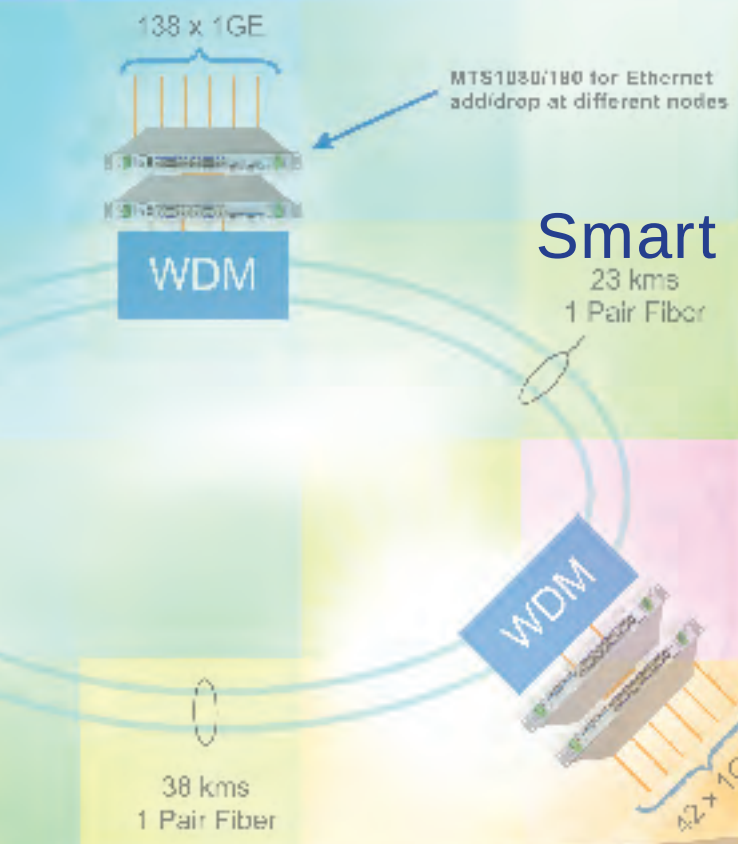
Dows Lake MICROSYSTEMS



Smart Network Building Blocks

Carrier Ethernet Switches

WDM for Metro & Acess

Optical Amplification

Last Mile Optical Solutions

Products and Solutions

überreicht durch:
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Opternus GmbH
September 2014

DowsLake MICROSYSTEMS

		Carrier Ethernet						Enterprise Ethernet						Industriel					
		MTS-100	MTS-180	MTS-1080	MTS-1090-P	MTS-1090-C	MTS-10080	MTS-170 GE	MTS-194 GE	MTS-1928 10G	MTS-1928-40G	MTS-19080	MTS-6000 10G	MTS-10-04xx	MTS-10-08xx	MTS-10.16xx	MTS-10-24xx	ETC-M-11	ETC-M-21
Ethernet	FE	x	x	x		x		x	x	x	x		x	x	x	x	x	x	x
	GE	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	10 GE			x	x	x	x			x	x	x	x						
PDH/SDH	E1																		
	STM-1																		
	STM-4																		
	STM-16																		
	STM-64																		
	STM-256																		
Fibre Channel	FC																		
	FC-2x																		
	FC-4x																		
	FC-8x																		
	FC-10x																		
	FC-16x																		
OSI	Layer 1																		
	Layer 2	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Layer 3	o	o	o	o	o	o		x	x	x	x	x						
	Layer 4	o	o	o	o	o	o												
Application	STP	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	IGMP	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	LAG	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	VLANs	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Multicast	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Carrier Ethernet	SyncE				x	x	x												
	IEEE 1855v2					x	x												
	ERPS G8032v2	x	x	x	x	x	x							x	x	x	x	x	x
	MPLS-TP				x	x	x												
	QoS	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	GUI	x	x	x	x	x	x												
	OAM	x	x	x	x	x	x												
PON	GPON																		
	EPON																		
Power	AC	x		x	x	x		x	x	x	x	x	x	x	x	x	x	x	x
	DC	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	POE													x	x	x	x	x	x
	Redundant	x	x	x	x	x	x									x	x		
Interface	Optical	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Electrical	x	x	o	o	o	o	x	x	x	o	o	x	x	x	x	x	x	x
	RJ-45	x	x	o	o	o	o	x	x	x	o	o	x	x	x	x	x	x	x
	SFP	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	SFP+						x			x	x	x	x						
	XFP			x	x	x	x												
	QSFP										x	x	x						
	Seite	31	30	28	26	26	24	40	39	37	37	35	32	58	58	58	58	59	59

x = unterstützt o = bedingt unterstützt

		CATS xWDM								Optcial Amp & ROADAM					FTTx			PTN	
		CLTT	CLCT	CLXT	CLXTv2	COAT	COST	CLFT	XMUX-D	C-MS-1025	C-MS-1025R	ROADM-1x4-50G	ROADM-1x2-50G	CMD-40	MTE.3600	MTE-3800	MTE-9000	MTN600	MTN100
Ethernet	FE		x			x	o								x	x	x		x
	GE	x	x			x	o		x						x	x	x	x	x
	10 GE			x		x	o								x	x	x	x	
PDH/SDH	E1																	x	x
	STM-1																	x	x
	STM-4		x			x	o												
	STM-16		x			x	o												
	STM-64			x		x	o												
	STM-256					x	o												
Fibre Channel	FC	x	x			x	o												
	FC-2x		x			x	o												
	FC-4x		x			x	o												
	FC-8x			x		x	o												
	FC-10x			x		x	o												
	FC-16x					x	o												
OSI	Layer 1	x	x	x		x	x	x											
	Layer 2														x	x	x	x	x
	Layer 3														x	x	x	x	x
	Layer 4																		
Application	STP														x	x	x	x	x
	IGMP														x	x	x		
	LAG														x	x	x	x	x
	VLANs														x	x	x	x	x
	Multicast														x	x	x	x	x
Carrier Ethernet	SyncE																	x	x
	IEEE 1855v2																	x	x
	ERPS G8032v2														x	x	x	x	x
	MPLS-TP																		
	QoS														x	x	x	x	x
	GUI	**CATS CEO**																	
	OAM														x	x	x	x	x
PON	GPON														x	x	x		
	EPON														x	x	x		
Power	AC	x	x	x	x	x	x	x	x	x	x	x	x	o	x	x	x	x	x
	DC	x	x	x	x	x	x	x	x	x	x	x	x	o	x	x	x	x	x
	POE																		
	Redundant	x	x	x	x	x	x	x	x	x	x	x	x	o	x	x	x	x	x
Interface	Optical	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Electrical	o	o						o						x	x	x	x	x
	RJ-45	o	o						o									x	x
	SFP	x	x						x						x	x	x	x	x
	SFP+				x				x						x	x	x	x	x
	XFP			x	x				x									x	x
	QSFP																		
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x = unterstützt o = bedingt unterstützt

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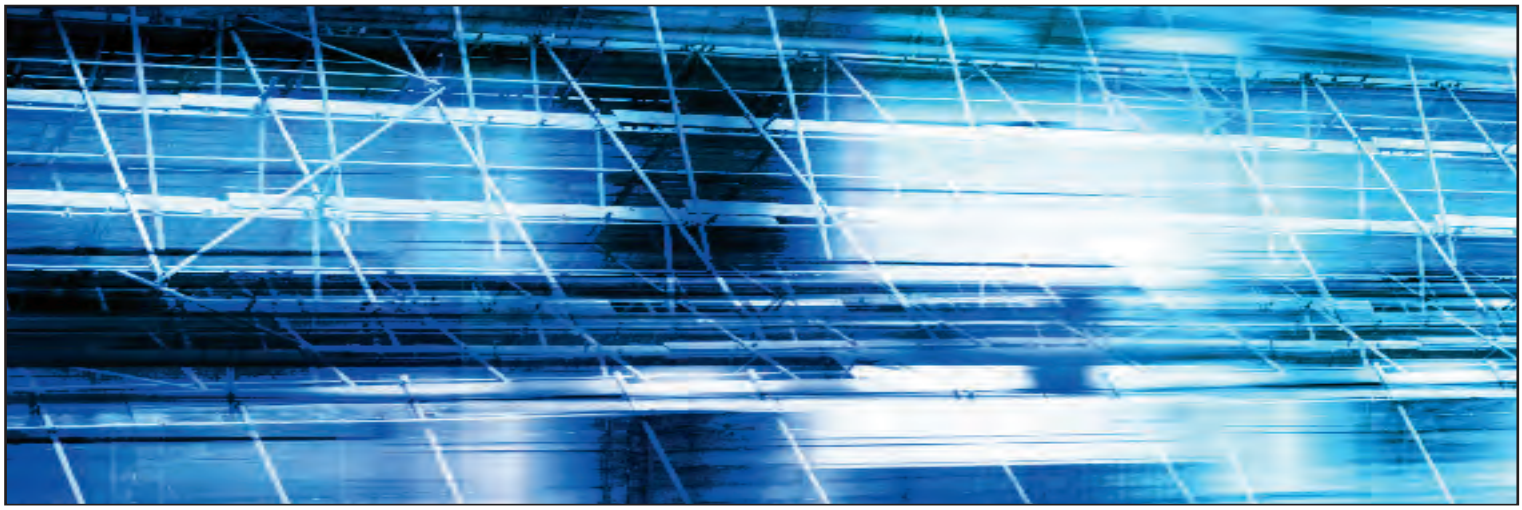


Dowslake Network Management

A network management system shall provide Fault, Configuration, Administration, Performance and Security Management. Based on such requirement, Dowslake provides several options depending on customer need and the sophistication of the network.

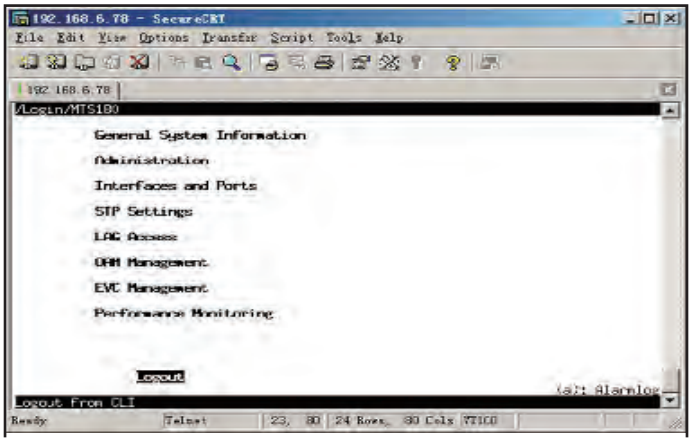
Command Line Interface (CLI)

All Dowslake equipment comes with CLI without exception. CLI can be connected via either local craft interface, or remote access through telnet.

Currently user may find 2 types of CLI interfaces in Dowslake products:

a. Menu driven CLI interface

This type of CLI gives automatically a list of menu items for user to choose. It is straight forward and easy to use without the need to find references. User can simply use the the key board to select the needed menu items to get into details or to change settings. Following shows an example of menu driven CLI:



b. CLI Commands

Newer generation equipment such as Dowslake MTS series Carrier Ethernet Switches offer real command type CLI interface similar to the UNIX shell or MS-DOS prompt. The advantage is that user can write script to automate operations rather than key in menu items one by one.

The general syntax for a CLI command is as below:

<Command> [Object] [Option] <Parameter>

A command can be used in the following ways:

as Command only

as Command with Object

as Command with Option

as Command with Parameters

For example, user can type

clock set <hh.mm.ss> <dd/mm/yyyy>

in order to set system clock and date. Refer to equipment user manual for detailed command descriptions.

SNMP

All Dowslake equipment comes with SNMP without exception.

Simple Network Management Protocol (SNMP) is a protocol defined by the Internet Engineering Task Force (IETF). Network devices supporting this protocol, such as Dowslake equipment, allow a management station to monitor network status, modify network settings, and receive network events.

A SNMP network management system consists of:

- one or more managed nodes, such as a Dowslake MTS carrier switch, each of which runs one or more SNMP agents. An agent keeps information about its managed node in a database called a Management Information Base (MIB).
- one or more network management stations, which runs network management software (NMS) such as HP OpenView™ and displays network information.
- a network management protocol, which defines how the managed node and the management station can communicate with each other over the network.

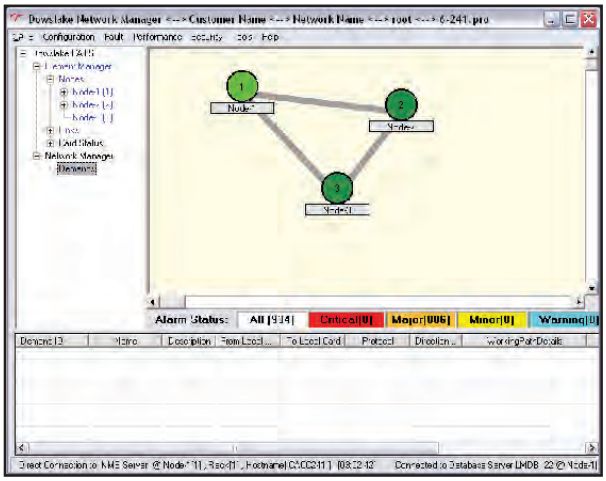
As a database which stores management information, a MIB is often shown as a tree, where the nodes of the tree define the database and its tables, rows and fields. The collection of all MIBs is organized in a tree structure, where each node on the tree represents a single MIB. The SNMP MIB hierarchy is defined by RFC 1155 and RFC 1213.
MIBs fall into two categories:
Standard MIB: A standard MIB is defined by the IETF. An example of a standard MIB is RFC 1215, a convention for defining traps for use with the SNMP.
Private MIB: A non-standard proprietary MIB is defined by an enterprise, such as Dowslake Microsystems. The IETF assigns a unique OID number to a company, under which they can define their own OIDs for their specific products. Dowslake company OID is assigned as 16726. All MIBs for Dowslake equipment are defined under such OID. As an example, Dowslake 10G carrier Ethernet switch MTS1080 SNMP agent contains following MIBs:
- RFC 1155: Structure of Management Information (SMI)
- RFC 1212: Concise MIB definitions
- RFC 1213: Management Information Base (MIB-II)
- RFC 1215: A convention for defining traps for use with the SNMP
- Dowslake-Global-Reg: A private MIB, which represents the Dowslake general product and MIB structures.
- DOWSLAKE-NETWORK.mib: A private MIB, which specifies general OIDs for DowsLake's Network products.
- DOWSLAKE-MTSCommon-sys-mgmt.mib: A private MIB, which specifies MTS1080 system specific management objects OIDs.
- DOWSLAKE-MTSCommon-dev-mgmt.mib: A private MIB, which specifies MTS1080 device specific management objects OIDs.
For detailed SNMP and MIB information of each product, please refer to the User Manual.

Graphic User Interface (GUI) for Element Control

The majority of Dowslake products also comes with Java based GUI for individual equipment control. It allows user to simply connect to the equipment and monitor/change alarms, parameters and operation modes. Below shows a Java GUI interface example for Dowslake 10G switch MTS1080. With GUI user can visualise port status, set parameters, or monitor alarms at a simple click of mouse.

Centralised Element Organiser (CEO)

Centralised Element Organiser (CEO) is Dowslake's new generation of network management. It provides a topology based network element management, allowing the administrator to centralise all information from each network element connected in the network. In order to keep cost down and operations simple, Dowslake provides 2 options to run CEO:
1) Using Master Node Controller as Management Server
The Master NE's powerful system controller provides a mySQL database which is used to collect information across the network for other Slave nodes. User can communicate with the Master node using a network terminal running a web browser. Through a Graphic User Interface, user can see all the NEs in the network and click on any one of them for configuration and operations purpose. See page 5 CATS network management as an example.
Direct connection between user's terminal and network Master node is best suited for smaller and simple networks.
2) Client-Server Type Using External Dedicated Server
When user needs to grow the network beyond hundreds of nodes, a more powerful client-server based management is necessary, reason why CEO offers a second option which is to run the network management from a server. The network management server needs to be pre-configured to run Linux, and with enough hardware support such as memory and hard drive. It allows to manage thousands of nodes populated with Dowslake equipment.



Master Controller & Server Specifications

Management Server (by Default it is the Master Controller)	
DataBase	MySQL V 4.0.23a
OS	Linux V 2.6.14.2
North-Bound Terminal HW	Windows XP or Windows Professional type min. Intel Pentium 1G Memory, 40G Hard Drive
Max. # of Nodes	Up to 180
External/Backup Server for Higher # of Nodes or for Backup	
Hardware	min. Pentium 2.0G, RAM 2.0G, 10G HD
OS	Linux SuSE 8.2(Kernal 2.4.20)
Min. Free RAM	600 M
Database	MySQL 4.0.21
Max. # of Nodes	> 1500
Network Management Hardware	
MNGT Port	10/100M Ethernet RJ45
In-band	Yes for Access Cards or using OSC
Remote Upgrade	Yes

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SNMPC for Large Network

Visualize, monitor and pro-actively manage your network. SNMPc is a secure distributed network management system that will monitor your entire network infrastructure. With support for SNMP v3, unparalleled ease of use, and versions for both small and large networks, is good fit for large network management up to 25,000 nodes.

Secure

Safely manage devices with SNMP V3 Authentication and Encryption. Tailor views and capabilities to each management user.

Scalable

Use distributed polling and server components for workgroup, large Intranet or Management Service Provider configurations.

Connected

Catch problems quickly with Email and Pager event notifications. Forward events to helpdesk or domain management systems.

Accessible

Monitor and manage your network from remote locations with the SNMPc Windows Client and JAVA WEB Consoles.

Pro-Active

Monitor LAN/WAN performance and Service availability with scheduled WEB reports to effectively plan upgrades and reduce wasted bandwidth.

Integrated

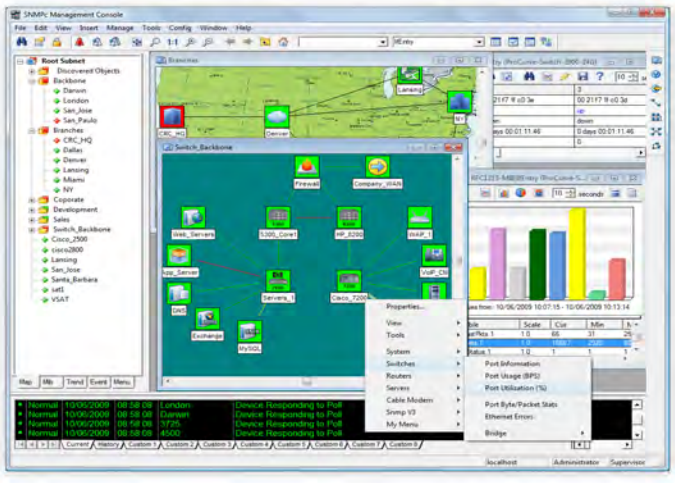
Automatically export map topology, trend statistics, and event log entries to industry standard databases.

Multi-Vendor

View and modify standard and private information on routers, switches, servers and other devices from any vendor.

Customizable

Simplify tasks with custom Expressions, Data Tables, and Menus. Develop Graphical Device Views with the BitView scripting tool and a variety of programming and scripting interfaces.



Specifications

SNMP Protocols:	V1, V2c, V3 with SHA/MD5 Authentication and DES Encryption
Device Discovery:	Automatically discovers and polls SNMP and ICMP (Ping) devices.
Service Discovery:	Performs service discovery on each device, including SNMP, ICMP, Telnet, FTP, HTTP, SMTP, and four user-specified TCP ports.
Service Polling:	Up to 16 user defined TCP ports per icon. Each with configurable send/reply string. External polling with custom applications
Topology Layout:	Multiple Level Hierarchies. Segmented by Polling Agent. Tree, Ring, or Snaked Bus networks.
Event Notification:	Ignore, Ignore Duplicates, Forward, Email, SMS, Display Alarm Box, or Execute Application.
Reporting:	Graph, Bar Chart, Distribution, and Summary. Printed and WEB Export.
Backup:	Live/Standby server support with automated failover.
External Interfaces:	ODBC and Text Export. Event Forwarding using SNMP Traps.
Customization:	Private MIB Import. Custom Tables, Expressions, and Menus. Execute applications from map double-click, on event reception, and during custom polling.
Programming Interfaces:	Proprietary object-oriented interface for C/C++ applications. SNMPc 4.0 DDE Interface. WinSNMP de-facto standard interface. Utilities for Scripting language support.

Requirements

Parameter	Enterprise	WorkGroup
CPU	Pentium III 1GHz	Pentium II 600 MHz
Memory	1 GB	512 MB
Disk	10 GB	5 GB
Windows Operating System	Vista/XP/2008/2003/2000	Vista/XP/2008/2003/2000

CATS Converged Access & Transport System

CATS Converged Access & Transport System is a next generation optical system platform for WDM, TDM and Ethernet applications. With this system, service providers can offer various bandwidth services using SDH/Sonet, Fiber Channel, Ethernet and/or E1/T1 protocols, while aggregating all customer interfaces on to the metro network. The centrally managed platform, ranging from 1RU "pizza-box" to 3U shelf, accepts plug-in cards for transport and access. CATS1000/3000 and CPE chassis support compact designed optical amplifier, transponder and access function card. CATS 2U chassis support 10G Muxponder, ROADM, Raman and 26dBm output EDFA for long distance and high capacity DWDM system.

CATS3000 3U chassis

CATS1000 1.5U chassis

CATS1000 1U chassis

CATS 2U chassis (CATS2-RO-2DC)

CATS 2U chassis (CATS2-2DC)

CPE Housing

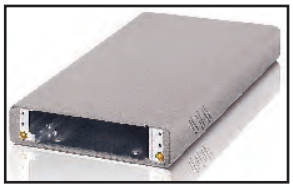
3U rack mount cards can become a standalone unit with RS232 port

RA-T-V-E99-W/V

Dual AC or Dual DC Input

RA-T-V-E/33-W/V

Single AC or DC Input



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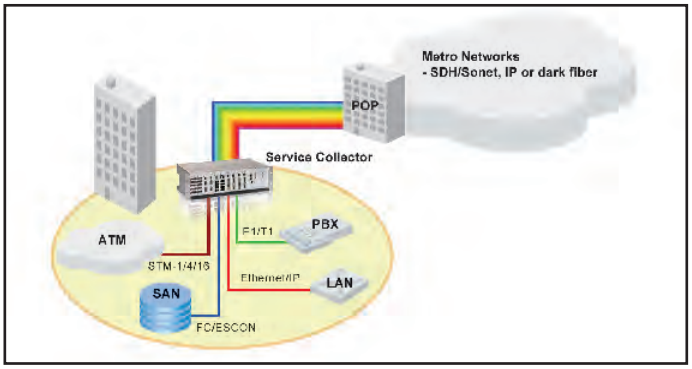
CATS System Information

Slots quantity of racks	
CPE version	1 functional card
1U 19″ Rack	2 functional card slots+ 1 management + 2 power supplies
1.5U 19″ Rack	2 functional card slots+ 1 management + 2 power supplies + 1 slot for WDM
2U 19″ Rack(CATS2-2DC)	2 pluggable CMS1025 card slots+ 1 management + 2 power supplies
2U 19″ Rack(CATS2-RO-2DC)	One up slot for ROADM/RAMAN/10G Muxponder/VMUX + One below slot for pluggable CMS1025 + 1 management + 2 power supplies
3U 19″ Rack	10 functional card slots + 1 management + 2 power supplies
Power Supply	
1U/1.5U Rack DC Power Supply	- 36 ~ – 72 VDC; -48VDC rated; 5V/14A output, 70W
2U Rack DC Power Supply	- 36 ~ – 72 VDC; -48VDC rated; 5V/20A output, 100W
3U Rack AC Power Supply	90~ 260 VAC; 50Hz; 5V/40A output, 200W
3U Rack DC Power Supply	- 36 ~ – 72 VDC; -48VDC rated; 5V/40A output, 200W
Management Card	
Management	GUI NMS, SNMPv.2, Telnet/SSH, local RS232
Management Port	10/100M Ethernet RJ45; Local RS232
In-band management	Yes
Remote Flash Update	Yes
Performance Monitoring	Optical power, Link status, Error Counters, etc
Cards available	
Function card for CATS1000 /3000 and CPE chassis	CLCT multi rate 2-in-1 transponder up to 4G transport data rate
	CLTT 2xGE/FC TDM MUXponder up to 2.5G transport data rate
	CLXT multi-protocol 8G&10G transponder
	CLXT v2 2-in-1 multi-protocol 10G transponder
	CLFT 4 wavelengths MUX/DEMUX card
	COAT optical amplifier
	COST intelligent optical switch
	SMUX-GE 4xE1+3xFE multiplexer up to 1GE uplink rate
	CMTS-GE GE uplink, FE aggregation & access
Function card for CATS 2U chassis	CMS1025 pluggable EDFA function card for CATS 2U chassis
	ROADM-1x4-50G 1x4 ROADM for CATS 2U chassis (CATS2-RO-2DC)
	CMS1025R-20-OD 20dB Raman for CATS 2U chassis (CATS2-RO-2DC)
	XMUX-D dual 10G Muxponder for CATS 2U chassis (CATS2-RO-2DC)
Environmental	
Operating Temperature	- 5 ~ + 55 °C
Operating Humidity	5 ~ 85% RH non-condensing
Dimensions (H x W x D)	
CPE chassis (mm)	39x144x267 (RA-T-V-E/33-W/V) ; 44x 482x 242 (RA-T-V-E99-W/V)
1U rack (mm)	44x 482x 242
1.5U rack (mm)	66x 482x 242
2U rack (mm)	88x 482x 242
3U rack (mm)	132.5x482.6x242

Why CATS?

CATS is an unique system combining both Layer 0, Layer 1 and Layer 2 functions into one shelf. It is designed for Packet Optical Transport and Service Delivery applications.



CATS by Network Functions

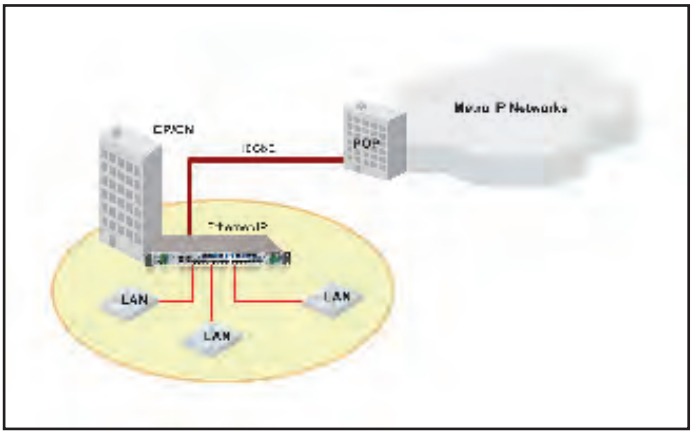
Currently, following functions are available within CATS platform:

| Wavelength multiplexing (WDM)
| Optical signal amplify in Layer 0
| wavelength convert and OEO repeater with 3R function
| Fast, Gigabit, or 10 Gigabit Ethernet service delivery
| Multi-service access for both TDM and Ethernet

WDM or Ethernet Aggregation?

The new generation of Ethernet equipment, such as our 10 G carrier Ethernet Switch MTS1080/MTS180 (P. 21), can aggregate Ethernet services while transporting traffics tens or even hundreds of kilometers without electrical regeneration.

MTS series carrier Ethernet switch is best used for Ethernet aggregation at high capacity, or for prioritized Ethernet service delivery. The metro network can be either IP based or SDH/Sonet based. The maximum trunk capacity per MTS shelf is 40 G (with 4x10 G ports).



Ethernet Aggregation Example: Collecting IP services in the access network, and connecting them to the metro network using 10 GbE.

Order Matrix

Description	Model
Standalone housing with alarm contact. 1 slot for 3U rack mount card, integrated power supply, VT100 Management port (RJ45), 115-230 V AC, with grounding bolt, ventilation, without power cord. High power	RA-T-V-E/33-W-H15
CATS1000 1U chassis , with two pluggable DC power supplies, one slot for management card, 2xslot for line card	CATS1-P-2DC
CATS1000 1.5U chassis , with two pluggable DC power supplies, one slot for management card, 2xslot for line card, 1xslot for mux/demux filter card	CATS1.5-P-2DC
CATS2000 2U chassis, with two pluggable DC power supplies, one slot for management card, 2xslot for pluggable CMS1025 card.	CATS2-2DC
CATS2000 2U chassis, with two pluggable DC power supplies, one slot for management card, 1xslot for pluggable CMS1025 card, and 1xslot for ROADM/RAMAN/10G Muxponder/VMUX	CATS2-RO-2DC
CATS3000, 3U tall, 19'', 10 slots x3U cards rack. Two pluggable 200W DC power and one alarm/fan included	CATS3-2DC
CATS3000, 3U tall, 19'', 10 slots x3U cards rack. Two pluggable 200W AC power and one alarm/fan included	CATS3-2AC
CATS system controller card for CATS 1000/2000	CACC-P-1R
CATS system controller card for CATS 3000	CACC-3R

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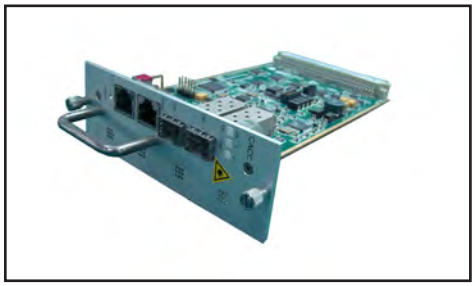
CATS CACC | CATS System Controller Card Extensive Element and Network Management Functions



Main Features

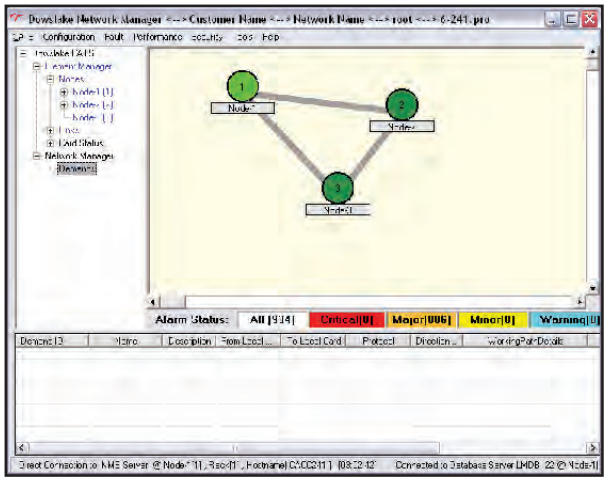
| Up to 2 dedicated management channels using optical supervisory channels (OSC), with hot pluggable SFPs
| Local and remote management via TCP/IP (Ethernet port)
| Manages CATS elements and hardware in a chassis, or in a network, via OSCs or out-band.
| In-band management possible with CATS access cards such as CMTS-GE

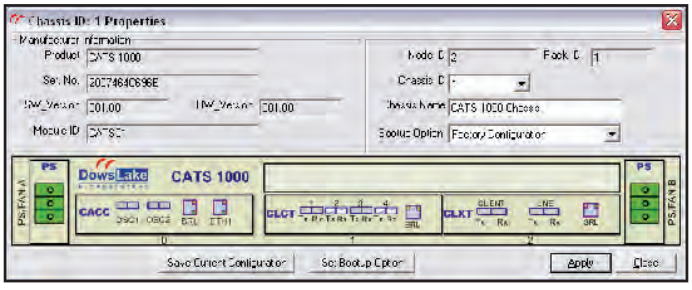
CATS system controller CACC is designed to allow the user to configure and access various settings for all Dowslake CATS elements. It manages various hardware and network faults by continuously communicating with CATS elements which have been integrated into the same software management environment.

Through the supervisory channels or in-band communication channels of certain CATS elements, CACC can manage remote nodes which are connected in the same network.

User Interfaces For Network Management

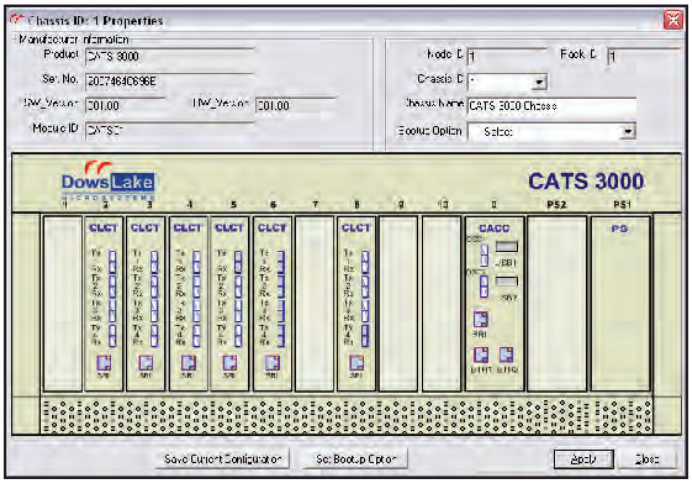
CATS system controller provides 3 types of user interfaces:
| CLI Commande Line Interface: this interface can be accessed either through the local craft terminal (RS232) or via telnet using TCP/IP.
| SNMP (V2): with MIBs integrated into user's control center, user can configure and monitor, remotely, CATS and each of its element
| Graphic User Interface (GUI): With CATS GUI, user can manage local and remote systems by point and click.





