ISSU and SSO—DHCP High Availability Features

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Cisco IOS Release 12.2(31)SB2 introduces the following series of Dynamic Host Configuration Protocol (DHCP) High Availability features that support the Broadband Access Server (BRAS):

- ISSU—DHCP Server
- SSO—DHCP Server
- ISSU—DHCP Relay on Unnumbered Interface
- SSO—DHCP Relay on Unnumbered Interface
- ISSU—DHCP Proxy Client
- SSO—DHCP Proxy Client
- ISSU—DHCP ODAP Client and Server
- SSO—DHCP ODAP Client and Server

These features are enabled by default when the redundancy mode of operation is set to Stateful Switchover (SSO).

Finding Feature Information in This Module

Your Cisco IOS software release may not support all of the features documented in this module. To reach links to specific feature documentation in this module and to see a list of the releases in which each feature is supported, use the "Feature Information for DHCP High Availability Features" section on page 11.

Finding Support Information for Platforms and Cisco IOS and Catalyst OS Software Images

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

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Prerequisites for DHCP High Availability

- The Cisco IOS In-Service Software Upgrade (ISSU) process must be configured and working properly. See the "Cisco IOS In-Service Software Upgrade Process" feature module for more information.
- Stateful Switchover (SSO) must be configured and working properly. See the "Stateful Switchover" feature module for more information.
- Nonstop Forwarding (NSF) must be configured and working properly. See the "Cisco Nonstop Forwarding" feature module for more information.

Restrictions for DHCP High Availability

The DHCP high availability features do not support DHCP accounting or DHCP authorized Address Resolution Protocol (ARP).

Information About DHCP High Availability

This section describes the following concepts:

ISSU

The ISSU process allows Cisco IOS software to be updated or otherwise modified while packet forwarding continues. In most networks, planned software upgrades are a significant cause of downtime. ISSU allows Cisco IOS software to be modified while packet forwarding continues, which increases network availability and reduces downtime caused by planned software upgrades.

SSO

SSO refers to the implementation of Cisco IOS software that allows applications and features to maintain a defined state between an active and standby Route Processor (RP).

In specific Cisco networking devices that support dual RPs, SSO takes advantage of RP redundancy to increase network availability. The SSO feature takes advantage of RP redundancy by establishing one of the RPs as the active RP while the other RP is designated as the standby RP, and then synchronizing critical state information between them. Following an initial synchronization between the two processors, SSO dynamically maintains RP state information between them.

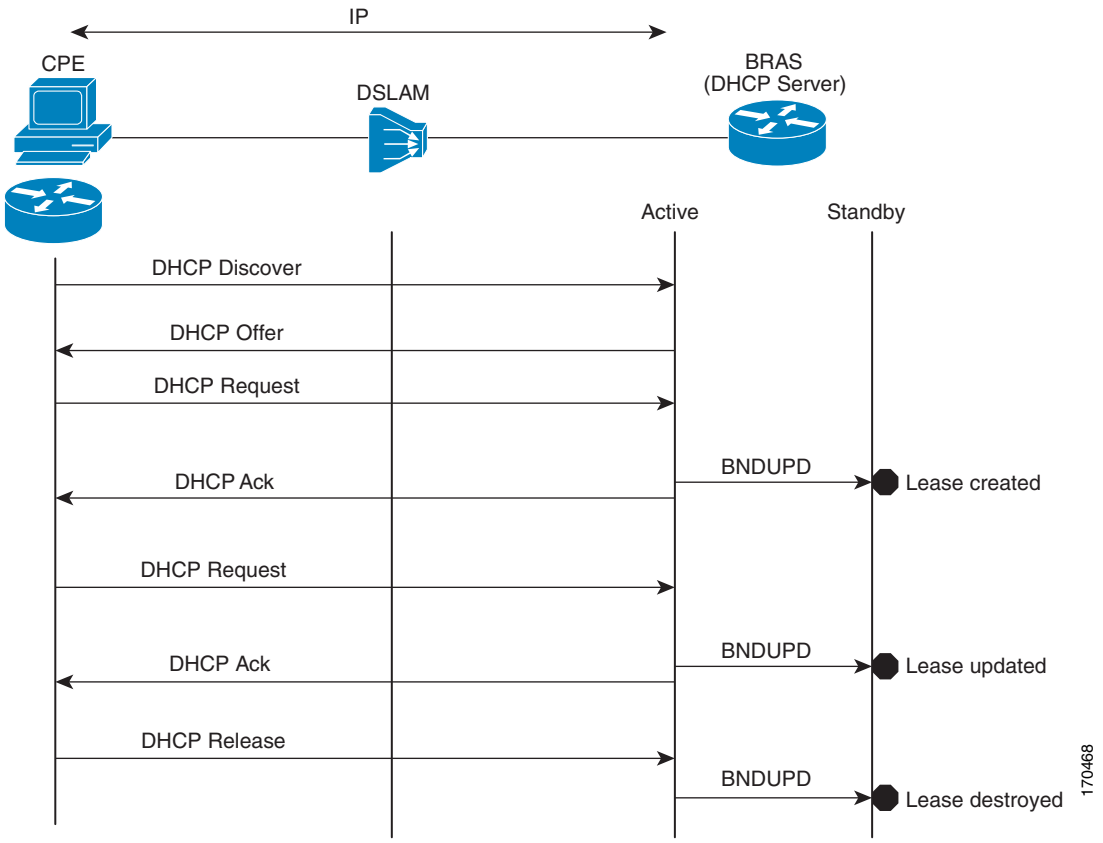
A switchover from the active to the standby processor occurs when the active RP fails, is removed from the networking device, or is manually taken down for maintenance.

