x950 Series

Expandable 10G/40G/100G stackable L3+ switches

Allied Telesis x950 Series switches are ideal for the modern enterprise network core, where stacking creates a resilient local or distributed solution. These powerful switches support 100 Gigabit connectivity, and provide the capacity that today's Smart City and IoT networks need.

x950 Series switches feature a high-performing 1.92 Terabit fabric, to eliminate bottlenecks, effortlessly stream video and ensure that all traffic in large networks is delivered reliably.

x950 switches feature either 24 x 1/10 Gigabit SFP+ ports or 24 x 1/2.5/5/10 Gigabit copper ports to enable flexible deployment, while 4 built-in 40G/100G ports provide high-speed backbone connectivity. With an expansion (XEM) bay, plus the ability to stack multiple units, extra capacity can be seamlessly added for a future-proof network.

Smart City and IoT networks

Large switching and routing tables support Smart City networks and the Internet of Things (IoT). The x950 Series meets the increasing demand for the convergence of multiple services, like video surveillance, public Wi-Fi, information kiosks, environmental information and more.

Network automation

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

Vista Manager™ EX is an intuitive visualization tool that complements the power of AMF. It allows a user to monitor the network and quickly identify issues before they become major problems.

Integrated network management

The x950 Series support integrated GUI-based management of wired and wireless Allied Telesis network devices and security appliances, making it ideal as a one-stop solution for medium-sized networks.

Wireless LAN management

The x950 Series feature Allied Telesis Autonomous Wave Controller (AWC), which is an intelligent, easy-to-use Wireless LAN controller that automatically maintains optimal wireless coverage. AWC is fully integrated with the GUI for easy setup, management, and monitoring of wireless access points. A network map that includes floor maps and wireless coverage heat maps enables simplified deployment and monitoring.

Secure

The x950 Series is packed with advanced security features to protect the network—from the edge to the core. This includes powerful control over network traffic types and protection against attacks.

AMF enables secure management without additional complexity.

Resilient

The convergence of network services has led to increasing demand for highly-available networks with minimal downtime. 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 x950 Series can form a VCStack of up to four units, at any port speed, for enhanced resiliency and simplified management. With VCStack over Long Distance (VCStack-LD), 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 x950 Series guarantees the continual delivery of essential services. Hot-swappable components, such as XEMs, fans and load-sharing power supplies, pair with near-hitless online stack reconfiguration to ensure that maintenance doesn't affect network uptime.

Environmentally friendly

The x950 Series supports Energy Efficient Ethernet (EEE), automatically reducing the power consumed by the switch whenever there is no traffic on a port, reducing operating costs.

Key Features

- High capacity, with 4 x QSFP+/ QSFP28 slots supporting 40G or 100G connectivity
- 10G, 40G, 100G XEMs
- Multi-speed (1/2.5/5/10G) XEM
- Allied Telesis Autonomous Management Framework™ (AMF)
- Large switching and routing tables support Smart City and IoT networks
- VCStack™ 4 units at any port speed with flexi-stacking
- VCStack-LD for long distance stacking
- EPSR™ and G.8032 ERPS for resilient rings
- Active Fiber Monitoring (AFM) for fiber data and stacking links
- OpenFlow v1.3 for SDN
- Web-based Graphical User Interface (GUI)
- AWC wireless network management
- Channel Blanket hybrid wireless

Key Features

Autonomous Management Framework™ (AMF)

- 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 everyday 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 x950 Series 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.
- The x950 Series provide a single-pane-of-glass interface to the entire network. Administrators can view the AMF topology map using the intuitive Device GUI.

AWC Wireless Management

- Optimize wireless network performance with the Autonomous Wave Controller (AWC), built-in to the x950 Series. 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.

Large network tables

- High-capacity 1.92 Terabit fabric and 1,190Mpps 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 x950-28XTQm and XEM2-12XTm expansion module support 2.5 and 5 Gigabit connectivity to enable high-speed wireless, or maximum downlink speed using legacy Cat5E/6 cabling.

