TEJAS NETWORKS

White Paper

Building Tomorrow's Metro/Regional Optical Transport System Today

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Contents

Executive Summary

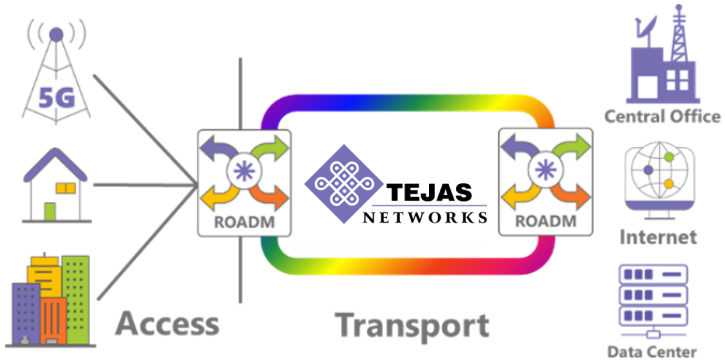
An Optical Transport System (OTS) is a high-capacity network infrastructure designed to transmit data over long distances using light signals through optical fiber. It forms the backbone of modern telecommunications, enabling efficient, scalable, and high-speed data transport for internet, voice, and video services.

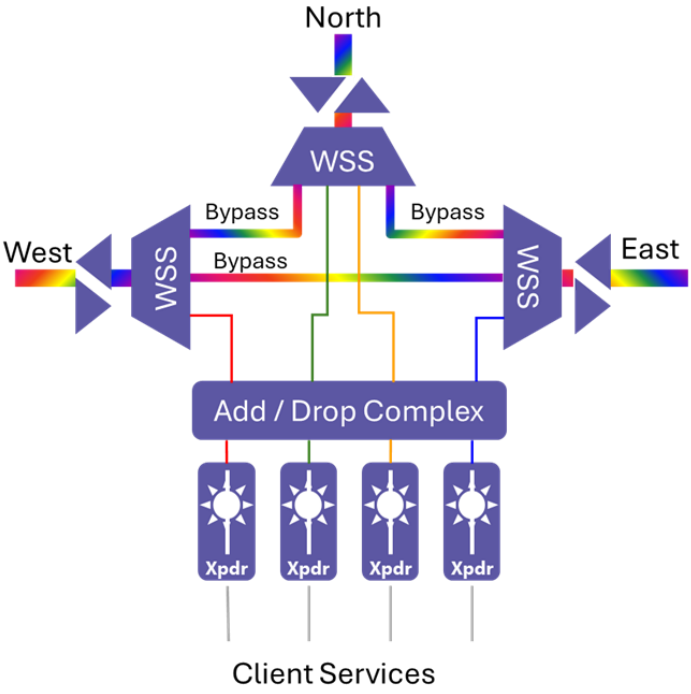
- **High Bandwidth**: Supports terabit-level data rates.
- **Scalability**: Easily expandable to meet growing data demands.
- **Low Latency:** Ideal for real-time applications like video conferencing and financial trading.
- **Energy Efficiency**: Optical transmission consumes less power than electrical alternatives.
- **Reliability**: Robust against electromagnetic interference and physical degradation.

Investing in OTS is critical for digital transformation, supporting emerging technologies like 5G, IoT, and AI. It ensures future-proof infrastructure capable of handling exponential data growth and evolving service demands.

The Issue

Traffic requirements of your metro/regional optical transport system are constantly growing. If traffic demands have outgrown your existing network's capabilities and capacity, you are probably planning for a new optical transport system.



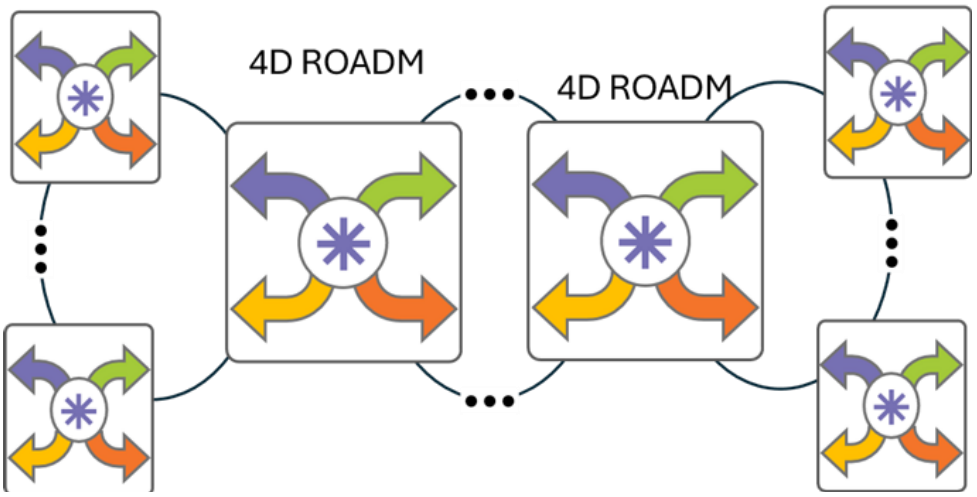


An Optical Transport system allows a Communication Service Provider (CSP) to efficiently and economically transport large volumes of data over long distances using optical fiber while providing the CSP to efficiently and flexibly transport large volumes of data over long distances using optical fiber and forms the foundation of nearly every CSP network.

