

Scaling edge packet networks to 100Gbit/s

Fighting bandwidth bottlenecks

There are good reasons why communication service providers (CSPs) are evolving their current 10Gbit/s access and metro packet networks to 100Gbit/s. Innovation in mobile technologies, the digitization of cable networks, cloudification of businesses or simply bandwidth-hungry customers in multi-tenant business parks; all of these share the need for high-bandwidth connectivity. But to benefit from this growing demand CSPs need to scale their metro networks to 100Gbit/s.

It's quite a step

100Gbit/s signals are more sensitive to fiber impairments, less tolerant to noise, and the interfaces consume more power. Coherent interfaces must be applied in order to remove distance restrictions caused by fiber dispersion. What's more, high-bandwidth interfaces frequently come with lower port density and higher power consumption, impacting operational cost but also requiring additional investment in site construction and air conditioning. Those challenges must be considered when planning the network evolution. Luckily, technological innovation can help CSPs take this vital step.

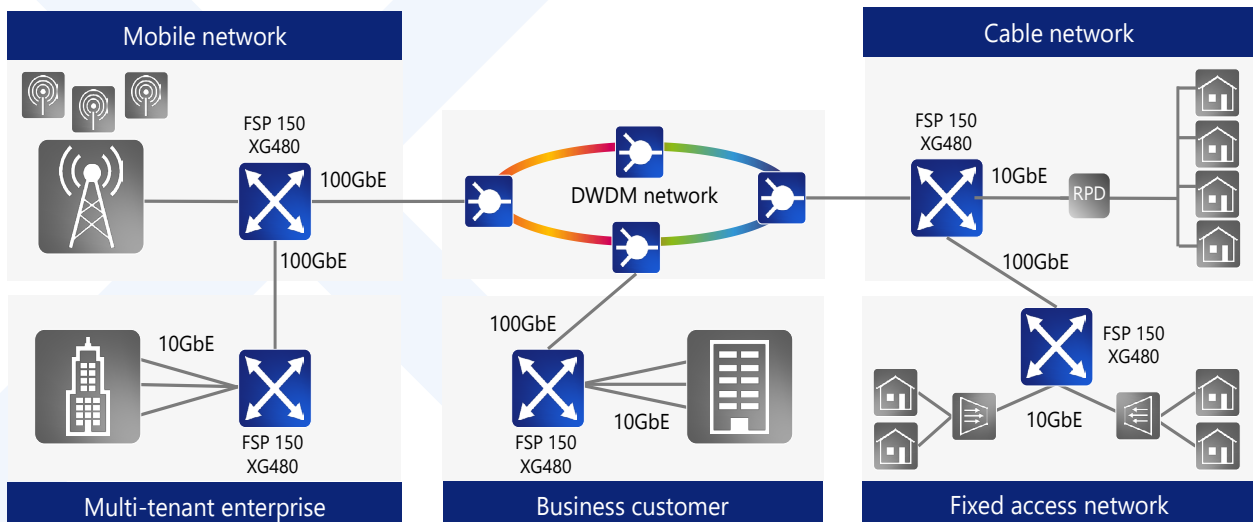
Ease of use makes the difference

Our compact and powerful FSP 150-XG480 aggregator with high 1, 10 and 25Gbit/s port count is an essential component for growing metro networks to 100Gbit/s. By supporting the same OAM capabilities as existing network gear, the move to higher bandwidth does not impact operational processes. With fully MEF 3.0-compliant interfaces, service activation in 100Gbit/s metro networks follows proven and well-established processes of existing CE networks.

Driving metro networks to 100Gbit/s

- ✘ Ever increasing numbers of mobile base-station sites demand powerful 100G backhaul networks
- ✘ Cable networks evolving to disaggregated access architecture create a need for 100Gbit/s aggregation hubs
- ✘ Multi-tenant business sites attract enterprises with especially lucrative, high-bandwidth communication services
- ✘ Converged multi-service networks aggregate traffic for efficient use of network resources on 100Gbit/s links

A small footprint enables equipment to be installed in addition or as a substitute to existing network gear, in many cases without the need for additional racks. While power consumption will grow, the environmentally hardened design allows operation even without air conditioning. This offloads CSPs from installing air-conditioning in shelters at the edge of their networks, minimizing the required infrastructure investment while significantly reducing power consumption.



