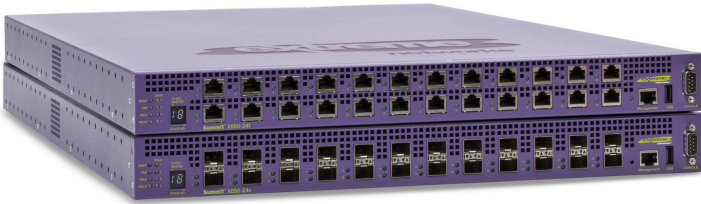# Summit X650 Series

*Summit X650 Series—The ultimate Top of Rack
10 Gigabit Ethernet switch.*

High-Performance Switching and Routing

- 24-port 10 Gigabit Ethernet non-blocking switching in 1 Rack Unit (RU) form factor with standard option to provide 40 Gbps SummitStack™ Stacking and 4-port Gigabit SFP ports

- Optional 8-port 10 Gigabit Ethernet module to provide the 80 Gbps uplinks and 40 Gbps SummitStack

- Optional 256 Gbps stacking for up to eight units in a stack to provide up to 192 10 Gigabit Ethernet ports in one logically integrated unit

- Optional 512 Gbps stacking for connecting two Summit X650 switches to provide non-blocking 48 10 Gigabit Ethernet ports

Versatile Architecture

- One network Operating System (OS) for Extreme Networks® Ethernet switches everywhere in the network

- 10 Gigabit Ethernet over UTP cable and SFP+ for fiber and passive copper direct host attack installation

- Dual Speed support on 10 Gigabit Ethernet and Gigabit Ethernet on 10GBASE-T and SFP+ ports providing smooth migration from Gigabit Ethernet to 10 Gigabit Ethernet

High Availability

- ExtremeXOS® modular OS for highly available network operation

- Carrier-grade redundant networking protocol including Ethernet Automatic Protection Switching (EAPS)

- Internal redundant AC/DC power supply and field replaceable fan tray

Comprehensive Security

- Robust MAC and IP security framework

- Threat detection and response instrumentation to react to network intrusion with CLEAR-Flow Security Rules Engine

The Summit® X650 series switch is a purpose-built Top of Rack switch designed for emerging 10 Gigabit Ethernet-enabled servers deployed in enterprise data centers. Summit X650 helps optimize new server deployments while providing a seamless migration path from existing Gigabit Ethernet-based servers to 10 Gigabit Ethernet-based high-performance servers to start the transition to the new virtualized environment.

Summit X650 provides remarkable high-density for 10 Gigabit Ethernet in a very small 1RU form factor for up to 32 ports in one system and 192 ports in a stacked system. Summit X650 offers two of the most advanced 10 Gigabit Ethernet technologies: 10GBASE-T and SFP+ to accommodate the needs for both copper twisted pair cable and optical fiber-based 10 Gigabit Ethernet.

With its versatile design, Summit X650 provides exceptionally high-density Layer 2 switching with ultra low latency and highly scalable IPv4 and IPv6 unicast and multicast routing to enable enterprise aggregation and core backbone deployment in AC-powered and DC-powered environments.

Summit X650 simplifies network operation with ExtremeXOS modular OS, used amongst all Extreme Networks Ethernet switches. The ExtremeXOS operating system provides high availability and simplicity with one OS everywhere in the network.

Target Applications

- Top of Rack switch for servers in enterprise data centers

- High-performance 10 gigabit core switch for a small network

- High-performance 10 gigabit aggregation switch in a traditional three-tiered network

- Interconnect switch providing low latency connections for High Performance Cluster Computing (HPCC)

Summit X650 switch is an industry-leading 10 Gigabit Ethernet stackable switch with ExtremeXOS modular operating system.

High-Performance Switching and Routing

Summit X650 offers intelligent switching and routing with exceptional high-performance stacking technology for next generation enterprise data centers—as well as dedicated 10 Gigabit Ethernet uplink capabilities powered by an ExtremeXOS modular OS. With its low packet forwarding latency, Summit X650 helps enhance the Data Center and the HPCC environment.

10 Gigabit Ethernet Switching

Summit X650 offers 24-port 10 Gigabit Ethernet non-blocking switching with IEEE 802.3an standard-based 10GBASE-T interfaces or 10GBASE-X SFP+ interfaces. Summit X650 is capable of Layer 2 and Layer 3 forwarding at 363 million packets per second forwarding rate in a small 1RU form factor enabling the next generation high-performance server deployment in data centers.

With its flexible architecture provided by the Versatile Interface Modules (VIMs), you can configure Summit X650 to best suit your network needs (see Figure 1).

SummitStack Support

Summit X650 supports compatible SummitStack solutions with a default configuration that is available in the popular Summit X250e, Summit X450e and Summit X450a series switches. Support for SummitStack offers a great migration path from gigabit-enabled servers to the new high-performance 10 gigabit-enabled servers. You can configure the use of two SummitStack 40G stacking ports to provide ease of management for gigabit and 10 gigabit mixed stacking. SummitStack is provided through the standard VIM1-SummitStack module installed by default.

