

Alcatel-Lucent 7710 SR SERVICE ROUTER

The Alcatel-Lucent 7710 Service Router (SR) is a compact, high performance, feature rich IP/MPLS router ideally situated for lower density point-of-presence (PoP) locations, business/enterprise edge network applications, and mobile backhaul aggregation. Combined with its smaller form factor, wide range of modular interface options, IPv4/IPv6-based routing capabilities, and L2/L3 multi-service delivery capabilities, the 7710 SR delivers a highly reliable and cost-effective solution without compromising performance or feature breadth.



Alcatel-Lucent is at the forefront of the development and delivery of ultra-scalable IP/MPLS networks. With a vision and commitment to solve the networking complexities and continuous challenges driven by the use of video and multimedia applications and the convergence of residential, business and mobile networks, Alcatel-Lucent has delivered the innovative, leading-edge Service Router portfolio for the new service edge.

Designed for smaller points of presence (PoP) or distributed hub sites, the Alcatel-Lucent 7710 SR enables service providers, multiple service operators (MSOs), mobile operators, Internet service providers and application service providers (operators) to extend network transformation to the furthest edge of their networks. It is also an ideal solution for industry and public sector (IPS) customers in key vertical markets — including government, utilities, transportation, finance and education — which need to provide highly flexible, reliable and manageable voice, video and data services to their end users.

As a member of the industry-leading Alcatel-Lucent SR portfolio, the Alcatel-Lucent 7710 SR inherits the performance and reliability capabilities of the Alcatel-Lucent proven feature set. It meets the service delivery requirements of operators and IPS customers for IP/MPLS platforms that are both innovative and profitable.

Alcatel-Lucent is committed to helping sustain a green, eco-friendly planet. We recognize the importance that a green telecommunications industry has on the overall environment and the beneficial impact that our technology and products can provide in helping our customers meet their energy reduction goals. The 7710 SR provides all of the benefits of a high performance, fully featured router in a compact, modular design. With minimized space, power, and cooling requirements, the 7710 SR is ideal for helping service providers and enterprise customers meet their energy efficiency and environmental goals.

Modular, purpose-built architecture

At the heart of the Alcatel-Lucent 7710 SR is the fully programmable, flexible FP silicon technology. Based on state-of-the-art network processing and traffic management technology, the Alcatel-Lucent FP processing complex provides high throughput, service depth and feature velocity in a compact service router. A revolutionary breakthrough in silicon technology, the FP processing complex delivers an optimal combination of performance and service flexibility to support hardware-based IP/MPLS, IPv4 and IPv6 routing, granular traffic management and high-touch packet services in a single routing complex. The FP processing complex delivers a high degree of scalability with no tradeoff between throughput and advanced service delivery. FP technology delivers rich and robust multi-service routing capabilities, supporting the full complement of IP routing and multiprotocol label switching (MPLS) protocols, and also delivers highly scalable multicast services.

Each FP processor complex is composed of customized, fully programmable processors. These processors are optimized for fast packet manipulation, allowing the 7710 SR to deliver the speed, density and packet processing intelligence required to enable advanced Layer 3 services while ensuring the continuity of legacy Layer 2 services over the IP/MPLS network infrastructure. In addition, FP technology supports all interface types, so common silicon is used across platform interface modules, enabling absolute service consistency with complete interoperability. Purpose-built and optimized for high-demand environments, the FP Processing complex enables the 7710 SR to deliver a variety of complex consumer, business and mobile services for small and medium capacity deployments with granular per-service and/or per-subscriber controls.

Available in two chassis sizes supporting up to 4 and 12 interface positions, the

Alcatel-Lucent 7710 SR has a unique, highly modular design. The use of distinct Compact Media Adapters (CMAs) or Media Dependent Adapters (MDAs) allows support for a broad range of interface types while minimizing capital expenditures (CAPEX) by reusing selected MDAs between 7710 SR and 7750 SR chassis. The Alcatel-Lucent 7710 SR-c12 provides 24 Gb/s (half duplex) throughput, with support to mix and match up to eight CMAs or six MDAs per chassis. The Alcatel-Lucent 7710 SR-c4 provides 18 Gb/s (half duplex) throughput, with support to mix and match up to four CMAs and two MDAs per chassis.

