

SwitchBlade® x8100 Series

With CFC400 Controller

Next generation intelligent Layer 3+ chassis switches

The Allied Telesis SwitchBlade x8100 Series of advanced Layer 3+ chassis switches are available in 6 and 12 slot models. The CFC400 based system delivers high availability, wirespeed performance, and a high port count. Advanced features provide the ideal solution for the modern enterprise network, where resiliency, reliability and high performance are the key requirements.






Overview

SwitchBlade x8100 Series switches provide a high performing scalable solution, with an extensive range of connectivity options. Dual CFC400 control cards provide resiliency. Line card options for 40G, 10G and gigabit ensure a system capable of meeting the requirements of today's networks, and the flexibility to expand when required.

High performing

Dual CFC400 control cards provide 80Gbps non-blocking throughput to each line card slot, providing maximum performance and wirespeed delivery of critical IPv4 and IPv6 traffic.

Powerful network management

The Allied Telesis Autonomous Management Framework™ (AMF) meets the increased management requirements of modern converged networks, automating many everyday tasks including configuration management. AMF has powerful centralized management features that manage a complete network as a single virtual device. The network can be expanded with plug-and-play simplicity, and network node recovery is fully zero-touch.

AMF secure mode increases network security with management traffic encryption, authorization, and monitoring. AMF Guestnode allows third party devices, such as IP phones and security cameras, to be part of an AMF network.

Resilient

SwitchBlade x8100 Series switches operate with one AC or DC system PSU. Installing a second load-sharing PSU provides ultimate redundancy. Installing two Power over Ethernet

(PoE) PSUs maximizes power available to connected devices.

The active/active control cards interconnect through redundant paths to the line cards over a passive backplane. Control cards, line cards, power supplies and fan tray are all hot-swappable, to minimize downtime when performing maintenance or upgrading the system.

To provide a high-speed solution where recovery occurs within as little as 50ms, SwitchBlade x8100 Series switches can be deployed in a ring-based topology, with the protected ring running at up to 40Gbps. This high performing resilient design for distributed networks is made possible with Allied Telesis EPSRing™ (Ethernet Protection Switched Ring) technology.

Scalable

The choice of 6 and 12-slot chassis versions provides a powerful solution for networks of all sizes, and both versions share the same fully featured AlliedWare Plus™ Operating System.

To expand the SwitchBlade x8100 system to encompass large networks, including stacking two chassis with VCStack Plus™, the CFC400 control cards can be replaced with CFC960 control cards, while retaining all existing line cards.

The modular SBx81XLEM line card is extremely flexible, supporting 40, 10 and 1 Gigabit Ethernet options. It also offers increased L2 and L3 table sizes for large core applications.

There are three 24-port Gigabit line cards available: copper, PoE+, and fiber (SFP).

Power over Ethernet Plus (PoE+)

SwitchBlade x8100 Series switches support IEEE 802.3at PoE+ (30W). The greater power supplied by PoE+ supports devices such as pan, tilt and zoom IP surveillance cameras, IP video phones, and wireless access points.

Environmentally friendly



SwitchBlade x8100 Series switches are designed to reduce power consumption and minimize hazardous waste. Features include high efficiency power supplies and low power chip sets. An ECO-Switch button on the front panel allows additional power conservation, by turning off all diagnostic LED indicators when they are not required.



Key Features

- ▶ Allied Telesis Autonomous Management Framework™ (AMF)
- ▶ AMF secure mode
- ▶ EPSR™ and G.8032 Ring Protection
- ▶ 40G Ethernet with the SBx81XLEM line card
- ▶ Active Fiber Monitoring
- ▶ VLAN Mirroring (RSPAN)



Key Features

Allied Telesis Autonomous Management Framework™ (AMF)

- ▶ Allied Telesis Autonomous Management Framework (AMF) 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.
- ▶ Any SwitchBlade x8100 Series switch can operate as the AMF network master, storing firmware and configuration backups for all other network nodes. The AMF master enables auto-provisioning and auto-upgrade by providing appropriate files to new network members. New network devices can be pre-provisioned making installation easy because no on-site configuration is required.
- ▶ AMF secure mode encrypts all AMF traffic, provides unit and user authorization, and monitors network access to greatly enhance network security.
- ▶ 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 CFC400 can manage AMF networks of up to 80 nodes, which can be located locally or across WAN links.

