SwitchBlade® x8100 Series

With CFC960 Controller

Next generation intelligent Layer 3+ chassis switches

CFC960 | AlliedWare Plus OPERATING SYSTEM | Rb READY

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.

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 1/10GbE[1] 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™ Plus (AMF Plus) meets the increased management requirements of modern converged networks, automating many everyday tasks including configuration management. AMF Plus 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 Plus secure mode increases network security with management traffic encryption, authorization, and monitoring. AMF Plus Guestnode allows third party devices, such as IP phones and security cameras, to be part of an AMF Plus network.

For individual switches, the Device GUI on the SwitchBlade x8100 Series enables graphical monitoring of key switch features to support easy management.

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 1/10[1] 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 40-port Gigabit (CSFP) line card enables high-density fiber connectivity.

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

Key Features

- Allied Telesis Autonomous Management Framework™ Plus (AMF Plus)
- AMF Security compatible
- EPSR™ and G.8032 Ring Protection
- EPSR Master
- Large tables support with XLEM line card
- Active Fiber Monitoring of fiber data and stacking links
- VLAN Mirroring (RSPAN)
- Upstream Forwarding Only (UFO)
- Bi-directional Forwarding Detection (BFD)
- Multicast Source Discovery Protocol (MSDP)
- Enhanced Transmission Selection (ETS)
- Link Monitoring
- NETCONF/RESTCONF with YANG data modelling
- PFIX (IP Flow Information Export)
- Device GUI for visual management)

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

[1] Gigabit connectivity is only supported on the CFC960v2 running firmware 5.4.9-1 or later

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 1/10[1] 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™ Plus (AMF Plus)

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

Any SwitchBlade x8100 Series switch can operate as the AMF Plus network master, storing firmware and configuration backups for all other network nodes. New network devices can be pre-provisioned making installation easy because no on-site configuration is required.

AMF Plus secure mode encrypts all AMF traffic, provides unit and user authorization, and monitors network access to greatly enhance network security.

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

AMF Plus Controller

The CFC960 can manage AMF plus networks of up to 300 nodes, which can be located locally or across WAN links. This can be dramatically increased by installing the AMF Plus Controller, which enables multiple AMF Plus Masters to be managed from a single point, supporting thousands of devices.

AMF-Security and Application Proxy

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

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. ISSU is supported on dual controller systems and can be used with VCStack Plus for high availability.

Virtual Routing and Forwarding (VRF-Lite)

VRF-Lite provides Layer 3 network virtualization by dividing a single switch into multiple independent virtual routing domains. With independent routing domains, IP addresses can overlap without causing conflict, allowing multiple customers to have their own secure virtual network within the same physical infrastructure. VRF-Lite supports IPv4 and IPv6 unicast and multicast traffic.

The built-in DHCP Server on the CFC960 is VRF aware, enabling the supply of IP addresses to clients across multiple isolated networks.

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. The SwitchBlade x8100 can act as the EPSR Master.

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

G.8032 Ethernet Ring Protection

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

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

Access Control Lists (ACLs)

ACLs filter network traffic to control whether routed packets are forwarded or blocked, and can be applied to a specific port or a VLAN. This provides a powerful network security mechanism to select the types of traffic to be analyzed, forwarded, or influenced in some way.

NETCONF/RESTCONF

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

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.

Enhanced Transmission Selection (ETS) provides quality of service by allocating bandwidth to important traffic classes, with the flexibility to share remaining bandwidth to maximize traffic throughput and performance.

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.

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.

Active Fiber Monitoring

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

IPFIX (IP Flow Information Export)

IPFIX enables exporting IP flow data in a network for analysis. This provides network administrators with information for accounting, billing, capacity planning, and performance optimization.

sFlow

sFlow is an industry-standard technology for monitoring high-speed switched networks. It provides complete visibility into network use, enabling performance optimization, usage accounting/billing, and defense against security threats. Sampled packets sent to a collector (up to 5 collectors can be configured) ensure it always has a real-time view of network traffic.

TACACS+ Command Authorization

TACACS+ Command Authorization offers centralized control over which commands may be issued by each specific AlliedWare Plus device user. It complements authentication and accounting services for a complete AAA solution.

