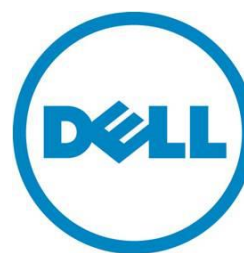

S4048-ON Data Center TOR & Aggregation Switch

Line rate, non-blocking, low-latency and lower power switch enabling a greener, faster data center



Platform Book

Dell Networking



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S4048-ON Data Center ToR and Aggregation Switch

Product Description

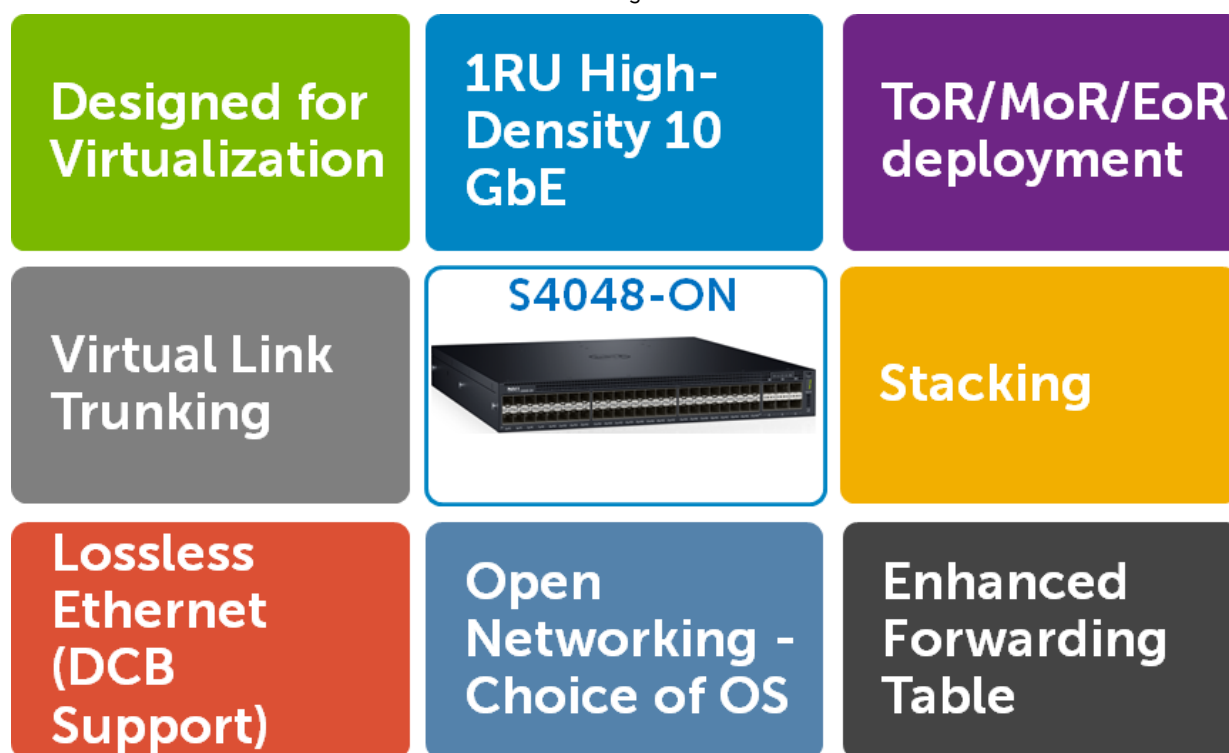
S4048-ON is a low cost top of rack switch/router product for fiber connections to 10GbE Servers and 40G uplinks to 40G switching fabric in the core. S4048-ON is a 1/10/40GE switching product with 1/10GbE links for server connections and 10/40G links for clustering (VLT, Stacking) and uplinks to aggregation and core switches. S4048-ON is a refresh of S4810 product with Broadcom silicon and leverages density, features and table size benefits from the chip at a significantly lower cost point. S4048-ON switches supports various configurations depending on oversubscription rates. The switch is a fixed form factor switch.

The S4048-ON is a compact next-generation switch designed to meet the requirements for high-density 10/40GbE TOR and aggregation in a data center network. The S4048-ON switch addresses data center 10/40GbE TOR solutions demanding high capacity solutions in racks boasting significant network demand in 10GbE capacity. It also supports aggregation requirements through centralized core or distributed core architectures for high-performance enterprise data centers, high-performance computing cores, cloud computing cores, provider hosted data centers, and enterprise LAN cores.

The S4048-ON can be positioned as a TOR or small core or aggregation switch within a data center. The S4048-ON can support 48 ports of 10GbE SFP+ (plus 6 ports of 40GbE QSFP+) or 72 ports of 10GbE SFP+ ports (realized through breakout cables for 6x40GbE ports). A breakout cable allows a QSFP+ port to be converted to 4 SFP+ ports. Powered by the Dell Networking Operating System 9, the S4048-ON delivers uncompromised stability, resiliency, advanced monitoring, and serviceability. The S4048-ON supports a full suite of Ethernet switching and routing protocols in the field-hardened Dell Networking OS9 operating system to enable Layer 2 or Layer 3 network architectures.

S4048-ON Data Center ToR and Aggregation Switch

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In a TOR or VLT lagged dual TOR design the S4048-ON provides for massive 10GbE aggregation in demanding solution utilizing the full capability of say multiple blade switching systems, MXLs/FNIOA, with 10GbE uplinks. Additionally, a distributed core design using the S4048-ON can enable the build-out of massively scalable, high-performance data center networks with 10/40GbE core network connections. A distributed control plane in a Clos-based leaf-spine architecture can be leveraged to build a highly scalable data center switching fabric. Distribution of traffic between the leaf and spine trunks can be achieved through ECMP.

With the S4048-ON, resiliency in a distributed core model is much improved compared to centralized architectures, as the failure of a single node within a distributed leaf and spine network cannot bring down the entire switching fabric. In the event of a failure, a single switching element can be restarted or replaced, rather than an entire chassis reboot required in a centralized core model.

The Dell S4048-ON supports the industry standard Open Network Install Environment (ONIE) for zero touch installation of alternate network operating systems.

S4048-ON Data Center ToR and Aggregation Switch

Product Positioning and Key Marketing Messages

Product Positioning for the S4048-ON

The S4048-ON is designed to address both high capacity TOR environments and data center core and aggregation requirements for high-performance enterprise data centers.

A distributed core fabric implemented with the s4048-ON enables a scalable, line-rate data center with 10/40GbE network connections. The distributed control plane in Clos leaf-spine network enables a highly scalable and resilient control plane. Manageability and resiliency in a distributed core model are significantly higher than in a centralized core model.






The S4048-ON can be used to design a high performance, non-blocking, centralized or distributed data center core. Applications such as cloud computing, server virtualization, and high-performance computing are driving a rapid migration to 10GbE direct server connectivity at the access layer. These applications require 40GbE uplinks at the aggregation and core layers.

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S4048-ON Data Center ToR and Aggregation Switch

The S4048-ON can be positioned as L2/L3 TOR where Network Virtualization Overlay (NVO) solutions are required to bridge from a virtualized data center to a non-virtualized data center. It can also be positioned as a core / aggregation layer extending the Layer 2 VLANs up to the core/aggregation layer with active – active redundant systems and L2/ L3 multipath without the disadvantages of Spanning Tree protocols. This is achieved with VLT (Virtual Link Trunking) and mVLT (Multi Domain Virtual Link Trunking). This enables the enterprise customers to build a S4048-ON based distributed core / aggregation with Layer 2 in ToR / aggregation.

S4048-ON can be positioned with alternate operating system for Linux savvy customers. S4048-ON supports Cumulus OS Linux, Big Switch Networks Switch Light OS, Pluribus Networks NetVisor OS and IP Infusion OcNOS as alternate operating systems. The table below shows OS software matrix for S4048-ON.

Platform	Cumulus Linux	Big Switch Switch Light OS	Pluribus Networks NetVisor OS	IP Infusion OcNOS	Dell Networking OS 9.x
S4048-ON					

The S4048-ON is targeted at enterprise customers interested in building next-generation data centers for numerous applications, including Hadoop, HPCC, Web 2.0, and cloud computing.

The following table serves as guidance for customers in choosing Dell Networking OS 9 versus one of the supported alternate operating systems on S4048-ON:

S4048-ON Data Center ToR and Aggregation Switch

	S4810 with Dell OS9	S4048-ON with Dell OS9	S4048-ON with non Dell OS
Recommend to customers who also purchase	S55, S60, S4810, S4820T, S5000, S6000, Z9000, Z9500	S4048-ON, S6000-ON	S4810-ON, S4048-ON, or S6000-ON with non Dell OS
SW installed in Factory or by customer	Pre-loaded In Factory	Pre-loaded In Factory	At Customer Site
Switch has port numbers with labels and CLI based from:	Zero	One	One
Protocol support and scaling	Full Dell Networking OS support	Full Dell Networking OS support	Limited support, based on the alternate OS selected
Ability to load alt OS	No	Not at this time	Yes
Minimum SW Version Required	All OS 9.X Supported	Dell Net OS 9.8 and up	3 rd Party – no restriction

S4048-ON Hardware Overview

- a. Ethernet switch:
 - o 48 x 1/10GbE SFP/SFP+ autosensing ports
 - o 6 x 40GbE QSFP+ ports
- b. 1.44Tbps full-duplex switching bandwidth
- c. IO panel to PSU airflow or PSU to IO panel airflow
- d. Redundant, hot-swappable AC power supply; redundant, hot-swappable fans
- e. Processor and memory:
 - o Intel CPU
 - o 4GB DDR3 CPU memory. The 4G products are identified by the following PN:

S4048 (4G DDR)	Dell PN
S4048-ON, No-OS, Normal	VDVC6
S4048-ON, No-OS, Reverse	X47M6
S4048-ON, FTOS, Normal	TF3V9
S4048-ON, FTOS, Reverse	8N75N
S4048-ON, FTOS, Normal – TAA	YR5GR (Later)
S4048-ON, FTOS, Reverse – TAA	1J0P1 (Later)

- o 8G SSD flash

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S4048-ON Data Center ToR and Aggregation Switch

f. Management:

- o 1xRJ45, 1xmicro USB serial console port
- o 10/ 100/1000 base-T management port

Target Market Applications

Below are five common deployment scenarios for the S4048-ON core switch:

- High Capacity and Storage ToR/MoR/EoR (Redundant solution)
- High Performance Active Fabric Leaf Switch
- Small Capacity Core / Aggregation Switch
- NVO
- Open Networking Environment

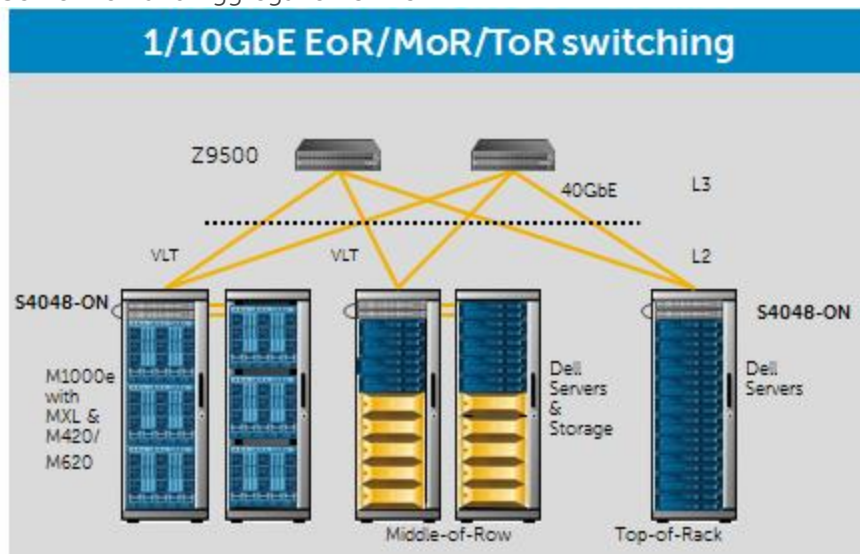
High Capacity and Storage ToR/MoR/EoR (Redundant solution)

The S4048-ON can be deployed as a Top-of-Row, Middle-of-Row, End-of-Row switch to provide 1GbE/10GbE connections to blade servers or rack servers using SFP+ optics. Support for 40GbE uplink ports enables high-speed connectivity to aggregation or core switches. High-density 10GbE connectivity provides scalability. S4048-ON can be deployed in low-latency, high-speed data center environments to minimize network layers, reduce rack space, increase performance, and lower operating expenses

Additionally VLT and mVLT provide for robust multi-chassis lagging features permitting solutions with High Availability even during chassis upgrade times.