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 to further improve 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.

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.
- 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.

Premium Software License

- By default, the x950 Series offers a comprehensive Layer 2 and standard Layer 3 feature set. The feature set can easily be elevated to full Layer 3 by applying the premium software license. This adds increased dynamic routing protocols and Layer 3 multicasting capabilities.

Active Fiber Monitoring (AFM)

- AFM 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.

Optical DDM

- Most modern optical SFP/SFP+/QSFP+/QSFP28 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.

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.

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.

Software-Defined Networking (SDN)

- OpenFlow is a key technology that enables the use of SDN to build smart applications that unlock value and reduce cost.

AMF Application Proxy

- Allied Telesis SES (Secure Enterprise SDN) solution enables internal LAN threat detection and automatic end-point isolation to protect the network. The AMF Application Proxy enables the SES controller to communicate with the AMF master when a threat is detected, so the AMF master can take action to block the threat at source by quarantining the infected end-point.

TACACS+ Command Authorization

- Centralize control of which commands may be issued by a specific user of an AlliedWare Plus device. TACACS+ command authorization complements authentication and accounting services for a complete AAA solution.

UniDirectional Link Detection

- UniDirectional Link Detection (UDLD) is useful for monitoring fiber-optic links between two switches that use two single-direction fibers to transmit and receive packets. UDLD prevents traffic from being sent across a bad link by blocking the ports at both ends of the link in the event that either the individual transmitter or receiver for that connection fails.

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.

VLAN ACLs

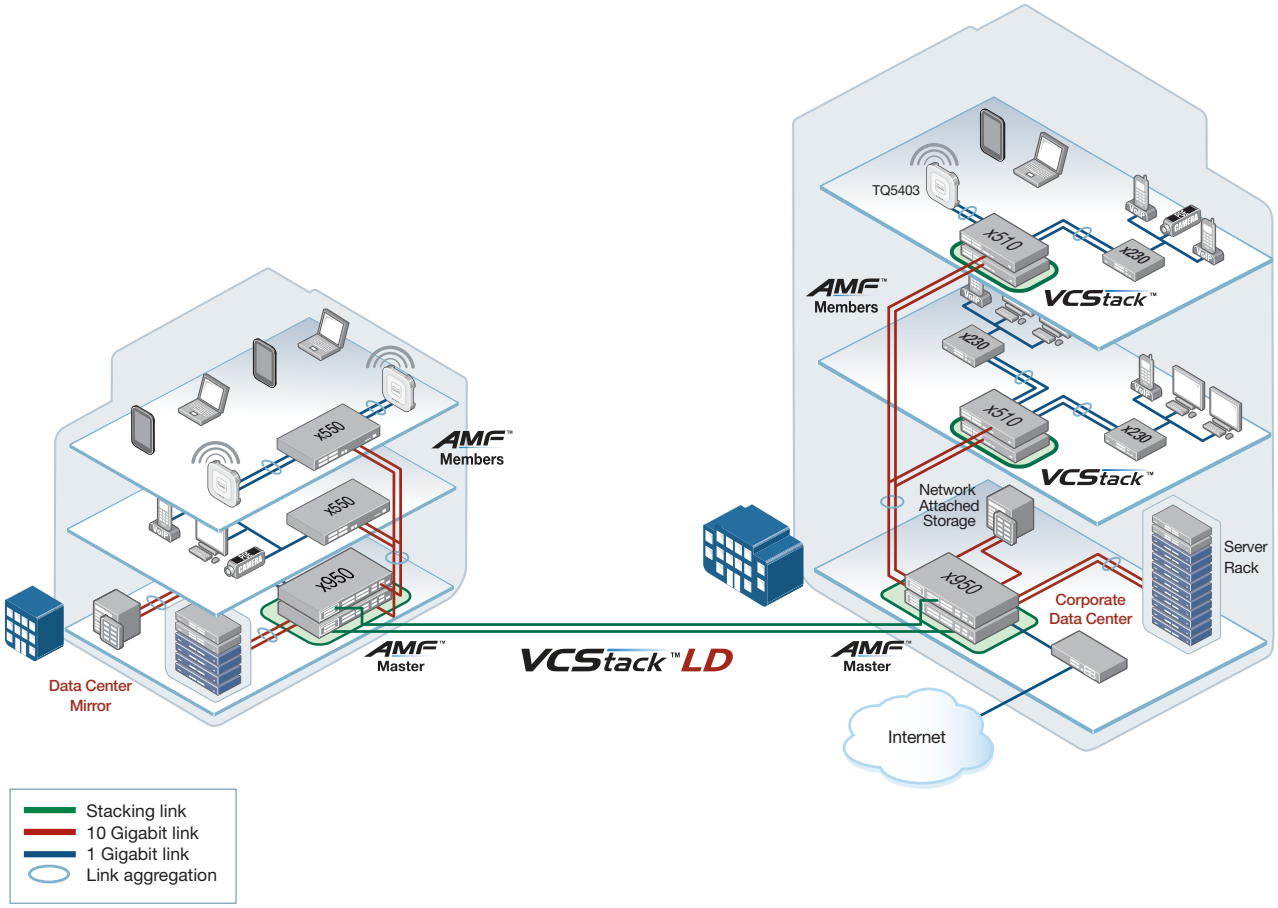
- Simplify access and traffic control across entire segments of the network. Access Control Lists (ACLs) can be applied to a Virtual LAN (VLAN) as well as a specific port.