Dedicated Uplinks at 80 Gbps

Summit X650 can support additional 8-port 10 Gigabit Ethernet by installing optional VIM-10G8X module which offers 8-port 10 Gigabit Ethernet SFP+ ports as well as SummitStack 40G ports. With this option, you can maximize the number of interfaces for servers up to 24 ports while using the dedicated 8-port 10 Gigabit Ethernet for uplink connectivity. The optional VIM1-10G8X provides ideal bandwidth to the backbone by offering 80 Gbps aggregated bandwidth. With this 8-port 10 Gigabit Ethernet SFP+ module, Summit X650 can support up to 32 ports of 10 Gigabit Ethernet ports in a 1RU form factor. This option provides 3:1 oversubscription from front ports (total 24 ports) to uplink ports (total 8 ports) and maximizes server port density. Both in star and ring topologies, this architecture helps build a 10 Gigabit Ethernet data center or HPCC application (see Figure 2).

10 Gigabit Optimized Stacking Support

In case of a higher density 10 Gigabit Ethernet requirement for now or in the future, Summit X650 is designed to provide a 10 gigabit optimized stacking solution. Summit X650 offers an optional SummitStack256 module which provides up to 256 Gbps full duplex stacking bandwidth. With this exceptional SummitStack256 solution, Summit X650 can provide 256 Gbps stacking bandwidth optimized for high-density 10 Gigabit Ethernet switching and provides up to 192 10 Gigabit Ethernet ports with only 8RU of height in a fully redundant configuration. Summit X650 also offers an optional 48-port 10 Gigabit Ethernet non-blocking configuration by stacking two Summit X650 switches together with an optional VIM1-SummitStack512 module.

High Performance Computer Cluster

Ethernet-based HPCC installations have been increasing because of its highly economical architecture and lower cost of operation. With Summit X650, the cluster can be connected via 10 Gigabit Ethernet and with its low latency, Summit X650 helps increase the computing power for HPCC systems.

VIM Options	VIM1-SummitStack (default option)	VIM1-10G8X	VIM1-SummitStack256	VIM1-SummitStack512
Summit X650-24t	24 x 10GBASE-T SummitStack (shared with the last two 10GBASE-T ports) 4 x 1000BASE-X (SFP)	24 x 10GBASE-T and 8 x 10GBASE-X (SFP+) 2 x SummitStack	24 x 10GBASE-T SummitStack256 4 x 1000BASE-X (SFP)	24 x 10GBASE-T SummitStack512
Summit X650-24x	24 x 10GBASE-X (SFP+) SummitStack (shared with the last two 10GBASE-T SFP+ ports) 4 x 1000BASE-X (SFP)	24 x 10GBASE-X (SFP+) and 8 x 10GBASE-X (SFP+) 2 x SummitStack	24 x 10GBASE-X (SFP+) SummitStack256 4 x 1000BASE-X (SFP)	24 x 10GBASE-X (SFP+) SummitStack512

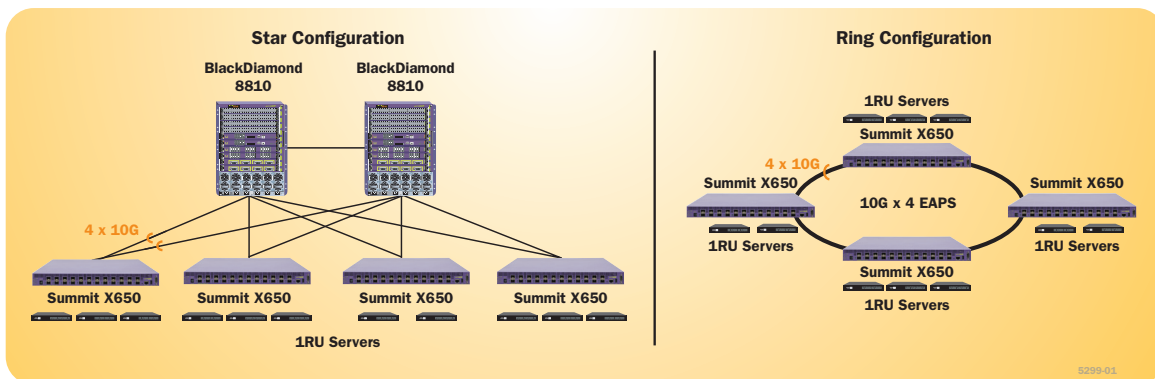**Figure 1: Summit X650 Port Configurations and Options**

Figure 2: Summit X650 High Speed Uplink Option

Versatile Architecture

Summit X650 is designed to help deploy multiple applications that require high-performance 10 Gigabit Ethernet switching and routing. By offering enterprise core class scalability, Summit X650 can be used anywhere you need 10 Gigabit Ethernet. Summit X650, together with all Extreme Networks Ethernet switching products, runs the same ExtremeXOS modular OS.

