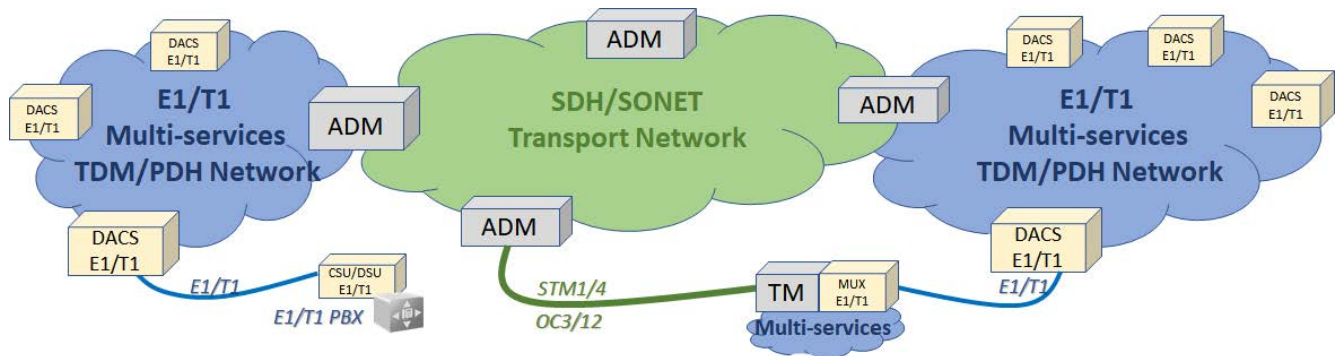
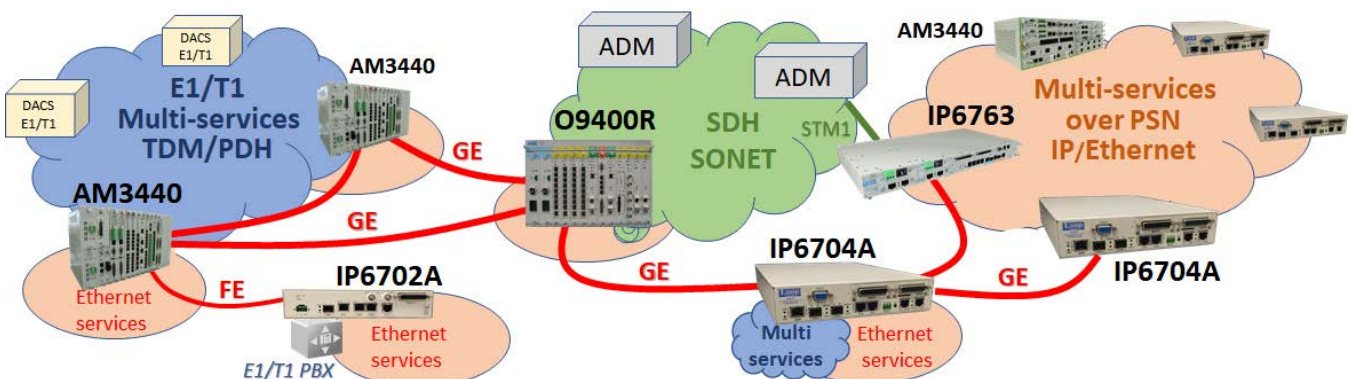


The TDM world is clearly decreasing against packet IP or Ethernet core network solution. Because traffics sensitive to latency, high reliability and very large number of installations for legacy and industrial applications for analog and frequency based communication RTU/NTU, the transport or multiplexing such traffic over TDM links is still unavoidable. TDM PseudoWire is direct solution to make legacy and sensitives installed applications coexist inside IP/Ethernet. The PseudoWire Emulation End to End over switched packet Ethernet/IP/MPLS can transport a full services such E1, T1, E3, T3 TDM or ATM, or STM-x/OC-xx SDH/SONET together with IP or Ethernet traffic. This emulation transports not only the data but also the interface control of these links and make sure that the both-end equipment are not missing the service of the interface. Loop equipment provides :

From full conventional TDM/PDH Multi-services and SDH/SONET transport



... to partial or total migration over Packed Switched Networks: IP, Ethernet or MPLS



These PseudoWire equipment are designed for remotes small sites with few analog or legacy interfaces plus Ethernet services over fiber Ethernet as point to point or point to multipoint.



IP6702A

1U, 1/2 19" device, option tray:

Layer 2 switch with WAN/LAN:

- 1 x 100FX SFP
- 3 x 10/100BaseT
- VLAN, S-VLAN/C-VLAN

TDM tributaries :

- 1 x E1 120ohms/T1, RJ48
- Or E1 75ohms with 2 BNC
- Support E1/T1 G703, FE1/FT1 G704 n.64kbps framing and E1-CAS voice traffic
- 1 serial interfaces n 64kbps RS422 or X21*

PseudoWire

- 16 simultaneous
- SAToP, CESoPSN, MEF-8*



IP6704A

1U, 1/2 19" device, option tray:

Layer 2 switch with WAN/LAN

- 2 x 100/1000 SFP
- 2 x 10/100/1000BaseT
- SyncE
- VLAN , Q-in-Q

TDM tributaries :

- 2 x E1/T1, with RJ48
- 2 factory modules for:
 - 1 or 4* E1/T1, n.64kbps X21, RS232/V24, V35 or RS530*, 1 C37.94 , 1 G703 64k CD
 - 4 E&M, 4 FXO, 4 FXS, 4 Magneto*, Echo cancellation*
- E1/T1 support G703, FE1 G704 n.64kbps framing and E1-CAS voice traffic

PseudoWire

- 16 simultaneous
- SAToP, CESoPSN, MEF-8*
- ACR Automatic Clock Recovery.
- OAM, QoS
- Power supply: AC & DC or 2 DC

* in implementation

Loop Telecom has extensive expertise to convert and transport voices, analog signals, synchronous, asynchronous, legacy interfaces, teleprotection, dry contacts... and Ethernet over TDM or IP networks. Naturally we have developed a range of TDM over PSN solutions for our TDM/SDH/SONET customers who like to interconnect these over IP/Ethernet backbone or add new TDM sites using Ethernet backhaul because E1/T1 are no longer available from telecom operator.