ISSU and SSO—DHCP Server

The DHCP server that is ISSU and SSO aware is able to detect when a router is failing over to the standby RP and preserve the DHCP lease across a switchover event.

Each DHCP binding is synchronized and re-created from the active RP to the standby RP upon lease commit. Figure 1 illustrates this process. The lease extension and release are also synchronized to the standby RP.

Figure 1 DHCP Server Maintaining States Between the Active and Standby Route Processor



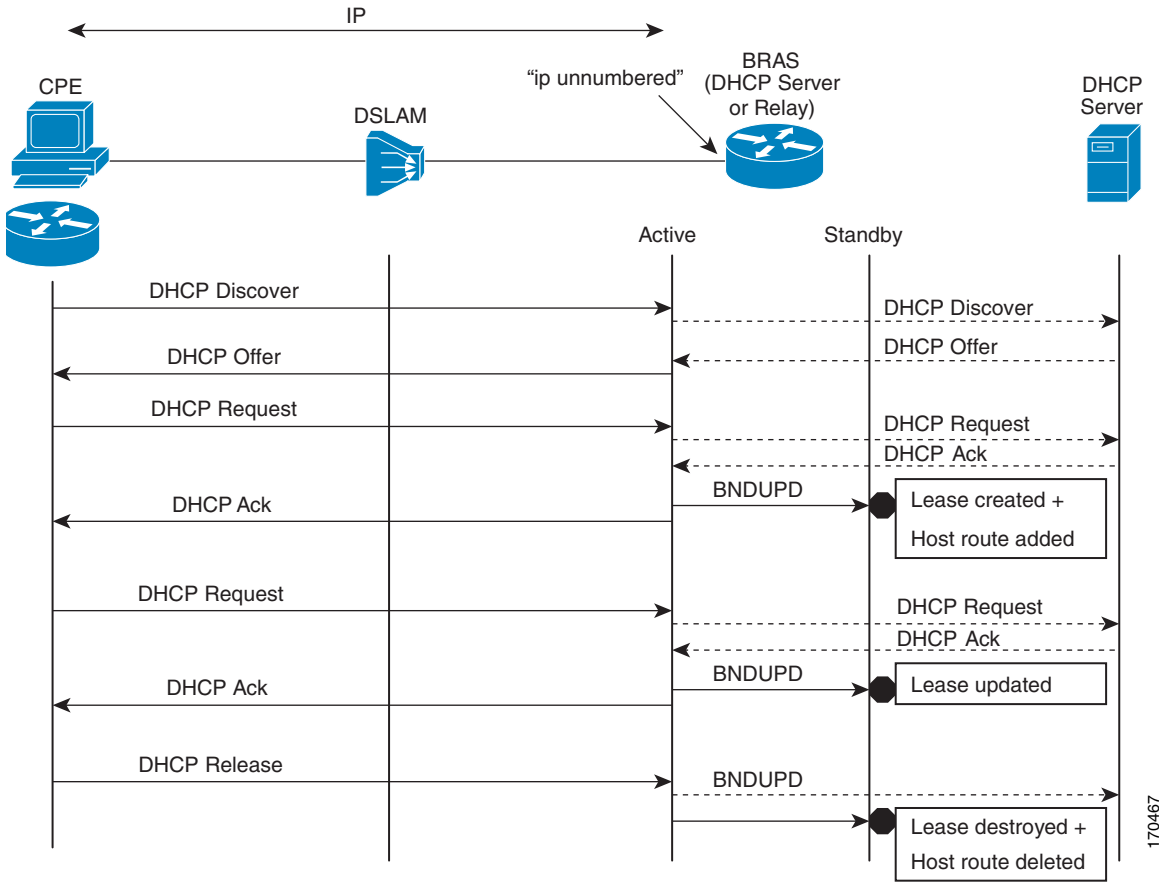
ISSU and SSO—DHCP Relay on Unnumbered Interface