Product Specifications

Network Management	
User Interface	GUI, SNMPv.2, CLI (Telnet/SSH)
Supervisory Channel	2 x OSC
Managemt Port	10/100M Ethernet RJ45, Local RS232
Remote Flash Update	Yes
Performance Monitoring	Optical Power, Link Status, Error Count etc.
OSC	
Density	2 order SFPs Separately
Data Rate	100baseFx
Interface	Hot pluggable SFP module
OSC Wavelength	CWDM, or Custom
Operating Conditions	
Humidity	0 to 85% non-condensing
Operating Temperature	-5 °C to 55 °C
Storage Temperature	-40 °C to 70 °C
Power Consumption(with 2 OSC)	< 10 W
Mechanical	
Mounting Options	Plug-in Card
Platform	CATS 1000/2000/3000
Slot Assignment	Slot 0



Order Matrix

CACC	CATS System Controller Card

Extensive Element and Network Management Functions with 2 OSCS , one Ethernet port and one Local RS232

Description	Code	Model
CATS system controller card for CATS 1000/2000, with 2xOSC plug-in	8000-103	CACC-P-1R
CATS system controller card for CATS 3000, with 2xOSC plug-in	8000-302	CACC-3R

Order OSC SFPs seperately.

CATS CLXT/CLXTv2 | Multi-Protocol 10 G Transponder

10 GbE Demarcation or 3R Regeneration for SDH/Sonet or Ethernet

Main Features

| Multi-service transmission at 10 G
| Software settable for SDH/Sonet or Ethernet
| Client side and line side hot-pluggable SFP+/XFP
| User can choose color and distance for either interface
| Fits CATS Converged Access & Transport System
| Extensive management features thru local CLI or CATS system controller CACC
| Performance monitoring: optical power, error, wavelength etc.
| Alarm monitoring
| On-board APS for line protection (CLXTv2)
| 8GFC is supported(CLXT only)

The optical line-card CLXT/CLXT v2, as part of CATS transport and access solutions, enables enterprises and service providers to transport data at 10 Gbps. The clock and data recovery (3R) in CLXT/CLXT v2 supports various transmission protocols around 10 G. Thus multiple protocols, namely, SDH/Sonet, 10 G Ethernet, or even 10 G Fibre-Channel (optional) are supported using the one and the same line card. Different transmission distances or different transmitter wavelengths are available via the selection of SFP+/XFP interfaces. In addition, APS line protections are supported by CLXT v2.

CLXT/CLXT v2 is fully integrated into CATS – Converged Access & Transport System, with element and network management capabilities for easy installation, provisioning, and maintenance. Network operators can now provision and manage end-to-end high or low bit-rate data services using a single platform in an efficient and cost-effective manner.

Management Features

| SNMPv.2 agent and CLI
| Secure configuration via SSHv2 (Secure Shell) terminal
| Optical Supervisory Channel available within CATS platform
| GUI based network management via CACC system controller

Applications

CLXT/CLXT v2, combined with CATS CACC system controller, and other line cards such as CLCT 2-in-1 transponder for up to 4G data rate, COAT optical amplifier card etc.,allows the user to configure single wavelength (grey), or multi-wavelength (WDM) transport system for 10G Ethernet services. It can also be used as a 10G Ethernet demarcation device, linking the core router based IP network to the customer premises.

CLXT v2

Product Specifications

Transmission Standard	
CLXT: OC192/STM64 10 GbE 10 G FC (optional) OTU 2 (optional)	 9.953 Gbps, ITU G.707, GR-253 10.312 Gbps, IEEE802.3ae, 10GBASE-LW, 10GBASE-LR 10.518 Gbps , draft standard 1200-SM-LL-L, 1200-MX-SN-I 10.709 Gbps, FEC, ITU G.709
CLXT v2: 10 GbE 10 G FC (optional) OTU 2 (optional)	 10.312 Gbps, IEEE802.3ae, 10GBASE-LW, 10GBASE-LR 10.518 Gbps , draft standard 1200-SM-LL-L, 1200-MX-SN-I 10.709 Gbps, FEC, ITU G.709
Client Interface	
CLXT: XFP Transceiver	 Hot Pluggable
CLXT v2: SFP+ Transceiver	 Hot Pluggable
Line Interface	
CLXT: XFP Transceiver	 Hot Pluggable
CLXT v2: XFP Transceiver	 Hot Pluggable
Performance	
Eye Mask Jitter Tolerance Jitter Transfer	Compliant ITU G.691, G.959.1, IEEE 802.3ae Compliant GR-253, IEEE 802.3ae Compliant GR-253
Operating Conditions	
Temperature Humidity	- 5 to + 55 °C 5 to 85% RH non-condensing
Dimensions (H x W x D)	
Package Options Platform	 Plug-in CATS 1000/3000
Power Consumption	< 10 W(CLXT); <22W(CLXTv2)

Order Matrix

CLXT	Multi-protocol 10G Transponder

Wavelength Conversion and 3R Regeneration for SDH/Sonet, Ethernet

Description	Code	Model
CATS1000 multi-protocol 10G transponder with 1xRJ45 console port, OC192/STM64 and 10GE (default), other protocol optional.	8000-111	CLXT-P-1R
CATS3000 multi-protocol 10G transponder with 1xRJ45 console port, OC192/STM64 and 10GE (default), other protocol optional.	8000-310	CLXT-3R
CATS1000 multi-protocol 10G transponder with APS with 1xRJ45 console port, 10GE (default), other protocol optional.	8000-115	CLXTv2 -P-3R
CATS3000 multi-protocol 10G transponder with APS with 1xRJ45 console port, 10GE (default), other protocol optional.	8000-320	CLXTv2 -3R

Order racks, power supply, management card and XFP seperately

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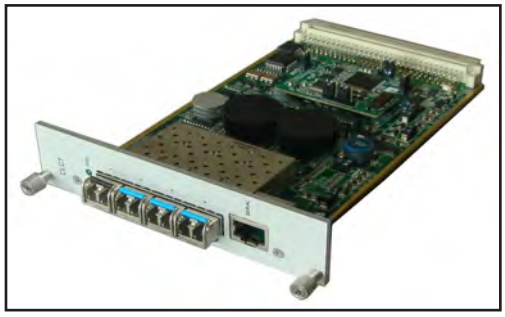
CATS CLCT | Multi-Rate 2-in-1 Transponder

Wavelength Conversion and 3R Regeneration from Sonet/SDH, Ethernet, or Fiber Channel

Main Features

| Multi-service transmission from 155 Mbps to 4.25 Gbps
| Software settable for SDH, Sonet, Ethernet or Fiber Channel
| 2-in-1 transponder line card saving space and cost
| Client side and line side with hot pluggable SFPs
| Can co-locate with other CATS line cards
| Extensive management features thru RS232 or TCP/IP
| Performance monitoring: optical power, error, wavelength etc.
| Alarm monitoring



The optical line card CLCT, as part of CATS WDM solutions, enables enterprises and service providers to transport data services from 155 M to 4.25 G with 3R (re-amplify, re-shaping, re-clocking) functions. The clock and data recovery (3R) in CLCT supports various transmission rates, settable through user software interface. Thus multiple protocols, namely, SDH/Sonet, Gigabit Ethernet, 1G, 2G or 4G Fibre Channel, are supported using the one and the same line card. Different transmission distances of up to 180 km are available via the selection of SFP interfaces.

CLCT is fully integrated into CATS – Converged Access & Transport System, and can be managed through CATS system controller CACC.

System Features

| Supports 2 transponders in 1 card with Clock and Data Recovery
| Supports latest high speed protocols including SAS, SATA, Gigabit Ethernet and Fiber Channel
| Automatic protection switch built-in for dual homing application
| Fits CATS platform 1000/3000
| Centralized management via CATS system controller CACC

Application Example - Dual Homing

Data centers require unprecedented protections. CATS CLCT offers a dual homing scheme allowing operators to connect data center customers to the main and the redundant core transport network.

In the diagram on the right side, it shows CLCT used for dual homing application. Client's SAN equipment (1 interface) is fed to CLCT. CLCT with internal APS routes the traffic to either WDM1 based ring network, or, in case of failure within WDM1 network, switches automatically to WDM2 based redundant ring.

Order Matrix

CLCT	Multi-rate 2-in-1 Transponder

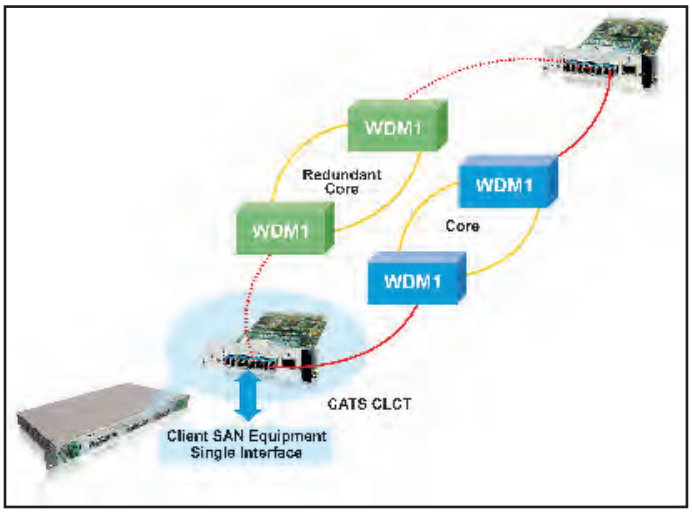
Wavelength Conversion and 3R Regeneration from 155M up to 4G

Description	Code	Model
CATS1000 2-in-1 transponder for 155 Mbps to 4 Gbps. No SFP included.	8000-121	CLCT-P-1R
CATS3000 2-in-1 transponder for 155 Mbps to 4 Gbps. No SFP included.	8000-320	CLCT-3R

Order SFP seperately.

Product Specifications

Transmission Data Rate	
SDH Sonet Ethernet Fiber Channel	STM-1, STM-4, STM-16 OC-3, OC-12, OC-48 100 M (2R), 1000 M 1G, 2G, 4G
Client Interface	
Number of Interfaces Up to 300 m Up to 2 km Up to 10 km > 10 km Connector	2 x SFP, Hot Pluggable MM 850 nm SM 1310 nm SM 1310 nm SM 1310 nm or 1550 nm Grey or Colored LC
Line Interface	
Number of Interfaces Up to 10 km Up to 40 km Up to 80 km > 80 km Connector	2 x SFP, Hot Pluggable SM 1310 nm SM 1550 nm Grey or Colored SM 1550 nm Grey or Colored Require Optical Amplifier and/or Dispersion Compensation LC
Performance	
Eye Mask Jitter Tolerance Jitter Transfer	Compliant ITU G.691, G.959.1, IEEE 802.3ae Compliant GR-253, IEEE 802.3ae Compliant GR-253
Operating Conditions	
Temperature Humidity	- 5 to + 55 °C 5 to 85% RH non-condensing
Dimensions	
Package Options Platform	Plug-in CATS 1000/3000
Power Consumption	< 13 W (excluding SFP)



CATS CLTT | 2.5 G MUXponder for Gigabit Ethernet or Fiber Channel

Time Domain Multiplxing 2 x GE or 2 x FC into Single Wavelength

Main Features

| Dual port protocol multiplexing
| Software settable for Ethernet or Fiber Channel data rate
| 2 interfaces into 1 link for efficient wavelength utilization
| Client side and line side hot pluggable SFPs
| Fits CATS Converged Access & Transport System
| Extensive management features thru RS232 or TCP/IP
| Performance monitoring: Optical Power, Error, Wavelength etc.
| Alarm Monitoring

The optical line card CLTT, as part of CATS WDM solutions, enables service providers to cut wavelength requirement by half by multiplexing 2 Gigabit Ethernet, or 2 Fiber Channel client interfaces into 1 fiber link. Different transmission distances of up to 180 km are available via the selection of SFP interfaces. Both client and line interface SFPs are hot-pluggable and can be replaced without changing the card.

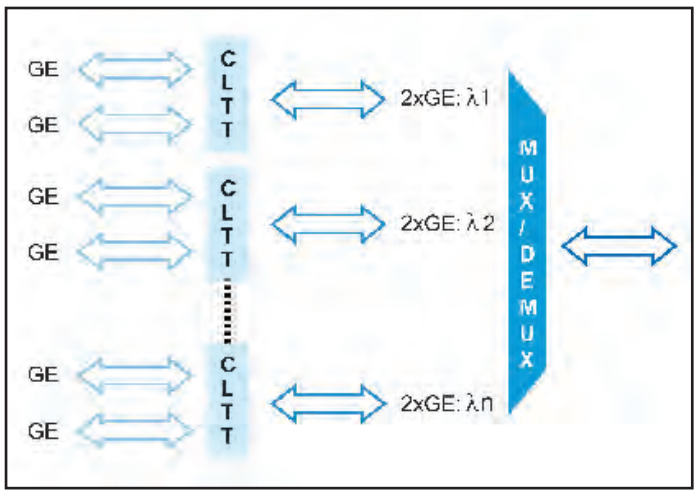
CLTT is fully integrated into CATS – Converged Access & Transport System, and can be managed through CATS system controller CACC.

System Features

| Supports Gigabit Ethernet multiplexing
| Supports 1 Gigabit Fiber Channel multiplexing
| Easy to install, operate, and manage
| Fits CATS 1000/3000 platform
| Centralized management through CATS system controller CACC

Application Example - Saving Wavelengths

CATS CLTT allows to multiplex 2 times GE or Fiber Channel signals into one wavelength, allowing wavelength savings. Typically used in CWDM or DWDM transport system, CLTT can serve for gigabit Ethernet transport and service delivery at high efficiency.



Product Specifications

Client Transmission Rate	
Ethernet Fiber Channel	1000BaseFx 1 G
Line Transmission Rate	
Data Rate Framing	2.5 Gbps Propritary
Client Interface	
Number of Interfaces Up to 300 m Up to 2 km Up to 10 km > 10 km Connector	2 x SFP, Hot Pluggable MM 850 nm SM 1310 nm SM 1310 nm SM 1310 nm or 1550 nm Grey or Colored LC
Line Interface	
Number of Interfaces Up to 10 km Up to 40 km Up to 80 km > 80 km Connector	1 x SFP, Hot Pluggable SM 1310 nm SM 1550 nm Grey or Colored SM 1550 nm Grey or Colored Require Optical Amplifier and/or Dispersion Compensation LC
Performance	
Eye Mask Jitter Tolerance Jitter Transfer	Compliant ITU G.691, G.959.1, IEEE 802.3ae Compliant GR-253, IEEE 802.3ae Compliant GR-253
Operating Conditions	
Temperature Humidity	- 5 to + 55 °C 5 to 85% RH non-condensing
Dimensions	
Package Options Platform	plug-in CATS 1000/3000
Power Consumption	< 12 W (excluding SFP)

Order Matrix

CLTT	2.5 G MUXponder for Gigabit Ethernet or Fiber Channel

Multiplexing 2 client interfaces into 1 wavelength

Description	Code	Model
CATS1000 2xTDM for GE or FC 2.5 G MUXponder. SFP not included	8000-126	CLTT-P-1R
CATS3000 2xTDM for GE or FC 2.5 G MUXponder. SFP not included	8000-325	CLTT-3R

Order racks, power supply, management card and SFP seperately

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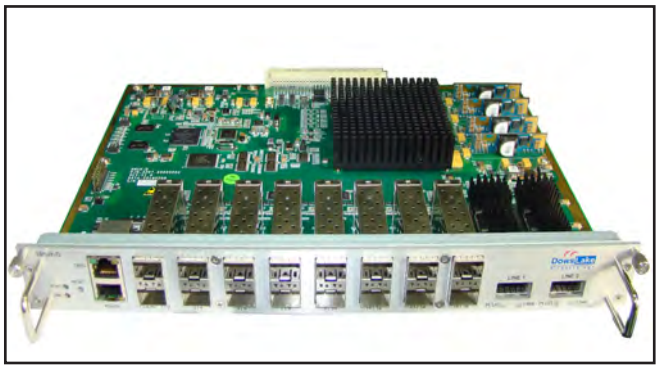
CATS XMUX-D | Flexible Dual 10G Muxponder

Main Features

| Muxponder any low data rata traffic to 10G traffic
| 16 SFP ports, support any traffic 125Mbps to 5Gbps transparent, total max 20G traffic
| 2 XFP ports, support OC192/10G Lan/OTU 2/OTU2e
| XFP 10G port support Tri-FEC for maximum network interoperability
| With different software configuration, one card can work as two 10G Muxpoders or one 10G Muxpodner with two 10G ports for network protection etc.
| With cross block in the card, SFP ports are able to be software configured to work as 2.5G Muxponder and 2.5G transponder
| With management card, can be managed by CEO GUI(Graphics User Interface), or local management via CLI port



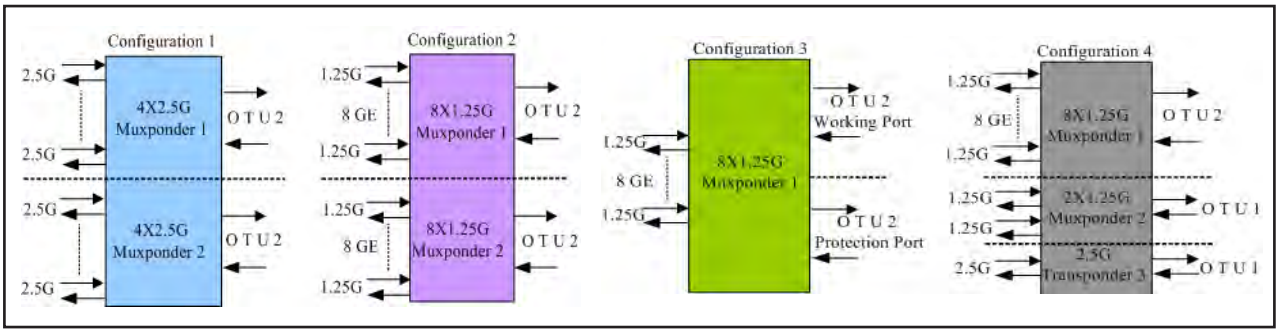
Applications

XMUX-D is a flexible high capacity function card for multi-service provisioning platform (MSPP). One card is with 16 SFP ports and two XFP ports; max can support 20G traffic.

These SFP port support any-service any-port configurability, can be software configurable to support OTU 1, OC3/12/48(STM-1/4/16), 100/1000Mbps full duplex Ethernet, Fibre Channel FC-15/25/50/100/200/400, FICON and ESCON, bit transponder clients include DVB-ASI, SD-SDI, HD-SDI, DV6000 etc. Two XFP ports can be independently configured for OC192, 10G Lan, OTU 2 or OTU 2e, can work independent to support two 10G traffic or configure as one working port and one protection port for one 10G traffic. Via selction proper SFP/XFP transceiver, XMUX-D client and line side are able to support different applications(different wavelength and different distance).

With cross block in the card, XMUX-D SFP ports are able to be software configured to work as 2.5G Muxponder(or 2.5G transponder), and line side is standard OTU 1 traffic support standard FEC function for 2.5G long haul system.

Four typical configuration of XMUX-D are as below:



Operating Conditions	
Operating Temperature Operating Humidity Storage Temperature	-5 to 55 °C 5 to 95% (non-condensing) -40 to + 70°C
Max power consumption	80W
Mechanical	
Package Options chassis type	Plug-in CATS 2U chassis (CATS2-RO-2DC)

Order Matrix

Description	Model
Pluggable dual 10G Muxponder card for 2U chassis CATS2-RO-2DC	XMUX-D

CATS COAT | Protocol Transparent Optical Amplifier Card

Increase Power Budget Indepedant of Data Rate

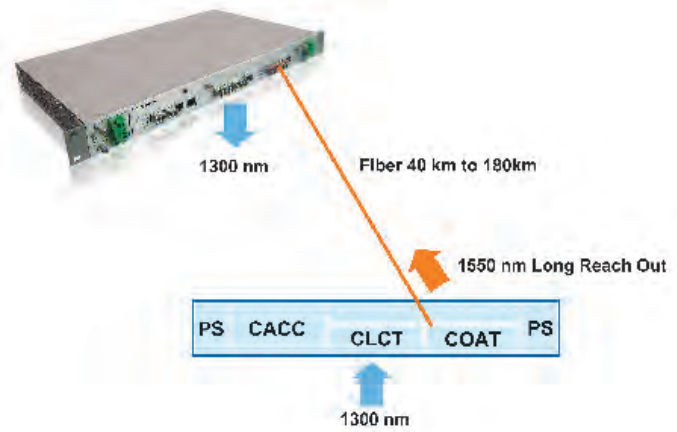
Main Features

| Protocol Independant
| Automatic Control for Gain or Power
| Gain Flattened or Single Channel Type
| Fits CATS Converged Access & Transport Platform
| Can be Used in 3U Stand-alone Chassis

COAT optical amplifier card as part of CATS product family, is a smart and plug-in card for CATS1000/3000, max output is able to be 20dBm. The amplifier can be custom built to meet the specific requirement, for single wavelength or multi-wave (WDM) applications.Via CATS system controller card, COAT can be managed by GUI based network management, command line interface(CCLI) and SNMP. also via serial port COAT card can be managed locally.

Application Example - Fiber Extension

Combining COAT and other line cards, CATS provides a simple and elegant soution for fiber extension, including for 1300 nm client signals. As illustrated below, using CATS 1000, a 1300 nm signal can be converted to 1550 nm wavelength using CLCT (up to 4G) or CLXT (10G), then fed to COAT. COAT boosts the output to 13 or 17 dBm, allowing a long distance transmission of up to 180 km at 2.5G (45 dB loss budget). For 10G signal, dispersion compensation must be taken into account for transmission distance beyond 80 km. Contact Dowslake for detailed 10G fiber extension solutions..

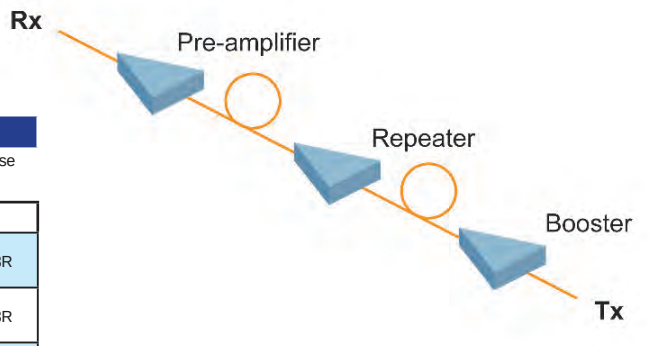


Product Specifications

Common Features	
wavelength Range	C band: 1529 to 1564 nm L band: 1570 nm to 1608 nm
Gain flatness	+/- 0.5 dB typical for WDM models
Input/Output Detection Range	25 dB min. 35 dB max
Optical Return Loss	30 dB min.
Polarization Mode Dispersion	0.3 ps typ. 0.5 ps max.
Polarization Dependent Gain	0.2 dB typ. 0.5 dB max.
Power Consumption	<15W
Operating Conditions	
Operating Temperature	-5 to 55 °C
Operating Humidity	5 to 95% (non-condensing)
Storage Temperature	-40 to + 70°C
Mechanical	
chassis type	CATS1000/CATS3000
Package Options	plug-in

Application Specific	Booster	In-line	Pre-amplifier
Min Input power (dBm)	-20	-30	-40
Max input power (dBm)	Maximum Output - Specified Gain		
Max output power (dBm)	<=20	<=20	<=13
Gain (Typical, dB, see note)	5 ~ 20	10 ~ 35	15 ~ 35
NF (Typical, dB)	6	5	4.5
ASE filter (optional)	N/A	N/A	100GHz
Mid-stage loss(optional)	3-12dB		

Note:
1) Customer specified output power shall be less or equal than the above specification.
2) Gain for single channel amplifier is used as reference only for optimization purpose. Customer can set gain within the amplifier control limit, taking into account gain and noise figure trade-offs.



Order Matrix

COAT	Optical Fiber Amplifier Card

Below are some typical Model No for COAT card, if below card can not meet your application, please contact Dowslake

Description	Code	Model
CATS3000 COAT card with booster EDFA, rated gain 18dB, max output power 13dBm for single wavelength	8000-603	COAT-18OB13-LPC-3R
CATS3000 COAT card with booster EDFA, rated gain 20dB, max output power 18dBm for single wavelength	8000-602	COAT-20OB18-LPC-3R
CATS3000 COAT card with in-line EDFA, rated gain 35dB, max output power 18dBm for single wavelength	8000-604	COAT-35OL18-LPC-3R
CATS3000 COAT card with booster EDFA rated gain 20dB, max output power 18dBm for DWDM application	8000-607	COAT-20WB18-LPC-3R
CATS3000 COAT card with booster EDFA rated gain 20dB, max output power 20dBm for DWDM application	8000-611	COAT-20WB20-LPC-3R
CATS3000 COAT card with pre-EDFA rated gain 20dB, max output power 13dBm for DWDM application	8000-614	COAT-20WP13-LPC-3R

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CATS COST | Intelligent Fiber Optical Switch Card

For Transmission Line 1+1 Protection

Main Features

| 1+1 line protection
| Monitors optical connections via LOS Loss of Signal
| Switching time <25 ms
| Latched switch for fiber security, even in case of power failures
| Protocol and data transparent (2 Mbps –40 Gbps)
| Fits CATS Converged Access & Transport Platform

COST switch card, integrating intelligent fiber-optic switch, protects optical fiber connections in case of failures. Immediately after an error is detected, it automatically switches the link to an alternative line within a reaction time of max. 25 ms, less than Sonet/SDH requirement of 50 ms.

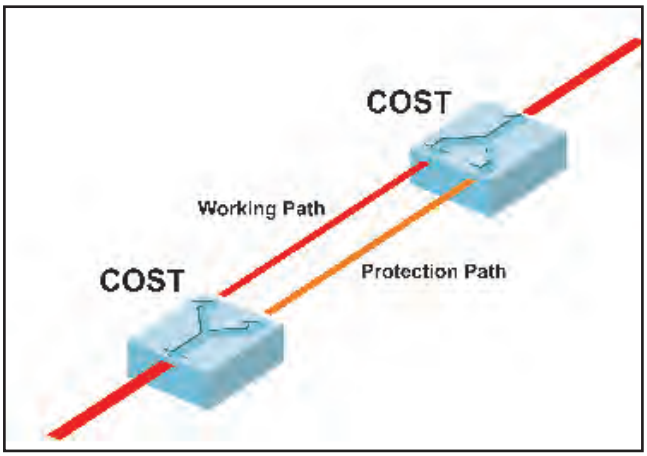
Protocol and data rate transparent, COST switch card provides 1+1 protection to any point-to-point fiber optic transmission line.

Product Specifications

Intelligent Optical Switch	
Data Rate Switch Time	Transparent from 2Mbps to 40Gbps <25ms
Interface Port	
Multimode/Single mode Connector	Transparent LC
Line Port	
Multimode/Single mode Connector	Transparent LC
Transmission Character	
Insersion Loss	Max 4.0 dB (Ein to Eout) Max 1.5dB (Win to Wout)
Operating Conditions	
Temperature Humidity	- 5 to + 55 °C 5 to 85% RH non-condensing
Dimensions	
Package Options Platform	Plug-in Card CATS 1000/3000

Management Features

| SNMPv.2 agent and CLI
| Secure configuration via SSHv2 (Secure Shell) terminal
| GUI based network management via CATS system controller



Application

COST optical switch card can be used stand-alone in CPE chassis or within CATS1000/3000 platform. It is managed by CACC system controller, with which the user can monitor and configure the switch.

Controllable parameters include automatic switch-over Enable or Disable, and LOS detection threshold. When automatic switch is disabled, user can switch over manually.

COST can also be used within larger CATS platform such as CATS 3000. In combination with CATS CLCT, CLXT, CLFT and COAT cards, it can form a powerful protected WDM transmission link in point-to-point, linear chain, or ring network configuration.

Check other CATS plug-in cards in this catalog, or at Dowslake website www.dowslakemicro.com.

Order Matrix

COST	Intelligent Optical Switch

Optical switch for 1+1 protection of fiber optic links

Description	Code	Model
CATS1000 COST Intelligent Optical Switch for transmission line 1+1 protection	8000-151	COST-P-1R
CATS3000 COST Intelligent Optical Switch for transmission line 1+1 protection	8000-350	COST-3R

CATS CLFT | Mux/Demux Card

Multiplexing Wavelengths into One Fiber

Main Features

| MUX and DEMUX in one card for wavelength aggregation
| Flexible wavelength plan per customer requirement
| Maximum 4 wavelengths per card as MUX/DEMUX
| 1300/1550 MUX/DEMUX available
| Fits CATS Converged Access & Transport Platform
| Can be used in the stand-alone CPE package

The optical line card CLFT, as part of CATS WDM solutions, enables service providers to multiplex/demultiplex up to 4 wavelengths into, and from one fiber. Each card includes MUX and DEMUX functions. Upgrade ports are provisioned such that more CLFT can be cascaded to allow multiplexing higher number of wavelengths.

CLFT is fully integrated into CATS– Converged Access & Transport System, with element and network management capability for easy installation, provisioning, and maintenance. Network operators can now provision and manage end-to-end high bit-rate data services using a single platform in an efficient and cost-effective manner.

System Features

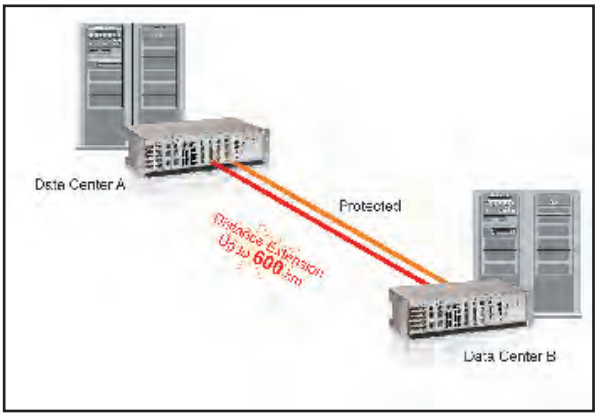
| Data rate or protocol transparent wavelength multiplexing
| Upgrade ports for future capacity expansion
| Easy to install, operate, and manage
| Fits CATS platform or goes into RA-T chassis

Application Example - Disaster Recovery

CLFT enables wavelength division multiplexing which offers a simple solution for the disaster recovery requiring very high bandwidth. In the diagram illustrated on the right side, a CATS 3000, populated with 10G CLXT cards and CLFT Mux/Demux filter cards, is located next to the data servers at location A. The same configuration for CATS 3000 is used at the data certer location B. Each CATS 3000 allows to have up to 8 x CLXT cards, and 2xCLFT cards, offering up to 80 gigabit of bandwidth. Using CATS CACC system controller, and with redundant power supply, CATS 3000 offers reliable backup services for data center applications.

Product Specifications

Channel Count	DWDM	CWDM	1300/1550
Number of Wavelengths	4	4	2
Pass Band			
CWDM DWDM	+/- 6.5 nm +/- 0.8 nm		N/A
Insertion Loss			
Maximum Upgrade Port	max 2.2 dB max 2.2 dB		max 1.5 dB
Transmission Character			
Directivity Return Loss In-band Ripple Adjacent Channel Isolation	> 50 dB > 30 dB < 0.5 dB > 25 dB		
Operating Conditions			
Temperature Humidity	- 5 to + 55 °C 5 to 85% RH non-condensing		
Dimensions (H x W x D)			
Rackmount Card Card Dimension (mm) Package Options Platform	3U 30 x 128.5 x 190 CPE or Plug-in CATS 3000		



Order Matrix

CLFT	MUX/DEMUX or OADM Passive Card

Multiplexing up to 4 wavelengths into one fiber

Description	Code	Model
CATS3000 4 ch CWDM MUX/DEMUX, XX start wavelength, YY stop wavelength. Indicate middle 2 digits, for example 47 for 1471 nm, with upgrade port from 1260 to 1620 except XX - YY	80xx-363	CLFT-04-C-XXMYY-ZZ-3R
CATS3000 4 ch.DWDM MUX/DEMUX, 100G, XX start channel ITU#; YY stop channel ITU#; with upgrade port from 1500 to 1600 except XX - YY.	80xx-364	CLFT-04-D-XXMYY-ZZ-3R
CATS3000 MUX/DEMUX 1300nm and 1550 nm standard LC connectors	8000-364	CLFT-S-13M15-3R

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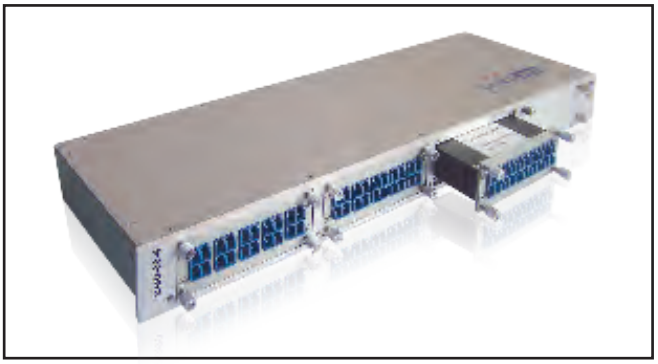
CMD - 08 and CFT Filter Card

CMD-08 has 4 pluggable modular slots for plug in CFT cards which are up to 8-wavelength mux/demux filters with expansion ports. Very flexible for pay-as-you-grow, CMD-08 and CFT together enable service providers to deploy WDM system gradually, and to cascade up to 4 x CFT cards for 32 wavelengths per shelf.



