Alcatel-Lucent 7250 SAS

SERVICE ACCESS SWITCH

The Alcatel-Lucent 7250 Service Access Switch (SAS) is a feature-rich customer edge device, purpose-built to increase service-provider revenues and deliver a complete portfolio of Carrier Ethernet services to enterprises. The 7250 SAS is Metro Ethernet Forum (MEF) 9 and MEF 14 certified and supports Multiprotocol Label Switching (MPLS), Ethernet, circuit emulation, and operations, administration and maintenance (OAM) tools. It is managed by the Alcatel-Lucent 5620 Service Aware Manager (SAM). The 7250 SAS enables service providers to increase revenues through enhanced service offerings and allows enterprise customers to expand capabilities and decrease costs.

The Alcatel-Lucent 7250 SAS gives service providers a competitive edge by cost-effectively extending service intelligence to the customer edge. By extending service intelligence to the customer premises, the 7250 SAS allows service providers to extend service level agreements (SLAs) to the customer premises and provides access to more enhanced Carrier Ethernet services such as virtual private local area network (LAN) services (VPLS) and virtual private wire services (VPWS), which support the increasing demands of enterprise data, voice and video applications. In addition, the 7250 SAS enables service providers to transparently carry Time Division Multiplexing-(TDM) based voice and data applications across an IP/MPLS backbone to enable new circuit emulation services (CES) and support TDM backhauling applications such as Private Branch Exchange (PBX) backhaul and leased line replacement.

The 7250 SAS gives enterprise customers a competitive advantage by reducing their leased line costs when connectivity is provided by the service provider. The 7250 SAS also increases the services that enterprises can provide to their internal customers. All the benefits of the 7250 SAS gained by a service provider that offers services to enterprises can be realized by enterprise customers who decide to install and manage their own private networks.

With its MPLS, circuit emulation, hierarchical quality of service (H-QoS), IEEE 802.1q virtual LAN (VLAN) stacking, and wire-speed non-blocking architecture, the 7250 SAS has the versatility, flexibility and reliability to provide access to a whole new stream of revenue opportunities for service providers, and feature enhancements and cost savings for private networks. These advanced features, along with extensive OAM tools, a modular design featuring hot-swappable modules with redundant configuration options, and a wide selection of interfaces, allow service providers to cost-effectively deliver a suite of user-centric VPN services, with strict, per-application SLAs.

Purpose-built for metro service applications

The 7250 SAS is purpose-built to support the data, voice and video applications that are transforming the way enterprises conduct business. With its advanced feature set, robust design and wire-speed performance, the 7250 SAS provides seamless access to services when networked with the Alcatel-Lucent 7450 Ethernet Service Switch (ESS), the Alcatel-Lucent 7710 Service Router (SR), and the Alcatel-Lucent 7750 SR.

Features

- Integrates MPLS, Ethernet and TDM technologies onto a single MEF 9 and MEF 14 certified platform:
  - ¬ MPLS includes Fast Re-Route (FRR), loose-hop label switched paths (LSPs), and Resource Reservation Protocol with Traffic Engineering (RSVP-TE)
  - ¬ Ethernet VLAN stacking per IEEE 802.1q with a variety of Fast Ethernet and Gigabit Ethernet (GigE) interfaces
  - ¬ DS1/E1 CES interface module supports structured and unstructured packetization modes, with Temperature Compensated Oscillator (TCXO) and Oven Controlled Oscillator (OCXO) options
  - ¬ Provides less than 50 ms reliability using FRR, dual homing, dynamic bypass LSPs, and fast ring Ethernet
- Offers H-QoS with up to two levels of hierarchical scheduling and per-service class-based queuing
- Is managed by the 5620 SAM
- Offers MEF OAM, IEEE 802.1ag, IEEE 802.3ah, service assurance agent (SAA), and Bi-directional Forwarding Detection (BFD) tool kit
- Has hot-swappable, redundant AC or DC power
- Provides dry contact inputs through a DB-9 interface on rear panel

