Cisco Nexus 7000 Series Operational Continuity
Delivering a Zero Service Disruption Architecture

Why Is Operational Continuity Important in the Data Center?

As information technology is further integrated into core business operations, "best effort" availability is no longer acceptable. Businesses demand availability 24 hours a day from their IT infrastructure to meet business needs, customer expectations, and regulatory requirements.

Within the data center, the expanding role of the network, especially in virtualized environments, places increased demands on the network infrastructure to provide dependable, predictable, and scalable services

Cisco Nexus 7000 Series

The Cisco® Nexus 7000 Series (Figure 1) is the first in a new generation of data center–class switches and expands the Cisco portfolio of data center switching solutions. As the network platform for Cisco Data Center 3.0, the Cisco Nexus 7000 Series delivers new levels of operational continuity, transport flexibility, and infrastructure scalability to meet the demands of the next-generation data center. The Cisco Nexus 7000 Series also positions customers to effectively address emerging data center trends such as resource virtualization, faster transport (40 Gigabit Ethernet and 100 Gigabit Ethernet), and unified fabric with a hardware and software architecture designed for investment protection.

Figure 1.   Cisco Nexus 7000 Switch Series

For More Information
- Cisco Nexus 7000 Series: http://www.cisco.com/go/nexus7000
- Cisco NX-OS: http://www.cisco.com/go/nxos
- Cisco Data Center Network Manager (DCNM): http://www.cisco.com/go/dcnm

Operational Continuity in the Cisco Nexus 7000 Series

Zero-Service Disruption Architecture: The Cisco Nexus 7000 Series provides a set of hardware and software features that enable the system to continue providing network services in the event of component failure or other disruption

- No single point of failure in the hardware
- Multifaceted system resiliency with a modular operating system with built-in operational continuity mechanisms such as Cisco In Service Software Upgrade (ISSU)
- Resilient and stable network services based on time-proven Layer 2 and 3 technologies and protocols combined with innovative technologies such as Stateful Process Re-start to ensure non-stop operation in the most demanding environments

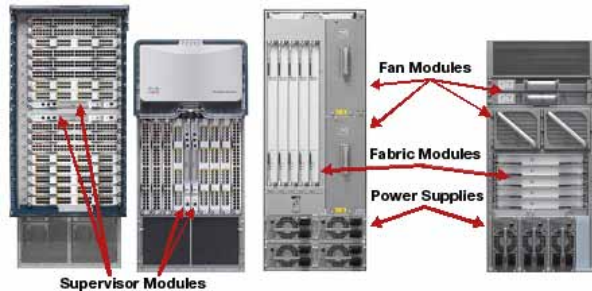Operational Manageability: The Cisco Nexus 7000 Series is designed to work the way you do

- Graceful operations simplify operational complexity
- Integrated management tools such as the Wireshark integrated onboard control plane packet analyzer, Connectivity Management Processor (CMP), Cisco Embedded Event Manager (EEM) for tracking anomalies, Cisco Smart Call Home feature, and Cisco Generic Online Diagnostics (GOLD) to reduce time to resolution

Virtual Device Contexts (VDCs): Cisco NX-OS allows virtualization of the control and management plane, creating separate operating environments for independent configuration and management. Thus separating the fault domains to improve system availability and avoid cascading service disruptions.

Hardware System Resiliency
- Supervisor redundancy: Dual supervisor modules running in active-standby mode help ensure operational continuity in the event of a supervisor failure.
- Switch fabric redundancy: Up to five switch fabric modules can be deployed to provide N+1 redundancy of the fabric. The fabric modules can be added to or removed from the system without service disruption.
- Redundant power supplies: Redundant power supplies supporting N+1 redundancy, input grid redundancy, and full redundancy provide variable levels of usable power and flexible load sharing for higher efficiency and resilience to unplanned outages.
- Redundant out-of-band channels: Gigabit Ethernet–based switched out-of-band channels between the supervisor and line cards enable independent control and management.
- Connectivity Management Processor (CMP): A separate CPU complex on each supervisor module provides advanced remote (lights out) management of the system through a dedicated 10/100/1000 Ethernet connection. See Figure 2.

