’ should be *USER if the host is not a CSM server
- Enter the IP address, user ID, password and a description of the host for:
  - SVCs
  - DS8Ks
  - HMCs
- This information is encrypted and placed into the device data domain and is kept consistent on both of the controllers.
- WRKCSECRDL uses PowerHA to keep the controllers in sync
- Use option 6 to validate the credentials

```
                          Work with CSE Credentials List

Type options, press Enter.
  1=Add   2=Change   4=Remove

Opt     IP Address          Role        User ID              Description

        9.5.95.139          *USER       qlpar                CTCHAHMC2
        9.5.167.58          *USER       qlpar                IBM.2107-75XA511
```

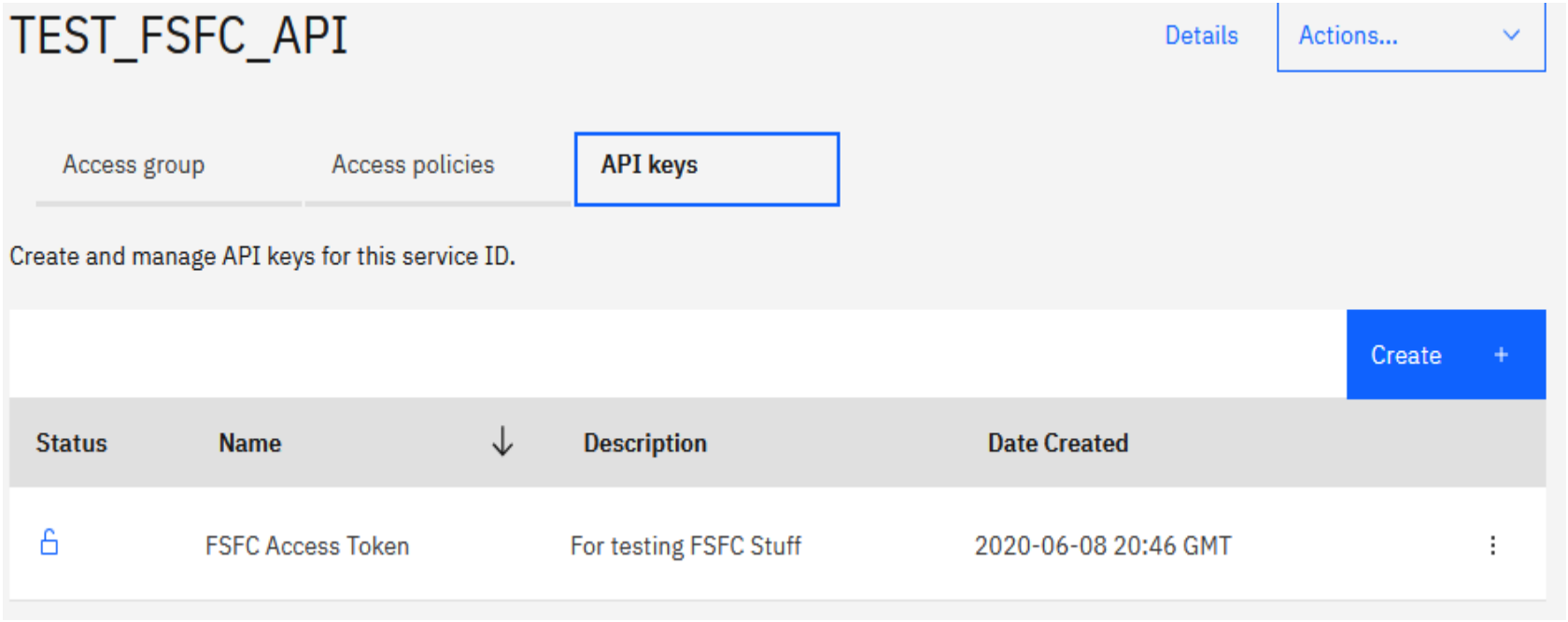
Create or identify a Cloud Service ID

- FSFC uses an API Key to authenticate cloud resource usage.
  - An API Key is associated with a Service ID. Use the Cloud IAM web GUI to create or identify a service ID.



Create Service ID API Key

- After identifying the Service ID identify or create an API Key
  - When the API Key is created it will be displayed or downloaded in a file.
    - You *must* record this API Key as there will not be an opportunity to retrieve it later. If you have a Service ID but no API Key then create a new key.



Enter the API Key into WRKCSECRDL

- Use the command WRKCSECRDL TYPE(*CLOUD) to work with Cloud credentials.
  - Use option 1 to add a new set of credentials. Give the credentials a name which will later be used to refer to the this cloud instance.
  - The API Key can be entered but not extracted. It is stored in an encrypted space.
  - The URNs and URLs will depend on the specific cloud implementation
    - `Identity Services endpoint:  iam.cloud.ibm.com`
    - `Resource controller:  resource-controller.cloud.ibm.com`
    - `Common URN Endpoints:  us-east.power-iaas.cloud.ibm.com`
    - `dal.power-iaas.cloud.ibm.com`
  - For Cloud Instance ID enter *SELECT and the API will provide a list based on the resources the API Key is authorized to.

