TM-Series specifications

CAPACITY

DWDM

Fiber-pair:	80ch@50GHz spacing
	32ch@100GHz spacing
Single-fiber:	10ch@200GHz spacing (unamplified)
	16ch@200GHz spacing (amplified)

CWDM

Fiber-pair:	8ch per fiber-pair (1470-1610nm)
Single-fiber:	8ch per single-fiber (1270-1610nm)

CHASSIS

TM-3000:

Unit slots:	17 full-sized / 10 half-sized units
Primary power:	115/230V AC or -48V DC, max 700W
Mounting:	ETSI, 19" or 23" racks
Size:	height: 10U/460mm

TM-301:

Unit slots:	4 full-sized / 4 half-sized units
Primary power:	115/230V AC or -48V DC, max 120W
Mounting:	ETSI, 19" or 23" racks
Size:	height: 3U/133mm

TM-101/102:

Unit slots:	1 full-sized & 1 half-sized units
Primary power:	115/230V AC or -48V DC, Max 90W
Size:	height: 1U/44mm

LINE CARDS

Transponders:

2.5G

TPMR25-V2	MultiRate FEC Transponder (1000km)
TPQMR	4x MultiRate (100Mb/s-2.7Gb/s Transponder)
	4x Regenerator
TPDDGBE	2x(2xGbE) Transponder with dual line ports for
	1+1 protection. 4x Regen Transponder

4G

TPQMS	Quad MultiService Transponder for 1/2/4G FC
	4x Regen Transponder

10G

TPD10G-Lite	2x MultiService Transponder (8G/10G FC,
	10GbE, STM-64/OC-192, OTU-2)
	2x Regen Transponder
TPD10G FEC	2x Transponder for 10GbE, STM-64/OC-192
	with FEC. 2x Regen Transponder
TP10GCLX/TC	1x Transponder for 10GbE, STM-64/OC-192
	with FEC fixed/tunable line I/F
TP10G/TC-ER	1x Transponder for 10GbE, STM-64/OC-192
	with EFEC fixed/tunable line I/F
TP10GOTN	OTU-2 Transponder for STM-64/OC-192,
	GbE-LAN and GbE-WAN

> **i** Note that TM-3000, TM-301 and TM-101/102 are generic chassis that can be used to create any NE-type using CWDM and/or DWDM units.

Muxponders:

2.5G

GFP Muxponder	10-port GFP Muxponder on STM-16/OC-48
	(GbE/1G, 2G FC, ESCON, DVB-ASI)
MXP8	8-port STM-16 Muxponder for STM-1/STM-4

4G

MS-MXP	10-port reconfigurable unit for SDH/SONET,
	Ethernet, SAN etc. Multiple traffic images
	4x Regen Transponder

10G

9xGbE/10G	9x GbE on 10Gb/s line
9xGbE/10G FEC	9x GbE. Dual line ports with FEC for 1+1 protection
4x2G5/10G	4x STM-16/OC-48 on STM-64/OC-192 with FEC option
10G MS-MXP	10x SFP and 2x XFP port unit reconfigurable
	for SDH/SONET, Ethernet, SAN etc. Multiple
	traffic images. FEC on line
10G MS-MXP/ER	10x SFP and 1x fixed/tunable line port unit
	reconfigurable for SDH/SONET, Ethernet,
	SAN etc. Multiple traffic images. EFEC on line

Layer-2

EDU/6PGBE	Ethernet Demarcation unit (MEF9/14) with
	4x UNI and 2x UNI ports 10/100/1000Mb Eth.
EDU/12PGBE	Ethernet Demarcation unit (MEF9/14) with
	10x UNI and 2x UNI ports 100/1000Mb Eth.
12-port EMXP	12-port Ethernet Muxponder. 10x FE/GbE ports, 2x 10GbE-LAN ports
24-port EMXP	24-port Ethernet Muxponder. 22x FE/GbE ports, 2x 10GbE-LAN ports

Misc

1x4ROADM	4-degree ROADM
OAR450	Raman Amplifier
OA26C	Power Extender
OCM/2P	2-port Optical Channel Monitoring unit
VOA units	8-port and 2-port Variable Optical Attenuators

