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</table>

Loop Telecom supplies Ethernet to 10 Gigabit Ethernet solutions for:

- Power Companies, Oil & Gas,
- Railway Transportation including High Speed Rails, MRT, LRT, Tramway
- Air Traffic Control, Airport Ground Transport, ITS,
- TELCO, ISP,
- Military and National infrastructures,
- Industries ...

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Loop Telecom History
Since 1992, Loop Telecom has developed and produced in Taiwan commercial/industrial grade Transmission / Switching equipment conforming to ANSI and ETSI standards IETF recommendations over copper, fiber, and wireless. Starting with CSU/DSU Loop Telecom has developed TDM Multiservice cross-connect, then SDH/SONET transport multiplexers, and a range of Ethernet devices such as Switch, Router, Demarcation Devices, and PseudoWire Emulation.
Today, Loop Telecom has launched a new generation of Packet Transport Network equipment: PTN with MPLS-TP or Carrier Ethernet on 10GE and Optical Transport Network OTN. These solutions are tracking from single DS0 Multiservice to high rate IP/ Ethernet traffic, and Industrial Ethernet switch router solutions.

Loop Telecom develops high tech-professional equipment and solutions according to the requirements of its major customers and compliant to recognized standards and regulations.
Loop Telecom actively pursues the following markets:
- Utilities: Power Companies, Oil, Gas and Water Companies,
- Transportations: Railway including High-Speed Rails, MRT, LRT and Air traffic Control, Airport Ground Transport, ITS,
- Telco, ISP,
- Military and National infrastructures,
- Industries.

These worldwide deployments are either through partners who also supply local service or OEM large contracts.

Short Telecom Glossary

Multiservice TDM/PDH The multiple applications as voice, analogue data, asynchronous and synchronous low rate, contact relay information like teleprotection are converted into digital information within Time Division Multiplexing nx64kbps and transports by Time Slots or DS0 in framed E1 2,048Mbps ETSI or T1 1,544Mbps ANSI interfaces.

SDH/SONET Synchronous Digital Hierarchy (ETSI) / Synchronous Optical Networking (ANSi) makes the transport over STM-xx/OC-xx fiber of TDM, ATM independent circuits and Ethernet EoS within a hierarchy, mechanism of protection SNCP/MSP/MS-SPRing in ring, bus or Mesh infrastructures, independent synchronization and with an absolute QoS.
PWE3 or PW PseudoWire Emulation End-to-End transport a TDM full service such as E1/T1, SDH, Ethernet... over Packet Switched Network IP, Ethernet or MPLS as direct connection.

PTN The New Generation “Packet Transport Network” combines SDH/SONET advantages and high capacity transport of the packet. PTN uses transport protocol as Carrier Ethernet or MPLS as encapsulation in LSP running over GE/10GE Synchronous (SyncE) fibers and with PTP 1588v2 timing technologies available at each node.

MPLS-TP The Multiprotocol Label Switching - Transport Profile is a Switching variant of IP-MPLS protocol. It applies a Label Switching Path (LSP) on packets of multiple protocols, as PW for TDM or SDH/SONET circuits, to accelerate the speed over Mesh infrastructure or over VPN without packet analysis. The MPLS-TP connection-oriented packed switched is implemented like circuits of SDH infrastructure. Therefore, MPLS-TP features the OAM functions for the Alarm Monitoring and Alarm Signaling, Traffic Diagnosis and Circuit Performance Monitoring at every layer (Section, LSP, PW).

LSP The Label Switching Path of MPLS. The Label pertaining to the packet of multiple protocols and to give the information of the Switching Path. Then Multi-Protocol-Routers in MPLS infrastructure switch the packet very rapidly in the infrastructure.

VPWS This Virtual Private Wire Services over MPLS-TP allows you a point-to-point Layer 2 bridging tunnel for any Ethernet service.

VPLS This Virtual Private LAN Services over MPLS-TP allows interconnection over a Mesh of sites any-point-to-any-point with Layer 2 tunnels for services such as Ethernet connectivity and multicast video.

Carrier Ethernet This switching/bridging Ethernet protocol of transport is defined by MEF services that include E-Line, E-LAN, E-Tree and E-Access infrastructure and organize the transport of Ethernet frame based on Services VLAN.

G.8032 This ITU-T protection for PTN with MPLS or CE networks provide a ring protection with a recovery time much better than 50ms. The G.8032 v2 protection is applied on the full interface of on the VLAN of an interface. See description pages 5 and 7.

PTP 1588v2 This Precision Time Protocol is more precise than NTP. PTP exchanges messages between nodes, calculates the link delay and the time difference, it shares results and adjusts the client clock. Different modes are used as “Transparent clock” mainly for Peer to Peer application often in automation exchanges or “Boundary clock” more use to synchronize mobile systems.

SyncE This ITU-T standard define the transport of synchronization over GE, 10 GE or more Ethernet fiber or copper interfaces. Each crossed node must support SyncE. This signal synchronize in frequency native Ethernet equipment or TDM PseudoWire equipment with high precision. As the SDH/SONET with SSM the SyncE support an ESMC message that informs about the quality of the clock.

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To 10 Gigabit Ethernet MPLS/CE for “Critical Communication”

Loop Telecom Switch - Router portfolio

Loop Telecom is pleased to present you along these pages different solutions of switch-router adapted to applications, their critical utilization and the working environment.

We manufacture and provide PTN system for large infrastructures using MPLS-TP or Carrier Ethernet transport protocols with sophisticated OAM, and also Switch/Router to deploy at short distance applications that are carrying packet of Critical Communication over encapsulated PseudoWire of Multiservice applications together with large less critical data, or theses devices are designed as EDD/NID elements for Carrier Ethernet infrastructure for Telco.

We wish you a pleasant reading of this brochure, in case you do not find the right equipment for your needs please contact Loop Telecom team.

SUMMARY

Page 2  Short glossary,
Page 3  Summary and Enterprise Gigabit Ethernet switches,
Pages 4-5  Industrial high density 19”, 10GE Layer 2, 3 and 2.5 Switch - Router, MPLS-TP and Carrier Ethernet,
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Gigabit Ethernet Enterprise switches

**IP6330**  This compact economic 24 GbE switch is used in standard environment but with good level of performances for the enterprise or industrial switching with access security and a good CoS management based on VLAN.

**IP6340**  This 1U 19” economic switch supports 24 LAN GbE ports and 4 GbE fiber uplinks to use in standard environment but with good level of switching performances a secure access and a good CoS management based on VLAN.