CMD - 08 and CFT filter modules

Product Specifications CMD and CFT card

Chassis	CMD-08-4-1R		
Number of slot	up to 4 CFT pluggable card		
Number of Wavelength	up to 32		
Dimension(LxWxH)	473x160x44.3mm, 1RU 19'' chassis		
Example of Plug-in Filter Module	CFT-08-4761-13-1R	CFT-08-D-XXMYY-ZZ-1R	CFT-04-D-XXMYY-ZZ-1R
Max number of Wavelength	8	8	4
Channel Space	20nm	100 GHz	
Operate Wavelength(nm)	1260~1620 (CWDM)	1500~1600	
Expansion Channel	1280~1458nm for CFT-08-4761-13-1R	1500~1600 except 8 MUX/DEMUX DWDM channels	1500~1600 except 4 MUX/DEMUX DWDM
Center Wavelength(nm) λc	1471, 1491 , 1511, 1531 1551, 1571, 1591, 1611	C band 100 GHz ITU Grid	
Pass Band (nm) min.	λc ± 6.5	ITU ch. λc +/- 0.11nm	
Insersion Loss (dB)	<3.5 (Com to Pass channel) <1.0 (Com to 1310 nm)	<3.5	< 2.2
Isolation(dB)	> 30 (adjacent channel) > 45 (non-adjacent channel)	<25 (Adjacent channel) <35 (Non-adjacent channel)	
Ripple(dB)	<0.5	<0.5	
General Optical Performance			
Directivity(dB) Return Loss(dB) Fiber Type PDL(dB) PMD(ps) Power Handling(mW)	>50 >45 SMF-28e <0.3 <0.3 >500 for DWDM >300 for CWDM		
Temperature Ranges			
Operating Temperature Storage Temperature	-5 to 70° C -45 to 85° C		
Connector Type	LC/UPC as default or Customer specified		

Order Matrix

CFT	Passive Mux/Demux C/DWDM Filter Module

Description	Code	Model
1RU, 19'' passive chassis for 4 x pluggable CFT module (8 ch MUX/DEMUX)	8000-960	CMD-08-4-1R
8 ch. MUX/DEMUX CWDM module for CMD chasiss, 1470 to 1610 nm, including 1310 nm expansion port	8000-961	CFT-08-4761-13-1R
8 ch. MUX/DEMUX DWDM module for CMD chassis,100G,XX start channel ITU#, YY stop channel ITU#, ZZ expansion port,wavelength range from 1500 to1600nm other than XX-YY	80XX-962	CFT-08-D-XXMYY-ZZ-1R
4 ch.DWDM MUX/DEMUX module for CMD chassis,100G,XX start channel ITU#; YY stop channel ITU#; ZZ expansion port,wavelength range from 1500 to1600nm other than XX-YY	80XX-964	CFT-04-D-XXMYY-ZZ-1R

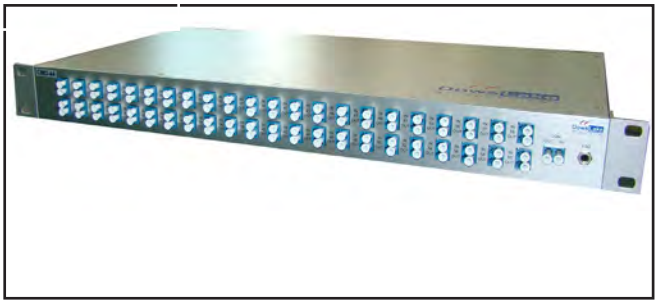
Note:
1) for CFT MUX/DEMUX card, customer can speicfy any four or eight of CWDM/DWDM wavelengths.also wavelength number of CFT MUX/DEMUX can be customer specified.

2) as customer requrest, CFT is able to work as Fixed OADM, max support 4ch CWDM/DWDM OADM.

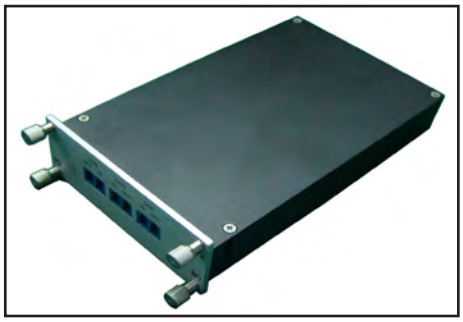
8ch Mux/Demux

40/44ch MUX/DEMUX and Interleaver

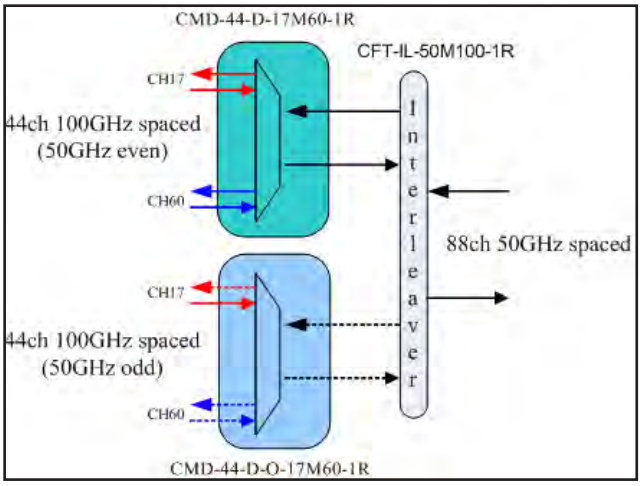
40/44ch MUX/DEMUX are passive AAWG based, easy to intall and maintenance. There are two kinds of 40/44ch MUX/DEMUX, one DWDM channel is 50GHz even, and another is 50GHz odd. 50GHz Interleaver card MUX/DEMUX two set(50GHz even and 50GHz odd) of 100GHz DWDM channels, its package is same as 8ch CFT card, and be pluggable in CMD-08 chassis. With interleaver and two kinds of 44ch MUX/DEMUX, DWDM system max support 88 channels.



DWDM 40/44CH MUX/DEMUX, standard 1U chasssis



Interleaver Card CFT-IL-50M100-1R



50GHz 88ch DWDM system

Product Specifications for 40/44ch MUX/DEMUX

40/44ch DWDM MUX/DEMUX	
Dimension(LxWxH)	473x160x44.3, 1RU 19'' chassis
number of DWDM channels	40/44
Channel Space	100 GHz
Operate Wavelength(nm)	1529 ~ 1564
Center Wavelength(nm) λc	C band 100 GHz ITU Grid 50GHz even or odd
Pass Band (nm) min.	ITU ch. λc +/- 0.11nm
Insersion Loss (dB)	<5.5
Loss Uniformity(dB)	<1.2 for 40ch <1.5 for 44ch
Isolation(dB)	> 25 (adjacent channel) > 35 (non-adjacent channel)
Ripple(dB)	<0.5
General Optical Performance	
Directivity(dB)	>50
Return Loss(dB)	>45
Fiber Type	SMF-28e
PDL(dB)	<0.5
PMD(ps)	<0.5
Power Handling(mW)	>500
Temperature Ranges	
Operating Temperature	0 to 70° C
Storage Temperature	-45 to 85° C
Connector Type	LC/UPC

Product Specifications for Interleaver card

Interleaver function card	
Chassis	CMD-08-4-1R
Wavelength Range(nm)	1528.77 ~ 1566.72
Channel Space	50 GHz
Center Wavelength(nm) λc	C band ITU Grid 50GHz even and odd
0.5dB Pass Band(GHz)	+/-13.5
1dB Pass Band(GHz)	+/- 15
3dB Pass Band(GHz)	+/-19
25dB Stopband (GHz)	+/-10
Insersion Loss (dB)	<2.2
Loss Uniformity(dB)	<0.5 within port <1.0 for all port
Isolation(dB)	> 25 (adjacent channel)
General Optical Performance	
Directivity(dB)	>50
Return Loss(dB)	>40
Fiber Type	SMF-28e
PDL(dB)	<0.5
PMD(ps)	<0.4
Power Handling(mW)	>500
Temperature Ranges	
Operating Temperature	0 to 70° C
Storage Temperature	-45 to 85° C
Connector Type	LC/UPC

Order Matrix

Description	Model
CFT with two 50G/100G Interleavers MUX/DEMUX, pluggable in CMD-08 chassis	CFT-IL-50M100-1R
40CH DWDM MUX/DEMUX filter, 100G , start channel 21; stop channel 60, 1RU, 19'' Chassis, mux and demux module included	CMD-40-D-21M60-1R
40CH DWDM MUX/DEMUX filter, 100G(50G odd) , start channel 21(192.15THz); stop channel 60(196.05THz), 1RU, 19'' Chassis, mux and demux module included	CMD-40-D-O-21M60-1R
44CH DWDM MUX/DEMUX filter, 100G , start channel 17; stop channel 60, 1RU, 19'' Chassis, mux and demux module included	CMD-44-D-17M60-1R
44CH DWDM MUX/DEMUX filter, 100G(50G odd) , start channel 17; stop channel 60, 1RU, 19'' Chassis, mux and demux module included	CMD-44-D-O-17M60-1R

Note:
above are typical interleaver and 40/44ch MUXD/DEMUX model, for customer specified DWDM channels model, please contact Dowslake for more information

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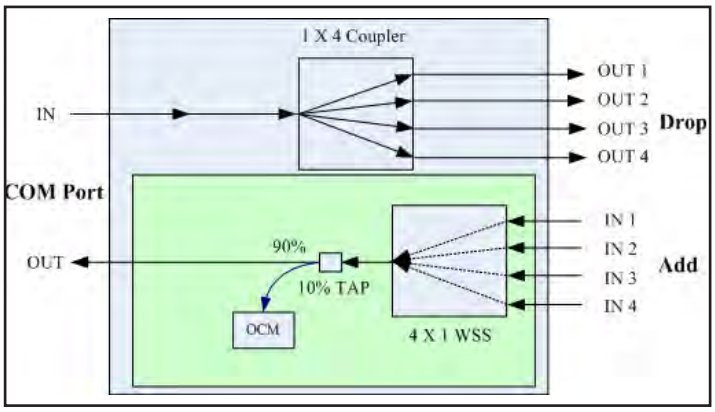
CATS ROADM | Reconfigurable Optical add-drop multiplexers

Main Features

| ROADM support C band 50GHz space 88 channels
| Provides high-capacity DWDM ring interconnect max 9-degree flexibility
| Wavelength independent selective switching, blocking, attenuation and/or equalization of 88 wavelengths
| Integrated OPM to monitor Optical signal quality
| With CACC card, fully integrated into CATS platform
| GUI based network management via CATS system controller or CLI loacl managemeng



Function block of 1X4 ROADM

Dowslake ROADM Reconfigurable optical Add/Drop Multiplexer is a flexible and powerful wavelength switching and channel grooming solution for intelligent DWDM system, able to support max 88ch 50GHz DWDM system.

With advanced Wavelength Selective Switch(WSS) and Optical Performance Monitoring(OPM) technology. Dowslake ROADM provide the capability to dynamically mange add/drop and to monitor each DWDM channel optical parameters, include DWDM channel optical frequency, optical power and optical signal OSNR. ROADM support optical power control for each DWDM channel, and can compensate individual channel degradation, amplifier gain tilt, and is suitable for a number of applications:

•Re-configurable add/drop node in an East/West traffic node

•Uni-directional power balancer

•High capacity DWDM ring interconnect with N-degree flexibility

•Amplified Add/Drop networks with active power balancing

•Linear and ring architectures requiring wavelength re-use

With CATS system management card, ROADM can be managed via GUI, SNMP and Telent. The ROADM card also support local management (CLI).

Order Matrix

Description	Model
ROADM 1x4 50GH Spacing, max 88ch for 2U chassis CATS2-RO-2U	ROADM-1x4-50G
ROADM 1x2 50GH Spacing, max 88ch for 2U chassis CATS2-RO-2U	ROADM-1x2-50G

Note:
Above are typical ROADM function card, for other degree of ROADM card, please contact DowsLake for more information

Product Specifications of 1X4 ROADM

Parameter	
Operation wavelength range	191.55 ~ 196.1 THz
channel center wavelength	ITU Grid 50GHz 191.7 ~ 196.05THz
Channel Space	50 GHz
Channel number	max 88 channels
Insertion loss (COM IN - 1/2/3/4 port OUT)	max 8.0dB
Min Insertion loss (1/2/3/4 port IN - COM OUT)	max 6.5dB
Power off Insertion loss (1/2/3/4 port IN - COM OUT)	min 20dB
Block Insertion loss (1/2/3/4 port IN - COM OUT)	min 35dB
Input power range(per wavelength)	max 10dBm
Input power (All wavelength)	max 25dBm
Clear Channel bandwidth	min +/-13GHz
Insertion Loss Ripple	max 0.5dB
Attenuation Range	0 - 15dB
Attenuation Step Size	0.1dB
Attenuation Response	max 250ms
Switch time	2400ms
Return Loss	min 40dB
Chromatic dispersion	-15 ~ +15ps/nm
GDR	max 5ps
PMD	0.75ps
PDL	max 0.9dB @ (0 - 10dB attenuation) max 10% of attenuation @ (10 - 15dB attenuation)
Optical frequency monitor range	191.70 ~ 196.05THz
Absolute frequency monitor accuray	+/- 8GHz
Optical power monitor range	-30 ~ 0dBm
Absolute monitor power accuracy	+/- 1dB
Optical Connector Type	LC/UPC
Operation Temperature	-5 - 50C
Operation Humidity	5 to 95 % (non-condensing)
Power Consumption	max 20W
Platform	2U chassis CATS2-RO-2DC

CATS C-MS1025 Fully Managed Optical Amplifier

Introduction

Protocol transparanet optical amplifier is one of the most important technology breakthrough in fiber commmunications. Prior to the invention of Erbium dopped fiber, optical transmission could not go more than a few tens of kilometers before an optical-electrical-optical repeater is required to regenerate the signal.

Now optical amplifiers based on Erbium dopped fiber (EDFAs) and Raman are widely used in submarine, inter-city and even metropolitan networks in order to compensate losses and to enable long distance transport. Without EDFAs, we would not have today's highly efficient Dense Wavelength Division Multiplexing (DWDM) networks.

Do You Know?

Dowslake team is one of the most experienced team working on optical amplifier technology. Following are a few inventions to our team's credit:

| First DWDM EDFA in 1997, when DWDM technology was still at its infancy;
| First smart EDFA in 1997, with integrated electronics, software, and optics for automatic gain and power control;
| First dynamic EDFA in 1998, with integrated variable attenuator to compensate gain tilt caused by the dynamic add/drop nature of the metropolitan networks;
| First L band EDFA and first field deployed L band EDFA product in 1999, extending DWDM spectrum from 1550 nm to 1610 nm;
| First miniature smart EDFA in 2001, shrinking EDFA packaging to a credit card size;
| First pocket size C and L band gain flattened smart EDFA in 2003, enabling EDFA technology moving from long-haul to metro access.

Optical Amplifier Selection Guide

Depending on the application, EDFAs can be design for following transmission links:

| Sonet/SDH single wavelength transmission
For this type of network, EDFA design is typically the simplest and the design focus is to allow maximum power budget to achieve the highest detection sensitivity.

| DWDM multi-wavelength transmission
DWDM links have typically 8, 16, 32 or 40 wavelength channels in each fiber. EDFA needs to be not only high power low noise, but also gain flattened such that all wavelength channels can be amplified equally.

| Dynamic network with optical add/drop
If your network has optical channels adding and droping, consider EDFAs with integrated VOA in order to keep surviving channels to stay un-affected. Otherwise major gain discrepency may occur.

Controllable EDFA Parameters

Dowslake is the specialist in providing smart optical amplifier features. Following are the most common control parameters:

1) Set gain - user settable gain per application. It's the most common parameter for WDM application
2) Set power - user settable power, especially for single channel application
3) Set automatic shutdown - user can provide a threshold below which the EDFA can turn off the laser for protection purpose.
4) Set various alarm thresholds

CATS Integration

Now customers may order Dowslake optical amplifiers with full network management in association with other CATS elements such as CLXT 10G transponders. CATS network management can communicate with the remote amplifier shelf either through direct Ethernet connection or via optical supervisory channel (OSC).

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CATS C-MS1025 | EDFA Amplifier Integrating VOA for Multi-wavelength Transmission, Managed by CATS System Controller

standard alone 1U chassisa

pluggable card for 2U chassis

Main Features

| max 26dBm output
| Gain flattened for WDM, or single channel application
| Variable gain for repeater application, with fast transient control
| C or L band options
| Mid-stage option for compensation DCM or OADM
| Supervisory channel Add/Drop Options
| Input and Output monitoring taps
| GUI based network management via CATS system controller or CLI loacl managemeng

C-MS1025 as part of CATS product family, is designed specifically for intelligent WDM or SDH optical system. It is based on Dowslake flagship product MS1025, integrating Dowslake patented SmartGAIN optical amplifiers.
MS1025 is a stand-alone shelf level optical amplifier, successfully deployed in large scale in the United States and European networks. Now Dowslake has integrated MS1025 into CATS platform, offering C-MS1025, allowing service providers not only to benefit from the 1st class amplifier supplier and the leader in optical amplifier technology, but also to take advantage of Dowslake CATS platform, in order to expand the transmission distances in many applications such as data center backup, fiber extension, Ethernet traffic transport from Gigabit to 40 Gigabit per second.

Considerations for Cost Saving

| Try to plan your wavelengths around 1550 nm first. In 1550 nm +/- 5 nm range EDFA gain is naturally flat, thus saving gain flattening cost
| You may not need variable gain EDFA if your gain variation is not more than +/- 3 dB, or your system power budget is large enough to tolerate power discrepancy of different channels
| Better flatness, or higher output power means higher cost.

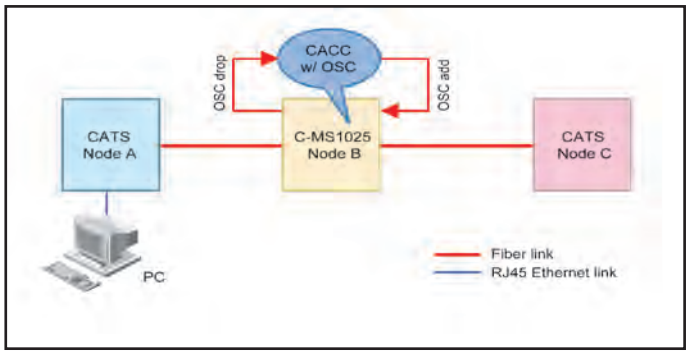
Product Specifications

Common Features			
Wavelength Range	C band: 1528 to 1565 nm L band: 1570 nm to 1608 nm		
Gain Flatness	+/- 0.8dB (typ for DWDM applation)		
Input/Output Dectection Range	25 dB min. 35 dB max		
Optical Return Loss	30 dB min.		
Polarization Mode Dispersion	0.3 ps typ. 0.5 ps max		
Polarization Dependent Gain	0.2 dB typ. 0.5 dB max		
Power Consumption	<35W (pluggable card) <60W (standalone chassis)		
Environmental			
Operating Temperature Operating Humidity Storage Temperature	-5 to 55 OC 5 to 95% (non-condensing) -20 to + 85 OC		
Mechanical			
Rack Mount Unit	standallone 19" 1U or pluggable card in CATS2U chassis		
Application Specific	Booster	Inline	Pre-amplifier
Minimum Input (dBm)	-20	- 30	-40
Maximum Input (dBm)	Maximum Output - Specified Gain		
Maximum Output (dBm)	<=26	<=26	<=13
Gain (Typical, dB, see note)	5 ~ 20	10 ~ 30	15 ~ 35
Noise Figure (typical)	6dB	6dB	5.5dB
ASE Filter (optional)	N/A	N/A	100GHz for single wavelength
Mid-stage Loss (optional)	From 3 to 12 dB customizable		
Transient Overshoot	+/-1dB typ		

Note:
1) Customer specified output power shall be less or equal than the above specification.
2) Optimum gain is where the user achieves the best gain flatness.
3) Noise Figure is gain dependant. When user sets a lower gain compared to the optimum gain value, the noise figure will be worse.

Application Example - Repeater & Optical Supervisory Channel Termination

Thanks to the built-in OSC channels, C-MS1025 allows user to manage remotely located optical amplifiers without the need for any external monitoring device.



Order Matrix

Description	Model No
CATS MS1025, C-Band variable gain amplifier Max.output 20dBm for WDM, user settable gain maximum 25 dB,1RU,19" shelf with integrated controller CACC & OSC (order SFP separately),CLI/SNMP and CATS NMS. Redundant DC power supply	CMS1025-25WV20-SPC
pluggable EDFA card for CATS 2U chassis,EDFA with middle stage and gain variable for DWDM application , max gain 28dB,max output 26dBm,middle stage loss: 0 - 5dB, with OSC add/drop port and output monitor	CMS1025-28WV26-LAC-2R
pluggable EDFA card for CATS 2U chassis,EDFA with middle stage and gain variable for DWDM application , max gain 20dB,max output 20dBm ,middle stage loss: 0 - 5dB, with OSC add/drop port and output monitor	CMS1025-20WV20-LAC-2R

Note:
above are typical CMS1025 model no, for other CMS1025 model no, please contact Dowslake for more information.

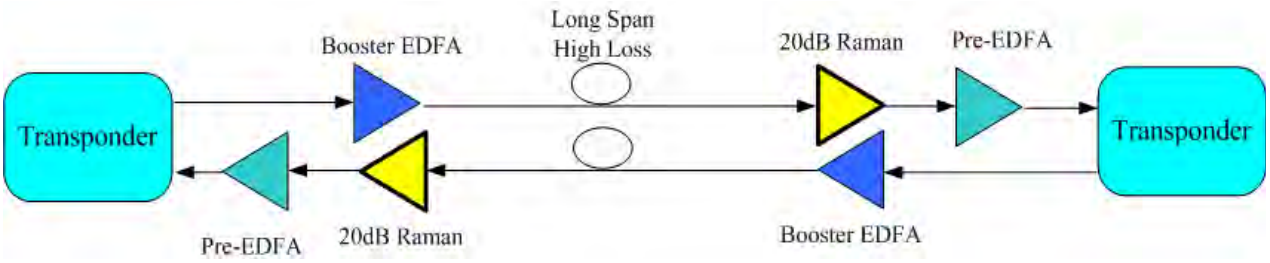
CATS C-MS1025R | Raman Amplifier For Long haul Transmission, Managed by CATS System Controller

Main Features

| High gain,max 20dB
| Perfect gain flatness, +/-0.5dB in the range of 1529 ~1564nm
| Low Noise Figure, max -2dB@20dB gain
| Support OSC channel 1510 pass through
| Support gain mode and power mode, easy to configuration
| Hot pluggable in CATS 2U chassis, fully integrated into CATS platform
| Fully integrated into CATS platform, with Graphic User Interface and SNMP/CLI management

C-MS1025R is next generation of Raman Amplifier, it is natural low noise figure, and also is with high gain and friendly user interface. C-MS1025R is able to detect optical signal power accurate no matter pump is on or off, once optical signal is lower than threshold, Raman can set up alarm and shutdown pump automatically. also C-MS1025R detect reflected pump otpcial pwoer, once reflected pump optical power is higher than threshold, C-MS1025R will decrease Pump output power automatically. C-MS1025R support gain mode, and then it controll pump output power atuomatically to get constant Raman gain, this make C-MS1025R insensitive to fiber type, fiber loss coefficitent and point loss. C-MS1025R is with perfect gain flatness and aslo gain value is user configurable. these features make C-MS1025R easy to configure and maintenance

C-MS1025R Raman amplifier as part of CATS product family is designed specifically for long haul transmission.Thanks to the Raman Amplifier loaded in, C-MS1025R allows user to use it as a low noise figure, high optical Gain and high power stability preamplifier. Typical application is



Product Specifications

Optical Features	
Signal wavelength range	1529 - 1564 nm
OSC wavelength range	1500 - 1520 nm
on/off gain, @ fiber loss less then 0.21dB/km	15 ~ 20dB
Gain Flatness@20dB	max +/-0.5dB
NF @ 20dB gain	max -2dB
Raman gain @ 1510nm	Signal gain - 3.5 dB
Signal Input Range	-40 - 0dBm
Loss from line in to output @ pump off	max 1.5dB
Optical Return Loss	min 40 dB
Degree of pump	max 10%
Max pump output power	800 mW
Polarization Mode Dispersion	max 0.5 ps
Optical connecort	LC/APC

Environmental	
Operating Temperature Operating Humidity Storage Temperature max power consumption	-5 to 55 C 5 to 95% (non-condensing) -20 to + 85 C 100W
Mechanical	CATS 2U chassis CATS2-RO-2DC

Order Matrix

Description	Model
pluggable Raman function card for CATS2-RO-2DC chassis, max gain 20dB whole C band	CMS1025R-20-OD

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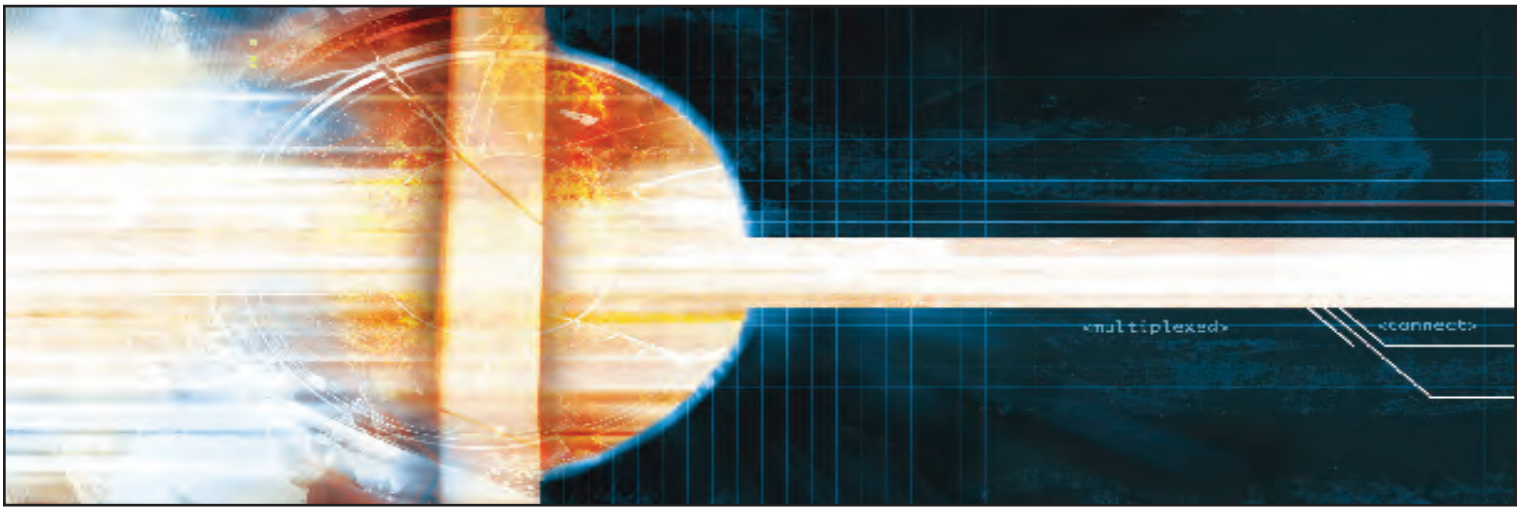
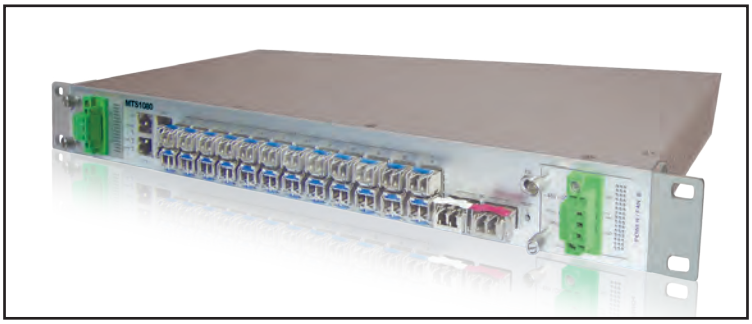


MTS Series Carrier Ethernet Switch - Aggregation or Access

MTS Series Carrier Ethernet switches are designed for Ethernet aggregation and access applications. These switches are not ordinary enterprise switches - they provide the latest carrier Ethernet features and comply to IEEE, ITU and MEF standards.



Carrier Ethernet Differentiation Versus Enterprise Ethernet	
OAM	Fault detection, location, and correction. Performance monitoring for jitter, delay Traffic statistics
QoS	Flow or EVC based CIR/PIR Priority, Policing, Shaping, Scheduling Service Level Assurances
Standardized Services	End to End Services Carrier telephony and video EPL, EVPL, EP-LAN, EVP-LAN
Scale	From thousands to millions of end users Isolation of client ports From 1 Mbps to 10 Gbps
Reliability	High availability. Failover in less than 50 milliseconds, without affecting users.

OAM

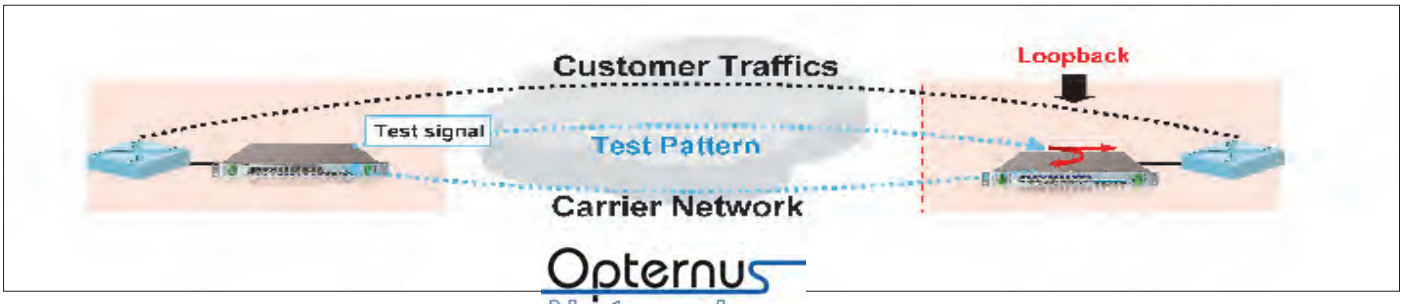
First and foremost, Carrier Ethernet is significantly enhanced by carrier-class OAM or Operations, Administration, and Maintenance. To provide highly reliable services to customers, service providers need a comprehensive and powerful set of monitoring and management capabilities. Several standards have been developed to serve this need:

* ITU standard Y.1731 and IEEE standard 802.1ag have been developed for end-to-end fault management and performance monitoring of Ethernet services and infrastructure.

* IEEE 802.3ah addresses similar concerns but for the link instead of for the end-to-end connection.

IEEE 802.1ag specifies protocols and procedures for Connectivity Fault Management, enabling discovery, verification, and isolation of the location of any interruption in Ethernet services. For fault detection, **Continuity Check** messages are periodically sent in-band through the network. **Loopback** messages are used to verify connectivity between a local device and a remote device, depending on whether or not Loopback Reply messages are received. Fault isolation can be similarly achieved through Linktrace Messages and Linktrace Replies.

Y.1731 extends these OAM capabilities, primarily with performance monitoring, and also including a fault notification by means of an **Alarm Indication Signal**. Performance monitoring and reporting are the foundation for offering quality and Service Level Assurances to customers. **Frame Loss** is calculated by sending transmit and receive counters within the Continuity Check Messages. The far end counters can then be compared with those produced locally to derive frame loss ratio as a percentage. Similarly, **Frame Delay** is calcu



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Y.1731 extends these OAM capabilities, primarily with performance

QoS

Quality of Service and Service Level Assurances must be available from carriers to

* extend the usefulness of Carrier Ethernet,

* make it suitable for real time applications such as voice and video

* put it on a par with other Metro and WAN services.

Quality of Service can be achieved with the monitoring of service qualities such as availability, frame loss, delay, and delay variation, as enabled by Y.1731.

