SwitchBlade® x8100 Series

With CFC960 Controller

Next generation intelligent Layer 3+ chassis switches

Allied Telesis SwitchBlade x8100 Series Layer 3+ chassis switches, with CFC960 control cards, guarantee high performance for the large enterprise network core. Available in 6 and 12 slot models, with the ability to stack two chassis into a single virtual unit, the CFC960 based system combines resilience and scalability in a superior solution.

CFC960 | AlliedWare Plus OPERATING SYSTEM | IPv6 READY

High performing

The SwitchBlade x8100 Series offers an extensive range of 40, 10 and 1 Gigabit connectivity options. The CFC960 control card provides powerful processing ability ideal for the large network core, and incorporates four 10GbE ports. Dual active/active CFC960 control cards provide chassis resilience, and up to 160Gbps throughput to each line card slot for maximum performance and wirespeed data delivery.

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.

Total reliability

For resiliency against network failures, two chassis can be stacked together into a single virtual unit using VCStack Plus™. This creates a powerful and completely resilient network core, which can even be distributed over long distance.

The SwitchBlade x8100 Series switches operate with a single AC or DC PSU. Installing a second load-sharing PSU provides complete power redundancy.

To minimize downtime when maintaining or upgrading the system, In-Service Software Upgrade can be used to upgrade software without interrupting network traffic, and control cards, line cards, power supplies and the fan tray are all hot-swappable.

Scalable

Both the 6- and 12-slot chassis options provide a powerful network solution. VCStack Plus uses the 10 Gigabit ports on the CFC960 control cards to allow two chassis to combine as a single virtual unit.

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.

The 6-port and 16-port 10 Gigabit (SFP+) line cards provide high-speed downlink connectivity.

There are three 24-port Gigabit line cards available: copper, PoE+, and fiber (SFP). The 40-port Gigabit copper line card maximizes port density, providing up to 400 Gigabit copper ports in a single 7RU SwitchBlade x8112 chassis, or 200 Gigabit copper ports in a single 4RU SwitchBlade x8106 chassis.

PoE plus

Environmentally friendly

eco 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 allows additional power conservation, by turning off all diagnostic LED indicators when they are not required.

New Features

- AMF secure mode
- New SBx81XLEM/GT8 line card module
- Large tables support with XLEM line card
- Active Fiber Monitoring
- VLAN Mirroring (RSPAN)
- VLAN ACLs

VCStack PLUS™ | AMF™ | EPSRing™ | ACTIVE Fiber Monitoring™

Key Features

VCStack Plus™

- Two SwitchBlade x8100 chassis can be stacked together into a single virtual unit using VCStack Plus. The stacking link uses the 10 Gigabit front panel ports on the CFC960 control cards, which provides a massive 160 Gigabits of stacking bandwidth. VCStack Plus provides a highly available system where network resources and distribution switches are connected across the units for ultimate resiliency. Management is simplified as the two chassis operate as a single virtual unit.

Long-distance VCStack Plus

- As the VCStack Plus links are fiber, the two chassis do not need to be collocated, but can be kilometres apart - perfect for a distributed network environment, or data-mirroring solution.

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.

AMF Controller

- The CFC960 can manage AMF networks of up to 120 nodes, which can be located locally or across WAN links. This can be dramatically increased by installing the AMF Controller, which enables multiple AMF Masters to be managed from a single point. With the AMF Controller, a network of over 7,000 devices can be managed, allowing all the time saving, cost reducing benefits of AMF to be multiplied and efficiencies to be increased.

In-Service Software Upgrade (ISSU)

- ISSU (also called "hitless firmware upgrade") allows firmware to be updated without causing any network disruption from a device reboot. This enables essential maintenance to be performed when it is required rather than having to schedule a network outage or tolerate any loss of service. ISSU is supported on dual controller systems and can be used in conjunction with VCStack Plus, making it ideal for high availability applications.

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 on the CFC960 supports both unicast and multicast traffic.

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.

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 influenced in some way.

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 as commands may be used in scripts. Triggers can also be utilized, providing a powerful mechanism for automatic and timed management by automating the execution of commands in response to specific events.
- With three distinct modes, the CLI is very secure, and the use of encrypted remote login sessions ensures CLI access is not compromised.

