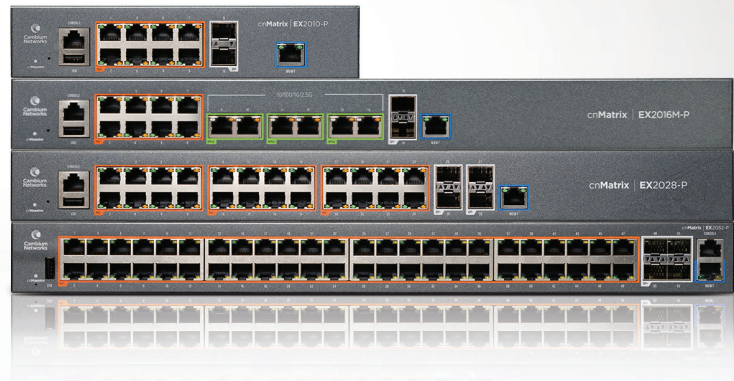


# cnMatrix Switches



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™
- Zero touch deployment of switches makes installation easy
- Zero touch policy based configuration enables automation, reduces errors and network downtime
- Device profiling, automatic port configuration and network segmentation improves security posture of the network
- Wireless Aware: Together with Cambium Networks cnPilot Wi-Fi solution, enables a simple, easy-to-use cloud managed Unified Wired-Wireless access solution
- Affordable, high quality and enterprise grade Layer 2, Layer 3 feature set



The cnMatrix series of fully managed switches delivers full Layer2 and Layer 3 capabilities with enhanced access security. cnMatrix switches deliver power savings with several models offering fanless operation. Depending on the model, the cnMatrix EX2K series offers flexibility with SFP+ (10Gbps) or SFP (1Gbps) uplink ports.

\* Feature to be included in a future release.

## SPECIFICATIONS

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

## cnMatrix

## ALL MODELS

|                     |  |  |
|---------------------|--|--|
| Quality of Service  | <ul style="list-style-type: none"> <li>ACL mapping and marking of ToS/DSCP (COS)</li> <li>ACL mapping to priority queue</li> <li>Honoring DSCP and 802.1p(CoS)</li> <li>Priority queue management using Weighted Round Robin (WRR), Strict Priority (SP) and a combination of WRR and SP</li> </ul>  | <ul style="list-style-type: none"> <li>ACL mapping marking of 802.1p</li> <li>DiffServ support</li> <li>Traffic shaping/metering</li> </ul>  |
| Traffic Management  | <ul style="list-style-type: none"> <li>ACL-based inbound rate limiting policies</li> <li>Inbound rate limiting per port</li> </ul>   | <ul style="list-style-type: none"> <li>Broadcast, multicast and unknown unicast rate limiting</li> <li>Outbound rate limiting per port/queue</li> </ul>  |
| Security            | <ul style="list-style-type: none"> <li>802.1x authentication</li> <li>DHCP snooping</li> <li>Radius/Tacacs/Tacacs+</li> <li>Secure shell</li> <li>Local username/password</li> </ul>   | <ul style="list-style-type: none"> <li>MAC authentication*</li> <li>RADIUS authentication/authorization</li> <li>Authentication, Authorization, and Accounting (AAA)</li> <li>Secure copy (SCP)*</li> </ul>  |
| Layer 2 Feature Set | <ul style="list-style-type: none"> <li>802.1s multiple spanning tree</li> <li>802.1d</li> <li>Auto MDI/MDIX</li> <li>IGMP Snooping v1/v2/v3*, Fast Leave</li> <li>IGMP Proxy</li> <li>Flow Control per port</li> <li>Port Mirroring: port based, ACL based, VLAN based</li> <li>Link Aggregation Groups (Static/LACP)</li> <li>Jumbo frame (9k)</li> <li>BPDU filtering</li> <li>DoS Protection</li> </ul> | <ul style="list-style-type: none"> <li>VLAN, Port, Protocol, 802.1q</li> <li>802.1x authentication</li> <li>Bpdu Guard, Root Guard</li> <li>LLDP/LLDP Med</li> <li>Static MAC</li> <li>Per VLAN STP (PVST/PVRST)</li> <li>Port Isolation/Private VLAN Edge</li> <li>Rate Limiting/Storm Control</li> <li>DHCP Snooping</li> <li>Broadcast/Multicast/Unlearned Unicast (Storm Control)</li> <li>Ping/TraceRoute/ICMPv6</li> </ul> |



