

# Tejas XTN TJ1600

## Converged Packet Optical Transport

### Advanced Packet Transport

### OTN and SONET/SDH Switching

### Advanced DWDM Transport

### High Capacity & Low Granularity: 2Mb (E1s) to 200G

### MPLS-TP: Traffic Engineered Pseudowires

### Sub-50ms Protection: 1:1,SNCP, PW & Tunnel Protection

### Carrier Ethernet : VLAN and Q-in-Q

**Network Evolution:** Networks designers are constantly looking to drive the lowest cost per bit for services transport while providing high reliability. Leveraging the advantages of statistical multiplexing while minimizing the number of protocol layers used at each node the service passes through helps to minimize costs. The TJ1600 allows network designers to use the most cost effective transport technologies for each service type.

**One Device for Packet, TDM and DWDM:** The TJ1600 balances Packet and TDM transport in a way unique to the industry. Its hybrid architecture allows for three configurations; TDM with Packet Transport, Hybrid TDM and Packet Transport and all DWDM Optical Transport using the same hardware, software and features. This flexibility creates a unique opportunity for network designs by allowing every service to be optimized based upon the service requirements, not the limitations of a particular transport technology. In addition, the TJ1600 reduces operations costs by having a single platform for all services requirements preventing the need for multiple devices at any site.

**Flexible Packet and TDM Switching:** With a scalable Packet switch provisioned separately from the TDM switch, the 1600 can quickly and easily adapt

**Optimizing Services:** With the 1600 services can be matched to the best transport technology whether that is maximizing efficiency with Stat-muxing, reducing costs by using OTN switching or multi-degree ROADMs to by-pass routers, maximizing fiber utilization with DWDM or minimizing latency with optical / OTN switching.

**Optimizing Packet to DWDM Interworking:** To provide the lowest cost Packet to DWDM interworking the TJ1600 use a unique blend of technologies including 10GE interfaces with OTN wrappers and direct interconnection between Packet and TDM switches to simplify router by-pass in regional / long haul networks.



**Lower Packet Transport Costs:** The TJ1600 optimizes 1G and 10G transport by using OTN switching to efficiently pack and route traffic through the network. The use of OTN switching also reduces the complexity of the Packet network by offloading high bandwidth services directly onto the OTN/ DWDM optical layer.

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## Converged Packet Optical Transport

**Longer Spans for Lower Costs:** Coherent Optics support with Soft Decision Forward Error Correction (SDFEC) technology is used by the TJ1600 to increase optical span length reducing the cost of optical

**DWDM up to 2000+ kms:** With DWDM available for all high speed interfaces, the 1600 can optimize fiber utilization using the latest in amplifier and dispersion compensation technology for reliable transport in metro, regional and long haul networks.

**SONET/SDH/front-haul:** With a complete suite of SONET/SDH capabilities the TJ1600 provides the reliability and performance expected of your transport network; exceptional performance, deterministic routes, predictable latency, low protection switch times and easy network planning. SONET/SDH/ CPRI/OBSAI to OTN and Packet gateway capabilities are available to ensure a seamless interworking of services in the network

**MPLS-TP:** The TJ1600 provides MPLS-TP based pseudowires for traffic engineered flows on trunks, which optimizes the network by providing the right amount of control. The cost benefits of stat-muxing are combined with traffic engineering and capacity planning to lower CAPEX by right sizing the network. OPEX reductions come through faster provisioning, robust protection and quicker root cause analysis during failures.

**Managing Latency:** By matching the services interface to the best switch and the best transport (Ethernet, SONET, OTN and/or DWDM), each service can be delivered with the lowest latency required.

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**Network Management:** With Tejas Networks' suite of management tools network evolution is much easier to manage. Point and Click technologies for Packet, SONET and OTN traffic allow for more accurate service designs, more efficient routing and better fault correlation. Accurate alarming and "fault to affected service mapping" enables fault resolution prioritization. Enhanced network element backups and simple remote software upgrades reduce operational

costs while enhancing reliability. NMS server redundancy and geographical diversity ensure faster disaster recovery.

**Advanced Ethernet Features:** The TJ1600 provides best in class packet switching to create networks with the highest performance. Ingress rate limiting prevents any one service/application from congesting/choking the network. Each packet is classified so that the appropriate network policies (like prioritization and scheduling) can be applied. Eight CoS queues and scheduling algorithms ensure that there are sufficient options available to manage the data traffic efficiently. The TJ1600 provides sub 50ms protected packet rings for greater resiliency.

**Ethernet OAM:** allows real-time monitoring of end-to-end circuits, connections or trunks, enabling quick detection and isolation of faults to a particular subnet, trunk, link or node. The TJ1600 supports BFD based Fault OAM and ping/traceroute at tunnel/pseudowire level. It also supports MPLS-TP based performance OAM for MPLS-TP based PW services.

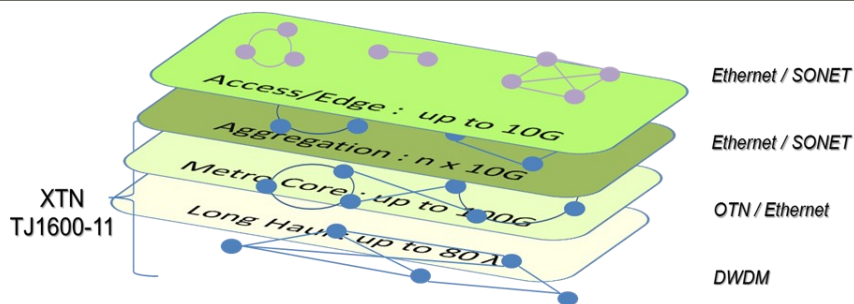
**Circuit Emulation:** Circuit Emulation provides an alternative transport method using an all Packet Transport Network. The 1600 supports E1 SAToP and STM-1 CEP for carrying this traffic with the reliability of TDM networks while providing a seamless gateway between Packet and TDM networks.

