

# Summit X450a Series



*Summit® X450a series—The highly scalable advanced aggregation switch with the revolutionary modular operating system, ExtremeXOS®.*

## Voice-Class Availability

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

## Advanced Features Offer Versatile Deployment

- High bandwidth, non-blocking architecture for demanding edge applications
- High density gigabit ports with optional 10 gigabit uplinks that provide high-performance aggregation
- Advanced routing protocols such as OSPF, BGP and multicast for an efficient and productive small network core
- Exceptional Quality of Service (QoS) with advanced traffic management capabilities for triple play services in Carrier Ethernet networks

## Comprehensive Security

- User authentication, host integrity enforcement and Identity Management
- Universal Port dynamic security profile to provide fine granular security policies in the network
- Threat detection and response instrumentation to react to network intrusion with CLEAR-Flow Security Rules Engine
- Harden the network infrastructure with Denial of Service (DoS) protection and IP security against man-in-the-middle and DoS attacks

*Summit X450a switch is an industry-leading converged Gigabit Ethernet aggregation switch with the ExtremeXOS modular operating system and optional dual 10 Gigabit Ethernet ports.*

The Summit X450a series is based on Extreme Networks® revolutionary ExtremeXOS OS. ExtremeXOS modular OS is a highly resilient OS that provides continuous uptime, manageability and operational efficiency. Each Summit X450a switch offers the same high-performance, non-blocking hardware technology used on Extreme Networks BlackDiamond® 8800 series, in the Extreme Networks tradition of simplifying network deployments through the use of common hardware and software throughout the network.

The highly flexible and scalable Summit X450a switch is an ideal aggregation switch for traditional small core enterprise networks. The Summit X450a series is a perfect first level aggregation device for DSLAMs at a local central office before traffic is passed on to the Extreme Networks BlackDiamond 20808 or BlackDiamond 20804 core switch at the Point of Presence (POP) where traffic is managed and connected to service networks.

The extremely versatile Summit X450a switch provides high-density gigabit plus optional 10 Gigabit Ethernet ports in a compact 1RU format, supporting a full range of Layer 2 to Layer 4 functionalities on every port to allow high productivity. Optional redundant power supplies are offered with each switch to protect against power anomalies, providing a continuous operational network.

## Target Applications

- Core switch for a small network
- Aggregation switch in a traditional three tiered network that requires high availability and ExtremeXOS advanced features
- Customer Edge (CE) or Provider Edge (PE) device in a Carrier Ethernet network
- Interconnect switch providing low latency connections for High Performance Cluster Computing (HPCC)



## Voice-Class Availability

Powered by the ExtremeXOS, Summit X450a supports process recovery and application upgrades without the need for a system reboot. Summit X450a provides the high network availability required for converged applications.

### Modular Operating System for Non-Stop Operation

#### True Preemptive Multitasking and Protected Memory

The Summit X450a series switch allows each of the many applications—such as Open Shortest Path First (OSPF) and Spanning Tree Protocol (STP)—to run as separate OS processes that are protected from each other. This drives increased system integrity and inherently protects against DoS attacks.

#### Process Monitoring and Restart

ExtremeXOS 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, Voice-over-IP calls will not drop and digital video feeds will not freeze or pixelize in most situations.

#### Spanning Tree/Rapid Spanning Tree Protocols

The Summit X450a series supports 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. The Summit X450a series continuously checks 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

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

The Summit X450a series 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, Summit X480 and Summit X650 switches. It provides sub-second failover for path failure and hitless master/backup failover along with hitless protocol support such as OSPF graceful restart and Network Login user authentication. The Summit X450a switch provides chassis-like management and availability with its SummitStack stacking technology (see Figure 2).

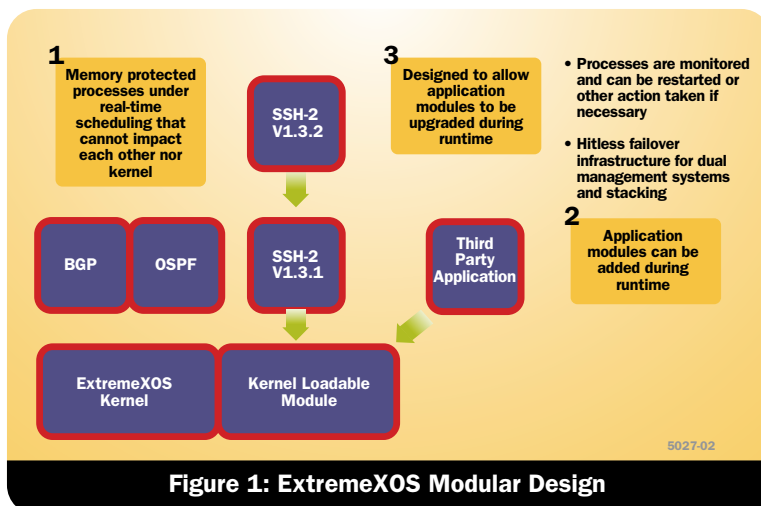


Figure 1: ExtremeXOS Modular Design

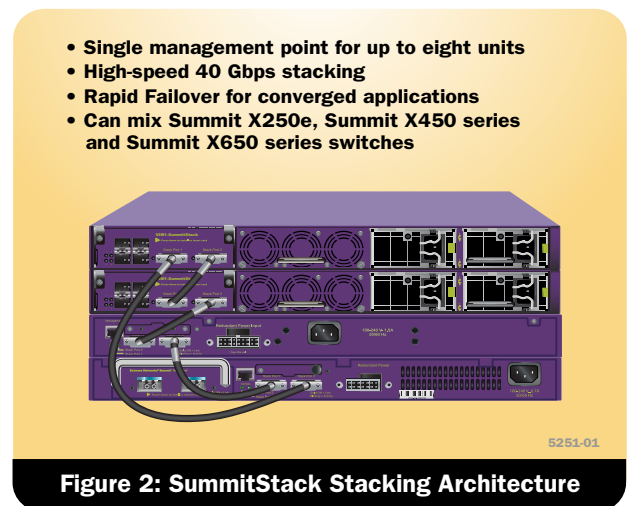


Figure 2: SummitStack Stacking Architecture

## Advanced Features Offer Versatile Deployment

Combining superior resiliency, comprehensive security, and nonblocking performance, the Summit X450a switch is the cornerstone of a high-performance network. Summit X450a series provides a high bandwidth, non-blocking architecture with tri-speed copper Gigabit Ethernet ports for demanding Top-of-Rack data center applications. With optional 10 gigabit trunks, Summit X450a switches connect to gigabit edge devices and provide a high-performance aggregation layer in a traditional three-tier LAN. For Carrier Ethernet networks, Summit X450a switches deliver exceptional QoS and traffic management capabilities.