The Service Routing Advantage

The Alcatel-Lucent 7710 SR is a full-featured router available in a small footprint. It delivers high-touch packet processing, enabling next-generation service creation without compromising forwarding performance and service depth. For edge and aggregation routing applications, the 7710 SR supports a wide range of IPv4/IPv6 and unicast/multicast routing protocols: Border Gateway Protocol (BGP)-4, Intermediate System-to-Intermediate System (IS-IS), Open Shortest Path First (OSPF) v3, Routing Information Protocol (RIP), Internet Group Management Protocol (IGMP) v3 with Snooping, and Equal Cost Multipath Protocol (ECMP). This compact routing platform supports industry-leading scaling and performance with wire-speed packet tunnel encapsulation and access control list (ACL) filtering, simultaneous Layer 2 or Layer 3 services to any port, 1 million IPv4/IPv6 routes, 17 million BGP paths, 512 BGP peers and up to 7,000 customers.

The Alcatel-Lucent 7710 SR is equipped with a dual IPv4/IPv6 stack, allowing simultaneous delivery of IPv4- and IPv6-based services with no performance impact. This allows the operator to deliver IPv6-based services on a per customer basis, negating the need to migrate the entire network to IPv6. IPv6 support includes IPv6 provider edge routing, full multicast support

and non-stop routing on OSPF, IS-IS and BGP4, enabling a number of applications including IPv6 provider edge (6VPE) for IP VPNs, IPv6 Internet exchange peering and IPv6-based Internet services.

The Alcatel-Lucent 7710 SR has also integrated MPLS into the control plane, making it an ideal platform for convergence. Consistent with the attributes of MPLS, it supports the IETF's standards for architecture, stack, traffic engineering and signaling, Ethernet, Frame Relay and ATM pseudowires using Pseudowire Emulation Edge-to-Edge (PWE3), as well as OAM standards for service tunneling flexibility. The 7710 SR is capable of delivering any combination of routed or switched services to any port without compromising service depth and forwarding performance.

High availability

The Alcatel-Lucent 7710 SR is designed to exceed the stringent reliability demands of next-generation residential, business and mobile services with a hardware and software architecture created for maximum uptime. The 7710 SR supports non-stop routing on OSPF, IS-IS, BGP, Resource Reservation Protocol with Traffic Engineering (RSVP-TE), IGMP snooping states, Protocol Independent Multicast (PIM) — Sparse Mode (SM) and PIM-Source-specific Mode (SSM) variants, and OSPFv3 on IPv6. It supports non-stop services on triple play, IP VPN, VPLS, VPWS, PBB-based services and enhanced Internet services. Non-stop routing and non-stop services are a must to meet high-availability requirements for always-on IP/MPLS-based services. The 7710 SR also supports in-service software upgrades for non-stop operation, MPLS TE graceful shutdown, multi-chassis LAG, multi-chassis automatic protection switchover, Fast Reroute (FRR) and active/standby LSPs. In addition, Graceful Restart - Helper Mode is supported for interoperability with legacy IP routing platforms.

Multi-service flexibility

The 7710 SR leverages sophisticated FP technology to deliver unmatched multi-service flexibility capabilities. The scalable architecture of the Alcatel-Lucent 7710 SR provides concurrent support for IP VPN, high-speed enhanced Internet services, triple play, Virtual Private LAN Services (VPLS), Virtual Private Wire Services (VPWS) and provider backbone bridging (PBB)-based services to any port. The 7710 SR can simultaneously support thousands of Layer 2 and Layer 3 service instances on a single platform. To ensure continuity with legacy services, the 7710 SR supports Pseudowire Emulation Edge-to-Edge (PWE3) technology with network and service interworking using Ethernet, Frame Relay and ATM pseudowires for advanced Virtual Private Wire Services (VPWS) over the IP/MPLS backbone.