The technology of TDM PseudoWire Emulation End To End over Packet Switched Networks (PSN: Ethernet, IP, MPLS)

TDM PseudoWire Emulation End to End (PW or PWE3) transport the full TDM service which includes:

- the TDM data Unframed or Framed including
- the bit streams for the CAS with Multi-frame, the CRC control and CCS for ISDN E1/T1, and
- the clock synchronization, which is very important for TDM networks and applications.

This is an **emulation of the full service End-to-End**. From the perspective of customer end equipment (CE), the PWE3 appears as unshared link with the designated service, like an E1 or T1 from a public network or and STM-1/OC12 from a SDH/SONET ADM.

The PWE3 provide a relatively straightforward mechanism to implement TDM/SDH/SONET services across packet-switched networks, and to achieve interoperability among arbitrary sets of equipment from multiple vendors.

TDM Encapsulation/Emulation and constraint over PSN

IP/Ethernet networks are elastic and their stability of traffic depends on crossed nodes switch or router. The TDM links require high stability and low latency. In order to emulate correctly the PseudoWire over PSN we have to select the adapted emulation protocol to the interfaces type, the size of the packets and the buffer size to limit jitter delay. Customers must take a compromise between small packet size with low latency requiring high bandwidth and larger packet size with more latency and but reduced required bandwidth. Loop provides tools and OAM to control these parameters.

TDM PseudoWire emulation Protocols

SAToP (Structure Agnostic TDM over Packet) according to RFC 4553. This emulation use to transport only unframed service or clear channel interfaces E1, T1, E3, DS3 only.

Unframed data link, or any link transported as G.703, is sliced according to the synchronization but without consideration of content. This simple emulation protocol is mainly used for mobile transport.

CESoPSN (Circuit Emulation Services over Packet Switched Network) according to RFC 5086. This emulation is used to transport only framed service of n.64kbps, E1, DS1, E3 and DS3 circuits only.

The customer must choose a multiple of E1 structured frames with number TS/DS0 in a CESoPSN frame. The latency is directly depending of the size of this frame and the number of Time Slot (TS or DS0). This protocol is used by industry, Scada, teleprotection, small independent circuits with few TS/DS0 dispatched to different application server or NTU.

MEF 8 or **CESoE** (Circuit Emulation Services over Ethernet) design by MEF Metro Ethernet Forum is similar to CESoPSN and supports framed service n.64kbps, E1, DS1, E3 and DS3 circuits.

CEP (SDH or SONET Circuit Emulation over Packet) RFC4842, supports the Emulation End to End of Virtual Container VC-11, VC-12, VC-3, VC-4, VC-4-4c or Synchronous Payload Envelope STS-1, STS-3c STS-12c...

The **Bundle** is the name of a TDM PseudoWire including both end addresses and TS number.

IP6704A A powerful Multi-services access and PseudoWire Gateway for substation

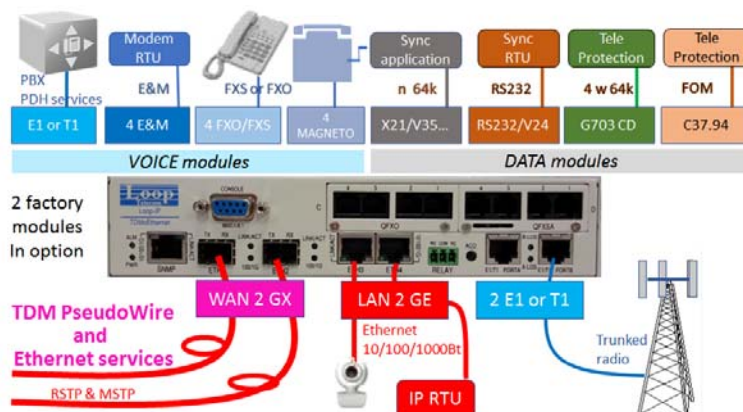
The Loop Telecom IP6704A is a powerful **Layer 2 switch** used in industrial customer premises to concentrate the Ethernet traffics through two Gigabit Ethernet and different type voice band signals and synchronous data over TDM PseudoWire Emulation and this support RSTP and MSTP protection.

IP6704A multiple functions:

Multi-Services access multiplexer, with voice band E1, T1, E&M, FXS, FXO, Magneto, Echo Cancellation that are converting to PCM and synchronous data n x 64K/2Mbps, codirectional, C37.94... links.

PseudoWire Gateway that emulate these TDM services to PWE3 over Ethernet or IP networks.

Layer 2 switch with 4 FE/GE, 2 SFP and 2 copper used as WAN or LAN, Thanks to VLAN, Q-in-Q, OoS and CoS with flow control of Ethernet traffic it optimize the PWE3 over the WAN.



