

SwitchBlade x908 Generation 2

High Capacity Stackable Layer 3+ Modular Switch



The Allied Telesis SBx908 GEN2 is the ideal solution for the modern enterprise network core. This stackable modular switch also has the capacity to support Smart City and IoT networks.

The high-capacity 2.6 Terabit fabric eliminates bottlenecks, effortlessly streams video and ensures all traffic in large networks is delivered reliably. Flexible hot-swappable expansion modules (XEMs) support multi-speed (1/2.5/5/10G), 10 Gigabit, 40 Gigabit, and 100 Gigabit to easily expand the SBx908 GEN2 to meet network traffic demands, both now and well into the future.

Smart City and IoT networks

The SBx908 GEN2 has large switching and routing tables to support Smart City networks and the Internet of Things (IoT). It meets the increasing demand for the convergence of multiple services, like video surveillance, public Wi-Fi, information kiosks, environmental sensors and more.

Network automation

Allied Telesis Management Framework™ Plus (AMF Plus) meets the increasing management requirements of modern converged networks, by automating many everyday tasks. AMF Plus has powerful features that allow an entire network to be easily managed as a single virtual device.

Vista Manager™ EX is an intuitive graphical tool for monitoring and managing AMF Plus wired and Autonomous Wave Control (AWC) wireless devices. Full visibility and powerful features enable proactive management of large networks.

Device and network management

The Device GUI on the SBx908 GEN2 enables graphical monitoring of key switch features to support easy management.

Integrated into the Device GUI, the wireless controller supports visibility and management of AMF Plus wired and AWC wireless network devices, making it ideal as a one-stop solution for small to medium-sized networks. AWC is an intelligent, easy to use Wireless LAN controller that automatically maintains optimal wireless coverage. The wireless controller includes AWC floor and heat maps showing wireless coverage. It also supports AWC Channel Blanket hybrid operation, providing maximum performance and seamless roaming, as well as AWC Smart Connect for simplified deployment, and a resilient Wi-Fi network solution using wireless uplink connectivity.

Resilient

The convergence of network services in the enterprise has led to increasing demand for highly available networks with minimal downtime.

Allied Telesis Virtual Chassis Stacking (VCStack™), in conjunction with link aggregation, provides a network with no single point of failure and a resilient solution for high-availability applications. The SBx908 GEN2 can form a VCStack of up to four units, at any port speed, for enhanced resiliency and simplified device management. Stacks can also be created over long distance fiber links, making it the perfect choice for distributed environments too.

Allied Telesis Ethernet Protection Switched Ring (EPSRing™), and the standards-based G.8032 Ethernet Ring Protection, ensure that distributed network segments have high-speed, resilient access to online resources and applications.

Reliable

Designed with reliability in mind, the SBx908 GEN2 guarantees the continual delivery of essential services. Hot-swappable components such as XEMs, fans, and load-sharing Power Supply Units (PSUs) pair with near hitless online stack reconfiguration, to ensure that maintenance doesn't affect network uptime.

Key Features

- 2.6 Terabit fabric
- 10G, 40G, 100G XEMs
- Multi-speed (1/2.5/5/10G) XEMs
- Allied Telesis Autonomous Management Framework™ Plus (AMF Plus)
- AMF Security compatible
- Active Fiber Monitoring of fiber data and stacking links
- OpenFlow v1.3 for SDN
- Large switching and routing tables
- VCStack™ up to 4 units, locally or over distance
- EPSRing™ and G.8032 ERPS for resilient rings
- EPSR Master
- Media Redundancy Protocol (MRP)
- Media Access Control Security (MACSec)
- Multicast Source Discovery Protocol (MSDP)
- Link Monitoring
- Bidirectional Forwarding Detection (BFD)
- Upstream Forwarding Only (UFO)
- VXLAN static tunnels
- The wireless controller enables:
 - Wired and wireless network visibility
 - AWC wireless network management
 - AWC-Channel Blanket hybrid wireless
 - AWC-Smart Connect wireless uplinks
- FIPS 140-2 certified
- Precision Time Protocol (PTP) Transparent Mode
- NETCONF/RESTCONF with YANG data modelling

KEY FEATURES

VCStack™

Create a VCStack of up to four units at any port speed. Stacking links are connected in a ring so each device has dual connections for resiliency. VCStack provides a highly available system where network resources are spread out across stacked units, reducing the impact if one of the units fails. Aggregating switch ports on different units across the stack provides excellent network resiliency.

VCStack LD

Long-distance stacking allows a VCStack to be created over fiber links to span longer distances, perfect for a distributed network environment.

Wireless controller

Integrated into the Device GUI, the wireless controller provides full network visibility of AMF Plus wired and AWC wireless devices. Manage and simplify wireless deployment with AWC-Smart Connect, and support optimal wireless performance from AWC hybrid operation with maximum throughput and a seamless Wi-Fi user experience.

Allied Telesis Autonomous Management Framework™ Plus (AMF Plus)

AMF Plus is a sophisticated suite of management tools that provide a simplified approach to network management. Powerful features like centralized management, auto-backup, auto-upgrade, auto-provisioning and auto-recovery enable plug-and-play networking and zero-touch management.

The SBx908 GEN2 operating as the AMF Plus master stores firmware and configuration backups for all other network nodes. This enables auto-provisioning and auto-upgrade by providing appropriate files to new network members.

The SBx908 GEN2 provides a single-pane-of-glass interface to the entire network. Administrators can view the topology map using the intuitive Device GUI.

