

## x510 Series

### STACKABLE GIGABIT EDGE SWITCHES

The Allied Telesis x510 Series of stackable gigabit edge switches have a full set of security and resiliency features, coupled with easy management, that make them the ideal choice for applications at the network edge.



The Allied Telesis x510 Series is a high performing and feature-rich choice for today's networks that offers a versatile solution for enterprise applications. With a choice of 24-port and 48-port models with 10Gigabit uplink ports, plus the power of VCStack, the x510 Series can connect anything from a small workgroup right up to a large business.

#### Easy Management

The x510 runs the advanced AlliedWare Plus™ fully featured Operating System delivering a rich feature set and an industry-standard CLI. The CLI reduces training requirements and is consistent across all AW+ devices, simplifying network management.

The CLI allows configuration tasks to be automated, as commands may be used in scripts. Triggers can also be utilized, providing a powerful management mechanism by automating the execution of scripts in response to specific events.

The built-in, web-based Graphical User Interface is an easy-to-use and powerful management tool. With comprehensive monitoring facilities and the ability to view a virtual chassis as a single entity, the GUI is an essential part of your network management toolkit.

#### Reliable

The x510 was designed with reliability in mind to guarantee the continued delivery of essential services. With dual built-in power supplies and the ability to stack up to four devices, you can maintain and reconfigure when necessary without affecting network uptime. Dual internal PSUs eliminate the need for an external Redundant Power Supply (RPS), which occupies valuable rack space. The x510 also features front-to-back cooling, making it ideal for data center applications.

#### Secure

Advanced security features protect the network from the edge to the core. Unprecedented control over user access is provided with Network Access Control (NAC), to mitigate threats to network infrastructure. This ensures the network is accessed only by known users and devices, as users' adherence to network security policies is checked and access granted or remediation offered. Secure access can also be provided for guests.

A secure network environment is guaranteed, with powerful control over network traffic types, secure management options, and other multi-layered security features built right into the x510 Series switches.

#### Future-Proof

A future-proof network is ensured with the flexibility of the x510 Series, coupled with the ability to stack multiple units. All x510 models come with a comprehensive IPv6 feature set as standard to ensure they are ready for future traffic demands. A powerful software licensing scheme enables the x510 to be easily upgraded from a full L2+ feature set to advanced L3 feature set to accommodate future growth in your network.

#### ECO Friendly

The x510 Series supports Energy Efficient Ethernet, which automatically reduces the power consumed by the switch whenever there is no traffic on a port. This sophisticated feature can significantly reduce your operating costs by reducing the power requirements of the switch and any associated cooling equipment.

#### What's New

- » Energy Efficient Ethernet
- » EPSR SuperLoop Protection
- » Optical DDM
- » TACACS+ Accounting
- » IPv6-aware services

**PRELIMINARY - INFORMATION AND SPECIFICATIONS SUBJECT TO CHANGE**

# Key Features

## VCStack

» Create a VCStack of up to four units with 40Gbps of stacking bandwidth to each unit. VCStack provides a highly available system where network resources are spread out across stacked units, reducing the impact if one of the units fails. Aggregating switch ports on different units across the stack provides excellent network resiliency.

## Long-distance Stacking

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

## Ethernet Protection Switching Rings (EPSRing)

» EPSRing and 10 Gigabit Ethernet allow several x510 switches to form a high-speed protected ring capable of recovery within as little as 50ms. This feature is perfect for high performance and high availability in enterprise networks.

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

## Industry-leading Quality of Service (QoS)

» Comprehensive low-latency wire-speed QoS provides flow-based traffic management with full classification, prioritization, traffic shaping and min/max bandwidth profiles. Enjoy boosted network performance and guaranteed delivery of business-critical Ethernet services and applications. Time-critical services such as voice and video take precedence over non-essential services such as file downloads, maintaining responsiveness of Enterprise applications.

