

## DWDM Networking 32ch @ 100GHz

TM-Series  
TM-3000/-301/-101/-102

The TM-Series platform has been extremely successful due to its ability to combine CWDM, DWDM and SDH technologies within the same system, sharing the same card cage, carried on the same fiber and being managed by the same management system.

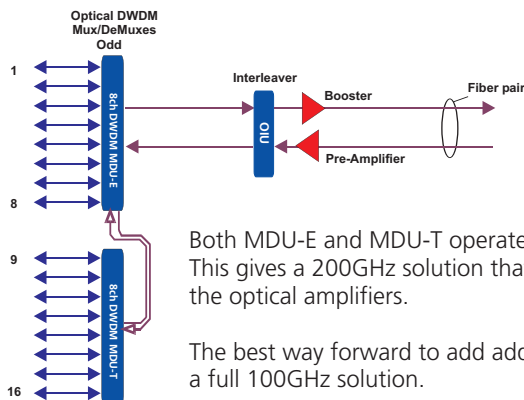
Also, the ability to support both single-fiber as well as fiber-pair configurations opens for unique networking solutions that can be used for both access, metro and regional networks.

It all addresses some of the imperative factors an operator must take into consideration when selecting the best transport solution, i.e. low CAPEX and OPEX.

The TM-platform has two alternative solutions for DWDM over fiber-pair configurations:

- A set of passive filters operating at odd and even 100GHz channels that are combined to a 100GHz/32ch solution.
- A set of passive filters operating at odd and even 50GHz channels that are combined to a 50GHz/80ch solution.

The Data Sheet covers the 32ch/100GHz alternative.



### From 1 to 16 channels

The optical Mux/DeMux (MDU-E) provides a solution for an initial 8 channels. Via an extension port on the MDU-E the solution can be upgraded to 16 channels by adding the MDU-T unit.

Both MDU-E and MDU-T operates on every odd 100GHz DWDM channel (as specified in G.694.1). This gives a 200GHz solution that enables up to 16 channels to fit within the amplification band of the optical amplifiers.

The best way forward to add additional channels is within the same wavelength band, i.e. going to a full 100GHz solution.

### Expansion up to 32 channels

The key objective is to provide a 100GHz solution without the need to replace the existing MDU's. This is solved by an optical Interleaver.

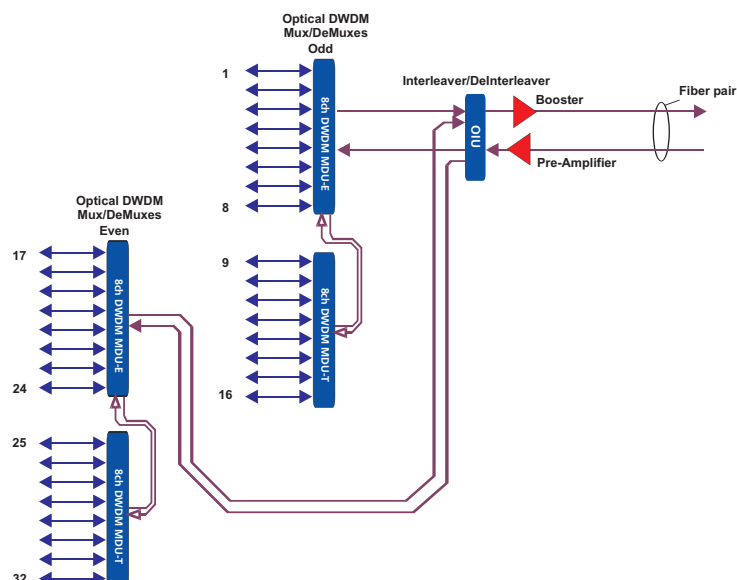
The optical Interleaver is used to combine odd and even 100GHz channels in the transmit direction, and separate the two in the receive direction.

The figure shows how an additional 8+8 channels are added via MDU's operating on the even 100GHz channels. The odd and even MDU's are connected to the optical Interleaver to provide a 32 channel solution.

It is thus possible to have a hitless upgrade from 1 to 32 channels with a modularity of 8 channels per MDU. This requires of course that the optical Interleaver is installed from day 1, and that the proper transmission design has been done to cope with all 32 channels.

Optical amplifiers (EDFA) and dispersion compensation units (fiber based and DFG-based) are provided to compensate for the optical losses and chromatic dispersion, respectively.

The amplifiers can be set in either pre-amplifier or line-/power- amplifier mode.