Ethernet Protection Switched Ring (EPSRing™)

- ▶ EPSRing combines with 40G or 10G Ethernet to allow several switches to form high-speed protected rings capable of recovery within as little as 50ms. This feature is perfect for high performance and high availability 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.

Access Control Lists (ACLs)

- ▶ AlliedWare Plus™ delivers industry-standard access control functionality with ACLs. ACLs filter network traffic to control whether routed packets are forwarded or blocked at the port interface. This provides a powerful network security mechanism to select the types of traffic to be analyzed, forwarded, or otherwise influenced.

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.

Industry-leading Quality of Service (QoS)

- ▶ Comprehensive low-latency wirespeed 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 such as voice and video take precedence over non-essential services such as file downloads, maintaining responsiveness of enterprise applications.

Power over Ethernet Plus (PoE+)

- ▶ With PoE, a separate power connection to media end points such as IP phones and wireless access points is not necessary. PoE+ provides even greater flexibility, providing the capability to connect devices requiring more power (up to 30 Watts)—for example, tilt and zoom security cameras.

Ease of management

- ▶ The AlliedWare Plus operating system incorporates an industry standard CLI, facilitating intuitive manageability.
- ▶ Configuration tasks can be automated since commands may be used in scripts. Triggers can also be utilized. These provide a powerful mechanism for automatic and timed management, by automating command execution in response to specific events.
- ▶ With three distinct user modes, the CLI is very secure, and the use of encrypted remote login sessions ensures CLI access is not compromised.
- ▶ A web-based Graphical User Interface (GUI) simplifies management and monitoring

VLAN Mirroring (RSPAN)

- ▶ VLAN mirroring allows traffic from a port on a remote switch to be analysed locally. Traffic being transmitted or received on the port is duplicated and sent across the network on a special VLAN.

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.

sFlow

- ▶ sFlow is an industry standard technology for monitoring high-speed switched networks. It gives 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.

Optical DDM

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

Active Fiber Monitoring

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

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.

Tri-authentication

- ▶ Authentication options on SwitchBlade x8100 switches also include alternatives to IEEE 802.1x port-based authentication, such as Web authentication to enable guest access, and MAC authentication for end points that do not have an IEEE 802.1x supplicant. All three authentication methods—IEEE 802.1x, MAC-based and Web-based—can be enabled simultaneously on the same port. This is called tri-authentication.

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.

