

Simplified 400-Gbps Cabling Deployment Solutions with Cisco Nexus 3000 Series Switches

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What you will learn

With the ever-expanding bandwidth needs that virtualization and cloud technologies have applied to the data center network, staying ahead of the curve is extremely important to maintain a competitive advantage. This document introduces products from Cisco and Panduit that address the associated needs. This document also maps the logical designs to the physical layout and displays those products deployed within the data center network. The first section of this document provides specifications for the Cisco Nexus® 3000 Series Switches. The second section describes the cabling scenarios and the optics needed for the interworking of the products from both companies. The last portion of the document summarizes Panduit product offerings and next steps.

Introduction

Data centers are undertaking some profound changes due to ongoing data-center consolidation, virtualization, and cloud technology and increasing demands on application workload extensivity and agility. All these driving forces are changing every facet of the data center, flattening its topology from the traditional core-aggregation-access three-tier design to the spine-leaf two-tier architecture, boosting its bandwidth capacity from 1GE at access and 10GE at aggregation to 10GE/25GE/50GE/100GE at the leaf and 40GE/100GE/400GE at the spine, and morphing its operational model from a per-box CLI manual approach to a system-level automated process through Restful API. While performance, bandwidth, and latency are remaining as the most important elements in data-center networks, management and operational agility and simplicity have risen to the top of mind of data-center architects and operators.

Cisco Nexus 3000 Series Switches are the next-generation products aiming to take data-center networks through all of these transitions and even beyond. With their unprecedented performance and port density, they are well suited for both the traditional three-tier design and spine-leaf design, providing forwarding capacity for fast increasing server-to-server traffic. They are also equipped with unmatched programmability and automation functionalities to transform the data-center network management model.

Cisco Nexus 3000 Series Switches

The Cisco Nexus 3000 Series Switches are ideal for general-purpose deployments, High Performance Computing (HPC), High Frequency Trading (HFT), Massively Scalable Data Centers (MSDCs), and cloud networks. Designed for data-center top-of-rack deployments, the Cisco Nexus 3000 Series provide 24 to 256 ports, offering flexible connectivity, high performance, and a comprehensive feature set to meet various data center requirements.

Cisco Nexus 3000 400G switches

Two of the Cisco Nexus 3000 Series Switches (Table 1) are designed to provide 400 Gbps connectivity. The Cisco Nexus 3432D-S (Figure 1) is a 1RU fixed switch offering 32 ports of 40/50/100/400 Gbps (QSFP-DD) with a non-blocking switch architecture. The Cisco Nexus 3408-S (Figure 2) is a 4RU fixed switch offering 32 ports of 400 Gbps (QSFP-DD) with a non-blocking switch architecture. The 3432D-S is well suited for data-center Top-of-Rack (ToR). The 3408-S switch is intended for aggregation, core, or spine applications.

Table 1. Cisco Nexus 3400 Switch details

	Cisco Nexus 3432D-S	Cisco 3408-S
Rack Unit (RU)	1	4
Switching capacity	25.6 Tbps	25.6 Tbps
Interface type	32 QSFP-DD	32 QSFP-DD or 128 QSFP28
Maximum 10 GE ports	128	-
Maximum 25 GE ports	128	-
Maximum 40 GE ports	32	128
Maximum 50 GE ports	128 (PAM4)	-
Maximum 100 GE ports	128	128
Maximum 400 GE ports	32	32



Figure 1.
Cisco Nexus 3432D-S

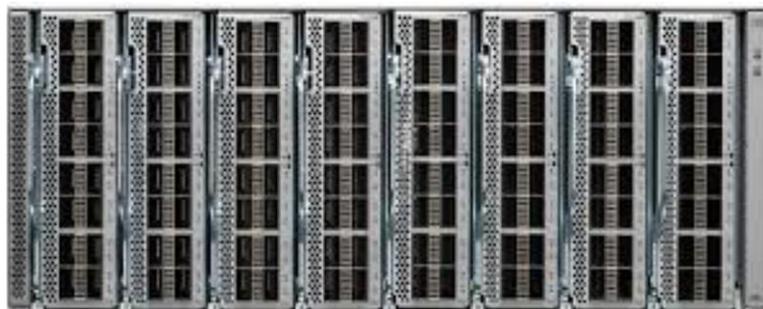


Figure 2.
Cisco Nexus 3408-S

Cisco and Panduit 400G wiring scenarios

The following scenarios in this section present the high-level cabling and optics requirements for the Cisco Nexus 3000 series 400G switches. Typical wiring solutions that include products from Cisco and Panduit are described.

The wiring scenarios described here can be used in a Cisco Nexus 3000 Series 400G Switch deployment.

PanMPO Connector

The PanMPO™ Connector (Figure 3) is Panduit's revolutionary MPO connector that protects your fiber infrastructure investment and improves operational efficiency to save time and money. With the PanMPO Connector, customers can change the polarity and gender of their fiber cable assemblies on the fly. This unique, patented connector helps to ease migration from 10G Ethernet to 40G/100G and 400G Ethernet while keeping the installation in compliance.

