transmode

Data sheet

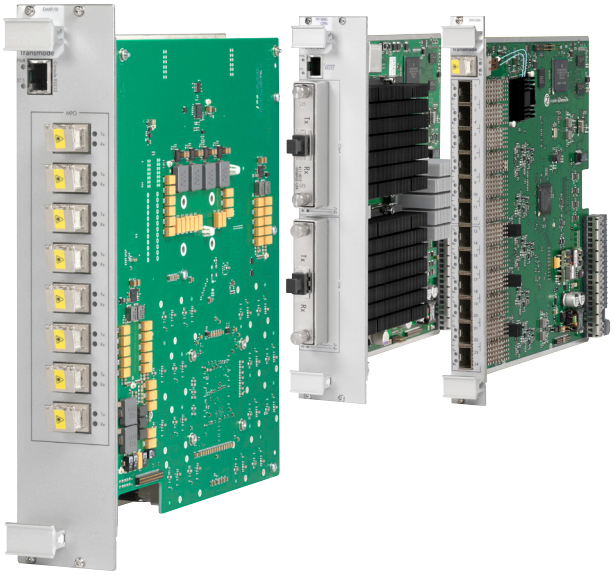
TM-Series

PT-Fabric

Packet Transport optimized 100G Networking and Ethernet services in Native Packet Optical networks

Key benefits:

- Flexible modular design with support for a mix of 100G and 10G interfaces
- High switching capacity, supporting up to 8x 100G interfaces or 96x 10G interfaces
- Flexible front-plane architecture allowing any card in any slot minimizes stranded assets in the nodes
- Integrated 100G-SR10 client interfaces lowers the cost by eliminating the need for separate optical client modules
- Support for CFP modules for coherent Metro 100G with up to 1200km reach
- 10G interfaces with selectable mode; OTU2e with FEC for enhanced 1500-2000 km reach, or 10G LAN
- Provides CE2.0 compliant E-Line, E-LAN, E-Access or E-Tree services
- Flexible network resiliency options through Ethernet ring protection, and link aggregation
- Synchronous Ethernet and IEEE 1588 for efficient frequency and time synchronization essential for mobile backhaul and networks for TDM-over-packet services
- Ultra low latency and almost zero jitter
- Low Power Design ensures low total cost of ownership



EMXP III, the key part of PT-Fabric accompanied with the 100G OTN Transponder and PTIO-10G for 100G and 10G services.

The PT-Fabric (Packet Transport Fabric) is part of Transmode's TM-Series that provides seamless integration of Layer 1 and Layer 2 Metro Ethernet functionality in one single platform.

PT-Fabric is a powerful terabit-class packet optical transport switch consisting of a system of cards that expands the Native Packet Optical 2.0 (NPO2.0) architecture to 100G Metro networking. It is powered by the EMXP III as central switching unit and utilizes different types of interface modules connected via an optical front-plane for various line and client formats.

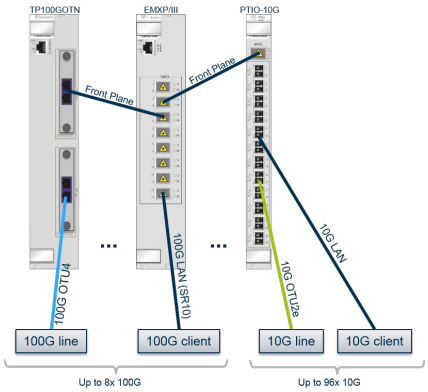


Fig. 1 PT-Fabric consists of the EMXP III accompanied with the 100G Transponder and PTIO-10G interface modules.

The use of pluggable 10G and 100G optics in combination with support for Forward Error Correction (FEC), enables cost efficient metro and regional transport with links to other PT-Fabric nodes or to EMXP IIe without requiring the use of additional external transponders.

