Metro and regional transport is entering a period of dramatic expansion, driven by demand for advanced Ethernet, broadband and Video-on-Demand services. Successful competition depends on having a single core infrastructure that supports aggregation, management and transport of high-bandwidth service applications. The FLASHWAVE® 7500 Multifunction ROADM/DWDM platform enables this infrastructure with scalable Reconfigurable Add/Drop Multiplexer (ROADM) technology and advanced operational and service delivery features, for deployment in metro/regional networks.

Flexible Architecture, Deployed Worldwide

Chosen by major service providers worldwide, the FLASHWAVE 7500 platform is deployed in North America, Europe and Asia. American National Standards Institute (ANSI) and European Telecom Standards Institute (ETSI)-certified versions allow operation in any network environment. The platform aggregates voice, data, video, storage and wavelength services, while providing as-needed wavelength selectable, Synchronous Optical Network (SONET) and future Optical Transport Network (OTN)-compliant switching mechanisms for efficiency and flexibility.

Metro/Regional Transport Solutions

The FLASHWAVE 7500 platform is the ideal core infrastructure solution for metro and regional long-haul networks. The system offers compelling advantages for Multiple System Operators (MSOs), Tier 1 and 2 telecommunications service providers, the federal government, and emerging research and education networks. Key features and benefits include:

▶ Seamless integration and network design of metropolitan Dense Wavelength Division Multiplexing (DWDM) networks with regional and long-distance infrastructure
▶ Remotely reconfigurable ROADM with optical hubbing support for up to 12 degrees
▶ Optical wavelength switching and options for service-based STS-level switching
▶ Unregenerated transport of 10 Gbps and 40 Gbps wavelengths for up to 1200 and 1000 km respectively through up to 24 nodes
▶ Superior network interfaces with full-band tunable narrowband lasers, OTN-compliant digital wrappers and multiple Forward Error Correction (FEC) options
▶ Small Form-factor Pluggable (SFP) and 10 Gbps small form-factor (XFP) units
▶ Self-leveling amplifiers and automated channel balancing for easy service activation and economical operations
▶ Direct optical interconnection with FLASHWAVE 4500 Multiservice Provisioning Platform (MSPP)-based networks, plus direct connection of narrowband optics from any International Telecommunications Union (ITU)-compliant source

Field-Proven Technology

The FLASHWAVE 7500 platform has undergone rigorous independent assessment. One example is testing by the U.S. Defense Information Systems Agency (DISA)-sanctioned Joint Interoperability Test Command (JITC) for use in the Defense Information System Network (DISN). The platform is included on the Department of Defense’s Approved Product List and has been tested by the Department of Army Technology Integration Center (TIC) and is recommended for use in the Installation Information Infrastructure Modernization Program (I3MP).
As a unified, scalable platform, the FLASHWAVE 7500 system offers flexible configurations to support a wide range of applications including:

- The FLASHWAVE 7500 2-degree (2D) ROADM (40-channel)
- The FLASHWAVE 7500 WSS ROADM scalable in-service to a 12-degree hub configuration (40-channel)
- The FLASHWAVE 7500 Extension Shelf for non-ROADM, standalone service applications

The platform’s tunable Optical Line Cards (OLCs) and software are common to all FLASHWAVE 7500 configurations. This offers opportunities for cost-efficiency in engineering, training, installation and sparing. Chassis options include a 23-inch North American carrier-centric version, a 19-inch data center version and a 500 mm ETSI version.

The FLASHWAVE 7500 system also supports managed service extensions with the FLASHWAVE CDS Micro Packet Optical Networking Platform (Packet ONP). The FLASHWAVE CDS is a compact 2U customer premises platform that is managed via embedded communications channels. This simplifies operations, provides network demarcations, and introduces a cost-effective way to deploy private-line Gigabit Ethernet services.