Microsoft Network Load Balancing (MS NLB) Support

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

Key Solutions

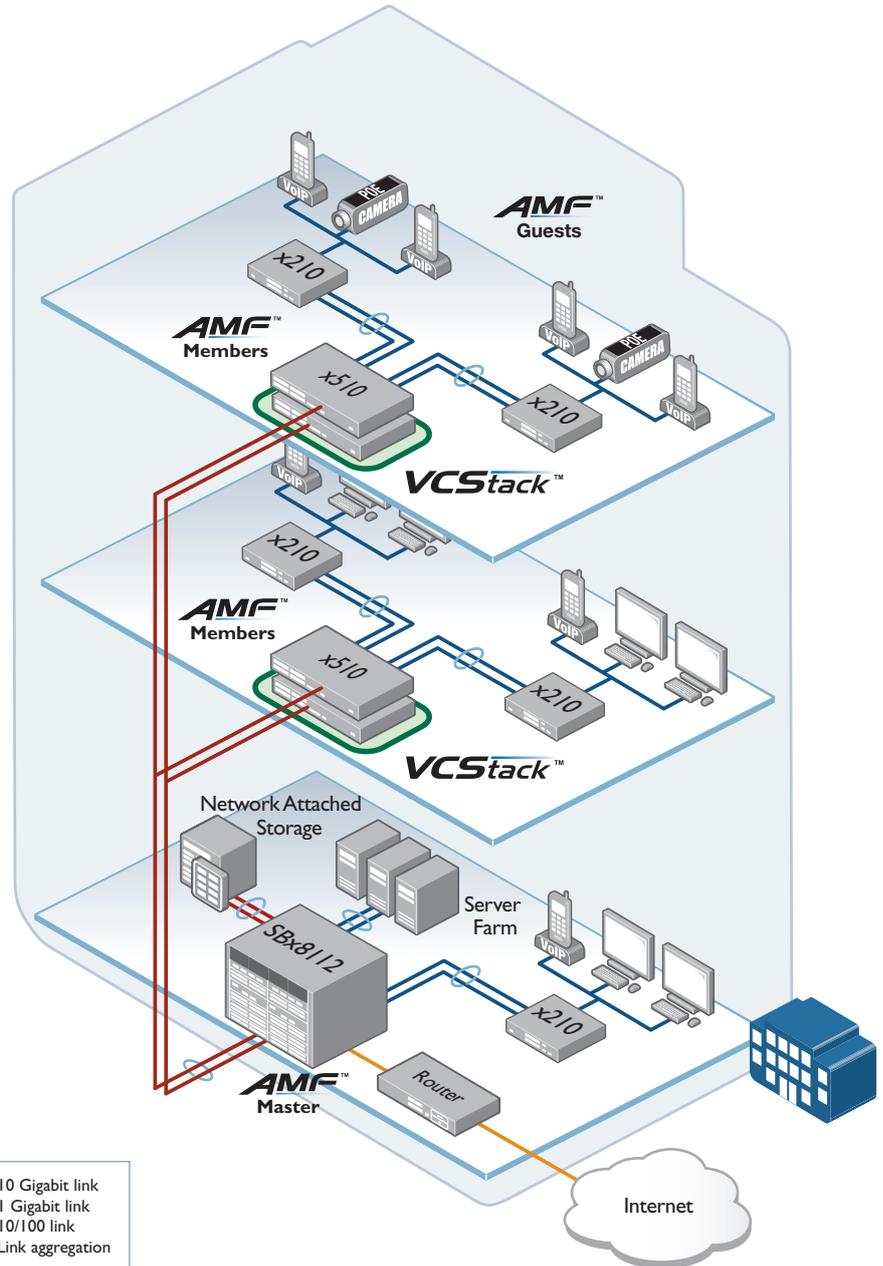
Network core resiliency

The convergence of network services in the enterprise has led to increasing demand for high performing networks with minimal downtime. In this solution, a SwitchBlade x8112 with dual CFC400 control cards provides a powerful network core with extremely high reliability. PSU redundancy ensures maximum uptime, while hot-swappable PSUs, fan tray, control and line cards allow for system maintenance or reconfiguration with no network interruption.

Real-time applications like VoIP and streaming video are assured premium service on the network, as near hitless failover between the dual control cards on the SwitchBlade x8112 means there is no perceptible disruption in the case of a problem.

Link aggregation across line cards to servers, network storage, and distribution switches leaves no single point of failure in this high performing network core.

AMF allows the whole network to be managed as a single virtual entity, with plug-and-play expansion and zero-touch recovery. With AMF Guestnode, IP phones and security cameras are also part of the AMF network.