An AMF Plus license (from AW+ version 5.5.2-2 onwards) provides all standard AMF network management and automation features, and also enables the AMF Plus intent-based networking features in Vista Manager EX (from version 3.10.1 onwards).

AWC Wireless Management

Optimize wireless network performance with the Autonomous Wave Controller (AWC), built-in to the SBx908 GEN2. AWC analyzes wireless traffic patterns and automatically reconfigures access points to meet demand.

Wireless network operation in multi-channel, single-channel (Channel Blanket), and hybrid (multi-channel and Channel Blanket) modes, supports maximum data throughput and seamless roaming for the most flexible wireless solution available.

AWC-Smart Connect (AWC-SC) enables plug-and-play wireless network growth, as new APs only need a power connection, and will then automatically create resilient wireless uplink connections to other APs.

AMF-Security and Application Proxy

The AMF-Security (AMF-Sec) solution enables internal LAN threat detection and automatic end-point isolation to protect the network. The AMF Application Proxy (included for free in the base license) enables the AMF-Sec controller to communicate with the AMF Plus master when a threat is detected, so the AMF Plus master can take

action to block the threat at source by quarantining the infected end-point.

Large Network Tables

High-capacity 2.6 Terabit fabric and 1,905Mpps packet forwarding provide powerful data transfer capability, supporting large campus networks as well as Smart City and IoT solutions. Large MAC and IP host tables are ready for the increasing number of connected devices found in modern enterprise and city-wide networks.

Multi-speed Ports

Copper ports on the XEM2-12XTm and XEM2-8XSTm expansion modules support 2.5 and 5 Gigabit connectivity to enable high-speed wireless, or maximum downlink speed using legacy Cat5E/6 cabling.

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. VRF-Lite supports IPv4 and IPv6 unicast and multicast traffic.

The built-in DHCP Server on the SBx908 GEN2 is VRF aware, enabling the supply of IP addresses to clients across multiple isolated networks.

EPSRing™

EPSRing allows several switches to form protected rings with 50ms failover—perfect for high performance at the core of Enterprise or Provider Access networks. The SBx908 GEN2 can act as the EPSR Master.

SuperLoop Protection enables a link between two EPSR nodes to be in separate EPSR domains, improving redundancy and network fault resiliency.

G.8032 Ethernet Ring Protection

G.8032 provides standards-based high-speed ring protection, that can be deployed stand-alone, or interoperate with Allied Telesis EPSR.

Ethernet Connectivity Fault Monitoring (CFM) proactively monitors links and VLANs, and provides alerts when a fault is detected.

Media Recovery Protocol (MRP)

MRP enables high-availability automation networks, and is specified for rings with up to 50 devices, where it guarantees fully deterministic switchover behavior.

NETCONF/RESTCONF

NETCONF/RESTCONF with YANG data modeling provides a standardized way to represent data and securely configure devices.

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 defense against security threats. Sampled packets sent to a collector (up to 5 collectors can be configured) ensure it always has a real-time view of network traffic.

Precision Time Protocol (PTP)

PTP (IEEE 1588v2) synchronizes network clocks with micro-second accuracy, supporting industrial automation and control systems. PTP operates on standalone or stacked switches.

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. Active Fiber Monitoring is supported on fiber data and fiber stacking links.

VLAN Translation

Service Providers can use VLAN Translation to provide customer traffic with a unique VLAN-ID for use within the SP's network. It does this by mapping traffic arriving on a VLAN to a different VLAN on the outgoing paired interface.

This feature is also useful in Enterprise environments where it can be used to merge two networks together, without manually reconfiguring the VLAN numbering scheme.

Media Access Control Security (MAC-Sec)

802.1AE MACSec secures all traffic on point-to-point Ethernet links between directly connected nodes, ensuring protection against security threats such as denial of service, intrusion, man-in-the-middle, passive wiretapping, and playback attacks.

Bi-directional Forwarding Detection (BFD)

BFD enables fast detection of link failures, to minimize recovery. It works with static routes, and alongside BGP and OSPF routing protocols supporting faster shutdown of neighbor connections if a peer session goes down. When using VRF-Lite, BFD is supported globally or within a domain.

Upstream Forwarding Only (UFO)

UFO manages which ports in a VLAN can communicate with each other, and which only have upstream access to services, for secure multi-user deployment.

Multicast Source Discovery Protocol (MSDP)

MSDP enables two or more PIM-SM (Sparse Mode) domains to share information on active multicast sources, for more efficient forwarding of multicast traffic.

Link Monitoring (Linkmon)

