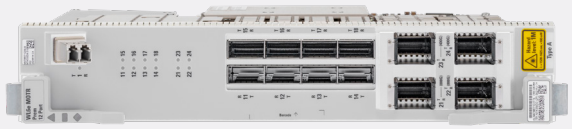
DATA SHEET

WaveLogic 6 Extreme 1.6T MOTR module

For the 6500 Packet-Optical Platform



WaveLogic™ 6 Extreme (WL6e) MOTR is a coherent transceiver and service channel interface capable of transmitting and receiving up to an industry-leading 1.6 Tb/s of client payload on a single-carrier wavelength. Advanced 3 nm coherent DSP technology—combined with state-of-the-art high-bandwidth 200 GBaud electro-optics—enables flexible 200 Gb/s to 1.6 Tb/s coherent transmission to maximize capacity across any network path and deliver ubiquitous 800G connectivity, all while operating in existing network assets.

The WL6e MOTR 12-port interface combines 12 client ports (8 QSFP28 + 2 QSFP28/DD + 2 QSFP-DD800/DD) and one programmable 200–1,600 Gb/s coherent DWDM line interface in a double-slot form factor. It doubles the capacity per wavelength to support highest connectivity speeds up to 1.6 Tb/s on a single wavelength and 800 Gb/s across the longest links. With WL6e MOTR supported in existing 6500 D/S-Series shelves, network operators can mine their existing 6500 installed base to achieve greater capacity scale and improved performance and power efficiencies.

Pay-as-you grow pluggable QSFP28/QSFP-DD/DD800 client options allow operators to accommodate a flexible mix of high-bandwidth 100GbE, OTU4, and 400GbE connectivity and the ability to elegantly evolve to 800GbE-router architectures in the future. QSFP28 ports support both 100GbE and OTU4 protocols. The QSFP-DD port supports both 400GbE and 4 x 100GbE client options, and the QSFP-DD800 ports support 800GbE, 2 x 400GbE, and 8 x 100GbE to enable a maximum of 1.6 Tb/s throughput across the interface. Various high-density aggregation modules can be equipped alongside WL6e MOTR that allow for aggregation of lower-speed 1G-to-10G services.

WL6e MOTR supports fully flexible coherent wavelength capacity settings, from 200 to 1,600 Gb/s with adjustable baud from 95 GBaud to 200 GBaud,

Features and benefits

- Provides single-carrier 200–1,600 Gb/s coherent transmission to maximize capacity across any distance
- Doubles the wavelength capacity and delivers power-per-bit and spectral efficiency improvements compared to WaveLogic 5 Extreme
- Supports flexible mix of clients:
  - OTU4
  - 100/400/800GbE
- Enables ubiquitous 800G connectivity across any distance

Part order number

- NTK550DD: WL6e MOTR Premium
- NTK550DE: WL6e MOTR Submarine

so operators can optimize capacity and spectral efficiency for any network path. Operators can achieve 1.6 Tb/s for metro ROADM applications, 1.2 Tb/s for 1,000 km distances, and a minimum of 800G for ultra-long-haul and uncompensated submarine applications. Ready for next-generation router architectures, WL6e enables ubiquitous deployment and efficient 800G client connectivity at any distance—from across the metro to across the Pacific. Industry-leading performance is enabled through a vertically integrated, co-optimized 200 GBaud design, using state-of-the-art 3 nm CMOS, high-bandwidth silicon photonics, and indium phosphide-based electro-optics.