VLAN Translation

VLAN Translation allows traffic arriving on a VLAN to be mapped to a different VLAN on the outgoing paired interface.

Service Providers can provide customer traffic with a unique VLAN-ID for use within the SP’snetwork.

Enterprises can merge two networks together, without reconfiguring VLAN numbering.

Upstream Forwarding Only (UFO)

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

Bi-directional Forwarding Detection (BFD)

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

Multicast Source Discovery Protocol (MSDP)

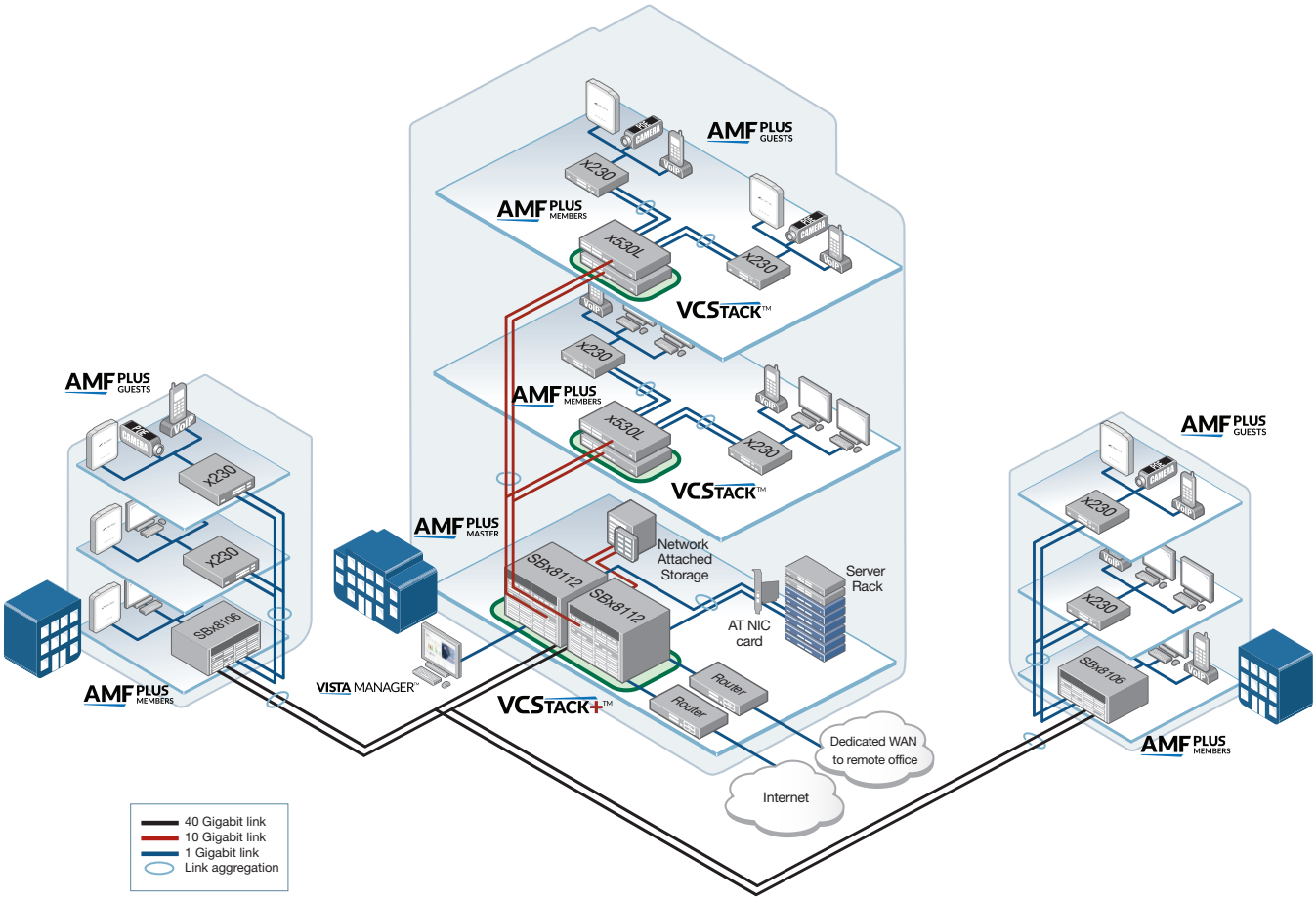
MSDP enables two or more PIM-SM (Sparse Mode) domains to share information on active multicast sources, for more efficient forwarding of multicast traffic.