## Loop Protection

» Thrash Limiting, also known as Rapid MAC Movement, detects and resolves network loops. It is highly user-configurable - from the rate of looping traffic to the type of action the switch should take when it detects a loop.

» With Thrash Limiting, the switch only detects a loop when a storm has occurred, which can potentially cause disruption to the network. To avoid this, Loop Detection works in conjunction with Thrash Limiting to send special packets that the switch listens for. If a port receives a special packet, you can choose to disable the port, disable the link, or send an SNMP trap.

## Power over Ethernet Plus (PoE+)

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

## Link Layer Discovery Protocol – Media Endpoint Discovery (LLDP – MED)

» LLDP-MED extends LLDP basic network endpoint discovery and management functions. LLDP-MED allows for media endpoint specific messages, providing detailed information on power requirements, network policy, location discovery (for Emergency Call Services) and inventory.

## Voice VLAN

» Voice VLAN automatically separates voice and data traffic into two different VLANs. This automatic separation places delay-sensitive traffic into a voice dedicated VLAN, which simplifies QoS configurations.

## Open Shortest Path First (OSPFv3)

» OSPF is a scalable and adaptive routing protocol for IP networks. The addition of OSPFv3 adds support for IPv6 and further strengthens the Allied Telesis focus on next generation networking.

## 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 ensure it always has a real-time view of network traffic.

## Dynamic Host Configuration Protocol (DHCP) Snooping

» DHCP servers allocate IP addresses to clients, and the switch keeps a record of addresses issued on each port. IP Source Guard checks against this DHCP snooping database to ensure only clients with specific IP and/or MAC address can access the network. DHCP snooping can be combined with other features, like Dynamic ARP Inspection, to increase security in layer 2 switched environments, and also provides

a traceable history, which meets the growing legal requirements placed on Service Providers.

## Network Access Control (NAC)

» NAC allows for unprecedented control over user access to the network, in order to mitigate threats to network infrastructure. Allied Telesis x510 switches use 802.1x port-based authentication in partnership with standards-compliant dynamic VLAN assignment, to assess a user's adherence to network security policies and either grant access or offer remediation.

» If multiple users share a port, then multi-authentication can be used. Different users on the same port can be assigned into different VLANs, and so given different levels of network access. Additionally, a Guest VLAN can be configured to provide a catch-all for users who aren't authenticated.

## Tri-authentication

» Authentication options on the x510 Series also include alternatives to 802.1x port-based authentication, such as web authentication to enable guest access and MAC authentication for end points that do not have an 802.1x supplicant. All three authentication methods—802.1x, MAC-based and Web-based—can be enabled simultaneously on the same port. This is called tri-authentication.

## Premium Software License

» By default, the x510 Series offers a comprehensive Layer 2+ feature set that includes static L3 routing and IPv6 management features. The feature set can easily be elevated to full Layer 3 by applying the Premium Software License. This adds dynamic routing protocols and L3 multicasting capabilities.

## Terminal Access Controller Access-Control System Plus (TACACS+) Authentication and Accounting

» TACACS+ provides access control for network users from a centralized server. Authentication is carried out via communication between the local switch and a TACACS+ server to check the credentials of users seeking network access. Accounting keeps a record of commands entered during user sessions to ensure a secure network and clear audit trail.