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<tr>
<th>Models</th>
<th>IP6330</th>
<th>IP6340</th>
</tr>
</thead>
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<td>Enterprise Switch</td>
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<td>Layer 2, 1U 19”</td>
</tr>
<tr>
<td>WAN Uplink ports</td>
<td>-</td>
<td>4 x GbE optical SFP</td>
</tr>
<tr>
<td>LAN ports</td>
<td>24 x 10/100/1000BaseT</td>
<td>24 x 10/100/1000BaseT</td>
</tr>
<tr>
<td>Ethernet switch</td>
<td>IEEE802.3X flow control and back presure</td>
<td>IEEE802.3X flow control and back presure</td>
</tr>
<tr>
<td>Protection</td>
<td>STP, RSTP</td>
<td>STP, RSTP, MSTP</td>
</tr>
<tr>
<td>QoS</td>
<td>8 queues for SP and WRR, port Ingress/Egress rate limiting</td>
<td>CoS, DSCP, IP precedence, 8 queues for SP and WRR, port Ingress/Egress rate limiting</td>
</tr>
<tr>
<td>VLAN</td>
<td>Static, port based, Tag based IEEE802.1q up to 1024</td>
<td>Static, port based, Tag based IEEE802.1q up to 1024, Voice VLAN</td>
</tr>
<tr>
<td>Security</td>
<td>Broadcast, flooding and multicast traffic control</td>
<td>Port isolation/protection, ACL, Storm Control (broadcast, unicast, multicast), DoS attack prevention, DHCP snooping</td>
</tr>
<tr>
<td>Multicast</td>
<td>IGMP snooping for 256 group and Query</td>
<td>IGMP snooping v2/v3</td>
</tr>
<tr>
<td>Performances</td>
<td>Switch capacity 480Gbps, packet forward 35.7Mpps</td>
<td>Switch capacity 56Gbps, packet forward 41,66Mpps</td>
</tr>
<tr>
<td>Port Trunking</td>
<td>LACP IEEE802.3ad, 8 trunks</td>
<td>LACP IEEE802.3ad, 8 trunks</td>
</tr>
<tr>
<td>Management</td>
<td>Telnet, http, https, SNMPv1/v2, port mirroring and port statistic</td>
<td>Telnet, http, https, SNMPv ??, port mirroring, Ping testing, copper testing</td>
</tr>
<tr>
<td>MTU</td>
<td>Jumbo frame up 9,216 Byte</td>
<td>Jumbo frame up 9,600 Byte</td>
</tr>
<tr>
<td>Dimensions</td>
<td>267 x 162 x 42mm, rack mountable</td>
<td>1 U 19” = 440 x 131 x 44mm</td>
</tr>
<tr>
<td>Power supply</td>
<td>One 100 to 240Vac or -36 to -72Vdc</td>
<td>One 100 to 240Vac</td>
</tr>
<tr>
<td>Environment (v18/12)</td>
<td>Working temperature 0 to 50°C, humidity 10 to 95% non condensed</td>
<td></td>
</tr>
</tbody>
</table>
IP6320A This Layer 3/2 switch/router supports 8 GE/10GE SFP+ and 48 FE/GE copper ports with a 120Gbps switching capacity. This device is used in Metro infrastructure, Data Center, Enterprise thanks to his supported protocols as ERPS protections with 16 instances, PIM-SM, VRRP, CIR/PIR traffic engineering, OAM link and service... it is deployed for CCTV, industrial process automation.

G7820 This Layer 2/5/3 industrial switch/router with similar hardware then IP6320A support in addition the PTN MPLS-TP or CE 2.0* transport protocol to build to carry in high speed the IP/Ethernet traffic over VPLS/VPWS. SyncE and PTP1588* give it the possibility to deploy P-to-P/P-to-MP application for industrial automation or critical communication over GE/10GE infrastructures. G7820-FL Fanless version is compliant for substations IEC61850-3, IEEE1613 and railway EN50121-4.

IP6828 This modular hardened Layer 2/3 switch/router available with 4 uplink GE or GE/10GE has 3 slots for plug-in modules with 8 GE/GE ports as SFP, copper and POE+ or 4 ports with MACsec encryption. This versatile device is deployed in Access or Aggregation of industrial network. Thanks to the EN50121-4 compliance it is used in Railway substation and work in –40 to 75°C environment.

IP6838 Ready 2020 Q1 this modular hardened Layer 2 switch with 4 uplink GE/10GE designed for Electrical Substation IEC61850-3, IEEE1613. Its particular concept for power industry provides 3 slots for 8 GE/GE copper or SFP, but also high availability HSR/PRP and IRIG-B 4 ports modules. Based on SyncE with PTP 1588 hardware it supports nanosecond level of accuracy time. The IP6838 works within –40 to 85°C environment.

G7860A This Layer 2/2.5 is a PTN Concentrator, Backbone or Service Aggregation Device that supports MPLS-TP and Carrier Ethernet transport. Build with 6 GE/10GE SFP+, 4 GE SFP and optionally 16 E1/T1, 2 slots support 8 GE/GE copper or fiber, 32 E1/T1 or STM1/4-OC3/12 modules. G7860A has access in 10GE network to TDM in PseudoWire/LSP and IP/Ethernet over VPLS/VLWS with high speed switching.

<table>
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<tr>
<th>Models</th>
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<td>Layer 2 and 3</td>
<td>Layer 2</td>
<td>Layer 2 and 2.5</td>
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<tr>
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<td>G7820</td>
<td>Modular, Rugged industrial, Fanless</td>
<td>Modular, Rugged industrial, Fanless</td>
<td>G7860A</td>
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<tr>
<td>FANLESS Version</td>
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<td>G7820-FL*</td>
<td>-</td>
<td>-</td>
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<td>IP/Ethernet</td>
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<td>-</td>
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<td>-</td>
<td>-</td>
<td>VPWS, VPLS, H-VPWS</td>
</tr>
<tr>
<td>WAN Uplink ports</td>
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<td>8 x 10GE SFP+, SyncE</td>
<td>4 x GX or 4 x 10GE SFP+</td>
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<tr>
<td>LAN ports</td>
<td>48 x FE/GE</td>
<td>48 x FE/GE</td>
<td>3 slots for module: 8 FE/GE, 8 FX/GX SFP</td>
<td>3 slots for module: 8 FE/GE, 8 FX/GX SFP</td>
<td>-</td>
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<tr>
<td>POE+ ports</td>
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<td>-</td>
<td>module 8 FE/GE, POE+</td>
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<tr>
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<td>-</td>
<td>modules MACsec 4FE/GE and 4FX/GX SFP</td>
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<td>-</td>
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<td>-</td>
<td>8 FE/GE, 8 FX/GX SFP or TDM</td>
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<td>-</td>
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<tr>
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<td>G.8031/32, RSTP, MSTP</td>
<td>G.8032, RSTP, MSTP</td>
<td>G.8032, RSTP, MSTP, MRP</td>
<td>G.8031/32, RSTP, MSTP</td>
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<td>-</td>
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<tr>
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<td>IGMP Snooping v2/2/3</td>
<td>IGMP Snooping v1/2/3</td>
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<tr>
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<td>NTP, SyncE, PTP1588v2*</td>
<td>NTP(30,40,50)</td>
<td>NTP, SyncE, PTP1588v2</td>
<td>NTP, SyncE, PTP1588v2</td>
</tr>
<tr>
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<td>-</td>
<td>-</td>
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<tr>
<td>Switching Fabric</td>
<td>120 Gbps</td>
<td>120 Gbps</td>
<td>28/64Gbps (6G/10GE uplink)</td>
<td>128 Gbps</td>
<td>85 Gbps</td>
</tr>
<tr>
<td>Maxi Throughput</td>
<td>41,67Mpps/95,24 Mpps</td>
<td>-</td>
<td>95,24 Mpps</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Working temperature</td>
<td>0 to 50°C*</td>
<td>Standard 0 to 55°C*</td>
<td>-40 to 75°C*</td>
<td>-40 to 85°C*</td>
<td>Standard 0 to 55°C*</td>
</tr>
<tr>
<td>EMC Environment (v19/12)</td>
<td>Industrial standard</td>
<td>IEC61850-3, IEEE1613</td>
<td>EN50121-4*</td>
<td>EN50121-4, EN50155</td>
<td>IEC61850-3, IEEE1613</td>
</tr>
</tbody>
</table>