DCB, iSCSI FCoE, and Routable RoCE support also position the S4048-ON as a premier storage direct connect when high capacity storage needs to be co-located or nearby the servers.

S4048-ON Data Center ToR and Aggregation Switch

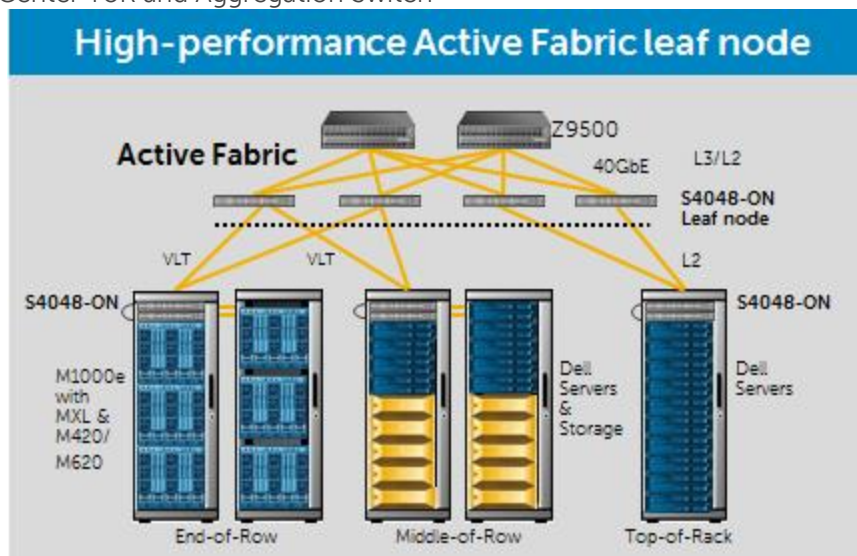


High Performance Active Fabric Leaf Switch

With high-density 1/10GbE ports, 40GbE ports as uplinks and support for Layer 2 and Layer 3 features, S4048-ON can be deployed as a high performance leaf switch in Active Fabric Core for medium to large data center networks. Reduce rack space and save power by deploying the S4048-ON in place of chassis switches. S4048-ON provides uncompromised line-rate performance in a 1RU, low-latency, low power, cost-effective switch.

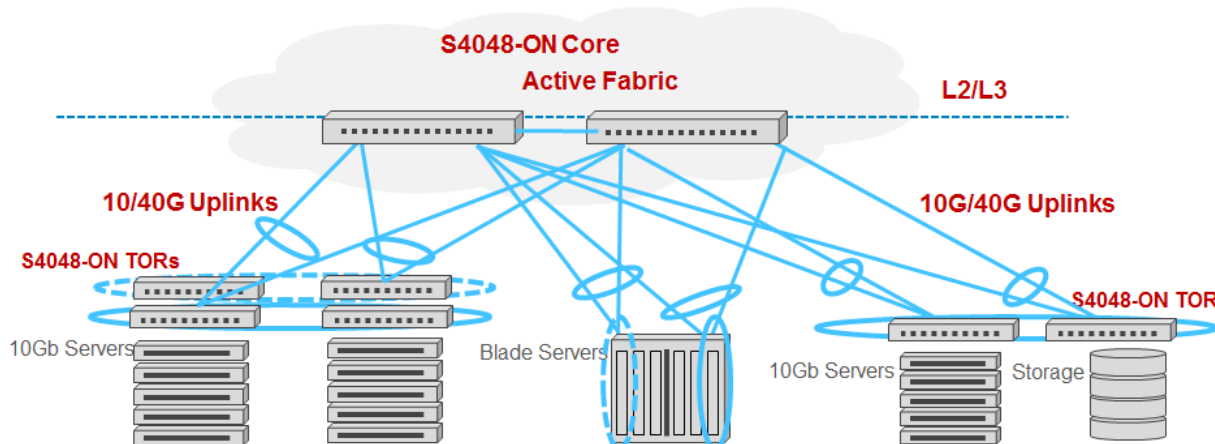
- Designed and architected for multiple data center applications
- High-density and high-performance Dell Networking OS9 switch
- Mature / Proven CLOS architectural solutions
- Optimized 1/10GbE switch for price and performance
- 1.44Tbps Switch Fabric Capacity in 1RU
- Supports 48 1/10GbE ports and 6 ports of 40GbE or full 72 10GbE ports
- Scalable L2 and L3 features for unicast and multicast applications

S4048-ON Data Center ToR and Aggregation Switch



Small Capacity Core / Aggregation Switch

Small to medium networks can deploy S4048-ON as a core switch. S4048-ON can be used as a core switch connected to S-Series ToR switches (S4048-ON, S4820T), N2000 using 10GbE uplink ports. Features such as IPv4, IPv6, multicast, Layer 3 protocols such as the Routing Information Protocol (RIP), the Open Shortest Path First (OSPF) Protocol, the Border Gateway Protocol (BGP), and the Intermediate System to Intermediate System (IS-IS) Protocol enable S4048-ON to be used as a core switch in data center applications.



Data Center Active Fabric Architecture (VLT)

S4048-ON as a Core Switch in Small and Medium Data Center

S4048-ON Data Center ToR and Aggregation Switch

S4048-ON ToR Switch

- ✓ 40G uplinks
- ✓ Power & Space
- ✓ Storage (DCB)
- ✓ Scale forwarding (tables*)
- ✓ Performance (line rate)
- ✓ Price (\$/port)

NVO

NVO (Network Virtualization Overlays) is achieved via an integrated VXLAN virtualization gateway for VMWare environments. Network virtualization allows complete traffic and address isolation for multiple tenants while permitting traffic from one virtual network to another. VXLAN is an industry standard protocol for extending virtual environments across layer 2/3 boundaries. Customers further benefit from a VXLAN Gateway to expedite vMotion and VM processing across virtual infrastructures.

Open Networking Environment

S4048-ON supports the open source Open Network Install Environment (ONIE) for zero-touch installation of alternate network operating systems. S4048-ON supports

- a. Cumulus Linux OS
- b. Big Switch Networks Switch Light OS
- c. Pluribus Networks NetVisor OS
- d. IP Infusion OcNOS

Organizations can take advantage of this disaggregated networking model using industry-leading hardware and a choice of leading network operating systems to simplify data center fabric orchestration and automation and accelerate innovation.

S4048-ON Data Center ToR and Aggregation Switch

Key Marketing Messages for the S4048-ON

The S4048-ON is designed to address data center ToR, aggregation and Core requirements for high-performance enterprise data centers. The S4048-ON delivers an industry-leading 1.44 Tbps performance in a 1RU form factor. By deploying the S4048-ON in distributed leaf-spine architecture, the customer can improve the data center core architecture and eliminate bandwidth bottlenecks.

S4048-ON distributed leaf-spine core architecture is non-blocking and can provide full bandwidth connectivity between servers. This enables build-out of massively scalable, high-performance data center network fabrics. Distribution of traffic between the leaf and spine trunks can be achieved through Equal-Cost Multi-path (ECMP) routing at Layer 3 (OSPF and ISIS). Manageability and resiliency in a distributed core model are much improved compared to Centralized core architecture, since the failure of a single node within a Clos network cannot bring down the entire switching fabric.

The key features and benefit of S4048-ON is captured below:

Feature	Function	Benefit
Trident2 silicon	<ul style="list-style-type: none">• 720Gbps switching capacity• Enhanced hardware tables• Enhanced data center features like multi-tenancy• Enhanced buffering• Low latency	Empowering demanding applications with ultra-low latency and optimum performance
Enhanced forwarding table sizes	Up to 6X to 8X larger ARP/LPM tables compared to S4810	Enables higher density virtualization and rack scaling
PHY-less design	<ul style="list-style-type: none">• PHY silicon integrated into core chip eliminating the need for multiple external PHY chips• Results in saving cost, power and circuit board area	Helping to lower overall power and latency within the switch and across the data center
Open Networking	<ul style="list-style-type: none">• Supports Open Networking Install Environment (ONIE)• Supports choice of NOS including FTOS, Cumulus and Big Switch Networks	Allows customer the choice of switch hardware, NOS and Linux or open source based applications and tools

S4048-ON Data Center ToR and Aggregation Switch

S4048-ON Key Features and Performance

S4048-ON key features and performance

Feature	Overview
Density	High-density 10/40 GbE ToR, aggregation, core switch with 48 dual-speed 1/10 GbE (SFP+) ports and six 40 GbE (QSFP+) uplinks (totaling 72 10 GbE ports with breakout cables)
Design	Extremely compact form factor with a 1RU design
Capabilities	Scalable Layer 2 and Layer 3 switching with QoS and a full complement of standards based IPv4 and IPv6 for unicast and multicast applications
Performance	1.44 Tbps non-blocking, fabric delivers line-rate performance under full load
Serviceability	a) Supports Modular Dell Networking Operating System (OS9) software that delivers inherent stability as well as advance monitoring and serviceability functions. b) Supports Open Networking Install Environment (ONIE) boot and provides choice of alternate Operating Systems to accelerate innovation.
Power consumption	Low power consumption at 234W (Max) / 153 W (typical) per system
Latency	<600ns
Software Defined Networking	Support for Openflow 1.3 and interoperable with any standard based Openflow 1.3 compliant controller.
LAG	Support for 128 link aggregation groups with up to 16 members per group
Jumbo frame	Support for jumbo frames, 12K
Airflow	Front-to-back and back-to-front airflow
Packet memory	Total aggregated packet buffer memory of 12MB
High availability	Redundant, hot-swappable power supplies and fans
Traffic monitoring	sFlow-based real-time network and application traffic monitoring
VLT	Virtual Link Trunking (VLT) provides multi-chassis link aggregation that provides active-active load sharing of links.
Stacking	User port stacking to six units.

Virtual link trunking (VLT) Overview

Virtual link trunking (VLT) allows physical links between two chassis to appear as a single virtual link to the network core. VLT eliminates the requirement for Spanning Tree protocols by allowing LAG terminations on two separate S4048-ON switches and by supporting a loop free topology. VLT

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S4048-ON Data Center ToR and Aggregation Switch

provides Layer 2 multi-pathing, creating redundancy through increased bandwidth, enabling multiple parallel paths between nodes and low latency balancing traffic where alternative paths exist. The ability to connect multiple VLT domains together with a VLT LAG is called mVLT (Multi Domain VLT). S4048-ON supports VLT, mVLT and routed VLT.

Open Automation Overview

Dell Networking's Open Automation Framework is made possible through the ubiquitous Dell Networking switch operating system – Dell Networking OS 9, that runs across all Dell Networking switches and routers. By delivering the same operating system across its entire switch and router line, Dell Networking ensures that organizations benefit from stable code, a consistent feature set, and simpler software management. Dell Networking OS 9 also gives Dell Networking switches an extensible and autonomous operational model that is essentially more like a server than a traditional switch. The OS adds server-style intelligence and general programmability to Dell Networking's switches and routers, greatly extending their capabilities.

Dell Networking Operation System (OS9) Overview

The Dell Networking OS 9 is a powerful and robust operating system that runs on the Dell Networking switch/router product lines. It is architected for high performance, resiliency, and portability. The Hardware Abstraction Layer (HAL) makes the applications portable across product lines. Its modular design dramatically increases code reuse and accelerates the delivery of applications. It is based on NetBSD, with application code developed and maintained by Dell Networking.