The DHCP relay agent supports the use of unnumbered interfaces. For DHCP clients connected through the unnumbered interfaces, the DHCP relay agent automatically adds a static host route once the DHCP client obtains an address, specifying the unnumbered interface as the outbound interface. The route is automatically removed once the lease time expires or when the client releases the address.

The **ip helper-address** interface configuration command must be configured on the unnumbered interface to enable the Cisco IOS DHCP relay agent on unnumbered interfaces. See the "Configuring the Cisco IOS DHCP Relay Agent" configuration module for more information.

The ISSU and SSO DHCP relay on unnumbered interface functionality adds high availability support for host routes to clients connected through unnumbered interfaces. The DHCP relay agent can now detect when a router is failing over to the standby RP and keep the states related to unnumbered interfaces. Figure 2 illustrates the process.

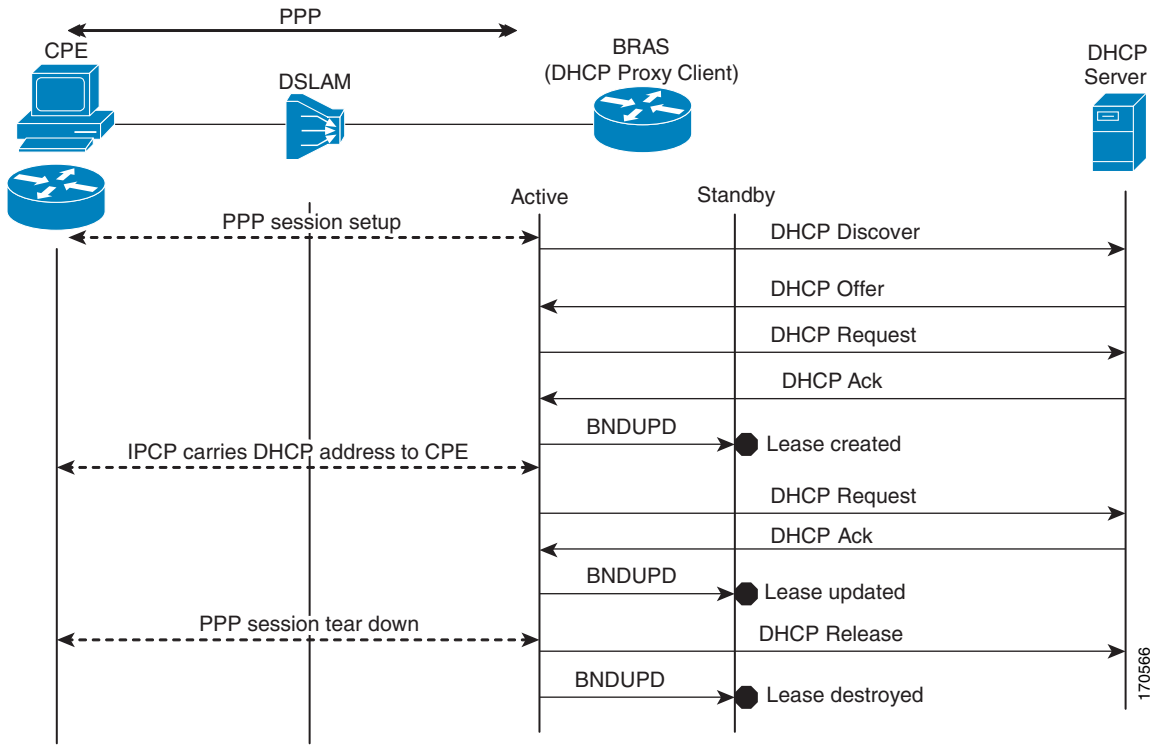
Figure 2 DHCP Maintaining States with an IP Unnumbered Interface