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ERPS (Ethernet Ring Protection Switch) G.8032 recovers the traffic in less than 50ms,

The ERPS G8032 v2 is a protection mechanism that supports single or multiple instance (with RAPS-VLAN) in physical ring infrastructure. For each ERPS instance one node is set as “RPL Owner Node” which blocks the RPL (Ring Protection Link) set in one of its two ring ports. Then one section of the ring is blocking any loop of the Ethernet traffic. Any node along the ring will generate a R-APS-signal-fail message when a failure is detected on a ring port. When RPL Owner receives the message it will unblock the RPL and the traffic will be recovered. The recovery time is less than 50ms and supports over 100 switches and is less dependent of the model, because it doesn’t need many resources against the RSTP protocol. This protocol is robust and is applied for bidirectional transmission can be set as un-reversible and, a hold-off timer can be set to weigh the action of protection.

The same switch can support simultaneously multiple ERPS instances or ring with ERPS protection (see page 7).

VRRP (Virtual Router Redundancy Protocol) RFC5798 provides redundant gateway,

The VRRP is a Layer 3 protocol that supports IP and MPLS packet forwarding. This protocol eliminates the risk of single point of failure with a static default routing. In the same Ethernet Layer 2 network we can install two gateway Layer 3 switches as one Master Router and one or more Backup routers. The Virtual IP address is the gateway address set in the LAN participants. This Virtual IP is associated to a Virtual Router which forwards the traffic to the Master Router or to Backup router in case the Master Router has failed.

This static VRRP protocol is relatively simple to set in routers and provides a dynamic routing. To optimize the utilization of both routers, two Virtual IP addresses can be used, or more one per application for example and each router is Master of one VRRP and Backup of the other VRRP for two gateways. The VRRP protocol is interoperable with the RSTP, MSTP and ERPS Layer 2 protections, and is particularly interesting in large networks which transport multiples applications.

OAM (Operation, Administration and Maintenance) with link EFM, service CFM & Y.1731

The OAM mechanisms are the necessary tools to make sure that we can provide, maintain and administrate the services over the network. These standards are based on three protocols IEEE 802.3ah, IEEE 802.1ag and ITU-T Y1731.

The IEEE 802.3ah describes the Ethernet link level or Ethernet First Mile (EFM). This detects the remote, in case of active mode it will manage the link, the alarm, detect the fault, link-down the remote with dying-gasp and reply to loopback. Parameters will define its mission.

The IEEE 802.1ag is known as Connectivity Fault Management (CFM). This detects, diagnoses the level of Ethernet service link fault and relays at the other MEP of the peer over the other MIP (intermediates) with the same service. This includes multicast unidirectional sent periodically to detect the loss of connectivity, loopback messages of the peer similar to a MAC ping and send a multicast message and a request to get a trace route of all hops.

The ITU-T Y1731 is a standardized end-to-end fault management, diagnostics, and performance management service, sharing the same construction of maintenance domain. The Y1731 OAM messages include Fault Management: ETH-AIS, ETH-RDI, ETH-LCK and ETH-Test, the Performance Management: ETH-DM and ETH-LM.

With the EFM we can manage each links and with the CFM and the Y1731 we can manage the Ethernet Service between the two ends of the peer in the customer premise.
Loop Telecom DIN-Rail industrial switches and routers are used in Industries particularly inside Electrical substation to carry SCADA, GOOSE protocols and for many applications as IP-CCTV. These switches are protected by RSTP, MSTP or ERPS G.8032 protocols. Some versions support 4 or 8 POE/POE+ ports, some others support RS232/RS485 and dry contacts. All are FANLESS, they are powered by dual DC sources and models are compliant to Industrial, Electrical Substation or Railway environments.

**IP6810** is an economical Layer 2 switch for industry with 2 uplink ports 100FX SP or 10/100BaseT and 3 ports 10/100BaseT with POE option, 2 RS232/485 and 2/20 dry contacts. This economic device compliant to IEE1613, IEC61850-3 to be used in Power Substation works in many old and IP SCADA networks with high speed asyncnch P-to-MP or omnibus, Ethernet flow control, VLAN and with RSTP protection and assisted deployment for large rings.

**IP6820** is a powerful Layer 2 switch SyncE with 2 GE SFP uplinks, 2 GE SFP, up to 8 x 10/100/1000BaseT. Versions are supporting 4 or 8 RS232/422/485, 2/20 dry contacts or POE+ on the 8 Ethernet ports. Compliant to IEE1613, IEC61850-3 and ENS0121-4 it is used in Electric Substation and Railway station. It supports VLAN and Q-in-Q, IGMP snooping for multicast and RSTP, MSTP and G.8032 on WAN port with 8 queues of CoS with bidirectional rate limiting with full OAM.

**IP6818-BR** or **IP6818-RT** are Layer 2 switch or Layer 2/3 switch/router with 4 GE SFP and 4 POE+ 10/100/1000BaseT. It is compliant to ENS0121-4 and particularly designed for deployment in Railway station for multiple applications including IP-CCTV. It supports VLAN with 8 queues of CoS, IGMP snooping with PIM-SM*/DM* for multicast, RSTP, MSTP and 4 instances of G.8032 to support multiple rings. The RT version supports Static, RIPv1/v2, OSPF v2 and VRRP.