Multi-service density

With highly flexible, modular physical network interface options, the Alcatel-Lucent 7710 SR supports a full breadth of interface types. For example, the 7710 SR-c12 supports up to 360 10/100Base-T Ethernet ports, 120 GigE ports, 48 OC-3c/STM-1c packet over SONET/SDH (PoS) ports, 12 OC-48c/STM-16c PoS ports, 8 OC-3/STM-1 circuit emulation services (CES) ports, 24 OC-3c/STM-1c/OC-12c/STM-4c multirate ATM ports, 64 DS1-E1 ATM ports and 64 channelized DS1/E1 interfaces per chassis. Portable across platforms, compact media adapters (CMAs) and selected media dependent adapters (MDAs) provide configuration flexibility and investment preservation.

CMAs are hot-swappable adapters occupying one slot position that insert directly into the 7710 SR chassis. MDAs are hot-swappable adapters that occupy two slot positions and insert into the 7710 SR chassis using an MDA carrier module (MCM). The control forwarding modules (CFMs) provide the forwarding and packet services and deliver the full complement of the Alcatel-Lucent SR OS capabilities for the 7710 SR. The 7710 SR CMA and MDAs deliver

comprehensive IEEE 802.3 compliance and provide multi-service support for Layer 2 and Layer 3 IPv4 and IPv6 routing services, IP/MPLS, Ethernet over MPLS (EoMPLS), VPLS and VPWS with a highly personalized service context. As well, CMAs and MDAs use small form factor pluggable (SFP) optics to provide greater flexibility by populating MDAs with the required optics on a per-port basis.

For true multi-service, multi-encapsulation interface flexibility, the Any Service Any Port (ASAP) Media Dependent Adapter (MDA) converges diverse interfaces and protocols onto a common MDA for the 7710 SR. Each ASAP MDA port can be independently configured to deliver clear channel or channelized connections — supporting from DS0 up to the maximum port speed, with increments through DS3/E3, OC-3/STM-1 and OC-12/STM-4. Each port or channel can be configured with any combination of Layer 2 and Layer 3 services, and each port's or channel's upper layer encapsulation can be flexibly configured to support Ethernet, Frame Relay, Point-to-Point Protocol (PPP), Packet over SONET (POS), Asynchronous Transfer Mode (ATM) and High-Level Data Link Control (HDLC). Additionally, the ASAP MDA supports channel bundling using Multi-Link PPP (MLPPP) and ATM Inverse Multiplexing over ATM (IMA) over multiple DS1/E1 links, enabling service operators to offer very granular bandwidth services and a broader range of tiered offerings.

Service-aware H-QoS

Service-aware quality of service (QoS) on the Alcatel-Lucent 7710 SR provides application-based queuing, policing and shaping, with per-service bandwidth guarantees to meet the most demanding SLAs for video, VoIP and data applications — without the extra cost of special modules for advanced features. Service-aware QoS also ensures subscriber isolation, allowing for simultaneous support of Layer 2 and Layer 3 services while maintaining SLAs for existing and emerging services.

For increased service differentiation, the 7710 SR delivers service-aware Hierarchical Quality of Service (H-QoS) and accounting for innovative service bundles. This helps guarantee the performance of each forwarding class in terms of bandwidth, delay and jitter, while allowing lower-priority traffic to burst when higher-priority applications go idle.