Quality of Service Concern	Solutions
Bandwidth	Committed, Peak, and Excess Information Rates
Frame Loss	SLA specified. Flow control
Delay & Delay Variation	SLA specified. Traffic Prioritization, shaping, and scheduling
Availability	Monitoring, fast failover

Carrier Ethernet service also defines attributes such as the Bandwidth profile, which includes:

* a Committed Information Rate (**CIR**),

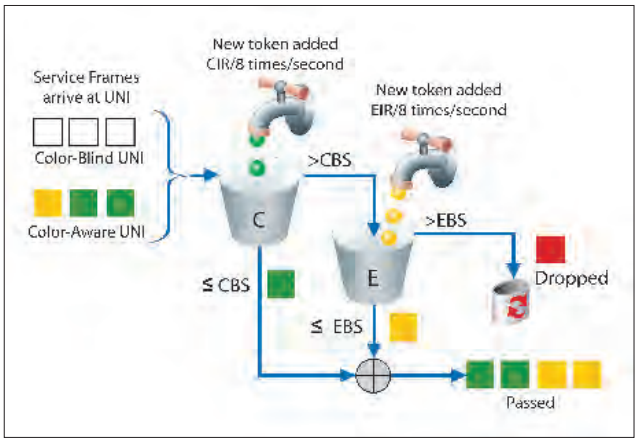
* Excess Information Rate (**EIR**), (or a PIR Peak Rate, which is the sum of the CIR and EIR)

* Committed/Excess Burst Size (**CBS / EBS**).

With a CIR, customers are assured of enough bandwidth for their high priority and time-sensitive protocols, such as voice traffic, while the EIR allows for full use of the available bandwidth. Note this significant improvement over traditional Ethernet Class of Service traffic prioritization, which does not offer any bandwidth guarantees.

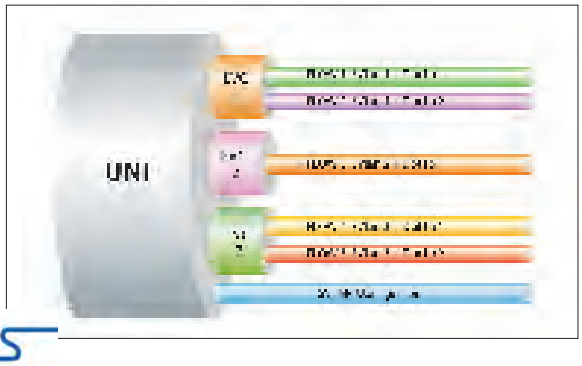
Prioritization of traffic is achieved with the 802.1Q 3-bit user_priority field, and priority is set based on high layer protocol, physical port, or VLAN ID. Most implementations also can map priority from IP packets to Ethernet, according to IP layer differentiated services code point (DSCP) markings. The CIR and EIR will normally be selected with traffic prioritization in mind, such that the CIR accommodates the highest priority traffic and the lowest priority is relegated to the EIR. Connection Admission Control can also now be implemented so that traffic that would exceed the CIR may be gracefully rejected (by signaling vs. dropping). Typically bandwidth parameters can be configured per customer or port, but may be configured per EVC, or even per each class of service within an EVC (also known as per flow). Provider monitoring and reporting of service performance is the basis of the Service Level Assurances given to customers.

Conformance	Color	Service Frame Delivery
CIR		Service Frames green and delivered per the performance objectives specified in the SLA/SLS.
EIR		Service Frames are yellow and may be delivered but with no performance assurances.
None		Service Frames are red and dropped.



Scalability Through S-VLAN ID

IEEE 802.1ad (Provider Bridges, also known as Q-in-Q or Stacked VLANs) enables scaling VLANs to thousands of enterprise customers, and millions of users. While 4096 VLANS as per 802.1Q are sufficient for enterprises, this is not adequate for larger scale service provider networks. To implement stacked VLANs, customer's traffic is tagged with a service provider VLAN ID (**S-VLAN**) at the edge of provider's network, allowing not only separation of customer traffic but also differentiated treatment of customer traffic through the service provider network. With this independence, each customer's traffic can be transported transparently: all addresses, management traffic, broadcasts etc are contained only within the customer VLAN (C-VLAN). A Q-in-Q frame looks like a VLAN 802.1Q frame, but has two 802.1Q tags instead of one.



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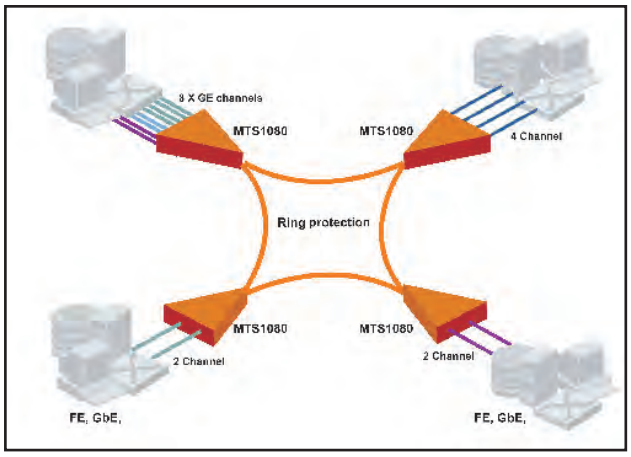
Automatic Protection - ERPS G.8032

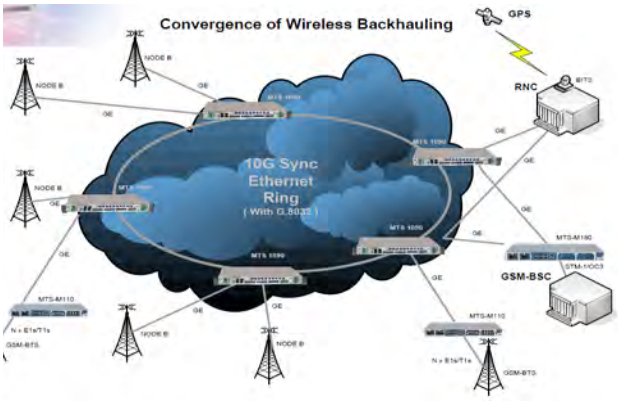
MTS series carrier Ethernet switches can achieve Sonet/SDH - like fast protection switch-over, thanks to the adoption of the advanced Automatic Protection Switching per G.8032 standards.



G.8032 uses slightly different mechanism. It uses CCM (Continuity Check Message), per Y1731 standard, to continously survey the health of the network. G.8032 is specifically applicable for ring applications. It requires that for a number of nodes not exceeding 16, the protection switching speed must be below 50 ms.

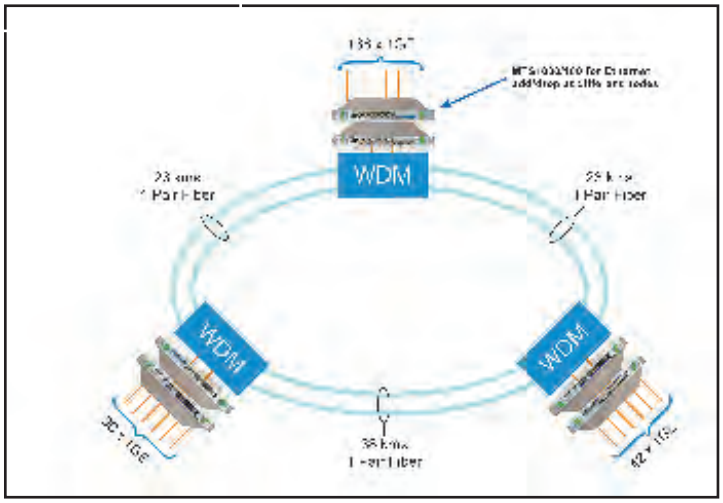
Major Application I - Mobile backhaul for legacy and 4G

Next generation MTS switch, MTS1090 can support different clock synchronization including SyncE, IEEE1588v2 and Adaptive Clock Recovery. When MTS switches are interworking with MTS-M series convergence switches, legacy TDM links T1/E1, OC3/STM1 can be seamlessly delivered along the Packet network with clock synchronization being complaint to ITU G.8261. MTS and MTS-M series are the best breed to realize the Network Convergence.



Major Application II - Packet ADM

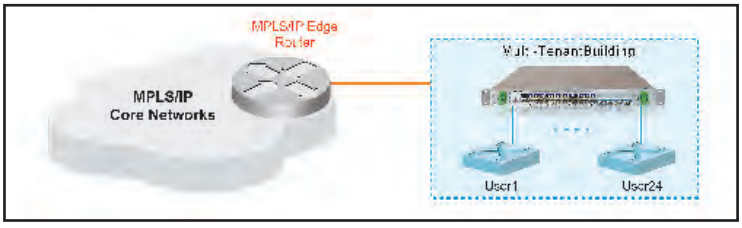
In Metro areas, carrier's networks are often in a ring topology since rings are easy to deploy and provide link failure protection. With MTS Series carrier Ethernet switch, adding Ethernet capacity and services is less expensive, and more flexible than adding additional SONET/SDH capacity. In combination with WDM equipment, either from Dowslake CATS product line, or from a 3rd party, MTS Carrier Ethernet switch can be implemented directly onto a wavelength. Each node passed by this particular wavelength carrying Ethernet is an Ethernet switch that acts as an ADM or add-drop multiplexer for Ethernet traffic, at lower costs than SONET/SDH ADMs.

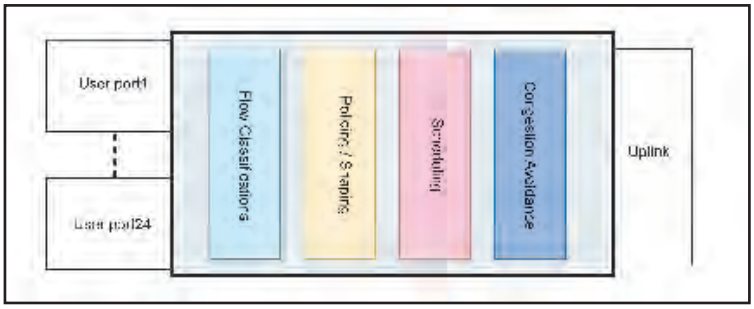


Carrier Ethernet Switch for Packet ADM	
Bandwidth	Ports for 1 G and 10 G Optical Ethernet
VLAN tagging	Q-in-Q double VLAN tagging
OAM	End-to-End Connection, Performance monitoring and Fault Correction
Priority and QoS	Priority handling to meet guaranteed QoS and SLAs
Resiliency	Sub-50 msec restoration
Scale	High bandwidth and large number of customers

Major Application III - Customer Premises

The biggest interest for carriers to utilize a carrier Ethernet switch, such as Dowslake MTS, as a CPE, is due to the possibility for prioritized traffic management. A carrier Ethernet type of device organizes traffics according to their priorities first. Then through policing, traffics are sorted out before being shaped according to their categories and priorities. The carrier Ethernet switch would then utilize the scheduling to pass the traffics to the uplink. In other words, customer traffics are organized according to their priority, and traffics from Gold level customers are guaranteed up to CIR such that no packet would be lost within CIR bandwidth.





MTS10080 | 24x10 G Carrier Ethernet L2 Switch
MPLS-TP and IEEE1588v2 support

Main Feature

- Up to 24 x 10 G Port Carrier Ethernet Switch
- Suports MPLS-TP, IEEE1588v2 and Sync. E
- Supports 10G Ethernet over WDM
- Bandwidth configuration and QoS, Q-in-Q features
- Ring Protection Switching per G.8032
- OAM Features per 802.3ah, 802.1ag, Y1731

Management Features

- Command Line Interface (CLI), Java based GUI, SNMP v1,v2
- SSHv2,Telnet, FTP/TFTP
- Remote In-band Management
- Hitless software local and remote upgrade
- Alarm: traps and dry-contact
- RADIUS & Syslog
- RMON
  RFC 2613 groups: SMONVlanstat, SMONPrioStat
  RFC2819 groups: Ethernet history, Alarm, and Event;
  RFC2819 groups: Ethernet statistics
- Reports for customer validation

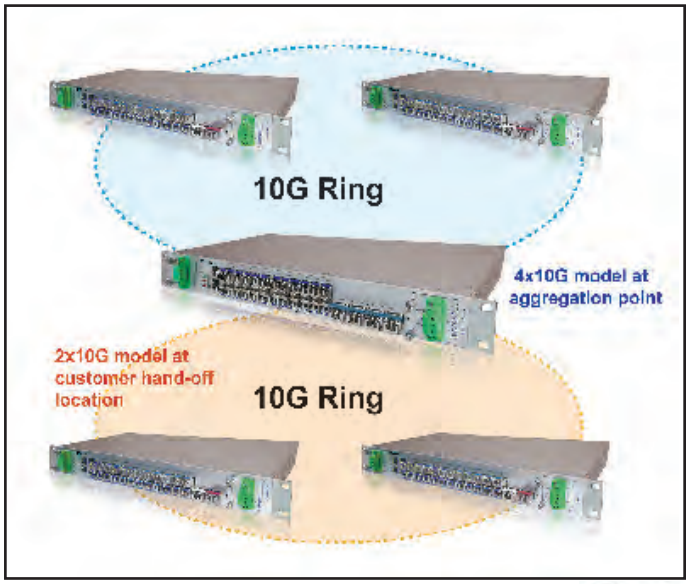
Application Examples

Conneted Rings

User can build 2 connected rings using MTS1080 models. The 4x10G model would be sitting at the cross point with the four 10G ports equally splitted to support north and south rings. The 2x10G model hands off Gigabit traffics at customer locations.

User Configurable Network or Client Interfaces

MTS1080 also allows user to connect to customer equipment with both Gigabit and 10G links, i.e., user can configure any of the 10G ports to be either network facing or client facing, and set limited bandwidth for the 10G pipe as needed. For example, user can set 2 Gigabit bandwidth using one of 10G client links.



L2 Switching Capability

- Auto-negotiation for port speed and duplex mode Flow Control:
- IEEE 802.3x & Back-Pressure
- Spanning Tree Protocol:
  IEEE 802.1D Spanning Tree Protocol (STP)
  IEEE 802.1w Rapid Spanning Tree Protocol (RSTP)
- VLANs:
  4K IEEE 802.1Q VLANs
  Port-based VLAN
  Q-in-Q 802.1ad
  Add/Remove inner tag
  Inner tag translation
- Link Aggregation:
  Static Trunk
  IEEE 802.3ad LACP
  Load Balancing: SA,DA,SA+DA,SIP,DIP,SIP+, DIP
  Trunk groups: 8

QoS Capability

- 8 Priority Queues
- Two levels of hierarchical scheduling policing parameters:
  CIR, PIR, CBS, EBS
- Priority Queues Scheduling Scheme:
  SP, WRR, WDRR, SP+WRR/WDRR
- Rate Limiting: 1Mbps per step
- UNI port Egress Policing: Per flow, EVC, UNI port
- Total number of flow: >1K
- Traffic classification and priority management based on:
  IEEE 802.1p,IP Precedence/DSCP,TCP/UDP port number,IP Address ,Mac Address,Ethernet Type,C-VLAN

IEEE1588 Clock Synchronization

MTS10080 supports SyncE to deliver accurate clock signal along the Packet network. Besides, it also supports IEEE1588 to satisfy the stringent requirement for synchronization.

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OAM Capability

- 802.3ah
  Remote failure indication, Self discovery
  Dying Gasp
  Link Fault, Critcal Event
  Remote Loopback
  Delay/delay variation
  Frame loss test
  User data packets loopback, User enable/disable loopback
  Performance monitoring
  Errored Symbols Seconds, Errored Frames Summary

- IEEE 802.1ag (CFM)
  Path discovery, Fault detection
  Link trace Message and Reply (LTM, LTR)
  Continuity Check Messages (CCM)
  Fault verification and isolation
  Loopback Message and Reply (LBM, LBR)
  Fault notification and recovery
  Performance monitoring
  Frame Loss Ratio (FLR), Delay (FD) and Delay Variation (FDV)

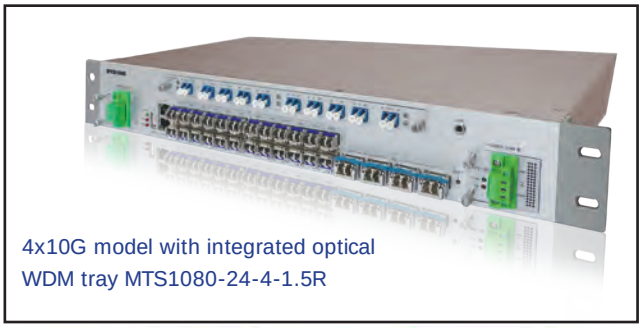
- ITU Y.1731 AIS/RDI/LCK/TST

Automatic Protection Capability

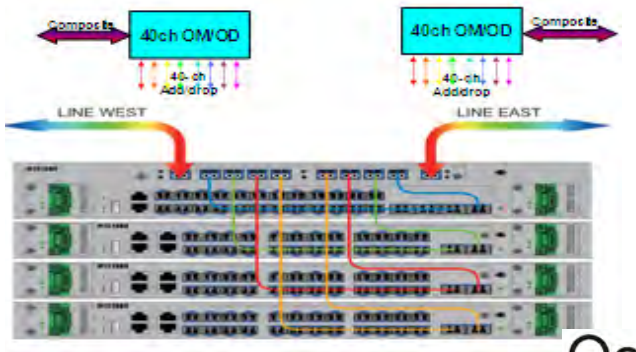
- G.8032: under 50ms for up to 16 nodes
  Dual ring, Subtending rings, Multiple rings
  CCM OAMPDU failure detection
- Failure detection
  Loss of Light/Signal
  Loss of Continuity (CCM)
  Manually initiated switch-over
- In-service addition of nodes to the ring

Ethernet over WDM Capability

- Optional built-in optical tray for WDM mux/demux or add/drop
- Instantly upgrade link capacity using colored 10G transceivers
- Optional forward error correction for long distance transport



4x10G model with integrated optical
WDM tray MTS1080-24-4-1.5R



Product Specifications

Fiber Optic 10GE Ports (SFP+)	MTS10080-L / MTS10080-H
Port Density	8 / 20
Data Rate	10000Base Fx
Wavelength or Distance	Choose SFP separately
Single Fiber Solution	Support Bi-Directional SFP
Fiber Optic 10GE Ports (XFP)	MTS10080-L / MTS10080-H
Port Density	8 / 4
Data Rate	10 GbE, with or without OTN
Wavelength or Distance	Choose XFP separately (1310, 1550, WDM)
Single Fiber Solution	Optional
Ethernet Features	
Bandwidth Limitation	tamper-proof in steps of 1 Mbps per port
Performance Monitoring	Yes
DHCP Client Support	Yes
VLAN Support	Port, EVC or Flow based tagging and QinQ. Policing/Shaping/Scheduling
Supported MAC Addresses	4096
Link/Ring Protection	ERPS per G.8032
Optional Forward Error Correction Features	
Link Interface w./ FEC	11.1 Gbps (G.709 OTU2) with FEC on
FEC Coding	G. 975 (RS 255, 239)
Link Interface w/o FEC	10.3 Gbps
Network Management	
Ethernet Port	Telnet/SSH
Local Craft	RS232 (VT100)
User Interface	SNMPv.2, CLI, GUI
Secure Configuration	SSHv2 (Secure Shell) terminal
Compliance Status	
NEBS	Level 3 GR-63
EMC	GR-1089
Safety	UL (# E318639); CE (EMC/EMI)
Operating Conditions	
Temperature	- 5 to + 55 °C
Humidity	5 to 85% non-condensing
Mechanical	
1U 19" Rackmount	44 x 483 x 240 (H x W x D, mm)
1.5U 19" Rackmount	66 x 483 x 240 (H x W x D, mm)
Power Consumption	< 75W (23 BTU/H)

Order Matrix

MTS10080

10 Gigabit Carrier Ethernet Switch

Description	Code	Model
8x10GE SFP+ ports, 8x10GE XFP ports, no FEC, without SFP and XFP ; MTS10080 service card, redundant DC power. CLI/SNMP/GUI management	7000-201	MTS10080-L
20x10GE SFP+ ports, 4x10GE XFP ports, no FEC, without SFP and XFP ; MTS10080 service card, redundant DC power. CLI/SNMP/GUI management	7000-202	MTS10080-L
MTS10080 5RU 19" chassis with redundant DC power and CLI/SNMP/GUI management included	7000-203	MTS10080-Chassis

Please Order pluggable SFP/XFP and optical MUX/DEMUX or OADM tray separately.

MTS1090 | 10G Carrier Ethernet L2 Switch
MPLS-TP and IEEE1588v2 support

4x10G model MTS1090-24-4

Main Feature

| Up to 4 x 10 G Port Carrier Ethernet Switch
| 1U 19 inch rack 24 x GE ports
| Suports Packet ADM and Customer Premises Applications
| Supports 10G Ethernet over WDM
| Bandwidth configuration and QoS, Q-in-Q features
| Ring Protection Switching per G.8032
| OAM Features per 802.3ah, 802.1ag, Y1731
| MTS1090 support IEEE1588 for clock synchronization

Management Features

- Command Line Interface (CLI), Java based GUI, SNMP v1,v2
- SSHv2,Telnet, FTP/TFTP
- Remote In-band Management
- Hitless software local and remote upgrade
- Alarm: traps and dry-contact
- RADIUS & Syslog
- RMON
  RFC 2613 groups: SMONVlanstat, SMONPrioStat
  RFC2819 groups: Ethernet history, Alarm, and Event;
  RFC2819 groups: Ethernet statistics
- Reports for customer validation

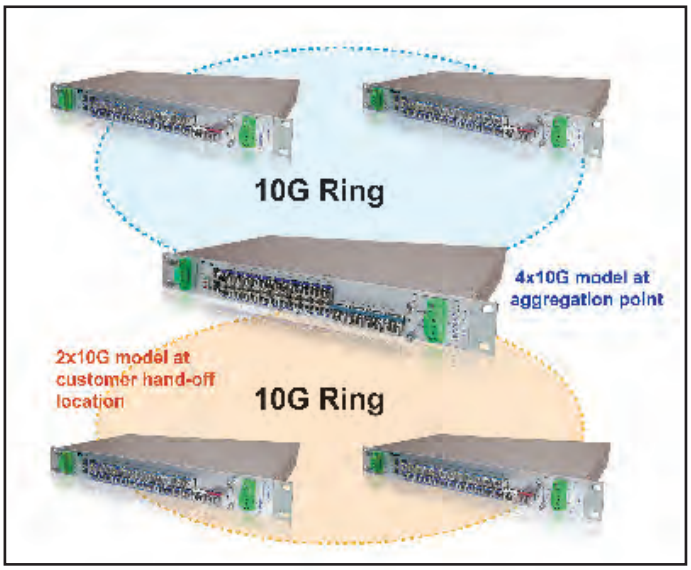
Application Examples

Conneted Rings

User can build 2 connected rings using MTS1080 models. The 4x10G model would be sitting at the cross point with the four 10G ports equally splitted to support north and south rings. The 2x10G model hands off Gigabit traffics at customer locations.

User Configurable Network or Client Interfaces

MTS1080 also allows user to connect to customer equipment with both Gigabit and 10G links, i.e., user can configure any of the 10G ports to be either network facing or client facing, and set limited bandwidth for the 10G pipe as needed. For example, user can set 2 Gigabit bandwidth using one of 10G client links.



L2 Switching Capability

- Auto-negotiation for port speed and duplex mode Flow Control:
- IEEE 802.3x & Back-Pressure
- Spanning Tree Protocol:
  IEEE 802.1D Spanning Tree Protocol (STP)
  IEEE 802.1w Rapid Spanning Tree Protocol (RSTP)
- VLANs:
  4K IEEE 802.1Q VLANs
  Port-based VLAN
  Q-in-Q 802.1ad
  Add/Remove inner tag
  Inner tag translation
- Link Aggregation:
  Static Trunk
  IEEE 802.3ad LACP
  Load Balancing: SA,DA,SA+DA,SIP,DIP,SIP+, DIP
  Trunk groups: 8

QoS Capability

- 8 Priority Queues
- Two levels of hierarchical scheduling policing parameters:
  CIR, PIR, CBS, EBS
- Priority Queues Scheduling Scheme:
  SP, WRR, WDRR, SP+WRR/WDRR
- Rate Limiting: 1Mbps per step
- UNI port Egress Policing: Per flow, EVC, UNI port
- Total number of flow: >1K
- Traffic classification and priority management based on:
  IEEE 802.1p,IP Precedence/DSCP,TCP/UDP port number,IP Address ,Mac Address,Ethernet Type,C-VLAN

IEEE1588 Clock Synchronization

MTS1090 supports SyncE to deliver accurate clock signal along the Packet network. Besides, it also supports IEEE1588 to satisfy the stringent requirement for synchronization.

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OAM Capability

- 802.3ah
  Remote failure indication, Self discovery
  Dying Gasp
  Link Fault, Critcal Event
  Remote Loopback
  Delay/delay variation
  Frame loss test
  User data packets loopback, User enable/disable loopback
  Performance monitoring
  Errored Symbols Seconds, Errored Frames Summary

- IEEE 802.1ag (CFM)
  Path discovery, Fault detection
  Link trace Message and Reply (LTM, LTR)
  Continuity Check Messages (CCM)
  Fault verification and isolation
  Loopback Message and Reply (LBM, LBR)
  Fault notification and recovery
  Performance monitoring
  Frame Loss Ratio (FLR), Delay (FD) and Delay Variation (FDV)

- ITU Y.1731 AIS/RDI/LCK/TST

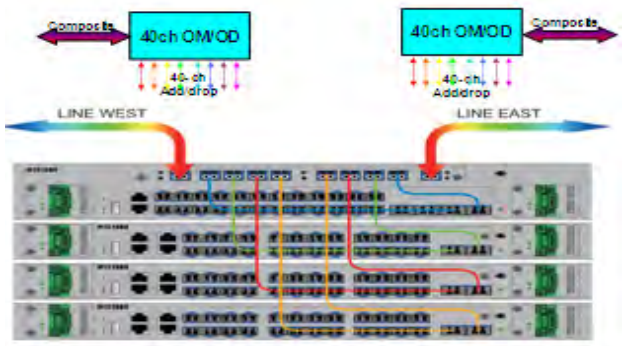
Automatic Protection Capability

- G.8032: under 50ms for up to 16 nodes
  Dual ring, Subtending rings, Multiple rings
  CCM OAMPDU failure detection
- Failure detection
  Loss of Light/Signal
  Loss of Continuity (CCM)
  Manually initiated switch-over
- In-service addition of nodes to the ring

Ethernet over WDM Capability

- Optional built-in optical tray for WDM mux/demux or add/drop
- Instantly upgrade link capacity using colored 10G transceivers
- Optional forward error correction for long distance transport

4x10G model with integrated optical WDM tray MTS1090-24-4-1.5R



Product Specifications

Fiber Optic GE Ports (SFP)	
Port Density	24
Data Rate	1000Base Fx
Wavelength or Distance	Choose SFP separately
Single Fiber Solution	Support Bi-Directional SFP
Fiber Optic 10GE Ports (XFP)	
Port Density	2 or 4
Data Rate	10 GbE, with or without OTN
Wavelength or Distance	Choose XFP separately (1310, 1550, WDM)
Single Fiber Solution	Optional
Ethernet Features	
Bandwidth Limitation	tamper-proof in steps of 1 Mbps per port
Performance Monitoring	Yes
DHCP Client Support	Yes
VLAN Support	Port, EVC or Flow based tagging and QinQ. Policing/Shaping/Scheduling
Supported MAC Addresses	4096
Link/Ring Protection	ERPS per G.8032
Optional Forward Error Correction Features	
Link Interface w./ FEC	11.1 Gbps (G.709 OTU2) with FEC on
FEC Coding	G. 975 (RS 255, 239)
Link Interface w/o FEC	10.3 Gbps
Network Management	
Ethernet Port	Telnet/SSH
Local Craft	RS232 (VT100)
User Interface	SNMPv.2, CLI, GUI
Secure Configuration	SSHv2 (Secure Shell) terminal
Compliance Status	
NEBS	Level 3 GR-63
EMC	GR-1089
Safety	UL (# E318639); CE (EMC/EMI)
Operating Conditions	
Temperature	- 5 to + 55 °C
Humidity	5 to 85% non-condensing
Mechanical	
1U 19" Rackmount	44 x 483 x 240 (H x W x D, mm)
1.5U 19" Rackmount	66 x 483 x 240 (H x W x D, mm)
Power Consumption	< 75W (23 BTU/H)

Order Matrix

MTS1090

10 Gigabit Carrier Ethernet Switch

Description	Code	Model
24xGE ports, up to 4x10G ports, without SFP and XFP; support IEEE1588; 1RU 19" shelf with redundant DC power and CLI/SNMP/GUI management included	7000-190	MTS1090-10GE-24-4
24xGE, 4x10GE, without SFP and XFP; support IEEE1588; 1.5U high 19" shelf, with redundant DC power and CLI/SNMP/GUI management, built-in filter tray. Order filter tray separately	7000-191	MTS1090-10GE-24-4-1.5R

Please Order pluggable SFP/XFP and optical MUX/DEMUX or OADM tray separately.

MTS1080 | 10G Carrier Ethernet L2 Switch

Main Feature

| Up to 4 x 10 G Port Carrier Ethernet Switch
| 1U 19 inch rack 24 x GE ports
| Suports Packet ADM and Customer Premises Applications
| Supports 10G Ethernet over WDM
| Bandwidth configuration and QoS, Q-in-Q features
| Ring Protection Switching per G.8032
| OAM Features per 802.3ah, 802.1ag, Y1731

Management Features

- Command Line Interface (CLI), Java based GUI, SNMP v1,v2
- SSHv2,Telnet, FTP/TFTP
- Remote In-band Management
- Hitless software local and remote upgrade
- Alarm: traps and dry-contact
- RADIUS & Syslog
- RMON
  RFC 2613 groups: SMONVlanstat, SMONPrioStat
  RFC2819 groups: Ethernet history, Alarm, and Event;
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- Reports for customer validation

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User can build 2 connected rings using MTS1080 models. The 4x10G model would be sitting at the cross point with the four 10G ports equally splitted to support north and south rings. The 2x10G model hands off Gigabit traffics at customer locations.

