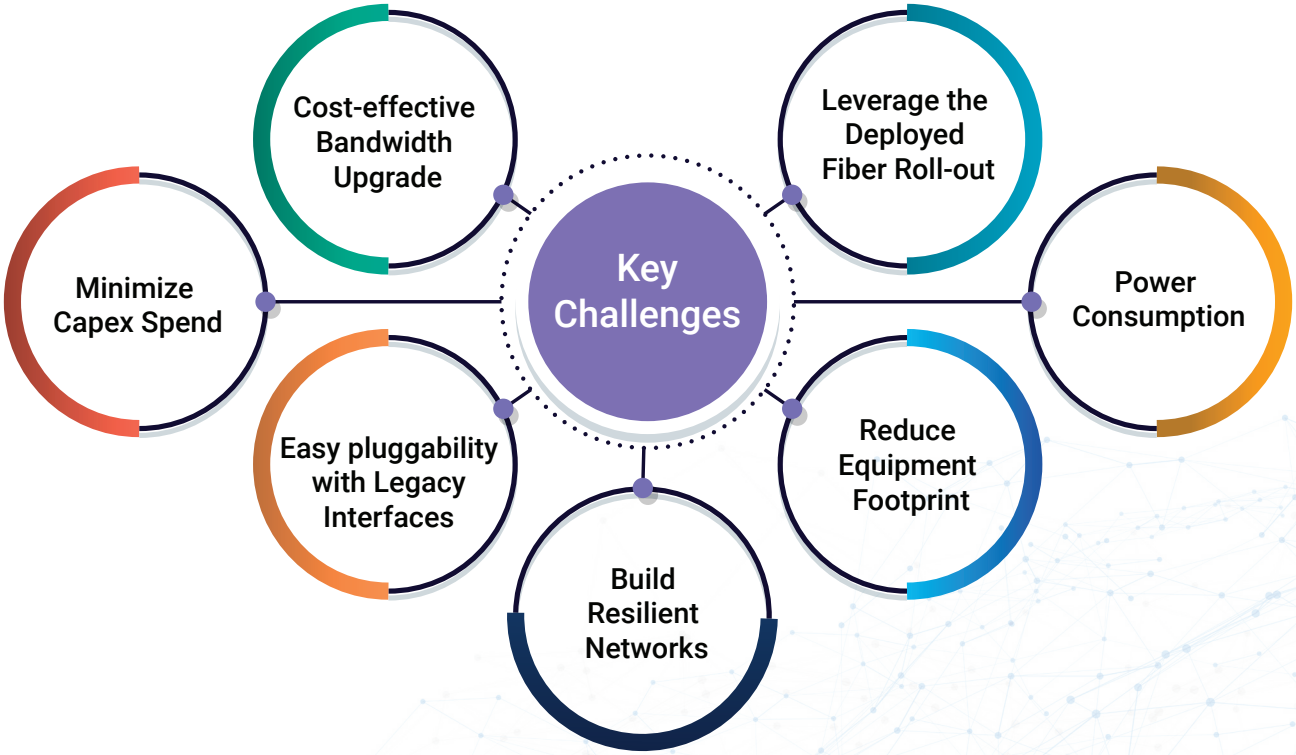
TEJAS® NETWORKS

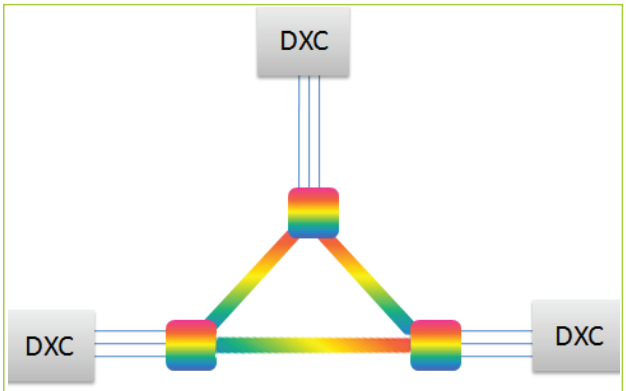
COST-EFFECTIVE SOLUTION TO OPTIMIZE AND SCALE ACCESS NETWORKS

Micro-OTN | Compact Integrated OTN DXC Platform

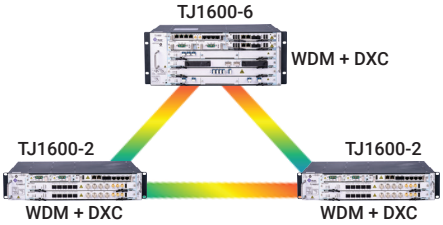
Global broadband networks have been inundated by data traffic due to the rapid growth of home broadband usage, large-scale enterprise cloud adoption, and the emergence of hyper-scale data centers. The COVID-19 outbreak has underscored the importance of delivering fast and reliable broadband services to homes, businesses, government offices and other critical institutions. “Remote working” and “video conferencing” has become the new norms for today’s businesses, with telecoms and ISPs being the invisible hand driving this shift. Together, these trends are fueling demand for a compact low-cost DWDM and capacity multiplier in the access part of the network.



WDM with integrated fabric architecture is the new generation architecture. It utilizes the same transponder/ muxponder architecture, but introduces an integrated digital OTN switch to enable grooming of services within and across all wavelengths transiting a node. This architecture facilitates both intra- and inter-wavelength grooming using the digital OTN switch. Sub-wavelength services can be multiplexed onto the fewest possible output wavelengths, with the intent of fully filling the payload of each wavelength thereby reducing the number of WDM channels deployed.



Legacy WDM platform with external DXC



Converged WDM+OTN DXC platform

