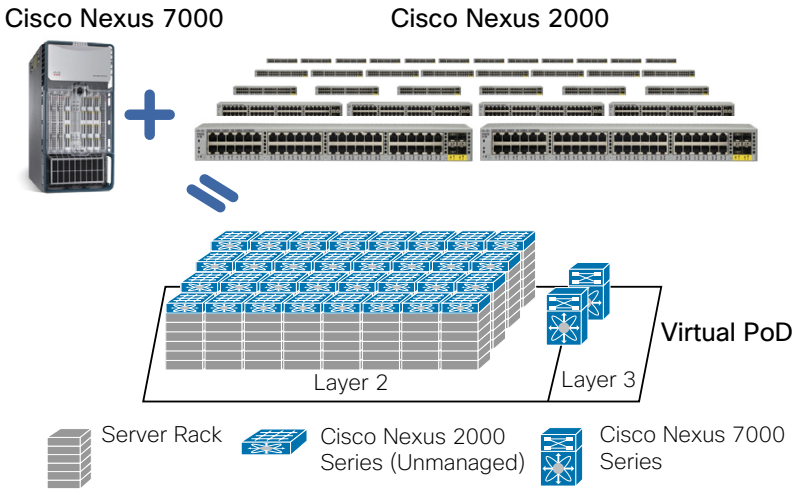
Cisco Nexus 7000 Series Switches and Cisco Nexus 2000 Series Fabric Extender

Cisco Nexus 2000 Series Fabric Extenders Overview

The Cisco Nexus® 2000 Series Fabric Extenders have transformed data center designs and enabled data center architects to gain new design flexibility while simplifying cabling infrastructure and reducing management complexity. The Cisco Nexus 2000 Series can use the Cisco Nexus 7000 and 5000 Series Switches as upstream switches. This document focuses on the combination of the Cisco Nexus 2000 Series and the Cisco Nexus 7000 Series (Figure 1).

Figure 1. Cisco Nexus 2000 Series and Cisco Nexus 7000 Series Combination



Modern data center designs rely on the concept of the point of demarcation (PoD), a repeatable construct that includes a variety of networking equipment servicing a group of hosts. The PoD is also typically a Layer 2/Layer 3 boundary. With its unique scalability and performance, the Cisco Nexus 7000 Series can aggregate all the servers in a data center PoD through several Cisco Nexus 2000 Series Fabric Extenders. This innovative virtual PoD architecture extends the comprehensive feature set of Cisco's premier data center switching platform to the host, while maintaining the cost-effective cabling typical of distributed top-of-rack (ToR) designs.

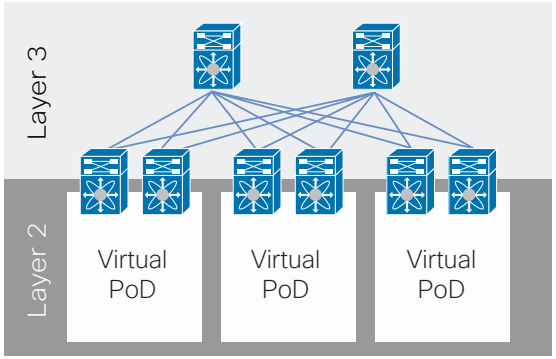
Cisco Nexus 7000 and Cisco Nexus 2000 Series Combination: Virtual PoD

Before the introduction of the Cisco Nexus 2000 Series, a PoD included several Layer 2 ToR access switches or end-of-row (EoR) switches. Those switches were then redundantly attached to a tier of distribution switches implementing the Layer 2 and 3 boundary.

The performance and scale of the Cisco Nexus 7000 Series along with the Nexus 2000 Series allows many more racks to be attached to a single pair of EoR switches. The efficient cabling of the ToR architecture is maintained by the introduction of the unmanaged Cisco Nexus 2000 Series Fabric Extenders, as shown in Figure 1: short copper cables connect the servers to a ToR Cisco Nexus 2000 Series Fabric Extender, and the fabric extender is itself linked using fiber to one of the access Cisco Nexus 7000 Series Switches. Twinax cables as well as fabric extender transceivers (FET; available as a bundle with the Cisco Nexus 2000 Series) are cost-effective alternatives to the Enhanced Small Form-Factor Pluggable (SFP+) optics typically used to implement the horizontal cabling.

From a management perspective, ports located on a Cisco Nexus 2000 Series Fabric Extender appear to the user as if they were local to the upstream switch. Thus, in the virtual pod architecture, all the servers now appear to be directly connected to a Cisco Nexus 7000 Series Switch. Figure 2 shows how this PoD model can be integrated into a data center by aggregating the access to another tier of Cisco Nexus 7000 Series Switches.

Figure 2. Data Center with Cisco Nexus 7000 Series Switch plus Cisco Nexus 2000 Series PoDs



The Cisco Nexus 2000 Series is bringing the scale and performance of the Cisco Nexus 7000 Series down to the access layer along with some unique industry wide features:

- Full hardware redundancy
- Real In-Service Software Upgrade (ISSU), with no packet loss for either Layer 2 or Layer 3 traffic
- Segmentation with virtual device contexts (VDCs), a Payment Card Industry (PCI) certified feature
- Port profiles, VLAN ACLs (VACLs), port ACLs (PACLs), and router ACLs (RACLs) that can now be applied to the whole pod in one operation
- Virtual Routing and Forwarding (VRF) Lite
- Up to 16,000 VLANs spread across four VDCs
- Large routing tables (FIB can hold up to 1 million entries), when connected to a M-Series module
- Large MAC address tables and access control list (ACL) tables (128,000 entries each), when connected to a M-Series module
- NetFlow (with 512,000 entries), when connected to a M-Series module
- FabricPath capabilities, when connected to a F2-Series module