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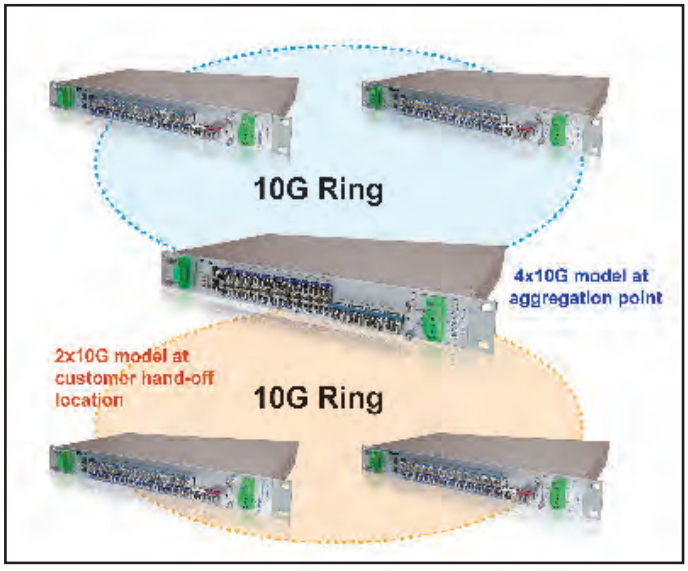

2x10G model MTS1080-24-2

4x10G model MTS1090-24-4

L2 Switching Capability

- Auto-negotiation for port speed and duplex mode Flow Control:
- IEEE 802.3x & Back-Pressure
- Spanning Tree Protocol:
  IEEE 802.1D Spanning Tree Protocol (STP)
  IEEE 802.1w Rapid Spanning Tree Protocol (RSTP)
- VLANs:
  4K IEEE 802.1Q VLANs
  Port-based VLAN
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  Trunk groups: 8

QoS Capability

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Automatic Protection Capability

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  Loss of Continuity (CCM)
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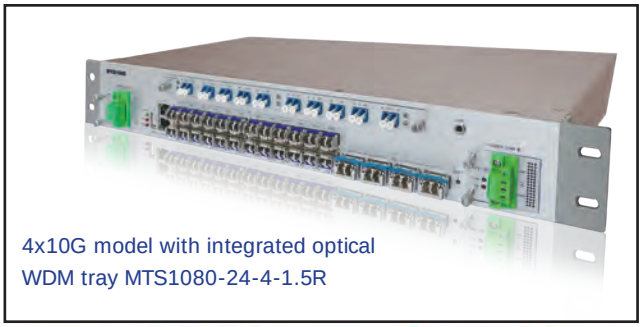
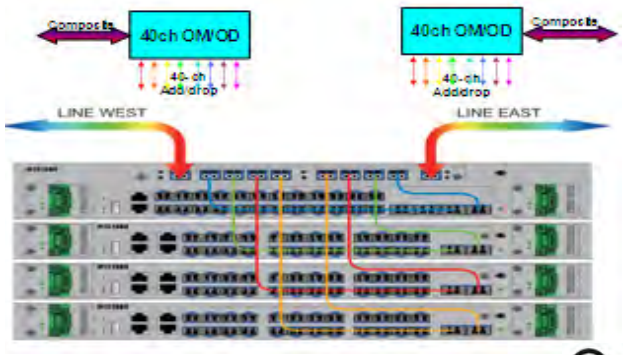
Ethernet over WDM Capability

- Optional built-in optical tray for WDM mux/demux or add/drop
- Instantly upgrade link capacity using colored 10G transceivers
- Optional forward error correction for long distance transport



4x10G model with integrated optical
WDM tray MTS1080-24-4-1.5R



Product Specifications

Fiber Optic GE Ports (SFP)	
Port Density	24
Data Rate	1000Base Fx
Wavelength or Distance	Choose SFP separately
Single Fiber Solution	Support Bi-Directional SFP
Fiber Optic 10GE Ports (XFP)	
Port Density	2 or 4
Data Rate	10 GbE, with or without OTN
Wavelength or Distance	Choose XFP separately (1310, 1550, WDM)
Single Fiber Solution	Optional
Ethernet Features	
Bandwidth Limitation	tamper-proof in steps of 1 Mbps per port
Performance Monitoring	Yes
DHCP Client Support	Yes
VLAN Support	Port, EVC or Flow based tagging and QinQ. Policing/Shaping/Scheduling
Supported MAC Addresses	4096
Link/Ring Protection	ERPS per G.8032
Optional Forward Error Correction Features	
Link Interface w./ FEC	11.1 Gbps (G.709 OTU2) with FEC on
FEC Coding	G. 975 (RS 255, 239)
Link Interface w/o FEC	10.3 Gbps
Network Management	
Ethernet Port	Telnet/SSH
Local Craft	RS232 (VT100)
User Interface	SNMPv.2, CLI, GUI
Secure Configuration	SSHv2 (Secure Shell) terminal
Compliance Status	
NEBS	Level 3 GR-63
EMC	GR-1089
Safety	UL (# E318639); CE (EMC/EMI)
Operating Conditions	
Temperature	- 5 to + 55 °C
Humidity	5 to 85% non-condensing
Mechanical	
1U 19" Rackmount	44 x 483 x 240 (H x W x D, mm)
1.5U 19" Rackmount	66 x 483 x 240 (H x W x D, mm)
Power Consumption	< 75W (23 BTU/H)

Order Matrix

MTS1080

10 Gigabit Carrier Ethernet Switch

Description	Code	Model
24xGE ports, 2x10G ports, no FEC, without SFP and XFP ; 1RU 19" shelf with redundant DC power. CLI/SNMP/GUI management	7000-150	MTS1080-10GE-24-2
24xGE ports, 4x10G ports , No FEC, without SFP and XFP ; 1RU 19" shelf with redundant DC power and CLI/SNMP/GUI management	7000-160	MTS1080-10GE-24-4
24xGE ports, up to 4x10G ports, without SFP and XFP; support IEEE1588; 1RU 19" shelf with redundant DC power and CLI/SNMP/GUI management included	7000-190	MTS1090-10GE-24-4
24xGE, 4x10GE, without SFP and XFP;; 1.5U high 19" shelf, with redundant DC power and CLI/SNMP/GUI management, built-in filter tray. Order filter tray separately	7000-165	MTS1080-10GE-24-4-1.5R
4CH 100G DWDM OADM fi lter, XX start dropping channel ITU#; YY stop dropping channel ITU #	70xx-154	MTS-04-D-XXAYY
8CH 100G DWDM MUX/DEMUX filter, XX start channel ITU#; YY stop channel ITU #	70xx-158	MTS-08-D-XXMYY

Please Order pluggable SFP/XFP and optical MUX/DEMUX or OADM tray separately.

MTS180 | Gigabit Carrier Ethernet L2 Switch

Main Features

| 4 x GE carrier Ethernet switch
| User configurable GE ports to be either line or client interfaces
| 8 or 16 x 10/100BaseT + 8 x 100BaseFx interfaces
| Suports packet ADM and customer premises applications
| OAM and QoS compliant to IEEE standards 802.1ag and Y.1731
| Ring protection per G.8032
| OAM Features per 802.3ah, 802.1ag, Y1731

The carrier Ethernet switch MTS180 provides cost effective, prioritized Ethernet services with carrier grade QoS and OAM features.

An Example of Prioritized Ethernet Services

Service Class	Traffics	Customer A	Customer B	Traffics Rate at this time	Note
Gold	VOIP	CIR/PIR: 200/200M	CIR/PIR: 200/200M	100 (A & B)	CIR must be equal to PIR for Gold service
Silver	Video	CIR/PIR: 500/1000M	CIR/PIR: 500/1000M	800 (A & B)	
Bronze	Premium Data	Do not subscribe	CIR/PIR: 300/1000M	500 (B)	Customer B willing pay more for data service
Standard	Internet Data	CIR/PIR: 0/1000M	CIR/PIR: 0/1000M	500 (A & B)	CIR must be equal to 0 for standard service
		total CIR/PIR 700/2200M	Total CIR/PIR 1000/3200M	Total=3300	Uplink BW=2000M

In the above example, MTS180 is used at the edge connecting to a MPLS router. One of its client GE port is connected to customer A, and another client GE port to customer B. Each customer pays different prices per traffic critical levels. The total bandwidth in the uplink available for both A and B is 2000M (2xGE), so with a total bandwidth need of 3300M at this particular time, there is an over-subscription.

MTS180 color marks various level of services. Traffics within CIR for Gold service is all green. Gold service has PIR equal to CIR thus the entire bandwidth service is guaranteed. Silver has certain green (traffics within CIR), and certain yellow (traffics between CIR and PIR) marked traffics. The sum of green marked traffics, i.e., the total CIR bandwidth, shall never exceed the available uplink bandwidth (2G in this example). So the green marked traffics always pass.

In this example, total aggregated CIR bandwidth needed (committed/guaranteed to pass) is 1500M (600M for Customer A, 900M for customer B). With the total allocated bandwidth to Customer A and B being 2000M, the remaining 500 M is shared by the yellow marked traffics. For yellow marked traffics, the rule of what to pass is then based on WRR which defines the bandwidth allocation for the queu.

For Silver level customer, it will get WRR=60% of remaining bandwidth, Bronze's WRR is 30%, Standard 10%. As result, the remaining 500M bandwidth is distributed to Silver, Bronze, Standard traffics per WRR ratio, which means:

Silver (WRR=60%) 500*60% = 300M
Bronze (WRR=30%) 500*30% = 150M
Std (WRR=10%) 500*10% = 50M

As conseuqnece, all Gold traffics pass, Silver traffics pass within CIR plus 150M of EIR (WRR=60%), Bronze traffics pass within CIR plus 150M of EIR (WRR=30%), and Standard traffics pass only 25M (WRR=10%). Check www.dowslakemicro.com for more details.

Product Specifications

Client Port - Fast Ethernet	
Port Density	Up to 24
Port Configuration	8 x 100BaseFx (SFP) and 16 x 10/100BaseT (RJ45) or 24 x 100BaseFx (SFP)
Wavelength or Distance	Choose SFP separately
Single Fiber Solution	Bi-Directional SFP optional
Client Port - Gigabit Ethernet	
Port Density	Maximum 3 (leaving 1xGE for line port)
Data Rate	1000BaseFx with rate limiting
Wavelength or Distance	Choose SFP separately
Single Fiber Solution	BiDi SFP optional
Line Port - Gigabit Ethernet	
Port Density	Up to 4 (if no GE port is configured as Client)
Data Rate	1000BaseFx
Wavelength or Distance	Choose SFP separately (1310, 1550, WDM)
Single fiber solution	BiDi SFP optional
Ethernet Features	
Bandwidth Limitation	tamper-proof in steps of 1 Mbps per port
Performance Monitoring	Yes
DHCP Client Suppor	Yes
VLAN Support	Port, EVC or Flow based tagging and QinQ. Policing/Shaping/Scheduling
Supported MAC Addresses	4096
Link Protection	Link Aggregation (egress), ERPS optional
Network Management	
Ethernet Port	Telnet/SSH
Local Craft	RS232 (VT100)
User Interface	SNMPv.2, CLI, GUI
Secure Configuration	SSHv2 (Secure Shell) terminal
Operating Conditions	
Temperature	- 5 to + 55 °C
Humidity	5 to 85% non-condensing
Mechanical	
1U 19″ Rackmount	44 .3x 482.6 x 240 (H x W x D, mm)
Power Consumption	< 50 W

Order Matrix

MTS180

Gigabit Ethernet Transport Switch

Description	Code	Model
16xFE RJ45 ports, 8xFO ports for pluggable SFP; 4xGE optical ports for pluggable SFP, without SFP; 1RU 19" Shelf with redundancy DC power, CLI/SNMP management included	7000-170	MTS180-1608-4
All optical switch: 24xFE optical ports for pluggable SFP; 4xGE optical ports for pluggable SFP, without SFP; 1RU 19" Shelf with redundancy DC power and CLI/SNMP management included	7000-180	MTS180-0024-4
Pluggable DC power supply, -48V power supply 50W for MTS1080, MTS180	7000-110	MDC-50-1R
AC/DC external power supply for MTS180,MTS1080 and CATS1000: input 110..240 V AC, output -48VDC	1755-008	PS-CM-W

Please Order pluggable SFP modules separately.

MTS100 | FE/GE Carrier Ethernet L2 Switch

Main Features

| Carrier Ethernet CPE switch
| User configurable GE ports to be either line or client interfaces
| 2x100M/1000M SFP ports uplink
| OAM and QoS compliant to IEEE standards 802.1ag and Y.1731
| Ring protection per G.8032
| OAM Features per 802.3ah, 802.1ag, Y1731

The carrier Ethernet switch MTS100 provides cost effective, prioritized Ethernet services with carrier grade QoS and OAM features.

An Example of Prioritized Ethernet Services

Service Class	Traffics	Customer A	Customer B	Traffics Rate at this time	Note
Gold	VOIP	CIR/PIR: 200/200M	CIR/PIR: 200/200M	100 (A & B)	CIR must be equal to PIR for Gold service
Silver	Video	CIR/PIR: 500/1000M	CIR/PIR: 500/1000M	800 (A & B)	
Bronze	Premium Data	Do not subscribe	CIR/PIR: 300/1000M	500 (B)	Customer B willing pay more for data service
Standard	Internet Data	CIR/PIR: 0/1000M	CIR/PIR: 0/1000M	500 (A & B)	CIR must be equal to 0 for standard service
		total CIR/PIR 700/2200M	Total CIR/PIR 1000/3200M	Total=3300	Uplink BW=2000M

In the above example, MTS100 is used at the edge connecting to a MPLS router. One of its client GE port is connected to customer A, and another client GE port to customer B. Each customer pays different prices per traffic critical levels. The total bandwidth in the uplink available for both A and B is 2000M (2xGE), so with a total bandwidth need of 3300M at this particular time, there is an over-subscription.

MTS100 color marks various level of services. Traffics within CIR for Gold service is all green. Gold service has PIR equal to CIR thus the entire bandwidth service is guaranteed. Silver has certain green (traffics within CIR), and certain yellow (traffics between CIR and PIR) marked traffics. The sum of green marked traffics, i.e., the total CIR bandwidth, shall never exceed the available uplink bandwidth (2G in this example). So the green marked traffics always pass.

In this example, total aggregated CIR bandwidth needed (committed/guaranteed to pass) is 1500M (600M for Customer A, 900M for customer B). With the total allocated bandwidth to Customer A and B being 2000M, the remaining 500 M is shared by the yellow marked traffics. For yellow marked traffics, the rule of what to pass is then based on WRR which defines the bandwidth allocation for the queu.

For Silver level customer, it will get WRR=60% of remaining bandwidth, Bronze's WRR is 30%, Standard 10%. As result, the remaining 500M bandwidth is distributed to Silver, Bronze, Standard traffics per WRR ratio, which means:

Silver (WRR=60%) 500*60% = 300M
Bronze (WRR=30%) 500*30% = 150M
Std (WRR=10%) 500*10% = 50M

As conseuqnece, all Gold traffics pass, Silver traffics pass within CIR plus 150M of EIR (WRR=60%), Bronze traffics pass within CIR plus 150M of EIR (WRR=30%), and Standard traffics pass only 25M (WRR=10%). Check www.dowslakemicro.com for more details.

Product Specifications

Client Port - Fast Ethernet	MTS100-GE / MTS100-FG
Port Density Port Configuration	4 / 6 10/100BaseT (RJ45)
Line Port - Fast Ethernet or Gigabit Ethernet	
Port Density Data Rate Wavelength or Distance Single fiber solution	2 1000M BaseFX / 100/1000BaseFx Choose SFP separately (1310, 1550, WDM) BiDi SFP optional
Ethernet Features	
Bandwidth Limitation Performance Monitoring DHCP Client Suppor VLAN Support Supported MAC Addresses Link Protection	tamper-proof in steps of 1 Mbps per port Yes Yes Port, EVC or Flow based tagging and QinQ. Policing/Shaping/Scheduling 4096 Link Aggregation (egress), ERPS optional
Network Management	
Ethernet Port Local Craft User Interface Secure Configuration	Telnet/SSH RS232 (VT100) SNMPv.2, CLI, GUI SSHv2 (Secure Shell) terminal
Operating Conditions	
Temperature Humidity	- 5 to + 55 °C 5 to 85% non-condensing
Mechanical	
Size	44 .3x 220.6 x 160 (H x W x D, mm)
Power Consumption	< 20 W

Order Matrix

MTS100

Gigabit Ethernet Transport Switch

Description	Code	Model
6xFE RJ45 ports, 2xFO FE/GE ports for pluggable SFP; without SFP; CPE Shelf with AC power, CLI/SNMP management included	7000-170	MTS100-FG
4xFE RJ45 ports, 2xGE RJ45 ports, 2xFO GE ports for pluggable SFP; without SFP; CPE Shelf with AC power, CLI/SNMP management included	7000-171	MTS100-GE

Please Order pluggable SFP modules separately.

MTS6000 | High Density 10G Ethernet Aggregation Switch

Overview

MTS6000 is a multi-card, fully redundant, carrier Ethernet switch providing L2/L3/L4 wire-speed switching and routing capability. The backplane capacity is up to 768Gbps with a selection of line cards for 10G or GE ring aggregation at carrier's central office.

Main Feature

| Chassis with 2 CPU + 4 line card slots
| Available line cards include 8 port 10G, 24 port GE types
| Up to 768Gbps capacity with dual switch fabric/CPU
| Power Supply, CPU and switch fabric redundancy
| IPv4 L3 hardware based routing
| IPv4 L3 hardware based multicast routing
| Suports L2 and L3 MPLS
| MEF 9 Abstract Test Suite for Ethernet Services at UNI
| MEF 14 Abstract Test Suite for Traffic Management
| Supports 10G Ethernet over WDM
| Bandwidth configuration and QoS, Q-in-Q features
| Multiple Rings Protection Switching per ERPS
| OAM Features

Automatic Protection Capability

- ERPS: Switchover time:<50ms
- Failure detection
  Loss of Light/Signal
  Manually Initiated Switch
- In-service addition of nodes to the ring

Management Features

- Command Line Interface (CLI), SNMP v1,v2
- SSHv2,Telnet, FTP/TFTP
- Remote In-band Management
- Hitless software local and remote upgrade
- Alarm: traps and dry-contact
- RADIUS & Syslog
- RMON: RFC2819 groups: Ethernet history, Alarm, and Event;
- Reports for customer validation

Network Management System (NMS)

- Client-server Based NMS using Java Graphic Interface
- MySQL Database for Information Collection and Storage
- Can operate in multiple OS environment (Windows or Linux)
- Topology based Network Management with Auto-detection of sub-networks or elements
- Monitors and Supervises the Entire Access Network Built Based on Dowslake Products
- Can integrate 3rd Party Element Management System (EMS) Based on SNMP, CLI or HTTP

L2 Switching Capability

- Auto-negotiation for port speed and duplex mode Flow Control:
- IEEE 802.3x & Back-Pressure
- Spanning Tree Protocol:
  IEEE 802.1D Spanning Tree Protocol (STP)
  IEEE 802.1w Rapid Spanning Tree Protocol (RSTP)
  IEEE 802.1s Multiple Spanning Tree Protocol (MSTP)
- VLANs:
  4K IEEE 802.1Q VLANs
  Port-based VLAN
  Q-in-Q 802.1ad
  Add/Remove inner tag
  Inner tag translation
- Link Aggregation:
  Static Trunk
  IEEE 802.3ad LACP
  Load Balancing: SA,DA,SA+DA,SIP,DIP,SIP+, DIP
  Trunk groups: 8
- Multicast
  IGMP Snooping
  IGMP Proxy query

QoS Capability

- 8 Priority Queues
- Two levels of hierarchical scheduling policing parameters:
  CIR, PIR, CBS, EBS
- Priority Queues Scheduling Scheme:
  SP, WRR, WDRR, SP+WRR/WDRR
- Rate Limiting: 1Mbps per step
- UNI port Egress Policing: Per flow, EVC, UNI port
- Total number of flow: >10K
- Traffic classification and priority management based on:
  IEEE 802.1p
  IP Precedence/DSCP
  TCP/UDP port number
  IP Address
  Mac Address
  Ethernet Type
  C-VLAN
  RFC 2698 and MEF specs 10 marker (colors)

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L3 Routing Capability

- Comprehensive IPv4 unicast routing support
  Static, RIP, OSPF, IS-IS, BGP-4 support
  Support for VRRP
  8-path Equal Cost Multipath (ECMP)
  Supported IPv4 multicast protocols include PIM-DM,PIM-SM, PIM-SSM
  IGMP v2/v3 routing and snooping support
- Hardware-based Layer 3 and Layer 2 ACLs
  Ability to bind multiple ACLs to the same port
  Hardware-based receive ACLs
- security capabilities:
  Port-based network access control using 802.1x or MAC
- port security
  Root guard and BPDU guard
  Broadcast, multicast and unknown unicast rate limits
  ARP Inspection for static entries

MPLS Capability

MTS6000 comes with MPLS capability. It provides a complete solution for MPLS, Layer 2, and Layer 3 virtual private networks (VPNs) by using MPLS based virtual private wire service (VPWS) and VPLS (virtual private LAN services). MTS1928 can operate the following functions:

- MPLS label operation in the core
- VPWS (L2 MPLS pseudo-wires or L2 MPLS PWE)
  RFC4448—encapsulation methods for transport of Ethernet over MPLS
  Provides a point-to-point Layer 2 virtual circuit that allows extension of a LAN seg ment across MPLS cloud networks.
  Provides the MPLS lookup at the end of the PW to determine the final output port (after decapsulating or terminating the packet)
- VPLS
  Provides a point-to-multipoint service
  Support for hub and spoke VPN and mesh VPN topologies
  Provides a full L2 lookup at the end of the PW based on the inner L2 header
- L3 MPLS-VPN using BGP VPN extensions (RFC2547)
  Provides address space and routing separation through per-VPN routing tables (VRF)
- L3 MPLS traffic engineering (TE)
- Fast reroute non-shortest path routing)
- MPLS DiffServ

Automatic Protection Capability

- G.8032
- Failure detection
  Loss of Light/Signal
  Manually Initiated Switch
- In-service addition of nodes to the ring

SLA Statistics Capability

- Ethernet Frame Loss Ratio (FLR)
- Ethernet Frame Delay (FD)
- Ethernet Frame Delay Variation (FDV)
- Errored Symbols Seconds
- Errored Frames Seconds
- Ethernet statistics
- Link status

Supported Protocols

Standard

802.3 10BaseT
802.3u 100BaseTX,100BaseFX
802.3z 1000BaseSX
802.3z 1000BaseLX
802.3ab 1000BaseT
802.3ae 10 Gigabit Ethernet
802.3x Flow Control
802.3ad Link Aggregation
802.1p/q VLAN Tagging
802.1d Bridging
802.1w Rapid STP
802.1s Multiple STP
802.1x User authentication
802.3 Ethernet Like MIB
Ethernet Interface MIB
SNMP v1, v2c and V3
SNMP MIB II

OSPF

RFC 2178 OSPF
RFC 1583 OSPF v2
RFC 1587 OSPF NSSA
RFC 1745 OSPF Interactions
RFC 1765 OSPF Database Overflow
RFC 1680 OSPF Traps
RFC 2154 OSPF w/Digital Signatures
RFC2328 OSPF v2
RFC 1680 OSPF v2 MIB
RFC 1997 Communities Attributes
RFC 2368 TCP MD5
RFC 2370 OSPF Opaque LSA Option

IP Multicast

RFC 1122 DVMRP Host Requirements
RFC 1256 ICMP Router Discovery Protocol
RFC 1112 IGMP
RFC 2236 IGMP v2
RFC 2362 PIM-SM,DVMRP v3-07
RFC 2336 IGMP v2

IS-IS

– RFC 1195 Routing in TCP/IP and Dual Environments
– RFC 1142 OSI IS-IS Intra-domain Routing Protocol
– RFC 2763 Dynamic Host Name Exchange
– RFC 2966 Domain-wide Prefix Distribution

Routing Protocol

RFC 791 IP
RFC 792 ICMP
RFC 793 TCP
RFC 783 TFTP
RFC 826 ARP
RFC 768 UDP
RFC 894 IP over Ethernet
RFC 903 RARP
RFC 1027 Proxy ARP
RFC 684 TELNET
RFC 1591 DNS (client)
RFC 1812 General Routing
RFC 1541 and 1542 DHCP
RFC 2131 BootP/DHCP Helper
RFC 2338 VRRP

Other Protocols

RFC1354 IP Forwarding MIB
RFC 1757 RMON Groups 1,2,3,9
RFC 2068 HTTP
RFC 2030 SNTP
RFC 2138 RADIUS
G.8032 ERPS

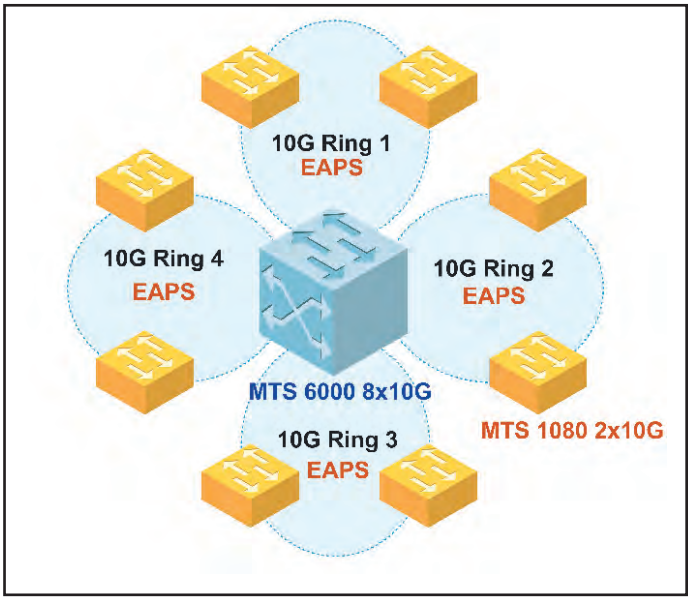
BGPv4

RFC 4271 BGPv4
RFC 1745 OSPF Interactions
RFC 1997 Communities & Attributes
RFC 2439 Route Flap Dampening
RFC 2796 Route Reflection
RFC 1965 BGP4 Confederations
RFC 2842 Capability Advertisement
RFC 2918 Route Refresh Capability
RFC 1269 Managed Objects for BGP
RFC 2385 BGP Session Protection via TCP MD5
RFC 3682 Generalized TTL Security Mechanism, for eBGP Session Protection
RFC 4273 BGP-4 MIB
RFC 3682 Generalized TTL Security Mechanism, for eBGP Session Protection

RIP

RFC 1058 RIP v1
RFC 1723 RIP v2
RFC 1812 RIP Requirements

Application Example



MTS6000 as a high capacity switch system, is best suited for central office applications to aggregate multiple 10G or GE rings and connect them to the MPLS core network.

Conneting Access Networks to MPLS Core

The availability of 10G line cards in MTS6000 supporting MPLS allows the access network built based on Dowslake MTS series switches to connect to the core MPLS network. With its L2/L3/L4 capability, MTS6000 organises incoming and outgoing traffics in whatever way the user needs, such as labeling, tagging, forwarding, adding or dropping, prioritizing etc., with additional security.
In such situation, MTS6000 plays the dual role as the edge switch for the MPLS core, and the aggregation switch for the access rings.

Aggregation of 10G Rings

As illustrated above, one MTS6000 can support up to 32x10G ports, making it possible to aggregate up to 16 rings with each of them having 10G capacity.

Aggregation of GE Rings

Similar to the aggregation of 10G rings, MTS6000 can also handle up to 48 GE rings (4 line cards of up to 24xGE ports each).

Complete Redundancy

The redundant design of the system control, switch fabric and power supply makes the user worry free. Also, cross-card redudnancy is available. For example, user can connect 10G port from line card A and another 10G port from line card B to build a ring, so in case one of the line cards is down, the built-in protection will allow traffics to go in the other direction of the ring without making the ring broken.

Product Specifications

System Control Card	
RS232	1xRJ45
AUX	1xRJ45
GE-Combo Upgrade Port	1000M SFP or RJ45
Flash Memory Slot	Pcmcia up to 4GB
Build-in Switch Fabric	Capacity 384Gb per Card
Hot swapable	Yes
Line Card 24GE-SFP	
Port Density	24SFP, include 4 SFP/TX Combo Ports
Data Rate	1000Base Fx
Wavelength or Distance	Choose SFP separately
Single Fiber Solution	Support Bi-Directional SFP
Hot swapable	Yes
Line Card 8TE-XFP	
Port Density	8 x 10G XFP
Data Rate	10 GbE
Wavelength or Distance	Choose XFP separately (1310, 1550, WDM)
Hot swapable	Yes
Power Supply Card	
AC Power Supply	100 ~ 240VAC, 50/60 Hz, min. 5A
DC Power Supply	-36 to - 72VDC, min. 20A
Network Management	
Ethernet Port	Telnet/SSH
Local Craft	RS232 (VT100)
User Interface	NMS, SNMPv.2, CLI
Secure Configuration	SSHv2 (Secure Shell) terminal
NMS Terminal Specifications	
Operating System	Windows NT/Windows 2000/Windows XP
CPU	Pentium IV 1.6GHz
Memory	512 MB RAM
Hard Drive	320 MB
Compliance Status	
NEBS	Level 3 GR-63
EMC	GR-1089
Safety	UL (# E318639); CE (EMC/EMI)
Operating Conditions	
Temperature	- 5 to + 55 °C
Humidity	5 to 85% non-condensing
Power Consumption	1000W fully loaded

Order Matrix

MTS6000 High Capacity Aggregation Switch

10 Gigabit Carrier Etherne L3 Switch

Description	Code	Model
chassis for 6U MTS6000 aggregation switch, including 2xDC power supplies	7090-600	MTS6-2DC
system controller card for MTS6000. Order 2 units for CPU redundancy	7090-610	MTS6-MSU-III
Plug-in card for MTS6000, with up to 8xXFP pluggables	7090-620	MTS6-8TE-XFP
Plug-in card for MTS6000, with up to 24xSFP pluggables 1000M	7090-630	MTS6-24GE-SFP
Plug-in card for MTS6000, 12xGE SFP and 12x10/100/1000BaseT, supports MPLS	7090-640	MTS6-12GE-TxSFP-MPLS
Plug-in card for MTS6000, 8 x XFP pluggables, supports MPLS	7090-650	MTS6-8TE-XFP-MPLS

Please Order pluggable SFP and XFP modules separately.

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MTS19080 | 40G Carrier Ethernet L3 Switch

Main Feature

| Up to 24 x 10G SFP+ Port Carrier Ethernet Switch
| Up to 2x 40G QSFP Port
| IPv4/IPv6 L3 hardware based routing
| IPv4/IPv6 L3 hardware based multicast routing
| Support Hardware MPLS L2/L3 VPN
| Bandwidth configuration and QoS, Q-in-Q features
| Ring Protection Switching per RRPP
| Support Flexible Stacking
| OAM 802.3ah

Management Features

- Command Line Interface (CLI, SNMP v1,v2)
- SSHv2,Telnet, FTP/TFTP
- Remote In-band Management
- Alarm: Traps and Email
- RADIUS & Syslog
- RMON: RFC2819 groups: Ethernet history, Alarm, and Event;
- Reports for customer validation

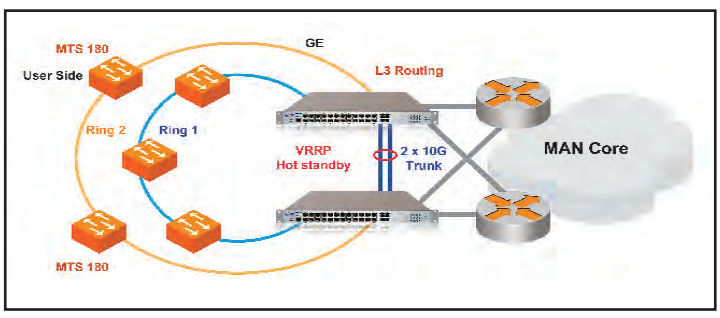
Application Example

The major difference between a L2 and L3 switch is the possibility to do routing. MTS19088 has the possibility to do Hot Standby when doing routing.

In the below illustration, 2 Dowslake L3 switches, MTS19080, are connected in the GE rings built based on Dowslake L2 Gigabit switch MTS1080, with each of them connected to both core routers. The built-in L3 protocol VRRP of MTS19080 takes care of monitoring and supervision of the equipment.

Ring Broken: In case one of Gigabit switch MTS1080 is down, or there is a fiber cut in the ring, the ring switches over in the other direction based on automatic protection switching concept.

Conection to Core Router Broken: In case one of MTS19080 is down, or one of the core router is down, the hot stand-by feature provided by MTS19080 takes care of the traffic flow, making the network very robust.



L2 Switching Capability

- Auto-negotiation for port speed and duplex mode Flow Control:
- IEEE 802.3x & Back-Pressure
- Spanning Tree Protocol:
  IEEE 802.1D Spanning Tree Protocol (STP)
  IEEE 802.1w Rapid Spanning Tree Protocol (RSTP)
  IEEE 802.1s Multiple Spanning Tree Protocol (MSTP)
- VLANs:
  4K IEEE 802.1Q VLANs
  Port-based VLAN
  Q-in-Q 802.1ad
  Add/Remove inner tag
  Inner tag translation
- Link Aggregation:
  Static Trunk
  IEEE 802.3ad LACP
  Load Balancing: SA,DA,SA+DA,SIP,DIP,SIP+, DIP
  Trunk groups: 8
- Multicast
  IGMP Snooping/MLD Snooping
  IGMP Proxy query

QoS Capability

- 8 Priority Queues
- Two levels of hierarchical scheduling policing parameters:
  CIR, PIR, CBS, EBS
- Priority Queues Scheduling Scheme:
  SP, WRR, WDRR, SP+WRR/WDRR
- Rate Limiting: 1Mbps per step
- UNI port Egress Policing: Per flow, EVC, UNI port
- Total number of flow: >1K
- Traffic classification and priority management based on:
  IEEE 802.1p
  IP Precedence/DSCP
  TCP/UDP port number
  IP Address
  Mac Address
  Ethernet Type
  C-VLAN
  RFC 2698 and MEF specs 10 marker (colors)
  RFC3176 S-FLOW

L3 Routing Capability

- Comprehensive IPv4/v6 unicast routing support
  Static, RIP, OSPF, IS-IS, BGP support
  Support for VRRP
  8-path Equal Cost Multipath (ECMP)
  Supported IPv4/v6 multicast protocols include PIM-DM,PIM-SM, PIM-SSM
  IGMP v2/v3 routing and snooping support
  MLD snooping support
- Hardware-based Layer 3 and Layer 2 ACLs
  Ability to bind multiple ACLs to the same port
  Hardware-based receive ACLs
- Security capabilities:
  Port-based network access control using 802.1x or MAC
- Port security
  Root guard and BPDU guard
  Broadcast, multicast and unknown unicast rate limits
  ARP Inspection for static entries

MPLS Capability

MTS19080 support MPLS. It provides a complete solution for MPLS, Layer 2, and Layer 3 virtual private networks (VPNs) by using MPLS based virtual private wire service (VPWS) and VPLS (virtual private LAN services). MTS19080 can operate the following functions:

- MPLS label operation in the core
- VPWS (L2 MPLS pseudo-wires or L2 MPLS PWE)
  RFC4448—encapsulation methods for transport of Ethernet over MPLS
  Provides a point-to-point Layer 2 virtual circuit that allows extension of a LAN seg ment across MPLS cloud networks.
  Provides the MPLS lookup at the end of the PW to determine the final output port (after decapsulating or terminating the packet)
- VPLS
  Provides a point-to-multipoint service
  Support for hub and spoke VPN and mesh VPN topologies
  Provides a full L2 lookup at the end of the PW based on the inner L2 header
- L3 MPLS-VPN using BGP VPN extensions (RFC2547)
  Provides address space and routing separation through per-VPN routing tables (VRF)
- L3 MPLS traffic engineering (TE)
- Fast reroute non-shortest path routing)
- MPLS DiffServ

Automatic Protection Capability

- RRPP Ring Protection <50ms
- Failure detection
  Loss of Light/Signal
  Manually Initiated Switch
- In-service addition of nodes to the ring
- FlexLink Dual Uplink Protection <50ms

Product Specifications

Fiber Optic 10G Ports (SFP+)	
Port Density	24
Data Rate	10G Base Fx
Wavelength or Distance	Choose SFP+ separately
Fiber Optic 40G Ports (QSFP)	MTS19080-24-2 only
Port Density	2
Data Rate	40G Base Fx
Wavelength or Distance	Choose SFP+ separately
Ethernet Features	
Bandwidth Limitation	tamper-proof in steps of 1 Mbps per port
Performance Monitoring	Yes
DHCP Client Support	Yes
VLAN Support	Port, EVC or Flow based tagging and QinQ. Policing/Shaping/Scheduling
Supported MAC Addresses	128K
Link/Ring Protection	RRPP
L3 & MPLS Features	
L3 Routing	Hardware based
VPN	Virtual Private LAN Services
MPLS	MPLS based virtual private wire services
Network Management	
Ethernet Port	Telnet/SSH
Local Craft	RS232 (VT100)
User Interface	SNMPv.2, CLI
Secure Configuration	SSHv2 (Secure Shell) terminal
Compliance Status	
NEBS	Level 3 GR-63
EMC	GR-1089
Safety	UL (# E318639); CE (EMC/EMI)
Operating Conditions	
Temperature	- 5 to + 55 °C
Humidity	5 to 85% non-condensing
Mechanical	
1U 19″ Rackmount	44 x 360x 440 (H x W x D, mm)
Power Supply	100~220V AC or 36~72V DC
Power Redundent	1+1 Protection
Power Consumption	< 130W (23 BTU/H)

Order Matrix

MTS 19080

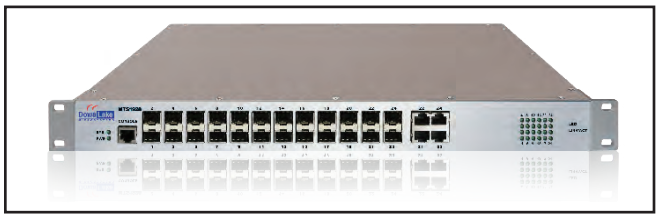
10 Gigabit Carrier Ethernet L3 Switch

Description	Code	Model
L2/L3 carrier Ethernet switch, 24x10GE Fx, without FEC, SFP+ not included. SNMP,CLI,Web manage-ment	7010-210	MTS19080-24
L2/L3 carrier Ethernet switch, 24x10GE Fx, 2x40G Fx, without FEC, SFP+/QSFP not included. SNMP,CLI,Web management	7010-211	MTS19080-24-2

Please Order pluggable SFP+/QSFP separately.

