

**IBM System Lab Services  
PowerHA Tools for IBM i**

**Full System Replication  
Manager  
Installation and Users Guide**

**February 22, 2022  
Version 4.6**

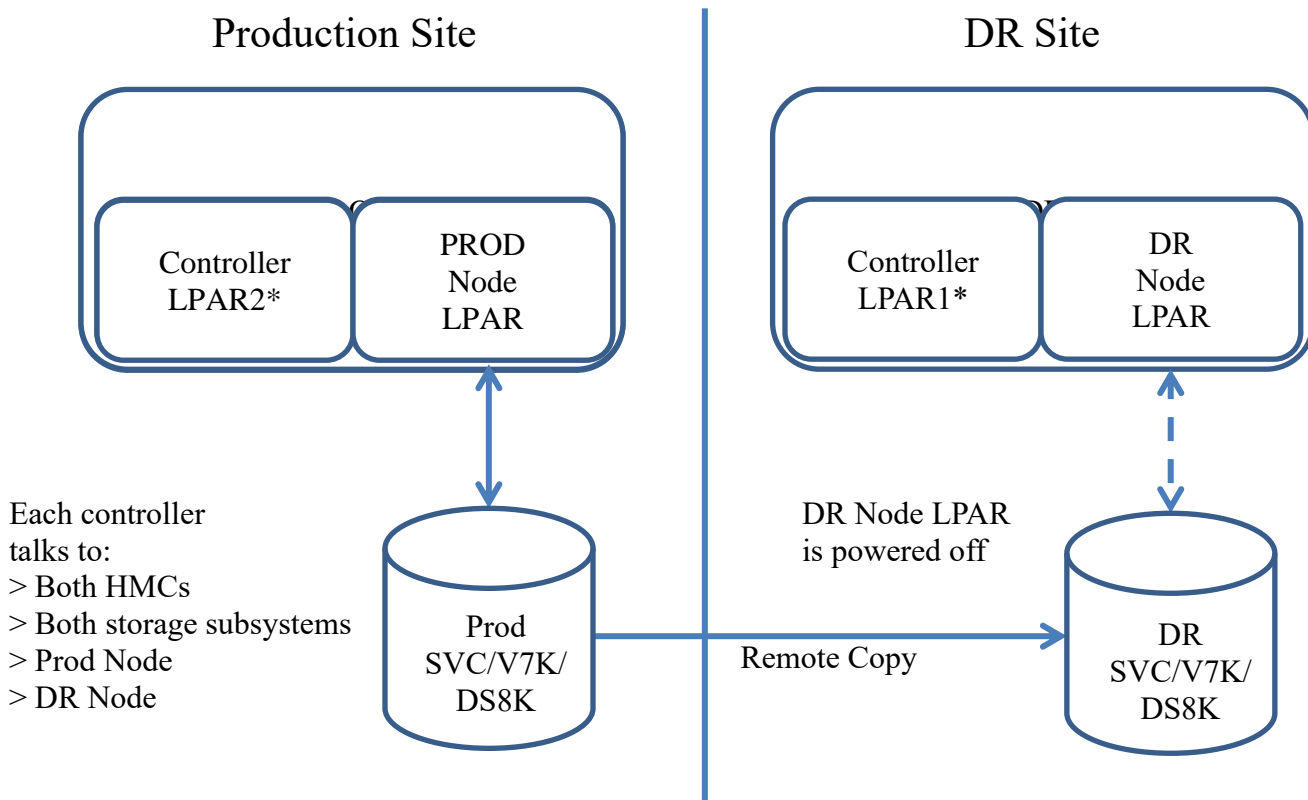
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# 1 Introduction

The following picture shows an overview of the PowerHA Tools for IBM i - FSR relationships between various entities involved in a HA and/or DR architecture for an IBM i environment.



\*It is recommended to have 2 control LPARs. If using only 1, then it should be at the DR site.

Note: Any reference to SVC in this document applies equally to V7000, V5000 and V3700.

## 1.1 What's new in 4.1

FSR 4.1 adds support for Full System Replication on the DS8000 storage subsystem using Metro or Global Mirror.

## 1.2 What's new in 4.2

FSR 4.2 primarily adds support for Full System FlashCopy, which is licensed separately. FSR benefits from several new features which were added for FSFC:

- All fixes to 4.1

- WRKCSEDTA - new command
- WRKCSECRDL enhancements:
  - Stores DSCLI credentials
    - No longer restricted to user QLPAR and password files
  - Option 2 displays the user profile
  - List is properly populated the first time
  - Password mismatch error message was incorrect
- WRKSTRPRSC enhancements:
  - Allow \*VIRTUAL IP interfaces
  - Allow entries with duplicate LOCCODE
  - Data area LASTCONFIG removed when changes are made in WRKSTRPRSC
- FIXSTRPRSC enhancements:
  - Data area LASTCONFIG only created after successful completion of configuration
- CHKCSE / CHKPPRC enhancements:
  - Checks for QSYSOPR in \*DFT reply mode
  - Does not crash QZRDIAEXT2
- Changed the product access codes:
  - 80 - FSR for Storwize
  - 82 - FSR+FSFC version 1 for Storwize
  - 87 - FSR+FSFC version 2 for Storwize
  - 88 - FSR+FSFC version 2 for DS8K
  - 89 - FSR for DS8K
- Source and target LPAR's are always IPL'd in B-mode.
  - Detach will always be in manual mode
  - Switch will use what is defined by the HMC (i.e. \*PANEL)
- CHGASPACT(\*FRCWRT) performed prior to detach
- WRKCSE enhancements:
  - Opt 10 on GMCV can fail - now fixed
  - DS8K MMIR errors have better messages
  - DS8K detach occasionally tried to re-attach
  - Changing GMIR environment handles prompting better
- SWCSE \*UNSCHEDULED in batch will send inquiry message to QSYSOPR

### 1.3 What's new in 4.3

Version 4.3 was released with the intent of providing new enhancements for Full System Flash Copy. One of those enhancements was to remove the limit of how many CSE Data's were allowed, and that also benefits FSR. This was accomplished by re-structuring the PowerHA space where the FSR data was stored, therefore, all toolkit installations in the same PowerHA cluster must be at the same release level, and upgrading to version 4.3 requires recording, removing and recreating all the CSE Data's.

There are no other significant changes to 4.3 relevant for FSR. It is still recommended that customers upgrade to 4.3 as defects and new features will be delivered in version 4.3.

## 1.4 What's new in 4.4

Version 4.4 was primarily a release to add new Full System Flashcopy features but some of those features also benefitted Full System Replication. Primarily it increased the number of environments allowed in WRKCSE to nearly 1000. Most customers will skip this release and go directly to 4.5.

## 1.5 What's new in 4.5

Version brought many new features to Full System Replication and Flashcopy, including:

- Full System LUN Switch
- DS8K environments are changed to only support Host name and volume mappings. Volume groups are no longer supported.
- Support for cascading Flashcopies on DS8K. This means checking for multiple flashcopies at the target of GMIR replication prior to a switch have been disabled, as they are now allowed and will not prevent a switch.
- CSM Support, including dual-control and unique users
- Better FSR cleanup on failed detach
- Warn if IPL attribute set to start in restricted state
- CHKCSE verifies RCCG replicates the right volumes
- Support for aggregate communication lines
- Detach will invoke \*FRCWRT on the source LPAR
- Better cleanup if the detach fails
- Prompt (F4) on the shutdown command in CSEDTA
- CHKCSE will warn if qzrdhsm.log is greater than 20 MB
- After a switch, replication is not restarted until the LPAR has finished it's IPL.
- IASP DS8K PPRC license sufficient to create full system replication environments (but no automation)

## 1.6 What's new in 4.6

Version 4.6 introduced PowerVS support for FSFC, but there were some enhancements for FSR:

- Command TSTCOMM added
- WRKCSEDTA filtering, position-to fields, and opt 15 = display log with auto refresh.
- Full System LUN Switch is supported for SVC
- WRKCSECRDL Validation (option 6)
- WRKCSEDTA Option 15 – Auto-refresh log
- Check that QLPAR on the source is neither disabled nor expired and has \*ALLOBJ, \*SECADM and \*IOSYSCFG authorities
- SAVDDD gets new parameter \*GEN
- SAVDDD and RSTDDD have more log entries

- SETUPFSR includes parameters for access codes.
- WRKCEDTA F7 = WRKACTJOB SBS(QZRDFSR)
- Support for BRMS restricted state IP addresses
- WRKSTRPRSC has one port per location code for SRVIOS compatibility
- WRKSTRPRSC can resolve port numbers automatically
- \*SGxx entries in WRKSTRPRSC

## 1.7 Planning

Planning for FSR installation is part of the services engagement associated with purchasing this product. This includes ensuring that all requirements/restrictions are followed. An overview of the Requirements and Restrictions is included below.

## 1.8 Requirements

Prior to the start of installation, the services representative must ensure the following tasks have been completed.

IBM i Release	IBM i Copy Services Manager for Power HA on i 4.3
i 7.1	Preferred
i 7.2	Preferred
i 7.3	Preferred
I 7.4	Preferred

- Each system/partition has its own Fiber Channel attachment card(s), or access to NPIV adapters
- Source and Target LPARs must have 100% of SYSBAS on supported storage devices
  - DS8K family
  - Storwize (SVC) family, including V3700, V5000, V7000 and V9000
  - Other storage is supported if managed by an SVC
- IBM i PowerHA has been set up on the control nodes
- Copy Services Metro or Global Mirror code enabled on the IBM System Storage
- Storwize units have a max of 32 simultaneous connections.
  - Each GUI browser and FSR process consumes at least one connection
  - 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

HMC Requirements:

- An HMC is required to manage the LPARs
  - FSM or ISV is not supported without an HMC
- At least one Controlling LPAR(s) is required



## 1.9 Controlling LPAR(s) Requirements

The Controlling LPAR(s)s must meet the following requirements:

- CPU: >= 0.1 or access to uncapped CPU
- Memory: >= 6 GB
- Disk: 200+GB. Can be internal or external disk.
- IBM i 7.1 or newer
- DS8K requires DSCLI installed on the IBM i
- IP connectivity to:
  - Source and Target LPARs
  - Storage (DS8K HMC or Storewize management interface)
  - LPAR HMC
- The following LPP and PTFs:

7.1	7.2	7.3	7.4
5733SC1 *Base, 1	5733SC1 *Base, 1	5733SC1 *Base, 1	5733SC1 *Base, 1
5770SS1 30, 33,41	5770SS1 30, 33, 41	5770SS1 30, 33, 41	5770SS1 30, 33, 41
5761JV1 *Base, 14	5770JV1 *Base, 14	5770JV1 *Base, 16	5770JV1 *Base, 16
5770HAS *Base, 1	5770HAS *Base, 1	5770HAS *Base, 1	5770HAS *Base, 1
Group PTFs SF99572	Group PTFs SF99716	Group PTFs SF99725	Group PTFs SF99665
5770HAS SI57181, SI65323	5770HAS SI57302, SI62180, SI65314		
	5770999 PTF MF62565	5770999 PTF MF62566	

For details installing Java 1.7 on IBM i 7.1 please visit this page:

## 1.10 Source LPAR Requirements

The Source LPAR must meet the following requirements:

- IBM i 7.1 or newer
- SYSBAS 100% on external storage
- The following PTFs:

7.1	7.2	7.3	7.4
	5770999 PTF MF62565	5770999 PTF MF62566	

## 1.11 Installation Overview Checklist

The following checklist is provided to facilitate the installation process of FSR. Each installation task has been cross referenced with a page number, where instructions on completing the task can be found.

Task Name	Page
<b>Planning Considerations</b>	
FSR Subsystem Considerations	11
Clustering Security Requirements	11
Coordinate QTIME between all nodes	12
<b>Prerequisites Before Starting Toolkit Installation</b>	
Make LPARs available	15
Install PowerHA (57xxHAS and 57xxSS1 opt 41 )	15
Configure System i clustering on the control nodes	15
Restore the FSR library ( QZRDHASM)	16
Install software licenses	16
Change FSR Object Ownership	17
Download Java Secure Channel code	17
Create credentials to be used by the control nodes	19

<b>Configuration Steps</b>	
Create a Full System Replication environment	20
Describe resource differences between Production and DR nodes	28
Customize the IPL startup program	33
Perform first activation of the DR node	36

## 2 Planning Considerations

### 2.1 FSR Subsystem Considerations

FSR jobs are submitted by IBM i clustering to the \*JOBQ specified by the \*JOBID associated with the QLPAR user profile. The default \*JOBID is QDFTJOBID, and its default \*JOBQ is QBATCH. This \*JOBQ must be configured to allow multiple clustering jobs to run without any delay. Two jobs are submitted for each Copy Services Environment (CSE) CRG.

*Tip: Create a new \*JOBID for clustering that specifies Job Queue QSYSNOMAX. The JOBID parameter of the QLPAR User Profile must be changed to use this new Job Description. This will ensure that all clustering jobs can run as required in the QSYSWRK subsystem.*

#### 2.1.1 Running FSR in another subsystem

If running in QBATCH or QSYSNOMAX is not a valid option, then it is possible for the environment to be changed so that the jobs run in an independent subsystem. The standard work management objects must be created: subsystem description, job description, job queue and class. Change user profile qlpar to use these objects.

### 2.2 Clustering Security Requirements

*Note: Some of the TCP/IP servers used by clustering require that the QUSER user profile's STATUS = \*ENABLED and that it does NOT have \*SECADM or \*ALLOBJ special authority. It must also NOT be expired. If this is not possible, the file /QIBM/ProdData/OS400/INETD/inetd.conf must be changed to use a different profile that matches these requirements.*

```

Edit File: /QIBM/ProdData/OS400/INETD/inetd.conf
Record :   10   of   20 by  10           Column :   1   76 by 126
Control : _____

CMD .....1.....2.....3.....4.....5.....6.....7.....8..
# ##### DO NOT MODIFY THIS FILE #####
#
# Any changes made to this file will be lost during release upgrade.
# User-defined services may be defined in file:
# /QIBM/UserData/OS400/INETD/inetd.conf
#
#
# Clustering

```

```
as400-cluster stream tcp wait QUSER /QSYS.LIB/QCSTINETD.PGM QCSTINETD
#
*****End of Data*****
```

Figure 2-1

The ALWADDCLU (Allow Add to Cluster) network attribute must be appropriately set on the target node if trying to start a remote node. This should be set to \*ANY or \*RQSAUT depending on the environment. If set to \*RQSAUT, then -- Digital Certificate Manager (57xxSS1 Option 34) on IBM i 6.1, or later release must be installed.

To change the ALWADDCLU (Allow Add to Cluster) network attribute, use the following green screen command:

```
CHGNETA (Change Network Attributes)
Specify ALWADDCLU = *ANY or *RQSAUT
```

Note: This applies only to the control nodes.

## 2.3 Requirement to coordinate QTIME between managing partitions

To prevent simultaneous operations on the same environment, a cluster wide lock per environment has been added, set at the start of SWPPRC, SWCSE, CHKPPRC, CHKCSE and STRFLASH operations and released at the end. The default time for automatic release of the lock is 15 minutes, and the time-of-day for the timeout is calculated and communicated to the other nodes in the cluster. Therefore, it is preferable to make sure that the QTIME system value on all systems contain the same time-of-day. You should consider use of the Simple Network Time Protocol (SNTP) TCP server to automate keeping the time synchronized.

**Note: If systems are in different time zones or the system times are significantly different, then this locking will work only on the local system.**

## 3 Setting up Full System Replication

### 3.1 Considerations

At setup time, the production system will be running, and all resources required for that partition will be known to the system. However some information about DR node resources may not be known until the DR node is activated for the first time. The IP addresses for both the source and target should be known prior to starting the setup.