WDM-only architecture uses transponders or muxponders to map a client service onto a long-reach WDM line-side interface. External DXC would be required for grooming the traffic. Most of the legacy DWDM vendors still rely on this architecture. A converged solution with integrated DWDM and OTN DXC platform delivers multiple benefits to the operator.

Optimizing the Network Architecture with Micro OTN

In the next-generation transport networks the optical layer, typically referred to as “Layer 0” or the “DWDM layer”, is the most cost-effective layer for maximizing fiber network utilization and managing point-to-point traffic that is 10Gbs and higher. DWDM layer is capable of handling traffic at a wavelength layer providing either a 10Gbps or a 100Gbps granularity in the DWDM network depending on the interface used. Since DWDM by itself does not offer any way to consolidate partially filled wavelengths, this leads to a lot of bandwidth wastage. OTN solves this problem by providing sub lambda grooming through an OTN cross-connect at the granularity of 1Gbps.

Tejas TJ1600 is a converged platform and integrates DWDM and OTN/SDH/PTN Fabric in a single platform.

TJ1600-2

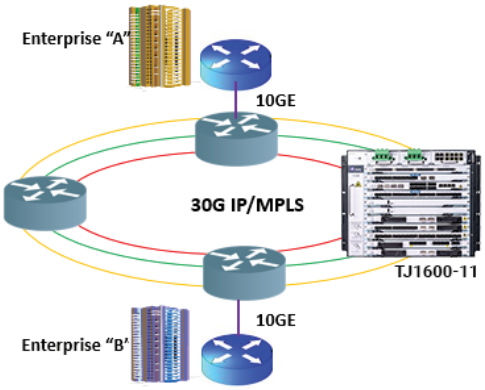
- 2.4Tb Shelf Capacity
- Integrated OTN XC
- Muxponder/Transponder
- DWDM Amplifiers
- 2RU, 19” Wide, 300mm deep
- Full Front Access

TJ1600-6

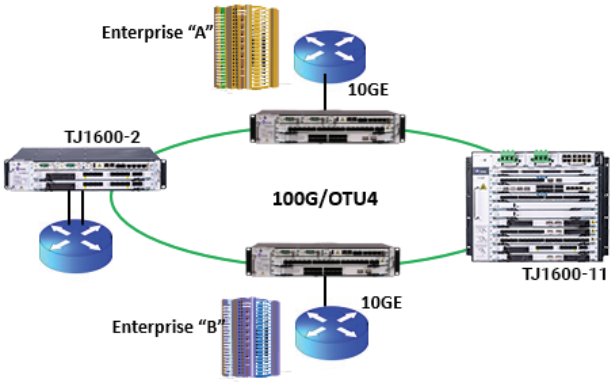
- 4.8Tb Shelf Capacity
- Integrated OTN XC
- Muxponder/Transponder
- Packet Fabric (L2/MPLS-TP)
- Multi-degree Flex CD ROADM + Amplifiers
- 4RU, 19” Wide, 300mm deep
- Full Front Access