These devices provide timing synchronization PTP 1588 v2 transparent clock by hardware with 2ns precision, boundary by software and NTP client/server for automation application.

**IP6808** is a Web managed switch with limited function of VLAN and CoS prioritization to Profinet packets. This 6 x 10/100/1000BaseT ports and 2 GE SFP or copper WAN ports with one MACsec 56bit key encryption instance per port provide an easy deployment for secure application in industry.

<table>
<thead>
<tr>
<th>Rail DIN</th>
<th>IP6810</th>
<th>IP6820</th>
<th>IP6818-BR</th>
<th>IP6818-RT</th>
<th>IP6808</th>
</tr>
</thead>
<tbody>
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<td>Layer 2</td>
<td>Layer 2</td>
<td>Layer 2</td>
<td>Layer 2 &amp; 3 router</td>
<td>-</td>
</tr>
<tr>
<td><strong>WAN Uplink ports</strong></td>
<td>2 x FE or 2 FX SFP</td>
<td>2 x GX SFP</td>
<td>4 x FX/GX SFP</td>
<td>2 x FE/GX SFP or 2 x FE/GE, -</td>
<td>-</td>
</tr>
<tr>
<td><strong>LAN</strong></td>
<td>3 FE</td>
<td>2 GX SFP, 4 FE/GE</td>
<td>4 x FE/GE POE+</td>
<td>-</td>
<td>6 x FE/GE</td>
</tr>
<tr>
<td><strong>POE/POE+</strong></td>
<td>version 3 FE POE</td>
<td>option 4 FE/GE</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>RS232/RS485</strong></td>
<td>option 0 or 2</td>
<td>option 0, 4 or 8</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Dry Contact</strong></td>
<td>2 In, 2 Out</td>
<td>2 In, 2 Out</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Protection</strong></td>
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<td>RSTP, MSTP, G.8032 with 4 instances</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>L2 protocols</strong></td>
<td>Flow control, VLAN port, 802.1q</td>
<td>Flow control, VLAN port, 802.1q and Q-in-Q, Link aggregation, QoS 802.1p w 8 queues</td>
<td>Flow control, VLAN port, 802.1q and Q-in-Q, QoS 802.1p w 8 queues, Port trunking LACP</td>
<td>Flow control 802.3e &amp; 3az For Profinet packets: VLAN 802.1q, CoS 802.1p</td>
<td>-</td>
</tr>
<tr>
<td><strong>L3 protocols</strong></td>
<td>-</td>
<td>-</td>
<td>Static, RIPv1/v2, OSPF v2, VRRP</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Multicast</strong></td>
<td>IGMP snooping v1/v2</td>
<td>IGMP snooping v1/v2/v3</td>
<td>-</td>
<td>-</td>
<td>MACsec 802.1ae on 2 WAN</td>
</tr>
<tr>
<td><strong>MACsec Encryption</strong></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Synchronization/Timing</strong></td>
<td>SNTP</td>
<td>NTP, SyncE</td>
<td>SNTP, NTP/client/server</td>
<td>PTP 1588v2 transparent (hw) boundary (lw)</td>
<td>-</td>
</tr>
<tr>
<td><strong>Switching Fabric</strong></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Maxi Throughput</strong></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>OAM link, Services</strong></td>
<td>802.3ah, 802.1ag/1.171</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Management</strong></td>
<td>Telnet, SSH, SNMP v1/v3</td>
<td>http, https, Telnet, SSH, SNMP v1/v2/v3, Radius</td>
<td>http, https, Telnet, SSH, SNMP v1/v2/v3, Radius</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Power supply</strong></td>
<td>single/dual DC 24V or 48V single AC 100-240V</td>
<td>single/dual DC 24V or 48V</td>
<td>dual input DC 9 to 57V, 48V mini for POE, 57V mini for POE+</td>
<td>dual input DC 9 to 48V</td>
<td>-</td>
</tr>
<tr>
<td><strong>Dimensions WxHxD</strong></td>
<td>218 x 41.5 x 135mm, deskop, wall, DIN-rail</td>
<td>21 x 67.2 x 167mm, deskop, DIN-rail</td>
<td>54 x 113 x 124mm, DIN-rail, opt wall</td>
<td>43.5 x 89.6 x 110mm</td>
<td>-</td>
</tr>
<tr>
<td><strong>Working temperature</strong></td>
<td>-20 to 70°C</td>
<td>-20 to 70°C</td>
<td>-20 to 70°C</td>
<td>-20 to 70°C</td>
<td>-</td>
</tr>
<tr>
<td><strong>Environment (v19/12)</strong></td>
<td>IEC61850-3/IEEE1613</td>
<td>IEC61850-3/IEEE1613</td>
<td>Railway ENS0121-4</td>
<td>Railway ENS0121-4, ENS0155</td>
<td>Standard industry</td>
</tr>
</tbody>
</table>

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Multi-interfaces Gigabit Ethernet Switch for industries

The IP6820 is a powerful Layer 2 Gigabit Ethernet switch. Basically it has 2 WAN GE SFP, 2 GE LAN SFP and 4 GE LAN. In option we provide up to:
- POE+ on 8 ports for connect VoIP, CCTV, Wifi and IP-SCADA terminal,
- 8 RS232, RS485, RS422 asynchronous interfaces from 200bps to 430kbps, point-to-multipoint, Omnibus pass-through and the IP or TCP encapsulation to cover many SCADA applications,
- 2 In and 2 Out dry contacts for alarms and commands transport ,
- WAN ports are SyncE and provide SyncE frequency synchronization on GE ports for the applications like PseudoWire gateway, All these features enable the IP6820 to perform the mission of Telecom gateway in industrial infrastructure and replaces multiple access equipment.

Multi-instance of ERPS Layer 2 protection for “No single point of Failure”

As explained in the page 5 the ERPS G8032 v2 is a protection mechanism that supports single or multiple instances (RAPS-VLAN) in physical ring infrastructure.
Then with ERPS models IP6818, IP6828, G7820 and IP6320A it is possible to support infrastructure with main ERPS ring and sub rings connected to the main ring by two nodes. The final path of this Ethernet traffic will use the Sub-ring section and the merge Main-ring. This solution do not need to deploy Layer 3 routing and take place in existing Ethernet structure. This provides an infrastructure with No Single Point of failure that is requested in Critical Communications like for Railways infrastructures.
The IP6818, IP6828 and IP6320 are supporting Q-in-Q, then the ERPS RAPS-VLAN will transport the existing C-VLAN traffic. When using the wireless link, the UERPS can be activated to verify the link path by sending a “heartbeat” at regular intervals.
The support of POE+ on 4 FE/GE ports of IP6818 is particularly interesting for the deployment in public stations of WLAN thanks to UERPS for the Internet access of visitors but also the POE+ video camera supports thanks to the multicast support IGMP v1/v2/v3 and PIM-SM/DM of the router version.

