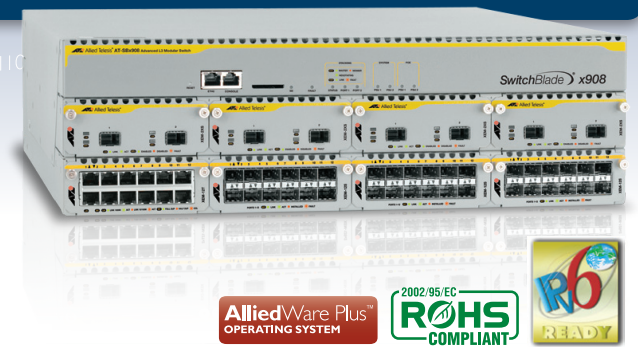
Allied Telesis

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.

AlliedWare Plus OPERATING SYSTEM

2002/95/EC ROHS COMPLIANT

R6 READY

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.

Resilient

VCStack™

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.

EPSRing™

EPSRing™ (Ethernet Protection Switched Ring) and 10 Gigabit Ethernet allow several switches to form a high speed protected ring, capable of recovery within as little as 50ms. This feature is perfect for network designs that demand high performance and high availability.

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.

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.

MEF Certified

CARRIER ETHERNET MEF Certified Compliant

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

- Energy Efficient Ethernet
- Find me
- DHCPv6
- PIM-SMv6
- VRRPv3
- MLDv2
- OSPFv3 Authentication

Key Features

Easy to Manage

» Allied Telesis SwitchBlade x908 Layer 3+ switches run the AlliedWare Plus™ advanced Layer 3 fully featured operating system, delivering a rich feature set and an industry-standard CLI. In addition to the CLI, SwitchBlade x908 switches feature a comprehensive GUI for easy access to monitoring and configuration.

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-1XP - 1 x 10GbE (XFP) port
- » AT-XEM-2XP - 2 x 10GbE (XFP) ports
- » AT-XEM-2XS - 2 x 10GbE (SFP+) ports
- » AT-XEM-2XT - 2 x 10GbE (RJ-45) ports
- » AT-XEM-12S - 12 x 100/1000X SFP ports
- » AT-XEM-12T - 12 x 10/100/1000T (RJ-45) ports
- » AT-XEM-12Sv2 - 12 x 1000X SFP ports
- » AT-XEM-12Tv2 - 12 x 10/100/1000T (RJ-45) 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 the SwitchBlade x908, with a number of x900 Series or iMAPs, to form a protected ring 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.

Network Access Control (NAC)

» NAC allows for unprecedented control over user access to the network, in order to mitigate threats to network infrastructure. The SwitchBlade x908 supports NAC by using 802.1x port-based authentication in partnership with standards-compliant dynamic VLAN assignment, to assess a user's adherence to the network's security policies and then either grant authentication or offer remediation.

» Allied Telesis NAC also supports alternatives to 802.1x port-based authentication, such as web authentication to enable guest access, and MAC authentication for end points without an 802.1x supplicant. Furthermore, if multiple users share a port, multi-authentication can be used and a Guest VLAN (also known as Default VLAN) can be configured to provide a catch-all for users without an 802.1x supplicant.

» Additional security features include a full RADIUS client and server implementation for remote and local user authentication, Private VLANs to provide port isolation when multiple customer use the same VLAN, and STP Root Guard to protect against an unauthorized device becoming the STP Root Bridge.

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.

Virtual Router Redundancy Protocol (VRRPv3)

» VRRPv3 is a protocol for providing device redundancy, by connecting redundant WAN gateway routers or server access switches in an IPv6 network. It allows a backup router or switch to automatically take over if the primary (master) router or switch fails.

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.