Enter the API Key into WRKCSECRDL

```
                        Add Cloud Credential Entry (ADDCLDCRDE)

Add Cloud Credential Entry (ADDCLDCRDE)

 Type choices, press Enter.

 Key name . . . . . . . . . . . . . > fsfckey       Character value
 IAM Identity Services URL  . . .   iam.cloud.ibm.com

 Resource controller URL  . . . .   resource-controller.cloud.ibm.com

 API Key  . . . . . . . . . . . .   kHGvx1eua38LB_gcfZqdHVXTQWj0Ttl8pSAnka_QMXzn

 URN Endpoint . . . . . . . . . .   us-east.power-iaas.cloud.ibm.com

 Cloud Instance ID  . . . . . . .   *SELECT

 Description  . . . . . . . . . .   What does the smell of Purple sound like?
```

SVC vs. DS8K configuration

SVC Environment Configuration

DS8K Environment Configuration

Cloud Environment Configuration

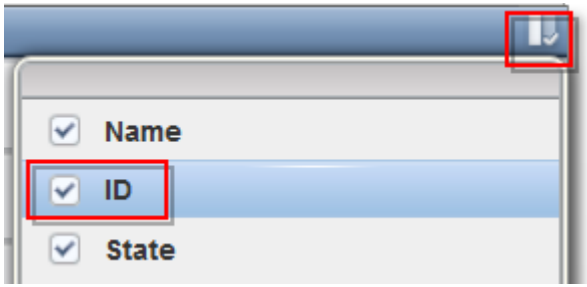
Create the SVC environments on the **controller**

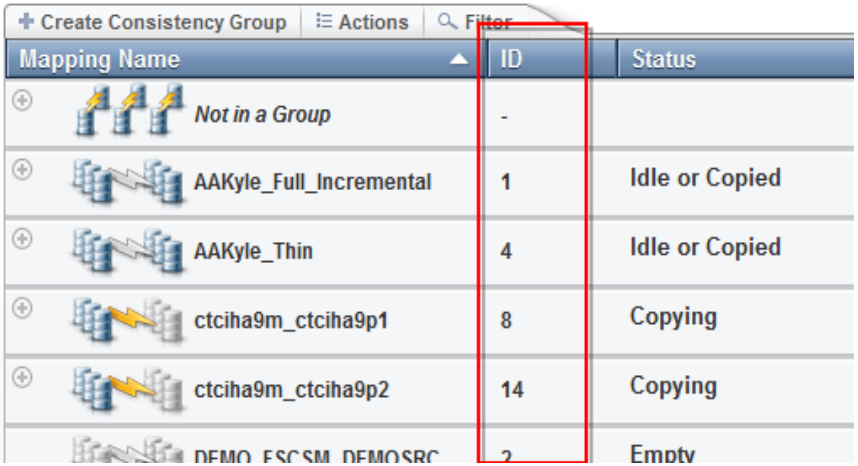
- An FSFC Environment describes the storage to the toolkit. Use WRKCSE to manage the environments.
  - Option 1 creates a new environment
  - Enter *NONE when prompted for ASP Copy Descriptions
- The environments are stored in the device data domain and is kept in sync with both controllers.
- On the SVC, flashcopy consistency groups define background copy rates, full or incremental etc. The toolkit just manages the consistency groups.

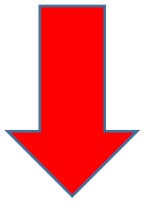
```
                              Change a FLASH Environment
 Type choices, press Enter.

 Environment name . . . . . :   TEST
 Storage Type . . . . . :   SVC

 FlashCopy SVC information:
   Flash SVC IP Address . . . . . .   1.2.3.4                 IPv4
   FlashCopy consistency group Id . .   2                     Id
   GMCV Source SVC IP Address . . . .                         IPv4
   Remote copy consistency group Id                           Id

 Comment:
   Text . . . . . .   Something meaningful to humans


Bottom
 F1=Help    F3=Exit    F6=Validate    F12=Cancel
```

Finding the Flashcopy consistency group Id

- The environment requires the Flashcopy consistency group Id.
- To find it, view the flash copy consistency groups and enable the Id column







Click here to continue with CSE Data

Create the DS environments on the controller

- An FSFC Environment describes the storage to the toolkit. Use WRKCSE to manage the environments.
  - Option 1 creates a new environment
- The environments are stored in the device data domain and is kept in sync with both controllers.
- Enter the requested information then PAGE DOWN

```
Change a FLASH Environment
Type choices, press Enter.

Environment name . . . . . :   TEST
Storage Type . . . . . :   DS8K

FlashCopy Power HA, ASP information:
  Device name  . . . . . .   *SYSTEM                  *SYSTEM, Name
  Source Copy Description  . . . . .   *NONE          *NONE, Name
  Target Copy Description  . . . . .   *NONE          *NONE, Name

FlashCopy DS unit information:
  Device . . . . . .   IBM.1234-1234565         Name


                                                More . . .
```

