Access Layer-Enabling High Availability with Cisco Catalyst Switches

At-A-Glance

High Availability in the Access Layer

Businesses continue to converge their networks and roll out IP telephony, video applications, and other real-time collaboration tools. As part of this transition to converge applications onto one IP network, enterprises are taking a new look at providing higher availability in the wiring closet, because it is a critical single point of failure in today's converged networks.

As a critical and integral tool, the network has become the backbone of the organization. More than ever before, business success is closely linked to the network's ability to deliver applications. Figure 1 shows the cost to businesses resulting from network outages. Users unable to access the network can cost organizations hundreds of dollars per hour

Figure 1 Costs of Loss of Access

More than just Revenue Impacted

- Impaired Performance
- Damaged Reputation
- Additional Expenses
- Employee Frustration
- National/International Security

Industry Sector	Revenue/ Hour	Revenue/ Employee-Hour
Energy	$2,817,846	$569
Telecommunications	$2,066,245	$186
Manufacturing	$1,610,654	$134
Financial Institution	$1,495,134	$1,079
Insurance	$1,202,444	$370
Retail	$1,107,274	$244
Transportation	$668,586	$107
Average	**$1,010,536**	**$205**

Source: META Group (Gartner) Comprehensive of HA Data Center Networking (2004)
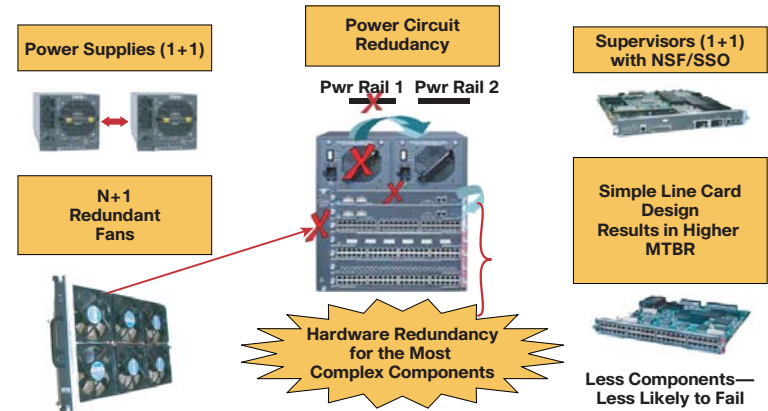
With Cisco® Catalyst® Series switches, organizations can deploy industry-leading high-availability features and technology innovations that can mitigate downtime, at both a device level and a network protocol level.

Device-Level High Availability

Enterprises can choose to deploy a fixed platform or a modular-based platform. For enterprises that choose to deploy a fixed solution, the Cisco Catalyst 3750 delivers the innovative StackWise technology to help ensure higher availability. This technology brings to fixed switches a level of resiliency previously not found in stackables.

The Cisco Catalyst 6500 and 4500 Series modular chassis advance high availability with numerous innovative features to help ensure high levels of resiliency anywhere in the network, but especially in the wiring closet. Figure 2 show the physical redundant features of Cisco Catalyst modular switches that are optimized for deployment in "single connection" environments, such as the wiring closet.
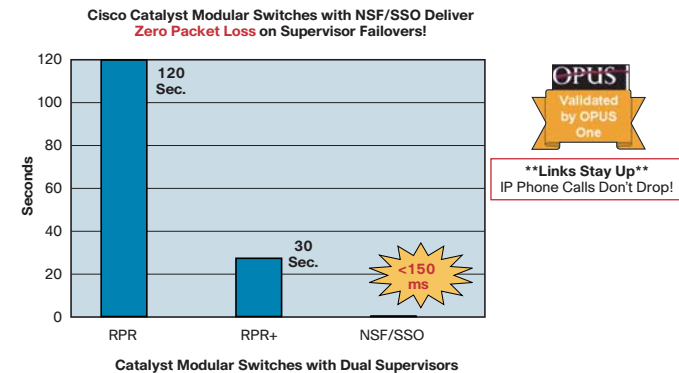
Figure 2 Modular Chassis Redundancy

Power Supplies (1+1)

Power Circuit Redudancy
Pwr Rail 1   Pwr Rail 2

Supervisors (1+1) with NSF/SSO

N+1 Redundant Fans

Simple Line Card Design Results in Higher MTBR

Hardware Redundancy for the Most Complex Components

Less Components— Less Likely to Fail

Nonstop Forwarding/Stateful Switchover

In modular chassis with dual supervisors, Nonstop Forwarding/State Switchover (NSF/SSO) synchronizes information between the primary and backup supervisors, allowing for rapid supervisor switchover in case the primary fails. Figure 3 shows test results with NSF/SSO enabled, with subsecond switchover times. Test results show that Cisco Catalyst modular switches with NSF/SSO deliver zero packet loss on supervisor failure, meaning that IP phone calls do not drop.

