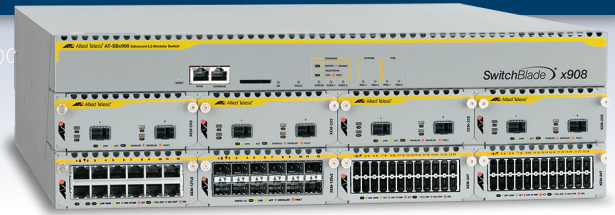


SwitchBlade[®] x908

Advanced Layer 3+ Modular Switch

The Allied Telesis SwitchBlade x908 modular switch is the ideal solution for the modern enterprise network core where reliability, resiliency and high performance are the key requirements.



Reliable

The SwitchBlade x908 was designed with reliability in mind. With dual power supplies, fan modules and a comprehensive range of expansion modules (XEMs) — all hot-swappable — the SwitchBlade x908 can be maintained and reconfigured when necessary without affecting network uptime.

The SwitchBlade x908 switch operates with one PSU, and installing a second PSU provides ultimate redundancy. Dual internal PSUs eliminate the need for an external Redundant Power Supply (RPS), thus saving valuable rack space. Built-in redundancy guarantees uninterrupted delivery of essential services.

The SwitchBlade x908 also features front-to-back cooling, making it ideal for data center applications.

Powerful network management

The Allied Telesis Management Framework (AMF) meets the increased management requirements of modern converged networks, automating many everyday tasks including configuration management. AMF has powerful centralized management features that manage a complete network as a single virtual device. The network can be expanded with plug-and-play simplicity, and network node recovery is fully zero-touch. AMF Guestnode allows third party devices, such as IP phones and security cameras, to be part of an AMF network.

Resilient

High availability features such as VCStack™ (Virtual Chassis Stacking) and EPSRing™ (Ethernet Protection Switched Rings) ensure traffic flow continues even during unscheduled outages.

VCStack provides excellent resiliency by creating a single “virtual chassis” from two SwitchBlade x908 physical devices, using dedicated high speed stacking links. VCStack provides a highly available system where network resources are spread out across stacked units, reducing the impact should one of the stacked units fail. Switch ports may be aggregated on different units, for excellent high availability. VCStack delivers a resilient solution at a fraction of the cost of a full chassis-based system, and the stack may be managed as a single network node, greatly simplifying management tasks.

High Performing

The SwitchBlade x908 features fully non-blocking switching on all ports, to facilitate low latency, wirespeed IPv4 and IPv6 Layer 2 switching and Layer 3 routing. This is ideal for high-end server deployments. When combined with a large Layer 3 route table, it is ideal for aggregating gigabit connections.

MEF Certified

The SwitchBlade x908 has been certified by the Metro Ethernet Forum (MEF) Certification program, which tests products for conformance to the strict requirements of Carrier Ethernet. Specifically, the SwitchBlade x908 is certified for compliance to MEF 9 and MEF 14 Ethernet Services tests.



New Features

- ▶ AMF Guestnode
- ▶ AMF Starter
- ▶ Active Fiber Monitoring
- ▶ Microsoft Network Load Balancing (MS NLB) support

VCStack™

AMF™

EPSRing™

ACTIVE
Fiber Monitoring™

Key Features

Allied Telesis Management Framework (AMF)

- ▶ Allied Telesis Management Framework (AMF) is a sophisticated suite of management tools that provide a simplified approach to network management. Common tasks are automated or made so simple that the every-day running of a network can be achieved without the need for highly-trained, and expensive, network engineers. Powerful features like centralized management, auto-backup, auto-upgrade, auto-provisioning and auto-recovery enable plug-and-play networking and zero-touch management.
- ▶ The SwitchBlade x908 switch can operate as the AMF network master, storing firmware and configuration backups for all other network nodes. The AMF master enables auto-provisioning and auto-upgrade by providing appropriate files to new network members.
- ▶ AMF Guestnode allows Allied Telesis wireless access points and further switching products, as well as third party devices such as IP phones and security cameras, to be part of an AMF network.

Virtual Routing and Forwarding (VRF Lite)

- ▶ VRF Lite provides Layer 3 network virtualization by dividing a single switch into multiple independent virtual routing domains. With independent routing domains, IP addresses can overlap without causing conflict, allowing multiple customers to have their own secure virtual network within the same physical infrastructure.

Scalable

- ▶ Allied Telesis high speed XEMs provide both copper and fiber connectivity, delivering the ultimate in flexibility.
XEM options are:
 - ▶ AT-XEM-2XP - 2 x 10GbE (XFP) ports
 - ▶ AT-XEM-2XS - 2 x 10GbE (SFP+) ports
 - ▶ AT-XEM-12Sv2 - 12 x 1000X SFP ports
 - ▶ AT-XEM-12Tv2 - 12 x 10/100/1000T (RJ-45) ports
 - ▶ AT-XEM-24T - 24 x 10/100/1000T (RJ Point 5) ports

All XEMs provide non-blocking performance. XEMs are ideal for aggregating Gigabit to the desktop, or for Gigabit uplinks from Fast Ethernet switches.

EPSRing™ (Ethernet Protection Switched Rings)

- ▶ EPSRing and 10GbE modules allow several switches to form protected rings with 50ms failover — perfect for high performance at the core of Enterprise or Provider Access networks.
- ▶ SuperLoop Protection enables a link between two EPSR nodes to be in separate EPSR domains, improving redundancy and network fault resiliency.

sFlow

- ▶ sFlow is an industry standard technology for monitoring high speed switched networks. It provides complete visibility into network use, enabling performance optimization, usage accounting/billing, and defence against security threats. Sampled packets sent to a collector ensure it always has a real-time view of network traffic.

Quality of Service (QoS)

- ▶ Comprehensive low-latency wire-speed QoS provides flow-based traffic management with full classification, prioritization, traffic shaping and min/max bandwidth profiles. Enjoy boosted network performance and guaranteed delivery of business-critical Ethernet services and applications. Time-critical services like voice and video applications take precedence over non-essential services like file downloads, maintaining responsiveness of Enterprise applications.