### FLASHWAVE 7500 2D ROADM

An economical choice for locations requiring two degrees of connectivity, the FLASHWAVE 7500 2D ROADM can be deployed in a single-ring topology. The system provides full add/drop, pass-through and optical drop and continue capabilities in protected or unprotected point-to-point, linear and ring topologies. By combining ROADM and multiplexer functionality into a dedicated card, the platform makes slots available for optical line interfaces and revenue-generating service interfaces.

### FLASHWAVE 7500 WSS ROADM

The FLASHWAVE 7500 wavelength selective switch (WSS) ROADM provides a powerful and cost-effective deployment solution for metro, regional and long-haul networks. The system dramatically reduces both capital outlay and operational expenses by fully automating zero-impact nodal upgrade capability. Configurations range from simple ROADM to multidegree hub with fast service delivery and transparent interoperability between rings and mesh networks.

### FLASHWAVE 7500 Extension Shelf

The FLASHWAVE 7500 Extension Shelf is a non-ROADM stand-alone configuration that delivers high-capacity optical services to customer premises where OADM infrastructure is not needed. The system reduces operational expenses by consolidating the complete DWDM infrastructure, from the customer to the network core, onto a unified platform.
The FLASHWAVE 7500 platform is engineered to simultaneously deliver 10 Gbps and 40 Gbps wavelengths across the same fiber using the same dispersion map. The ability to base such a wide range of configurations on a single platform and support upgrades to 10 Gbps and 40 Gbps extends the network’s life, reduces costly equipment changes, and brings optical networking benefits closer to the network edge than ever before.

The system supports wavelength-level optical switching, integrated SONET-based STS switching, and G.709 compliant OTN interfaces, along with the industry’s most advanced optical technologies. Advanced control-plane intelligence and sophisticated optical self-tuning allow scalable end-to-end service activation and multidegree hub configurations on a single interoperable platform.

Multiple DWDM Options

The Flexponder unit on the FLASHWAVE 7500 is an MSPP –on- a- card. The unit supports multiplexing and grooming for up to eight GigE, OC3/12/48 signals, along with two high speed, fully tunable ITU-T compliant OC192/OTU2 interfaces, and up to 20G of STS-based switching. Additional non-blocking grooming and ports can be added with each additional Flexponder, up to 160G of switching capacity. Flexponders also support SONET UPSR and 1+1, along with OTN 1+1 protection switching. Traffic management features include STS-based TSA/TSI, ADM on a wavelength, GFP mapping, VCAT and hairpinning. The Flexponder option is supported in any FLASHWAVE 7500 configuration.

Features that Drive Application Breadth

The FLASHWAVE 7500 platform offers several features that extend the scope of possible applications:

▶ Advanced traffic management features
▶ Automatic span-loss adjustment
▶ Tunable ITU-T compliant narrowband optics
▶ Cost-effective light path protection
▶ Maintenance Loop Signaling Entity (MLSE) functionality for mitigation of high Polarization Mode Dispersion (PMD)-fiber impediments
▶ Variable embedded dispersion compensation for 40 Gbps transport
▶ Inline amplification of DWDM signals
▶ In-service upgrade capability to a full-featured ROADM
▶ Automatic topology and link discovery
The FLASHWAVE 7500 platform enables a broad spectrum of new, high-bandwidth applications such as broadband Internet transport, high-density video distribution, and advanced IP/Ethernet services.

**Core Transport Infrastructure**

As a high-capacity optical transport platform, the FLASHWAVE 7500 multifunction ROADM/DWDM platform is ideal for transparently aggregating large, high-bandwidth service applications over a single optical core. For metro and regional long-haul networks, the system enables seamless migration of existing voice, data and video infrastructure into a single DWDM infrastructure.

**Video Distribution**

Perfectly suited for streaming Video-on-Demand and broadcast applications, the FLASHWAVE 7500 platform lets service providers distribute multiple video streams throughout the optical DWDM infrastructure.