Enter the DS information

- Enter the flashcopy details
- Enter the DS unit details
- If the IP address isn't in WRKCSECRDL yet, pressing enter will take you there to add it.

```
 Change a FLASH Environment
 Type choices, press Enter.

 FlashCopy IASP Manager options:
   Full FlashCopy . . . . . .   *NO                    *YES, *NO
   Resync FlashCopy . . . . . .   *NO                  *YES, *NO
   Multi incremental resync . . . . .   *YES           *YES, *NO
   Space Efficient FlashCopy  . . . .   *NO            *YES, *NO
   Target PPRC  . . . . . .   *NO                      *YES, *NO
   GMIR D-Copy target flash . . . . .   *NO            *YES, *NO

 DS unit SMC information:
   Flash hmc1 . . . . . .                             IPv4
   Flash hmc2 . . . . . .                             IPv4
   Port . . . . . .   1751                            1750, 1751

 Comment:
   Text . . . . . .

Press Enter to add DS8K credentials for 1.2.3.4, press F12 to cancel.
```

Enter the DS information

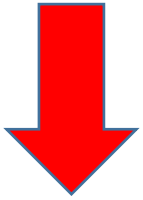
- Enter the volume details

```
Add, Change or Delete Volumes

  Environment  . :   TEST                  Source device  :   IBM.123
  Type . . . . . :   FLASH                 Target device  :   IBM.123
  Volume sets  . :   0

Type Volume options; 1=Add, 2=Change, 4=Delete, press Enter.
             Source          Flash
  Opt       Volumes          Volumes
   1        0100             0200
```

Enter the DS information – host connections

- From WRKCSE, use option 16 to manage the target LPAR host connections
- Note the use of F4 to prompt for hosts, and F6 to import LUNs

```
                                Work with Host Connections

  Environment  . :   FSFC137              Device . . . . :   XBM.2107-75XA511
  Type . . . . . :   FLASH

Type options, press Enter.
  1=Add   2=Change   4=Delete   6=Work with Volumes

                                Number
  Opt     Host name            Volumes

          CTCCSM1                   1

                                                                      Bottom
F1=Help   F3=Exit   F4=Prompt   F12=Cancel
```



Click here to continue with CSE Data

Enter the Cloud information – PVM Instance Information

- From WRKCSE, use option 1 to create a new Cloud environment.
- Enter the API Key name you created in WRKCSECRDL
- On the 'PVM instance' parameters press F4 to retrieve a list of the instances associated with the API Key
  - Very important to get these right or the production VM and disks may be removed!

```
                                Change a FLASH environment
Type choices, press Enter.

Environment name . . . . . :   CLOUD
Storage Type . . . . . . . :   CLOUD

Primary ASP  . . . . . . . .   *SYSTEM                  *SYSTEM

Cloud information:
  API Key name . . . . . . .   us-east
  Source LPAR PVM instance     47094614-322c-4c90-9006-f833b2676613
  Target LPAR PVM instance     1786c35b-715a-475d-8f40-2c947b864c37
```

Enter the Copy Services Environment (CSE) Data on either **Controller**

- The CSE Data describes the non-storage elements of an environment.
- This data is also stored in CRG's. The toolkit will create the CRG. It will always remain inactive when viewed in WRKCLU opt 9.
- CRTCSEDTA, CHGCSEDTA, DLTCSEDTA and DSPCSEDTA can be used to work with this information.
  - Stored in the CRG so the data is synchronized between the controllers
- WRKCSEDTA displays all the data created.

```
                          Work with CSE Data

Type options, press Enter.
  1=Create   2=Change   3=Copy   4=Delete   5=Display

                       CRG
Opt     CSE Data       type       Text

        FSR9M2         FSR        FSR from 9M to 9O
        HA8FSR2        FSR        DS8K FSR from HA8FSR1 to HA8FSR2
        FSFC9J9K       FSFC
        FSFC9M9N       FSFC       GMCV Flash
        FSFC9M9P1      FSFC
        FSR9J2         FSR
        FSFC9M9P2      FSFC
        FSFC9F9G       FSFC
                                                                  More...
Parameters or command:
===>
```

Enter the Copy Services Environment (CSE) Data on either **Controller**

- Use CRTCSEDTA or WRKCSEDTA opt 1 to enter the flashcopy operational details
- The command will prompt for details depending on what you enter

```
                          Create Full System FlashCopy CSE Data

 Supply all required values, press Enter.

 CSE Data Name  . . . . . :   TEST
 Use  . . . . . :   *SYSTEM
 Copy type  . . . . . :   *FLASH

 Environment  . . . . . .   TEST              Name
 HyperSwap environment  . . . .   *NONE            *NONE, Name
 Primary controlling node . . .   NODE1             Name
 Secondary controlling node . .   node2             Name
 Communications port  . . . . .   55920

 Physical-Virtual Isolation
   FlashCopy  . . . . . .   *NO               *YES, *NO



                                                                    More...
F1=Help   F3=Exit   F4=Prompt   F6=Query HMC   F12=Cancel
```

Enter the Copy Services Environment (CSE) Data on either **Controller**

- Start with *FRCWRT

```
                          Change Full System FlashCopy CSE Data

Supply all required values, press Enter.

Source LPAR IP address . . . .   1.2.3.4          IPv4 address
Source host alias  . . . . . .   PROD             Name
Target host alias  . . . . . .   FC               Name

Method to flush memory . . . .   *FRCWRT          *QUIESCE, *FRCWRT, *IPL,
                                                    *NONE

                                                                      More...
F1=Help    F3=Exit    F4=Prompt    F6=Query HMC    F12=Cancel
```