Dynamic Host Configuration Protocol (DHCPv6)

- ▶ DHCPv6 is used to dynamically assign IPv6 addresses to hosts from a central location. Acting as DHCPv6 client enables the switch to receive an IPv6 address, and acting as server enables the switch to dynamically allocate IPv6 addresses to hosts. The DHCPv6 server and client both support the Prefix Delegation feature which allocates a whole IPv6 subnet to a DHCP client. The client, in turn, can allocate addresses from this subnet to the hosts that are connected to it.

Microsoft Network Load Balancing (MS NLB) Support

- ▶ Support for MS NLB, which clusters identical servers together for increased performance through load-sharing.

Find Me

- ▶ In busy server rooms comprising of a large number of equipment racks, it can be quite a job finding the correct switch quickly among many similar units. The 'Find Me' feature is a simple visual way to quickly identify the desired physical switch for maintenance or other purposes, by causing its LEDs to flash in a specified pattern.

Optical DDM

- ▶ Most modern optical SFP/SFP+/XFP transceivers support Digital Diagnostics Monitoring (DDM) functions according to the specification SFF-8472. This enables real time monitoring of the various parameters of the transceiver, such as optical output power, temperature, laser bias current and transceiver supply voltage. Easy access to this information simplifies diagnosing problems with optical modules and fiber connections.

Active Fiber Monitoring

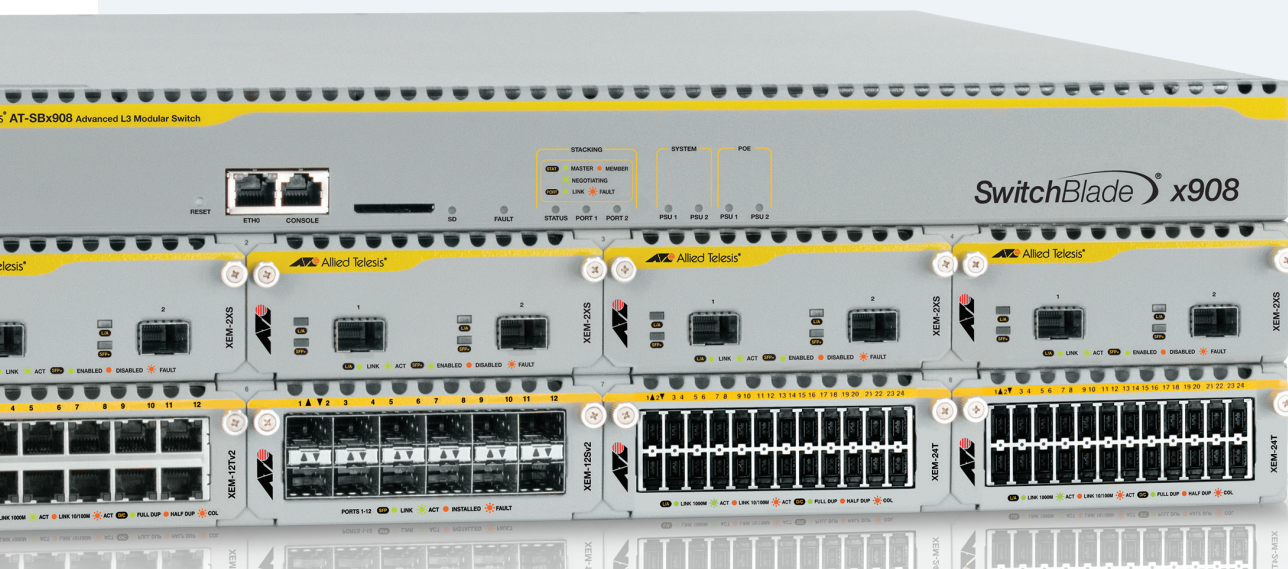
- ▶ Active Fiber Monitoring prevents eavesdropping on fiber communications by monitoring received optical power. If an intrusion is detected, the link can be automatically shut down, or an operator alert can be sent.

Extended Mode

- ▶ Users can now configure the SwitchBlade x908 to use larger hardware table sizes and more ACLs, QoS traffic classes and Link Aggregation Groups (LAGs). These increases make the SwitchBlade x908 more suitable for applications in the core or distribution layers of larger networks.
- ▶ Refer to the table on page 6 for details.

