



# Dell Networking N2000 series

Dell Networking N2000 is a series of energy-efficient and cost-effective 1GbE switches designed for modernizing and scaling network infrastructure. N2000 switches utilize a comprehensive enterprise-class Layer 3 Standard feature set, deliver consistent, simplified management and offer high-availability device and network design.

The N2000 switch series offers a power-efficient Gigabit Ethernet (GbE) network-access switching solution with integrated 10GbE uplinks. The N2000 switch series has high-performance capabilities and wire-speed performance, utilizing a non-blocking architecture to easily handle unexpected traffic loads. The switches offer simple management and scalability via an 84Gbps (full-duplex) high-availability stacking architecture that allows management of up to 12 switches from a single IP address.

An integrated 80PLUS-certified power supply and features such as Energy-Efficient Ethernet and short cable detection provide energy efficiency to help decrease power and cooling costs.

# Modernize campus network architectures

Modernize campus network architectures with a power-efficient and resilient 1/10GbE switching solution with Power over Ethernet Plus (PoE+). Select N2000 models offer 24 or 48 ports of PoE+ to deliver clean power to network devices such as wireless access points (APs), Voice-over-IP (VoIP) handsets, video conferencing systems and security cameras. For greater interoperability in multivendor networks, N2000 switches offer the latest openstandard protocols and include technology to interface with Cisco protocol RPVST+ and devices using CDP. Achieve high availability and full bandwidth utilization with Multi-chassis Link Aggregation (MLAG). N2000 switches support MLAG to create active/active loop-free redundancy without spanning tree.The N2000 series is also fully tested and validated to work with Dell EqualLogic™ PS-Series storage arrays.\*

# Leverage familiar tools and practices

All N-Series switches include Dell Networking OS 6, designed for easier deployment, greater interoperability and a lower learning curve for network administrators. One common command line interface (CLI) and graphic user interface (GUI) using a well-known command language gets skilled network administrators productive quickly. This allows network administrators to maintain consistent configurations by running one OS release across all N-Series products. With USB auto-configuration, network administrators can rapidly deploy mirrored configurations to numerous devices by simply inserting a USB key.

# Deploy with confidence at any scale

N2000 series switches help create performance assurance with a data rate up to 220Gbps (full duplex) and a forwarding rate up to 164Mpps. Scale easily with built-in rear stacking ports. Switch stacks of up to 600 1GbE ports can be managed from a single screen using the highly-available stacking architecture for high-density aggregation with seamless redundant availability. N-Series switches help provide certainty with a lifetime warranty that covers software upgrades, hardware repair or replacement, and optics and cables purchased with the switch. Details at Dell.com/LifetimeWarranty.\*\*

# Hardware, performance and efficiency

- Up to 48 line-rate GbE RJ-45 ports and two integrated 10GbE SFP+ ports.
- Support for 24 ports of PoE+ in 1RU or up to 48 ports of PoE+ with an optional external power supply.
- Up to 600 1GbE ports in a 12-unit stack for high-density, highavailability in IDFs, MDFs and wiring closets.
- Non-stop forwarding and fast failover in stack configurations.
- Energy-Efficient Ethernet and lower power PHYs reduce power to inactive ports and idle links, providing energy savings from the power cord to the port.
- Dell Fresh Air compliance for operation in environments up to 113°F (45°C) helps reduce cooling costs in temperature constrained deployments.

# Deploying, configuring and managing

- USB auto-configuration rapidly deploys the switch without setting up complex TFTP configurations or sending technical staff to remote offices.
- Management via an intuitive and familiar CLI, embedded web server (GUI), SNMP-based management console application (including Dell OpenManage Network Manager), Telnet or serial connection.
- Private VLAN extensions and Private VLAN Edge support.
- AAA authorization, TACACS+ accounting and RADIUS support for comprehensive secure access support.
- Authentication tiering allows network administrators to tier port authentication methods such as 802.1x, MAC Authentication Bypass and Captive Portal in priority order so that a single port can provide flexible access and security.
- Achieve high availability and full bandwidth utilization with MLAG and support firmware upgrades without taking the network offline.
- Interfaces with RPVST+ protocol for greater flexibility and interoperability in Cisco networks.
- Layer 3 Standard IPv4 and IPv6 functionality including static routing, RIP, and OSPFv2 (future OS release) support.
- Policy based forwarding provides access control for all packets that are bridged within a VLAN or that are routed into or out of a VLAN.
- Remote Switch Port Analyzer (RSPAN) monitors ports across a Layer 2 domain without costly dedicated network taps.

