Router-Shelf Redundancy for the Cisco AS5800

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This document describes router-shelf redundancy for the Cisco AS5800 universal access server. It includes the following sections:

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Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see Bug Search Tool and the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the feature information table at the end of this module.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Feature Overview

This feature provides router-shelf redundancy by using a second router shelf that automatically takes over the other shelf’s dial-shelf cards (DSCs) if it appears that the other router shelf has died. Failover is disruptive in that there is no attempt to maintain calls that were established on the failing router shelf; the DSCs controlled by the failing router shelf are restarted under control of the backup router shelf and hence become available again.

Two router shelves are connected to the same DSC (as in split mode), but with only one router shelf active at a time. Both router shelves are configured for normal mode as opposed to split mode. Each router shelf contains the same configuration, being whatever configuration is appropriate for the full set of DSCs. The active router shelf controls all the DSCs, while the other router shelf functions purely as a backup. If the
active router shelf fails, all DSCs restart under the control of the backup router shelf, which then functions as the active router shelf.

Only one router shelf has control of the DSCs at a time; the other keeps trying to take control but is unable to, and does not interfere with operation of the active router shelf. If, however, the active router shelf crashes, then it relinquishes control of all DSCs to the other router shelf, which restarts the DSCs and commences normal operation. If the crashed router shelf recovers or is restarted, it does not take back control of the DSCs, but instead functions as a backup, and takes control again only if the other router shelf fails.

External interfaces cannot share the same IP address between the two router shelves, to prevent duplicate IP address errors.

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**Note**

Triggers for a failover to occur are those that lead to a hub switchover. The main trigger is loss of the link between the active router shelf (the one with control of the cards) and its DSC as detected by link monitoring on the DSC. Any router-shelf failures that do not result in this link going down do not cause failover—for example, the active router’s egress interface going down does not trigger failover. Conversely, any temporary loss of the link between the active router and a DSC does cause failover, even if the router shelf itself does not crash and connectivity is quickly reestablished—for example, if the BIC cable is knocked out and then quickly replaced. In addition, failover is triggered if a DSC connected to the active router shelf goes down and fails to recover within 90 seconds.

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**Additional Considerations**

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**System Controller**

When a system controller is used with a redundant router shelf, router-shelf failover should look like a single router shelf going down briefly and then recovering. With the current system-controller code, this does not work. The Cisco SC3640 expects only a single router shelf to be configured with any given shelf ID. To get around this, a router in backup mode must be prevented from sending Session Definition Protocol (SDP) packets to the Cisco SC3640. In addition, the SDP packets sent by the router shelves to the Cisco SC3640 currently include a field identifying the MAC address of the sending router. The Cisco SC3640 stores this MAC address and, if it subsequently receives another SDP packet containing the same shelf ID but not the same MAC address, it concludes that multiple routers are configured with the same shelf ID and treats this as an error. This is precisely the situation after a failover, when the backup router shelf starts sending SDP packets with the same shelf ID but different MAC address.

To get around this, you must configure a failover group code—an integer that identifies a redundant pair of router shelves. Each member of the pair must be configured with the same group code. When failover mode
is enabled, this group code is sent in place of the router MAC address. These changes are all made to the system-controller code that runs on the router shelf itself, rather than on the Cisco SC3640.

**Load Sharing**

There is no load sharing between the two routers shelves--no calls can go through the backup router shelf. One disadvantage of this is that you cannot split the load between the routers to reduce the number of calls that are lost when a router crashes. There are, however, also some advantages: with load sharing, you must ensure that each router can support the entire dial shelf, since upon failure of a router shelf the surviving router shelf owns all the dial-shelf resources, and therefore has a sudden change in the amount of traffic it is supporting. If care had not been taken to test under failover conditions, at full load the surviving router shelf might be overwhelmed, and perhaps provide degraded service. With a redundant router shelf instead acting purely as a standby, provided that the backup router shelf is the same model as the active router shelf, the load is unchanged after switchover--so no change is expected to the router-shelf performance.

Having a single router shelf active at a time is simpler, and makes it easier to support failover when dealing with external servers such as signaling controllers for SS7, RPMS server, and system controllers.

**Hitless Redundancy**

When router-shelf failover occurs, all calls associated with the failed router shelf are lost. To maintain calls through router-shelf failure requires mirroring call state and fast failure detection. This shelf-redundancy feature ensures only that resources (particularly trunk lines) do not remain unusable while the router shelf that was controlling them is down.