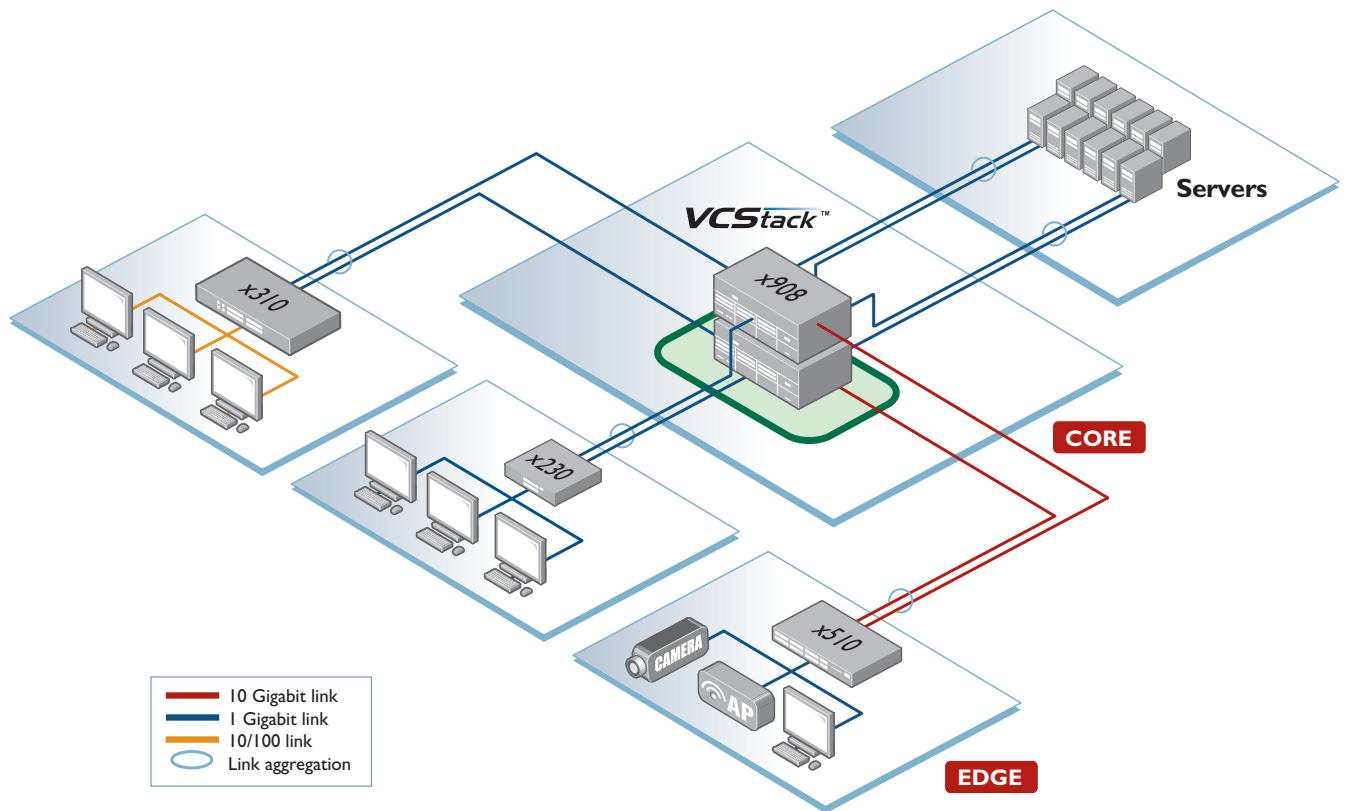
Energy Efficient Ethernet

- ▶ The SwitchBlade x908 supports Energy Efficient Ethernet on the XEM-12Tv2, which automatically reduces the power consumed by the switch whenever there is no traffic on a port. This sophisticated feature can significantly lower operating costs by reducing the power requirements of the switch and any associated cooling equipment.



Key Solutions

VCStack (Virtual Chassis Stacking)

**VCStack: Resiliency and Stability**

Today's enterprises rely on Information Technology resources and applications to access business-critical information, and for day-to-day work. A high-availability infrastructure is of paramount importance, starting with a resilient network core. VCStack on the SwitchBlade x908 provides the ideal solution — without the expense of a full chassis. With the benefits of high availability, increased capacity and ease of management, VCStack makes networking reliable and simple.

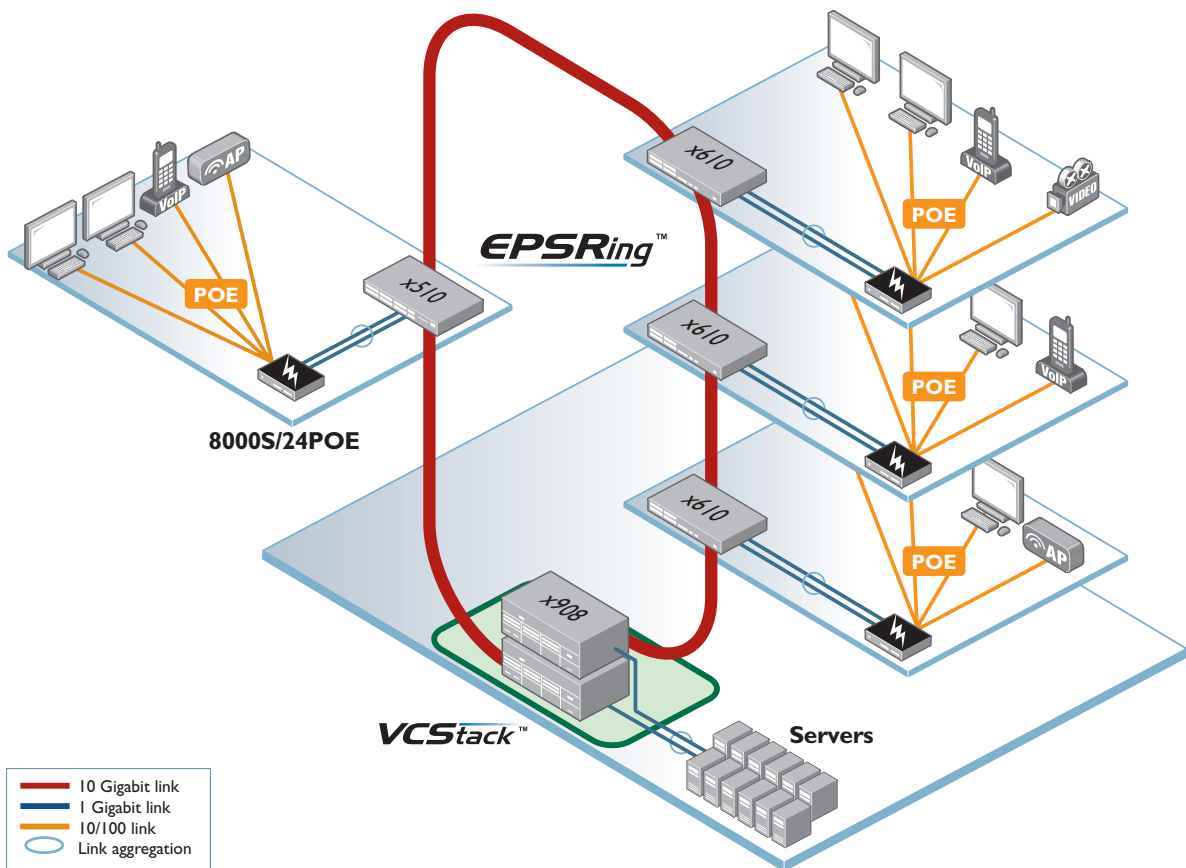
Using VCStack at the core of the network allows multiple switches to appear as a single virtual chassis. In normal operation, this virtual chassis acts as a single switch, simplifying management.

The diagram above shows link aggregation between the core VCStack and the edge switches. With link aggregation across ports on different virtual chassis members, there is no perceptible disruption in the case of a link failure, and the full bandwidth of the network remains available. Fast failover ensures absolutely minimal network downtime in the event of a problem.

VCStack and link aggregation provide a solution where network resources are spread across the virtual chassis members, ensuring device and path resiliency. Virtualization of the network core ensures uninterrupted access to information when needed.

Key Solutions

EPSR (Ethernet Protection Switched Ring)

**EPSR: Resiliency and Fault Tolerance**

The increasing convergence of services and applications in the enterprise has led to increasing demand for highly available networks with minimal downtime. High bandwidth is also required for the multiple applications simultaneously using the network. Real-time applications like surveillance, video streaming and Voice over IP (VoIP) are used alongside data and Internet access.

