

# Alcatel-Lucent OmniSwitch 6570M

## Gigabit Metro Ethernet LAN Switch Family

The Alcatel-Lucent OmniSwitch® 6570M Gigabit Ethernet LAN switch family is an industry-leading edge and aggregation solution for both enterprise and service provider networks.

The family offers versatile 12- and 28-port fixed configuration gigabit switches with 10G uplinks, 10G uplink license upgrades, fan-less designs and AC/DC primary/redundant power supply options. The OmniSwitch 6570M (OS6570M) uses the Alcatel-Lucent Operating System (AOS) offering a rich set of both advanced enterprise and metro ethernet features for both the next-generation enterprise networks and service provider solutions.



**OS6570M-D12**



**OS6570M-U28**

Offering a design optimised for flexibility, scalability and low power consumption, the OmniSwitch 6570M is an outstanding edge solution. It uses the field-proven Alcatel-Lucent Operating System (AOS) to deliver highly available, secure, self-protective, easily managed and eco-friendly networks.

The Alcatel-Lucent OmniSwitch 6570M family is embedded with the latest technology innovations and offers maximum investment protection.

Deployments benefiting from the OmniSwitch 6570M family include:

- Edge of small-to-mid-sized networks
- Branch office enterprise and campus workgroups
- Service provider managed services application
  - Customer Premises Equipment (CPE)
  - Fibre aggregations

## Features

### OmniSwitch 6570M-12/12D:

- 8 ports RJ45 port non-PoE 10/100/1000 Base-T with 2x100/1G Base-X SFP and 2x1G/10G SFP+ ports
- Primary internal AC/DC power supply with optional external AC/DC backup power supply
- Optimised ½ x 1RU form factor with optional mounting offerings
- Fan-less design with 0-50 C operating temperature
- Metro Ethernet Service features included for service provider deployments
- IEEE 802.1AE MACSec encryption

### OmniSwitch 6570M-U28X/-U28XD:

- 20x100/1000 Base-X SFP ports, 4xSFP/RJ45 1G combo, 4x1G/10G\* SFP+ ports and 2x1G/10G SFP+ uplink/VLF ports
- Modular primary AC/DC power supply with optional modular AC/DC backup power supply
- Supports additional 4x10 GigE uplink/VFL ports with the OS6570-SW-PERF\* license
- Fan-design with 0-50 C operating temperature
- 1RU x rack width form factor
- Metro Ethernet Service features included for service provider deployments
- IEEE 1588v2 (PTP) Transparent Clock and IEEE 802.1AE MACSec encryption

## Management

- AOS field-proven software with management through web interface (WebView), command line interface (CLI) and Simple Network Management Protocol (SNMP)
- Ethernet operations, administration and management (OA&M) support for service configuration and monitoring
- Cloud-enabled with [Alcatel-Lucent OmniVista® Cirrus Network Management as a Service](#) for a secure, resilient and scalable cloud-based network management
- Support by [Alcatel-Lucent OmniVista® 2500 Network Management System \(NMS\)](#)

## Security

- 256bit MACSec encryption to secure the network edge\*\*
- Secure boot and secure storage capable\*\*
- Advanced Quality of Service (QoS) and Access Control Lists (ACLs) for traffic control, including an embedded denial of service (DoS) engine to filter out unwanted traffic attacks
- Extensive support of user-oriented features such as Learned Port Security (LPS), port mapping, Dynamic Host Configuration Protocol (DHCP) binding tables and User Network Profile (UNP)

## Performance and redundancy

- Advanced Layer 2+ features with basic Layer 3 routing for both IPv4 and IPv6
- Triple speed (10/100/1G) user interfaces and fibre interfaces (SFPs) supporting 100FX/1000Base-X or 1G/10GBase-X optical transceivers
- Up to 6 x 10G uplinks total (OS6570M-U28)
- IEEE 1588v2 Precision Time Protocol (PTP)
- Wire-rate switching and routing performance
- High availability with virtual chassis concept, redundant stacking links, primary/secondary unit failover, hot-swappable power options and configuration rollback

\*\*Note: Hardware capable, requires future SW development.

