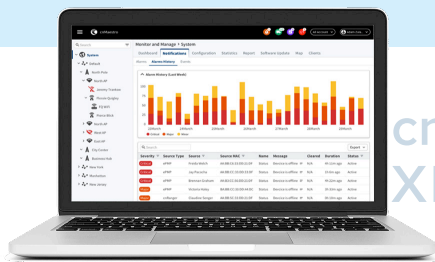
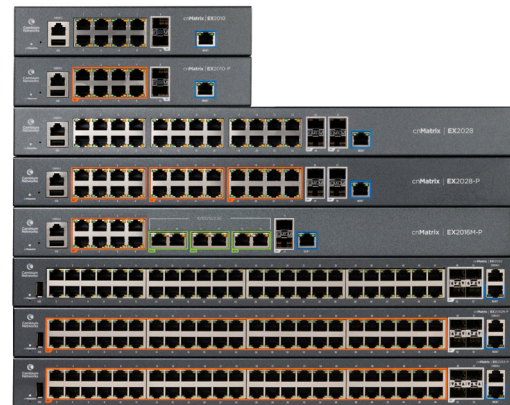


# cnMatrix™ EX2000 Series Switches

## QUICK LOOK:

- **Zero-touch deployments**
- **Policy Based Automation**
- **Auto device profiling and segmentation**
- **Non-blocking, line-rate architecture with fully featured L2/L3 switching**



cnMaestro™  
XMS

Cambium Networks' next generation switching platform offers a cloud managed, high performance, feature rich enterprise grade ethernet switching solution.

The cnMatrix platform of switches provides:

- Easy and simple, free cloud (or on premise) management with cnMaestro™ or XMS\*
- Zero-touch deployment of switches makes installation easy
- Policy Based Automation eliminates manual and time consuming configuration
- Enhanced Security with automated device profiling and segmentation
- Policy Based Automation eliminates manual configuration during adds, moves and changes of network devices
- Unified Wired-Wireless access solution



The cnMatrix series of fully managed switches delivers full Layer 2 and Layer 3 capabilities with enhanced access security. Depending on the model, the cnMatrix EX2000 series offers flexibility with SFP+ (10 Gbps) or SFP (1 Gbps) uplink ports.

\* Feature to be included in a future release.

## cnMatrix™ EX2000 Series Switches

## Specifications

	EX2052	EX2052-P	EX2052R-P	EX2016M-P	EX2028-P	EX2028	EX2010-P	EX2010
<b>Throughput</b>	176 Gbps	176 Gbps	176 Gbps	86 Gbps	128 Gbps	128 Gbps	20 Gbps	20 Gbps
<b>Forwarding Rate in Mpps (64 Byte Packets)</b>	120	120	120	120	120	120	120	120
<b>10/100/1000 Ports</b>	48	48	48	8	24	24	8	8
<b>2.5 G Ports</b>	n/a	n/a	n/a	6	n/a	n/a	n/a	n/a
<b>Uplink Ports</b>	4 SFP+	4 SFP+	4 SFP+	2 SFP+	4 SFP+	4 SFP+	2 SFP	2 SFP
<b>PoE+ Enabled Ports (802.3af/at)</b>	n/a	48	48	14	24	n/a	8	n/a
<b>Serial Console</b>	✓	✓	✓	✓	✓	✓	✓	✓
<b>USB</b>	✓	✓	✓	✓	✓	✓	✓	✓
<b>Out-of-Band Management Port</b>	✓	✓	✓	✓	✓	✓	✓	✓
<b>Rack Mount Kit</b>	✓	✓	✓	✓	✓	✓	Optional	Optional
<b>Internal Fans</b>	2	2	2	2	2	Fanless	Fanless	Fanless
<b>Reset Button</b>	✓	✓	✓	✓	✓	✓	✓	✓
<b>MAC Address Table Size</b>	16K	16K	16K	16K	16K	16K	16K	16K
<b>Flash Storage</b>	128 MB	128 MB	128 MB	128 MB	128 MB	128 MB	128 MB	128 MB
<b>DRAM</b>	512 MB	512 MB	512 MB	512 MB	512 MB	512 MB	512 MB	512 MB
<b>VLANs</b>	4K	4K	4K	4K	4K	4K	4K	4K
<b>Port Based VLANs</b>	4K	4K	4K	4K	4K	4K	4K	4K
<b>LACP/Trunking</b>	8 LAGs/8 links per LAG		8 LAGs/8 links per LAG		8 LAGs/8 links per LAG		8 LAGs/8 links per LAG	
<b>QoS Priority Queues</b>	8	8	8	8	8	8	8	8
<b>PVRST</b>	32	32	32	32	32	32	32	32
<b>Ingress/Egress ACL</b>	128	128	128	128	128	128	128	128
<b>Static ARP Entries</b>	512	512	512	512	512	512	512	512
<b>ARP Entries</b>	512	512	512	512	512	512	512	512
<b>Static Routes</b>	64	64	64	64	64	64	64	64
<b>Dynamic Routing</b>	512	512	512	512	512	512	512	512
<b>IGMP Multicast Groups</b>	256	256	256	256	256	256	256	256
<b>Policy Based Automation</b>	✓	✓	✓	✓	✓	✓	✓	✓