Bandwidth service providers appreciate open control

As CSPs introduce new network elements, they can benefit from standardized NETCONF/YANG SDN interfaces for simplifying system integration. In combination with standard compliant user and network interfaces, our FSP 150-XG480 can be rolled out in the shortest time possible, allowing bandwidth service providers to respond to bandwidth needs in a fast and efficient way. Providing MEF 3.0-compliant OAM as well as service activation and testing features enables their service teams to operate the new network elements with established processes. What's more, there's no need for extensive training or re-engineering of existing workflows.

Synchronization is key in mobile backhaul networks

With any innovation in mobile radio access technologies there's an increasing need for accuracy of base station synchronization. Highly precise time and phase synchronization can only be provided from timing-aware backhaul networks. This is why our FSP 150-XG480 comes with sophisticated IEEE 1588 transparency clock capabilities for significantly improving performance for timing packets as they are forwarded over this high-capacity switch. What's more, our unique SyncJack™ synchronization assurance technology makes the FSP 150-XG480 a monitoring point to constantly control the accuracy of network synchronization. With full on-path timing support, our mobile backhaul solution provides precise synchronization to each and every base station.

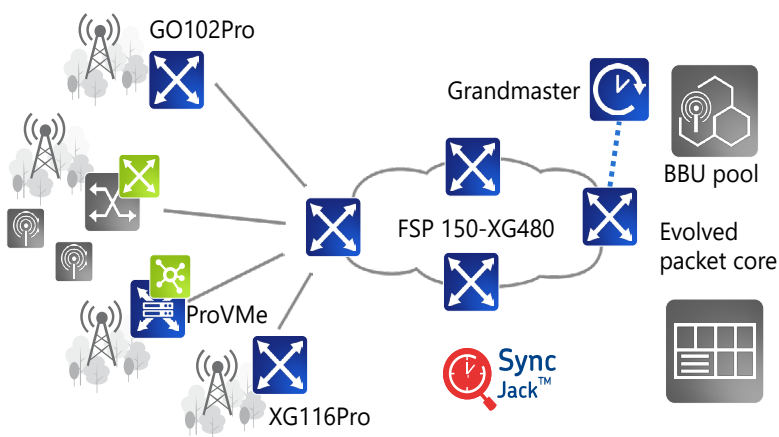
Key capabilities

- ✘ MEF 3.0-compliant interfaces and OAM capabilities for seamless integration into existing networks and established processes
- ✘ Comprehensive set of synchronization delivery and assurance features to meet even the most stringent timing requirement in mobile networks
- ✘ Unique ability to be applied under restricted space conditions at an extended temperature range
- ✘ High-density 1, 10 and 25Gbit/s interfaces for efficient traffic aggregation in converged, mobile, enterprise and cable networks

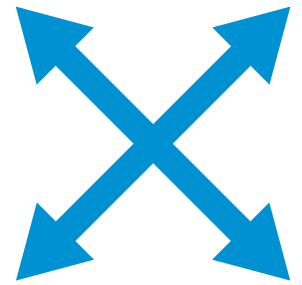
Cable networks from analog to digital

MSOs / cable network operators evolving their analog fiber networks to digital Ethernet transport creates the need for environmentally hardened, easy to operate 100Gbit/s aggregation nodes. Our FSP 150-XG480 is evaluated with major cable companies as it meets all of their size, environmental and feature needs in a way not matched by any other solution in the market. It connects a high number of remote PHY devices and also provides high-bandwidth connectivity services to business customers, aggregating traffic into 100Gbit/s wavelengths. Its colored interfaces offer a simple way to more efficiently use scarce fiber in the access network. Designed for 300mm ETSI racks, our FSP 150-XG480 is extremely compact, enabling cable network operators to meet key space-restriction challenges.