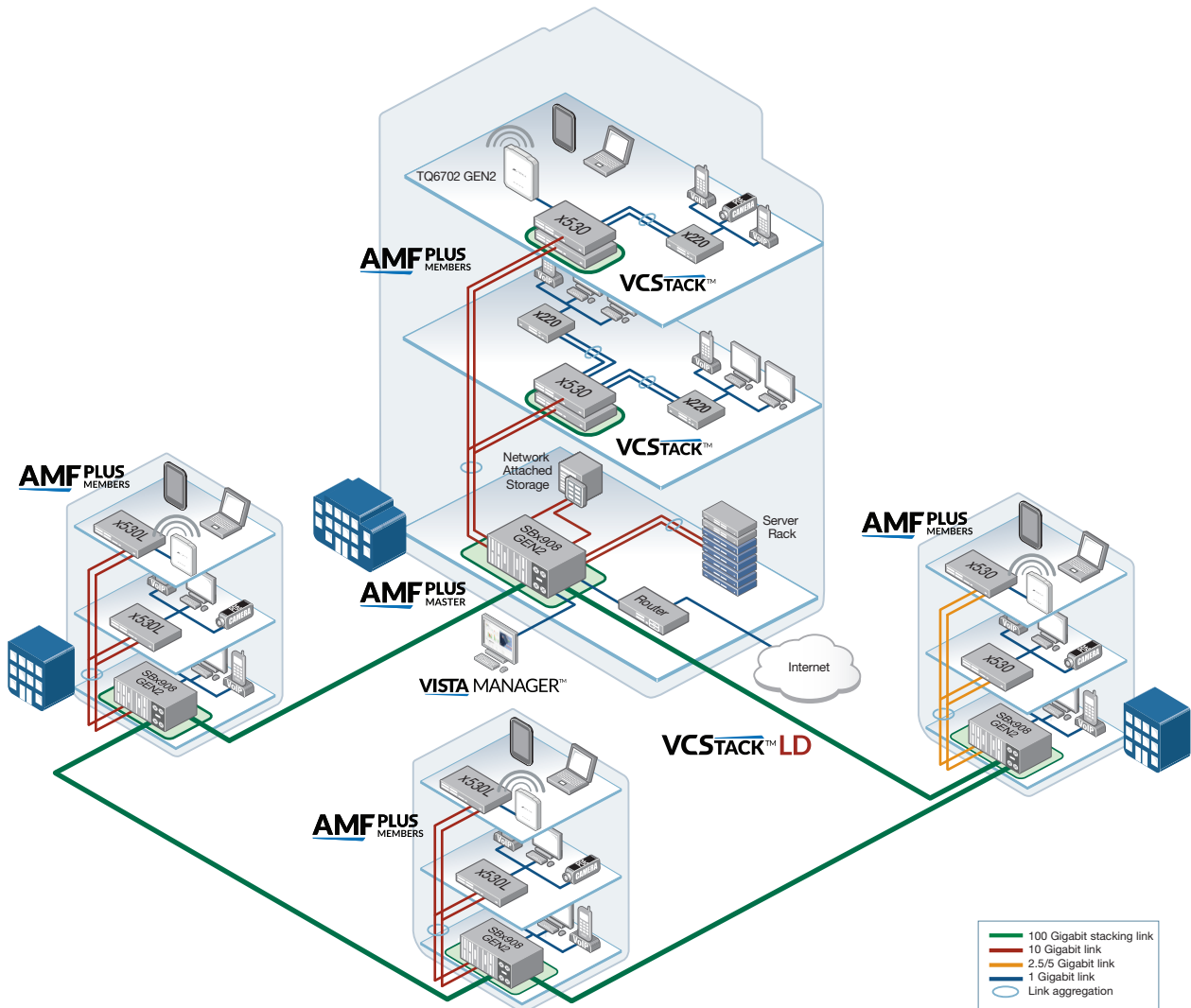
Linkmon enables network health monitoring by regularly sending probes over key links to gather metrics comprising latency, jitter, and probe loss. This supports pro-active network management, and can also be used with triggers to automate a change to device or network configuration in response to the declining health of a monitored link.

Virtual Extensible LAN (VXLAN) tunnels

VXLAN tunnels let you join two or more L2 networks over an L3 IP network to form a single L2 broadcast domain. VXLAN adds scalability to cloud computing environments. The SBx908 GEN2 supports static VXLAN tunnels.

KEY SOLUTIONS

Distributed network core



Today's large enterprises demand ready access to online resources and applications, and require a high-performing network that can seamlessly carry multiple converged services. This campus solution uses the SwitchBlade x908 GEN2 and VCStack LD—ideal for a distributed network core that provides high availability, increased capacity and ease of management.

Using VCStack at the core of the network allows multiple switches to appear as a single virtual chassis, simplifying

management. In normal operation, the full bandwidth of the network is used, ensuring always-available online services. Seamless wireless access, and the convergence of business data, voice, and video surveillance traffic on the network, are easily supported with this powerful solution.

AMF Plus allows the entire network to be unified for ease of management. The SwitchBlade x908 GEN2 acts as the AMF Plus Master, automatically backing up the entire network, and enabling plug-and-

