# FSP 3000 metro open line system solution

## A flexible optical layer designed for metro network demands

Metro networks are going through incredible transformation due to rapid advances in mobile and cloud connectivity. However, metro network evolution cannot rely solely on increasing network capacity. The desire for hardware and software that enables open, flexible and scalable optical network infrastructure has also reached metro networks. Standard solutions deployed in core infrastructure are not efficient as core and metro networks have different requirements. Our FSP 3000 has expanded to address metro network transformation at metro economics.

### Metro networks have unique demands

ROADM-based optical layer architectures have been widely adopted in core network infrastructure. However, these solutions do not fit in metro network environments. The high first-in cost, complexity and footprint of core ROADMs make them inefficient for metro networks. Metro networks are usually optimized for traffic aggregation with linear add/drop chains or ring topologies. For this reason, common core network demands, such as high-degree counts and contentionless networks, don't apply in metro environments. The new components of the FSP 3000 open line system (OLS) have been specifically designed to meet next-generation metro network demands.

### A new flexible optical layer at metro economics

The innovative technology behind the new FSP 3000 OLS components avoids high first-in costs and enables ultra-compact network nodes that can be equipped in space-constrained metro points of presence, including street cabinets. Economical 2-degree ROADMs enable cost-efficient reconfigurable optical layers even in networks with few add/drop wavelengths per node.

Supporting high-speed coherent wavelengths brings additional cost efficiency. Most metro services are still 10Gbit/s or lower-speed services. However, the ability to groom those services into high-speed coherent wavelengths increases fiber usage efficiency and drives down cost.

### Your benefits

- **Enhanced spectral efficiency for lower cost**
  Leverage the benefits of coherent technology
- **Deployment even at space-constrained PoP**
  Outstanding consolidation of common functions, reducing footprint, installation and cabling efforts
- **Pay-as-you-grow**
  Flexible and scalable optical layer with low initial cost
- **Outstanding surveillance**
  Automated performance monitoring and fault management; integrated OTDR port for fiber monitoring (ALM)
- **Fully remote operation**
  Automated setup procedures, power levelling and span equalization for fully remote operation
- **Avoids lock-ins**
  Open line system with metro-optimized ROADMs supporting flexgrid and high-speed coherent modulation schemes

**Ultra-compact in-line amplifier (ILA) with OSC and OTDR port to monitor fiber integrity**

**Ultra-compact 2-degree ROADM (line switching, OSC and OTDR port)**

## Metro networks need 2-degree ROADMs

Transport aggregation in the metro usually happens through rings and linear chains, with hub-and-spoke traffic. In these scenarios, 2-degree nodes are predominant, and metro-optimized 2-degree ROADMs bring enormous benefits. These benefits go beyond a remote and flexible allocation of wavelengths between nodes. ROADMs supporting flexgrid are essential for the transport of high-speed coherent wavelengths, and they enable control of analog photonic layer parameters such as individual channel power levels.

With focus on metro network demands, our Metro OLS solution comprises two types of ROADM nodes: an ultra-compact and cost-effective 2-degree ROADM, and a multi-degree ROADM for interconnection of metro aggregation rings with the metro core. Both network elements have a compact and simple architecture and support flexgrid.

The FSP 3000 metro OLS solution also include an ultra-compact in-line amplifier that can be equipped in a single 1RU chassis.

## Innovation for ultra-compact nodes

The following innovative modules make possible the FSP 3000 Metro OLS ultra-compact and cost-efficient network elements:

- MicroROADM™ provides blocking function and facilitates ultra-compact and cost-effective 2-degree ROADMs, supporting up to 96-channels with 50GHz spacing or flexgrid
- MicroAmp™ consolidates all common line terminal functions (OSC, EDFA, OTDR and OTC ports) and provides mid-stage pre-amp access for dispersion compensation; several variants are available with or without add/drop function as well as with or without booster
- 9ROADM-RS compact 9-degree module with route-and select architecture for up to 9-degree ROADMs

## Operational simplicity

- Guided fiber installation and ROADM commissioning
- Automated performance monitoring and fault management for improved availability
- Automated power levelling of pass-through channels and span equalization for fully remote operation
- Self-tuned dispersion compensation for simplified operation of coherent and direct detect wavelengths
- AutoConnect™ suite for best user experience
- Easy control of the large set of parameters of the analog photonic layer

## Open and software-defined networking

The trend towards open and software-defined networking is extending quickly from data centers to optical transmission systems and is driving disaggregation. By grouping functions by their innovation rate, we have a much greater flexibility to introduce innovation in the network. Partially disaggregated scenarios with the entire optical line system disaggregated from the terminals are usually preferred, because they are simpler to operate and control.

With an open and disaggregated architecture our FSP 3000 enables highest flexibility to deploy best-in-class equipment for every network need, avoiding implementation lock-ins. What's more, automated operational processes and a flexible and reconfigurable optical layer that supports flexgrid and high-speed coherent modulation schemes make our metro OLS the ideal foundation for a software-defined metro network evolution.