**ASON GMPLS Control Plane:** With Tejas Networks' ITU-T G.8080 based GMPLS control plane software, highly resilient networks with multiple levels of protection can be created with ease. . The 1600 supports 1+Reroute and 1+1+ Reroute options by implementing standard protocols.

**Flexible Network Architectures:** The TJ1600 has a flexible architecture that allows it to build the network best suited for all services linearly for rapid deployment such as hub and spoke for cost effective build outs at the edge of the network, ring and ringlet for high utilization and resiliency, meshed for low latency and flexible protection. This is achieved with a unique combination of functionality including the ability for traffic to be switched at Packet, TDM or the optical layer depending on service requirements.

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## Converged Packet Optical Transport



High Density Switching and Optical Transport

### SDH/OTN Switch Capacity

- 1T OTN (1:1 fabric)
- 640G OTN/HO (1:1 fabric)
- 360G OTN/HO, 120G LO (1:1 fabric)
- 340G OTN/HO (1:1 fabric)
- 80G HO/LO (1:1 fabric)

### SONET/OTN Switch Capabilities

- VT1.5, VC12, VC4, VC-4-4c, VC-4-16c, VC-4-64c, STS-1, STS-4c, STS-16c, STS-64c
- ODU2, ODU0, ODU1, ODUFlex
- LO and HO Virtual Concatenation
- Hairpinning
- Ethernet GFP-mapped; VCAT and LCAS

### Interfaces Supported

- 10 Gig E
- 1 Gig E
- 10/100/1000bT
- 10/100bTDS1
- DS3 STM1/STM4/STM16/OC-3/OC12/OC48
- STM64/OC-192/OTU2/OTU2e
- OTU4
- 200G DWDM
- CPRI1-7
- FC100/200/400/800/1200

### Network Protection

- Unprotected, 1+1 APS
- UPSR, 2F BLSR
- ODUk SNC

### Enhanced TDM Services

- VLAN to SONET VCG Mapping
- VLAN to ODUFlex Mapping

Revertive and non-revertive switching

### DWDM/CWDM Optical Layer

- SFP, XFP and Tunable SFP+/XFP/CFP
- eFEC for 10G ports, SDFEC for 100G ports
- FEC for 2.5G and 622M ports
- Up to 80 Channels/Lambda per fiber
- 100G/10G Links up to 2000 km
- Fiber Protection Unit

### ROADMs, OADMs and Optical Multiplexers

- ROADM :
  - 8 degree Colorless, Directionless
  - 4 degree / 2 degree
- Optical Mux/DeMux: 8 Ch and 40/80 Ch
- OADM: 1Ch and 4 Ch
- DCM: Fiber and FBG Based

### Amplifiers

- 17dBm/20dBm/26dBm/Raman
- Pre, Post and Inline

### Transponders and Muxponders

- 10 x 10G Transponder
- 2 x 10G with 16 SFP Muxponder
- 200G/100G Transponder/Muxponder

### Network Management

- Web-based Craft UI
- Network Management System
- SNMP
- GMPLS/ASON

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## Converged Packet Optical Transport

### Ethernet Switch Capacity – Single Shelf

80 to 240 Gbps bidirectional

### Interfaces to Ethernet Switch – Single Shelf

10 Gig E – up to 90 ports

1 GigE – up to 288 ports

10/100/1000bT – up to 192 ports

10/100bT – up to 144 ports

DS1 – up to 756 ports

### MPLS-TP

MPLS-TP Connection Oriented Ethernet

VPWS, VPLS, H-VPLS

ELAN, EVLAN, EVPL, EPL, E-TREE, E-ACCESS

IGMP snooping v1/v2/v3

### Ethernet Switching

VLAN, QinQ based services

Ingress Rate Limiting at 64kbps granularity

Programmable Committed / Peak Rates

Programmable Committed / Peak Burst sizes

Egress rate shaping on all ports

8 classes of service as per IEEE 802.1p

2 Rate, 3 color marking

### Ethernet/MPLS-TP OAM

MPLS-TP OAM RFC5860

BFD based Fault OAM

LSP Ping and Traceroute (RFC6426)

PW Ping

On demand LM/DM based at Tunnel/PW level based on MPLS-TP

link OAM

Link integrity (LLCF/LLR)

SNMPv3

### Network Protection & Security

1:1 bidirectional Linear Protection LSP (RFC6378)

1:1 bidirectional PW

MPLS-TP Mesh

Link Aggregation Group (LAG)

Port mirroring and loopback

### Synchronization

SyncE , DCR, ACR

1588v2 BC with ToD interface

### Circuit Emulation

E1 SAToP RFC4553/MEF8

STM1 CEP RFC4842

### Power Supply (optional redundancy)

-40V to -60V DC

2500 Watts maximum per unit

### Environmental

Operating Temperature : 5°C to 40°C

Short term 0°C to 50°C.

Relative Humidity:

10% to 90%, non condensing.

FCC Part 15 Class A

NEBS Level 3 Compliant

UL60950-1:2007

ICES 003 Issue-4

### Dimensions (W x H x D)

372 mm x 445 mm x 258 mm (TJ1600C 11-slot)

178 mm x 445 mm x 258 mm (TJ1600C 6-slot)

89 mm x 445 mm x 258 mm (TJ1600C 2-slot)

19" and 23" rack mount options

All Front Access

### Related Products

TJ1400-P 1U Packet Transport Solution

1400-7 2U Converged Packet Optical

*\*upcoming release*

*specifications subject to change without notice*

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Software Enabled Transformation

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