**PRELIMINARY - INFORMATION AND SPECIFICATIONS SUBJECT TO CHANGE**

# Key Solutions

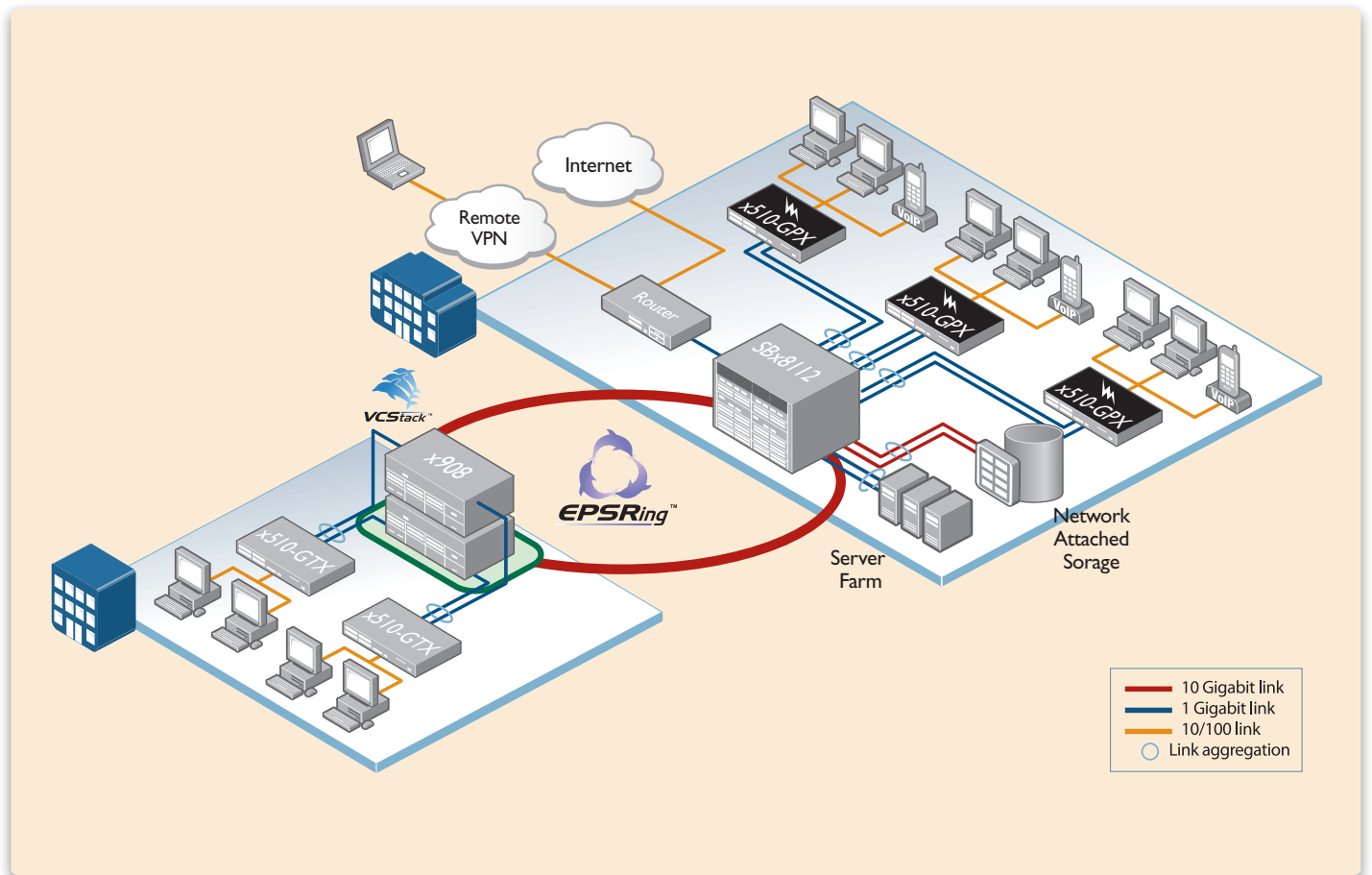


Diagram 1: Network Resiliency

## Network Resiliency

The convergence of network services in the enterprise has led to increasing demand for highly available networks with minimal downtime. VCSStack in conjunction with link aggregation provides a network with no single point of failure. The addition of EPSRing ensures distributed network segments have highspeed, resilient access to online resources and applications, as shown in diagram 1.