When a high-performing, resilient Enterprise core network is required, using EPSRing with the SwitchBlade x908 provides the ideal solution. EPSR creates a high speed resilient ring that can utilize today's maximum Ethernet standard of 10Gbps, and provide extremely fast failover between nodes. EPSR enables rings to recover within as little as 50ms, preventing a node or link failure from affecting customer experience, even with demanding applications such as IP telephony and video monitoring.

The diagram above shows a corporate network based on a central EPSR ring. The inclusion of Allied Telesis VCStack (Virtual Chassis Stacking) technology at the core of the network adds a further layer of resiliency, increasing the availability of critical resources.

Now that technology has made high-availability and high-bandwidth so accessible, corporate business, education providers and other enterprise network users can enjoy the many benefits that EPSRing provides. By ensuring always-available online applications and resources, this advanced self-healing network technology meets the constant demand for information at your fingertips.

Specifications

Performance

- ▶ 357Mpps forwarding rate
- ▶ Extensive wirespeed traffic classification for ACLs and QoS
- ▶ Supports 10KB Jumbo frame size for data center and server aggregation applications
- ▶ Wirespeed multicasting
- ▶ 640Gbps Switching Fabric
- ▶ Up to 16K MAC addresses (64K in Extended Mode)
- ▶ Up to 4K Layer 2 multicast entries
- ▶ Up to 1K Layer 3 IPv4 multicast entries
- ▶ 4K VLANs
- ▶ 512MB DDR SDRAM
- ▶ Separate packet buffer memory
- ▶ 64MB Flash Memory

Reliability

- ▶ Modular AlliedWare Plus operating system
- ▶ Dual hot swappable PSUs with 1 + 1 redundancy
- ▶ Dual feed support: a separate power circuit can feed each power supply providing extra reliability
- ▶ Hot-swappable XEMs
- ▶ Hot-swappable fan modules
- ▶ Full environmental monitoring of PSUs, fans, temperature and internal voltages, with SNMP traps to alert network managers in case of any failure

Expandability

- ▶ 8 high speed 60Gbps expansion bays
- ▶ 2 x 80Gbps stacking connectors on the rear of the chassis, to create a single VCStack from 2 physical units
- ▶ Versatile licensing options for additional features

Power Characteristics

- ▶ AC Voltage: 100 to 240V (+/-10% auto ranging)
- ▶ Frequency: 47 to 63Hz
- ▶ DC Voltage: 36 to 72V

Flexibility and Compatibility

- ▶ Eight expansion bays supporting a choice of modules, for port flexibility and application versatility
- ▶ XEM modules compatible with AT-x900-24X and AT-x900-12XT/S
- ▶ SFP ports will support any combination of 1000T, 100FX, 100BX, 1000SX, 1000LX, 1000ZX or 1000ZX CWDM SFPs (XEM-12Sv2 does not support 100X)

Diagnostic Tools

- ▶ Active Fiber Monitoring detects tampering on optical links
- ▶ Built-In Self Test (BIST)
- ▶ Cable fault locator (TDR)
- ▶ UniDirectional Link Detection (UDLD)
- ▶ Find-me device locator
- ▶ Hardware health monitoring
- ▶ Automatic link flap detection and port shutdown
- ▶ Optical Digital Diagnostic Monitoring (DDM)
- ▶ Ping polling for IPv4 and IPv6
- ▶ Port mirroring
- ▶ TraceRoute for IPv4 and IPv6

IPv4 Standards

- ▶ Black hole routing
- ▶ Directed broadcast forwarding
- ▶ DNS relay
- ▶ Equal Cost Multi Path (ECMP) routing
- ▶ Policy-based routing
- ▶ Route maps & Route redistribution (OSPF, BGP, RIP)
- ▶ Static unicast and multicast routes for IPv4
- ▶ UDP broadcast helper (IP helper)
- ▶ Up to 64 Virtual Routing and Forwarding (VRF lite) domains (with license)

IPv6 Standards

- ▶ DHCPv6 client and relay
- ▶ DNSv6 client and relay
- ▶ IPv4 and IPv6 dual stack
- ▶ IPv6 aware storm protection and QoS
- ▶ IPv6 hardware ACLs
- ▶ Device management over IPv6 networks with SNMPv6, Telnetv6 and SSHv6
- ▶ NTPv6 client and server
- ▶ Static unicast and multicast routes for IPv6
- ▶ Log to IPv6 hosts with Syslog v6

Management

- ▶ Allied Telesis Management Framework (AMF) enables powerful centralized management and zero-touch device installation and recovery
- ▶ Try AMF for free with the built-in AMF Starter license
- ▶ Console management port on the front panel for ease of access
- ▶ Eco-friendly mode allows ports and LEDs to be disabled to save power
- ▶ Web-based Graphical User Interface (GUI)
- ▶ Industry-standard CLI with context-sensitive help
- ▶ Out-of-band 10/100/1000T Ethernet management port
- ▶ SD/SDHC memory card socket allows software release files, configurations and other files to be stored for backup and distribution to other devices
- ▶ Built in text editor with powerful CLI scripting engine
- ▶ Configurable logs and triggers provide an audit trail of SD card insertion and removal
- ▶ Comprehensive SNMP MIB support for standards-based device management
- ▶ Event-based triggers allow user-defined scripts to be executed upon selected system events

Quality of Service (QoS)

- ▶ 8 priority queues with a hierarchy of high priority queues for real time traffic, and mixed scheduling, for each switch port
- ▶ Limit bandwidth per port or per traffic class down to 64kbps
- ▶ Wirespeed traffic classification with low latency essential for VoIP and real-time streaming media applications
- ▶ IPv6 QoS support
- ▶ Policy-based QoS based on VLAN, port, MAC and general packet classifiers
- ▶ Policy-based storm protection
- ▶ Extensive remarking capabilities
- ▶ Taildrop for queue congestion control

- ▶ Strict priority, weighted round robin or mixed scheduling
- ▶ IP precedence and DiffServ marking based on layer 2, 3 and 4 headers