MANAGEMENT SYSTEM

TNM Server:

|	
HW platform:	IBM PC compatible for small network or Sun
	UltraSparc for medium to large networks
Interfaces:	Performance Management: proprietary
	XML/ftp interface Physical inventory export:
	proprietary XML/ftp interface
	End-to-end circuit export: TMF 854 compliant
	XML/ftp interface, Interface to Radius, TACACS
Protocol:	SNMPv3 (TM-Series)
PM:	ES, SES, BBE, UAS acc to G.826
No of nodes:	Up to 1500
No of clients:	Up to 20 simultaneous

TNM Client:

HW platform:	IBM PC Compatible or Sun UltraSparc
Operate system:	Windows system or Sun Solaris, web access is
	supported

ENM:

Protocol:	SNMP v3
Interface:	CLI, Browser, SNMP, FTP
Browsers:	Internet Explorer
MIB:	RFC1213, RFC2573

NEC's Metro WDM TM-Series
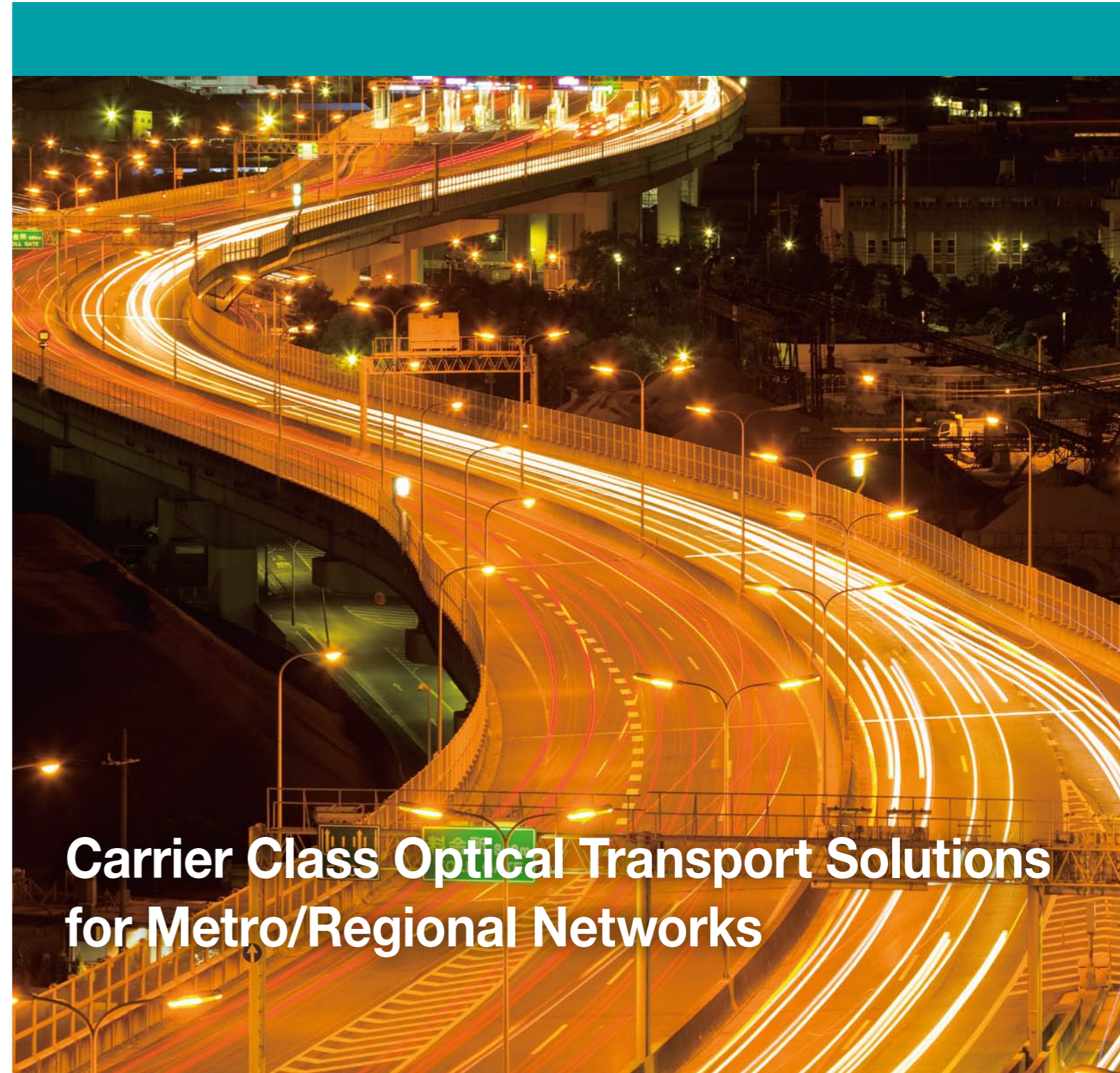
Carrier Class Optical Transport Solutions for Metro/Regional Networks

NEC Corporation and Transmode have a global partnership agreement under which NEC integrates and resells Transmode's Metro WDM optical networking equipment allowing NEC to provide a first class offering to its customers.