ISSU and SSO—DHCP Proxy Client

The DHCP proxy client enables the router to obtain a lease for configuration parameters from a DHCP server for a remote Point-to-Point Protocol (PPP) client. The DHCP proxy client that is ISSU and SSO aware is able to request a lease from the DHCP server and the state of the lease is synchronized between the active and standby RP. Figure 3 illustrates the process.

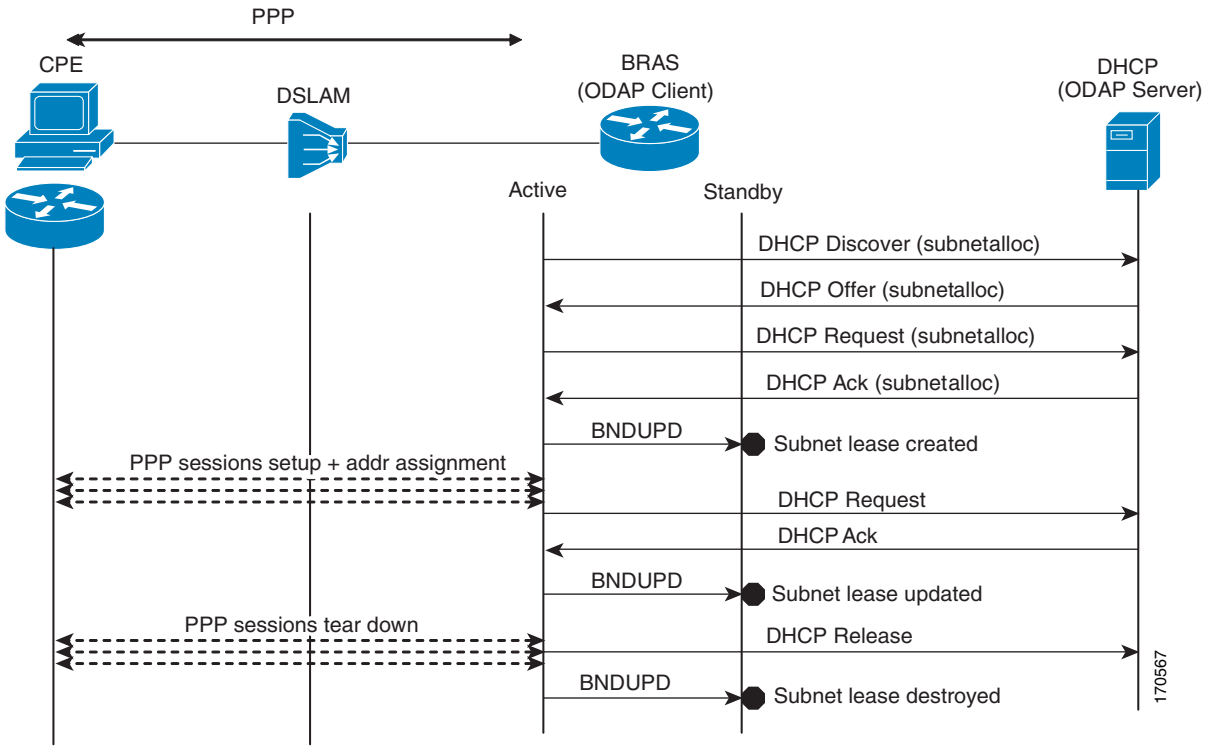
Figure 3 DHCP Proxy Client Lease Synchronization



ISSU and SSO—DHCP ODAP Client and Server

The DHCP on-demand address pool (ODAP) client that is ISSU and SSO aware can request a lease for a subnet from the DHCP ODAP server. After the DHCP ODAP server allocates the subnet to the client, the state of the lease is synchronized between the active and standby RP through binding updates. Following a switchover event, the DHCP ODAP client can continue to allocate IP addresses from the same subnets and also continue to renew the subnets from the DHCP ODAP server. Figure 4 illustrates the process.