<sup>\*</sup>Contact your Dell representative for a full list of validated storage arrays.

<sup>\*\*</sup>Select Networking products carry a Lifetime Limited Warranty with Basic Hardware Service (repair or replacement) for life. Repair or replacement does not include troubleshooting, configuration, or other advanced service provided by Dell ProSupport.

# Specifications: Dell Networking N2000 series

#### **Dell SKU description**

N2024: 24x RJ45 10/100/1000Mb auto-sensing ports, 2x SFP+ ports, 2x stacking ports, 1 integrated 100W PSU

N2024P: 24x RJ45 10/100/1000Mb PoE+ (up to 30.8w) autosensing ports, 2x SFP+ ports, 2x stacking ports, 1 integrated 1000W PSU (requires C15 plug)

N2048: 48x RJ45 10/100/1000Mb auto-sensing ports, 2x SFP+ ports, 2x stacking ports, 1 integrated 100W PSU

N2048P: 48x R,145 10/100/1000Mb PoE+ (up to 30.8w) autosensing ports, 2x SFP+ ports, 2x stacking ports, 1 integrated 1000W PSU (requires C15 plug)

Power cords C13 to NEMA 5-15, 3M

C13 to C14, 2M

C15 to NEMA 5-15, 2M (C15 for POE N-Series only)

Power supplies (optional)
RPS720 external power supply for N2000 non-POE (720 watts): N2024 and N2048 (sold separately)

MPS1000 external power supply for N2000 PoE+ switches (1000 watts): N2024P and N2048P (sold separately)

### Optics (optional)

Transceiver, SFP, 1000BASE-T

Transceiver, SFP, 1000BASE-SX, 850nm wavelength, up to 550m reach Transceiver, SFP, 1000BASE-LX, 1310nm wavelength, up to 10km reach Transceiver, SFP, 1000BASE-ZX, 1550nm wavelength, up to 80km

Transceiver, SFP+, 10GbE, LRM, 1310nm wavelength, up to 220m

Transceiver, SFP+, 10GbE, SR, 850nm wavelength, up to 300m reach Transceiver, SFP+, 10GbE, LR, 1310nm wavelength, up to 10km reach Transceiver, SFP+, 10GbE, ER, 1550nm wavelength, up to 40km reach Cables (optional)

Stacking cable 0.5m, 1m and 3m

Dell Networking, cable, SFP+ to SFP+, 10GbE, copper twinax direct attach cable, 0.5m, 1m, 3m, 5m and 7m

### **Physical**

2 rear stacking ports (21Gbps) supporting up to 84Gbps (full-duplex)

2 integrated front 10GbE SFP+ dedicated ports

USB (Type A) port for configuration via USB flash drive Auto-negotiation for speed and flow control

Auto MDI/MDIX, port mirroring Flow-based port mirroring

Broadcast storm control

Energy-Efficient Ethernet per port settings

Redundant variable speed fans Air flow: I/O to power supply

Integrated power supply: 100W AC (N2024, N2048), 1,000W AC (N2024P, N2048P)

RJ45 console port with RS232 signaling (RJ-45 to female DB-9 connector cable included)

Dual firmware images on-board

Switching engine model: Store and forward

Size (1RU): 1.7 in x 17.3 in x 10.1 in (43.5 mm x 440.0 mm x 257.0 mm) (H x W x D) (N2024 and N2048)

1.7 in x 17.3 in x 15.2 in (43.5 mm x 440.0 mm x 387.0 mm) (H x W x D) (N2024P and N2048P) Approximate weight: 8.1351lbs/3.69kg (N2024),

14.0435lbs/6.37kg (N2024P), 8.9287lbs/4.05kg (N2048), 14.9914lbs/6.8kg (N2048P)

Rack mounting kit with 2 mounting brackets, bolts and cage nuts

#### **Environmental**

Power supply efficiency: 80% or better in all operating modes Max. thermal output (BTU/hr): 11744 (N2024), 3,113.33 (N2024P), 167.7 (N2048), 6069.80 (N2048P)