Furthermore, the management of the solution has been greatly simplified:

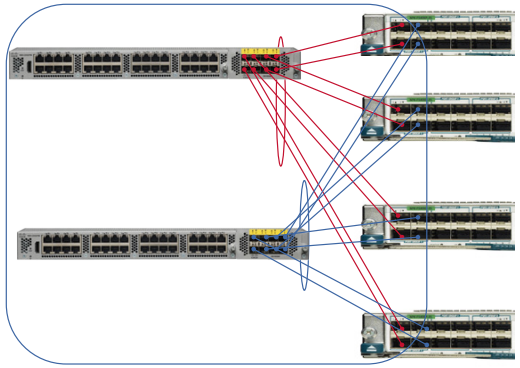
- All ports in the PoD are now managed in a single location, with a single console and MIB access.
- A software upgrade on the whole PoD can be achieved by installing a single image, with no traffic interruption.
- The PoD still provides the Layer 2/Layer 3 boundary. However, Layer 2 connectivity between its edge ports is achieved without resorting to the use of the Spanning Tree Protocol, thus making the solution immune to the limitations and risks of this protocol.

High Availability of the Cisco Nexus 7000 and 2000 Series Combination

The Cisco Nexus 2000 Series Fabric Extender connects to a single Cisco Nexus 7000 Series Switch, operating like a remote I/O module. The Cisco Nexus 7000 Series is a fully redundant platform from both the hardware and software perspectives. To extend this redundancy to the servers, the Cisco Nexus 2000 Series uplinks can be bundled in a PortChannel and distributed across several I/O modules on the Cisco Nexus 7000 Series Switch.

Figure 3 shows an example of two Cisco Nexus 2232TP 1G/10GE Fabric Extenders, each connected though eight uplinks to four different Cisco® 32-port 10-Gbps SFP+ I/O modules with (N7K-F248XP-25) on a Cisco Nexus 7000 Series Switch.

Figure 3. Connection of Cisco Nexus 2000 Series to Cisco Nexus 7000 Series

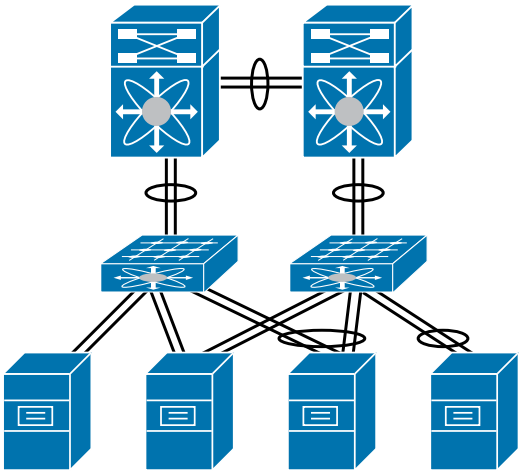


Even if there is no theoretical limit, the connection of up to 32 Cisco Nexus 2000 Series Fabric Extenders to a single Cisco Nexus 7000 Series Switch is validated and supported in Cisco NX-OS Software Release 5.2. These connections represent a pod with 1500-Gbps attached servers using a single point of management.

Host-to-Cisco Nexus 2000 Series Connectivity Options

A host can connect to a Cisco Nexus 2000 using all the most common technologies like network interface card (NIC) teaming or MAC pinning (active-active uplinks using the Cisco Nexus 1000V Switch, for example) or port channels. On the top of those, the Nexus 2000 supports the Virtual Port Channel (vPC) functionality, a unique Cisco feature that allows hosts to attach to a pair of Cisco Nexus 2000 with active/active redundancy based on standard port channeling. Those options are represented in Figure 4 below.

Figure 4. Options for Connecting Servers to the Cisco Nexus 2000 Series



Hardware Support for the Cisco Nexus 7000 and 2000 Series Combination

The Cisco Nexus 2000 Series can be connected to following Cisco Nexus 7000 Series I/O modules, listed in Table 1.

Table 1. I/O Modules

I/O Module	Description	Minimum NX-OS Software
N7K-M132XP-12	32-port 10-Gbps SFP+ I/O module	5.1
N7K-M132XP-12L	32-port 10-Gbps SFP+ I/O module with XL tables	5.1
N7K-F248XP-25	48-port 10-Gbps SFP+ I/O module	6.0

Table 2 below lists the Nexus 2000 models supported.

Nexus 2000 Model	Description	Minimum NX-OS Software
Nexus 2248TP	48 server ports 100/1000Base-T, 4 uplinks 10 GE SFP+	NX-OS 5.1
Nexus 2224TP	24 server ports 100/1000Base-T, 2 uplinks 10 GE SFP+	NX-OS 5.2
Nexus 2232PP	32 server ports 10GE, 8 uplinks 10 GE SFP+	NX-OS 5.2

Conclusion

The Cisco Nexus 2000 Series in combination with the Cisco Nexus 7000 Series provides a model that achieves both the cabling cost efficiency of a ToR architecture and the efficient management of an EoR deployment. With the scalability and performance of the Cisco Nexus 7000 Series, this architecture allows an entire PoD to be managed on a single switching platform that provides an exceptional feature set to the access layer. This capability is made possible by the data center–class reliability and redundancy built in to the Cisco Nexus 7000 Series.

For More Information

Cisco Nexus 7000 Series Switches:
http://www.cisco. com/en/US/products/ps9402/index.html

Cisco Nexus 2000 Fabric Extenders at a glance:
http://www.cisco.com/en/US/prod/collateral/switches/ps9441/ps10110/at_a_glance_c45-511599.pdf