### High Bandwidth, Non-Blocking Architecture for Demanding Edge Applications

When deployed as an access switch, Summit X450a, with its modular 10 gigabit integrated fiber gigabit ports, provides the bandwidth required by the most demanding applications. With more than 20 gigabits of uplink capacity, uplink bandwidth bottlenecks are eliminated. Providing line-rate throughput and supporting jumbo frames up to 9,216 bytes, Summit X450a allows transfers to be completed in minimal time.

### High Density Gigabit Ports with Optional 10 Gigabit Uplinks

The Summit X450a switches provide ideal performance and functionalities for the aggregation layer. 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 X450a 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.

### Link Redundancy Protocols

Aggregation switches are located in the network crossroads with high-density traffic from many users. Because of its location, every connection to and from an aggregation switch must be redundant in order to allow a safe failover of traffic to a secondary path in case of link or device failure. The Summit X450a series offers superior link redundancy features that provide a highly available aggregation layer.

For example, where voice-grade resiliency is required, EAPS allows links to failover rapidly so that voice call sessions are not dropped. Other link resiliency features include OSPF, ECMP and VRRP, providing standards-based Layer 3 dual homing, ESRP that offers dual homing at both Layer 2 and Layer 3, and a unique software redundant port that does not require any loop detection protocol and is easy to configure.

### Advanced Routing Capabilities for Small Network Core

Supporting core deployments requires full protocol support. Summit X450a switches support advanced protocols for an efficient and productive small network core. The switches provide static, RIP and Edge-OSPF protocols with policy-based routing capabilities. An optional ExtremeXOS core license extends the feature set to include other important core functions such as:

- Full OSPF for much greater extensibility than RIP can provide
- BGP for inter-autonomous system forwarding
- PIM, sparse and dense modes for routing of multicast streams
- IPv6 hardware forwarding with OSPFv3
- IPv6 tunnels, IPv6-to-IPv4 translation, and IPv6 multicast discovery for extensive IPv6 support

### Exceptional Policy-Based QoS and Traffic Management for Triple Play Services

The Summit X450a series provides eight hardware queues per port to support granular traffic classification, and up to 2,048 centralized ACLs per 24-port block that can use information from Layers 1 – 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 X450a provides advanced traffic management features that support the high quality triple play of voice, video and data services.

Summit X450a switches support Extreme Networks vMAN tag stacking mechanism, which is compliant with the IEEE 802.1ad Provider Bridges standard. vMAN allows service providers to aggregate subscribers by using stacked Q-tags.

Summit X450a switches provide low latency and hardware-based support for multicast traffic, making them excellent solutions for IPTV deployment over Carrier Ethernet infrastructures. The DC-powered version of Summit X450a switches provides an internal DC PSU and an optional redundant PSU and can be deployed in a POP where AC is not available.

## Comprehensive Security

Implementing a secure network means providing protection at the network perimeter as well as the core. Working together with Extreme Networks Sentriant® family of products, Summit X450a switches use advanced security functions in protecting your network from known or potential threats.

### User Authentication and Host Integrity Checking

#### Network Login and Dynamic Security Profile

Summit X450a 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, and a MAC-based authentication model. 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 feature available in Summit X450a lets you implement Dynamic Security Profiles with Network Login and 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 access to the application servers or segments within the network.

#### Multiple Supplicant Support

Converged network designs often involve the use of shared ports that represent a potential vulnerability in a network. Multiple supplicant capabilities on a switch allow it to uniquely recognize and apply the appropriate policies for each user or device on a shared port.

#### MAC Security

MAC security allows the lockdown of a port to a given MAC address and limiting the number of MAC addresses on a port. This can be used to dedicate ports to specific hosts or devices such as VoIP phones or printers, and avoid abuse of the port—an interesting capability specifically in environments such as hotels. In addition, an aging timer can be configured for the MAC lockdown, protecting the network from the effects of attacks using (often rapidly) changing MAC addresses.

#### IP Security

ExtremeXOS IP security framework protects the network infrastructure, network services such as DHCP and DNS, and host computers from spoofing and man-in-the-middle attacks. It also protects the network from statically configured and/or spoofed IP addresses. It builds an external trusted database of MAC/IP/port bindings so you know where traffic from a specific address comes from for immediate defense.

#### Identity Management

Identity Management allows customers to track users who access their network. User identity is captured based on NetLogin authentication, LLDP discovery and Kerberos snooping. ExtremeXOS uses the information to then report on the MAC, VLAN, computer hostname, and port location of the user.

#### Host Integrity

Host integrity checking keeps infected or non-compliant machines off the network. Summit X450a series support a host and endpoint integrity solution that is based on a model promoted by the Trusted Computing Group by interfacing with Extreme Networks endpoint security product, Sentriant AG.

### Threat Detection and Response

#### CLEAR-Flow Security Rules Engine

CLEAR-Flow Security Rules Engine provides first order threat detection and mitigation, and mirrors traffic to appliances for further analysis of suspicious traffic in the network.

#### sFlow

sFlow® is a sampling technology that provides the ability to sample application level traffic flows on all interfaces simultaneously.