Benefits

- Integrates MPLS, Ethernet and TDM, allowing for a variety of service options
- Extends service intelligence to the customer premises
  - ¬ Enables increased revenues through enhanced VPWS, VPLS, IP-VPN and CES service offerings by extending SLAs to the customer premises
  - ¬ Enables end-to-end solutions for Carrier Ethernet and CES when networked with the 7450 ESS, the 7710 SR and the 7750 SR
  - ¬ Provides scaling and operational advantages such as simplified signaling, fewer LSPs, and scalable inter-domain VPLS for large VPLS deployments
- Cost-effectively delivers advanced voice and data services in multi-tenant buildings over the IP/MPLS service infrastructure
- Delivers higher-margin services with access to a full suite of enhanced Carrier Ethernet services to support demanding enterprise applications
- Provides new CES and transparently carries TDM-based data, voice and video applications over the IP/MPLS service infrastructure, while preserving the full array of Class 5 features
- Eliminates service impact and simplifies the process of inserting (or removing) a new node into an existing ring topology
- Enhances SLAs by proactively monitoring the status of co-located equipment in real time
- Offers streamlined management and service assurance with the 5620 SAM and the extensive OAM tool kit

Technical specifications

Interfaces

- Twelve 100Base-FX Small Form Factor Pluggable (SFP) ports
- Eight 10/100Base-T RJ-45 ports
- Two Enhanced GigE SFP uplink ports
- Two GigE SFP ports
- Optional CES access module with 4-port DS1/E1 RJ-48c ports with TCXO and OCXO variants
- Four dry contact inputs through a DB-9 connector (on rear panel)

Ethernet switching features

- Technology: Application Specific Integrated Circuit- (ASIC) based, with parallel store-and-forward
- Bridging
  - ¬ IEEE 802.1d Spanning Tree Algorithm
  - ¬ IEEE 802.1p Priority Queuing
  - ¬ IEEE 802.1q VLAN Tagging
  - ¬ IEEE 802.1w Rapid Spanning Tree Algorithm
  - ¬ IEEE 802.1s Multiple Spanning Tree Algorithm
  - ¬ IEEE 802.3ad Link Aggregation
  - ¬ Fast ring Ethernet Ring Restoration (<50 ms)
- 4092 virtual LAN (VLAN) IDs per IEEE 802.1q
- Ability to disable learning per access port
- Ability to set Media Access Control (MAC) entry limits per service and per access port
- Notification that the MAC table limit has been reached
- Statistics: According to Access Control List (ACL)
- Address table: 16,000 MAC table entries
- Forwarding rate
  - ¬ 148,000 pps per 100 Mb/s port
  - ¬ 1,488,000 pps per 1 Gb/s port
- Flow control: IEEE 802.3x for full duplex; back pressure for half duplex transmission
- Port trunking: IEEE 802.3ad Link Aggregation

MPLS features

- RSVP-TE: according to RFC 3209
- FRR, including support for rapid failure detection and switching, penultimate hop popping (PHP), point of local repair (PLR), and merge point functionality with dynamic bypass LSPs for MPLS ring topologies
- Multiple LSPs and the ability to use different LSPs using specific pseudo-wires for VPWS on enhanced GigE uplink ports
- Signaling of MPLS Power Distribution Units (PDUs) with expired Time to Live (TTL) to the central processing unit (CPU) according to RFC 3443
- Definition of different LSPs to different hubs and load balancing among them
- Label switched router (LSR) functionality, enabling support for tandem or ring applications
- Label edge router (LER) functionality, providing for:
  - ¬ label stacking of up to two labels for LSP and the virtual circuit (VC) with an additional third label for OAM
  - ¬ label stacking of up to three labels for FRR+LSP+VC with an additional fourth label for OAM
- Hierarchical VPLS (H-VPLS) spokes
- MPLS traffic engineering: Label Distribution Protocol (LDP) and targeted LDP (TLDP)
- Dual homing: One active service distribution point (SDP) and a single backup SDP
- Link Aggregation Control Protocol (LACP) and static Link Aggregation Groups (LAGs) are supported with MPLS
- Ability to revert switching to backup SDP based on LDP/TLDP hello failure
- Selectable uplink ports (for example, 10/100Base-T, 100Base-FX or GigE)
- Global definition of the number of retries to set up an RSVP-TE LSP
- Support for re-signaling of RSVP-TE based on LSP demand
- Definition of up to 16 calculated or configured hops in each path
- Support for strict and loose hops on the same path
- Global definition of the amount of time that the ingress node holds before programming its data plane and declaring the LSP is up
- Definition of up to 16 calculated or configured hops in each path