- Easily convert between male and female genders and between key-up and key-down polarity for a standards-compliant 10G, 40G/100G, or 400G Ethernet installation
- Connector changes are made in the field, as needed
- Always have the right cable assembly on hand
- Available on trunks, harnesses, interconnects, and reference cords

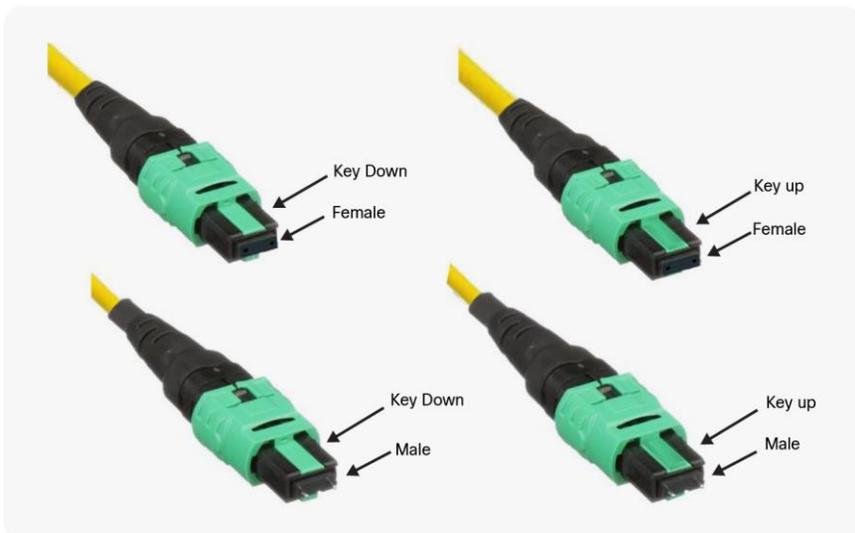


Figure 3.
PanMPO Connector options

PanMPO single-mode 400G connectivity

Connecting a Cisco Nexus 3432D-S switch to Cisco Nexus 3408-S switch using QSFP-DD-to-QSFP-DD PanMPO connectivity for single-mode connectivity, see Figure 4.

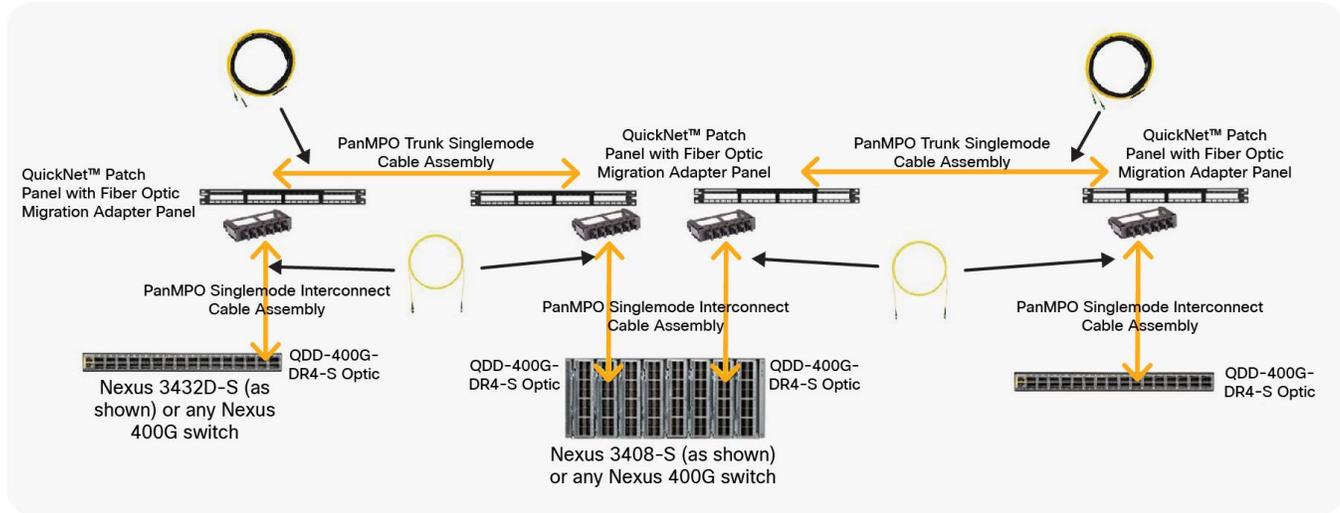


Figure 4.
Cisco Nexus 3432D-S to Cisco Nexus 3408-S PanMPO to PanMPO single-mode cabling components

Table 2 shows the Cisco and Panduit optics and cabling options with corresponding part numbers for a QSFP-DD - to QSFP-DD multimode connection. Figure 5 shows a PanMPO cabling scenario.

Table 2. Cisco Nexus 3000 Series Switches PanMPO to PanMPO multimode QSFP-DD optics and cabling products

Cisco product description	Cisco part number
400GBASE DR4-S QSFP-DD, 500m with OS2	QDD-400G-DR4-S
Panduit product description	Panduit part number
QuickNet 24-Port Patch Panel	QPP24BL
QuickNet Fiber Optic Migration Adapter Panel	FQMAP66BL
QuickNet PanMPO Interconnect Cable Assembly (OS2) (Configured with Female to Female, Method B*)	F9TRP7N7NBNF**
QuickNet PanMPO Trunk Cable Assembly (OS2) (Configured with Male to Male, Method B*)	F9TYP8585BAF**

* PanMPO cable assemblies can change polarity and gender as needed, but should be ordered with the polarity and gender configuration required to accelerate installation.

** Insert the required distance for the correct Panduit product number (for example, a three-foot cable is 003 or FXTYP8E8EBAF003).