OTN on an Access network is best delivered with compact Micro OTN products. This also can easily integrate with an IP/MPLS router network to enable the following benefits:

- **Interface costs:** The price of an OTN interface is significantly higher on an IP router. This is because of the additional overhead costs related to expensive buffers, network processor units, and memory chips used on routing platforms.
- **Power and density:** The overall power dissipation footprint for an IP router is also higher due to the complexity and sophistication required to meet the packet processing functions. This has an adverse impact on the density and scalability achievable when compared to best-of-breed micro POTP platforms.
- **Operational paradigm:** Historically, network operators have preferred to separate routing and transport domains since the nature of skill sets, training needs, provisioning, maintenance, and management processes are very different for the two.
- **Link integrity:** OTN technology provisions OAM interworking between packet and transport infrastructures. It meets carrier requirements for sub-50ms fast failover and recovery for high-quality IP traffic carried as Ethernet over OTN. Both pro-active signaling (link degradation) and post-facto signaling (link failure) protocols are supported.



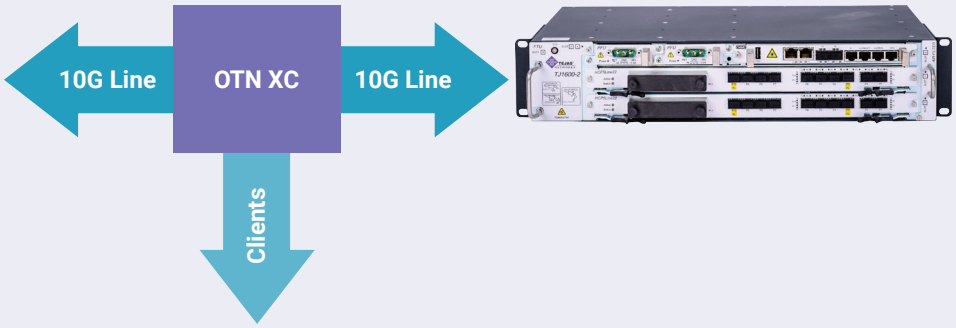
Traditional Router-based Network Design



OTN/DWDM-based Network Design

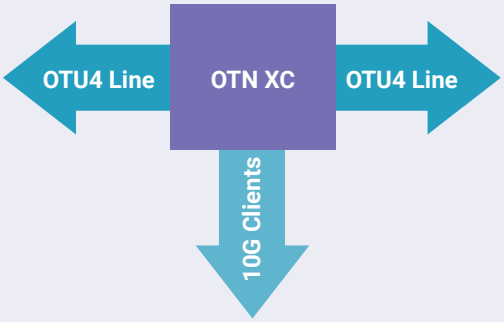
TJ1600 – Micro OTN provisions a scalable network with traffic not destined for an IP router is selectively bypassed at OTN layer which results in reduced capex and lower power consumption.

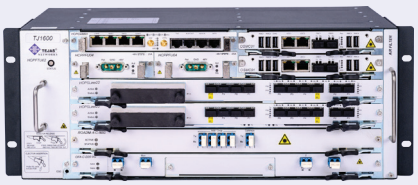
Sample XC Configuration with TJ1600-2



- OTU2/2e line ports
- eFEC supported on line ports
- 10GE ODUFlex supported
- ODU cross connects supported: ODU0/ ODU1/ ODU2/2e/ ODUFlex
- Client ports which supports
  - 10GE/1GE
  - STM-64/ STM-16/ STM-4/ STM-1
  - OC192/ OC48/ OC12/ OC3
  - FC100/FC200/ FC400/FC800

Sample XC Configuration with TJ1600-6





- 100G ports: OTU4 with SD-FEC
- 10G Payloads: OTU2/2e/STM64/10GE/OC192/FC8G
- Supports Coherent CFP and non-coherent CFP
- GCC support
- All slots support DWDM cards and Line cards

Key Benefits of Micro OTN for Service Providers

1. Latency

- Low latency applications are better served through TDM based OTN network in the order of sub-100 micro-seconds.