VPLS features

- Rate limiting and priority on a per-VLAN basis
- Application of qualified and unqualified MAC learning to the same port
- Ability to disable MAC learning per port
- Ability to limit the number of MAC entries learned per service access point
- Notification that the MAC table limit has been reached
- Discarding of packets with unknown destination in a VPLS instance
- Discarding of packets with unknown source in a VPLS instance
- Statistics per service access point
- Internet Group Management Protocol (IGMP) snooping

H-QoS features

- Per-service and per-forwarding class queuing
- Up to two levels of hierarchical scheduling
- 16,000 queues for ingress and 16,000 queues for egress
- Up to 32 forwarding-class queues per service
- Congestion avoidance and buffer allocation using hierarchical weighted random early detection (WRED) mechanism
- Up to two levels of hierarchical-scheduling policing parameters, including committed information rate (CIR), peak information rate (PIR), committed burst size (CBS), maximum burst size (MBS), and high-priority settings
- Rate limiting for bandwidth allocation
- Separate access-list rate limiter for broadcast and/or multicast, in frames per second
- Extensive accounting and billing capabilities
- Enhanced filtering capabilities

QoS features

- Advanced QoS, with IEEE 802.1p and differentiated services code point (DSCP) filtering/marking/re-marking
- Eight output queues per port
- Rate limiting for bandwidth allocation
- Setting of a separate access-list rate limiter for broadcast and multicast traffic, in frames per second
- Mapping of untagged traffic into a separate VPN
- Mapping of untagged traffic on tagged ports
- ACL and policing statistics
- Packet and byte counter statistics (ingress and egress)

CES features

- Structure-Agnostic Traffic over Packet (SAToP) for unstructured DS1/E1 channel transport
- CES over Packet-Switched Networks (CESoPSN) for structured n*64 kb/s channel transport
- Loop, line, adaptive and free-run timing options
- Encapsulation techniques
  - ¬ IP packets (as defined by CESoPSN/SAToP)
  - ¬ Ethernet packets (according to MEF 8)
  - ¬ MPLS Martini Pseudowire Emulation Edge to Edge (PWE3) (as defined by CESoPSN/SAToP)
- DS1 specifications
  - ¬ Unframed, super-framed and extended super-framed mode
  - ¬ ANSI T1.403-1989
  - ¬ ANSI T1.102-1993
  - ¬ ANSI T1.107-2002
- E1 specifications
  - ¬ Unframed and framed modes
  - ¬ ITU-T G.703
  - ¬ ITU-T G.823 traffic interfaces
  - ¬ ITU-T G.824 traffic interfaces
  - ¬ Multiframe CRC-4 generation, multiframe channel associated signaling (CAS), common channel signaling (CCS)

OAM features

- MEF OAM that includes end-to-end service discovery and SLA validation over Ethernet uplinks and over VPLS clouds
- IEEE 802.1ag implementation, defining proactive and diagnostic fault localization procedures to monitor the health of links, check the connectivity of ports, detect fabric failures, and provide hierarchical layering of OAM perspectives for customers, service providers and operators
- IEEE 802.3ah EFM OAM implementation for transport layer OAM, providing mechanisms to monitor the operation and health of the physical link and improve fault isolation
- Bi-directional Forwarding Detection (BFD) to monitor and detect failures on the Open Shortest Path First (OSPF) protocol
- MPLS LSP ping and traceroute
- Service assurance agent, providing two-way performance measurement of frame-delay variation, frame-loss ration, packet loss, and round-trip delay