## Benefits

- Meets any customer configuration need and offers excellent investment protection and flexibility, as well as ease of deployment, operation and maintenance
- Provides outstanding performance when supporting real-time voice, data and video applications for converged scalable networks
- Ensures efficient power management, reduces operating expenses (OPEX) and lowers total cost of ownership (TCO) through low power consumption and dynamic PoE allocation, which delivers only the power needed by the attached device
- A field-upgradeable solution that makes the network highly available and reduces OPEX
- Fully secures the network at the edge at no additional cost
- Enterprise-wide cost reduction through hardware consolidation to achieve network segmentation and security without additional hardware installation
- Supports cost-effective installation and deployment with automated switch setup and configuration and end-to-end virtual LAN (VLAN) provisioning
- OmniVista Cirrus (OVC) powers secure, resilient and scalable cloud-based network management. OVC offers hassle-free network deployment and easy service rollout with advanced analytics for smarter decision making. IT friendly Unified Access with secure authentication and policy enforcement for users and devices.

**Table 1. Available OmniSwitch 6570M models**

Models	10/100/1000 RJ 45 ports	100M/1G SFP ports	1G/10G SFP(+) ports	1G SFP Uplink 10G SFP+ VFL	Power supply	Backup supply	Fan status
OS6570M-12	12	2	0	2	Internal AC	External AC/DC	Fan-less
OS6570M-12D	12	2	0	2	Internal DC	External DC/AC	Fan-less
OS6570M-U28	20	4	4*	2	Internal AC	External AC/DC	Fan-less
OS6570M-U28D	20	4	4*	2	Internal DC	External DC/AC	Fan-less

\*Note: Default speed is 1G. Apply performance license upgrade for 10G operation.

## Technical specification

Gigabit product matrix	OS6570M-12/12D	OS6570-U28/-U28D
Gigabit RJ 45 ports	8	0
100FX/1G SFP user ports	2	20
RJ45/SFP 100FX/1G combo user ports	0	4
1G SFP(+) uplink ports (*10G upgradeable)	0	4*
1G/10G SFP+ Uplink or 10G VFL port	2	2
Console port	1	1
USB/1G Ethernet OoB management port	1	1
Primary power	Fixed internal	Internal modular
Backup power	Fixed external	Internal modular
CPU	Dual Core Arm Cortex A55 1.5GHz	Dual Core Arm Cortex A55 1.5GHz
File system flash	4 GB	4 GB
RAM	2 GB	2 GB
Packet buffers	24Mbyte	24Mbyte
Max switching ASIC capacity	80 Gb/s	210 Gb/S
Switch capacity	60 Gb/s	168 Gb/s
Throughput	44.6 Mpps	125 Mpps

Gigabit product matrix	OS6570M-12/12D	OS6570-U28/-U28D
2x10GE VFL capacity	40 Gb/s	40 Gb/s
System power consumption:		
• Idle	15W	61W
• 100% traffic all ports (max)	24W	90W
System heat dissipation @ 100%	89 (BTU/h)	306 (BTU/h)
Power supply efficiency (max load)	83.5%	86%
Acoustics (dB) @25C	0 db(A)	<40 db(A)
# switch of fans	0	0
# of power supply fans	0	1
MTBF (hours) @ 25C	tbd	tbd
Height	4.4 cm (1.73 in)	4.4 cm (1.73 in)
Width	21.7 cm (8.55 in)	44 cm (17.32 in)
Depth	28 cm (11.05 in)	33.5 cm (13.18 in)
Weight	1.7 Kg (3.8 lbs)	4.08 Kg (9.0 lbs)
Operating temperature	0°C to 50°C (32°F to 122°F)	0°C to 50°C (32°F to 122°F)
Storage temperature	-20°C to 60°C (-4°F to 140°F)	-20°C to 60°C (-4°F to 140°F)
Humidity (operating)	5% to 95% non-condensing	5% to 95% non-condensing

## OmniSwitch 6570

### OS6570 backup power supply and specifications

All OmniSwitch 6570 models support 1+1 hot-swappable secondary/redundant power supplies in a 1RU configuration, allowing for easier maintenance and replacement. The OS6570M-12 port, non-PoE models have a fixed, internal, primary supply and an external AC/DC supply. The OS6570M-U28 models have an internal AC/DC modular primary, internal AC/DC modular secondary power supply.

