Summit X450e Series



Summit® X450e—The industry's first PoE edge switches with the revolutionary modular operating system, ExtremeXOS®.

Voice-Class Availability

- Modular ExtremeXOS operating system
- Ethernet Automatic Protection Switching (EAPS) resiliency protocol
- SummitStack™—highly available, high-speed stacking support

Designed for Converged Network Applications

- High bandwidth, non-blocking architecture for demanding edge applications
- Exceptional Quality of Service (QoS) with advanced traffic management capabilities for converged applications
- Convergence-ready connectivity with Voice-over-IP (VoIP) automatic provisioning
- Efficient management to handle convergence-driven network changes with Power over Gigabit Ethernet

Comprehensive Security Enabling Defense-in-Depth

- User policy and host integrity enforcement
- Universal Port dynamic security profile to provide fine granular security policy in the network
- Detection and response to network intrusion

Summit X450e series switches are based on the revolutionary ExtremeXOS core-class operating system from Extreme Networks. ExtremeXOS highly resilient, modular operating system provides continuous uptime, manageability and operational efficiency.

Summit X450e provides high availability and performance with its advanced traffic management capabilities to support a large-scale rollout of converged network that supports devices such as IP telephones, wireless APs and other devices that require power from a LAN connection. With low-latency line-rate performance, Summit X450e supports the 802.3af standards-based Power over Ethernet (PoE) on every port.

Summit X450e supports hardware-based routing for both IPv4 and IPv6 which helps provide investment protection by allowing the rollout of IPv6 in your network now or in the future.

The highly flexible Summit X450e switch provides high-density Gigabit Ethernet ports plus dedicated 40 Gbps high-speed stacking ports and optional 10 Gigabit Ethernet ports in a compact 1RU format, supporting a full range of Layer 2 to Layer 4 functionalities on every port for high productivity. Optional redundant power supplies are offered with each switch to protect against power anomalies, providing a continuous operational network.

Target Applications

- Edge PoE switch providing high-density Gigabit PoE to the desktop in a network running ExtremeXOS from edge to core

Summit X450e switch is an industry-leading converged Gigabit Ethernet PoE edge switch with ExtremeXOS modular operating system and optional dual 10 Gigabit Ethernet ports.

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Voice-Class Availability

Powered by the ExtremeXOS modular operating system, the Summit X450e switch supports process recovery and application upgrades without the need for a system reboot. Summit X450e provides the high network availability required for converged applications.

Modular Operating System for Non-Stop Operation

True Preemptive Multitasking and Protected Memory

Summit X450e switches allow each of the many applications—such as Open Shortest Path First (OSPF) and Spanning Tree Protocol (STP)—to run as separate Operating System (OS) processes that are protected from each other. This drives increased system integrity and inherently protects against Denial of Service (DoS) attacks.

Process Monitoring and Restart

The ExtremeXOS modular OS dramatically increases network availability using process monitoring and restart. Each independent OS process is monitored in real time. If a process becomes unresponsive or stops running, it can be automatically restarted.

Loadable Software Modules

The modular design of ExtremeXOS allows the upgrading of individual software modules, should this be necessary, leading to higher availability in the network (see Figure 1).

High Availability Network Protocols

Ethernet Automatic Protection Switching (EAPS)

EAPS allows the IP network to provide the level of resiliency and uptime that users expect from their traditional voice network. EAPS is superior to Spanning Tree or Rapid Spanning Tree protocols and offers sub-second (less than 50 milliseconds) recovery that delivers consistent failover regardless of the number of VLANs, network nodes or network topology. Since EAPS allows the network to recover almost transparently, VoIP calls do not drop and digital video feeds do not freeze or pixelize in most situations.

Spanning Tree/Rapid Spanning Tree Protocols

Summit X450e switches support Spanning Tree (802.1D), Per VLAN Spanning Tree (PVST+), Rapid Spanning Tree (802.1w) and Multiple Instances of Spanning Tree (802.1s) protocols for Layer 2 resiliency.

Software-Enhanced Availability

Software-enhanced availability allows users to remain connected to the network even if part of the network infrastructure is down. Summit X450e switches continuously check for problems in the uplink connections using advanced Layer 3 protocols such as OSPF, VRRP and ESRP (ESRP supported in Layer 2 or Layer 3), and dynamically routes traffic around the problem.

Equal Cost Multipath Routing

Equal Cost Multipath (ECMP) routing allows uplinks to be load balanced for performance and cost savings while also supporting redundant failover. If an uplink fails, traffic is automatically routed to the remaining uplinks and connectivity is maintained.

Link Aggregation (802.3ad)

Link aggregation allows trunking of up to eight links on a single logical connection, for up to 20 gigabits per second (Gbps) of redundant bandwidth per logical connection.

Voice-Grade Stacking with SummitStack

Summit X450e offers dual stacking interfaces to provide high-speed 40 Gbps stacking bandwidth. SummitStack stacking architecture is designed to support converged services such as VoIP and video by its highly available, rapid failover capability with n-1 master redundancy, distributed Layer 2 and Layer 3 switching, link aggregation across the stack and distributed uplinks. SummitStack supports up to eight units in a stack and the mixture of the units can be Summit X250e, Summit X450e, Summit X450a and Summit X650 switches, provides sub-second failover for path failure and hitless master/backup failover along with hitless protocol support such as OSPF graceful restart, PoE configuration and Network Login user authentication.

Summit X450e provides chassis-like management and availability with its SummitStack stacking technology (see Figure 2).

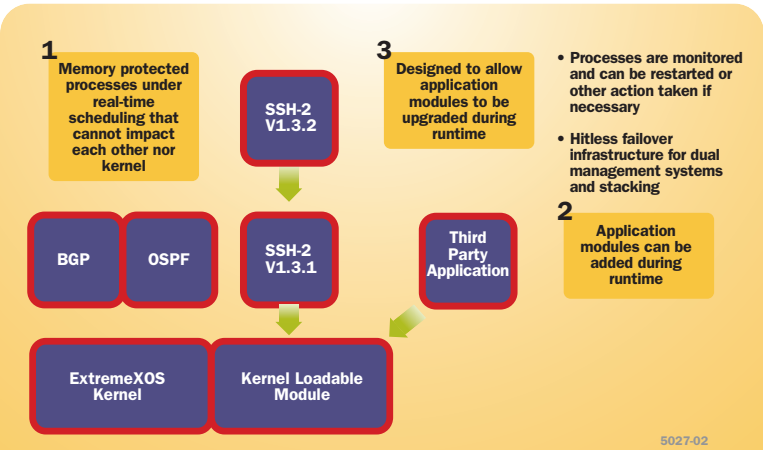


Figure 1: ExtremeXOS Modular Design



Figure 2: SummitStack Stacking Architecture

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Designed for Converged Network Applications

Summit X450e provides a high bandwidth, non-blocking architecture with tri-speed copper Gigabit Ethernet ports with PoE for demanding edge applications.