MACsec encryption for industrial applications easy to install,

The IP6808, IP6828 with 4 ports M4 and M5 modules provide an encryption of GE links over fiber or copper. The MACsec 56 bits encryption is very simple to deploy for industrial application, it saves the need for certificate server by using an authentication and encryption based on the unique Mac address of link both ends.
The IP6808 supports 2 GE WAN ports with encryption and the IP6828 can support up to 12 optical/copper encrypted GE ports.
Both switches can support the encrypted transport of TDM PseudoWire traffic for industrial applications.
The Power Companies are using a growing number of Ethernet or IP applications for the SCADA and the Teleprotection based on IEC-61850 GOOSE protocol or the transport of Mirrored Bits or MODBUS over RS232 and transported in Ethernet.

Loop Telecom proposes hardened switches conform to electrical substation environment standard IEC-61850-3/IEEE-1613 and transparent to GOOSE IEC-61850 protocol.

We supply also 10GE/GE switches for Ethernet WAN infrastructure that can be relayed by Ethernet over SDH/SONET or MPLS-TP infrastructures. These Layer 2 and 3 switch/routers are installed to deploy large bandwidth IP/Ethernet applications as CATV and various LAN application for the power companies with highly secure control by QoS.

Teleprotection with Peer to Peer transmission:
The IP6820 provides Peer to Peer communication with RS232 over Ethernet encapsulation between two teleprotection devices using SEL Mirrored Bits® protocol or other proprietary communications.
The IP6820, IP6320A and IP6828 switches are transporting transparently IEC-61850 GOOSE protocols with 802.1p QoS between teleprotection devices.

Ring Protection:
The Layer 2 and 3 are supporting the standard STP, RSTP and MSTP Spanning Tree protocol but also the Ethernet Ring Protection Switching IUT G.8032 v2 for more nodes and a short recovery time better than 50ms at port or VLAN level.

Dual central node protection:
Based on Layer 3 VRRP protocol two concentration switches are working in parallel but only one is visible at the same time based on a virtual address. This give the possibility to secure WAN Ethernet infrastructures by doubling simple CPU switches, doubling the WAN infrastructures and the independent bridging instances.

HSR/PRP, (High-availability Seamless Redundancy/Parallel Redundancy Protocol)
These Zero Packet loss solutions are implemented in four ports modules of the future IP6838 modular Layer 2 switch. A card can be used as 4 ports HSR and PRP mode with protection path or as quad Red-Box with 2 ports working in HSR Ring and 2 ports as PRP Parallel Redundant end-application. These protections insure no packet loss of the GOOSE communication to their respective destinations.

High Bandwidth traffic
The IP6320A or IP6828 support over 240 or 120Gbps of switching capacity with maximum throughput of 132 or 95Mpps. They offer 8 or 4 x 10Gigabit Ethernet uplinks ports and 48 fixed or 3 x 8 FE/GE tributary ports. Such configurations satisfy generally traffic demand from Power Companies.

Mechanical and Power
IP6810 and IP6820 are DIN-Rail switch powered by dual inputs or dual power supplies -48v or -24V and build FAN-less for hardened environment up to 70°C. The G7820, IP6828 and IP6838 are 19” 1U switch with dual AC or DC 48v redundant power supplies and they are working over 70°C.

POE/POE+ version
As option, IP6810 supports 3 POE ports, IP6820 up to 8 POE/POE+ ports and IP6828 can be used with 3 x 8 POE/POE+ ports. The POE ports and power limits are remotely manageable.

Automatic discovery of ring with NTU and 64/128 RTU
The IP6810 or IP6820 support an automatic discovery of 64 or 128 units. After DI switches selection of the master unit and others as slave, the master will discover and provides the settling of slaves to avoid the preset of devices and save deployment time.

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Teleprotection over Ethernet Transport

Loop Telecom IP6820 Gigabit Ethernet industrial grade switch supports transparent and low latency over fiber the transport of communication between the Teleprotection devices.

Thanks to the RS232/RS485 interfaces the IP6820 interconnects with Mirror Bits protocol these teleprotection devices synchronized by local GPS.

The IP6820, connected with GE SyncE fiber WAN is supporting transparently the GOOSE communication with IEC61850 protocol for new generation teleprotection devices.

Ethernet Backbone and Access for SCADA, Security and Voice
Ethernet Switches for Railway Station

Hardened Ethernet Layer 2 Switch
ENS0121-4 for railway station
DIN-rail, FAN-less, -20 to 70°C

IP6818-BR Layer 2 switch for harsh environment in railway station with 4 x GE SFP, 4 x FE/GE POE+, Protection: ERPS 5 instances, RSTP/MSTP.
Compliance EN-50121-4

IP6818-RT Layer 2/3 switch router, idem plus Routing: Static, RIP, OSPF, VRRP, Multicast IGMP, PIM-SM/DM/SSM.

IP6820 2 x GX SFP WAN, and 6 to 10 GE LAN ports:
Different versions: 2x GX SFP, 4 or 8 FE/GE, POE or POE+.
All GE/GX interfaces SyncE, or 8 RS232/485, 2I/2O dry contacts, full OAM, WAN ports protection: RSTP, MSTP and ERPS G.8032.
Compliance IEEE-1613, IEC61850-3, ENS0121-4

Industrial GE / 10 GE Ethernet Layer 2/3 Switch/Router

G7820 Router-switch Layer 2/3 and Layer 2.5 MPLS-TP, CE with 8 x 10GE SFP+, 48 x FE/GE, Routing Static, RIP, OSPF, PIM-SM* & VRRP, Protection ERPS G.8023 v2, RSTP, MSTP, LACP.
MEF Ethernet Services: E-Line, E-LAN, E-Tree.
MPLS-TP: 2k instances: VPWS, VPLS or H-VPLS / Clock SyncE, PTP 1588* transparent/boundary, OAM, dual AC or DC power supplies, FAN.

G7820-FL* Router-switch idem but FANLESS.
Working at –20 to 55°C, Compliance to IEEE-1613, IEC-61850-3 and for railway station EN-50121-4

IP6828 Modular Switch/Router Layer 2 or L2/3 with 4 x GE SFP or 4 x 10GE SFP+ uplink, with 3 LAN slots for module: 8 FE/GE, 8 FX/GX SFP, 8 FE/GE POE/POE+, 4 GE or GX with MACsec encryption.
Protection ERPS G.8032 v2, RSTP, LACP, MRPP, Routing static, RIP, OSPF, PIM-DM*/SM*.
Working at -40 to +75°C
Compliance to EN-50121-4 in railway station and EN-50155 inside rolling stock material.