## cnMatrix™ EX2000 Series Switches

### Specifications - All Models

**Quality of Service**

ACL mapping and marking of ToS/DSCP (COS)

ACL mapping marking of 802.1p

ACL mapping to priority queue

DiffServ support

Honoring DSCP and 802.1p (CoS)

Traffic shaping/metering

Priority queue management using Weighted Round Robin (WRR), Strict Priority (SP) and a combination of WRR and SP

**Traffic Management**

ACL-based inbound rate limiting policies

Broadcast, multicast and unknown unicast rate limiting

Inbound rate limiting per port

Outbound rate limiting per port/queue

**Security**

802.1x authentication

MAC authentication\*

DHCP snooping

RADIUS authentication/authorization

Radius/Tacacs/Tacacs+

Authentication, Authorization, and Accounting (AAA)

Secure shell

Secure copy (SCP)\*

Local username/password

**Layer 2 Feature Set**

802.1s multiple spanning tree

VLAN, Port, Protocol, 802.1q

802.1d

802.1x authentication

Auto MDI/MDIX

BPDU Guard, Root Guard

IGMP Snooping v1/v2/v3\*, Fast Leave

LLDP/LLDP MED

IGMP Proxy

Static MAC

Flow Control per port

Per VLAN STP (PVST/PVRST)

Port Mirroring: port based, ACL based, VLAN based

Port Isolation/Private VLAN Edge

Link Aggregation Groups (Static/LACP)

Rate Limiting/Storm Control

Jumbo frame (9k)

DHCP Snooping

BPDU filtering

Broadcast/Multicast/Unlearned Unicast (Storm Control)

DoS Protection

Ping/TraceRoute/ICMPv6

**Layer 3 Feature Set**

Inter-VLAN Routing

Static ARPs

Static Routes

DHCP Relay

Dynamic Routing – RIPv1/v2

Dynamic Routing – OSPFv2

Route Redistribution

\* Feature to be included in a future release.

## cnMatrix™ EX2000 Series Switches

### Specifications - All Models cont'd

#### Management

cnMaestro (cloud management)	Simple Network Time Protocol (SNTP)
Industry standard Command Line Interface (CLI)	Local/remote system logging
DHCP Client	Policy Based Automation
Embedded web management (HTTP/HTTPS)	Display log messages multiple terminals*
Embedded DHCP server	TFTP/SFTP
USB file management and storage	Telnet client/server
Out-of-Band Ethernet Management	IPv6 management
SSH / SSH v2	Password management
SNMP v1/v2/v3	Autoinstall support for firmware images and config files
DHCP relay	

#### Security

PERMIT/DENY ACTIONS FOR INBOUND IP AND LAYER 2 TRAFFIC CLASSIFICATION BASED ON:

Source/Destination IP address	EtherType
TCP/UDP Source/Destination port	IEEE 802.1p user priority
IP Protocol Type	VLAN ID
Type of Service (ToS) or differentiated services (DSCP) field	RFC 1858—Security Considerations for IP Fragment Filtering
Source/Destination MAC address	

\* Feature to be included in a future release.