Leadership in mobile IP network transformation

The Alcatel-Lucent 7710 SR is also fully equipped to enable mobile network transformation and convergence. By integrating TDM, ATM and Ethernet traffic, the 7710 SR simplifies and scales CDMA/EV-DO and GSM/UMTS/HSPA networks, enabling evolution to an efficient all-IP transport network as well as removing barriers to offering new services. To handle bandwidth-intensive IP data services, Multilink Point-to-Point Protocol (MLPPP), ATM Inverse Multiplexing over ATM (IMA) and multi-chassis automatic protection switching (MC-APS) are supported. Circuit emulation service (CES) standards, either CES over packet (CESoP) or Structure Agnostic Transport over Packet (SAToP), enable the backhauling of 2G and 3G network traffic over IP/MPLS or Ethernet. The 7710 SR delivers advanced synchronization techniques and allows flexible options for transport of timing over packet networks (line timing, BITS, adaptive and differential clock recovery). CDMA/EV-DO operators can facilitate network provisioning and operation with configurable QoS profiles for multi-class MLPPP. The use of multi-class MLPPP enables efficient multi-class traffic convergence and extends the life of costly backhaul links.

The Alcatel-Lucent 7710 SR also safeguards investments by offering the ability to seamlessly and smoothly transition to 4G (WiMAX, LTE). Using the 7710 SR, mobile operators can allow the seamless coexistence of existing 2G and 3G mobile technologies with reliable and efficient bearer and control transport of 4G mobile traffic.

Business Critical Services

The Alcatel-Lucent 7710 SR helps operators address the growing demand for higher bandwidth business-critical services and reduce the total cost of ownership through industry-leading IP transformation. The 7710 SR-based business services solution supports both Layer 2 Carrier Ethernet 2.0 and Layer 3 IP-VPNs on the same platform, with flexible interface options which allow operators to support any-to-any connectivity regardless of access technology differences. For service providers and MSOs who want to deploy robust and highly reliable MEF-certified networks, the 7710 SR is MEF 9- and MEF 14-certified.

The 7710 SR-based single aggregation solution allows operators to meet existing SLA(s) and offer premium SLA(s) for higher-margin business VPN services, using inherent differentiated capabilities of the 7710 SR platform. Service-aware H-QoS permits per business-subscriber (site) per service granularity for tailored SLAs that relate directly to the networking objectives of the enterprise. Service-aware OAM ensures that these services can be fully managed end-to-end. Fast, accurate and fully integrated service provisioning, management and restoration allow operators to have full visibility of network and service profile capabilities to manage services end-to-end.

In addition to full standards-based support for VPLS and PBB, the Alcatel-Lucent 7710 SR delivers another technology innovation first by tightly integrating PBB with VPLS. The integrated solution combines the scalability benefits of PBB and the resiliency, traffic engineering and convergence benefits of VPLS. This enables operators to leverage their existing metro Ethernet infrastructure, providing interoperability between native Ethernet and VPLS, while expanding their service to reach national or international markets. Leveraging the programmability of FP technology, PBB was introduced

through software, without any hardware upgrades. The industry-leading standards-based flood containment and tiered resiliency mechanisms for PBB-VPLS provide improved reliability and flexibility for end-to-end Ethernet services.

Service-based OAM

With a purpose-built, service-aware framework, the Alcatel-Lucent 7710 SR offers simplification and cost reduction of network operations through rapid diagnosis of network and service level faults, early detection of component and service degradation, and a highly automated process of isolating network-induced errors. The 7710 SR service-aware OAM tools include Service Assurance Agent (SAA) tests with scheduling and hardware timestamps, Bidirectional Forwarding Detection (BFD), service ping, LSP ping and traceroute, VPLS ping and traceroute, service mirroring, virtual circuit connectivity verification, IEEE 802.1ah and a suite of multicast troubleshooting tools. These tools are integrated into the Alcatel-Lucent 5620 Service Aware Manager (SAM), which uses a GUI to ensure rapid fault isolation.

To enable service providers to meet lawful intercept (LI) requirements, the Alcatel-Lucent 7710 SR LI supports a non-service-affecting LI that provides an assurance of confidentiality and security for the LI administrator, activities and information. To meet the size and scale of LI regulatory and customer SLA requirements, the flexibility of the 7710 SR LI implementation provides various deployment options. The 7710 SR formally separates the control planes between the LI agency and the network administrator, with completely transparent accounts and operations. Furthermore, each deployment option permits the integration of native and third-party LI interfaces with the 7710 SR LI capability, to minimize churn and support flexible equipment reuse.