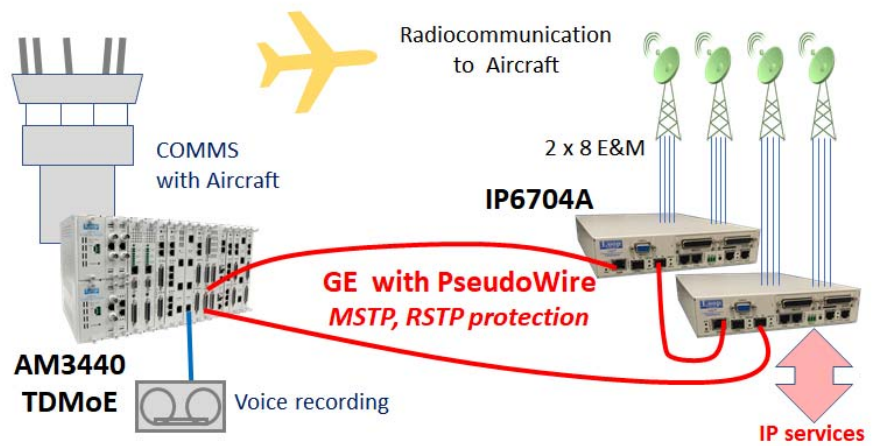
Voice & Data transmission over Wireless



To simplify the deployment of conventional or legacy services together with Ethernet services the IP6702A, a compact Loop Telecom PseudoWire gateway, can easily carry an E1 for PBX or E1/T1 mux together with IP applications over a Wi-Fi point-to-point as Loop Telecom W8150 WiFi or W8320 400Mbps Ethernet over radio. The IP6702A supports E1/T1 Unframed but also Framed G704 or voice E1-CAS. The Layer 2 switch provides the bandwidth control to secure PseudoWire against the IP/Ethernet services. The remote radios and IP6702A can be managed from central site with i-NET.

Air Traffic Control

The Air Traffic Control use many radio communications between Aircraft and Air Traffic Controller with analog voice and a mandatory recording of all communications. Many AM3440 or O9550 are installed in several Air Traffic Control organizations over the world with different service including radar transmission. The radios use E&M interfaces with additional Ethernet controlling. During the migration this service can migrate easily to Ethernet backbone by using the compact IP6704A PseudoWire gateway that emulate up to 8 E&M. For more ports they are daisy chained. In central we can use an AM3440 with TDMoEA card and support up to 88 E&M radio and the duplication for recording.



Analog Voice, Conference and RTU communication for Railway

Loop Telecom supplies TDM DSO multiplexing solutions to different railway companies around the world. Some of our railway customers want migrate a part their application from main SDH transport to Ethernet fiber or from old copper connectivity to Ethernet backbone. IP6704A is a factory modular system, it is an economical solution to transport over Gigabit Ethernet fiber a part of dedicated Railway services without modification of end-to-end engineering which are tested and mandatory for Railway infrastructure.

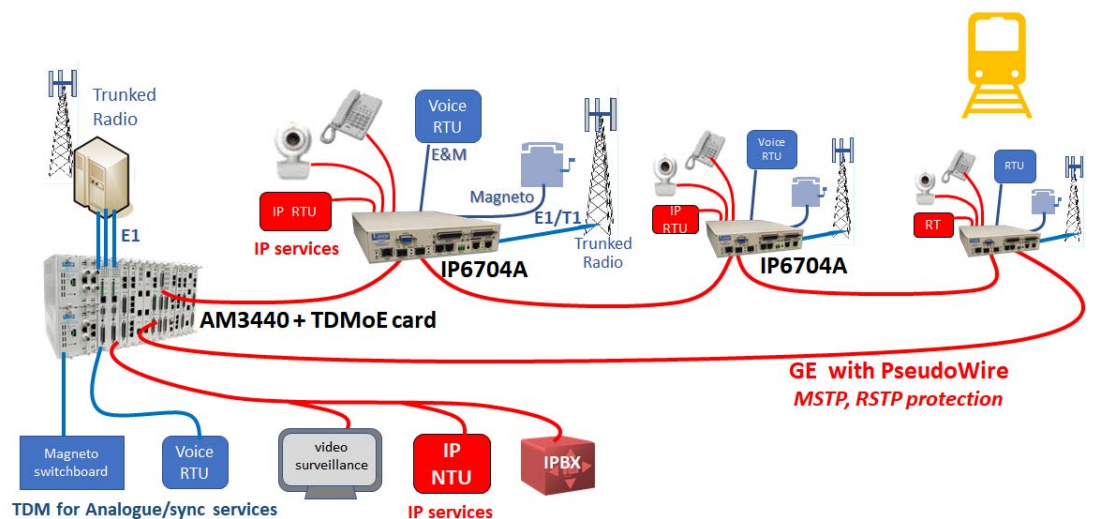
The IP6704A nodes are secured by redundant power supplies, WAN fiber optic links with RSTP or MSTP ring protection and if necessary the equipment can be double per site for CPU and tributary redundancy.

Thanks to E&M, FXO, FXS, magneto voice interfaces IP6704A carry voice traffic to PBX or dedicate switchboard for railway.

The serial interfaces can support some SCADA applications (RS232, G703 64K) and the two E1 can be used for trunked radio (PMR) along railway lines.

The internal L2 switch with VLAN, QoS... and with 2 100/1000BaseT LAN ports it is supporting the TDM PseudoWire services and the additional IP services as the IP-voice, IP-Video, access control...

An AM3440 with TDMoEA card could be the right device in central node and NOC to concentrate up to 64 PseudoWires.



These concentration solutions are supporting TDM, SDH/SONET and TDM over Ethernet or IP networks.



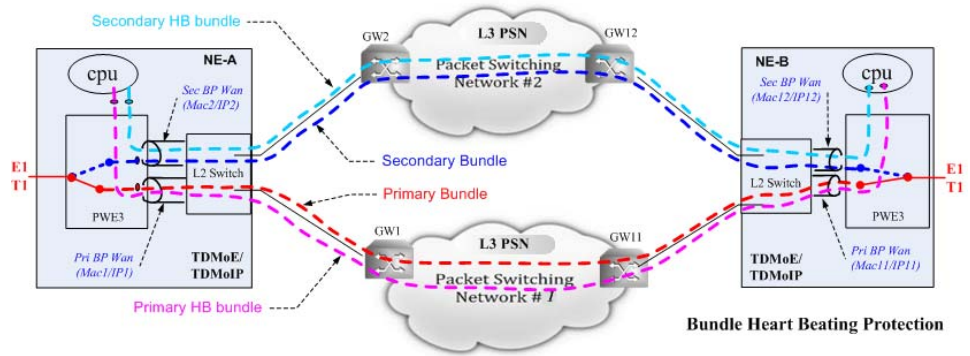
TDMoEA cards for AM3440 DS0 DCS TDM and O9550-A, O9500R hybrid TDM & SDH This one slot card support 4 E1 or T1 backplane conversion to TDM over IP/Ethernet . Layer 2 switch with WAN/LAN

- 2 x Combo GE/GX SFP
- 2 x 10/100/1000BaseT
- VLAN , Q-in-Q , QoS PseudoWire
- 64 PWE3 n.64kbp or 2Mbps
- SAToP, CESoPSN, TDMoIP
- ACR Automatic Clock Recov.