Power supply models	OS6570-12-BP	OS6570-12-BP-D	OS6570-BP	OS6570-BP-D
Description	External AC power supply. Provides system power to one OS6570-12 switch.	External DC power supply. Provides system power to one OS6570-12 switch.	Modular AC power supply. Provides system power to one OS6570 non-PoE switch.	Modular AC power supply. Provides system power to one OS6570 non-PoE switch.
Dimensions (H x W x L)	3.1 x 6.2 x 110 cm (1.22 x 2.44 x 4.33 in)	3.5 x 5.8 x 9.0 cm (1.37 x 2.28 x 3.54 in)	3.9 x 5.0 x 18.5 cm (1.54 x 2.0 x 7.3 in)	3.9 x 5.0 x 18.5 cm (1.54 x 2.0 x 7.3 in)
Weight	.22 kg (.48 lbs)	.44 kg (1.0 lbs)	.88 kg (1.94 lbs)	.88 kg (1.94 lbs)
Input voltage/current	100V-240VAC/3A	-18V to -72V DC / 0-2.5A	90-136 VAC / 3 A 180-264 VAC / 1.5 A	-36V to -72 V DC 1.8 A to 6 A
Max output power/ current	60W/5A	30W/2.5A	150W/12.5 A	150W/12.5 A
Power supply efficiency	88%	89%	90%	92%
Fans	0	0	1	1

## Commercial reference

Model	Description
OS6570M-12	OS6570M-12 GigE 1RU x 1/2 rack chassis. 8xRJ45 10/100/1000 BaseT, 2x100/1G Base-X SFP, 2x1G/10G SFP+ ports. Internal AC PSU. Separately orderable 19" rack mount kit and optional backup power supply.
OS6570M-12D	OS6570M-12 GigE 1RU x 1/2 rack chassis. 8xRJ45 10/100/1000 BaseT, 2x100/1G Base-X SFP, 2x1G/10G SFP+ ports. Internal DC PSU. Separately orderable 19" rack mount kit and optional backup power supply.
OS6570M-U28	OS6570M-U28 GigE 1RU chassis. 20x100/1000 Base-X SFP ports, 4xSFP/RJ45 combo, 4x1G/10G* SFP+ ports and 2x1G/10G SFP+ uplink/VLF ports. Includes modular AC power supply and switch mounting brackets. Optional backup power supply and additional 10G ports performance license upgrade.
OS6570M-U28D	OS6570M-U28D GigE 1RU chassis. 20x100/1000 Base-X SFP ports, 4xSFP/RJ45 combo, 4x1G/10G* SFP+ ports and 2x1G/10G SFP+ uplink/VLF ports. Includes modular DC power supply and switch mounting brackets. Optional backup power supply and additional 10G ports performance license upgrade.
<b>SW upgrades</b>	
OS6570-SW-PERF	*Performance software license allowing 2 fixed SFP+ ports of an OS6570 24/48 model switch to operate at 10G speed.
<b>Backup supplies</b>	
OS6570-12-BP	Optional external 65W AC backup power supply and mounting bracket. Provides backup power to one OS6570 12 port switch.
OS6570-12-BP-D	Optional external 65W DC backup power supply and mounting bracket. Provides backup power to one OS6570 12 port switch.
OS6570-BP	Optional modular 150W AC backup power supply. Provides system and backup power to one OS6570 24/48 port switch.
OS6570-BP-D	Optional modular 150W DC backup power supply. Provides system and backup power to one OS6570 24/48 port switch.
<b>OmniSwitch 6570 transceivers and cables</b>	
SFP-10G-C1M	10 Gigabit direct attached uplink/stacking copper cable (1 m, SFP+).
SFP-10G-C3M	10 Gigabit direct attached uplink/stacking copper cable (3 m, SFP+).
SFP-GIG-T	1000Base-T Gigabit Ethernet Transceiver (SFP MSA). SFP works at 1000 Mb/s speed and full-duplex mode.
SFP-GIG-SX	1000Base-SX Gigabit Ethernet optical transceiver (SFP MSA).
SFP-GIG-LX	1000Base-LX Gigabit Ethernet optical transceiver (SFP MSA).
SFP-GIG-LH40	1000Base-LH Gigabit Ethernet optical transceiver (SFP MSA). Typical reach of 40 km on 9/125 m SMF.
SFP-GIG-LH70	1000Base-LH Gigabit Ethernet optical transceiver (SFP MSA). Typical reach of 70 km on 9/125 m SMF.
SFP-10G-SR	10 Gigabit optical transceiver (SFP+). Supports multimode fibre over 850 nm wavelength (nominal) with an LC connector.
SFP-10G-LR	10 Gigabit optical transceiver (SFP+). Supports monomode fibre over 1310 nm wavelength (nominal) with an LC connector.
SFP-10G-ZR	10 Gigabit optical transceiver (SFP+). Supports data transmission at 1550 nm over up to 80km single mode fibre with an LC connector.
SFP-10G-ER	10 Gigabit optical transceiver (SFP+). Supports monomode fibre over 1550 nm wavelength (nominal) with an LC connector. Typical reach of 40 km.