The Railway, MRT, LRT and Tramway customers are developing a growing number of Ethernet or IP applications for the organization of transport infrastructure as automatic transport, railway signalization, SCADA, power distribution, security, stations without personal, customer services, CCTV with permanent analysis and they request a high level of reliability and security.

Loop Telecom proposes hardened switches conforming to railway station ENS0121-4 and electrical substations environment with IEC-61850-3/IEEE-1613 standard.

Layer 2 and Layer 3 switch:
The IP6818, IP6828 and G7820 switches support highly developed IP stacks of Layer 2 transmission including the IEEE: 802.3x Flow Control, 802.1q VLAN and 802.1ad Q-in-Q, port isolation, 802.1p QoS, 802.3ad Link Aggregation Control Protocol (LACP).
Administration is with secured access 802.1X Radius and SSH2, https and SNMP v3 communication.
Router versions of IP6818-RT, IP6828-RT and G7820 support Static and VLAN routing, RIP v1/v2, OSPF and Layer 3 services as VRRP and Multicast IGMP v1/v2/v3 and PIM.

No single point of failure:
The engineering of telecommunication in railway request no single point of failure, means that all paths even over low rate switches must be doubled up. The IP6818, IP6828 and G7820 provide multiple ERPS G.8032 instance of ring protection per node that give the possibility to connect any application to low level ring itself connected to main ring by two nodes with automatic protection based on Layer 2 and 3. The Ethernet Ring Protection Switching IUT G.8032 v2 for excess 100 node per ring support a short recovery time better than 50ms.
This v2 version supports the ring protection on physical port or on VLAN with same performances.

Dual central node protection:
Based on Layer 3 VRRP protocol two concentration switches work in parallel but only one is visible at the same time based on a virtual address. This give the possibility to secure WAN Ethernet infrastructures by doubling simple CPU switches, doubling the WAN infrastructure and the independent bridging instances.

VLAN:
These switches support VLAN with single and dual tagging or Q-in-Q with C-VLAN and S-VLAN. They support the registration of VLAN GARP, GVRP, and GMRP for fast deployment of VLAN.

POE/POE+ version:
The IP6818, IP6820 and IP6828 support according to theirs configuration up to 4, 8 or 24 POE/POE+ ports. The ports, power limits are remotely manageable.

Mechanical and power supply:
All these switches are build with industrial grade components to work from –20 to 70°C and under 95% humidity non-condensing generally in IP30 aluminum case for DIN rail models and in metal case for 19” models. All models exist in FANLESS version that is requested particularly in tunnel environment. The DIN rail models can be powered in -24Vdc or –57Vdc for POE+ and 19” chassis are powered by single or dual –48Vdc or AC power supplies.

Management:
All Loop Telecom switches are manageable in https, Telnet/SSH, SNMP v1/v3 and they are visible and managed by the Loop-iNET EMS described in page 11. the access are secured by 802.1x, Radius and for some TACAS+. Secure tools are available as ACL, DHCP Server/Relay/Client and Options 66/67/82 to secure the deployment and other as Mirror port, RMON, BootP to help for the maintenance.

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Ethernet Switches for Railway Substation EN50121-4

LRT, Tramway transmission networks for Signalization, SCADA, Voice services, Customer ticketing and services, Power teleprotection ...

The telecommunication for the deployment of LRT, Tramway, Buses infrastructure/stations along short or medium distances is more appropriate to use Ethernet solutions. Thanks to the protocols: Layer 2 as the G.8032 ring, or the Layer 3 VRRP or PIM-SM/DM for multicast application, all give the possibility to deploy secured transmission in such configuration. According to environment requirements of these infrastructures, Loop Telecom supply switches with EN50121-4 railway station compliance.

Our solution support VLAN and Q-in-Q with QoS with 8 queues and bandwidth control to organize the different services on the same trunk. In case of request from services as analog interfaces, contact or the teleprotection for the tramway power distribution, we can combine with PseudoWire equipment described in the previous pages. iNET and iNMS systems are supporting switch organization and management of Loop equipment and some function of other equipment.

CCTV infrastructure and full video solution with analysis for public sites: station, airport...

Loop Telecom has supplied several secured switches CCTV infrastructures for large public site airport, railways station, conference center...

With partners we also supply full CCTV solution including hardware cameras, video servers for recording, image synchronization, video streaming and software for analysis like: intrusion, gate flow, occupancy rate, left object, stolen object, vehicle license plate....

Such Ethernet G.8032 ring infrastructure run over 60 IP6820 GE industrial switches, which connect up to 8 POE+ cameras. In central video node two IP6320A, layer 3 10GE switches with VRRP protection, can support few hundred cameras in CCTV installation.

iNET management system support Loop switches, and third party cameras and access server.

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The IP6608/IP6618 are purpose-built silicon technologies to match the needs of Carrier Ethernet 2.0 class services. Their features bring hassle free operations with the benefits of unmatched resiliency, high synchronization accuracy, and comprehensive OAM.

These Network Interface Devices (NID) are used to build a full CE network or integrated in existing CE 2.0 infrastructure, or used as Ethernet Demarcation Device (EDD) for large Ethernet operator Network thanks to DHCP, VLAN developed features and ultra-low power consumption.

**IP6608** This NID Network Interface Device is a powerful EDGE device of Carrier Ethernet Network that provide Ethernet distribution services with Phase and Clock synchronization based on SyncE with ESMC messages, PTP IEEE1588 boundary and transparent clock with ns precision and supporting redundant Grand Master and Multiple timing domain.

This device supports 6 GE optical SFP and 4 copper 10/100/1000BaseT ports, all are usable as NNI or UNI. This Fan less device work in -40 to 65°C environment for customer premise and in industries.

**IP6618** This NID Network Interface Device is a stronger EDGE or small center device of Carrier Ethernet Network that provide Ethernet distribution services particularly for LTE distribution with all feature of Phase and Clock synchronization based on SyncE and PTP IEEE1588.

This device supports 2 optical 10GE SFP+, 2 optical GE SFP and 4 copper 10/100/1000BaseT ports, all are usable as NNI or UNI.

**Carrier Ethernet Features** Both devices support the non blocking wire speed switching for the CE 2.0 services: E-LINE (EPL/EP-VL), E-LAN (EP-LAN/EVP-LAN), E-TREE (EP-Tree/EVP-Tree) and E-Access (Access EPL/EVPL) with per EVC QoS, policing and shaping for isolation and Traffic Engineering with high ports and VLAN control, Strict Priority and Weighting Round Robin (WR), rate limiting, TOS with Status/Statistic monitoring.