Figure 4 ODAP Subnet Lease Synchronization



How to Configure DHCP High Availability

There are no configuration tasks. The DHCP high availability features are enabled by default when the redundancy mode of operation is set to SSO.

Configuration Examples for DHCP High Availability

There are no configuration examples for DHCP high availability features.

Additional References

The following sections provide references related to DHCP high availability features.

Related Documents

Related Topic	Document Title
DHCP commands: complete command syntax, command modes, command history, defaults, usage guidelines, and examples	"DHCP Commands" chapter of the *Cisco IOS IP Addressing Services Command Reference,* Release 12.4T.
DHCP conceptual and configuration information	*Cisco IOS IP Addressing Services Configuration Guide*, Release 12.4T
In-Service Software Upgrade process conceptual and configuration information	*Cisco IOS In-Service Software Upgrade Process* feature module, Release 12.2(31)SB2
Nonstop Forwarding conceptual and configuration information	*Cisco Nonstop Forwarding* feature module, Release 12.2(31)SB2
Stateful switchover conceptual and configuration information	*Stateful Switchover* feature module, Release 12.2(31)SB2

Standards

Standard	Title
No new or modified standards are supported by this feature.	—

MIBs

MIB	MIBs Link
No new or modified MIBs are supported by this feature.	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

RFC	Title
No new or modified RFCs are supported by this feature.	—

Technical Assistance

Description	Link
The Cisco Technical Support & Documentation website contains thousands of pages of searchable technical content, including links to products, technologies, solutions, technical tips, tools, and technical documentation. Registered Cisco.com users can log in from this page to access even more content.	http://www.cisco.com/techsupport

Command Reference

This section documents new commands only.

- **debug dhcp redundancy**
- **debug ip dhcp server redundancy**

debug dhcp redundancy

To display debugging information about DHCP proxy client redundancy events, use the **debug dhcp redundancy** command in privileged EXEC mode. To disable the display of debugging output, use the **no** form of this command.

debug dhcp redundancy

no debug dhcp redundancy

Syntax Description

This command has no arguments or keywords.

Command Default

Debugging output is disabled for DHCP redundancy events.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.2(31)SB2	This command was introduced.

Examples

The following example displays debug messages regarding DHCP redundancy events. The last line is output when the **debug dhcp redundancy** command is enabled. The line indicates that the active Route Processor has sent a dynamic lease synchronization message for IP address 10.1.1.1:

```
Router# debug dhcp redundancy

*Mar 15 10:32:21: DHCPD: assigned IP address 10.1.1.1 to client
*Mar 15 10:32:21: DHCPD: dynamic sync sent for 10.1.1.1
```

Related Commands

Command	Description
debug ip dhcp server redundancy	Displays debugging information about DHCP server and relay agent redundancy events.

debug ip dhcp server redundancy

To display debugging information about DHCP server and relay agent redundancy events, use the **debug ip dhcp server redundancy** command in privileged EXEC mode. To disable the display of debugging output, use the **no** form of this command.

debug ip dhcp server redundancy

no debug ip dhcp server redundancy

Syntax Description

This command has no arguments or keywords.

Command Default

Debugging output is disabled for DHCP server and relay agent redundancy events.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.2(33)ZW	This command was introduced.
12.2(31)SB2	This command was integrated into Cisco IOS release 12.2(31)SB2.

Usage Guidelines

Use this command with caution. Many bindings being synchronized between the active and standby Route Processor (RP) can trigger a large amount of debugging output.