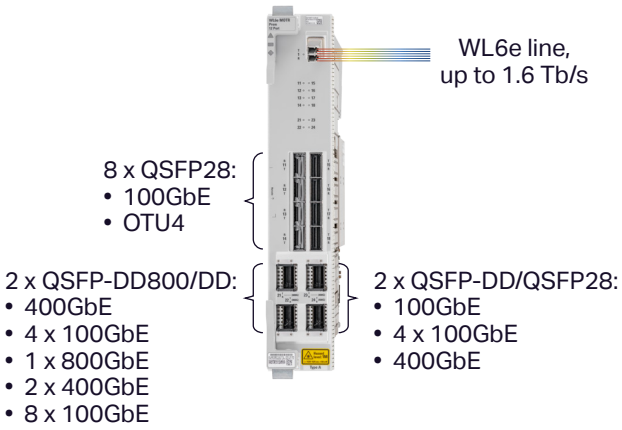


Figure 1. Flexible 100/400/800GbE client mix supporting up to 1.6 Tb/s throughput

In addition to power savings that enable a "greener" network, WL6e MOTR integrates link monitoring and other operational features to automate turn-up and simplify deployment and networking. As an example, 16 integrated test sets (one for each client interface), as well as client and facility loopbacks, facilitate remote testing of all paths—both the DWDM line and subtending equipment from the client port—to accelerate turn-up and troubleshooting. Extensive link monitoring, along with the programmability of WL6e MOTR, provides real-time visibility of network performance and the ability to quickly adjust to unpredictable demands, enabling the evolution to the Adaptive Network. Features supporting tight integration between router and transport layers include Link Layer Discovery Protocol (LLDP) automated topology discovery and link state holdoff to increase network resiliency and enable operational process automation across L0–L3 networks.

With 6500 WL6e MOTR, operators can efficiently transport 100G–800G services, provide greater service differentiation through unique high-speed wavelength connectivity options up to 1,600 Gb/s, and gain improvements in networking efficiencies through reduced power and cost per bit. Extensive link monitoring—combined with integrated operational features—speeds turn-up, provides real-time visibility into network performance, and facilitates software automation across L0–L3 networks.

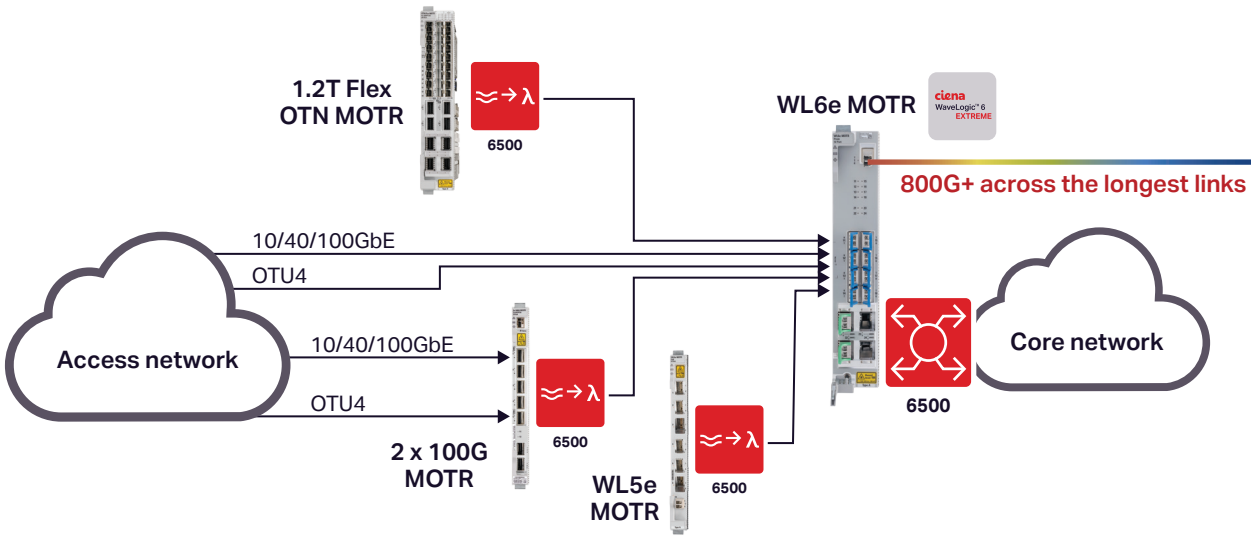


Figure 2. WL6e MOTR enables efficient service aggregation into the core network

General specifications

Ports
- 1 coherent DWDM line port, 12 client ports

Weight
- 3.1 kg (6.8 lbs.)