2. Dedicated Bandwidth with Guaranteed QoS

- Many enterprises use secure and unshared circuits. Micro OTN becomes an ideal platform for such services where every customer can be provisioned with dedicated non-shared bandwidth and guaranteed QoS.

3. Resiliency

- OTN ensures the switching time to be 50ms which is very essential for enterprise service providers

4. Interfaces & Capacity

- Along with transmitting packet services such as Ethernet, OTN is able to support the multiplexing of many different protocols including SONET/SDH, video, and storage protocols such as Fiber Channel. This allows supporting both legacy and new segments of the network over a single converged product - TJ1600.

4. Capacity Scalability

- TJ1600-2/6 can scale from nX10G to 100G with just the addition of optics. A highly scalable model, ideal for enterprises, where the capacity requirements are increasing rapidly.
- Upgrade to higher data rates like 200G/400G/600G can be easily accomplished with Tejas' Software-defined Hardware™.

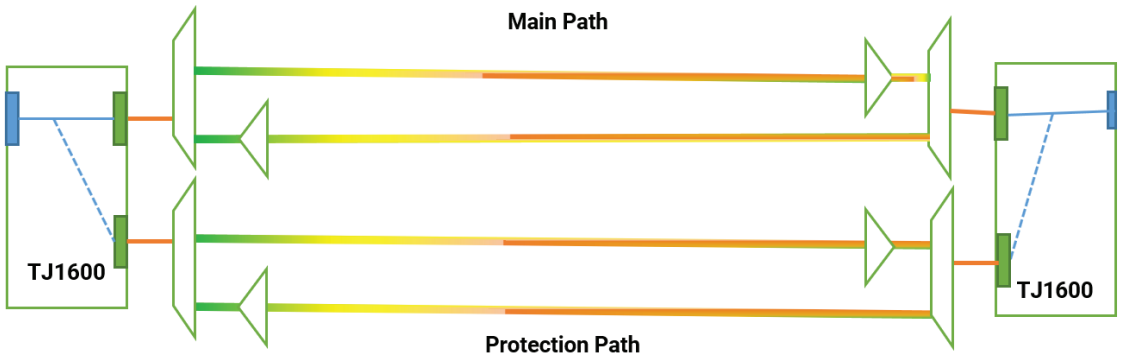
5. Operational ease for better SLAs

- TJ1600-2/6 provisions for OAM. In addition to fault identification, OTN DXC OAM helps in pinpointing the location of the fault. Hence, enabling a better SLA, which is critical for B2B services.
  - Performance monitoring for B2B customers can be enabled to monitor the network.
  - OTN's Tandem Connection Monitoring (TCM) capabilities allow each carrier to know the location of the fault, regardless of which carrier's network the fault occurred on.

- For better SLAs, end-to-end error rate across the OTN network can be monitored. Falling of BER can be seen in advance and appropriate corrective measures can be initiated.

6. Link Reach

- OTN offers forward error correction (FEC) and ODUk protection, allowing for extended reach of the optical links. This results in substantial reduction in CAPEX.
- Supports a reach of up to 2000kms.



7. Encryption & Synchronization

- With increasing requirements for encryption, using OTN is more efficient. In IP routers, the signal needs to be encrypted at every node whereas using OTN, it can be done only at end-points.
- OTN Muxes are timing transparent and do not need clock or external Sync.

Summary

The compact TJ1600 Micro OTN platform (available in a 2RU or a 6RU platform) increases bandwidth efficiency thereby enabling the deployment of fewer wavelengths leading to significantly lower network costs in large deployments. By converging multiple technologies such as SDH/SONET, DWDM and OTN in a single shelf, TJ1600 reduces the number of nodes required to be collocated at each site. Thus, the overall capital expenditure is lowered. Statistically multiplexed IP/MPLS rings have limited scalability and burn additional fiber beyond 10GE. This results in consuming expensive router ports and also results in high power consumption. Using a converged DWDM and OTN platform, the network with traffic not destined for an IP Router is selectively bypassed at the OTN layer. This results in reduced capex and lower power consumption. In addition, TJ1600 is coupled with a multilayered management system that simplifies end-to-end service provisioning and network configuration to reduce the operational expenditure.