VLAN Translation

- VLAN Translation allows traffic arriving on a VLAN to be mapped to a different VLAN on the outgoing paired interface.
- In Metro networks, it is common for a network Service Provider (SP) to give each customer their own unique VLAN, yet at the customer location give all customers the same VLAN-ID for tagged packets to use on the wire. SPs can use VLAN Translation to change the tagged packet's VLAN-ID at the customer location to the VLAN-ID for tagged packets to use within the SP's network.
- 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. This situation can occur if two companies have merged and the same VLAN-ID is used for two different purposes.

Key Solutions

Distributed network core



Today's corporate network users demand a high-performing enterprise network that can seamlessly carry multiple converged services, and provide instant access to online resources and applications. This key solution uses the x950 Series and long-distance Virtual Chassis Stacking (VCStack-LD)—ideal for a distributed business network core that provides high availability, increased capacity and ease of management.

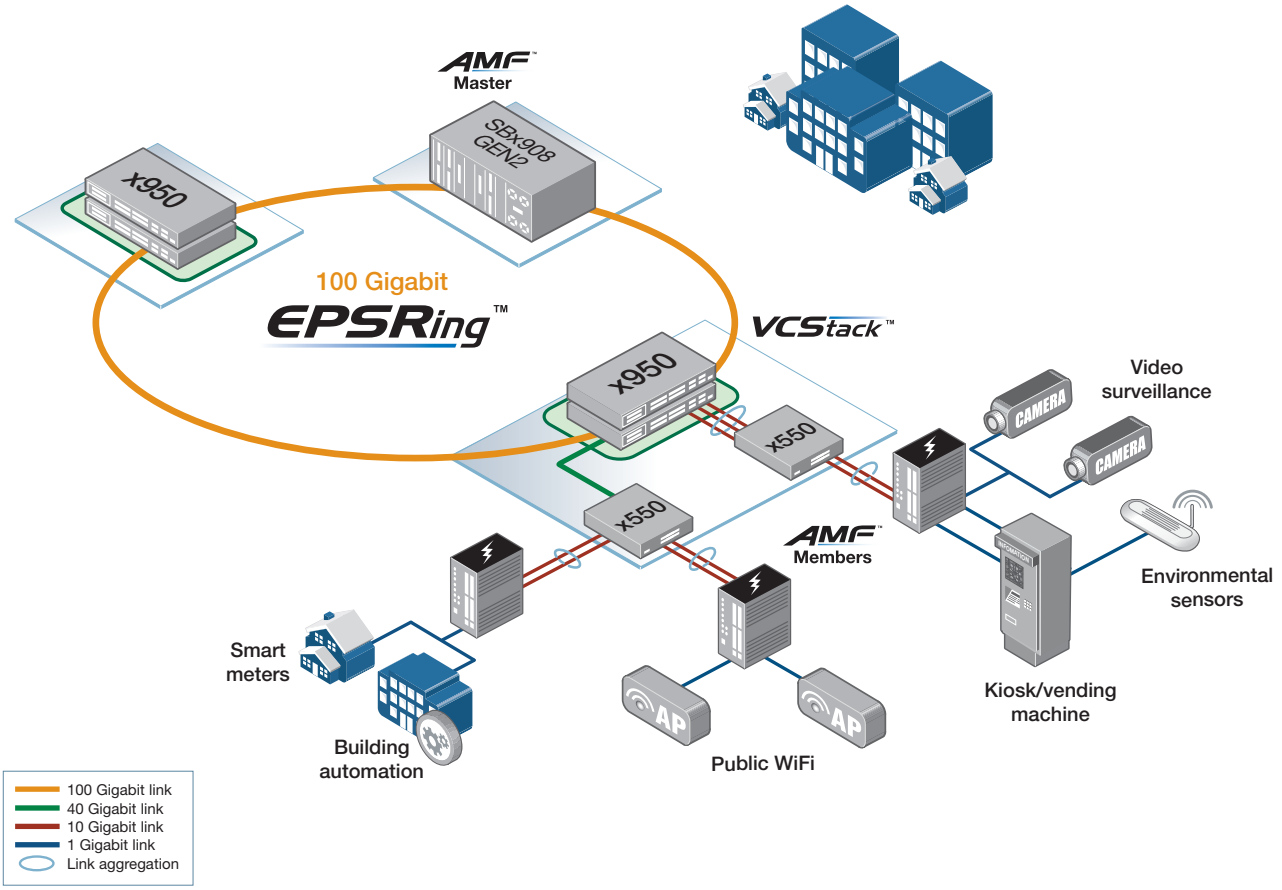
Using VCStack at the core of the network allows multiple switches to appear as a single virtual chassis, simplifying management. In normal operation, the full bandwidth of the network is used, and with two x950 switches in each location, there is both device and path resiliency. The x950 series stacks up to four units at any port speed for flexible deployment—supporting up to four locations with complete resiliency, or up to eight locations with a single switch each.

This powerful solution easily supports all online services, while mirroring of the corporate data center enables automated disaster recovery, to ensure always-available access to digital resources.

AMF allows the entire network to be unified for ease of management. The x950 VCStack acts as the AMF Master, automatically backing up the entire network, and enabling plug-and-play networking with zero-touch expansion and recovery.

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.

In this key solution, x950 Series switches, together with the Allied Telesis SwitchBlade x908 Gen2, create the ideal distributed 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, building automation, and many more.