Matching NEC's recognized Microwave, SDH and long-haul WDM solutions and global presence with Transmode's well respected Metro WDM portfolio; TM-Series were transparently meshed with NEC's portfolio, providing a comprehensive and competitive End-to-End solution, under the same NEC's management system and the same global outstanding after-sales services support.

transmode

For inquiries, contact
URL http://www.nec.com/global/solutions/nsp/

Carrier Class Optical Transport Solutions for Metro/Regional Networks

Platform Description

The TM-Series platform is a carrier grade optical networking solution covering transparent transport of any service from 100Mbit/s to 40Gbit/s for metro, regional and long haul applications. Its unique characteristics support any network type within this environment:

- ✓ Mobile backhaul networks
- ✓ Fixed broadband backhaul networks
- ✓ City carriers' networks
- ✓ High-end enterprise networks
- ✓ Storage area networks
- ✓ Long haul networks

The cornerstone of the TM-Series solution is a unique system architecture based on iWDM™ (intelligent WDM) technology providing highest flexibility, lowest investment and lowest operations costs.

The TM-Series is an integral part of the NEC family of optical transmission solutions which extends all the way from transoceanic cable systems to the last mile of the access network.

"All in one" system

The TM-Series gives unique advantages for any operator within the competitive metro/regional environment. Within a TM-Series network you can carry IP, SDH/SONET, SAN or Video services where each connection can be optimized from cost and functionality perspective without the limitations that are imposed by a stand-alone SDH/SONET or OTN systems.

The TM-Series solution combines iWDM™ multiplexing with CWDM, DWDM and SDH/SONET technologies into one product. It combines the capacity and scalability capabilities only found in DWDM systems, with the low equipment costs of CWDM systems and all managed by the same node and network management system.

Reconfigurable hardware, pluggable optics (C/DWDM SFPs and XFPs) combined with embedded management channels, 15min/24h Performance Monitoring (PM) statistics and Forward Error Correction (FEC) are just some of the carrier-class features that reside within the TM platform that make it into the most powerful and flexible networking solution on the market today.

Furthermore, NEC's MS5000 network management solution integrates multiple other technologies such as microwave radio links and Ethernet aggregation switches under the same management platform for true end-to-end control with minimum OpEx.
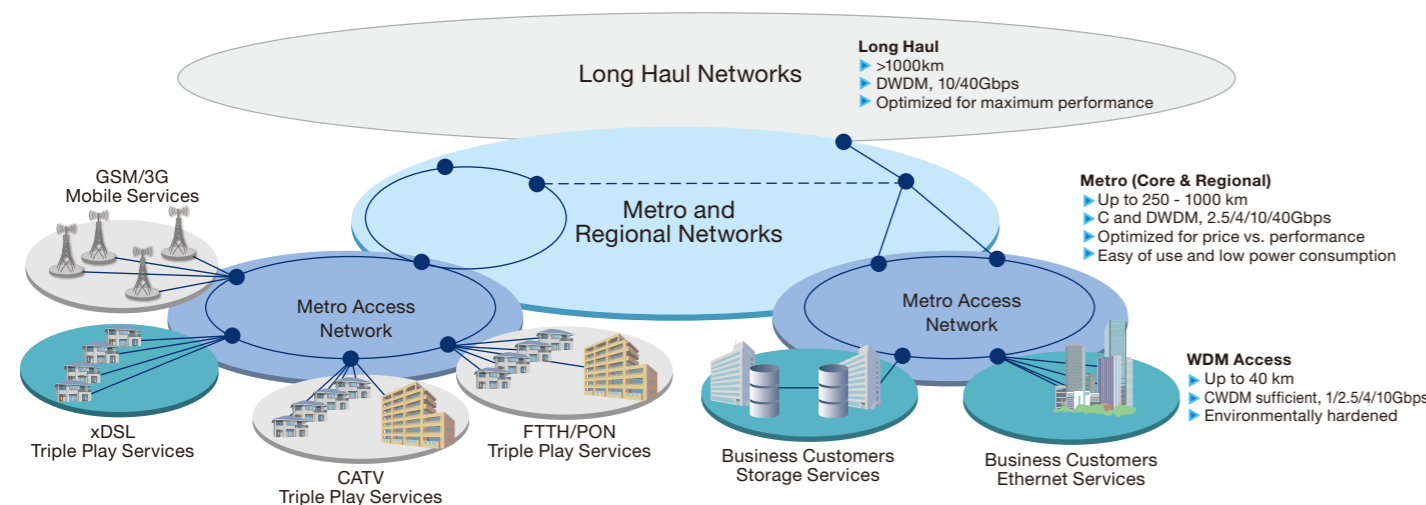
DWDM – for powerful applications