Note: See the OmniSwitch transceiver guide for other supported SFPs/cables.

## Warranty

The OmniSwitch 6570 family comes with a Limited Lifetime Warranty.

## Detailed product features

### Simplified management

- Intuitive CLI in a scriptable BASH environment via console, Telnet or Secure Shell (SSH) v2 over IPv4/IPv6
- Powerful WebView Graphical Web Interface through HTTP and HTTPS over IPv4/ IPv6+
- Fully programmable RESTful web services interface with XML and JSON support. API enables access to CLI and individual mib objects.
- Integrated with OmniVista products for network management
- Full configuration and reporting using SNMPv1/2/3 to facilitate third-party network management over IPv4/IPv6
- File upload using USB, TFTP, FTP, SFTP or SCP using IPv4/IPv6
- Human-readable ASCII-based configuration files for off-line editing, bulk configuration and out-of-the-box auto-provisioning
- Fully programmable OpenFlow 1.3.1 and 1.0 agent for control of native OpenFlow and hybrid ports
- Multiple microcode image support with fallback recovery
- Dynamic Host Configuration Protocol (DHCP) relay for IPv4/IPv6
- IEEE 802.1AB Link Layer Discover Protocol (LLDP) with Media Endpoint Discover (MED) extensions
- Network Time Protocol (NTP)
- DHCPv4 and DHCPv6 server managed by Alcatel-Lucent DNS/DHCP IP Address Management

### Monitoring and troubleshooting

- Local (on the flash memory) and remote server logging (Syslog): event and command logging
- IP tools: ping and trace route
- Dying Gasp support through SNMP and syslog messages
- Loopback IP address support for management per service
- Policy- and port-based mirroring
- Remote port mirroring
- sFlow v5 and Remote Monitoring (RMON)
- Unidirectional Link Detection (UDLD), Digital Diagnostic Monitoring (DDM)

### Network configuration

- Remote auto-configuration download feature
- Auto-negotiating 10/100/1000 ports automatically configure port speed and duplex setting