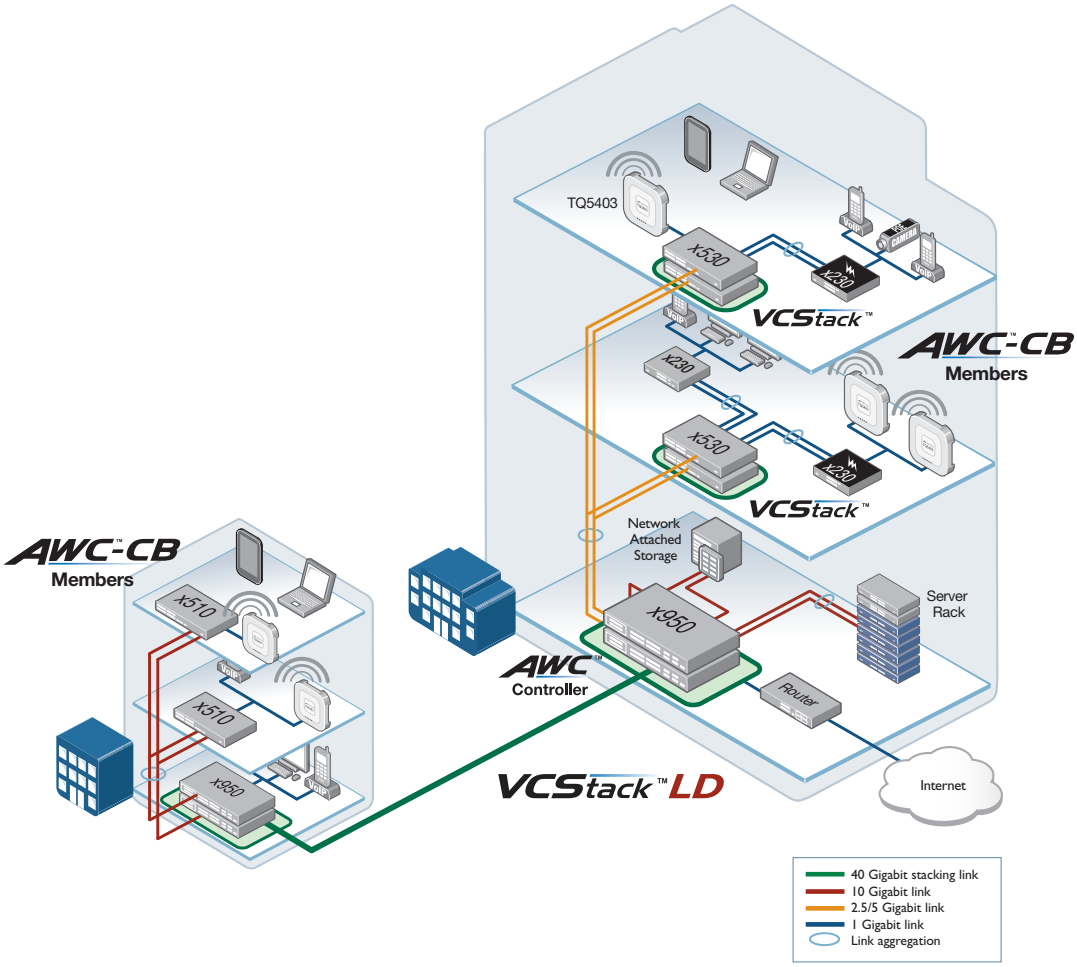
In this Smart City solution, the flexible x950 Series provides 10G, 40G and 100G connectivity. Allied Telesis EPSR creates a high-speed resilient metro ring running at 100Gbps for maximum performance, and extremely fast failover between nodes. EPSR enables rings to recover within as little as 50ms, preventing a node or link failure from impacting the delivery of converged data and video traffic.

AMF 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 x950 Series and Allied Telesis advanced features enable network managers to deliver leading Smart City services.

Key Solutions

Integrated wireless LAN management



Allied Telesis Autonomous Wave Controller (AWC) offers solutions for two of the most common problems with Wireless LANs: initial setup complexity and on-going 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 re-calibrates the signal strength and radio channel of each Access Point (AP) for optimal WLAN performance. This re-calibration is performed daily based on measurements taken from each AP to compensate for interference such as unscreened electrical equipment, changes to office layout, or neighbouring wireless networks.

AWC is integrated into the x950 Series and provides an ideal solution for modern enterprise networks, enabling management of both the wired (with AMF) 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 5 TQ Series wireless APs can be managed for free, and up to a further 120 APs (max 125) with feature licenses, available separately.

When using the TQ5403 APs, 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 120 APs.