Protection is insured by LACP, RSTP/MSTP and ELPS/ERPS v2 with 64 instances. These Layer2 switches with a high speed provider bridge support VLAN translation, voice VLAN, trunking... and automatic registration. Layer 3 switching support DHCP opt82 relay, UPnP, and Unicast IPv4 routing. These devices support Multicast management with IGMP v2/v3 and MLDv1/v2 snooping, IPMC with Throttling, Filtering, Fast Leave and Proxy and Broadcast/Multicast Storm control, filtering and protocol forwarding.

### Models | IP6608 | IP6618
---|---|---
Switch 19” 1U | Layer 2, Layer 3 limited | Layer 2, Layer 3 limited
Carrier Ethernet Service | E-Line, E-LAN, E-Tree, E-Access - CE 2.0 compliant | E-Line, E-LAN, E-Tree, E-Access - CE 2.0 compliant
Fiber ports NNI or UNI | 6 x FE/GE SFP | 2 x GE/10GE SFP+, 2 x FE/GE SFP
Copper ports NNI or UNI | 4 x 10/100/1000BaseT | 4 x 10/100/1000BaseT
Synchronization/Timing | SyncE (G.8262) with ESMC message, NTP client/server, PTP (1588 v2): Boundary clock, Peer-to-peer Transparent clock , Multiple timing domains. PTP Telecom Profile with Boundary and Transparent clock (G.827.x) | Layer 2, Layer 3 limited
Protection | LACP (802.3ad), ELPS (G.8032), ERPS (G.8032) with 64 instances, RSTP/ MSTP (801.1w/s) | Layer 2, Layer 3 limited
L2 protocols | VLAN (802.1q) , 802.1ad, VLAN translation, VLAN trunking, Multiple Registration P. GVRP et MRVP. Voice VLAN Auto VoIP | Layer 2, Layer 3 limited
QoS | QoS (802.1p) with 8 hardware priority queues, Per-Port/VLAN rate limiting, Per-EVC QoS, Policing and Shaping for Service Isolation and Traffic Engineering | Layer 2, Layer 3 limited
Multicast | IGMP Snooping v1/v2/v3, MLD v1, IP Multicast, filtering, storm control, MVR | Layer 2, Layer 3 limited
L3 protocols | Unicast Static Routing, DHCP Option 82 relay, UPnP | Layer 2, Layer 3 limited
Security | Network Access Server : port-based (802.1x) single/multiple Radius or TACACS++, MAC-Based, ACL’s for filtering-policing, port copy | Layer 2, Layer 3 limited
Management | http/https, CLI over Telnet/SSH v2, IP v4/v6, SNMP v1/v2c/3, DHCP Client/server, RMON 1,2,3 and 9, System syslog, Loop-inET-EMS* | Layer 2, Layer 3 limited
Port Control | Speed, Duplex mode, Flow control, Frame Size, Status, cable diagnostics | Layer 2, Layer 3 limited
OAM link, services | link: LLDP 802.1AB, EFM 802.3ah, services: CFM 802.1ag, Y.1564 test, Y.1731 performance monitoring | Layer 2, Layer 3 limited
Switching Fabric | 13 Gbps | 32 Gbps
Maxi Throughput | Non blocking wire speed switching. | Layer 2, Layer 3 limited
MTU | MTU from 1518 to 10,240 Bytes | MTU from 1518 to 10,240 Bytes
Working temperature | FANLESS, -40 to +60°C | Layer 2, Layer 3 limited
Power supply | DC -36 to 72V, consumption Green Power 5 W, option AC/DC converter, or AC version * | DC -36 to 72V, consumption Green Power 5 W, option AC/DC converter, or AC version *
EMC Environment | CE, FCC Part 15 | CE, FCC Part 15
Carrier Ethernet Network design for multiples operators

As the private Carriers focus more on industries, power, transportation, bank, trading stock exchange, multisite distribution, and large infrastructures as railway, national grids... to cover large territories they mix their own resources together with fibers from Telco or Ethernet pipe from other carriers. They must share all with a good flexibility and provide dedicated and secured resources to their customer. The deployment of Carrier Ethernet is a very practical and scalable structure for such multisite customers and applications.

The IP6608/IP6618 NID give the possibility to deploy very easily with service VLAN (S-VLAN) for point to point links (E-Line) or point to multipoint E-LAN and to provide permanent or on-demand point to multipoint access with E-Tree or E-Access MEF services. Carrier Ethernet CE 2.0 provides the default isolation between remotes sites and the deployment LAN with C-VLAN very simple for the customers. The carrier these customer can use a complex mix infrastructure with is own network and rent network from other carrier.

Deployment of PTN structure with BW guaranty and clock/phase synchronization,

The dual 10GE IP6618 switch coupled with GE IP6608 NID give the possibility to deploy rapidly for a reasonable cost a small PTN infrastructure that will guarantee the customers and their applications to preserve bandwidth per-EVC QoS, Traffic-Engineering engine with strict priority Weighting Round-Robin (WRR) scheduling. This solution deploy the SyncE clock for all PseudoWire nodes for Multiservice TDM transport and provide a transparent structure for all Peer-to-Peer of automation applications that are using transparent PTP 1588v2 with a nanosecond precision level. The deployment of VLAN is helped by the Multiple registration MRVP and GRVP but also by the support of multiple protocols and modes to integrate with existing other switches. The IP6608/IP6618 are visible in iNET and manageable from this ENMS together with all other Loop Telecom ranges and 3d party products.

Optimization of 10GE link,

Different telecommunication applications, as mobile, require physical 10GE link but with a maximum of 30% utilization. A pair of IP6618 can share these costly links, preserve the bandwidth of the main application per-EVC QoS and Traffic-Engineering engine with strict priority Weighting Round-Robin (WRR) scheduling and provide 6 FE/GE interfaces for other IP/Ethernet.

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PTN solutions for Gigabit Ethernet and E1/T1 deployment

Loop produces devices used for Mobile backhaul and for industrial applications with Gigabit Ethernet and E1/T1 flows deployment

**G7860A**
PTN Concentrator, Backbone, Service Aggregation Device, Carrier Ethernet / MPLS-TP
- 6 GE/10GE SFP+, 4 GE SFP
- 2 modules for
- 8 GE SFP or 8 FE/GE RJ45
- 4 STM1 or 1 STM4 SFP
- 32 E1/T1 with SCSI

**PseudoWires**
- E1, T1, FE1, FT1, VCxx, VC-4c
- ACR or DCR
- PW/LSP, SAToP, CESoPSN, MEF-8 (CESoEth), CEP
- VPLS, VPWS, H-VPLS for Ethernet services

**Layer 2 switch**
- 85GB non blocking switch
- SyncE GE/10GE ports,
- IEEE1588v2 slave, boundary transparent clock, Stratum 3
- TOD and 1PPS interfaces
- VLAN, Q-in-Q, QoS
- OAM 802.1ag, 802.3ah
- G.8031, G.8032 protection
- RSTP, MSTP

