Dell Networking C9010 network director and C1048P rapid access node
Providing next-generation scalability from edge to core

The Dell large enterprise network simplifies network deployment and management and extends the functionality of core devices all the way to the network edge. It achieves this by collapsing separate network tiers into a single logical switching tier, thereby removing complex protocols running between access and core/aggregation tiers, and centralizing management and control.

Next-generation modular chassis

The Dell Networking C9010 network director is a next-generation, multi-rate capable modular switching platform designed as the core/aggregation for medium to large enterprise campus and mid-market data center networks. The C9010 is the first platform delivering on the Dell unified enterprise network architecture, ushering in a new way to design and manage networks when used in conjunction with the C1048P rapid access node.

The C9010 can also be deployed as a traditional switching platform without the C1048P, serving to aggregate legacy switching platforms in wiring closets and server racks. In this deployment model, C1048P rapid access nodes can be introduced at any time to benefit from the new architecture, while maintaining investment protection for legacy switches.

The C9010 is an intelligently designed 8RU platform with modular slots for up to 10 line card modules, two route processor modules (RPM), three fan modules and four power supply modules. The integrated backplane is 100GbE multi-rate capable (up to 600Gbps to each line card slot) and provides the investment protection necessary to deploy a modular chassis.

For line-rate designs[1], two RPMs provide the required bandwidth to each line card slot for inter-line card switching. Intra-line card switching is managed within the line card. Three line card options are available for design flexibility:

- 24-port SFP+ line card
- 24-port 10GBASE-T line card
- 6-port QSFP+ line card

Next-generation access

The Dell Networking C1048P extends the capabilities of the C9010 by providing 48 10/100/1000BASE-T PoE+ ports for user/server access, and two SFP+ uplinks for connectivity back to the C9010. The C1048P can be deployed stand-alone, or in a stacked configuration (up to eight units high) depending on required density and deployment model.

In this scenario, the C1048P rapid access nodes receive their configuration and software updates centrally from the C9010 network director, greatly simplifying initial deployment, and ongoing maintenance and operation.

Key applications

- Collapsed core designs
- Network tier simplification
- Medium-large network core/aggregation
- High-performance SDN/OpenFlow 1.3 enabled with ability to inter-operate with industry standard Open-Flow controllers

1 Performance rated over aggregate operation and with average packet transfers greater than 200 bytes.

Key features

- Up to 60 40GbE QSFP+ ports
- Up to 248 10GbE ports (240 SFP+ or 10GBASE-T ports plus eight SFP+ ports on two RPMs)
- Support for 2,000 virtual ports (via port extenders), and concurrent support for traditional Ethernet switches/ devices
- Side-to-side airflow (right to left)
- VRF-lite enables sharing of networking infrastructure and provides L3 traffic isolation across tenants (including support for multicast and IPv6 routing)
- Enhanced automation capabilities (puppet agent, REST API extensions)

- Support for jumbo frames for high-end performance in virtualized environments and IP storage/server communication
- Removable chassis mid-walls for future support of full-width modules
- Tool-less mounting and optional ReadyRails™ port extenders stack up to eight units high
- Embedded Open Automation Framework adds VM awareness as well as automated configuration and provisioning capabilities to simplify the management of virtual network environments

Specifications: C9010 network director and C1048P rapid access node

C9010 network director
10 slot, includes 1x RPM, 1x AC PSU, 3x Fan Modules
C9010 Modular Switch, 10 slot, includes 1x RPM, 1x AC PSU, 3x Fan Modules, TAA

Redundant RPM
C9000 RPM 2.56T, Redundant RPM

Line cards
C9000 24-port 10GbE 10GBASE-T Line Card
C9000 24-port 10GbE SFP+ Line Card
C9000 6-port 40GbE QSFP+ Line Card

Redundant power supplies
C9000 2,900W Power Supply

Fans
C9000 Hot Swappable Fan Module

C1048P port extender
C1048P Port Extender, 48x 10/100/1000BASE-T PoE+ ports, 2x SFP+ ports, 2x stacking ports, 1 integrated 1000W power supply (requires C15 plug)