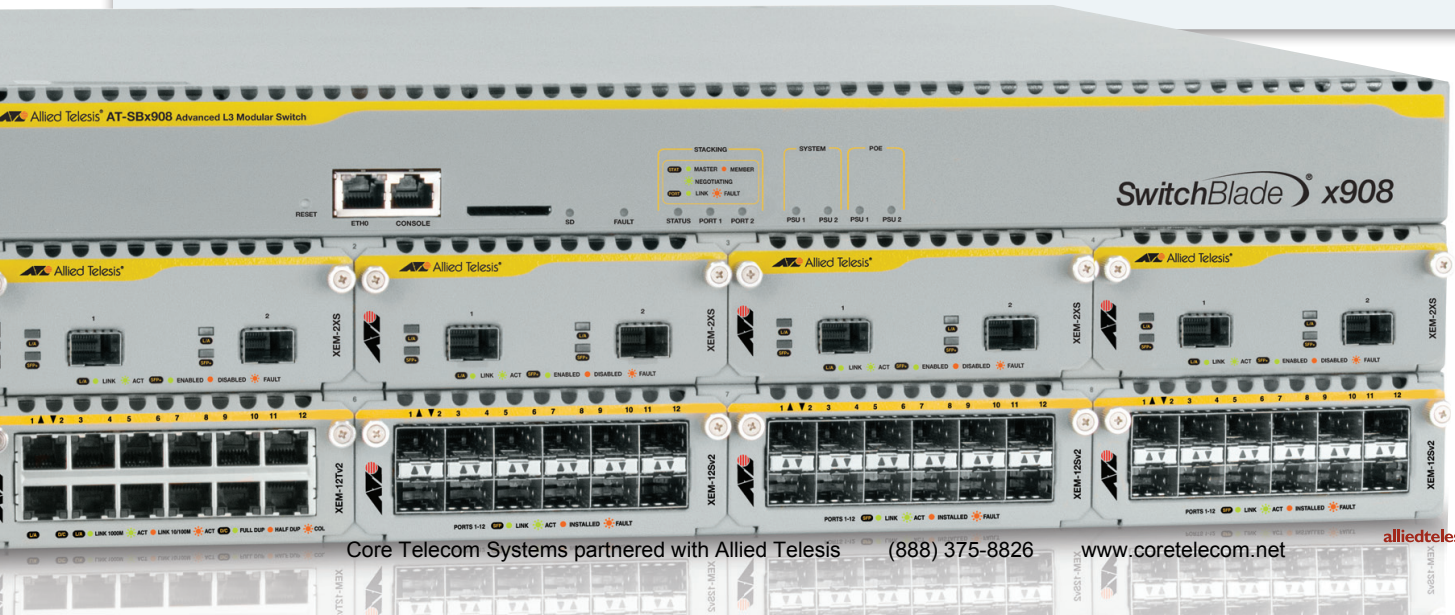
Extended Mode

» 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 5 for details.