S4048-ON Data Center ToR and Aggregation Switch

Detailed Product Specification**S4048-ON Features List**

System and management features

SNMP Features	Description
RIB/FIB/CAM utilization via Simple Network Management Protocol (SNMP)	Provide RIB, FIB, and CAM utilization via SNMP and generate syslog and SNMP traps when CAM limit is exceeded.
CPU memory utilization via SNMP	Maintain history of CPU and memory utilization and generate syslog and SNMP traps when limit is exceeded
SNMP management information base (MIB) and command-line interface (CLI) for monitoring queue drops per queue	Expose the queue drops in all ingress and egress queues via SNMP and CLI.
Link Aggregation Control Protocol (LACP) state monitoring via SNMP	Monitor the LACP state of the LAG link and generate traps for every state change via SNMP.
Power and temperature monitoring of optics via SNMP	Monitor power and temperature via SNMP and maintain the history of temperature for all optics.
Link bundle monitoring via SNMP	Monitor a link bundle (LAG or equal cost multipath [ECMP]) and generate a syslog and SNMP trap whenever the standard deviation of traffic distribution on a member link exceeds the limit.
MIB support per VLAN counter	Provides VLAN utilization via SNMP Shows Ingress and Egress bytes utilization per VLAN The following 64 bit counters are supported IF-MIB::ifHCInOctets.<vlan ifIndex> IF-MIB::ifHCOctets.<vlan ifIndex> F10-IF-EXTENSION-MIB::f10IfInVlanPkts F10-IF-EXTENSION-MIB::f10IfOutVlanPkts
IPv6—SNMP over IPv6	Manage Dell Networking OS9 using SNMP over IPv6.
sFlow SNMP set configuration	Configure some sFlow parameters through SNMP.
SNMP—Force10-IF-extensions-MIB for interface counters	Extend SNMP support for interface-related statistics.
SNMP set	Configure Dell Networking OS9 using SNMP.
SNMP set—copy configuration files	Initiate a copy of a file using SNMP.
SNMP set—copy startup config to running config	Copy a saved configuration to running-config using SNMP.

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SNMP Features	Description
SNMPv1/SNMPv2/SNMPv3	Manage Dell Networking OS9 using SNMP.
SNMP HW MIB to monitor statistics	Allow SNMP MIB to monitor hardware statistics associated with the network processor.
SNMP trap and syslog for BGP neighbor state changes	Generate a syslog and SNMP trap for every BGP state change.
IPv6 MIBS (RFC 4293)	Support all the forwarding information and statistics of the IPv4 and IPv6 except the IPv6 Scope Zone Index Table; manage the IP and Internet Control Message Protocol (ICMP) implementations, excluding their management of IP routes.
BGP MIB	Allow SNMP support for BGP.
BGPv2 MIB	Manage objects for BGP-4
OSPF MIB	Allow the MIB to understand the topology and database of information generated by the OSPF Protocol.
PIM MIB	Support PIM MIBs.
Discovery Features	Description
LLDP	Support LLDP.
LLDP—show LLDP system name in CLI commands	Support LLDP—show LLDP system name in CLI commands.
DHCP Features	Description
DHCP relay agent	Pass DHCP messages between the client and server via an intermediary network device when the server is not on the same subnet as the host.
DHCP server	Allow assigning IP addresses dynamically to a host present in a network.
DHCP server—clear command for a DHCP binding table	Clear the DHCP binding table that maintains information such as source MAC address, IP address, lease duration, VLAN ID, and port.
DHCP snooping—drop DHCP packets upon snooping table exhaustion only on snooped VLANs	Drop DHCP packets upon snooping table exhaustion only on snooped VLANs.
DNS Features	Description
DNS	Support a DNS to accomplish translation between a host name and IP address and vice versa.
IPv6 DNS	Provide DNS support for IPv6 in the management interface and front-end interface ports.
IPv6 RDNSS	Recursive DNS Server

S4048-ON Data Center ToR and Aggregation Switch

NTP Features	Description
NTP client	Auto-update the correct time or synch the time difference using the NTP server.
NTP Server	Supported
Local and Remote Access Features	Description
Management interface	Support a dedicated management interface.
Management route	Support a default route for the management interface.
Password recovery mechanism	Recover the manageability of the system after a forgotten password.
Password encryption	Encrypt passwords before storing.
Strong encryption (MD5) for local passwords	Use MD5 for storing passwords.
Management port throttling	Throttle ingress traffic toward the CPU in the management port when the ingress rate exceeds a specific fixed threshold.
SSH	Support the SSH Protocol.
SSH client and server with AES encryption enabled—federal government (S4810-EEO)	Support AES (128-bit) encryption for an SSH client and server in Dell Networking OS9.
Telnet	Support the Telnet Protocol used for management.
SCP (client and server)	Secure the Copy Protocol.
IPv6—Telnet client over IPv6 (outbound Telnet)	Enable establishing Telnet session over IPv6 to a server.
IPv6—Telnet server over IPv6 (inbound Telnet)	Enable managing Dell Networking OS9 over a Telnet session over IPv6.
System Features	Description
Calendar (hardware clock)	Enable a calendar (hardware clock).
Clock (software clock)	Enable a clock (software clock).
Command history	Maintain a history of commands.
Case-insensitive search for the "grep" CLI command	Search through a CLI output without case sensitivity.
Extended ping	Use an interactive ping utility to discover end-to-end packet loss or latency issues.
Ping—extended IPv4 ping in non interactive mode	Use ping to non-interactively discover end-to-end packet loss or latency issues on IPV4 based networks.

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S4048-ON Data Center ToR and Aggregation Switch

System Features	Description
Flow control	Support PAUSE.
Format the flash file system	Support the ability to reformat the file system.
Interface range	Configure a range of interfaces in a single command.
Network boot	Support downloading a Dell Networking OS9 image from a network.
QSFP --> SFP+ SR cable support	Support a 40GbE port to work as 4 * 10GbE ports.
Rate interval	Determine the number of seconds of traffic statistics to display in interfaces output.
Save to file option for CLI show commands	Save output of CLI commands to permanent storage.
Syslog	Support the ability to send messages to a syslog server.
Log breakout	Ability to pull out Syslog, audit log, and security log messages for extended logging purposes.
TFTP	Support the simple FTP that makes use of little memory and is lightweight in nature.
FTP (IPv4 client and server)	Support an FTP-over-IPv4 network.
IPv6—syslog over IPv6	Send syslog messages over IPv6.
IPv6—trace route over IPv6	Support a trace route utility in IPv6 network topology.
IPv6—VTY ACLs	Support VTY access control with IPv6.
IPv6—SSH client support over IPv6 (outbound SSH)	Support the ability to establish an SSH session over IPv6 to a server.
IPv6—SSH server support over IPv6 (inbound SSH)	Support the ability to manage Dell Networking OS9 over an SSH session over IPv6.
IPv6 management services	Allow the system to use IPv6.
IPv6—FTP (inbound and outbound)	Support IPv6 FTP.
IPv6 TFTP	Support TFTP for IPv6 in the management interface.
IPv6 management interface/route	Support the configuration of an IPv6 address in the management interface/route.
IPv6 SCP	Support SCP for IPv6 in the management interface.
IPv6 NTP	Support NTP for IPv6.
IPv6 TACACS	Support TACACS for IPv6.

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S4048-ON Data Center ToR and Aggregation Switch

System Features	Description
IPv6 Remote Authentication Dial-In User Service (RADIUS)	Support RADIUS for IPv6.
IPv6 virtual IP	Support the configuration of a virtual IPv6 address for the active management interface.
Serviceability Features	Description
Digital optical monitoring (DOM) on qualified Dell Networking SFP and SFP+ optical media modules	Support viewing information in the DOM region of the optic.
Hardware serviceability and diagnostic CLI commands ("show hardware" command tree)	Support CLI commands to get details about the hardware such as port buffer usage and port drops.
Console file—unit failure modes	Store console output during unit failures.
Environmental monitoring	Monitor the power supplies and FANs in the system.
Hardware watchdog timer	Reset the board if the SW hangs the board.
Offline diagnostics	Support the capability to run diagnostics taking the card offline.
Link dampening	Minimize the risk of protocol loops during continuous link flaps by imposing a penalty for each flap and decaying the penalty exponentially.
Link monitoring	Provide packets/sec utilization rates for each interface and counter refresh interval via SNMP.
Monitor interface	Monitor interface statistics.
Syslog to differentiate unrecognized optic	Throw a syslog when an unsupported optic is used.
Tcpdump for CPU-bound traffic	Support tcpdump to display CPU-bound network traffic to analyze the network situations better.

Layer 2 switching and protocols features

VLANs Features	Description
Native VLAN	Support native VLAN assignment to untagged frames in a hybrid port.
VLAN tracking	Track the Layer 3 operational state of a VLAN, using a subset of the specified VLAN member interfaces.
VLANs tagged/untagged	Add a Layer 2 interface to a VLAN as a tagged/untagged interface.
VLAN stacking	Stack VLAN tags and tunnel through a switched network (QinQ).

S4048-ON Data Center ToR and Aggregation Switch

VLANs Features	Description
VLAN stacking—multiple tagging support on trunk interfaces	Allow multiple tagging support on trunk interfaces.
Native VLAN on port channel interfaces	Support native VLAN on port channel interfaces.
VLAN stacking—configurable 2-byte stack VLAN	Support a VLAN stacking—configurable 2-byte stack VLAN.
Null VLAN to prevent switching of untagged traffic	Support the CLI option to disable switching of traffic in the default VLAN.
VLAN stacking—S-tag drop eligible indicator (DEI) bit honoring and marking	Support VLAN stacking—S-tag DEI bit honoring and marking.
VLAN stacking—C-tag to S-tag CoS value mapping	Support VLAN stacking—C-tag to S-tag CoS value mapping.
General Ethernet Features	Description
FRRP	Use the FRRP to provide fast network convergence to Layer 2 switches interconnected in a ring topology, such as a MAN or large campuses.
GVRP	Support the generic VLAN registration protocol.
L2PT	Support Layer 2 protocol tunneling.
Static multicast MAC	Support static mapping of Layer 2 multicast entries to ports instead of dynamic learning of the same.
Redundant pairs	Create redundant links in network that do not use STP by configuring backup interfaces on either side of the primary link.
Redundant pairs over LAG	Create redundant LAGs in network that do not use STP by configuring backup LAGs on either side of the primary LAG.
PVLAN Features	Description
PVLAN	Support the RFC 5517 private VLAN—a mechanism for end devices to share the same IP subnet while being Layer 2 isolated.
Spanning-Tree Features	Description
RSTP	Support RSTP.
MSTP	Support MSTP.
RSTP timer enhancement to decrease convergence time	Support RSTP timer enhancement to decrease convergence time.
User-configurable provider bridge MAC address for xSTP and GVRP	Support the user-configurable provider bridge MAC address for xSTP and GVRP.

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Spanning-Tree Features	Description
PVST+	Support PVST+.
PVST+—unique bridge IDs for interoperating with VLAN-unaware devices	Support PVST+—unique bridge IDs for interoperating with VLAN-unaware devices.
STP (802.1D)	Support IEEE 802.1d STP support.
STP—port fast	Enable an edge port to go to forwarding state.
BPDU guard	Block an edge port upon receiving a BPDU to prevent network disruptions.
Link Aggregation Features	Description
LACP	Support LACP.
LACP slow start	Support LACP slow start.
LACP config blowout enhancements	Retain LACP port channel created after removing the LACP from the interface context.
LACP long timeout	Support enhanced LACP to have a timeout of 90 seconds from the default 3 seconds.
Minimum LAG links	Bring down LAG unless a minimum number of links is up.
Predictable LAG order (that is, deterministic LAG)	Add member ports to LAG in ascending order of port number to give predictability.
Static LAG	Group a set of links into a LAG by configuring them.
LAG hashing—Layer 2	Support the CLI option to configure the LAG hash algorithm to be used for load balancing Layer 2 packets.
LAG hashing—Layer 3	Support the CLI option to configure the LAG hash algorithm to be used for load balancing Layer 3 packets.
Deterministic LAG membership	Support deterministic LAG membership.
FRRP—round-robin FRRP hellos over LAG to minimize ring convergence	Support round-robin FRRP hellos over LAG to minimize ring convergence.
LAG hash algorithm—display egress port	Support the CLI option that displays the LAG member through which a packet with given parameters would be sent based on the configured LAG hashing algorithm.

IPv4 Layer 3 routing and protocols features

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OSPF Features	Description
Multiprocess OSPF	Enhance the OSPF code and the related infrastructure to be multiple processes oriented.
OSPF	Support the OSPF routing protocol.
OSPF 1583 forwarding	Support an older version of OSPFv2 style forwarding.
OSPF fast convergence	Enable OSPF to converge quickly by manipulating the appropriate LSA generation/acceptance timers.
OSPF LSA throttling	Enable OSPF to slow down the LSA updates dynamically in unstable networks.
ECMP 64 way for OSPF and static routes	Support a maximum of 64 ECMP for routes learned via OSPF and static.
Open Shortest Path First (OSPF) graceful restart	Enable OSPF to exchange the capability with neighbors to handle known and unknown stack-unit switch over without impacting the forwarding plane for OSPF routes; OSPF module would relearn the needed routes from neighbors.
BFD for OSPF	Support BFD sessions with neighboring interfaces participating in OSPF.

