

Tellabs SmartCore® 9200 Content-Aware Routing Series

Intelligent-high-capacity IP edge solution for next-generation networks.

Overview

The Tellabs SmartCore® 9200 Series enables advanced performance and scalability to optimize service provider profitability and enhance the user experience. With industry-leading scale, the Tellabs SmartCore 9200 series is designed for over 1 Tbps (half duplex) per slot.

The platform consists of multiple chassis sizes, including:

- Tellabs SmartCore® 9280 Platform – 11.2 Tbps, 16 rack unit
- Tellabs SmartCore® 9240 Platform – 4.4 Tbps, 6 rack unit
- Tellabs SmartCore® 9220 Platform – 2.2 Tbps, 4 rack unit

This portfolio provides investment protection to save operators money and meet unforeseen future demands.

Highlights

The Tellabs SmartCore 9200 Series separates itself from the competition with a mixture of features.

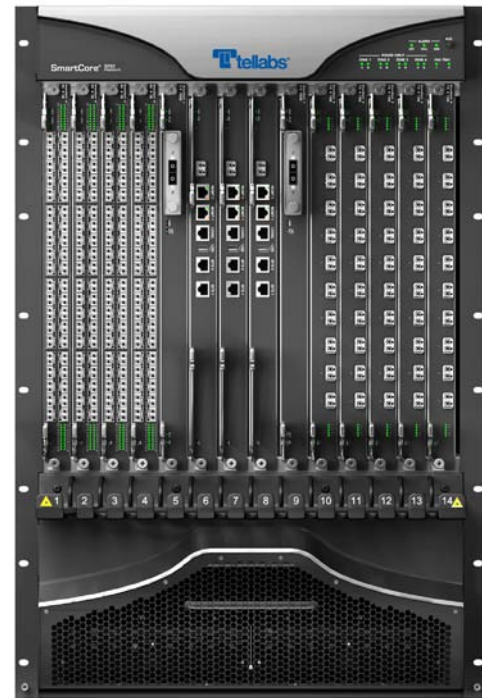
Intelligence and Visibility

Tellabs 9200 line cards (“SmartCards”) have on-board content and security engines that enable flow and packet-based traffic inspection. These functions enable varying levels of network visibility for content awareness, policy enforcement and security. The Tellabs SmartCore 9200 Series integrates this intelligence onto each network-facing line card, which saves service providers from a dedicated server-blade approach. The server-blade approach uses dedicated cards for services, processing and compute power, but lacks actual traffic bearing Ethernet interfaces. The Tellabs SmartCore 9200 Series approach makes the most efficient use of each chassis slot.

Multi-layer Packet Loop Test (ML-PLT) and Service OAM (SOAM)

The Tellabs SmartCore 9200 Series introduces Multi-layer Packet Loop Test (ML-PLT) and Service OAM (SOAM) for fast troubleshooting and high resiliency. SOAM enables proactive and non-intrusive testing to detect problems before they occur, lowering costs and increasing quality of experience.

The ML-PLT feature contains a versatile collection of tests for ensuring flawless performance of the network and services before or after service turn-up. These tests based on Y.1564 can be executed remotely through the management system, increasing the service provider’s efficiency and decreasing operations work. Furthermore, the ML-PLT feature provides Integrated Test Head (ITH) functionality that offers the ability to generate test traffic from within the NE. This eliminates the need and cost for external test equipment and for field service calls.



The Tellabs SmartCore 9200 Series delivers data throughput from 100G to over 500G (future). The Tellabs SmartCore 9280 platform is shown above.

Scalable Router Design

With exceptional scalability, the Tellabs SmartCore 9200 Series is designed to meet the scaling needs vital to addressing current and future advanced Ethernet and IP/MPLS requirements. Flexible physical and logical scalability provides investment protection that saves operators money while meeting future traffic demands.

