# Enable Cross-rack Pairing

Cross-rack (or inter-rack) pairing allows pairing route processors (RP) between racks to provide high availability (HA) against rack failures. The RP of one rack is paired with the RP on the next rack. The pairing is determined by the SDR manager through a daisy chain algorithm. The XR process manager breaks or creates a new pair based on the pairing algorithm decided by the SDR manager. The algorithm is executed only on the discovered set of nodes. The pairing remains consistent as long as the set of nodes that were discovered is constant.

Figure 1: Inter-rack pairing using daisy chain algorithm
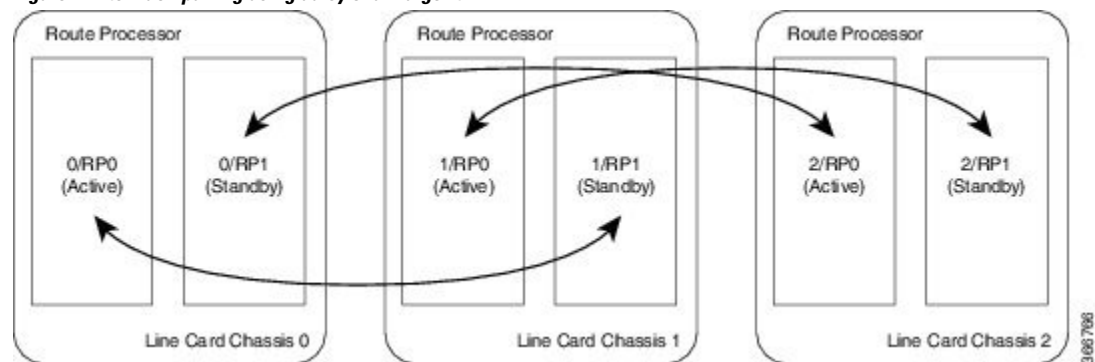
Only the racks with dual RPs (an RP on both slots of rack) are considered for inter-rack pairing.

The pairing algorithm is triggered automatically when:

- a rack is inserted

- a change in chassis configuration is committed

- RP card is inserted

- re-pair command is manually executed

- change in configuration between inter-rack to intra-rack pairing, and vice versa

Cross rack pairing is not supported on racks when:

- inserted into the system with only one RP

- transitions to a state of single RP, and a change in cross-rack pairing is triggered either manually or automatically. An example of automatic and manual trigger are:

    - a re-pair is automatically initiated when a rack or an RP is added or deleted from the configuration

• user can trigger a re-pair after online insertion or removal (OIR) of an RP

For more information about scenarios that initiate automatic and manual re-pair of RPs, see Use Cases for Re-pairing RP, on page 8.

Verify System Readiness

The system must be ready before and after enabling inter-rack pairing. Run these commands to improve debuggability and compare their output to expected behavior. This ensures that the system is ready, and any changes in System Admin are reflected in XR VMs.

Description	Commands
Verify that all nodes are in OPERATIONAL state, a standby RP is available and in READY state.	**SysAdmin VM:** show sdr default-sdr pairing show platform show platform slice show vm show version show inventory show log show install log show run dir harddisk: **XR-VM:** show redundancy show redundancy summary show platform vm show placement program all show health gsp show health sysdb show platform show log show install log show run show placement reoptimize cfs check dir harddisk:
Verify the fabric health and system environment. Ensure all fabric planes are UP, and fan speed is not zero. **Note** A power module in FAILED state may not indicate a problem. A power module that is inserted and powered Off will appear as failed.	**SysAdmin VM:** show controller fabric health show controller fabric plane all show alarms detail show environment power show environment fan show environment temp

Description	Commands
Verify the current packages installed on the device.	**SysAdmin (Calvados) VM:** show install active show install committed show install inactive show install repository **XR-VM:** show install active show install committed show install inactive show install repository

Enable Inter-rack Pairing Mode

The pairing mode is a SDR configurable option. The default mode is intra-rack, and the pairing algorithm is run when inter-rack (also known as cross-rack) pairing mode is enabled.

Note Traffic loss may occur when moving between inter-rack and intra-rack pairing modes. All cross-rack related triggers must be done in a maintenance window. For more information about scenarios that initiate automatic and manual re-pair of RPs, see Use Cases for Re-pairing RP, on page 8.

Before you begin

Verify the status of the system. For more information, see Verify System Readiness, on page 2.

SUMMARY STEPS

1. **conf**
2. **sdr default-sdr pairing-mode inter-rack**
3. **end**
4. **show sdr default-sdr pairing**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**conf** **Example:** `sysadmin-vm:0_RP0#conf`	Enter System Admin Config mode.

	Command or Action	**Purpose**

Step 2	**sdr default-sdr pairing-mode inter-rack**
	
	Example:
	
	`sysadmin-vm:0_RP0(config)# sdr default-sdr`
	`pairing-mode inter-rack`
		Enable inter-rack pairing mode.

Step 3	**end**
	
	Example:
	
	`Uncommitted changes found, commit them?`
	`[yes/no/CANCEL] yes`
	`Commit complete.`
		Commit the changes.

Step 4	**show sdr default-sdr pairing**
	
	Example:
	
	`sysadmin-vm:0_RP0# show sdr default-sdr pairing`
	` Pairing Mode   INTER-RACK`
	` SDR Lead`
	`   Node 0 0/RP0`
	`   Node 1 1/RP1`
	` Pairs`
	`   Pair Name Pair0`
	`    Node 0   0/RP0`
	`    Node 1   1/RP1`
	` Pairs`
	`   Pair Name Pair1`
	`    Node 0   1/RP0`
	`    Node 1   2/RP1`
	` Pairs`
	`   Pair Name Pair2`
	`    Node 0   2/RP0`
	`    Node 1   0/RP1`
		Verify that the pairing is inter-rack and the partner nodes are on different racks.