High Density Gigabit Ports with Optional 10 Gigabit Uplinks

The Summit X450e series provides ideal performance and functionalities for access switches. They eliminate the need to funnel traffic through a low bandwidth gigabit trunk by providing non-blocking 10 gigabit links to the core. As an option module, Summit X450e provides a variety of choices for 10 Gigabit Ethernet uplinks, dual port 10GBASE-T for UTP connectivity, dual port SFP+ for fiber and passive copper connectivity, dual port XFP and dual port XENPAK.

Exceptional Policy-based QoS

Summit X450e switches provide eight hardware queues per port to support granular traffic classification with bandwidth allocation. 1024 centralized classifiers per switch can use information from Layers 1 through 4 to prioritize and meter incoming packets at line-rate. When metering traffic, the switches can drop out-of-spec traffic or flag it for later action. To expedite upstream traffic handling, a packet's classification can be carried forward with Layer 2 (802.1p) and Layer 3 (DiffServ) markings. Summit X450e switches provide advanced traffic management features that support the highest-quality triple play of voice, video and data services.

Efficient Management to Handle Convergence-Driven Network Changes

Universal Port—Voice-over-IP Auto-Provisioning

Summit X450e switches set the stage for convergence applications by allowing enterprises to add new access devices in a non-disruptive plug-and-play fashion. Voice and wireless services can be easily implemented without major network upgrades. Summit X450e supports automatic provisioning of VoIP using LLDP and event-based command scripting capability. It allows dynamic configuration of voice VLANs and QoS. This auto-configuration capability allows you to configure VoIP phone settings such as voice VLAN settings, call server IP address configuration, etc. This level of simplicity in managing network changes can greatly reduce operating expenses.

Power Over Gigabit Ethernet

Deployments of IP Telephony depend on reliable, consistent power from the Ethernet jack. Summit X450e is the basis for a reliable LAN telephony infrastructure with fully redundant 15.4 watts per port, and QoS and resiliency to match the failover requirements for latency-sensitive services like VoIP phones. With Summit X450e, deployment of powered LAN devices is quick and easy with its support of the IEEE 802.3af standard and full Class 3 power availability on all ports, backed up 100% by the EPS-500 redundant power supply (Summit X450e-24p). Summit X450e-48p can provide up to 370W of PoE power and can be increased up to 740W of PoE power to provide full 15.4W Class 3 devices on all 48 ports by adding External Power System (EPS-C and EPS-600LS).

Voice Grade Connections

Summit X450e supports a range of QoS technologies that can prioritize and predictably handle high-priority traffic policing or rate limiting on ingress, 802.1q tagging and DiffServ marking, and shaping on egress with eight queues per port. The Extreme Networks tradition of building products with low latency and jitter continues with Summit X450e.

Universal Connectivity

Summit X450e switches offer universal connectivity with high-performance gigabit to the desktop, PoE and wireless support from every RJ-45 port. Installing universal services ports everywhere for data and device power greatly simplifies installations and moves, and helps to future-proof your edge network. Summit X450e provides universal attachment at any desktop Ethernet speed, and any power level from none to full 15.4 Watts.

Comprehensive Network Management

Summit X450e switches support comprehensive network management through Command Line Interface (CLI), SNMP v1, v2c, v3, and an embedded XML-based Web User Interface, ExtremeXOS ScreenPlay. With a variety of management options and consistency across other Extreme Networks modular and stackable switches, Summit X450e series switches provide ease-of-management for demanding converged applications.

Extreme Networks has developed tools that help save you time and resources in managing your network. EPICenter® management suite provides fault configuration, accounting, performance and security functions, allowing more effective management of Extreme Networks multi-layer switching equipment in a converged network.

Advanced Routing Capabilities for the Edge

Summit X450e switches support advanced protocols for an efficient and productive network. Summit X450e switches provide static and RIP routing for simple IPv4 and IPv6 Layer 3 deployment. An optional ExtremeXOS Advanced Edge license extends the feature set to include other important edge functions such as:

- Edge OSPF for much greater extensibility than RIP can provide
- Edge PIM sparse modes for routing of multicast streams
- Policy-based routing
- sFlow® hardware sampling

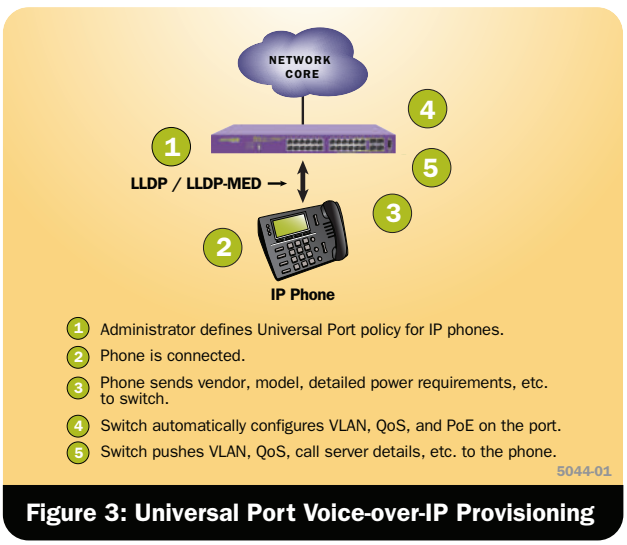


Figure 3: Universal Port Voice-over-IP Provisioning

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Comprehensive Security Using Defense-in-Depth

Implementing a secure network means providing protection at the network perimeter as well as the core. Working together with the Sentriant® family of products from Extreme Networks, Summit X450e uses a defense-in-depth strategy in protecting your network from known or potential threats. Extreme Networks security offerings encompass three key areas: user and host integrity, threat detection and response, and hardened network infrastructure. Furthermore, with policy-based routing, measures can be taken to provide confidentiality of selective data in transit between internal network nodes.