GeniOS Operating System

Supporting IPv6 on day one, the Tellabs® GeniOS™ operating system coupled with the Tellabs® 8000 Intelligent Network Manager (INM) offers an open software platform and comprehensive GUI based visibility and control. Tellabs GeniOS is built on an open platform that easily integrates third-party applications and offers rapid turn-up of revenue-generating services. Tellabs GeniOS enables granular user control and network traffic visibility that enable personalization and a better user experience. In Service Software Upgrade (ISSU) and software patches enable graceful software enhancements that minimize traffic impact and maximize system capabilities.



The Tellabs SmartCore 9200 Series is available in multiple form-factors for cost-effective scalability. Tellabs SmartCore 9240 Platform is shown above.

Applications and Services

The Tellabs SmartCore 9200 Series enables service providers to offer a variety of services on a converged network architecture, enabling new revenue opportunities while maintaining legacy investments:

- Ethernet Transparent LAN Services (L2 VPN)
 - 802.1Q
 - 802.1ad Provider Bridge/VLAN Stacking
 - Virtual Private Wire Services (VPWS)
 - Virtual Private LAN Services (VPLS)
 - H-VPLS for large-scale multipoint-to-multipoint connectivity
- IP/MPLS
- IP Routing and Layer 3 VPNs
 - Layer 3 BGP/MPLS VPNs
 - IP VPN using GRE
- Broadband Aggregation
 - DSLAM aggregation and backhaul using Metro Ethernet aggregation
- Wireless Transport
 - 3G migration
 - 4G/LTE migration
 - Wireless backhaul
 - RAN aggregation
 - Wireless core
- Triple play services
 - IP telephony
 - IPTV
 - Broadcast TV
 - VoIP

Tellabs 8000 Intelligent Network Manager (INM)

The Tellabs SmartCore 9200 Series can be fully managed with the Tellabs 8000 INM, Tellabs' flagship management system.

The Tellabs 8000 INM is a powerful element, network and service management system supporting Tellabs mobile, optical and business solutions. It provides a complete network management solution, from deep node level troubleshooting to end-to-end service management.

The Tellabs 8000 INM includes:

- Rich and intuitive GUI tools, including wizards and templates
- Advanced OAM test tools
- Multiple North Bound Integration (NBI) interfaces, including off-the-shelf solutions with industry leading OSS
- Statistics collection and reporting, with trend analysis and alarm thresholding
- Multi-layer troubleshooting graphical tools
- Web-based reporting GUI

Switch Complexes

The Tellabs SmartCore 9200 Series uses unique active-active switch complexes. All provide redundancy, control and management functionality, and all support distributed fabric using any available fabric across all available switch cards. The Tellabs SmartCore 9280 Platform uses up to four switch and control cards (SXC), the number used depending on the redundancy and total switching capacity desired. Thus, SXCs provide N:1 automatic, hot-standby redundancy and data plane load sharing.

Similarly, the Tellabs SmartCore 9240 and 9220 Platforms contain two compact central fabric management controllers (CFMC). CFMCs provide both redundant 1:1 active-active control and switching capabilities in compact, cost-effective form factors.

The switch fabric has the following switching and fault tolerant features:

- Fully non-blocking switching architecture
- Highly efficient and deterministic performance
- Instantaneous routing/switching around internal failures

Tellabs 9200 SmartCards

The Tellabs 9200 SmartCards are designed for use in any Tellabs 9200 SmartCore Series chassis. This means all SmartCards can be used in any slot in any Tellabs 9200 SmartCore Series chassis, adding simplicity and cost savings for service providers.