Link Monitoring (Linkmon)

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

[1] Gigabit connectivity is only supported on the CFC960v2 running firmware 5.4.9-1 or later

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 Plus 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.

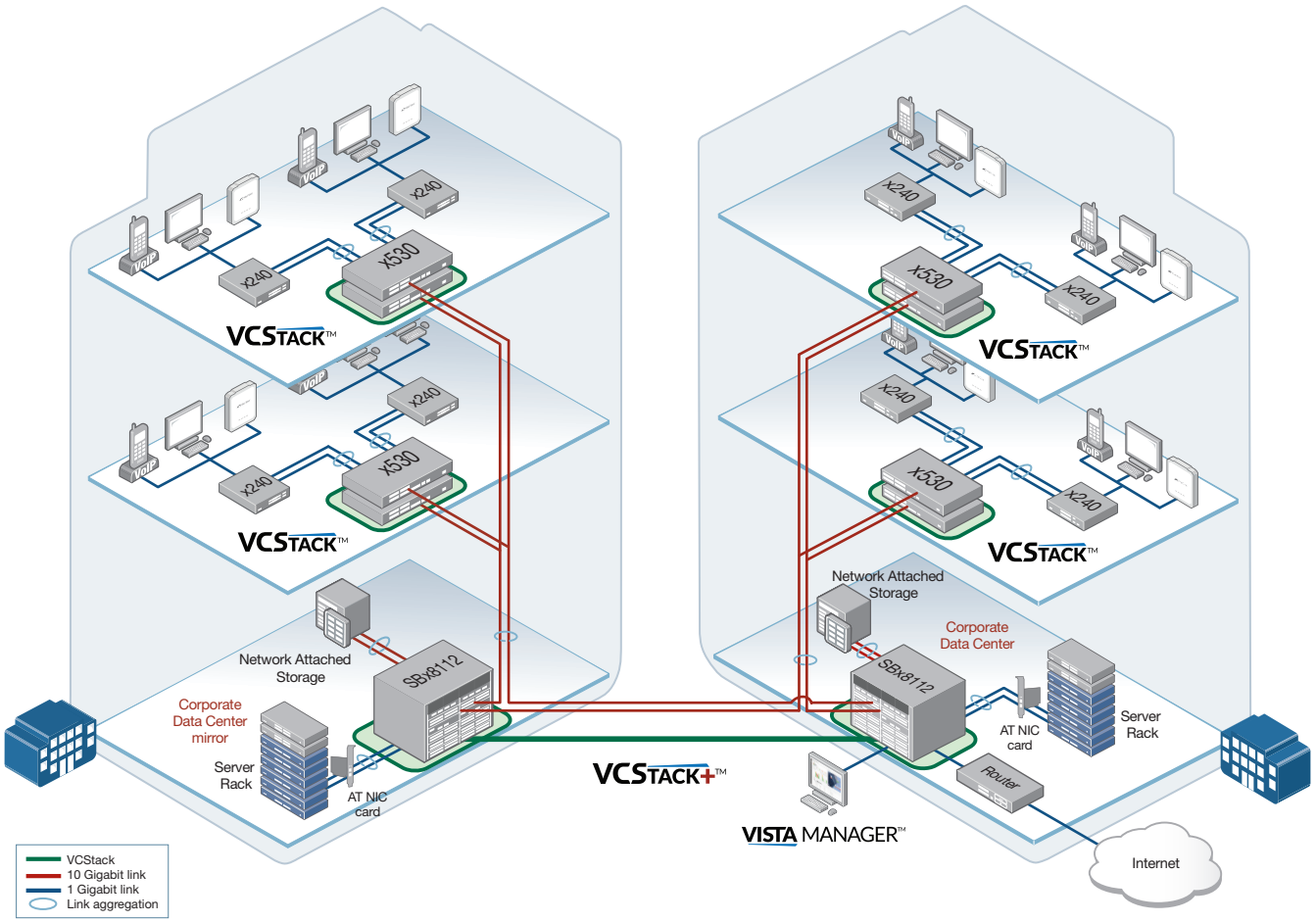
SwitchBlade x8106 chassis use high-speed 40 Gigabit Ethernet to deliver traffic from other buildings.