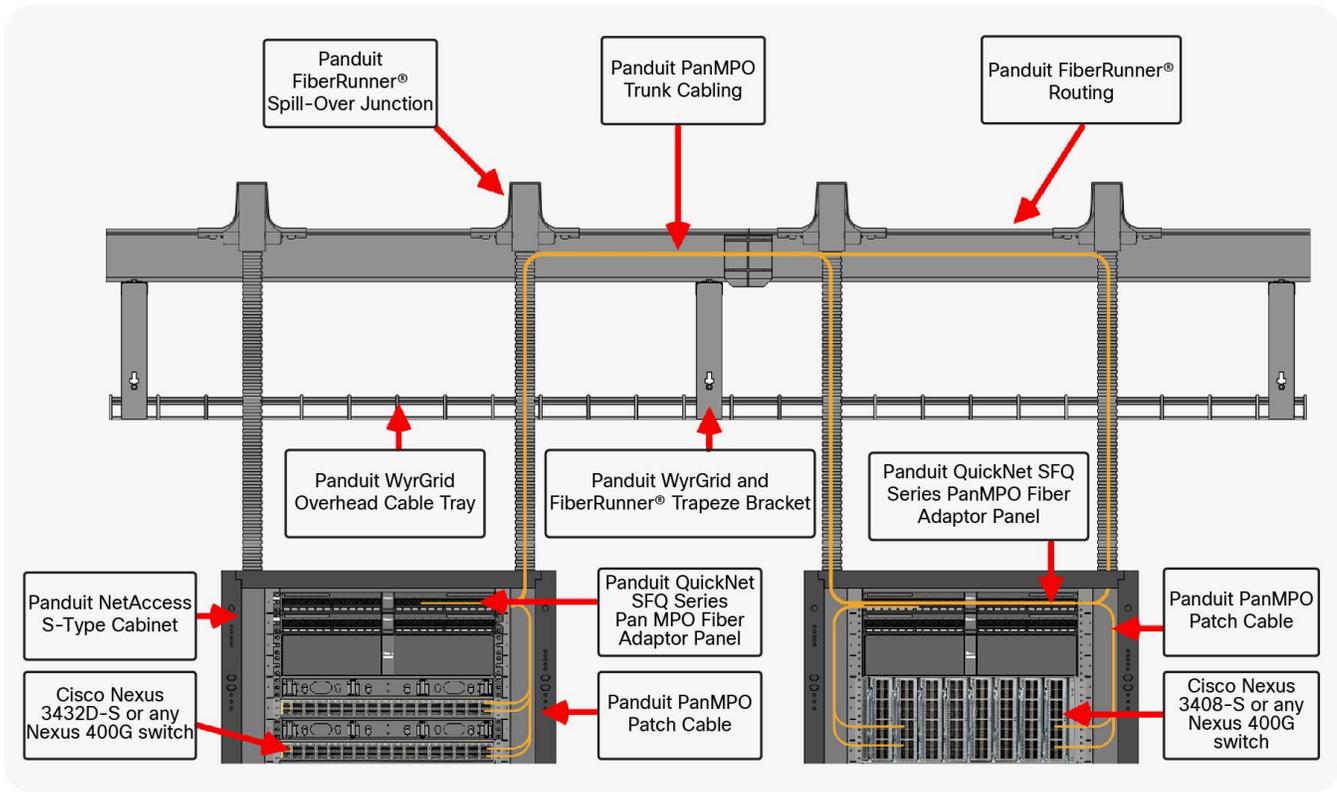


Figure 5. Cisco Nexus 3000 Series Switch PANMPO to PANMPO cabling diagram

LC duplex single-mode 400G connectivity

Connecting a Cisco Nexus 3432D-S switch to Cisco Nexus 3408-S switch using QSFP-DD-to-QSFP-DD LC duplex Connectivity for single-mode connectivity is shown in Figure 6.

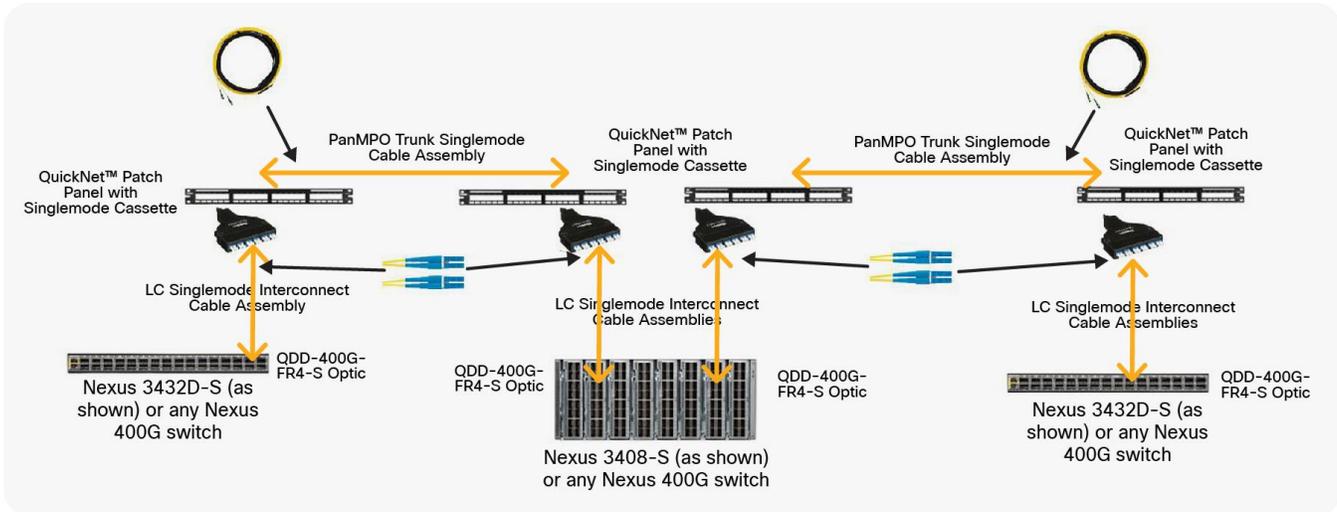


Figure 6. Cisco Nexus 3432D-S to Cisco Nexus 3408-S LC duplex to LC duplex single-mode cabling components

Table 3 shows the Cisco and Panduit optics and cabling options with corresponding part numbers for a QSFP-DD - to QSFP-DD multimode connection. Figure 7 also shows this scenario.