Connectivity and synchronization in mobile backhaul networks



- ✓ Hardened 100G aggregation
- ✓ Open, standardized interfaces
- ✓ Highly precise synchronization
- ✓ Compact, 300mm ETSI design
- ✓ MEF 3.0 interfaces and OAM
- ✓ 1/10/25 Gbit/s client interfaces



FSP 150-XG100Pro Series

10G programmable demarcation, aggregation and edge computing

Connectivity networks are becoming exhausted as soaring backhaul bandwidth needs and the shift of appliances and data into the cloud use up more and more capacity. Service providers need edge and aggregation devices that enable a seamless transition from 1Gbit/s to 10Gbit/s service offerings and meet stringent requirements for cost, space and power consumption. What's more, emerging low-latency services demand data processing at the edge of the network.





Offering higher bandwidth services impacts technology installed on the customer premises and cell sites and creates the need for high-capacity aggregation switches. High-bandwidth demarcation and edge aggregation devices need to grow network capacity without exceeding space, power and cost requirements. That's why we built our FSP 150-XG100Pro Series. Part of our successful FSP 150 ProNID family, the FSP 150-XG100Pro Series combines 10Gbit/s MEF 3.0 Carrier Ethernet and IP services demarcation and aggregation with a rich set of programmability, synchronization and security features. A high-performance pluggable server module enables our FSP 150-XG100Pro Series to be upgraded in-service into a uCPE device.



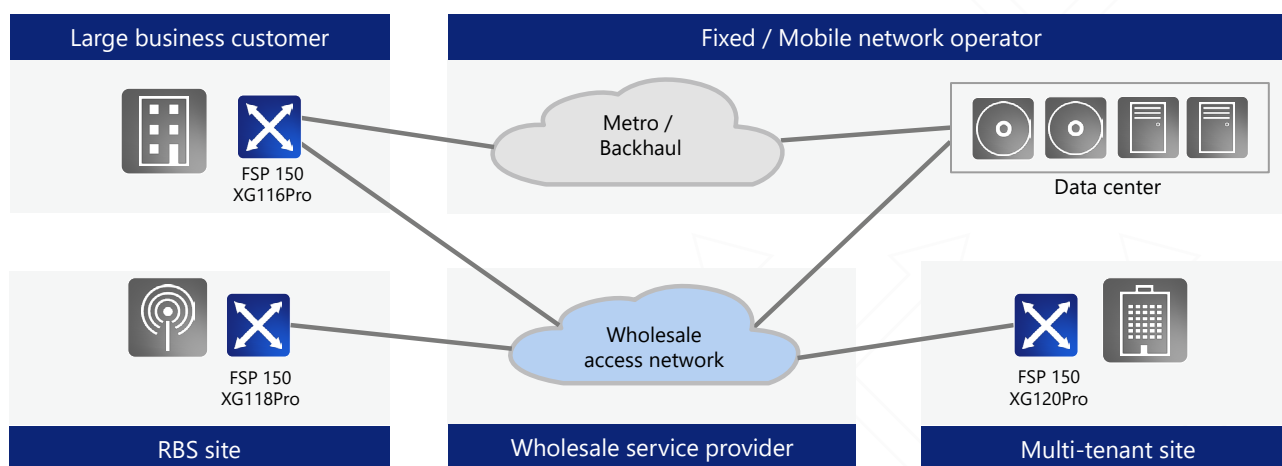
Your benefits

- ✔ **Member of the FSP 150 ProNID family**
 Comprehensive and compatible combination of features with a unique set of demarcation capabilities
- ✔ **Multi-technology edge device**
 Highly precise, assured distribution of time and frequency meeting LTE and emerging 5G requirements
- ✔ **Multi-layer technology**
 Extending Ethernet demarcation with forwarding, filtering and advanced monitoring capabilities for IP traffic
- ✔ **High port-density**
 Latest innovation in high-scale integration for high port number and compact design enabling seamless network growth
- ✔ **Multi-access edge compute**
 Pluggable server allows NFV hosting at the edge of the network for latency sensitive applications
- ✔ **Superior manageability**
 Ensemble network management and control with future-proof SDN control and open APIs.