- Auto MDI/MDIX automatically configures transmit and receive signals to support straight-through and crossover cabling
- BOOTP/DHCP client allows auto-configuration of switch IP information for simplified deployment
- DHCP relay to forward client requests to a DHCP server
- IEEE 802.1AB Link Layer Discovery Protocol (LLDP) with MED extensions for automated device discovery
- Multiple VLAN Registration Protocol (MVRP) for IEEE 802.1Q-compliant VLAN pruning and dynamic VLAN creation
- Auto QoS for switch management traffic as well as traffic from Alcatel-Lucent IP phones
- Network Time Protocol (NTP) for network-wide time synchronisation
- Virtual chassis up to 8 units

### Resiliency and high availability

- Unified management, control and Virtual chassis technology
- Virtual Chassis 1+N redundant supervisor manager
- Virtual Chassis In-Service Software Upgrade (ISSU)
- Smart continuous switching technology
- ITU-T G.8032/Y1344 2010: Ethernet Ring Protection
- IEEE 802.1s Multiple Spanning Tree Protocol (MSTP) encompasses IEEE 802.1D Spanning Tree Protocol (STP) and IEEE 802.1w Rapid Spanning Tree Protocol (RSTP)
- Per-VLAN spanning tree (PVST+) and 1x1 STP mode
- IEEE 802.3ad/802.1AX Link Aggregation Control Protocol (LACP) and static LAG groups across modules
- Virtual Router Redundancy Protocol (VRRP) with tracking capabilities
- IEEE protocol auto-discovery
- Bidirectional Forwarding Detection (BFD) for fast failure detection and reduced re-convergence times in a routed environment
- Redundant and hot-swappable power supplies
- Built-in CPU protection against malicious attacks

- Split Virtual Chassis protection: Auto-detection and recovery of Virtual Chassis splitting due to one or more VFL or stack element failures

## Advanced security

### Access control

- Alcatel-Lucent Access Guardian framework for comprehensive user policy-based NAC
- Autosensing IEEE 802.1X multi-client, multi-VLAN support
- MAC-based authentication for non-IEEE 802.1X hosts
- Web-based authentication (captive portal): a customisable web portal residing on the switch
- User Network Profile (UNP) simplifies NAC by dynamically providing pre-defined policy configuration to authenticated clients — VLAN, ACL, BW
- Secure Shell (SSH) with public key infrastructure (PKI) support
- Terminal Access Controller Access Control System Plus (TACACS+) client
- Centralised Remote Access Dial-in User Service (RADIUS) and Lightweight Directory Access Protocol (LDAP) administrator authentication
- Centralised RADIUS for device authentication and network access control authorisation
- Learned Port Security (LPS) or MAC address lockdown
- Access Control Lists (ACLs); flow-based filtering in hardware (Layer 1 to Layer 4)
- DHCP Snooping, DHCP IP and Address Resolution Protocol (ARP) spoof protection
- ARP poisoning detection
- IP Source Filtering as a protective and effective mechanism against ARP attacks
- Bring Your Own Device (BYOD) provides onboarding of Guest, IT/non-IT issued and silent devices. Restriction/Remediation of traffic from non-compliant devices. Uses RADIUS CoA to dynamically enforce User Network Profiles based on Authentication, Profiling, Posture check of devices with OmniVista UPAM or Aruba ClearPass management applications.

## Converged networks

### QoS

- Priority queues: Eight hardware-based queues per port for flexible QoS management
- Traffic prioritisation: Flow-based QoS with internal and external (also known as, remarking) prioritisation
- Bandwidth management: Flow-based bandwidth management, ingress rate limiting; egress rate shaping per port
- Queue management: Configurable scheduling algorithms — Strict Priority Queuing (SPQ), Weighted Round Robin (WRR)
- Congestion avoidance: Support for End-to-End Head-Of-Line (E2E-HOL) Blocking Protection
- Auto QoS for switch management traffic as well as traffic from Alcatel-Lucent IP phones

### Software Defined Networking (SDN)

- Programmable AOS RESTful API

### Layer 2, Layer 3 Routing and Multicast

#### Layer 2 switching

- Up to 32k MAC Addresses
- Up to 4000 VLANs
- Up to 1.5k total system policies
- Latency: < 4 µs
- Max Frame: 9216 bytes (jumbo)