#### Port Mirroring

To allow threat detection and prevention, Summit X450a 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. The Summit X450a series supports up to 2,048 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 X450a effectively handles DoS attacks. If the switch detects an unusually large number of packets in the CPU input queue, it will assemble ACLs that automati-

cally 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 and Comprehensive Network Management

As the network becomes a foundation of the enterprise application, network management becomes an important piece of solution. Summit X450a supports comprehensive network management through Command Line Interface (CLI), SNMP v1, v2c, v3, and the 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 X450a series switches provide ease-of-management for demanding converged applications.

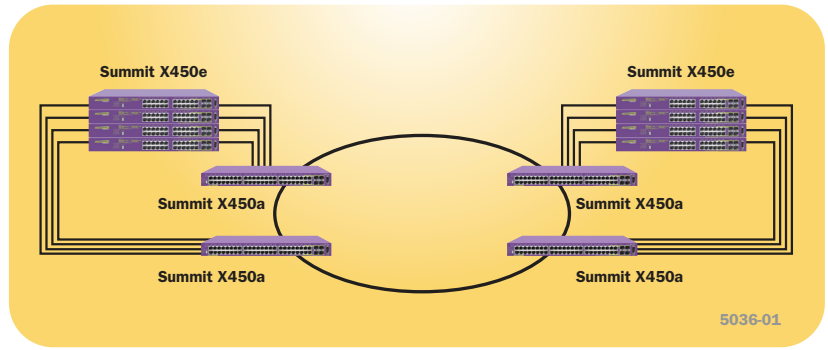
Extreme Networks has developed tools that help save you time and resources in managing your network. EPICenter® management suite provides fault, configuration, accounting, performance and security functions, allowing more effective management of Extreme Networks multi-layer switching equipment in a converged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



# Target Applications

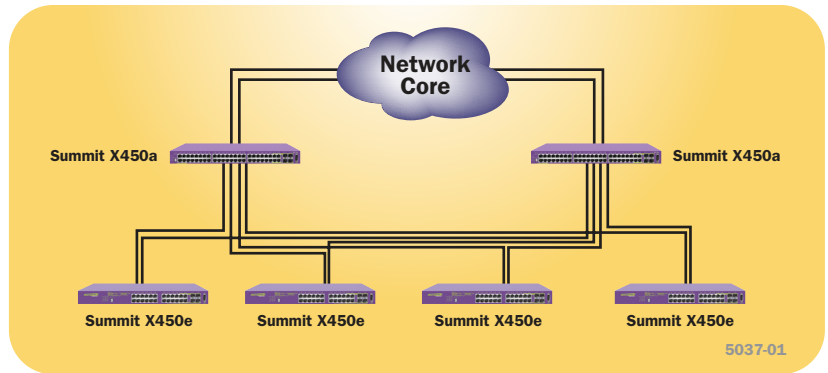
## Small Network Core Switch

Summit X450a is ideal as a small network switch. The optional 10 gigabit ports are perfect for setting up a high bandwidth 10 gigabit backbone, or for aggregating multiple gigabit ports for inter-switch connectivity. All necessary core protocols are available, including BGPv4 and IPv6. With non-blocking performance, extensive DoS protection, Longest Prefix Match routing and superior traffic management features, Summit X450a has been designed from the ground up to be an ideal small core switch.



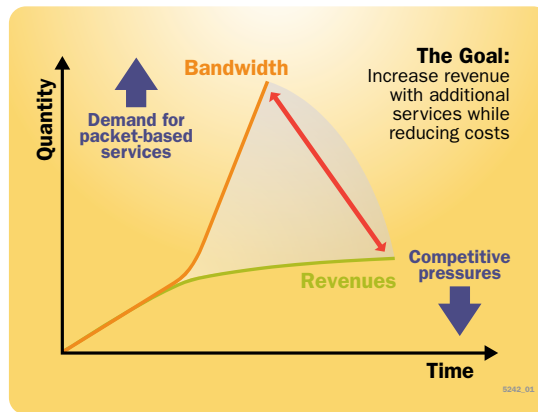
## Traditional Aggregation Layer

Summit X450a is easily deployed as a technology upgrade to a traditional aggregation layer, bringing 10 gigabit uplinks and high availability. For copper and fiber deployments, a pair of Summit X450a switches provide redundant aggregation switching.



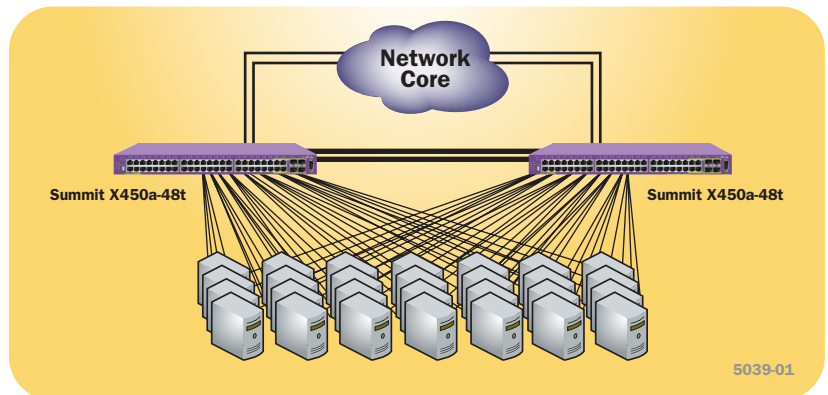
## Carrier Ethernet Services

Summit X450a is an ideal service delivery platform for Carrier Ethernet networks. The advanced traffic management, resiliency and scalability features give it the flexibility to be deployed at the Customer Edge (CE) or as an aggregation switch at the Provider Edge (PE). By supporting both CE and PE service delivery requirements, Summit X450a minimizes service providers' operational expenses.



## High-Performance Cluster Computing (HPCC)

HPCC consists of many servers working cooperatively to solve large computational problems. With the use of relatively inexpensive and compact 1RU servers, a significant amount of processing power can be cost-effectively packed into a relatively small footprint. Summit X450a series switches address the need for high-performance and cost-effective connectivity required for HPCC using gigabit and 10 Gigabit Ethernet as the interconnect technology.