Enter the Copy Services Environment (CSE) Data on either **Controller**

- If the source or target LPARs participate in LPM or LUN switches, specify *SEARCH on the HMC Managed System Name parameter.
- If this is a PowerVS Cloud environment specify *CLOUDENV on the Primary HMC IP parameter and leave the rest blank.
- Note that you can prompt on the system, LPAR and Profile names using F6
- Do not specify BRMS integration (yet)

```
                          Create Full System FlashCopy CSE Data

Supply all required values, press Enter.

Target LPAR Information:
  Primary HMC IP . . . . . .    1.2.3.4           IPv4 address
  Secondary HMC IP . . . . . .                    IPv4 address
  HMC managed system . . . . .  *SEARCH
  HMC LPAR name  . . . . . .    lparName
  HMC Profile name . . . . . .  lparProfile
  Shutdown target before
    FlashCopy  . . . . . .      *YES              *YES, *NO
  Restart target after
    FlashCopy  . . . . . .      *YES              *YES, *NO, *INQ, *FRCINQ,
                                                   *PAUSE, *COPIED

  Use BRMS integration . . . . .  *NO             *YES, *NO




                                                                      More...
F1=Help    F3=Exit    F4=Prompt    F6=Query HMC    F12=Cancel
```

Enter the Copy Services Environment (CSE) Data on either **Controller**

- If it is available, enter:
  - Target LPAR IO Card location code, line description and IP interfaces (include iSCSI interfaces)
    - Use *LPAR- to have toolkit resolve type-model-serial-id on the target, i.e. *LPAR-C2-T1
  - Routing details and backup device setup

```
                          Change Full System FlashCopy CSE Data

Supply all required values, press Enter.

Target Comm Interfaces:

  IO card location code  . . .   *NONE
                                                *NONE, identifier
  Line description . . . . . .                  line name, *VIRTUALIP
  IP interface . . . . . . . .   *NONE           IPv4 address

      + for more values  . . .

Target LPAR Default Route:
  Binding interface  . . . . .   *NOCHANGE       IPv4 address
  Next hop . . . . . . . . . .                  IPv4 address

Target LPAR Device Setup:
  Backup device description      *NONE           *NONE, device name
  Device serial number . . . .   *NONE
      + for more values  . . .
                                                                  More...
F1=Help   F3=Exit   F4=Prompt   F6=Query HMC   F12=Cancel
```

Enter the Copy Services Environment (CSE) Data on either **Controller**

- No backup command (yet)
- “Wait for ENDFSFLASH” set to *YES
- Target keylock position set to *MANUAL if not a Cloud environment
  - Cloud environments can use the system value QIPLTYPE but since there is no option for the user to change host connections or specify the wrong consistency group this step isn’t necessary

```
                      Change Full System FlashCopy CSE Data

Supply all required values, press Enter.

Target LPAR backup command #1    *NONE


      + for more values  . . .

Wait for ENDFSFLASH  . . . . .   *YES             *YES, *NO
FlashCopy Exit program . . . .   *NONE            *NONE, program name
  Library  . . . . . . . . . .                    library name
Hold scheduled jobs  . . . . .   *YES             *YES, *NO
Target keylock position  . . .   *MANUAL          *PANEL, *AUTO, *MANUAL
Stop target after backups  . .   *NO              *YES, *NO, *RMV
Source lock wait time out  . .   3600            300 - 108000 (seconds)
Target lock wait time out  . .   86400           300 - 108000 (seconds)

Auto start cluster . . . . . .   *YES             *YES, *NO
Message Queue  . . . . . . . .   *SYSOPR          name, *SYSOPR
  Library  . . . . . . . . . .                    library name
                                                                    More...
F1=Help   F3=Exit   F4=Prompt   F6=Query HMC   F12=Cancel
```

Test the configuration on either **Controller**

- Use CHKFSFLASH to verify communications configurations first
- Resolve issues until it is successful

```
CHKFSFLASH CSEDTA(FSFC9M9P1)
Acquired lock on LPAR CTCIHA9M.
Validating flashcopy consistency group 8
Validating flashcopy mappings
Consistency group 8 validated.
Successfully performed local verifications.
Performing Full System FlashCopy verifications on CTCIHA9M.
Released lock on LPAR CTCIHA9M.
Log file used : /QIBM/Qzrdhasm/fsfc/FSFC9M9P1/ctl.log.
CHKFSFLASH validation for FSFC9M9P1 completed successfully.
```

Before you test the Flash Copy

- On the production LPAR, do QCTL and QSYSWRK have prestart or autostart jobs?
  - DSPSBSD SBSD(QSYS/QCTL) options 3 and 10
  - DSPSBSD SBSD(QSYS/QSYSWRK) options 3 and 10
  - If YES then you'll need to use the exit program QZRDIAFFEX
    - Remove them at *QUIESCE and add them back at *POSTFLASH (include MONMSG CPF0000)
      - RMVAJE SBSD(QSYS/QCTL) JOB(jobname)
      - RMVPJE
      - ADDAJE SBSD(QSYS/QCTL) JOB(jobname) JOBD(job description)
      - ADDPJE
    - Add them to the BRMS Recovery report (we'll do this later when we edit QO1AUSRRCY)
    - Update the CSE Data to call the exit program
- Did you add RUNLPARCMD to the startup program?
- On the target LPAR, do any comm adapters (virtual and physical) have the same slot numbers (Cxx) as the comm adapters on the source LPAR?
  - If yes, move them to other slots
  - This will prevent the OS from using them with the existing line descriptions.