Table 3. Cisco Nexus 3000 Series Switches LC to LC single-mode QSFP-DD optics and cabling products

Cisco product description	Cisco part number
400GBASE FR4-S QSFP-DD, 2km with OS2	QDD-400G-FR4-S
Panduit product description	Panduit part number
QuickNet 24-Port Patch Panel	QPP24BL
QuickNet SFQ Universal Cassette, six LC Duplex Adapters to PanMPO	FQ9N-12-10U
QuickNet LC Interconnect Cable Assembly (OS2) – Push/Pull	F92ERQ1Q1SNF**
QuickNet PanMPO Trunk Cable Assembly (OS2) (Configured with Female to Female, Method B*)	F9TYP7575BAF**

* PanMPO cable assemblies can change polarity and gender as needed, but should be ordered with the polarity and gender configuration required to accelerate installation.

** Insert the required distance for the correct Panduit product number (for example, a three-foot cable is 003 or FX8RP7NUSQNFoo3).

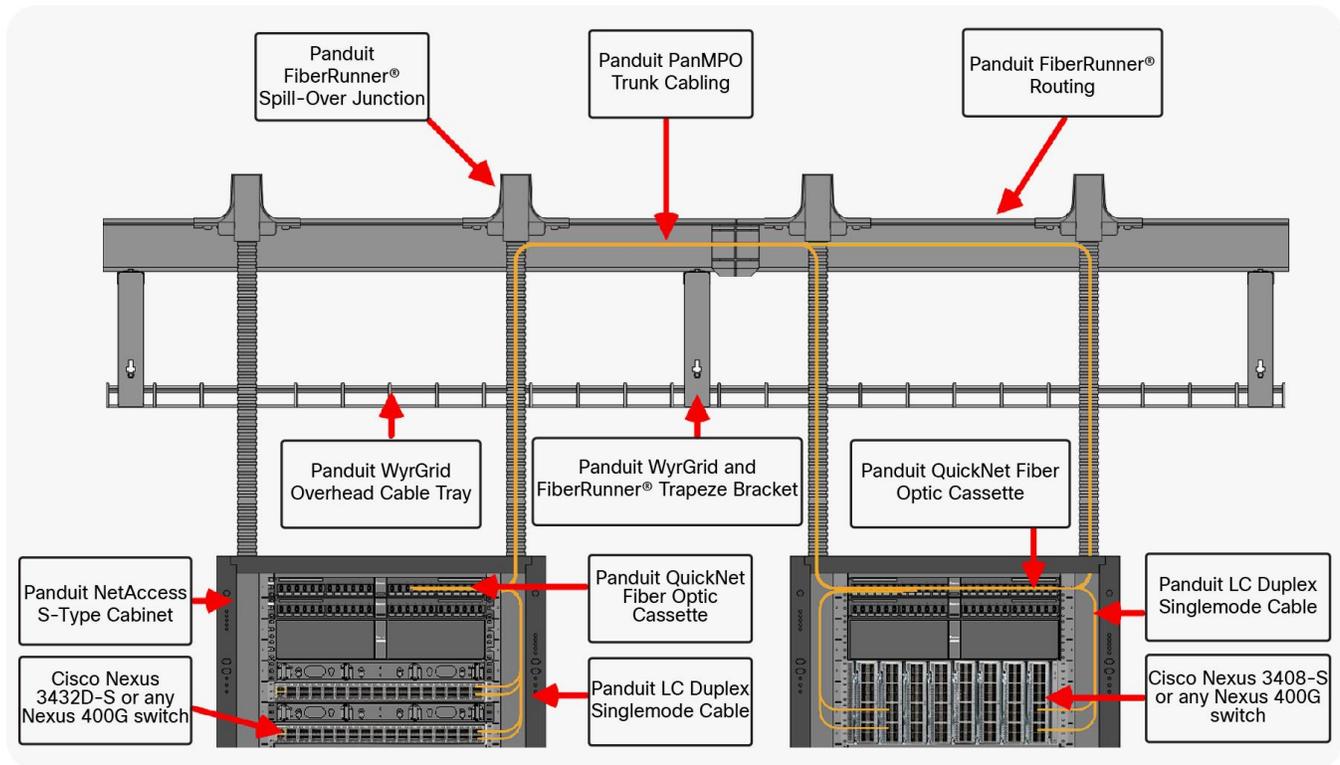


Figure 7. Cisco Nexus 3000 Series Switch LC duplex to LC duplex single-mode cabling diagram

PanMPO to (4) LC duplex single-mode 400G to (4) 100G connectivity

Connecting a Cisco Nexus 3432D-S switch to a Cisco Nexus 3408-S switch using QSFP-DD-to-QSFP-DD PanMPO to (4) LC duplex connectivity for single-mode connectivity is shown in Figure 8.