## Technical Specifications

### ExtremeXOS 12.4 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-rstp-mib-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 – LLDP Link Layer Discovery Protocol
- 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
- ITU-T Y.1731 Frame delay measurements
- IEEE 802.3ah Ethernet OAM – Unidirectional Link Fault Management – supported only in Summit X450a-24x

#### 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, 1905 – 1908 SNMP v2c, SMIv2 and Revised MIB-II
- RFC 2576 Coexistence between SNMP Version 1, Version 2 and Version 3
- RFC 2578 – 2580 SMIv2 (update to RFC 1902 – 1903)
- RFC 3410 – 3415 SNMPv3, user based security, encryption and authentication
- RFC 3826 – The Advanced Encryption Standard (AES) Cipher Algorithm in the SNMP User-based Security Model
- RFC 1757 RMON 4 groups: Stats, History, Alarms and Events

- RFC 2021 RMON2 (probe configuration)
- RFC 2613 SMON MIB
- 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 2096 IPv4 Forwarding Table MIB
- RFC 2737 Entity MIB v2
- RFC 2233 Interface MIB
- RFC 3621 PoE-MIB (PoE switches only)
- IEEE 802.1ag MIB
- 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™
- IP Route Compression
- Stacking – SummitStack™

#### 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

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

#### Security Detection and Protection

*In Core and Aggregation Products only*

- CLEAR-Flow, threshold-based alerts and actions (*in non-SummitStack configuration only*)

#### 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
- PIM Snooping
- 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

## Technical Specifications

### IPv4 Router Requirements continued

- RFC 2933 IGMP MIB
- RFC 2096 IPv4 Forwarding Table MIB
- RFC 1724 RIPv2 MIB
- RFC 3768 VRRPv2
- 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 2934 PIM MIB
- RFC 3569, draft-ietf-ssm-arch-06.txt PIM-SSMPIM Source Specific Multicast
- draft-ietf-pim-mib-v2-o1.tx
- Mtrace, a “traceroute” facility for IP Multicast: draft-ietf-idmr-traceroute-ipm-07
- Mrinfo, the multicast router information tool based on Appendix-B of draft-ietf-idmr-dvmrp-v3-11

### IPv6 Host Requirements

- RFC 5095, Internet Protocol, Version 6 (IPv6) Specification
- RFC 4861, 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
- 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

### Core Protocols for Layer 2, IPv4 and IPv6

*Requires Core License*

- EAPsv2 Shared Ports – multiple interconnections between rings
- PIM-DM Draft IETF PIM Dense Mode draft-ietf-idmr-pim-dm-05.txt, draft-ietf-pim-dm-new-v2-04.txt
- RFC 3618 Multicast Source Discovery Protocol (MSDP)
- RFC 3446 Anycast RP using PIM and MSDP
- RFC 2740 OSPFv3, OSPF for IPv6
- RFC 1771 Border Gateway Protocol 4
- RFC 1965 Autonomous System Confederations for BGP
- RFC 2796 BGP Route Reflection (supersedes RFC 1966)
- RFC 1997 BGP Communities Attribute
- RFC 1745 BGP4/IDRP for IP-OSPF Interaction
- RFC 2385 TCP MD5 Authentication for BGPv4
- RFC 2439 BGP Route Flap Damping
- RFC 2918 Route Refresh Capability for BGP-4
- RFC 3392 Capabilities Advertisement with BGP-4
- RFC 4360 BGP Extended Communities Attribute
- RFC 4486 Subcodes for BGP Cease Notification message
- draft-ietf-idr-restart-10.txt Graceful Restart Mechanism for BGP
- RFC 4760 Multiprotocol extensions for BGP-4
- RFC 1657 BGP-4 MIB
- Draft-ietf-idr-bgp4-mibv2-02.txt – Enhanced BGP-4 MIB
- RFC 1195 Use of OSI IS-IS for Routing in TCP/IP and Dual Environments (TCP/IP transport only)
- RFC 2763 Dynamic Hostname Exchange Mechanism for IS-IS
- RFC 2966 Domain-wide Prefix Distribution with Two-Level IS-IS
- RFC 2973 IS-IS Mesh Groups
- RFC 3373 Three-way Handshake for IS-IS Point-to-Point Adjacencies
- RFC 3784 IS-IS Externs for Traffic Engineering (wide metrics only)
- Draft-ietf-isis-restart-02 Restart Signaling for IS-IS
- Draft-ietf-isis-ipv6-06 Routing IPv6 with IS-IS
- Draft-ietf-isis-wg-multi-topology-1.1 Multi Topology (MT) Routing in IS-IS

### QoS and VLAN Services

#### 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
- RFC 5517 Private VLANs
- VLAN Translation
- IEEE 802.1ad Provider Bridge Network, virtual MANs (vMANs)
- vMAN Ethertype Translation/Secondary vMAN Ethertype
- Multicast Support for PVLAN
- Multicast Support for VLAN Aggregation
- VLAN Aggregation

# Technical Specifications

## Summit X450a-24x

### 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)
- 2,048 centralized ACL rules per switch

#### Forwarding Tables

- Layer 2/MAC Addresses: 16K
- IPv4 LPM Entries: 12K
- IPv6 LPM Entries: 6K

#### Rate Limiting

- Ingress bandwidth policing/rate limiting per flow
- Egress bandwidth rate shaping per egress queue and per port
- Rate Limiting Granularity: 64Kbps
- Available Rate Limiters: 2,048 per 24-port block

#### Indicators

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

#### Ports

- 24 ports 1000BASE-X SFP
- 4 ports 10/100/1000BASE-T (shared PHY with 4 1000BASE-X 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

#### External Power Supply Support

- EPS-500

### Physical Specifications

#### Dimensions

- Height: 1.73 Inches/4.4 cm
- Width: 17.4 Inches/44.1 cm
- Depth: 15.3 Inches/38.9 cm
- Weight: 13.0 lbs/5.9 kg