FSP 150-XG100Pro Series at a glance

	Product	Key Application
	FSP 150-XG116Pro	Multi-tenant 10G demarcation device for business services, mobile backhaul and cloud access. Two variants available: a half-rack width unit featuring integrated power supply with DC and AC feeds and a full-rack width unit featuring dual, hot-swappable PSUs (AC or DC)
	FSP 150-XG120Pro	Multi-tenant 10G demarcation and aggregation device for business services, mobile backhaul and cloud access, featuring redundant power supply units (AC or DC)
	FSP 150-XG118Pro (SH)	10G programmable cell-site gateway with optional server blade. Two chassis versions (AC and DC) featuring hardware-based synchronization, clock I/O, redundant power supplies and I-temp
	FSP 150-XG120Pro (SH)	Multi-tenant 10G edge device with hardware-based synchronization, for business services, mobile backhaul and cloud access. Two chassis versions (AC and DC) featuring clock I/O, redundant power supplies and I-temp

Applications in your network



Cloud access, mobile backhaul and business services

- The perfect choice for high-bandwidth demarcation and aggregation in multi-technology Carrier Ethernet and IP connectivity networks
- Compact and temperature-hardened design featuring high port-density and a rich feature set for seamless migration from 1Gbit/s to 10Gbit/s edge services
- Hardware-based synchronization for delivery of precise timing
- Future-proof solution – a high-performance server ensures in-service upgradability to tackle future demands
- Agility and speed in service provisioning with central SDN control in combination with proven, highly reliable network management solution



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FSP 150-XG100Pro series overview

	Traffic ports	Traffic plane	Operating temperature	Power supply	Size	Power consumption (typical)
FSP 150-XG116Pro	6 x 1/10GbE, 2 x 1GbE	62Gbit/s	-40°C to +65°C	Integrated, with DC and AC feeds	1RU (H), 220mm (W)	70W
FSP 150-XG116Pro (H)	6 x 1/10GbE, 2 x 1GbE	62Gbit/s	-40°C to +65°C	Modular, dual DC or dual AC	1RU (H), 443mm (W)	80W
FSP 150-XG120Pro	4 x 1/10GbE, 22 x 1GbE	62Gbit/s	-40°C to +65°C	Modular, dual DC or dual AC	1RU (H), 443mm (W)	85W
FSP 150-XG118Pro (SH)	8 x 1G/10GbE 2 x 10GbE to server	82Gbit/s	-40°C to +65°C	Modular, dual AC or dual DC	Size: 1RU (H), 445mm (W)	85W (w/o server)
FSP 150-XG120Pro (SH)	6 x 1G/10GbE 20 x 1GbE	82Gbit/s	-40°C to +65°C	Modular, dual AC or dual DC	Size: 1RU (H), 445mm (W)	85W

Traffic ports

- FSP 150-XG116Pro
 - Six 1/10GbE (SFP/SFP+) ports
 - Two 100/1000BaseX (SFP) ports
- FSP 150-XG116Pro (H)
 - Six 1/10GbE (SFP/SFP+) ports
 - Two 1GbE combo ports (10/100/1000BASE-T RJ-45 or 100/1000BaseX SFP)
- FSP 150-XG118Pro (SH)
 - Eight 1/10GbE (SFP/SFP+) ports
 - Two internal 10GbE ports to server slot
 - Flexible allocation of bandwidth to traffic ports and server ports
- FSP 150-XG120Pro
 - Four 1/10GbE (SFP/SFP+) ports
 - Fourteen 1000BaseX (SFP) ports
 - Eight 100/1000BaseX (SFP) ports
- FSP 150-XG120Pro (SH)
 - Six 1/10GbE (SFP/SFP+) ports
 - Twelve 1000BaseX (SFP) ports
 - Eight 100/1000BaseX (SFP) ports