Software
Software, Dell Networking OS9.X,

Physical (C9010)
Up to 240 line-rate1 1/10GBASE-T ports
Up to 248 line-rate1 1/10GbE SFP+ ports
Up to 60 line-rate1 40GbE QSFP+ ports
3 fan modules
4 2,900W power supplies
Up to 2 RPMs
1 RJ45 console/management port with RS232 signaling and 1 USB-B port (per RPM)
Size: 8 RU, 13.9"h x 17.4" w x 18.0" d (35.26 cm h x 44.20 cm w x 45.70 cm d)
Weight: 55.4 lbs (25.2 kg) empty, 151.3 to 165.3 lbs (68.8 to 75.1 kg) fully loaded, depending on line cards installed
Nominal Input Voltage: 100/120 VAC 50/60 Hz and 200/240 VAC 50/60 Hz
Max input current per power supply @ 1,450W (100/120V): 16A at 100V, 14A at 120V
Max input current per power supply @ 2,900W (200/240V): 16A at 200V, 14A at 240V
Max system power input (using 4 power supplies):

2,950 VA
Max. power consumption: 2,950W
Max. thermal output: 10,066 BTU/hr
Typ. power consumption: 1410-2400 Watts fully loaded, depending on line cards installed
Max. operating specifications:
Operating temperature: 32° to 113°F (0° to 45°C)
Operating humidity: 5 to 85% (RH), non-condensing
Operating altitude: 0ft to 10,000ft above sea level
Max. non-operating specifications:
Storage temperature: −40° to 158°F (−40° to 70°C)
Storage humidity: 5 to 95% (RH), non-condensing

Physical (C1048P)
48 10/100/1000BASE-T RJ45 PoE+
2 integrated SFP+ uplink ports
2 integrated 21Gbps stack ports
Console/management port with RS232 signaling USB-A port
Size: 1 RU, 1.7"h x 17.3" w x 10.1" d (4.4 cm h x 44.0 cm w x 38.7 cm d)
Weight: 15.0 lbs (6.8 kg)
Max. operating specifications:
Operating temperature: 32° to 113°F (0° to 45°C)
Operating humidity: 5 to 95% (RH), non-condensing
Operating altitude: 0ft to 10,000ft above sea level
Max. non-operating specifications:
Storage temperature: −40° to 149°F (−40° to 65°C)
Storage humidity: 5 to 95% (RH), non-condensing
PoE/PoE+ Power Budget: 850W using integrated power supply. 1,700W when used in conjunction with MPS1000

Redundancy
Hot swappable redundant RPMs
Hot swappable redundant power supplies

Performance
MAC addresses: 160K
IPv4 routes: 128k (in scaled mode); 16k in default mode
IPv6 routes: 32K (shared CAM space with IPv4)
RPM switch fabric capacity: 2.56Tbps (full-duplex) 1.28Tbps (half-duplex)
RPM throughput: 1,462 Mpps
Line Card switch fabric capacity: 1.44Tbps (full-duplex) 720Gbps (half-duplex)

Line Card throughput: 714 Mpps
Link aggregation: 16 links per group, 128 groups per stack
Queues per port: 8 queues
Layer 2 VLANs: 4K
MSTP : 64 instances
VRF-lite: 32 instances (64 in future release)
Line-rate Layer 2 switching: all protocols, including IPv4 and IPv6
Line-rate Layer 3 routing: IPv4 and IPv6
IPv4 host table size 32K
IPv6 host table size 16K
IPv4 Multicast table size 4K
LAG load balancing: based on Layer 2, IPv4 or IPv6 headers

IEEE compliance
802.1AB LLDP
802.1BR (Tagging/Detection/Distribution)
802.1D Bridging, STP
802.1p L2 Prioritization
802.1Q VLAN Tagging, Double VLAN Tagging, GVRP
802.1s MSTP
802.1w RSTP
802.1X Network Access Control
802.3ab Gigabit Ethernet (1000BASE-T)
802.3ac Frame Extensions for VLAN Tagging
802.3ad Link Aggregation with LACP
802.3ae 10 Gigabit Ethernet (10GBASE-X) on optical ports
802.3af
802.3at
802.3u Fast Ethernet (100BASE-TX) on mgmt ports
802.3x Flow Control
802.3z Gigabit Ethernet (1000BASE-X)
ANSI/TIA-1057 LLDP-MED
Force10 PVST+
MTU 12,000 bytes