The optical transport system, based on Reconfigurable Optical Add-Drop Multiplexers (ROADMS) automates the configuration by automatically and remotely adding and dropping wavelengths throughout the network. The ROADM network includes components like Wavelength Selective Switches (WSS) to route optical signals, along with transponders and muxponders, amplifiers, and a system to on-ramp and off-ramp optical signals, known as an add/drop complex

The optical transport system, based on Reconfigurable Optical Add-Drop

The flexible nature of the ROADM, as described above, allows an endless number of deployment scenarios and topologies from small networks to large metro/regional optical networks.



You should select your next optical transport system such that it can fulfill your traffic capacity requirements, capabilities and feature needs for the next 7 t0 10 years. As you plan to replace your existing optical transport system, don't build it for today's needs, think about the needs for the next 10 years. Yes, this is very hard. The key is to think about flexibility. Specifically, can your new networks grow to meet your future needs?

Planning for Future Requirements

Transponders are a source of rapid innovation, with new generations coming out every 18 months. So, make sure your new line system can accommodate the ever-growing line speed offered by new transponders. The recent trend in next generation transponders is to go beyond the standard 50 MHz grid spacing and use wider bandwidth channel spacing. This accommodates higher BAUD rate through modern modulation schemes which results in increased spectral density and lower cost/bit/mile. This requirement can be met with an optical system that supports Flex-grid. Luckily, virtually all new ROADMs support Flex Grid.

Additionally, don't buy a network designed for Tier 1 when you are building a smaller metro/regional network since you don't necessarily have the same requirements as nation-wide Tier 1s. For instance, Tier 1 SPs have recently been driving specific technologies, such as 32D WSSs and CDC everywhere. These features, while new and flashy, may not be needed by T2/3/4 networks and will likely drive up the network cost of a metro/regional optical network. It may be more appropriate for you to buy an optical transport system suited for you, the Tier 2/3/4. Specifically, think about low cost and a comprehensive feature suite.

The Tejas optical transport system has focused on providing a wide range of features and capabilities while reducing capital and operations costs. To highlight a few:

OTDR - Optical Time Division Reflectometry (OTDR) is a technology used to maintain the performance of the optical network. It works by sending a light pulse down the fiber and measuring the light that is reflected back, allowing it to identify faults, measure length, and assess the quality of the fiber. Most optical line systems use a third party OTDR system, which can be cumbersome. Tejas has built-in OTDR capabilities which reduces cost and improves operational efficiency.

WSS size - When building a ROADM, all a optical transport vendors utilize a Wavelength Selector switch to switch wavelengths to different destinations. Tejas provides 4-port, 8-port, 9-port and 20-port WSS components. The 4-port WSS is unique to Tejas. Approximately 2/3 of all ROADMs ever deployed are 2-degrees. A higher port WSS is wasted at these 2-degree sites. By offering a 4D WSS, Tejas does not waste ports at these 2D sites and saving you capital investment.

Breadth of client services - Support for low-speed client service I/Fs impacts cost as well as adding additional revenue streams. Most of our competitors offer optical services including 10/100/400 Gbps. There are many customers who want lower speed services, such as 1 Gbps, various fiber channel rates and even OC3/12/48 rates. If the system you have does not support these rates, then you are forced into one of two options. Decline these customers and let them go to other service providers or add a third-party aggregation device, which increases the complexity of your network and drives cost up. Tejas supports this entire range of client services ensuring that you can service the broadest range of revenue streams with an economical network cost.

Feature Versatility - When thinking about the capabilities of the system, features such as maximum versatility, Sub-lambda grooming, encryption, SFW, your reach requirements.

Expanded Protection Options - Virtually every solution provides unprotected services and protected services via a y-cable or a Fiber Protection Unit card, as does the Tejas solution. These work and protect services usually provide 99.999% uptime depending on the Mean Time to Repair (MTTR) provided by the service provider. The Tejas solution also provides an additional option via WSON that can provide an additional '9' of uptime. The Tejas WSON feature, during times of both the work and protect path being in a fault condition, the system will automatically search for a viable path and automatically reconfigure the system to use this path. Thus, providing additional uptime. This capability provides an additional higher revenue generating ultra available service option for those situations such as mission critical traffic and some financial services.