**Network Management**

Minimal Simple Network Management Protocol (SNMP) support is provided--a trap is issued when failover occurs, and SNMP variables indicate whether a router shelf is active or on standby. An existing MIB--CISCO-C8500-REDUNDANCY-MIB--defines a suitable trap for issuing on failover.

**Benefits**

When an active router shelf in a Cisco AS5800 loses communication with its DSC, a backup router shelf can be invoked to automatically take over DSCs controlled by the lost router shelf. This backup method, called redundancy, is provided on the Cisco AS5800 to prevent a single point of failure, subsequent downtime, and user intervention to resolve unrecoverable hardware faults.

**Restrictions**

**Router Shelves**

Two router shelves of the same model and configuration must be available for this feature to operate.

**External Servers**

Although some of the failover functionality exists in the existing code base, ensure that the various external servers that can run with the Cisco AS5800 still function when redundant router shelves are used. The servers of concern at the moment are RPMS, SS7, and System Controller; the first two are discussed below:
• Resource pool management server (RPMS). For Resource Pool Management (RPM) to work, the resource pool manager server (RPMS) must be configured with the same information for both router shelves.

• Signaling System 7 (SS7). In an SS7 setup, the call signaling comes through an external Cisco SC2200 unit rather than directly from the switch over the trunk line (as for CAS and ISDN). For call signaling to work after failover, both router shelves must be connected to the Cisco SC2200 using the SS7 Redundant Link Manager (RLM) feature, which was intended to provide redundant links between a single router shelf and the signaling controller. RLM links must be configured from both the active and standby router shelves--the change of router shelves will look like a change from one redundant link to another.

Related Features and Technologies

RSC Handover Redundancy

The Router Shelf Controller Handover Redundancy feature that is available on the Cisco AS5850 is similar to Router Shelf Redundancy on the Cisco AS5800.

Prerequisites

• Ensure that your network is up and running.
• Test each router shelf to verify connectivity.

Configuration Examples

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Configuring the Cisco AS5800 for Shelf Redundancy

SUMMARY STEPS

1. Router(config)# redundancy
2. Router(config-red)# failover group-number group-code

DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td></td>
</tr>
<tr>
<td>Router(config)# redundancy</td>
<td>Enters configuration-redundancy mode.</td>
</tr>
</tbody>
</table>
Command or Action | Purpose
--- | ---
Step 2 Router(config-red)# failover group-number group-code | Configures router-shelf failover. Note: Use the same group-code argument for both routers. This code is used when the system controller is used and it identifies the two routers as effectively representing the same set of dial-shelf resources.

Connect to each router shelf in turn and enter these commands. Treat router shelves as if they are connected as a split dial-shelf configuration.

Note: This configuration by itself is not enough for successful failover to occur. Because there is no automatic synchronization of configuration between router shelves, you must configure each router shelf separately. Typically the two router shelves, active and backup, must have the same configuration except for the IP address on egress interfaces.

Note: Since configuration is error prone, test the backup router shelf’s configuration to ensure that errors are not discovered only when the active router shelf fails in a production environment.

### Configuring the Shelf Redundancy Feature

**SUMMARY STEPS**

1. Router(config)# redundancy
2. Router(config-red)# failover group-number group-number

**DETAILED STEPS**

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<td>Step 1 Router(config)# redundancy</td>
<td>Enters configuration-redundancy mode.</td>
</tr>
<tr>
<td>Step 2 Router(config-red)# failover group-number</td>
<td>Sets the router shelf to failover mode. You must enter this command on both router shelves.</td>
</tr>
</tbody>
</table>

### Verifying Shelf Redundancy

Use the `show redundancy` command to verify whether the "Shelf is redundant" string is displayed on a redundancy-enabled access server, as illustrated below:

```
Router# show redundancy
T1 1/0 is up.
   Applique type is Channelized T1
   Cablelength is long gain36 0db
   No alarms detected.
   alarm-trigger is not set
   Version info of slot 3: HW: 256, PLD Rev: 1
   Framer Version: 0x8
Manufacture Cookie Info:
```
EEPROM Type 0x0001, EEPROM Version 0x01, Board ID 0x02,
Board Hardware Version 1.0, Item Number 32-0-00,
Board Revision 00, Serial Number 12059496,
Framing is ESF, Line Code is AMI, Clock Source is Line.
Trunk setting is rbs-zero.
Data in current interval (619 seconds elapsed):
380 Line Code Violations, 171 Path Code Violations
0 Slip Secs, 0 Fr Loss Secs, 137 Line Err Secs, 10 Degraded Mins
137 Errored Secs, 21 Bursty Err Secs, 0 Severely Err Secs, 0 Unavail Secs
Total Data (last 24 hours):
203903 Line Code Violations, 27284 Path Code Violations, 7 Slip Secs, 531 Fr Loss Secs, 18414 Line Err Secs, 1431 Degraded Mins