Figure 3 NSF/SSO OPUS Test

Cisco Catalyst Modular Switches with NSF/SSO Deliver Zero Packet Loss on Supervisor Failovers!

120 Sec.
30 Sec.
<150 ms

Seconds

RPR   RPR+   NSF/SSO

Catalyst Modular Switches with Dual Supervisors

OPUS Validated by OPUS One

Links Stay Up IP Phone Calls Don't Drop!

NSF/SSO is an essential feature for single points of termination in the wiring closet, especially in converged networks, where users are heavily dependent on the network for voice and data.

Control Plane Policing

Control plane policing allows users to configure a quality-of-service (QoS) filter that manages the traffic flow to the CPU to help ensure that malicious traffic does not cripple a switch by overwhelming the CPU.
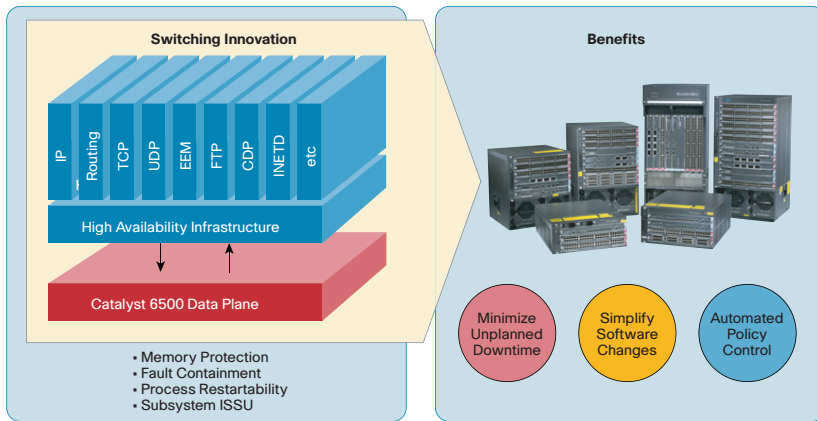
Generic Online Diagnostics

Generic Online Diagnostics (GOLD) provides proactive hardware and software diagnosis of faults before they become problems. It provides enhanced diagnostics during bootup and nonintrusive on-demand tests on live systems.

Cisco IOS Software Modularity

With modular Cisco IOS® Software (Figure 4), disruption of a single protocol or process because of internal or external influences will no longer affect the entire system. Because protocols/processes run independently, they can be upgraded without bringing down the entire device, critical for in-service maintenance and maintaining high availability.

Figure 4 Cisco IOS Software Modularity Benefits

Embedded Event Manager (EEM), part of Cisco IOS Software modularity, gives the switch the capability to automatically take a prescribed action based on an event. This automation tool further enhances the switch's capability to avoid an outage by taking immediate action.

Network Protocol-Level High Availability

Hot Standby Router Protocol (HSRP) and Virtual Router Redundancy Protocol (VRRP) target single points of termination in a Layer 2 access design. HSRP and VRRP provide a backup standby default gateway for users connected in the wiring closet.

Gateway Load Balancing Protocol

Gateway Load Balancing Protocol (GLBP) is an extension to HSRP. GLBP allows users to use the HSRP standby router while functioning as a standby. This allows better utilization of network investments by load balancing traffic across the active and standby gateway routers.

Routed Access (Layer 3 in the Wiring Closet)

More and more customers are considering extending routing to the access layer. Deploying routing in the access layer:

- Reduces network recovery times by converging around failures more quickly
- Eliminates the need for Spanning Tree Protocol in the network, reducing the need for multiple protocols
- Provides simpler configuration and troubleshooting
- Allows better utilization of bandwidth

Summary

High availability in the wiring closet is more critical with real-time application deployments.

Designing a highly available network can no longer be relegated to the core or distribution; it needs to extend to the wiring closet.

Cisco Catalyst switches provide extensive resiliency features to help network managers build highly available networks with device-level features and network-level features (Figure 5).

Figure 5 High Availability Hierarchical Network Design