Specifications

PRODUCT	1/2.5/5/10G (RJ-45) COPPER PORTS	1/10 GIGABIT SFP+ PORTS	40G/100G QSFP+/ QSFP28 PORTS	XEM BAY	SWITCHING FABRIC	FORWARDING RATE
x950-28XSQ		24	4*	1	1.92Tbps	1190Mpps
x950-28XTQm	24		4*	1	1.92Tbps	1190Mpps

*Can also support up to 16 10G ports (using 4 x 10G breakout cables)

Performance

- Extensive wirespeed traffic classification for ACLs and QoS
- Supports 10KB Jumbo frame size for data center and server aggregation applications
- Wirespeed multicasting
- 96K MAC address entries
- Up to 96K host entries
- Up to 8K multicast entries
- Up to 128 Link Aggregation Groups (LAGS) - any combination of static and dynamic (LACP)
- 4K VLANs
- 4GB DDR SDRAM
- 16MB packet buffer memory
- 4GB 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 expansion module (XEM)
- 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

- Support for 4 x 40G or 100G connections built in, and an expansion bay to add further switching capacity
- Versatile licensing options for additional features

Power Characteristics

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

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
- 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 64 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
- NTPv6 client and server
- Static unicast and multicast routing for IPv6
- Log to IPv6 hosts with Syslog v6

Management

- 7-segment LED provides at-a-glance status and fault information
- Autonomous Management Framework (AMF) enables powerful centralized management and zero-touch device installation and recovery
- Try AMF for free with the built-in 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
- 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
- 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

- 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 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)
- 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)
  0°C to 45°C (32°F to 113°F) if using 100G QSFP28 modules
  Derated by 1°C per 305 meters (1,000 ft)
- 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

Restrictions on Hazardous Substances (RoHS) Compliance

- EU RoHS compliant
- China RoHS compliant

Physical Specifications

PRODUCT	WIDTH X DEPTH X HEIGHT	MOUNTING	WEIGHT	
			UNPACKAGED	PACKAGED
x950-28XSQ	440 x 482 x 44 mm (17.32 x 18.98 x 1.73 in)	Rack-mount 1 RU	7.2 kg (15.9 lb)	9.2 kg (20.3 lb)
x950-28XTQm	440 x 482 x 44 mm (17.32 x 18.98 x 1.73 in)	Rack-mount 1 RU	7.3 kg (16.1 lb)	9.3 kg (20.5 lb)
PWR600	51 x 245 x 40 mm (2.0 x 9.6 x 1.6 in)	N/A	0.68 kg (1.50 lb)	0.68 kg (1.50 lb)
FAN05	152 x 43 x 42 mm (6.0 x 1.7 x 1.6 in)	N/A	0.34 kg (0.75 lb)	0.34 kg (0.75 lb)
XEM2-12XTm	109 x 170 x 40 mm (4.29 x 6.69 x 1.57 in)	N/A	0.75 kg (1.65 lb)	1.8 kg (3.97 lb)
XEM2-12XT	109 x 170 x 40 mm (4.29 x 6.69 x 1.57 in)	N/A	0.75 kg (1.65 lb)	1.8 kg (3.97 lb)
XEM2-12XS	109 x 170 x 40 mm (4.29 x 6.69 x 1.57 in)	N/A	0.75 kg (1.65 lb)	1.8 kg (3.97 lb)
XEM2-4QS	109 x 170 x 40 mm (4.29 x 6.69 x 1.57 in)	N/A	0.66 kg (1.45 lb)	1.7 kg (3.75 lb)
XEM2-1CQ	109 x 170 x 40 mm (4.29 x 6.69 x 1.57 in)	N/A	0.62 kg (1.37 lb)	1.6 kg (3.53 lb)

Power, Noise, Latency (microseconds)

PRODUCT	MAX POWER CONSUMPTION	MAX HEAT DISSIPATION	NOISE	LATENCY
x950-28XSQ	231.2W	789.0 BTU/h	63.4 dBA	0.8 µs
x950-28XTQm	255.3W	871.1 BTU/h	61.9 dBA	2.3 µs
XEM2-12XTm (1/2.5/5/10G)	39.7W	135.6 BTU/h	N/A	2.4 µs
XEM2-12XT (1G/10G)	39.7W	135.6 BTU/h	N/A	2.4 µs
XEM2-12XS (1G/10G)	30.3W	103.4 BTU/h	N/A	1.9 µs
XEM2-4QS (40G)	16.1W	55.1 BTU/h	N/A	0.7 µs
XEM2-1CQ (100G)	6.7W	22.9 BTU/h	N/A	0.7 µs

