



## Multicast in the Data Center

Servers in the data center use IP Multicast to disseminate information and communicate with clients or other application servers. Examples include video and IPTV servers using multicast and broadcast techniques to deliver content to their end users. IP Multicast helps conserve precious bandwidth in the data center. The Financial Services industry, especially the market data infrastructure relies extensively on IP multicast to deliver stock quotes. Increased reliance on multicast in next generation data center requires higher performance and capacity especially from the data center network switches. The Cisco Nexus 7000 Series addresses the performance requirements for IP multicasting in the data center.

## Cisco Nexus 7000 Series

The Cisco® Nexus 7000 Series is the first in a new generation of data center-class switches and expands Cisco's 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.

## For More Information

- Cisco Nexus 7000 Series:  
<http://www.cisco.com/go/nexus7000>
- Cisco NX-OS:  
<http://www.cisco.com/go/nxos>

## Multicast on Cisco Nexus 7000 Series Switches

Cisco Nexus 7000 Series Switches, Cisco NX-OS and the Cisco Data Center Network Manager (DCNM) provide a state-of-the-art platform with a feature-rich multicast implementation.

The Cisco NX-OS multicast feature set is built for the data center, where efficient handling of multicast traffic is critical. It lays the foundation for the development of innovative IP services, addressing current and future needs where optimization of traffic routing and forwarding is critical. Further, Cisco NX-OS enables full compatibility with other platforms based on Cisco IOS® Software to achieve the full benefit of a pervasive multicast deployment in a data center network.

The Cisco Nexus 7000 Series provides hardware acceleration for high-performance multicast handling through distributed egress replication, intelligent fabric load sharing, and multicast-aware scheduling mechanisms.

The virtualization architecture, a key feature of the Cisco Nexus 7000 series platform, increases the scalability for IP Multicast services in the data center.

## Optimized Multicast Delivery

The Cisco Nexus 7000 Series uses its system hardware capabilities along with the self-healing Cisco NX-OS operating system to provide the following features:

- **Bidirectional Protocol Independent Multicast (bidir-PIM):** Customers can deploy applications with multiple distributed sources while maintaining limited multicast states in the network. A single distribution tree can be used bidirectionally to allow multicast sources and receivers to be located on any branch of the tree. Many-to-many multicast connectivity is typical in the data center, where applications must communicate at high rates in a reliable manner.

The bidir-PIM architecture completely separates the control and data plane functions, making the control plane robust and also optimizing performance by ensuring that all data traffic is switched in the hardware.

- **Source-Specific Multicast (SSM):** The Cisco Nexus 7000 Series enables optimized multicast forwarding that provides shortest path multicast routing and routing path diversity. SSM mapping enables the static mapping of multicast sources to SSM groups, allowing customers to use SSM while not requiring a full deployment of IGMPv3.

## Performance, Scalability, and Flexibility

Cisco Nexus 7000 Series Switches combine high performance IP Multicast forwarding with advanced multicast features.

- Support for 20,000 entries for IPv4 multicast with egress replication
- Support for 2000 entries for IPv6 multicast with egress replication
- Support for 15,000 Layer 2 Internet Group Management Protocol (IGMP) snooping entries
- Fully distributed Layer 2, Layer 3 IPv4, and IPv6 multicast hardware forwarding
- Distributed multicast packet replication using egress replication

## Virtualized Multicast

Cisco Nexus 7000 Series supports Virtual Device Contexts (VDC's) that allow multicast protocols to be spawned on a per-VDC basis, increasing the scalability for multicast services in the data center. Further, with each VDC supporting an independent operating environment, it increases the fault isolation between processes across the VDC's.