- Pseudo-wire status-notification message according to RFC 4447
- Local loopback for TDM port
- Local loopback for CES service
- Bit error-rate test on the local TDM port

Physical interfaces

- 10/100Base-T:
  - ¬ Connectors: RJ-45
  - ¬ Transmission: Full/half duplex
  - ¬ Range: 100 m (328.08 ft)
  - ¬ Ports: Auto-sensing
- 100Base-FX: SFP-based, LC connector
- 1000Base-X: SFP-based, LC connector
- 4-port DS1/E1 module: E1/T1 to RJ-48c connector
- 4 dry contact inputs through a DB-9 connector

Dimensions

- Height: 44 mm (1.73 in.)
- Width: 440 mm (17.32 in.)
- Depth: 419 mm (16.5 in.)

Weight

- Chassis without power supply unit (PSU): 3.7 kg (8.2 lb)
- Single AC power supply: 0.6 kg (1.3 lb)
- Single DC power supply: 0.6 kg (1.3 lb)

Power supply

- Redundant, hot-swappable
- AC version: 100 V to 240 V, 50/60 Hz
- DC (-48 V) version: -36 V to -75 V
- Power consumption: 90 W maximum

Certification

- Safety: EN 60950-1 (2001), AS/NZS 60950.1 (2003)
- EMC
  - ¬ Emissions EN 55022 - 1998/A1 - 2000/A2 - 2003
  - ¬ ICES-003 Issue 4 Class A
  - ¬ FCC 47 CFR Part 15 Class A
  - ¬ VCCI Class A
  - ¬ AS/NZS CISPR 22 - 2002 Class A
  - ¬ EN 61000-3-2 - 2000
  - ¬ EN 61000-3-3 - 1995/A1 - 2001
- Immunity
  - ¬ EN 55024 - 1998/A1 - 2001/A2 - 2003
- Emissions and Immunity
  - ¬ EN 300 386 v1.3.2
- Network Equipment Building System (NEBS) Level 3 compliant
- CES Module and High Performance CES Module
  - ¬ AS/ACIF S016 - 2001
  - ¬ FCC Part 68; TIA-968-A/A1, A2, A3; Industry Canada, IC-CS03
  - ¬ TBR 12 - 1993/A1 - 1996

Environment

- Operating temperature: 0°C to 45°C (32° F to 113°F)
- Short-term extended temperature: -20°C to +60 C (-4°F to +140°F)
- Humidity: Up to 95%, non-condensing

Network management

- The 7250 SAS is supported by the 5620 SAM, including:
  - ¬ 5620 SAM-E
  - ¬ 5620 SAM-P
  - ¬ 5620 SAM-A
- Standard management support includes:
  - ¬ STD-15
  - ¬ SNMPv1
  - ¬ STD-16 SMIv1
  - ¬ STD-17 MIB-11
  - ¬ STD-50 EtherLike MIB
  - ¬ STD-58 SMIv2
  - ¬ STD-59 RMON
  - ¬ STD-62 SNMPv3
  - ¬ SNMPv2c
  - ¬ SNMPv1
  - ¬ RFC 2668 MAU
  - ¬ RFC 29250
  - ¬ Ping MIB
- Command line interface (CLI)
  - ¬ Serial
  - ¬ Telnet
  - ¬ Secure Shell (SSH)
- Interface: In-band/out-of-band
- Local interface: RJ-45, TIA/EIA-232
- Software download: Trivial File Transfer Protocol (TFTP)
- Remote Authentication Dial-In User Service (RADIUS)
- Syslog

Standards compliance

IEEE standards

- IEEE 802.1d Spanning Tree Algorithm
- IEEE 802.1p Priority Queuing
- IEEE 802.1q VLAN Tagging
- IEEE 802.1w Rapid Spanning Tree
- IEEE 802.1s Multiple Spanning Tree
- IEEE 802.1ad Provider Edge Bridges
- IEEE 802.1ag Connectivity Fault Management
- IEEE 802.3ad Link Aggregation
- IEEE 802.3 Ethernet CSMA/CD Access Method and Physical Layer Specifications
- IEEE 802.3ah Ethernet First Mile
- IEEE 802.3u Fast Ethernet
- IEEE 802.3x Flow Control on Access
- IEEE 802.3z Gigabit Ethernet