- SmartCard-1: Supports mobile backhaul and Ethernet services.
- SmartCard-2: Supports mobile backhaul, Ethernet services and offers content and security engines for flow-based inspection and classification.
- SmartCard-3: Supports mobile backhaul, Ethernet services and offers content and security engines for packet-based inspection and classification.
- Wire speed 1G, 10G, 40G and 100G interfaces
- Per-flow wire speed traffic management
- IPSec
- Flow-based accounting
- IEEE 1588 precision timing protocol and synchronous Ethernet timing
- Network-based security

Traffic Management

Innovative SLAs can be provisioned and managed on Tellabs 9200 SmartCards:

- Per-flow policing, queuing and shaping
- Per-flow congestion detection and avoidance
- Hierarchical ingress scheduling
- Hierarchical egress QoS
- Support of IP QoS based on Differentiated Services (DiffServ) classes of service
- Support of Ethernet CoS based on IEEE 802.1p
- Wire-speed IP forwarding and processing with complex lookup and filtering mechanisms
- Support of tens of thousands of flows per line card and hundreds of thousands of flows per chassis

Combined with the switch fabric, the Tellabs SmartCore 9200 Series line cards provide the ability to offer integrated and highly efficient data forwarding across multiple services.

Distributed Intelligence and Multi-Dimensional Scalability

Tellabs 9200 SmartCards provide per-flow and per-packet traffic management, hardware assist OAM, IPSec, flow-based accounting and packet synchronization (1588v2, G.8362 SyncE). Additionally, SmartCards offer distributed intelligence, processing and multi-dimensional scalability over high-density Ethernet interfaces.

SmartCard-2 and SmartCard-3 contain additional on-board content and security engines for advanced inspection, processing, security, and content awareness. SmartCard-2 contains over 10G of additional processing for flow-based inspection, which could be used to identify traffic types traversing a network as an example.

SmartCard-3 offers more than 50G of additional on-board content and security engine processing. SmartCard-3 will be used where real-time, line rate packet-level inspection is needed. Applications include security and virus detection, as examples. SmartCard-3's advanced engines are also ideal for P-GW/S-GW functions in LTE.

High Availability and Resiliency

The Tellabs SmartCore 9200 Series leverages Tellabs 20+ years in mobile and packet core products and services with a high-availability platform that provides a full suite of Layer-2/3 applications to the converged IP/MPLS Core, including:

- Distributed architecture
- No fate sharing
- Data and control plane isolation
- Redundant management and route processors with redundant SXC deployment
- MPLS-TP LSP/PW protection (50 ms)
- End-to-End PW redundancy
- LAG, MC-LAG Inter-Chassis Control Protocol (ICCP), MC-APS
- Non-stop routing, forwarding, and services, fast OSPF convergence and ECMP
- Virtual router services (VRRP), including BFD to VRRP tracking, 802.1ag to VRRP tracking, RSTP, and Ethernet linear protection switching (G.8031)
- MPLS Fast Reroute (FRR), RSVP primary backup, and fast
- DP ECMP
- BFD, 802.1ag, and ML-PLT
- Tellabs® In Service Software Upgrade (ISSU) to minimize services and customer traffic loss
- Hot-swappable switch fabric and line cards
- N:1 redundancy on all common systems elements: Switch fabric, management processor, routing processor, power supplies, dual DC feeds, cooling, external BITS inputs
- Stratum 3E timing