PanMPO 400G to (4) 100G LC single-mode breakout

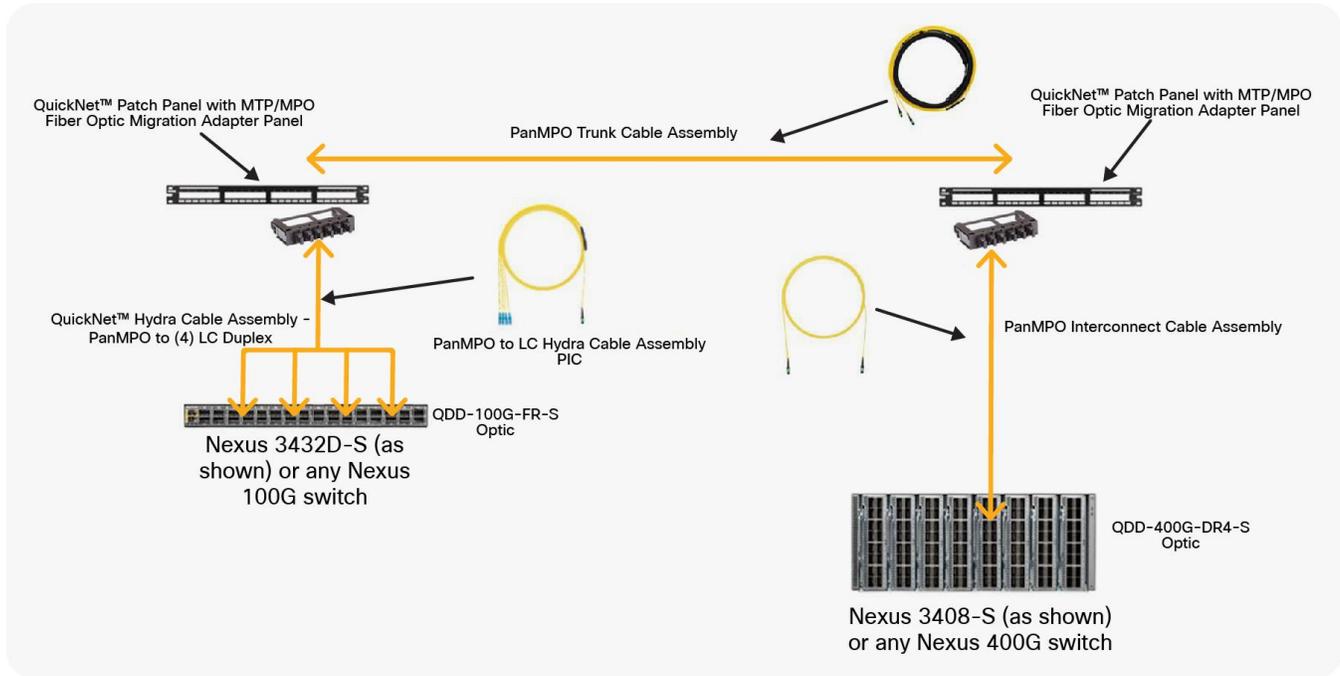


Figure 8.
Cisco Nexus 3000 PanMPO to (4) LC duplex breakout cabling components

Table 4 shows the Cisco and Panduit optics and cabling options with corresponding part numbers for a PanMPO 4-to-1 conversion harness cable assembly multimode connection. Figure 9 shows a PanMPO 4-to-1 conversion harness cable assembly cabling scenario.

Table 4. Cisco Nexus 3000 PanMPO 4-to-1 conversion harness optics and cabling products

Cisco product description	Cisco part number
400GBASE DR4-S QSFP-DD, 500m with OS2	QDD-400G-DR4-S
100GBASE FR-S QSFP28, 2km with OS2	QSFP-100G-FR-S
Panduit product description	Panduit part number
QuickNet 24-Port Patch Panel	QPP24BL
QuickNet Fiber Optic Migration Adapter Panel	FQMAP66BL
QuickNet PanMPO Interconnect Cable Assembly (OS2) (Configured with Female to Female, Method B*)	F9TRP7N7NBNF**

Cisco product description	Cisco part number
QuickNet PanMPO Trunk Cable Assembly (OS2) (Configured with Male to Male, Method B*)	F9TYP8585BAF**
QuickNet PanMPO 4-to-1 Conversion Harness Cable Assembly (OS2) (Female MPO to (4) Duplex LC)	F98RP7NLSQNF**

* PanMPO cable assemblies can change polarity and gender as needed, but should be ordered with the polarity and gender configuration required to accelerate installation.

** Insert the distance for the correct Panduit product number (for example, a three-foot cable is 003 or FX8RP7NUSQNF003).