User Authentication and Host Integrity Checking

Network Login and Dynamic Security Profile

Network Login capability implemented in ExtremeXOS enforces user admission and usage policies. Summit X450e series switches support a comprehensive range of Network Login options by providing an 802.1x agent-based approach, a Web-based (agent-less) login capability for guests, and a MAC-based authentication model for devices. With these modes of Network Login, only authorized users and devices can connect to the network and be assigned to the appropriate VLAN. The Universal Port scripting framework available in Summit X450e lets you implement Dynamic Security Profiles which in sync with Network Login allows you to implement fine-grained and robust security policies. Upon authentication, the switch can load dynamic ACL/QoS for a user or group of users, to deny/allow the access to the application servers or segments within the network.

Multiple Supplicant Support

Shared ports represent a potential vulnerability in a network. Multiple supplicant capability on a switch allows it to uniquely authenticate and apply the appropriate policies and VLANs for each user or device on a shared port.

Multiple supplicant support secures IP Telephony and wireless access. Converged network designs often involve the use of shared ports.

Media Access Control (MAC)

MAC lockdown secures printers, wireless APs and servers. The MAC address security/lockdown feature allows Summit X450e to block access to any Ethernet port when the MAC address of a station attempting to access the port is different from the configured MAC address. This feature is used to "lock down" any device to a specific port.

Host Integrity Checking

Host integrity checking helps keep infected or non-compliant machines off the network. Summit X450e series switches support a host integrity or endpoint integrity solution that is based on the model from the Trusted Computing Group. Summit X450e interfaces with Sentriant AG, endpoint security software from Extreme Networks, to verify that each endpoint meets the security policies that have been set and quarantines those that are not in compliance.

Network Intrusion Detection and Response

Hardware-based sFlow Sampling

sFlow is a sampling technology that provides the ability to continuously monitor application-level traffic flows on all interfaces simultaneously. The sFlow agent is a software process that runs on Summit X450e and packages data into sFlow datagrams that are sent over the network to an sFlow collector. The collector gives an up-to-the-minute view of traffic across the entire network, providing the ability to troubleshoot network problems, control congestion and detect network security threats.

Port Mirroring

To allow threat detection and prevention, Summit X450e switches support many-to-one and one-to-many port mirroring. This allows the mirroring of traffic to an external network appliance such as an intrusion detection device for trend analysis or for utilization by a network administrator for diagnostic purposes. Port mirroring can also be enabled across switches in a stack.

Line-Rate ACLs

ACLs are one of the most powerful components used in controlling network resource utilization as well as protecting the network. Summit X450e switches support 1,024 centralized ACLs per 24-port block based on Layer 2, 3 or 4-header information such as the MAC or IP source/destination address.

Denial of Service Protection

Summit X450e switches effectively handle DoS attacks. If the switch detects an unusually large number of packets in the CPU input queue, it will assemble ACLs that automatically stop these packets from reaching the CPU. After a period of time, these ACLs are removed, and reinstalled if the attack continues. ASIC-based LPM routing eliminates the need for control plane software to learn new flows, allowing more network resilience against DoS attacks.

Secure Management

To prevent management data from being intercepted or altered by unauthorized access, Summit X450e switches support SSH2, SCP and SNMPv3 protocols. The MD5 hash algorithm used in authentication prevents attackers from tampering with valid data during routing sessions.

IPv6 Hardware Forwarding

For more than a decade, a new version of the ubiquitous Internet Protocol (IP) that powers global network interconnectivity has been under development, with the primary goal of expanding IP's address range to allow a unique IP address for any device in the world that might some day need to be addressable. Summit X450e series switches offer this next-generation IPv6 routing in hardware to provide wire-speed routing capability in IPv4/IPv6 dual stack environment.

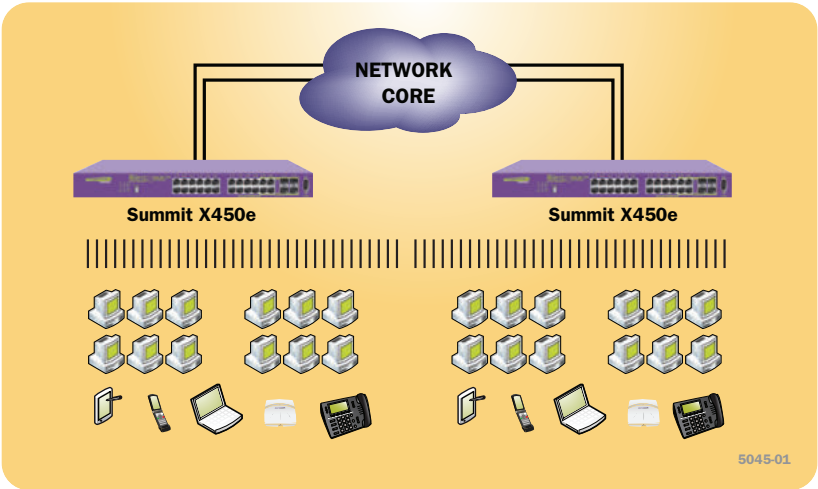
ExtremeXOS on Summit X450e delivers more than just IPv6 hardware forwarding; it provides the power to control undesired IPv6 traffic to assure network uptime in the presence of IPv6. Summit X450e series switches help provide investment protection by allowing the rollout of IPv6 in your network now or in the future, when needed.

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Target Applications

Edge PoE Switch for High-Bandwidth Applications

The Summit X450e switch is deployed as a PoE edge switch, extending the benefits of the ExtremeXOS operating system to the network edge. This uniformity provides consistent quality and performance throughout your converged network while eliminating operational inefficiencies. With line-rate performance and low latency, Summit X450e edge switch connects wireless devices, LAN telephony, PDAs and other equipment without compromising security, scalability, availability, mobility or management.



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Accessories

Summit X450e Series Redundant PSUs

EPS-500

EPS-500 is the redundant AC Power Supply for higher power consuming AC PSU-based switches including Power-over-Ethernet enabled switches. EPS-500 is one rack unit height and works in standalone. EPS-500 can be rack mounted in a regular 19 inch rack system. EPS-500 comes with a DC output cable to connect between the Summit switch and EPS-500.



