

# BRINGING OPTICAL NETWORKING TO THE NEXT LEVEL



# THE CHALLENGE OF INCREASING REVENUE, NOT COSTS

It's common knowledge that the explosive growth in high bandwidth services for residential and business customers is putting great demands on the transport network.

There are many reasons for this transport overload. Examples include IPTV, Docsis 3.0, mobile Internet, information transfer through huge data centers or communication hubs, and business applications that require large flows and secure access pipes. The collective weight of this progress is driving demand for a transport network that can cope with these massive and simultaneous rivers of data.

The challenge for many operators, service providers and large enterprises is to utilize and capitalize on the opportunities that ever-increasing bandwidth creates. That's why Transmode created the TM-Series of CWDM and DWDM based products for carrier grade optical transport. Whether its

used to push WDM all the way out to the mobile access cell site, or enabling Ethernet transport that works well with your existing IP investments, the TM-Series has the flexibility it takes to let your optical network serve you well without inflating the cost side of your business.

Widely deployed around the world, Transmode's solutions allow operators to affordably increase transport network capacity; to expand the network step by step; and to develop cost effective ways to exploit the new revenue streams that higher bandwidth in the access network can provide. As an example; Transmode's solution for mobile backhaul eases mobile or wholesale operators' migration to 3G, 4G and LTE technologies and enables cost efficient capitalization of these high bandwidth services. Of course, all of this is accomplished using the fiber infrastructure that is already in place.

## MORE GIGABYTES FOR THE BUCK – COST-EFFICIENTLY INCREASE YOUR TRANSPORT NETWORK CAPACITY

The TM-Series offers transparent carriage of services, such as SDH/ SONET, Gigabit Ethernet, Video and SAN, over a CWDM and/or DWDM network. Full utilization of existing fiber infrastructure is crucial for overall economic viability. And Transmode has developed its intelligent WDM (iWDM™) concept precisely to meet this need. It's an innovative way to use standardized WDM technology, resulting in higher capacity at less expense.

### **iWDM – for higher capacity and less cost**

iWDM offers a unique way to transport and manage large amounts of traffic, yielding unmatched advantages in network economics, both in OPEX savings and low CAPEX. The seamless mix of CWDM and DWDM, combined with the single-fiber and fiber-pair configurations that iWDM enables, bring valuable scalability and pay-as-you-grow advantages. Furthermore, reconfigurable hardware and dynamic networking using the integrated ROADM provide vital benefits in flexibility and cost efficiency. iWDM is also essential to Transmode's offer of combined Layer-1 and Layer-2 functionality. This helps operators design a converged transport and Ethernet layered network and thereby create the most economic transport for multiple services.

### **Low Power Design – for the environment**

Low Power Design is Transmode's way to minimize power consumption throughout the whole portfolio, while simultaneously optimizing environmental performance. Compact, small-footprint solutions made possible by the use of iWDM, combined with low-power components to create optical transport solutions with unrivaled energy efficiency.

### **Open management system – for easy integration with higher layer OSS/BSS**

Transmode's Network Management system (TNM) is a cost-efficient carrier-class network manager for the TM-and TS-Series. Its open and standardized northbound interface makes integration with higher level OSS/BSS systems easy. TNM provides important timesaving functions for enhancing optical network operations, for example it reduces the time needed to reveal network problems and to troubleshoot end-to-end optical circuits.

# MULTI-DIMENSIONAL SCALABILITY BRINGS YOU UNLIMITED GROWTH POTENTIAL

Flexibility is tightly connected to scalability and modularity. That's why the TM-Series offers such a multitude of dimensions to handle all the changes that take place in a network over time. These changes can include sheer growth, increasing capacity and reach, providing new services, but also adding functionality.