### Operating Specifications

- Operating Temperature Range: 0° C to 40° C (32° F to 104° F)
- Operating Humidity: 10% to 93% relative humidity, non-condensing
- Operating Altitude: 0 – 3,000 meters (9,850 feet)
- Operational Shock (Half Sine): 30 m/s<sup>2</sup> (3 g), 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: 10% to 95% RH, non-condensing
- Packaged Shock (Half Sine): 180 m/s<sup>2</sup> (18 g),

6ms, 600 shocks

- Packaged Sine Vibration: 5 – 62 Hz @ Velocity 5mm/s, 62-500 Hz @ 0.2G
- Packaged Random Vibration: 5 – 20 Hz @ 1.0 ASD w/-3dB/oct. from 20-200 Hz
- 14 drops min on sides & corners @ 42" (<15 kg box)

#### Power & Acoustic Sound

- Voltage Input Range: 90 – 264V
- Nominal Input Ratings: 100~240V, 50/60 Hz, 1.5A
- Nominal Input Current: 1.0A @ 115V~ (lowline) 0.5A @ 230V~ (highline)
- 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: 80W (334 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 @ .6 m

## Summit X450a-24xDC

### 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)
- 2,048 centralized ACL rules per switch

#### Forwarding Tables

- Layer 2/MAC Addresses: 16K
- IPv4 LPM Entries: 12K
- IPv6 LPM Entries: 6K

#### Rate Limiting

- Ingress bandwidth policing/rate limiting per flow
- Egress bandwidth rate shaping per egress queue and per port
- Rate Limiting Granularity: 64Kbps
- Available Rate Limiters: 2,048 per switch

#### Indicators

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

#### Ports

- 24 ports 1000BASE-X SFP
- 4 ports 10/100/1000BASE-T (shared PHY with 4 1000BASE-X 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

#### External Power Supply Support

- EPS-150DC

### Physical Specifications

#### Dimensions

- Height: 1.73 Inches/4.4 cm
- Width: 17.4 Inches/44.1 cm
- Depth: 15.3 Inches/38.9 cm
- Weight: 12.5 lbs/5.67 kg

### Operating Specifications

- Operating Temperature Range: 0° C to 40° C (32° F to 104° F)
- Operating Humidity: 10% to 93% relative humidity, non-condensing
- Operating Altitude: 0 – 3,000 meters (9,850 feet)
- Operational Shock (Half Sine): 30 m/s<sup>2</sup> (3 g), 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: 10% to 95% RH, non-condensing
- Packaged Shock (Half Sine): 180 m/s<sup>2</sup> (18 g), 6ms, 600 shocks
- Packaged Sine Vibration: 5-62 Hz @ Velocity 5mm/s, 62-500 Hz @ 0.2G
- Packaged Random Vibration: 5-20 Hz @ 1.0 ASD w/-3dB/oct. from 20-200 Hz
- 14 drops min on sides & corners @ 42" (<15 kg box)

#### Power & Acoustic Sound

- Voltage Input Range: -36 to -72V
- Nominal Input Ratings: -48VDC, 2.5A
- Input current: 2.5A @ -36 VDC 1.25A @ -72VDC
- Inrush current: 40A peak maximum
- Input wire harness: Extreme PN 250088
- Wire size: 14 AWG
- Connector on cable: TYCO PN 206060-1
- Heat Dissipation: 98W (334 BTU/hr)
- Bystander Sound Pressure: 54 dBA right side @ .6m



## Technical Specifications

### Summit X450a-24t

#### 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)
- 2,048 centralized ACL rules per switch

##### Forwarding Tables

- Layer 2/MAC Addresses: 16K
- IPv4 LPM Entries: 12K
- IPv6 LPM Entries: 6K

##### Rate Limiting

- Ingress bandwidth policing/rate limiting per flow
- Egress bandwidth rate shaping per egress queue and per port
- Rate Limiting Granularity: 64Kbps
- Available Rate Limiters: 2,048 per switch

##### Indicators

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

##### Ports

- 24 ports 10/100/1000BASE-T 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

##### External Power Supply Support

- EPS-LD

#### Physical Specifications

##### Dimensions

- Height: 1.73 Inches/4.4 cm
- Width: 17.4 Inches/44.1 cm
- Depth: 15.3 Inches/38.9 cm
- Weight: 13.8 lbs/6.24 kg

#### Operating Specifications

- Operating Temperature Range: 0° C to 40° C (32° F to 104° F)
- Operating Humidity: 10% to 93% relative humidity, non-condensing
- Operating Altitude: 0 – 3,000 meters (9,850 feet)
- Operational Shock (Half Sine): 30m/s<sup>2</sup> (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: 10% to 95% RH, noncondensing

- Packaged Shock (Half Sine): 180m/s<sup>2</sup> (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" (<15 kg box)

##### Power & Acoustic Sound

- Voltage Input Range: 90 – 264V
- Nominal Input Ratings: 100~240V, 50/60 Hz, 1.0A
- Nominal Input Current: 1.0A @ 115V~ (lowline) 0.5A @ 230V~ (highline)
- 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: 100W (341 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 @ .6 m

### Summit X450a-24tDC

#### 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)
- 2,048 centralized ACL rules per switch

##### Forwarding Tables

- Layer 2/MAC Addresses: 16K
- IPv4 LPM Entries: 12K
- IPv6 LPM Entries: 6K

##### Rate Limiting

- Ingress bandwidth policing/rate limiting per flow
- Egress bandwidth rate shaping per egress queue and per port
- Rate Limiting Granularity: 64 Kbps
- Available Rate Limiters: 2,048 per switch

##### Indicators

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

##### Ports

- 24 ports 10/100/1000BASE-T with auto-speed and auto-polarity
- 4 ports SFP (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

##### External Power Supply Support

- EPS-150DC

#### Physical Specifications

##### Dimensions

- Height: 1.73 Inches/4.4 cm
- Width: 17.4 Inches/44.1 cm
- Depth: 15.3 Inches/38.9 cm
- Weight: 12.3 lbs/5.56 kg