Some applications require the more powerful DWDM technology. This may be due to a number of reasons, such as:

- ✓ Need for high scalability in terms of wavelengths, e.g. 80λ on 50GHz spacing
- ✓ Need for high capacity per wavelength, e.g. 40Gbit/s
- ✓ Longer distances, high fiber losses, etc

The TM-Series DWDM application includes two concepts of DWDM networking:

1. An un-amplified, single-fiber configuration utilizing optical add/drop filters that are perfect for metro networks with dynamic traffic patterns and a mix of small and larger access nodes.

2. Amplified fiber-pair configurations utilizing optical Mux/Demux units for long-haul point-to-point networks, up to ~1000km using multiple line amplifier sites that can be combined with passive add/drop filters or ROADM technology to create intermediate OADM nodes.

The iWDM™ technology enables building of networks where DWDM and CWDM solutions can be combined on the same fiber, both in single-fiber as well as fiber-pair configurations.

Transmission Network Manager

More complex networks can be managed using the network management solution Transmission Network Manager (TNM). This is a client-server based solution that can be installed on computers using Windows or Solaris operative systems (i.e. PCs and Unix workstations). TNM gives a total control of the network with alarm collection, performance management on circuit level plus configuration management, security management, software upgrade, graphical interface etc. Alarm notification can as an option be provided via SMS or email.
Standardized management protocols (SNMP) are used to easy integration with other higher order management systems.

...and end-to-end (E2E)

In practical multi-service network applications spanning the core, metro and access, transport solutions are commonly constructed of a wide variety of elements, mixing fiber and wireless transmission, and making interconnections at all layers from Layer 0 to Layer 3.
The TM-Series is fully compatible with NEC's end-to-end higher layer network management solution, the MS-5000.
This feature-rich NMS platform integrates a diverse range of nodes under a common management layer to provide point-and-click provisioning of services and connectivity, along with a full range of fault and performance management functions. This minimizes OpEx even when the network calls for a multiplicity of client signals, transmission media and network layers.

CWDM – for lower capacity demands

The majority of the traffic units are based on pluggable transceivers and can thus be used for CWDM as well as DWDM applications. Even 10Gbit/s traffic can be applied on CWDM networks via XFPs that provide up to 8 CWDM channels in the 1470 to 1610nm range.

The TM-Series iWDM™ concept enables transport of C/DWDM signals running at a rate of 2.5Gbit/s, 4Gbit/s and 10Gbit/s enabling a more cost efficient transport solution as compared to other C/DWDM solutions.

The TM-Series CWDM application provides two concepts of CWDM networking:

- ✓ Single-fiber configuration for best flexibility and utilization of the fiber infrastructure in point-to-point, bus and ring networks.

- ✓ Fiber-pair configuration for powerful CWDM solutions that easily can be combined with up to 80 DWDM channels, even amplified DWDM.

Long Haul Networks
Long Haul
- ▶ >1000km
- ▶ DWDM, 10/40Gbps
- ▶ Optimized for maximum performance

Metro and Regional Networks
Metro (Core & Regional)
- ▶ Up to 250 - 1000 km
- ▶ C and DWDM, 2.5/4/10/40Gbps
- ▶ Optimized for price vs. performance
- ▶ Easy of use and low power consumption

WDM Access
- ▶ Up to 40 km
- ▶ CWDM sufficient, 1/2.5/4/10Gbps
- ▶ Environmentally hardened

GSM/3G Mobile Services

Metro Access Network

Metro Access Network

xDSL Triple Play Services

CATV Triple Play Services

FTTH/PON Triple Play Services

Business Customers Storage Services

Business Customers Ethernet Services

TM-3000

TM-301

TM-101/102