Enable Inter-rack Pairing in Multi-SDR Configuration

This task shows how to enable inter-rack pairing mode in a multi-SDR configuration.

SUMMARY STEPS

1. **show running-config sdr**
2. **show sdr default-sdr pairing**
3. **conf**
4. **no sdr default-sdr**
5. **sdr <sdr-name>**
6. **show running-config sdr**
7. **show sdr <sdr-name> pairing**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**show running-config sdr**
	
	 Example:
	
	 ```sysadmin-vm:0_RP0# show running-config sdr```
	 ```sdr default-sdr```
	 ``` pairing-mode intra-rack```
	 ``` location all```
	 ``` !```
	 ```!```
		Show the running configuration for the SDR.

Step 2	**show sdr default-sdr pairing**
	
	 Example:
	
	 ```sysadmin-vm:0_RP0# show sdr default-sdr pairing```
	 ``` Pairing Mode INTRA-RACK```
	 ``` SDR Lead```
	 ``` Node 0 0/RP0```
	 ``` Node 1 0/RP1```
	 ``` Pairs```
	 ``` Pair Name Pair0```
	 ``` Node 0 0/RP0```
	 ``` Node 1 0/RP1```
	 ``` Pairs```
	 ``` Pair Name Pair1```
	 ``` Node 0 1/RP0```
	 ``` Node 1 1/RP1```
	 ``` Pairs```
	 ``` Pair Name Pair2```
	 ``` Node 0 3/RP0```
	 ``` Node 1 3/RP1```
		Display the default pairing in the SDR.

Step 3	**conf**
	
	 Example:
	
	 ```sysadmin-vm:0_RP0# conf```
	 ```Entering configuration mode terminal```
		Enter the configuration mode.

Step 4	**no sdr default-sdr**
	
	 Example:
	
	 ```sysadmin-vm:0_RP0(config)# no sdr default-sdr```
	 ```sysadmin-vm:0_RP0(config)# commit```
	 ```Commit complete.```
		Remove the default SDR.

Step 5	**sdr <sdr-name>**
	
	 Example:
	
	 ```sysadmin-vm:0_RP0(config)# sdr abc```
	 ```sysadmin-vm:0_RP0(config-sdr-abc)# pairing-mode```
	 ```inter-rack```
	 ```sysadmin-vm:0_RP0(config-sdr-abc)# location 0/RP0```
	
	 ```sysadmin-vm:0_RP0(config-location-0/RP0)# location```
	 ``` 0/RP1```
	 ```sysadmin-vm:0_RP0(config-location-0/RP1)# location```
	 ``` 1/RP0```
	 ```sysadmin-vm:0_RP0(config-location-1/RP0)# location```
		Configure two new SDRs with pairing set to inter-rack mode.

Command or Action	Purpose
``1/RP1

sysadmin-vm:0_RP0(config-location-1/RP1)# sdr xyz
sysadmin-vm:0_RP0(config-sdr-xyz)# pairing-mode
inter-rack
sysadmin-vm:0_RP0(config-sdr-xyz)# location 0/RP0

sysadmin-vm:0_RP0(config-location-0/RP0)# location
 0/RP1

sysadmin-vm:0_RP0(config-location-0/RP1)# commit
Commit complete.``` | |
| **Step 6** **show running-config sdr** **Example:** ```sysadmin-vm:0_RP0# show running-config sdr
sdr abc
 pairing-mode inter-rack
 location 0/RP0
 !
 location 0/RP1
 !
 location 1/RP0
 !
 location 1/RP1
 !
!
sdr xyz
 pairing-mode inter-rack
 location 0/RP0
 !
 location 0/RP1
 !
!``` | Verify that the new SDRs are included in the multi-SDR configuration. |
| **Step 7** **show sdr <sdr-name> pairing** **Example:** ```sysadmin-vm:0_RP0# show sdr abc pairing
 Pairing Mode   INTER-RACK
 SDR Lead
   Node 0 0/RP0
   Node 1 1/RP1
 Pairs
   Pair Name Pair0
    Node 0   0/RP0
    Node 1   1/RP1
 Pairs
   Pair Name Pair1
    Node 0   1/RP0
    Node 1   0/RP1

sysadmin-vm:0_RP0# show sdr xyz pairing
 Pairing Mode   INTER-RACK
 SDR Lead
   Node 0 0/RP0
   Node 1 0/RP1
 Pairs
   Pair Name Pair0``` | Verify that the new SDRs are paired in the inter-rack pairing mode. |

Command or Action	Purpose
| ```
Node 0   0/RP0
Node 1   0/RP1
``` | |

Manually Initiate Re-pair

The user can manually initiate a re-calculation of the inter-rack pairing algorithm. This task changes the pairing based on the current state of the card inventory.

SUMMARY STEPS

1. **sdr default-sdr re_pair**
2. **show sdr default-sdr pairing**

DETAILED STEPS

	Command or Action	Purpose
| Step 1 | **sdr default-sdr re_pair**<br><br>**Example:**<br><br>```
sysadmin-vm:0_RP1# sdr default-sdr re_pair
Current Configuration
    0/RP0 1/RP1
    1/RP0 2/RP1
    2/RP0 0/RP1
Re_Paired Configuration
    0/RP0 1/RP1
    1/RP0 0/RP1
Would you like to proceed ? [yes/no]:  yes
Proceeding with action
``` | Display the prediction of change in the re-pair configuration. Observe that rack 2 is down, and the re_pair command optimizes the pairing based on this change.<br><br>**Note**    Proceeding with the re-pair action even when the `re_pair` command does not predict any changes does not affect the system. |
| Step 2 | **show sdr default-sdr pairing**<br><br>**Example:**<br><br>```
sysadmin-vm:0_RP0#show sdr default-sdr pairing
 Pairing Mode   INTER-RACK
 SDR Lead
   Node 0 0/RP0
   Node 1 1/RP1
 Pairs
   Pair Name Pair0
    Node 0   0/RP0
    Node 1   1/RP1
 Pairs
   Pair Name Pair1
    Node 0   1/RP0
    Node 1   0/RP1
``` | Verify that the pairing shows the updated configuration. |

Use Cases for Re-pairing RP

In this section, certain use cases with automatic and manual re-pairing of RPs are described.