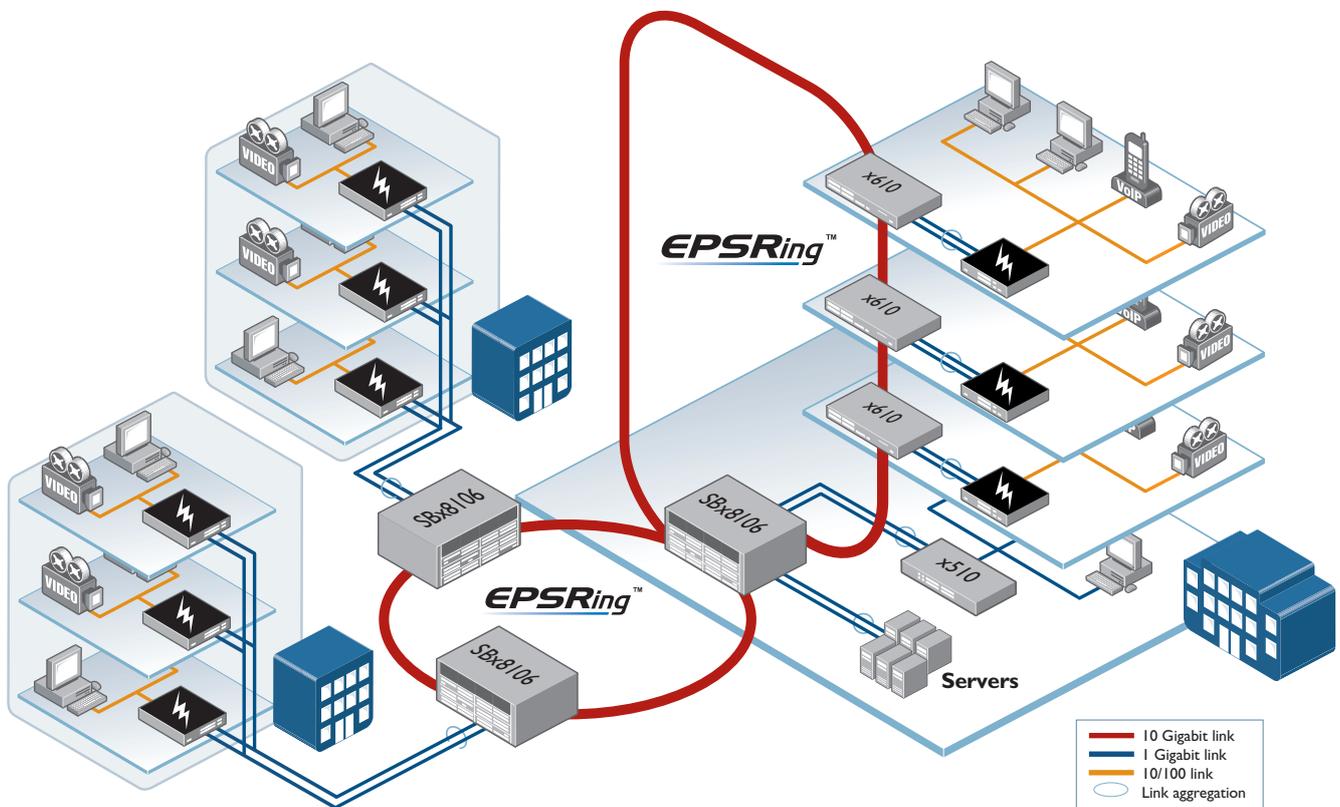


Key Solutions

Distributed network with EPSRing

Wherever a distributed network design is required, Allied Telesis Ethernet Protection Switched Ring (EPSRing) with the SwitchBlade x8106 is ideal, providing high-speed 10GbE connectivity. Failover in a little as 50ms prevents a node or link failure from affecting customer experience, even when using demanding applications such as IP telephony and video monitoring.

This is the ideal solution for ensuring continual access to online resources and applications in a multi-building business. 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. This advanced self-healing network technology meets today's constant demand for information.



Product Specifications

AT-SBx81CFC400 (Controller Fabric Card)

- ▶ 512MB SDRAM
- ▶ 512KB NVRAM
- ▶ 128MB flash memory
- ▶ Up to 32K MAC addresses¹
- ▶ Up to 8K multicast entries (with SBx81XLEM)¹
- ▶ Up to 2K multicast entries (with other line cards)¹
- ▶ 24Mbit packet buffer memory
- ▶ Supports 10KB jumbo packets
- ▶ 4K VLANs

AT-SBx81GP24 (24 x 10/100/1000T PoE+ line card)

AT-SBx81GT24 (24 x 10/100/1000T line card)

- ▶ 12Mbit packet buffer memory

AT-SBx81GS24a (24 x 100/1000 SFP line card)

- ▶ 24Mbit packet buffer memory

AT-SBx81XLEM (12 x 100/1000 SFP, 1 module slot line card)

- ▶ 32Mbit packet buffer memory

Reliability

- ▶ Modular AlliedWare Plus operating system
- ▶ Redundant controller fabric cards
- ▶ Redundant 1200W AC or DC system power supplies
- ▶ Load-sharing 1200W PoE+ power supplies
- ▶ Full environmental monitoring of PSUs, fans, temperature and internal voltages. SNMP traps alert network managers in case of failure
- ▶ Over-temperature monitoring and shut-down

Expandability

- ▶ High-speed line slots support any mix of hot-swappable cards for port flexibility and application versatility
- ▶ A line card can be installed in the second CFC slot of the SBx8106 chassis for extra port density
- ▶ Premium license option for additional features
- ▶ AMF Master license option for 40 and 80 node networks

Flexibility and Compatibility

- ▶ Gigabit SFP ports will support any combination of Allied Telesis SFP modules listed in this document under Ordering Information
- ▶ 10G SFP+ ports will support any combination of Allied Telesis SFP+ modules and direct attach cables listed in this document under Ordering Information