#### Operating Specifications

- Operating Temperature Range: 0° C to 40° C (32° F to 104° F)
- Operating Humidity: 10% to 93% relative humidity, non-condensing
- Operating Altitude: 0 – 3,000 meters (9,850 feet)

- Operational Shock (Half Sine): 30m/s<sup>2</sup> (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: 10% to 95% RH, noncondensing
- Packaged Shock (Half Sine): 180m/s<sup>2</sup> (18g), 6ms, 600 shocks
- Packaged Sine Vibration: 5 – 62 Hz @ Velocity 5mm/s, 62-500 Hz @ 0.2G
- 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: -36 to -72V
- Nominal Input Ratings: -48VDC, 2.0A
- Input current: 2.0A @ -36 VDC 1.0A @ -72 VDC
- Inrush current: 40A peak maximum
- Input wire harness: Extreme PN 250088
- Wire size: 14 AWG
- Connector on cable: TYCO PN 206060-1
- Heat Dissipation: 75W (369 BTU/hr)

# Technical Specifications

## Summit X450a-48t

### 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)
- 2,048 centralized ACL rules per 24-port block

#### Forwarding Tables

- Layer 2/MAC Addresses: 16K
- IPv4 LPM Entries: 12K
- IPv6 LPM Entries: 6K

#### Rate Limiting

- Ingress bandwidth policing/rate limiting per flow
- Egress bandwidth rate shaping per egress queue and per port
- Rate Limiting Granularity: 64 Kbps
- Available Rate Limiters: 2,048 per 24-port block

#### Indicators

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

#### Ports

- 48 ports 10/100/1000BASE-T 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

#### External Power Supply Support

- EPS-500

### Physical Specifications

#### Dimensions

- Height: 1.73 Inches/4.4 cm
- Width: 17.4 Inches/44.1 cm
- Depth: 17.0 Inches/43.2 cm
- Weight: 15.8 lbs/7.14 kg

### Operating Specifications

- Operating Temperature Range: 0° C to 40° C (32° F to 104° F)
- Operating Humidity: 10% to 93% relative humidity, non-condensing
- Operating Altitude: 0 – 3,000 meters (9,850 feet)
- Operational Shock (Half Sine): 30m/s<sup>2</sup> (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: 10% to 95% RH, noncondensing
- Packaged Shock (Half Sine): 180m/s<sup>2</sup> (18g), 6ms, 600 shocks
- Packaged Sine Vibration: 5 – 62 Hz @ Velocity 5mm/s, 62-500 Hz @ 0.2G
- 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, 1.5A
- Nominal Input Current: 1.45 A @ 115V~ (lowline) 0.65A @ 230V~ (highline)
- 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: 160W (512 BTU/hr)
- Sound Power in accordance with EN 300 753 (10-1997)

## Summit X450a-48tDC

### 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)
- 2,048 centralized ACL rules per 24-port block

#### Forwarding Tables

- Layer 2/MAC Addresses: 16K
- IPv4 LPM Entries: 12K
- IPv6 LPM Entries: 6K

#### Rate Limiting

- Ingress bandwidth policing/rate limiting per flow
- Egress bandwidth rate shaping per egress queue and per port
- Rate Limiting Granularity: 64 Kbps
- Available Rate Limiters: 2,048 per 24-port block

#### Indicators

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

#### Ports

- 48 ports 10/100/1000BASE-T 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

#### External Power Supply Support

- EPS-150DC

### Physical Specifications

#### Dimensions

- Height: 1.73 Inches/4.4 cm
- Width: 17.4 Inches/44.1 cm
- Depth: 15.3 Inches/38.9 cm
- Weight: 15.5 lbs/7.03 kg

### Operating Specifications

- Operating Temperature Range: 0° C to 40° C (32° F to 104° F)
- Operating Humidity: 10% to 93% relative humidity, non-condensing
- Operating Altitude: 0 – 3,000 meters (9,850 feet)
- Operational Shock (Half Sine): 30m/s<sup>2</sup> (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: 10% to 95% RH, noncondensing
- Packaged Shock (Half Sine): 180m/s<sup>2</sup> (18g), 6ms, 600 shocks
- Packaged Sine Vibration: 5 – 62 Hz @ Velocity 5mm/s, 62 – 500 Hz @ 0.2G
- 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

- Nominal Input Ratings: -48VDC, 4.5A
- Voltage Input Range: -36 to -72 V
- Input current: 4.0A @ -36VDC, 2.0A @ -72VDC
- Inrush current: 40 A peak maximum
- Input wire harness: Extreme PN 250088
- Wire size: 14 AWG
- Connector on cable: TYCO PN 206060-1
- Bystander Sound Pressure: 54 dBA right side @ .6 m

# Technical Specifications

## All Summit X450a Series Switches

### Regulatory/Safety

#### North American Safety of ITE

- UL 60950-1 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)

#### European Safety of ITE

- EN60950-1:2001+A11
- EN 60825-1+A2:2001 (Lasers Safety)
- TUV-R GS Mark by German Notified Body
- 2006/95/EC Low Voltage Directive

#### International Safety of ITE

- CB Report & Certificate per IEC 60950-1:2001 + National Differences
- AS/NZS 60950-1 (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 55022:2003 Class A
- EN 55024:A2-2003 Class A includes IEC 61000-4-2, 3, 4, 5, 6, 11
- EN 61000-3-2,8-2000(Harmonics)
- EN 61000-3-3 1995+A1:2001(Flicker)
- ETSI EN 300 386 v1.3.3, 2005-04 (EMC Telecommunications)
- 2004/108/EC EMC Directive