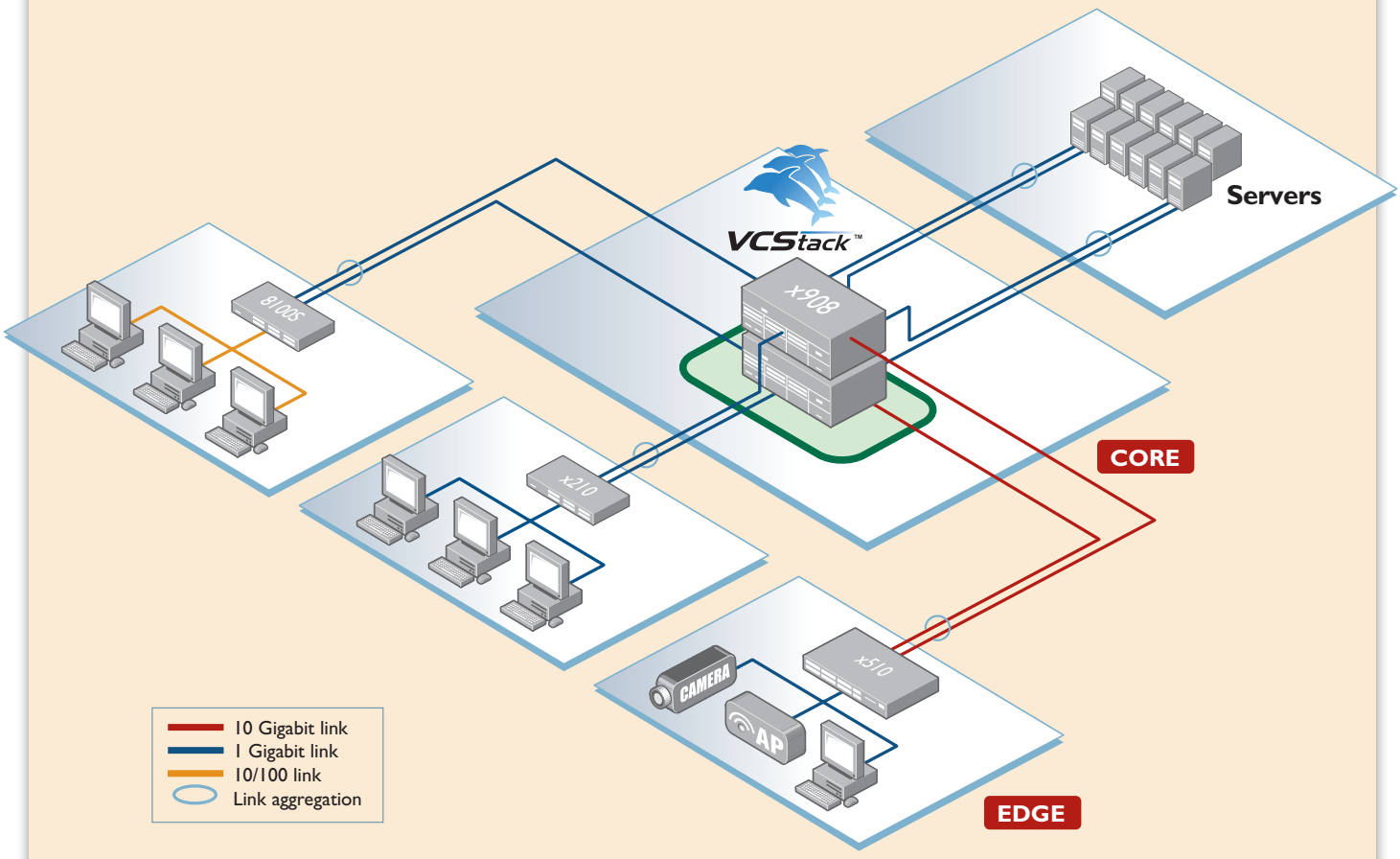
Energy Efficient Ethernet

» 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 Solution

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.

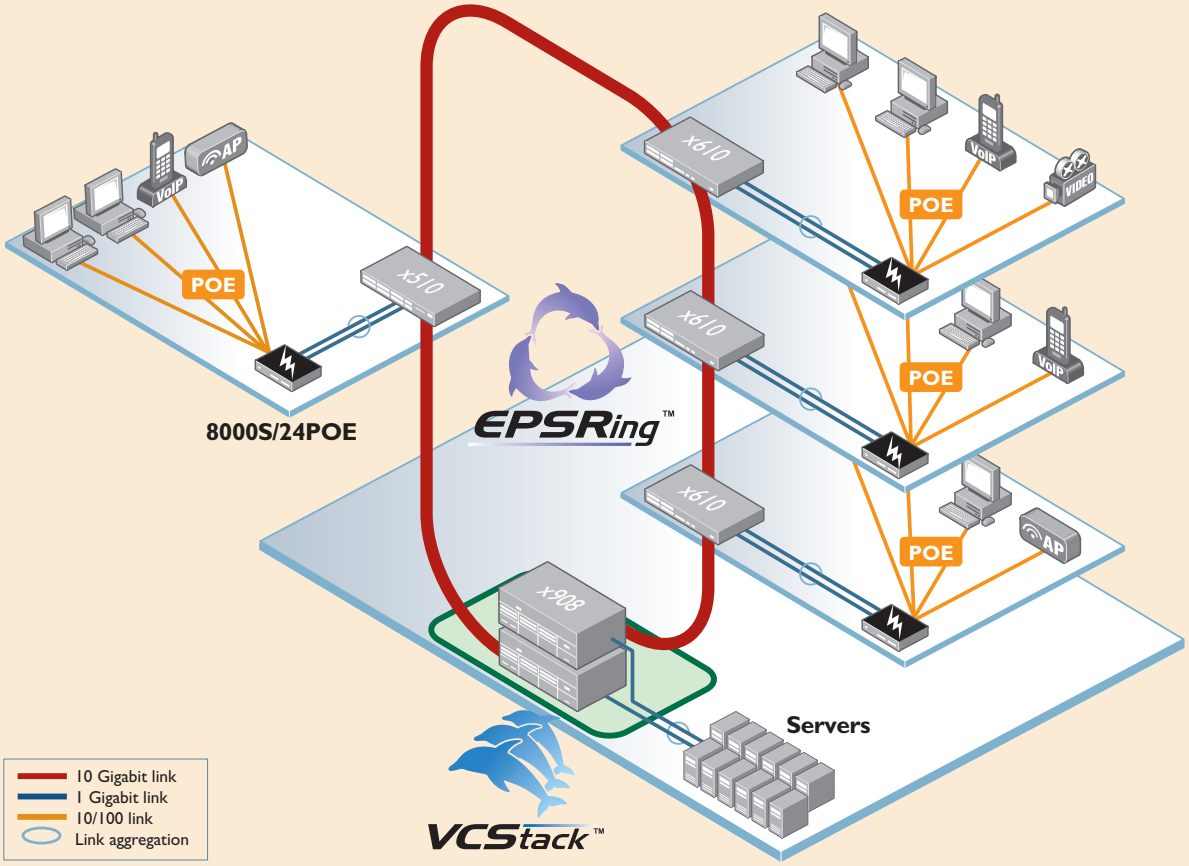
Using VCStack at the core of the network allows multiple switches to appear as a single virtual chassis. In normal operation, this virtual chassis acts as a single switch, simplifying management.

