High Availability on the Cisco Catalyst 4500 E-Series

Several features of the Cisco Catalyst 4500 E-Series work together to provide a high degree of availability for the system, its supervisor cards, and software. This At-A-Glance lists the most relevant features and technologies.

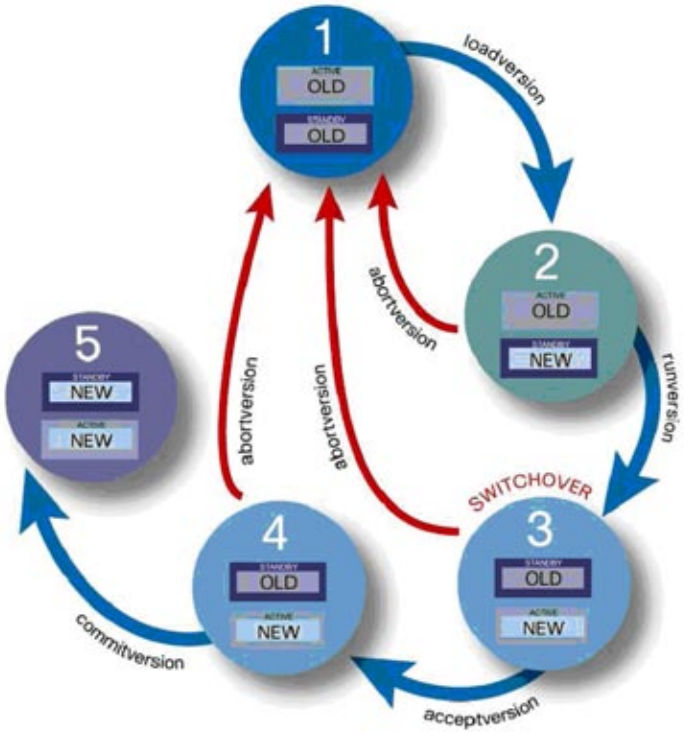
Table 1. Cisco Catalyst 4500 E-Series High-Availability Features

Feature	Description
In-Service Software Upgrade*	In-Service Software Upgrade (ISSU) allows full image upgrade and downgrade with less than 200 ms traffic disruption.
Nonstop Forwarding with Stateful Switchover*	Nonstop Forwarding with Stateful Switchover (NSF/SSO) maintains L2 and L3 adjacencies and forwarding of traffic during supervisor switchover.
Uplink Redundancy	Uplink ports on active and backup Cisco® Catalyst® 4500 Series Supervisor Engine 6-E forward traffic simultaneously.
Gateway Load Balancing Protocol	Gateway Load Balancing Protocol (GLBP) provides multiple redundant IP gateways.
EtherChannel®	Bundles up to eight links between a pair of switches into one logical link.
Power Supply Redundancy	Allows operation of the switch if one power supply fails.
Fan Redundancy	Hot-swappable fan tray with redundant fans.
Embedded Event Manager	Embedded Event Manager monitors the state of switch operation and allows scripted responses.
Online Insertion and Removal	Hot-swappable line cards, supervisor engines, power supplies, and fan trays.

In-Service Software Upgrade

ISSU allows customers to virtually eliminate planned outages for full image software upgrades or downgrades. It provides the means to upgrade or downgrade the Cisco IOS® Software in a Cisco Catalyst 4500 E-Series switch with redundant supervisors. ISSU is an administrator-initiated process of CLI commands issued in a specific order. The commands and the resulting supervisor states are illustrated in Figure 1.

Figure 1. ISSU Commands and States



SSO/NSF

Cisco Catalyst 4500 E-Series switches allow a redundant supervisor to take over if the active supervisor engine fails. With SSO enabled, if a hardware or software failure occurs, the redundant supervisor takes over as the active supervisor in less than one second. SSO preserves the state of L2 protocols and adjacencies, including:

- 802.3
- 802.3u
- 802.3x (Flow Control)
- 802.3ad (LACP)
- 802.1X

* Available Q1CY 08

- 802.1D
- 802.3af (In Line Power)
- Port Aggregation Protocol (PAgP)
- Dynamic ARP Inspection
- Dynamic Host Configuration Protocol (DHCP) Snooping
- IP Source Guard
- Multicast storm control/Broadcast storm control

NSF works with SSO to minimize the amount of time the network is unavailable following a supervisor switchover. NSF uses the capabilities of Layer 3 routing protocols and Cisco Express Forwarding to maintain routing protocol relationships and continue forwarding traffic when a redundant supervisor becomes the active supervisor. NSF works with the following routing protocols:

- Border Gateway Protocol (BGP)
- Open Shortest Path First (OSPF)
- Intermediate System-to-Intermediate System (IS-IS)
- Enhanced Interior Gateway Routing Protocol (EIGRP)

Supervisor Uplink Redundancy

The Supervisor Engine 6-E includes two 10 Gigabit Ethernet uplinks. The Cisco Catalyst 4500 E-Series is designed such that the uplink ports on both the active and redundant supervisor engines are active and forwarding traffic at the same time. The uplinks operate in several modes. When both ports on both supervisor engines are forwarding traffic, the configuration is referred to as 2+2 redundancy. In the 2+2 configuration, the uplinks are oversubscribed 2:1. When only one port on each of the two supervisor engine carries traffic, the configuration is referred to as 1+1 redundancy, and each port forwards traffic at line rate.

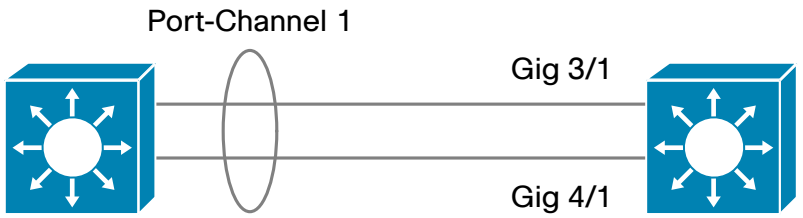
Gateway Load Balancing Protocol

GLBP provides automatic router backup for IP hosts configured with a single default gateway on an IEEE 802.3 LAN. Multiple first hop Cisco Catalyst 4500 E-Series switches combine to offer a single virtual first hop IP address while sharing the packet forwarding load. Should one of the switches fail, others act as redundant GLBP routers to continue forwarding traffic.

EtherChannel

EtherChannel bundles individual Ethernet links into one logical link. On the Cisco Catalyst 4500 E-Series, EtherChannel can bundle up to eight individual Fast Ethernet or Gigabit Ethernet links into a single Port-Channel interface of 800 Mbps or 8 Gbps, respectively. EtherChannel can also bundle two 10 Gigabit Ethernet links into a 20 Gigabit Port-Channel interface. Figure 2 illustrates an EtherChannel connection configured between two Cisco Catalyst 4500 E-Series switches.

Figure 2. EtherChannel



Power Supply Redundancy

The Cisco Catalyst 4500 E-Series supports dual redundant power supplies. There are five internal AC power supply models and two DC power supply options. Two of the same power supply models are required for redundant operation. In redundant mode, both power supplies are online, and each provides half the power the system is using. The supervisor engine does not allocate more power than can be supplied by a single power supply.