Test the configuration on either **Controller**

- Did you read the previous slide?
- Use STRFSFLASH to perform a flashcopy
- The target will IPL into manual mode
- Sign on to the target LPAR console
- Continue to IPL the LPAR to restricted state (unless PowerVS implementation)
  - When you've got a command line, verify the startup program is QZRDHASM/QZRDIASTRP
    - DSPSYSVAL QSTRUPPGM
  - Continue the IPL
    - STRSBS QCTL
- Get the information needed for the communications interface
  - DSPHDWRSC *CMN
  - Get the location code
- Get the information needed for the tape devices
  - DSPHDWRSC *STG
  - Get the serial number
- On the target, execute command QZRDHASM/ENDFSFLASH to finish the process

Update the configuration on either **Controller**: Communications

- Using CHGCSEDTA, update:
  - Communications interface location code
    - *LPAR will results type, model, serial and virtual bus on the target
    - Cxx = slot number xx
  - Line description
  - IP Address

```
Change Full System FlashCopy CSE Data

Supply all required values, press Enter.

Target Comm Interfaces:

  Identifier Type  . . . . .   *LOC              *SRLN, *LOC, *NONE
  IO card identifier . . . .   *LPAR-C2-T1

  Line Description . . . . .   FSFCLINE          line name, *VIRTUALIP
  IO card IP interface . . .   9.5.167.93        IPv4 address

      + for more values  . .

Target LPAR default route:
  Binding interface  . . . .   *NOCHANGE         IPv4 address
  Next hop . . . . . . . . .                     IPv4 address
```

Update the configuration on either **Controller**: Tape devices

- Using CHGCSEDTA, update:
  - Device descriptions that the backups will use
  - Serial numbers of the devices
    - If using logical libraries, use the tape drive serial numbers

```
Change Full System FlashCopy CSE Data

Supply all required values, press Enter.

Target LPAR Device Setup:

  Backup device description    TS3400PROD        *NONE, device name
  Device serial number . . .   78-78F1101

      + for more values  . .
```

Update the configuration on either **Controller**: BRMS

- Using CHGCSEDTA, update:
  - BRMS Integration = *YES
  - Change the defaults if necessary

```
Use BRMS integration . . . . .   *YES              *YES, *NO
BRMS information:
  BRMS Transfer method . . . . . :   *ALL
  BRMS Transfer port . . . . . . :   *DFT
  Encrypt BRMS transfer  . . . . . :   *NO
  Custom *SYSBAS timestamp . . . . . :   *NONE
  Control group error behavior . . . :   *NOTIFY
  Control groups prior to xfer . . . :   1
  Lock BRMS  . . . . . . . . . . . . :   *SRCONLY
  Lock type  . . . . . . . . . . . . :   *FCNUSG
  Base media class . . . . . . . . . :   *NONE
  Base media class suffix  . . . . . :   *NONE
  Restricted media class(es) . . . . :   *NONE
```

Update the configuration on either **Controller**: BRMS

- Specify a BRMS command
  - If SBMJOB(*YES) then specify a job description that ensures it will run (i.e. if QBATCH isn't started don't send it to QBATCH)
    - JOBQ(QSYSNOMAX) JOBD(QLPARJOBD) sends it to job queue QSYSNOMAX which sends to QSYSWRK and runs the backups under QLPAR

Target LPAR backup command	`STRBKUBRM CTLGRP(BACKUPS) SBMJOB(*YES or *CTLSBS)`

- Prompting (F4) is available on the command

  But … it is prompted on the local (controlling) LPAR, not where the command will run (on the source LPAR). Select a default control group (like *BKUGRP) then change it to the desired control group after pressing enter.
- At 7.5 BRMS changed the functional usage to be more restrictive. As a result, QPGMR does not have the authority to run BRMS commands. Therefore, one of the following must be done:
  - On the source LPAR, issue `SETUSRBRM USER(QPGMR) USAGE(*ADMIN)`
  - Change the 'Target LPAR backup command' to:

```
SBMJOB CMD(STRBKUBRM CTLGRP(BACKUPS) SBMJOB(*YES or *CTLSBS)) JOB(BRMBACKUP)
JOBQ(QSYS/QSYSNOMAX) USER(QLPAR)
```

Update the configuration on either **Controller**: Keylock

- Using CHGCSEDTA, update:
  - Target keylock position = *AUTO
- Note: This parameter is not available in Cloud environments

```
 Change Full System FlashCopy CSE Data

Supply all required values, press Enter.

Wait for ENDFSFLASH  . . . .   *YES             *YES, *NO
FlashCopy Exit program . . .   *NONE
  Library  . . . . . . . . .     *LIBL          *LIBL, library
Hold scheduled jobs  . . . .   *YES             *YES, *NO
Target keylock position  . .   *AUTO            *PANEL, *AUTO, *MANUAL
Stop target after backups      *NO              *YES, *NO, *RMV

Request type . . . . . . . .   0                Number
Auto start cluster . . . . .   *YES             *YES, *NO
Wait time  . . . . . . . . .   0                Number of seconds
Message Queue  . . . . . . .   *SYSOPR          name, *SYSOPR
  Library  . . . . . . . . .                    library name

Text . . . . . . . . . . . .
```