Enterprise Core Class Routing and Switching Scalability

In the enterprise campus network, there is a need for cost-effective 10 Gigabit Ethernet switches, both in small-sized core backbone and in traditional three tier network architectures. Summit X650 not only offers next generation server aggregation, but also offers the 10 Gigabit Ethernet campus aggregation application with its core class routing and switching scalability. Summit X650 can support up to 12,000 IPv6 longest prefix matching routing table, 6,000 IP ARP entries and 2,000 IP multicast group entries. Summit X650 switch's true versatility simplifies network deployment.

One Operating System

Extreme Networks provides simple network operation for the Ethernet switching products by offering one common OS throughout the entire portfolio—the ExtremeXOS network OS. From 10/100 Mbps switching products such as Summit X150 and Summit X250e to the multi-10 gigabit core backbone

BlackDiamond® modular chassis switches, all switches run exactly the same version of the OS, which helps deploy, operate and maintain your entire network.

Multiple Choices: UTP, Passive Copper or Fiber Optical Installation

With two models, Summit X650 provides a variety of configuration options from which to choose. One solution is based upon the latest IEEE standard specification called IEEE 802.3an, 10GBASE-T enables 10 Gigabit Ethernet over UTP. 10GBASE-T meets industry standard and commonly used unshielded twisted pair cable, and can support up to 100 meters with Category 6e or higher grade cable. 10GBASE-T is the first standard which provides 100 meter solution over a copper cable infrastructure. The other solution is based upon the latest MSA technology called SFP+. The SFP+ model can support both passive copper cable for up to 5 meters and fiber optical cable installation with SFP+ fiber optical transceivers (see Figure 3).

Dual Speed Support

Both 10GBASE-T and SFP+ support the flexible, dual interface speed of 10 gigabit and gigabit. 10GBASE-T ports can auto-negotiate down to 1000BASE-T to provide the unified switch infrastructure for both 10GBASE-T and 1000BASE-T with UTP cable. SFP+ ports can take both 10 gigabit SFP and gigabit SFP, depending upon the pluggable optics you choose, SFP+ can work in both modes.

Optimized Air Ventilation

Most of the servers installed in the standard 19-inch rack system flow air from front-to-back to maximize their cooling performance. Compared to side-to-side air flow, front-to-back air flow gives more effective cooling throughout the rack system in the data center. Summit X650 has a field replaceable fan tray offering effective front-to-back air flow.

SFP+ Optics

10GBASE-CR SFP+ Passive Copper Cable

SFP Modules	Summit X650-24x	VIM1-10G8X
	24 x SFP+ ports	8 x SFP+ ports
SX SFP	Yes*	Yes
LX SFP	Yes*	Yes
ZX SFP	Yes*	Yes
LX100 SFP	Yes*	Yes
1000BX SFP BX-D/U	Yes*	Yes
10GBASE-SR SFP+	Yes	Yes
10GBASE-LR SFP+	Yes	Yes
10GBASE-CR SFP+ 1m – 10m	Yes	Yes

Technology	Cabling	Support Link Segments Distances
10GBASE-T	Category 6a	100 meters
	Category 6	55 meters
	Category 5e	55 meters
10GBASE-X SFP+	Multimode Fiber / 10GBASE-SR	300 meters
	Singlemode Fiber / 10GBASE-LR	10,000 meters
	Passive Copper / 10GBASE-CR	1-10 meters

* Excludes port number 23 and port number 24

Figure 3: Summit X650 10 Gigabit Ethernet Cable Options

High Availability

Powered by the ExtremeXOS OS, Summit X650 supports process recovery and application upgrades without the need for a system reboot. Summit X650 provides the high network availability required for mission-critical servers and applications through its advanced modular OS, highly available hardware architecture and carrier-grade network redundancy protocols.

Modular Operating System for Non-Stop Operation

True Preemptive Multitasking and Protected Memory

Summit X650 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 OS allows the upgrading of individual software modules, should this be necessary, leading to higher availability in the network (see Figure 4).

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 more adaptable than 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 (VoIP) calls will not drop and digital video feeds will not freeze or pixelize in most situations.

Spanning Tree/Rapid Spanning Tree Protocols

Summit X650 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. Summit X650 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 80 Gbps of redundant bandwidth per logical connection.

Voice-Grade Stacking with SummitStack

Summit X650 provides high-speed 40 Gbps stacking bandwidth by default, and offers SummitStack256 and SummitStack512 options for higher bandwidth demand. All SummitStack stacking architecture is designed to support mission-critical applications 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 X650, Summit X450a, Summit X450e and Summit X250e, providing 50 mili-seconds failover for path failure and hitless master/backup failover along with hitless protocol support such as OSPF graceful restart and Network Login user authentication. Summit X650 provides chassis-like management and availability with its SummitStack stacking technology (see Figure 5).