**PRELIMINARY - INFORMATION AND SPECIFICATIONS SUBJECT TO CHANGE**

## Specifications

PRODUCT	10/100/1000T (RJ-45) COPPER PORTS	100/1000 BASE-X SFP PORTS	1/10 GIGABIT SFP+ PORTS	10 GIGABIT STACKING PORTS	MAX POE+ PORTS	SWITCHING FABRIC	FORWARDING RATE
AT-x510-28GTX	24	-	2	2*	-	128Gbps	95.2Mpps
AT-x510-28GPX	24	-	2	2*	24	128Gbps	95.2Mpps
AT-x510-28GSX	-	24	2	2*	-	128Gbps	95.2Mpps
AT-x510-52GTX	48	-	2	2*	-	228Gbps	130.9Mpps
AT-x510-52GPX	48	-	2	2*	48	228Gbps	130.9Mpps

\* Stacking ports can be configured as additional 10G Ethernet ports when unit is not stacked

### Performance

- » 40 Gbps of stacking bandwidth
- » Supports 13kB Jumbo frames
- » Wirespeed multicasting
- » 4K configurable VLANs
- » Up to 16K MAC addresses
- » Up to 2K IPv4 routes or up to 1K IPv6 routes
- » 512MB DDR SDRAM, 64MB flash memory
- » Packet buffer memory: AT-x510-28 - 2MB  
AT-x510-52 - 4MB

### Reliability

- » Modular AlliedWare Plus operating system
- » Internal redundant power supplies load share providing uninterrupted power and extra reliability
- » Full environmental monitoring of PSUs, fans, temperature and internal voltages. SNMP traps alert network managers in case of any failure

### Power Characteristics

- » AC Voltage: 90 to 260V (auto-ranging)
- » Frequency: 47 to 63Hz
- » DC Voltage: 36 to 72V

### Expandability

- » Stackable up to four units in a VCStack
- » Premium license option for additional features (available from AW+ 5.4.3)

### Flexibility and compatibility

- » SFP ports will support any combination of 1000T, 100X, 100FX, 100BX, 1000X, 1000SX, 1000LX, 1000ZX or 1000ZX CWDM SFPs
- » SFP+ ports will support any combination of 1000T, 1000X, 1000SX, 1000LX, 1000ZX, 1000ZX CWDM SFPs or 10G-SR, 10G-LR SFP+ modules
- » Stacking ports can be configured as 10G Ethernet ports

### Diagnostic Tools

- » Built-In Self Test (BIST)
- » Find-Me device locator
- » Optical Digital Diagnostic Monitoring (SFF-8472)
- » Ping Polling
- » Port Mirroring
- » Trace Route

### General Routing

- » Black Hole Routing
- » Directed Broadcast Forwarding
- » DNS Relay
- » Equal Cost Multi Path (ECMP) routing

- » Policy-based Routing
- » Route Maps
- » Route Redistribution (OSPF, RIP)
- » UDP Broadcast Helper (IP Helper)

### IPv6 Features

- » 6to4 Tunneling
- » DHCPv6 Relay, DNSv6, NTPv6
- » IPv4 & IPv6 Dual Stack
- » IPv6 Management via Ping, TraceRoute, Telnet and SSH

### Management

- » Front panel 7-segment LED provides at-a-glance status and fault information
- » ECO-mode allows ports and LEDs to be disabled to save power
- » Industry-standard CLI with context-sensitive Help
- » Web-based Graphical User Interface (GUI)
- » Console management port on the front panel for ease of access
- » Powerful CLI scripting tool
- » Secure Copy (SCP)
- » Built-in text editor
- » Event-based triggers allow user-defined scripts to be run 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

- » Limit bandwidth per port or per traffic class down to 64Kbps
- » Wire-speed traffic classification with low latency essential for VoIP and real-time streaming media applications
- » Policy-based QoS based on VLAN, Port, MAC & general packet classifiers
- » Policy-based Storm Protection
- » Extensive remarking capabilities
- » Strict priority scheduling, weighted round robin or mixed
- » RED and WRED curves for drop precedence

### Resiliency Features

- » Control Plane Prioritization ensures the CPU always has sufficient bandwidth to process network control traffic
- » Dynamic Link Failover
- » Ethernet Protection Switching Rings (EPSRing)
- » EPSR Super-Loop Protection (SLP)
- » Long-Distance Stacking