Use Case: Automatic Re-pairing Algorithm

Insert a Rack Online

This task shows the automatic recalculation of pairing algorithm when a rack is inserted online. For more information about installing RP cards, see Cisco ASR 9000 Series Aggregation Services Router Hardware Installation Guide.

SUMMARY STEPS

1. **show chassis**
2. **show redundancy summary**
3. **show sdr default-sdr pairing**
4. **show running-config chassis**
5. **conf**
6. **chassis serial <serial-number> rack 1**
7. **commit**
8. Insert the rack.
9. **show chassis**
10. **show sdr default-sdr pairing**
11. **show redundancy summary**
12. **show running-config chassis**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**show chassis** **Example:** ``` sysadmin-vm:F1_SC0# show chassis Serial Num Rack Num Rack Type Rack State Data Plane Ctrl Plane --- FLM171662RX 0 LCC UP CONN CONN FMP17260280 F1 FCC UP CONN CONN ```	Shows the chassis details including the chassis serial number. In the example, observe that rack 1 has not been associated with the chassis configuration.
Step 2	**show redundancy summary** **Example:** ``` Router#show redundancy summary Active Node Standby Node ----------- ----------- 0/RP0/CPU0 0/RP1/CPU0 (Node Ready, NSR:Ready) ```	View the redundancy summary of the node.
Step 3	**show sdr default-sdr pairing** **Example:** ``` sysadmin-vm:3_RP1# show sdr default-sdr pairing Pairing Mode INTER-RACK ```	View the current pairing information.