BRMS Changes on the **Source** LPAR

- Change the system policy to allow backups in batch:
  - WRKPCYBRM *SYS, Option 1, Page down

```
 V7R3M0                    Change System Policy                      CTCIHA9L

Type choices, press Enter.

 End all subsystems options
   Controlled end delay time  . . . . . . 1200          1-99999 seconds,*IMMED
   Abnormal end delay time  . . . . . . . *NOLIMIT      10-999 minutes,*NOLIMIT
   End servers wait time  . . . . . . . .    0          0-9999 seconds
 Controlling subsystem:
   Allow backups in batch . . . . . . . . *YES          *NO, *YES
   Restricted state time limit  . . . . . *NOMAX        5-9999 minutes, *NOMAX
 Allow alternate input media. . . . . . . *YES          *NO, *YES
 Volume prefix  . . . . . . . . . . . . .               Prefix
 Enable Full System 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
 BRMS flight recorder size  . . . . . . . 050          001-999 megabytes
```

Specify an Output Queue on the **Source** LPAR

- Change the system policy to specify output for joblogs from the backups:
  - WRKPCYBRM *SYS, Option 1, Page down
  - If no output queue is specified, the toolkit will create and use QUSRBRM/QZOUTQ
  - Use ENDFSFLASH *TAGJOBLOG on the target in a job to bring back its joblog to the source LPAR
    - Find them with WRKOUTQ QUSRBRM/QZOUTQ

```
V7R4M0                    Change System Policy                      CTCHADV1

Type choices, press Enter.

 Media policy . . . . . . . . . . . . . . . ULTRIUM3      Name, F4 for list
 Devices  . . . . . . . . . . . . . . . . . TAPMLB01      Name, F4 for list



 Home location for media  . . . . . . . . . LOST          Name, F4 for list
 Media class  . . . . . . . . . . . . . . . ULTRIUM3      Name, F4 for list
 Sign off interactive users . . . . . . . . *NO           *YES, *NO
 Sign off limit . . . . . . . . . . . . . .  30          0-999 minutes
 Output queue . . . . . . . . . . . . . . . *PRTF         Name, *PRTF
   Library  . . . . . . . . . . . . . . . .               Name, *LIBL
 Day start time . . . . . . . . . . . . . .  0:00:00     Time
 Media monitor  . . . . . . . . . . . . . . *YES          *YES, *NO
 Shared inventory delay . . . . . . . . . .   60         30-9999 seconds
 Auto enroll media  . . . . . . . . . . . . *NO           *NO, *YES
 Default usage. . . . . . . . . . . . . . . *YES          *NO, *YES
                                                                    More...
F3=Exit    F4=Prompt    F5=Refresh    F12=Cancel
```

BRMS Selector

Standard BRMS

BRMS in PowerVS with VTL

BRMS using Cloud Object Storage (COS)

BRMS Changes on the **Source** LPAR for PowerVS and VTL

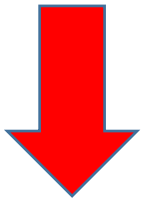
- Recovering SAVSYS in a PowerVS environment must be done from a virtual optical device which means the save must first be to virtual optical, then copied to virtual tape. BRMS accommodates this with control groups using specific names.
- The first control group (QNFSSYSFUL) will do a non-restricted save of user data and calls the second control group (QNFSIPLFUL)
- The second control group saves SAVSYS to an optical image then copies it to the VTL
  - The control group names are important!
- Details:
  - https://helpsystemswiki.atlassian.net/wiki/spaces/IWT/pages/1597276195/Overview+Videos
- The final *EXIT in the the first control group (QNFSSYSFUL) should start the second control group:
  - STRBKUBRM CTLGRP(QNFSIPLFUL) SBMJOB(*CTLSBS)
- Both control groups should specify QZBRMSEXIT as the Backup item exit program
  - IBM i OS releases prior to V7R5M0 must use Exit Program Format BKUI0100

```
  Change Backup Control Group Attributes

Group  . . . . . . . . . . . . . . . . . : TESTEXIT

Type information, press Enter.

Backup item exit program . . . . . . . . QZBRMSEXIT  Name, *NONE, *BKUPCY
   Exit program library  . . . . . . . . QZRDHASM    Name
   Exit program format . . . . . . . . . *BOTH       BKUI0100
```

WRKCSEDTA Changes on the **Controlling** LPAR for PowerVS and VTL

- In WRKCSEDTA:
- Specify the backup command:
  - STRBKUBRM CTLGRP(QNFSSYSFUL) SBMJOB(*YES) JOBQ(QSYSNOMAX) JOBD(QLPARJOBD)
- Indicate two control groups will finish:

```
Use BRMS integration . . . . .   *YES              *YES, *NO
BRMS information:
  BRMS Transfer method . . . . . :   *ALL
  BRMS Transfer port . . . . . :   *DFT
  Encrypt BRMS transfer  . . . . . :   *NO
  Custom *SYSBAS timestamp . . . . . :   *NONE
  Control group error behavior . . . :   *NOTIFY
  Control groups prior to xfer . . . :   2
  Lock BRMS  . . . . . :   *SRCONLY
  Lock type  . . . . . :   *FCNUSG
  Base media class . . . . . :   *NONE
  Base media class suffix  . . . . . :   *NONE
  Restricted media class(es) . . . . :   *NONE
```