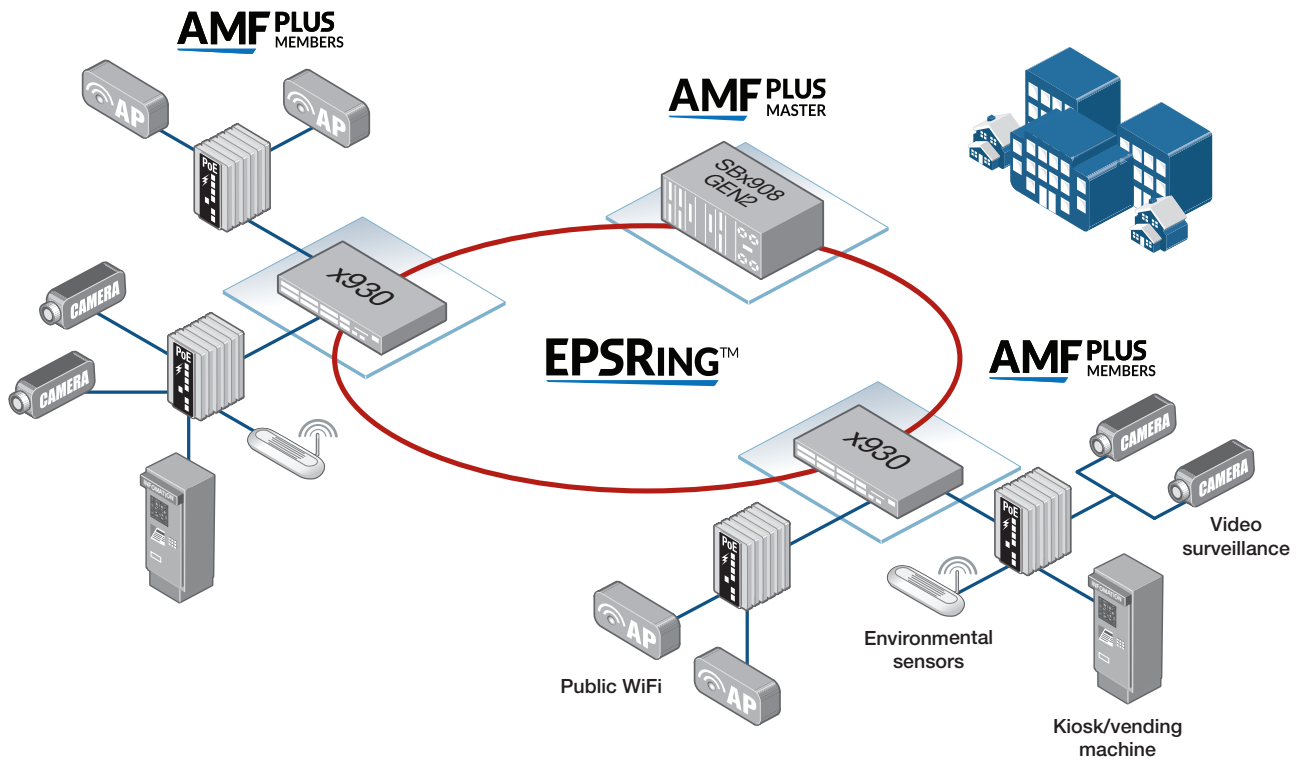
play networking with zero-touch expansion and recovery.

Vista Manager enables visual management and monitoring of the entire network including all wired, wireless, and endpoint devices.

The SwitchBlade x908 GEN2 delivers a protocol-less and Active/Active campus backbone solution, with high performance and flexible scalability.

KEY SOLUTIONS

Smart city network



All over the world, Smart Cities are looking to increase information availability, security and transport efficiency, whilst reducing pollution and waste. Access to real-time data from a variety of sources gives cities the ability to enhance the quality of their urban services, and increase citizen safety.

The SwitchBlade x908 GEN2 is the ideal network core solution for Smart City and IoT networks. Large switching and routing tables support the many devices that

make up modern metropolitan networks, including video surveillance cameras, environmental sensors, information kiosks, public Wi-Fi and many more.

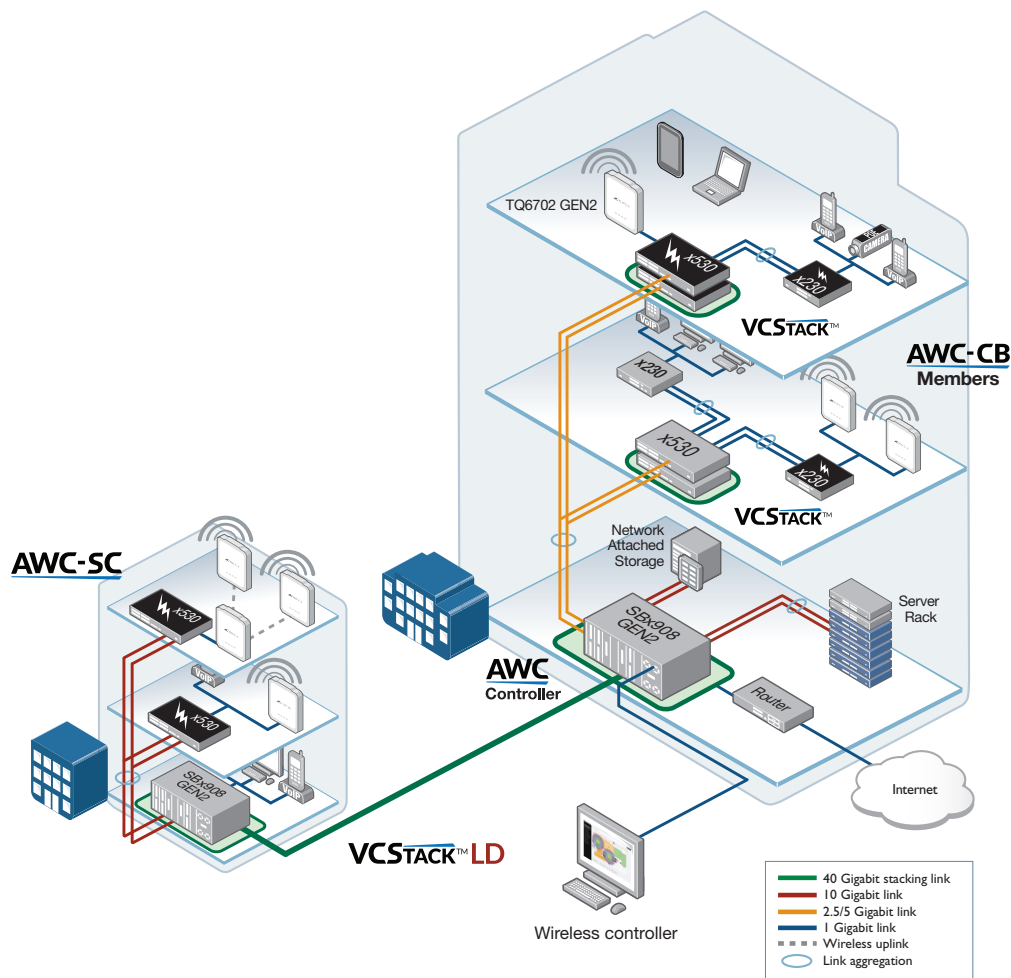
EPSR creates a high-speed resilient ring that can utilize 10G, 40G or 100G, and provides extremely fast failover between nodes. EPSR enables rings to recover within as little as 50ms, preventing a node or link failure from impacting the delivery of converged data and video traffic.