Frontplane design

The use of an optical front-plane between the central 960Gbps capable switching module and line interface modules for 10G and 100G allows scaling the capacity for the system without the need for introducing a costly high-speed backplane for connectivity to all slots in a chassis. The front-plane uses VCSEL technology and fiber ribbon cords between cards in the PT-Fabric which allows cards to be freely placed within a chassis or to build up functionality over multiple chassis.

Front-plane technology ensures that existing TM-Series chassis can be used with PT-Fabric and gain switching capabilities for 100G networking applications. There is no need for fork-lift upgrades of chassis in the field.

Each of the eight front-plane connectors of the EMXP III can connect to an PTIO-10G card for up to 96x 10G or it can connect to the client side of a 100G OTN Transponder for 100G Metro coherent connectivity.

Furthermore it is possible to connect 100G LAN clients using SR10 optics directly to the EMXP III card which lowers the cost of client optics and saves valuable rack space. If only 100G client optics are needed the EMXP III can handle a full 800G in only two slots without need for other transport cards.

Ethernet Service Transport

The PT-Fabric creates a Layer 2 optimized transport architecture using selective integration of Layer 2 and MPLS functions.

Ethernet services can be port-based or fully service multiplexed based on flexible combinations of C/S VLANs traffic type and priority on any interface in the system. A full range of E-Line, E-LAN E-Access or E-Tree services, compliant to the Metro Ethernet Forum's CE2.0 are supported.

A strong classification and policy engine can be used to define flexible Ethernet services based on service-specific requirements and to use QoS classifications for traffic differentiation in the network. Bandwidth profiles allow service providers to offer services with bandwidth regulated to any speed.

The PT-Fabric has the capability to perform sub 50ms protection for Ethernet services over a range of different topologies thanks to its built-in support for hardware based OAM used together with protection.

The EMXP III provides a flexible toolkit of traffic management features. The toolkit includes features such as strict and weighted scheduling, bandwidth profiles and shaping of bandwidth.

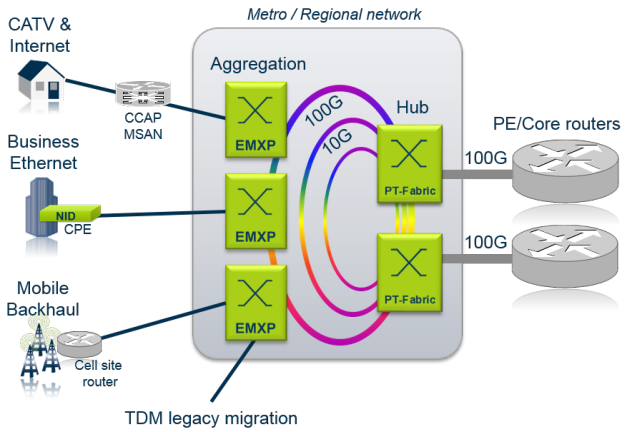


Fig. 2 PT-Fabric in a network scenario with other EMXP packet optical transport switches.

Resiliency

The PT-Fabric offers various methods to provide resiliency through the capabilities of the EMXP III unit. The simplest method is to utilize IEEE 802.3ad Link Aggregation Group (LAG). Normal LAG as well as N+1 and N+N protection LAG are supported.

Furthermore, a LAG can be distributed over two separate PT-Fabric systems units using Multi Chassis LAG that coordinate information to present a single LAG to the connected system.

If PT-Fabric and/or the units in the EMXP family are deployed in a ring topology, then ITU-T G.8032v1 and v2 Ethernet Ring Protection Switching also becomes an option. V2 supports multiple logical rings for flexibility to use different VLANS in different rings and allows dual interconnect points between rings to eliminate single points of failure. Rings can also be used in combination with LAG so that the capacity of the rings can be easily scaled. It is even possible to add/remove links without service interruption.

Protection switching is performed with carrier class sub 50 ms protection using any of these protection schemes.