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.

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

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.

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]
- Up to 8K multicast entries (with SBx81XLEM)[1]
- Up to 2K multicast entries (with other line cards)[1]
- Up to 114 Link Aggregation Groups (LAGS) - any combination of static and dynamic (LACP)
- 32Mbit packet buffer memory
- 10KB L2 and 9KB L3 Jumbo frames
- 4K VLANs
- 4 x 10GbE ports for stacking or uplinks (CFC960v1)[2]
- 4 x 1/10GbE ports for stacking or uplinks (CFC960v2)[2]

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

- 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 Plus licenses support up to 300 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

[2] To use CFC960v2 (or CFC960v2 together with CFC960v1) requires one of the following releases:
- 5.4.7-2.14 or later 5.4.7-2 release
- 5.4.8-2.9 or later 5.4.8-2 release
- 5.4.9-0.6 or later 5.4.9-x release

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 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
- NTP client and server
- IPv6 static unicast and multicast routing
- IPv6 Ready certified
- VRF-Lite

Management

- Autonomous Management Framework Plus (AMF Plus) enables powerful centralized management and zero-touch device installation and recovery
- Try AMF Plus for free with the built-in Starter license (includes network management and automation features, but not Vista Manager AMF Plus features)
- NETCONF/RESTCONF northbound interface with YANG data modelling
- 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
- Enhanced Transmission Selection (ETS)

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
- Bi-directional Forwarding Detection (BFD)
- 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

Security Features

- Access Control Lists (ACLs) based on layer 3 and 4 headers, per VLAN or port
- Configurable ACLs for management traffic
- ACL Groups enable multiple hosts/ports to be included in a single ACL, reducing configuration
- 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
- Learn limits (intrusion detection) for single ports or LAGs
- Private VLANs provide security and port isolation for multiple customers using the same VLAN
- Simple Certificate Enrollment Protocol (SCEP) supports secure management
- Secure Copy (SCP) 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

STANDARDS & PROTOCOLS

AlliedWare Plus Operating System

Version 5.5.6

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 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

AT Enterprise MIB with MIB objects and traps for AMF Plus and VCS+
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 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
RFC 7011 IPFIX: a method of exporting IP flow data in a network for analysis

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 3618 Multicast Source Discovery Protocol (MSDP)
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
IEEE 802.1Qaz Enhanced Transmission Selection (ETS)
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 802.1AXL 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 802.3adStatic and dynamic link aggretion
RFC 5798 Virtual Router Redundancy Protocol version 3 (VRRPv3) for IPv4 and IPv6
RFC5880 Bidirectional Forwarding Detection (BFD)

Routing Information Protocol (RIP)

RFC 1058 Routing Information Protocol (RIP)
RFC 2080 RIPng for IPv6
RFC 2081 RIPng protocol applicability statement
RFC 2082 RIP-2 MD5 authentication
RFC 2453 RIPv2

Security Features

SSH remote login
SSLv2 and SSLv3
TACACS+ Accounting, 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 5176 RADIUS CoA (Change of Authorization)
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 8446 Transport Layer Security (TLS) v1.3
RFC 8894 Simple Certificate Enrollment Protocol (SCEP)

Services

RFC 854 Telnet protocol specification
RFC 855 Telnet option specifications
RFC 857 Telnet echo option
RFC 858 Telnet suppress go ahead option
RFC 1091 Telnet terminal-type option
RFC 1350 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) (port-based and VLAN-based 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