#### International EMC Certifications

- CISPR 22: 2005, Class A (International Emissions)
- CISPR 24:A2:2003 Class A (International Immunity)
- IEC/EN 61000-4-2:2001 Electrostatic Discharge, 8kV Contact, 15 kV Air, Criteria A
- EC/EN 61000-4-3:2002 Radiated Immunity 10V/m, Criteria A
- EC/EN 61000-4-4:2004 Transient Burst, 1 kV, Criteria A
- IEC/EN 61000-4-5:2001 Surge, 2 kV L-L, 2 kV L-G, Level 3, Criteria A
- IEC/EN 61000-4-6:2004 Conducted Immunity, 0.15-80 MHz, 10V/m unmod. RMS, Criteria A
- EC/EN 61000-4-11:2004 Power Dips & Interruptions, >30%, 25 periods, Criteria C

#### Country Specific

- VCCI Class A (Japan Emissions)
- ACMA (C-Tick) (Australia Emissions)
- KCC Mark EMC Approval (Korea)

### Telecom Standards

- EN/ETSI 300 386:2001 (EMC Telecommunications)
- EN/ETSI 300 019 (Environmental for Telecommunications)
- MEF9 and MEF14 certified for EPL, EVPL and ELAN

#### Summit X450a-48tDC, Summit X450a-24tDC, Summit X450a-24xDC, EPS-150DC, and EPS-T2

- NEBS Level 1 Certified by MET labs in accordance with GR-1089-CORE, Issue 4, and GR-63-CORE, Issue 3 as defined in SR-3580 Issue 3 and includes all Verizon and AT&T Level-1 variations
- NEBS Level 3 compliant as defined in SR3580 in accordance with GR-1089 Issue 4 & GR-63 Issue 3 with exception to filter requirement

#### IEEE 802.3 Media Access Standards

- IEEE 802.3ab 1000BASE-T
- IEEE 802.3z 1000BASE-X
- IEEE 802.3ae 10GBASE-X
- IEEE 802.3an 10GBASE-T

### Environmental Standards

- EN/ETSI 300 019-2-1 v2.1.2 (2000-09) - Class 1.2 Storage
- EN/ETSI 300 019-2-2 v2.1.2 (1999-09) - Class 2.3 Transportation
- EN/ETSI 300 019-2-3 v2.1.2 (2003-04) - Class 3.1e Operational
- EN/ETSI 300 753 (1997-10) – Acoustic Noise
- ASTM D3580 Random Vibration Unpackaged 1.5G

### Warranty

- Ltd. 1-year on Hardware
- 90-days on Software
- For warranty details, visit [www.extremenetworks.com/go/warranty](http://www.extremenetworks.com/go/warranty)

## Accessories

### Summit X450a Redundant Power Supply Units (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 1RU height and works as a 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.



#### EPS-150DC and EPS-T2

EPS-150DC is the redundant DC Power Supply for DC PSU-based Summit switches. When installing it, the EPS-T2 power tray is required to rack-mount this external power supply. EPS-T2 power tray can take up to two EPS-150DC power modules, and each EPS-150DC works individually. EPS-150DC comes with DC output cable to connect between the Summit switch and EPS-150DC.



### Redundant PSU Compatibility Matrix

| Summit Switch Models | Summit Switch Part Number(s) | External Redundant PSU Options                     |
|----------------------|------------------------------|--|
| Summit X450a-24t     | 16151                        | EPS-500 (10911) external power supply              |
| Summit X450a-48t     | 16157                        | EPS-500 external power supply (10911)              |
| Summit X450a-24x     | 16155                        | EPS-500 (10911) external power supply              |
| Summit X450a-24tDC   | 16153                        | EPS-150DC power module (10909) with EPS-T2 (10910) |
| Summit X450a-48tDC   | 16165                        | EPS-150DC power module (10909) with EPS-T2 (10910) |
| Summit X450a-24xDC   | 16159                        | EPS-150DC power module (10909) with EPS-T2 (10910) |

## Power Supply Units

### EPS-500

#### Dimensions and Weight

##### EPS-500

- Height: 1.73 Inches/4.4 Cm
- Width: 17.4 Inches/44 Cm
- Depth: 7.6 Inches/19.3 Cm
- Weight: 10.8 Lbs/4.9 Kg

#### Power

- Voltage Input Range: 90 – 264V
- Nominal Input Ratings: 100 – 240V~, 50 – 60Hz, 10A
- Line Frequency Range: 47 – 63 Hz
- Maximum 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, 7.5A max, 90 Watts
- Power Supply Input Socket: IEC 320 C14
- Power Cord Input Plug: IEC 320 C13
- Heat Dissipation: 158W (539.1 BTU/h)
- Power Consumption: 659W (2448.6 BTU/h)

### EPS-150DC

#### Dimensions and Weight

##### EPS-150DC

- Height: 1.65 Inches/4.2 cm
- Width: 3.74 Inches/9.5 cm
- Depth: 10.12 Inches/25.7 cm
- Weight: 3.76 Lbs/1.71 Kg

#### Power – EPS-150DC




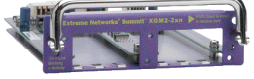
- Voltage Input Range: -36 to -72VDC, 6.0A
- Input Current Rating: 5.5A @ -36VDC, 2.6A @ -72VDC
- Maximum Inrush Current: 20A@-48VDC, 40A @ -72VDC
- Efficiency: 75% with 100% load at 25° C
- Power Supply Input Socket: TYCO 206061-1
- Power Cord Input Plug: TYCO 206060-1

- Heat Dissipation: 45W (153.5 BTU/h)
- Power Consumption: 195W (665.4 BTU/h)