The Controller partitions do not need to be dedicated to this purpose. They can be any other partition available, i.e., dev, QA, etc. They need to be able to communicate with the production partitions they will manage via TCP with the Full System Replication tools.

#### *3.1.1 System name vs. LPAR name*

The system name is stored in \*SYSBAS via the CHGNETA command. Thus when the DR node is active, it sees its system name as that of the Production node. The LPAR name is stored in the hosting HMC.

#### *3.1.2 System serial number and software licensing*

The serial number is stored in the hardware so it will be different between the Production and DR nodes. Licenses for 3<sup>rd</sup> party software that depend upon a specific serial number will need to be adjusted after a switch. The new RTVLPARINF command can be used to determine the current LPAR for the system. The new RUNLPARCMD command can also be used in the startup program to make changes. Licenses for FSR allow multiple serial numbers and will not require adjustment. You should check with the vendors of other licensed software to determine how to install serial-number-based licenses for their products.

#### *3.1.3 IP addresses*

The IP addresses and subnetwork of a node may need to change as part of a switchover. The IP addresses for when the partition is active at the production site and at the DR site must be configured on the node. The replication tool will modify the “online at IPL” attributes of these addresses as part of each switch.

#### *3.1.4 Clustering*

One or two control nodes are required in a cluster.

The cluster function allows the CSE data to be mirrored between the control nodes so that either control node can run functions at any time.

### ***3.1.5 Production LPAR Communication Agent***

The Controller(s) must be able to communicate with the Production LPARs. To do so, subsystem QZRDFSR must be started on the Production LPAR, with pre-start program QZRDIAEXT2 handling service requests from the Controllers. The subsystem can be started by using command STRSBS /QZRDHASM/QZRDFSR . Use of the WRKSTRPRSC or FIXSTRPRSC on the production node will also automatically start the subsystem

The Communication Agent listens on a specified port, and default port is 55920. On the Production LPAR, use the command SETUPFSR to change the port. This information is stored in file /QIBM/Qzrdhasm/FSRPort. On the Controlling LPAR, the port is configured using CRTCS EDTA or CHGCSEDTA. The port specified must be the same on both the Controller and Production LPAR. Communications between the Production and Controller are encrypted.

### ***3.1.6 Credentials***

The Controller(s) must be able to communicate with all participants in the Full System Replication environment:

1. Production Power System HMC
2. DR Power System HMC
3. Production SVC/DS HMC
4. DR SVC/DS HMC
5. Production node
6. DR node

Configuring the user profiles and passwords for the SVCs, DS HMCs and Power Systems HMCs in the configuration is required as part of setup.

### ***3.1.7 LPAR date and time***

The date and time of an LPAR is stored in the HMC with offsets stored in IBM i \*SYSBAS. Since only \*SYSBAS, not the HMC data, is replicated to the DR site, the first time an LPAR is IPLed the date and time must be configured. Subsequent IPLs will retain the correct date/time.

### ***3.1.8 Communications ports***

The following communications ports are used by FSR Full System Replication and access must be allowed through the firewall:

- Managing partitions to SVC on port 22 ( if applicable )
- Managing partitions to DS HMC on ports 1751/1750 ( if applicable )
- Managing partition to Power System HMC on port 22
- DR and Production Controllers to Production and DR LPARs on port 55920 (or the port you specify)

### 3.1.9 Upgrading to version 4.3

FSR Version 4.3 uses a different PowerHA DDD structure. It is not compatible with prior versions. Therefore, the upgrade from pre-4.3 to 4.3 and beyond requires the following steps be observed:

- All nodes in the PowerHA cluster must be upgraded to version 4.3
  - This includes FSR, FSFC and IASP installations of the toolkit
- Production LPARs not in the cluster can be at one version older (i.e. a 4.3 controller and 4.2 production LPAR)
- Before the new library is restored, use WRKCSEDTA to record then delete the existing entries.
- After the new library is restored, use WRKCSEDTA to re-create the recorded entries.

After the upgrade, use CHKCSE and a test switch to validate the changes.

## 3.2 Installation

### 3.2.1 Make the LPARs available

- Controlling partitions -- create if necessary
- Production and DR nodes -- ensure there is a partition profile on the target site.

Both control node(s) and the Production node must be active; the DR node must be powered down but with resources identified.

### 3.2.2 Configure the Storage replication

- Create the user profile and password.
  - For SVC, the user must have administrator authority; copy operator authority is insufficient.
  - For DS8K the user should have admin authority
- Create the volumes, host connections, partnerships and remote copy consistency groups (RCCGs) as required by the storage type
- Start replication. Note that this can take a while, and switching cannot be performed until the relationships reach a synchronized state.

### 3.2.3 Install IBM PowerHA for i on the control nodes

A separate licensed program, **IBM PowerHA for i (5770HAS)**, is required. This provides the commands for configuring and starting clustering.

### 3.2.4 Set up and start clustering

There will be one or two control nodes in the cluster. Add the nodes to the device domain.

```
Display Cluster Information
Cluster . . . . . : <cluster name>
Consistent information in cluster : Yes
Number of cluster nodes . . . . . : 2
```

```

Number of device domains . . . . . : 1

                                Cluster Membership List

Node      Status      -----Interface Addresses-----
<PROD Ctl> Active      nnn.nnn.nnn.nnn
<DR Ctl>   Active      nnn.nnn.nnn.nnn

```

**3.2.5 Install FSR on all three LPARs**

- Restore library QZRDHASM from the savefile provided by the Systems Lab Services consultant.

**3.2.6 Install software licenses**

On all the nodes, use the ADDPRDACS command to enter the license information for FSR. On the Production LPAR use the command twice to enter the keys for both the Production LPAR and the DR LPAR, assuming they have different system serial numbers. FSR can determine which node it is running on and check for the appropriate license.

- ADDLIBLE QZRDHASM

Run the QZRDHASM/SETUPFSR command

```

                Setup IBM i Copy Services Mana (SETUPFSR)

Type choices, press Enter.

Node role . . . . . > *CTL          *CTL, *PRD
Toolkit access code for *CTL . . *SAME

```

```

                Setup IBM i Copy Services Mana (SETUPFSR)

Type choices, press Enter.

Node role . . . . . > *PRD          *CTL, *PRD
FSR communications port . . . . *SAME      1-65535, *SAME, *DFT
Toolkit access code for *PS . . *SAME
Toolkit access code for *PT . . *SAME

```

If you select Node type = \*PRD, a second prompt requests entry of the port to be used for FSR communications from a control node.

Enter the toolkit access code for the LPAR you're setting it up on. Note that when setting it up for \*PRD enter both \*PS and \*PT access codes.



The access code is unique for each of the following:

- The system (serial number) on which FSR is installed
- The FSR capabilities to be used (PPRC, Global Mirror, Full System Replication)

The access code enables use of the following FSR commands for Full System Replication:

- Add CSE Credential Entry (ADDCSECRDE)
- Change CSE Credential Entry (CHGCSECRDE)
- Change CSE Data (CHGCSEDTA)
- Check CSE Environment (CHKCSE)
- Create CSE CRG (CRTCSEDTA)
- Display CSE Data (DSPCSEDTA)
- Fix Startup Resources (FIXSTRPRSC)
- Remove CSE Credential Entry (RMVCSECRDE)
- Retrieve LPAR Information (RTVLPARINF)
- Run LPAR Command (RUNLPARCMD)
- Switch CSE Environment (SWCSE)
- Work with CSE Environments (WRKCSE)
- Work with CSE Credential List (WRKCSECRDL)
- Work with CSE Data (WRKCSEDTA)
- Work with Startup Resources (WRKSTRPRSC)

You must verify the availability of the FSR communications port on the Production node. Use NETSTAT option 3 (Work with IPv4 connection status) and F14=Display port numbers. If the default, 55920, is already being used, choose another number. Then use the CHGCSEDTA command on the control nodes to specify the port to use.

After SETUPFSR is run, library QUSRSYS contains the following FSR objects:

- QIASP                               \*JRNRCV
- QIASP                               \*JRN

SETUPFSR will create user profile QLPAR, the required directories and set authorities.

### ***3.2.7 Change ownership of FSR objects***

All FSR objects are shipped as owned by QPGMR, and the \*PUBLIC has \*CHANGE authority to them. It is recommended to change the authorities to the objects in the QZRDHASM library based upon the security guidelines of your organization.

### ***3.2.8 Download Java Secure Channel code (JSch)***

Download JSch to /QIBM/qzrdhasm/ssh on all three nodes from <http://prdownloads.sourceforge.net/jsch/jsch-0.1.52.jar?download>

- Don't download a different version. It won't work.
- The Java Secure Channel is an open-source implementation of ssh which allows FSR to issue ssh calls programmatically and to review the results.

- Because it is open-source, you must download it yourself (i.e., we can't bundle it with our FSR code). It is recommended to read the End User License Agreement for JSch.
- Download to your desktop and then use FTP to copy it to your IBM i at /QIBM/qzrdhasm/ssh.

```

ftp> bin
200 Representation type is binary IMAGE
ftp> put jsch-0.1.52.jar /QIBM/qzrdhasm/ssh/jsch-
0.1.52.jar
227 Entering Passive Mode (9,5,168,177,167,46).
150-NAMEFMT set to 1
150 Sending file to /QIBM/qzrdhasm/ssh/jsch-0.1.52.jar
226 File transfer completed successfully.
249282 bytes sent in 0.742 secs (336.12 Kbytes/sec)
ftp>

```

### 3.2.9 Create the credentials to be used by the control nodes

On either control node, use the Work with CSM Credentials List (WRKCSECRDL) command to enter the User IDs and passwords for:

- Production SVC
- DR SVC ( if applicable )
- Production HMC
- DR HMC ( if applicatble )
- Production DS8K
- DR DS8K ( if applicable )

The credentials information will be encrypted and replicated automatically to all nodes in the cluster.

```

                                Work with CSE Credentials List

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

Opt      Host IP Address      User ID      Host description
  -      nnn.nnn.nnn.nnn

```

Press Enter after keying the IP address to enable entry of the credentials for the device.

```

                                Add CSE Credential Entry (ADDCSECRDE)

Type choices, press Enter.

Host IP address . . . . . > 'nnn.nnn.nnn.nnn'
User ID . . . . . _____
Password . . . . . _____
Confirm password . . . . . _____
Host description . . . . . _____

```

Repeat for the other three devices.

### 3.2.10 Create a Full System Replication environment for SVC

Enter the WRKCSE command on either control node in the cluster. The information will be replicated to the other control node.

```

                                Copy Services Environments

Type options, press Enter.
  1=Add   2=Change   4=Delete   5=Display   12=Work with
 14=List Stream files  16=Define host connections  18=Make PPRC Paths

Opt   Name          Type   Text
 1    (name)

```

Key the desired name and press Enter. You must then specify MMIR or GMIR for Copy Service Type on the second display (GMIR if using Global Mirror with Change Volumes, GMCV).

```

                                Add an Environment

Enter Copy Service Type

Environment name . . . . : (name)
Copy Service Type . . . . : MMIR          FLASH, GMIR, LUN, MMIR

```

And SVC for Storage Type on the third display.

```

                                Add an Environment

Enter Copy Service Type

Environment name . . . . : (name)
Copy Service Type . . . . : MMIR
Storage Type . . . . . : SVC          DS8K, SVC

```

Specify \*NONE for Preferred Source and Preferred Target Copy Descriptions on the fourth display.

**Add an Environment**

Enter Copy Services and ASP information

Environment name . . . . . : (name)  
Copy Service Type . . . . . : MMIR  
Storage Type . . . . . : SVC

ASP/SVC Copy Descriptions:

Preferred Source . . . . .	<u>*NONE</u>	Name, *NONE
Preferred Target . . . . .	<u>*NONE</u>	Name, *NONE

Enter the details for the SVC environment on the fifth display: Production node name, Preferred Source SVC information, (and after Page Down) Preferred Target SVC information. Note: Even though the RCCG names may be the same between the two SVCs, they will have different RCCG IDs.

**Change a MMIR Environment.**

Type choices, press Enter.

Environment name . . . . . : (name)  
Storage type . . . . . : SVC

Metro Mirroring Power HA, ASP information:

Device name . . . . .	<u>*SYSTEM</u>	Name, *SYSTEM
Source Copy Description . . . . .	<u>*NONE</u>	Name, *NONE
Target Copy Description . . . . .	<u>*NONE</u>	Name, *NONE

Production node . . . . . : <prod name> Name

Preferred Source SVC Information:

IP Address . . . . .	<u>0.0.0.0</u>	IPv4
Remote copy consistency group Id	<u>0</u>	Id

More...

```

Change a MMIR Environment.
Type choices, press Enter.

Preferred Target SVC Information:
IP Address . . . . . 0.0.0.0 IPv4
Remote copy consistency group Id 0 Id

Comment:
Text . . . . . _____
_____
Bottom

```

**3.2.11 Create a Full System Replication environment for DS8K**

Enter the WRKCSE command on either control node in the cluster. The information will be replicated to the other control node.

```

Copy Services Environments

Type options, press Enter.
1=Add 2=Change 4=Delete 5=Display 12=Work with
14=List Stream files 16=Define host connections 18=Make PPRC Paths

Opt Name Type Text
1 (name) .

```

Key the desired name and press Enter. You must then specify MMIR or GMIR for Copy Service Type on the second display.

```

Add an Environment

Enter Copy Service Type

Environment name . . . . : (name)
Copy Service Type . . . . MMIR FLASH, GMIR, LUN, MMIR

```

And DS8K for Storage Type on the third display.

```

Add an Environment

Enter Copy Service Type

Environment name . . . . : (name)
Copy Service Type . . . . : MMIR
Storage Type . . . . . DS8K DS8K, SVC

```

Specify \*NONE for Preferred Source and Preferred Target Copy Descriptions on the fourth display.

```

                                Add an Environment
Enter Copy Services and ASP information

Environment name . . . . . : (name)
Copy Service Type . . . . . : MMIR
Storage Type . . . . . : DS8K

ASP/SVC Copy Descriptions:
Preferred Source . . . . . *NONE Name, *NONE
Preferred Target . . . . . *NONE Name, *NONE
    
```

Enter the details for the DS8K environment on the fifth display: Production node name, source and target DS unit information:

```

                                Change a MMIR Environment.
Type choices, press Enter.

Environment name . . . . . : (name)

Storage type . . . . . : DS8K

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

CSM information:
CSM Replication . . . . . *NO *YES, *NO

Production node . . . . . <prod name> Name

Metro Mirroring DS unit information:
Source device . . . . . IBM.2107-75XXXXX Name
Target device . . . . . IBM.2107-75YYYYY Name, *SAME
More...
    
```

GMIR environments will have a slightly different panel, with more parameters.

```

Change a GMIR Environment
Type choices, press Enter.

Environment . . . . . : HA8FSR

Storage type . . . . . : DS8K

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

CSM information:
CSM Replication . . . . . *NO          *YES, *NO

Production TCP/IP host name . . . . . HA8FSR      Name

More..

```

Page down for more parameters:

```

Change a GMIR Environment
Type choices, press Enter.

Global Mirroring ICSM options:
Symmetrical Mirroring . . . . . *NO          *YES, *NO
D-Copy Flash normal . . . . . *NO          *YES, *NO
D-Copy Flash reversed . . . . . *NO          *YES, *NO
Override Master LSS . . . . . *NO          *YES, *NO

Global Mirroring DS unit information:
Source device . . . . . IBM.2107-75XA511 Name
Target device . . . . . IBM.2107-75HH571 Name, *SAME
Session number . . . . . 01          Hexadecimal
                               number
Reverse session number . . . . .           Required if
                               Symmetrical
CG interval . . . . . 0          Seconds (0 -
                               65535)

More...