Physical Specifications

	Width	Depth	Height	Weight	Package Width	Package Depth	Package Height	Package Weight
SBx8112 chassis	48.0 cm	38.8 cm	31.0 cm	17.8 kg (39.1 lb)	58.2 cm	50.6 cm	50.6 cm	22.5 kg (49.6 lb)
SBx8106 chassis	48.0 cm	38.8 cm	17.6 cm	14.4 kg (31.8 lb)	58.2 cm	50.6 cm	50.6 cm	18.1 kg (39.9 lb)
SBx81CFC960 controller fabric card	20.7 cm	31.3 cm	4.1 cm	1.1 kg (2.3 lb)	38.1 cm	27.1 cm	10.0 cm	2.0 kg (4.4 lb)
SBx81GP24 PoE+ line card	20.7 cm	31.3 cm	4.1 cm	1.1 kg (2.3 lb)	38.1 cm	27.1 cm	10.0 cm	1.5 kg (3.3 lb)
SBx81GT24 line card	20.7 cm	31.3 cm	4.1 cm	1.1 kg (2.3 lb)	38.1 cm	27.1 cm	10.0 cm	1.4 kg (3.1 lb)
SBx81GS24a SFP line card	20.7 cm	31.3 cm	4.1 cm	1.1 kg (2.3 lb)	38.1 cm	27.1 cm	10.0 cm	2.0 kg (4.4 lb)
SBx81XLEM 40G modular line card	20.7 cm	31.3 cm	4.1 cm	1.1 kg (2.3 lb)	38.1 cm	27.1 cm	10.0 cm	2.0 kg (4.4 lb)
SBxPWRSYS2 AC system PSU	10.2 cm	32.2 cm	4.3 cm	2.8 kg (6.1 lb)	32.6 cm	42.1 cm	17.7 cm	3.5 kg (7.7 lb)
SBxPWRSYS1-80 DC system PSU	10.2 cm	32.2 cm	4.3 cm	2.8 kg (6.1 lb)	32.6 cm	42.1 cm	17.7 cm	3.9 kg (8.6 lb)
SBxPWRPOE1 PoE+ power supply	10.2 cm	32.2 cm	4.3 cm	2.7 kg (6.0 lb)	32.6 cm	42.1 cm	17.7 cm	3.9 kg (8.7 lb)
SBxFAN12 fan tray	2.7 cm	33.4 cm	26.0 cm	1.8 kg (4.0 lb)	21.0 cm	42.9 cm	11.3 cm	2.9 kg (6.4 lb)
SBxFAN06 fan tray	2.6 cm	29.8 cm	10.3 cm	0.86 kg (1.9 lb)	35.4 cm	42.9 cm	11.3 cm	1.8 kg (3.9 lb)

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
SBx81GS24a	56.3W	192.1 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

SBx8112 (2 x CFC960) 1.92Tbps

SBx8106 (2 x CFC960) 960Gbps

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

	Switching capacity	Forwarding rate
SBx81CFC960	80Gbps	60Mpps
SBx81XLEM (+ module)	184Gbps	137Mpps
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/Q2	1.5 µs (40Gbit)		
SBx81CFC960	2.9 µs (10Gbit)		

Feature Licenses

	Description	Includes	Stack Licensing
AT-FL-CFC960-01[3]	AT-SBx8100 Premium license	■ OSPF[3] (5K routes or 10K with XLEM) ■ BGP4[3] (5K routes or 10K with XLEM) ■ PIMv4-SM, DM and 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 and v2 ■ PIMv6-SM and SSM ■ VRF lite (64 domains) ■ RADIUS Full ■ UDLD ■ VLAN Translation	■ One license per stack member
AT-FL-CF9-VCSPL	VCStack Plus	■ VCStack Plusl for CFC960	■ One license per stack member
AT-SW-APM10-1YR[4, 5]	Cumulative AMF Plus Master license	■ AMF Plus Master license for up to 10 nodes for 1 year	■ One license per stack
AT-SW-APM10-5YR[4, 5]	Cumulative AMF Plus Master license	■ AMF Plus Master license for up to 10 nodes for 5 years	■ One license per stack
AT-SW-APC10-1YR[4, 6]	Cumulative AMF Plus Controller license	■ AMF Plus Controller license for up to 10 areas for 1 year	■ One license per stack
AT-SW-APC10-5YR[4, 6]	Cumulative AMF Plus Controller license	■ AMF Plus Controller license for up to 10 areas for 5 years	■ One license per stack
AT-FL-CF9-8032	ITU-T G.8032 license	■ G.8032 ring protection ■ Ethernet CFM	■ One license per stack member