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.

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.

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.

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.

SBx81CFC960

SBx81XS16

SBx81XLEM with Q2 module

Key Solutions

Complete network core resiliency

Today's large enterprises demand ready access to online resources and applications. These needs require a high performing network, one that can seamlessly carry multiple converged services.

Two SwitchBlade x8112 chassis with dual CFC960 control cards combine to form a single virtual unit with VCStack Plus. This provides a powerful network core, with complete resiliency, and the simplicity of managing just one device. AMF allows the entire network to be unified for management, supporting plug-and-play networking with zero-touch expansion and recovery.

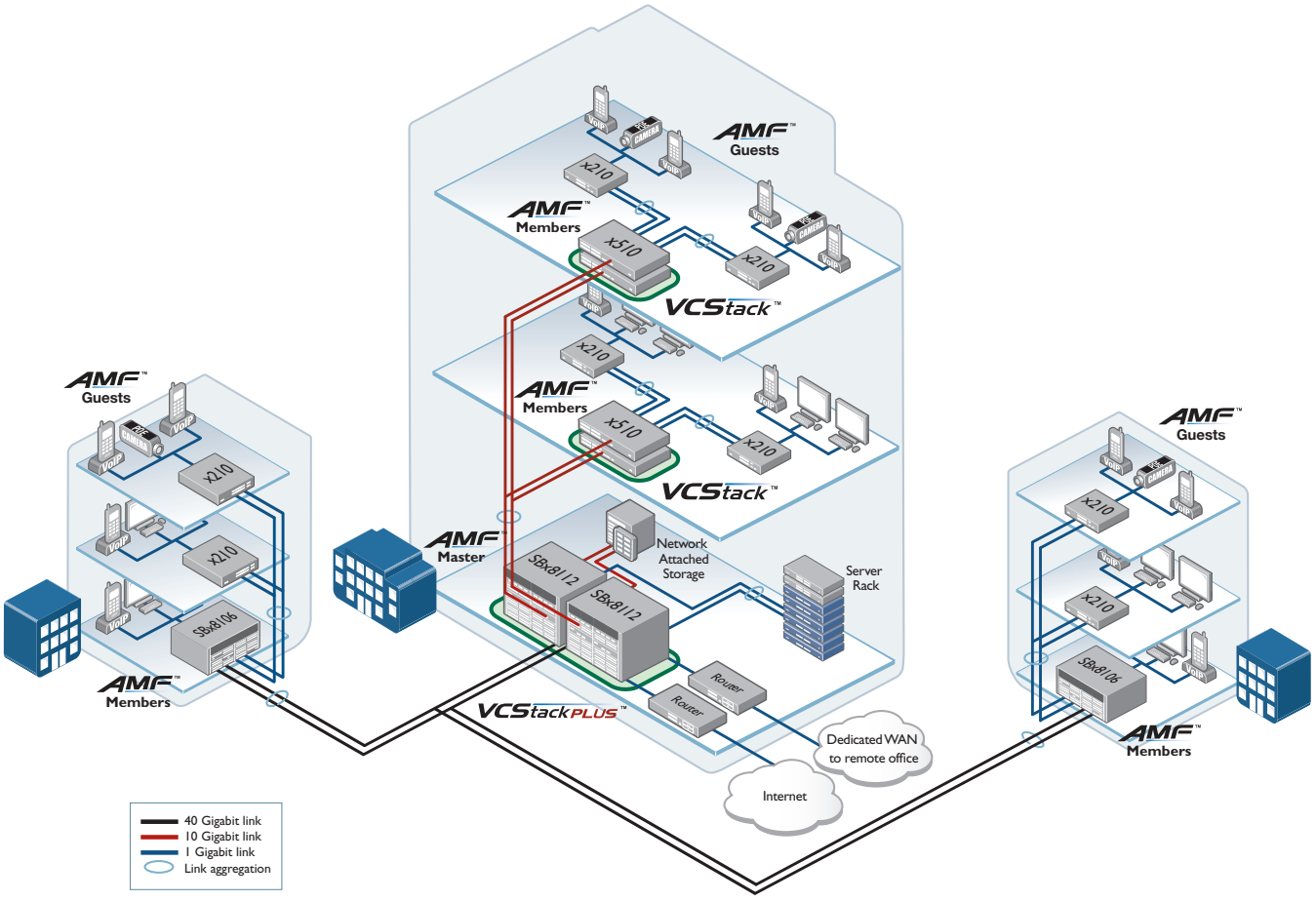
Link aggregation across the two chassis to servers, network storage, and distribution switches leaves no single point of failure in this high performing network core, ensuring device and path resiliency. Each individual chassis has PSU redundancy to ensure maximum uptime.