The migration to the packet switching world will take long time for many technical applications. Loop Telecom Multi-Services DACS support connection over traditional TDM/SDH/SONET and new IP/Ethernet links, backbone, fiber, wireless toward new distant nodes for IP traffic plus Legacy, Scada and low rate high sensitivity traffic.

Protection of the of the TDM links with PseudoWire solutions:

E1/T1 protection The TDM multiplexer can provide a 1+1 protection of E1/T1 TDM copper/fiber by an E1/T1 PWE3 or between 2 E1/T1 PWE3. The conventional E1/T1 can be also protected by a TDMoEA over PSN network or inverse...



Bundle Protection or Heart Beating Protection. This 1:1 bundle protection is available in IP6763 and AM3440/O9550/O9500R-TDMoEA cards. Primary Bundle (PWE3) is using Layer3 path with gateways and it is protected by Secondary Bundle with Layer3 protection path. In parallel of those traffic bundles, primary and secondary "Heart Beating" bundles are controlling availability of bundles and CPUs will switch to secondary according to selected rule on number of missing periods in primary.

Ethernet WAN protection. All Gigabit Ethernet WAN PW devices are supporting RTSP, MSTP to protect at Layer2 the PWE3 circuits over the networks. The MSTP protocol with VLAN can be used particularly to optimize the protection of the PW traffics against others Ethernet traffics.

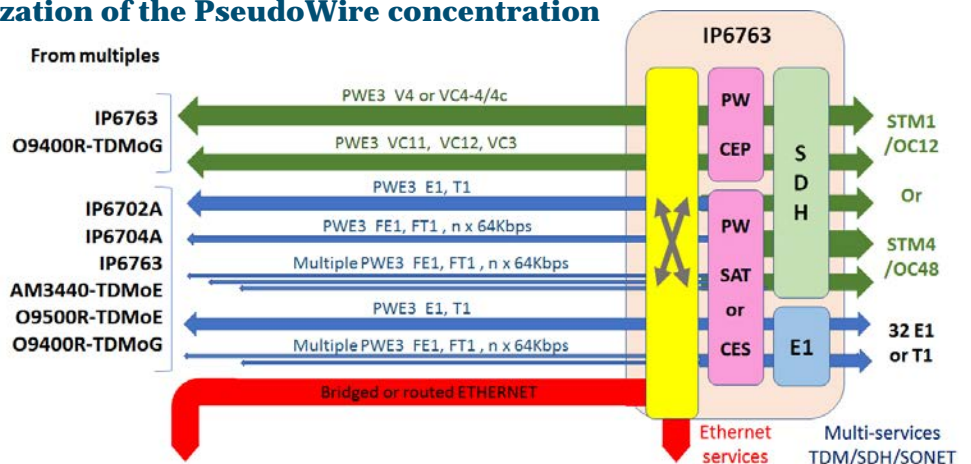
WAN for TDM PW and growing Ethernet traffics with QoS and CoS

The evolution of these nodes is generally resulting in increase of the local Ethernet traffic. The TDMoEA card owns 4GE copper or fibers usable as WAN or LAN and other models own 2 GE combo WAN and 4 GE LAN with internal 10GE L2 switch. All are supporting link aggregation to provide high WAN traffic. Thanks to the VLAN type of traffic, the Q-in-Q for other LAN traffics, the rate limiting per Ethernet port n.64kbps to n.10Mbps and the switching QoS based on PCT for Ethernet frame with 4 or 8 queues (*1), the IP DSCP TOS field ToS and the scheduling with algorithm SP or WRR the bandwidth for TDM PWE3 is preserved and permit to carry a maximum of Ethernet traffic over the shared WAN.

OAM and Diagnostic test of TDM interfaces and PW

Different models of PseudoWire equipment provide different tests. Please read the right brochure. We support the local/distant loop test and 24-hour performance in 15-minute interval of E1/T1, SDH/SONET interfaces. The system provides information internal direct tests ARP, Ping and TraceRoute and per PseudoWire/Bundle the Round-trip Delay analysis with record of mini/maxi/average. These provide Pseudowire Information of Packet Creation Time (ms), Jitter-Tolerance Delay (ms) and with an external software calculator the Frame Length (bytes) Packets/s and the Required Bandwidth (Mbps).

Optimization of the PseudoWire concentration



IP6763

Layer 2 switch with

- 2 x GE Combo WAN
- 4 x 10/100/1000BaseT LAN
- VLAN , Q-in-Q , QoS TDM tributaries factory opt.
- 32 x E1/T1: unframed G703, G704, E1-CAS, CRC, DS1/D4/ESF
- 2 x 2 or 2+2 STM1/OC3
- 1+1 STM4/OC12,
- 252 VT11/VT12

PseudoWires

- VC4>VC4, VC4-4/c>VC4-4/c, VC12>E1 or >FE1, VC11>T1, E1>FE1 with TS grooming
- 512 simultaneous
- 32 with ACR supports
- SAToP, CESoPSN, MEF-8, CEP for SDH/SONET
- OAM, performance analysis