Synchronization and Timing

Mobile networks need reliable and accurate frequency synchronization from the mobile backhaul network, and some recent standards such as LTE-A also require phase and time synchronization. The support for distributing both frequency through SyncE and phase and time through precision time protocol (PTP) is built into the PT-Fabric.

The implemented SyncE in the EMXP III supports clock selection logic and on-board hold-over that exceeds SDH requirements. Synchronization signaling is used to provide traceability of the synchronization source and to do automatic sync source selection providing high reliability of the sync.

The EMXP III support IEEE 1588 Transparent Clock for phase and time synchronization. The function adjusts the timestamps automatically for timing packets that are carried over native Ethernet or encapsulated in SVLANs or inside MPLS pseudo wires. Adjusting these timestamps to compensate for the internal delay improves the accuracy of the PTP protocol and allows the protocol to have more switch hops between grandmaster and slave without the need for expensive external references (e.g. from GPS).

Ultra Low Latency in time-critical applications

The EMXP III has ultralow microseconds latency and virtually zero jitter for all packet sizes, regardless of traffic load. This makes it ideally suited to Ethernet applications where latency and jitter are important, such as services for financial institutions, video distribution and LTE backhaul.

Low Power Design

A fully equipped PT-Fabric system with eight 100 Gigabit Ethernet ports where four are OTU4 with coherent optics using four 100G OTN Transponders and the other four are SR-10 100G client ports directly connected to the EMXP III consumes about 0.5 watt per gigabit. Low power consumption in combination with a small footprint reduces operational costs and enables more capacity to be handled at sites with restrictions on power consumption, cooling and space.

Technical specifications

Interfaces	EMXP III has eight MPO connectors for fiber ribbon cable. Each MPO connector can be used in the following modes: • 100G LAN client (SR10, 100m) • Front-plane connection to PTIO-10G • Front-plane connection to TP100GOTN Via PTIO-10G support for • 10G-LAN mode or OTU2e framing with GFEC, I.4 or I.7 FEC • Uncolored Multi mode and Single mode • CWDM up to 8 channels, DWDM up to 80 channels Via TP100GOTN support for • OTU4 coherent PM-QPSK ~1200 km reach tunable over 80 DWDM wavelengths with SD-FEC • 100G LAN on LR4
Resilience	IEEE 802.3ad Link Aggregation with LACP. Loadsharing, N+1 and N+N protection LAG, Multi-chassis LAG ITU-T G.8032 Ethernet Ring Protection v1 and v2 Supports Ethernet Ring over LAG and in-service adding/removing links (future release will also support MPLS-TP with 1+1 linear protection)
Ethernet Services	E-Line (EPL and EVPL), E-LAN (EP-LAN and EVP-LAN), E-Tree (EP-Tree), E-Access CE2.0 Compliant, MEF 9+14
Quality of Service	Policing using bandwidth profiles Flexible Traffic Classification, e.g. based on DSCP, CoS, port and inner/outer VLAN 8 Strict priority queues / WRR queues, Min and Max Shaping. WRED
OAM	IEEE 802.1ag Continuity Check and Loopback, Port Mirroring Management VLAN for in-band management Port isolation using Private VLAN technique
Synchronous Ethernet and timing	ITU-T G.8262 Synchronous Ethernet Equipment Clocks (EEC) ITU-T G.8264 Ethernet Synchronization Messaging Channel (ESMC) ITU-T G.781 Synchronization Status Messages (SSM) IEEE 1588v2 Transparent Clock
L2 Switching	Up to 960Gbps Ethernet switching on EMXP III depending on units connected via front plane Selectable learning enabled per VLAN, 4,094 VLAN IDs, 256K MAC-addresses Storm Control IEEE 802.1ad Q-in-Q SVLAN Flexible VLAN tag handling: push, pop, swap, pop-swap, including double tag operations Super Jumbo Frames up to 10248 Bytes
Power consumption (including optics)	EMXP III 140W TP100GOTN 70W PTIO-10G 42W

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