```



```

Change a GMIR Environment.
Type choices, press Enter.

Space Efficient FlashCopy options:
  On Normal CG Flashes . . . . . *NO          *YES, *NO
  On Reversed CG Flashes . . . . . *NO          *YES, *NO

DS unit SMC information:
  Source hmc1 . . . . . 0.0.0.0          IPv4
  Source hmc2 . . . . .                      IPv4
  Source QLPAR password . . . . . xxxxxxxxx
  Source port . . . . . 1751          1750, 1751
  Target hmc1 . . . . . 0.0.0.0          IPv4, *SAME
  Target hmc2 . . . . .                      IPv4, *SAME
  Target QLPAR password . . . . . xxxxxxxxx
  Target port . . . . . 1751          1750, 1751

Comment:
  Text . . . . . DS8K FSR

```

Press enter, then key in the volumes for MMIR:

```

Add, Change or Delete Volumes

Environment . : DS8KMM          Source device :
IBM.2107-XXXXXX
Type . . . . . : MMIR          Target device :
IBM.2107-YYYYYY
Volume sets . : 6

Type Volume options; 1=Add, 2=Change, 4=Delete, press Enter.
  Opt      Source      Target
         Volumes      Volumes
  -      8810-8812    8810-8812
  -      8910-8912    8910-8912
  -

```

Or for GMIR:

```

                                Add, Change or Delete Volumes

Environment . . : HA8FSR      Source device : IBM.2107-XXXXXX
Type . . . . . : GMIR       Target device : IBM.2107-YYYYYY
Volume sets . . : 3

Type Volume options; 1=Add, 2=Change, 4=Delete, press Enter.
      Source          Target          Target          Source
Opt   PPRC Vols      PPRC Vols      CG Flash Vols   CG Flash Vols
  -   BA00-BA02      BA00-BA02      BA03-BA05      BA03-BA05
  -

```

### 3.2.12 Create a cluster resource group for the environment

Use the CRTCS EDTA command on either control node in the cluster to enter the SVC and node information.

```

                                Create CSE CRG

Supply all required values, press Enter.

CRG Name . . . . . _____ Name
Use . . . . . _____ *IASP, *SYSTEM

```

Note: The CRG name must be the same as the environment name created in the previous step.

Specify \*SYSTEM for use. A second display requests Copy type which must be \*PPRC. A third display supports entry of the remaining information; the Preferred target details can be entered after pressing Page Down.

Create CSE CRG

Supply all required values, press Enter.

CRG Name . . . . . : (name)  
Use . . . . . : \*SYSTEM  
Copy type . . . . . : \*PPRC

Environment name . . . . . (name) \_\_\_\_\_  
Production node name . . . . . \_\_\_\_\_ .  
FSR communications port . . . . . 55920 \_\_\_\_\_ .  
Controlling node name . . . . . \_\_\_\_\_  
Secondary controlling node name \_\_\_\_\_

Preferred source details:

IP address . . . . . \_\_\_\_\_  
HMC LPAR name . . . . . \_\_\_\_\_  
HMC Profile name . . . . . \_\_\_\_\_  
HMC managed system . . . . . \_\_\_\_\_  
Primary HMC IP . . . . . \_\_\_\_\_  
Secondary HMC IP . . . . . \_\_\_\_\_

More...

- Environment name
- Production node name
- Controlling node name (DR Controller)
- Secondary controlling node name (Production Controller)
- IP address of Production node
- Production LPAR name as known to the Power System HMC (case sensitive)
- Production LPAR profile name as known to the HMC (case sensitive)
- Name of the Power System HMC server that manages the production node (case sensitive)
- Production Power System HMC IP addresses

Create CSE CRG

Supply all required values, press Enter.

Preferred target details:

IP address . . . . . \_\_\_\_\_  
HMC LPAR name . . . . . \_\_\_\_\_  
HMC Profile name . . . . . \_\_\_\_\_  
HMC managed system . . . . . \_\_\_\_\_  
Primary HMC IP . . . . . \_\_\_\_\_  
Secondary HMC IP . . . . . \_\_\_\_\_

Power down command . . . . . \_\_\_\_\_

- IP address of DR node
- DR LPAR name as known to the Power System HMC (case sensitive)
- DR LPAR profile name as known to the Power System HMC (case sensitive)
- Name of the Power System HMC server that manages the DR node (case sensitive)
- DR Power System HMC IP addresses
- Power down command or customer program to be called on the Production node when a scheduled switch is requested. An inquiry message is sent to QSYSOPR on the Production node requesting permission to proceed.

### ***3.2.13 Configure the IP interface(s) on the Production node***

- Create the Ethernet line description
- Using CFGTCP option 1 (Work with TCP/IP Interfaces), Add the IP interface for the Production node. Add a second for the DR node if different from the Production node
- CHGIPLA STRTCP(\*NO)

### ***3.2.14 Describe resource differences between Production and DR nodes***

Communications, tape storage, BRMS resources and TCP/IP routing entries may be different between the two nodes. Use the Work with Startup Resources (WRKSTRPRSC) command to describe the differences. The Configure Startup Resources (CFGSTRPRSC) command uses this information to make the necessary changes during IPL. Past releases used Fix Startup Resources (FIXSTRPRSC), which will still work but is deprecated and won't support some of the new features.

```

Work with Startup Resources (WRKSTRPRSC)

Type choices, press Enter.

Resource type . . . . . *SYS      *CMN, *STG, *BRM, *RTE, *SYS

```

#### **3.2.14.1 System Information**

The System Information panel is used to determine the role of the LPAR when it is running a specified serial and LPAR number. Since there can be more than one preferred source, target or LPAR the toolkit has been updated to allow for a range of 00-99 LPARs of each type.

```

Work with System Information Entries

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

Serial    LPAR    Default

```

Opt	Usage	number	number	CSDTA	Comment
	*PS	06BD50P	21	*NONE	CTCIHA4R_PS
	*PT01	1016B4P	11	*NONE	CTCIHA4R_PT
	*PT02	1016B4P	12	*NONE	CTCIHAMR
	*FC00	1234567	234	*NONE	Used for Flashcopy

\*PS and \*PT are valid entries. The \*FCxx entries and CSDTA are used for Physical-Virtual Isolation (PVI) flashcopy and is not covered in this FSR document.

### 3.2.14.2 Communication 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					
	*PS	9.5.167.97	ETHLINAGG	U8205.E6B.06BD50P-V21-C23-T1	0
	*PT01	9.5.167.97	ETHLINE	U9179.MHD.1016B4P-V11-C10-T1	0
	*PT02	9.5.168.193	ETHLINE	U9179.MHD.1016B4P-V12-C11-T1	0
—	—	—	—	—	—

Since the DR node has not yet been IPLed, its resource information cannot be seen. Select Option 1=Add and press Enter to enter the information for the Production node Ethernet adapter.

Add or Change Communication Resources		
Enter details, press Enter.		
Usage . . . . .	*PS	*PS, *PT,
*FCxx, *CTLx		
IP Interface . . . . .	1.2.3.4	IPv4 address
Line Description . . . . .	*IPADDR	Name, *LINE,
*NONE		
Resource Location . . . . .	*LINE	_____
		Name, *LINE, blank
Resource Location . . . . .	*LINE	_____
		Name, *LINE, blank
Resource Location . . . . .	*LINE	_____
		Name, *LINE, blank
Resource Location . . . . .	*LINE	_____
		Name, *LINE, blank

Resource Location . .	*LINE	Name, *LINE, blank
Resource Location . .	*LINE	Name, *LINE, blank
Resource Location . .	*LINE	Name, *LINE, blank
Resource Location . .	*LINE	Name, *LINE, blank
Resource Location . .	*LINE	Name, *LINE, blank

- Usage is either \*PS (Preferred Source – Production node), \*PS00-99 or \*PT (Preferred Target – DR node) or \*PT00-99. Specify \*PS.
- IP interface is the address to be activated after the Ethernet line is started. If you have multiple IP addresses per line, add an entry for each one. CFGSTRPRSC will start the line after updating it.
- Line Description is the name of the line to be changed. If you specify \*IPADDR for the line description, the line description name will be retrieved from the interface information provided that the interface has been defined.
- For Aggregate Line Descriptions list all the resource location codes.
- Hardware Resource Location is used to identify the communications resource, for example U9406.MMA.105C880-V2-C9-T1. If you specify \*LINE for the resource description, the resource description will be retrieved from the information in the line description. After you press Enter you will see the values listed in the entry.
- Port is used to distinguish between multiple hardware resources
- To start virtual IP interfaces which are not associated with line descriptions, specify \*VIRTUALIP on the Line Description parameter
- Virtual IP addresses will be started after other IP addresses have been started.

Note: If your \*CMN resource does not have a location code, your HMC firmware may be downlevel.

FSR uses the location code to identify the resource name (CMNnn) to be associated with the line description.

### 3.2.14.3 Storage information

Work with Storage Startup Resources				
Type options, press Enter.				
1=Add    2=Change    4=Remove				
Opt	Usage	Storage Resource Serial Number	Device Description	Device Type
—	—	—		

Select Option 1=Add and press Enter.

```

                                Add or Change Storage Resources
Enter details, press Enter.

Usage . . . . .          _____          *PS, *PT
Serial Number . . . . .  _____          Character value
Device Description       _____          Name
Device Type . . . . .    _____          *MLB, *TAP

```

- Usage is either \*PS or \*PT
- Serial Number is used to find the resource name which will be assigned to the device description specified -- for either a tape or media library resource.
- Device Description is the name of the tape device to be changed
- Device Type is \*TAP or \*MLB

Note: You may have to wait until the DR node is activated for the first time to find the serial number for its device.

FSR uses the serial number to identify the resource name (TAPnn or TAPMLBnn) to be associated with the device description and varies on the device description.

### 3.2.14.4 BRMS information

Typically, the customer has a tape library at the DR site which is a different BRMS location. Changing the device's location based upon the node being IPLed allows BRMS to select volumes from the correct location without changing the device used in the control groups or commands.

```

                                Work with BRMS Startup Resources

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

Opt  Usage  Object Name  Object Type  Attribute  New Value
  _   _     _____  _____  _____  _____

```

Select Option 1=Add and press Enter.

```

                                Add or Change BRMS Resources
Enter details, press Enter.

Usage . . . . .          *PS          *PS, *PT
Object Name . . . . .  BRMSTAPE       Name
Object Type . . . . .  *DEVICE       *DEVICE, *MEDPCY
Attribute . . . . .    *LOC          *LOC, *MEDCLS, *MOVPCY, *MARKDUP

```

**\*MARKHST, \*MINVOL, \*TEXT, \*VOLSEC**

**New Value . . . . .** \_\_\_\_\_

- Usage is either \*PS or \*PT
  - Object Name is the name of the device or media policy to change. Only devices listed in WRKDEVBRM are valid.
  - - \*DEVICE
    - \*MEDPCY
  - - \*LOC
    - \*MEDCLS
    - \*MOVPCY
    - \*MARKDUP
    - \*MARKHIST
    - \*MINVOL
    - \*TEXT
    - \*VOLSEC
- Object Type is the type of BRMS object to change
- Attribute is the attribute of the BRMS object to change

Each Attribute has a list of possible New Values:

Attribute	Possible New Values
*LOC	*ANY or <valid BRMS location name>
*MEDCLS	*NONE, *ADSM, or <media class name>
*MOVPCY	*NONE, *ADSM, or <move policy name>
*MARKDUP	*NO or *YES
*MARKHIST	*NO or *YES
*MINVOL	*NONE or <number of required volumes>
*TEXT	*NONE or <text description>
*VOLSEC	*NO, *YES, or *ADSM

### 3.2.14.5 TCP/IP routing entries

TCP/IP routing entries must be restored from information entered via WRKSTRPRSC. Up to eight \*DFTROUTEs may be specified along with an unlimited number of other routing entries.

Note: All necessary routing entries must be entered. If any routing entries in WRKSTRPRSC apply to the current IPL, then CFGSTRPRSC will remove all existing routing entries.



**Work with Routing Entry Startup Resources**

Type options, press Enter.

1=Add    2=Change    4=Remove

Opt	Usage	Destination	Subnet Mask	Next Hop	Preferred Interface
-	---	-----			

Select Option 1=Add and press Enter.

**Add or Change Routing Entry Resources**

Enter details, press Enter.

Usage . . . . .	_____	*PS, *PT
Destination . . . . .	_____	IPv4 address, *DFTRROUTE
Subnet Mask . . . . .	_____	nnn.nnn.nnn.nnn, *NONE
Next Hop . . . . .	_____	IPv4 address
Preferred Interface	_____	IPv4 address, *NONE

- Usage is either \*PS or \*PT
- Destination is \*DFTRROUTE or an IP address
- Subnet mask is \*NONE or an IP address
- Next Hop is the IP address of the next system in the route, usually a router
- Preferred Interface is \*NONE or an IP address

View the WRKSTRPRSC Help text for more information.

### ***3.2.15 Customize the IPL startup program***

When a switch occurs, the DR node is IPLed, and a customer startup program must make the necessary adjustments in the environment, considering that the Production node now has a different serial number and physical resources. The program to run is specified by System Value QSTRUPPGM. At minimum, the startup program must run command QZRDHASM/FIXSTRPRSC.

**Configure Startup Resources (CFGSTRPRSC)**

Type choices, press Enter.

Type of IPL . . . . .	Variable
-----------------------	----------

In the startup program add a new variable in the declaration section:

```
DCL VAR(&IPLTYPE) TYPE(*CHAR) LEN(5) VALUE('?????')
```

And then add a call to CFGSTRPRSC before any other statements:

```
/* PowerHA Tools for IBM i */
QZRDHASM/CFGSTRPRSC RTNVAR(&IPLTYPE)
MONMSG      MSGID(CPF0000)
IF          COND((%SST(&IPLTYPE 1 3) *EQ '*FC') *OR +
                (%SST(&IPLTYPE 1 5) *EQ '*DTCH') *OR +
                (%SST(&IPLTYPE 1 5) *EQ '?????')) +
            THEN (RETURN)
STRTCP
MONMSG      MSGID(CPF0000)
```

It is not recommended to have a universal exception handler in the startup program.

Since TCP should not be started until after CFGSTRPRSC has run, issue this command on the production node after modifying the startup program:

```
CHGIPLA STRTCP (*NO)
```

TCP will be started from the startup program after CFGSTRPRSC has been called.

This program uses the information created with WRKSTRPRSC to set up the proper environment on the node being switched to. Processing steps are:

- Determine where running: \*PS, \*PT, or unknown
- If data area QZRDHASM/QDETACHED exists:
  - CHGIPLA STRTCP(\*NO) STRRSTD(\*YES)
  - Change all line descriptions to ONLINE(\*NO)
  - Change all IP interfaces [except loopback] to AUTOSTART(\*NO)
  - Exit
- Else:
  - Check data area QZRDHASM/LASTCONFIG for \*PS or \*PT. If it matches where we are currently running (serial and LPAR numbers), exit. Else, delete QZRDHASM/LASTCONFIG and continue ...
- Configure storage
  - Find the resource serial number in \*STG hardware resources
  - Resolve the resource name depending upon whether it is \*TAP or \*MLB
  - Vary off the device, if necessary
  - Modify the device description resource name, if necessary
  - Vary on the device, if necessary
- Configure BRMS
  - Call QZRDHASM/CHGBRMSOBJ for each entry in WRKSTRPRSC \*BRM
- Configure routes
  - If a route is specified in WRKSTRPRSC \*RTE for this LPAR, **clear all existing routes**
  - Add the routes specified in WRKSTRPRSC \*RTE
- Configure communications

- If a line description and IP address are specified in WRKSTRPRSC \*CMN for this LPAR
  - Change all line descriptions to ONLINE(\*NO)
  - Change all IP interfaces (except loopback) to AUTOSTART(\*NO)
- Find each resource specified in WRKSTRPRSC \*CMN and for each resource:
  - Vary off the line, if necessary
  - Modify the line description resource name, if necessary
  - Change the line description to ONLINE(\*YES)
  - Vary on the line, ignoring any errors
  - Change the IP address to AUTOSTART(\*YES)
- If everything was successful, create data area QZRDHASM/LASTCONFIG with \*PT or \*PS.
- STRSBS QZRDHASM/QZRDFSR. The subsystem contains information that enables communications between the control nodes and the Production node.