Resiliency

- ▶ Control Plane Prioritization (CPP) ensures the CPU always has sufficient bandwidth to process network control traffic
- ▶ Dynamic link failover (host attach)
- ▶ EPSRing (Ethernet Protection Switched Rings) with SuperLoop Protection (SLP) and enhanced recovery for extra resiliency
- ▶ Loop protection: loop detection and thrash limiting
- ▶ PVST+ compatibility mode
- ▶ STP root guard
- ▶ VCStack fast failover minimizes network disruption

Security

- ▶ Access Control Lists (ACLs) based on layer 3 and 4 headers
- ▶ Configurable ACLs for management traffic
- ▶ Auth-fail and guest VLANs
- ▶ Authentication, Authorisation and Accounting (AAA)
- ▶ Bootloader can be password protected for device security
- ▶ BPDU protection
- ▶ DHCP snooping, IP source guard and Dynamic ARP Inspection (DAI)
- ▶ Dynamic VLAN assignment
- ▶ MAC address filtering and MAC address lock-down
- ▶ Network Access and Control (NAC) features manage endpoint security
- ▶ Port-based learn limits (intrusion detection)
- ▶ Private VLANs provide security and port isolation for multiple customers using the same VLAN
- ▶ Secure Copy (SCP)
- ▶ Strong password security and encryption
- ▶ Tri-authentication: MAC-based, web-based and IEEE 802.1x
- ▶ RADIUS group selection per VLAN or port

Environmental Specifications

- ▶ Operating temperature range: 0°C to 40°C (32°F to 104°F)
Derated by 1°C per 305 meters (1,000 ft)
- ▶ Storage temperature range: -30°C to 70°C (-13°F to 158°F)
- ▶ Operating relative humidity range: 5% to 85% non-condensing
- ▶ Storage relative humidity range: 5% to 95% non-condensing
- ▶ Operating altitude: 3,050 meters maximum (10,000 ft)

Electrical Approvals and Compliances

- ▶ EMC: EN55022 class A, FCC class A, VCCI class A
- ▶ Immunity: EN55024, EN61000-3-levels 2 (Harmonics), and 3 (Flicker)

Safety

- ▶ Standards: UL60950-1, CAN/CSA-C22.2 No. 60950-1-03, EN60950-1, EN60825-1, AS/NZS 60950
- ▶ Certification: UL, cUL, TUV

Physical Specifications

PRODUCT	WIDTH	DEPTH	HEIGHT	MOUNTING	WEIGHT	
					UNPACKAGED	PACKAGED
SwitchBlade x908	440 mm (17.32 in)	456 mm (17.95 in)	132 mm (5.19 in)	3 RU	14.32 kg (31.57 lb)	16.7 kg (36.81 lb)
AT-PWR05	84 mm (3.30 in)	299 mm (11.77 in)	40 mm (1.57 in)	N/A	1.32 kg (2.91 lb)	1.9 kg (4.18 lb)
AT-XEM-12Sv2*	109 mm (4.29 in)	253 mm (9.96 in)	45 mm (1.77 in)	N/A	0.82 kg (1.80 lb)	1.4 kg (3.08 lb)
AT-XEM-12Tv2*	109 mm (4.29 in)	253 mm (9.96 in)	45 mm (1.77 in)	N/A	0.82 kg (1.80 lb)	1.4 kg (3.08 lb)
AT-XEM-24T**	109 mm (4.29 in)	253 mm (9.96 in)	45 mm (1.77 in)	N/A	0.82 kg (1.80 lb)	1.4 kg (3.08 lb)
AT-XEM-2XP	109 mm (4.29 in)	253 mm (9.96 in)	45 mm (1.77 in)	N/A	0.82 kg (1.80 lb)	1.4 kg (3.08 lb)
AT-XEM-2XS	109 mm (4.29 in)	253 mm (9.96 in)	45 mm (1.77 in)	N/A	0.82 kg (1.80 lb)	1.4 kg (3.08 lb)

Chassis with 2 x PSU's and 8 x XEMs is 25.2 kg * Require AlliedWare Plus software release 5.4.2 - 2.5 or later ** Require AlliedWare Plus software release 5.4.3 - 2.5 or later

Power Characteristics

PRODUCT	FULLY LOADED (ONE AC PSU)		FULLY LOADED (TWO LOAD-SHARING AC PSUs)	
	MAX POWER CONSUMPTION	MAX HEAT DISSIPATION	MAX POWER CONSUMPTION	MAX HEAT DISSIPATION
SwitchBlade x908	675W	2305 BTU/hr	700W	2390 BTU/hr

Latency (microseconds)

PRODUCT	PORT SPEED			
	10 MBPS	100 MBPS	1 GBPS	10 GBPS
AT-XEM-12Sv2			3.2µs	
AT-XEM-12Tv2	32.6µs	6.3µs	3.7µs	
AT-XEM-24T	32.7µs	6.4µs	3.7µs	
AT-XEM-2XS				4.8µs
AT-XEM-2XP				3.8µs

Restrictions on Hazardous Substances (RoHS) Compliance

- ▶ EU RoHS compliant
- ▶ China RoHS compliant

Country of Origin

- ▶ Singapore

Extended Mode

Extended Mode takes advantage of larger table sizes and increased limits, and can be enabled via the CLI when compatible XEMs are installed:

	STANDARD MODE	EXTENDED MODE
MAC entries	16K	64K
NextHop entries	2.5K	8K
QoS Traffic Classes	713	4,096
LAGs	31	128
ACLs	1,024	4,096
Compatible XEMs	All	XEM-24T XEM-12Sv2 XEM-12Tv2 XEM-2XP XEM-2XS

Standards and Protocols

AlliedWare Plus Operating System

Version 5.4.6-1

Border Gateway Protocol (BGP)

- BGP dynamic capability
- BGP outbound route filtering
- RFC 1772 Application of the Border Gateway Protocol (BGP) in the Internet
- RFC 1997 BGP communities attribute
- RFC 2385 Protection of BGP sessions via the TCP MD5 signature option
- RFC 2439 BGP route flap damping
- RFC 2545 Use of BGP-4 multiprotocol extensions for IPv6 inter-domain routing
- RFC 2858 Multiprotocol extensions for BGP-4
- RFC 2918 Route refresh capability for BGP-4
- RFC 3392 Capabilities advertisement with BGP-4
- RFC 3882 Configuring BGP to block Denial-of-Service (DoS) attacks
- RFC 4271 Border Gateway Protocol 4 (BGP-4)
- RFC 4360 BGP extended communities
- RFC 4456 BGP route reflection - an alternative to full mesh iBGP
- RFC 4724 BGP graceful restart
- RFC 4893 BGP support for four-octet AS number space
- RFC 5065 Autonomous system confederations for BGP