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Figure 2.   Hardware Redundancies in Cisco Nexus 7000

Operating System Resiliency

The Cisco Nexus 7000 Series runs the Cisco NX-OS operating system. The modular design of this operating system enables greater redundancy, improved fault isolation, and improved resource efficiency. Process modularity within the OS allows modular patches and upgrades. Cisco NX-OS is designed with specific features to support operational continuity:

• System Manager orchestrates overall system functions, including supervisor switchover and system health monitoring.

• Persistent Storage Service (PSS) stores and manages the operational runtime information and configuration of the other platform services. PSS enables stateful process restart and stateful switchover between the supervisors.

• Messaging and Transaction Service (MTS) is a high-performance interprocess communications (IPC) service with built-in redundancy and persistency, helping ensure that no system updates or internal messages are lost.

Network Resiliency

Cisco NX-OS provides stateful restart of network processes, so that a network process can be restarted without having to relearn adjacencies, MAC addresses, etc. This feature increases both the processes capability of the system and the overall network stability: a process can be restarted before neighboring nodes notice.

• Graceful Restart: Standards-based extensions for graceful restart of Layer 3 protocols (Open Shortest Path First [OSPF], Intermediate System–to–Intermediate System [IS-IS], Border Gateway Protocol [BGP], Enhanced Interior Gateway Routing Protocol [EIGRP]. etc.) allow nonstop forwarding (NSF) on the data plane. The routing protocol reinserts into a network nondisruptively without loss of adjacencies or state information.

• Stateful Process Restart: Processes in Cisco NX-OS can resume operation at the previous check pointed state obtained from the PSS, helping ensure minimal disruption to data center operations.

• Protocol-based periodic refresh: Protocols with no graceful restart extensions, such as Routing Information Protocol Version 2 (RIPv2), Protocol Independent Multicast (PIM), Internet Group Management Protocol (IGMP), Multicast Source Discovery Protocol (MSDP), and Multicast Listener Discovery (MLD), use periodic refresh from neighbors to reestablish their state.

• Virtual Output Queuing (VOQ): A central arbitration mechanism and virtual output queues for buffer availability at the egress helps ensure delivery and traffic.

Operational Manageability

The Cisco Nexus 7000 Series Switches are designed with a number of integrated features to enhance troubleshooting and reduce time to resolution:

• Cisco Generic OnLine Diagnostics (GOLD): This tool performs diagnostic tests on the hardware and data path at bootup, on demand, and as scheduled to provide rapid fault isolation, proactive fault detection, and periodic critical health monitoring of the hardware.

• Cisco Embedded Event Manager (EEM): This powerful device and system management technology can harness network device intelligence and allows behavior customization based on triggered events.

• Smart Call Home: This free value-added service for Cisco SMARTNet® Service contract provides 24-hours-a-day monitoring of hardware and software components with interactive technical support. This feature combines the capabilities of GOLD and EEM for real-time alerts.

• Wireshark: Cisco NX-OS has an integrated packet-capture tool for network traffic destined for the control plane. This tool is built on top of open-source Wireshark called Ethanalyzer to facilitate troubleshooting, reducing time to isolation and improving the overall operational continuity of the network infrastructure.

• Open Extensible Markup Language (XML) interface: Every command is accessible through an open XML interface.

• Cisco Flexible NetFlow: Cisco Flexible NetFlow is the next generation of Cisco NetFlow and allows a high degree of customization for monitoring and accounting.

Why Invest in Operational Continuity in the Data Center?

System availability is a fundamental measure of IT infrastructure—even more so than performance or other measures. In recognition of this, Cisco invested significant R&D effort in building a platform designed to support continuous business operations. The investment is justified by the capability to avoid direct costs of system downtime through lost revenue or regulatory compliance issues. System downtime also generates other costs, from loss of productivity to undermining of customer trust.