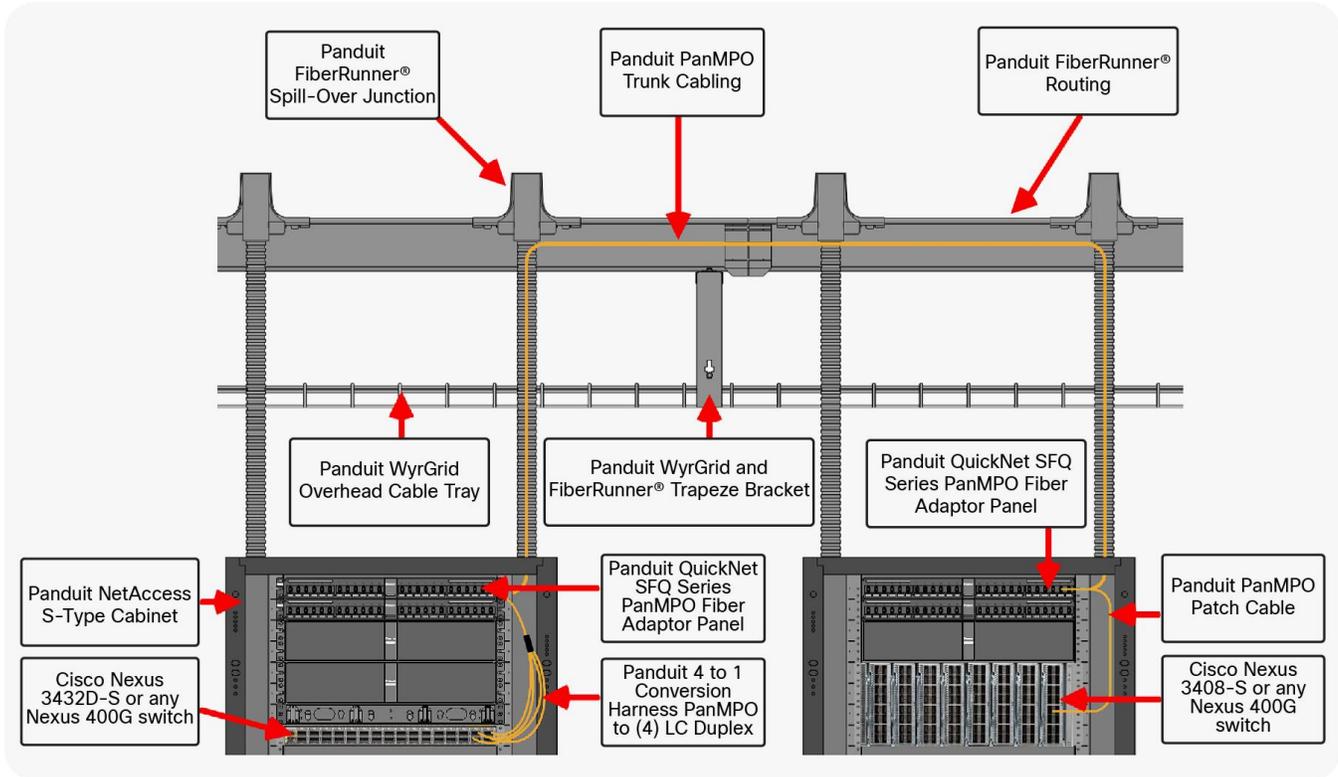


Figure 9.
Cisco Nexus 3000 PanMPO 4-to-1 conversion harness cable assembly cabling diagram

Panduit cabinet and cable management solutions

Panduit cabinet and cable management solutions help enable 10, 25, 40, 50, 100, and 400 Gigabit Ethernet switching platforms such as the Cisco Nexus 3000 Series Switches. Panduit cabinet and rack solutions support both two-post and four-post applications with sizes ranging from 42RU to 52RU. The cabinet solution also includes cable management and thermal management both inside and outside the cabinet. Panduit Thermal Ducting Solutions are specifically designed to work with the equipment used in a Cisco Nexus 3000 Series deployment. Panduit Pre-configured Infrastructure Solutions simplify and accelerate deployment, enhance thermal performance, and decrease energy use. Figure 10 shows some of the features of Panduit cabinet and cable management component options that could make up its solutions.