## Accessories

### XGM2 Dual 10 Gigabit Ethernet Modules

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

## Ordering Information

| Part Number | Name                     | Description   |
|-------------|--------------------------|---|
| 16151       | Summit X450a-24t         | 24 10/100/1000BASE-T; 4 unpopulated 1000 BASE-X SFP ports (shared); slot for XGM2 10 Gigabit Ethernet module; 2 SummitStack stacking ports; AC PSU; connector for EPS-500 external redundant PSU; ExtremeXOS Advanced Edge license  |
| 16151T      | Summit X450a-24t-TAA     | U.S. Federal TAA; 24 10/100/1000BASE-T; 4 unpopulated 1000 BASE-X SFP ports; dual 10G option slot; 2 dedicated 10G stacking ports; AC PSU; connector for EPS-500 external redundant PSU; ExtremeXOS Advanced Edge license           |
| 16153       | Summit X450a-24tDC       | 24 10/100/1000BASE-T; 4 unpopulated 1000BASE-X SFP ports (shared); slot for XGM2 10 Gigabit Ethernet module; 2 SummitStack stacking ports; DC PSU; connector for EPS-150DC external redundant PSU; ExtremeXOS Advanced Edge license |
| 16153T      | Summit X450a-24tDC-TAA   | U.S. Federal TAA; 24 10/100/1000BASE-T; 4 unpopulated 1000BASE-X SFP ports; dual 10G option slot; 2 dedicated stacking ports; DC PSU; connector for EPS-150DC external redundant PSU; ExtremeXOS Advanced Edge license              |
| 16157       | Summit X450a-48t         | 48 10/100/1000BASE-T; 4 unpopulated 1000BASE-X SFP ports (shared); slot for XGM2 10 Gigabit Ethernet module; 2 SummitStack stacking ports; connector for EPS-500 external redundant PSU; ExtremeXOS Advanced Edge license           |
| 16157T      | Summit X450a-48t-TAA     | U.S. Federal TAA; 48 10/100/1000BASE-T; 4 unpopulated 1000BASE-X SFP ports; dual 10G option slot; 2 dedicated 10G stacking ports; connector for EPS-500 external redundant PSU; ExtremeXOS Advanced Edge license                    |
| 16165       | Summit X450a-48tDC       | 48 10/100/1000BASE-T; 4 unpopulated SFP ports (shared); slot for XGM2 10 Gigabit Ethernet module; 1 DC PSU; ExtremeXOS Advanced Edge license; connector for EPS-150DC external redundant PSU  |
| 16155       | Summit X450a-24x         | 24 1000BASE-X SFP ports; 4 10/100/1000BASE-T ports; slot for XGM2 10 Gigabit Ethernet module; 2 SummitStack stacking ports; 1 AC PSU; ExtremeXOS Advanced Edge license; connector for EPS-500 or EPS-LD external redundant PSU      |
| 16155T      | Summit X450a-24x-TAA     | U.S. Federal TAA; 24 1000BASE-X SFP ports; 4 10/100/1000BASE-T ports; option slot for 10 Gigabit option card XGM2; 1 AC PSU; ExtremeXOS Advanced Edge license; connector for EPS-500 or EPS-LD external redundant PSU               |
| 16159       | Summit X450a-24xDC       | 24 1000BASE-X SFP; 4 10/100/1000BASE-T ports; option slot for XGM2 10 Gigabit Ethernet module; 1 DC PSU; ExtremeXOS Advanced Edge license; connector for EPS-150DC external redundant PSU   |
| 16170       | Summit X450 Core License | ExtremeXOS Core License for Summit X450-24x, Summit X450-24t, Summit X450a-24t/24tDC, Summit X450a-48t/48tDC and Summit X450a-24x/24xDC   |
| 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   |
| 10909       | EPS-150DC                | External Power System Power Module for EPS-T, 150 Watts, Power cord ordered separately, DC Input  |
| 10910       | EPS-T2                   | External Power System Power Tray. Accepts up to two EPS-150DC Power Modules   |
| 10911       | EPS-500 External AC PSU  | External Power System 500 Watts, Power cord ordered separately  |
| 10110       | SR XENPAK                | 10GBASE-SR XENPAK Transceiver. 850nm, up to 300m on Multi-mode Fiber, SC Connector  |
| 10111       | LR XENPAK                | 10GBASE-LR XENPAK Transceiver, 1310nm, up to 10km on Single-mode Fiber, SC Connector, Power cord ordered separately   |
| 10112       | ER XENPAK                | 10GBASE-ER XENPAK Transceiver, 1550nm, up to 40km on Single-mode Fiber, SC Connector  |
| 10113       | ZR XENPAK                | 10GBASE-ZR XENPAK Transceiver, 1550nm, up to 80km on Single-mode Fiber, SC Connector  |
| 10114       | LX4 XENPAK               | 10GBASE-LX4 XENPAK Transceiver, 1310nm, up to 300m on Multi-mode Fiber and up to 10 km on a Single-mode Fiber, SC Connector   |

## Ordering Information

| Part Number | Name                               | Description   |
|-------------|------------------------------------|---|
| 10116E      | LW XENPAK                          | 10GBASE-LW (WAN PHY) XENPAK Transceiver, 1310nm, up to 10km on SMF, 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 MMF                |
| 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, LC Connector   |
| 10052       | LX SFP                             | 1000BASE-LX SFP, LC Connector   |
| 10053       | ZX SFP                             | 1000BASE-ZX SFP, Extra Long Distance SMF 70 km/21 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)                                     |
| 10060       | 100FX/1000LX SFP <sup>1</sup>      | 100FX/1000LX SFP, SMF, LC Connector (Requires MCP and 6dB Attenuator for 100FX-MMF Operation) |
| 10063       | 100FX SFP <sup>2</sup>             | 100FX SFP, MMF, LC Connector  |
| 10064       | LX100 SFP                          | 1000BASE-LX100 SFP, Extra Long Distance SMF 100 km/30dB Budget, LC Connector                  |
| 10065       | 10/100/1000BASE-T SFP <sup>3</sup> | 10/100/1000BASE-T, SFP, CAT 5 cable 100m, RJ-45 Connector                                     |
| 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/UniStack Stacking Cable, 3.0M   |
| 16105       | Stacking Cable, 5.0M <sup>4</sup>  | SummitStack Stacking Cable, 5.0M  |

<sup>1</sup> Compatible with Summit X450a-24tDC, Summit X450a-48tDC and Summit X450a-24xDC

<sup>2</sup> Compatible with Summit X450a-24t, Summit X450a-48t and Summit X450a-24x

<sup>3</sup> Not supported on Combo ports for Summit X450, Summit X450a and Summit X450e

<sup>4</sup> Not supported when using with Summit X650 and UniStack



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