Opternus Networks
Tel.: 04532 - 20 44 - 100

MTS1928 | 10G Ethernet L3 Switch



Main Feature

| Up to 4 x 10 G Port Carrier Ethernet Switch
| 1U 19 inch rack 24 x GE ports
| IPv4 L3 hardware based routing
| IPv4 L3 hardware based multicast routing
| Suports L2 and L3 with optional MPLS capability
| Supports 10G Ethernet over WDM
| Bandwidth configuration and QoS, Q-in-Q features
| Ring Protection Switching
| OAM Features

Management Features

- Command Line Interface (CLI, SNMP v1,v2)
- SSHv2,Telnet, FTP/TFTP
- Remote In-band Management
- Hitless software local and remote upgrade
- Alarm: traps and dry-contact
- RADIUS & Syslog
- RMON: RFC2819 groups: Ethernet history, Alarm, and Event;
- Reports for customer validation

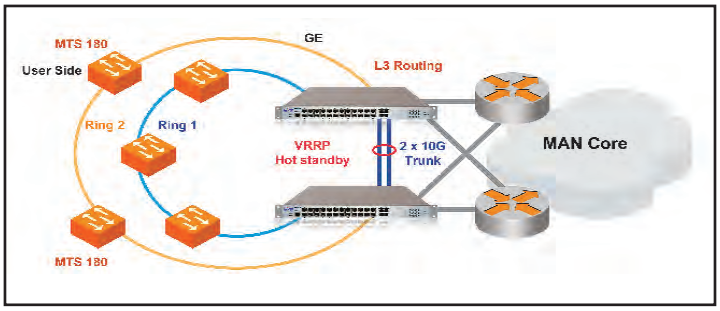
Application Example

The major difference between a L2 and L3 switch is the possibility to do routing. MTS1928 has the possibility to do Hot Standby when doing routing.

In the below illustration, 2 Dowslake L3 switches, MTS1928, are connected in the GE rings built based on Dowslake L2 Gigabit switch MTS180, with each of them connected to both core routers. The built-in L3 protocol VRRP of MTS1928 takes care of monitoring and supervision of the equipment.

Ring Broken: In case one of Gigabit switch MTS180 is down, or there is a fiber cut in the ring, the ring switches over in the other direction based on automatic protection switching concept.

Conection to Core Router Broken: In case one of MTS1928 is down, or one of the core router is down, the hot stand-by feature provided by MTS1928 takes care of the traffic flow, making the network very robust.



L2 Switching Capability

- Auto-negotiation for port speed and duplex mode Flow Control:
- IEEE 802.3x & Back-Pressure
- Spanning Tree Protocol:
  IEEE 802.1D Spanning Tree Protocol (STP)
  IEEE 802.1w Rapid Spanning Tree Protocol (RSTP)
  IEEE 802.1s Multiple Spanning Tree Protocol (MSTP)
- VLANs:
  4K IEEE 802.1Q VLANs
  Port-based VLAN
  Q-in-Q 802.1ad
  Add/Remove inner tag
  Inner tag translation
- Link Aggregation:
  Static Trunk
  IEEE 802.3ad LACP
  Load Balancing: SA,DA,SA+DA,SIP,DIP,SIP+, DIP
  Trunk groups: 8
- Multicast
  IGMP Snooping
  IGMP Proxy query

QoS Capability

- 8 Priority Queues
- Two levels of hierarchical scheduling policing parameters:
  CIR, PIR, CBS, EBS
- Priority Queues Scheduling Scheme:
  SP, WRR, WDRR, SP+WRR/WDRR
- Rate Limiting: 1Mbps per step
- UNI port Egress Policing: Per flow, EVC, UNI port
- Total number of flow: >1K
- Traffic classification and priority management based on:
  IEEE 802.1p
  IP Precedence/DSCP
  TCP/UDP port number
  IP Address
  Mac Address
  Ethernet Type
  C-VLAN
  RFC 2698 and MEF specs 10 marker (colors)

L3 Routing Capability

- Comprehensive IPv4 unicast routing support
  Static, RIP, OSPF, IS-IS, BGP-4 support
  Support for VRRP
  8-path Equal Cost Multipath (ECMP)
  Supported IPv4 multicast protocols include PIM-DM,PIM-SM, PIM-SSM
  IGMP v2/v3 routing and snooping support
- Hardware-based Layer 3 and Layer 2 ACLs
  Ability to bind multiple ACLs to the same port
  Hardware-based receive ACLs
- Security capabilities:
  Port-based network access control using 802.1x or MAC
- Port security
  Root guard and BPDU guard
  Broadcast, multicast and unknown unicast rate limits
  ARP Inspection for static entries

Optional MPLS Capability

MTS1928 can come with an option which supports MPLS. It provides a complete solution for MPLS, Layer 2, and Layer 3 virtual private networks (VPNs) by using MPLS based virtual private wire service (VPWS) and VPLS (virtual private LAN services). MTS1928 can operate the following functions:

- MPLS label operation in the core
- VPWS (L2 MPLS pseudo-wires or L2 MPLS PWE)
  RFC4448—encapsulation methods for transport of Ethernet over MPLS
  Provides a point-to-point Layer 2 virtual circuit that allows extension of a LAN seg ment across MPLS cloud networks.
  Provides the MPLS lookup at the end of the PW to determine the final output port (after decapsulating or terminating the packet)
- VPLS
  Provides a point-to-multipoint service
  Support for hub and spoke VPN and mesh VPN topologies
  Provides a full L2 lookup at the end of the PW based on the inner L2 header
- L3 MPLS-VPN using BGP VPN extensions (RFC2547)
  Provides address space and routing separation through per-VPN routing tables (VRF)
- L3 MPLS traffic engineering (TE)
- Fast reroute non-shortest path routing)
- MPLS DiffServ

Automatic Protection Capability

- Failure detection
  Loss of Light/Signal
  Manually Initiated Switch
- In-service addition of nodes to the ring

Product Specifications

Fiber Optic GE Ports (SFP)	
Port Density	24
Data Rate	1000Base Fx
Wavelength or Distance	Choose SFP separately
Single Fiber Solution	Support Bi-Directional SFP
Copper GE Ports	
Port Density	4
Data Rate	10/1001000Base T
Fiber Optic 10GE Ports (XFP)	
Port Density	4
Data Rate	10 GbE without OTN
Wavelength or Distance	Choose XFP separately (1310, 1550, WDM)
Single Fiber Solution	Optional
Ethernet Features	
Bandwidth Limitation	tamper-proof in steps of 1 Mbps per port
Performance Monitoring	Yes
DHCP Client Support	Yes
VLAN Support	Port, EVC or Flow based tagging and QinQ. Policing/Shaping/Scheduling
Supported MAC Addresses	4096
Link/Ring Protection	G.8032
L3 & MPLS Features	
L3 Routing	Hardware based
VPN	Virtual Private LAN Services
MPLS	Optional MPLS based virtual private wire services
Network Management	
Ethernet Port	Telnet/SSH
Local Craft	RS232 (VT100)
User Interface	SNMPv.2, CLI
Secure Configuration	SSHv2 (Secure Shell) terminal
Compliance Status	
NEBS	Level 3 GR-63
EMC	GR-1089
Safety	UL (# E318639); CE (EMC/EMI)
Operating Conditions	
Temperature	- 5 to + 55 °C
Humidity	5 to 85% non-condensing
Power Consumption	80W
Mechanical	
1U 19″ Rackmount	44 x 483x 440 (H x W x D, mm)
Power Consumption	< 75W (23 BTU/H)

Order Matrix

MTS 1928

10 Gigabit Carrier Ethernet L3 Switch

Description	Code	Model
L2/L3 carrier Ethernet switch, 24xGE Fx, 4x1000MbaseT, up to 4x10G XFP pluggable, without FEC, SFP/XFP not included. SNMP,/CLI	7010-160	MTS1928-10GE-24-4
L2/L3 carrier Ethernet switch, 24xGE Fx, 4x1000MbaseT, up to 4x10G XFP pluggable, without FEC, SFP/XFP not included. SNMP,/CLI.	7010-165	MTS1928-10GE-24-4-MPLS

Please Order pluggable SFP/XFP separately.

Opternus Networks
Tel.: 04532 - 20 44 - 100

MTS194GE | Gigabit Ethernet L3 Switch

Main Feature

- Up to 52x GE Port Carrier Ethernet Switch
- IPv4/v6 L3 hardware based routing
- IPv4/v6 L3 hardware based multicast routing
- Bandwidth configuration and QoS, Q-in-Q features
- Ring Protection Switching
- OAM Features per 802.3ah

Management Features

- Command Line Interface (CLI), SNMP v1,v2
- SSHv2,Telnet, FTP/TFTP
- Remote In-band Management
- Hitless software local and remote upgrade
- Alarm: traps and dry-contact
- RADIUS & Syslog
- RMON: RFC2819 groups (Ethernet history, Alarm, and Event)
- Reports for customer validation

L2 Switching Capability

- Auto-negotiation for port speed and duplex mode Flow Control:
- IEEE 802.3x & Back-Pressure
- Spanning Tree Protocol:
  STP, RSTP, MSTP
- VLANs:
  4K IEEE 802.1Q VLANs
  Port-based VLAN
  Q-in-Q 802.1ad
- Link Aggregation:
  Static Trunk
  IEEE 802.3ad LACP
  Load Balancing: SA, DA, SA + DA, SIP, DIP, SIP+, DIP
  Trunk groups: 8 per group, max. 32 groups
- Multicast
  IGMP Snooping,MLD-snooping
  IGMP Proxy query

QoS Capability

- 8 Priority Queues
- Two levels of hierarchical scheduling policing parameters:
  CIR, PIR, CBS, EBS
- Priority Queues Scheduling Scheme:
  SP, WRR, WDRR, SP+WRR/WDRR
- Rate Limiting: 1Mbps per step
- UNI port Egress Policing: Per flow, EVC, UNI port
- Total number of flow: >1K
- Traffic classification and priority management based on:
  IEEE 802.1p
  IP Precedence/DSCP
  TCP/UDP port number
  IP Address
  Mac Address
  Ethernet Type

L3 Routing Capability

- Comprehensive IPv4/V6 unicast routing support
- Static, RIPv1/ng, OSPFv3, IS-IS, BGP-4+ support
- Support for VRRP
- 8-path Equal Cost Multipath (ECMP)
- Supported IPv4/v6 multicast protocols include PIM-DM,PIM-SM, PIM-SSM
- IGMP v2/v3 routing support

Product Specifications

Ethernet Copper	
Port Density	Up to 52
Port Configuration	48 x 10/100/1000BaseT (RJ45)
Ethernet Fiber	
Port Density	Up to 4
Data Rate	1000BaseFx
Wavelength or Distance	Choose SFP separately (1310, 1550, WDM)
Single fiber solution	BiDi SFP optional
Ethernet Features	
QoS	8 Queues, 2 scheduling/policing levels
VLAN Support	Port based tagging and QinQ. Policing/Shaping/Scheduling
Supported VLANs	4k 802.1Q
MAC Address	16k
Routing Table	30k
Buffer	64 Mb
Link Aggregation	802.3ad LACP
STP	STP, RSTP, MSTP
Routing	RIP v1/v2, OSPFv2, BEIGRP, BGPv4
Network Management	
RMON	RFC2819 group 1,2.3.9
Local Craft	RS232 (VT100)
Remote Management	SNMPv.2, CLI
Secure Configuration	SSHv2 (Secure Shell) terminal
Operating Conditions	
Power Supply	100 ~ 240VAC
Temperature	0 to + 50 °C
Humidity	5 to 85% non-condensing
Power Consumption	60 W
Mechanical (1RU rack)	44mm × 442mm x 316mm (H x W x D)

Order Matrix

MTS194GE

Gigabit Carrier Ethernet L3 Switch

Description	Code	Model
MTS194 L3 switch 48xRJ45 10/100/1000BaseT, 4xGE optical SFP, SFP not included, 1RU 19" shelf with AC/DC power supply and SNMP/CLI management interface	7010-172	MTS194-4804GE
MTS194 L3 switch 24xRJ45 10/100/1000BaseT, 4xGE optical SFP, SFP not included, 1RU 19" shelf with AC/DC power supply and SNMP/CLI management interface	7010-173	MTS194-2404GE
MTS194 L3 switch 24xRJ45 10/100BaseT, 4xGE combo RJ45 and optical SFP, SFP not included, 1RU 19" shelf with AC/DC power supply and SNMP/CLI management interface	7010-173	MTS194-2400-4

Please Order pluggable SFP modules separately.

MTS170GE | Gigabit Ethernet L2 Switch

Main Feature

- Up to 28 x GE Ports Ethernet Switch
- 4 GE SFP/TX Combo ports
- 1U 19 inch rack
- IPv4 none blocking forward
- Bandwidth configuration and QoS, Q-in-Q features
- Ring Protection Switching per EAPS
- OAM Features per 802.3ah

Management Features

- Command Line Interface (CLI), SNMP v1,v2
- SSHv2,Telnet, FTP/TFTP
- Remote In-band Management
- Alarm: traps and dry-contact
- RADIUS & Syslog
- RMON: RFC2819 groups (Ethernet history, Alarm, and Event)
- Reports for customer validation
- Anti-DDOS attack

L2 Switching Capability

- Auto-negotiation for port speed and duplex mode Flow Control:
- IEEE 802.3x & Back-Pressure
- Spanning Tree Protocol:
  STP, RSTP, MSTP
- VLANs:
  4K IEEE 802.1Q VLANs
  Port-based VLAN
  Q-in-Q 802.1ad
- Link Aggregation:
  Static Trunk
  IEEE 802.3ad LACP
  Load Balancing: SA, DA, SA + DA, SIP, DIP, SIP+, DIP
  Trunk groups: 8 per group, max. 32 groups
- Multicast
  IGMP Snooping
  IGMP Proxy query

QoS Capability

- 4 Priority Queues
- Two levels of hierarchical scheduling policing parameters
- Priority Queues Scheduling Scheme:
  SP, WRR, WDRR, SP+WRR/WDRR
- Rate Limiting: 1Mbps per step
- UNI port Egress Policing: Per flow, EVC, UNI port
- Total number of flow: >1K
- L2-L4 Traffic classification and priority management based on:
  IEEE 802.1p
  IP Precedence/DSCP
  TCP/UDP port number
  IP Address
  MAC Adress

Product Specifications

MTS170-0424GE	
Port Density Port Configuration	Up to 28 24 x 1000BaseFX SFP ports, 4 GE TX/SFP combo ports
MTS170-2404GE	
Port Density Port Configuration	Up to 28 24 x 10/100/1000BaseT ports, 4 GE TX/SFP combo ports
MTS170-2404GE-8P	
Port Density Port Configuration	Up to 28 include 8 POE 24 x 10/100/1000BaseT ports, 4 GE TX/SFP combo ports
Ethernet Features	
QoS VLAN Support Supported VLANs MAC Address Buffer Link Aggregation STP	4 Queues, 2 scheduling/policing levels Port based tagging and QinQ. Policing/Shaping/Scheduling 4k 802.1Q 8k 64 Mb 802.3ad LACP STP, RSTP, MSTP
Network Management	
RMON Local Craft Remote Management Secure Configuration	RFC2819 group 1,2.3.9 RS232 (VT100) SNMPv.2, CLI SSHv2 (Secure Shell) terminal
Operating Conditions	
Power Supply Temperature Humidity Power Consumption	100 ~ 240VAC -10 to + 60 °C 5 to 85% non-condensing 60W /180W POE
Mechanical (1RU rack)	44mm × 442mm x 316mm (H x W x D)

Order Matrix

MTS170GE

Gigabit Carrier Ethernet L2 Switch

Description	Code	Model
MTS170-0424GE L2 switch, 24xGE SFP ports, with 4xGE combo RJ45 and optical SFP ports, SFP not included, 1RU 19" shelf with single AC/DC power supply and SNMP/CLI management interface	7010-170	MTS170-0424GE
MTS170-2404GE L2 switch, 24xRJ45 10/100/1000BaseT, with 4xGE combo RJ45 and optical SFP ports, SFP not included, 1RU 19" shelf with single AC/DC power supply and SNMP/CLI management interface	7010-171	MTS170-2404GE
MTS170GE-0802GE L2 switch, 8xRJ45 10/100/1000BaseT, with 2xGE SFP ports, SFP not included, 1RU 19" shelf with single AC/DC power supply and SNMP/CLI management interface	7010-172	MTS170-0802GE

Please Order pluggable SFP modules separately.

Opternus Networks
Tel.: 04532 - 20 44 - 100

ETS - A11/B11 | Gigabit Ethernet Demarcation

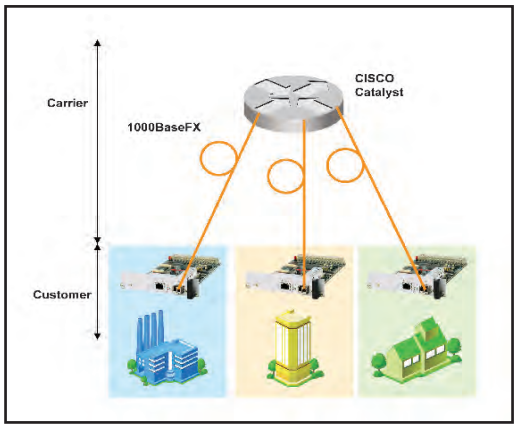
Terminating Carrier GE Service with Sophisticated Management

Main Features

| Managed FE/GE Ethernet media converter
| Fully compliant to 802.3ah for Status monitoring, Parameter configuration, Event trap notification and remote OAM loopback
| Support Far End Fault Indication (FEFI)
| Support Link Fault Pass Through (LFP)
| Support Jumbo Frame up to 9k
| Permanent remote in-band management
| Support Dying Gasp (in RA-T stand-alone chassis)
| Support Ethernet standards 802.3x for Flow Control, 802.3w for RSTP, 802.3xy for Pause Function, and 802.1q for VLAN Tag Transparency
| Compact 3U rack mount card for CATS chassis

Application Example 1

Service providers can adopt ETS-A11/B11 to provide Gigabit service to its customers. ETS-A11/B11 typically connects to a carrier switch such as Cisco Catalyst, within a distance up to 80 km. At customer end, ETS-A11/B11 provides copper connection to the customer's IP equipment. The management capability, the compact size, the interroperability between ETS-A11/B11 and major carrier switch, and the low cost are a few reasons that ETS-A11/B11 is the right solution for GE termination.



Order Matrix

ETS-B11

Gigabit Ethernet Media Converter

Description	Code	Model
Gigabit Ethernet media converter compliant to 802.3ah, 1 RJ45 port user link 10/100/1000BaseT, 1 fiber uplink 100M Fx	5008-004	ETS-A11/PS-3R
Gigabit Ethernet media converter compliant to 802.3ah, 1 RJ45 port user link 10/100/1000BaseT, 1 fiber uplink 1000M Fx	5008-005	ETS-B11/PS-3R

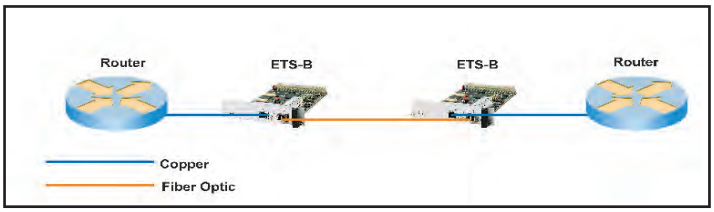
Order rack, chassis and pluggable SFP modules separately.

Product Specifications

Copper User Ports (RJ45)	ETS-A11/B11
Port density	1
Interface	10/100/1000BaseTx (full/half duplex)
Auto-Sensing	Yes
Auto-Crossing (MDI / MDIX)	Yes
Fiber Optic Line Ports (SFP)	
ETS-A11: Port density	1 x 100BaseFx
ETS-B11: Port density	1 x 1000BaseFx
Wavelength or Distance	Choose SFP separately
Single Fiber Solution	Support Bi-Directional SFP
Ethernet Features	
Bandwidth Limitation	Yes
Performance Monitoring	Yes
STP/RSTP	Yes
Supported MAC Addresses	> 8k
Jumbo Frame	> 9k
Compliant Standards	
10/100/1000 Base-Tx	IEEE 802.3, IEEE 802.3u, IEEE 802.3ab
OAM	IEEE 802.3ah
1000 Base-X	IEEE 802.3z
Flow Control	IEEE 802.3x
RSTP	IEEE 802.3w
Pause Function	IEEE 802.3xy
VLAN Tag Transparency	IEEE 802.1q
Network Management	
Ethernet Port	Telnet/SSH
Local Craft	RS232 (VT100) via Stand-alone RA-T-V only
User Interface	SNMPv.2, CLI, Web GUI
Secure Configuration	SSHv2 (Secure Shell) terminal
Mechanical	
Rackmount Card	3U
Card Dimension (mm)	30 x 130 x 190
Package Options	CPE or Plug-in to Racks
Platform	CATS
Density	See CATS1000/3000/5000
Power Consumption	< 4 W

Application Example 2

ETS-A11/B11 can work as a managed media converter for Gigabit Ethernet.

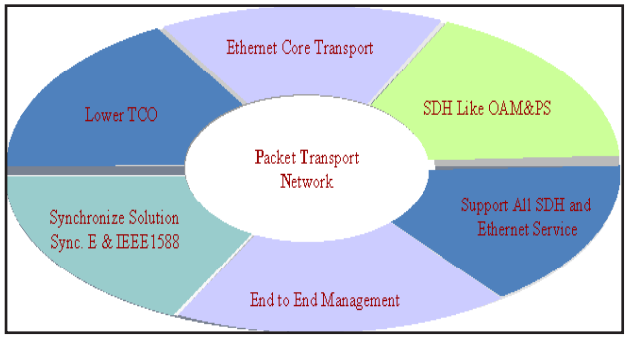


For more sophisticated carrier Ethernet features, please check CATS CMTS-GE , or MTS series carrier Ethernet switches .
Check *www.dowslakemicro.com* for the most updated Ethernet products and solutions.

PTN Service

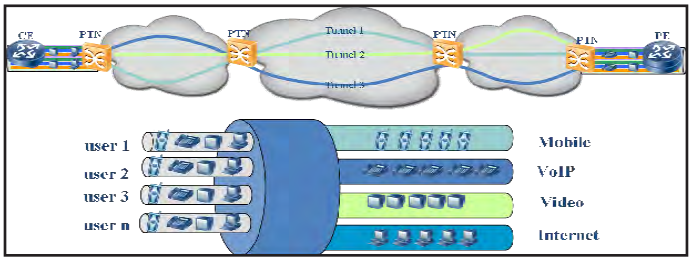
Packet Transport Network

Dowslake MTN seriees is a next--generation metro opti cal transmission product, which develooped from MPLS-TP technology. As communication networks began heading towards ALL IP and mobile backhaul services brought with growinng bandwidth requirements, the TDM--based tran sport network (grooming based on VC) have failed too keep pace with the increase demands in services scheduling and processing, banndwidth efficiency and massive bandwidth requirements. Thus, based on MPLS--TP/ T-MPLS technologies and traditional SDH/ MSTP OAM functionn, the Dowslake MTN adapts t o the requirement of data packet transmission and supports packet statistical multiplexing by kernel packet processing.



Dowslake MTN is applicable to multi-service environment and capable of accessing, converging and transportingg Ethernet, ATM and TDM services via PWE3 circuit emulation. The T-MPLS/MPLS-TP based PTN technology is designed for unified multi-service transport technoology. It not only permits networrk operators to provide carrier-class Ethernet services with standardized services, high reliability, flexible extension, strict QoS guarantees and perfect OAM sysstem, but also supports both TDM and ATM, inheriting SDH-orig ented GUI and end-to-end service configuration functions.

The Dowslake MTN is designed for unified multi-service transport technology and end-to-end management of IP services,, as well as a variety of SDH-like quick protections. It satisfiies the requirement of high-capacity ALL IP transmission networks and carrier-class metro transmission service for network operators and service providers. Dowslake MTN series provides an ideal platform for IP--based multti-service transmission network.



Dowslake MTN series be applied to access layer of the metro transport network by providing 8G sysstem capacity and interfaces for E1 up to 32 and for GE up to 6, FE up to 8 and FX up to 8. The transmission/acceess integration design can be applied to multi-service environment and effectively reduce capital and operational expenditures.

Opternus Networks
Tel.: 04532 - 20 44 - 100

MTN | PTN Service

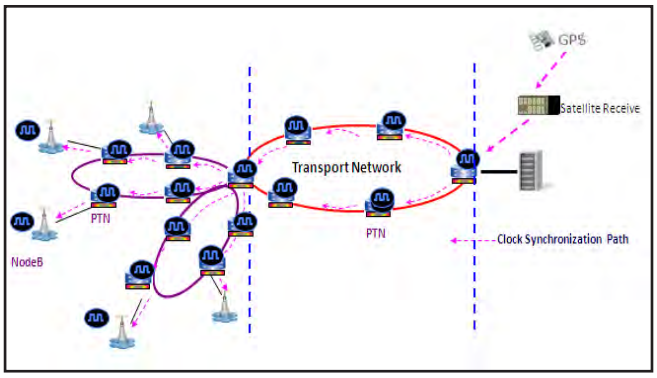
TDM over IP Transport, Packet Transfer Network

Main Features

- Redundant pluggable service card
- Support L2VPN (E-LINE/E-LAN/E-TREE), TDM CES, MPLS-TP
- QoS: Support DiffServ, including traffic classification, traffic policing,congestion management, Queue scheduling, traffic shaping, and support hierarchical QoS
- OAM:Support 3-layer OAM, PW OAM, LSP OAM and Section OAM
- Fault Mgmt:Support Y.1731, 802.3ah, 802.1ag
- Performance Mgmt:Support two-way delay measurement
- Hardware Protection:Support switch/Clock/Control/Power 1+1, E1 1+1 TPS
- Network Protection:Support LSP 1:1, SNCP, Wrapping, dual-home, MSP1+1/1:1, Protection time less than 50ms ; Support LAG
- Syncronization:Support TDM clock/1588v2/TDM CES clock/sync.E
- MEF 9,14,18 Certification ready

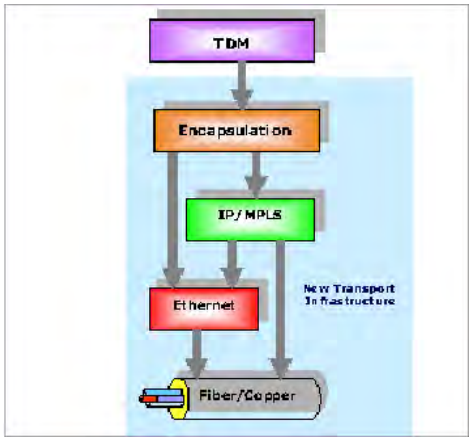
MTN series service optimized Ethernet Access solutions

Global competition forces operators to reduce OPEX and CAPEX. To address the issues, the market mega-trend is moving toward the ubiquitous transport networks by use of Ethernet to transport TDM, SONET and Packet. By supporting MPLS-TP and OAM(802.1ag, Y.1731), MTN are well positioned to the Packet Transport Network and are capable of dealing with cost-effective transport aggregation traffic for many high-speed access networks. E-LINE, E-LAN and E-Tree services in MTN can provide differentiated QoS and SLA assurance for Ethernet private line services. In addition, MTN significantly reduce OPEX by providing easy migration from legacy TDM to Ethernet networks with seamless support of SONET/SDH grooming, cross-connect and transport service. Cost-effective mixture of Ethernet and TDM traffic allows MTN to provide an agile platform for the deployment of point-to-point private line service for both TDM and Ethernet. MTN especially provides an ideal and cost-effective service for transporting SONET/SDH over Packet Transport Network.



Wireless backhaul solutions

Today's traffic in the wireless backhaul is steadily increasing by video and data traffic over the voice service network. Unfortunately current TDM based wireless backhaul capacity is hardly able to keep pace with the relevant bandwidth growth. On other hand, the ARPU (Average Revenue Per User) is not growing as much as bandwidth growth is. We believe that PTN is a unique solution to reduce OPEX and CAPEX for the wireless operators. Dowslake's MTN series provides seamless migration path from current legacy based radio access networks to full Carrier Ethernet Networks. MTN are the most compact but highly integrated Ethernet based radio access networks equipment in the world.



MTN is a flexible multi-service access switch which fit for various types of TDM and Ethernet multi-service line cards. The User Service modules are available for STM-1/OC-3, E1/T1 and Ethernet services. The MTN can locate as a small scale aggregation site for the wireless backhaul network. The compact design of MTN 4U height supports very low power consumption and saves space. The MTN offer a full scale of carrier class high availability with G.8032 ERPS (Ethernet Ring Protection). The ERPS function provides SONET level of protection within 50m seconds. In addition, the MTN offers carrier grade OAM features, such as 802.3ah, 802.1ag and Y.1731.generation either collectable via user-management interfaces CLI or SNMPv1/v2/v3.