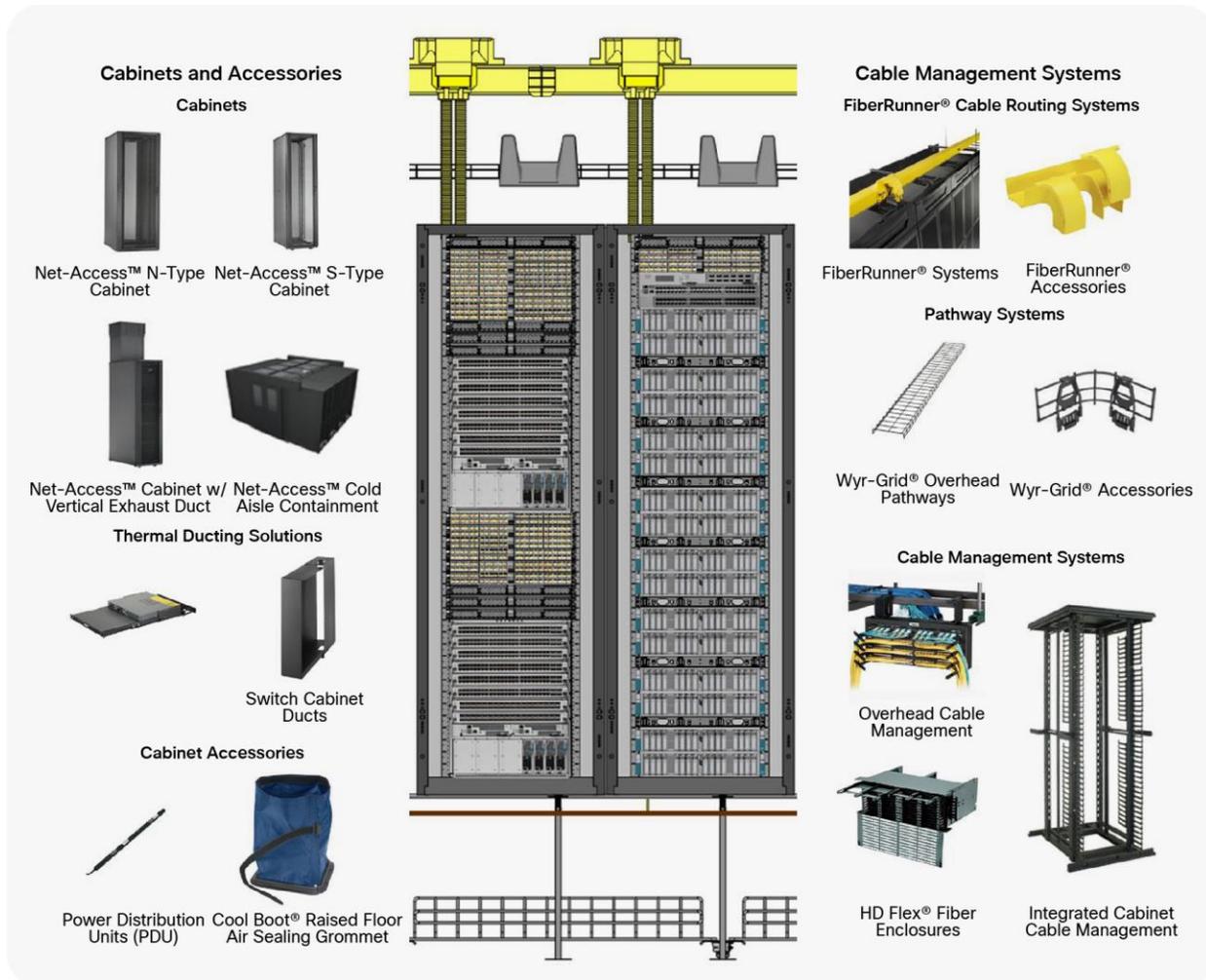


Figure 10.
Panduit cabinet and cable management products

Panduit Connectivity Solutions

Panduit Connectivity Solutions provide fiber optic and copper cabling solutions for 10, 25, 40, 50, 100, and 400 Gigabit Ethernet support switching platforms such as the Cisco Nexus 3000 Series Switches. The Panduit Signature Core Fiber Optic Cabling System is a Panduit innovative, high-performance fiber that balances both modal and chromatic dispersion, allowing it to extend its reach beyond standard requirements. Panduit is leading the way in the relevant standard bodies to promote enhanced customer expectations through the use of this new technology. Panduit Signature Core extends the radius of fiber networks to meet customer implementation requirements.

Panduit copper technology incorporated into SFP+ 10-Gbps direct-attach copper (DAC) cable assemblies and TX6A 10Gig and TX6A-SD 10Gig UTP copper cable for 10GBASE-T provide enhanced performance characteristics. Both copper and fiber products can be incorporated into the Panduit QuickNet Cabling System, which offers factory-terminated and tested cable assemblies. This feature greatly accelerates the deployment of the solution and helps ensure expected performance.

Figure 11 shows some of the product options that can be used in a Panduit Connectivity Solution for Cisco 3000 Series Switches.

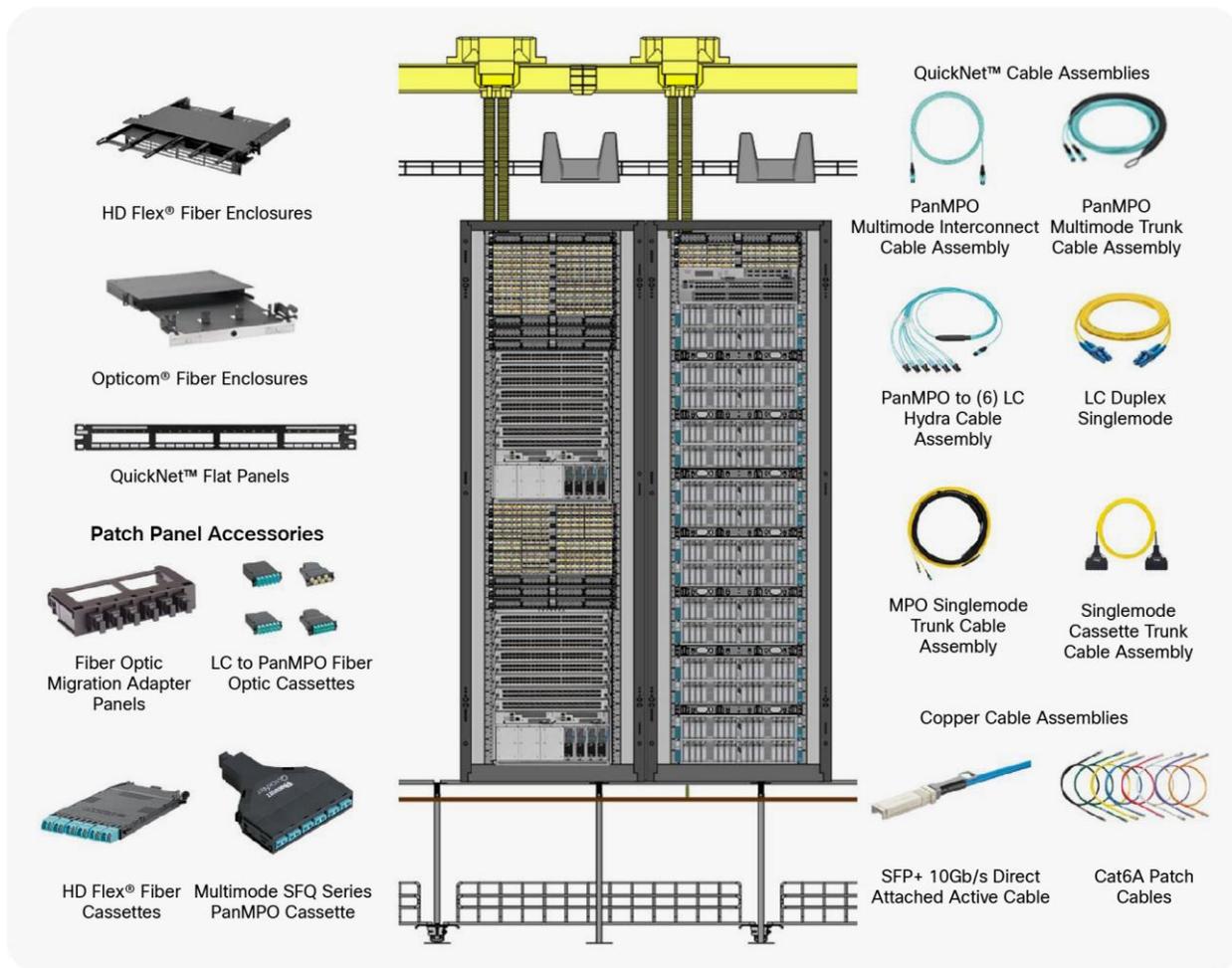


Figure 11. Panduit Connectivity products

Panduit Operation Management Solutions and SmartZone software

Panduit Operation Management Solutions help enable new technology such as the 10, 25, 40, 50, 100, and 400 Gigabit Ethernet switching platform of the Cisco 3000 Series Switches. This includes features for grounding, identification and labeling of products, installation tools, and Panduit SmartZone™ software and appliances. Panduit Advisory Services offer a broad array of assessment and optimization services to assist customers with the evaluation and deployment of Panduit Physical Infrastructure Solutions (Figure 12).