**Tellabs SmartCore 9280
Platform**



**Tellabs SmartCore 9240
Platform**



**Tellabs SmartCore 9220
Platform**

Backplane Capacity	11.2 Tbps (HD)	4.4 Tbps (HD)	2.2 Tbps (HD)
Bandwidth Per Slot	1.1 Tbps (HD)	1.1 Tbps (HD)	1.1 Tbps (HD)
Fabric	2 to 4 SXC: *2 for 100G/slot *3 for 100G/slot with redundancy *4 for 500G/slot (future)	2 CFMC	2 CFMC
SmartCards per Chassis	12	4	2
Size (RU)	16 RU	6 RU	4 RU
Units per Rack	3	8	12
Redundancy	Distributed control plane: dual control plane links between SmartCards and SXC/CFMCs		
Control plane	Non-stop hardware forwarding		
Forwarding plane	Load balancing across active Tellabs 9200 SmartCard links and active SXC/CFMCs		
Switch fabric			
Mechanical Dimensions	Height: 27.97 in / 71.04 cm Width: 17.33 in / 44.02 cm Depth: 24.5 in / 62.23 cm	Height: 10.47 in / 26.59 cm Width: 17.33 in / 44.02 cm Depth: 24.5 in / 62.23 cm	Height: 7 in / 17.78 cm Width: 17.33 in / 44.02 cm Depth: 24.5 in / 62.23 cm
Cooling	<ul style="list-style-type: none"> ▪ Redundant fan tray module with 9 fans each ▪ Upper and lower in a “Push Push” configuration ▪ Cools up to 400W per slot 	Redundant fan control logic to cool up to 400W per slot	Redundant fan control logic to cool up to 400W per slot
Electrical Power	17.5A @ -48 V DC	17.5A @ -48 V DC	17.5A @ -48 V DC
DC	-40.5 V DC to -72.0 V DC	-40.5 V DC to -72.0 V DC	-40.5 V DC to -72.0 V DC
Temperature	Operating: 0° C to 40° C Storage: (-40° C to 70° C)	Operating: 0° C to 40° C Storage: (-40° C to 70° C)	Operating: 0° C to 40° C Storage: (-40° C to 70° C)
Operational Relative Humidity	Operating 5–90% non-condensing	Operating 5–90% non-condensing	Operating 5–90% non-condensing

Regulatory Compliance

Safety

- UL 60950-1
- EN 60950-1:2001
- CSA C22.2 No. 60950-1
- AS/NZS 60950.1:2003
- EN 60825-1:1994, A11, A2

EMC/Immunity

- FCC Part 15 Class A
- ICES-003 Class A (Canada)
- EN 55022 (1998) Class A (Europe)
- VCCI (April 2000) Class A (Japan)

NEBS

- GR-63-CORE: Issue 2 (APR 2002) NEBS Physical Protection
- GR-1089-CORE Issue 3 (2002): EMC and Electrical Safety
- ETS 300 019-2-1
- ETS 300 019-2-2
- ETS 300 019-2-3
- ETS 300 019-2-4
- ETS 300 753
- SBC-TP-96200 Issue 5A, Feb 2004
- ANSI T1.315-2001

Software Specifications

Layer 3 Protocols Supported

- Routing: BGP4, IS-IS, OSPF, PIM-SM
- Advanced Routing features: BGP Confederation and BGP graceful restart
- IS-IS: graceful restart, Jumbo Frames, Domain-wide Prefix Distribution, Mesh Groups, IGP Shortcuts
- OSPF: Stateful Redundancy, NSSA, IGP Shortcuts, Multiple Instances, graceful restart
- MPLS: LDP, RSVP-TE
- Advanced MPLS Features: MPLS traffic engineering, RSVP-TE, IS-IS-TE, OSPF-TE, Constraint-based Shortest Path First (CSPF)
- RSVP-TE: Stateful redundancy, fast reroute (FRR) with sub 10ms failover, Diffserv encoding, backup LSPs, open-bandwidth LSPs and auto-bandwidth LSPs
- LDP: LDP QoS, graceful restart, fault tolerant, LDP over SVP tunnels
- IP VPN: RFC2547bis/4364 MP-BGP, OSPF multi-instance, overlapping VPNs, Full mesh and hub/spoke VPN topologies
- IP Multicast: IGMPv2, PIM-SMv2, IGMP Snooping, IGMP Proxy
- Policies: access lists, prefix lists, route maps, AS-path lists, extended community lists
- DHCP relay

Layer 1 and 2 Protocols Supported

- Ethernet/VLAN, link aggregation, E-line and E-LAN, VPLS, H-VPLS, Q-in-Q STP, RSTP, MSTP
- EoS (X.86) and GFP