Standards and Protocols

AlliedWare Plus Operating System

Version 5.4.9-1.3

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 (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 802.2 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 802.3bz 2.5GBASE-T and 5GBASE-T
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 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 (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 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 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 (QoS)

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

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

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 (AAA)
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 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-x950-01	950 Premium license	▶ OSPF[1] (16,000 routes) ▶ BGP4[1] (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 (64 domains) ▶ RADIUS Full ▶ UDLD ▶ VLAN Translation	▶ One license per stack member
AT-FL-x950-AM40-1YR	AMF Master license	▶ AMF Master 40 nodes for 1 year	▶ One license per stack
AT-FL-x950-AM40-5YR	AMF Master license	▶ AMF Master 40 nodes for 5 years	▶ One license per stack
AT-FL-x950-AM80-1YR	AMF Master license	▶ AMF Master 80 nodes for 1 year	▶ One license per stack
AT-FL-x950-AM80-5YR	AMF Master license	▶ AMF Master 80 nodes for 5 years	▶ One license per stack
AT-FL-x950-AM120-1YR	AMF Master license	▶ AMF Master 120 nodes for 1 year	▶ One license per stack
AT-FL-x950-AM120-5YR	AMF Master license	▶ AMF Master 120 nodes for 5 years	▶ One license per stack
AT-FL-x950-AM180-1YR	AMF Master license	▶ AMF Master 180 nodes for 1 year	▶ One license per stack
AT-FL-x950-AM180-5YR	AMF Master license	▶ AMF Master 180 nodes for 5 years	▶ One license per stack
AT-FL-x950-AAP-1YR	AMF Application Proxy license	▶ AMF Application Proxy license for 1 year	▶ One license per stack
AT-FL-x950-AAP-5YR	AMF Application Proxy license	▶ AMF Application Proxy license for 5 years	▶ One license per stack
AT-FL-x950-OF13-1YR	OpenFlow license	▶ OpenFlow v1.3 for 1 year	▶ Not supported on a stack
AT-FL-x950-OF13-5YR	OpenFlow license	▶ OpenFlow v1.3 for 5 years	▶ Not supported on a stack
AT-FL-x950-8032	ITU-T G.8032 license	▶ G.8032 ring protection ▶ Ethernet CFM	▶ One license per stack member
AT-FL-x950-AWC40-1YR[2]	AWC license	▶ Wireless Controller license for up to 40 access points for 1 year	▶ One license per stack
AT-FL-x950-AWC40-5YR[2]	AWC license	▶ Wireless Controller license for up to 40 access points for 5 years	▶ One license per stack
AT-FL-x950-AWC80-1YR[2]	AWC license	▶ Wireless Controller license for up to 80 access points for 1 year	▶ One license per stack
AT-FL-x950-AWC80-5YR[2]	AWC license	▶ Wireless Controller license for up to 80 access points for 5 years	▶ One license per stack
AT-FL-x950-AWC120-1YR[2]	AWC license	▶ Wireless Controller license for up to 120 access points for 1 year	▶ One license per stack
AT-FL-x950-AWC120-5YR[2]	AWC license	▶ Wireless Controller license for up to 120 access points for 5 years	▶ One license per stack
AT-FL-x950-CB40-1YR[3]	AWC-CB license	▶ AWC-Channel Blanket license for up to 40 access points for 1 year	▶ One license per stack
AT-FL-x950-CB40-5YR[3]	AWC-CB license	▶ AWC-Channel Blanket license for up to 40 access points for 5 years	▶ One license per stack
AT-FL-x950-CB80-1YR[3]	AWC-CB license	▶ AWC-Channel Blanket license for up to 80 access points for 1 year	▶ One license per stack
AT-FL-x950-CB80-5YR[3]	AWC-CB license	▶ AWC-Channel Blanket license for up to 80 access points for 5 years	▶ One license per stack
AT-FL-x950-CB120-1YR[5]	AWC-CB license	▶ AWC-Channel Blanket license for up to 120 access points for 1 year	▶ One license per stack
AT-FL-x950-CB120-5YR[5]	AWC-CB license	▶ AWC-Channel Blanket license for up to 120 access points for 5 years	▶ One license per stack