AMF plus automates many day-to-day tasks, backs up the entire network, and provides the ability to configure many or all devices city-wide—with a single command.

The SwitchBlade x908 GEN2 and Allied Telesis advanced features support network managers in delivering leading Smart City services.

KEY SOLUTIONS

Integrated wireless LAN management



Allied Telesis Autonomous Wave Control (AWC) offers solutions for two of the most common problems with Wireless LANs: initial setup complexity, and ongoing performance degradation. Initial WLAN set-up usually requires a site survey to achieve the best coverage, and performance of WLANs can often change over time as external sources of radio interference reduce coverage and bandwidth. These issues can be time-consuming to identify and resolve.

AWC features an intelligent process that automatically recalibrates the signal strength and radio channel of each Access Point (AP) for optimal WLAN performance.

AWC Smart Connect (AWC-SC) uses wireless uplink connections between APs, so deployment is as easy as plugging in and powering on the new APs, which automatically extend the Wi-Fi network, creating a resilient solution.

The AWC wireless controller is integrated into the SwitchBlade x908 GEN2 and provides the ideal solution for modern enterprise networks, enabling management of both the wired (with AMF Plus) and wireless (with AWC) networks to be automated. This reduces both the time and cost of network administration, as well as maximizing network performance for a superior user experience.

Up to five TQ Series wireless APs can be managed for free, and up to a further 300 APs (max 305) with feature licenses, available separately.

On some AP models, hybrid channel blanket enables multi-channel and single-channel WiFi operation simultaneously. This supports seamless roaming and maximum throughput. Channel Blanket licenses are available for up to 300 APs. For plug-and-play wireless deployment AWC-SC licenses are available for up to 300 APs.

SPECIFICATIONS

Performance

- 2.6 Terabit Switching Fabric
- 1,905Mpps forwarding rate
- Extensive wirespeed traffic classification for ACLs and QoS
- 9KB L2/L3 Jumbo frames
- Wirespeed multicasting
- 96K MAC address entries
- Up to 96K host entries
- Up to 32K multicast entries
- Up to 168 Link Aggregation Groups (LAGS) - any combination of static and dynamic (LACP)
- 4K VLANs
- 4GB DDR SDRAM
- 16MB packet buffer memory
- 4GB Flash Memory
- Multicore CPU with 4 dual-threaded cores for high-performance, and enabling wireless network management

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 expansion modules (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

- Eight high speed expansion bays supporting a choice of modules for port flexibility and application versatility
- 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

Diagnostic Tools

- Active Fiber Monitoring detects tampering on optical links
- Built-In Self Test (BIST)
- Cable fault locator (TDR)
- 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
- No limit on mirrored ports
- Up to 4 mirror (analyzer) ports
- VLAN mirroring (RSPAN)
- TraceRoute for IPv4 and IPv6
- Uni-Directional Link Detection (UDLD)

IPv4 Features

- 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 routing for IPv4
- UDP broadcast helper (IP helper)
- Up to 600 Virtual Routing and Forwarding (VRF lite) domains (with license)

IPv6 Features

- DHCPv6 client and relay
- DNSv6 client and relay
- IPv4 and IPv6 dual stack
- IPv6 hardware ACLs
- Device management over IPv6 networks with SNMPv6, Telnetv6 and SSHv6
- NTP client and server
- Static unicast and multicast routing for IPv6
- Log to IPv6 hosts with Syslog v6
- IPv6 Ready certified
- VRF Lite

Management

- 7-segment LED provides at-a-glance status and fault information
- Allied Telesis Management Framework Plus (AMF Plus) enables powerful centralized management and zero-touch device installation and recovery
- Try AMF Plus for free with the built-in Starter license (includes network management and automation features, but not Vista Manager AMF Plus features)
- NETCONF/RESTCONF northbound interface with YANG data modelling
- Console management port on the front panel for ease of access
- Eco-friendly mode allows ports and LEDs to be disabled to save power
- Industry-standard CLI with context-sensitive help
- Out-of-band 10/100/1000T Ethernet management port
- Powerful CLI scripting engine
- 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
- USB interface allows software release files, configurations and other files to be stored for backup and distribution to other devices

Quality of Service

- 8 priority queues with a hierarchy of high priority queues for real time traffic, and mixed scheduling, for each switch port
- Bandwidth limiting (virtual bandwidth) 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 and IPv6-aware storm protection
- Policy-based QoS based on VLAN, port, MAC and general packet classifiers
- Policy-based storm protection
- Extensive remarking capabilities and taildrop for queue congestion control
- Queue scheduling options for strict priority, weighted round robin or mixed scheduling
- IP precedence and DiffServ marking based on layer 2, 3 and 4 headers