Note: IP interfaces are not started by CFGSTRPRSC.

The following should be added to the customer's startup program (note that the STRTCP command should be called after the subsystems have been started):

There are two additional tools which can be used to customize the startup process: RUNLPARCMD and RTVLPARINF. These are documented elsewhere in this document.

### ***3.2.16 Bypass the Multi-path Reset***

When the Production LPAR IPLs after a switch it will have different disk adapters and different paths to its disk. This will result in CPP7777 messages posted to QSYSOPR. When FIXSTRPRSC runs it will perform a multi-path reset and will prevent additional CPP7777 messages in QSYSOPR.

However, if there are missing paths, the multi-path reset will mask them. For this reason some customers choose to ignore the CPP7777 messages and would prefer to not have the multi-path resetter run. To disable the multi-path reset, create this data area on the production LPAR:

```
CRTDTAARA QZRDHASM/NOMULTPATH *CHAR 1
```

### ***3.2.17 Retrieve LPAR Information (RTVLPARINF)***

The Retrieve LPAR Information command can be used in the customer startup program to make changes based upon the serial number and LPAR number where it is running. This command returns a value that allows execution of larger sections of code. The variable returned is a three byte string and will contain either '\*PS', '\*PT', or '???'.

Here's an example of the additions to a customer startup program:

```
RTVLPARINF PSSRLN(<serial>) PSLPAR(nn) PTSRLN(<serial>)
PTLPAR(nn) LPARUSAGE(&NODE)
IF COND(&PROD *EQ *PS) CMD(DO)
```

```

SNDMSG MSG('Running on <name of Prod LPAR>') TOUSR(*SYSOPR)
( list of commands for the Production node )
ENDDO
ELSE CMD(DO)
SNDMSG MSG('Running on <name of DR LPAR>') TOUSR(*SYSOPR)
( list of commands for the DR node )
ENDDO

```

Note: It is recommended to use the QZRDHASM/LOGMSG function to make an entry in the Viewlog for each major function of the startup program to help with debugging.

### ***3.2.18 Run LPAR Command (RUNLPARCMD)***

The command Run LPAR Command can also be used in the customer startup program to make changes based upon the serial number and LPAR number where it is running.

Example:

```

QZRDHASM/RUNLPARCMD SRLN(<PROD node serial number>)
  CMD(SNDMSG MSG('Running on <name of PROD node LPAR>') TOUSR(*SYSOPR))
MONMSG MSGID(CPF0000)
QZRDHASM/RUNLPARCMD SRLN(<DR node serial number>)
  CMD(SNDMSG MSG('Running on <name of DR node LPAR>') TOUSR(*SYSOPR))
MONMSG MSGID(CPF0000)

```

### ***3.2.19 First activation of the DR node***

It will probably be necessary to activate the DR node in order to determine the resource information necessary for WRKSTRPRSC TYPE(\*CMN) and TYPE(\*STG) for \*PT. For Metro Mirror and Global Mirror with Change Volumes (GMCV), a detach is the preferred method since this will automatically activate the DR node in restricted state without taking the production node offline. For Global Mirror (GMIR), a detach is not supported. Therefore a switch or manual detach is required.. Since communications cannot be started yet, the research must be done using the console for the DR node.

Perform the following steps on a Controller to do a detach:

- Enter WRKCSE and Select option 12=Work with for the Full System Replication environment
- On the Work with SVC PPRC Environment display, option 8=Detach
  - The following steps are performed on the Production node:
    - The IPL attributes are set to Restricted=Yes if QLPAR has \*SECADM authority
    - Data area QZRDHASM/QDETACHED is created
    - Replication is stopped
    - The target node is IPLed in Manual mode while the production node continues to run
    - The IPL attributes are set back to Restricted=No, if necessary
    - Data area QZRDHASM/QDETACHED is deleted

Alternatively, do a switch which will deactivate the Preferred Source LPAR and reverse the replication.:

- CHGIPLA STRTCP(\*NO) STRRSTD(\*YES) to IPL in the restricted state without TCP/IP communications
- On one of the Controllers, do a CHKCSE for the environment to assure readiness for a switch
- On one of the Controllers, do a SWCSE for the environment to activate the DR node

In either case:

- Sign on to the HMC for the DR node and establish a console session to the DR node
- Use WRKHDWRSC TYPE(\*CMN) and select option 7 (Display resource detail) for an operational Ethernet port to determine the Location information.

```

                                Display Resource Detail

Resource name . . . . . : CMNnn
Text . . . . . : Ethernet Port
Type-model . . . . . : 268C-002
Serial number . . . . . : 00-00000
Part number . . . . . :

Location : U9179.MHD.1016B4P-V3-C2-T1
  
```

- Use WRKSTRPRSC \*CMN on the Production node to enter the location for \*PT. As before, add an entry for each IP address.

```

                                Add or Change Communication Resources
Enter details, press Enter.

Usage . . . . . *PT
IP Interface . . . . . nnn.nnn.nnn.nnn
Line Description . . . . . *IPADDR .
Resource Location . . . . . *LINE .
-----
Port . . . . . _____
  
```

Note: If you did a Detach, there may be no Ethernet line description on the DR node so you cannot use the defaults of \*IPADDR and \*LINE.

- Use WRKHDWRSC \*STG to locate the serial number for the DR node tape device, and then use WRKSTRPRSC \*STG to enter the information for \*PT
- Prepare to switch back to the Production node. CHGIPLA STRTCP(\*YES) STRRSTD(\*NO)
- On one of the Controllers, do a CHKCSE for the environment to assure readiness for a switch

- On one of the Controllers, do a SWCSE for the environment to reactivate the Production node

### 3.2.20 Work with Copy Services Environments (WRKCSE) Security

The functions of the Work with Copy Services Environments (WRKCSE) menu require the adoption of the QLPAR user profile which has \*ALLOBJ special authority. The WRKCSE command is shipped with \*PUBLIC authority \*CHANGE so it may be desirable to limit access to one or more of the WRKCSE functions.

**Note:** Command line access from within WRKCSE will be as the original user profile only. No command line access is available when switched to QLPAR.

For most WRKCSE options, the WRKCSE command processing program calls a program named QZRDSECURE in the QZRDHASM library -- a user-written security policy program. If QZRDSECURE is not available, no operations authority checking is done by WRKCSE, and QLPAR is used for all DSCLI function. QZRDSECURE is called when any option is selected for FLASH, MMIR and GMIR environments.

This program must issue an IAS0391 exception message when it detects a user who is not authorized to a specific operation. This message is located in the message file QZRDHASM/QZRDIAMSGF. Any exception message issued by this program will deny access to the operation.

The WRKCSE command processing program passes the following parameters to QZRDSECURE:

1. Environment (IASP CRG) name, char(10).
2. Environment type, char(5);
  - FLASH
  - LUN
  - MMIR
  - GMIR
3. Option, char(2);
  - 1 = Add ('51' is passed)
  - 2 = Change ('52' is passed)
  - 4 = Delete ('54' is passed)
  - 14 = List Stream files.
  - 16 = Define host connections
  - 18 = Make PPRC Paths

If option 12 = Work with is selected on the main menu, QZRDSECURE is not called; the appropriate submenu for the environment is displayed, and its options will call QZRDSECURE with the name and type of environment plus the following options:

**Note:** The option passed will be a two-digit character value based on the option number from the screen (i.e., '01' is passed for opt 1)

FLASH environment options:

- 1 = Start Flash
- 2 = Stop Flash
- 12 = Work with Volumes
- 14 = List Stream files

MMIR environment options:

- 2 = Pause
- 3 = Resume
- 4 = Failover
- 6 = Start Replication after failover
- 12 = Work with Volumes
- 13 = Display Out of Sync sectors
- 14 = List Stream files

GMIR environment options:

- 2 = Pause
- 3 = Resume
- 4 = Failover
- 5 = Symmetrical switchover
- 12 = Work with Volumes
- 13 = Display Out of Sync sectors
- 14 = List Stream files

Any or all of these parameters may be used to define the client's security policy in regards to the WRKCSE command.

The QCLSRC file in library QZRDHASM contains a skeleton QZRDSECURE program that may be used to get you started. This source code is supplied for example and testing purposes only. If modifications are to be made, this source member should be copied to a library other than QZRDHASM and the modifications made there. Otherwise revised source code may be overlaid by a restore of the QZRDHASM library.

## 4 Performing switches with Full System Replication

The process of switching between Production and DR nodes is performed on either the Production or DR Controller, and the first step is to verify that all is ready for a switch.

Enter command Check Copy Services Environ. (CHKCSE) and press F4=Prompt.

```

                Check Copy Services Environ. (CHKCSE)

Type choices, press Enter.

Environment name . . . . . _____ Name
  
```

Key the environment name and press Enter. The following conditions are checked to determine readiness for a switch:

- The control node can communicate to the Production node.
- The environment must be \*PPRC only (no FlashCopy)
- At least one of the HMCs for the Production LPAR must be available
- At least one of the HMCs for the DR LPAR must be available
- CSE data must show USE(\*SYSTEM)
- Both storage units are available
- The \*PPRC direction in the CRG exit data must match the replication direction
- QSYSOPR is in \*DFT reply mode

### 4.1 Scheduled switch

System maintenance on the Production node may require a planned switch to the DR node. Enter command Switch Copy Services Environ. (SWCSE) and press F4=Prompt.

```

                Switch Copy Services Environ. (SWCSE)

Type choices, press Enter.

Environment name . . . . . _____ Name
Switch type . . . . . *SCHEDULED *SCHEDULED, *UNSCHEDULED
Type . . . . . * *, *GMIR, *MMIR
Auto replicate . . . . . *DFT *DFT, *YES, *NO
  
```

Key the environment name and type and Press Enter. The following steps are performed:

- If the Production node is running, send an \*INQ message (IAS0029) to QSYSOPR requesting permission to proceed
- Call the customer-specified power down command
  - \*STATUS message “Current SRC for <Production node LPAR> is nnnnnnnn” indicates progress toward shutdown



- Wait until the Production node LPAR is deactivated
- Pause replication
  - \*STATUS message “Starting switchover of node <Production node> from LPAR <Production node> to LPAR <DR node>”
- IPL the DR node
  - \*STATUS message “Current SRC for <DR node LPAR> is nnnnnnnn” indicates progress of the IPL. Message “The PPRC switch for the \*SYSTEM CRG <CRG name> is complete.” is sent to the joblog of the Controller where the SWCSE was entered
  - The LPAR is always IPLd to the B side
- After the DR node has IPL’d start replication if ‘Auto Replicate’ is not \*NO
- Call the customer startup program
  - FIXSTRPRSC processes the information for \*CMN, STG, \*BRM, and \*RTE differences entered with WRKSTRPRSC
  - Change license keys for other programs dependent upon the system serial number
  - Other customer-specified processing
- Start clustering; when clustering was set up, IP addresses for both the Production and DR nodes were specified

## 4.2 Unscheduled switch

If the Production node becomes inoperative, an unscheduled switch is necessary to activate the DR node. The only differences in the process described above are:

- CHKCSE cannot be used
- If running in batch, \*INQ message is sent to QSYSOPR on the Controlling node requesting permission to proceed.
- No \*INQ message is sent to QSYSOPR on the Production node requesting permission to proceed.
- The default is not to start replication automatically

### *4.2.1 Starting replication after unscheduled switch*

To start replication after an unscheduled switch, use WRKCSE Option 12=Work with.

**Note: screens show SVC but functionality is identical with DS8K however a Metro Mirror will not show Detach and Reattach options**

```

                                Work with SVC PPRC
Environment
Environment . . . . . : <name>
MMIR Status . . . . . : Idling
Direction . . . . . :

Select one of the following:
  2. Pause
  3. Resume

  5. Switch
  6. Start Replication after Switch

  8. Detach
  9. Reattach
 10. Display replication

```

Select Option 6 (Start replication after switch). A Warning window opens:

```

.....
:                               Confirm Start of Replication                               :
:                                                                                       :
: Warning; this option may be hazardous to the health                               :
: data of your production data. It is possible to start                             :
: replication in either direction. BEFORE CONTINUING,                               :
: CONFIRM THE NEW NODE ROLES BELOW.                                                 :
:                                                                                       :
:                                                                                       :
: Press F10 to continue, F8 to reverse, F12 to cancel.                             :
:                                                                                       :
: Source LPAR . :   ctciha4e                                                         :
: Target LPAR . :   ctciha9e                                                         :
:                                                                                       :
:                                                                                       :
:                                                                                       Bottom :
: F1=Help      F3=Exit   F8=Reverse the Direction                                   :
: F10=Continue  F12=Cancel                                         :
:                                                                                       :
:.....

```

Be very careful here. The Source and Target LPARs are determined by FSR from the CSE exit data status of \*NORMAL or \*REVERSED. Be sure to confirm that FSR determined correctly before proceeding. Press F8=Reverse the Direction if you decide otherwise. Press F10 when ready to start replication.

Next, select Option 10 if available (Display replication) and press F11=Show status to monitor progress. For DS8K Metro Mirror, use option 12 ( Work with Volumes) and Option 13 (Display out of sync sectors ) instead.

```

Display Replication

Environment . . . : <name>                               Type . . . . . : MMIR
Consistency group : <name>
Cycle period . . : *NONE
Primary . . . . . : Master (or Aux)
State . . . . . : Inconsistent_copying

Relationship      State / in sync?      Freeze time      Progress
<name>           inconsistent_copying
<name>           inconsistent_copying
<name>           inconsistent_copying
<name>           inconsistent_copying

```

Eventually you will see that replication is running (Consistent synchronized).

```

Display Replication

Environment . . . : <name>                               Type . . . . . : MMIR
Consistency group : <name>
Cycle period . . : *NONE
Primary . . . . . : Master (or Aux)
State . . . . . : Consistent_synchronized

Relationship      State / in sync?      Freeze time      Progress
<name>           consistent_synchronized
<name>           consistent_synchronized
<name>           consistent_synchronized
<name>           consistent_synchronized

```

### 4.3 Detach

The detach function stops replication and IPLs the target node in manual mode and restricted state. The source node continues to run. On one of the Controllers, use the WRKCSE command and option 12 (Work with) to access this function.

- This function is not supported for GMIR replication without change volumes for SVC.
- This function is not supported for MMIR replication with DS8K

**Work with SVC PPRC Environment**

```
Environment . . . . . : <name>
MMIR Status . . . . . : Consistent synchronized
Direction . . . . . : Normal (or Reversed)
```

Select one of the following:

- 2. Pause
- 3. Resume
  
- 5. Switch
- 6. Start Replication after Switch
  
- 8. Detach
- 9. Reattach
- 10. Display replication

Select option 8 (Detach). The following steps are performed:

- The IPL attributes are set to Restricted=Yes if QLPAR has \*SECADM authority
- Data area QZRDHASM/QDETACHED is created
- LPAR memory is flushed
- Replication is stopped
- The target node is IPLed in Manual mode while the production node continues to run
- The IPL attributes are set back to Restricted=No, if necessary
- Data area QZRDHASM/QDETACHED is deleted

Wait for \*STATUS message IAS00E4 (Current SRC for <LPAR name of target node> is C600 4301) indicating the console is available for signon. Sign on the console and provide responses to complete the IPL. Any data changes on the target node will be lost when reattach restarts replication from the Production node.

## 4.4 Reattach

When you are ready to resume normal operations, select option 9 (Reattach). The following steps are performed:

- The target node is powered down, if not already Inactive
- Replication is resumed in the same direction as before the detach. You can monitor progress toward “Consistent\_synchronized” by selecting option 10 (Display replication) and pressing F11>Show status.