### Hardware Specifications

	EX2052	EX2052-P	EX2052R-P	EX2016M-P	EX2028-P	EX2028	EX2010-P	EX2010
<b>Power Supply</b>	100-240 VAC	100-240 VAC	CRPS dependent	100-240 VAC	100-240 VAC	100-240 VAC	100-240 VAC	100-240 VAC
<b>Max Switch Power (WITH TRAFFIC)</b>	38.88 W	39.24 W	46.98 W	26.76 W	25.10 W	19.50 W	10.54 W	9.88 W
<b>MTBF (Hours)</b>	393,648	238,063	202,977	385,242	285,350	432,283	338,917	806,354
<b>Weight</b>	3.6 kg (7.93 lb)	5.4 kg (11.90 lb)	4.3 kg (9.48 lb) or 5.2 kg (11.46 lb)	3.6 kg (7.93 lb)	3.96 kg (8.75 lb)	2.77 kg (6.1 lb)	1.99 kg (4.375 lb)	1.6 kg (3.5375 lb)
<b>Dimensions</b>	44 x 4.4 x 25 cm (17.3 x 1.75 x 9.85 in)	44 x 4.4 x 35 cm (17.3 x 1.75 x 13.78 in)	44 x 4.4 x 35 cm (17.3 x 1.75 x 13.78 in)	44 x 4.4 x 25 cm (17.3 x 1.75 x 9.85 in)	44 x 4.4 x 25 cm (17.3 x 1.75 x 9.85 in)	44 x 4.4 x 20.9 cm (17.3 x 1.75 x 8.22 in)	21 x 4.4 x 25 cm (8.26 x 1.75 x 9.85 in)	21 x 4.4 x 25 cm (8.26 x 1.75 x 9.85 in)
<b>CPU Speed</b>	800 MHz	800 MHz	800 MHz	800 MHz	800 MHz	800 MHz	800 MHz	800 MHz
<b>LEDs Per Port</b>	Link/Activity	Link/Activity, PoE	Link/Activity, PoE	Link/Activity, PoE	Link/Activity, PoE	Link/Activity	Link/Activity, PoE	Link/Activity
<b>PoE+ Power Budget</b>	n/a	400 W	CRPS dependent	240 W	400 W	n/a	100 W	n/a
<b>PoE + Voltage</b>	n/a	54 V	54 V	54 V	54 V	n/a	54 V	n/a

## cnMatrix™ EX2000 Series Switches

### Hardware Specifications cont'd

	<b>EX2052</b>	<b>EX2052-P</b>	<b>EX2052R-P</b>	<b>EX2016M-P</b>	<b>EX2028-P</b>	<b>EX2028</b>	<b>EX2010-P</b>	<b>EX2010</b>
<b>PoE Max Power Per Port</b>	n/a	30 W	30 W	30 W, 60 W	30 W	n/a	30 W	n/a
<b>Rack Mountable</b>	Yes 1U	Yes 1U	Yes 1U	Yes 1U	Yes 1U	Yes 1U	Yes 1U	Yes 1U
<b>Temperature Ranges</b>	0°C to 50°C (32°F to 122°F)	0°C to 50°C (32°F to 122°F)	0°C to 50°C (32°F to 122°F)	0°C to 50°C (32°F to 122°F)	0°C to 50°C (32°F to 122°F)	0°C to 50°C (32°F to 122°F)	0°C to 50°C (32°F to 122°F)	0°C to 50°C (32°F to 122°F)
<b>Operating Humidity</b>	55° at 95% RH	55° at 95% RH	55° at 95% RH	55° at 95% RH	55° at 95% RH	55° at 95% RH	55° at 95% RH	55° at 95% RH
<b>Storage Temperature</b>	-40°C to 70°C (-40°F to 158°F)	-40°C to 70°C (-40°F to 158°F)	-40°C to 70°C (-40°F to 158°F)	-40°C to 70°C (-40°F to 158°F)	-40°C to 70°C (-40°F to 158°F)	-40°C to 70°C (-40°F to 158°F)	-40°C to 70°C (-40°F to 158°F)	-40°C to 70°C (-40°F to 158°F)