Examples

The following example displays debug messages regarding DHCP server and relay agent redundancy events. The last line (and only that line) is output when the **debug ip dhcp server redundancy** command is enabled. The line indicates that a binding update message has been sent to the standby for the IP address 10.0.0.2 in the pool named “test.”

```
Router# debug ip dhcp server redundancy

*Mar 22 10:32:21: DHCPD: assigned IP address 10.0.0.2 to client
0063.6973.636f.2d30.3030.342e.3465.6130.2e30.3831.632d.4661.312f.302e.31.
*Mar 22 10:32:21:  DHCPD: lease time = 3600
*Mar 22 10:32:21: DHCPD: dhcpd_lookup_route: host = 10.0.0.2
*Mar 22 10:32:21: DHCPD: dhcpd_lookup_route: index = 0
*Mar 22 10:32:21: DHCPD: dhcpd_create_and_hash_route: host = 10.0.0.2
*Mar 22 10:32:21: DHCPD: dhcpd_create_and_hash_route index = 0
*Mar 22 10:32:21: DHCPD: dhcpd_add_route: lease = 3600
*Mar 22 10:32:21: DHCPD: dynamic sync completed for 10.0.0.2 in pool test
```

Related Commands

Command	Description
debug dhcp redundancy	Displays debugging information about DHCP proxy client redundancy events.

Feature Information for DHCP High Availability Features

Table 1 lists the release history for these features.

Not all commands may be available in your Cisco IOS software release. For release information about a specific command, see the command reference documentation.

Use Cisco Feature Navigator to find information about platform support and software image support. Cisco Feature Navigator enables you to determine which Cisco IOS and Catalyst OS software images support a specific software release, feature set, or platform. To access Cisco Feature Navigator, go to http://www.cisco.com/go/cfn. An account on Cisco.com is not required.

Note Table 1 lists only the Cisco IOS software release that introduced support for a given feature in a given Cisco IOS software release train. Unless noted otherwise, subsequent releases of that Cisco IOS software release train also support that feature.

Table 1 Feature Information for DHCP High Availability Features

Feature Name	Releases	Feature Information
ISSU—DHCP Server	12.2(31)SB2	The DHCP server has been enhanced to support ISSU.
SSO—DHCP Server	12.2(31)SB2 12.2(33)SRB	The DHCP server has been enhanced to support SSO.
ISSU—DHCP Relay on Unnumbered Interface	12.2(31)SB2	The DHCP relay on unnumbered interface has been enhanced to support ISSU.
SSO—DHCP Relay on Unnumbered Interface	12.2(31)SB2 12.2(33)SRB	The DHCP relay on unnumbered interface has been enhanced to support SSO.
ISSU—DHCP Proxy Client	12.2(31)SB2	The DHCP proxy client has been enhanced to support ISSU.
SSO—DHCP Proxy Client	12.2(31)SB2	The DHCP proxy client has been enhanced to support SSO.
ISSU—DHCP ODAP Client and Server	12.2(31)SB2	The DHCP client and server have been enhanced to support ISSU.
SSO—DHCP ODAP Client and Server	12.2(31)SB2	The DHCP ODAP client and server have been enhanced to support SSO.

Glossary

CPE—customer premises equipment. Terminating equipment, such as terminals, telephones, and modems, supplied by the service provider, installed at customer sites, and connected to the network.

DSLAM—digital subscriber line access multiplexer. A device that connects many digital subscriber lines to a network by multiplexing the DSL traffic onto one or more network trunk lines.

ISSU—In Service Software Upgrade. ISSU is a process that allows Cisco IOS software to be updated or otherwise modified while packet forwarding continues.

ODAP—On-Demand Address Pool. ODAPs enable pools of IP addresses to be dynamically increased or reduced in size depending on the address utilization level. Once configured, the ODAP is populated with one or more subnets leased from a source server and is ready to serve address requests from DHCP clients or from PPP sessions.

RP—Route Processor. A generic term for the centralized control unit in a chassis.

SSO—Stateful Switchover. SSO refers to the implementation of Cisco IOS software that allows applications and features to maintain a defined state between an active and standby RP. When a switching occurs, forwarding and sessions are maintained. SSO makes an RP failure undetectable to the network.

Note See *Internetworking Terms and Acronyms* for terms not included in this glossary.