	Command or Action	Purpose
| | ```
 SDR Lead
   Node 0 0/RP0
   Node 1 0/RP1
 Pairs
   Pair Name Pair0
    Node 0   0/RP0
    Node 1   0/RP1
``` | |
| Step 4 | **show running-config chassis**<br><br>**Example:**<br><br>```
sysadmin-vm:F1_SC0# show running-config chassis
chassis serial FLM171662RX
  rack 0
!
chassis serial FMP17260280
 rack F1
!
``` | Check the current chassis configuration. |
| Step 5 | **conf**<br><br>**Example:**<br><br>```
sysadmin-vm:F1_SC0# conf
``` | Enter the System Admin Config mode. |
| Step 6 | **chassis serial <serial-number> rack 1**<br><br>**Example:**<br><br>```
sysadmin-vm:F1_SC0(config)# chassis serial
FLM171762WW rack 1
``` | Enter the configuration mode for the chassis with the rack number associated to the chassis. |
| Step 7 | **commit**<br><br>**Example:**<br><br>```
sysadmin-vm:F1_SC0(config)# commit
Commit complete.
``` | Commit the changes. |
| Step 8 | Insert the rack. | |
| Step 9 | **show chassis**<br><br>**Example:**<br><br>```
sysadmin-vm:F1_SC0# show chassis
Serial Num      Rack Num     Rack Type   Rack
State    Data Plane    Ctrl Plane
----------------------------------------------
FLM171662RX       0             LCC         UP
         CONN         CONN
FLM171762WW       1             LCC         UP
         CONN         CONN
FMP17260280       F1            FCC         UP
         CONN         CONN
``` | Verify that rack 1 is visible. |
| Step 10 | **show sdr default-sdr pairing**<br><br>**Example:**<br><br>```
sysadmin-vm:3_RP1# show sdr default-sdr pairing
 Pairing Mode  INTER-RACK
 SDR Lead
``` | Verify that rack1 is included in the pairing that was automatically updated after inserting the rack. |

Command or Action	Purpose

<pre>   Node 0 0/RP0
    Node 1 1/RP1
 Pairs
    Pair Name Pair0
     Node 0   0/RP0
     Node 1   1/RP1
Pairs
    Pair Name Pair1
     Node 0   1/RP0
     Node 1 0/RP1</pre>	

Step 11	**show redundancy summary**
	
	Example:
	<pre>Router#show redundancy summary
	    Active Node Standby Node
	    ----------- ------------
	     0/RP0/CPU0 1/RP1/CPU0 (Node Ready,
	NSR:Ready)
	     1/RP0/CPU0 0/RP1/CPU0 (Node Ready,
	NSR:Ready)</pre>	

Step 12	**show running-config chassis**
	
	Example:
	<pre>sysadmin-vm:F1_SC0# show running-config chassis
	chassis serial FLM171662RX
	 rack 0
	!
	chassis serial FLM171762WW
	 rack 1
	!
	chassis serial FMP17260280
	 rack F1
	!</pre>
		Verify the chassis configuration.

Remove a Rack from System

This task shows the automatic recalculation of pairing algorithm when a rack is deleted from the configuration.

SUMMARY STEPS

1. **show running-config chassis**
2. **show chassis**
3. **show sdr default-sdr pairing**
4. **show redundancy summary**
5. Remove a rack from the system.
6. **show chassis**
7. **show sdr default-sdr pairing**
8. **show redundancy summary**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**show running-config chassis** **Example:** ``` sysadmin-vm:F1_SC0# show running-config chassis chassis serial FLM171662RX rack 0 ! chassis serial FLM171762WW rack 1 ! chassis serial FLM171763M4 rack 2 ! chassis serial FMP12020039 rack 3 ! chassis serial FMP17260280 rack F1 ```	Display the current configuration of the chassis.

Step 2	**show chassis**
	
	Example:
	
	``
	sysadmin-vm:F1_SC0# show chassis
	Serial Num Rack Num Rack Type Rack State
	    Data Plane Ctrl Plane
	-- 	
	FLM171662RX 0 LCC UP
	        CONN CONN
	FLM171762WW 1 LCC UP
	        CONN CONN
	FLM171763M4 2 LCC UP
	        CONN CONN
	FMP12020039 3 LCC UP
	        CONN CONN
	FMP17260280 F1 FCC UP
	        CONN CONN
	``
		Display the racks and their states.

Step 3	**show sdr default-sdr pairing**
	
	Example:
	
	``
	sysadmin-vm:2_RP0# show sdr default-sdr pairing
	Pairing Mode INTER-RACK
	 SDR Lead
	   Node 0 0/RP0
	   Node 1 1/RP1
	 Pairs
	   Pair Name Pair0
	    Node 0 0/RP0
	    Node 1 1/RP1
	 Pairs
	   Pair Name Pair1
	    Node 0 1/RP0
	    Node 1 2/RP1
	 Pairs
	   Pair Name Pair2
	    Node 0 2/RP0
	    Node 1 3/RP1
	``
		View the current active and standby pairing of RPs.

	Command or Action	Purpose
| | ```
 Pairs
   Pair Name Pair3
     Node 0   3/RP0
     Node 1   0/RP1
``` | |
| **Step 4** | **show redundancy summary**<br><br>**Example:**<br><br>```
Router#show redundancy summary
    Active Node    Standby Node
    -----------    ------------
    1/RP0/CPU0     2/RP1/CPU0 (Node Ready,
NSR:Ready)
    2/RP0/CPU0     3/RP1/CPU0 (Node Ready,
NSR:Ready)
    3/RP0/CPU0     0/RP1/CPU0 (Node Ready,
NSR:Ready)
    0/RP0/CPU0     1/RP1/CPU0 (Node Ready,
NSR:Ready)
``` | Verify node status and pairing. |
| **Step 5** | Remove a rack from the system. | |
| **Step 6** | **show chassis**<br><br>**Example:**<br><br>```
sysadmin-vm:F1_SC0# show chassis
Serial Num    Rack Num    Rack Type    Rack State
    Data Plane    Ctrl Plane

----------------------------------------------------
FLM171662RX    0             LCC          UP
        CONN       CONN
FLM171763M4    2             LCC          UP
        CONN       CONN
FMP12020039    3             LCC          UP
        CONN       CONN
FMP17260280    F1            FCC          UP
        CONN       CONN
``` | Show the chassis configuration. Observe that rack 1 is deleted from the configuration. |
| **Step 7** | **show sdr default-sdr pairing**<br><br>**Example:**<br><br>```
sysadmin-vm:2_RP0# show sdr default-sdr pairing
 Pairing Mode   INTER-RACK
 SDR Lead
   Node 0 0/RP0
   Node 1 2/RP1
 Pairs
   Pair Name Pair0
     Node 0   0/RP0
     Node 1   2/RP1
 Pairs
   Pair Name Pair2
     Node 0   2/RP0
     Node 1   3/RP1
 Pairs
   Pair Name Pair3
     Node 0   3/RP0
     Node 1   0/RP1
``` | Display the recalculated pairing configuration. Observe that the deleted rack is not included in the new pairing. The XR VMs must reflect the SDR pairing of the RPs. |

	Command or Action	Purpose

Step 8	**show redundancy summary**
	
	Example:
	
	``
	Router#show redundancy summary
	    Active Node Standby Node
	    ----------- ------------
	    2/RP0/CPU0 3/RP1/CPU0 (Node Ready,
	NSR:Ready)
	    3/RP0/CPU0 0/RP1/CPU0 (Node Ready,
	NSR:Ready)
	    0/RP0/CPU0 2/RP1/CPU0 (Node Ready,
	NSR:Ready)
	``
		Verify the node status and pairing.

Insert an RP Online to Create Dual RP

When an RP is inserted to a rack to create a chassis with dual RP, the re-pairing of RPs is automatically recalculated. The dual RP can be created using one of these methods.

Insert an RP

This task shows the automatic recalculation of pairing algorithm when an RP is added online to create a dual RP.

SUMMARY STEPS

1. **show redundancy summary**
2. Insert an RP. Consider that 2/RP0 is inserted.
3. **show sdr default-sdr pairing**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**show redundancy summary**
	
	Example:
	
	``
	    Active Node Standby Node
	    ----------- ------------
	    0/RP0/CPU0 1/RP1/CPU0 (Node Ready,
	NSR:Ready)
	    1/RP0/CPU0 0/RP1/CPU0 (Node Ready,
	NSR:Ready)
	    2/RP1/CPU0 N/A
	``
		Verify node status and pairing. In the example, the standby RP 0/RP1 reloads to pair with 1/RP0.

Step 2	Insert an RP. Consider that 2/RP0 is inserted.	

Step 3	**show sdr default-sdr pairing**
	
	Example:
	
	``
	sysadmin-vm:2_RP0# show sdr default-sdr pairing
	 Pairing Mode INTER-RACK
	 SDR Lead
	   Node 0 0/RP0
	   Node 1 1/RP1
	 Pairs
	``
		Pairing is automatically recalculated to include rack 2. In the example, observe that 2/RP1 reloads to become the standby RP, and a third pair is created.

Command or Action	Purpose
| ```
   Pair Name Pair0
     Node 0   0/RP0
     Node 1   1/RP1
  Pairs
    Pair Name Pair2
     Node 0   1/RP0
     Node 1   2/RP1
  Pairs
    Pair Name Pair3
     Node 0   2/RP0
     Node 1   0/RP1

RP/0/RP0/CPU0:ios#show redundancy summary
    Active Node    Standby Node
    -----------    ------------
     0/RP0/CPU0      1/RP1/CPU0 (Node Ready,
NSR:Ready)
     1/RP0/CPU0      2/RP1/CPU0 (Node Ready,
NSR:Ready)
     2/RP0/CPU0      0/RP1/CPU0 (Node Ready,
NSR:Ready)
``` | |

Add an RP to a Named SDR

This task shows the automatic recalculation of pairing algorithm when an RP is added to a named SDR.