Traffic Management

- MPLS traffic engineering using OSPF-TE, ISIS-TE, RSVP-TE, LDP over RSVP tunnel
- CSPF routing
- E-LSP (EXP inferred)
- L-LSP (Label inferred)
- 2-Stage CAC at Layer 2, Layer 3 and LSP level
- Strict Priority Queuing: CBR, VBR-rt, VBR-nrt, UBR, UBR+ and UBR+max
- Weighted Fair Queuing (WFQ) based on Deficit Round Robin (DRR) scheme
- Policing at the ingress (dual leaking bucket algorithm with 3 color marking + explicit drop)
- Shaping at the egress and ingress
- Weighted Random Early Detection (WRED) and/or Weighted Tail Drop (WTD)
- Hierarchical queuing
- Hierarchical QoS
- 256,000 queues per Tellabs 9200 SmartCard
- Virtual output queues
- SLAs are applied (both policing and shaping) on Per-Flow Queues via state-of-the-art ASICs
- Multi-class Pseudowires
- Weighted QoS

Security

Well-defined secure network element access, extensive monitoring and disaster recovery methods based on layered, reliable and scalable security architecture:

- Operating system security using protected memory and modular processes
- Management plane security using multi-level security matrix for secure EMS/NMS access, SNMPv3 security support, SCP, RADIUS, TACACS+, forensics capability for security audit or threat diagnostics, network database backup for disaster recovery
- Control plane security against DDoS and TCP SYN attacks and MD5 authentication for IP, ATM/FR and MPLS
- Data plane security for flexible class based traffic protection, E911 regulation for public safety, deep packet inspection, flexible access control list, lawful interception, resource protection, spoofing

Standards Compliance

TCP/IP

- RFC 2413 IPv4/v6 Dual-Stack
- RFC 768 User Datagram Protocol (UDP)
- RFC 791 Internetwork Protocol (IP)
- RFC 792 Internet Control Message Protocol (ICMP)
- RFC 793 Transmission Control Protocol (TCP)
- RFC 813 Window and Acknowledgement Strategy in TCP/IP
- RFC 815 IP Datagram Reassembly Algorithms
- RFC 826 Address Resolution Protocol (ARP)
- RFC 854 Telnet Protocol Specification
- RFC 879 The TCP Maximum Segment Size and Related Topics
- RFC 894 Standard for Transmission of IP Datagrams over Ethernet
- RFC 919 Broadcasting Internet Datagrams
- RFC 950 Internet Standard Subletting Procedure
- RFC 1042 Standard for the Transmission of IP Datagrams over IEEE 802 Network
- RFC 1122 Requirements for Internet Hosts — Communication Layers
- RFC 1141 Incremental Updating of the Internet Checksum
- RFC 1191 Path MTU Discovery
- RFC 1256 ICMP Router Discovery Messages
- RFC 1305 Network Time Protocol (NTP) Version 3
- RFC 1323 TCP Extensions for High Performance
- RFC 1349 Type of Service in the Internet Protocol Suite
- RFC 1350 TFTP Version 2 (revision of RFC 783)
- RFC 1812 Requirements for IP Version 4 Routers
- RFC 1918 Address Allocation for Private Internets
- RFC 2018 TCP Selective Acknowledgment
- RFC 2390 Inverse Address Resolution Protocol
- RFC 2581 TCP Congestion Control
- RFC 3768 Virtual Router Redundancy Protocol (VRRP)

IP Multicast

- RFC 1112 Host Extensions for IP Multicasting
- RFC 2236 Internet Group Management Protocol, Version 2
- RFC 3046 DHCP Relay Agent Information Option
- RFC 4601 Protocol Independent Multicast-Sparse Mode (PIM-SM) (Revision of RFC 2362)
- Draft-IETF-PIM-SM-BSR: Boot Strap Router (BSR) Mechanism for PIM Sparse Mode
- Draft-IETF- magma-snoop: Considerations for IGMP and MLD Snooping Switches