Resiliency Features

- Control Plane Prioritization (CPP) ensures the CPU always has sufficient bandwidth to process network control traffic
- Dynamic link failover (host attach)
- Ethernet Protection Switched Rings (EPSR) with SuperLoop Protection (SLP) and EPSR enhanced recovery for extra resiliency
- G.8032 Ethernet Ring Protection
- Media Redundancy Protocol (MRP)
- Bidirectional Forwarding Detection (BFD)
- Flexi-stacking allows the use of any port speed to stack
- Long-Distance VcStack over fiber (VcStack LD)
- Loop protection: loop detection and thrash limiting
- PVST+ compatibility mode
- STP root guard
- VcStack fast failover minimizes network disruption

Security

- Federal Information Processing Standard Publication 140-2 (FIPS 140-2) certified
- Access Control Lists (ACLs) based on layer 3 and 4 headers
- Configurable ACLs for management traffic
- Dynamic ACLs assigned via port authentication
- ACL Groups enable multiple hosts/ports to be included in a single ACL, reducing configuration
- 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)
- DoS attack blocking and virus throttling
- Dynamic VLAN assignment
- MAC address filtering and MAC address lock-down
- Media Access Control Security (MACSec)
- Network Access and Control (NAC) features manage endpoint security
- Learn limits (intrusion detection) for single ports or LAGs
- Private VLANs provide security and port isolation for multiple customers using the same VLAN
- Simple Certificate Enrollment Protocol (SCEP) supports secure management
- Secure Copy (SCP)
- Secure File Transfer Protocol (SFTP) client
- Strong password security and encryption
- TACACS+ command authorisation
- Tri-authentication: MAC-based, web-based and IEEE 802.1x
- Web-based authentication
- RADIUS group selection per VLAN or port
- RADIUS Proxy

Software-Defined Networking (SDN)

- OpenFlow v1.3 with support for encryption, connection interruption and inactivity probe

Environmental Specifications

- Operating temperature range: 0°C to 50°C (32°F to 122°F)
Derated by 1°C per 305 meters (1,000 ft)

* A reboot is required after hot-swapping a XEM2-1CQ with a XEM of a different type

- Storage temperature range: -25°C to 70°C (-13°F to 158°F)
- Operating relative humidity range: 5% to 90% 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: EN55032 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, FIPS 140-2

Restrictions on Hazardous Substances (RoHS) Compliance

- EU RoHS compliant
- China RoHS compliant

Physical Specifications

	Width	Depth	Height	Mounting	Weight
SwitchBlade x908 GEN2	440 mm (17.32 in)	480 mm (18.89 in)	132 mm (5.19 in)	Rack-mount 3 RU	16.7 kg (36.81 lb)
SBxPWRSYS2	84 mm (3.30 in)	170 mm (6.69 in)	40 mm (1.57 in)	N/A	1.9 kg (4.18 lb)
XEM2-8XSTm*	130 mm (5.11 in)	166 mm (6.53 in)	40 mm (1.57 in)	N/A	1.7 kg (3.75 lb)
XEM2-12XTm	130 mm (5.11 in)	166 mm (6.53 in)	40 mm (1.57 in)	N/A	1.8 kg (3.97 lb)
XEM2-12XS v2	130 mm (5.11 in)	166 mm (6.53 in)	40 mm (1.57 in)	N/A	1.8 kg (3.97 lb)
XEM2-4QS	130 mm (5.11 in)	166 mm (6.53 in)	40 mm (1.57 in)	N/A	1.7 kg (3.75 lb)
XEM2-1CQ*	130 mm (5.11 in)	166 mm (6.53 in)	40 mm (1.57 in)	N/A	1.6 kg (3.53 lb)

Power and Latency (microseconds)

	Max Power Consumption	Max Heat Dissipation	Latency
SwitchBlade x908 GEN2 with two fan modules and two PSUs	124.7W	425.5 BTU/h	N/A
XEM2-8XSTm (1/2.5/5/10G)*	17.8W	60.7 BTU/h	2.2 µs
XEM2-12XTm (1/2.5/5/10G)	29.0W	98.9 BTU/h	2.4 µs
XEM2-12XS v2 (1G/10G)	30.3W	103.4 BTU/h	1.9 µs
XEM2-4QS (40G)	16.1W	55.1 BTU/h	0.7 µs
XEM2-1CQ (100G)*	6.7W	22.9 BTU/h	0.7 µs

STANDARDS & PROTOCOLS

AlliedWare Plus Operating System

Version 5.5.6

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 (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 802.1AE Media Access Control Security (MACSec)
- IEEE 802.2 Logical Link Control (LLC)
- IEEE 802.3 Ethernet
 - IEEE 802.3ab 1000BASE-T
 - IEEE 802.3ae 10 Gigabit Ethernet
 - IEEE 802.3an 10GBASE-T
 - IEEE 802.3az Energy Efficient Ethernet (EEE)
 - IEEE 802.3ba 40GBASE-X
 - IEEE 802.3bj 100GBASE-X
 - IEEE 802.3x Flow control - full-duplex operation
 - IEEE 802.3z 1000BASE-X

IPv4 Features

- 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 Features

RFC 1981	Path MTU discovery for IPv6
RFC 2460	IPv6 specification
RFC 2464	Transmission of IPv6 packets over Ethernet networks
RFC 2711	IPv6 router alert option
RFC 3484	Default address selection for IPv6
RFC 3587	IPv6 global unicast address format
RFC 3596	DNS extensions to support IPv6
RFC 4007	IPv6 scoped address architecture
RFC 4193	Unique local IPv6 unicast addresses
RFC 4213	Transition mechanisms for IPv6 hosts and routers
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 Plus 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 2578	Structure of Management Information v2 (SMIPv2)
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 3621	Power over Ethernet (PoE) MIB
RFC 3635	Definitions of managed objects for the Ethernet-like interface types