**IP6750**
Service Aggregation and Access Device, PTN Carrier Ethernet
- 2 x GE Combo WAN
- 4 modules for
- 4 E1/T1 with DB37
- 2 GE Combo SFP and RJ45

**PseudoWires**
- E1, T1, FE1, FT1
- with TS grooming
- 64 simultaneous PWE3
- 32 with ACR or DCR for remote synchronization
- Adaptive Clock Recovery
- Differential Clock Recovery
- SAToP, CESoPSN, MEF-8 (CESoEth)

**Layer 2 switch**
- 5GB non blocking switching
- SyncE GE ports,
- IEEE1588v2 slave, boundary transparent clock, Stratum 3
- TOD and 1PPS interfaces
- VLAN, Q-in-Q, QoS
- OAM 802.1ag, Y.1731, 802.3ah
- Protection G.8031, ERPS G.8032* and RSTP, MSTP*
- Out-door version available on special orders

**Deployment of 2G/3G/LTE infrastructure in low density area**

The G7860A and IP6750 are performance and adaptable solution to deploy in low density areas the Mobile network and backhaul thanks to the modularity of both devices. The EDGE/Access IP6750 node can, with two WAN port used for protection of devices in daisy chain, can be configured with a configuration of 16 E1/T1 and 8 GE Combo. The backbone/aggregation device G7860A basically equipped with 6 10GE, 4 GE and 16 E1/T1 can support a mix of maximum 20 GE or 80 E1/T1. Both support SyncE and PTP 1588v2 for frequency and phase synchronization requested by mobile BTS/Node-B.

The QoS management based on Token Bucket (TB), Two Rate Three Color (TRTC), and Hierarchical QoS (H-QoS), the selection of Ingress/Egress per port, all give a guaranty of high level of stability for transport of mix traffic. Both devices are supported by the iNET management.

**Deployment of IP-PMR or Private-LTE in tunnel.**

The diffusion of IP-PMR inside tunnel may need several BTS and antennas. The switches support 1GE of shared traffic with RSTP or ERPS ring and they are synchronized by SyncE line and PTP 1588v2 with redundant PTP 1588 Grand Master.

The IP6750 can support up to 9 hops of SyncE and PTP 1588 Boundary an Transparent clock to provide the requested frequency, and phase synchronization at each node along the ring. All devices are managed by iNET EMS.

**Gigabit Ethernet & E1/T1 backhaul**

Several thousand of IP6750 in versions indoor or outdoor have been deployed by some Telcos to support point-to-point backhaul for Mobile 2G, 3G and LTE or other TDM application. Thanks to SyncE and PTP 1588v2 support the IP6750 provides the frequency and timing synchronization requested by BTS/Node-B. Both fiber links provide trunked LACP bandwidth or protection G.8031.

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Loop-iNET, based on scalable and modularized architecture, is an intelligent network management software for Element Management Layer (EML) and Network Management Layer (NML) based on Telecommunications Management Network (TMN) model. It provides a GUI (graphical user interface) for the management of a communications network containing Loop Telecom products and 3rd-party NE.

Loop-iNET management system is a Web based application and supported by MS Windows server platform and MySQL RDBMS database server.

This solution option with hot standby server redundancy and with automatic switchover provides high availability (HA). The system access security is based on users with privilege access that are customized through combination of operation functions and managed NEs, user access log with single or multiple GUI.

Multi-hierarchical subnet structure allows users to provide multi-level network topology display. This SNMP based management system supports functions including commands, alarms, and statistics gathering.

iNET can support up to 100,000 Network Elements (NEs) of TDM, Ethernet and PseudoWire Loop Telecom devices and generic 3rd-party NE. The robust and reliable design provides flexible and scalable solution for network expansions.

Loop-iNMS-NMS Loop-iNMS (Integrated/Intelligent Network Management System) is a set of software programs supporting the Loop equipment compliant to TMN. This system manages the device of Transport Network (SDH), Access Network (PDH), Ethernet with PseudoWire-3E and PTN over MPLS-TP.

This is a GUI, End-to-End commissioning with several services for small to very large infrastructure with a NBI to access to a head NMS.

- Full SNMP supports functions including commands, alarms, and statistics gathering
- Viewing and printing of all node statistics, alarm reports, configurable report design
- Enriched topology management with GIS geographic maps, zoom and drag-and-drop
- Views of optical cable connection, cross-connection, panel view, and resource trees
- Clock Distribution Map
- System Redundancy and Protection
- Efficient performance monitoring in real-time and history for PM, NE and circuits
- Alarm management with notification via e-mail, GSM message (SMS), with filtering
- Root Cause Analysis accurately diagnoses faults on NEs and managed circuits by status and severity levels
- System Access Security and many options to customize your requirement.

For PseudoWire, iNMS provides the management and commissioning of
- PseudoWire Circuits commissioning PWoIP, PWoEth and PWoMPLS
- Hybrid Multi-Segments Circuit : Access TDM + PWE3 + TDM
- For IP67xx, PseudoWire gateway PWoIP, PWoEth with bundle protection
- For G7860 PTN MPLS-TP support PWoEth and PWoMPLS with LSP and LSP protection and the automatic-commissioning of nodes and LSP.
- OAM for End to End circuit over IP or Ethernet network or LSP.

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Loop Telecom supplies Transmission and Networking solutions for “Critical Communication”

SDH/SONET Transport
- Versions STM1/4/16 or OC3/12/48
- Tributaries E1/T1, E3, EoS, STMx
- Versions with TDM DACS

PseudoWire over IP/Ethernet
- Packet transport of TDM E1/T1, n64K, E3/T3 for Voice and Serial data Emulation, Ethernet
- Transport of synchronization
- Modular configurations or compact devices

Multiservice analogue/digital TDM/DACS Multiplexing
- TDM/PDH
- From 1 to 504 E1/T1
- Modular, scalable
- Redundant CPU/DACS

Concentration Switches and Router
- GE/10 GE switch/router L2, L2.5, L3
- 19” 1U fix or modular FANLESS
- For Power domain IEC61850, HSR/PRP
- For Railway domain EN50121-4
- POE+, MACsec, SyncE, PTP 1588,

Ethernet and E1/T1 Backhaul
- Over
- Gigabit Ethernet
- Gigabit Transport
- Chassis and CPE

EMS - NMS system
- Local Craft Interface or Web
- Element Network Management
- Intelligent Network Management with node automatic commissioning

CWDM/DWDM multiplexing
- CWDM/DWDM multiplexing
- 1550nm, 1530nm wavelengths
- DWDM, EDFA, CWDM

Worldwide
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