RFC and I-D compliance

3376 IGMPv3
MSDP
draft-ietf-pim-sm-v2-new-05
PIM-SMw

General Internet protocols

768 UDP
793 TCP
854 Telnet
959 FTP

General IPv4 protocols

791 IPv4
792 ICMP
826 ARP
1027 Proxy ARP
1035 DNS (client)
1042 Ethernet
Transmission
1305 NTPv3
1519 CIDR
1542 BOOTP (relay)
1812 Requirements for
IPv4 Routers
1918 Address Allocation
for Private Internets
2474 Diffserv Field
in IPv4 and Ipv6
Headers
2596 Assured Forwarding
PHB Group
3164 BSD Syslog
3195 Reliable Delivery for
Syslog
3246 Expedited Assured
Forwarding
4364 VRF-lite (IPv4 VRF
with OSPF, BGP, IS-IS, and v4 multicast)
5798 VRRP

General IPv6 protocols

1981 Path MTU Discovery Features
2460 Internet Protocol, Version 6 (IPv6)
Specification
2464 Transmission of IPv6 Packets over Ethernet
Networks
2710 Multicast Listener Discovery (MLD) for IPv6
2711 IPv6 Router Alert Option
3810 Multicast Listener Discovery Version 2
(MLDv2) for IPv6
4007 IPv6 Scoped Address Architecture
4213 Basic Transition Mechanisms for IPv6 Hosts
and
Routers
4291 IPv6 Addressing Architecture
4443 ICMP for IPv6
4861 Neighbor Discovery for IPv6
4862 IPv6 Stateless Address Autoconfiguration
5095 Deprecation of Type 0 Routing Headers in
IPv6
IPv6 Management support (telnet, FTP, TACACS,
RADIUS, SSH, NTP)
VRF-Lite (IPv6 VRF with OSPFv3, BGPv6, and IS-IS)

RIP

1058 RIPv1 2453 RIPv2

OSPF (v2/v3)

1587 NSSA
4552 Authentication
2328 OSPFv2 OSPFv3
2370 Opaque LSA (Partial)
5340 OSPF for IPv6

BGP

1997 Communities
2385 MD5
2545 BGP-4 Multiprotocol Extensions for IPv6

Inter-Domain
Routing
2439 Route Flap Damping
2796 Route Reflection
2842 Capabilities
2858 Multiprotocol Extensions
2918 Route Refresh
3065 Confederations
4360 Extended Communities
4893 4-byte ASN
5396 4-byte ASN representations
draft-ietf-idr-bgp4-20 BGPv4
draft-michaelson-4byte-as-representation-05
4-byte ASN Representation (partial)
draft-ietf-idr-add-paths-04.txt ADD PATH

Multicast

1112 IGMPv1
2236 IGMPv2
3376 IGMPv3
MSDP
draft-ietf-pim-sm-v2-new-05
PIM-SMw
RFC4602   Protocol Independent Multicast
RFC4610   Anycast-RP Using PIM
RFC5015   Bidirectional PIM
RFC5059   Bootstrap Router (BSR) Mechanism for
PIM
RFC5294   Host Threats to PIM
RFC5384   PIM Join Attribute Format
RFC5496   Reverse Path Forwarding Vector TLV
RFC5796   Authentication and Confidentiality in
PIM-SM Link-Local Messages
RFC6166   A Registry for PIM Message Types
RFC6226   PIM Group-to-Rendezvous-Point
Mapping
RFC6395   An Interface Identifier (ID) Hello Option
for PIM
RFC6420   PIM Multi-Topology ID Join Attribute
RFC6559   A Reliable Transport Mechanism for
PIM

Network management

1155 SMIv1
1157 SNMPv1
1212 Concise MIB Definitions
1215 SNMP Traps
1493 Bridges MIB
1850 OSPFv2 MIB
1901 Community-Based SNMPv2
2011 IP MIB
2096 IP Forwarding Table MIB
2578 SMIv2
2579 Textual Conventions for SMIv2
2580 Conformance Statements for SMIv2
2618 RADIUS Authentication MIB
2665 Ethernet-Like Interfaces MIB
2674 Extended Bridge MIB
2787 VRRP MIB
2819 RMON MIB (groups 1, 2, 3, 9)
2863 Interfaces MIB
3273 RMON High Capacity MIB
3410 SNMPv3
3411 SNMPv3 Management Framework
3412 Message Processing and Dispatching for the
Simple Network Management Protocol (SNMP)
3413 SNMP Applications
3414 User-based Security Model (USM) for
SNMPv3
3415 VACM for SNMP
3416 SNMPv2
3417 Transport mappings for SNMP
3418 SNMP MIB
3434 RMON High Capacity Alarm MIB
3584 Coexistence between SNMP v1, v2 and v3
4022 IP MIB
4087 IP Tunnel MIB
4113 UDP MIB