SUMMARY STEPS

1. **show running-config sdr**
2. **show sdr newsdra pairing**
3. **conf**
4. **sdr newsdra location 1/RP1**
5. **show running-config sdr**
6. **show sdr newsdra pairing**

DETAILED STEPS

	Command or Action	Purpose
| **Step 1** | **show running-config sdr** <br><br> **Example:** <br><br> ```
sysadmin-vm:F1_SC0# show running-config sdr
newsdra
pairing-mode inter-rack
 location 0/RP0
 !
 location 0/RP1
 !
 location 1/RP0
 !
 location 2/RP1
 !
!
``` | Display the current configuration of the named SDR. |

	Command or Action	Purpose

Step 2	**show sdr newsdra pairing**
	
	Example:
	
	``
	sysadmin-vm:2_RP0# show sdr newsdra pairing
	 Pairing Mode INTER-RACK
	 SDR Lead
	   Node 0 0/RP0
	   Node 1 0/RP1
	 Pairs
	   Pair Name Pair0
	   Node 0 0/RP0
	   Node 1 0/RP1
	 Pairs
	   Pair Name Pair2
	   Node 0 1/RP0
	   Node 1 NONE
	 Pairs
	   Pair Name Pair3
	   Node 0 2/RP1
	   Node 1 NONE
	``
		Observe that rack 1 and rack 2 are not included in pairing because both the racks have a single RP. Inter-rack pairing does not support racks with single RP.

Step 3	**conf** **Example:** ``` sysadmin-vm:F1_SC0# conf Entering configuration mode terminal ```	Enter the configuration mode.
Step 4	**sdr newsdra location 1/RP1** **Example:** ``` sysadmin-vm:F1_SC0(config)# sdr newsdra location 1/RP1 sysadmin-vm:F1_SC0(config-location-1/RP1)# commit Commit complete. ```	Add 1/RP1 to the SDR configuration, and commit the configuration.
Step 5	**show running-config sdr** **Example:** ``` sysadmin-vm:F1_SC0# show running-config sdr sdr newsdra pairing-mode inter-rack location 0/RP0 ! location 0/RP1 ! location 1/RP0 ! location 1/RP1 ! location 2/RP1 ! ! ```	View the updated rack details in the SDR configuration.
Step 6	**show sdr newsdra pairing** **Example:** ``` sysadmin-vm:2_RP0# show sdr newsdra pairing Pairing Mode INTER-RACK SDR Lead ```	Verify the re-paired algorithm. The algorithm has automatically recaluculated to include rack 1 in the pairing.

Command or Action	Purpose
| ```
  Node 0 0/RP0
  Node 1 1/RP1
 Pairs
  Pair Name Pair0
  Node 0   0/RP0
  Node 1   1/RP1
 Pairs
  Pair Name Pair2
  Node 0   1/RP0
  Node 1   0/RP1
 Pairs
  Pair Name Pair3
  Node 0   2/RP1
  Node 1   NONE
``` | |

Use Case: Manual Re-pairing Algorithm

Rack Failure

A re-pair of the RPs can be initiated manually when a rack is not functional. This will re-establish rack level high availability (HA). A rack failure may occur during one or more of these circumstances:

- simultaneous hardware or software failure on both RPs in the rack

- simultaneous loss of ethernet connectivity from rest of the system on both RPs in the rack

- isolation of rack due to fiber cuts

- power failure

HA can be re-established by triggering re-calculation of pairing within a maintenance window. This can be done by:

- removing the affected rack from the system by deleting it from the chassis configuration using **no chassis serial <chassis-serial-number>** command

- shutting down the rack and running re-pair manually

This section shows the steps for shutting down the rack and running the re-pair manually:

SUMMARY STEPS

1. **show chassis**
2. **show running-config chassis**
3. **show sdr default-sdr pairing**
4. **sdr default-sdr re_pair**
5. **show chassis**
6. **show running-config chassis**
7. **show sdr default-sdr pairing**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**show chassis**
	
	Example:
	
	`sysadmin-vm:F1_SC0# show chassis`
	`Serial Num   Rack Num    Rack Type   Rack State`
	`Data Plane  Ctrl Plane`
	`───────────────────────────────────────────────`
	`FLM171662RX   0           LCC         UP`
	` CONN       CONN`
	`FLM171762WW   1           LCC         DOWN`
	` CONN       CONN`
	`FLM171763M4   2           LCC         UP`
	` CONN       CONN`
		Show the current chassis configuration. Note that rack 1 has failed and is in DOWN state.

Step 2	**show running-config chassis**
	
	Example:
	
	`sysadmin-vm:2_RP0# show running-config chassis`
	`chassis serial FLM171662RX`
	` rack 0`
	`!`
	`chassis serial FLM171762WW`
	` rack 1`
	`!`
	`chassis serial FLM171763M4`
	` rack 2`
		Display the current running configuration of the chassis.