### Acoustic Noise dBA Per Switch (AMBIENT TEMPERATURE)

**EX2052** 40.9 dB - < 33°C, 44.2 dB - 30°C-40°C, 47.3 dB - > 43°C

**EX2052-P** 48.5 dB - < 33°C, 51.3 dB - 30°C-40°C, 54.0 dB - > 43°C

**EX2052R-P** 1200W CRPS: 74.5 dB - < 33°C, 74.3 dB - 30°C-40°C, 74.3 dB - >43°C,  
930W CRPS: 70.8 dB - < 33°C, 70.7 dB - 30°C-40°C, 70.7 dB - > 43°C,  
600W CRPS: 67.2 dB - < 33°C, 67.3 dB - 30°C-40°C, 67.5 dB - > 43°C

**EX2016M-P** 44.4 dB - < 33°C, 46.9 dB - 30°C-40°C, 49.3 dB - > 43°C

**EX2028-P** 40 dB - < 33°C, 44.3 dB - 30°C-40°C, 52 dB - > 43°C

**EX2028** Fanless

**EX2010-P** Fanless

**EX2010** Fanless

## cnMatrix™ EX2000 Series Switches

### IEEE Standards

#### Switching

##### Core Switching Features

IEEE 802.1ab—Link Layer Discovery Protocol (LLDP)
IEEE 802.1D—Spanning tree compatibility
IEEE 802.1p—Ethernet priority with user provisioning and mapping
IEEE 802.1s—Multiple spanning tree compatibility
IEEE 802.1Q—Virtual LANs with port-based VLANs
IEEE 802.1X—Port-based authentication

##### VLAN Support

IEEE 802.1W—Rapid spanning tree compatibility
IEEE 802.3—10BASE-T
IEEE 802.3u—100BASE-T
IEEE 802.3ab—1000BASE-T
IEEE 802.3ac—VLAN tagging
IEEE 802.3ad—Link aggregation
IEEE 802.3x —Flow control
Bridged Local Area Networks - Amendment 07: Multiple Registration Protocol

##### IEEE 802.1Q-2003

RFC 4541—Considerations for Internet Group Management Protocol (IGMP) Snooping Switches
ANSI/TIA-1057—LLDP-MEDia Endpoint Discovery (MED)

##### Advanced Layer 2 Features

Authentication, Authorization, and Accounting (AAA)
Broadcast/Multicast/Unknown unicast storm recovery
DHCP Snooping
IGMP Snooping Querier
Independent VLAN Learning (IVL) support
Jumbo Ethernet frame support
Port MAC locking
Port mirroring
Protected ports
Static MAC filtering

##### Layer 3 Features

Inter-VLAN Routing
Static ARP
Static Routes
RFC 2131 – DHCP Relay
RFC 2328 – OSPF Version 2
RFC 2453 – RIP Version 2

## cnMatrix™ EX2000 Series Switches

### System Facilities

Event and error logging facility

Run-time and configuration download capability

PING utility

FTP Transfers via IPv4/IPv6

RFC 768—UDP

RFC 783—TFTP

RFC 791—IP

RFC 792—ICMP

RFC 793—TCP

RFC 826—ARP

RFC 894—Transmission of IP datagrams over Ethernet networks

RFC 896—Congestion control in IP/TCP networks

RFC 951—BOOTP

RFC 1034—Domain names - concepts and facilities

RFC 1035—Domain names - implementation and specification

RFC 1321—Message digest algorithm

RFC 1534—Interoperability between BOOTP and DHCP

RFC 2021—Remote network monitoring management information base version 2

RFC 2030—Simple Network Time Protocol (SNTP)

RFC 2132—DHCP options and BOOTP vendor extensions

RFC 2819—Remote Network Monitoring Management Information Base

RFC 2865—RADIUS client

RFC 2869—RADIUS Extensions

RFC 3579—RADIUS support for EAP

RFC 3580—IEEE 802.1X RADIUS usage guidelines

RFC 3164—BSD syslog protocol

RFC 3580—802.1X RADIUS Usage Guidelines

\* Feature to be included in a future release.