Traffic capacity

- 62Gbit/s full-duplex, non-blocking
- 82Gbit/s only for XG118Pro (SH) and XG120Pro (SH)

Traffic protection

- IEEE 802.1AX link aggregation – active/standby or load balancing
- ITU-T G.8032 Ethernet ring protection
- ITU-T G.8031 Ethernet linear protection switching

VLAN support

- 4096 VLANs (IEEE 802.1Q customer-tagged) and stacked VLANs (Q-in-Q service provider tagged)
- 2-tag management (push/pop/swap) for c-tag and s-tag
- IEEE 802.1ad provider bridging (c-tag, s-tag)
- Ethertype translation
- Point-to-point, multipoint and rooted-multipoint Ethernet virtual circuits (EVC)
- 9612 byte-per-frame MTU transparency
- EoMPLS encapsulation

Server capability (FSP 150-XG118Pro(SH) only)

- Fully open architecture supporting Ensemble Connector or other VNFIs
- Hot pluggable server option
- High-performance Xeon-D x86 CPU. Up to 16 cores
- Up to 64 GBytes DDR4 SDRAM, up to 1TB of SSD
- Independent supervision processor installs and monitors server software and status
- Expandable via eSATA and USB interfaces

XG118Pro (SH) Server Card	Processor	Cores	DDR4	SSD	Temperature Range
F150/VME/SRV/X8/32	Intel D-1539	8	32GB	256 – 512GB	I-Temp
F150/VME/SRV/X12/32	Intel D-1559	12	32GB	256 – 512GB	I-Temp
F150/VME/SRV/X16/64	Intel D-1577	16	64GB	256GB – 1TB	C-Temp

Synchronization (FSP 150-XG118Pro(SH) and FSP 150-XG120(SH))

- ITU-T G.8261 / G.8262 / G.8264 Synchronous Ethernet on all traffic interfaces
- Sync status message support
- IEEE 1588v2 Precision Time Protocol with hardware time-stamping
- ITU-T G.8265.1 and G.8275.1 PTP telecom profiles
- G.8265.1 telecom slave
- G.8273.2 telecom boundary clock
- BITS-in and BITS-out with sync status messaging
- Combined 1PPS and TOD clock output
- Internal Stratum-3E clock with holdover

Layer 2 traffic management

- Acceptable client frame policy: tagged or untagged
- Service classification based on IEEE 802.1p, 802.1Q and IP-TOS/DSCP
- VLAN tag priority mapping (IEEE 802.1ad PCP encoding)
- MEF-compliant policing (CIR/CBS/EIR/EBS) with three-color marking and eight classes of service
- Port shaping on transmit
- MEF 10.3 hierarchical policing with token-share envelopes
- DiffServ supporting WFQ/SP mix
- Elephant flows management

Layer 3 traffic management

- L2-L4 access control lists (ACL) for classification
- VRF-lite virtual routing and forwarding
- BGP and OSPF dynamic routing
- DHCP relay agent
- DSCP remarking

Operation, administration and maintenance (OAM)

- IEEE 802.3ah EFM-OAM link management
- IEEE 802.1ag connectivity fault management (CFM) with hardware assistance
- ITU-T Y.1731 performance monitoring
- ITU-T Y.1564 service activation testing
- Terminal and facility loopbacks on port- and EVC-level for all interfaces
- Embedded RFC 2544 test generator and analyzer (ECPA)
- MEF-compliant Layer 2 control protocol disposition and extensive filter options for Layer 2 packet types
- Link loss forwarding to signal local link and network path failures
- Dying gasp message for power failure alarm (EFM-OAM and SNMP trap option)