Hardware Redundancy

Summit X650 supports dual redundant AC/DC power supply which can be installed in the system, to provide the high availability. Power Supply can be hot-swapped and replaced when it fails. Summit X650 supports removable fan with field replaceability.
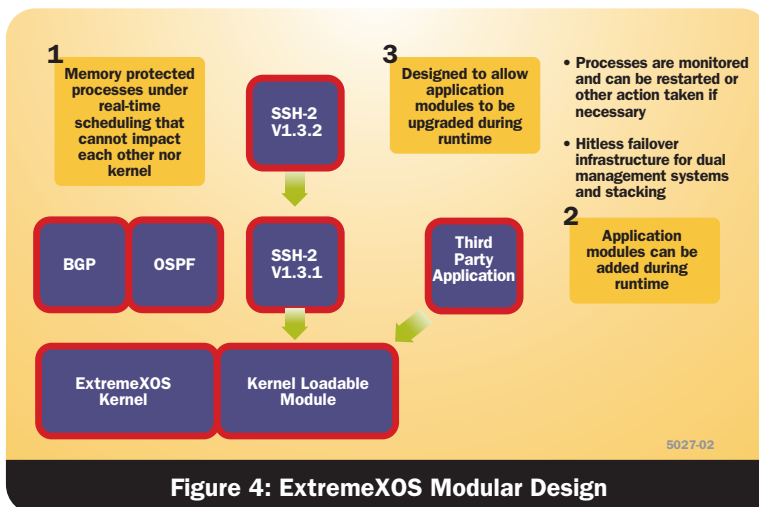
1 Memory protected processes under real-time scheduling that cannot impact each other nor kernel

SSH-2 V1.3.2

3 Designed to allow application modules to be upgraded during runtime

• Processes are monitored and can be restarted or other action taken if necessary

• Hitless failover infrastructure for dual management systems and stacking

BGP   OSPF   SSH-2 V1.3.1   Third Party Application

2 Application modules can be added during runtime

ExtremeXOS Kernel   Kernel Loadable Module

5027-02

Figure 4: ExtremeXOS Modular Design

• **Single management point for up to eight units**
• **High-speed 40 Gbps stacking**
• **Rapid Failover for converged applications**
• **Can mix Summit X250e, Summit X450 series and Summit X650 series switches**
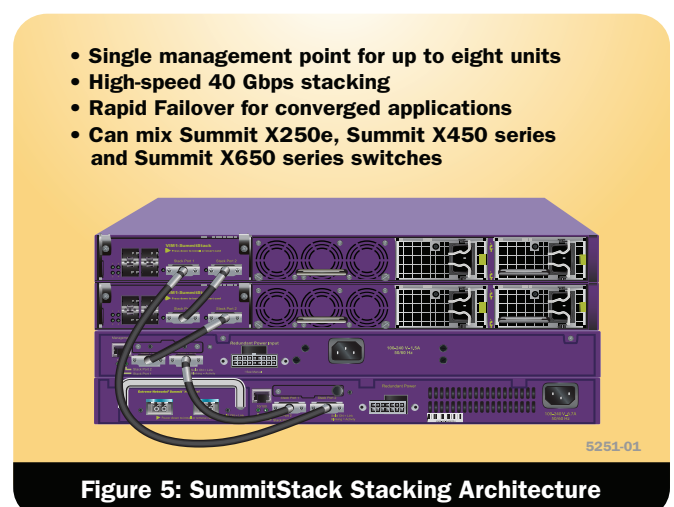
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Figure 5: SummitStack Stacking Architecture

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 X650 uses a defense-in-depth strategy in protecting your network from known or potential threats.

Robust IP and MAC Security Framework

MAC Security

MAC security allows the lock down of a port to a given MAC address and to limit 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 and builds an external trusted database of MAC/IP/port bindings providing the traffic's source from a specific address for immediate defense.

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 such as Sentriant NG300 for further analysis of suspicious traffic in the network. Using CLEAR-Flow with Sentriant NG300 provides cost-effective scalability of the security solution. Sentriant NG300 can add/modify the Summit X650 series switch's CLEAR-Flow rules and ACLs to inspect additional traffic or change inspection thresholds thereby allowing an automated system to fine tune inspection rules in real-time. (See Figure 6).

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 X650 supports 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 X650 supports up to 2,048 centralized ACLs per 12-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 X650 effectively handles Denial of Service (DoS) attacks. If the switch detects an unusually large number of packets in the CPU input queue, it assembles 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 and Comprehensive Network Management

As the network becomes a foundation of the enterprise application, network management becomes an important piece of the solution. Summit X650 supports comprehensive network management through Command Line Interface (CLI), SNMP v1, v2c, v3, and ExtremeXOS ScreenPlay™ embedded XML-based web user interface. With a variety of management options and consistency across other Extreme Networks modular and stackable switches, Summit X650 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.