### Display Replication

Environment . . . : <name>                    Type . . . . . : MMIR  
Consistency group : <name>  
Cycle period . . : \*NONE  
Primary . . . . . : Master (or Aux)  
State . . . . . : Inconsistent\_copying

Relationship	State / in sync?	Freeze time	Progress
<name>	inconsistent_copying		96
<name>	inconsistent_copying		97
<name>	inconsistent_copying		96
<name>	inconsistent_copying		97

## 5 Displaying Full System Replication information

### 5.1 WRKCSE Option 5=Display

```

                                     Display a PPRC Environment
Press Enter to continue.

Environment . . . . . : <name>
Type . . . . . : MMIR (or GMIR)
Storage Type . . . . . : SVC
ASP Device name . . . . . : *SYSTEM
Source Copy Description . . . . . : *NONE
Target Copy Description . . . . . : *NONE
Production node . . . . . : <PROD node name>
Preferred source SVC Information:
  IP Address . . . . . : nnn.nnn.nnn.nnn
  Remote copy consistency group Id n
Preferred target SVC Information:
  IP Address . . . . . : nnn.nnn.nnn.nnn
  Remote copy consistency group Id n
```

### 5.2 WRKCSE Option 12=Work with

```

                                     Work with SVC PPRC Environment

Environment . . . . . : <name>
MMIR Status . . . . . : Consistent synchronized
Direction . . . . . : Normal (or Reversed)

Select one of the following:

    2. Pause
    3. Resume

    5. Switch
    6. Start Replication after Switch

    8. Detach
    9. Reattach
   10. Display replication
```

Note: Direction shows what is actually occurring between the storage units, not what is in the CSE data.

### 5.2.1 WRKCSE Work with Option 10=Display replication

```

                                Display Replication

Environment . . . . : <name>                Type : MMIR (or GMIR)
Consistency group : <RCCG ID and name>
Cycle period . . . : *NONE
Primary . . . . . : Master (or Aux)
State . . . . . : Consistent_synchronized

Relationship      Master volume      Auxiliary volume
<name>           <volume name>      <volume name>
<name>           <volume name>      <volume name>
<name>           <volume name>      <volume name>
<name>           <volume name>      <volume name>

```

Primary = Master if replicating in the normal direction or Aux if replicating in the reversed direction.

### 5.3 WRKCSEDTA Option 5 = Display

```

                                Work with CSE Data

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

Opt      CSE Data      CRG      Text
BRMS9M9P1  FSFC
CTCHAFS    FSR
EXIT9M9P1  FSFC
FSFCDS8K   FSFC
FSFC9F9G   FSFC
FSFC9J9K   FSFC
FSFC9M9N   FSFC      GMCV Flash
FSFC9M9P1  FSFC
FSFC9M9P1Q FSFC
FSFC9M9P2  FSFC
FSR9J2     FSR

```

### 5.4 DSPCSEDTA

```

                                Display CSE CRG Data

Press Enter to continue.

```

```
CRG Name . . . . . : <name>
Use . . . . . : *SYSTEM
Copy type . . . . . : *PPRC

Environment name . . . . . : <name>
Preferred production node name : <PROD node>
FSR communications port . . . : 55920
PPRC status . . . . . : *READY
PPRC direction . . . . . : *REVERSED
Controlling node name . . . . : <DR Ctl>
Secondary controlling node name: <PROD Ctl>
```

More...

Note: Direction is what is recorded in the CSE exit data based upon FSR processing and may not match the replication direction that is actually occurring between the SVCs.



Display CSE CRG Data

Press Enter to continue.

Preferred production details:

HMC LPAR name . . . . . : <name>  
HMC Profile name . . . . . : <name>  
HMC managed system . . . . . : <name>  
Primary HMC IP . . . . . : nnn.nnn.nnn.nnn  
Secondary HMC IP . . . . . :

Preferred target details:

HMC LPAR name . . . . . : <name>  
HMC Profile name . . . . . : <name>  
HMC managed system . . . . . : <name>  
Primary HMC IP . . . . . : nnn.nnn.nnn.nnn  
Secondary HMC IP . . . . . :

More...

Display CSE CRG Data

Press Enter to continue.

Power down command . . . . . : PWRDWN SYS OPTION(\*IMMED)

Bottom

## 6 Full System LUN Switch

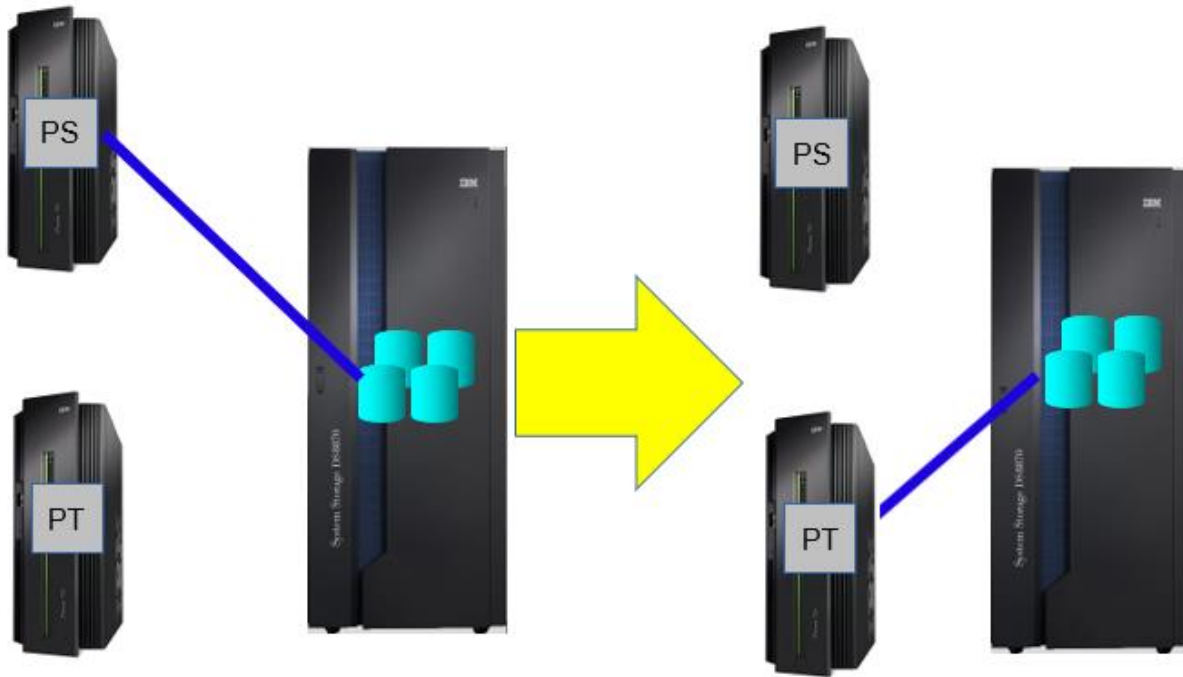
The LUN switch is very similar to Full System Replication, but instead of managing the replication it is only the LPAR host connections which are changed. This can be useful when performing a scheduled or unscheduled switch from one LPAR to another LPAR, and can be combined with Full System Replication.

Compared to Logical Partition Movement (LPM):

- An outage (shutdown and IPL) is required
- An LPAR must exist on each system
- The switch is performed and managed from a controlling LPAR running IBM i
- The switch can be executed with an active or deactivated LPAR (i.e. after a failure)
- Resources (communication, storage, BRMS details etc.) on the LPAR are managed by the toolkit same as with Full System Replication

The Full System LUN Switch can be combined with Full System Replication but there is limited support for this configuration and requires manually updating the WRKCEDTA prior to switch. This will be better addressed in a future release.

### 6.1 Configuring a Full System LUN Switch



To configure Full System LUN Switch, first create the environment (WRKCSE)

```

                                Add an Environment

Enter Copy Services and ASP information

Environment name . . . . . : TESTLS
Copy Service Type . . . . . : LUN
Storage Type . . . . . : SVC or DS8K

Primary ASP . . . . . *SYSTEM                33 - 255, *SYSTEM
  
```

Use option 16 to enter the Production and HA Node host connection information (note that the panels may differ slightly depending on whether they are using Storwize or DS8K units).

Use F6 to import hosts directly from the storage unit:

```

                                Select production and target hosts

Select 2 hosts, press Enter.
  1=Select Production Host   2=Select HA Host

Opt   Host name
      ctciha91
  
```

```
ctciha9k
ctciha9j
1  ctciha9e
2  ctciha4p
   ctciha4q
   dummyhost
```

More...

F1=Help F12=Cancel

### Change Host Volume List

```
SVC IP Address . . . . . : 9.5.167.87
Production Host name . . . : ctciha9e
HA Host name . . . . . : ctciha4p
```

Bottom

Type choices, press Enter

Volume ranges:

0002-0005 0035-0035

F1=Help F12=Cancel

Volume Ids imported successfully...press Enter to accept.

### Work with Host Mappings

```
Environment . : LUNSW
Type . . . . . : LUN
SVC IP Address : 9.5.167.87
```

Type option, press Enter.

1=Add 2=Change 4=Remove 6=Change host volume list

Opt	Production Node Host Name	HA Node Host Name	Volume Count
	ctciha9e	ctciha4p	5

Bottom

F1=Help F3=Exit F6=Import host F8=Validate F12=Cancel

Then use WRKCSEDTA to create a Full System Replication entry using the LUN switch environment. Continue to set up Full System LUN Switch similarly to FSR (WRKSTRPRSC etc).

## 6.2 Performing a Full System LUN Switch

Use the commands CHKCSE and SWCSE to perform the switches, specifying the CSE Data.

The process of switching between Production and DR nodes is performed on either the Production or DR Controller, and the first step is to verify that all is ready for a switch.

Enter command Check Copy Services Environ. (CHKCSE) and press F4=Prompt.

```
                Check Copy Services Environ. (CHKCSE)
Type choices, press Enter.
Environment name . . . . . _____ Name
```

Key the environment name and press Enter. The following conditions are checked to determine readiness for a switch:

- The control node can communicate to the Production node.
- At least one of the HMCs for the Production LPAR must be available
- At least one of the HMCs for the DR LPAR must be available
- CSE data must show USE(\*SYSTEM)
- The storage unit is available
- QSYSOPR is in \*DFT reply mode

### 6.2.1 Scheduled switch

System maintenance on the Production node may require a planned switch to the DR node. Enter command Switch Copy Services Environ. (SWCSE) and press F4=Prompt.

```
                Switch Copy Services Environ. (SWCSE)
Type choices, press Enter.
Environment name . . . . . _____ Name
```

Switch type . . . . .	<u>*SCHEDULED</u>	*SCHEDULED, *UNSCHEDULED
Type . . . . .	<u>*</u>	*, *GMIR, *MMIR
Auto replicate . . . . .	<u>*DFT</u>	*DFT, *YES, *NO

Key the environment name and type and Press Enter. The following steps are performed:

- If the Production node is running, send an \*INQ message (IAS0029) to QSYSOPR requesting permission to proceed
- Call the customer-specified power down command
  - \*STATUS message “Current SRC for <Production node LPAR> is nnnnnnnn” indicates progress toward shutdown
- Wait until the Production node LPAR is deactivated
- Change the host connections to the DR node LPAR.
- IPL the DR node
  - \*STATUS message “Current SRC for <DR node LPAR> is nnnnnnnn” indicates progress of the IPL. Message “The switch for the \*SYSTEM CRG <CRG name> is complete.” is sent to the joblog of the Controller where the SWCSE was entered
  - The LPAR is always IPLd to the B side
- Call the customer startup program
  - FIXSTRPRSC processes the information for \*CMN, STG, \*BRM, and \*RTE differences entered with WRKSTRPRSC
  - Change license keys for other programs dependent upon the system serial number
  - Other customer-specified processing
- Start clustering; when clustering was set up, IP addresses for both the Production and DR nodes were specified

**6.2.2 *Unscheduled switch***

If the Production node becomes inoperative, an unscheduled switch is necessary to activate the DR node. The only differences in the process described above are:

- CHKCSE cannot be used
- If running in batch, \*INQ message is sent to QSYSOPR on the Controlling node requesting permission to proceed.
- No \*INQ message is sent to QSYSOPR on the Production node requesting permission to proceed.

# 7 Commands

## 7.1 ADDCSECRDE - Add CSE Credential Entry

ADDCSECRDE allows the user to add credential entries. This information is used by the toolkit whenever it needs to communicate with the device specified on the Host IP address parameter, and is used when communicating with the DS8K, HMC and SVC's. This information is encrypted and stored in the PowerHA device data domain, and is available to all the nodes in the cluster.

```
                                Add CSE Credential Entry (ADDCSECRDE)

Type choices, press Enter.

Host IP address . . . . . _____
User ID . . . . . _____
Password . . . . . _____
Confirm password . . . . . _____
Host description . . . . . _____
```

**Host IP address:** Enter the IP address of the host which the credentials are for. A valid IP address is required; name resolution is not performed by the toolkit.

**User ID:** Enter the user ID which exists on the device specified by the Host IP address.

**Password:** Enter the password for the user ID which exists on the device specified by the Host IP address.

**Confirm password:** Re-enter the password to ensure that it is correct.

**Host description:** Enter a description to make it easy for humans to see which host the IP address is for.

## 7.2 CHGBLDFLG – Change Build Flags

This command alters flags held in the BUILD data area that are used for debugging and other purposes within PowerHA Toolkit for IBM i. The command should only be used when so recommended by an IBM consultant or support personnel.

```
                                Change ICSM Build Flag (CHGBLDFLG)

Type choices, press Enter.

Specific build flag . . . . . *DEBUGEXIT      *DEBUGEXIT, *DEBUGFLASH...
Setting . . . . . *OFF                      *ON, *OFF
```

**Specific build flag:** Determines which flag to toggle. The possible values are:

- **\*DEBUGCRG:** Change the DEBUGCRG flag used with the toolkit. Setting it on will result in more detailed messages related to the CRG DDD space.
- **\*DEBUGEXIT:** Change the DEBUGEXIT flag used with the toolkit for debugging the CRG exit program.
- **\*DEBUGFLASH:** Change the DEBUGFLASH flag used with the toolkit. Setting it on will result in more detailed messages related to flash operations.
- **\*DEBUGTPC:** Change the DEBUGTPC flag used within the toolkit for debugging CSM (formerly TPC-R).
- **\*DEBUGDDD:** Change the DEBUGDDD flag used within the toolkit. Setting it on will result in more detailed messages related to the DDD space.
- **\*TEST:** Change the TEST flag used within the toolkit. This should only be used for toolkit development testing.
- **\*XTRALOGS:** Change the XTRALOGS flag used within the toolkit. This will result in additional logging messages generated and retained.

**Setting:** Used to toggle the specified build flag. The possible values are:

- **\*OFF:** Change the above flag to off.
- **\*ON:** Change the above flag to on.

### 7.3 CHGBRMSOBJ - Change BRMS Object Attributes

This command allows you to change an attribute of a BRMS object. It is particularly useful for programmatically changing values which do not have a BRMS command line interface.

```
Change BRMS Object Attributes (CHGBRMSOBJ)

Type choices, press Enter.

BRMS Object type to change . . . _____ *DEVICE, *MEDPCY, *CTLGATTR
Name of BRMS object to change . . _____ Object name
BRMS Attribute to change . . . . _____ *LOC, *MEDCLS, *MOVPCY...
New attribute value . . . . . _____
```



**Object type to change:** Specify the type of object to change. The objects which can be changed are:

- **\*CTLGATTR:** The following control group attributes (WRKCTLGBRM opt 8) can be changed:
  - \*DEVICE
- **\*DEVICE:** The following device attributes (WRKDEVBRM) can be changed:
  - \*LOC
  - \*TEXT
- **\*MEDPCY:** The following media policy attributes (WRKPCYBRM) can be changed:
  - \*LOC
  - \*MEDCLS
  - \*MOVPCY
  - \*MARKDUP
  - \*MARKHST
  - \*MINVOL
  - \*TEXT
  - \*VOLSEC

**Name of BRMS object to change:** Specify the name of the BRMS object to change.

**BRMS Attribute to change:** Specify the attribute of the object to change. The valid combination of object to change and the attribute to change varies.