RSVP

- RFC 2205 Resource ReSerVation Protocol (RSVP)
- RFC 2209 Resource ReSerVation Protocol (RSVP) — Version 1 Message Processing Rules
- RFC 2210 The USE of RSVP with IETF Integrated Service
- RFC 2961 RSVP Refresh Overhead Reduction Extension
- RFC 3097 RSVP Cryptographic Authentication (revision of RFC 2747)
- RFC 3209 RSVP-TE: Extensions to RSVP for LSP Tunnels
- RFC 3210 Applicability Statements for Extensions to RSVP for MPLS Tunnels
- RFC 4090 Fast Reroute Extensions to RSVP-TE for LSP Tunnels

CIDR

- RFC 1519 Classless Inter-Domain Routing (CIDR) an Address Assignment and Aggregation

OSPF

- RFC 1370 Applicability Statement for OSPF
- RFC 1403 BGP OSPF Interaction
- RFC 1745 BGP4/IDRP for IP/OSPF Interaction
- RFC 1850 OSPF Version2 Management Information Base
- RFC 2307 The OSPF Opaque LSA Option
- RFC 2328 OSPF Version 2
- RFC 2740 OSPF for IPv6 (upgradable)
- RFC 3101 The OSPF Not So Stubby Area Option
- RFC 3137 OSPF Stub Router Advertisement
- RFC 3623 Graceful OSPF Restart
- RFC 3630 Traffic Engineering Extensions to OSPF v2
- Draft-IETF-L3VPN-OSPF-2547: OSPF Multi-instance in BGP/MPLS VPNs
- Draft-IETF-OSPF-2547-dnbit: DN bit to prevent looping

IS-IS

- ISO/IEC 10589: IS-IS Routing Protocol
- RFC 1142 OSI IS-IS Intra-Domain Routing Protocol
- RFC 1195 Use of OSI IS-IS for Routing in TCP/IP in Dual Environment
- RFC 2763 Dynamic Hostname Exchange Mechanism for IS-IS
- RFC 2966 Domain-wide Prefix Distribution with Two-Level IS-IS
- RFC 2973 IS-IS Mesh Groups
- RFC 3277 IS-IS Transient Black Hole Avoidance
- RFC 3373 Three-Way Handshake for IS-IS Point-to-Point Adjacencies
- RFC 3567 Intermediate System to Intermediate System
- Cryptographic Authentication
- RFC 3784 ISIS-TE
- RFC 3847 Restart signaling for IS-IS
- Draft-IETF-ISIS-WG-MIB: Management Information Base for IS-IS
- Draft-IETF-ISIS-IGP-P2P-Over -LAN: Point-to-point Operation Over LAN in Link-state Routing Protocols
- Draft-IETF-ISIS-ext-ETH: Extended Ethernet Frame Size Support
- Draft-IETF-ISIS-IPv6: Routing IPv6 with IS-IS (upgradable)

VPLS and H-VPLS

- RFC 4762 Virtual Private LAN Services over MPLS
- Draft-IETF-L2VPN-ARP-Mediation: ARP Mediation for IP Interworking of Layer 2 VPN

BFD

- Draft-IETF-BFD-base: Bidirectional Forwarding Detection
- Draft-IETF-generic: Generic Application of BFD
- Draft-IETF-BFD-v4v6: BFD for IPv4 and IPv6
- Draft-IETF-BFD-MPLS: Bidirectional Forwarding Detection for MPLS LSPs