O9400R-TDMoG

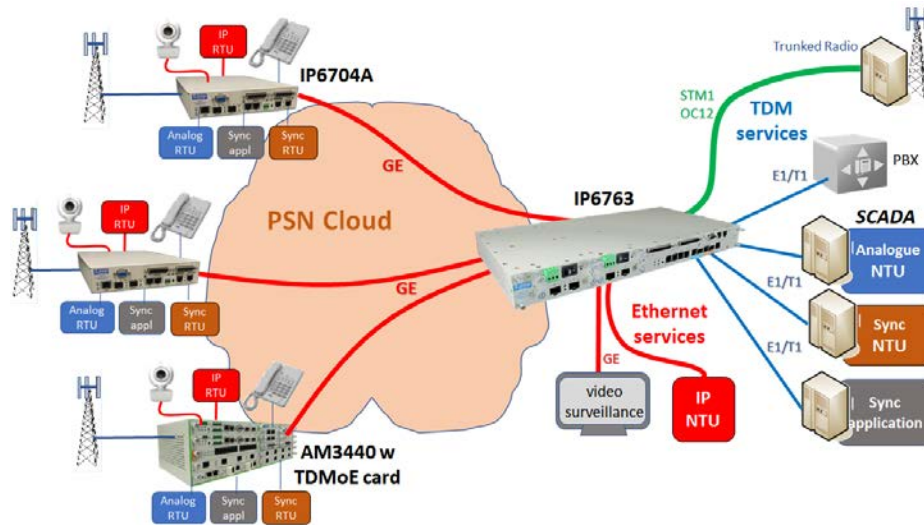
Layer 2 switch with

- 2 x GE/GX Combo, 4 GE LAN
- 4 VC4 back plane to SDH

PseudoWires

- VC4>VC4, VC4c>VC4c, VC12>E1, VC11>T1,
- 512 simultaneous
- 32 with ACR supports
- SAToP, CESoPSN, MEF-8, CEP for SDH/SONET

Migration of Multi-Services applications application to IP/Ethernet transport



Loop Telecom PseudoWire Gateway family can replace, for Multi-Services, the existing TDM/PDH or SDH/SONET transport networks by PseudoWire interconnection over a Packet Switching Network IP or Ethernet. The remote access equipment are replaced by small gateway IP6702A or IP6704A or for large density of interfaces by an AM3440 with TDMoEA card. In central we will use the universal gateway that convert PseudoWire from remote site for E1, FE1, T1, FT1, voice TS in direct access to SCADA or LTU or Sync/Async servers with physical E1 or VC12/VC11 in STM1/OC3 interface for SDH/SONET Network. The IP6763 is doing the grooming of similar application interfaces in the same E1, T1, VCxx and avoid adding a TDM/PDH multiplexer or a SDH/SONET ADM.

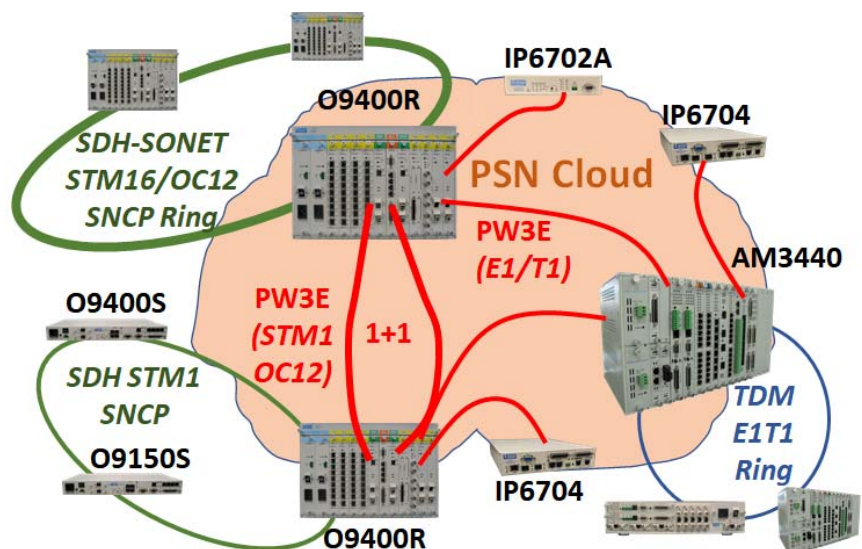
The IP6763 is really a concentration site which support up to 512 PWE3 and synchronize up to 32 remote PseudoWire gateways with ACR mode. Thanks to his 32E1/T1 and 4 STM1 or 1 STM4 interfaces it is a large extension of TDM/PDH and SDH/SONET network over the Packet Switched Network or simple Ethernet backhaul.

The IP6763 manage together the Ethernet traffic concentration and Layer 2 switching with VLAN and Q-in-Q from remote gateways with full support of QoS particularly for PWE3 transport.

Power transport/distribution, Oil and Gaz plan or Chemical Industrial complex... Interconnexion of existing TDM/SDH/SONET networks with Gigabit backbone, Addition of remote node over Ethernet Backhaul.

In many large industrial infrastructures, the networks of transport TDM/PDH and SDH/SONET are installed and are working correctly with reasonable OPEX cost for applications requiring stability, low latency or simply working without limitation. The new network installations are built with Ethernet backbones but they are not open to these original networks. The PseudoWire emulation gateway are the right solution to interconnect TDM/SDH/SONET networks by crossing the new GE/10GE/... backbone. Each conventional network will provide their synchronization and the addition of the TDM/PDH or SDH/SONET networks will be monitored by the same management system as the iNMS.

In case customer like to add a new TDM DACS as AM3440 or a new SDH/SONET Terminal Multiplexer we will use PseudoWire Emulation of E1 or STM1/4 over Ethernet backbone and the local node will synchronize the remote node in Automatic Recovery Clock (ACR) mode over the backbone or Ethernet link. Point to point 1+1 protection will apply on the PWE3 or with Ethernet WAN protection.



10G PTN with MPLS-TP or CE protocols solutions

In case of multiple nodes deployment, it can be easier through the deployment of Loop Telecom PTN MPLS-TP solution based on G7860 or O9400R-PTN or O9500R-PTN equipment. We combine TDM/PDH, SDH/SONET and GE/10GE with MPLS-TP or Carrier Ethernet protocol. Please contact Loop Telecom.

Loop produces a new range of devices used for Mobile backhaul and for industrial application with E1/T1 and with deployment of multiple Ethernet flows .