Automated Attack Mitigation

1. An infected source enters the network.

2. Summit X650 series static ACLs and CLEAR-Flow* rules filter out DoS attacks, determine traffic class as 'suspicious'.

3. Selectively port-mirror traffic to Sentriant NG300 for further analysis.

4. Sentriant NG300 continues to watch suspicious traffic and uses its internal rules to escalate traffic-class from suspicious to high level alert.

5. Sentriant NG300 initiates a dynamic ACL on Summit X650 series. Summit X650 series applies the dynamic ACL in real-time and continues to port mirror suspicious traffic. Sentriant NG300 also sends the mitigation action to Extreme Networks EPICenter network management software.

6. EPICenter works with core and edge switches to enforce the security policy (mitigation action).

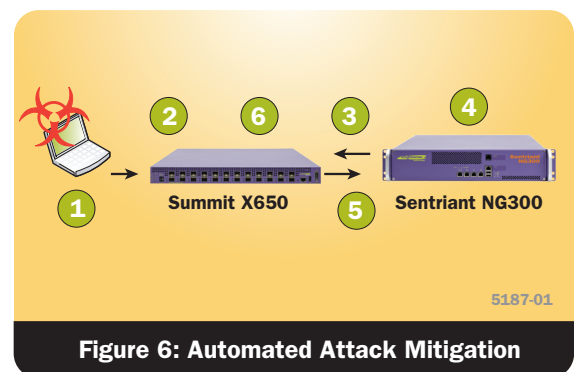*CLEAR-Flow is supported in non-SummitStack configuration only.

5187-01

Figure 6: Automated Attack Mitigation

Target Applications

Summit X650 offers a variety of applications with high-performance, low latency switching along with highly-scalable Layer 2 and Layer 3 switching.

Top of Rack Switch for Servers in the Enterprise Data Centers

In the enterprise data center, many servers and storage systems are packed in racks, with all systems needing high-speed connectivity. A Top of Rack architecture is one way to simplify the cabling infrastructure and minimize the space requirements in the enterprise data center. Summit X650 is optimized to support 10 gigabit connectivity for servers and other network attached devices. With its 1RU design, Summit X650 allows maximizing computing power per rack without taking space away from other network-attached computing devices.
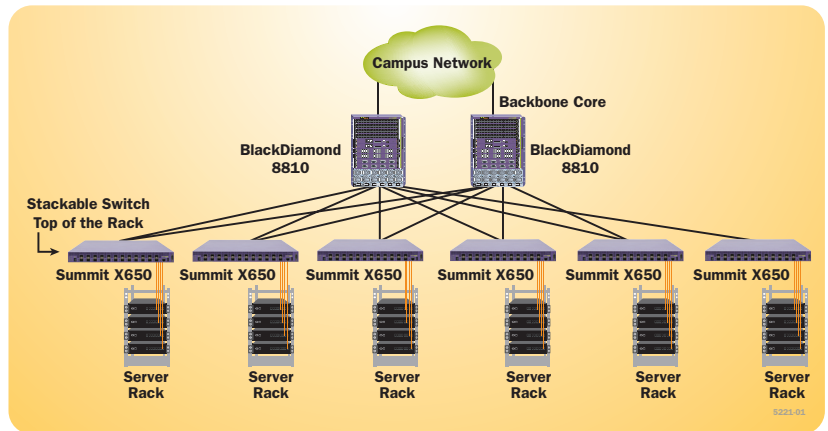

High-Performance 10 Gigabit Core Switch for a Small Network and Aggregation Switch in a Traditional Three-Tiered Network

Summit X650 offers enterprise-core class scalability for both Layer 2 and Layer 3 switching. You can support up to 12,000 IPv6 longest prefix matching routes, 6,000 IP ARP entries and 2,000 multicast groups. The Summit X650 switch can be used in the network aggregation layer in an enterprise network. With its versatile design, Summit X650 simplifies enterprise network deployment.
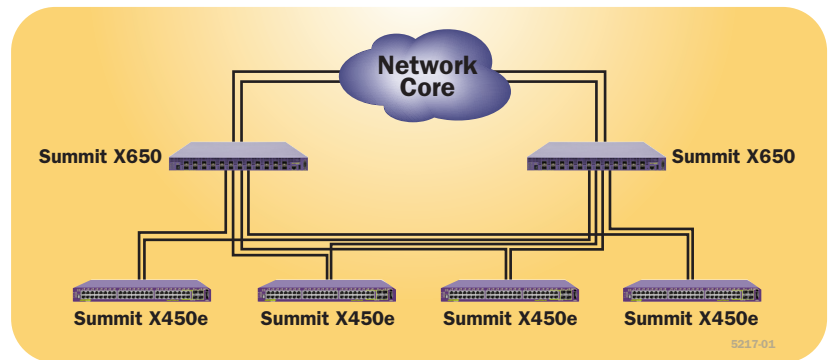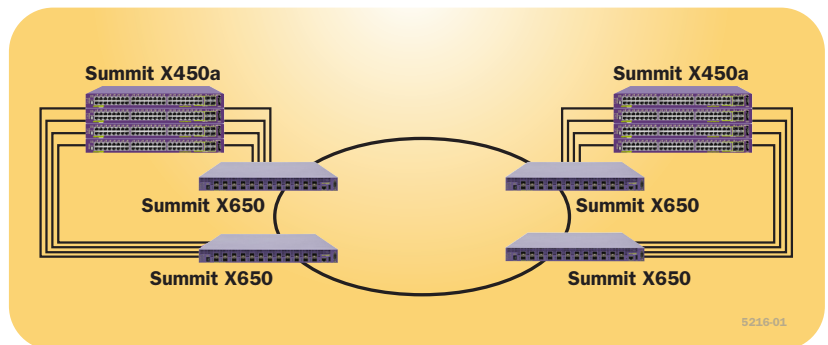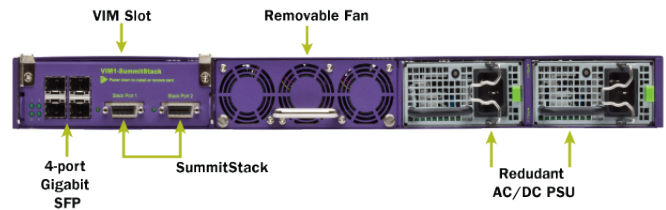