### Management

SNMP v1, v2, and v3

SSH 1.5 and 2.0

RFC 4252—SSH authentication protocol

RFC 4253—SSH transport layer protocol

RFC 4254—SSH connection protocol

RFC 4251—SSH protocol architecture

RFC 4716—SECSH public key file format

RFC 4419—Diffie-Hellman group exchange for SSH transport layer protocol

SSL 3.0 and TLS 1.0

RFC 2246—TLS protocol, version 1.0

RFC 2818—HTTP over TLS

RFC 3268—AES cipher suites for transport layer security

Telnet

Web GUI

## cnMatrix™ EX2000 Series Switches

### SNMP MIBs

#### Enterprise MIBs for Full Configuration Support of Switching Features

RFC 1213—MIB II

RFC 1493—Bridge MIB

RFC 1612—DNS resolver MIB extensions

RFC 1643—Definitions of managed objects for Ethernet-like interface types

RFC 2233—Interfaces group MIB using SMI v2

RFC 2613—SMON MIB

RFC 2618—RADIUS authentication client MIB

RFC 2674—VLAN MIB

RFC 2737—Entity MIB version 2\*

RFC 2819—RMON groups 1, 2, 3, and 9

RFC 2863—IF-MIB

RFC 2925—Definitions of Managed Objects for Remote Ping, Traceroute, and Lookup Operations

RFC 3273—RMON Groups 1, 2, and 3

RFC 3291—Textual conventions for Internet network addresses

RFC 3434—RMON Groups 1, 2, and 3

RFC 4022—TCP-MIB

RFC 4113—UDP-MIB

\* Feature to be included in a future release.

#### Quality of Service MIBs

MIBs for full configuration support of DiffServ, ACL, and CoS functionality

RFC 3289—Management information base for DiffServ architecture (read-only)

### Quality of Service

#### Classify Traffic Based on Same Criteria as ACLs and Optionally:

Mark the IP DSCP or Precedence header fields

Police the flow to a specific rate with two-color aware support

RFC 2474—Definition of the differentiated services field (DS field) in the IPv4 and IPv6 headers