Hot-swappable PSUs, fan tray, control and line cards allow for system maintenance and reconfiguration with no network interruption.

SwitchBlade x8106 chassis use high-speed 40 Gigabit Ethernet to deliver traffic from other buildings.

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 each SwitchBlade x8112 means there is no perceptible disruption in the case of a problem. Even if a whole chassis is powered down, access to online resources is retained without disruption.

With the benefits of high availability, increased capacity and ease of management, VCStack Plus makes large networks reliable and simple.



Key Solutions

Distributed collapsed backbone

As large businesses spread across multiple buildings, both onsite and across distances, their need for reliable access to online resources and applications grows. Employees expect seamless connectivity to data center services from all business locations.

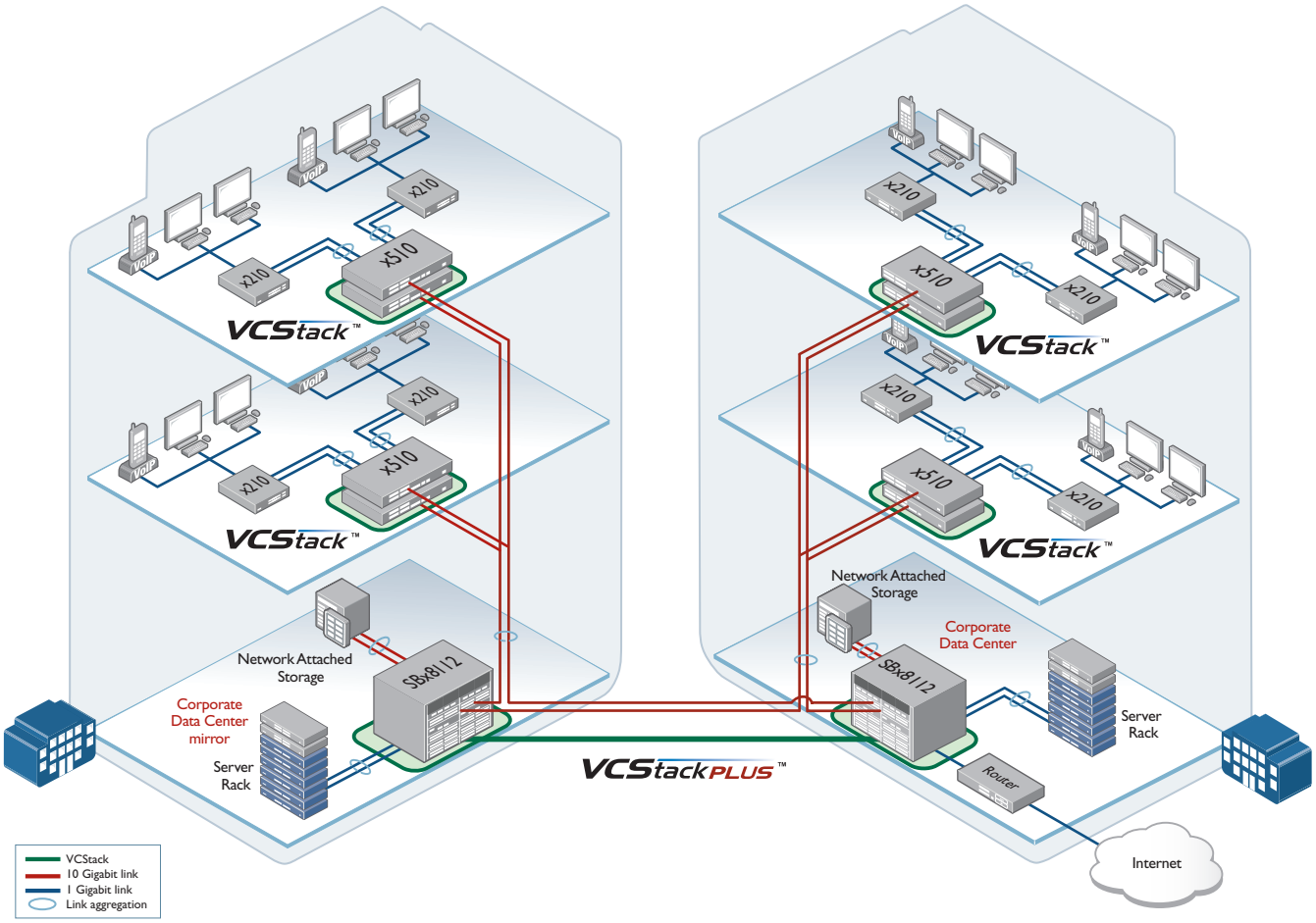
Allied Telesis VCStack Plus allows two SwitchBlade x8100 chassis with dual CFC960 control cards to combine as a single virtual unit. Fiber stacking connectivity means that the two chassis do not have to be collocated, but can be kilometres apart. This provides the complete resiliency of a distributed backbone with separate physical units. It also retains the simplicity of a collapsed backbone network, with only a single virtual core chassis to manage.