High-Performance Cluster Computing

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 X650 series switches address the need for high-performance and cost-effective connectivity required for HPCC using 10 Gigabit Ethernet as the interconnect technology.
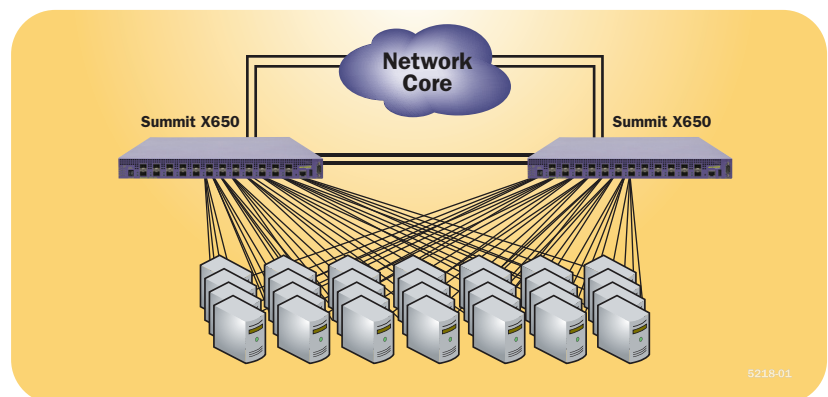
Accessories

Summit X650 Options: Summit X650 provides highly flexible modular hardware design, and offers customized configurations for your network requirements.

VIM Slot   Removable Fan

VIM-SummitStack

Stack Port 1   Stack Port 2

4-port Gigabit SFP   SummitStack   Redundant AC/DC PSU

Versatile Interface Modules

VIM1-SummitStack

Default option for Summit X650 switches. VIM1-SummitStack provides two SummitStack ports and four Gigabit Ethernet SFP ports. SummitStack ports are shared with the last two 10 Gigabit Ethernet ports in the front panel.

VIM1-10G8X

Option module for high-speed backbone connectivity. VIM1-10G8X provides eight ports of 10 Gigabit Ethernet SFP+ and SummitStack ports. With this option, SummitStack ports are dedicated and not shared with any other port in the switch.

VIM1-SummitStack256

Option module for high-speed stacking. VIM1-SummitStack256 provides SummitStack256 ports and four Gigabit Ethernet SFP ports. SummitStack256 provides up to 256 Gbps of stacking bandwidth for up to eight Summit X650 switches in a stack.

VIM1-SummitStack512

Option module for high-speed stacking. VIM1-SummitStack512 provides SummitStack512 ports. SummitStack512 provides up to 512 Gbps of stacking bandwidth for up to two Summit X650 switches in a stack and supports 48-port 10 Gigabit Ethernet non-blocking switching.

Power Supply and Fan Tray

Summit X650 AC PSU

The Summit X650 switch does not include a power supply. Summit X650 has two unpopulated power supply slots and can take up to two power supplies in a redundant configuration. A minimum of one power supply is required for operation.

Summit X650 Fan Tray

Summit X650 switch comes with one fan tray and is field replaceable. A fan tray can be ordered separately as a spare, and in case of fan failure, the fan tray can be replaced by the customer.