Service velocity

The Alcatel-Lucent 7710 SR uses the Alcatel-Lucent Service Router Operating System (SR OS) image across all platforms. This is the same production-hardened operating system spanning the entire Service Router portfolio, which includes the Alcatel-Lucent 7750 SR. The Alcatel-Lucent SR OS provides the high-performance, highly available IP routing foundation that tightly integrates with the fully programmable FP packet processing technology. The combination of SR OS and FP technology means that new features and protocols such as IPv6-based IP VPNs are implemented as software enhancements, requiring no hardware changes and allowing for rapid service introduction.

Leading network management innovation

The Alcatel-Lucent 7710 SR is fully managed by the industry-leading Alcatel-Lucent 5620 SAM and Alcatel-Lucent 5650 Control Plane Assurance Manager (CPAM). The 5620 SAM is a single management platform offering element, network and service management. It gives the operator a comprehensive fault management system with which to perform root cause analysis, schedule a suite of OAM tests for SLA compliance, run predefined test suites, set threshold crossing alerts to detect potential SLA violations, and simplify service provisioning with GUI-based templates. The 5650 CPAM is an IP/MPLS multivendor-compatible control plane management solution. It enables service operators to assure network and service availability against control plane misconfigurations, malfunctions and undetected routing updates, as well as to accelerate service problem resolution over an IP/MPLS infrastructure. Together, the Alcatel-Lucent 7710 SR, 5620 SAM and 5650 CPAM form the industry's most comprehensive unified IP network resource and service management solution.



Alcatel-Lucent 7710 SR-c12

Throughput

- 24 Gb/s (half-duplex) forwarding capacity

CMAs/MDAs per system

Any one of the following options:

- Up to eight CMAs and two MDAs
- Up to six CMAs and three MDAs
- Up to four CMAs and four MDAs
- Up to two CMAs and five MDAs
- Up to six MDAs

Redundancy

- Fully redundant platform with no single point of failure
- 1:1 redundancy on all common system elements (power supplies, etc.)
- 1:1 Control and Forwarding Module (CFM) redundancy
- Non-stop routing, including BGP, OSPFv3, IS-IS, RIP, RSVP-TE, LDP, T-LDP
- In-service insertion and removal of system components and physical interfaces

Physical dimensions

- Height: 22.2 cm (8.7 in.)
- Width: 44.4 cm (17.5 in.)
- Depth: 60.0 cm (23.6 in.)

Power

- -40 V to -75 V DC
- 85 V to 265 V AC
- 1+1 redundancy

Cooling

- Horizontal forced airflow



Alcatel-Lucent 7710 SR-c4

Throughput

- 18 Gb/s (half-duplex) forwarding capacity

CMAs/MDAs per system

Any one of the following options:

- Up to four CMAs
- One MDA (requires one MCM) and up to two CMAs
- Up to two MDAs (requires one MCM per MDA)

Redundancy

- 1:1 redundancy on all common system elements (power supplies, etc.)
- In-service insertion and removal of system components and physical interfaces

Physical dimensions

- Height: 13.3 cm (5.3 in.)
- Width: 44.4 cm (17.5 in.)
- Depth: 55.9 cm (22.0 in.)