BGP

- RFC 1172 Application of the BGP in the Internet
- RFC 1268 Application of BGP in the Internet
- RFC 1403 BGP OSPF Interaction
- RFC 1657 Definitions of Managed Objects for Version 4 of the Border Gateway Protocol (BGP-4)
- RFC 1745 BGP4/IDRP for IP — OSPF Interaction
- RFC 1772 Application of the Border Gateway Protocol in the Internet
- RFC 1997 BGP Communities Attribute
- RFC 1998 BGP Communities Attribute in Multi-home Routing
- RFC 2385 Protection of BGP Sessions via the TCP MD5 Signature Option
- RFC 2439 BGP Route Flap Damping
- RFC 2519 A Framework for Inter-domain Route Aggregation
- RFC 2547bis/4364 BGP/MPLS VPNs — Inter-AS and CsC
- RFC 2796 BGP Route Reflection (Revision of RFC 1966)
- RFC 2858 Multi-Protocol Extensions for BGP-4 (Revision of RFC 2283)
- RFC 2918 Route Refresh Capability for BGP-4
- RFC 3065 Autonomous System Confederation for BGP (Revision of RFC 1965)
- RFC 3107 Carrying label information in BGP
- RFC 3392 Capability Advertisement with BGP-4 (Revision of RFC 2842)
- RFC 4271 A Border Gateway Protocol (BGP-4) (Revision of RFC 1771)
- RFC 4364 (Revision of RFC 2547bis) BGP/MPLS VPNs
- RFC 4724 Graceful Restart Mechanism for BGP
- RFC 4781 Graceful Restart Mechanism for BGP with MPLS
- Draft-IETF-IDR-BDP-ext-communities: BGP Extended Communities Attribute
- Draft-IETF-L2VPN-OSPF-2547: OSPF Multi-instance in BGP/MPLS VPNs

Ethernet

- IEEE 802.1d Bridging
- IEEE 802.1p Priority
- IEEE 802.1q VLAN
- IEEE 802.1ad Q-in-Q/VLAN stacking
- IEEE 802.1ag (Draft) service OAM
- IEEE 802.3 10Base-T
- IEEE 802.3u 100Base-TX
- IEEE 802.3x Flow Control
- IEEE 802.3z 1000Base-SX/LX
- IEEE 802.3ad Link Aggregation
- IEEE 802.3ae 10 Gbps Ethernet
- IEEE 802.3x Ethernet Flow Control
- IEEE 802.3 with 802.2 SAP
- IEEE 802.3 with 802.2 SNAP

MPLS

- RFC 2597 Assured Forwarding PHB Group
- RFC 2598 An Expedited Forwarding PHB
- RFC 2702 Requirements for Traffic Engineering Over MPLS
- RFC 3031 MPLS Architecture
- RFC 3032 MPLS Label Stack Encoding
- RFC 3036 LDP Specification
- RFC 3037 LDP Applicability
- RFC 3063 MPLS Loop Prevention Mechanism
- RFC 3107 Carrying Label Information in BGP-4
- RFC 3215 LDP State Machines
- RFC 3270 MPLS Support for Differentiated Services
- RFC 3346 Applicability Statement for Traffic Engineering with MPLS
- RFC 3443 Time to Live (TTL) Processing in Multi-Protocol Label Switching (MPLS) Networks
- RFC 3468 The Multiprotocol Label Switching (MPLS) Working Group Decision on MPLS Signaling Protocols
- RFC 3469 Framework for Multi-Protocol Label Switching (MPLS) based Recovery
- RFC 3478 Graceful Restart Mechanism for Label Distribution Protocol
- RFC 3479 Fault Tolerance for LDP
- RFC 3564 Requirements for Support of Differentiated Services-aware MPLS Traffic Engineering
- RFC 3612 Applicability Statement for Restart Mechanisms for the Label Distribution Protocol (LDP)
- RFC 4221 Overview of MPLS Management
- RFC 4364 (Revision of RFC 2547bis)
- RFC 4379 Detecting MPLS Data Plane Failures