#### IPv4 and IPv6

- Static routing for IPv4 and IPv6
- RIP v1 and v2 for IPv4; RIPng for IPv6
- Up to 256 IPv4 and 128 IPv6 static and RIP routes
- Up to 128 IPv4 and 16 IPv6 interfaces
- OSPFv2 and OSPFv3 routing
- OSPFv2, OSPFv3 support

#### Multicast

- IGMPv1/v2/v3 snooping to optimise multicast traffic
- Multicast Listener Discovery (MLD) v1/v2 snooping
- Up to 1000 multicast groups
- IP Multicast VLAN (IPMVLAN) for optimised multicast replication at the edge, saving network core resources\*\*

### Network protocols

- DHCP relay (including generic UDP relay)
- ARP
- Generic User Datagram Protocol (UDP) relay per VLAN
- DHCP Option 82 — configurable Relay agent information

### Metro Ethernet access

- Ethernet services support per IEEE 802.1ad Provider Bridge
  - ↳ Transparent LAN Services with Service VLAN (SVLAN) and Customer VLAN (CVLAN) concept
  - ↳ Ethernet network-to-network interface (NNI) and user network interface (UNI) services
  - ↳ Service Access Point (SAP) profile identification
  - ↳ CVLAN to SVLAN translation and mapping
- IEEE 802.1ag Ethernet OAM: Connectivity Fault Management (L2 ping and link trace)
- Ethernet OAM compliant with IEEE 802.3ah
- ITU-T G.8032 Ethernet Ring Protection designed for loop protection and fast convergence times (sub 50 ms) in ring topologies
- Service Assurance Agent (SAA) for proactively measuring network health, reliability and performance. Four SAA tests including L2-MAC, IP, ETH-LB and ETH-DMM depending on your network requirements
- Customer Provider Edge (CPE) test head traffic generator and analyser tool used in the metro Ethernet network to validate customer Service Level Agreements (SLA)
- IPMVLAN for optimised multicast replication at the edge saving network core resources\*\*
- Layer 2 Multicast VLAN Replication (MVR) – allows users from different multicast VLANs to subscribe to a multicast group from an upstream trunk interface\*\*
- TR-101 Point-to-Point Protocol over Ethernet (PPPoE) Intermediate Agent allowing for the PPPoE network access method
- MAC-forced forwarding support according to RFC 4562

- L2CP – Layer 2 Control Protocol for tunneling a customer's L2CP frames, using a well-known address, on a given UNI for the EPL and EVPL services
- Dying Gasp using SNMP and Ethernet OAM delivery
- Metro Ethernet Forum CE 3.0 Certified\*\*
- Managed by Nokia Network Functions Manager-Packet (NFM-P)\*\*

### Indicators

#### System LEDs

- System (OK) (chassis HW/SW status)
- PWR (primary power supply status)
- VC (virtual chassis primary)

#### Per-port LEDs

- 10/100/1000: link/activity
- 1G/10GE: link/activity
- SFP: Link/activity
- Virtual Chassis (VFL): Link/activity

\*\*Future certifications and software development required

### Compliance and certifications Commercial EMI/EMC

- 47 CRF FCC Part 15: 2015 Subpart B (Class A)
- VCCI (Class A limits. Note: Class A with UTP cables)
- ICES-003:2012 Issue 5, Class A
- AS/NZS 3548 (Class A) - C-Tick
- AS/NZS 3548 (Class A limits. Note: Class A with UTP cables)
- CE-Mark: Marking for European countries (Class A limits. Note: Class A with UTP cables)
- CE Emission consists of:
  - ↳ EN 50581: Standard for technical documentation for RoHS recast
  - ↳ EN 55022 (EMI and EMC requirement)
  - ↳ EN 55024: 2010 (ITE Immunity characteristics)
  - ↳ EN 61000-3-2 (Limits for harmonic current emissions)
  - ↳ EN 61000-3-3
  - ↳ EN 61000-4-2
  - ↳ EN 61000-4-3
  - ↳ EN 61000-4-4
  - ↳ EN 61000-4-5
  - ↳ EN 61000-4-6
  - ↳ EN 61000-4-8
  - ↳ EN 61000-4-11
  - ↳ IEEE802.3: Hi-Pot Test (2250 V DC on all Ethernet ports)