Power

- -40 V to -75 V DC
- 85 V to 265 V AC
- 1:N redundancy

Cooling

- Horizontal forced airflow

Table 1. CMA support

CMA TYPE	PORTS PER CMA	PORTS PER 7710 SR-C4	PORTS PER 7710 SR-C12
10/100Base-T	8	32	64
1 GigE	1	4	8
Channelized DS1/E1 (n x 64 kb/s)	8	32	64
Channelized OC-3/STM-1 CES	1	4	8
DS3/E3	4	16	32
OC-3c/OC-12c/STM-1c/STM-4c PoS	2	8	16
DS1/E1 ATM	8	32	64

Table 2. MDA support

MDA TYPE	PORTS PER MDA	PORTS PER 7710 SR-C4	PORTS PER 7710 SR-C12
10/100Base-T	60	120	360
10/100/1000-TX	20	40	120
100Base-FX	20	40	120
1 GigE	5	10	30
1 GigE	20	40	120
OC-3c/STM-1c	8	16	48
OC-48c/STM-16c	2	4	12
OC-3c/OC-12c/STM-1c/STM-4c ATM	4	8	24
Channelized DS3/E3 ASAP	4	8	24
Channelized DS3/E3 ASAP	12	24	72
Channelized OC-3/STM-1 ASAP	4	8	24
Channelized OC-12/STM-4 ASAP	1	2	6

SR OS specifications (Common to both chassis variants)

Services

- IP VPN (RFC 4364)
- IPv6-based IP VPN
- VPWS point-to-point Layer 2 VPN
- VPLS multipoint Layer 2 VPN (RFC 4762)
- Direct Internet access
- CES
- Mobile transport
- IP multicast support with Virtual Private Routed Network (VPRN) using “draft Rosen”
- PWE3 using “draft Martini” encapsulation
- Generic routing encapsulation (GRE)
- PBB based on IEEE 802.1ah
- PBB & VPLS integration

QoS

- Per-service QoS with per-service queuing, shaping and policing
- Hierarchical queuing and scheduling
- Ingress and egress buffering (up to 200 ms at 12 Gb/s in each direction)
- Committed information rate (CIR), peak information rate (PIR), maximum burst size (MBS) queue parameters
- Thousands of ingress and egress operations
- Programmable queues with CIR/PIR enforcement
- Premium, assured and best-effort forwarding classes
- IEEE 802.1p filtering/marking/re-marking
- IETF DSCP filtering/marking/re-marking
- Weighted random early detection (WRED) on ingress and egress
- Packet marking (DiffServ)
- Traffic shaping and policing (ingress and egress)
- Packet and byte counter statistics (ingress and egress)

Security

- Wire-speed ACLs
- MD5 password encryption and authentication for routing protocols
- Classification and prioritization of control traffic
- Secure Shell (SSH) v1/v2 and Secure Copy (SCP)
- IEEE 802.1x port-based authentication
- Prevention of unauthorized communication between DSL subscribers
- Dynamic Host Configuration Protocol (DHCP)-based automatic IP/MAC filter and static Address Resolution Protocol (ARP) cache population for DSL subscribers
- Dedicated management Ethernet routing instance
- Inbound and outbound LDP label binding filtering
- Limitation of MAC address moves between VPLS instances

Lawful Intercept

- Highly-flexible Intercept Access Point (IAP) mirroring supports LI mirroring on a per-subscriber, per-service, per-flow and per-network IAP basis

- Full content mirroring includes signaling, routing and switched data traffic
- Flexible packet size for mirrored LI traffic enables full or partial packets to be mirrored
- Local and remote LI mirroring
- Layer 2 and Layer 3 services LI mirroring of both routed (Layer 3) and switched (Layer 2) services, which includes IP VPN, IES, VLL, VPLS and CES
- Comprehensive set of LI mirroring-capable interfaces supports subscriber- and classification-based interception mirroring across a wide set of interfaces – Supported interfaces include TDM, ATM, Frame Relay, SONET/SDH, Ethernet, virtual LAN (VLAN), link aggregation group and circuit emulation service
- Configurable QoS for mirrored LI traffic locally on the network element and across the network
- The data-plane supports line-rate switching for the traffic aggregate – the total original and mirrored traffic