IETF specifications

General

- RFC 768 User Datagram Protocol
- RFC 783 TFTP
- RFC 791 Internet Protocol
- RFC 792 Internet Control Message Protocol
- RFC 793 Transmission Control Protocol
- RFC 826 Ethernet Address Resolution Protocol
- RFC 854 Telnet Protocol Specification
- RFC 1122 Requirements for Internet Hosts - Communication Layers
- RFC 1518 Classless Inter-Domain Routing (CIDR) Architecture
- RFC 1519 Classless Inter-Domain Routing (CIDR)
- RFC 1812 Requirements for IPv4 Routers DiffServ
- RFC 2474 Definition of the Differentiated Services Field (DS Field) in IPv4 and IPv6 Headers
- RFC 2475 DiffServ Core and Edge Routing Functions
- RFC 2597 DiffServe Assured Forwarding
- RFC 3140 Per Hop Behavior Identification Codes
- RFC 3246/2598 Expedited Forwarding PHB

Table 1. 7250 SAS platform variant requirements for key features

KEY FEATURE	7250 SAS* (3HE01188AA)	7250 SAS ES (3HE01189AA)	7250 SAS ESA (3HE03250AA)
Ethernet switching and bridging	√	√	√
CES	√	√	√
Enhanced GigE uplink (with H-QoS, MPLS, FRR, RSVP-TE)		√	√
Dry contact inputs, loose-hop LSPs, dynamic bypass LSPs, 5620 SAM support for Server Assignment Answer (SAA), pseudo-wire status message			√

* Note: A 7250 SAS standard-variant manufacturer-discontinuation notification was issued in October 2007.

Routing protocols

- OSPF
  - ¬ RFC 1370 Applicability Statement for OSPF
  - ¬ RFC 1587 OSPF NSSA Option
  - ¬ RFC 1765 OSFP Overflow Graceful Handling
  - ¬ RFC 2328 OSPFv2.0 Protocol
  - ¬ RFC 2370 Opaque LSA Option
  - ¬ RFC 3101 OSPF NSSA Option
  - ¬ RFC 3630 OSPF Traffic Engineering
- Routing Information Protocol (RIP)
  - ¬ RFC 1058 RIP Version 1.0
  - ¬ RFC 2082 RIP Version 2.0
  - ¬ RFC 2453 RIPv2.0 MD5 Authentication
- MPLS
  - ¬ RFC 2702 Requirements for Traffic Engineering over MPLS
  - ¬ RFC 3031 MPLS Architecture
  - ¬ RFC 3032 MPLS Label Stack Encoding
  - ¬ RFC 3063 MPLS Loop Prevention Mechanism
  - ¬ RFC 4090 MPLS Fast Reroute - Facility Backup Method
  - ¬ RFC 4447 Pseudowire Setup and Maintenance Using the Label Distribution Protocol (LDP) FEC 128 Support
  - ¬ RFC 4448 Encapsulation Methods for Transport of Ethernet over MPLS Networks
- LDP
  - ¬ RFC 3036 LDP Specification
  - ¬ RFC 3037 LDP Applicability
- RSVP-TE
  - ¬ RFC 2430 A Provider Architecture for DiffServ and TE
  - ¬ RFC 3209 Extensions to RSVP for LSP Tunnels
  - ¬ RFC 3210 Applicability Statement for Extensions to RSVP for LSP Tunnels
- VPLS
  - ¬ RFC 4762 Virtual Private LAN Service (VPLS) using Label Distribution Protocol (LDP) Signaling
- Ethernet Pseudowire
  - ¬ IETF draft as defined in draft-ietf-pwe3-ethernet-encap-11
- LSP Ping
  - ¬ Draft-mpls-lsp-ping-3 LSP ping draft version 3
  - ¬ Draft-mpls-lsp-ping-7 LSP ping draft version 7
- Bi-directional Forwarding Detection
  - ¬ Draft-ietf-bfd-base-05
  - ¬ Draft-ietf-bfd-v4v6-1hop-06 BFD for IPv4 and IPv6 (single hop)
- Terminal Access Concentrator Access Control Server Plus (TACACS+)
  - ¬ IEFT draft as defined in draft-grant-tacacs-02
- SSH
  - ¬ IETF draft of SSH Authentication Protocol
  - ¬ IETF draft of SSH Connection Protocol
  - ¬ IETF draft of SSH Transport Protocol
- RADIUS
  - ¬ RFC 2865 Remote Authentication Dial In User Service
  - ¬ RFC 2866 RADIUS Accounting