Expanded Revenue Service Options - multiple revenue service types can help your business tremendously as customer requirements evolve, such as:

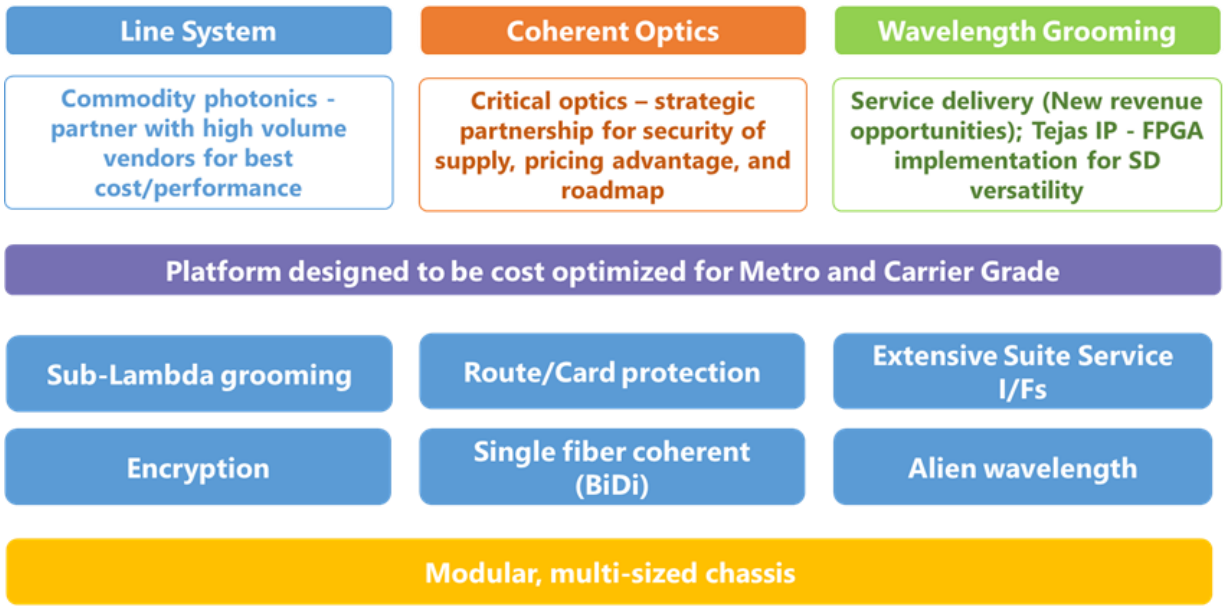
- Wholesale services
- Wavelength services
- Optical services
- OTN services
- Ethernet services

Application Versatility - It will likely benefit you to support a variety of applications including alien wavelengths, wholesale services, point to point DWDM, Access, Metro, Regional, and Long Haul WDM with 10G to 1.2TB waves, DWDM aggregation, metro optical cores and Datacenter Interconnect/router bypass.