Performance monitoring

- RFC 2819 RMON Etherstats on a per-port and per-service basis
- 15-minute and 1-day performance data bins
- IEEE 802.3ah/ITU-T G.8021 PHY level monitoring
- ITU-T Y.1731 single- and dual-ended frame loss measurement
- Synthetic frame loss and delay measurement for multi-point service monitoring
- TWAMP sender/reflectors for L3 based service assurance
- Multi-CoS monitoring on EVCs
- IPFIX
- Threshold-setting and threshold-crossing alerts
- Physical parameter monitoring for SFP optics, including TCAs
- Temperature monitoring and thermal alarms

Low-touch provisioning

- DHCP/BOOTP auto-configuration
- IEEE 802.1x port authentication (supplicant and authenticator)
- Text-based configuration files
- TFTP/SCP for software image upgrade and configuration file copy

Management and security

Local management

- Local LAN port (RJ45) using CLI, SNMP and Web GUI interfaces
- USB (Type B Mini) using CLI
- 3G/LTE/Wi-Fi USB interface

Remote management

- Maintains in-band VLAN and MAC-based management tunnels
- Fully interoperable with other FSP 150 products

Management protocols

- IPv4 and IPv6 DCN protocol stacks, including dual-stack operation and 6-over-4 tunnels
- Telnet, SSH (v1/v2), HTTP/HTTPS, SNMP (v1/v2c/v3)
- NETCONF/YANG, OpenFlow

Secure administration

- Configuration database backup and restore
- System software download via FTP, HTTPS, SFTP or SCP (dual flash banks)
- Remote authentication via RADIUS/TACACS
- SNMPv3 with authentication and encryption
- IPsec on management traffic
- Access control list (ACL)

IP routing

- DHCP, RIPv2 and static routes, ARP cache access control

System logging

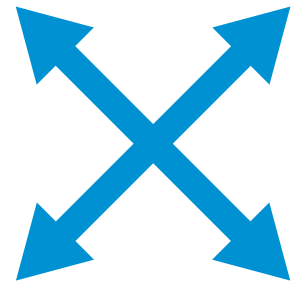
- Alarm log, audit log and security log

Regulatory and standards compliance

- MEF CE 2.0 certified
- IEEE 802.1Q (VLAN), 802.1p (Priority), 802.1ag (CFM), 802.3ah (EFM), 802.1x
- ITU-T Y.1731, G.8010/Y.1306, G.8011.1+2, G.8032
- MEF-6.1, -9, -10.2, -11, -14, -20, -21, -22.1, -23.1, -25, -26.1, -30, -33, -35, -36
- IETF RFC 2544 (Frame Tests), RFC 2863 (IF-MIB), RFC 2865 (RADIUS), RFC 2819 (RMON), RFC 5357 (TWAMP)
- MEF-48 and MEF-49 compliant ITU-T Y.1564 service activation testing
- ANSI C84.1-1989
- ETSI 300 132-2, BTNR2511, ETS 300-019, ETS 300-019-2-[1,2,3], ETS 300-753
- NEBS Level 3 compliant
- Telcordia GR-499, GR-63-CORE, SR-332
- Safety IEC/UL/EN 60950, 21CFR1040.10, EN 60825, EN 50371, EN 300-386, EN 50160, IEC 60320/C14
- EMI EN 300-386, GR-1089-CORE, ETS 300-132, FCC Part 15, Class A, Industry Canada