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 Solution

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 256K IPv4 routes
» 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
» IPv6 routing license option
» Advanced Layer 3 license option

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, including 1 x 10GbE, 2 x 10GbE, 12 x 1GbE (SFP), 12 x 1GbE (RJ45) 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

Diagnostic Tools

» Built-In Self Test (BIST)
» Find Me device locator
» Optical Digital Diagnostic Monitoring (SFF-8472)
» Ping Polling
» Port Mirroring
» Trace Route

General Routing

» Black Hole Routing
» Directed Broadcast Forwarding
» DNS Relay
» Equal Cost Multi Path (ECMP) routing
» Policy-based Routing
» Route Maps
» Route Redistribution (OSPF, BGP, RIP)
» UDP Broadcast Helper (IP Helper)
» Up to 64 Virtual Routing and Forwarding (VRF) Lite domains (with license)

IPv6 Features

» 6 to 4 Tunneling
» DHCPv6 Relay
» DNSv6
» IPv4 and IPv6 Dual Stack
» IPv6 Management via SNMP, Ping, TraceRoute, Telnet and SSH
» NTPv6

Management

» 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
» Powerful CLI scripting engine
» Configurable logs and triggers provide an audit trail of SD card insertion and removal
» Secure Copy (SCP)
» Comprehensive SNMP MIB support for standards-based device management
» Built-in text editor
» Event-based triggers allow user-defined scripts to be executed upon selected system events

Quality of Service

» Limit bandwidth per port or per traffic class down to 64Kbps
» Wire-speed traffic classification with low latency essential for VoIP and real-time streaming media applications
» Policy-based QoS based on VLAN, Port, MAC and general packet classifiers
» Policy-based Storm Protection
» Extensive remarking capabilities
» Strict priority scheduling, weighted round robin or mixed
» RED and WRED curves for drop precedence

Resiliency Features

» Control Plane Prioritization ensures the CPU always has sufficient bandwidth to process network control traffic
» Dynamic Link Failover
» EPSRing (Ethernet Protection Switched Rings) with SuperLoop Protection (SLP)
» Loop Protection: Loop Detection and Thrash Limiting
» PVST+ compatibility-mode
» STP Root Guard
» VCStack Fast Failover minimizes network disruption

Security Features

» Access Control Lists (ACLs)
» BPDU Protection
» DHCP Snooping, IP Source Guard and Dynamic ARP Inspection
» Dynamic VLAN Assignment
» Configurable Guest and Auth-Fail VLANs
» Tri-Authentication: MAC-based, Web-based and IEEE 802.1x
» MAC address filtering and MAC address lock-down
» Port-based Learn Limits (Intrusion Detection)
» Private VLANs provide security and port isolation for multiple customers using the same VLAN
» Strong password security and encryption

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

Restrictions on Hazardous Substances (RoHS) Compliance

» EU RoHS compliant
» China RoHS compliant

Country of Origin

» Singapore

Extended Mode

The SwitchBlade x908 can operate in "Extended Mode" to take advantage of larger table sizes and increased limits. Extended Mode 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-12Sv2 XEM-12Tv2 XEM-2XP XEM-2XS XEM-2XT

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-12T	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-12S	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-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-STK	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-1XP	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)
AT-XEM-2XT	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

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	83.8µs	11.4µs	4.2µs	
AT-XEM-12Tv2			3.7µs	
AT-XEM-2XT				5.5µs
AT-XEM-2XS				4.9µs
AT-XEM-2XP				3.9µs

Standards and Protocols

AlliedWare Plus Operating System
Version 5.4.3

Authentication
RFC 1321 MD5 Message-Digest Algorithm
RFC 1828 IP Authentication using Keyed MD5

Border Gateway Protocol (BGP)
BGP Dynamic Capability
BGP Outbound Route Filtering
RFC 1772 Application of the Border Gateway Protocol 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 2858 Multiprotocol Extensions for BGP-4
RFC 2918 Route Refresh Capability for BGP-4
RFC 3392 Capabilities Advertisement with BGP-4
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

Encryption
FIPS 180-1 Secure Hash Standard (SHA-1)
FIPS 186 Digital Signature Standard (RSA)
FIPS 46-3 Data Encryption Standard (DES & 3DES)