- **\*DEVICE:** Specifies the device(s) to be associated with the object. Only one device is currently supported. The possible values are:
  - **\*BKUPCY:** The value for the backup device field in this control group uses the default value for this field from the backup policy.
  - **\*SYSPCY:** The value for the backup device field in this control group uses the default value for this field from the system policy.
  - **device-name:** Specify the names of the devices that are used in processing this backup control group. Only one device is currently supported.
  - **\*NONE:** There is no device for this save operation. Save files are used to store the saved data.
  - **\*MEDCLS:** Devices for this policy or control group are selected based on device types that support the density for the media class specified in the media policy. The \*MEDCLS special value is used for devices that are part of a device pool, such as several systems that share a single or set of devices.
- **\*LOC:** Specifies the storage location to be associated with the object. The possible values are:
  - **\*ANY:** Any device in any location capable of saving to the specified media class can be utilized for the save operation.

- location-name: Specifies the location name of the device that is to be used with this policy. Only devices assigned this location name can be used for the save operation.
- **\*MEDCLS:** Specifies the name of the media class to be used for any volume created using this media policy. The possible values are:
  - \*NONE: No media class is assigned for this media policy.
  - \*ADSM: No media class is assigned for this media policy. The media is managed by the TSM server.
  - media-class-name: Specify the name of the media class that is to be used with this media policy.
- **\*MOVPCY:** Specifies the name of the move policy to be associated with this object. The possible values are:
  - \*NONE: Specifies that no move policy is associated with this media policy.
  - \*ADSM: Specifies no move policy is associated with this media policy. A TSM server is responsible for movement and storage of the media.
  - move-policy-name: Specifies the name of the move policy that is to be assigned to volumes used by this media policy.
- **\*MARKDUP:** Specifies whether history items created by the save will be marked for duplication. You can use DUPMEDBRM VOL(\*SRCHHST) command to duplicate the marked saved items. The possible values are:
  - \*NO: History items created during a save operation that use this media policy will not be marked for duplication.
  - \*YES: History items created during a save operation that use this media policy will be marked for duplication.
- **\*MARKHST:** Specifies whether media volumes will be marked for duplication. If a volume is a member of a media set and it is marked for duplication, all members of the media set will be marked for duplication. When the DUPMEDBRM VOL(\*SEARCH) command is used, active volumes that have been marked will be selected and duplicated. The possible values are:
  - \*NO: Volumes written to during a save operation that use this media policy will not be marked for duplication.
  - \*YES: Volumes written to during a save operation that use this media policy will be marked for duplication.
- **\*MINVOL:** Specifies the minimum number of expired volumes that must be present before any save can begin. The possible values are:
  - \*NONE: There is no check done to determine the minimum number of required volumes before a save operation begins.
  - number-of-required-volumes: Specify the number of expired media volumes that must be available before any BRMS save operation will begin. The number of volumes can range from 1 to 9,999.
- **\*TEXT:** Specifies text that describes the object. The possible values are:
  - \*NONE: No text will be used to describe the object.
  - text-description: Specifies the text description to be used.

- **\*VOLSEC:** The secure volume attribute will be changed. Value values are:
  - **\*NO:** Volume security will not be applied to this media class. Volumes that do not have volume security can be read by anyone.
  - **\*YES:** Volume security will not be applied to this media class. Only users with special authorities **\*ALLOBJ** or **\*SECADM** can read media volumes in this media class. \*
  - **\*ADSM:** Volume security will not be applied. Volume security is managed by the TSM server.

**New attribute value:** Specify the new value value.

## 7.4 CHGCSECRDE - Change CSE Credential Entry

This command can be used to change a user credential entry in the Device Domain Data associated with IBM i Copy Services Manager. The information is encrypted using a 128 bit AES key before it is retained.

For a description of the parameters, see the command **ADDCSECRDE**.

## 7.5 CHGCSEDTA – Change CSE Data

CHGCSEDTA is used to change the CSE Data as it relates to the operational characteristics of the toolkit. The parameters of **CRTCSEDTA** and **DSPCSEDTA** are similar and these descriptions apply to those commands as well. Please refer to **CRTCSEDTA** for parameter details.

## 7.6 CHKCSE – Check Copy Services Environment

The Check Copy Services Environment (**CHKCSE**) command verifies that all of the requirements are in place to perform a scheduled CSE switch. It is recommended to call this command after making changes to the CSE or **CSEDTA**, and to schedule it to run during the day to catch any changes in configuration which may prevent a switch.

An error in the configuration will result in an escape message being sent.

**CHKCSE** performs many more checks than **SWCSE**, including whether the LUNs attached to the source LPAR are the ones replicated. If some LUNs are missing from the replication then **CHKCSE** will fail; if LUNs are replicated but are not configured to the LPAR then **CHKCSE** will issue a warning. To prevent **CHKCSE** from checking any LUNs create a system environment variable **QZ\_DISABLE\_LUN\_CHECK**. Note: Disk mappings using vSCSI are not supported and they will result in the LUN check failing.

If the LUNs are attached using vSCSI CHKCSE will always fail (we do not support vSCSI). To disable LUN checking create environment variable QZ\_DISABLE\_LUN\_CHECK on the controlling LPAR.

CHKCSE will warn if qzrdhasm.log is greater than 20 MB

```

                                Check Copy Services Environ. (CHKCSE)

Type choices, press Enter.

Environment name . . . . . _____ Name

                                Additional Parameters

Message queue . . . . . *NONE          Name, *QSYSOPR, *NONE
Library . . . . . *LIBL             Name, *LIBL

```

**Environment name:** Specifies the name of the Environment which is to be checked. This name also refers to the CRG (CSEDTA) name.

**Message queue:** The message queue and library name where inquiry messages will be routed. The default is \*NONE. If a user message queue name is provided, a library name is required.

## 7.7 CLEANLOGS – Clean Toolkit Logs

In prior releases this command was named CLNICSMLOG.

This command will clean the logs related to the IASP Copy Services Manager, Full System Replication Manager, or Full System FlashCopy Manager. CLEANLOGS removes specified entries from the /QIBM/Qzrdhasm/Qzrdhasm.log, removes any temporary directories created by DMPINF, dmpinf zip files and toolkit joblogs in /QIBM/Qzrdhasm/joblogs/ which are older than the number of days specified on this command. This command should be run periodically to prevent log files from consuming excessive space.

**Days of information to retain:** How many days of information to retain.

**FSFC environment:** The name of the FSFC environment to be cleaned.

- **\*NONE:** Do not clean up the logs for any environment.
- **\*ALL:** Clean up the logs for all environments.
- **environment-name:** Clean up the logs for the named environment.

## 7.8 CLRDDD – Clear Device Data Domain

CLRDDD is a utility command used to clear data out of PowerHA device data domains. It should only be used when instructed by IBM personnel and may remove toolkit configuration data.

## 7.9 CPYCSEDTA – Copy CSE Data

This interactive command will create a new Cluster Resource Group and write configuration data to the CSE Data device domain based on information from an existing CRG and existing CSE Data. The configuration data may be modified before the CSE Data is created.

Please refer to the command CRTCS EDTA for a detailed description of the parameters.

**CSE Data name:** The name that identifies both the CRG and the CSE Data.

**To CRG:** Specifies the name of the CRG device which is to be prepared for backup. This name identifies a CRG device description on the owning cluster node. This is also the Environment name referenced elsewhere within ICSM. The environment is configured using WRKCSE.

## 7.10 CRTCS EDTA - Create Copy Services Environment Data

CRTCS EDTA is used to enter the CSE Data as it relates to the operational characteristics of the toolkit. The parameters of CHGCSEDTA and DSPCS EDTA are similar and these descriptions apply to those commands as well. Flash and Replication, IASP and Full system all use CRTCS EDTA, but the parameters differ based on the initial selections.

```
                                Create CSE CRG

Supply all required values, press Enter.

CRG Name . . . . . : TEST
Use . . . . . : *SYSTEM
Copy type . . . . . *PPRC          *PPRC, *FLASH
```

For FSR operations the CRG Name must be the same as the environment name, as only one CSEDTA is expected for FSR (this differs from FSFC). Entering use \*SYSTEM and type \*PPRC indicates this is going to be a CSE Data for Full System Replication. Press Enter and the remaining FSR-specific parameters are displayed.

```
                                Create CSE Data

Supply all required values, press Enter.
```

```

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

Environment name . . . . . _____
Production node name . . . . . _____
FSR communications port . . . . . 55920
Primary controlling node . . . . . _____ Name
Secondary controlling node . . . . . _____ Name

Preferred source details:
IP address . . . . . _____
Primary HMC IP . . . . . _____
Secondary HMC IP . . . . . _____
HMC managed system . . . . . _____
HMC LPAR name . . . . . _____
HMC Profile name . . . . . _____

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

More...

```

**Environment:** Refers to the environment previously created in WRKCSE. This must be an FSR environment of the same name as the CSESDTA, and determines the external storage details.

**Primary and Secondary controlling nodes:** Enter the cluster node names of the controllers. There is no practical distinction between primary and secondary nodes. If there is only one node, do not enter a secondary node.

**Communications port:** The port on the source LPAR the controllers will use to communicate with the source and target LPARs. Program QZRDIAEXT2 in subsystem QZRDFSR is expected to be listening to this port when the FlashCopy operations are performed.

**Preferred source details:** Specify the details for the preferred source LPAR. The *IP Address* is used by the controller to reach the preferred source host. The *Primary HMC IP* is required and *Secondary HMC IP* is optional. The *HMC LPAR name*, *HMC profile name*, and *HMC managed system* parameters are case sensitive and can be queried directly from the HMC by pressing F6 after the HMC IP addresses are entered. If the toolkit receives an unexpected response from the currently used HMC it will automatically retry the response on the other HMC, if it is configured.

```

Create CSE Data

Supply all required values, press Enter.

Preferred target details:
IP address . . . . . _____
Primary HMC IP . . . . . _____
Secondary HMC IP . . . . . _____
HMC managed system . . . . . _____
HMC LPAR name . . . . . _____
HMC Profile name . . . . . _____

```

```
Power down command . . . . . _____
```

```
Auto start cluster . . . . . *YES *YES, *NO  
Message Queue . . . . . *SYSOPR name, *SYSOPR  
Library . . . . . _____ a  
library name
```

**Preferred target details:** Specify the details for the preferred target LPAR. The *IP Address* is used by the controller to reach the preferred target host, it can be the same as the source LPAR. The *Primary HMC IP* is required and *Secondary HMC IP* is optional. The *HMC LPAR name*, *HMC profile name*, and *HMC managed system* parameters are case sensitive and can be queried directly from the HMC by pressing F6 after the HMC IP addresses are entered. If the toolkit receives an unexpected response from the currently used HMC it will automatically retry the response on the other HMC, if it is configured.

**Power down command:** This is the command that will be issued on the running LPAR prior to the switch. It can be a PWRDWN SYS or a program call that will perform more graceful shutdown procedures. The power down command should NOT perform a restart; the toolkit will do that. If no shutdown is desired, enter \*NONE. Prompting is available using F4, but note that the controller is used for prompting despite the command will actually run on the source LPAR.

**Auto start cluster:** Specify \*YES or \*NO depending on whether the CHKCSE/SWCSE command should issue the STRCLUNOD if the cluster is not started.

**Message queue:** The message queue and library name where inquiry messages will be routed. The default is \*SYSOPR. If a user message queue name is provided, a library name is required.

## 7.11 DLTCSEDTA - Delete CSE Data

This command will delete the specific CSE Data from the CRG device domain data. It also deletes the CRG.

**CSE Data name:** The name that identifies the CSE Data.

## 7.12 DSPCSEDTA - Display Copy Services Data

This interactive command displays the specific CSE Data configuration information in the CRG device domain data space. It also displays CRG exit data.

**CSE Data name:** Specifies the name of the CSE Data and the exit data that is to be displayed.

## 7.13 DSPDDDLCK - Display DDD lock holder

This is a utility command for display the job and user who holds a cluster-wide lock on the specified artifact. This command should be used if a log message indicates a lock is preventing an operation.

**Name:** Enter the name of the object to display a lock for.

**Type:** Enter the type of object to display a lock for.

## 7.14 IPLPAR – IPL Partition

This command will activate the specified LPAR.

**HMC partition name:** Specify the name of the LPAR to activate. This parameter is case sensitive.

**Partition profile:** Specify the partition profile to use when activating the partition. This parameter is case sensitive.

- **\*LPARNAME:** The name of the profile is the same as the partition name.

**Managing system:** The managed system name must be specified. This parameter is case sensitive.

**Primary HMC IP address:** Enter the IP address of the primary HMC. This address must have credentials listed in WRKCSECRDL.

**Secondary HMC IP address:** Enter the IP address of the secondary HMC. This address must have credentials listed in WRKCSECRDL. This IP address is optional and will only be used if an unexpected response is received from the primary HMC.

**IPL Source:** Specifies whether an initial-program-load (IPL) is started from the A-source, B-source or D-source of the system. This parameter allows you to control which Licensed Internal Code (LIC) storage source of the system to IPL. Also, the source of the system determines where LIC program temporary fixes (PTFs) are applied. This parameter also allows the system to be upgraded to a new release from an install image on DASD.

LIC has three storage areas known as the A-source, the B-source and the D-source. The D-source is the install media. The A- and B-sources are part of the system memory. Initially, the A- and B-sources are identical, but when Licensed Internal Code fixes are performed temporarily (PTF), the temporary fixes are stored on the B-source. When the same fixes become permanent, they are copied from the B-source to the A-source; therefore, the fixes reside on both the A-source and the B-source.

When you want to send temporary fixes to the B-source, you must start the system from the A-source, which causes the fixes to be sent to the B-source.



When you start the system from the A-source, you are running the system from the permanent fixes. When you start the system from the B-source, you are running the system from a mixture of temporary and permanent fixes. When you start the system from the D-source, you are using the Licensed Internal Code loaded from the install media.

It is recommended that you specify RESTART(\*YES); otherwise, you cannot be assured which source of the system is actually started. This precaution can save you some time.

- **\*PANEL:** The partition is started from the source that is currently shown on the operator's panel, the A-source, the B-source, or the D-source.
- **A:** The partition is started from the A-source.
- **B:** The partition is started from the B-source.
- **D:** The system is started from the D-source, the install media.

**Keylock position:** Specifies whether the LPAR will be activated for attended (manual) or unattended (auto) mode.

- **\*PANEL:** The partition is started in the mode that is currently shown on the operator's panel.
- **\*AUTO:** The partition is started in unattended mode.
- **\*MANUAL:** The partition is started in attended mode.

**Block until LPAR is active:** This parameter determines whether IPLLPAR will return control to the caller immediately or after the LPAR has reached the “Running” state.

- **\*YES:** IPLLPAR will remain active until the LPAR has reached a “Running” state.
- **\*NO:** IPLLPAR will terminate immediately after activating the LPAR.

**Max minutes to block:** Specifies how long IPLLPAR will wait for the partition to reach a “Running” state. This is ignored if **Block until LPAR is active** is \*NO. If the partition does not enter the “Running” state before the specified number of minutes has elapsed, IPLLPAR will issue and escape message.

**Confirm activation:** Configures IPLLPAR to wait on an inquiry message before activating the partition.

- **\*YES:** IPLLPAR will issue an inquiry message and will wait for a positive response before activating the partition.
- **\*NO:** IPLLPAR will activate the partition immediately.