Diagnostic Tools

- ▶ Active Fiber Monitoring detects tampering on optical links
- ▶ Cable fault locator (TDR)
- ▶ UniDirectional Link Detection (UDLD)
- ▶ Hardware health monitoring
- ▶ Automatic link flap detection and port shutdown
- ▶ Optical Digital Diagnostic Monitoring (DDM)
- ▶ Connectivity Fault Management (CFM)
- ▶ Continuity Check Protocol (CCP) for use with G.8032 ERPS

- ▶ Ping polling and TraceRoute for IPv4 and IPv6
- ▶ Port mirroring
- ▶ VLAN mirroring (RSPAN)

IPv4 Features

- ▶ Black hole routing
- ▶ Directed broadcast forwarding
- ▶ DNS relay
- ▶ Policy-based routing
- ▶ Equal Cost Multi Path (ECMP) routing
- ▶ Route maps and route redistribution (OSPF, BGP, RIP)
- ▶ Static unicast and multicast routes for IPv4
- ▶ UDP broadcast helper (IP helper)

IPv6 Features

- ▶ DHCPv6 relay, DHCPv6 client
- ▶ DNSv6 relay, DNSv6 client
- ▶ IPv4 and IPv6 dual stack
- ▶ IPv6 QoS and hardware ACLs
- ▶ Device management over IPv6 networks with SNMPv6, Telnetv6, SSHv6 and Syslogv6
- ▶ NTPv6 client and server
- ▶ Static unicast and multicast routes for IPv6

Management

- ▶ Allied Telesis Management Framework (AMF) enables powerful centralized management and zero-touch device installation and recovery
- ▶ Try AMF for free with the built-in AMF Starter license
- ▶ 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 on the CFC front panel for ease of access
- ▶ Powerful CLI scripting engine and built-in text editor
- ▶ Comprehensive SNMP MIB support for standards-based device management
- ▶ Management via Telnet or SSH to CLI, or HTTP to web interface (GUI)
- ▶ 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 (QoS)

- ▶ 8 priority queues with a hierarchy of high priority queues for real time traffic, and mixed scheduling, for each switch port
- ▶ Limit bandwidth per port or per traffic class down to 64kbps
- ▶ Wirespeed traffic classification with low latency essential for VoIP and real-time streaming media applications
- ▶ Policy-based QoS based on VLAN, port, MAC and general packet classifiers
- ▶ Policy-based storm protection
- ▶ Taildrop for queue congestion control
- ▶ Strict priority, weighted round robin or mixed scheduling
- ▶ IP precedence and DiffServ marking based on layer 2, 3 and 4 headers
- ▶ DSCP remarking based on TCP/UDP port number

Resiliency Features

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

Security Features

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

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: -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: 3,048 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) – AC models only

Safety

- ▶ Standards: UL60950-1, CAN/CSA-C22.2 No. 60950-1-03, EN60950-1, EN60825-1, AS/NZS 60950.1
- ▶ Certification: UL, cUL, TUV

¹ Depending on selected configuration

Restrictions on Hazardous Substances (RoHS) compliance

- ▶ EU RoHS compliant
- ▶ China RoHS compliant

Standards and Protocols

AlliedWare Plus Operating System

Version 5.4.8-2

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

- IEEE 802.2 Logical Link Control (LLC)
- IEEE 802.3 Ethernet
- IEEE 802.3ab1000BASE-T
- IEEE 802.3ae10 Gigabit Ethernet
- IEEE 802.3af Power over Ethernet (PoE)
- IEEE 802.3an10GBASE-T
- IEEE 802.3at Power over Ethernet plus (PoE+)
- IEEE 802.3azEnergy Efficient Ethernet (EEE)
- IEEE 802.3ba40GBASE-X
- IEEE 802.3u 100BASE-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 3056 Connection of IPv6 domains via IPv4 clouds
- RFC 3484 Default address selection for IPv6
- RFC 3596 DNS extensions to support IPv6
- RFC 4007 IPv6 scoped address architecture
- RFC 4193 Unique local IPv6 unicast addresses
- RFC 4291 IPv6 addressing architecture
- RFC 4443 Internet Control Message Protocol (ICMPv6)
- RFC 4861 Neighbor discovery for IPv6
- RFC 4862 IPv6 Stateless Address Auto-Configuration (SLAAC)
- RFC 5014 IPv6 socket API for source address selection
- RFC 5095 Deprecation of type 0 routing headers in IPv6
- RFC 5175 IPv6 Router Advertisement (RA) flags option
- RFC 6105 IPv6 Router Advertisement (RA) guard