Environmental

- Dimensions (W x H x D):
 - FSP 150-XG116Pro: 220mm x 43.7mm x 280mm (1RU half rack-width chassis)
 - FSP 150-XG116Pro (H): 443mm x 43.7mm x 217.8mm (1RU chassis)
 - FSP 150-XG120Pro AC: 443mm x 43.6mm x 387.6mm (1RU chassis)
 - FSP 150-XG120Pro DC: 443mm x 43.6mm x 216.8mm (1RU chassis, ETSI 300mm)
 - FSP 150-XG118Pro (SH) AC: 445.5 mm x 43.6 mm x 366.6 mm
 - FSP 150-XG118Pro (SH) DC: 445.5 mm x 43.6 mm (1.7 in.) x 255.4 mm
 - FSP 150-XG120Pro (SH) AC: 443mm x 43.6mm x 387.6mm (1RU chassis)
 - FSP 150-XG120Pro (SH) DC: 443mm x 43.6mm x 216.8mm (1RU chassis, ETSI 300mm)
- Operating temperature:
 - 40°C to +65°C / -40°F to 149°F (hardened environment)
- Storage temperature:
 - 40°C to +70°C / -40°F to 158°F (GR-63-CORE)
- Humidity:
 - 5 to 95%, B1 (non-condensing)
- Power supply:
 - FSP 150-XG116Pro: integrated PSU, 110/240VAC, -48 to -72VDC with over-voltage and over-current protection
 - FSP 150-XG116Pro (H), FSP 150-XG120Pro, XG118Pro (SH) and FSP 150-XG120(SH): redundant modular hot-swappable PSU:
 - 110/240VAC, with over-voltage and over-current protection or
 - 48 to -72VDC with over-voltage and over-current protection



FSP 150-XG400 Series

Service demarcation and aggregation for 100Gbit/s edge networks

The demand for bandwidth in the metro space is constantly rising. It's being fueled by the boom in cloud computing and the hunger for mobile broadband, both of which create the need for traffic aggregation. As a result, business and mobile network operators are rolling out 10Gbit/s services in their networks, driving the demand for 100Gbit/s demarcation and aggregation at the metro edge. Our FSP 150-XG400 Series is a family of carrier-class packet edge products that enable MEF 3.0 CE 100Gbit/s demarcation and high-scale 10Gbit/s service aggregation in a compact form factor.

Our FSP 150-XG400 Series is designed for high-density aggregation and demarcation of MEF 3.0 CE services. The products feature 25GbE, 40GbE and 100GbE interfaces for high-speed connectivity to the metro core and support hardware-based time distribution on all traffic ports (Synchronous Ethernet and IEEE 1588). The XG400 Series provides standard Ethernet OAM and Y.1564 for service activation testing up to 100Gbit/s. It supports network overlay capabilities, such as VXLAN, for the delivery of MEF services over IP networks. It also features a wide range of traffic protection mechanisms including IEEE 802.1AX DRNI for high service availability. A common software stack assures consistent operation with any member of this series. What's more, the FSP 150-XG400 Series has been designed to work in locations with no temperature control.



Your benefits

- ✓ **MEF 3.0 CE 100GbE UNI**
Ultra-compact 100Gbit/s UNI demarcation solution for large enterprises
- ✓ **Compact design**
100Gbit/s UNI demarcation in 1RU
High port count, low footprint aggregation: 1RU or 2RU height and 227.4mm depth
- ✓ **Versatile deployment**
Compact size and extended operating temperature range (-40°C to 65°C) enable deployment in street cabinets and harsh environments
- ✓ **High-density 10GbE service aggregation**
Seamless transition from 1Gbit/s to 10Gbit/s services with 25GbE and 100GbE trunk capacity
- ✓ **Timing distribution**
Hardware-based timing support on all traffic interfaces enabling accurate frequency and phase distribution using Sync-E and 1588v2 PTP
- ✓ **Carrier class**
Standard Ethernet OAM and Y.1564 service activation testing for delivery of MEF 3.0 Carrier Ethernet services up to 100GbE

High-level specifications

Switching capacity

- 1.6Tbit/s (800Gbit/s full duplex) switching capacity (XG480)
- 600Gbit/s (300Gbit/s full duplex switching capacity (XG404 and XG418)

Advanced Ethernet OAM

- Y.1564 SAT up to 100GbE
- MEF-48/49 SAT IEEE 802.1ag CFM
- IEEE 802.3ah/ITU-T G.8021 PHY level monitoring
- Y.1731 AIS and PM
- MEF-35 SOAM PM

Synchronization

- Synchronous Ethernet
- IEEE 1588-2008
- PTP telecom profiles for time/phase distribution (G.8275.1, G.8275.2)
- Telecom boundary clock and telecom transparent clock