[1] 64 OSPF and BGP routes included in base license
[2] 5 APs can be managed for free. Add an additional 40, 80, or 120 APs with an AWC license
[3] Channel Blanket is not available as a free service. Both an AWC-CB license and an AWC license are required for Channel Blanket to operate

Ordering Information

AT-x950-28XSQ-B0y[4, 5]
24-port 1/10G SFP/SFP+ stackable switch with 4 x 40G/100G QSFP+/QSFP28 ports, a XEM bay, and dual hotswap PSU and Fan bays

AT-x950-28XTQm-B0y[4, 5]
24-port 1/2.5/5/10G copper stackable switch with 4 x 40G/100G QSFP+/QSFP28 ports, a XEM bay, and dual hotswap PSU and Fan bays

AT-FAN05-B0y[4]
Spare hot-swappable fan module

AT-PWR600-BXy[4, 5, 6]
600W AC system power supply

AT-XEM2-12XTm-B0y[4]
12 x 1/2.5/5/10G RJ45 ports

AT-XEM2-12XT-B0y[4]
12 x 100M/1G/10G RJ45 ports

AT-XEM2-12XS-B0y[4]
12 x 1G/10G SFP+ ports

AT-XEM2-4QS-B0y[4]
4 x 40G QSFP+ ports

AT-XEM2-1CQ-B0y[4]
1 x 100G QSFP28 port

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-QSFP1CU
1 meter QSFP+ direct attach cable

AT-QSFP3CU
3 meter QSFP+ direct attach cable

AT-QSFPSR4
40GSR4 850nm short-haul up to 150 m with MMF

AT-QSFPLR4
40GLR4 1310 nm medium-haul, 10 km with SMF

AT-QSFPER4
40GER4 1310 nm long-haul, 40 km with SMF

AT-MTP12-1
1 meter MTP optical cable for AT-QSFPSR

AT-MTP12-5
5 meter MTP optical cable for AT-QSFPSR

Breakout Cables For 4 x 10G connections

AT-QSFP-4SFP10G-3CU
QSFP to 4 x SFP+ breakout direct attach cable (3 m)

AT-QSFP-4SFP10G-5CU
QSFP to 4 x SFP+ breakout direct attach cable (5 m)

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-SP10LR
10GLR 1310 nm medium-haul, 10 km with SMF

AT-SP10LR/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-SP10T
10GBase-T 20 m copper[7]

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

1000Mbps SFP Modules

AT-SPSX/I
1000SX GbE multi-mode 850 nm fiber up to 550 m industrial temperature

AT-SPTX
1000T 100 m copper

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

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-SPBD20-13/I
1000BX GbE Bi-Di (1310 nm Tx, 1550 nm Rx) fiber up to 20 km

AT-SPBD20-14/I
1000BX GbE Bi-Di (1490 nm Tx, 1310 nm Rx) fiber up to 20 km

AT-SPBD40-13/I
1000LX GbE single-mode Bi-Di (1310 nm Tx, 1490 nm Rx) fiber up to 40 km, industrial temperature

AT-SPBD40-14/I
1000LX GbE single-mode Bi-Di (1490 nm Tx, 1310 nm Rx) fiber up to 40 km, industrial temperature

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

AT-SPZX120/I
1000ZX GbE single-mode 1550 nm fiber up to 120 km industrial temperature

[4] Where Oy = 01 for 1 year Net Cover support
05 for 5 years Net Cover support

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

[6] 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

[7] Using Cat 6a/7 cabling

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