## Optimized Multicast Control Plane

The Cisco Nexus 7000 Series supports the following multicast protocols in the control plane:

- **Multiprotocol Border Gateway Protocol (MBGP):** MBGP is used extensively in data centers to optimize insertion of services such as firewalls. Multi-hop MBGP with the extensions in BGP enables the dynamic insertion of services such as firewalls, that have limited routing capabilities, in the data centers with limited routing capabilities.
- **Multicast Source Discovery Protocol (MSDP):** MSDP allows multicast sources for a group to be known to all rendezvous points in different domains.
- **Anycast rendezvous point (Anycast RP):** Anycast RP in Cisco Nexus 7000 Series can be combined with MSDP in a traditional setup or supported with PIM for reduced operational complexity. Both options provide backward compatibility with other platforms and support enhanced manageability for networks where all rendezvous points are Cisco Nexus platforms.
- **Improved Auto-RP discovery:** The Auto-RP listener function is supported in Cisco Nexus 7000 Series and has increased capabilities enabling automatic rendezvous point discovery without requiring dense mode Protocol Independent Multicast (PIM).
- **Standards-based rendezvous point discovery:** Support for Bootstrap Router (BSR) and BSR listener, allowing the Cisco Nexus 7000 Series to interoperate with third-party platforms.
- **Virtual Route Forwarding (VRF) Lite:** The Cisco Nexus 7000 Series supports multicast within VRFs where each VRF is an independent routing domain. It also supports 8 bidir RPs per VRF, group address reuse and topology diversity. This increases the scalability and utilization of network resources.

## Multicast Security

Cisco Nexus 7000 Series is the first platform to deploy Cisco TrustSec which allows encryption of multicast traffic while maintaining optimal multicast replication in the network. By using IEEE 802.1AE link-layer cryptography, Cisco TrustSec transparently provides privacy and integrity to multicast flows without affecting performance or traffic handling characteristics.

## Enhanced IGMP Forwarding and Filtering

Cisco Nexus 7000 Series supports enhancements to IGMP:

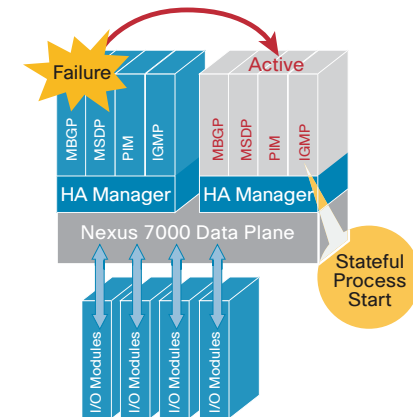
- **IGMP Filtering:** Allows customers to control the distribution of multicast services on each switch port.
- **IGMP Snooping:** Constrains multicast traffic to host or router ports, helping to ensure delivery of multicast traffic to the specific groups.

## Multicast High Availability

Cisco NX-OS includes built-in features such as memory transaction services, persistent storage, and interprocess communication, providing stateful process restart and stateful supervisor switchover and helping to ensure the continuity of multicast services.

- Cisco NX-OS supports In-Service Software Upgrade (ISSU), minimizing the effect of upgrades on mission-critical multicast applications.
- The granular modularity of Cisco NX-OS provides redundancy within the multicast process architecture, allowing a process to obtain state information from a fellow process instead of a neighboring device, minimizing disruption of network traffic.
- The Cisco Nexus 7000 Series distributed hardware-based forwarding and its nonstop forwarding (NSF) capabilities maintain uninterrupted data forwarding.

Figure 1. Stateful Switchover for Multicast Protocols



## Multicast Manageability

- **The Cisco Nexus 7000 Series** supports Cisco NetFlow, which allows customers to monitor and account for multicast traffic. Per-interface Cisco NetFlow allows customers deploying bidirectional trees to track active sources and improve the manageability of bidir-PIM.
- **Cisco Data Center Network Manager (DCNM)** provides a programmable Extensible Markup Language (XML) interface that enables communication with different management systems.
- **Cisco NX-OS** supports multicast ping and traceroute, which are instrumental in the troubleshooting of multicast-enabled networks.

## Why Invest in Multicast for the Data Center?

Every data center needs a scalable multicast infrastructure that also ensures reliable delivery of service. The Cisco Nexus 7000 Series, with its extensive multicast features, manageability, and high availability, provides the secure platform that increases the reach, flexibility, and richness of services delivered across the data center.