The distributed collapsed backbone encompasses the best of both worlds.

With a chassis in two different locations, data center services can be mirrored for 'always-on' access, and to ensure automated disaster recovery. Each individual chassis has power and control resiliency to maximize uptime. Management of the network core remains simple, as the virtual unit formed by the two SBx8100 chassis keeps all switching and routing information completely synchronized, for zero-touch failover.

Long-distance VCStack Plus on the SwitchBlade x8100 with CFC960 control cards makes the distributed collapsed backbone a reality.

Allied Telesis build networks that guarantee data availability for the large enterprise business.



Product Specifications

AT-SBx81CFC960 (Controller Fabric Card)

- 2GB SDRAM
- 512KB NVRAM
- 256MB flash memory
- Up to 128K MAC addresses and 100K routes (with SBx81XLEM)[1]
- Up to 32K MAC addresses and 7K routes (with other line cards)[1]
- 32Mbit packet buffer memory
- Supports 10KB jumbo packets
- 4K VLANs
- 4 x 10GbE ports for stacking or uplinks

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)
AT-SBx81XS6 (6 x 10Gbps SFP+ line card)

- 24Mbit packet buffer memory

AT-SBx81GT40 (40 x 10/100/1000T RJ.5 line card)
AT-SBx81XS16 (16 x 10GbE SFP+ line card)
AT-SBx81XLEM (12 x 100/1000 SFP, 1 module slot line card)

- 32Mbit packet buffer memory

A maximum of 6 x AT-SBx81XS16 line cards can be installed in an SBx8112 chassis, and 5 in an SBx8106 chassis

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

- 160Gbps of stacking bandwidth
- High-speed line slots support any mix of hot-swappable cards for port flexibility
- 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 options for 40, 80 and up to 120 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
- 40G QSFP+ ports will support any combination of Allied Telesis QSFP+ modules and 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)
- Ping polling and TraceRoute for IPv4 and IPv6
- Port and VLAN mirroring (RSPAN)

IPv4 Features

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

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
- IPv6 static unicast and multicast routing

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
- 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
- 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
- Extensive remarking capabilities
- Taildrop for queue congestion control
- Strict priority, weighted round robin or mixed scheduling
- IP precedence and DiffServ marking based on layer 2, 3 and 4 headers
- 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
- EPSRing (Ethernet Protection Switched Rings) with SuperLoop Protection (SLP) and enhanced recovery for extra resiliency
- Loop protection: loop detection and thrash limiting
- PVST+ compatibility mode
- STP root guard
- BPDU forwarding
- VCStack Plus enables two SBx8100 chassis with CFC960 to form a stack for ultimate resiliency and simplified management
- In-Service Software Upgrade provides hitless firmware update to prevent outages during essential maintenance