Cryptographic Algorithms

FIPS Approved Algorithms

- Encryption (Block Ciphers):
 - ▶ AES (ECB, CBC, CFB and OFB Modes)
 - ▶ 3DES (ECB, CBC, CFB and OFB Modes)
- Block Cipher Modes:
 - ▶ CCM
 - ▶ CMAC
 - ▶ GCM
 - ▶ XTS
- Digital Signatures & Asymmetric Key Generation:
 - ▶ DSA
 - ▶ ECDSA
 - ▶ RSA
- Secure Hashing:
 - ▶ SHA-1
 - ▶ SHA-2 (SHA-224, SHA-256, SHA-384, SHA-512)

Message Authentication:

- ▶ HMAC (SHA-1, SHA-2(224, 256, 384, 512))

Random Number Generation:

- ▶ DRBG (Hash, HMAC and Counter)

Non FIPS Approved Algorithms

- RNG (AES128/192/256)
- DES
- MD5

Ethernet Standards

- IEEE 802.1AX Link aggregation (static and LACP)
- IEEE 802.2 Logical Link Control (LLC)
- IEEE 802.3 Ethernet
- IEEE 802.3ab 1000BASE-T
- IEEE 802.3ad Static and dynamic link aggregation
- IEEE 802.3ae 10 Gigabit Ethernet
- IEEE 802.3an 10GBASE-T
- IEEE 802.3az Energy Efficient Ethernet (EEE)
- IEEE 802.3u 100BASE-X
- IEEE 802.3x Flow control - full-duplex operation
- IEEE 802.3z 1000BASE-X

IPv4 Standards

- RFC 768 User Datagram Protocol (UDP)
- RFC 791 Internet Protocol (IP)
- RFC 792 Internet Control Message Protocol (ICMP)
- RFC 793 Transmission Control Protocol (TCP)
- RFC 826 Address Resolution Protocol (ARP)
- RFC 894 Standard for the transmission of IP datagrams over Ethernet networks
- RFC 919 Broadcasting Internet datagrams
- RFC 922 Broadcasting Internet datagrams in the presence of subnets
- RFC 932 Subnetwork addressing scheme
- RFC 950 Internet standard subnetting procedure
- RFC 951 Bootstrap Protocol (BootP)
- RFC 1027 Proxy ARP
- RFC 1035 DNS client
- RFC 1042 Standard for the transmission of IP datagrams over IEEE 802 networks
- RFC 1071 Computing the Internet checksum
- RFC 1122 Internet host requirements
- RFC 1191 Path MTU discovery
- RFC 1256 ICMP router discovery messages
- RFC 1518 An architecture for IP address allocation with CIDR

RFC 1519 Classless Inter-Domain Routing (CIDR)
 RFC 1542 Clarifications and extensions for BootP
 RFC 1591 Domain Name System (DNS)
 RFC 1812 Requirements for IPv4 routers
 RFC 1918 IP addressing
 RFC 2581 TCP congestion control

IPv6 Standards

RFC 1981 Path MTU discovery for IPv6
 RFC 2460 IPv6 specification
 RFC 2464 Transmission of IPv6 packets over Ethernet networks
 RFC 3056 Connection of IPv6 domains via IPv4 clouds
 RFC 3484 Default address selection for IPv6
 RFC 3596 DNS extensions to support IPv6
 RFC 4007 IPv6 scoped address architecture
 RFC 4193 Unique local IPv6 unicast addresses
 RFC 4291 IPv6 addressing architecture
 RFC 4443 Internet Control Message Protocol (ICMPv6)
 RFC 4861 Neighbor discovery for IPv6
 RFC 4862 IPv6 Stateless Address Auto-Configuration (SLAAC)
 RFC 5014 IPv6 socket API for source address selection
 RFC 5095 Deprecation of type 0 routing headers in IPv6
 RFC 5175 IPv6 Router Advertisement (RA) flags option
 RFC 6105 IPv6 Router Advertisement (RA) guard

Management

AMF MIB and SNMP traps
 AT Enterprise MIB
 Optical DDM MIB
 SNMPv1, v2c and v3
 IEEE 802.1AB Link Layer Discovery Protocol (LLDP)
 RFC 1155 Structure and identification of management information for TCP/IP-based Internets
 RFC 1157 Simple Network Management Protocol (SNMP)
 RFC 1212 Concise MIB definitions
 RFC 1213 MIB for network management of TCP/IP-based Internets: MIB-II
 RFC 1215 Convention for defining traps for use with the SNMP
 RFC 1227 SNMP MUX protocol and MIB
 RFC 1239 Standard MIB
 RFC 1724 RIPv2 MIB extension
 RFC 2096 IP forwarding table MIB
 RFC 2578 Structure of Management Information v2 (SMIv2)
 RFC 2579 Textual conventions for SMIv2
 RFC 2580 Conformance statements for SMIv2
 RFC 2674 Definitions of managed objects for bridges with traffic classes, multicast filtering and VLAN extensions
 RFC 2741 Agent extensibility (AgentX) protocol
 RFC 2787 Definitions of managed objects for VRRP
 RFC 2819 RMON MIB (groups 1,2,3 and 9)
 RFC 2863 Interfaces group MIB
 RFC 3164 Syslog protocol
 RFC 3176 sFlow: a method for monitoring traffic in switched and routed networks
 RFC 3411 An architecture for describing SNMP management frameworks
 RFC 3412 Message processing and dispatching for the SNMP
 RFC 3413 SNMP applications
 RFC 3414 User-based Security Model (USM) for SNMPv3
 RFC 3415 View-based Access Control Model (VACM) for SNMP
 RFC 3416 Version 2 of the protocol operations for the SNMP
 RFC 3417 Transport mappings for the SNMP
 RFC 3418 MIB for SNMP
 RFC 3635 Definitions of managed objects for the Ethernet-like interface types
 RFC 3636 IEEE 802.3 MAU MIB
 RFC 4022 SNMPv2 MIB for TCP using SMIv2
 RFC 4113 SNMPv2 MIB for UDP using SMIv2
 RFC 4293 SNMPv2 MIB for IP using SMIv2
 RFC 4188 Definitions of managed objects for bridges