Front View

Rear View

EPS-600LS and EPS-C

EPS-600LS is a power module that works with the EPS-C External Power System Chassis. EPS-C has three slots for EPS-600LS and one DC output to connect to high-density PoE Summit switches. Depending upon the number of EPS-600LS installed in EPS-C, it can provide 1) Redundant configuration for up to 370 watts of PoE power with one EPS-600LS installed; 2) Non-Redundant configuration for up to 740 watts of PoE power with two EPS-600LS installed; and 3) Redundant configuration for up to 740 watts of PoE power with three EPS-600LS are installed. EPS-C comes with a DC output cable to connect between the Summit switch and EPS-C with EPS-600LS installed.



Front View

Rear View

Configured View

Redundant PSU Compatibility Matrix

Summit Switch Models	Summit Switch Part Number(s)	External Redundant PSU options
Summit X450e-24p	16142	EPS-500 external power supply (10911)
Summit X450e-48p	16148	EPS-C (10912) and EPS-600LS (10913)
Summit X450e-48p-TAA	16150	EPS-C (10912) and EPS-600LS (10913)

XGM2 Dual 10 Gigabit Ethernet Modules

				
XGM2 Dual 10 Gigabit Ethernet Module	**XGM2-2bt**	**XGM2-2sf**	**XGM2-2xf**	**XGM2-2xn**
Interface Type	10GBASE-T	SFP+	XFP	XENPAK
Supported Media	UTP	SFP+ Passive Copper SFP+ Optics	XFP Optics	XENPAK Optics
Distance	100 meters (Category 6a) 55 meters (Category 6 and 5e)	1-10 meters (Passive Copper) 300m-10km	300m-80km	300m-80km
Optics Support	N/A	10GBASE-SR/LR	10GBASE-SR/LR/ER/ZR	10GBASE-SR/LR/ER/ZR/LW

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Technical Specifications

ExtremeXOS 12.2 Supported Protocols

Switching

- RFC 3619 Ethernet Automatic Protection Switching (EAPS) and EAPSv2
- IEEE 802.1D – 1998 Spanning Tree Protocol (STP)
- IEEE 802.1D – 2004 Spanning Tree Protocol (STP and RSTP)
- IEEE 802.1w – 2001 Rapid Reconfiguration for STP, RSTP
- IEEE 802.1Q – 2003 (formerly IEEE 802.1s) Multiple Instances of STP, MSTP
- EMISTP, Extreme Multiple Instances of Spanning Tree Protocol
- PVST+, Per VLAN STP (802.1Q interoperable)
- Draft-ietf-bridge-rstpmib-03.txt – Definitions of Managed Objects for Bridges with Rapid Spanning Tree Protocol
- Extreme Standby Router Protocol (ESRP)
- IEEE 802.1Q – 1998 Virtual Bridged Local Area Networks
- IEEE 802.3ad Static load sharing configuration and LACP based dynamic configuration
- Software Redundant Ports
- IEEE 802.1AB – Link Layer Discovery Protocol (LLDP)
- LLDP Media Endpoint Discovery (LLDP-MED), ANSI/TIA-1057, draft 08
- Extreme Discovery Protocol (EDP)
- Extreme Loop Recovery Protocol (ELRP)
- Extreme Link State Monitoring (ELSM)
- IEEE 802.1ag L2 Ping and traceroute, Connectivity Fault Management

Management and Traffic Analysis

- RFC 2030 SNTP, Simple Network Time Protocol v4
- RFC 854 Telnet client and server
- RFC 783 TFTP Protocol (revision 2)
- RFC 951, 1542 BootP
- RFC 2131 BOOTP/DHCP relay agent and DHCP server
- RFC 1591 DNS (client operation)
- RFC 1155 Structure of Mgmt Information (SMIv1)
- RFC 1157 SNMPv1
- RFC 1212, RFC 1213, RFC 1215 MIB-II, Ethernet-Like MIB & TRAPs
- RFC 1573 Evolution of Interface
- RFC 1650 Ethernet-Like MIB (update of RFC 1213 for SNMPv2)
- RFC 1901 – 1908 SNMP v2c, SMIv2 and Revised MIB-II
- RFC 2570 – 2575 SNMPv3, user based security, encryption and authentication
- RFC 2576 Coexistence between SNMP Version 1, Version 2 and Version 3
- RFC 2613 SMON MIB
- RFC 1757 RMON 4 groups: Stats, History, Alarms and Events
- RFC 2021 RMON2 (probe configuration)
- RFC 2925 Ping/Traceroute MIB
- RFC 2668 802.3 MAU MIB
- draft-ietf-hubmib-mau-mib-v3-02.txt
- RFC 1643 Ethernet MIB
- RFC 1493 Bridge MIB
- RFC 1354 IPv4 Forwarding Table MIB
- RFC 2737 Entity MIB v2
- RFC 2233 Interface MIB
- RFC 3621 PoE-MIB (PoE switches only)
- Secure Shell (SSH-2) client and server
- Secure Copy (SCP-2) client and server
- Secure FTP (SFTP) server
- sFlow version 5
- Configuration logging
- Multiple Images, Multiple Configs
- RFC 3164 BSD Syslog Protocol with Multiple Syslog Servers
  - 999 Local Messages (criticals stored across reboots)
- Extreme Networks vendor MIBs (includes FDB, PoE, CPU, Memory MIBs)
- XML APIs over Telnet/SSH and HTTP/HTTPS
- Web-based device management interface – ExtremeXOS ScreenPlay
- Stacking – SummitStack (Summit products with SummitStack feature only)