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
- 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) and Secure File Transfer Protocol (SFTP)
- Strong password security and encryption
- 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

Restrictions on Hazardous Substances (RoHS) Compliance

- EU and China RoHS compliant

Country of Origin

- Indonesia

[1] Depending on selected configuration

Standards and Protocols

AlliedWare Plus Operating System
Version 5.4.7-2

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 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 802.3an 10GBASE-T
IEEE 802.3at Power over Ethernet plus (PoE+)
IEEE 802.3azEnergy Efficient Ethernet (EEE)
IEEE 802.3ba40 Gigabit Ethernet
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 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
AT Enterprise MIB with MIB objects and traps for AMF and VCS+
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/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)

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
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-supplicant 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

Services

RFC 854 Telnet protocol specification
RFC 855 Telnet option specifications
RFC 857 Telnet echo option
RFC 858 Telnet suppress go ahead option
RFC 1091 Telnet terminal-type option
RFC 1350 Trivial File Transfer Protocol (TFTP)
RFC 1985 SMTP service extension
RFC 2049 MIME
RFC 2131 DHCPv4 (server, relay and client)
RFC 2132 DHCP options and BootP vendor extensions
RFC 2554 SMTP service extension for authentication
RFC 2616 Hypertext Transfer Protocol - HTTP/1.1
RFC 2821 Simple Mail Transfer Protocol (SMTP)
RFC 2822 Internet message format
RFC 3046 DHCP relay agent information option (DHCP option 82)
RFC 3315 DHCPv6 (server, relay and client)
RFC 3633 IPv6 prefix options for DHCPv6
RFC 3646 DNS configuration options for DHCPv6
RFC 3993 Subscriber-ID suboption for DHCP relay agent option
RFC 4330 Simple Network Time Protocol (SNTP) version 4
RFC 5905 Network Time Protocol (NTP) version 4

VLAN Support

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

Voice over IP (VoIP)

LLDP-MED ANSI/TIA-1057
Voice VLAN

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)
SBx81CFC960 controller fabric 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)
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)
SBx81GT40 RJ.5 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)
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)
SBx81XS6 SFP+ line card	20.7 x 31.3 x 4.1 cm	0.8 kg (1.8 lb)	38.1 x 27.1 x 10.0 cm	2.0 kg (4.4 lb)
SBx81XS16 SFP+ line card	20.7 x 31.3 x 4.1 cm	1.0 kg (2.2 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
SBx81CFC960	75.0W	255.9 BTU/hr
SBx81GP24	34.4W	117.4 BTU/hr
SBx81GT24	34.4W	117.4 BTU/hr
SBx81GT40	53.9W	183.7 BTU/hr
SBx81GS24a	56.3W	192.1 BTU/hr
SBx81XS6	48.3W	164.8 BTU/hr
SBx81XS16	52.2W	178.1 BTU/hr
SBx81XLEM	44W	150.1 BTU/hr
SBx81XLEM (+ module)	65W	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 CFC960
SBx8112	1.92Tbps
SBx8106	960Gbps

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

	Switching capacity	Forwarding rate
SBx81CFC960	80Gbps	60Mpps
SBx81XLEM (+ module)	184Gbps	137Mpps
SBx81XS6	120Gbps	89Mpps
SBx81XS16	320Gbps	238Mpps
SBx81GT24	48Gbps	36Mpps
SBx81GP24	48Gbps	36Mpps
SBx81GS24a	48Gbps	36Mpps
SBx81GT40	80Gbps	60Mpps

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
SBx81GT40	165.0 µs	20.0 µs	6.0 µs
SBx81GS24a	38.5 µs	7.0 µs	2.8 µs
SBx81XS6	3.1 µs (10Gbit)		
SBx81XS16	3.1 µs (10Gbit)		
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/Q2	1.5 µs (40Gbit)		
SBx81CFC960	2.9 µs (10Gbit)		