Management

- AMF MIB and SNMP traps
- AT Enterprise MIB
- Optical DDM MIB
- SNMPv1, v2c and v3
- IEEE 802.1ABLink 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 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 SNMPv2 MIB for TCP using SMIv2
- RFC 4113 SNMPv2 MIB for UDP using SMIv2
- RFC 4188 Definitions of managed objects for bridges
- RFC 4292 IP forwarding table MIB
- RFC 4293 SNMPv2 MIB for IP using SMIv2
- RFC 4318 Definitions of managed objects for bridges with RSTP
- RFC 4560 Definitions of managed objects for remote ping, traceroute and lookup operations
- RFC 5424 Syslog protocol
- RFC 6527 Definitions of managed objects for VRRPv3

Multicast Support

- Bootstrap Router (BSR) mechanism for PIM-SM
- IGMP query solicitation
- IGMP snooping (v1, v2 and v3)
- IGMP snooping fast-leave
- IGMP/MLD multicast forwarding (IGMP/MLD proxy)
- MLD snooping (v1 and v2)
- PIM-SM and SSM for IPv6
- RFC 1112 Host extensions for IP multicasting (IGMPv1)
- RFC 2236 Internet Group Management Protocol v2 (IGMPv2)
- RFC 2710 Multicast Listener Discovery (MLD) for IPv6
- RFC 2715 Interoperability rules for multicast routing protocols
- RFC 3376 IGMPv3
- RFC 3810 Multicast Listener Discovery v2 (MLDv2) for IPv6
- 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
- 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
- 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 3246 DiffServ Expedited Forwarding (EF)

Resiliency Features

- ITU-T G.8032 / Y.1344 Ethernet Ring Protection Switching (ERPS)
- IEEE 802.1AXLink 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 802.3adStatic 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, Authentication, Authorization (AAA)
- IEEE 802.1X authentication protocols (TLS, TTLS, PEAP and MD5)
- IEEE 802.1X multi-suplicant authentication
- IEEE 802.1X port-based network access control
- RFC 2560 X.509 Online Certificate Status Protocol (OCSP)
- RFC 2818 HTTP over TLS ("HTTPS")

- RFC 2865 RADIUS authentication
- RFC 2866 RADIUS accounting
- RFC 2868 RADIUS attributes for tunnel protocol support
- RFC 2986 PKCS #10: certification request syntax specification v1.7
- 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 Transport Layer Security (TLS) v1.2
- RFC 5280 X.509 certificate and Certificate Revocation List (CRL) profile
- RFC 5425 Transport Layer Security (TLS) transport mapping for Syslog
- RFC 5656 Elliptic curve algorithm integration for SSH
- RFC 6125 Domain-based application service identity within PKI using X.509 certificates with TLS
- RFC 6614 Transport Layer Security (TLS) encryption for RADIUS
- RFC 6668 SHA-2 data integrity verification for SSH

- 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 and port
- IEEE 802.3acVLAN tagging

Voice over IP (VoIP)