Technical Specification

Mechanical Specification
- Management Interface: 1x10/100M RJ45
- Max Switching Capacity: 92G
- 6 Main Control & Service Slots

Total Ports in two service cards
- 10G Ports:10xXFP
- GE Ports: 96xSFP
- E1 Ports: 32xRJ45
- STM-1 Ports:36xSFP
- 2 FAN Module (FCM)
- 2 Main Switching Control Units

Power Supply
- DC Power: 40 to 60 VDC 1+1 Protection
- Power Consumption: 400W

Environmental Specifications
- Operating temp: -30~55℃
- Storage temp: -40~85℃
- Humidity: 0%~90% non-condensing

Demension
-4442×275×188 (4U) mm (WxDxH)

Management Specification
- Command line interface
- Protocols: SNMP V1/v2/v3, Telnet, SSH
- Radius

Regulatory Specifications
- CE and UL
- ETSI 300 019 class3.1
- FCC Part15 Class A, Part68
- NEBS level 3 compliance design

Clock Synchronization
- Adaptive Clock Recovery (ACR)
- Differential Clock Recovery (DCR)
- 1588v2 slave
- Individual clock mode of DS1/E1
- G.8261 Ether Sync

Software Specification

Ethernet Functions
- Ethernet Provider Bridging (802.1Q/802.1ad)

Services
- E-Line: EPL, EVPL
- E-LAN: Multipoint-tomultipoint
- E-Tree: Rooted multipoint
- TDM private line
- SONET/SDH Cross-connect

QoS Management
- Classification based on Port/MAC/VLAN/ EtherType/802.1p/IPv4 TOS and DSCP
- Per EVC Ingress metering, coloring shaping & policing
- trTCM
- 8 class of service queue
- Scheduling with Weighted random early detection (WRED)

Routing
- Static routing

MPLS Functions
- IETF PWE3 encapsulation
- MPLS label swap
- RSVP-TE
- LDP
- LSP Ping, traceroute
- PWE3 OAM (VCCV) ut

OAM functions
- 802.3ah link OAM
- 802.1ag Connectivity Fault Management (CFM)
- Y.1731 performance monitoringut

Resiliency
- G.8031 Linear protection
- G.8032 2010 Ring protection
- 802.3ad Link Aggregation
- 1:1 End-to-end service protection (50msec)
- SONET/SDH APS

PWE3 Specification

Packet encapsulation
- MEF 8, MPLS, UDP

Protocols
- SAToP (RFC4553)
- CESoPSN (RFC5086)
- RTP header
- ATM
  - UNI and IMA
  - One-to-One mode
  - N to One mode
  - AAL5 SDU
  - PVI/VCI Switching
  - Fault management(F4/F5)
- HDLC/PPP, ML/PPP
- Circuit Emulation over Packet (CEP)
- Ethernet Psuedowire (RFC 4448): Raw and tagged mode
- BFD/VCCV

Order Matrix

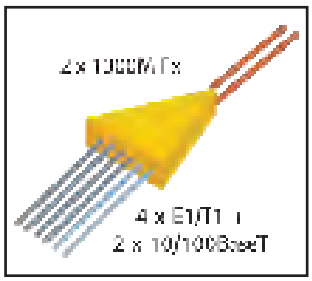
MTSN

Packet Transport Network

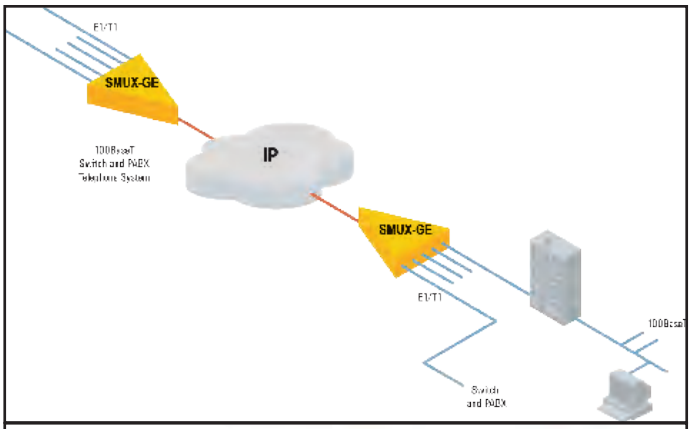
Description	Code	Model
MTN600XCTPS-A -Swtich+Control+Time+1*10GE XFP+4*GE SFP +2*STM-1+32*E1 -120 OHM -Service card, Need IP32 card for E1 port output.	230-170	MTN600
MTN500 Chassis with 19-inch mounting ears, 3 slots, support 62G switching+control+timing+16*GE	230-171	MTN500
MTN200 Chassis with 19-inch mounting ears, 2 slots	230-172	MTN200
MTN100 Box with 19-inch mounting ears -DB3 -120 OHM, 4*GE+4*FX+4*FE+16*E1	230-173	MTN100
MTN50 Box, 2*GE+4*FE+4*E1	230-174	MTN50

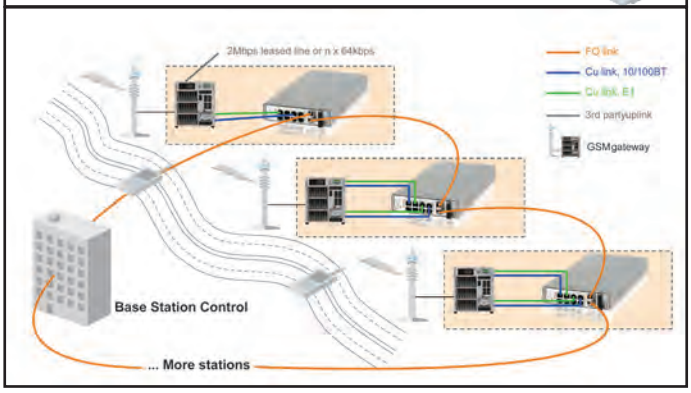
Please Order pluggable SFP modules separately.

SMUX-GE/FE | Gigabit Multiplexer for E1/T1 + FE



| Next generation Add/Drop multiplexer for 10/100M FE and E1/T1
| Trunk bandwidth 6 x 155M compared to popular MSPP equipment
| Supports 4G wireless networks for backhauling
| Point-to-point or RING
| Sub-50 ms Automatic Protection Switching
| Very small size



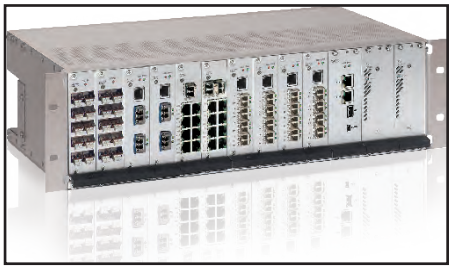


Example:
Using SMUX-GE for linear multi-service transport, or ring multi-service support for connecting GSM base stations with E1/T1 and Fast Ethernet

Product Specifications

| Optical multiplexer which can be used in E1/T1 and FE multi-service add/drop linear or ring networks
| Simultaneous voice and data transmission
| 4 x E1/T1 and 3 x 10/100BaseTx, 2x100/1000M Fx over Fiber Optic
| Single fiber transmission solution available
| Web based management and integrated performance management
| Pluggable optics for flexible transmission distance
| Stand-alone or rack-mount

Copper Ethernet Interfaces	
Ethernet	2 x 10/100BaseTx, auto negotiation
Connector	RJ45
Compliance	IEEE 802.3, IEEE 802.1Q
E1/T1 Interface Port	
E1/T1 Interface	4 x G.703
Connector	RJ45 Connector
Line Coding	HDB3 (E1), B8Z3, AMI (T1)
Output Impedance	120 Ohm balanced (E1), 100 Ohm (T1)
Jitter Performance	G.823, G.824, G.812 (type VI)
Compliance	G.703, G.704
Optical Interfaces	
SFP transcieiver	2 x SFP Pluggable, BiDi possible
Max Data Rate	SMUX-GE: 1000 Mbps with user settable bandwidth SMUX-FE: 100 Mbps with user settable bandwidth
	1 interface can be configured as client
Up to 10km	SM 1310nm
Up to 80km	SM 1550nm Grey or colored
Connector	LC
Features	
Management	CLI, SNMP, Web based GUI
Certifications	CE, UL,FCC, EN300-386 (B), EN60825-1
Operation Condition	
Humidity	10%-90% non-condensed
Operating Temperature	0 °C - 50 °C
Dimensions	
Rackmount Card	3U
Card Dimension (mm)	30 x 130 x 190
Package Options	CPE or Plug-in to Racks
Platform	CATS
Density	See CATS1000/3000/5000
Power consumption	<8W



10 x

Order Matrix

SMUX-GE/FE	Ethernet and E1/T1 Multi-Service Fiber Multiplexer

4 x E1/T1 and 10/100BaseTx over Fiber, without power supply

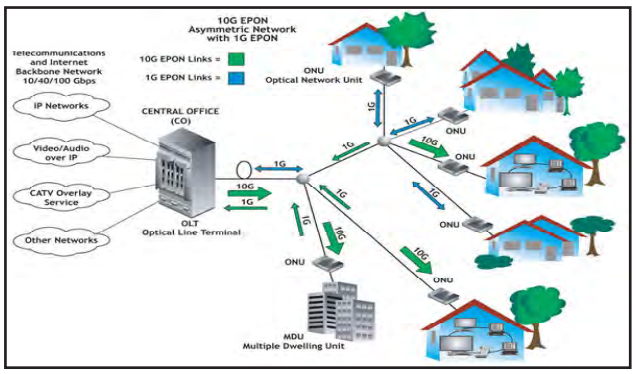
Description	Art. No.	Short Name
E1/T1 and GE fiber optic multiplexer 3U plug-in card	4637-006	SMUX-GE/PS-3R
E1/T1 and FE fiber optic multiplexer 3U plug-in card	4637-506	SMUX-FE/PS-3R

Order optical interface SFPs separately.

1 x

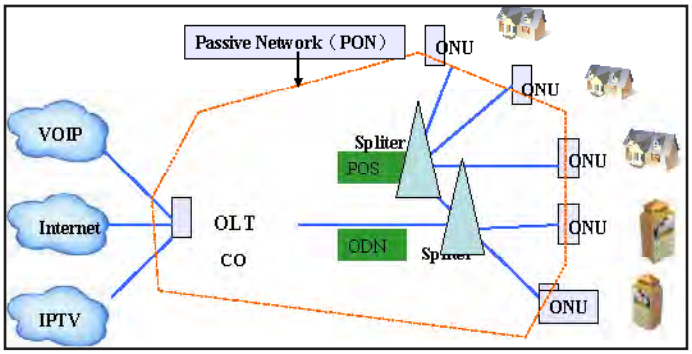
Dowslake MTE EPON/GPON Service

A passive optical network (PON) is a telecommunications network that uses point-to-multipoint fiber to the premises in which unpow ered optical splitters are used to enable a single optical fiber to serve multiple premises. A PON consists of an optical line terminal (OLT) at the service provider's central office and a number of optical network units (ONUs) near end users. A PON reduces the amount of fiber a nd central office equipment required compared with point-to-point architectures. A passive optical network is a form of fiber-optic access network.



A PON takes advantage of wavelength division multiplexing (WDM), using one wavelength for downstream traffic and another for up stream traffic on a single non-zero dispersion-shifted fiber (ITU-T G.652). BPON, EPON, GEPON, and GPON have the same basic wavelength plan and use the 1,490 nanometer (nm) wavelength for downstream traffic and 1,310 nm wavelength for upstream trafic. 1,550 nm is reserved for optional overlay services, typically RF (ana log) video.

PON ensure that the transmission distance of 10-20 KM in the case of high-bandwidth, completely overcome the limitations of Ethernet and xDSL technologies in the distance and bandwidth, more flexible deployment of access solutions.



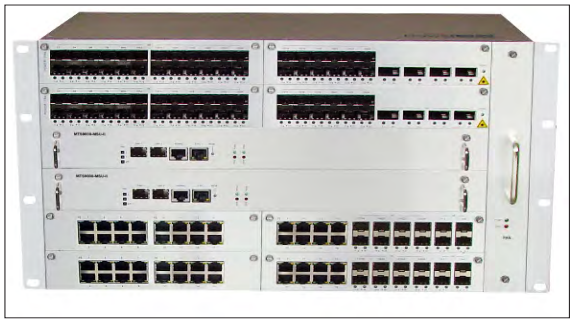
Dowslke PON adventage:
Provide long-distance high-bandwidth access;
Save a lot of fiber and optical transceivers, and reduce costs;
Active devices in the network, high reliability and significantly reduce maintenance costs;
PON network structure can be used as a video broadcast transmis sion network;

Opternus Networks
Tel.: 04532 - 20 44 - 100

MTE9000 | xPON/L2&L3 Switching
EPON, GPON, 10G EPON All In One Solution,High Density xPON Platform

Main Feature

- Modularized design with 1.6Tbps high density and large capacity easy for expansion and upgrade.
- Support IPv4/v6 L2/L3 switching,static routes,RIP,OSPFv3, BGPv4,IS-IS.
- Redundant Main Control Unit and Power Supply
- Hitless Protection System (HPS) secures the high reliability
- Up to 32 10G EPON ports with ratio of 1:128.
- Up to 32 GPON ports with ratio of 1:128.
- Support various interface types including GE, 10GE, xPON.
- Support CTC2.0/2.1, automatically detects and works harmoniously with ONUs made by different manufacturers.
- Support 802.3ah OAM.



Overview

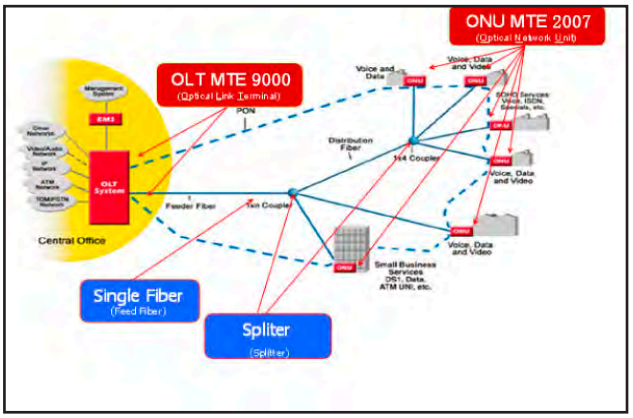
Dowslake MTE9000 series are designed for high-density access switching integrated platform which combine multi-service and high-density 10G xPON OLT requirement, they are deployed for high-density xPON OLT as carrier broadband access network.

MTE9000 series have the unique half-size slot service cards for the highest density EPON/GPON/10GE/10GEPON port and terabit switching net can provide the ability of 40/100G future upgrade switching and smooth upgrade access platform.

MTE9000 series have the first innovation processing architecture with fully distributed based on 64-bit multi-core processors and high performance AISC. They can provide IPv4/IPv6 wire-speed transferring capacity and be widely used on the IP MANs of carriers, WANs and MANs of enterprises, egress, core layer, and convergence layer of enterprise

Application Example

GEPON is a point to multipoint, fiber to the premises network architecture in which unpowered optical splitters are used to enable a single fiber to serve multiple premises, typically 16~64. It consists of OLT, ODN, ONU, etc. The downstream signals are broadcast to all premises sharing a single fiber, while upstream signal are using TDMA technology.



L2 Switching Capability

- Auto-negotiation for port speed and duplex mode Flow Control:
- IEEE 802.3x & Back-Pressure
- EAPS/ERPS 50ms Ring protection
- Spanning Tree Protocol:
  IEEE 802.1D Spanning Tree Protocol (STP)
  IEEE 802.1w Rapid Spanning Tree Protocol (RSTP)
  IEEE 802.1s Multiple Spanning Tree Protocol (MSTP)
- VLANs:
  4K IEEE 802.1Q VLANs,Port-based VLAN,Q-in-Q 802.1ad Vlan stacking,Inner tag translation
- Link Aggregation:
  Static Trunk,IEEE 802.3ad LACP,
  Load Balancing: SA,DA,SA+DA,SIP,DIP,SIP+, DIP
- Multicast
  IGMP Snooping, IGMP Proxy query
- DHCP
  DHCP Relay, DHCP Option 82,DHCP Server,DHCP Snooping
- Mirror
  Port Mirror, Remote Mirror
- Management
  Console,CLI,WEB,SNMPv1/v2/v3,Out of Band
  Radius,TACACS+,Syslog,FTP/TFTP,NTP client,AAA Authentication

QoS Capability

- 8 Priority Queues
- Two levels of hierarchical scheduling policing parameters:
  CIR, PIR, CBS, EBS
- Priority Queues Scheduling Scheme:
  SP, WRR, WDRR, SP+WRR/WDRR
- QoS&Ratelimiting Policing: Per flow, EVC, VLAN, UNI port
- Traffic classification and priority management based on:
  IEEE 802.1p COS
  IP Precedence/DSCP TOS
  TCP/UDP port number
  IP Address
  Mac Address
  Ethernet Type
  C-VLAN
  RFC 2698 and MEF specs 10 marker (colors)

L3 Routing Capability

- Comprehensive IPv4 unicast routing support
  Static, RIP, OSPF, IS-IS, BGP-4 support
  8-path Equal Cost Multipath (ECMP)
  Support IPv4 multicast protocols PIM-DM,PIM-SM, PIM-SSM
  IGMP v2/v3 routing and snooping support
- IPv6 support
  ICMPv6,DHCPv6,ACLv6,Configured Tunnel,6to4 tunnel
  OSPFv3, BGPv4,PIM-SMv6,PIM-DMv6,PIM-SSMv6,
  MLDv2/MLDv2 Snooping
- Hardware-based Layer 3 and Layer 2 ACLs
  Hardware-based receive ACLs
- Security capabilities:
  Port-based network access control using 802.1x or MAC
- Port security
  Root guard and BPDU guard
  Broadcast, multicast and unknown unicast rate limits
  ARP Inspection for static entries

Product Specifications

Expanded slot	MTE9000-8: 2 slots for the Main Switching Unit 8 service card or uplink slots MTE9000-4: 2 slots for the Main Switching Unit 4 service card or uplink slots
Switching Capacity	MTE9000-8: 1.6 Tbps MTE9000-4: 960 Gbps
Wavelength of PON port	GPON/EPON: Downstream1490nm; upstream 1310nm 10G EPON: 10G Downstream 1577nm,upstream 1270nm; 1G Downstream1490nm; upstream 1310nm
Rate	GPON: Downstream: 2.5G; upstream 1.25G 10G EPON: Downstream: 1G/10G; upstream 1G/10G
Average Transmit power of the PON port Receving Sencitivity	GPON: Tx: 0~+5dBm RX:-29dBm 10G EPON: TX:+2~+7dBm RX: -29dBm
MAC table	32K
ARP table	8K
ACL table	4K per card
VLAN table QinQ table	4096 4096
Routing table	12K per card
Multicast Routing table	12K per card
IGMP Snooping table	1K per card
Port Queue	8 per port
Link Aggregation Group	32
DBA bandwidth control	1K step
Operating temperature Relative Humidity	0°C~60°C 10%~85% no condensation
Storage temperature Relative Humidity	-40°C~80°C 5%~95% no condensation
Power Supply characteristics	AC power: 200-240VAC, 50/60 Hz DC power: -48V
Physical size (H*D*W)	442mm×176mm×420mm 442mm×310mm×420mm
Power consumption	300W/680W
Certification	CE

Order Matrix

MTE9000 xPON/L2&L3 Switching Service

Description	Code	Model
MTE9000-04 Modular EPON OLT chassis (6 slots, including 2 MSU slot and 4 network module slots, Power supply not include, Max support 2)	7020-140	MTE9000-04
MTE9000-08 Modular EPON OLT chassis (10 slots, including 2 MSU slot and 8 network module slots, Power supply not include, Max support 2)	7020-141	MTE9000-08
MTE9000 Power Supply, AC 100-240V, Max 750W	7020-142	MTE9000-PWR-2AC
MTE9000 Power Supply, DC 48V, Max 750W	7020-143	MTE9000-PWR-2DC
Main Switching Unit I for MTE9000-04	7020-144	MTE9000-MSU-I
Main Switching Unit II for MTE9000-08	7020-145	MTE9000-MSU-II
8 port OLT EPON+4 port GE SFP + 2 port GE TX Service Card(the price is w/o SFP)	7020-146	MTE9000-8EPON-6GE
4 port OLT 10G EPON XFP + 4 port Ethernet 10G SFP+ Service Card(the price is w/o SFP)	7020-147	MTE9000-4TEPON-4TE
8 port OLT GPON +8 port GE SFP card(the price is w/o SFP)	7020-148	MTE9000-8GPON-8GE
4 port 10G SFP+ L2/L3 switching Card	7020-149	MTE9000-4TE-SFP+
8 port 10G SFP+ L2/L3 switching Card	7020-150	MTE9000-8TE-SFP+
24 port GE SFP L2/L3 Switching Card	7020-151	MTE9000-24GE-SFP
24 port 10/100/1000M TX L2/L3 Switching Card	7020-152	MTE9000-24GE-TX

Please Order pluggable SFP/XFP separately.

MTE3800 | GPON OLT 16xGPON + 8xGE + 2x10G Uplink

Main Feature

- 1.5RU design with 8 GPON and 16 GE ports
- Support 2x10G uplink, Switching Capacity 102Gbps
- Support L2/L3 switching,static routes, RIP,OSPF,BGP.
- Support IPv6 Routing
- Redundant Power Supply
- Each GPON port has a maximum optical coupling ratio of 1:128
- Support CTC2.0/2.1, automatically detects and works harmoni ously with ONUs made by different manufacturers.
- Support 802.3ah OAM.

Main Strengths

MTE3800 OLT provides 8 downstream GPON ports, 8 uplink GE optical port and 8 GE electrical ports, with an expansion slot, which can access 2 10GE SFP+ ports. The 1U height can be easy installed and maintained to save space. The MTE3800 adopts the industrial advanced technology, with powerful Ethernet services and QoS feature, supporting SLA and DBA. The splitting ratio up to 1:128, supporting different types of ONU in different networks, minimizing operators' investments.

QoS guarantee for multi-services: The QoS mechanism, based on ITU-T Y.1291, is supported, including priority labeling, queue schedule, flow shaping, congestion limit and cache management. Different users and services have different delays, jitters, guaranteed bandwidths and maximum bandwidths, and the DBA mechanism is supported so that the uplink bandwidth of each ONU can be distributed and limited.

Unified and versatile network management system: The network management system is service oriented and it provides the un fied network transmission and networking protocol, address management, domain management, security management, user access
management and so on. It has rich OAM functions such as co figuration, alarm, performance monitoring, trouble isolation and security management.

GPON Features

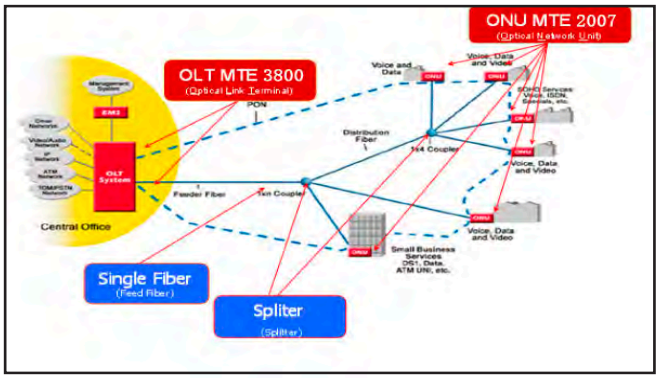
- Satisfy ITU -T standard
- TR-101 compliant solution for FTTx OLT applications
- High splitter rate, each PON port supports 64*ONU ,96*T-CONT
- Maximum transmission distance of 20KM
- Support uplink FEC, downlink FEC(Forward Error Correction)
- ONU identifier authentication :SN /SN+PASSWD
- Bandwidth allocation mechanism
- 5 types of T-CONT bandwidth
- Static Bandwidth Allocation
- Dynamic Bandwidth Allocation
- GPON feature parameter
  4096 port-IDs per GPON MAC (Downstream and Upstream)
  1024 Alloc -IDs per GPON MAC (Upstream)

L2 Switching Capability

- Auto-negotiation for port speed and duplex mode Flow Control:
- IEEE 802.3x & Back-Pressure
- EAPS/ERPS 50ms Ring protection
- FlexLink dual homing 50ms protection
- Spanning Tree Protocol:
  IEEE 802.1D Spanning Tree Protocol (STP)
  IEEE 802.1w Rapid Spanning Tree Protocol (RSTP)
  IEEE 802.1s Multiple Spanning Tree Protocol (MSTP)
- VLANs:
  4K IEEE 802.1Q VLANs,Port-based VLAN,Q-in-Q 802.1ad Vlan stacking,Inner tag translation
- Link Aggregation:
  Static Trunk,IEEE 802.3ad LACP,
  Load Balancing: SA,DA,SA+DA,SIP,DIP,SIP+, DIP
- Multicast
  IGMP Snooping, IGMP Proxy query
- DHCP
  DHCP Relay, DHCP Option 82,DHCP Server,DHCP Snooping
- Mirror
  Port Mirror, Remote Mirror
- Management
  Console,CLI,WEB,SNMPv1/v2/v3,Out of Band
  Radius,TACACS+,Syslog,FTP/TFTP,NTP client,AAA Authentication

Application Example

GPON is a point to multipoint, fiber to the premises network architecture in which unpowered optical splitters are used to enable a single fiber to serve multiple premises, typically 16~64. It consists of OLT, ODN, ONU, etc. The downstream signals are broadcast to all premises sharing a single fiber, while upstream signal are using TDMA technology.



L3 Routing Capability

- Comprehensive IPv4 unicast routing support
  Static, RIP, OSPF, IS-IS, BGP-4 support
  8-path Equal Cost Multipath (ECMP)
  Support IPv4 multicast protocols PIM-DM,PIM-SM, PIM-SSM
  IGMP v2/v3 routing and snooping support
- IPv6 support
  ICMPv6,DHCPv6,ACLv6,Configured Tunnel,6to4 tunnel
  OSPFv3, BGPv4,PIM-SMv6,PIM-DMv6,PIM-SSMv6,
  MLDv2/MLDv2 Snooping
- Hardware-based Layer 3 and Layer 2 ACLs
  Ability to bind multiple ACLs to the same port
  Hardware-based receive ACLs
- Security capabilities:
  Port-based network access control using 802.1x or MAC
- Port security
  Root guard and BPDU guard
  Broadcast, multicast and unknown unicast rate limits
  ARP Inspection for static entries

QoS Capability

- 8 Priority Queues
- Two levels of hierarchical scheduling policing parameters:
  CIR, PIR, CBS, EBS
- Priority Queues Scheduling Scheme:
  SP, WRR, WDRR, SP+WRR/WDRR
- QoS&Ratelimiting Policing: Per flow, EVC, VLAN, UNI port
- Traffic classification and priority management based on:
  IEEE 802.1p COS
  IP Precedence/DSCP TOS
  TCP/UDP port number
  IP Address
  Mac Address
  Ethernet Type
  C-VLAN
  RFC 2698 and MEF specs 10 marker (colors)

Product Specifications

GPON Port	8 x GPON ports
Ethernet Port	8xGE SFP ports, 8x10/100/1000 TX ports up to 2x10G SFP+ expand
Management port	1xRJ45 console port 1x10/100M TX Management port
Wavelength of PON port	Downstream1490nm; upstream 1310nm
Rate	upstream 1.25G; downlstream: 2.5G
Average Transmit power of the PON port B+ Receving Sencitivity	0~+5dBm <-29dBm
Throughput	75.88 Mpps
MAC table	32K
ARP table	8K
ACL table	4K
VLAN table QinQ table	4K 4K
Routing table	12K
Multicast Routing table	12K
IGMP Snooping	1K
Port Queue	8 per port
Link Aggregation Group	32
DBA bandwidth control	1K step
Operating temperature Relative Humidity	0°C~60°C 10%~85% no condensation
Storage temperature Relative Humidity	-40°C~80°C 5%~95% no condensation
Power Supply	2x pluggable DC48 V or AC220V 47-63Hz
Physical size (H*D*W)	440mm×380mm×44mm
Power consumption	80W
Certification	CE

Order Matrix

MTE3800 GPON Service

Description	Code	Model
OLT MTE300 with 8 GPON ports (1 console port, 1 x10/100M MGMT port, 8 fixed PON ports, OLT SFP optical module not include), 8xGE SFP,8x10/100/1000 TX, 2x 10G SFP+ uplink,1xAC90-264V power supply,19-inch cabinet shape)	7020-144	MTE3800-8
MTE3800 2x10G SFP+ uplink card	7020-145	MTE3800-2TE
MTE3800 AC Power supply, 100-240V AC	7020-146	MTE3800-PWR-AC
MTE3800 DC Power supply, 36-72V DC	7020-147	MTE3800-PWR-DC

Please Order pluggable SFP/XFP separately.

Opternus Networks
Tel.: 04532 - 20 44 - 100

MTE3600 | GEPON OLT 16xEPON + 8xGE+2x 10G Uplink

Main Feature

| 1.5RU design with 8/16 PON and 8 GE ports
| Support 2x10G uplink, Switching Capacity 88Gbps
| Support L2/L3 switching,static routes, RIP,OSPF,BGP.
| Redundant Power Supply
| Each EPON port has a maximum optical coupling ratio of 1:64,
| Up to 512 ONUs by 1:32 at 20km transmission distance.
| Support CTC2.0/2.1, automatically detects and works harmoni ously with ONUs made by different manufacturers.
| Support 802.3ah OAM.

Main Strengths

Powerful and flexible network construction mode: Between any two PON ports of MTE3600 OLT series, the redundancy of the backbone optical fiber is supported and the switchover time is less than 50ms. At the same time, MTE3600 OLT series supports to establish RSTP and EAPS between SNIs and the switchover time is less than 50ms. Additionally it can work together with ONUs to construct the bus or tree networktopology with hand-in-hand protection.

EPON transmission network: The optical fiber is used as the transmission media and there is no source in the whole tran mission, so it runs stably and reliably. The bidirectional high-bandwidth services can be realized on a single fiber with a downlink/uplink rate of 1.25Gbps. The EPON network supports the multi-level prismatic bus topology which is suitable to the structure of the power lines of the distribution network.

QoS guarantee for multi-services: The QoS mechanism, based on ITU-T Y.1291, is supported, including priority labeling, queue schedule, flow shaping, congestion limit and cache management. Different users and services have different delays, jitters, guaranteed bandwidths and maximum bandwidths, and the DBA mechanism is supported so that the uplink bandwidth of each ONU can be distributed and limited.

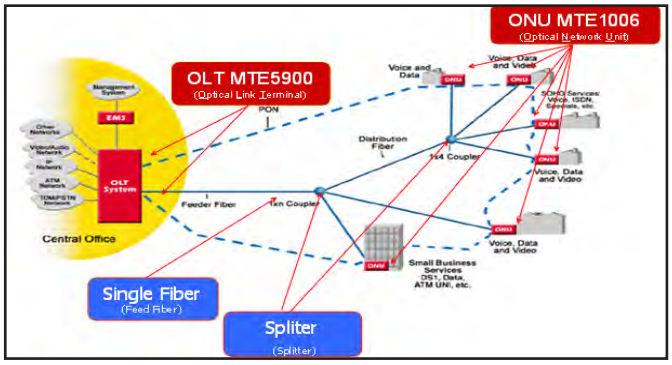
Unified and versatile network management system: The network management system is service oriented and it provides the un fied network transmission and networking protocol, address management, domain management, security management, user access
management and so on. It has rich OAM functions such as co figuration, alarm, performance monitoring, trouble isolation and security management.

L2 Switching Capability

- Auto-negotiation for port speed and duplex mode Flow Control:
- IEEE 802.3x & Back-Pressure
- EAPS/ERPS 50ms Ring protection
- Spanning Tree Protocol:
  IEEE 802.1D Spanning Tree Protocol (STP)
  IEEE 802.1w Rapid Spanning Tree Protocol (RSTP)
  IEEE 802.1s Multiple Spanning Tree Protocol (MSTP)
- VLANs:
  4K IEEE 802.1Q VLANs,Port-based VLAN,Q-in-Q 802.1ad Vlan stacking,Inner tag translation
- Link Aggregation:
  Static Trunk,IEEE 802.3ad LACP,
  Load Balancing: SA,DA,SA+DA,SIP,DIP,SIP+, DIP
- Multicast
  IGMP Snooping, IGMP Proxy query
- DHCP
  DHCP Relay, DHCP Option 82,DHCP Server,DHCP Snooping
- Mirror
  Port Mirror, Remote Mirror
- Management
  Console,CLI,WEB,SNMPv1/v2/v3,Out of Band
  Radius,TACACS+,Syslog,FTP/TFTP,NTP client,AAA Authentication

Application Example

GEPON, short for Gigabit Ethernet Passive Optical Network, is a point to multipoint, fiber to the premises network architecture in which unpowered optical splitters are used to enable a single fiber to serve multiple premises, typically 16~64. It consists of OLT, ODN, ONU, etc. The downstream signals are broadcast to all premises sharing a single fiber, while upstream signal are using TDMA technology.