Table 2. Ordering information

ORDERING CODE	ITEM NAME	DESCRIPTION
3HE03250AA	7250 SAS ESA with software	• 7250 SAS chassis with 2 SFP GigE uplink ports supporting enhanced services with 2 SFP GigE, 12 SFP 100Base-FX and 8 10/100Base-T Ethernet interfaces; 2 slots for CES modules; and 4 dry contact inputs through a DB-9 interface • Optical ports require SFPs • Power supplies are not included; up to 2 can be installed • Software includes support for enhanced MPLS, H-QoS, CES and OAM
3HE01189AA	7250 SAS ES with software	• 7250 SAS chassis with 2 SFP GigE uplink ports supporting enhanced services, with 2 SFP GigE, 12 SFP 100Base-FX and 8 10/100Base-T Ethernet interfaces and 2 slots for CES modules • Optical ports require SFPs • Power supplies are not included; up to 2 can be installed • Software includes support for enhanced MPLS, H-QoS, CES and OAM
3HE01190AA	CES Access Module	• Access module with 4-port E1/T1 CES • Connector RJ-48 (balanced) • Distance: 200 m • TCXO variant • Up to 2 modules can be installed per chassis
3HE01544AA	High Performance CES Access Module	• Access module with 4-port E1/T1 CES • Connector RJ-48 (balanced) • Distance: 200 m • High Performance Clock Recovery (HPCR) with OCXO variant • Up to 2 modules can be installed per chassis
3HE01191AA	-48V DC Power Supply	• -48 V DC power supply (one is required; a second is required for optional redundancy)
3HE01192AA	110-220V AC Power Supply	• 110 V to 220 V AC power supply (one is required; a second is required for optional redundancy)
3HE00062AA	PBA GigE TX SFP Copper Module	• 1-port 1000Base-TX SFP Copper Module • Cat5 • RJ-45 connector

Table 2. Ordering information cont.

ORDERING CODE	ITEM NAME	DESCRIPTION
3HE00027AA	PBA GigE SX SFP Optics Module	• 1-port 1000Base-SX SFP Optics Module • 850 nm • LC connector
3HE00028AA	PBA GigE LX SFP Optics Module	• 1-port 1000Base-LX SFP Optics Module • 1310 nm • 10 km • LC connector
3HE00029AA	PBA GigE ZX SFP Optics Module - LC	• 1-port 1000Base-ZX SFP Optics Module • 1550 nm • 70 km • LC connector
3HE00024AA	PBA 100FX SFP Optics Module - LC	• 1-port 100FX-SX SFP Optics Module • 1310 nm • LC connector
3HE00266AA	KIT 100FX SFP Optics Module SM 25 km - LC	• 1-port 100Base-FX SFP Optics Module • Single mode • 25 km • 1310 nm • LC connector
3HE00867AA	KIT GigE EX SFP Optics Module - LC	• 1-port 1000Base-EX SFP Optics Module • 1310 nm • 40 km • LC connector
3HE00868AA	KIT GigE BX10-U SFP - LC	• 1-port 1000Base-BX-U Bi-Directional (BiDi) SFP Optics Module • TX: 1310 nm • RX: 1490 nm • 10 km • LC connector
3HE00868AB	KIT GigE BX10-D SFP - LC	• 1-port 1000Base-BX-D BiDi SFP Optics Module • TX: 1490 nm • RX: 1310 nm

Alcatel·Lucent