Power consumption max (watts): 42.9 (N2024), 913 (N2024P), 53.9 (N2048), 1738 (N2048P)

Operating temperature: 32° to 113°F (0° to 45°C)

Storage temperature: -40° to 149°F (-40° to 65°C) Storage relative humidity: 85%

Operating humidity: 95%

### Performance

MAC addresses:

256 (IPv4)/128 (IPv6) Static routes:

Dynamic routes 256 (IPv4)

172Gbps (N2024 and N2024P) 220Gbps (N2048 and N2048P) Switch fabric capacity: (full duplex) 128Mpps (N2024 and N2024P) Forwarding rate: 164Mpps (N2048 and N2048P) Link aggregation

128 LAG groups, 144 dynamic ports per stack, 8 member ports per LAG

Priority queues per port:

Line-rate Layer 2 switching: All (non-blocking) Line-rate Layer 3 routing: All (non-blocking) 256MB

Flash memory: Packet buffer memory: 4MB CPU memory: 1GB RIP routing interfaces: 256 VLAN routing interfaces: 256 4.094 VI ANs supported: Protocol-based VLANs: Supported ARP entries: 1,024 NDP entries: 400 Access control lists (ACI ): Supported MAC and IP-based ACLs: Supported Time-controlled ACLs: Supported

Max rules per ACL: Max ACL rules per interface (IPv4): 1,024 (ingress), 512 (egress) Max ACL rules per interface (IPv6): 512 (ingress), 256 (egress)

2,048

Max VLAN interfaces with ACLs applied:

Max number of ACLs:

Max ACL rules system-wide

IEEE compliance

802.1AB LLDP Voice VLAN Dell

Dell ISDP (inter-operates with devices running CDP)

802.1D 802.1p

ISDP (Inter-operates with devices running CDP)
Bridging, Spanning Tree
Ethernet Priority (User Provisioning and Mapping)
Adjustable WRR and Strict Queue Scheduling
VLAN Tagging, Double VLAN Tagging, GVRP
Multiple Scanning Tree (MCTP) Dell 802.1Q

802.1S 802.1v Multiple Spanning Tree (MSTP)
Protocol-based VLANs 802 1W

Rapid Spanning Tree (RSTP)
RSTP-Per VLAN (compatible with Cisco's RPVST+) Dell Spanning tree optional features: STP root guard, BPDU guard, BPDU filtering Network Access Control, Auto VLAN Dell

802.1X Logical Link Control 10BASE-T

802.2 802.3

Gigabit Ethernet (1000BASE-T) Frame Extensions for VLAN Tagging 802.3ab 802.3ac 802.3ad 802.3ae Link Aggregation with LACP 10 Gigabit Ethernet (10GBASE-X) 802.3at 802.3AX

10 Gigabit Eriterriet (1004855-X)
POE+ (N2024P and N2048P)
LAG Load Balancing
Multi-Chassis LAG (MLAG)
Policy Based Forwarding
Energy Efficient Ethernet (EEE)
Fast Ethernet (100BASE-TX) on Management Ports Dell Dell 802 3az

Flow Control Gigabit Ethernet (1000BASE-X) LLDP-MED (TIA-1057) 802.3x 802.3z

ANSI 9,216 bytes

#### RFC compliance and additional features **General Internet protocols**

General Internet protocols are supported. For a detailed list, please contact your Dell representative.

# General IPv4 protocols

General IPv4 protocols are supported. For a detailed list, please contact your Dell representative.

# **General IPv6 protocols**

General IPv6 protocols are supported. For a detailed list, please contact your Dell representative.