Management

- Alcatel-Lucent 5620 SAM provides extensive Fault, Configuration, Accounting, Performance, and Security (FCAPS)
- Fully featured industry CLI, including service CLI
- SSH v1/v2 and Telnet
- FTP, TFTP and SCP
- RADIUS (AAA)
- TACACS+
- SNMP v1, v2c and v3
- cflowd v5 and v8
- Local and remote port/service/flow mirroring
- Service assurance tools, including service ping, SDP ping, LSP ping, MAC ping and MAC traceroute
- Path maximum transmission unit (MTU) size measurement
- Round-trip delay, jitter, loss measurement (SAA)

Safety standards and compliance agency certifications

Safety

- EN 60590-1
- IEC 60950-1CB Scheme
- CSA/UL 60950-1 NRTL
- FDA CDRH 21-CFR 1040
- EN 60825-1
- EN 60825-1A2
- IEC 60825-1
- IEC 60825-2

EMC

- ICES-003 Class A
- FCC Part 15 Class A
- EN 300 386
- EN 55022
- EN 55024
- EN 61000-4-2
- EN 61000-4-3
- EN 61000-4-4

- EN 61000-4-5
- EN 61000-4-6
- EN 61000-4-11
- IEC CISPR22
- AS/NZS CISPR 22

Immunity

- EN 61000-3-2 Power Line Harmonics
- EN 61000-3-3 Voltage Fluctuations and Flicker
- EN 61000-4-2 Electric Static Discharge
- EN 61000-4-3 Radiated Immunity
- EN 61000-4-4 EFT
- EN 61000-4-5 Surge
- EN 61000-4-6 Low Frequency Common Immunity
- EN 61000-4-11 Voltage Dips and Sags

Telecom

- Telcordia GR-253-CORE Issue 3
- IEEE 802.3 (Gigabit Ethernet, Ethernet)
- ANSI T1.105.03
- ANSI T1.105.06
- ANSI T1.105.09
- ANSI T1.403 (DS1)
- ANSI T1.404 (DS3)
- ITU-T G.957
- ITU-T G.825
- ITU-T G.824
- ITU-T G.823
- ITU-T G.813
- ITU-T G.707
- ITU-T G.703

Environmental

- ETS 300 019-1-1, Storage Tests, Class 1.2
- ETS 300 019-1-2, Transportation Tests, Class 2.3
- ETS 300 019-1-3, Operational Tests, Class 3.2
- ETS 300 019-2-4, pr A1 Seismic

Environmental specifications

- Operating temperature: 0°C to 40°C (32°F to 104°F)
- Relative humidity: 15% to 85% (non-condensing)
- Operating altitude: sea level to 3048 m (10,000 ft)

Electronic equipment devices

- WEEE
- RoHS
- R&TTE
- China CRoHS

Certifications

- Network Equipment Building System (NEBS) Level 3
 - Telcordia GR-63-CORE, Issue 4, June 2006
 - Telcordia GR-1089-CORE, Issue 3, March 2006
 - ATT-TP-76200
- CE

Protocol Support

OSPF

RFC 1765 OSPF Database Overflow
RFC 2328 OSPF Version 2
RFC 2370 Opaque LSA Support
RFC 2740 OSPF for IPv6 (OSPFv3) draft-ietf-ospf-ospfv3-update-14.txt
RFC 3101 OSPF NSSA Option
RFC 3137 OSPF Stub Router Advertisement
RFC 3623 Graceful OSPF Restart – GR helper
RFC 3630 Traffic Engineering (TE) Extensions to OSPF Version 2
RFC 4203 Shared Risk Link Group (SRLG) sub-TLV

BGP

RFC 1397 BGP Default Route Advertisement
RFC 1772 Application of BGP in the Internet
RFC 1965 Confederations for BGP
RFC 1997 BGP Communities Attribute
RFC 2385 Protection of BGP Sessions via MD5
RFC 2439 BGP Route Flap Dampening
RFC 2547bis BGP/MPLS VPNs
draft-ietf-idr-rfc2858bis-09.txt
RFC 2918 Route Refresh Capability for BGP-4
RFC 3392 Capabilities Advertisement with BGP4
RFC 4271 BGP-4 (previously RFC 1771)
RFC 4360 BGP Extended Communities Attribute
RFC 4364 BGP/MPLS IP Virtual Private Networks (VPNs) (previously RFC 2547bis BGP/MPLS VPNs)
RFC 4456 BGP Route Reflection: Alternative to Full-mesh IBGP (previously RFC 1966 & 2796)
RFC 4724 Graceful Restart Mechanism for BGP – GR helper
RFC 4760 Multi-protocol Extensions for BGP (previously RFC 2858)
RFC 5065 Confederations for BGP (obsoletes 3065)