- LLDP-MED ANSI/TIA-1057
- Voice VLAN

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

Physical specifications

Product	Dimensions (WxDxH)	Weight (kg/lbs)	Package dimensions (WxDxH)	Package weight (kg/lbs)
SBx8112 chassis	48.0 x 38.8 x 31.0 cm	17.8 kg (39.1 lb)	58.2 x 50.6 x 50.6 cm	22.5 kg (49.6 lb)
SBx8106 chassis	48.0 x 38.8 x 17.6 cm	14.4 kg (31.8 lb)	58.2 x 50.6 x 50.6 cm	18.1 kg (39.9 lb)
SBx81CFC400 controller fabric card	38.1 x 27.1 x 10.1 cm	1.1 kg (2.4 lb)	38.1 x 27.1 x 10.0 cm	1.6 kg (3.5 lb)
SBx81GP24 PoE+ line card	20.7 x 31.3 x 4.1 cm	1.1 kg (2.3 lb)	38.1 x 27.1 x 10.0 cm	1.5 kg (3.3 lb)
SBx81GT24 line card	20.7 x 31.3 x 4.1 cm	1.1 kg (2.3 lb)	38.1 x 27.1 x 10.0 cm	1.4 kg (3.1 lb)
SBx81GS24a SFP line card	20.7 x 31.3 x 4.1 cm	1.1 kg (2.3 lb)	38.1 x 27.1 x 10.0 cm	2.0 kg (4.4 lb)
SBx81XLEM 40G modular line card	20.7 x 31.3 x 4.1 cm	1.1 kg (2.3 lb)	38.1 x 27.1 x 10.0 cm	2.0 kg (4.4 lb)
SBxPWRSYS2 AC system PSU	10.2 x 32.2 x 4.3 cm	2.8 kg (6.1 lb)	32.6 x 42.1 x 17.7 cm	3.5 kg (7.7 lb)
SBxPWRSYS1-80 DC system PSU	10.2 x 32.2 x 4.3 cm	2.8 kg (6.1 lb)	32.6 x 42.1 x 17.7 cm	3.9 kg (8.6 lb)
SBxPWRPOE1 PoE+ power supply	10.2 x 32.2 x 4.3 cm	2.7 kg (6.0 lb)	32.6 x 42.1 x 17.7 cm	3.9 kg (8.7 lb)
SBxFAN12 fan tray	2.7 x 33.4 x 26.0 cm	1.8 kg (4.0 lb)	21.0 x 42.9 x 11.3 cm	2.9 kg (6.4 lb)
SBxFAN06 fan tray	2.6 x 29.8 x 10.3 cm	0.86 kg (1.9 lb)	35.4 x 42.9 x 11.3 cm	1.8 kg (3.9 lb)

PoE power provisioning

Maximum number of ports that can be powered (with 2 x AT-SBxPWRPOE1 installed)

	PoE Power	Class 3 (15.4W)	Class 4 (30W)
PSUs in redundant mode	1200W	77	40
PSUs in boost mode	2400W	155	80

Power consumption

	Maximum	Heat dissipation
SBx81CFC400	48.3W	164.8 BTU/hr
SBx81GP24	34.4W	117.4 BTU/hr
SBx81GT24	34.4W	117.4 BTU/hr
ASBx81GS24a	56.3W	192.1 BTU/hr
SBx81XLEM	44.0W	150.1 BTU/hr
SBx81XLEM (+ module)	65.0W	221.8 BTU/hr

Power efficiency

Maximum power supply efficiency (based on 100V input voltage)

SBxPWRSYS2	78.4% (100% load)
	81.8% (50% load)
SBxPWRPOE1	81.3% (100% load)
	83.6% (50% load)

Power characteristics

- Voltage: 100-240V AC (10% auto-ranging)
- Frequency: 50/60 Hz
- Maximum current: 16A @ 100V

Chassis switching fabric

	2 x CFC400
SBx8112	800Gbps
SBx8106	320Gbps

Control and line card switching capacity and forwarding rates (per card)

	Switching capacity	Forwarding rate
SBx81XLEM (+module)	184 Gbps	137 Mpps
SBx81GT24	48Gbps	36Mpps
SBx81GP24	48Gbps	36Mpps
SBx81GS24a	48Gbps	36Mpps

Latency

Measured in microseconds (µs) at 64byte framesize

	10Mbit	100Mbit	1000Mbit
SBx81GP24	36.0 µs	5.6 µs	2.6 µs
SBx81GT24	36.0 µs	5.6 µs	2.6 µs
SBx81GS24a	38.5 µs	7.0 µs	2.8 µs
SBx81XLEM (base)		6.3 µs	3.5 µs
SBx81XLEM/GT8		6.0 µs	5.5 µs
SBx81XLEM/XT4	6.5 µs (10Gbit)		
SBx81XLEM/XS8	1.7 µs (10Gbit)		
SBx81XLEM/XQ2	1.7 µs (40Gbit)		