RFC 3636	IEEE 802.3 MAU MIB
RFC 4022	MIB for the Transmission Control Protocol (TCP)
RFC 4113	MIB for the User Datagram Protocol (UDP)
RFC 4188	Definitions of managed objects for bridges
RFC 4292	IP forwarding table MIB
RFC 4293	MIB for the Internet Protocol (IP)
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 for IPv6	
PIM 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 3618	Multicast Source Discovery Protocol (MSDP)
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
RFC 5340	OSPFv3 for IPv6 (partial support)

Quality of Service Features

IEEE 802.1p	Priority tagging
RFC 2211	Specification of the controlled-load network element service
RFC 2474	DiffServ precedence for eight 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

IEC61439-2	Media Redundancy Protocol (MRP)
IEEE 802.1AX	Link aggregation (static and LACP)
IEEE 802.1D	MAC bridges
IEEE 802.1s	Multiple Spanning Tree Protocol (MSTP)
IEEE 802.1w	Rapid Spanning Tree Protocol (RSTP)

IEEE 802.3ad	Static and dynamic link aggregation
RFC 5798	Virtual Router Redundancy Protocol version 3 (VRRPv3) for IPv4 and IPv6
RFC 5880	Bidirectional Forwarding Detection (BFD)

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+ Accounting and Authentication	
IEEE 802.1X	Authentication protocols (TLS, TTLS, PEAP and MD5)
IEEE 802.1X	Multi-supplicant authentication
IEEE 802.1X	Port-based network access control
RFC 2818	HTTP over TLS ("HTTPS")
RFC 2865	RADIUS authentication
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	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 5176	RADIUS CoA (Change of Authorization)
RFC 8446	Transport Layer Security (TLS) v1.3
RFC 8894	Simple Certificate Enrollment Protocol (SCEP)

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	The TFTP protocol (revision 2)
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	Dynamic Host Configuration Protocol for IPv6 (DHCPv6)
RFC 3633	IPv6 prefix options for DHCPv6
RFC 3646	DNS configuration options for DHCPv6
RFC 3993	Subscriber-ID sub-option 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
Static VXLAN tunnels ¹	(part of RFC 7348)

Voice over IP (VoIP)

LLDP-MED	ANSI/TIA-1057
Voice VLAN	

FEATURE LICENSES

	Description	Includes	Stack Licensing
AT-FL-GEN2-01	SwitchBlade x908 GEN2 Premium license	<ul style="list-style-type: none"> ■ OSPF¹ (16,000 routes) ■ BGP4¹ (5,000 routes) ■ PIMv4-SM, DM and SSM (2,000 entries) ■ VLAN double tagging (Q-in-Q) ■ RIPng (5,000 routes) ■ OSPFv3 (8,000 routes) ■ BGP4+ (5,000 routes) ■ MLDv1 and v2 ■ PIMv6-SM and SSM (1,000 entries) ■ VRF lite (63 domains) ■ RADIUS Full ■ UDLD ■ VLAN Translation ■ G.8032 ring protection ■ Ethernet CFM ■ VXLAN ■ PTP Transparent Mode 	<ul style="list-style-type: none"> ■ One license per stack member
AT-SW-APM10-1YR^{2,3}	Cumulative AMF Plus Master license	<ul style="list-style-type: none"> ■ AMF Plus Master license for up to 10 nodes for 1 year 	<ul style="list-style-type: none"> ■ One license per stack
AT-SW-APM10-5YR^{2,3}	Cumulative AMF Plus Master license	<ul style="list-style-type: none"> ■ AMF Plus Master license for up to 10 nodes for 5 years 	<ul style="list-style-type: none"> ■ One license per stack
AT-SW-APC10-1YR^{2,4}	Cumulative AMF Plus Controller license	<ul style="list-style-type: none"> ■ AMF Plus Controller license for up to 10 areas for 1 year 	<ul style="list-style-type: none"> ■ One license per stack
AT-SW-APC10-5YR^{2,4}	Cumulative AMF Plus Controller license	<ul style="list-style-type: none"> ■ AMF Plus Controller license for up to 10 areas for 5 years 	<ul style="list-style-type: none"> ■ One license per stack
AT-FL-GEN2-OF13-1YR	OpenFlow license	<ul style="list-style-type: none"> ■ OpenFlow v1.3 for 1 year 	<ul style="list-style-type: none"> ■ Not supported on a stack
AT-FL-GEN2-OF13-5YR	OpenFlow license	<ul style="list-style-type: none"> ■ OpenFlow v1.3 for 5 years 	<ul style="list-style-type: none"> ■ Not supported on a stack
AT-FL-GEN2-MSEC⁵	MACSec license	<ul style="list-style-type: none"> ■ Media Access Control Security 	<ul style="list-style-type: none"> ■ One license per stack member
AT-FL-GEN2-VLF	VRF-Lite Full license	<ul style="list-style-type: none"> ■ VRF lite (600 domains) 	<ul style="list-style-type: none"> ■ One license per stack member
AT-SW-AWC10-1YR⁶	Cumulative AWC license	<ul style="list-style-type: none"> ■ Autonomous Wave Control (AWC) license for up to 10 access points for 1 year 	<ul style="list-style-type: none"> ■ One license per stack
AT-SW-AWC10-5YR⁶	Cumulative AWC license	<ul style="list-style-type: none"> ■ Autonomous Wave Control (AWC) license for up to 10 access points for 5 years 	<ul style="list-style-type: none"> ■ One license per stack
AT-SW-CB10-1YR-2022⁷	Cumulative AWC-CB and AWC-SC license	<ul style="list-style-type: none"> ■ AWC Channel Blanket and AWC Smart Connect license for up to 10 access points for 1 year 	<ul style="list-style-type: none"> ■ One license per stack
AT-SW-CB10-5YR-2022⁷	Cumulative AWC-CB and AWC-SC license	<ul style="list-style-type: none"> ■ AWC Channel Blanket and AWC Smart Connect license for up to 10 access points for 5 years 	<ul style="list-style-type: none"> ■ One license per stack