IS-IS Features	Description
Multi-topology IS-IS	Enable IS-IS to support multiple topologies in the single area and allow use of a new metric style.
IS-IS for IPv4	Enable IS-IS to exchange and build a routing table based on IPv4 addresses.
BFD for ISIS	Support BFD sessions with neighboring interfaces participating in IS-IS.
ECMP 64 way for IS-IS	Support a maximum of 64 ECMP for routes learned via ISIS.

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BGP Features	Description
BGP passive peer group for iBGP	Allow iBGP speakers to wait and accept connections from other iBGP neighbors as governed by a peer group subnet range.
Retain iBGP next hop	Enable iBGP speakers to not modify the next hop to self in order for external routes to be re-advertised to iBGP speakers.
BGP soft-reconfig inbound with IPv6	Enable storing of received IPv6 route updates from a neighbor so policies can be replied to without disrupting the neighbor connection.
BGP	Support BGP.
BGP—extended communities	Enable BGP to support transitive attributes, which allow granular control over the extended communities.
BGP—regex engine performance enhancement	Improve CPU performance by caching and reusing the results of regular expression results.
BGP "neighbor {ip-addr} local-as" CLI command for ASN transitions	Allow BGP speaker to behave like a member of another AS system (as secondary) in certain conditions.
BGP "neighbor allows-in" CLI command to allow prefixes with own ASN in ASPATH	Enable BGP to ignore the algorithm and accept prefixes with its own ASN as part of the ASPATH attribute.
BGP 4-byte ASNs	Enhance BGP to support 4-byte ASNs (traditionally only 2 bytes are used to designate ASNs).
BGP graceful restart	Enable the BGP speaker to negotiate GR capability with its neighbors and receive full routing tables so that it can handle planned/unplanned stack-unit switch overs without impacting the forwarding plane functionality for BGP routes.
BGP neighbor fast failover	Enable BGP to monitor peering sessions per neighbor and bring down a session if that neighbor is not reachable.
BGP soft reconfig	Enable storing of received route updates from a neighbor so that policies can be replied to without disrupting the neighbor connection.
BGP configurable 4-byte ASN notation	Enable configuration of 4-byte ASN format.
BGP—advertise BGP MED when route map is set with metric type internal	Enhance BGP to set the IGP cost to MED for advertised routes.
BGP to OSPF redistribution via route maps	Provide a host of route map options to redistribute BGP routes to OSPF.
BGP dynamic application of ASN notation type to running-config and show commands	Apply ASN notation type changes dynamically to running-config statements and reflect them in the output of show commands.
BGP—ignore router ID option in BGP best-path calculations	Enable BGP to ignore the router IDs when computing the path selection algorithm.
BGP add path	Enable an iBGP speaker to send/receive multiple paths to a prefix in route reflector environments.

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Passive eBGP	Enable an eBGP speaker to accept connections from neighbors whose IP addresses fall in the subnet range configured.
Passive iBGP with maximum peer limit	Enable an iBGP speaker to accept connections from neighbors whose IP addresses fall in the subnet range configured.
CIDR block in BGP peer group	Enable a BGP peer group config to support a range of IP addresses in a subnet/block.
BFD on BGP	Support BGP to use BFD for rapid convergence.
IP AS path ACLs	Support a set of AS path related ACLs to be used in policies.
IP community lists	Support a set of community attribute ACLs to be used in policies.
IP prefix lists	Support an ACL based on IP address related parameters.
IP route maps	Support a host of routing parameters related to access list configuration.
Passive eBGP maximum peer limit	Support the capability to limit the number of incoming eBGP neighbor connections when the Dell Networking router is configured as a passive device.
Weighted ECMP	Uses BGP Link Bandwidth information between BGP neighbors and programs ECMP flows in accordance to their weights. Also called Unequal Cost Load Balancing
RIP Features	Description
RIP	Support RIPv2.
General Routing and L3 Features	Description
ECMP group path management	Improve ECMP group/path control and visibility.
Deterministic ECMP for IPv4 and IPv6	Support deterministic ECMP for IPv4 and IPv6.
64 ECMP recursive routes	Support ECMP for 64 recursive routes.
Hash algorithm extension for ECMP load balancing	Support a CLI option to configure the hash algorithm to be used for ECMP load balancing.
ARP learning via gratuitous ARP	Update an ARP table using a gratuitous ARP request and reply (for example, an ARP request having a source and destination IP as the native host's IP address and the destination MAC address as a broadcast MAC address).
ARP learning via ARP request	Update an ARP table upon receipt of ARP reply and request packets.
ARP—configurable retries	Allow the configuration of the number of ARP retries to resolve an unknown destination MAC address for a packet.
ARP dampening	Support a back-off time interval before the node retries ARP resolution.
31-bit prefix support on point-to-point Ethernet interfaces	Allow a 31-bit prefix to be configured for the IP address of a point-to-point interface.
BFD on physical interfaces	Support BFD (a protocol to rapidly detect communication failures between two adjacent systems) configured on a physical link.

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General Routing and L3 Features	Description
BFD on VLAN/LAG interfaces	Support BFD sessions at the VLAN/LAG level.
Hash seed	Support a CLI option to configure the hash seed value to be used for the hashing algorithms.
IP unreachable	Report different unreachability errors to a host defined by ICMP/ICMPv6.
Static routes	Support static routing functionality.
Policy Based Routing (PBR)	Ability to route packets based on user defined rules
Policy Based Routing (PBR) with Next-Hop tracking	Ability to monitor static route with PBR

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VRRP Features	Description
VRRP	Support VRRP, which is designed to eliminate a single point of failure in a statically routed network (this protocol is defined in RFC 2338 and RFC 3768).
VRRP—scalability enhancements	Support scaling the VRRP environment to more than 500 x 10 interfaces per group.
VRRP boot init delay	Support a configurable delay after a boot for VRRP interfaces to be activated.

Multicast features

PIM Features	Description
Protocol independent multicast (PIM)—filtering multicast routes per PIM neighbor	Provide support to filter multicast routing entries per PIM neighbor.
PIM—join filter for filtering multicast messages	Support filtering of join/prune messages of PIM based on ACL config.
PIM—prevent router from sending register packets for multicast group and source address	Support a PIM source DR router to filter the register packets to be sent to RP.
PIM MIB	Support PIM MIBs.
PIM-SM	Support PIM sparse mode functionality.
PIM-SM—BSR	Support bootstrap router functionality.
PIM-SM—support on port channel interfaces	Enable PIM-SM support over port channel interfaces.
PIM-SSM	Enable PIM SSM functionality.
PIM-SSM—custom SSM ranges	Enable PIM-SSM to support different ranges using an access list.
MSDP Features	Description
MSDP anycast RP	Enable a PIM-SM network to load share two or more RPs in the registration processes.
MSDP	Enable MSDP to connect multiple PIM domains.
MSDP—redistribute filter	Enable MSDP to filter local SA entries in the local SA cache.
MSDP—SA filter	Permit or deny MSDP SA messages based on a multicast source and/or a group from the specified peer.

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IGMP Features	Description
IGMP—rate limiting IGMP join requests	Support rate limiting of IGMP join requests.
IGMPv1 and IGMPv2	Support IGMPv1 and IGMPv2.
IGMPv2 to PIM-SSM mapping for transition to IGMPv3	Enable mapping of IGMP v1/IGMPv2 joins—(*,G) membership to (S,G) membership.
IGMPv3	Support IGMPv3-related functionalities.
IGMP—disable multicast flooding for unregistered frames	Enhance IGMP functionality to not flood the unregistered frames while doing IGMP snooping.
IGMPv1/IGMPv2 snooping	Support IGMPv1 and IGMPv2 snooping to avoid flooding of multicast traffic.
IGMPv3 snooping	Enable snooping of IGMPv3 messages.
General Multicast Features	Description
Multicast IP helper enhancement	Support a multicast destination for an IP helper address.
Static multicast MAC	Support static mapping of Layer 2 multicast entries to ports instead of dynamic mapping.
Multicast policies—maximum multicast route limits	Enable setting a maximum limit on the number of multicast route entries in the multicast routing table.
Configurable multicast (S,G) expiry timer	Support statically changing the expiry timer for multicast (S,G) entries in the multicast routing table.

IPv6 L3 routing and protocols features

IPv6 IS-IS Features	Description
IPv6 Routing—IS-IS	Enable IPv6 support in the IS-IS routing protocol.
IS-IS—multi-topology IS-IS	Enable IS-IS to support multiple topologies in the single area and allow use of a new metric style.
IPv6 routing—IS-IS with redistribution, distribute lists, and distance option	Enable IS-IS IPv6 routing with redistribution, distribute lists, and distance option.
IPv6 BGP Features	Description
BGP soft-reconfig inbound with IPv6	Enable storing of the received IPv6 route updates from a neighbor so that policies can be replied without disrupting the neighbor connection.
IPv6 routing—BGP message digest 5 (MD5) authentication	Enable MD5 authentication on a TCP connection between two IPv6 neighbors.

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IPv6 routing—multiprotocol BGP (MBGP)	Enable an IPv6 address family in MBGP.
IPv6 VRRP (vrrpv3)	Support VRRP version 3 (described in RFC 5798).
IPv6 VRRP (vrrpv3) MIB	Support vrrpv3 MIB.

IPv6 General Routing Features	Description
IPv6 neighbor discovery (ND) prefix valid/preferred lifetime	Advertise a time interval in which a IPv6 prefix remains valid or preferred to be valid (this feature aids the host's stateless autoconfiguration mechanism).
IPv6—duplicate address detection	Eliminate, using a router's DAD advertisement, all the duplicate IPv6 address in a stateless address autoconfiguration process.
IPv6 RAD	Send out, using RAD, router advertisements (RAs) with information that helps hosts autoconfigure themselves (RAs are sent out periodically and in response to router solicitations sent by hosts).
IPv6 unicast routing	Enable the forwarding of IPv6 packets between interfaces on the router.
IPv6—neighbor discovery	Detect connected neighbors nodes and maintain metrics related to them.
IPv6 routing—equal cost multipath	Make the packet traverse the multiple best path, calculated using routing metrics (this routing strategy helps in load balancing, which in turn increases network bandwidth).
IPv6—ICMPv6	Support ICMPv6 on IPv6.
IPv6 routing—static routes	Maintain manually added routes in the routing table and make use of them.
IPv6—adjustable IPv6 ND MTU	Advertise the router's MTU in ND packets to make the neighbor host adjust its IP stack MTU metrics.
IPv6 Transition mechanisms	Following transition tunnels are supported to interconnect IPv6 islands over IPv4 networks or vice versa: <ul style="list-style-type: none"> - 4-in-6 - 6-in-4 - 6-in-6 - 4-in-4
IPv6 – Tunnels	Multipoint Receive only Tunnels

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Monitoring features

sFlow Features	Description
sFlow	Monitor traffic by sampling.
sFlow—extended sFlow—extended switch	Support a CLI option that, when enabled, gives information about the source and destination VLAN of the packet by parsing the sample contents for switched packets.
Ingress and Egress sFlow	Ingress sFlow enables sampling of Multicast traffic. Also supports counter sampling of LAG and IPv4/IPv6 tunnels. Egress sFlow is also supported.
Interface Level Features	Description
Port mirroring—single session	Copy all incoming/outgoing packets on a given port and forward them to another port.
Port mirroring—multiple sessions	Support multiple port mirroring sessions.
Routed Port Mirroring (RSPAN) and Switched Port Mirroring (ERSPAN)	Ability to mirror packets to remote destinations
Flow based SPAN, RSPAN, ESPAN	Ability to apply ACL based rules to port mirroring
Show IP flow and show port channel flow	Identify the port on which data traffic is sent in a multiple Layer 3 path scenario and a port channel.
RMON Features	Description
RMON	Monitor network traffic.

Security features

ACL Features	Description
Egress Layer 3 ACL lookup for control plane IP traffic	Support a CLI that enables/disables an egress ACL lookup for IP control traffic.
ACL counters	Enable hardware counters for counting the number of packets hitting a particular ACL rule.
ACL remark	Add comments to the ACL rules for end-user information.
ACL re-sequence	Rearrange the sequence numbers within an access list according to user preference.
Hot lock egress IP ACLs	Write the new order of rules, when a new rule is inserted between existing rules or a re-sequence is done on an egress IP ACL, in the hardware before the old order is deleted.
Hot lock ingress IP ACLs	Write the new order of rules, when a new rule is inserted between existing rules or a re-sequence is done on ingress IP ACL, in the hardware before the old order is deleted.