### Layer 3 functionality

1058 RIPv1 2082 RIP-2 MD5 Auth 1724 RIPv2 MIB Extension 2453 RIPv2

Multicast

2365 Admin scoped IP Mcast 4541 2932 IPv4 MIR IGMP v1/v2/v3 Snooping and Ouerier

IEEE 802.1ag draft 8.1 – Connectivity Fault Management

### Quality of service

2474 DiffServ Field 2697 srTCM 4115 2475 DiffServ Architecture trTCM Assured Fwd PHB L4 Trusted Mode Dell Port Based OoS (TCP/LIDP)

Services Mode Flow Based QoS Services Mode (IPv4/IPv6) Dell

Network management and security				
	1155	SMIv1	2863	Interfaces MIB
	1157	SNMPv1	2865	RADIUS
	1212	Concise MIB Definitions	2866	RADIUS Accounting
	1213	MIB-II	2868	RADIUS Attributes for
	1215	SNMP Traps		Tunnel Prot.
	1286	Bridge MIB	2869	RADIUS Extensions
	1442	SMIv2	3410	Internet Standard
	1451	Manager-to-Manager		Mgmt. Framework
	MIB		3411	SNMP Management
	1492	TACACS+		Framework
	1493	Managed Objects for Bridges MIB	3412	Message Processing and Dispatching
	1573	Evolution of Interfaces	3413	SNMP Applications
	1612	DNS Resolver MIB Extensions	3414	User-based security
	1643	Ethernet-like MIB	model	
	1757	RMON MIB	3415	View-based control
	1867	HTML/2.0 Forms with File Upload Extensions	model	SNMPv2
	1901	Community-based		
		SNMPv2	3417	Transport Mappings
	1907	SNMPv2 MIB	3418	SNMP MIB
	1908	Coexistence Between	3577	RMON MIB
		SNMPv1/v2	3580	802.1X with RADIUS
	2011	IP MIB	3737	Registry of RMOM MIB
	2012	TCP MIB	4086	Randomness
	2013	UDP MIB	4447	Requirements
	2068	HTTP/1.1	4113	UDP MIB
	2096	IP Forwarding Table MIB	4251 4252	SSHv2 Protocol
	2233	Interfaces Group using		SSHv2 Authentication
		SMIv2	4253 4254	SSHv2 Transport SSHv2 Connection
	2246	TLS v1	4254	Protocol
	2271	SNMP Framework MIB	4419	SSHv2 Transport Layer
	2295	Transport Content Negotiation	4521	Protocol LDAP Extensions
	2296	Remote Variant Selection	4716	SECSH Public Key File
	2346	AES Ciphersuites for TLS	6101	Format SSL
	2576	Coexistence Between	6398	IP Router Alert
		SNMPv1/v2/v3	Dell	Enterprise MIB
	2578	SMIv2		supporting routing
	2579	Textual Conventions for SMIv2		features draft-ietf- hubmib-etherif- mib- v3-00.txt (Obsoletes
	2580	Conformance Statements for SMIv2	Dell	RFC 2665) LAG MIB Support for
	2613	RMON MIB	Dell	802.3ad Functionality
	2618	RADIUS Authentication MIB	Dell	sflow version 1.3 draft 5
	2620	RADIUS Accounting MIB	Dell	802.1x Monitor Mode
	2665	Ethernet-like nterfaces	Dell	Custom Login Banners
		MIB	Dell	Dynamic ARP
	2666	Identification of Ethernet Chipsets	Dell	Inspection IP Address Filtering
	2674	Extended Bridge MIB	Dell	Tiered Authentication
	2737	ENTITY MIB	Dell	RSPAN
	2818	HTTP over TLS	Dell Dell	
	2819	RMON MIB (groups 1,	Dell	Change of Authorization
	0056	2, 3, 9)	Demo	OpenFlow 1.0
	2856	Text Conv. For High	20110	OPCI 11 10 VV 1.0
		Capacity Data Types		

## Regulatory, environment and other compliance

# Safety and emissions

Australia/New Zealand: ACMA RCM Class A

Canada: ICES Class A: cUL China: CCC Class A: NAI Europe: CE Class A

Japan: VCCI Class A USA: FCC Class A; NRTL UL Eurasia Customs Union: EAC

Germany: GS mark

Product meets EMC and safety standards in many countries

inclusive of USA, Canada, EU, Japan, China.

For more country-specific regulatory information and approvals, please see your Dell representative.

Product meets RoHS compliance standards in many countries inclusive of USA, EU, China, and India. For more country-specific RoHS compliance information, please see your Dell representative. FUWFFF

EU Battery Directive REACH

**Energy** 

Japan: JFI

Certifications (available or coming soon)

Available with US Trade Agreements Act (TAA) compliance.

N-Series products have the necessary features to support a PCIcompliant network topology.

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