4133 Entity MIB
4292 MIB for IP
4293 MIB for IPv6 Textual Conventions
4502 RMONv2 (groups 1,2,3,9)
5060 PIM MIB
ANSI/TIA-1057 LLDP-MED MIB
Dell_ITA.Rev_1_1 MIB
draft-grant-tacacs-02 TACACS+
draft-ietf-idr-bgp4-mib-06 BGP MIBv1
IEEE 802.1AB LLDP MIB
IEEE 802.1AB LLDP DOT1 MIB
IEEE 802.1AB LLDP DOT3 MIB
sFlow.org sFlowv5
sFlow.org sFlowv5 MIB (version 1.3)
FORCE10-BGP4-V2-MIB Force10 BGP MIB
(draft-ietf-idr-bgp4-mibv2-05)
FORCE10-IF-EXTENSION-MIB
FORCE10-LINKAGG-MIB
FORCE10-COPY-CONFIG-MIB
FORCE10-PRODUCTS-MIB
FORCE10-SMI
FORCE10-TC-MIB
FORCE10-TRAP-ALARM-MIB
DELL-NETWORKING-CHASSIS-MIB
DELL-NETWORKING-FPSTATS-MIB
f10-bmp.mib
f10-bpstats.mib
f10-dcbx.mib
f10-fib.mib
f10-fip-snooping.mib
f10-isis.mib
f10-openFlow.mib
f10-VirtualLinkTrunk.mib
RFC5240   PIM Bootstrap Router MIB
RFC5060   PIM MIB

Regulatory compliance

Safety

UL/CSA 60950-1, Second Edition
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 Fibre Communication
Systems
FDA Regulation 21 CFR 1040.10 and 1040.11

Emissions

Australia/New Zealand: AS/NZS CISPR 22: Class A
Canada: ICES-003, Issue-4, Class A
Europe: EN 55022: (CISPR 22:), Class A
Japan: VCCI Class A
USA: FCC CFR 47 Part 15, Subpart B: Class A

Immunity

EN 300 386 EMC for Network Equipment
EN 55024
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 C Series components are EU RoHS compliant.

Certifications

Available with US Trade Agreements Act (TAA)
compliance
USGv6 Host and Router Certified on Dell
Networking OS
9.5 and greater*
IPv6 Ready for both Host and Router*

*USGv6, IPv6 Ready, and UC APL certifications contingent upon successful test completion