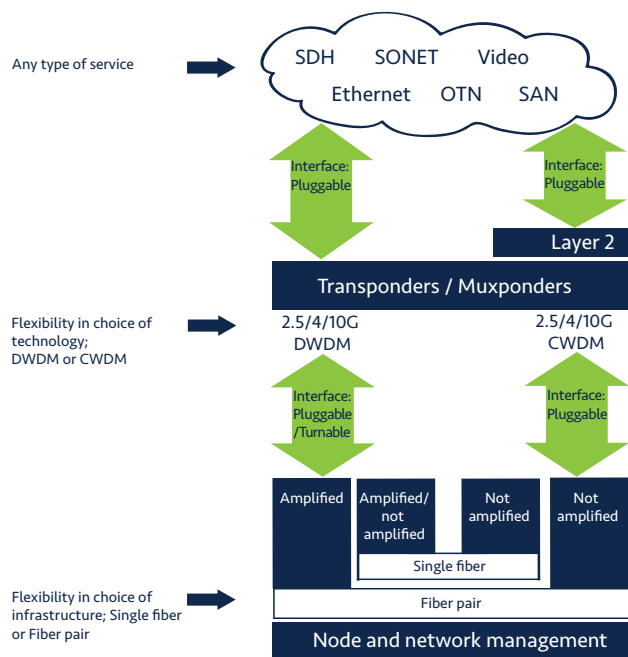
## Everything from powerful DWDM to affordable CWDM

Due to its flexibility in distance and reach (up to 1000km), the TM-Series targets networks from metro access to regional backhaul. The TM-Series DWDM application includes the carrier-class features required for long-haul traffic, whereas the more cost-efficient CWDM application is better suited for lower capacity and reach demands, such as in metro access networks. Both amplified and non-amplified DWDM applications are featured in the TM-Series. As an example of the flexibility provided, an amplified DWDM network can share the same fiber pair as a CWDM network, which means that both regional as well as metro access networks can share the same fiber.

## Capacity that suits your need

Granularity in terms of capacity allows the TM-Series to offer multiple levels of capacity. Line rates of 2.5G, 4G and 10G let operators select the capacity closest to the actual demand. This avoids the need to "oversize" the network, which leads to greater costs in terms of equipment, space and operations.

Similarly, the TM-Series includes three chassis size options – 10U, 3U or 1U – to let you tailor nodes for the best fit and keep investments and footprints to the lowest possible levels.



TM-Series, flexible solution for transport networks

# INNOVATIVE ETHERNET TRANSPORT PROMOTES SERVICE DIFFERENTIATION

There's no doubt that the bandwidth explosion in the access segment, both fixed and mobile, is a potential cash cow – the challenge is just to capitalize on it in a healthy manner. The right transport network can ease this business evolution by prohibiting excessive OPEX and CAPEX from ruining the business case.

The TM-Series' answer to this is to combine integrated Ethernet switching and Ethernet transport functionality to create a converged packet-optical platform. We call this an innovative Ethernet transport solution because it allows the design of simplified transport networks to provide more flexibility and reduce the number of physical elements in the network. Important Ethernet functionality, such as advanced OAM, Service Level Agreement (SLA) monitoring and Quality of Service (QoS) are provided with the TM-Series' Ethernet and Ethernet awareness capabilities.

This gives operators an Ethernet transport solution that offers a cost efficient way to support Ethernet services as well as a platform for service differentiation, SLA monitoring and other business-developing activities.

## THE TM-SERIES HELPS YOU

- Increase capacity in a cost efficient manner, while still utilizing existing investments.
- Build flexibility into the transport network to allow for variations in broadband deployment pace, business models, service types, capacity requirements over time, etc.
- Build an affordable transport network that allows the capitalization of the broadband explosion in fixed and mobile networks.



*Ethernet Demarcation Unit,  
Ethernet Muxponder and  
the 9xGbE/10G FEC Muxponder,  
three products within the  
TM-Series that provides Carrier  
Ethernet capabilities and allows  
simplified transport networks*

## SOLUTION FACTS

Transmode's TM-Series is optimized and specially designed for the challenges of carrier-class transport networks. The TM-Series involves the following families of boards and chassis:

MUXPONDERS		
LINE RATE	NAME	DESCRIPTION
2.5G	GFP Muxponder MXP8	10-client port GFP Muxponder on STM-16/OC-48 (GbE/SAN/Video). 8-client port STM-16 Muxponder for STM-1/STM-4.
4G	MS-MXP	8-client port, 4G Multi-Service Muxponder with dual line interfaces for 1+1 protection (SONET/SDH/GbE/SAN). 4x 4G Regenerator.
10G	9xGbE /10G MXP 9xGbE/10G FEC MXP 4x2G5-10G MXP 10G MS-MXP 10G MS-MXP/TC-ER	9x GbE / 10G Muxponder. 9xGbE/10G FEC Muxponder with dual line interfaces for 1+1 protection. 4-port STM-64/OC-192 Muxponder (STM-16/OC-48). 10xSFP and 2xXFP port Multi-Service Muxponder. (SDH/SONET, Ethernet, SAN etc.) Multiple traffic images. FEC on line. 10xSFP and 1xfixed/tunable line port Multi-Service Muxponder.(SDH/SONET, Ethernet, SAN etc.) Multiple traffic images. EFEC on line.
Layer 2	6-port EDU 12-port EDU 12-port EMXP 24-port EMXP	6 port Ethernet Demarcation Unit. 4xFE/GbE client ports, 2xFE/GbE line ports. L2 aggregator. MEF9, MEF14 compliant. 12 port Ethernet Demarcation Unit. 10xFE client ports, 2xFE/GbE line ports. L2 aggregator. MEF9, MEF14 compliant. 12 port Ethernet Muxponder. 10xFE/GbE ports, 2x10GbE-LAN ports. L2 aggregator. 24 port Ethernet Muxponder. 22xFE/GbE ports, 2x10GbE-LAN ports. L2 aggregator.

TRANSPONDERS		
LINE RATE	NAME	DESCRIPTION
2.5G	TPMR25-V2 TPQMR TPDDGBE	MultiRate 2500 DWDM FEC Transponder (1000km). 4x MultiRate (100Mb/s-2.7Gb/s) Transponder. 4x Regenerator. 2x (2xGbE) Transponder with dual line interfaces for 1+1 protection. 4x 2.5G Regenerator.
4G	TPQMS	Quad Multi-Service Transponder (1G/2G/4G FC). 4x 4G Regenerator.
10G	TPD10G-Lite TP10GCLX/TC TP10G/TC-ER TPD10GBE TP10GOTN	Dual 10G Lite Transponder (10G FC, 10GbE, STM-64/OC-192, OTU-2). 2x 10G Regenerator. 10G Tunable FEC Transponder. Tunable C-band (SDH/SONET/10GbE). 10G Tunable EFEC Transponder Tunable C-band - Extended Reach. (SDH/SONET/10GbE). Double 10GbE FEC Transponder (SDH/SONET/10GbE). 2x 10G Regenerator. 10G Tunable OTN Transponder. STM-64/OC-192, 10GbE-LAN/WAN, OTU-2. OTU-2 line interface (DWDM fixed/tunable).

MISCELLANEOUS TECHNOLOGY		DESCRIPTION
1x4 ROADM OAR450 OA26C VOA units OCM/2P		4-degree ROADM, 100GHz. Raman Amplifier, C-Band. Power Extender, C-Band. 8ch and 2ch Variable Optical Attenuators. 2-port Optical Channel Monitoring unit.

CAPACITY TECHNOLOGY		DESCRIPTION
DWDM		Fiber-pair: 80ch @ 50GHz spacing & 32ch @ 100GHz spacing. Single-fiber: 10ch @ 200GHz spacing (unamplified) & 16ch @ 200GHz spacing (amplified).
CWDM		Fiber-pair: 8ch (1470 - 1610nm). Single-fiber: 8ch (1270 - 1610nm).

CHASSIS NAME	MOUNTING	RACK UNITS
TM-3000	19", ETSI, 23"	10U, Up to 17 full-sized slots / 10 half-sized slots.
TM-301	19", ETSI, 23"	3 U, Up to 4 full-sized slots / 4 half-sized slots.
TM-101/102	19", ETSI, 23"	1 U, 1 full-sized slot + 1 half-sized slot.



TM-3000



TM-301



TM-102

Transmode is a leading provider of optical networking solutions for transport of data, voice and video traffic, based on CWDM and DWDM technology (Coarse/Dense Wavelength Division Multiplexing).

Transmode's unique Intelligent WDM (iWDM™) approach has led to widespread deployment of over 10000 systems in a customer base consisting of more than 250 fixed and mobile network operators, service providers, large enterprises and public institutions across Europe, the Americas and Asia.

Transmode's comprehensive product portfolio and strong global organization enable our customers to grow the capacity and to improve service level of their regional, metro and metro access networks, on a cost-efficient basis without compromising on functionality.

**[www.transmode.com](http://www.transmode.com)**