Security, Switch and Network Protection

- Secure Shell (SSH-2), Secure Copy (SCP-2) and SFTP client/server with encryption/authentication (requires export controlled encryption module)
- SNMPv3 user based security, with encryption/authentication (see above)
- RFC 1492 TACACS+
- RFC 2138 RADIUS Authentication
- RFC 2139 RADIUS Accounting
- RFC 3579 RADIUS EAP support for 802.1x
- RADIUS Per-command Authentication
- Access Profiles on All Routing Protocols
- Access Policies for Telnet/SSH-2/SCP-2
- Network Login – 802.1x, web and MAC-based mechanisms
- IEEE 802.1x – 2001 Port-Based Network Access Control for Network Login
- Multiple supplicants with multiple VLANs for Network Login (all modes)
- Fallback to local authentication database (MAC and Web-based methods)
- Guest VLAN for 802.1x
- RFC 1866 HTML – Used for web-based Network Login and ExtremeXOS ScreenPlay
- SSL/TLS transport – Used for Web-based Network Login and ExtremeXOS ScreenPlay (requires export controlled encryption module)
- MAC Security – Lockdown and Limit
- IP Security – RFC 3046 DHCP Option 82 with port and VLAN ID
- IP Security – Trusted DHCP Server
- Layer 2/3/4 Access Control Lists (ACLs)
- RFC 2267 Network Ingress Filtering
- RPF (Unicast Reverse Path Forwarding) Control via ACLs
- Wire-speed ACLs
- Rate Limiting / Shaping by ACLs
- IP Broadcast Forwarding Control
- ICMP and IP-Option Response Control
- SYN attack protection
- CPU DoS Protection with traffic rate-limiting to management CPU
- Robust against common Network Attacks:
  - CERT (http://www.cert.org)
  - CA-2003-04: "SQL Slammer"
  - CA-2002-36: "SSHredder"
  - CA-2002-03: SNMP vulnerabilities
  - CA-98-13: tcp-denial-of-service
  - CA-98.01: smurf
  - CA-97.28:Teardrop_Land -Teardrop and "LAND" attack
  - CA-96.26: ping
  - CA-96.21: tcp_syn_flooding
  - CA-96.01: UDP_service_denial
  - CA-95.01: IP_Spoofing_Attacks_and_Hijacked_Terminal_Connections
  - IP Options Attack
- Host Attacks
  - Teardrop, boink, opentear, jolt2, newtear, nestea, syndrop, smurf, fraggle, papasmurf, synk4, raped, winfreeze, ping –f, ping of death, pepsi5, Latierra, Winnuke, Simping, Sping, Ascend, Stream, Land, Octopus

Security, Router Protection – Requires Edge License or above

- IP Security – DHCP enforcement via Disable ARP Learning
- IP Security – Gratuitous ARP Protection
- IP Security – DHCP Secured ARP/ARP Validation
- Routing protocol MD5 authentication (see above)

IPv4 Host Requirements

- RFC 1122 Host Requirements
- RFC 768 UDP
- RFC 791 IP
- RFC 792 ICMP
- RFC 793 TCP
- RFC 826 ARP
- RFC 894 IP over Ethernet
- RFC 1027 Proxy ARP
- RFC 2068 HTTP server
- IGMP v1/v2/v3 Snooping with Configurable Router Registration Forwarding
- IGMP Filters
- Static IGMP Membership
- Multicast VLAN Registration (MVR)

IPv4 Router Requirements

- RFC 1812 Requirements for IP Version 4 Routers
- RFC 1519 CIDR
- RFC 1256 IPv4 ICMP Router Discovery (IRDP)
- Static Unicast Routes
- Static Multicast Routes
- RFC 1058 RIP v1
- RFC 2453 RIP v2
- Static ECMP
- RFC 1112 IGMP v1
- RFC 2236 IGMP v2
- RFC 3376 IGMP v3
- RFC 1724 RIPv2 MIB

IPv4 Router Requirements – Requires Advanced Edge License or above

- RFC 2338 VRRP
- RFC 2787 VRRP MIB
- RFC 2328 OSPF v2 (Edge-mode)
- OSPF ECMP
- OSPF MD5 Authentication
- RFC 1587 OSPF NSSA Option
- RFC 1765 OSPF Database Overflow
- RFC 2370 OSPF Opaque LSA Option
- RFC 3623 OSPF Graceful Restart
- RFC 1850 OSPFv2 MIB
- RFC 2362 PIM-SM (Edge-mode)
- RFC 3569, draft-ietf-ssm-arch-06.txt PIM-SSM PIM Source Specific Multicast
- draft-ietf-pim-mib-v2-01.txt

IPv6 Host Requirements

- RFC 2460, Internet Protocol, Version 6 (IPv6) Specification
- RFC 2461, Neighbor Discovery for IP Version 6, (IPv6)
- RFC 2463, Internet Control Message Protocol (ICMPv6) for the IPv6 Specification
- RFC 2464, Transmission of IPv6 Packets over Ethernet Networks
- RFC 2465, IPv6 MIB, General Group and Textual Conventions
- RFC 2466, MIB for ICMPv6
- RFC 2462, IPv6 Stateless Address Auto configuration – Host Requirements

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Technical Specifications

- RFC 1981, Path MTU Discovery for IPv6, August 1996 – Host requirements
- RFC 3513, Internet Protocol Version 6 (IPv6) Addressing Architecture
- RFC 3587, Global Unicast Address Format
- Telnet server over IPv6 transport
- SSH-2 server over IPv6 transport
- Ping over IPv6 transport
- Traceroute over IPv6 transport

IPv6 Interworking and Migration

- RFC 2893, Configured Tunnels
- RFC 3056, 6to4

IPv6 Router Requirements

- RFC 2462, IPv6 Stateless Address Auto configuration – Router Requirements
- RFC 1981, Path MTU Discovery for IPv6, August 1996 – Router requirements
- RFC 2710, IPv6 Multicast Listener Discovery v1 (MLDv1) Protocol
- RFC 3810, IPv6 Multicast Listener Discovery v2 (MLDv2) Protocol
- Static Unicast routes for IPv6
- RFC 2080, RIPng
- Static ECMP

QoS, VLAN Services and MPLS

Quality of Service and Policies

- IEEE 802.1D – 1998 (802.1p) Packet Priority
- RFC 2474 DiffServ Precedence, including 8 queues/port
- RFC 2598 DiffServ Expedited Forwarding (EF)
- RFC 2597 DiffServ Assured Forwarding (AF)
- RFC 2475 DiffServ Core and Edge Router Functions

VLAN Services: VLANs, vMANs

- IEEE 802.1Q VLAN Tagging
- IEEE 802.1v: VLAN classification by Protocol and Port
- Port-based VLANs
- Protocol-based VLANs
- MAC-based VLANs
- Multiple STP domains per VLAN
- Upstream Forwarding Only / Disable Flooding
- draft-sanjib-private-vlan-09.txt Private VLANs
- Asymmetric VLANs
- VLAN Translation
- IEEE 802.1ad Provider Bridge Network, virtual MANs (vMANs)
- vMAN Ethertype Translation/Secondary vMAN Ethertype
- VLAN Aggregation