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 (CESoE)

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
- G.8031, G8032* protection
- RSTP, MSTP*



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

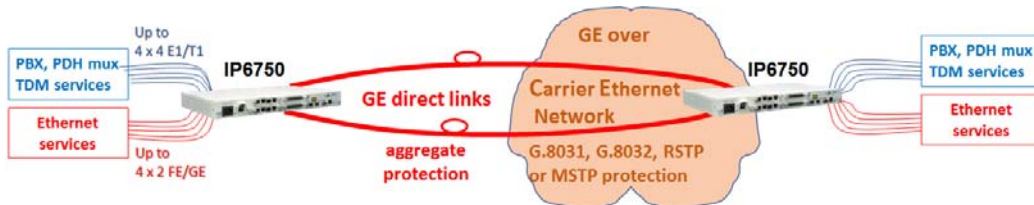
- E1, T1, FE1, FT1, VCxx, VC-4c
- ACR or DCR
- PW/LSP, SAToP, CESoPSN, MEF-8 (CESoEth), CEP
- VPLS, VPWS, H-VPLS for Ethernet services

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, Y.1731, 802.3ah

Loop Telecom produces a new range of Packet Transport Network equipment that support SyncE GE and 10GE interfaces with PTP1588 and MPLS-TP or Carrier Ethernet 2 transport protocol. These equipment support the transport of E1/T1, TDM Multi-Services, SDH/SONET and Ethernet services with high level of reliability and respect of clock distribution and latency. The iNMS system support the installation and administration of mix services to optimize CAPEX and OPEX for migration.

E1/T1 and Ethernet extension over fiber or cloud

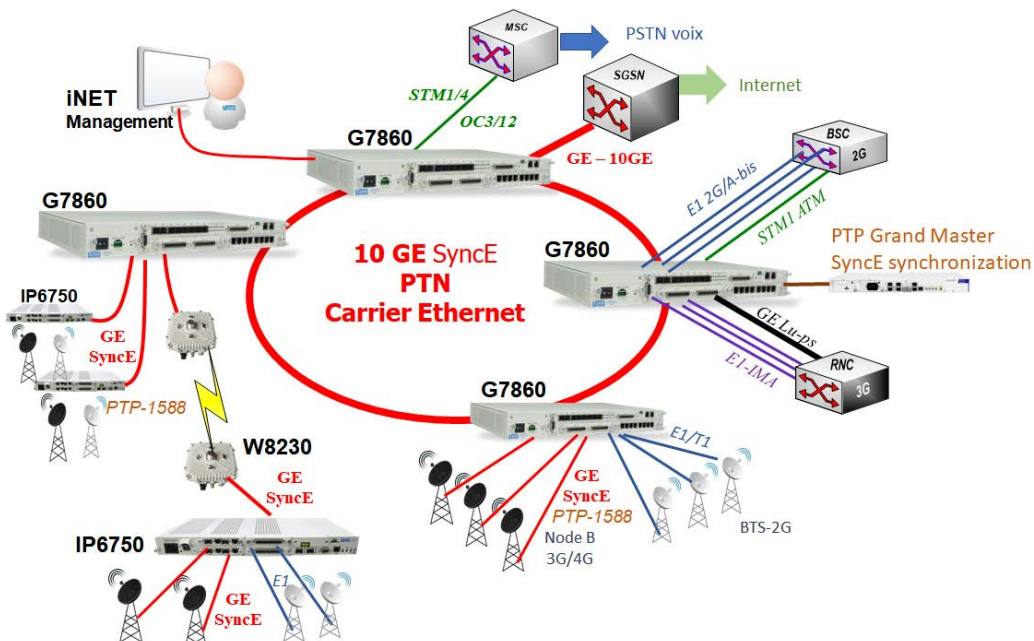


The IP6750 is a powerful switch with two optical GE WAN to carry Ethernet services and E1/T1 TDM circuit over PseudoWire. This can be use as single Ethernet switch with TDM extension over simple dark fibers and supporting the link aggregation protection or over a structured cloud as a Carrier Ethernet network with G.8031 ELPS, G.8032 ERPS, RSTP or MSTP protection.

Thanks to the SyncE Gigabit Ethernet and the PTP 1588, the IP6750 provides frequency and time synchronization to remote devices and following remotes over 6 chained hops. These synchronization are need by TDM terminals and secure applications.

Use as Point to Point, or Daisy chain this powerful Layer 2 switch support VLAN, Q-in-Q, QoS and OAM to deploy sensitive application in power, industry, military...

Ethernet backhaul for 2G/3/LTE BTS deployment



Ethernet backhaul based on IP6750 can deploy the E1-TDM for 2G BTS and the E1-IMA for 3G Node-B, and the Gigabit Ethernet for 3.xG and LTE node B and thanks to SyncE WAN and PTP 1588 circuit inside they provide frequency and phase synchronization to BTS and Node B. The IP6750 with WAN or Combo tributary ports can distribute connect other units and provide both synchronization up to 7 equipment in daisy chain. For non existing fiber link Loop propose Ethernet over radio up to 400Mbps and 20km. This extension can carry also the GE SyncE. The BTS/Node-B is also carried over the combined network.

For large infrastructure Loop Telecom proposes the G7860A PTN device supporting CE or MPLS-TP transport protocol to concentrate up to 22 GE SFP to IP6750 over four 10GE ports of MPLS-TP or CE networks toward the BSC, RNC and PSTN or RNC, SGSN and Cloud. The G7860A is supporting the transport of Ethernet VPLS/VPWS and over PseudoWire emulation over LSP of the E1, T1 and the VC12, VC4, VC4-c or VC-4c circuits over LSP. This give the possibility to maintain the administration of BTS sites by LSP number management. Small structure of equipment can be monitored through iNMS and large Network by the iNMS with automatic commissioning end-to-end of LSP and PseudoWires.