Continue with BRMS setup

BRMS Changes on the **Source** LPAR for COS

- No special toolkit changes are necessary for BRMS to work with Cloud Object Storage (COS)
- The toolkit will delay copying BRMS from the target to the source LPAR until all the image files have been transferred to COS.
- Additional information is available here:
  - https://helpsystemswiki.atlassian.net/wiki/spaces/IWT/pages/165642270/BRMS+and+IBM+Cloud+Storage+Solutions+for+i
  - https://www.ibm.com/docs/en/i/7.4?topic=brms-using-cloud-storage-solutions-i

BRMS Changes on the **Source** LPAR - Attributes

- Do not run STRMNTBRM or manage servers after control group
  - WRKCTLGBRM, Opt 8, page down all the way
  - Editable on V7R4M0, use OpsNav or API's on prior releases

```
Additional Backup Policy Properties

Client backup policy . . . . . : SAVSYSALL

Type information, press Enter.

Allow activity overrides . . . . . *YES        *NO, *YES
Allow retention overrides  . . . . . *YES      *NO, *YES
Additional management:
  TCP/IP servers . . . . . *NO                 *NO, *END, *RESTART, *BOTH
  Lotus servers  . . . . . *NO                 *NO, *END, *RESTART, *BOTH
  Integrated Windows servers . . . . . *NO     *NO, *VARYOFF, *VARYON ...
  Guest partitions . . . . . *NO               *NO, *VARYOFF, *VARYON ...
Unmount user-defined file systems  . . . *NO   *NO, *YES
Run maintenance after backup . . . . . *NO     *NO, *YES
```

BRMS Changes on the **Source** LPAR

- Modify the control group to call the toolkit exit program
  - WRKCTLGBRM, Opt 8, page down to Backup item exit program
  - Set the exit program to QZRDHASM/QZBRMSEXIT format BKUI0100
    - IBM i OS releases prior to V7R5M0 must use format BKUI0100

```
  Change Backup Control Group Attributes

Group  . . . . . . . . . . . . . . . . . : TESTEXIT

Type information, press Enter.

Backup item exit program . . . . . . . . QZBRMSEXIT  Name, *NONE, *BKUPCY
   Exit program library  . . . . . . . . QZRDHASM    Name
   Exit program format . . . . . . . . . *BOTH       BKUI0100, BKUI0200, *BOTH
```

  - Note this information: https://www.ibm.com/support/pages/node/6371290

BRMS Changes on the **Source** LPAR - Subsystems

- If processing subsystems, subsystems should NOT be set to start
  - WRKCTLGBRM, Opt 9

```
                                  Subsystems to Process

Use . . . . . . . . . . :  *BKU
Control group . . . . :  SAVSYSALL


Type choices, press Enter.
                                        End
  Seq    Subsystem     Library        Option     Delay       Restart

   10    *ALL          *ALL           *CNTRLD    30          *NO
```

Modify BRMS recovery report user-added steps

- Insert custom message into the recovery reports to change system settings to start IP etc.
  - STRSEU SRCFILE(QUSRBRM/QO1AUSRRCY) SRCMBR(STEP014)
  - Insert the following text:

```
If restoring configuration settings from a FSFC backup, run the following commands:
CHGSYSVAL SYSVAL(QSTRUPPGM) VALUE('QSTRUP    QSYS      ')
CHGLINETH LIND(ETHLINE) ONLINE(*YES)
CHGTCPIFC INTNETADR('1.2.3.4') AUTOSTART(*YES)
CHGIPLA STRTCP(*YES) ← skip this if also using FSR
Check the job scheduler entries
```

- Modify the recovery report creation to include the user info
  - Add the parameter USRRCYINF(*ADD)
  - If STRMNTBRM is used to generate the reports
    - Modify the STRMNTBRM call with PRTRCYRPT(*NONE)
    - Add STRRCYBRM USRRCYINF(*ADD) to the job scheduler, to run 15 minutes (or so) after STRMNTBRM
  - Consider using the Flashcopy Exit Program
    - WRKMBRPDM QZRDHASM/QCLSRC member QZRDIAFFEX
      - Copy the source files to utility libraries
      - Compile a blank program for the controller, and one that calls STRMNTBRM and STRRCYBRM at exit *FINISH on the source

Create an exit program to run BRMS Maintenance and generate reports

- On the source:
  - Copy the source from QZRDHASM/QCLSRC member QZRDIAFFEX to your tools library.
  - WRKMBRPDM to edit it. At the *FINISH section add this code:

```
IF COND(%SST(&EXTRAS 1 8) *EQ '*SUCCESS') THEN(DO)
  STRMNTBRM PRTRCYRPT(*NONE)
  STRRCYBRM  USRRCYINF(*ADD)
ENDDO
```

  - Consider starting 5250 services and ssh on the target LPAR.
    At exit point *TGTPSTTCP:

```
STRSBS QINTER
STRTCPSVR SERVER(*TELNET *SSH)
```