*This AN covers a small portion of all available units within the TM-platform.*

*See separate Data Sheets and Application Notes for more information about other products and other networking examples*



TM-101-102



TM-301



TM-3000



Double Dual GbE Transponder



Quad MultiRate Transponder

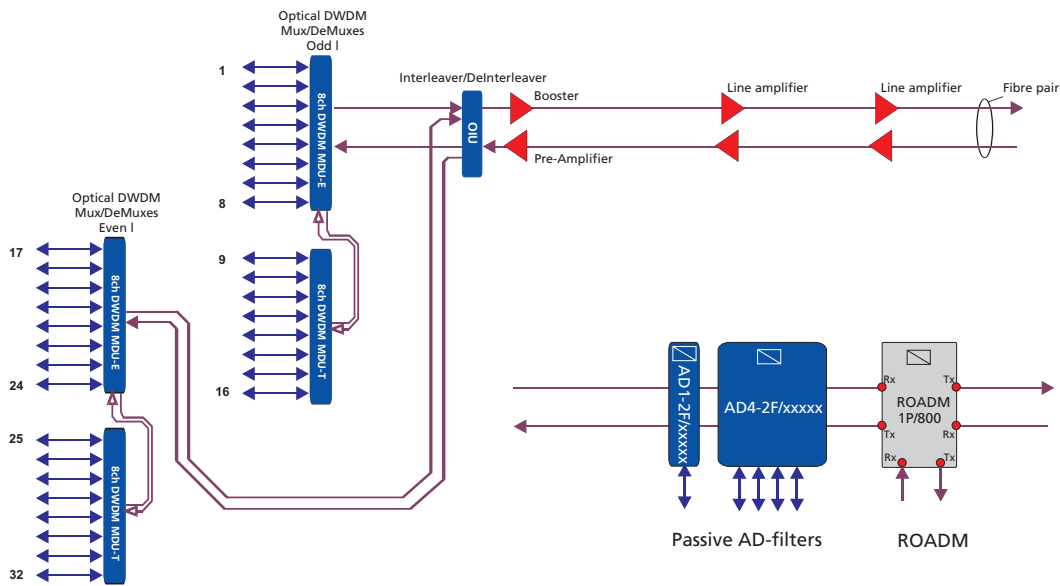


8-port SDH/SONET MuxPonder



4xSTM-16/STM-64 MuxPonder





The TM-series Platform entails both CWDM and DWDM solutions in single-fibre or fibre-pair configurations. All in the same card cage, one the same fibre and under the same node and network management system.

One benefit of fibre-pair configurations as compared to single-fiber configurations is the ability to introduce optical amplifiers in a cost-effective way to extend the transmission distance. Power- and pre-amplifiers can be used at the end nodes and multiple intermediate line amplifiers can be used to bridge long distances without need for electrical regeneration. The amplifiers (EDFA-based) are provided in different power alternatives and can be configured as pre-amplifiers or as line/booster amplifiers. The 17dBm and 20dBm amplifiers are provided in both singular and double unit types to optimize the cost profile.

The chromatic dispersion is addressed via a set of different optical dispersion compensation units that are placed at the end nodes and at the intermediate add/drop nodes if such are present. Variable Optical Attenuators (VOA's) can be introduced to provide automatic power control and Optical Channel Monitor units (OCM) are provided to enable measurement of wavelength power levels at amplifiers and ROADM units.

Intermediate add/drop nodes can be introduced in multiple ways. One option is to use the optical interleavers to extract channels bands along the link. Another alternative is to use optical filters (1ch and 4ch filters) or why not ROADM units that will give the ability to dynamically change the add/drop configuration along the link.

Another important aspect is to have Transponders with sufficient capabilities to bridge these distances. The TM-Series has both 2.5Gb/s and 10Gb/s Transponders with Forward Error Correction (FEC) that will boost the transmission performance with up to 5 to 6dB.



6-port Ethernet Demarcation Unit



9xGbE/10G Muxponder



10G Tunable Transponder



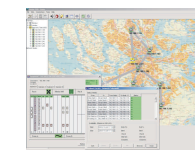
Double 10GbE DWDM Transponder



ROADM

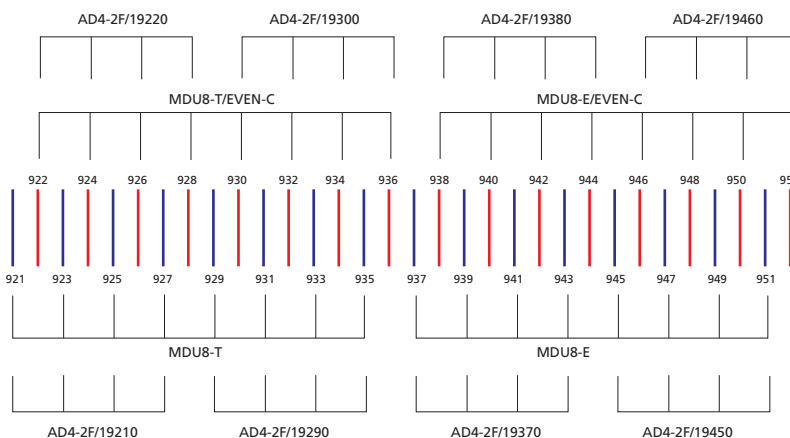


Embedded Node Manager (ENM)



Transmode Network Manager (TNM)

## Technical Data



The figure shows the wavelength allocation of the 8ch MDU's and the 4ch AD-filters. For more technical details, please contact Transmode or a Transmode representative.

The specifications and information within this document are subject to change without further notice. All statements, information and recommendations are believed to be accurate but are presented without warranty of any kind.