## 7.15 LOGMSG – Log Message

The default log is in /QIBM/Qzrdhasm/qzrdhasm.log but some toolkit processes will change to a different log. LOGMSG will insert the specified message to the current log in use by the job.

**Message:** Enter the message to be inserted, from 20-120 characters.

**Message format:** Determines how the message will look in the log.

- **\*STD:** Use the standard message format. An example:

```
2017-07-27 12:46:00      standard message (logmsg)
```

- **\*CMDSTR:** Use the ‘command start’ message format. An example:

```
682401 2017-07-27 12:51:10 Start command start message starting from job  
682401/AASLAND/QPADEV001Q
```

**Message type:** Indicates the message status tag. The possible values are:

- **\*INFO:** The message does not have a tag.
- **\*ERROR:** The message is tagged with ‘Error’
- **\*WARNING:** The message is tagged with ‘Warning’

## 7.16 PRTCSE – Print CSE Information

The PRTCSE command prints Copy Services Environment (CSE) information, that was entered by the WRKCSE command and stored in cluster Device Domain Data (DDD). The information is printed to a QPRINT spool file. Unlike the environment list generated within WRKCSE, this command can access defined environments from any node within the cluster. Any combination of ENV and TYPE parameter values may be used.

**Environment name:** Specifies the name of the environments for which all information is to be dumped. The possible values are:

- **\*ALL:** All types of environments with the Copy Service Type below or all environments may be dumped.

- **Environment name:** All types of environments with the supplied environment name may be dumped.

**Copy Service Type:** The type of Advanced Copy Service environment. This parameter is required. The possible values are:

- **\*ALL:** All types of environments with the environment name or all environments may be dumped.
- **\*FLASH:** The FlashCopy environment with the environment name or all FlashCopy environments may be dumped.
- **\*GMIR:** The PPRC Global Mirroring environment with this environment name or all GMIR environments may be dumped.
- **\*LUN:** The LUN Level connection switching environment with this environment name or all LUN environments may be dumped.
- **\*MMIR:** The PPRC Metro Mirroring environment with this environment name or all MMIR environments may be dumped.

## 7.17 RLSCSELCK - Release Copy Services Lock

This command releases a cluster wide environment lock used within IASP Copy Services Manager.

**Environment name:** Specifies the name of the Environment (which may be an Independent ASP). A special value of \*ALL may be used with RLSTYPE(\*OVR) to override all ICSM locks for the cluster.

**Release type:** The possible values are:

- **\*JOB:** Release the lock that is held by this process.
- **\*OVR:** Release a cluster wide environment lock which may be held by another process or when used with ENV(\*ALL), release all ICSM locks for the cluster. Use this only to override locks held by processes which are no longer active.

## 7.18 RMVCSECRDE - Remove CSE Credential Entry

This command can be used to remove a user credential entry from the Device Domain Data associated with IBM i Copy Services Manager.

**Host IP address:** The address of the host to be removed.

## 7.19 RSTDDD – Restore Toolkit Device Data Domains

The Toolkits uses Device Data Domains (DDD) to store WRKCSE, WRKCSEDTA and WRKCSECRDL information. Use RSTDDD to restore the DDD from files created by SAVDDD.

The sole parameter is the path to the directory which contains the DDD backup files generated by SAVDDD.

## 7.20 RTVINF - Retrieve ICSM Information

The Retrieve Information (RTVINF) command retrieves specific information from IASP Copy Services Manager. This command is only valid when executed within a CL program.

**Environment name:** This is a required parameter. Specifies the name of the Environment (which may be an Independent ASP) for which information is to be retrieved.

**Information:** This is a required parameter and specified the type of information to be returned. The possible values are:

- **\*CLUNODENAME:** The node name of this system within the cluster. The length of the first CL return variable below must be at least eight characters.
- **\*FLASHNODES:** The backup Flash Copy node names for the Flash configurations. Up to six FlashCopy environments may be configured. All six CL return variables must be specified and each of their lengths must be at least eight characters.
- **\*FLASHSTATUS:** First Flashcopy status. The length of the first CL return variable below must be at least three characters.
  - 0 = Ready
  - 100 = Flashed
  - other number = Flash in process
  - blank = undetermined.
- **\*FLASH2STATUS:** Second Flashcopy status. The length of the first CL return variable below must be at least three characters.
  - 0 = Ready
  - 100 = Flashed
  - other number = Flash in process
  - blank = undetermined.
- **\*FLASH3STATUS:** Third Flashcopy status. The length of the first CL return variable below must be at least three characters.
  - 0 = Ready
  - 100 = Flashed

- other number = Flash in process
- blank = undetermined.
- **\*FLASH4STATUS:** Fourth Flashcopy status. The length of the first CL return variable below must be at least three characters.
  - 0 = Ready
  - 100 = Flashed
  - other number = Flash in process
  - blank = undetermined.
- **\*FLASH5STATUS:** Fifth Flashcopy status. The length of the first CL return variable below must be at least three characters.
  - 0 = Ready
  - 100 = Flashed
  - other number = Flash in process
  - blank = undetermined.
- **\*FLASH6STATUS:** Sixth Flashcopy status. The length of the first CL return variable below must be at least three characters.
  - 0 = Ready
  - 100 = Flashed
  - other number = Flash in process
  - blank = undetermined.
- **\*GMIRDIRECTION:** The length of the first CL return variable below must be at least one character.
  - N = Normal
  - R = Reversed
  - Blank = undetermined.
- **\*GMIRNODEROLE:** This key value MUST replace any use of \*PPRCNODEROLE for GMIR type environments, else unpredictable results may occur. The length of the first CL return variable below must be at least one character.
  - S = Source
  - T = Target
  - blank = undetermined
- **\*GMIRSTATE:** The length of the first CL return variable below must be at least one character.
  - 0 = Stopped
  - 1 = Running
  - 2 = Failover
  - 3 = Suspended
  - 4 = Lagging
  - 5 = Extreme Lagging
  - 6 = Paused
  - 9 = Other

- M = Multi-target Incremental Resync Pair
- blank = undetermined. RTVLPARINF
- **\*GMIRSTATEDIRECT:** State is returned in RTNVALUE and the direction is returned in RTNVALUE2. The length of the first and second variables must be at least one character.
  - State (RTNVALUE):
    - 0 = Stopped
    - 1 = Running
    - 2 = Failover
    - 3 = Suspended
    - 4 = Lagging
    - 5 = Extreme lagging
    - 6 = Paused
    - 9 = Other
  - Direction: (RTNVALUE2):
    - M = Multi-target Incremental Resync Pair
    - N = Normal
    - R = Reversed
    - blank = undetermined
- **\*GMIR2DIRECTION:** The length of the first CL return variable below must be at least one character:
  - N = Normal
  - R = Reversed
  - Blank = undetermined
- **\*GMIR2NODEROLE:** This key value **MUST** replace any use of \*PPRCNODEROLE for GMIR2 type environments, else unpredictable results may occur. The length of the first CL return variable below must be at least one character
  - S = Source
  - T = Target
  - blank = undetermined.
- **\*GMIR2STATE:** The length of the first CL return variable below must be at least one character
  - 0 = Stopped
  - 1 = Running
  - 2 = Failover
  - 3 = Suspended
  - 4 = Lagging
  - 5 = Extreme Lagging
  - 6 = Paused
  - 9 = Other
  - M = Multi-target Incremental Resync Pair
  - blank = undetermined.

- **\*GMIR2STATEDIRECT:** State is returned in RTNVALUE and direction is returned in RTNVALUE2. The length of first and second CL return variables below must be at least one character.
  - State (RTNVALUE):
    - 0 = Stopped
    - 1 = Running
    - 2 = Failover
    - 3 = Suspended
    - 4 = Lagging
    - 5 = Extreme lagging
    - 6 = Paused
    - 9 = Other
  - Direction: (RTNVALUE2):
    - M = Multi-target Incremental Resync Pair
    - N = Normal
    - R = Reversed
    - blank = undetermined
  
- **\*IASPNAME:** The name of the Independent ASP used for the VRYCFG commands. The length of the first CL return variable below must be at least ten characters.
  
- **\*LUNCONNECTION:** The length of the first CL return variable below must be at least one character.
  - P = Connected to the Production Node
  - H = Connected to the HA node
  - Blank = undetermined
  
- **\*LUNNODEROLE:** The values indicate the normal role of this node. The length of the first CL return variable below must be at least one character.
  - P = Production Node
  - H = HA node
  - Blank = undetermined
  
- **\*MMIRDIRECTION:** The length of the first CL return variable below must be at least one character.
  - N = Normal
  - R = Reversed
  - Blank = undetermined
  
- **\*MMIRNODEROLE:** This key value should replace any use of \*PPRCNODEROLE for MMIR type environments. The length of the first CL return variable below must be at least one character.
  - S = Source
  - T = Target
  - Blank = undetermined

- **\*MMIRSTATE:** The length of the first CL return variable below must be at least one character.
  - 0 = Failed
  - 1 = Running
  - 2 = Failover
  - 3 = Suspended
  - 4 = Resuming
  - 6 = Paused
  - M = Multi-target Incremental Resync Pair
  - blank = undetermined.
  
- **\*MMIRSTATEDIRECT:** State is returned in RTNVALUE and direction is returned in RTNVALUE2. The length of first and second CL return variables below must be at least one character.
  - States:
    - 0 = Failed
    - 1 = Running
    - 2 = Failover
    - 3 = Suspended
    - 6 = Paused
    - M = Multi-target Incremental Resync Pair
    - blank = undetermined.
  - Directions:
    - N = Normal
    - R = Reversed
    - blank = undetermined.
  
- **\*MMIR2DIRECTION:** The length of the first CL return variable below must be at least one character.
  - N = Normal
  - R = Reversed
  - blank = undetermined.
  
- **\*MMIR2NODEROLE:** This key value should replace any use of \*PPRCNODEROLE for MMIR2 type environments. The length of the first CL return variable below must be at least one character.
  - S = Source
  - T = Target
  - blank = undetermined.
  
- **\*MMIR2STATE:** The length of the first CL return variable below must be at least one character.
  - 0 = Failed
  - 1 = Running
  - 2 = Failover
  - 3 = Suspended



- 4 = Resuming
  - 6 = Paused
  - M = Multi-target Incremental Resync Pair
  - blank = undetermined
- **\*MMIR2STATEDIRECT:** State is returned in RTNVALUE and direction is returned in RTNVALUE2. The length of first and second CL return variables below must be at least one character.
    - States:
      - 0 = Failed
      - 1 = Running
      - 2 = Failover
      - 3 = Suspended
      - 6 = Paused
      - M = Multi-target Incremental Resync Pair
      - blank = undetermined.
    - Directions:
      - N = Normal
      - R = Reversed
      - blank = undetermined.
- **\*MMIR3DIRECTION:** The length of the first CL return variable below must be at least one character.
    - N = Normal
    - R = Reversed
    - blank = undetermined.
- **\*MMIR3NODEROLE:** This key value should replace any use of \*PPRCNODEROLE for MMIR3 type environments. The length of the first CL return variable below must be at least one character.
    - S = Source
    - T = Target
    - blank = undetermined.
- **\*MMIR3STATE:** The length of the first CL return variable below must be at least one character.
    - 0 = Failed
    - 1 = Running
    - 2 = Failover
    - 3 = Suspended
    - 4 = Resuming
    - 6 = Paused
    - M = Multi-target Incremental Resync Pair
    - blank = undetermined

- **\*MMIR3STATEDIRECT:** State is returned in RTNVALUE and direction is returned in RTNVALUE2. The length of first and second CL return variables below must be at least one character.
  - States:
    - 0 = Failed
    - 1 = Running
    - 2 = Failover
    - 3 = Suspended
    - 6 = Paused
    - M = Multi-target Incremental Resync Pair
    - blank = undetermined.
  - Directions:
    - N = Normal
    - R = Reversed
    - blank = undetermined.
  
- **\*MULTITARGET:** Multi-target configuration
  - N = None
  - M = Multi-target using two Metro Mirror environments
  - G = Multi-target using one Metro Mirror environment and one Global Mirror environment.
  
- **\*PPRCNODEROLE:** The length of the first CL return variable below must be at least one character.
  - S = Source
  - T = Target
  - blank = undetermined
  
- **\*PPRCNODES:** The backup PPRC node names for the up to three PPRC configurations. RTNVALUE will contain the MMIR configuration node name. RTNVALUE2 will contain the GMIR configuration node name. RTNVALUE3 will contain the LUN configuration node name. All three CL return variables must be specified and each of their lengths must be at least eight characters.
  
- **PPRCNODE:** The Production node name. RTNVALUE will contain the node name. The CL return variable must be specified with a length of at least eight characters.

**Return value:** This is a required parameter. Specifies a CL character variable name for returned value.

**Return value 2:** This is a required parameter for \*MMIRSTATEDIRECT, \*GMIRSTATEDIRECT, \*FLASHNODES and \*PPRCNODES. For \*MMIRSTATEDIRECT and \*GMIRSTATEDIRECT, the PPRC direction ('N' or 'R') is returned here. For \*FLASHNODES, the second FlashCopy node will be returned here. For \*PPRCNODES, the GMIR target node will be returned here. Specifies a CL character variable name for the second returned value.

**Return value 3:** This is a required parameter for \*FLASHNODES and \*PPRCNODES. Specifies a CL character variable name for the third returned value. For \*FLASHNODES, the third FlashCopy node will be returned here. For \*PPRCNODES, the LUN HA node will be returned here.

**Return value 4:** This is a required parameter for \*FLASHNODES if a fourth FlashCopy environment is configured. Specifies a CL character variable name for the fourth returned value. The fourth FlashCopy node will be returned here.

**Return value 5:** This is a required parameter for \*FLASHNODES if a fifth FlashCopy environment is configured. Specifies a CL character variable name for the fifth returned value. The fifth FlashCopy node will be returned here.

**Return value 6:** This is a required parameter for \*FLASHNODES if a sixth FlashCopy environment is configured. Specifies a CL character variable name for the sixth returned value. The sixth FlashCopy node will be returned here.

## 7.21 RUNDSCMD - Run DS Scripted Command

The RUNDSCMD command is used in a CL program to run a scripted command through DSCLI and validate the results from the expected result list provided in the command parameters. The command optionally returns the total of numeric values in a specified column of the results.

Three exception messages may be issued:

- IAS0301 - Parameter error detected.
- IAS0302 - Result file error detected.
- IAS0303 - Results not as expected.

**Script input file:** The complete path and name of the script stream file. A value of '\*' is allowed when no script is to be executed, and only prior results are to be validated.

**Profile input file:** The complete path and name of the profile stream file. A value of '\*' is allowed when that value is also used for the script parameter.

**Results output file:** The complete path and name of the results stream file. This parameter is always required.

**User:** Specify the user profile name to be used to run the DSCLI scripted command.

**Result validation list:** A list of from one to ten validation entries to be matched against the results returned by the scripted command. The columns in the result file must be comma separated (refer to the profile that is in use).

Each validation list entry contains two or three elements:

- **Column position:** The comma separated column position for this element. This required value must be from one through 20.
- **Expected value:** The case sensitive character string that is expected. This value is required, must be enclosed in apostrophes, and may contain alphanumeric characters, blanks and punctuation marks except commas. Strings that are not to be found may be specified by placing a minus sign (-) as the first character of the string.
- **Logic to next in list:** The logical operator (\*AND or \*OR) to the next expected value in the list. This value is required on all list elements except the last. Note that the results of each file row are evaluated from the first to the last expected value. Careful consideration must be made when this value is mixed (both \*AND and \*OR used on a single RUNDSCMD command). If more complex result checking is required, the RUNDSCMD command may be run again specifying '\*' for the SCRIPT parameter and combined results may be evaluated within the user's CL program.