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ACL Features	Description
Hot lock ingress MAC ACLs	Write the new order of rules, when a new rule is inserted between existing rules or a re-sequence is done on MAC ACL, in the hardware before the old order is deleted.
IP ACL egress	Apply ACL rules when the traffic egresses out of a port or a VLAN matching IPv4s and IPv4s.
IP ACL ingress	Apply ACL rules when the traffic ingresses on a port or a VLAN matching IPv4s and IPv4s.
Longer names for ACLs and routing policies	Allow access list and route map rules to have 140 character name lengths.
User-configurable Layer 2 ACL region CAM allocations	Support user-configurable Layer 2 ACL region CAM allocations.
RBAC	Role Based Access Control
Explicit ACL rules for IP fragments	Support an option in the ACL rules to match fragmented IP or Layer 2 packets.
MAC ACL egress	Apply ACL rules matching a MAC address or other Layer 2 parameters on the egress.
MAC ACL ingress	Apply ACL rules matching a MAC address or other Layer 2 parameters on the ingress.
VTY IPv4 ACLs	Support VTY access control for IPv4.
VTY MAC-SA filters	Support VTY access control with MAC access lists that permit/deny based on the source MAC address.
IPv6—extended ingress ACLs	Allow an extended ACL to specify both the source and the destination address or the source TCP or UDP port in the ACL rules to be filtered at the ingress.
IPv6—extended egress ACLs	Specify an extended ACL to specify both the source and the destination address or the source TCP or UDP port in the ACL rules to be filtered at the egress.
IPv6 longer ACL	Increase the ACL name width from 16 to 140.
802.1x Features	Description
802.1X	Provide port security by authenticating all the connected devices.
802.1X with guest VLAN and authentication-fail VLAN	Provide a default guest VLAN for non-802.1x aware clients and a default failure VLAN for clients that fail authentication.
802.1x dynamic vlan assignment	Provide a vlan based on mac address dynamically after authentication
Multi-host	Allow network access to the devices without .1x supplicant capability after the first device is authenticated.
MAC Authentication Bypass	Allows network access to devices without .1x supplicant capability using the MAC address of the connecting device
Multi-supplicant	Allows multiple devices connected to a port to be authenticated independently

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802.1x Features	Description
Dynamic CoS	provides four levels of traffic prioritization based on User-Priority-Table attribute configured in the Authentication Server
AAA Features	Description
AAA accounting	Track services that users are accessing and the amount of network resources being consumed.
AAA authentication	Authenticate users using a local database or remote server.
AAA authentication key length extended to 42 characters	Extend the key length used for authenticating.
AAA authorization	Limit access to the system using privilege levels.
Port Security Features	Description
Port security	Limit the number of MACs learned on an interface to enhance security.
Port security—violation logging and shutdown options	Configure the action to take when the number of MACs learned on an interface violates a limit.
Infrastructure Features	Description
Secure DHCP—DHCP relay agent with option 82	Relay DHCP requests with option 82 inserted to provide greater security.
Secure DHCP—DHCP snooping	Snoop DHCP packets to provide security.
Secure DHCP—IP source address validation	Prevent IP spoofing by forwarding only packets validated using DHCP binding table.
Secure DHCP—support for Layer 2 VLAN interfaces	Provide security by snooping DHCP packets in Layer 2 VLAN interfaces.
Secure DHCP—dynamic ARP inspection	Prevent IP spoofing by inspecting ARP requests and reply and authenticate against a DHCP snooping database.
Secure DHCP—IP+MAC source address validation	Prevent IP spoofing by authenticating the IP and MAC address of packets with a DHCP snooping database.
Secure DHCP—trust option for dynamic ARP inspection	Allow downstream authentication by designating some ports as trusted.
Secure DHCP—dynamic ARP inspection on Layer 2 interfaces	Validate ARP packets before updating the ARP table of the respective hosts (this in turn makes the DHCP secure from various middle-man attacks).
DHCPv6 snooping and DHCP v6 relay agent	Enhances security between untrusted hosts and trusted DHCP servers
IPv6 RA Guard	Blocks / rejects IPv6 Route Advertisement frames from rogue routers reaching the hosts

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RADIUS Features	Description
RADIUS	Use a remote RADIUS server for AAA.
RADIUS—calling station ID attribute	Add support for the calling station ID attribute in RADIUS packets.
TACACS+ Features	Description
TACACS+	Use a remote TACACS+ server for AAA.
TACACS+ authorization of commands	Use a remote TACACS+ server for authorization of commands.

Quality of Service features

Buffer Settings Features	Description
Buffer settings—user configurable settings for control queues	Support user-configurable buffer profile templates for front-end and HiGig ports on data queues.
Buffer settings—userconfigurable settings for user queues	Support user-configurable buffer profile templates for front-end and HiGig ports on control queues.
Queuing Features	Description
QoS interface level—rate shape	Support rate shaping per queue.
Interface QoS	Support QoS configurations applied on the interface mode.
Rate-Limiting Features	Description
QoS interface level—rate police	Support rate-policing the ingress traffic on an interface.
QoS rate adjustment	Support a CLI option to include overhead fields in rate metering calculations by enabling QoS rate adjustments.
QoS Policy Options Features	Description
QoS interface level—set dot1P value	Mark the ingress packets with the dot1P value specified.
QoS interface level—trust dot1P value	Honor dot1P priorities on the ingress traffic and queuing based on the dot1P value.
QoS policies flow-based DSCP marking	Allow the assigning of different DSCP values to each match criteria class map mode using the option set-ip-dscp with the match command, so that matching flows within a class map can have different DSCP values.
QoS policies—honor dot1P	Configure the QoS policy template with "trust dot1P" to do queuing based on the packet dot1P.

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QoS Policy Options Features	Description
QoS policies—honor DSCP	Configure the QoS policy template with "trust diffserv" to do queuing based on the packet DSCP.
QoS policies—input rate policing	Configure the QoS policy template to do per queue level ingress rate policing.
QoS policies—match on Layer 3	Configure the QoS policy template to classify packets based on fields on the Layer 3 packet header.
QoS policies—match on Layer 2	Configure the QoS policy template to classify packets based on fields on the Layer 2 packet header.
QoS Policies—output bandwidth management	Specify the bandwidth to be allocated to the data queues (this can be applied globally or on an interface using the output QoS policy templates).
QoS policies—output rate shaping	Configure the QoS policy template to do per queue level egress rate shaping.
QoS policies—output WRED	Configure the QoS policy template to specify the WRED profile for the yellow and/or the green traffic.
QoS policies—set dot1P	Enable the QoS policy template to specify the dot1P value to be marked on the ingress packets.
QoS policies—set DSCP	Enable the QoS policy template to specify the DSCP value to be marked on the ingress packets.
QoS—WRED	Enable the QoS policy template to specify the WRED profile for the yellow and/or the green traffic.
QoS policies—match on VLAN	Define class maps to match the Layer 2 packets based on the VLAN ID.
QoS policies—class map names up to 32 characters	Allow the class maps to have name sizes up to 32 characters.
QoS Policies—fallback to trust diffserve or dot1P (dynamic classification)	Configure the Dell Networking OS9, when using QoS service policies with multiple match-all class maps, to use the incoming DSCP or dot1P marking as a secondary option for packet queuing in the event that no match occurs.
QoS policies—kbps support for rate limiting, policing, and shaping	Support the CLI option to specify the rate parameter in kilobits per second.
QoS policies—match on DSCP values in IP ACLs	Define class maps to match the packets based on the DSCP value on the matched ACL rule.
QoS ACL ordering (that is, QoS ACL exceptions)	Use the "order" keyword, when class maps with overlapping ACL rules are applied to different queues, to specify the order in which to apply the ACL rules.
QoS – Ipv6	IPv6 QoS

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Routable RoCE	Description
Queuing	<ul style="list-style-type: none"> • Dot1p & DSCP preservation across routed interfaces • PFC based on DSCP • Map RoCE packets to a strict priority queue based on classifier using 802.1p or DSCP bits. • Enabling PFC on Strict Priority Queues • Strict Priority scheduling between egress queues, with min and max bandwidth guaranteed for each queue:
ECN	<ul style="list-style-type: none"> • ECN marking based on Per-port-per-queue • Configurable Weights for ECN • Classifiers for ECT (ECN Capable transport)

Congestion Management Features	Description
WRED/ECN RFC3168	Specify ECN marking for TCP packets along with WRED profile setting.
WRED	Specify the QoS policy template to specify the WRED profile for the yellow and/or the green traffic.
Multicast QoS Features	Description
Storm control for multicast	Support storm control for multicast.
System QoS Features	Description
COPP	Support CLI options for control plane policing to specify the rate-limiting control traffic on the protocol level and/or queue level.
Storm control for broadcast and unknown unicast	Limit the percentage of the total bandwidth that broadcast traffic can consume on an interface (if configured locally) or on all interfaces (if configured globally).
QoS—global bandwidth weight assignments to COS queues	Specify the bandwidth to be allocated to the data queues (this is applied to all interfaces).
QoS—global dot1P to COS queue mapping	Specify the packet dot1P to queue mapping (this is applied to all interfaces).

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Open Automation features

Open Automation Features	Description
Bare metal provisioning (BMP)	Bare Metal Provisioning: Ease deployment by automatically upgrade to the latest image, retrieve and apply a configuration, and retrieve and execute scripts at boot time, using standard protocols such as DHCP, TFTP, FTP, HTTP, etc. Also allow auto config over front end ports and OOB management port. Easy to turn off for manual configuration. Best practices upgrades: Automated failback to previous image and configuration if the SW upgrade is not committed.
SmartScripting	A powerful scripting environment for custom applications that supports TCL, Perl, Python, and popular Unix shells. It includes a Web Server to implement REST-RPC calls; productivity libraries such as Net-SNMP and SQL client; and a powerful Event-based framework to define triggers and their respective actions. Ruby (Delivered in the Puppet package) <ul style="list-style-type: none"> o Enhancements to the Event-based Framework for usability (eg., support for regular expressions) o NFS added to types of file transfer protocols supported natively in the CLI o CLI command to copy OS images between partitions o Basic scripting on IOA (TCL)
SmartUtils	Library of convenient functions to ease the development of common switch configuration tasks; supports Perl, Python, and Unix scripts
Third-party NMS plug-ins	Plugins for third-party leading network management tools, such as HP Network Automation

REST commands	Description
REST API	Support for: Physical Interfaces, BGP, VLAN, LAG, Static Routes, IP Interfaces, MAC Address Table, Chassis Info, AAA, Static Routes, ACL, IPv6, W-ECMP, IP tunnel 100% CLI commands via REST CLI (unstructured) Statistics for: Interface, Forwarding Plane, BGP

Dev Ops Feature	Description
Puppet agent	Puppet with support for NetdevOps model (Hostname, Physical Interface, VLAN, Layer 2 Interface, Link Aggregation (static))

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SDN features

SDN Features	Description
OpenFlow 1.3	OpenFlow 1.3 agent for data plane flow rules provisioning
REST API's	Programmatic REST interface for monitoring and limited BGP provisioning.
SDN Controller Interoperability	OpenFlow agent can interoperate with any OpenFlow 1.3 compliant SDN Controller.

VLT features

VLT Features	Description
Virtual Link Trunking (VLT)	Layer 2 multi-pathing technology providing multi-chassis LAG capability
Multi-domain VLT (mVLT)	Cascading of two VLT domains to create a larger layer 2 domain.
Routed VLT (rVLT)	Routing protocols available on VLT ports enabling L2/L3 boundary at VLT layer.
Multicasting with VLT	PIM-SM and IGMP Snooping functions on VLT nodes
VRRP with VLT	Active-Active VRRPv2 and VRRPv3 on VLT nodes
PVST+ with VLT	Supports PVST+ in a VLT context to interoperate with existing PVST enabled networks
Q-in-Q with VLT	Supports Q-in-Q (aka VLAN Stacking) in a VLT context to provide multi-tenancy

VRF-Lite features

VRF-Lite Features	Description
Unicast Routing per VRF	IPv4 – BGP, OSPFv2, IS-IS IPv6 – BGPv6, OSPFv3, IS-IS
Multicast Routing	IPv4 Multicast routing per VRF
Management VRF	
Route Leaking	Static Route Leaking Dynamic Route Leaking

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S4048-ON Data Center ToR and Aggregation Switch

VRF-Lite Features	Description
VRRP with VRF	VRRPv3

S4048-ON Architecture Overview

The S4048-ON architecture can be divided functionally into two parts: a data plane consisting of the Ethernet switch and the control plane comprising the Intel processor.