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 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)
- 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

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 – (Requires Layer 3 Edge License or above)

- 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 1354 IP Forwarding Table MIB
- RFC 1724 RIPv2 MIB

IPv4 Router Requirements – (Requires Advanced Edge License)

- 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-o1.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

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 (Requires Edge License or above)
- 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 or above)
- 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-11 Multi Topology (MT) Routing in IS-IS

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 X650
General Specifications
Performance
- 488 Gbps (with VIM1-SummitStack), 680 Gbps (with VIM1-10G8X) aggregated switch bandwidth
- 363 Mpps (with VIM1-SummitStack), 506 Mpps (with VIM1-10G8X) frame forwarding rate
- 9216 Byte maximum packet size (Jumbo Frame)
- 128 load sharing trunks, up to 8 members per trunk
- 4,094 VLANs (Port, Protocol, IEEE 802.1Q)
- 2,048 centralized ACL rules per 12-port block

Forwarding Tables
- Layer 2/MAC Addresses: 32K
- IPv4 Host Addresses: 6K
- IPv4 LPM Entries: 12K
- IPv6 Host Addresses: 3K
- IPv6 LPM Entries: 6K

QoS, Rate Limiting
- 2,048 ingress bandwidth meters/12-port block
- Ingress bandwidth policing/rate limiting per flow/ACL
- 8 QoS egress queues/port
- Egress bandwidth rate limiting per egress queue
- Rate Limiting Granularity: 64 Kbps

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

External Ports with VIM1-SummitStack
- 24-port 10GBASE-T (1G/10G dual speed[1]) RJ45, 4-port 1000BASE-X SFP, 2-port SummitStack[2] (Summit X650-24t)

- 24 port 10GBASE-X SFP+ (1G/10G dual speed[1]), 4-port 1000BASE-X SFP, 2-port SummitStack[2] (Summit X650-24x)
- 1-port RS-232c Serial (control port)
- 1 10/100/1000BASE-T out-of-band management port

External Ports with VIM1-10G8X
- 24-port 10GBASE-T (1G/10G dual speed[1]) RJ45, 8-port 10GBASE-X SFP+ (1G/10G dual speed), 2-port SummitStack (Summit X650-24t)
- 32-port 10GBASE-X SFP+ (1G/10G dual speed[1]), 2-port SummitStack (Summit X650-24x with VIM1-SummitStack)
- 1-port RS-232c Serial (control port)
- 1 10/100/1000BASE-T out-of-band management port

Option Slot
- Slot for Versatile Interface Module 1 (VIM1)

Physical Specifications
Dimensions
Summit X650
Height Inches/cm: 1.73 Inches/4.4 cm
Width Inches/cm: 17.4 Inches/44.1 cm
Depth Inches/cm: 26 Inches/65.5 cm
Weight Lbs/Kg: 24.1 lbs/10.9 kg (Summit X650-24t); 20.4 lbs/9.2 kg (Summit X650-24x)

VIM1-SummitStack
Height Inches/cm: 1.7 Inches/4.3 cm
Width Inches/cm: 5.2 Inches/13.2 cm
Depth Inches/cm: 9.9 Inches/25.2 cm
Weight Lbs/Kg: 1.46 lbs/0.66 kg

VIM1-10G8X
Height Inches/cm: 1.7 Inches/4.3 cm
Width Inches/cm: 5.2 Inches/13.2 cm
Depth Inches/cm: 9.9 Inches/25.2 cm
Weight Lbs/Kg: 2.0 lbs/0.91 kg

Summit X650 AC PSU
Height Inches/cm: 1.57 Inches/4.0 cm
Width Inches/cm: 3.2 Inches/8.1 cm
Depth Inches/cm: 12.6 Inches/32.0 cm
Weight Lbs/Kg: 3.0 lbs/1.4 kg

Summit X650 FAN module
Height Inches/cm: 1.65 Inches/4.2 cm
Width Inches/cm: 4.8 Inches/12.3 cm
Depth Inches/cm: 6.0 Inches/15.3 cm
Weight Lbs/Kg: 0.45 lbs/0.99 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/s2 (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: 60% to 95% RH, non-condensing

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[1] Excludes port #23 and port #24
[2] SummitStack ports on VIM1-SummitStack is shared with the last two 10 Gigabit Ethernet ports on front panel (port #23 and port #24)

Technical Specifications

- Packaged Shock (Half Sine): 180 m/s2 (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

Summit X650 AC PSU specification

- Voltage input range: 90 to 264 V
- Nominal input ratings: 100 to 240 V , 50/60Hz, 10 A
- Nominal input current @ full loads: 12 A @ 90 V (low-line) 5 A @ 230 V (high-line)
- Maximum in-rush current: 100 A
- Efficiency: 80% with 60% to 100% load

- Line frequency range: 47 to 63 Hz
- Power supply input socket: IEC 320 C14
- Power cord input plug: IEC 320 C13
- Output: 12 V , 70 A max, 840 Watts, 3.3 V , 6 A max, 19.8 Watts

Summit X650-24t with VIM1-SummitStack

- Nominal Input Ratings: 100 – 240V~, 50/60Hz, 8.0A
- Input Current: 7.4A @ 100V~ (lowline) 3.0A @ 240V~ (high-line)
- Heat Dissipation: 735W (2,508 BTU/h)
- Power Consumption: 735W (2,508 BTU/h)