¹ 64 OSPF and BGP routes included in base license

² From AW+ version 5.5.2-2 onwards, AMF Plus licenses provide all standard AMF network management and automation features. They also enable the AMF Plus intent-based networking features in Vista Manager EX (from version 3.10.1 onwards)

³ Purchase one license per 10 nodes (up to 300 nodes maximum)

⁴ Purchase one license per 10 areas (up to 60 areas maximum)

⁵ MACSec only operates on the XEM2-12XS v2 and XEM2-8XSTm expansion modules

⁶ 5 APs can be managed for free. Purchase one license per 10 additional APs (up to 300 APs maximum)

⁷ Channel Blanket and Smart Connect are not available as free services. Both an AWC-CB license and an AWC license are required for Channel Blanket and/or Smart Connect to operate. Purchase one AWC-CB license per 10 APs (up to 300 APs maximum).

ORDERING INFORMATION

AT-SBx908GEN2-BOy⁸	High capacity Layer 3+ modular switch chassis with 8 x high speed expansion bays, fans included
AT-SBx908GEN2-J90⁹	High capacity Layer 3+ modular switch chassis with 8 x high speed expansion bays, fans included
AT-SBxPWRSYS2-Bxy^{10,11}	Hot-swappable load-sharing power supply
AT-SBxPWRSYS1-B8y¹¹	1200W DC system power supply
AT-FAN08¹¹	Spare hot-swappable fan module
AT-XEM2-8XSTm*	4 x 1/2.5/5/10G RJ45 ports and 4 x 1G/10G SFP+ ports
AT-XEM2-12XTm	12 x 1/2.5/5/10G RJ45 ports
AT-XEM2-12XS v2	12 x 1G/10G SFP+ ports
AT-XEM2-4QS	4 x 40G QSFP+ ports
AT-XEM2-1CQ*	1 x 100G QSFP28 port

⁸ Where Oy = 01 for 1 year Net Cover support
05 for 5 years Net Cover support

⁹ JITC approved models only available in North America. Please contact your sales representative

¹⁰ Where x = 1y for AC power supply with US power cord
2y for AC power supply with no power cord
3y for AC power supply with UK power cord
4y for AC power supply with AU power cord
5y for AC power supply with EU power cord

¹¹ Note that fans are included but NO power supplies ship with the base chassis, they must be ordered separately

*Please contact your sales representative for availability in your region

Accessories

100G QSFP28 Modules	
AT-QSFP28-SR4	100GSR 850nm short-haul up to 100 m with MMF
AT-QSFP28-LR4	100GLR 1310nm medium-haul, 10 km with SMF
AT-QSFP28-1CU	1 meter QSFP28 direct attach cable
AT-QSFP28-3CU	3 meter QSFP28 direct attach cable
40G QSFP+ Modules	
AT-QSFPSR4	40GSR4 850 nm short-haul up to 150 m with MMF, MPO-12
AT-QSFPSR4LCa	40GSR4 850 nm short-haul up to 150 m with MMF, LC
AT-QSFPLR4	40GLR4 1310 nm medium-haul, 10 km with SMF
AT-QSFPER4	40GER4 1310 nm long-haul, 40 km with SMF
AT-QSFP1CU	1 meter QSFP+ direct attach cable
AT-QSFP3CU	3 meter QSFP+ direct attach cable
AT-MTP12-1	1 meter MTP optical cable for AT-QSFPSR
AT-MTP12-5	5 meter MTP optical cable for AT-QSFPSR

10GbE SFP+ Modules	
AT-SP10SR	10GSR 850 nm short-haul, 300 m with MMF
AT-SP10SR/I	10GSR 850 nm short-haul, 300 m with MMF industrial temperature
AT-SP10LRM	10GLRM 1310 nm short-haul, 220 m with MMF
AT-SP10LRI	10GLR 1310 nm medium-haul, 10 km with SMF
AT-SP10LRa/I	10GLR 1310 nm medium-haul, 10 km with SMF industrial temperature
AT-SP10LR20/I	10GER 1310nm long-haul, 20 km with SMF industrial temperature
AT-SP10ER40/I	10GER 1310nm long-haul, 40 km with SMF industrial temperature
AT-SP10ZR80/I	10GER 1550nm long-haul, 80 km with SMF industrial temperature
AT-SP10TM	1G/2.5G/5G/10G, 100m copper,, TAA ¹²

¹² Trade Act Agreement compliant

10GbE SFP+ Cables	
AT-SP10TW1	1 meter SFP+ direct attach cable
AT-SP10TW3	3 meter SFP+ direct attach cable
AT-SP10TW7	7 meter SFP+ direct attach cable
1G SFP Modules	
AT-SPTX	10/100/1000T 100 m 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 1310 nm 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