Data Plane: The data plane consists of one Broadcom chip:

- All 10GbE ports support dual speed 1GbE/10GbE
- All 40GbE ports support 10GbE/40G (10GbE speeds are supported in break out mode)



Control Plane: The control plane consists of an Intel processor complex with these high-level features:

- DDR3 DRAM channels: The S4048-ON ships with 4GB of memory.
- PCIe links from ASIC: Used for device management as well as CPU-directed direct control packet traffic.
- Flash Memory: Fixed 8GB SSD flash for Dell Networking OS9, database, core dumps, and logs.
- Management ports: The management ports include a console port, an RJ-45 10/100/1000BASE-T primary management port, and a micro USB type B console port. The S4048-ON also has a two-digit, LED-based stack unit indicator display.

Switch Management

S4048-ON Management Strategy

Dell's goal is to offer a nonproprietary, standards-based network management solution. Standards-based solutions mean that Dell Networking products will ship with management agents adhering to industry standards such as SNMP, which enable Dell Networking switches to be managed by customers using existing or future, standards-based management utilities. Standards allow Dell

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S4048-ON Data Center ToR and Aggregation Switch

Networking products to integrate to most customer environments. Plug-ins are available for HP NA and EMC Ionix. The Dell OMNM version 6.0 software and beyond supports the S4048-ON.

CLI

The S4048-ON has an integrated CLI accessible via a terminal connection. The CLI is a preferred management interface for many enterprise network administrators.

The command-line structure is based on recognizable industry-standard CLI commands. Using a standard CLI helps increase the ROI by minimizing the training and support costs associated with a new deployment. Engineers familiar with Dell's key competitors' CLIs will quickly become acclimated to the S4048-ON management interface.

Country of Origin

The country of origin for the S4048-ON is China.

The country of origin for the S4048-ON-TAA is Taiwan.

The customer will need to use this information to execute the certificate of origin which is an obligation of the exporter of record.

The S4048-ON is United States Trade Agreements Act (TAA) compliant

Standards Compliance

IEEE Compliance

Scalability

RFC	Name
802.1AB	LLDP
802.1D	Bridging, STP
802.1p	Layer 2 Prioritization
802.1Q	VLAN Tagging, Double VLAN Tagging, GVRP
802.1s	MSTP
802.1w	RSTP
802.1X	Network Access Control (Port Authentication)
802.3ab	Gigabit Ethernet (1000BASE-T for Management Port)

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RFC	Name
802.3ac	Frame Extensions for VLAN Tagging
802.3ad	Link Aggregation with LACP
802.3ae	10 Gigabit Ethernet (10GbE BASE-X)
802.3ba	40 Gigabit Ethernet (40GBASE-SR4, 40GBASE-LR4) on optical ports
802.3x	Flow Control
ANSI/TIA1057	LLDP-MED
Force10	PVST+
MTU	12,000 bytes

RFC and I-D Compliance

General Internet Protocols

General Internet Protocols

RFC	Name
768	User Datagram Protocol
793	Transmission Control Protocol
854	Telnet Protocol Specification
959	File Transfer Protocol (FTP)
1321	The MD5 Message-Digest Algorithm
1350	The TFTP Protocol (Revision 2)
1918	Address Allocation for Private Internets
2474	Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers
2596	Assured Forwarding PHB Group
3164	The BSD syslog Protocol
3195	Reliable Delivery for Syslog
3246	An Expedited Forwarding PHB (Per-Hop Behavior)
5798	VRRP

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RFC	Name
5880	Bidirectional Forwarding Detection

General IPv4 Protocols

General IPv4 Protocols

RFC	Name
791	Internet Protocol
792	Internet Control Message Protocol
826	An Ethernet Address Resolution Protocol
1027	Using ARP to Implement Transparent Subnet Gateways
1035	DOMAIN NAMES - IMPLEMENTATION AND SPECIFICATION (client)
1042	A Standard for the Transmission of IP Datagrams over IEEE 802 Networks
1305	Network Time Protocol (Version 3) Specification, Implementation and Analysis
1519	Classless Inter-Domain Routing (CIDR): an Address Assignment and Aggregation Strategy
1542	Clarifications and Extensions for the Bootstrap Protocol
1812	Requirements for IP Version 4 Routers
1858	IP Fragment Filtering
2131	Dynamic Host Configuration Protocol (DHCP)
2338	Virtual Router Redundancy Protocol (VRRP)
3021	Using 31-Bit Prefixes on IPv4 Point-to-Point Links
3046	DHCP Relay Agent Information Option
3069	VLAN Aggregation for Efficient IP Address Allocation
3128	Protection Against a Variant of the Tiny Fragment Attack

General IPv6 Protocols

General IPv6 Protocols

RFC	Name
	DHCP snooping
1256	ICMP (PING)
1332	PPP
1657	MIB (Definitions for 4th version of BGP-4)
1772	Border Gateway Protocol (BGP-4)
1981	Path Maximum MTU Discovery
1989	PPP Link Quality
1990	PPP Multi-Link
1994	PPP Handshake
2131	DHCP Server

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2132	DHCP and BOOTP
2404	The Use of HMAC-SHA-1-96 within ESP and AH
2460	Internet Protocol, Version 6 (IPv6) Specification
2463	Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6) Specification
2464	Transmission of IPv6 Packets over Ethernet Networks
2581	TCP congestion control
2597	AF PHB
2597	Assured Forwarding PHB Group
2675	IPv6 Jumbograms
2711	IPv6 Router Alert Option
2737	MIB (Entity)
2740	OSPF for IPv6
3060	Policy Core Information
3140	PHBs
3392	Capabilities Advertisement
3584	Coexistence between SNMP v1, v2 and v3
3587	IPv6 Global Unicast Address Format
3748	Support for Extensible Authentication Protocol (EAP)
4007	Ipv6 Scoped Address Architecture
4087	IP Tunnel MIB
4213	Basic Transition Mechanisms for IPv6 Hosts and Routers
4253	The Secure Shell (SSH) Transport Layer Protocol
4271	BGP-4
4291	Internet Protocol Version 6 (IPv6) Addressing Architecture
4292	IP Forwarding MIB
4293	Management Information Base for the Internet Protocol (IP)
4443	ICMP for IPv6
4502	RMONv2
4552	Authentication/Confidentiality for OSPFv3
4552	Authentication/Confidentiality OSPFv3
4601	PIM-SM
4750	OSPFv2 MIB
4861	Neighbor Discovery for IPv6 (obsoletes 2461)
4862	Ipv6 Stateless Address Auto configuration (obsoletes 2462)
5095	Deprecation of Type 0 Routing Headers in IPv6
5187	OSPFv3 Graceful Restart
5340	OSPF for IPv6
6106	IPv6 Router Advertisement Options for DNS Configuration

Border Gateway Protocol (BGP)

Border Gateway Protocol (BGP)

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RFC	Name
1997	BGP Communities Attribute
2545	BGP 4 multiprotocol extensions for IPv6 Inter-Domain routing
2385	Protection of BGP Sessions via the TCP MD5 Signature Option
2439	BGP Route Flap Damping
2796	BGP Route Reflection: An Alternative to Full Mesh Internal BGP (IBGP)
2842	Capabilities Advertisement with BGP-4
2918	Route Refresh Capability for BGP-4
3065	Autonomous System Confederations for BGP
4271	Border Gateway Protocol 4 (BGP-4)
4360	BGP Extended Communities Attribute
4724	Graceful Restart Mechanism for BGP
4893	BGP Support for Four-octet AS Number Space
5396	Textual Representation of Autonomous System (AS) Numbers
Draft	BGP Add Path

Open Shortest Path First (OSPF)

Open Shortest Path First (OSPF)

RFC	Name
1587	The OSPF Not-So-Stubby Area (NSSA) Option
2154	OSPF with Digital Signatures
2328	OSPF Version 2
2370	The OSPF Opaque LSA Option
3623	Graceful OSPF Restart
4222	Prioritized Treatment of Specific OSPF Version 2 Packets and Congestion Avoidance

Intermediate System to Intermediate System (IS-IS)

Intermediate System to Intermediate System (IS-IS)

RFC	Name
1142	Base IS-IS Protocol
1195	IPv4 Routing
5301	Dynamic hostname exchange mechanism for IS-IS
5302	Domain-wide prefix distribution with two-level IS-IS
5303	Three way handshake for IS-IS point-to-point adjacencies
5304	IS-IS MD5 Authentication
5306	Restart signaling for IS-IS

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5308	IS-IS for IPv6
5309	IS-IS point to point operation over LAN
draft-isis-igp-p2p-over-lan-06	
draft-kaplan-isis-ext-eth-02	

Routing Information Protocol (RIP)

Routing Information Protocol (RIP)

RFC	Name
1058	Routing Information Protocol
2453	RIP Version 2

Multicast

Multicast

RFC	Name
1112	Host Extensions for IP Multicasting
2236	Internet Group Management Protocol, Version 2
3376	Internet Group Management Protocol, Version 3
3569	An Overview of Source-Specific Multicast (SSM)
3618	Multicast Source Discovery protocol (MSDP)
4541	Considerations for Internet Group Management Protocol (IGMP) Snooping Switches
draft-ietf-pim-sm-v2new-05	Protocol Independent Multicast-Sparse Mode (PIM-SM): Protocol Specification (Revised)

Network Management

Network Management

RFC	Name
1155	Structure and Identification of Management Information for TCP/IP-Based Internets
1157	A Simple Network Management Protocol (SNMP)
1212	Concise MIB Definitions
1215	A Convention for Defining Traps for Use with the SNMP

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RFC	Name
1493	Definitions of Managed Objects for Bridges (Except for the dot1dTpLearnedEntryDiscards Object)
1850	OSPF Version 2 MIB
1901	Introduction to Community-Based SNMPv2
2011	SNMPv2 Management Information Base for the Internet Protocol using SMIv2
2012	SNMPv2 Management Information Base for the Transmission Control Protocol using SMIv2
2013	SNMPv2 Management Information Base for the User Datagram Protocol using SMIv2
2096	IP Forwarding Table MIB
2576	Coexistence between Version 1, Version 2, and Version 3 of the Internet Standard Network Management Framework
2578	Structure of Management Information version 2 (SMIv2)
2579	Textual Conventions for SMIv2
2580	Conformance statements for SMIv2
2618	RADIUS Authentication Client MIB, Except the Following Four Counters: radiusAuthClientInvalidServerAddresses radiusAuthClientMalformedAccessResponses radiusAuthClientUnknownTypes radiusAuthClientPacketsDropped
2665	Definitions of Managed Objects for the Ethernet-like Interface Types
2674	Definitions of Managed Objects for Bridges with Traffic Classes, Multicast Filtering, and Virtual LAN Extensions
2787	Definitions of Managed Objects for the Virtual Router Redundancy Protocol
2819	Remote Network Monitoring Management Information Base (RMONv1): Ethernet Statistics Table, Ethernet History Control Table, Ethernet History Table, Alarm Table, Event Table, Log Table
2863	The Interfaces Group MIB
2865	Remote Authentication Dial In User Service (RADIUS)
3411	SNMPv3 Management Framework (obsoletes 2570)
3412	Message Processing and Dispatching for the Simple Network Management Protocol (SNMP) (obsoletes 2571)
3413	Simple Network Management Protocol (SNMP) Applications (obsoletes 2572)
3414	User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3)
3415	User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3)
3417	Transport Mappings for the Simple Network Management Protocol (SNMP)
3418	Management Information Base (MIB) for the Simple Network Management Protocol (SNMP)
3434	Remote Monitoring MIB Extensions for High Capacity Alarms, High-Capacity Alarm Table (64 bits)
4022	TCP MIB (obsoletes 2012)