Summit X650-24t with VIM1-10G8X

- Nominal Input Ratings: 100 – 240V~, 50/60Hz, 8.0A
- Input Current: 8.0A @ 115V~ (lowline) 3.3A @ 240V~ (high-line)

- Heat Dissipation: 797W (2,719 BTU/h)
- Power Consumption: 797W (2,719 BTU/h)

Summit X650-24x with VIM1-SummitStack

- Nominal Input Ratings: 100 – 240V~, 50/60Hz, 4.75A
- Input Current: 3.3A @ 100V~ (lowline) 1.3A @ 240V~ (high-line)
- Heat Dissipation: 329W (1,123 BTU/h)
- Power Consumption: 329W (1,123 BTU/h)

Summit X650-24x with VIM1-10G8X

- Nominal Input Ratings: 100 – 240V~, 50/60Hz, 4.75A
- Input Current: 4.1A @ 100V~ (lowline) 1.7A @ 240V~ (high-line)
- Heat Dissipation: 411W (1,402 BTU/h)
- Power Consumption: 411W (1,402 BTU/h)

All Summit X650 Series Switches
Regulatory/Safety

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)

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+All 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.A.)
- ICES-003 Class A (Canada)
- European EMC standards
- EN 55022:2006 Class A
- EN 55024:A2-2003 Class A includes IEC 61000-4-2, 3, 4, 5, 6, 11

- EN 61000-3-2,8-2006 (Harmonics)
- EN 61000-3-3 1995+A2:2005 (Flicker)
- ETSI EN 300 386 v1.4.1, 2008-04 (EMC Telecommunications)
- 2004/108/EC EMC Directive

International EMC Certifications

- CISPR 22: 2006 Ed 5.2, 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 61000-4-3:2006 Radiated Immunity 10V/m, Criteria A
- EC/EN 61000-4-4:2005 Transient Burst, 1 kV, Criteria A
- IEC/EN 61000-4-5:2005 Surge, 2 kV L-L, 2 kV L-G, Level 3, Criteria A
- IEC/EN 61000-4-6:2005 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)
- CNS 13438:1997 Class A (BSMI-Taiwan)
- MIC Mark

- KCC Mark EMC Approval (Korea)

Telecom Standards

- EN/ETSI 300 386:2001 (EMC Telecommunications)
- EN/ETSI 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
- 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

- 1-year on Hardware
- 90-days on Software

Ordering Information

Part Number	Name	Description
17001	Summit X650-24t	24 10GBASE-T, VIM slot populated with 1 VIM-SummitStack (2 SummitStack stacking ports and 4 100/1000BASE-X SFP ports), ExtremeXOS Advanced Edge License, unpopulated dual PSU power slot
17002	Summit X650-24x	24 10GBASE-X SFP+, VIM slot populated with 1 VIM1-SummitStack (2 SummitStack stacking ports and 4 100/1000BASE-X SFP ports), ExtremeXOS Advanced Edge License, unpopulated dual PSU power slot
17010	Summit X650 Series Core License	ExtremeXOS Core License, Summit X650 series
17012	VIM1-10G8X	VIM1-10G8X, 8 10GBASE-X SFP+ ports, 2 SummitStack stacking ports
17013	VIM1-SummitStack256[1]	VIM1-SummitStack256, 2 x 128G stacking ports and 4 100/1000BASE-X SFP ports
17014	VIM1-SummitStack512[1]	VIM1-SummitStack512, 4 x 128G stacking ports for 512 Gbps cross connecting two Summit X650 switches
10914	Summit X650 AC PSU	AC Power Supply module for Summit X650 series switches
10915	Summit X650 DC PSU[1]	DC Power Supply module for Summit X650 series switches
10916	Summit X650 Fan module	Fan Module for Summit X650 series switches, spare (included in 17001 or 17002)
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
10064	LX100 SFP	1000BASE-LX100 SFP, Extra Long Distance SMF 100 km/30dB Budget, LC connector
10065	10/100/1000BASE-T SFP	10/100/1000BASE-T, SFP, CAT 5 cable 100m, RJ-45 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)
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
16106	Stacking Cable, 20G, 0.5M	SummitStack/UniStack™ Stacking Cable, 0.5M
16107	Stacking Cable, 20G, 1.5M	SummitStack/UniStack Stacking Cable, 1.5M
16108	Stacking Cable, 20G, 3.0M	SummitStack/UniStack Stacking Cable, 3.0M
16105	Stacking Cable, 20G, 5.0M	SummitStack Stacking Cable, 5.0M (not supported for UniStack)
17021	Stacking Cable 128G, 0.5M[1]	SummitStack256/512 Stacking Cable, 0.5M
17022	Stacking Cable 128G, 1.5M[1]	SummitStack256/512 Stacking Cable, 1.0M
17023	Stacking Cable 128G, 3.0M[1]	SummitStack256/512 Stacking Cable, 3.0M

[1]Call for availability