**Result file rows:** The rows that are to be validated. The possible values are:

- **\*ALL:** The results specified in the validation list are expected to be found in at all of the result file rows.
- **\*ONE:** The results specified in the validation list are expected to be found in at least one of the result file rows.

**Summation column:** The comma separated column positional value that is to be summed and returned in the TOTAL parameter. Numeric values from one through 20 are allowed. The default is \*NONE. If a numeric value is specified, the content of that column in the result file may only contain numeric data.

**CL variable for returned total:** Specifies the name of the CL program variable that receives the total value being returned. The type and length for the CL variable must be TYPE(\*DEC) LEN(9 0). This parameter is required when the value of SUMCOLUMN is other than \*NONE.

**Return column:** The comma separated column positional value that is to be returned in the RTNVALUE parameter. Numeric values from one through 20 are allowed. The default is \*NONE. Refer to the RTNKEY parameter below. This parameter is required that the RTNCOLUMN parameter is also specified.

**Return key value:** Specifies the key string used to locate the row in the result file where the return value (RTNVALUE) will be extracted. The default is \*NONE. If a numeric value is specified for RTNCOLUMN and this parameter is \*NONE, the value in the first row of the result file is returned in RTNVALUE. If a numeric value is specified for RTNCOLUMN and this parameter specifies a key value, the value in the first row of the result file that contains that key is returned in RTNVALUE. This parameter is required that the RTNCOLUMN and RTNVALUE parameters are also specified.

**CL variable for returned value:** Specifies the name of the CL program variable that receives the character value being returned. The type and length for the CL variable must be TYPE(\*CHAR) LEN(80). This parameter requires that the RTNCOLUMN parameter is also specified.

## 7.22 RUNLPARCMD - Run command based on LPAR/SRLN

This command will run a specific command based on the specified LPAR and serial numbers detected. This command is usually used in the startup program to perform different tasks based on the serial and LPAR numbers.

NOTE: It is possible to test the behavior of this command on different serial and LPAR numbers by creating the following data areas:

```
CRTDTAARA DTAARA(QZRDHASM/FAKELPAR) TYPE(*CHAR) LEN(3)
VALUE('123')
```

```
CRTDTAARA DTAARA(QZRDHASM/FAKESRLN) TYPE(*CHAR) LEN(8)
VALUE('1234567')
```

The command RUNLPARCMD will look for these data areas and use them instead of detecting the actual serial or LPAR numbers.

**Serial number:** Specify the serial number required to run this command. NOTE: Prompt (F4) to see the current serial number.

- **\*ANY:** Run this command on any LPAR, regardless of serial number.
- **Serial-number:** Run the command on the LPAR with the specified serial number.

**LPAR number:** Specify the LPAR number required to run this command. NOTE: Prompt (F4) to see the current LPAR number.

- **\*ANY:** Run this command on any LPAR regardless of the LPAR number.
- **lpar-number:** Run the command on the LPAR with the specified number.

**Command to execute:** Run this command if the LPAR and serial numbers match those of the current LPAR. NOTE: Prompt (F4) to assist with building the command.

## 7.23 RUNSVCCMD - Run SVC Command

This command establishes an ssh session to an SVC, runs the user entered command, and stores the results in a stream file. NOTE: This command can establish an ssh session with any type of host, not just SVCs.

**Command:** Specifies the command to be run.

**SVC IP address:** Specifies the IPv4 formatted IP address of the SVC to be used.

**Results output file:** Specifies the IFS path name of the output file containing the results of the SVC command.

**Display results:** Specifies whether the results of the SVC command should be displayed in addition to be written to the output file.

## 7.24 SAVDDD – Save Toolkit Device Data Domains

The Device Data Domains (DDD) are where the Toolkit stores WRKCSE, WRKCSEDTA and WRKCSECRDL information. The command SAVDDD will extract that information and place it into IFS files. Any sensitive information including passwords will be encrypted.

Use the RSTDDD command to restore / recreate the DDD information.

**Directory path:** Where the DDD elements will be saved to.

- **\*GEN:** A directory using the current timestamp will be created
- **Path:** The path to the directory in which to place the files. The directory must exist.

## 7.25 SETCSELCK - Set Copy Services Lock

This command sets a cluster wide environment lock used within IASP Copy Services Manager.

**Environment name:** This is a required parameter. Specifies the name of the Environment (which may be an Independent ASP).

**Timeout minutes:** The number of minutes before the environment lock will self time out. The default is fifteen minutes.

## 7.26 SETDDDLCK - Set DDD lock holder

This is a utility command for setting the job and user who holds a cluster-wide lock on a specified artifact.

**Name:** Enter the name of the object to display a lock for.

**Type:** Enter the type of object to display a lock for.

## 7.27 SETUPFSR - Set up IBM Pwr HA tools – FSR

This command prepares IBM Power HA toolkit for IBM i for Full System replication operations after has operational library (QZRDHASM) has been restored. If a version change has been detected this command will make any changes required. The QZRDFSR subsystem will be started.

```
Setup IBM i Copy Services Mana (SETUPFSR)

Type choices, press Enter.

Node role . . . . . _____ *CTL, *PRD
FSR communications port . . . . *SAME 1-65535, *SAME, *DFT
Toolkit access code for *CTL . . *SAME
Toolkit access code for *PS . . *SAME
Toolkit access code for *PT . . *SAME
```

**Node Role:** Special values indicating which role the system will be acting. The possible values are:

- **\*CTL:** The system is a controlling node in Full System Replication.
- **\*PRD:** The system is the source LPAR in Full System Replication.

**FSR Communications Port:** The port to which the production node will be using for communications. This value must match the FSR communications port value specified in either CRTCEDTA or CHGCSEDTA that is run on the controlling node. The possible values are:

- **\*SAME:** The value does not change. This is the only valid value for NODETYPE(\*CTL)
- **\*DFT:** The default port (55920) will be used.
- **1 – 65535:** Specify the port number that is to be used.

**Toolkit access code for \*CTL:** Enter the access code when configuring the controlling LPAR.

**Toolkit access code for \*PS:** Enter the preferred target access code when configuring the production LPAR.

**Toolkit access code for \*PT:** Enter the preferred source access code when configuring the production LPAR.

## 7.28 SWCSE – Perform Full System Switch

The Switch Copy Service Environment (SWCSE) command causes the Production Node to be powered down and the DR node to be powered up, and replication in the mirroring environment to be pause or reversed. If the source storage is not available then replication will be idled and secondary access granted to the target LPAR.

```

Switch Copy Services Environ. (SWCSE)

Type choices, press Enter.

Environment name . . . . . Name
Switch type . . . . . *SCHEDULED *SCHEDULED, *UNSCHEDULED
Type . . . . . * * , *GMIR, *MMIR
Auto replicate . . . . . *DFT *DFT, *YES, *NO

```

**Environment name:** Specifies the name of the Environment which is to be checked. This name also refers to the CRG (CSEDTA) name.

**Switch type:** Indicates whether this is a *scheduled* or *unscheduled* switch. The possible values are:

- **\*SCHEDULED:** This CSE switch is planned. The Production system is available and subsystem QZRDFSR is running and listening on the port specified in the CSEDTA.
- **\*UNSCHEDULED:** This CSE switch is not planned. The Production system is not available.

**Type:** The type of the IBM i Copy Services environment. This optional parameter may be used to specify the type of the copy services environment to be switched. The possible values are:

- **\***: The specific type (GMIR or MMIR) will be resolved by the command processing program. Only one of these types may be configured with this environment name.
- **\*GMIR:** The Global Mirroring environment with this name will be switched.
- **\*MMIR:** The Metro Mirroring environment with this name will be switched.

**Auto replicate:** This optional parameter specifies whether replication is to be automatically started after the switch. The possible values are



- **\*DFT:** Use the default setting for the specific switch type. For a scheduled switch the default is \*YES. For an unscheduled switch the the default is \*NO.
- **\*YES:** A switch will auto replicate. The replication will not start until the DR node has finished it's IPL.
- **\*NO:** A switch will not auto replicate.

## 7.29 TSTCOMM – Test Communication Paths

This interactive command will test the communication on the ports specified.

**Role:** This parameter specifies what type of communication role the partition is to take. The possible values are:

- **\*SERVER:** The partition will act as a server.
- **\*CLIENT:** The partition will act as a client.

**IP Address:** This parameter specifies the IP address of the other partition. For a client, this will be the server address. For a server, this will be the expected address received after the accept operation completes.

**Port:** This is the IP port that will be used for the test.

To use this command, log into the two LPARs to test the communication between and free the port to be tested (this may mean ending QZRDFSR). Designate one LPAR as the server, the other as the client. On the server, issue the following command

```
TSTCOMM ROLE(*SERVER) IPADDR('<client IP address>') PORT(55920)
```

When TSTCOMM is 'Listening on socket' issue the following command on the client:

```
TSTCOMM ROLE(*SERVER) IPADDR('<server IP address>') PORT(55920)
```

The results will indicate either success or failure (timeout) communicating on the specified port.

## 7.30 VIEWLOG - View Log File

This interactive command allows editing of the Advanced Copy Services log file on the local system and displaying the same on another system. This utility can also view any stream file on the systems.

**System name:** The system where the file is located. The possible values are:

- **\*LOCAL:** View the main log file on the local system.
- **\*SNMP:** View the SNMP log file on the local system.
- **System name:** View the main log file on the named system.

**Stream file:** The specific file to be viewed. The possible values are:

- **\*SNMP:** View the SNMP log file. This option allows the SNMP log file on another system to be viewed.
- **Path and name of the stream file:** The default is /QIBM/Qzrdhasm/qzrdhasm.log

## 7.31 WRKCSE - Work with Copy Services Environment

This interactive command allows creation and editing of Flash Copy, Metro-Mirroring, Global-Mirroring and LUN environments defined for use within IBM i Copy Services Manager. Menus are also provided for basic operations. The information is retained in cluster Device Domain Data associated with IBM i Copy Services Manager.

There are no command parameters.

## 7.32 WRKCSECRDL - Work with CSE Credential List

This interactive command allows addition, editing, and removal of user credentials needed to establish SSH sessions with a host. Normally the host will be either a SAN Volume Controller (SVC) or a Hardware Management Console (HMC). The information is encrypted using a cryptographic derived 128 bit AES key and retained in cluster Device Domain Data associated with IBM i Copy Services Manager.

There are no command parameters.

## 7.33 WRKCSEDTA -Work with IBM i CSE Data

This interactive command provides basic operation to manage CSE Data used for Metro-Mirroring, Global-Mirroring, and Flash environments defined for use within IBM i Copy Services Manager.

**Select:** Select which CSE Data entries are to be displayed. The possible values are:

- **\*CRG:** Display only the CSE Data entries that are complete.
- **\*ALL:** Display all CSE Data entries.

## 7.34 WRKSTRPRSC - Work with Startup Resources

This interactive command provides the information for the toolkit to use. It should be executed on the source LPAR. The information is used by commands FIXSTRPRSC, CFGSTRPRSC, and STRFSFLASH.

There are five main panels on WRKSTRPRSC which can be selected on the command or cycled through using F11. The common element that ties the records together is the LPAR Usage. Once the toolkit (FIXSTRPRSC, CFGSTRPRSC) determines the current LPAR Usage, the rules on the remaining panels apply to when the LPAR is used in that role. Some LPAR Usage identifiers allow for multiple variations; for example, you can have two preferred source LPARs (\*PT01, \*PT02) depending on which serial number it is running on.

If the toolkit cannot determine the current role of the LPAR it will exit without performing any modifications.

The panels are:

- **\*SYS:** Determine the LPAR Usage based on the serial and LPAR numbers.
  - **\*PSxx:** Preferred Source – where your production LPAR is normally running.
  - **\*PTxx:** Preferred Target – where the target LPAR can run after a roleswap
  - **\*SGxx:** Safeguarded Copy – used when recovering from a Safeguarded Copy.
  - **\*FCxx:** Flashcopy Target – where the backups will occur after a Safeguarded Copy.
  - **Default CSEDTA:** Used for PVI configurations to determine which configuration to use for flashcopy backups.
- **\*CMN:** Determines which communications resources to bring online. All other lines and IP addresses are left offline.
  - **Usage:** Indicate the role in which these resources will be used
    - **\*PSxx:** Activated when the serial and LPAR numbers match the system usage for the preferred source.
    - **\*PTxx:** Activated when the serial and LPAR numbers match the system usage for the preferred target.
    - **\*SGxx:** Activated when the serial and LPAR numbers match the system usage for the Safeguarded Copy for recovery.
    - **\*FCxx:** Activated when the serial and LPAR numbers match the system usage for Safeguarded Copy for backups.
    - **\*CTL1:** The IP for the primary controller. Used by CFGSTRPRSC in a PVI configuration to reach the controllers. STRFSFLASH CTLR(\*AUTO) will use

this entry first to find a working controller. Hardware Resource Location is not used.

- **\*CTL2:** The IP for the secondary controller. Used by CFGSTRPRSC in a PVI configuration to reach the controllers. STRFSFLASH CTLR(\*AUTO) will use this entry to find a working controller if the primary is not reached. Hardware Resource Location is not used.
- **IP Interface:** Specifies the IP interface to be activated and set to autostart when the LPAR is in the specified role. The IP address must exist on the source LPAR.
- **Line Description:** Specifies the line description to be activated and set to autostart when the LPAR is in the specified role. The line description must exist on the source LPAR.
  - **\*IPADDR:** Use the line description currently assigned to the specified IP address.
  - **\*VIRTUALIP:** The specified IP address is virtual and does not have a line description associated with it. Start this IP address after all preceding IP addresses have been started. The Hardware Resource Location must be \*NONE.
- **Hardware Resource Location:** Indicates the hardware resource location that will be associated with the specified line description.
  - **\*LINE:** Use the resource location currently associated with the specified line description.
  - **\*NONE:** No hardware resource location is specified. This is only valid for \*VIRTUALIP
- **Port:** Specify the port of the resource if necessary.
  - **\*DFT:** Use the location code to determine the port number.
- **\*STG:** Determines the tape storage resources to configure based on the usage of the LPAR.
  - **Usage:** Configure the resource for the specified LPAR usage.
  - **Device Description:** What the toolkit will vary on and is expected to be used in the backups (WRKCTLGBRM etc).
  - **Device Type:** Indicate whether the device is media library (\*MLB) or tape drive (\*TAP). If \*DEV is specified, the toolkit will use the type which the device description refers to.
  - **Serial Number:** Enter the serial number of the tape resource. The toolkit will find the resource name (TAPMLBxx) associated with this serial number (it must be operational) and change the specified device description to it.
- **\*BRM:** Change the specified BRMS attributes. For example, you can change the location associated with a device, or the devices used by a control group, etc based on where the LPAR is IPL'ing. Note that only a handful of objects and attributes can be changed. See also the CHGBRMSOBJ command which has similar functionality.
  - **Usage:** Apply this rule to if the LPAR usage matches.
  - **Object Name:** The name of the BRMS object to change
  - **Object Type:** The type of BRMS object to change
  - **Attribute:** Which BRMS attribute to change
  - **New Value:** The new value for the specified attribute
- **\*RTE:** Routing entry changes based on LPAR usage. If there are any new routes for a specific LPAR usage, then *all the existing routes (CFGTCP opt 2) will be removed*. The new routes will be created.
  - **Usage:** Apply the new route if the LPAR usage matches.

- **Destination:** The route destination (IP or subnet)
- **Subnet Mask:** The destination subnet mask.
- **Next Hop:** The next hop in the network for the packet destined for the network
- **Preferred Interface:** Which interface to use to send these packets

### **7.35 ZAPDDLCK - Zap DDD lock**

This is a utility command for releasing the job and user who holds a cluster-wide lock on a specified artifact.

**Name:** Enter the name of the object to display a lock for.

**Type:** Enter the type of object to display a lock for.