RFC 2475—An architecture for differentiated services

RFC 2597—Assured forwarding Per-Hop Behavior



## cnMatrix™ EX2000 Series Switches

Cambium Ordering Information			
Type	Model	Part #	Description
<b>CRPS</b>	n/a	MXCRPSAC600A0	CRPS - AC - 600 W total Power, no power cord
<b>CRPS</b>	n/a	MXCRPSAC930A0	CRPS - AC - 930 W total Power, no power cord
<b>CRPS</b>	n/a	MXCRPSAC1200A0	CRPS - AC - 1200 W total Power, no power cord
<b>CRPS</b>	n/a	MXCRPSDC600A0	CRPS - DC - 600 W total Power, 37 v - 60 v, no power cord
<b>CRPS</b>	n/a	MXCRPSDC930A0	CRPS - DC - 930 W total Power, 37 v - 60 v, no power cord
<b>CRPS</b>	n/a	MXCRPSDC1200A0	CRPS - DC - 1200 W total Power, 37 v - 60 v, no power cord
<b>Power Cord</b>	n/a	N000900L092A	AC line cord, US Type B, 15A, 1.2 m C13 connector
<b>Rack Ears</b>	n/a	MX-EXTXFULLA-1	cnMatrix rack mount kit: Full-width switch
<b>Switch</b>	cnMatrix   EX2052	MXEX2052GxxA00	Intelligent Ethernet Switch, 48 x 1 Gbps and 4 SFP+ - no power cord
<b>Switch</b>	cnMatrix   EX2052-P	MXEX2052GxPA00	Intelligent Ethernet PoE Switch, 48 x 1 Gbps and 4 SFP+ Fixed 540 - no power cord
<b>Switch</b>	cnMatrix   EX2052R-P	MXEX2052GxPA10	Intelligent Ethernet PoE Switch, 48 x 1 Gbps and 4 SFP+ Fixed 540 - no power cord
<b>Switch</b>	cnMatrix   EX2016M-P	MXEX2016MxPA00	Intelligent Ethernet PoE Switch, 8 x 1 Gbps + 6 x 2.5 G Gbps + 2 x SFP+, no power cord
<b>Switch</b>	cnMatrix   EX1028	MX-EX1028xxA-0	Intelligent Ethernet Switch, 24 x 1 Gbps and 4 1 Gbps SFP fiber ports - no power cord
<b>Switch</b>	cnMatrix   EX1028-P	MX-EX1028PxA-0	Intelligent Ethernet PoE+ Switch, 24 x 1 Gbps and 4 x 1 Gbps SFP fiber ports - no power cord
<b>Switch</b>	cnMatrix   EX2028-P	MX-EX2028PxA-0	Intelligent Ethernet PoE Switch, 24 x 1 Gbps and 4 SFP+ fiber ports - no power cord
<b>Switch</b>	cnMatrix   EX2028	MX-EX2028xxA-0	Intelligent Ethernet Switch, 24 x 1 Gbps and 4 SFP+ fiber ports - no power cord
<b>Switch</b>	cnMatrix   EX2010-P	MX-EX2010PxA-0	Intelligent Ethernet PoE Switch, 8 x 1 Gbps and 2 SFP fiber ports - no power cord
<b>Switch</b>	cnMatrix   EX2010	MX-EX2010xxA-0	Intelligent Ethernet Switch, 8 x 1 Gbps and 2 SFP fiber ports - no power cord
<b>Switch</b>	cnMatrix   TX2028RF-P	MXTX2028GFPA10	Intelligent Ethernet PoE Switch, Cambium Sync, 16 x 1 Gbps, 8 x SFP, and 4 SFP+, Removeable Power Supply (not included) - no power cord
<b>Switch</b>	cnMatrix   TX2020R-P	MXTX2020GxPA10	Intelligent Ethernet PoE Switch, Cambium Sync, 16 x 1 Gbps and 4 SFP+, Removeable & Redundant Power Supplies (not included) - no power cord
<b>Switch</b>	cnMatrix   TX2012R-P	MXTX2012GxPA10	Intelligent Ethernet PoE Switch, Cambium Sync, 8 x 1 Gbps, and 4 SFP+, Removeable Power Supply (not included) - no power cord
<b>Switch</b>	cnMatrix   TX1012-P-AC	MXTX1012GxPA00	AC Powered Intelligent Ethernet PoE Switch, 8 x 1 Gbps, and 4 SFP+, no power cord
<b>Switch</b>	cnMatrix   TX1012-P-DC	MXTX1012GxPA20	DC Powered Intelligent Ethernet PoE Switch, 8 x 1 Gbps, and 4 SFP+, no power cord

## cnMatrix™ EX2000 Series Switches

### Cambium Ordering Information

Type	Model	Part #	Description
Transceiver	n/a	SFP-10G-SR	10G SFP+ MMF SR Transceiver, 850 nm. -40°C to 85°C (-40°F to 185°F)
Transceiver	n/a	SFP-1G-SX	1G SFP MMF SX Transceiver, 850 nm. -40°C to 85°C (-40°F to 185°F)
Transceiver	n/a	SFP-10G-LR	10G SFP+ SMF LR Transceiver, 1310 nm. -40°C to 85°C (-40°F to 185°F)
Transceiver	n/a	SFP-1G-LX	1G SFP SMF LX Transceiver, 1310 nm. -40°C to 85°C (-40°F to 185°F)
Transceiver	n/a	SFP-1G-Copper	1000Base-T (RJ45) SFP Transceiver. -40°C to 85°C (-40°F to 185°F)
Transceiver	n/a	SFP-10G-Copper	10G Base-T (RJ45) SFP Transceiver. 0°C to 70°C (-40°F to 185°F)



EX2010



EX2016M-P



EX2010-P



EX2028-P



EX2028



EX2052-P



EX2052



EX2052R-P / CRPS

### ABOUT CAMBIUM NETWORKS

Cambium Networks empowers millions of people with wireless connectivity worldwide. Its wireless portfolio is used by commercial and government network operators as well as broadband service providers to connect people, places and things. With a single network architecture spanning fixed wireless and Wi-Fi, Cambium Networks enables operators to achieve maximum performance with minimal spectrum. End-to-end cloud management transforms networks into dynamic environments that evolve to meet changing needs with minimal physical human intervention. Cambium Networks empowers a growing ecosystem of partners who design and deliver gigabit wireless solutions that just work.