- » Loop Protection - Loop Detection and Thrash Limiting
- » PVST+ compatibility-mode
- » STP Root Guard
- » VCStack Fast Failover minimizes network disruption if a stack member fails

### Security Features

- » Access Control Lists (ACLs)
- » BPDU Protection
- » DHCP Snooping, IP Source Guard and Dynamic ARP Inspection
- » DoS Attack Blocking and Virus Throttling
- » Dynamic VLAN Assignment
- » Guest VLAN and Auth Fail VLAN
- » MAC-based and Web-based Authentication
- » Port-based Learn Limits (Intrusion Detection)
- » MAC address filtering and MAC address lock-down
- » Private VLANs, providing security and port isolation of multiple customers using the same VLAN
- » Strong password security and encryption

### Environmental Specifications

- » Operating temperature range: 0°C to 45°C (32°F to 113°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 RoHS Compliant
- » China RoHS Compliant

### Country of Origin

- » Singapore

**PRELIMINARY - INFORMATION AND SPECIFICATIONS SUBJECT TO CHANGE**

# x510 Series | Stackable Gigabit Edge Switches

## Physical Specifications and MTBF Figures

PRODUCT	WIDTH	DEPTH	HEIGHT	MOUNTING	WEIGHT		MTBF (HOURS)
					UNPACKAGED	PACKAGED	
AT-x510-28GTX	440 mm (17.32 in)	290 mm (11.46 in)	44 mm (1.73 in)	1RU Rack mount	6.3 kg (13.89 lb)	8.8 kg (19.4 lb)	430,000
AT-x510-28GPX	440 mm (17.32 in)	320 mm (12.66 in)	44 mm (1.73 in)	1RU Rack mount	5.6 kg (12.35 lb)	7.6 kg (16.76 lb)	70,000
AT-x510-28GSX	440 mm (17.32 in)	290 mm (11.46 in)	44 mm (1.73 in)	1RU Rack mount	6.3 kg (13.89 lb)	9.7 kg (21.38 lb)	120,000
AT-x510-52GTX	440 mm (17.32 in)	290 mm (11.46 in)	44 mm (1.73 in)	1RU Rack mount	5.6 kg (12.35 lb)	7.6 kg (16.76 lb)	300,000
AT-x510-52GPX	440 mm (17.32 in)	320 mm (12.66 in)	44 mm (1.73 in)	1RU Rack mount	6.6 kg (14.55 lb)	9.2 kg (20.3 lb)	61,000

MTBF calculated using Telcordia SR-332(Issue 1, May 2001) at 25°C ambient operating temperature

## Power and Noise Characteristics

PRODUCT	NO POE LOAD			FULL POE+ LOAD			MAX POE POWER (BOOST MODE)	MAX 15.4W POE PORTS	MAX 30W POE+ PORTS
	MAX POWER CONSUMPTION	MAX HEAT DISSIPATION	NOISE	MAX POWER CONSUMPTION	MAX HEAT DISSIPATION	NOISE			
AT-x510-28GTX	52W		45 dBA	-	-	-	-	-	-
AT-x510-28GPX			45 dBA			55 dBA	740W	48	24
AT-x510-28GSX			45 dBA	-	-	-	-	-	-
AT-x510-52GTX	86W		45 dBA			55 dBA	-	-	-
AT-x510-52GPX			45 dBA	-	-	-	740W	48	24

NOISE: tested to ISO7779; front bystander position

## Standards and Protocols

### AlliedWare Plus Operating System

Version 5.4.3

### Authentication

RFC 1321 MD5 Message-Digest Algorithm  
 RFC 1828 IP Authentication using Keyed MD5

### Encryption

FIPS 180-1 Secure Hash Standard (SHA-1)  
 FIPS 186 Digital Signature Standard (RSA)  
 FIPS 46-3 Data Encryption Standard (DES & 3DES)