Ethernet
IEEE 802.1AX Link Aggregation (static and LACP)
IEEE 802.2 Logical Link Control
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
IEEE 802.3u 100BASE-X
IEEE 802.3x Flow Control - Full Duplex Operation
IEEE 802.3z 1000BASE-X

General Routing
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 & Extensions for the Bootstrap Protocol
RFC 1591 Domain Name System (DNS)
RFC 1812 Requirements for IPv4 Routers
RFC 1918 IP Addressing
RFC 2581 TCP Congestion Control

IPv6 Features
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 Autoconfiguration
RFC 5014 IPv6 Socket API for Source Address Selection
RFC 5095 Deprecation of Type 0 Routing Headers in IPv6
RFC 5175 IPv6 Router Advertisement Flags Option
RFC 6105 IPv6 Router Advertisement Guard

Management

AT Enterprise 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 1493 Bridge MIB
RFC 1724 RIPv2 MIB Extension
RFC 2011 SNMPv2 MIB for IP using SMIv2
RFC 2012 SNMPv2 MIB for TCP using SMIv2
RFC 2013 SNMPv2 MIB for UDP using SMIv2
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 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
IGMP/MLD Multicast Forwarding (IGMP/MLD Proxy)
MLD Snooping (v1 & v2)
PIM for IPv6
RFC 1112 Host extensions for IP multicasting
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 3376 IGMPv3
RFC 3810 Multicast Listener Discovery v2 (MLDv2) for IPv6
RFC 3973 PIM Dense Mode
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
OSPF Restart Signaling
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

IEEE 802.1p Priority Tagging
RFC 2211 Specification of the Controlled-Load Network Element Service
RFC 2474 DiffServ Precedence for 8 queues/port
RFC 2475 DiffServ Architecture
RFC 2597 DiffServ Assured Forwarding (AF)
RFC 2697 A Single-Rate Three-Color Marker
RFC 2698 A Two-Rate Three-Color Marker
RFC 3246 DiffServ Expedited Forwarding (EF)

Resiliency Features

IEEE 802.1D Rapid Spanning Tree Protocol (RSTP)
IEEE 802.1D MAC Bridges
IEEE 802.1Q Multiple Spanning Tree Protocol (MSTP)
RFC 5798 Virtual Router Redundancy Protocol version 3 (VRRPv3) for IPv4 and IPv6

Routing Information Protocol (RIP)

RFC 1058 Routing Information Protocol (RIP)
RFC 2080 RIPng for IPv6
RFC 2081 RIPng Protocol Applicability Statement
RFC 2082 RIP-2 MD5 Authentication
RFC 2453 RIPv2

Security Features

SSH Remote Login
SSLv2 and SSLv3
TACACS+ Authentication and Accounting
IEEE 802.1X Authentication protocols (TLS, TTLS, PEAP & MD5)
IEEE 802.1X Multi-Supplicant Authentication
IEEE 802.1X Port Based Network Access Control
RFC 2246 TLS Protocol v1.0
RFC 2865 RADIUS
RFC 2866 RADIUS Accounting
RFC 2868 RADIUS Attributes for Tunnel Protocol Support
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

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 2554 SMTP Service Extension for Authentication
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 & port
IEEE 802.3ac VLAN tagging

Voice over IP (VoIP)

LLDP-MED ANSI/TIA-1057
Voice VLAN

Ordering Information

Feature Licenses

NAME	DESCRIPTION	INCLUDES
AT-FL-SBX9-01	SwitchBlade x908 Advanced Layer 3 license	» OSPF[1] » BGP4 » PIM-v4-SM, DM & SSM » VLAN double tagging (Q-in-Q) » VRF Lite
AT-FL-SBX9-02	SwitchBlade x908 IPv6 Pack	» RIPng » MLDv1 & v2 » PIMv6-SM » OSPFv3
AT-FL-RADIUS-FULL	Increase local RADIUS server support limits[2]	» 5000 users » 1000 NAS

[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 AC load-sharing power supply

AT-PWR05-80
Hot-swappable DC load-sharing power supply

AT-FAN03[3]
Spare fan module

AT-XEM-1XP
1 x 10GbE (XFP) port

AT-XEM-2XP
2 x 10GbE (XFP) ports

AT-XEM-2XS
2 x 10GbE (SFP+) ports

AT-XEM-2XT
2 x 10GbE (RJ-45) ports

AT-XEM-12S
12 x 100/1000X SFP ports

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

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

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

AT-SP10LR
10GbE-LR 1310 nm medium-haul, 10 km with SMF

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

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

Where xx = 10 for US power cord
20 for no power cord
30 for UK power cord
40 for Australian power cord
50 for European power cord

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

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