Summit X450e-24p

General Specifications

Performance

- 128 Gbps switch fabric bandwidth
- 95.2 Mpps frame forwarding rate
- 9,216 Byte maximum packet size (Jumbo Frame)
- 128 load sharing trunks, up to 8 members per trunk
- 8 QoS queues/port
- 4,094 VLANs (Port, Protocol, IEEE 802.1Q)
- 1,024 centralized ACL rules per switch

Forwarding Tables

- Layer 2/MAC Addresses: 8K
- IPv4 LPM Entries: 512
- IPv6 LPM Entries: 256

Rate Limiting

- Ingress bandwidth policing/rate limiting per flow
- Egress bandwidth rate limiting per egress queue
- Rate Limiting Granularity: 64Kbps
- Available Rate Limiters: 1,024 per switch

Indicators

- Per port status LED including power status
- System Status LEDs: management, fan and power

Ports

- 24 ports 10/100/1000BASE-T PoE with auto-speed and auto-polarity
- 4 ports SFP (, shared PHY with 4 10/100/1000BASE-T ports)
- 1 port Serial (control port)
- 1 10/100BASE-T out-of-band management Port
- Per port status LED including power status

Option Slot

- Slot for XGM2 dual 10 gigabit option module

Physical Specifications

Dimensions

Height: 1.73 Inches/4.4 Cm
Width: 17.35 Inches/44.1 Cm
Depth: 15.3 Inches/38.7 Cm
Weight: 14 lbs/6.35 Kg

EPS Dimensions

EPS-500

Height: 1.73 Inches/4.4 Cm
Width: 17.4 Inches/44 Cm
Depth: 7.6 Inches/19.3 Cm
Weight: 13.75 Lbs/6.24 Kg

Operating Specifications

Temperature

- Operating Temperature Range: 0° C to 40° C (32° F to 104° F)
- Operating Humidity: 10% to 93% relative humidity, non-condensing
- Operational Shock (Half Sine): 30 m/s2 (3g), 11ms, 60 Shocks
- Operational Random Vibration: 3-500 MHz @ 1.5g rms

Storage & Transportation Conditions (Packaged)

- Transportation Temperature: -40° C to 70° C (- 40° F to 158° F)
- Storage and Transportation Humidity: 60% to 95% RH, non-condensing
- Packaged Shock (Half Sine): 180 m/s2 (18g), 6ms, 600 shocks
- Packaged Sine Vibration: 5 – 62 Hz @ Velocity 5mm/s, 62-500 Hz @ 0.2 G
- Packaged Random Vibration: 5 – 20 Hz @ 1.0 ASD w/-3dB/oct. from 20-200 Hz
- 14 drops min on sides & corners @ 42" (<15kg box)

Power & Acoustic Sound

- Voltage Input Range: 90 – 264V
- Nominal Input Ratings: 100 – 240V, 50/60Hz, 5.25A
- Nominal Input Current: 4.25A @ 115V~ (lowline) 2.0A @ 230V~ (high-line)
- Maximum In-Rush Current: 30A @115V/60 Hz, Max Load
- Efficiency: 80% with 60% – 100% load
- Line Frequency Range: 47 – 63 Hz
- Nominal Frequency Range: 50 – 60 Hz
- Power Supply Input Socket: IEC 320 C14
- Power Cord Input Plug: IEC 320 C13
- Heat Dissipation (with PoE full load): 120W (410 BTU/hr)
- Power Consumption (with PoE full load): 488W (1,665 BTU/hr)
- Heat Dissipation (without PoE): 54W (184 BTU/hr)
- Power Consumption (without PoE): 54W (184 BTU/hr)
- Sound Power in accordance with EN 300 753 (10-1997)
- Sound Power: 62 dBA per ISO 7779
- Declared Sound Power: 6.4 belsA per ISO 7779 & ISO 9296
- Bystander Sound Pressure in accordance with NEBS GR-63 Issue 2
- Bystander Sound Pressure: 54 dBA right side @ .6m

External Power Supply - EPS-500

- Operational Voltage Range: 90 – 264V
- Nominal Input ratings: 100 to 240V, 50 to 60 Hz, 10A
- Line Frequency Range: 47 – 63 Hz
- Nominal Input Current: 5.75A at 115 VAC, 2.80A at 230 VAC
- Maximum Inrush Current: 30A at 115 VAC, 60A at 230 VAC
- Output: -50 VDC, 7.5A max, 375 Watts 12 VDC, 10.5A max, 126 Watts
- Power Supply Input Socket: IEC 320 C14
- Power Cord Input Plug: IEC 320 C13
- Maximum continuous DC output shall not exceed 500 Watts
- Power Supply Input Socket: IEC 320 C14
- Power Cord Input Plug: IEC 320 C13
- Maximum continuous DC output shall not exceed 465 Watts

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Technical Specifications

Summit X450e-48p/ SummitX450e-48p-TAA

General Specifications

Performance

- 256 Gbps switch fabric bandwidth
- 130.9 Mpps frame forwarding rate
- 9,216 Byte maximum packet size (Jumbo Frame)
- 128 load sharing trunks, up to 8 members per trunk
- 8 QoS queues/port
- 4,094 VLANs (Port, Protocol, IEEE 802.1Q)
- 1,024 centralized ACL rules per 24-ports

Forwarding Tables

- Layer 2/MAC Addresses: 8K
- IPv4 LPM Entries: 512
- IPv6 LPM Entries: 256

Rate Limiting

- Ingress bandwidth policing/rate limiting per flow
- Egress bandwidth rate limiting per egress queue
- Rate Limiting Granularity: 64Kbps
- Available Rate Limiters: 1,024 per 24-port

Indicators

- Per port status LED including power status
- System Status LEDs: management, fan and power

Ports

- 48 ports 10/100/1000BASE-T PoE with auto-speed and auto-polarity
- 4 ports SFP (shared PHY with 4 10/100/1000BASE-T ports)
- 1 port Serial (control port)
- 1 10/100BASE-T out-of-band management port
- Per port status LED including power status