	Dell Networking C9000 series 2.56T RPM	Dell Networking C9000 series 6-port 10/40GbE QSFP+ line card	Dell Networking C9000 series 24-port 1/10GbE SFP+ line card	Dell Networking C9000 series 24-port 1/10GBASE-T line card	Dell Networking C1048P 48-port 10/100/1000BASE-T PoE+ Rapid access node
Description	2.56Tbps RPM with 4 integrated SFP+ ports	6-port 40GbE line card with pluggable QSFP+ modules, supporting 10 or 40GbE connectivity	24-port 10GbE line card with pluggable SFP+ modules, supporting 1 or 10GbE connectivity	24-port 10GbE line card with 10GBASE-T RJ45 ports, supporting 1 or 10GbE connectivity	48-port 1GbE PoE+ rapid access node with 10/100/1000BASE-T RJ45 ports, supporting 10MbE, 100MbE, or 1GbE PoE+ connectivity
Key features	Supports line rate switching between line cards within the chassis. Supports up to 2,000 virtual ports. Includes 4 integrated SFP+ ports for additional connectivity options.	Supports line rate switching for 6 40GbE ports (24 10GbE ports using breakout cables). Supports up to 2,000 virtual ports. Local switching supported on the line card. Half-width line card maximum flexibility. Per-port status and activity LEDs.	Supports line rate switching for 24 10GbE ports through optional SFP+ modules (1GbE supported via SFP modules). Supports up to 2,000 virtual ports. Local switching supported on the line card. Half-width line card maximum flexibility. Per-port status and activity LEDs.	Supports line rate switching for 24 10GbE ports through integrated 10GBASE-T ports (1GBASE-T also supported). Supports up to 2,000 virtual ports. Local switching supported on the line card. Half-width line card maximum flexibility. Per-port status and activity LEDs.	Supports 48 10/100/1000BASE-T PoE+ ports for user/ server connectivity. Extends C9010 functionality by extending port capacity by up to 2,000 virtual ports.
Ports					
10/100/1000BASE-T	None	None	None	None	48 RJ45
1/10GbE Copper	None	None	None	24 RJ45	None
1/10 GbE Fiber	4 SFP+	None	24 SFP+	None	2 SFP+
10/40 GbE Fiber	None	6 QSFP+	None	None	None
PoE/PoE+ Ports	None	None	None	None	48 PoE/PoE+
Optics (sold separately)	**Optics** Transceiver, SFP, 1000BASE-SX, 850nm Wavelength, 550m Reach Transceiver, SFP, 1000BASE-LX, 1310nm Wavelength, 10km Reach Transceiver, SFP, 1GbE, ZX, 1550nm Wavelength, 80km Reach typical on 9/125um SMF Transceiver, SFP, 1000BASE-T Transceiver, SFP+, 10GbE, SR, 850nm Wavelength, 300m Reach Transceiver, SFP+, 10GbE, LR, 1310nm Wavelength, 10km Reach Transceiver, SFP+, 10GbE, LRM, 1310nm Wavelength, 220 reach on MMF Transceiver, SFP+, 10GbE, ER, 1550nm Wavelength, 40km Reach	**Optics** Transceiver,40GE QSFP+ Short Reach Optic,850nm Wavelength,100-150m Reach on OM3/OM4 Transceiver, 40GbE QSFP+ ESR, 300m Reach on OM3 / 400m on OM4 Transceiver, 40GbE QSFP+ PSM4 with 1m pigtail to male MPO SMF, 2km reach Transceiver, 40GbE QSFP+ PSM4 with 5m pigtail to male MPO SMF, 2km reach Transceiver, 40GbE QSFP+ PSM4 with 15m pigtail to male MPO SMF, 2km reach Transceiver, 40GbE QSFP+ LR4, 10km Reach on SMF	**Optics** Transceiver, SFP, 1000BASE-SX, 850nm Wavelength, 550m Reach Transceiver, SFP, 1000BASE-LX, 1310nm Wavelength, 10km Reach Transceiver, SFP, 1GbE, ZX, 1550nm Wavelength, 80km Reach typical on 9/125um SMF Transceiver, SFP, 1000BASE-T Transceiver, SFP+, 10GbE, SR, 850nm Wavelength, 300m Reach Transceiver, SFP+, 10GbE, LR, 1310nm Wavelength, 10km Reach Transceiver, SFP+, 10GbE, LRM, 1310nm Wavelength, 220 reach on MMF Transceiver, SFP+, 10GbE, ER, 1550nm Wavelength, 40km Reach	None	**Optics** Transceiver, SFP, 1000BASE-SX, 850nm Wavelength, 550m Reach Transceiver, SFP, 1000BASE-LX, 1310nm Wavelength, 10km Reach Transceiver, SFP, 1GbE, ZX, 1550nm Wavelength, 80km Reach typical on 9/125um SMF Transceiver, SFP, 1000BASE-T Transceiver, SFP+, 10GbE, SR, 850nm Wavelength, 300m Reach Transceiver, SFP+, 10GbE, LR, 1310nm Wavelength, 10km Reach Transceiver, SFP+, 10GbE, LRM, 1310nm Wavelength, 220 reach on MMF Transceiver, SFP+, 10GbE, ER, 1550nm Wavelength, 40km Reach

Cables (sold separately)	Cables	Cables	Cables	None	Stacking Cables
	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	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	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,		Stacking cable 0.5m Stacking cable 1m Stacking cable 3m **Cables** 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
Maximum Power/Thermal	190W/648 BTU/hr	125W/426 BTU/hr	170W/580 BTU/hr	205W/699 BTU/hr	1,738W/6,070 BTU/hr
DRAM/Flash	24GB/32GB	2GB/4GB	2GB/4GB	2GB/4GB	1GB/256MB
Packet Buffer	9MB	9MB	9MB	9MB	4MB
Weight	4.18kg(9.20lbs)	2.11kg(4.63lbs)	2.74kg(6.03lbs)	2.74kg(6.03lbs)	6.81kg(14.99lbs)

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