### Ethernet

IEEE 802.1AX-2008 Link Aggregation (static and dynamic)  
 IEEE 802.2 Logical Link Control  
 IEEE 802.3 Ethernet  
 IEEE 802.3ab 1000BASE-T  
 IEEE 802.3ad Link Aggregation  
 IEEE 802.3ae 10 Gigabit Ethernet  
 IEEE 802.3af Power over Ethernet (PoE)  
 IEEE 802.3at Power over Ethernet Plus (PoE+)  
 IEEE 802.3az Energy Efficient Ethernet  
 IEEE 802.3u 100BASE-X  
 IEEE 802.3x Flow Control - Full Duplex Operation  
 IEEE 802.3z 1000BASE-X

### General Routing

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 903 Reverse ARP  
 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 & Extensions for the Bootstrap Protocol  
 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 Autoconfiguration  
 RFC 5014 IPv6 Socket API for Source Address Selection  
 RFC 5095 Deprecation of Type 0 Routing Headers in IPv6  
 RFC 5175 IPv6 Router Advertisement Flags Option  
 RFC 6105 IPv6 Router Advertisement Guard

### Management

AT Enterprise MIB  
 SNMPv1, v2c and v3  
 VRRPv3 MIB  
 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 1493 Bridge MIB  
 RFC 1724 RIPv2 MIB Extension  
 RFC 2011 SNMPv2 MIB for IP using SMIv2  
 RFC 2012 SNMPv2 MIB for TCP using SMIv2  
 RFC 2013 SNMPv2 MIB for UDP using SMIv2  
 RFC 2096 IP Forwarding Table MIB  
 RFC 2574 User-based Security Model (USM) for SNMPv3  
 RFC 2575 View-based Access Control Model (VACM) for SNMP  
 RFC 2674 Definitions of Managed Objects for Bridges with Traffic Classes, Multicast Filtering and VLAN Extensions  
 RFC 2741 Agent Extensibility (AgentX) Protocol  
 RFC 2787 Definitions of Managed Objects for VRRP  
 RFC 2819 RMON MIB (groups 1,2,3 and 9)  
 RFC 2863 Interfaces Group MIB  
 RFC 3164 Syslog Protocol  
 RFC 3176 sFlow: A Method for Monitoring Switched and Routed Networks Traffic in Message Processing and Dispatching for the SNMP  
 RFC 3412 Message Processing and Dispatching for the SNMP  
 RFC 3413 SNMP Applications  
 RFC 3418 MIB for SNMP  
 RFC 3621 PoE MIB  
 RFC 3635 Definitions of Managed Objects for the Ethernet-like Interface Types  
 RFC 3636 IEEE 802.3 MAU MIB  
 RFC 4188 Definitions of Managed Objects for Bridges  
 RFC 4318 Definitions of Managed Objects for Bridges with RSTP  
 RFC 4560 Definitions of Managed Objects for Remote Ping, Traceroute, and Lookup Operations

### Multicast Support

Bootstrap Router (BSR) mechanism for PIM-SM  
 IGMP Query Solicitation  
 IGMP Snooping

**PRELIMINARY - INFORMATION AND SPECIFICATIONS SUBJECT TO CHANGE**

# x510 Series | Stackable Gigabit Edge Switches

IGMP/MLD Multicast Forwarding (IGMP/MLD Proxy)  
MLD Snooping (v1 & v2)  
PIM for IPv6  
RFC 2236 Internet Group Management Protocol v2 (IGMPv2)  
RFC 2710 Multicast Listener Discovery (MLD) for IPv6  
RFC 3376 IGMPv3  
RFC 3810 Multicast Listener Discovery v2 (MLDv2) for IPv6  
RFC 3973 PIM Dense Mode  
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

## Quality of Service

IEEE 802.1p Priority Tagging  
RFC 2211 Specification of the Controlled-Load Network Element Service