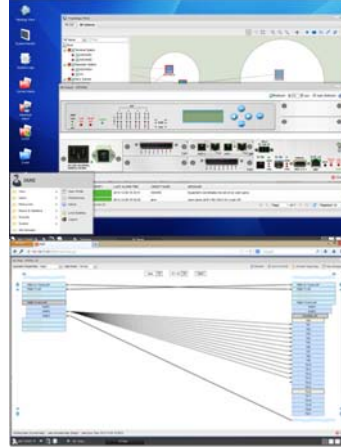
iNET *Loop-iNET, based on scalable and modularized architecture, is an intelligent network management software for Element Management Layer (EML) and Network Management Layer (NML) based on Telecommunications Management Network (TMN) model. It provides a GUI (graphical user interface) for the management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

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

This solution in option with hot standby server redundancy 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.

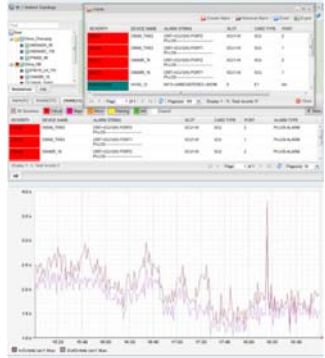
iNET can support up to 100,000 Network Elements (NEs) of TDM, Ethernet and PseudoWire Loop Telecom devices and generic 3rd-party NE. The robust and reliable design provides flexible and scalable solution for network expansions.



iNET-LCT

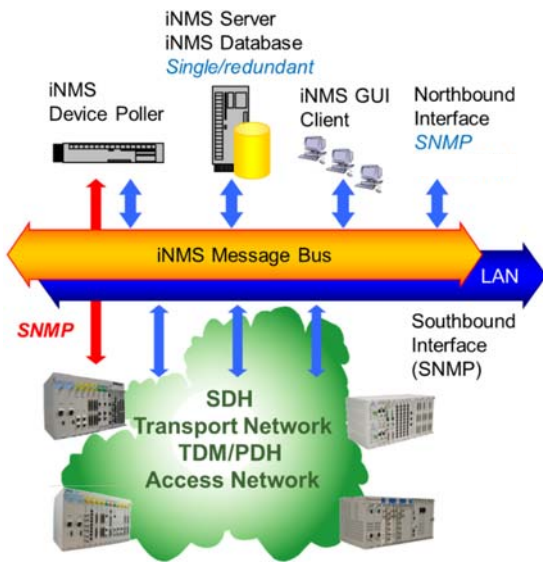
This light Window software is a Local Craft Interfaces.

This basic version of the iNET NMS is permitting to set-up node per node locally or over the network and gives the vision of all setting and cross-connects of the device.

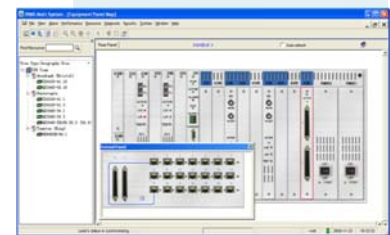
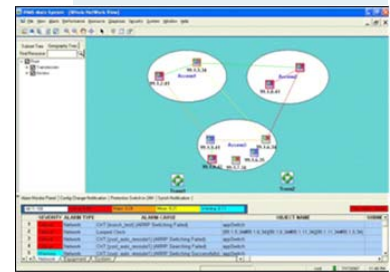
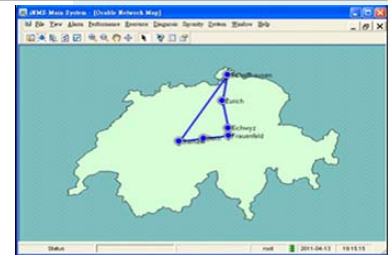


iNMS-NMS *Loop-iNMS (Integrated/Intelligent Network Management System) is a set of software programs supporting the Loop equipment compliant to TMN. This system manage the device of Transport Network (SDH), Access Network (PDH), Ethernet with PseudoWire-3E and PTN over MPLS-TP.*

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.



The iNMS system :

- The software runs Linux with
- Database Server: Oracle 10g, 11g, 12g*
- User-friendly GUI on MS Windows platform. Up to 50 GUI clients simultaneously are logged.
- iNMS support several thousand SNMP Loop nodes and 3rd-Party NE .

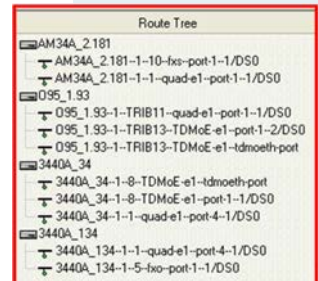
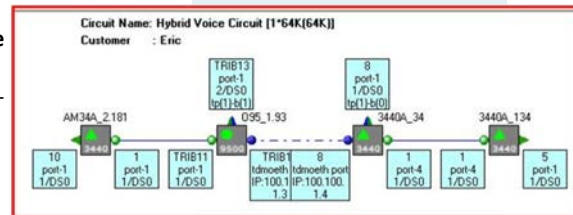
All servers, database, pollers can build with redundant with High Disaster Recovery option.

iNMS provides to administrator:

- High Level NMS
- GUI of device and Network view
- End-to-end service management with automatic commissioning of nodes

For PseudoWire iNMS provides the management and commissioning of

- PseudoWire Circuits commissioning PVoIP, PVoEth and PVoMPLS
- Hybrid Multi-Segments Circuit : Access TDM + PWE3 + TDM
- For IP67xx PseudoWire gateway PVoIP, PVoEth with bundle protection
- For G7860 PTN MPLS-TP support PVoEth and PVoMPLS 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.