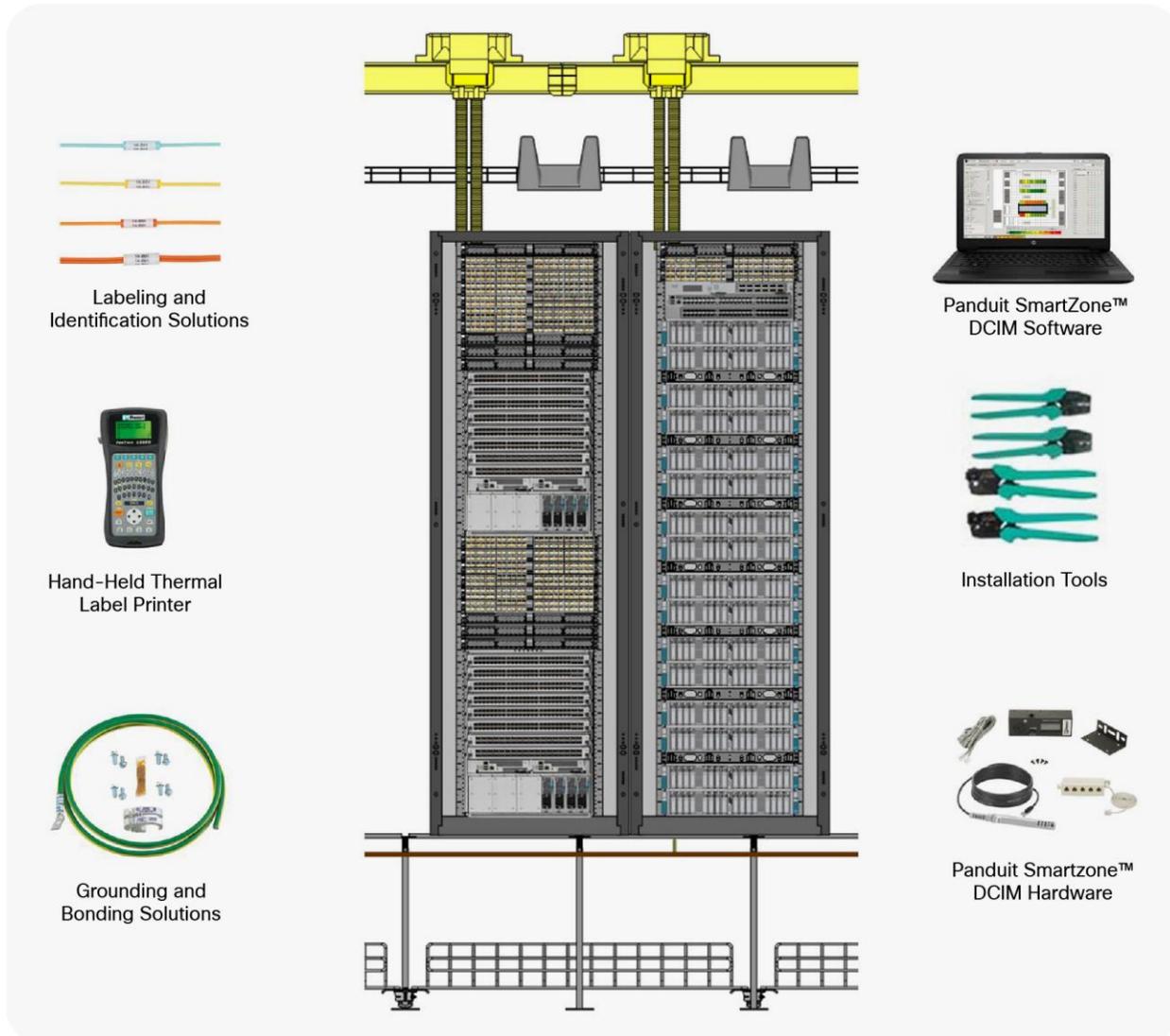


Figure 12.
Panduit Operation Management components

Conclusion

As virtualized environments are adopted by more enterprises, the pressure they apply on the network infrastructure will continue to cause data center stakeholders to reconsider the network architecture they use. The Cisco Nexus 3000 Series 400G switches were created to optimize network performance to allow virtualized environments to function without the restrictions that traditional network architecture can impose. For a Cisco Nexus 3000 Series switching platform network to operate at the highest level, it requires a physical infrastructure built to help ensure superior performance. The Panduit Physical Infrastructure Solution gives Cisco the performance, flexibility, and reliability needed to operate without constraints.

For more information

For more information, please contact Cisco at <https://www.cisco.com> or Panduit at <https://www.panduit.com/>.

About Cisco

Cisco (NASDAQ: CSCO) is the worldwide leader in networking that transforms how people connect, communicate, and collaborate. Information about Cisco can be found at <https://www.cisco.com>. For ongoing news, please visit <https://newsroom.cisco.com/>.

About Panduit

Panduit is a world leader that engineers flexible, end-to-end electrical and network connectivity physical infrastructure solutions that help businesses stay connected in a global world. Our high-performance products improve productivity and offer a lower total cost of ownership to create a competitive business advantage. Strong alliances with industry leaders, a global staff, and unmatched service and support make Panduit a valuable, trusted partner. For more information, please visit <https://www.panduit.com/>.

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