IS-IS

RFC 1142 OSI IS-IS Intra-domain Routing Protocol (ISO 10589)
RFC 1195 Use of OSI IS-IS for routing in TCP/IP & dual environments
RFC 2763 Dynamic Hostname Exchange for IS-IS
RFC 2966 Domain-wide Prefix Distribution with Two-Level IS-IS
RFC 2973 IS-IS Mesh Groups
RFC 3373 Three-Way Handshake for Intermediate System to Intermediate System (IS-IS) Point-to-Point Adjacencies
RFC 3567 Intermediate System to Intermediate System (ISIS) Cryptographic Authentication
RFC 3719 Recommendations for Interoperable Networks using IS-IS
RFC 3784 Intermediate System to Intermediate System (IS-IS) Extensions for Traffic Engineering (TE)
RFC 3787 Recommendations for Interoperable IP Networks
RFC 3847 Restart Signaling for IS-IS – GR helper
RFC 4205 for Shared Risk Link Group (SRLG) TLV
draft-ietf-isis-igp-p2p-over-lan-05.txt

LDP

RFC 3036 LDP Specification
RFC 3037 LDP Applicability
RFC 3478 Graceful Restart Mechanism for LDP – GR helper
draft-jork-ldp-igp-sync-03.txt

IPv6

RFC 1981 Path MTU Discovery for IPv6
RFC 2375 IPv6 Multicast Address Assignments
RFC 2460 Internet Protocol, Version 6 (IPv6) Specification
RFC 2461 Neighbor Discovery for IPv6
RFC 2462 IPv6 Stateless Address Auto configuration
RFC 2463 Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 Specification
RFC 2464 Transmission of IPv6 Packets over Ethernet Networks
RFC 2529 Transmission of IPv6 over IPv4 Domains without Explicit Tunnels
RFC 2545 Use of BGP-4 Multiprotocol Extension for IPv6 Inter-Domain Routing
RFC 2710 Multicast Listener Discovery (MLD) for IPv6
RFC 2740 OSPF for IPv6
RFC 3306 Unicast-Prefix-based IPv6 Multicast Addresses
RFC 3315 Dynamic Host Configuration Protocol for IPv6
RFC 3587 IPv6 Global Unicast Address Format
RFC3590 Source Address Selection for the Multicast Listener Discovery (MLD) Protocol
RFC 3810 Multicast Listener Discovery Version 2 (MLDv2) for IPv6
RFC 4007 IPv6 Scoped Address Architecture
RFC 4193 Unique Local IPv6 Unicast Addresses
RFC 4291 IPv6 Addressing Architecture
RFC 4659 BGP-MPLS IP Virtual Private Network (VPN) Extension for IPv6 VPN
RFC 5072 IP Version 6 over PPP
draft-ietf-isis-ipv6-05.txt
draft-ietf-isis-wg-multi-topology-xx.txt

Multicast

RFC 1112 Host Extensions for IP Multicasting (Snooping)
RFC 2236 Internet Group Management Protocol (Snooping)
RFC 3376 Internet Group Management Protocol, Version 3 (Snooping)
RFC 2362 Protocol Independent Multicast-Sparse Mode (PIM-SM)
RFC 3618 Multicast Source Discovery Protocol (MSDP)
RFC 3446 Anycast Rendezvous Point (RP) mechanism using Protocol Independent Multicast (PIM) and Multicast Source Discovery Protocol (MSDP)
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