## Safety agency certifications

- CDRH Laser
- Compliant with Restriction on Hazardous Substances (RoHS) and Waste Electrical and Electronic Equipment (WEEE) directives
- EN 60825-1 Laser
- EN 60825-2 Laser
- IEC 62368-1
- UL 60950-1, 2nd Edition, Information Technology Equipment
- CAN/CSA C22.2 No. 60950-1-07, 2nd Edition, Information Technology Equipment
- IEC 60950-1, with all National Deviations
  - UL-AR, Argentina
  - AS/NZ TS-001 and 60950, Australia
  - ANATEL, Brazil
  - CCC, China
  - UL-GS Mark, Germany
  - KCC, Korea
  - NOM-019 SCFI, Mexico
  - CU, EAC, Russia
  - BSMI, Taiwan

## Supported standards

### IEEE standards

- IEEE 802.1D (STP)
- IEEE 802.1p (CoS)
- IEEE 802.1Q (VLANs)
- IEEE 802.1ad (Provider Bridge) Q-in-Q (VLAN stacking)
- IEEE 802.1s (MSTP)
- IEEE 802.1w (RSTP)
- IEEE 802.1AE MAC Security
- IEEE 802.1X (Port Based Network Access Protocol)
- IEEE 802.3i (10Base-T)
- IEEE 802.3u (Fast Ethernet)
- IEEE 802.3x (Flow Control)
- IEEE 802.3z (Gigabit Ethernet)
- IEEE 802.3ab (1000Base-T)
- IEEE 802.3ac (VLAN Tagging)
- IEEE 802.3ad (Link Aggregation)
- IEEE 802.3ae (10 Gigabit Ethernet)
- IEEE 802.3af (Power-over-Ethernet)
- IEEE 802.3at (Power-over-Ethernet)
- IEEE 802.3bt (Power-over-Ethernet)
- IEEE 802.3az (Energy Efficient Ethernet)
- IEEE 802.3bz (2.5GE Multi-Gigabit Ethernet)
- IEEE 1588v2 Precision Timing Protocol (PTP)

## ITU-T recommendations

- G.8032/Y.1344 2010: Ethernet Ring Protection (ERPv2)

## IETF RFCs

### RIP

- RFC 1058 RIP v1
- RFC 1722/1723/1724/2453 RIP v2 and MIB
- RFC 1812/2644 IPv4 Router Requirement
- RFC 2080 RIPng for IPv6

### OSPF

- RFC 1850/2328 OSPF v2 and MIB
- RFC 2154 OSPF MD5 Signature
- RFC 2370/3630 OSPF Opaque LSA
- RFC 3623 OSPF Graceful Restart
- RFC 1765 OSPF Database Overflow
- RFC 3101 OSPF NSSA
- RFC 5838 MIB for OSPFv3
- RFC 4552 Authentication for OSPFv3
- RFC 5340/5838 OSPF v3 and MIB

### IP Multicast

- RFC 1112 IGMP v1
- RFC 2236/2933 IGMP v2 and MIB
- RFC 2365 Multicast
- RFC 3376 IGMPv3 for IPv6

### IPv6

- RFC 1886 DNS for IPv6
- RFC 2292/2373/2374/2460/2462
- RFC 2461 NDP
- RFC 2463/2466 ICMP v6 and MIB
- RFC 2452/2454 IPv6 TCP/ UDP MIB
- RFC 2464/2553/2893/3493/3513
- RFC 3056 IPv6 Tunneling
- RFC 3542/3587 IPv6
- RFC 4007 IPv6 Scoped Address Architecture
- RFC 4193 Unique Local IPv6 Unicast Addresses