Feature licenses

NAME	DESCRIPTION	INCLUDES	STACK LICENSING
AT-FL-CFC960-01[3]	AT-SBx8100 Premium License	▶ OSPF[2] (5K routes or 10K with XLEM) ▶ BGP4[2] (5K routes or 100K with XLEM) ▶ PIMv4-SM, DM, SSM ▶ VLAN double tagging (Q-in-Q) ▶ RIPng (1K routes or 3.5K with XLEM) ▶ OSPFv3 (1K routes or 5K with XLEM) ▶ BGP4+ (1K routes or 50K with XLEM) ▶ MLDv1 & v2 ▶ PIMv6-SM, SSM ▶ RADIUS-Full ▶ VRF-Lite (64 domains) ▶ UDLD	▶ One license per stack member
AT-FL-CF9-VCSPL[3]	VCStack Plus	▶ VCStack Plus for CFC960	▶ One license per stack member
AT-FL-CF9-AM80-1YR[3]	AMF Master License	▶ AMF Master 80 nodes for 1 year	▶ One license per stack
AT-FL-CF9-AM80-5YR[3]	AMF Master License	▶ AMF Master 80 nodes for 5 years	▶ One license per stack
AT-FL-CF9-AM120-1YR[3]	AMF Master License	▶ AMF Master 120 nodes for 1 year	▶ One license per stack
AT-FL-CF9-AM120-5YR[3]	AMF Master License	▶ AMF Master 120 nodes for 5 years	▶ One license per stack
AT-FL-CF9-AM300-1YR[3]	AMF Master License	▶ AMF Master 300 nodes for 1 year	▶ One license per stack
AT-FL-CF9-AM300-5YR[3]	AMF Master License	▶ AMF Master 300 nodes for 5 years	▶ One license per stack
AT-FL-CF9-AC10-1YR[3]	AMF Controller 10	▶ AMF Controller for 10 areas for 1 year	▶ One license per stack
AT-FL-CF9-AC10-5YR[3]	AMF Controller 10	▶ AMF Controller for 10 areas for 5 years	▶ One license per stack
AT-FL-CF9-AC30-1YR[3]	AMF Controller 30	▶ AMF Controller for 30 areas for 1 year	▶ One license per stack
AT-FL-CF9-AC30-5YR[3]	AMF Controller 30	▶ AMF Controller for 30 areas for 5 years	▶ One license per stack
AT-FL-CF9-AC60-1YR[3]	AMF Controller 60	▶ AMF Controller for 60 areas for 1 year	▶ One license per stack
AT-FL-CF9-AC60-5YR[3]	AMF Controller 60	▶ AMF Controller for 60 areas for 5 years	▶ One license per stack

[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

Ordering Information

AT-SBx8112
Rack mount 12-slot chassis with fan tray

AT-SBx8106
Rack mount 6-slot chassis with fan tray

AT-SBxFAN12
Contains four fans, temperature sensors and controller board for SBx8112 chassis

AT-SBxFAN06
Contains two fans, temperature sensors and controller board for SBx8106 chassis

AT-SBx81CFC960
960Gbps Controller fabric card with 4 x 10GbE ports

AT-SBx81GP24
24-port 10/100/1000T PoE+ Ethernet line card

AT-SBx81GT24
24-port 10/100/1000T Ethernet line card

AT-SBx81GT40
40-port 10/100/1000T RJ.5 Ethernet line card

AT-SBx81GS24a
24-port 100/1000X SFP Ethernet line card

AT-SBx81XS6
6-port 10GbE SFP+ Ethernet line card

AT-SBx81XS16
16-port 10GbE 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

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

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-QSFP1CU
QSFP+ direct attach cable 1 m

AT-QSFP3CU
QSFP+ direct attach cable 3 m

10GbE SFP+ modules

(Note that any Allied Telesis 10G SFP+ module can be used for stacking with the 10G ports on the CFC960)

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[4]

[4] Using Cat 6a/7 cabling

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

RJ.5 to RJ-45 cables
For use with AT-SBx81GT40

AT-UTP/RJ.5-100-A-008
RJ.5 to RJ-45 1 m Ethernet cables (pack of 8)

AT-UTP/RJ.5-300-A-008
RJ.5 to RJ-45 3 m Ethernet cables (pack of 8)

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

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-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-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

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