Option Slot

- Slot for XGM2 dual 10 gigabit option module

Physical Specifications

Dimensions

Height: 1.73 Inches/4.4 Cm
Width: 17.35 Inches/44.1 Cm
Depth: 17.0 Inches/43.2 Cm
Weight: 16.25 lbs/7.4 Kg

EPS Dimensions

EPS-C
Height: 1.73 Inches/4.4 Cm
Width: 17.4 Inches/44 Cm
Depth: 11.9 Inches/30.2 Cm

EPS-600LS
Height: 1.59 Inches/4.0 Cm
Width: 4.0 Inches/10.1 Cm
Depth: 10.4 Inches/26.4 Cm

Operating Specifications

Temperature

- Operating Temperature Range: 0° C to 40° C (32° F to 104° F)
- Operating Humidity: 10% to 93% relative humidity, non-condensing
- Operational Shock (Half Sine): 30 m/s2 (3g), 11ms, 60 Shocks
- Operational Random Vibration: 3-500 MHz @ 1.5g rms

Storage & Transportation Conditions (Packaged)

- Transportation Temperature: -40° C to 70° C (- 40° F to 158° F)
- Storage and Transportation Humidity: 60% to 95% RH, non-condensing
- Packaged Shock (Half Sine): 180 m/s2 (18g), 6ms, 600 shocks
- Packaged Sine Vibration: 5 – 62 Hz @ Velocity 5mm/s, 62 – 500 Hz @ 0.2 G
- Packaged Random Vibration: 5 – 20 Hz @ 1.0 ASD w/-3dB/oct. from 20 – 200 Hz
- 14 drops min on sides & corners @ 42”(<15kg box)

Power & Acoustic Sound

- Voltage Input Range: 90 – 264V
- Nominal Input Ratings: 100~240V, 50/60 Hz, 6.0A
- Nominal Input Current: 5.25A @ 100V~ (lowline) 2.5A @ 230V~ (high-line)
- Maximum In-Rush Current: 30A @115V/6.0 Hz, Max Load
- Efficiency: 80% with 60% – 100% load
- Line Frequency Range: 47 – 63 Hz
- Nominal Frequency Range: 50 – 60 Hz
- Power Supply Input Socket: IEC 320 C14
- Power Cord Input Plug: IEC 320 C13
- Heat Dissipation (with PoE full load): 180W (614 BTU/hr)
- Power Consumption (with PoE full load): 507W (1,730 BTU/hr)
- Heat Dissipation (without PoE): 73W (250 BTU/hr)
- Power Consumption (without PoE): 73W (250BTU/hr)
- Sound Power in accordance with EN 300 753 (10-1997)
- Sound Power: 62 dBA per ISO 7779
- Declared Sound Power: 6.4 belsA per ISO 7779 & ISO 9296
- Bystander Sound Pressure in accordance with NEBS GR-63 Issue 2
- Bystander Sound Pressure: 54 dBA right side @ .6m

External Power Supply - EPS-600LS

- Voltage Input Range: 90 – 264 V
- Nominal Input Voltage/Hz: 115V~/60Hz & 230V~/50Hz
- Line Frequency Range: 47 – 63 Hz
- Maximum Input Current Rating: 7A at 115 VAC, 3.5A at 230 VAC
- External Power Supply-EPS-C Chassis accepts up to three EPS-600LS power modules and provides the following capability depending upon the number of EPS-600LS installed
  - One EPS-600LS
    - Redundant, up to 370W PoE power
  - Two EPS-600LS
    - Non-Redundant, up to 740W PoE power
  - Three EPS-600LS
    - Redundant, up to 740W PoE power

Summit X450e Series - All

Regulatory/Safety Standards

North American Safety of ITE

- UL 60950-1:2003 1st Ed., Listed Device (U.S.)
- CSA 22.2#60950-1-03 1st Ed.(Canada)
- Complies with FCC 21CFR 1040.10 (U.S. Laser Safety)
- CDRH Letter of Approval (U.S. FDA Approval)
- IEEE 802.3af 6-2003 Environment A for PoE Applications

European Safety of ITE

- EN60950-1:2001 +A11
- EN 60825-1+A2:2001 (Lasers Safety)
- TUV-R GS Mark by German Notified Body
- 73/23/EEC Low Voltage Directive

International Safety of ITE

- CB Report & Certificate IEC 60950-1:2001+All National Differences
- AS/NZX 3260 (Australia /New Zealand)

EMI/EMC Standards

North America EMC for ITE

- FCC CFR 47 part 15 Class A (U.S)
- ICES-003 Class A (Canada)

European EMC Standards

- EN 55022:1998 Class A
- EN 55024:1998 Class A includes IEC 61000-4- 2, 3, 4, 5, 6, 8, 11
- EN 61000-3-2,3 (Harmonics & Flicker)
- ETSI EN 300 386:2001 (EMC Telecommunications)
- 89/336/EEC EMC Directive

International EMC Certifications

- CISPR 22:1997 Class A (International Emissions)
- CISPR 24:1997 Class A (International Immunity)
- IEC/EN 61000-4-2 Electrostatic Discharge, 8kV Contact, 15kV Air, Criteria A
- IEC/EN 61000-4-3 Radiated Immunity 10V/m, Criteria A
- IEC/EN 61000-4-4 Transient Burst, 1kV, Criteria A
- IEC/EN 61000-4-5 Surge, 2kV L-L, 2kV L-G, Level 3, Criteria A
- IEC/EN 61000-4-6 Conducted Immunity, 0.15- 80MHz, 10V/m unmod. RMS, Criteria A
- IEC/EN 61000-4-11 Power Dips & Interruptions, >30%, 25 periods, Criteria C

Country Specific

- VCCI Class A (Japan Emissions)
- AS/NZS 3548 ACA (Australia Emissions)
- CNS 13438:1997 Class A (BSMI-Taiwan)
- MIC Mark, EMC Approval (Korea)

Telecom Standards

- ETSI EN 300 386:2001 (EMC Telecommunications)
- ETSI EN 300 019 (Environmental for Telecommunications)
- IEEE 802.3 Media Access Standards
- IEEE 802.3ab 1000BASE-T
- IEEE 802.3z 1000BASE-X
- IEEE 802.3ae 10GBASE-X