## Manageability

- RFC 854/855 Telnet and Telnet options
- RFC 959/2640 FTP
- RFC 1350 TFTP Protocol
- RFC 1155/2578-2580 SMI v1 and SMI v2
- RFC 1157/2271 SNMP
- RFC 1212/2737 MIB and MIB-II
- RFC 1213/2011-2013 SNMP v2 MIB
- RFC 1215 Convention for SNMP Traps
- RFC 1573/2233/2863 Private Interface MIB
- RFC 1643/2665 Ethernet MIB

- RFC 1867 Form-based File Upload in HTML
- RFC 1901-1908/3416-3418 SNMP v2c
- RFC 2096 IP MIB
- RFC 2131 DHCP Server/Client
- RFC 2388 Returning Values from Forms: multipart/form-data
- RFC 2396 Uniform Resource Identifiers (URI): Generic Syntax
- RFC 2570-2576/3410-3415/3584 SNMP v3
- RFC 2616 /2854 HTTP and HTML
- RFC 2667 IP Tunneling MIB
- RFC 2668/3636 IEEE 802.3 MAU MIB
- RFC 2674 VLAN MIB
- RFC 3023 XML Media Types
- RFC 3414 User-based Security Model
- RFC 3826 (AES) Cipher Algorithm in the SNMP User-based Security Model
- RFC 4122 A Universally Unique Identifier (UUID) URN Namespace
- RFC 4234 Augmented BNF for Syntax Specifications: ABNF
- RFC 4251 Secure Shell Protocol Architecture
- RFC 4252 The Secure Shell (SSH) Authentication Protocol
- RFC 4627 JavaScript Object Notation (JSON)
- RFC 5424 The Syslog protocol
- RFC 6585 Additional HTTP Status Codes

## Security

- RFC 1321 MD5
- RFC 1826/1827/4303/4305 Encapsulating Payload (ESP) and crypto algorithms
- RFC 2104 HMAC Message

## Authentication

- RFC 2138/2865/2868/3575/2618 RADIUS Authentication and Client MIB
- RFC 2139/2866/2867/2620 RADIUS Accounting and Client MIB
- RFC 2228 FTP Security Extensions
- RFC 2284 PPP EAP
- RFC 2869/2869bis RADIUS Extension
- RFC 4301 Security Architecture for IP

## Quality of service

- RFC 896 Congestion control
- RFC 1122 Internet Hosts
- RFC 2474/2475/2597/3168/3246 DiffServ
- RFC 3635 Pause Control
- RFC 2697 srTCM\*\*
- RFC 2698 trTCM\*\*



## Others

- RFC 791/894/1024/1349 IP and IP/Ethernet
- RFC 792 ICMP
- RFC 768 UDP
- RFC 793/1156 TCP/IP and MIB
- RFC 826 ARP
- RFC 919/922 Broadcasting Internet Datagram
- RFC 925/1027 Multi-LAN ARP/Proxy

## ARP

- RFC 950 Subnetting
- RFC 951 BOOTP
- RFC 1151 RDP
- RFC 1191 Path MTU Discovery
- RFC 1256 ICMP Router Discovery
- RFC 1305/2030 NTP v3 and Simple

## NTP

- RFC 1493 Bridge MIB
- RFC 1518/1519 CIDR
- RFC 1541/1542/2131/3396/3442

## DHCP

- RFC 1757/2819 RMON and MIB
- RFC 2131/3046 DHCP/BootP Relay
- RFC 2132 DHCP Options
- RFC 2251 LDAP v3
- RFC 2338/3768/2787 VRRP and MIB
- RFC 3021 Using 31-bit Prefixes
- RFC 3060 Policy Core
- RFC 3176 sFlow

\*\*Future certifications and software development required

## Services and support

For more information about our Professional services, Support services and Managed services, please go to <https://www.al-enterprise.com/en/services>.