  - Compile the program
- On the Controller create an empty version of that program:

```
CRTCLPGM PGM(QGPL/QZRDIAFFEX) SRCFILE(QZRDHASM/QCLSRC) SRCMBR(QZRDIAFFEX)
```

- Use WRKCSEDTA opt 2 and set the exit program name

Test the configuration on either **Controller**

- Use CHKFSFLASH to verify communications configurations first
- Resolve issues until it is successful

```
CHKFSFLASH CSEDTA(FSFC9M9P1)
Acquired lock on LPAR CTCIHA9M.
Validating flashcopy consistency group 8
Validating flashcopy mappings
Consistency group 8 validated.
Successfully performed local verifications.
Performing Full System FlashCopy verifications on CTCIHA9M.
Released lock on LPAR CTCIHA9M.
Log file used : /QIBM/Qzrdhasm/fsfc/FSFC9M9P1/ctl.log.
CHKFSFLASH validation for FSFC9M9P1 completed successfully.
```

Test the configuration on either **Controller**

- Use STRFSFLASH to perform a flashcopy
- Flashcopy target LPAR IPL etc will occur
- If this is a SAVSYS backup then the HMC SRC will be A900 3C70 while in Batch Restricted State
- After backups, BRMS will be transferred to the source LPAR
  - If not, check /tmp/qzrdiash.log on the target
- On the source LPAR, verify backups are complete
  - DSPLOGBRM
  - WRKMEDIBRM
  - BRMS Recovery reports
    - Look for the customer recovery steps after RSTCFG.
    - This is usually step 14 – if not, find the correct step and move the text in member QUSRBRM/QO1AUSRRCY STEP014 to the correct member.

Schedule Log Cleanup on all **Controlling** LPARs

- CLEANLOGS will prune toolkit logs to save on space
  - Tell it how many days of log entries to retain
  - ADDJOBSCDE JOB(CLEANLOGS) FRQ(*WEEKLY) CMD(QZRDHASM/CLEANLOGS RETAIN(120)) SCDDATE(*NONE) SCDDAY(*ALL) SCDTIME(‘22:30')

```
                    Clean Toolkit Logs (CLEANLOGS)

                      Type choices, press Enter.

   Days of information to retain  .                *NONE, days

                                    Additional Parameters

FSFC environment . . . . . .   *NONE          Name, *NONE, *ALL
```

How to reset after failure

- Failures can happen, you need to know how to set things back to normal.
- To abandon the backups:
  - On the target: QZRDHASM/ENDFSFLASH *FAILBKU
  - On the source: QZRDHASM/ENDFSFLASH *RSTFCNUSG
- PowerVS Volumes-clones can be displayed, canceled and deleted with these commands:
  - DSPCLDCLNL
  - CNLCLDCLN
  - DLTCLDCLN
- The toolkit webpage contains additional recovery steps

Saving and Restoring WRKCSE, WRKCSEDTA and WRKCSECRDL

- WRKCSE, WRKCSEDTA and WRKCSECRDL information is stored on the controller in PowerHA device data domains (DDD)
- The DDD's are not saved/restored with the usual commands SAVCFG, SAVOBJ etc or even GO SAVE opt 21
- The Toolkit includes two commands to save and restore the DDD:
  - SAVDDD
    - Saves all the DDD information to an existing IFS directory
      - Use mkdir to create the directory first
  - RSTDDD
    - Restores all the DDD information from an existing IFS directory
- Recommendation is to run SAVDDD prior to an upgrade or backup of the controlling LPAR

Where can I find the logs for troubleshooting?

- Logs are in the following place:
  - /QIBM/Qzrdhasm/qzrdhasm.log
  - /QIBM/Qzrdhasm/fsfc/<CSE Data name>/*
  - /QIBM/Qzrdhasm/qzrdhasm.log.bak
  - /QIBM/Qzrdhasm/java.logs/*
  - /QIBM/Qzrdhasm/joblogs/*
- DMPINF ENV(*ALL) EXTDLOGS(*YES) will grab all these files and put them in a zip file.
  - Specify the failing job information on Job Name:

```
                        Dump ICSM Information (DMPINF)

Type choices, press Enter.

Environment name . . . . . .   *ALL          Name, *ALL
Type . . . . . .   *ALL          *ALL, *FLASH, *GMIR, *LUN...
Extended logging . . . . . .   *YES          *YES, *NO
Job name . . . . . .   *NONE         Name, *CURRENT, *NONE, *LAST
  User . . . . . .                   Name
  Number . . . . . .                 000000-999999
Days of logs to keep . . . . . .   90           days, *NONE, *NOMAX
```

Contacting support if you have problems

Support for the FSFC Toolkit is to customers who meet the following criteria:

- Current System i Software Maintenance Agreement
- Current FSFC Toolkit Software Maintenance Agreement

For non-urgent issues or questions contact the consultant who installed the Toolkit. To reach a Toolkit developer for non-urgent issues and questions, or to report a bug, send an email to iesspt@us.ibm.com

For immediate 24x7 assistance, reach out to IBM Support:

US: http://www.ibm.com/planetwide/us/

Worldwide: http://www.ibm.com/planetwide/

To assist IBM personnel in correctly routing your problem, request support for the iSeries

Lab Services “Copy Services Toolkit – Full System Flashcopy” using component

identifier 5798CST00.