Environmental Standards

- EN/ETSI 300 019-2-1 v2.1.2 – Class 1.2 Storage
- EN/ETSI 300 019-2-2 v2.1.2 – Class 2.3 Transportation
- EN/ETSI 300 019-2-3 v2.1.2 – Class 3.1e Operational
- EN/ETSI 300 753 (1997-10) – Acoustic Noise
- ASTM D3580 Random Vibration Unpackaged 1.5G

Warranty

- Limited Lifetime Warranty with Advanced Hardware Replacement
- 90-days on Software

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Ordering Information

Part Number	Name	Description
16142	Summit X450e-24p	24 10/100/1000BASE-T with PoE, 4 Unpopulated SFP Ports, Option Slot for 10 Gigabit Option Card XGM2-2xn/xf, 1 AC PSU, ExtremeXOS Edge License, Connector for EPS-500 or EPS-LD External Redundant PSU
16143	Summit X450e-24p Advanced Edge License	ExtremeXOS Advanced Edge License, Summit X450e-24p
16148	Summit X450e-48p	48 10/100/1000BASE-T with PoE, 4 Unpopulated SFP Ports, Option Slot for 10 Gigabit Option Card XGM2-2xn/xf, 1 AC PSU, ExtremeXOS Edge License, Connector for EPS-C External Power System Chassis (Requires EPS-600LS)
16150	Summit X450e-48p-TAA	U.S. Federal TAA, Built to Order, Call for Lead Time, 48 10/100/1000BASE-T with PoE, 4 unpopulated SFP ports, option slot for 10 gigabit option card XGM2-2xn/xf, 2 SummitStack Stacking ports, 1 AC PSU, ExtremeXOS Edge license, connector for EPS-C external power system chassis (Requires EPS-600LS)
16149	Summit X450e-48p Advanced Edge License[1]	ExtremeXOS Advanced Edge License, Summit X450e-48p
16112	XGM2-2xf	Option Card, Two Unpopulated 10 Gigabit XFP Slots, compatible with Summit X450e, and Summit X450a
16113	XGM2-2xn	Option Card, Two Unpopulated 10 Gigabit XENPAK Slots, compatible with Summit X450e and Summit X450a
16114	XGM2-2sf	Option Card, Two Unpopulated 10 Gigabit SFP+ Slots, compatible with Summit X350, Summit X450e, Summit X450a
16115	XGM2-2bt	Option Card, two 10GBASE-T ports, compatible with Summit X350, Summit X450e, Summit X450a
10911	EPS-500[2]	External Power Supply Unit 500 Watts with Cable
10912	EPS-C[3]	External Power Supply Unit, with Cable. Accepts up to three EPS-600LS Power Modules
10913	EPS-600LS	External Power System Power Module for EPS-C, 600 Watts
10110	SR XENPAK	10GBASE-SR XENPAK Transceiver, 850 nm, up to 300 m on Multimode Fiber, SC Connector
10111	LR XENPAK	10GBASE-LR XENPAK Transceiver, 1310 nm, up to 10 km on Single-mode Fiber, SC Connector
10112	ER XENPAK	10GBASE-ER XENPAK Transceiver, 1550 nm, up to 40 km on Single-mode Fiber, SC Connector
10113	ZR XENPAK	10GBASE-ZR XENPAK Transceiver, 1550 nm, up to 80 km on Single-mode Fiber, SC Connector
10114	LX4 XENPAK	10GBASE-LX4 XENPAK Transceiver, 1310 nm, up to 300 m on Multi-mode Fiber and up to 10 km on a Single-mode Fiber, SC Connector
10121	SR XFP	10GBASE-SR XFP Transceiver, 850nm, up to 300m on Multimode Fiber, LC Connector
10122	LR XFP	10GBASE-LR XFP Transceiver, 1310nm, up to 10km on Single-mode Fiber, LC Connector
10124	ER XFP	10GBASE-ER XFP Transceiver, 1550nm, up to 40km on Single-mode Fiber, LC Connector
10125	ZR XFP	10GBASE-ZR XFP Transceiver, 1550nm, up to 80km on Single-mode Fiber, LC Connector
10301	10GBASE-SR SFP+	10GBASE-SR SFP+, 850nm, LC Connector, transmission length of up to 300m on SMF
10302	10GBASE-LR SFP+	10GBASE-LR SFP+, 1310nm, LC Connector, transmission length of up to 10km on SMF
10304	10GBASE-CR SFP+ 1m	10GBASE-CR SFP+ pre-terminated twin-ax copper cable with link lengths of 1m
10305	10GBASE-CR SFP+ 3m	10GBASE-CR SFP+ pre-terminated twin-ax copper cable with link lengths of 3m
10306	10GBASE-CR SFP+ 5m	10GBASE-CR SFP+ pre-terminated twin-ax copper cable with link lengths of 5m
10307	10GBASE-CR SFP+ 10m	10GBASE-CR SFP+ pre-terminated twin-ax copper cable with link lengths of 10m
10051	SX SFP	1000BASE-SX SFP, 1000BASE-SX, LC Connector
10052	LX SFP	1000BASE-LX SFP, 1000BASE-LX, LC Connector

[1] Built to Order, Call for Lead Time
[2] Compatible with Summit X450e-24p
[3] Compatible with Summit X450e-48p and Summit X450e-48p-TAA

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Ordering Information

Part Number	Name	Description
10053	ZX SFP	1000BASE-ZX SFP, Extra Long Distance SMF 70 km/21 dB Budget, LC Connector
10064	LX100 SFP	1000BASE-LX100 SFP, Extra Long Distance SMF 100km/30 dB Budget, LC Connector
10056	1000BX SFP BX-D	1000BASE-BX-D SFP, SMF (1490 nm TX/1310 nm RX Wavelength)
10057	1000BX SFP BX-U	1000BASE-BX-U SFP, SMF (1310 nm TX/1490 nm RX Wavelength)
16106	Stacking Cable, 0.5M	SummitStack/UniStack™ Stacking Cable, 0.5M
16107	Stacking Cable, 1.5M	SummitStack/UniStack Stacking Cable, 1.5M
16108	Stacking Cable, 3.0M	SummitStack/UnitStack Stacking Cable, 3.0M
16105	Stacking Cable, 5.0M	SummitStack Stacking Cable, 5.0M (not supported for UniStack)

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