RFC 4318 Definitions of managed objects for bridges with RSTP
 RFC 4560 Definitions of managed objects for remote ping, traceroute and lookup operations
 RFC 6527 Definitions of managed objects for VRRPv3

Multicast Support

Bootstrap Router (BSR) mechanism for PIM-SM
 IGMP query solicitation
 IGMP snooping (IGMPv1, v2 and v3)
 IGMP snooping fast-leave
 IGMP/MLD multicast forwarding (IGMP/MLD proxy)
 MLD snooping (MLDv1 and v2)
 PIM-SM and SSM for IPv6
 RFC 1112 Host extensions for IP multicasting (IGMPv1)
 RFC 2236 Internet Group Management Protocol v2 (IGMPv2)
 RFC 2710 Multicast Listener Discovery (MLD) for IPv6
 RFC 2715 Interoperability rules for multicast routing protocols
 RFC 3306 Unicast-prefix-based IPv6 multicast addresses
 RFC 3376 IGMPv3
 RFC 3810 Multicast Listener Discovery v2 (MLDv2) for IPv6
 RFC 3956 Embedding the Rendezvous Point (RP) address in an IPv6 multicast address
 RFC 3973 PIM Dense Mode (DM)
 RFC 4541 IGMP and MLD snooping switches
 RFC 4601 Protocol Independent Multicast - Sparse Mode (PIM-SM): protocol specification (revised)
 RFC 4604 Using IGMPv3 and MLDv2 for source-specific multicast
 RFC 4607 Source-specific multicast for IP

Open Shortest Path First (OSPF)

OSPF link-local signaling
 OSPF MD5 authentication
 Out-of-band LSDB resync
 RFC 1245 OSPF protocol analysis
 RFC 1246 Experience with the OSPF protocol
 RFC 1370 Applicability statement for OSPF
 RFC 1765 OSPF database overflow
 RFC 2328 OSPFv2
 RFC 2370 OSPF opaque LSA option
 RFC 2740 OSPFv3 for IPv6
 RFC 3101 OSPF Not-So-Stubby Area (NSSA) option
 RFC 3509 Alternative implementations of OSPF area border routers
 RFC 3623 Graceful OSPF restart
 RFC 3630 Traffic engineering extensions to OSPF
 RFC 4552 Authentication/confidentiality for OSPFv3
 RFC 5329 Traffic engineering extensions to OSPFv3

Quality of Service (QoS)

IEEE 802.1p Priority tagging
 RFC 2211 Specification of the controlled-load network element service ng for IPv6
 RFC 2081 RIPng protocol applicability statement
 RFC 2082 RIP-2 MD5 authentication
 RFC 2453 RIPv2

Security

SSH remote login
 SSLv2 and SSLv3
 TACACS+ accounting and authentication
 IEEE 802.1X authentication protocols (TLS, TTLS, PEAP and MD5)
 IEEE 802.1X multi-suplicant authentication
 IEEE 802.1X port-based network access control
 RFC 2818 HTTP over TLS ("HTTPS")
 RFC 2865 RADIUS
 RFC 2866 RADIUS accounting
 RFC 2868 RADIUS attributes for tunnel protocol support
 RFC 3280 Internet X.509 PKI Certificate and Certificate Revocation List (CRL) profile
 RFC 3546 Transport Layer Security (TLS) extensions

RFC 3579 RADIUS support for Extensible Authentication Protocol (EAP)
 RFC 3580 IEEE 802.1x RADIUS usage guidelines
 RFC 3748 PPP Extensible Authentication Protocol (EAP)
 RFC 4251 Secure Shell (SSHv2) protocol architecture
 RFC 4252 Secure Shell (SSHv2) authentication protocol
 RFC 4253 Secure Shell (SSHv2) transport layer protocol
 RFC 4254 Secure Shell (SSHv2) connection protocol
 RFC 5246 TLS v1.2

Services

RFC 854 Telnet protocol specification
 RFC 855 Telnet option specifications
 RFC 857 Telnet echo option
 RFC 858 Telnet suppress go ahead option
 RFC 1091 Telnet terminal-type option
 RFC 1350 Trivial File Transfer Protocol (TFTP)
 RFC 1985 SMTP service extension
 RFC 2049 MIME
 RFC 2131 DHCPv4 (server, relay and client)
 RFC 2132 DHCP options and BootP vendor extensions
 RFC 2616 Hypertext Transfer Protocol - HTTP/1.1
 RFC 2821 Simple Mail Transfer Protocol (SMTP)
 RFC 2822 Internet message format
 RFC 3046 DHCP relay agent information option (DHCP option 82)
 RFC 3315 DHCPv6 (server, relay and client)
 RFC 3633 IPv6 prefix options for DHCPv6
 RFC 3646 DNS configuration options for DHCPv6
 RFC 3993 Subscriber-ID suboption for DHCP relay agent option
 RFC 4330 Simple Network Time Protocol (SNTP) version 4
 RFC 5905 Network Time Protocol (NTP) version 4

VLAN Support

Generic VLAN Registration Protocol (GVRP)
 IEEE 802.1ad Provider bridges (VLAN stacking, Q-in-Q)
 IEEE 802.1Q Virtual LAN (VLAN) bridges
 IEEE 802.1v VLAN classification by protocol and port
 IEEE 802.3ac VLAN tagging

Voice over IP (VoIP)