**Private Network Applications**

As the backbone infrastructure for large private network applications, the FLASHWAVE 7500 system ensures that financial institutions, educational consortia and federal government installations can accommodate data traffic growth without costly network upgrades.

**High-Capacity Access**

The wide range of compatible FLASHWAVE 7500 ROADM/DWDM configurations can seamlessly grow from low-traffic access points to fully-configured high-capacity systems, easily scaling up as data traffic increases.

---

**The Ideal High-Capacity Optical Transport Vehicle**

---
Fujitsu offers a broad selection of professional services to assist at every stage in a network’s evolution and operation. From planning through deployment and ongoing maintenance to future enhancements, Fujitsu Network Life Cycle Services are available whenever needed. Our comprehensive range of services includes network and system design, training, customized deployment, craft interface software, migration planning and more. Your Fujitsu sales representative can guide you in selecting the right service options for your business.

Popular planning and deployment services for the FLASHWAVE 7500 multifunction ROADM/DWDM platform include:

- **Fiber characterization** – Fujitsu offers comprehensive analysis of installed fiber to improve current network performance, prepare for new growth and identify potential issues.
- **Onsite mentoring** – Our experts provide full training and knowledge transfers.
- **Design services for DWDM networks** – Our professional design staff works with you to prepare a complete, custom roadmap for success.

**Service Support Packages for Ongoing Maintenance**

If you’re looking for a complete professional maintenance solution, Fujitsu service support packages have the right combination of flexibility and comprehensive assurance. Choose the level and types of service you need to supplement your own resources. Our service support packages help keep your network running smoothly, provide critical care and protect the longevity of your investment.

**Network Operations Center**

With a full range of vendor-independent network fault and performance monitoring features, the Fujitsu Network Operations Center (NOC) offers guaranteed, round-the-clock system protection. Our reliable NOC facility is available as a primary or supplemental operations resource. This service not only helps you control costs and maintain high levels of customer satisfaction, it also provides trustworthy and reliable after-hours and emergency coverage.
FEATURES AND SPECIFICATIONS

Architectures
- Optical hubbing (up to 12 degrees)
- Optical ring
- Optical mesh
- Linear add/drop
- Point-to-point

Network Capacity
- 1.6 Tbps (40 wavelengths at 40 Gbps each)
- Up to 1200 km reach for up to 24 spans without 3R regeneration
- Span loss up to 41 dB (0.19 dB/km) with RAMAN amplification
- WSS-based optical switch fabric (1 to 12 degrees)
- 2D-only ROADM
- Services extension configurations with Stand Alone Shelf (SAS) and FLASHWAVE CDS Packet ONP
- 12-degree optical hubbing
- Self-tuning/self-leveling/auto pre-channel power balancing
- Intelligent control plane GMPLS
- Inline amplifier

Interfaces
- Transponders/Regenerators for 40 Gbps, 10 Gbps, and low speed transmission
- Muxponders including 4:1 10G, 4:1 2.5G, and 8:1 1G
- Flexponder for SONET based networking and switching including 20G STS switch fabric (expandable to 160 Gbps), OC-3 to OC-192, and 1 Gigabit Ethernet services
- Network interface optics
- Full C-band tunable narrowband optics at 10 Gbps and 40 Gbps
- G.709 compliant digital wrappers with FEC

Client Interface Optics
- Small form-factor SONET/SDH (SR, IR and LR)
- Small form-factor CWDM (SR, LR)
- Forward Error Correction (FEC)
- Reed Solomon (239, 255) RS-FEC
- Ultra FEC (U-FEC), Enhanced FEC (E-FEC)

Operations
- TL1 over TCP/IP
- TL1 over OSI
- SNMP
- GMPLS control plane
- Software and firmware download
- Remote memory backup/restore
- OSC with 10 Mbps user channel
- SDCC for FLASHWAVE CDS Packet ONP management
- Remote OAM&P
- Remote equipment inventory
- NETSMART® 500 Craft User Interface
- NETSMART 1500 Management System
- NETSMART 2000 Network Design and Planning Tool