OAM

- RFC ITU-T I.610 B-ISDN Operation and Maintenance Principles and Functions
- ITU-T Q.933 Annex A DSS1 — Signaling Specification for Frame Mode Switched and Permanent Virtual Connection Control and Status Monitoring
- RFC 4379 Detecting MPLS Data Plane Failures
- Draft-IETF-PWE3-VCCV: Pseudo Wire Virtual Circuit Connectivity Verification (VCCV)
- Draft-IETF-BFD-MPLS: Bidirectional Forwarding Detection for MPLS LSPs
- ITU Y.1731
- IEEE 802.1ag Service OAM
- IEEE 802.3ah Link OAM

Pseudowires

- MFA: The Use of Virtual Trucks for ATM/MPLS Control Plane Interworking
- RFC 3916 Requirements for Pseudo-wire Emulation Edge-to-Edge (PWE3)
- RFC 3985 PWE3 Architecture
- RFC 4379: Detecting MPLS Data Plane Failures
- RFC 4446: IANA Allocations for Pseudo Wire Edge to Edge Emulation
- RFC 4447: Pseudowire Setup and Maintenance using LDP
- RFC 4448: Encapsulation Methods for Transport of Ethernet Frames Over MPLS
- RFC 4553: Structure-Agnostic TDM over Packet (SAToP)
- RFC 4618: Encapsulation Methods for Transport of PPP/HDLC over MPLS
- RFC 4619: Encapsulation Methods for Transport of Frame Relay Over MPLS
- RFC 4717: Encapsulation Methods for Transport of ATM over MPLS Networks
- RFC 4905: Encapsulation Methods for Transport of Layer 2 Frames over MPLS Networks
- RFC 4906: Transport of Layer 2 Frames Over MPLS
- Draft-IETF-PWE3-VCCV: Pseudo Wire Virtual Circuit Connectivity Verification (VCCV)
- Draft-IETF-PWE3-CW: PWE3 Control Word for Use Over an MPLS PSN
- Draft-IETF-BFD-MPLS: Bidirectional Forwarding Detection (BFD) for MPLS LSPs
- Draft-IETF-pwe3-ms-pw-requirement: Requirements for Multisegment Pseudowire Emulation Edge to Edge
- Draft-IETF-pwe3-segmented-pw: Segmented Pseudowires



GRE

- RFC 1701 Generic Route Encapsulation (GRE)
- RFC 1702 Generic Route Encapsulation over IPv4 networks
- RFC 2473 Generic Packet Tunneling in IPv6
- RFC 2784 Generic Routing Encapsulation (GRE) (revision of RFC 1701)

SNMP

- RFC 1157 Simple Network Management Protocol (SNMP)
- RFC 1215 Convention for Defining Traps for Use with SNMP
- RFC 1904 Conformance Statements for Version 2 of the Simple Network Management Protocol (SNMPv2)
- RFC 1905 Protocol Operations for Version 2 of the Simple Network Management Protocol (SNMPv2)
- RFC 1906 Transport Mappings for Version 2 of the Simple Network Management Protocol (SNMPv2)
- RFC 2012 SNMPv2 Management Information Base for the Transmission Control Protocol using SMIV2
- RFC 2570 SNMP Version 3 Framework
- RFC 2578 Structure of Management Information Version (SIMv2)
- RFC 2579 Textual conventions for SMIV2
- RFC 3411 An Architecture for Describing Simple Network Management protocol (SNMP) Management Frameworks
- RFC 3412 Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)
- RFC 3413 User-based Security Model (USM) for Version 3 of the Simple Network Management Protocol (SNMP) Applications
- RFC 3414 User-based Security Model (USM) for Version 3 of the Simple Network Management Protocol (SNMPv3)
- RFC 3415 View-based Security Model (USM) for Version 3 of the Simple Network Management Protocol (SNMP)
- RFC 3418 Management Information Base (MIB) for the Simple Network Management Protocol (SNMP)
- RFC 3584 Coexistence between Version 1, Version 2, and Version 3 of the Simple Network Internet-standard Network Management Framework

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