[3] 64 OSPF and BGP routes included in base license
[4] From AW+ version 5.5.2-2 onwards, AMF Plus licenses provide all standard AMF network management and automation features. They also enable the AMF Plus intent-based networking features in Vista Manager EX (from version 3.10.1 onwards)
[5] Purchase one license per 10 additional APs (up to 300 nodes maximum). Only a single license is required per chassis, which is automatically synchronized to the second control card
[6] Purchase one license per 10 areas (up to 60 areas maximum). Only a single license is required per chassis, which 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 1/10GbE[7] ports
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
50y 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)

[7] 1 Gigabit connectivity is only supported on the CFC960v2 running firmware 5.4.9-1 or later

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 850 nm short-haul up to 150 m with MMF
AT-QSFP1CU	1 meter QSFP+ direct attach cable
AT-QSFP3CU	3 meter QSFP+ direct attach cable
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-SP10LRa/I	10GLR 1310 nm medium-haul, 10 km with SMF industrial temperature

10GbE SFP+ Modules	
(Note that any Allied Telesis 10G SFP+ module can be used for stacking with the 10G ports on the CFC960)	
AT-SP10ER40a/I	10GER 1310 nm long-haul, 40 km with SMF industrial temperature
AT-SP10ZR80/I	10GER 1550 nm long-haul, 80 km with SMF industrial temperature
AT-SP10BD10/I-12	10 GbE Bi-Di (1270 nm Tx, 1330 nm Rx) fiber up to 10 km industrial temperature, TAA[8]
AT-SP10BD10/I-13	10 GbE Bi-Di (1330 nm Tx, 1270 nm Rx) fiber up to 10 km industrial temperature, TAA[8]
AT-SP10BD20-12	10 GbE Bi-Di (1270 nm Tx, 1330 nm Rx) fiber up to 20 km, TAA[8]
AT-SP10BD20-13	10 GbE Bi-Di (1330 nm Tx, 1270 nm Rx) fiber up to 20 km, TAA[8]
AT-SP10BD40/I-12	10 GbE Bi-Di (1270 nm Tx, 1330 nm Rx) fiber up to 40 km industrial temperature, TAA[8]
AT-SP10BD40/I-13	10 GbE Bi-Di (1330 nm Tx, 1270 nm Rx) fiber up to 40 km industrial temperature, TAA[8]
AT-SP10TM	1G/2.5G/5G/10G, 100 m copper, Trade Act Agreement compliant
10GbE SFP+ Cables	
AT-SP10TW1	1 meter SFP+ direct attach cable
AT-SP10TW3	3 meter SFP+ direct attach cable
AT-SP10TW7	7 meter SFP+ direct attach cable
Management Cable	
AT-VT-Kit3	Management cable (USB to serial console)
1000Mbps SFP Modules	
AT-SPSX/I	1000SX GbE multi-mode 850 nm fiber up to 550 m industrial temperature, TAA[8]
AT-SPTXc	1000T 100 m copper
AT-SPSX	1000SX GbE multi-mode 850 nm fiber up to 550 m

1000Mbps SFP Modules continued	
AT-SPEX	1000X GbE multi-mode 1310 nm fiber up to 2 km
AT-SPLX10a	1000LX GbE single-mode 1310 nm fiber up to 10 km
AT-SPLX10a/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, 1490 nm Rx) fiber up to 20 km industrial temperature
AT-SPBD20-14/I	1000BX GbE Bi-Di (1490 nm Tx, 1310 nm Rx) fiber up to 20 km industrial temperature
AT-SPBD20DUAL-14	20 km, 2 x1G, CSFP, SMF, BiDi, LC (1490 Tx/1310 Rx)
AT-SPBD40DUAL-14	40 km, 2 x1G, CSFP, SMF, BiDi, LC (1490 Tx/1310 Rx)
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
100Mbps 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, 1310 nm Rx) fiber up to 10 km

[8] Trade Act Agreement compliant