Symbol rates
- Adjustable baud from 95–200 GBaud

Single-carrier channel capacity
- 200–1,600 Gb/s

Photonic line channel plan
- Flexible-grid colorless configurations
- Fixed grid (200 GHz)

Client interfaces
- 100GbE
- OTU4
- 400GbE

Transmitter/Receiver specifications

Laser frequency tuning range
- C-band: 191.25–196.125 THz
- 100 MHz tuning granularity

Tx output power
- 9 dBm to +8 dBm

Rx sensitivity
- <1.1 Tb/s: -22.0 dBm
- 1.2 Tb/s: -19.5 dBm
- 1.4 Tb/s: -16.5 dBm
- 1.6 Tb/s: -12.0 dBm

Rx damage level
- +17 dBm

PMD tolerance
- <1.6 Tb/s: 50 ps mean, 150 ps peak
- 1.6 Tb/s: 30 ps mean, 90 ps peak

CD tolerance
- Terrestrial: -102,000 ps/nm to +164,000 ps/nm
- Submarine: -1,133,000 ps/nm to +2,226,000 ps/nm

ROADM support
- Up to 28

Operational features

Loopbacks
- Line facility and terminal loopback
- Client facility and terminal loopback

Integrated test set
- Up to 16 independent ITS per card (1 for each client interface)
- Test patterns:
  - 100/400GbE 802.3, OPU4 (fixed)

Topology discovery
- 100/400GbE LLDP snooping
- Trail Trace Indicator (TTI)
- Neighbor Discovery Protocol (NDP)

Router signaling
- 100/400GbE link signaling holdoff

Link monitoring
- Pre-FEC BER (avg, max)
- Pre-FEC Q (min, avg, max, stdev)
- Post-FEC error count
- SNR external (current, min, avg, max)
- Effective SNR (current, min, avg, max)
- Tx power (current, min, avg, max)
- Rx total/channel power (current, min, avg, max)
- Polarization mode dispersion (current, avg, max)
- Polarization-dependent loss (current, avg, max)
- Total Rx link dispersion (current, min, avg, max)
- Total Tx link dispersion (current)
- Cycle slip count (min, avg, max)
- Estimated fiber length
- Estimated unidirectional latency
- Delay measurement (min, avg, max)

Protection
- 1+1 OPS optical channel path protection
- 1+1 OPS optical trunk protection
- Layer 0 control plane restoration

Shelf/system specifications

6500-D4
- 3.2 Tb/s

6500-S8
- 6.4 Tb/s

6500-S14
- 11.2 Tb/s

6500-S32
- 25.6 Tb/s

C-band capacity (4800GHz)
- 38.4 Tb/s

Environmental specifications

Storage temperature
- 40°C to +70°C

Operating temperature
- -5°C to +45°C

Storage humidity
- 5%–93%, noncondensing

Operating humidity
- 5%–93%, noncondensing

Laser safety
- IEC/EN 60825-1 Edition 3 - Class 1
- IEC/EN 60825-2 Edition 3.2 - Hazard Level 1M
- FDA CDRH 21-CFR-1040

ESD
- GR-1089-CORE Issue 7
- ETSI EN 300 386 (other than telecom centers)
- EN 55032 / CISPR 32, Class A
- Electromagnetic emission FCC 47 CFR Part 15, Class A
- GR-1089-CORE, Class A
- ETSI EN 300 386, Class A
- EN 55035 / CISPR 35

Electromagnetic immunity
- GR-1089-CORE
- ETSI EN 300 386 (other than telecom centers)
- EN 55035 / CISPR 35

Office vibration/earthquake/shock
- GR-63-CORE, Zone 4
- ETSI EN 300 091-1-3, Class 3.1

Flammability
- GR-63-CORE, Section 4.2.3
- RoHS 2011/65/EU

Reliability
- GR-468-CORE
- GR-63-CORE
- GR-326-CORE