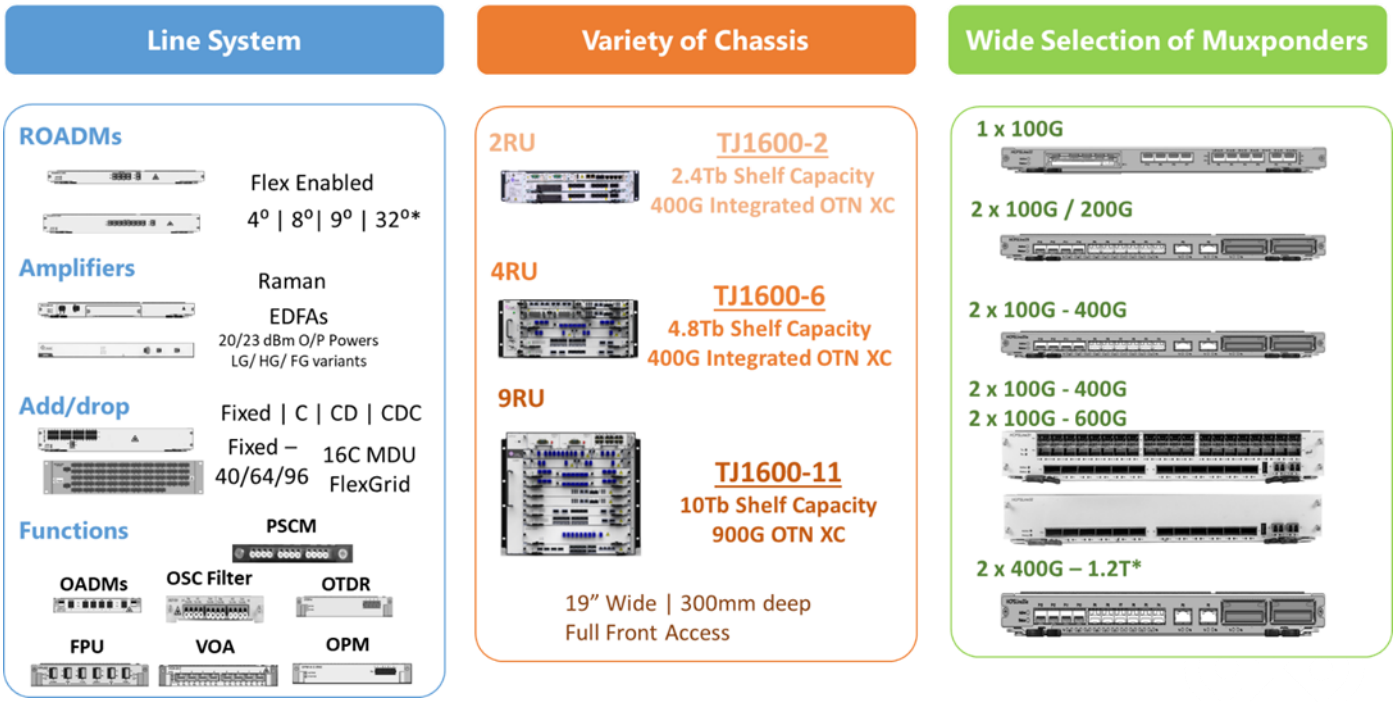
What is the Tejas Solution

The Tejas TJ1600 optical transport solution is designed to provide a full range of optical services for metro and regional applications, with a comprehensive set of features and capabilities.

The platform approach of the Tejas TJ1600 optical transport solution are shown below:

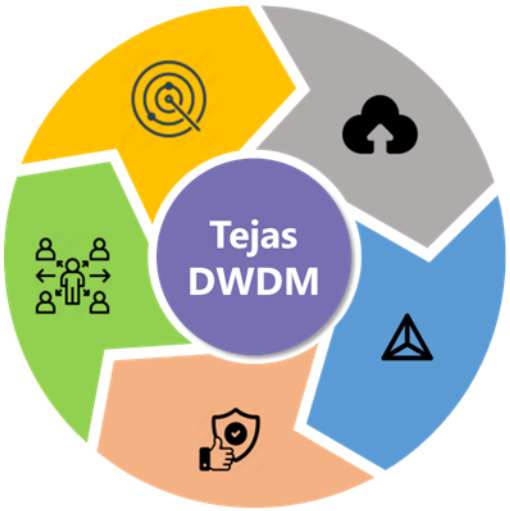


The hardware elements of the Tejas TJ1600 optical transport solution are shown below:



Value of Tejas Optical Transport Solution

The Tejas Optical Transport Solution brings numerous drivers/benefits to the service provider:



- **Comprehensive Suite DWDM Functions**
- **Broad Set of Muxponders Available**
- **Integrated Access, Switching, Transmission and Seamless Network Modernization**
- **Single Management System**
  DWDM / Packet / PON / Ckt Emulation
- **Client I/F Breadth**
  1/10 GE & OTU-1/1e/2/2e/4 & FC 1/2/4/8/12/16/32
  BiDi & OC-3/12/48/192 & STM-1/4/16/64
- **High Reliability:**
  Multiple Protection Mechanisms
  (WSON & FPU)

Conclusion

When upgrading your optical transport platform, plan for a system with a comprehensive suite of DWDM functions and capabilities, availability of a broad set of Muxponders, extensive client I/F breadth, high reliability with multiple protection mechanisms.

You also have an opportunity to align your overall network architecture to your future needs. Looking for a system that integrates access, switching, transport while supporting seamless network modernization will lead to reduction in network complexity and improve efficiency and reduce costs.

Also, the bane of every service provider is the proliferation of EMS systems. It can be a great boon to your business if your optical system has a single management system that can support DWDM / Packet / PON / Circuit Emulation / FWA and wireless technologies. A single management system will reduce your cost of operations, simplify EMS and Network Management training and improve customer satisfaction with more rapid network issue resolutions.

This is a daunting task, but the good news is that the Tejas Optical Transport solution meets all of these design objectives. If you are in need of exploring an Optical Transport solution to equipe your company for the next decade, Tejas welcomes the opportunity to work with you. Just email us at **sales_northamerica@tejasnetworks.com** to get started.

About the Author

Jeff Babbitt

Solution Leader

Mr. Jeff Babbitt is a Solution Lead at Tejas Networks. Mr. Babbitt has more than 30 years of experience in the telecommunications industry. During that time, he has remained dedicated to staying on the cutting edge of technology and sharing his knowledge through forward-thinking product planning and product management, business development as well as technical marketing. Jeff Babbitt holds a BS in Electrical Engineering from Colorado State University and a master's degree from The University of Texas at Arlington.