Feature licenses

NAME	DESCRIPTION	INCLUDES
AT-FL-CFC400-01³	AT-SBx8100 Premium License	<ul style="list-style-type: none"> ▶ OSPF² (5,000 routes) ▶ BGP4² (5,000 routes) ▶ PIMv4-SM, DM, SSM ▶ VLAN double tagging (Q-in-Q) ▶ RIPvng (1,000 routes) ▶ OSPFv3 (1,000 routes) ▶ BGP4+ for IPv6 (1,000 routes) ▶ MLDv1 & v2 ▶ PIMv6-SM, SSM ▶ RADIUS-Full ▶ UDLD
AT-FL-CF4-AM40-1YR³	AMF Master License	▶ AMF Master 40 nodes for 1 year
AT-FL-CF4-AM40-5YR³	AMF Master License	▶ AMF Master 40 nodes for 5 years
AT-FL-CF4-AM80-1YR³	AMF Master License	▶ AMF Master 80 nodes for 1 year
AT-FL-CF4-AM80-5YR³	AMF Master License	▶ AMF Master 80 nodes for 5 years
AT-FL-CF4-8032	ITU-T G.8032 license	<ul style="list-style-type: none"> ▶ G.8032 ring protection ▶ Ethernet CFM

² 64 OSPF and BGP routes included in base license

³ Only a single license is required per chassis. This is automatically synchronized to the second control card



Power cords are only shipped with AT-SBxPWRSYS2 or AT-SBxPWRPOE1 power supplies.
Note: Power entry connector is IEC 60320 C19 (High capacity)

Ordering Information

AT-SBx8112-96POE+

- 96-port PoE+ starter bundle
- 1 x AT-SBx8112 chassis
- 1 x AT-SBx81CFC400 controller fabric card
- 4 x AT-SBx81GP24 PoE+ line card
- 1 x AT-SBxPWRSYS1 system power supply
- 1 x AT-SBxPWRPOE1 PoE power supply

AT-SBx8112-12XR

- 12-port 10G resiliency starter bundle
- 1 x AT-SBx8112 chassis
- 2 x AT-SBx81CFC400 controller fabric card
- 2 x AT-SBx81XS6 SFP+ Ethernet line card
- 2 x AT-SBxPWRSYS1 system power supply

AT-SBx8112

Rack mount 12-slot chassis with fan tray

AT-SBx8106

Rack mount 6-slot chassis with fan tray

AT-SBx8112

Contains four fans, temperature sensors and controller board for SBx8112 chassis

AT-SBx8106

Contains two fans, temperature sensors and controller board for SBx8106 chassis

AT-SBx81CFC400

400Gbps Controller fabric card

AT-SBx81GP24

24-port 10/100/1000T PoE+ Ethernet line card

AT-SBx81GT24

24-port 10/100/1000T Ethernet line card

AT-SBx81GS24a

24-port 100/1000X SFP Ethernet line card

AT-SBx81XLEM

Modular 40G line card with 12 x 100/1000X SFP

AT-SBx81XLEM/Q2

2 x 40G QSFP+ expansion module for SBx81XLEM

AT-SBx81XLEM/XS8

8 x 1/10G SFP+ expansion module for SBx81XLEM

AT-SBx81XLEM/XT4

4 x 1/10G RJ45 expansion module for SBx81XLEM

AT-SBx81XLEM/GT8

8 x 1G RJ45 expansion module for SBx81XLEM

AT-SBxPWRSYS2-xx

1200W AC system power supply

AT-SBxPWRSYS1-80

1200W DC system power supply

AT-SBxPWRPOE1-xx

1200W AC PoE+ power supply

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

Accessories

40G QSFP+ Modules

AT-QSFPLR4

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

AT-QSFPSR4

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

AT-QSFPSR

40GSR 850nm short-haul up to 150 m with MMF

AT-MTP12-1

MTP optical cable for AT-QSFPSR, 1 m

AT-MTP12-5

MTP optical cable for AT-QSFPSR, 5 m

AT-QSF P1CU

QSFP+ direct attach cable 1 m

AT-QSFP3CU

QSFP+ direct attach cable 3 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 copper⁴

⁴ Using Cat 6a/7 cabling



AT-SPFXBD-LC-13

100BX Bi-Di (1310 nm Tx, 1550 nm Rx) fiber up to 10 km

AT-SPFXBD-LC-15

100BX Bi-Di (1550 nm Tx, 1310nm Rx) fiber up to 10 km

AT-SPTX

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-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-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 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

SFP modules

AT-SPFX/2

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

AT-SPFX/15

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