Step 3	**show sdr default-sdr pairing**
	
	Example:
	
	`sysadmin-vm:2_RP0# show sdr default-sdr pairing`
	` Pairing Mode   INTER-RACK`
	` SDR Lead`
	`   Node 0 0/RP0`
	`   Node 1 1/RP1`
	` Pairs`
	`   Pair Name Pair0`
	`    Node 0   0/RP0`
	`    Node 1   1/RP1`
	` Pairs`
	`   Pair Name Pair1`
	`    Node 0   1/RP0`
	`    Node 1   2/RP1`
	` Pairs`
	`   Pair Name Pair2`
	`    Node 0   2/RP0`
	`    Node 1   0/RP1`
		Display the current pairing algorithm of RPs.

Step 4	**sdr default-sdr re_pair**
	
	Example:
	
	`sysadmin-vm:0_RP0# sdr default-sdr re_pair`
	`Current Configuration`
	`Lead Pair: 0/RP0 1/RP1`
	`1/RP0 2/RP1`
	`2/RP0 0/RP1`
	`Re_Paired Configuration`
	`Lead Pair: 0/RP0 2/RP1`
		Remove rack 1 from the configuration.

	Command or Action	Purpose
| | ```
2/RP0 0/RP1
Would you like to proceed ? [yes/no]: yes
Proceeding with action
``` | |
| Step 5 | **show chassis**<br><br>**Example:**<br><br>```
sysadmin-vm:F1_SC0# show chassis
Serial Num    Rack Num    Rack Type    Rack State
 Data Plane  Ctrl Plane
_____

FLM171662RX   0             LCC          UP
  CONN       CONN
FLM171762WW   1             LCC          DOWN
  CONN       CONN
FLM171763M4   2             LCC          UP
  CONN       CONN
``` | Display the chassis configuration details. |
| Step 6 | **show running-config chassis**<br><br>**Example:**<br><br>```
sysadmin-vm:2_RP0# show running-config chassis
chassis serial FLM171662RX
 rack 0
!
chassis serial FLM171762WW
 rack 1
!
chassis serial FLM171763M4
 rack 2
``` | Show the current running configuration of the chassis. Observe that the chassis configuration is unchanged. |
| Step 7 | **show sdr default-sdr pairing**<br><br>**Example:**<br><br>```
sysadmin-vm:2_RP0# show sdr default-sdr pairing
 Pairing Mode   INTER-RACK
 SDR Lead
   Node 0 0/RP0
   Node 1 2/RP1
 Pairs
   Pair Name Pair0
   Node 0   0/RP0
   Node 1   2/RP1
 Pairs
   Pair Name Pair1
   Node 0   2/RP0
   Node 1   0/RP1
``` | Display the SDR pairing algorithm. The SDR configuration is updated to exclude rack 1. |

Remove RP

This task shows manually intitiating the recalculation of pairing algorithm when an RP is removed using online insertion and removal (OIR).

SUMMARY STEPS

1. **show sdr default-sdr pairing**
2. **show redundancy summary**

3. Remove an RP using OIR. For example, consider 0/RP0 is removed from the chassis.

4. **show redundancy summary** and **show sdr default-sdr pairing**

5. **sdr default-sdr re_pair**

6. **show sdr default-sdr pairing**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**show sdr default-sdr pairing**
	
	Example:
	
	``
	sysadmin-vm:3_RP1# show sdr default-sdr pairing
	 Pairing Mode INTER-RACK
	 SDR Lead
	   Node 0 0/RP0
	   Node 1 0/RP1
	 Pairs
	   Pair Name Pair0
	   Node 0 0/RP0
	   Node 1 1/RP1
	 Pairs
	   Pair Name Pair1
	   Node 0 1/RP0
	   Node 1 0/RP1
	``
		Display the pairing of RPs in the SDR configuration.

Step 2	**show redundancy summary**
	
	Example:
	
	``
	Router#show redundancy summary
	    Active Node Standby Node
	    ----------- ------------
	     0/RP0/CPU0 1/RP1/CPU0
	     1/RP0/CPU0 0/RP1/CPU0 (Node Ready,
	NSR:Ready)
	``	

Step 3	Remove an RP using OIR. For example, consider 0/RP0 is removed from the chassis.	

Step 4	**show redundancy summary** and **show sdr default-sdr pairing**
	
	Example:
	
	``
	Router#show redundancy summary
	    Active Node Standby Node
	    ----------- ------------
	     1/RP1/CPU0 N/A
	     1/RP0/CPU0 0/RP1/CPU0 (Node Ready,
	NSR:Ready)
	
	sysadmin-vm:3_RP1# show sdr default-sdr pairing
	 Pairing Mode INTER-RACK
	 SDR Lead
	   Node 0 0/RP0
	   Node 1 1/RP1
	 Pairs
	   Pair Name Pair0
	   Node 0 0/RP0
	   Node 1 1/RP1
	 Pairs
	``
		Observe the mismatch between the SDR configuration and the actual state of the nodes.