The following example shows output from two router shelves configured as a failover pair. The active router shelf is initially RouterA. The commands show redundancy history and show redundancy have been issued. The show redundancy command shows that failover is enabled and shows the configured group number. The show redundancy command also shows that this router shelf is the active one of the pair. Compare this output with that from the backup router shelf (RouterB) further below.

**Note** When RouterA is reloaded, thereby forcing a failover, new entries are shown on RouterB when a show redundancy history command is issued after failover has occurred.

**Log from the First Router Shelf (RouterA):**

RouterA# show redundancy status change history
DSC Redundancy Status Change History:
010215 18:17 Slot -1 DSC:Failover configured -> ACTIVE role by default.
010215 18:18 Slot -1 DSC:Failover -> BACKUP role.
010215 18:18 Slot 12 DSC:Failover -> ACTIVE role.
010215 18:18 Slot 12 DSC:Hub, becoming active - arb timeout
RouterA# reload Proceed with reload? [confirm]
*Feb 15 20:19:11.059:%SYS-5-RELOAD:Reload requested
System Bootstrap, Version 11.1(13)CA, EARLY DEPLOYMENT RELEASE SOFTWARE (fc1)
Copyright (c) 1997 by cisco Systems, Inc.
C7200 processor with 131072 Kbytes of main memory
rommon 1 >

**Log from the Second Router Shelf (RouterB):**

RouterB# show redundancy
failover mode enabled, failover group = 32
Currently BACKUP role.
No connection to slot 12
RouterB# reload
Proceed with reload? [confirm]
*Feb 16 03:24:53.931:%DSC_REDUNDANCY-3-BICLINK:Switching to DSC 13
*Feb 16 03:24:53.931:%DSC_REDUNDANCY-3-BICLINK:Failover:changing to active mode
*Feb 16 03:24:54.931:%DIAL13-3-MSG:
02:32:06:%DSC_REDUNDANCY-3-EVENT:Redundancy event:LINK_FAIL from other DSC
Verifying Shelf Redundancy

Additional References

Related Documents

<table>
<thead>
<tr>
<th>Related Topic</th>
<th>Document Title</th>
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<tbody>
<tr>
<td>Cisco IOS commands</td>
<td>Cisco IOS Master Commands List, All Releases</td>
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<tr>
<td>Cisco SS7 Interconnect for Access Servers Solution</td>
<td><a href="http://www.cisco.com/univercd/cc/td/doc/product/access/sc/r1/">http://www.cisco.com/univercd/cc/td/doc/product/access/sc/r1/</a></td>
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<td>Cisco SS7 Dial Access Solution System Integration</td>
<td><a href="http://www.cisco.com/univercd/cc/td/doc/product/access/sc/r2/">http://www.cisco.com/univercd/cc/td/doc/product/access/sc/r2/</a></td>
</tr>
<tr>
<td>Cisco SC2200 Signaling Controller documentation</td>
<td></td>
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</table>
Feature Information for Router-Shelf Redundancy for the Cisco AS5800

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

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<table>
<thead>
<tr>
<th>Feature Name</th>
<th>Releases</th>
<th>Feature Information</th>
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<tbody>
<tr>
<td>Router-Shelf Redundancy for the Cisco AS5800</td>
<td>12.1(5) XV1</td>
<td>This feature was introduced.</td>
</tr>
<tr>
<td>Router-Shelf Redundancy for the Cisco AS5800</td>
<td>12.2(11)T</td>
<td>This feature was integrated into Cisco IOS Release 12.2(11)T and support was added for the the Cisco AS5800 platform.</td>
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</tbody>
</table>

Glossary

**DSC** -- dial-shelf controller.

**DSIP** -- Dial Shelf Interconnection Protocol.

**RLM** -- redundant link manager.

**RPM** -- resource pool management.

**RPMS** -- resource pool manager server.
SDP --Session Definition Protocol.
SS7 --Signaling System 7.