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RFC	Name
4113	UDP MIB (obsoletes 2013)
4133	Entity MIB
4502	Remote Network Monitoring Management Information Base (RMONv2): Ethernet Statistics Table, Ethernet History Control Table, Ethernet History Table, Alarm Table, Event Table, Log Table
5060	Protocol Independent Multicast MIB
ANSI/TIA-1057	The LLDP Management Information Base extension module for TIA-TR41.4 Media Endpoint Discovery information
Dell_ITA.Rev_1_1	MIB
draft-ietf-idr-bgp4-mib-06	Definitions of Managed Objects for the Fourth Version of the Border Gateway Protocol (BGP-4) using SMIv2
IEEE 802.1AB	Management Information Base module for LLDP Configuration, Statistics, Local System Data and Remote Systems Data Components
IEEE 802.1AB	The LLDP Management Information Base Extension Module for IEEE 802.1 Organizationally Defined Discovery Information (LLDP DOT1 MIB and LLDP DOT3 MIB)
IEEE 802.1AB	The LLDP Management Information Base Extension Module for IEEE 802.3 Organizationally Defined Discovery Information (LLDP DOT1 MIB and LLDP DOT3 MIB)
sFlow.org	sFlow Version 5
sFlow.org	sFlow Version 5 MIB
SSHv2	SSH v2
SSHv3	SSH v3
FORCE10-BGP4-V2-MIB	Force10 BGP MIB (draft-ietf-idr-bgp4-mibv2-05)
FORCE10-IF-EXTENSION-MIB	Force10 Enterprise IF Extension MIB (extends the Interfaces portion of the MIB-2 (RFC 1213) by providing proprietary SNMP OIDs for other counters displayed in the "show interfaces" output)
FORCE10-LINKAGG-MIB	Force10 Enterprise Link Aggregation MIB
FORCE10-COPY-CONFIG-MIB	Force10 File Copy MIB (supporting SNMP SET operation)
FORCE10-PRODUCTS-MIB	Force10 Product Object Identifier MIB
FORCE10-SS-CHASSIS-MIB	Force10 S-Series Enterprise Chassis MIB
FORCE10-SMI	Force10 Structure of Management Information
FORCE10-TC-MIB	Force10 Textual Convention

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RFC	Name
FORCE10-TRAP-ALARM-MIB	Force10 Trap Alarm MIB
FORCE10-FORWARDING-PLANE-STATS-MIB	Force10 Forwarding Plane Statistics MIB

Security

Security

RFC	Name
3162	RADIUS and IPv6
3273	Remote Network Monitoring Management Information Base For High Capacity Networks (64 Bits): Ethernet Statistics High-Capacity Table, Ethernet History High-Capacity Table
3579	RADIUS (Remote Authentication Dial In User Service)
3580	802.1X with RADIUS
3768	EAP
3826	AES Cipher Algorithm in the SNMP User Based Security Model
4251	Secure Shell (SSH) Protocol Architecture
4252	Secure Shell (SSH) Authentication Protocol
4253	Secure Shell (SSH) Transport Layer Protocol
4254	Secure Shell (SSH) Connection Protocol
4301	Security Architecture for IPSec
4302	IPSec Authentication Header
4303	ESP Protocol
4807	IPsec Security Policy Database Configuration MIB

Regulatory Compliance

Safety

UL/CSA 60950-1, Second Edition

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S4048-ON Data Center ToR and Aggregation Switch
EN 60950-1, Second Edition

IEC 60950-1, Second Edition Including all National Deviations and Group Differences

EN 60825-1 Safety of Laser Products Part 1: Equipment Classification Requirements and User's Guide

EN 60825-2 Safety of Laser Products Part 2: Safety of Optical Fiber Communication Systems

FDA Regulation 21 CFR 1040.10 and 1040.11

Emissions

Australia/New Zealand: AS/NZS CISPR 22: 2008, Class A

Canada: ICES-003:2004, Class A

Europe: EN 55022: 2006+A1:2007 (CISPR 22: 2008), Class A

Japan: VCCI V-3/2010.04 Class A

USA: FCC CFR 47 Part 15, Subpart B:2011, Class A

Immunity

EN 300 386 V1.4.1:2008 EMC for Network Equipment

EN 55024: 1998 + A1: 2001 + A2: 2003

EN 61000-3-2: Harmonic Current Emissions

EN 61000-3-3: Voltage Fluctuations and Flicker

EN 61000-4-2: ESD

EN 61000-4-3: Radiated Immunity

EN 61000-4-4: EFT

EN 61000-4-5: Surge

EN 61000-4-6: Low Frequency Conducted Immunity

RoHS

All S4048-ON components are EU RoHS6 compliant.

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Mechanical

Note on airflow nomenclature: In this document the following terms are equivalent:

- Front-to-back airflow
- Normal airflow
- IO panel to PSU airflow

Chassis

The S4048-ON is a 1 RU fixed configuration data center switch. The following table provides the S4048-ON chassis physical dimensions and characteristics. The S4048-ON chassis is designed to provide 1+1 power redundancy.

Chassis physical dimensions and characteristics:

Dimension	Inches	Centimeters
Width	17.08	43.4
Depth	17.13	46.0
Height	1.71	4.35
Rack clearance required Front	5	12.7
Rack clearance required Rear	5	12.7
Weight	Weight: 18.52lbs (8.4kg) with 1 PSU	
Thermal dissipation	799.64 BTU/hr (234W) (Max) 750.(153W) (Typical)	
Power consumption	Typical: 153 Watts Maximum: 234 Watts	
Acoustic Noise (db)	Front: 42.6 Back: 44.6 Left: 46.9 Right: 44	
Operating temperature	0 - 45 Degree C	
Storage Temperature	-40C to 70C	
Operating Relative Humidity	5% - 90%	
Operating Altitude	10,000ft	
Storage Altitude	35,000ft	
Vibration 10~500HZ(G2/HZ=0.05), 4.9gRHS 30Minutes for each axis(x,y,z)	Pass	
Shock non-op. 11ms half-Sine Wave 50G, 3 shock for each face.	Pass	

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S4048-ON Data Center ToR and Aggregation Switch Chassis options

S4048-ON supports Ready Rails mounting.

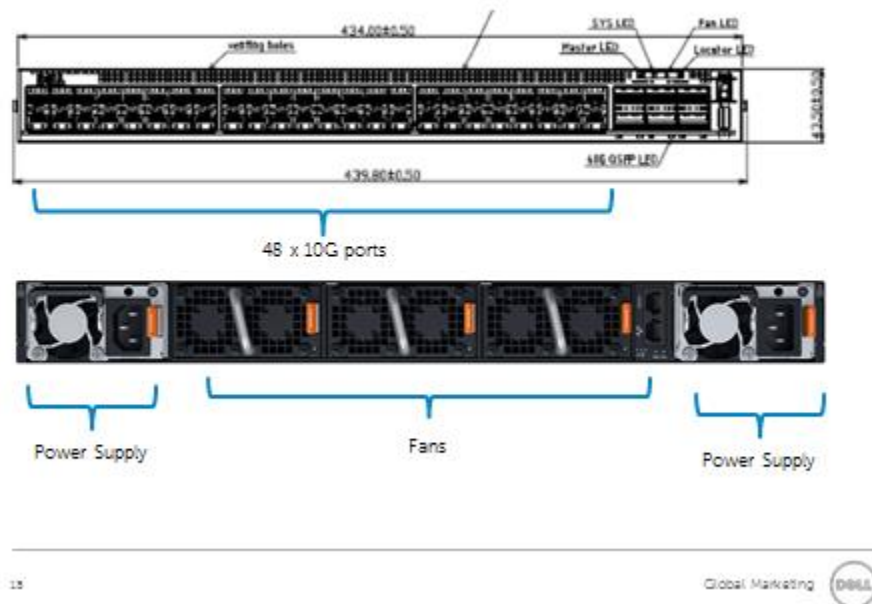
S4048-ON Data Center ToR and Aggregation Switch

System Overview

The S4048-ON is a 1RU chassis. The following pictures show the front and rear design of the S4048-ON.

Figure 1. Front and rear views of S4048-ON

S4048-ON IO side and PSU side view



- **Front facing User Ports:** The I/O side has 48x10GbE SFP+ + 6x40GbE QSFP+ autosensing ports.
- **Primary Management Port (Ethernet):** This 10/100/1000Base-T port is the primary management port for system access.
- **Console Port:** The RJ-45/RS-232 is a serial control port useful for connecting to a terminal server. The default configuration of the console interface is as follows:
 - 115200 baud rate, eight data bits, one stop bit, no Parity, no HW/SW handshaking.
 - The pin-out of the console RJ45 port on the switch side is as follows:

RJ45	Signal	I/O
------	--------	-----

S4048-ON Data Center ToR and Aggregation Switch

1	RTS	OUT
2	DTR	OUT
3	TxD	OUT
4	GND	
5	GND	
6	RxD	IN
7	DSR	IN
8	CTS	IN

- **Stacking LEDs:** This is a two-digit stacking ID display to stack master indication.
- **USB ports:** The I/O panel supports two USB ports:
 - **Support for USB type A receptacle (female) port:** This port supports a mass storage device. The port supports USB 2.0 with maximum data rates of 480Mbps.
 - **Support for micro USB type B receptacle (female) port:** This port can be used as a console port. A typical scenario would be to connect a laptop to this port using a standard male USB A to male USB B cable. The port supports USB 2.0 with maximum data rates of 480Mbps.
- **Power supply:** The power supply units are located opposite to the I/O side. The S4048-ON ships with one power supply. A second Power Supply can be separately ordered to provide full power redundancy.
- **Fan modules:** The S4048-ON ships with all three fan trays. The fan modules are field replaceable..

Access Ports

The S4048-ON has two management ports available for system access: a console port and a micro USB-B port. The micro USB-B ports act exactly like the console port. The terminal settings are the same for both access ports.

RJ-45 Console Port (RS-232)

The RS-232 console port is labeled on the S4048-ON chassis. It is in the upper-right side, as you face the I/O side of the chassis.

Micro USB-B Console Port

The terminal settings are the same for the USB-B port and the console port:

S4048-ON Data Center ToR and Aggregation Switch

- 115200 baud rate
- No parity
- 8 Data bits
- One stop bit
- No flow control

When the micro USB-B port is connected it becomes the primary connection, and the system sends all messages to the micro USB-B port when it is connected.

Electrical

System Architecture

Key Components

Key chipset components of S4048-ON switch.

- CPU: Intel
- ASIC: Broadcom
- RAM: 4GB
- FLASH: 8GB

Power System

Power Supplies Overview

The S4048-ON is designed to support two hot-swappable power supplies. The S4048-ON supports AC and DC* power supplies with two air-flow directions (normal (I/O side to PSU side) and reversed (PSU side to I/O side)). Two power supplies are required for full redundancy, and base SKU configurations ship with one unit. A second power supply unit can be ordered separately for a redundant configuration.

The S4048-ON AC system comes from the factory with one AC power supply and three fan modules installed in the chassis. Power supplies are field replaceable. When the S4048-ON is running with full

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S4048-ON Data Center ToR and Aggregation Switch redundancy (two power supplies installed and running), a power supply unit can be removed and replaced while the other is running without disrupting traffic.

Note that all S4048-ON configurations ship with one power supply of the requested personality. The following power supply options are available for the S4048-ON:

- AC power supply with integrated fan
- AC power supply with integrated reverse flow fan

*DC power supply option is available as a conversion kit.

Note: The S4048-ON does not support an AC power supply and a DC power supply running concurrently in the same switch.

Note: The S4048-ON does support air flow direction changes in the field but to accomplish this, the unit must be powered down and all power supplies and fan modules replaced with the new air flow direction modules before repowering the unit. All power supplies and fans must direct air in a uniform direction when the unit is powered on. If a single module (fan or power) is not in accord with the air direction of the other modules, the S4048-ON switch will not power up.

Environmental

Environmental Specifications

Parameter	Specifications
Temperature	32° to 113°F (0° to 45°C)
	-40° to 158°F (-40° to 70°C)
Maximum altitude	No performance degradation to 10,000 feet (3,048 meters)
Relative humidity	5 to 95% non-condensing

AC Power Requirements

AC Power Requirements

Parameter	Specifications
Power Supply	AC: 100 to 240 VAC, 50/60 Hz
Max current draw per system - AC	100VAC : 2.3A 240VAC : 0.95A
Maximum system power consumption	234 W

Acoustic Noise Report

ISO 7779 A-weighted sound pressure level: 20 dBA at 73.4oF (23oC).

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S4048-ON Data Center ToR and Aggregation Switch

MTBF

The estimate MTBF of S4048-ON is 768,000 hours.