TDM PseudoWire Emulation End to End over Packet Service Networks

Models	IP6702A	IP6704A	IP6750	IP6763	IP6700-E3	TDMoEA card for AM3440-A/B/C	TDMoG card for O9400R
System	TDM PseudoWire Emulation End-to-End (PW-E3) system stand alone					PW-E3 card for PDH/TDM DACS	PW-E3 card for SDH/SONET ADM
		1U, ½ 19"	1U, ½ 19"	1U 19"	1U, ½ 19"	Modular ETSI 5U, 2.5U or 3U	Modular 5U ETSI
	1 SNMP CPU AC or DC or AC&DC	1 SNMP CPU AC&DC or 2 DC	1 SNMP CPU AC or 2 DC	1 SNMP CPU AC or 2 DC	1 SNMP CPU AC or DC	2 redundant SNMP CPUs 2 DC red. AC or 2 DC	2 redundant SNMP CPUs 2 AC or 2 DC red.
PseudoWire (PWE3) Emulation protocol	SAT unframed CESoPSN framed MEF 8 (CESoEth)*	SAT unframed CESoPSN framed MEF 8 (CESoEth)*	SAT unframed CESoPSN framed MEF 8 (CESoEth)	SAT unframed CESoPSN framed CEP SDH, MEF 8	SAT unframed	SAT unframed CESoPSN framed MEF 8 (CESoEth)	SAT unframed CESoPSN framed CEP SDH, MEF 8
Number of PWE3	16	16	64	512	1	64	512
PVD compensation	Up 256ms	Up 256ms	Up 256ms	Up 128ms	45 & 60ms	Up 340ms	Up 128ms
Bundle protection	-	-	-	Yes L3	-	Yes L3	-
Emulation of services in PWE3	E1, FE1, T1 or serial	E1, FE1, T1, FT1 or serial or voice	E1, FE1, T1, FT1	VC4, VC4-4c, VC3, VC11, VC12, E1, T1 VC12 to FE1/FT1	VC3	E1, FE1, T1, FT1 or serial or voice	VC4, VC4-4c, VC3, VC12, E1, T1, E3, DS3 VC12 to FE1/FT1
Clock recovery master	ACR for 4 remotes	ACR for 4 remotes	ACR & DCR for 64 remotes	ACR for 32 remotes	-	ACR for 16 remotes	ACR for 32 remotes
WAN or LAN interfaces	1 FX SFP 3 x FE	2 FX/GX SFP 2 x FE/GE SyncE	WAN 2 GX SFP LAN with module SyncE	WAN 2 Combo GE LAN 3 FE/GE	WAN 1 FE or FX LAN 1 FE	WAN 2 Combo GE LAN 3 FE/GE	WAN 2 Combo GE LAN 4 FE/GE
over PSN	IP or Ethernet	IP or Ethernet	Carrier Ethernet, SyncE & PTP1588v2	IP or Ethernet	IP or Ethernet	IP or Ethernet	IP or Ethernet
Ethernet protection	-	RSTP, MSTP	RSTP, MSTP, G.8032	RSTP, MSTP	-	RSTP, MSTP	RSTP, MSTP
Tributaries interfaces	2 fixed	2 fixed + 2 factory modules	4 mini slots	32 E1/T1, 2 mod. SDH/SONET	1 fixed		
SDH/SONET	-	-	-	4 STM1 or 1 STM4 4 OC3 or 1 OC12 MSP 1+1		The main multiplexers AM3440-A/B/C and O9550-A/C support	The main O9400R supports 4 STM1 or 1 STM4 MSP 1+1
Cross-connect	-	-	From TDM to PW	From TDM to PW		Full non blocking DACS DS0	Full SDH VCxx
Tributary PDH E1,T1,E3,T3	1 E1/T1 Frame/Unframed	2 to 10* E1/T1 Frame/Unframed	0 to 16 E1/T1 Frame/Unframed	0 to 32 E1/T1 Frame/Unframed	1 E3 or 1 DS3 Unframed	E1/T1 Framed/CAS/Unframed	up to 388 E1/T1, 18 E3/DS3 Frame/Unframed
DTE n x 64k X21/V35/IEA530/RS232	1 RS422/V11	0 to 2 X21,RS232, V35,IEA530*	-	-	-	X21, V35, V36, RS232, RS485, RS422	-
E&M, Magneto, Conference	-	E&M, Magneto*	-	-	-	E&M, Magneto, Conference	-
Voice FXO, FXS, Echo Cancellation	-	0 to 8 FXO or FXS, Echo Cancel*.	-	-	-	FXS or FXO, echo cancellation	-
G703 64k, C37.94	-	0 to 2 G703, C37.94				G703 64K,C37.94,Teleprotection	
Environment	Fanless	Fanless	Fanless	Fan	Fanless	Chassis Fanless	Chassis Fan or Fanless
Size (WxHxD)	210 x 41,5 x 140 mm optional Tray	213 x 41 x 290 mm optional Tray	438 x 44 x 300 mm	438 x 44 x 225 mm	210 x 41,5 x 140 mm optional Tray		
Temperature	-10 to +55°C	-10 to +55°C	-10 to +60°C	-10 to +55°C	-10 to +55°C		
Compliances std	FCC Part 15 Subpart B, Class A - CE - Safety IEC60950-1						
Other compliances		IEC61850-3*	IEC61850-3*			IEC61850-3, EN50121-4	IEC61850-3, EN50121-4*
Management	Telnet/SSHv2 Craft	Telnet/SSHv2 Craft	Telnet/SSHv2 Craft	Telnet/SSH Craft	Telnet Craft	Telnet/SSHv2 Craft	Telnet/SSHv2 Craft
Local Port or over TS	RS232, Eth	RS232, Eth	RS232, Eth	RS232, Eth	RS232	RS232, Eth and TS	RS232, Eth and TS and DCC
SNMP	v1, v3	v1, v3	v1, v3	v1, v3	v1	v1, v3 v1, v3	v1, v3
LCT Interface	Node administration Windows GUI						
iNET (EMS)	Windows GUI , Graphic cross-connect, vision of programed circuit					Windows GUI , Graphic cross-connect, vision of programed circuit	
iNMS (NMS)	Support Transport, Access, PW3R circuits, automatic nodes commissioning, synchronization					Support Transport, Access, PW3R circuits, automatic nodes commissioning, synchronization	
<i>* in development or qualification</i>							



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