## IEEE STANDARDS

### SWITCHING

|                           |  |   |  |
|---------------------------|--|---|--|
| Core Switching Features   | <ul style="list-style-type: none"> <li>• IEEE 802.1AB—Link Layer Discovery Protocol (LLDP)</li> <li>• IEEE 802.1D—Spanning tree compatibility</li> <li>• IEEE 802.1p—Ethernet priority with user provisioning and mapping</li> </ul>   | <ul style="list-style-type: none"> <li>• IEEE 802.1s—Multiple spanning tree compatibility</li> <li>• IEEE 802.1Q—Virtual LANs with port-based VLANs</li> <li>• IEEE 802.1X—Port-based authentication</li> </ul> |  |
| VLAN Support              | <ul style="list-style-type: none"> <li>• IEEE 802.1W—Rapid spanning tree compatibility</li> <li>• IEEE 802.3—10BASE-T</li> <li>• IEEE 802.3u—100BASE-T</li> <li>• IEEE 802.3ab—1000BASE-T</li> <li>• Bridged Local Area Networks - Amendment 07: Multiple Registration Protocol</li> </ul> | <ul style="list-style-type: none"> <li>• IEEE 802.3ac—VLAN tagging</li> <li>• IEEE 802.3ad—Link aggregation</li> <li>• IEEE 802.3x —Flow control</li> <li>• Static Routing</li> </ul>                           |  |
| IEEE 802.1Q-2003          | <ul style="list-style-type: none"> <li>• RFC 4541—Considerations for Internet Group Management Protocol (IGMP) Snooping Switches</li> </ul>  | <ul style="list-style-type: none"> <li>• ANSI/TIA-1057—LLDP-Media Endpoint Discovery (MED)</li> </ul>   |  |
| Advanced Layer-2 Features | <ul style="list-style-type: none"> <li>• Authentication, Authorization, and Accounting (AAA)</li> <li>• Broadcast/Multicast/Unknown unicast storm recovery</li> <li>• DHCP Snooping</li> <li>• IGMP Snooping Querier</li> <li>• Independent VLAN Learning (IVL) support</li> </ul>         | <ul style="list-style-type: none"> <li>• Jumbo Ethernet frame support</li> <li>• Port MAC locking</li> <li>• Port mirroring</li> <li>• Protected ports</li> <li>• Static MAC filtering</li> </ul>               |  |
| Layer-3 Features          | <ul style="list-style-type: none"> <li>• RFC 2131 – DHCP Relay</li> </ul>  | <ul style="list-style-type: none"> <li>• RFC 2328 – OSPF Version 2</li> </ul>   | <ul style="list-style-type: none"> <li>• RFC 2453 – RIP Version 2</li> </ul> |

### 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—The BSD syslog protocol
- RFC 3580—802.1X RADIUS Usage Guidelines

### 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 the SSH transport layer protocol
- SSL 3.0 and TLS 1.0
- RFC 2246: The TLS protocol, version 1.0
- RFC 2818: HTTP over TLS
- RFC 3268: AES cipher suites for transport layer security
- Telnet
- Web GUI

### SNMP MIBs

|   |  |   |
|---|--|---|
| FASTPATH Enterprise MIBs for Full Configuration Support of Switching Features | <ul style="list-style-type: none"> <li>• RFC 1213—MIB II</li> <li>• RFC 1493—Bridge MIB</li> <li>• RFC 1612—DNS resolver MIB extensions</li> <li>• RFC 1643—Definitions of managed objects for the Ethernet-like interface types</li> <li>• RFC 2233—Interfaces group MIB using SMI v2</li> <li>• RFC 2613—SMON MIB</li> <li>• RFC 2618—RADIUS authentication client MIB</li> <li>• RFC 2674—VLAN MIB</li> <li>• RFC 2737—Entity MIB version 2*</li> </ul> | <ul style="list-style-type: none"> <li>• RFC 2819—RMON groups 1, 2, 3, and 9</li> <li>• RFC 2863—IF-MIB</li> <li>• RFC 2925—Definitions of Managed Objects for Remote Ping, Traceroute, and Lookup Operations</li> <li>• RFC 3273—RMON Groups 1, 2, and 3</li> <li>• RFC 3291—Textual conventions for Internet network addresses</li> <li>• RFC 3434—RMON Groups 1, 2, and 3</li> <li>• RFC 4022—TCP-MIB</li> <li>• RFC 4113—UDP-MIB</li> </ul> |
| Quality of Service MIBs   | <ul style="list-style-type: none"> <li>• MIBs for full configuration support of DiffServ, ACL, and CoS functionality</li> </ul>  | <ul style="list-style-type: none"> <li>• RFC 3289—Management information base for the DiffServ architecture (read-only)</li> </ul>  |

## IEEE STANDARDS

### SECURITY

|  |   |   |
|--|---|---|
| Permit/Deny Actions for<br>Inbound IP and Layer-2<br>Traffic Classification<br>Based on: | <ul style="list-style-type: none"> <li>• Source/Destination IP address</li> <li>• TCP/UDP Source/Destination port</li> <li>• IP Protocol Type</li> <li>• Type of Service (ToS) or differentiated services (DSCP) field</li> </ul> | <ul style="list-style-type: none"> <li>• Source/Destination MAC address</li> <li>• EtherType</li> <li>• IEEE 802.1p user priority</li> <li>• VLAN ID</li> <li>• RFC 1858—Security Considerations for IP Fragment Filtering</li> </ul> |
|--|---|---|

### QUALITY OF SERVICE

|   |   |  |
|---|---|--|
| Classify Traffic Based on<br>Same Criteria as ACLs<br>and Optionally: | <ul style="list-style-type: none"> <li>• Mark the IP DSCP or Precedence header fields</li> <li>• Police the flow to a specific rate with two-color aware support</li> <li>• RFC 2474—Definition of the differentiated services field (DS field) in the IPv4 and IPv6 headers</li> </ul> | <ul style="list-style-type: none"> <li>• RFC 2475—An architecture for differentiated services</li> <li>• RFC 2597—Assured forwarding Per-Hop Behavior</li> </ul> |
|---|---|--|

Discover more information on cnMatrix at: <http://community.cambiumnetworks.com/>