Accessories

Accessories

Dell SKU Description
Product
Dell Networking S4048-ON, 48x 10GbE SFP+ and 6x 40GbE QSFP+ ports, IO to PSU air, 1x AC PSUs, DNOS 9
Dell Networking S4048-ON, 48x 10GbE SFP+ and 6x 40GbE QSFP+ ports, IO to PSU air, 1x AC PSUs, No OS
Dell Networking S4048-ON, 48x 10GbE SFP+ and 6x 40GbE QSFP+ ports, PSU to IO air, 1x AC PSUs, DNOS 9
Dell Networking S4048-ON, 48x 10GbE SFP+ and 6x 40GbE QSFP+ ports, PSU to IO air, 1x AC PSUs, No OS
Dell Networking S4048-ON, 48x 10GbE SFP+ and 6x 40GbE QSFP+ ports, PSU to IO air, 1x AC PSUs, DNOS 9, TAA
Dell Networking S4048-ON, 48x 10GbE SFP+ and 6x 40GbE QSFP+ ports, IO to PSU air, 1x AC PSUs, DNOS 9, TAA
Replacement Power Supply
Power Supply, 460w, IO to PSU airflow, S4048-ON
Power Supply, 460w, PSU to IO airflow, S4048-ON
Optics
Transceiver, QSFP+, 40GbE, SR Optics, 850nm Wavelength, 100-150m Reach on OM3/OM4
Transceiver, QSFP+, 40GbE, LR4 Optics, 4 WDM channels in 1310nm window, 10km Reach on SMF
Transceiver, QSFP+ 40GbE, LM4 Optics. 2 fiber (1-TX, 1-RX, 4 wavelengths) MMF, 100m
Dell Networking, Transceiver, 40GbE QSFP+ ER4, LC, SMF
Transceiver, QSFP+, 40GbE eSR optics, 850nm wavelength, 300-400m reach on OM3/OM4
Transceiver, QSFP+, 40GbE, PSM4 with 1m Pigtail to MPO, 1490nm
Transceiver, QSFP+, 40GbE, PSM4 with 5m Pigtail to MPO, 1490nm
Transceiver, QSFP+, 40GbE, PSM4 with 15m Pigtail to MPO, 1490nm
Transceiver, QSFP+, 40GbE, PSM4-LR. QSFP+ to 4xSFP+LR MPO, SMF
Transceiver, QSFP+, 40GbE, QSFP+ to SFP+ Adaptor, QSA. Supported SFP/+ modules supported include SFP+ (ZR, ER, LR,SR) and SFP (LX, SX, Copper SFP)
Optics SMF breakout used in conjunction with PSM4-LR, MPO to 4x10GbE-LC
Transceiver, SFP, 1000BASE-SX, 850nm Wavelength, 550m Reach
Transceiver, SFP, 1000BASE-LX, 1310nm Wavelength, 10km Reach
Transceiver, SFP, 100BASE-FX, 1310nm Wavelength, 2km Reach
Transceiver, SFP, 1GbE, ZX, 1550nm Wavelength, 80km Reach typical on 9/125um SMF
Transceiver, SFP, 1000BASE-T

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S4048-ON Data Center ToR and Aggregation Switch

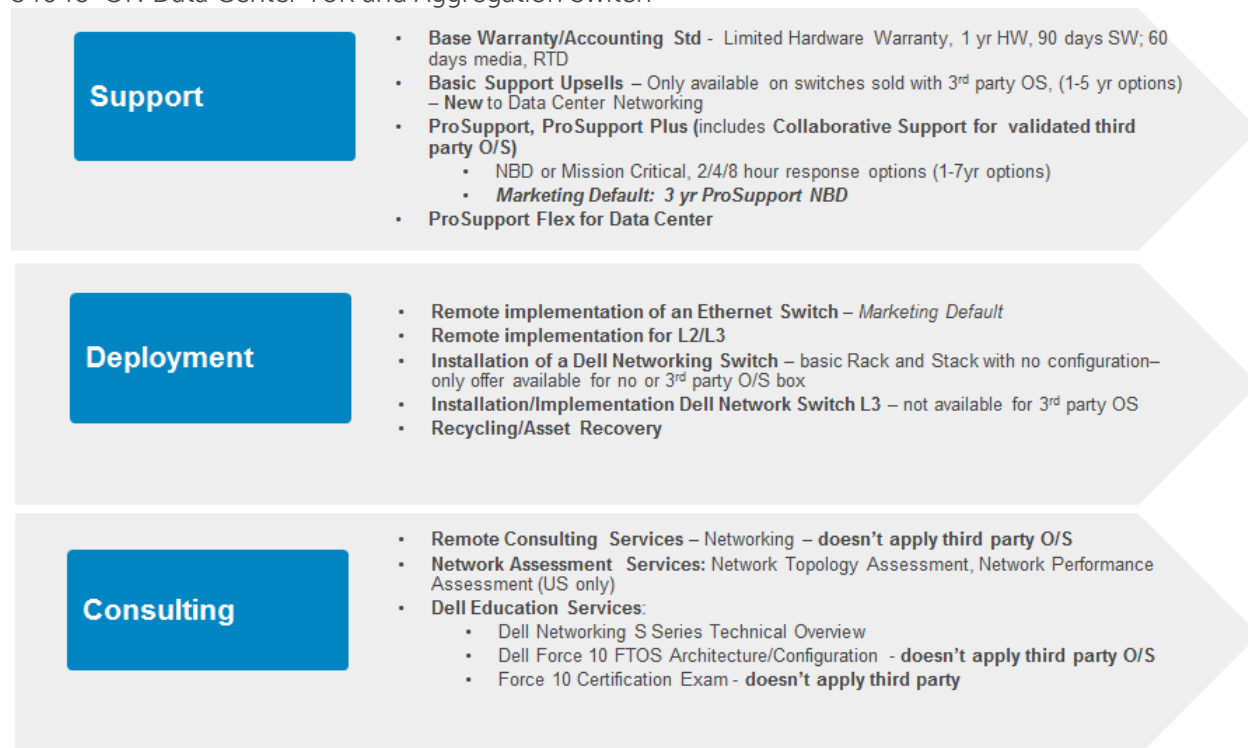
Dell SKU Description
Transceiver, SFP+, 10GbE, ZR
Transceiver, SFP+, 10GbE, SR, 850nm Wavelength, 300m Reach
Transceiver, SFP+, 10GbE, LR, 1310nm Wavelength, 10km Reach
Transceiver, SFP+, 10GbE, ER, 1550nm Wavelength, 40km Reach
Cables
Cable, 40GbE QSFP+ to 4xRJ45 Megabit Breakout cable 1M (spec sheet here)
Cable, SFP+ to SFP+, 10GbE, Copper Twinax Direct Attach Cable, 0.5 Meter Cable, SFP+ to SFP+, 10GbE, Copper Twinax Direct Attach Cable, 1 Meter Cable, SFP+ to SFP+, 10GbE, Copper Twinax Direct Attach Cable, 3 Meters Cable, SFP+ to SFP+, 10GbE, Copper Twinax Direct Attach Cable, 5 Meters Cable, SFP+ to SFP+, 10GbE, Copper Twinax Direct Attach Cable, 7 Meters Cable, QSFP+ to QSFP+, 40GbE Passive Copper Direct Attach Cable, 0.5 Meter Cable, QSFP+ to QSFP+, 40GbE Passive Copper Direct Attach Cable, 1 Meter Cable, QSFP+ to QSFP+, 40GbE Passive Copper Direct Attach Cable, 3 Meter Cable, QSFP+ to QSFP+, 40GbE Passive Copper Direct Attach Cable, 5 Meter Cable, QSFP+ to QSFP+, 40GbE Passive Copper Direct Attach Cable, 7 Meter Cable, QSFP+, 40GbE, Active Fiber Optical Cable, 10 Meters (No optics required) Cable, QSFP+, 40GbE, Active Fiber Optical Cable, 50 Meters (No optics required) Cable, 40GbE (QSFP+) to 4 x 10GbE SFP+ Passive Copper Breakout Cable, 0.5 Meters Cable, 40GbE (QSFP+) to 4 x 10GbE SFP+ Passive Copper Breakout Cable, 1 Meter Cable, 40GbE (QSFP+) to 4 x 10GbE SFP+ Passive Copper Breakout Cable, 3 Meters Cable, 40GbE (QSFP+) to 4 x 10GbE SFP+ Passive Copper Breakout Cable, 5 Meters Cable, 40GbE (QSFP+) to 4 x 10GbE SFP+ Passive Copper Breakout Cable, 7 Meters Cable, 40GbE MTP (QSFP+) to 4xLC Optical Connctrs, 1M (QSFP+, SFP+ Optics REQ, not incl) Cable, 40GbE MTP (QSFP+) to 4xLC Optical Connctrs, 3M (QSFP+, SFP+ Optics REQ, not incl) Cable, 40GbE MTP (QSFP+) to 4xLC Optical Connctrs, 5M (QSFP+, SFP+ Optics REQ, not incl) Cable, 40GbE MTP (QSFP+) to 4xLC Optical Connctrs, 7M (QSFP+, SFP+ Optics REQ, not incl) 1 meter QSFP+ to QSFP+ OM3 MTP Fiber Cable, Requires QSFP+ Optics 3 meter QSFP+ to QSFP+ OM3 MTP Fiber Cable, Requires QSFP+ Optics 5 meter QSFP+ to QSFP+ OM3 MTP Fiber Cable, Requires QSFP+ Optics 7 meter QSFP+ to QSFP+ OM3 MTP Fiber Cable, Requires QSFP+ Optics 10 meter QSFP+ to QSFP+ OM3 MTP Fiber Cable, Requires QSFP+ Optics 25 meter QSFP+ to QSFP+ OM3 MTP Fiber Cable, Requires QSFP+ Optics 50 meter QSFP+ to QSFP+ OM3 MTP Fiber Cable, Requires QSFP+ Optics 75 meter QSFP+ to QSFP+ OM3 MTP Fiber Cable, Requires QSFP+ Optics 100 meter QSFP+ to QSFP+ OM3 MTP Fiber Cable, Requires QSFP+ Optics
Software
Software, Dell Networking OS9 - Dell Networking Operating System Software, Layer3

Services

The following services portfolio is applicable to S4048-ON:

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S4048-ON Data Center ToR and Aggregation Switch



Statement of Volatility

Date

MM/DD/YYYY

Author

Dell Networking Product Management

Product/Release

S4048-ON

Introduction

Dell, Inc., manufactures the S4048-ON™ Ethernet switch. This Core, End-of-Row (EoR), or Top-of-Rack (ToR) switch is purpose-built for applications in high-performance data center and computing environments. This notice summarizes relevant security concerns associated with the movement of

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S4048-ON Data Center ToR and Aggregation Switch
sensitive data through the S4048-ON product and subsequent redeployment of this product into open environments.

Interoperability Issues

None

S4048-ON Memory Overview

Volatile and nonvolatile memory associated with the S4048-ON is allocated as follows:

Memory Overview

Memory Type	Volatility	User Data	How Memory is used in the system
SDRAM-CPU	Volatile	Yes	OS, application code, and configuration data (in data structures)
SRAM	Volatile	Yes	Ethernet controller memory
EEPROMs	Nonvolatile	No	Boot, manufacturing, and SW setup information
Boot Flash	Nonvolatile	No	Boot images (and fast boot system image)

Security: Operational Considerations

No mechanism is provided to record data streams as they pass through the S4048-ON. If recording of data streams is desired, software would have to be developed to perform that function. Although unlikely, it is theoretically possible that third parties could design and implement non-Dell Networking firmware and hardware to record data streams passing through the S4048-ON. Therefore, Dell recommends that customers have adequate physical security and access control to prevent corruption of the S4048-ON software that may cause the node to fail.

Dell recommends that customers apply the following procedure to ensure that any "failed" S4048-ON to be returned to Dell for service is wiped clean of any sensitive customer information. Use of this procedure to ensure all sensitive data is removed from any S4048-ON before leaving a secured area is strongly recommended.

To reformat the flash memory ("flash"), enter the following command at the Dell Networking CLI prompt:

```
Dell# format flash:
```

```
Formatting a file device will remove all files and directories on it.
```

```
Proceed to format the file device [confirm yes/no]: yes
```

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S4048-ON Data Center ToR and Aggregation Switch

To remove the flash, follow the directions in the *Hardware Installation Guide*.

Functional Considerations

The S4048-ON stores information that must be removed prior to returning the S4048-ON for service using the RMA process. The format command deletes the database and removes all trace files from the system. Note that the format command is performed by changing file services (as is typical with most disk operating systems), but the data itself is not removed at a bit level, so a residual image remains. The S4048-ON software does not currently support a CLI command to clean all nonvolatile memory at a bit level. A complete data removal must be performed by physically removing the compact flash.

Technical Assistance Contact Information

Contact information for S4048-ON equipment:

- Questions: <https://marketing.dell.com/force10-pp>
- Web: www.dell.com/networking
- Telephone: U.S. and Canada: 866-965-5800
- Telephone: International: +1-408-965-5800