RFC 2474 DiffServ Precedence for 8 queues/port  
RFC 2475 DiffServ Architecture  
RFC 2597 DiffServ Assured Forwarding (AF)  
RFC 2697 A Single-Rate Three-Color Marker  
RFC 2698 A Two-Rate Three-Color Marker  
RFC 3246 DiffServ Expedited Forwarding (EF)

## Resiliency Features

IEEE 802.1D Rapid Spanning Tree Protocol (RSTP)  
IEEE 802.1D MAC Bridges  
IEEE 802.1Q Multiple Spanning Tree Protocol (MSTP)  
IEEE 802.1s MSTP (Multiple Spanning Tree)  
IEEE 802.1w RSTP (Rapid Spanning Tree)  
RFC 5798 VRRP version 3 for IPv4 and IPv6

## Routing Information Protocol (RIP)

RFC 1058 Routing Information Protocol (RIP)  
RFC 2080 RIPng for IPv6  
RFC 2081 RIPng Protocol Applicability Statement  
RFC 2082 RIP-2 MD5 Authentication  
RFC 2453 RIPv2

## Security Features

SSH Remote Login  
SSLv2 and SSLv3  
TACACS+ Accounting and Authentication  
IEEE 802.1X Authentication protocols (TLS, TTLS, PEAP & MD5)  
IEEE 802.1X Multi-Suppliant Authentication  
IEEE 802.1X Port Based Network Access Control  
RFC 2246 TLS Protocol v1.0  
RFC 2865 RADIUS  
RFC 2866 RADIUS Accounting  
RFC 2868 RADIUS Attributes for Tunnel Protocol Support  
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

## 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 2030 Simple Network Time Protocol (SNTP) version 4  
RFC 2049 MIME  
RFC 2131 DHCP for IPv4  
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 DHCP for IPv6 (DHCPv6)  
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 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 & port  
IEEE 802.3ac VLAN tagging

## VoIP

LLDP-MED ANSI/TIA-1057  
Voice VLAN

## Ordering Information

### Feature Licenses

NAME	DESCRIPTION	INCLUDES
AT-FL-x510-01	x510 Premium License*	<ul style="list-style-type: none"> <li>» RIP</li> <li>» OSPF</li> <li>» PIMv4-SM, DM &amp; SSM</li> <li>» EPSR Master</li> <li>» VLAN Double Tagging (Q in Q)</li> <li>» RIPng</li> <li>» OSPFv3</li> <li>» MLDv1 &amp; v2</li> <li>» PIMv6-SM</li> </ul>

\* Premium License available from AW+ 5.4.3



**Ordering Information**

**Switches**

**AT-x510-28GTX-xx**  
24-port 10/100/1000BASE-T switch with 4 SFP+ ports and 2 fixed power supplies

**AT-x510-28GPX-yy**  
24-port 10/100/1000BASE-T PoE+ switch with 4 SFP+ ports and 2 fixed power supplies

**AT-x510-28GSX-xx**  
24-port 100/1000 SFP switch with 4 SFP+ ports and 2 fixed power supplies

**AT-x510-52GTX-xx**  
48-port 10/100/1000BASE-T switch with 4 SFP+ ports and 2 fixed power supplies

**AT-x510-52GPX-yy**  
48-port 10/100/1000BASE-T PoE+ switch with 4 SFP+ ports and 2 fixed power supplies

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  
80 for DC power supplies

Where yy = 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

**Stacking Accessories**

**AT-StackOP/0.3**  
SFP+ stacking module (300m)

**AT-StackOP/9.0**  
SFP+ stacking module (9km)

**AT-StackXS/1.0**  
1 meter stacking cable

**Cables**

**AT-SPI0TW1**  
1 meter SFP+ direct attach cable

**AT-SPI0TW3**  
3 meter SFP+ direct attach cable

**AT-SPI0TW7**  
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

**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

**10GbE SFP+ Modules**

**AT-SPI0SR**  
10GSR 850nm short-haul, 300m with MMF

**AT-SPI0LR**  
10GLR 1310nm medium-haul, 10km with SMF