	Command or Action	Purpose
| | ```
   Pair Name Pair1
    Node 0   1/RP0
    Node 1   0/RP1
``` | |
| **Step 5** | **sdr default-sdr re_pair**<br><br>**Example:**<br><br>```
sysadmin-vm:2_RP0# sdr default-sdr re_pair
Current Configuration
Lead Pair: 0/RP0 1/RP1
1/RP0 0/RP1
Re_Paired Configuration
Lead Pair: 1/RP1 N/A
0/RP0 0/RP1
Would you like to proceed ? [yes/no]: yes
Proceeding with action
``` | Use the re-pair command to solve the mismatch between SDR configuration and state of the nodes. |
| **Step 6** | **show sdr default-sdr pairing**<br><br>**Example:**<br><br>```
sysadmin-vm:2_RP0# show sdr default-sdr pairing
 Pairing Mode   INTER-RACK
 SDR Lead
   Node 0 1/RP1
   Node 1 N/A
 Pairs
   Pair Name Pair0
    Node 0   1/RP1
    Node 1   N/A
 Pairs
   Pair Name Pair1
    Node 0   0/RP0
    Node 1   0/RP1
``` | Verify that the SDR configuration shows the correct pairing on RPs. |

Remove RP from SDR Configuration

This task shows manually initiating the recalculation of pairing algorithm when an RP is removed from SDR configuration.

SUMMARY STEPS

1. **show running-config sdr abc**
2. **sh sdr**
3. **show sdr abc pairing**
4. **show redundancy summary**
5. **conf**
6. **sdr abc**
7. **no location 1/RP1**
8. **show running-config sdr abc**
9. **show sdr abc pairing**
10. **sdr abc re_pair**
11. **show sdr abc pairing**
12. **show sdr abc reboot-history**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**show running-config sdr abc** **Example:** ``` sysadmin-vm:0_RP0# show running-config sdr abc sdr abc pairing-mode inter-rack location 0/RP0 ! location 0/RP1 ! location 1/RP0 ! location 1/RP1 ! ! ```	Display current SDR configuration.

Step 2	**sh sdr**
	
	Example:
	
	``
	sysadmin-vm:0_RP0# sh sdr
	SDR: abc
	Location IP Address Status Boot
	 Count Time Started
	───
	0/RP0/VM1 192.3.0.4 RUNNING 1
	        06/26/2017 21:02:23
	0/RP1/VM1 192.3.4.4 RUNNING 1
	        06/26/2017 21:03:09
	1/RP0/VM1 192.2.0.4 RUNNING 1
	        06/26/2017 21:03:26
	1/RP1/VM1 192.2.4.4 RUNNING 1
	        06/26/2017 21:03:36
	
	SDR: abcabc
	Location IP Address Status Boot
	 Count Time Started
	───
	1/RP0/VM2 192.2.0.6 RUNNING 1
	        06/26/2017 21:14:29
	1/RP1/VM2 192.2.4.6 RUNNING 1
	        06/26/2017 21:14:37
	3/RP0/VM1 192.1.0.4 RUNNING 1
	        06/26/2017 21:14:01
	3/RP1/VM1 192.1.4.4 RUNNING 1
	        06/26/2017 21:15:31
	
	SDR: xyz
	Location IP Address Status Boot
	 Count Time Started
	───
	0/RP0/VM2 192.3.0.6 RUNNING 1
	        06/26/2017 21:04:15
	0/RP1/VM2 192.3.4.6 RUNNING 1
	        06/26/2017 21:04:38
	``
		Display SDR configuration details.

Step 3	**show sdr abc pairing** **Example:**	Verify that inter-rack mode is enabled in the SDR, and the pairing is displayed.

Command or Action	Purpose

``sysadmin-vm:0_RP0# show sdr abc pairing
 Pairing Mode INTER-RACK
 SDR Lead
   Node 0 0/RP0
   Node 1 1/RP1
 Pairs
   Pair Name Pair0
    Node 0   0/RP0
    Node 1   1/RP1
 Pairs
   Pair Name Pair1
    Node 0   1/RP0
    Node 1 0/RP1```	

Step 4 **show redundancy summary**
 	
Example:
 	
``RP/0/RP0/CPU1:ios#show redundancy summary
    Active Node   Standby Node
    -----------   -----------
     0/RP1/CPU1   1/RP0/CPU1 (Node Ready,
NSR:Not Configured)
     0/RP0/CPU1   1/RP1/CPU1 (Node Ready,
NSR:Not Configured)```
	Disolay summary of the nodes states.

Step 5 **conf** **Example:** ```sysadmin-vm:0_RP0# conf Entering configuration mode terminal```	Enter configuration mode.
Step 6 **sdr abc** **Example:** ```sysadmin-vm:0_RP0(config)# sdr abc```	Enter SDR configuration mode.
Step 7 **no location 1/RP1** **Example:** ```sysadmin-vm:0_RP0(config-sdr-abc)# no location 1/RP1 sysadmin-vm:0_RP0(config-sdr-abc)# end Mon Jun 26 21:18:32.448 UTC Uncommitted changes found, commit them? [yes/no/CANCEL] yes Commit complete.```	Remove the RP and commit the changes. In this example, the RP 1/RP1 is removed from the abc SDR configuration.
Step 8 **show running-config sdr abc** **Example:** ```sysadmin-vm:0_RP0# show running-config sdr abc sdr abc pairing-mode inter-rack location 0/RP0 ! location 0/RP1 ! location 1/RP0 ! !```	Verify that the SDR inventory has changed.

	Command or Action	**Purpose**

Step 9	**show sdr abc pairing**
	
	Example:
	
	``
	sysadmin-vm:0_RP0# show sdr abc pairing
	 Pairing Mode INTER-RACK
	 SDR Lead
	   Node 0 0/RP0
	   Node 1 1/RP1
	 Pairs
	   Pair Name Pair0
	     Node 0 0/RP0
	     Node 1 1/RP1
	 Pairs
	   Pair Name Pair1
	     Node 0 1/RP0
	     Node 1 0/RP1
	``
		View the SDR pairing information after the RP is removed. Observe that pairing is unchanged with the removed RP available in the pairing algorithm. Note that the output of **show running-config sdr** command in step 8 is different from the output in step 9.

Step 10	**sdr abc re_pair** **Example:** ``` sysadmin-vm:0_RP0# sdr abc re_pair Current Configuration Lead Pair: 0/RP0 1/RP1 1/RP0 0/RP1 Re_Paired Configuration Lead Pair: 0/RP0 0/RP1 1/RP0 Would you like to proceed ? [yes/no]: yes Proceeding with action ```	Manually initiate the recalculation of the pairing algorithm.

Step 11	**show sdr abc pairing**
	
	Example:
	
	``
	sysadmin-vm:0_RP0# show sdr abc pairing
	 Pairing Mode INTER-RACK
	 SDR Lead
	   Node 0 0/RP0
	   Node 1 0/RP1
	 Pairs
	   Pair Name Pair0
	     Node 0 0/RP0
	     Node 1 0/RP1
	 Pairs
	   Pair Name Pair1
	     Node 0 1/RP0
	     Node 1 NONE
	``
		Verify that the pairing is updated to exclude the details of the RP that was removed. Also, run the **show redundancy summary** command to verify that the XR VMs reflect the changes.

Step 12	**show sdr abc reboot-history** **Example:** ``` sysadmin-vm:0_RP0# show sdr abc reboot-history Reboots Since Location Created Reason ──────────────────────────────────── 0/RP0/VM1 1 06/26/2017 21:02:23 FIRST_BOOT 0/RP1/VM1 2 6/26/2017 21:25:23 VM_REQUESTED_GRACEFUL_RELOAD: Src: node0_RP0_CPU1, Partner change from ```	Verify the reboot history of the SDR nodes. The history reflects the changes made to the configuration.

Command or Action	Purpose
node1_RP1_CPU1 to node0_RP1_CPU1 06/26/2017 21:03:09 FIRST_BOOT 1/RP0/VM1 1 06/26/2017 21:03:26 FIRST_BOOT	

Process Placement after a Pairing Change

You must check the placement reoptimization of configuration before and after a change in pairing algorithm. This maintains HA for configurable processes.This includes moving to inter-rack or intra-rack pairing, running a manual re-pair, or triggering an automatic re_pair scenario. This feature provides the flexibility to decide a change in service placements based on the prediction from process placement.

SUMMARY STEPS

1. **show redundancy summary**
2. **show placement reoptimize**
3. **placement reoptimize**
4. **show placement reoptimize**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**show redundancy summary** **Example:** ``` RP/0/RP0/CPU1:ios#show redundancy summary Active Node Standby Node ----------- ----------- 1/RP0/CPU1 N/A 0/RP0/CPU1 0/RP1/CPU1 (Node Ready, NSR:Configured) ```	Display the summary of nodes on the configuration.
Step 2	**show placement reoptimize** **Example:** ``` Router#show placement reoptimize Group-Name Current-Placement Reoptimized-Placement central-services 0/RP0/CPU1(0/RP1/CPU1) 0/RP0/CPU1(0/RP1/CPU1) v4-routing 1/RP0/CPU1(NONE) 0/RP0/CPU1(0/RP1/CPU1) netmgmt 1/RP0/CPU1(NONE) 0/RP0/CPU1(0/RP1/CPU1) mcast-routing 0/RP0/CPU1(0/RP1/CPU1) 0/RP0/CPU1(0/RP1/CPU1) v6-routing 1/RP0/CPU1(NONE) 0/RP0/CPU1(0/RP1/CPU1) Group_0_1 0/RP0/CPU1(0/RP1/CPU1) 0/RP0/CPU1(0/RP1/CPU1) ```	Show current placements and reoptimized placements of services.

	Command or Action	Purpose
| | ```
Group_0_0          1/RP0/CPU1(NONE)
 0/RP0/CPU1(0/RP1/CPU1)
``` | |
| **Step 3** | **placement reoptimize**<br><br>**Example:**<br><br>```
RP/0/RP0/CPU1:ios#placement reoptimize