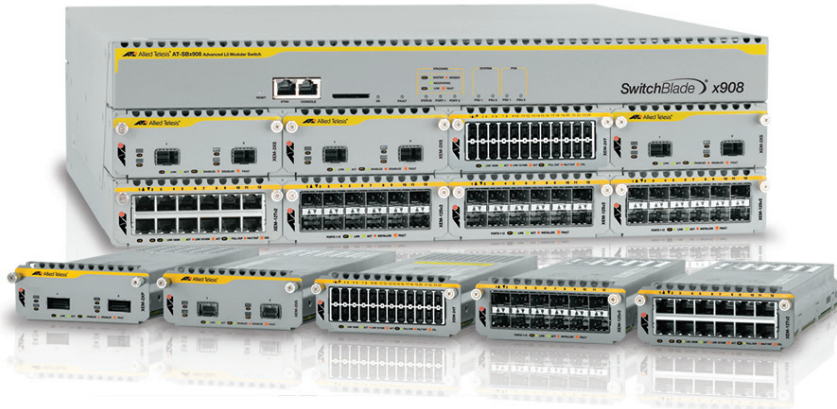
LLDP-MED ANSI/TIA-1057
 Voice VLAN

Feature Licenses

NAME	DESCRIPTION	INCLUDES	STACK LICENSING
AT-FL-SBX9-01	SwitchBlade x908 Advanced Layer 3 license	<ul style="list-style-type: none"> ▶ OSPF1 (10,000 routes) ▶ PIM-v4-SM, DM & SSM ▶ VLAN double tagging (Q-in-Q) ▶ BGP4 (5,000 routes) ▶ VRF Lite (64 domains) ▶ UDLD 	One license per stack member
AT-FL-SBX9-02	SwitchBlade x908 IPv6 Pack	<ul style="list-style-type: none"> ▶ RIPng (1,000 routes) ▶ MLDv1 & v2 ▶ PIMv6-SM and SSM ▶ BGP4+ for IPv6 (5,000 routes) ▶ OSPFv3 (8,000 routes) 	One license per stack member
AT-FL-RADIUS-FULL	Increase local RADIUS server support limits ²	<ul style="list-style-type: none"> ▶ 5000 users ▶ 1000 NAS 	One license per stack member
AT-FL-SBX9-AM40-1YR	AMF Master License	▶ AMF Master 40 nodes for 1 year	One license per stack
AT-FL-SBX9-AM40-5YR	AMF Master License	▶ AMF Master 40 nodes for 5 years	One license per stack

¹ 64 OSPF routes included in base software

² 100 users and 24 NAS can be stored in local RADIUS database with base software



Ordering Information

SwitchBlade x908

Advanced Layer 3 modular switch chassis
8 x high speed expansion bays

AT-PWR05-xx

Hot-swappable load-sharing power supply

AT-FAN03³

Spare fan module

AT-XEM-2XP

2 x 10GbE (XFP) ports

AT-XEM-2XS

2 x 10GbE (SFP+) ports

AT-XEM-24T

24 x 10/100/1000T (RJ Point 5) ports

AT-XEM-12Sv2

12 x 1000X SFP ports

AT-XEM-12Tv2

12 x 10/100/1000T (RJ-45) ports

AT-HS-STK-CBL650

650mm high speed stacking cable

Where xx = 10 for AC power supply with US power cord
20 for AC power supply with no power cord
30 for AC power supply with UK power cord
40 for AC power supply with AU power cord
50 for AC power supply with EU power cord
80 for DC power supply

Note that NO power supplies ship with the base chassis product, they must be ordered separately.

Accessories

SFP Modules

AT-SPFX/2

100FX multi-mode 1310 nm fiber up to 2 km

AT-SPFX/15

100FX multi-mode 1310 nm fiber up to 15 km

SwitchBlade x908 | Advanced Layer 3+ Modular Switch

AT-SPFXBD-LC-13

100BX Bi-Di (1310 nm Tx, 1550 nm Rx) fiber to 15 km

AT-SPFXBD-LC-15

100BX Bi-Di (1550 nm Tx, 1310 nm Rx) fiber to 15 km

AT-SPTX

1000T 100m copper

AT-SPSX

1000SX GbE multi-mode 850 nm fiber up to 550 m

AT-SPSX/1

1000SX GbE multi-mode 850 nm fiber up to 550 m industrial temperature

AT-SPEX

1000X GbE multi-mode 1310nm fiber up to 2 km

AT-SPLX10

1000LX GbE single-mode 1310 nm fiber up to 10 km

AT-SPLX10/1

1000LX GbE single-mode 1310 nm fiber up to 10 km industrial temperature

AT-SPBD10-13

1000LX GbE Bi-Di (1310 nm Tx, 1490 nm Rx) fiber up to 10 km

AT-SPBD10-14

1000LX GbE Bi-Di (1490 nm Tx, 1310 nm Rx) fiber up to 10 km

AT-SPLX40

1000LX GbE single-mode 1310 nm fiber up to 40 km

AT-SPZX80

1000ZX GbE single-mode 1550 nm fiber up to 80 km

10GbE XFP Modules

For use with XEM-1XP and XEM-2XP

AT-XPSR

10GbE-SR 850 nm short-haul, 300 m with MMF

AT-XPLR

10GbE-LR 1310 nm medium-haul, 10 km with SMF

AT-XPER40

10GbE-ER 1550 nm long-haul, 40 km with SMF

10GbE SFP+ Modules For use with XEM-2XS

AT-SP10SR

10GSR 850 nm short-haul, 300 m with MMF

AT-SP10SR/1

10GSR 850 nm short-haul, 300 m with MMF industrial temperature

AT-SP10LRM

10GLRM 1310 nm short-haul, 220 m with MMF

AT-SP10LR

10GLR 1310 nm medium-haul, 10 km with SMF

AT-SP10LR/1

10GLR 1310 nm medium-haul, 10 km with SMF industrial temperature

AT-SP10LR20/1

10GER 1310nm long-haul, 20 km with SMF industrial temperature

AT-SP10ER40/1

10GER 1310nm long-haul, 40 km with SMF industrial temperature

AT-SP10ZR80/1

10GER 1550nm long-haul, 80 km with SMF industrial temperature

10GbE SFP+ Cables for use with XEM-2XS

AT-SP10TW1

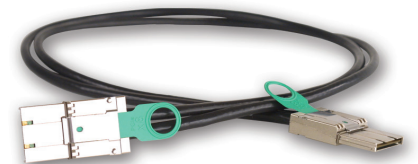
1 meter SFP+ direct attach cable

AT-SP10TW3

3 meter SFP+ direct attach cable

AT-SP10TW7

7 meter SFP+ direct attach cable



RJ.5 to RJ45 Cables For use with XEM-24T

AT-UTP/RJ.5-100-A-008

RJ.5 to RJ45 1 m Ethernet cables (pack of 8)

AT-UTP/RJ.5-300-A-008

RJ.5 to RJ45 3 m Ethernet cables (pack of 8)

³ For spares only. Fan modules are included with chassis.