L3 Routing Capability

- Comprehensive IPv4/v6 unicast routing support
  Static, RIP, OSPF, IS-IS, BGP-4 support
  Support for VRRP
  8-path Equal Cost Multipath (ECMP)
  Support IPv4/v6 multicast protocols include PIM-DM,PIM-SM, PIM SSM
  IGMP v2/v3 routing and snooping support
- Hardware-based Layer 3 and Layer 2 ACLs
  Ability to bind multiple ACLs to the same port
  Hardware-based receive ACLs
- Security capabilities:
  Port-based network access control using 802.1x or MAC
- Port security
  Root guard and BPDU guard
  Broadcast, multicast and unknown unicast rate limits
  ARP Inspection for static entries

QoS Capability

- 8 Priority Queues
- Two levels of hierarchical scheduling policing parameters:
  CIR, PIR, CBS, EBS
- Priority Queues Scheduling Scheme:
  SP, WRR, WDRR, SP+WRR/WDRR
- QoS&Ratelimiting Policing: Per flow, EVC, VLAN, UNI port
- Traffic classification and priority management based on:
  IEEE 802.1p COS
  IP Precedence/DSCP TOS
  TCP/UDP port number
  IP Address
  Mac Address
  Ethernet Type
  C-VLAN
  RFC 2698 and MEF specs 10 marker (colors)

Product Specifications

EPON Port	8/16 xPON ports
Ethernet Port	8xGE TX/SFP combo ports up to 2x10G expand
Management port	1xRJ45 console port 1x10/100M TX Management port
EPON Standard	Support IEEE 802.3ah EPON standards Support Hardware/Software DBA&SLA algorithm Manual/Automatic Authentication AES 128bit Encription
Wavelength of PON port	Downstream1490nm; upstream 1310nm
Rate	Symmetric uplink and downlink: 1.25G
Average Transmit power of the PON port Receving Sencitivity	+2dbm ~ +7dbm - 6dbm ~ - 27dbm
Protection	Support backbone optical-fiber protection, "1+1" hand-in-hand protection, full protection, switchover delay of less than 50ms.
MAC table	32K
ARP table	8K
ACL table	4K
VLAN table QinQ table	4K 4K
Routing table	12K
Multicast Routing table	12K
IGMP Snooping	1K
Port Queue	8 per port
Link Aggregation Group	32
DBA bandwidth control	1K step
Operating temperature Relative Humidity	0°C~60°C 10%~85% no condensation
Storage temperature Relative Humidity	-40°C~80°C 5%~95% no condensation
Power Supply	2x pluggable DC48 V or AC220V 47-63Hz
Physical size (H*D*W)	44mm×315mm×482mm
Power consumption	50W
Certification	CE

Order Matrix

MTE3600 GEPON Service

Description	Code	Model
OLT MTE3608 with 8 PON ports (1 console port, 1 x10/100M MGMT port, 8 fixed PON ports, OLT SFP optical module not include), 8xGE TX/SFP combo ports, 2x 10G SFP+ uplink,1xAC90-264V power supply,19-inch cabinet shape)	7020-144	MTE3608-2
OLT MTE3616 with 16 PON ports (1 console port, 1 x10/100M MGMT port, 16 fixed PON ports, OLT SFP optical module not include), 8xGE TX/SFP combo ports, 2x 10G SFP+ uplink,1xAC90-264V power supply,19-inch cabinet shape)	7020-145	MTE3616-2
MTE3600 AC Power supply, 100-240V AC	7020-146	MTE36-PWR-AC
MTE3600 DC Power supply, 36-72V DC	7020-147	MTE36-PWR-DC

Please Order pluggable SFP/XFP separately.

Opternus Networks
Tel.: 04532 - 20 44 - 100

MTE2507 | 4GE+2POTS+WiFi GPON Home Gateway

Main Feature

- 2.5G downstream and 1.25G upstream GPON transmission rate, efficient bandwidth usage and Ethernet services
- Support VoIP, WiFi 802.11b/g/n
- Supports T-CONT and DBA
- Support IGMP multicast and efficiently utilize the bandwidth
- Ethernet looping detection, automatically check the network looping interrupted, and resume the network when the looping disappeared
- Remote loopback and remote diagnostic of the network state
- Rich OAM function designs, including the configuration, alarm, performance monitoring, fault separation and security management

Product Specifications

PON	LLID Registration Encription AES 128bit 802.3ah OAM Discovery, OAM Loopback test DBA, T-CONT
WAN Connection	PPPoE, DHCP Client, Static, DHCP Option 60, IPv4/IPv6
IP NAT	IP translation, Port translation ALG (port forwarding) DMZ, VPN, DDNS
VLAN	802.1Q VLAN, tag/untag/Trunk
Storm Control	Broadcast, Multicast, Unknown unicast
QoS	MAC ACL, IP ACL Flow classify: ip acl, vlan, dscp, cos, ethernet type QoS action: drop,forward,cos,dscp,rate-limit SP, WRR, SP+WRR 802.1P CoS queue mapping Port Mirror
Fire Wall	Anti-DDOS, URL Filter, Key Filter Block ICMP, Telnet, SSH, TFTP/FTP
DHCP	IPv4/v6 DHCP server IPv4/v6 DHCP Client DHCP Option 60
L3 Routing	Rip v1/v2 Static
WLAN	802.11b/g/n, WEP/WPA/WPA2, 4 SSID, WDS, MAC filter On/Off Push Button, WPS Push Button
VoIP	SIPv2 Codec G.711, G.723.1, G.729 EC (Echo Canceler),MAX 128ms High/Low speed pass-through or T.38 FAX RFC2833 and redundant RFC2833, MD5 authentication Hot-line, call transfer, alarm clock, Abbreviated dialing 3-way meeting GR909 line detection
Management	Web GUI/ Telnet , User / Supervisor Privilege TR069 firmware/config auto upgrade TR069 Performance Monitoring Dying Gasp USB, NTP ,Syslog, TFTP/FTP, ONU alarm information

Hardware Specifications

Hardware and Interface	1 GPON interface 4 Gigabyte Ethernet LAN port(10/100/1000M Base-T) 2 FXS 1 WiFi 1 Power Supply port 1 Reset to Factory Default Button
GPON SFP Rcv Sencitivity GPON SFP Transmit Power	-3 ~ -28dbm 1 ~ 5dbm
Wavelength	Upstream 1310nm, Downstream 1490nm
Distance	20km at 1:64
VLAN table	4K
MAC table	4K
ACL table	1K
Port Queue	4 queue per port
DBA	1K bit/s step
Ratelimit	64K bit/s step
Environment requirements	Operation condition: 0°C-45°C; 10%-90% no condensation Storage condition: -40°C-80°C; 5%-95% no condensation
Power Supply	External Power adapter Input voltage: 110V~240V, 50Hz ±5% Output voltage: 12V, 1.5A Over-current protection and overvoltage protection Power consumption: Up to 10W
EMC	CE certification
Demension	200.0 mm(W) x 150 mm(D) x35 mm(H)

Order Matrix

MTE 2507

GPON ONT

Description	Code	Model
Desktop ONT, 1 PON interface (SC), 4 GE ports, 2 VoIP ports,WiFi 802.11b/g/n, plastic hull, AC220V, External Power adapter	7030-193	MTE2507

Please Order pluggable SFP modules separately.

MTE1507RF | 4GE+2POTS+WiFi+CATV RF EPON Home Gateway

Main Feature

- Symmetric uplink/downlink 1Gbps PON transmission rate, effi cient bandwidth usage and Ethernet services, helping carriers to provide reliable services to their users.
- Support VoIP, WiFi and CATV RF
- Supports SLA and DBA
- Support IGMP multicast and efficiently utilize the bandwidth
- Ethernet looping detection, automatically check the network looping interrupted, and resume the network when the looping disappeared
- Remote loopback and remote diagnostic of the network state
- Rich OAM function designs, including the configuration, alarm, performance monitoring, fault separation and security management

Product Specifications

PON	MAC Registration, LLID Registration Encription AES 128bit 802.3ah OAM Discovery, OAM Loopback test DBA&SLA
WAN Connection	PPPoE, DHCP Client, Static, DHCP Option 60, IPv4/IPv6
LAN	Automatic speed detection / Full /haft duplex / all port MDI & MDIX
IP NAT	IP translation, Port translation ALG (port forwarding) DMZ, VPN, DDNS Automatic discovered and authorized, plug and play
VLAN	802.1Q VLAN, tag/untag/Trunk
Storm Control	Broadcast, Multicast, Unknown unicast
Multicast	IGMP, IGMP snooping, MLD snooping
QoS	MAC ACL, IP ACL Flow classify: ip acl, vlan, dscp, cos, ethernet type QoS action: drop,forward,cos,dscp,rate-limit SP, WRR, SP+WRR 802.1P CoS queue mapping Port Mirror
Fire Wall	Anti-DDOS, URL Filter, Key Filter Block ICMP, Telnet, SSH, TFTP/FTP
DHCP	IPv4/v6 DHCP server IPv4/v6 DHCP Client DHCP Option 60
L3 Routing	Rip v1/v2 Static
WLAN	802.11b/g/n, WEP/WPA/WPA2, 4 SSID, WDS, MAC filter On/Off Push Button, WPS Push Button
VoIP	SIPv2 Codec G.711, G.723.1, G.729 EC (Echo Canceler),MAX 128ms High/Low speed pass-through or T.38 FAX RFC2833 and redundant RFC2833, MD5 authentication Hot-line, call transfer, alarm clock, Abbreviated dialing 3-way meeting GR909 line detection
Management	Web GUI/ Telnet , User / Supervisor Privilege TR069 firmware/config auto upgrade TR069 Performance Monitoring Dying Gasp USB, NTP ,Syslog, TFTP/FTP, ONU alarm informatio

Hardware Specifications

Hardware and Interface	1 GEPON interface (SC/APC) 4 Gigabit Ethernet LAN port(10/100/1000M Base-T) 2 POTS 1 WiFi 1 CATV RF 1 Power Supply port 1 Reset to Factory Default Button
PON SFP Rcv Sencitivity PON SFP Transmit Power	-8 ~ -24db -1 ~ 4db
Wavelength	Upstream 1310nm, Downstream 1490nm
Distance	20km at 1:32 , 10km at 1:64
VLAN table	4K
MAC table	4K
ACL table	1K
Port Queue	4 queue per port
DBA	1K bit/s step
Ratelimit	64K bit/s step
Environment requirements	Operation condition: 0°C-50°C; 10%-90% no condensation Storage condition: -40°C-80°C; 5%-95% no condensation
CATV RF	Connector: 75Ω Wavelength: 1550nm Bandwidth: 47Mhz ~ 870Mhz Output Level: 77dBuV Output Return Loss: 14db
Power Supply	External Power adapter Input voltage: 110V~240V, 50Hz ±5% Output voltage: 12V, 1.5A Over-current protection and overvoltage protection Power consumption: Up to 10W
EMC	CE certification
Demension	200.0 mm(W) x 150 mm(D) x35 mm(H)

Order Matrix

MTE 1507RF

EPON ONU

Description	Code	Model
Desktop ONU, 1 PON interface (SC), 4 GE ports, 2 VoIP ports,WiFi 802.11b/g,1 CATV RF port, plastic hull, AC220V, External adapter	7020-193	MTE1507RF

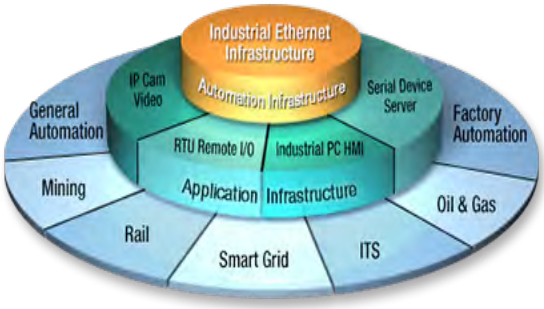
Please Order pluggable SFP modules separately.

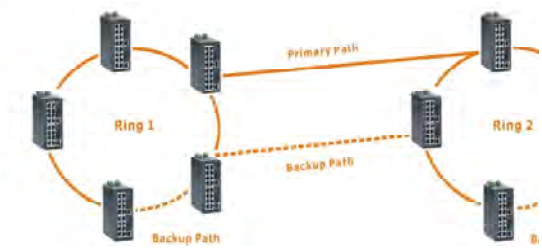
Dowslake Industrial Switch

MTS10 series switches are rail track management Industrial switch, which are designed for the Industrial automation fields include electronic field, coal Industry, traffic field, etc. They can work stable in the harsh environment. The basic specifications of this series products are including 0~4 Gigabit ports and 4~8 100base-tx ports, some models have 4 ports 100base-fx and some models support IEEE802.3af POE(-P+ support IEEE802.3AF/AT POE+) for optional.

MTS10 series Industrial switches support MSTP/RSTP/STP (IEEE 802.1S/W/D) and private EAPS, and can build Quich-Ring and Quick-Chain technology (recovery time < 20 ms) to protect the data transmission's safety. Except that, this series switches are also obtaining abundant management functions which include: Modbus/ TCP, LLDP, SNMP Inform, QoS, IGMP snooping, VLAN, IEEE 802.1X, HTTPS, SNMPv3, and SSH,WEB,CLI,AAA/RADIUS, etc.

MTS10 adopt MINI firm aluminum shell, being suitable for the high temperature, humidity, cold and harsh outdoor environment under -40 to 75°C, There are two install method including the Din rail or wall mounted. The products are all fit the FCC PART15 CLASS A and ROHS standard.





Intelligent Traffic System

Cost-effective and reliable total communication solution for the new tram network, Dowslake was capable of providing a comprehensive communication system with industrial-grade durability, rail-approved certifications, value-added features, pricing to meet a limited budget, and a customer-oriented approach to support all phases of the tram project.

Video Surveillance

Unlike legacy analog cameras and DVR systems, the on-board CCTV system on the Line uses the newest IP CCTV system with IP cameras and network video recorders (NVR). This system enjoys the benefits of an open network architecture, which enables live view and recording of videos not only in the metro trains, but also in remote sites such as stations and Operation and Control Centers (OCC).

POE

IEEE 802.3at can provide maximum 30W power output. Dowslake PoE+ switch features intelligent power managed functions, includ ing power scheduling and power device alive checking. In addition, it also supports IEEE 802.3at high power output and LLDP MED features.

MTS10 | Industrial Ethernet L2 Switch

IP30-IP54 Protection, -30°C ~75, Din Rail Mounted

Main Feature

- IP40~IP67 Industrial Protection
- FE,GE,TX/SFP Selectable
- POE/POE+ Support
- Din Rail and 19″Chassis Mount
- IPv4 none blocking forward
- Bandwidth configuration and QoS
- Ring Protection Switching per EAPS<20ms
- ESD and Thunder Protection

Management Features

- Command Line Interface (CLI), SNMP v1,v2
- SSHv2,Telnet, FTP/TFTP
- Remote In-band Management
- Alarm: traps and dry-contact
- RADIUS & Syslog
- RMON: RFC2819 groups (Ethernet history, Alarm, and Event)
- Reports for customer validation

L2 Switching Capability

- Auto-negotiation for port speed and duplex mode Flow Control:
- IEEE 802.3x & Back-Pressure
- Spanning Tree Protocol:
  STP, RSTP, MSTP
- VLANs:
  4K IEEE 802.1Q VLANs
  Port-based VLAN
- Link Aggregation:
  Static Trunk
  IEEE 802.3ad LACP
  Load Balancing: SA, DA, SA + DA, SIP, DIP, SIP+, DIP
  Trunk groups: 8 per group, max. 32 groups
- Multicast
  IGMP Snooping
  IGMP Proxy query

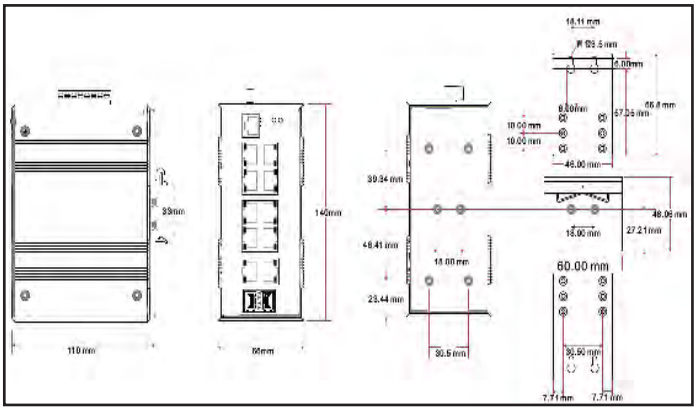
QoS Capability

- 4 Priority Queues
- Priority Queues Scheduling Scheme:
  SP, WRR, WDRR, SP+WRR/WDRR
- Rate Limiting: 1Mbps per step

Product Specifications

Ethernet Features	
QoS	4 Queues, 2 scheduling/policing levels
VLAN Support	Port based tagging Policing/Shaping/Scheduling
Supported VLANs	4k 802.1Q
MAC Address	16k
Buffer	4 Mb
Link Aggregation	802.3ad LACP
STP	STP, RSTP, MSTP
Network Management	
RMON	RFC2819 group 1,2.3.9
Local Craft	RS232 (VT100)
Remote Management	SNMPv.2, CLI
Secure Configuration	SSHv2 (Secure Shell) terminal
Operating Conditions	
Power Supply	12V ~ 48V DC, 100~240V AC
Temperature	-30 to + 75 °C
Humidity	5 to 85% non-condensing
Power Consumption	10W ~ 380W
Mechanical (Din Rail)	140mm ×66mm x 110mm (H x W x D)
Mechanical (1RU rack)	44mm × 442mm x 316mm (H x W x D)

Dimension



Opternus Networks
Tel.: 04532 - 20 44 - 100

MTS10 | Industrial Ethernet L2 Switch

Product Specifications

Unmanaged

- 4-6 10/100M Base-T Ports
- 0-2 10/100 SC/ST/LC
- 8 10/100/1000Base-T
- IP40 Protection
- Mental Housing
- Din-Rail Mount
- Plug and Play
- Auto-Negotiation

MTS10-0602-U
6 10/100Base-T
2 100Base SC/ST

MTS10-0800-U
8 10/100Base-T

MTS10-0800GE-U
8 10/100/1000Base-T

MTS10-0804GE-U
8 10/100/1000Base-T
4 100Base SFP

Managed

- 4-8 10/100M Base-T Ports
- 2-4 10/100 Base SFP
- 4-8 10/100/1000Base-T
- IP40 Protection
- EAPS <20ms Ring Protection
- QoS, IGMP snooping,VLAN
- LAG, SNMP v1/v2/v3, RMON
- Auto-Negotiation

MTS10-0800-2
8 10/100Base-T
2 100/1000Base SFP

MTS10-0604
6 10/100Base-T
4 100Base SFP

MTS10-0602
6 10/100Base-T
2 100Base SFP

MTS10-0800
8 10/100Base-T

MTS10-0402
4 10/100Base-T
2 100Base SFP

MTS10-0400-2
4 10/100Base-T
2 100/1000Base SFP

Managed Full GE

- 4-8 10/100/1000Base-T
- IP40 Protection
- EAPS <20ms Ring Protection
- QoS, IGMP snooping,VLAN
- LAG, SNMP v1/v2/v3, RMON

MTS10-0804GE
8 10/100/1000Base-T
4 1000Base SFP

MTS10-0404GE
4 10/100/1000Base-T
4 1000Base SFP

MTS10-0800GE
8 10/100/1000Base-T

Managed M12 Connector

- 4-8 10/100/1000Base-T M12
- IP40 Protection
- EAPS <20ms Ring Protection
- QoS, IGMP snooping,VLAN
- LAG, SNMP v1/v2/v3, RMON

MTS10-0800-M
8 10/100Base-T M12

MTS10-0400-M
4 10/100Base-T M12

MTS10-0800GE-M
8 10/100/1000Base-T

Managed High Density

- 13-22 10/100/1000Base-T
- IP40 Protection
- EAPS <20ms Ring Protection
- QoS, IGMP snooping,VLAN
- LAG, SNMP v1/v2/v3, RMON

MTS10-1503-2
15 10/100Base-T
2 10/100Base FX SM
1 10/100Base FX MM
2 100/1000Base TX/SFP

MTS10-1303
13 10/100Base-T
2 10/100Base FX SM
1 10/100Base FX MM

Managed 19' Chassis

- 8-24 10/100Base-T
- 2x 100-240 AC/DC input, IEC61850
- EAPS <20ms Ring Protection
- QoS, IGMP snooping,VLAN
- LAG, SNMP v1/v2/v3, RMON

MTS10-2400-2-C
24 10/100Base-T
2 100/1000Base TX/SFP

MTS10-1600-2-C
16 10/100Base-T
2 100/1000Base TX/SFP

MTS10-2400-2-C
8 10/100Base-T
2 100/1000Base TX/SFP

Managed 19' Chassis Full GE

- 8-24 10/100/1000Base-T
- 2x 100-240 AC/DC input, IEC61850
- EAPS <20ms Ring Protection
- QoS, IGMP snooping,VLAN
- LAG, SNMP v1/v2/v3, RMON

MTS10-2004GE-C
20 10/100/1000Base-T
4 100/1000Base TX/SFP

MTS10-1402GE-C
14 10/100/1000Base-T
2 100/1000Base TX/SFP

MTS10-0404GE-C
4 10/100/1000Base-T
4 100/1000Base TX/SFP

MTS10 | Industrial Ethernet L2 Switch

Product Specifications POE/POE+ Support

Unmanaged

- 4-6 10/100M Base-T Ports
- 0-2 10/100 SC/ST/LC
- 8 10/100/1000Base-T
- IP40 Protection
- 802.3af 15.4W
- Din-Rail Mount
- Plug and Play
- Auto-Negotiation

MTS10-0602-U-POE
6 10/100Base-T
2 100Base SC/ST
6 POE Ports

MTS10-0402-U-POE
4 10/100Base-T
2 100Base SC/ST
4 POE Ports

MTS10-0800GE-U-POE
8 10/100/1000Base-T
8 POE Ports

MTS10-0804GE-U-POE
8 10/100/1000Base-T
4 100Base SFP
8 POE Ports

Managed

- 4-8 10/100M Base-T Ports
- 2-4 10/100 Base SFP
- 4-8 10/100/1000Base-T
- IP40 Protection
- EAPS <20ms Ring Protection
- QoS, IGMP snooping,VLAN
- LAG, SNMP v1/v2/v3, RMON
- Auto-Negotiation

MTS10-0800-2-POE
8 10/100Base-T
2 100/1000Base SFP
8 POE Ports

MTS10-0804-POE+
8 10/100Base-T
4 100Base SFP
8 POE+ Ports

MTS10-0800-POE
8 10/100Base-T
8 POE Ports

MTS10-0402-POE
4 10/100Base-T
2 100Base SFP
4 POE Ports

MTS10-0400-2-POE+
4 10/100Base-T
2 100/1000Base SFP
4 POE+ Ports

Managed Full GE

- 4-8 10/100/1000Base-T
- IP40 Protection
- EAPS <20ms Ring Protection
- QoS, IGMP snooping,VLAN
- LAG, SNMP v1/v2/v3, RMON

MTS10-0804GE-POE
8 10/100/1000Base-T
4 1000Base SFP
8 POE Ports

MTS10-0804GE-POE+
8 10/100/1000Base-T
4 1000Base SFP
8 POE+ Ports

MTS10-0800GE-POE
8 10/100/1000Base-T
8 POE Ports

Managed M12 Connector

- 4-8 10/100/1000Base-T M12
- IP40 Protection
- EAPS <20ms Ring Protection
- QoS, IGMP snooping,VLAN
- LAG, SNMP v1/v2/v3, RMON

MTS10-0800-M-POE
8 10/100Base-T M12
8 POE Ports

MTS10-0400-M-POE
4 10/100Base-T M12
4 POE Ports

MTS10-0800GE-M-POE
8 10/100/1000Base-T
8 POE Ports

Managed High Density

- 13-22 10/100/1000Base-T
- IP40 Protection
- EAPS <20ms Ring Protection
- QoS, IGMP snooping,VLAN
- LAG, SNMP v1/v2/v3, RMON

MTS10-1503-2-POE
15 10/100Base-T
2 10/100Base FX SM
1 10/100Base FX MM
2 100/1000Base TX/SFP
15 POE Ports

MTS10-1303-POE
13 10/100Base-T
2 10/100Base FX SM
1 10/100Base FX MM
13 POE Ports

Managed 19' Chassis

- 8-24 10/100Base-T
- 2x 100-240 AC/DC input, IEC61850
- EAPS <20ms Ring Protection
- QoS, IGMP snooping,VLAN
- LAG, SNMP v1/v2/v3, RMON

MTS10-2400-2-POE
24 10/100Base-T
2 100/1000Base TX/SFP
24 POE Ports

MTS10-1600-2-C-POE
16 10/100Base-T
2 100/1000Base TX/SFP
16 POE Ports

MTS10-2400-2-C-POE
8 10/100Base-T
2 100/1000Base TX/SFP
8 POE Ports

Managed 19' Chassis Full GE

- 8-24 10/100/1000Base-T
- 2x 100-240 AC/DC input, IEC61850
- EAPS <20ms Ring Protection
- QoS, IGMP snooping,VLAN
- LAG, SNMP v1/v2/v3, RMON

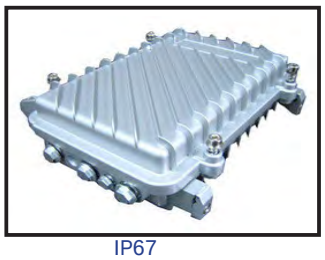
MTS10-2004GE-C-POE
20 10/100/1000Base-T
4 100/1000Base TX/SFP
24 POE Ports

MTS10-1402GE-C-POE
14 10/100/1000Base-T
2 100/1000Base TX/SFP
16 POE Ports

MTS10-0404GE-C-POE
4 10/100/1000Base-T
4 100/1000Base TX/SFP
8 POE Ports

Opternus Networks
Tel.: 04532 - 20 44 - 100

ETC-M | Industrial Fast Ethernet Media Convertor



IP67

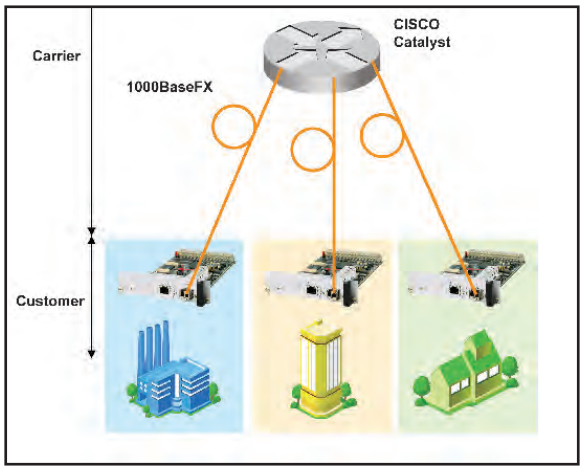
IP40

Main Features

| Industrial Fast Ethernet media converter
| Support Far End Fault Indication (FEFI)
| Support Link Fault Pass Through (LFP)
| Permanent remote in-band management
| Support Ethernet standards 802.3x for Flow Control, 802.3x for Pause Function
| Support Broadcast storm control
| -20℃~ 70℃ working envirement

Application Example 1

Service providers can adopt ETC-M to provide Fast Ethernet service to its customers. ETC-M typically connects to a switch such as Cisco Catalyst, within a distance up to 80 km. At customer end, ETC-M provides copper connection to the customer's IP equipment. The industrial level protection, the compact size, the interroperability between ETC-M and major switch, and the low cost are a few reasons that ETC-M is the right solution for FE termination.



Product Specifications

Copper User Ports (RJ45/M12)	ETC-M11 / ETC-M21
Port density Interface Auto-Sensing Auto-Crossing (MDI / MDIX)	1 10/100BaseTx or 10/100/1000M Tx Yes Yes
Fiber Optic Line Ports (SFP)	
Port density Single Fiber Solution	1 x 100BaseFx or 1x1000BaseFx Choosable Bi-Directional
Optical	
Power Sencitivity Distance	-15db -38db 10km - 80km
Compliant Standards	
10/100 Base-Tx 100 Base-X Flow Control	IEEE 802.3, IEEE 802.3u IEEE 802.3u IEEE 802.3x
Working Envirement	
Operating Tempreture Storage Humidity	-20ºC to 70ºC -45ºC to 85ºC Up to 95%, noncondensing
Mechanical	
Din Rail Dimension (mm) IP67 Dimension (mm) Weight	35mm 40x110x74 160x65x120 500g / 1000g
Power Input	DC 12V - 48V
Power Consumption	< 4 W

For more sophisticated Ethernet product, please check MTS series Ethernet switches.
Check *www.dowslakemicro.com* for the most updated Ethernet products and solutions.

Order Matrix

ETC-M11

Industrial Fast Ethernet Media Converter

Description	Code	Model
IP67 Industrial Fast Ethernet media converter, 1 M12 port user link 10/100BaseT, 1 M12 fiber uplink 100M Fx	5008-006	ETC-M11-IP67
Industrial Fast Ethernet media converter, 1 RJ45 port user link 10/100BaseT, 1 fiber uplink 100M Fx	5008-007	ETC-M11
Industrial Fast Ethernet media converter, 1 RJ45 port user link 10/100/1000BaseT, 1 fiber uplink 1000M Fx	5008-008	ETC-M21

Order rack, chassis and pluggable SFP modules separately.

Pluggable Transceiver Order Matrix

Category	Code	Model	Description
	1766-476	IM-P-C012R-LMA	10/100/1000BASE-T Copper SFP,with spring latch
GE, 1G Fiber Channel	1766-004	IM-P-8L-12	SFP, 1.25Gbps, 850 nm, MM, 500 m
	1766-578	IM-P-4L-12-10	SFP, 1.25Gbps, 1310 nm, SM, 10 km
	1766-501	IM-P-4L-12-40	SFP, 1.25Gbps, 1310 nm, SM, 40 km
	1766-500	IM-P-BL-12-40	SFP, 1.25Gbps, 1550 nm, SM, 40 km
	1767-103	IM-P-W4L-12-10	SFP BIDI, 1.25Gbps, Tx1310nm/Rx1550nm, 10km
	1767104	IM-P-WBL-12-10	SFP BIDI, 1.25Gbps, Tx1550nm/Rx1310nm, 10km
	1767-105	IM-P-W4L-12-40	SFP BIDI, 1.25Gbps, Tx1310nm/Rx1550nm, 40km
	1767-106	IM-P-WBL-12-40	SFP BIDI, 1.25Gbps, Tx1550nm/Rx1310nm, 40km
	1766-2xx	IM-P-CXX-12-80	SFP, CWDM (1470-1610nm), 1.25Gbps, SM, 80km
	1766-3xx	IM-P-CXX-12-120	SFP, CWDM (1470-1610nm), 1.25Gbps, SM,120km
2GE, 2G Fiber Channel, 2.5G	1766-579	IM-P-8L-25	SFP, 2.5Gbps, 850 nm, MM, 500 m
	1766-580	IM-P-4L-25-2	SFP, 2.5Gbps, 1310 nm, SM, 2 km
	1766-419	IM-P-BL-25-40	SFP, 2.5Gbps, 1550nm, SM, 40km,
	1766-420	IM-P-BL-25-80	SFP, 2.5Gbps, 1550nm, SM, 80km
	1766-4xx	IM-P-CXX-25-40	SFP, CWDM (XX: middle 2 digits of 1470 ~ 1610 nm), 2.5Gbps, SM, 40 km
	1766-8xx	IM-P-CXX-25-80	SFP, CWDM (XX: middle 2 digits of 1470 ~ 1610 nm), 2.5Gbps, SM, 80 km
	1766-9xx	IM-P-DXX-25-120	SFP, DWDM (XX:ITU Channel No), 2.5Gbps, SM,120km
XFP 10G Multi-protocol	1767-116	XFP-8L-10	XFP, 10 to 10.3Gbps, 850 nm, MM, 300m
	1767-113	XFP-4L-11-10	XFP, 10 to 11.1Gbps, 1310 nm, SM, 10km
	1767-114	XFP-BL-11-40	XFP, 10 to 11.1Gbps, 1550 nm, SM, 40km
	1767-115	XFP-BL-11-80	XFP, 10 to 11.1Gbps, 1550 nm, SM, 80km
	1767-2XX	XFP-DXX-11-40	XFP, 10 to 11.1Gbps, DWDM wavelength (XX:ITU channel), 40km
	1767-3XX	XFP-DXX-11-80	XFP, 10 to 11.1Gbps, DWDM wavelength (XX:ITU channel), 80km
XFP 8G	1767-116	XFP-8L-8G	XFP, 8.5Gbps, 850 nm, MM
	1767-141	XFP-4L-8G-10	XFP, 8.5Gbps, 1310 nm, SM,10km
	1767-9XX	XFP-CXX-8G-40	XFP,8.5G,CWDM wavelength (XX:middle 2 digits of 1470 ~ 1610), 40km
	1767-AXX	XFP-DXX-8G-80	XFP,8.5G,DWDM wavelength (XX:ITU channel), 80km
4G Fiber Channel	1767-102	IM-P-8L-4G	SFP, 1/2/4Gbps Fibre Channel, 850 nm MM, 500m
	1767-111	IM-P-4L-4G-4	SFP, 1/2/4Gbps Fibre Channel,1310 nm, 4km
	1767-4XX	IM-P-CXX-4G-40	SFP, CWDM (XX: middle 2 digits of 1470 nm - 1610 nm), 4G FC, SM, 40 km
	1767-6XX	IM-P-Dxx-4G-80	SFP, DWDM (XX: ITU channel),4G, SM, 80km
FE 100M, SDH/Sonet 155M	1766-504	IM-P-4L-01-40	SFP, 155Mbps,1300 nm SM, 40km
	1766-502	IM-P-BL-01-120	SFP, 155Mbps, 1550nm, SM, 120km
	1767-107	IM-P-WBL-01-40	SFP, BIDI 155Mbps Tx1550/Rx1310nm, 40km
	1767-108	IM-P-W4L-01-40	SFP, BIDI 155Mbps Tx1310/Rx1550 nm, 40km
	1767-109	IM-P-W4L-01-80	SFP, BIDI 155Mbps Tx1310/Rx1550nm, 80km
	1767-110	IM-P-WBL-01-80	SFP, BIDI 155Mbps Tx1550/Rx1310nm, 80km
	1766-0xx	IM-P-CXX-01-80	SFP, CWDM(1470-1610nm), 155Mbps, SM, 80km

Note: not all the transceiver possibilities are shown. For other SFP or XFP options, please contact Dowslake for more details

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Opternus GmbH
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