Group-Name       Current-Placement
 Reoptimized-Placement

central-services   0/RP0/CPU1(0/RP1/CPU1)
 0/RP0/CPU1(0/RP1/CPU1)
v4-routing          1/RP0/CPU1(NONE)
 0/RP0/CPU1(0/RP1/CPU1)
netmgmt             1/RP0/CPU1(NONE)
 0/RP0/CPU1(0/RP1/CPU1)
mcast-routing       0/RP0/CPU1(0/RP1/CPU1)
 0/RP0/CPU1(0/RP1/CPU1)
v6-routing          1/RP0/CPU1(NONE)
 0/RP0/CPU1(0/RP1/CPU1)
Group_0_1           0/RP0/CPU1(0/RP1/CPU1)
 0/RP0/CPU1(0/RP1/CPU1)
Group_0_0           1/RP0/CPU1(NONE)
 0/RP0/CPU1(0/RP1/CPU1)


Do you want to proceed with the
reoptimization[y/n]y
Triggering reoptimize
Migration running in the background
Please don't trigger one more migration
``` | Display the placement reoptimize details. |
| **Step 4** | **show placement reoptimize**<br><br>**Example:**<br><br>```
Router#show placement reoptimize

Group-Name       Current-Placement
 Reoptimized-Placement

central-services   0/RP0/CPU1(0/RP1/CPU1)
 0/RP0/CPU1(0/RP1/CPU1)
v4-routing          0/RP0/CPU1(0/RP1/CPU1)
 0/RP0/CPU1(0/RP1/CPU1)
netmgmt             0/RP0/CPU1(0/RP1/CPU1)
 0/RP0/CPU1(0/RP1/CPU1)
mcast-routing       0/RP0/CPU1(0/RP1/CPU1)
 0/RP0/CPU1(0/RP1/CPU1)
v6-routing          0/RP0/CPU1(0/RP1/CPU1)
 0/RP0/CPU1(0/RP1/CPU1)
Group_0_1           0/RP0/CPU1(0/RP1/CPU1)
 0/RP0/CPU1(0/RP1/CPU1)
Group_0_0           0/RP0/CPU1(0/RP1/CPU1)
 0/RP0/CPU1(0/RP1/CPU1)


No changes predicted.
``` | Verify re-optimized placement matches the current placement and no more changes are predicted. |