Service Modules

<table>
<thead>
<tr>
<th>Service Modules</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fast Ethernet</td>
<td>Multirate 2.5 Gbps transponder</td>
</tr>
<tr>
<td>ESCON</td>
<td>(1 port 100 Mbps–2.5 Gbps)</td>
</tr>
<tr>
<td>D1/SDI Video</td>
<td></td>
</tr>
<tr>
<td>Fibre Channel/FICON</td>
<td></td>
</tr>
<tr>
<td>HDTV</td>
<td></td>
</tr>
<tr>
<td>DV6000</td>
<td></td>
</tr>
<tr>
<td>FDDI</td>
<td></td>
</tr>
<tr>
<td>OC-3/OC-3c/OC-3 UNI/STM-1</td>
<td>Multirate 2.5 Gbps transponder</td>
</tr>
<tr>
<td>OC-12/OC-12c/OC-12 UNI/STM-4</td>
<td>(1 port 100 Mbps–2.5 Gbps)</td>
</tr>
<tr>
<td>Gigabit Ethernet</td>
<td>10 Gbps Flexponder (8 ports)</td>
</tr>
<tr>
<td>OC-48/OC-48c/OC-48 UNI/STM-16</td>
<td>Multirate 2.5 Gbps transponder</td>
</tr>
<tr>
<td>10 Gigabit Ethernet (LAN PHY)</td>
<td>(1 port 100 Mbps–2.5 Gbps)</td>
</tr>
<tr>
<td>10 Gigabit Ethernet (WAN PHY)</td>
<td>10 Gbps Flexponder (8 ports)</td>
</tr>
<tr>
<td>OC-192/STM-64</td>
<td></td>
</tr>
<tr>
<td>OTU2</td>
<td>40 Gbps muxponder (4 x 10 Gbps ports)</td>
</tr>
<tr>
<td>OC-768/STM-256</td>
<td>40 Gbps transponder</td>
</tr>
</tbody>
</table>

Monitoring and Alarms
- Optical performance monitoring
- Wavelength management
- Lightpath circuit tracking
- Topology discovery and display
- SONET PM
- Gigabit Ethernet PM

Power Consumption/Heat Dissipation
- Optical/HUB shelf <360W (1228 BTU/hr)
- 2D-ROADM shelf <680W (2318 BYU/hr)
- Tributary shelf <930W (3170 BTU/hr)

Operating Environment
- Temperature 0 to 50 °C (32 to 122 °F)
- Humidity 5 to 95% (non-condensing)
- NEBS Level 3 compliant

Physical Characteristics
- Dimensions (H x W x D)
  - 23” Shelf 22.7 x 21.3 x 11.5” (573 x 541 x 296 mm)
  - 19” Shelf 22.7 x 18.5 x 11.5” (577 x 470 x 292 mm)
  - ETSI shelf 30.2 x 19.7 x 11.1” (775 x 500 x 280 mm)

Weight
- Fully-loaded shelf <160 lb (73 kg)
- Power input ~48 V DC
- Integrated redundant power supply

Physical Characteristics

<table>
<thead>
<tr>
<th>Feature</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions (H x W x D)</td>
<td>23” Shelf 22.7 x 21.3 x 11.5” (573 x 541 x 296 mm)</td>
</tr>
<tr>
<td></td>
<td>19” Shelf 22.7 x 18.5 x 11.5” (577 x 470 x 292 mm)</td>
</tr>
<tr>
<td></td>
<td>ETSI shelf 30.2 x 19.7 x 11.1” (775 x 500 x 280 mm)</td>
</tr>
</tbody>
</table>

Weight
- Fully-loaded shelf <160 lb (73 kg)
- Power input ~48 V DC
- Integrated redundant power supply