Advanced service capabilities

- HQoS with advanced policing and scheduling mechanisms
- NETCONF/YANG open control
- Egress hierarchical shaping and scheduling; ingress hierarchical policing MEF 10.3
- Counters per shaper

Ethernet Layer 2 services

- Highly scalable and resilient Layer 2 solution
- MEF E-LINE, E-TREE, E-LAN, E-ACCESS services
- E-LINE/VPWS, E-LAN/VPLS services, statics labels

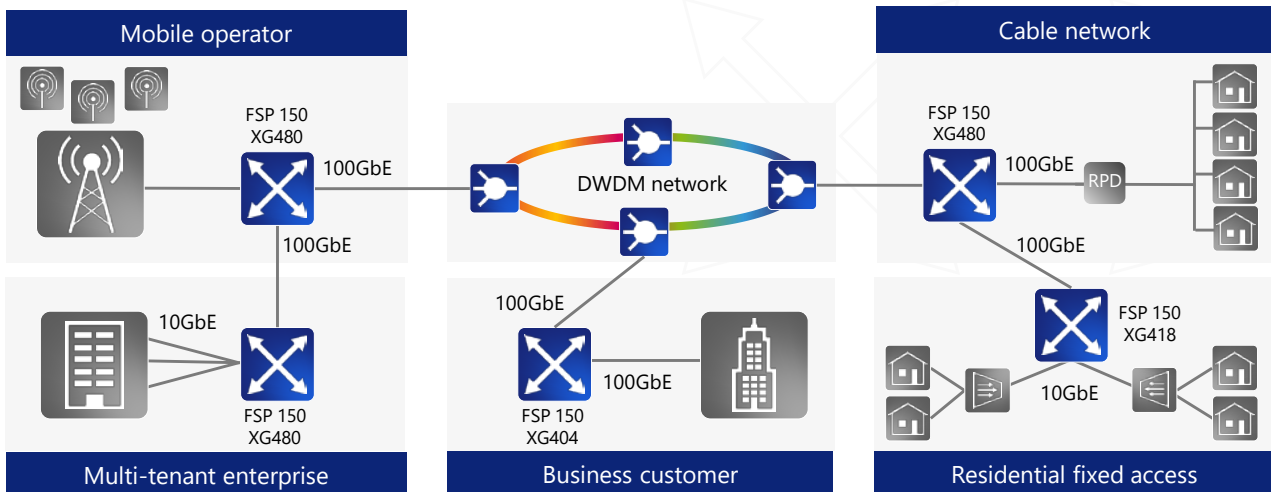
Environmental specifications

- 1RU for XG404/418 and 2RU for XG480; 227.4mm deep
- Operating temp: -40°C to 65°C
- Redundant fans and dual hot-swappable AC and/or DC power supplies

Applications in your network

Aggregation of high-bandwidth business and wholesale services

- Highly resilient, SLA-based 10, 25 and 100GbE MEF 3.0 CE service aggregation featuring ENNI and UNI
- Growing mobile backhaul and fronthaul networks to 10Gbit/s and 25Gbit/s at the base station
- Aggregating DSLAM traffic in metro networks for residential and multi-tenant applications







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Switching capacity and traffic ports

FSP 150-XG404 variants		
		
Traffic ports:	4x QSFP+/QSFP28 25GbE, 40GbE and 100GbE data rates	2x QSFP+/QSFP28 + 2x CFP2 25GbE, 40GbE and 100GbE data rates
Switching capacity:	600Gbit/s (300Gbit/s full duplex) switching capacity	600Gbit/s (300Gbit/s full duplex) switching capacity

FSP 150-XG418 variants		
		
Traffic ports:	4x 1/10G (SFP/SFP+) + 8x 10G (SFP+) + 4x 10/25G (SFP+/SFP28); 2x 40/100G (QSFP+/QSFP28)	4x 1/10G (SFP/SFP+) + 8x 10G (SFP+) + 4x 10/25G (SFP+/SFP28); 2x 100G (CFP2)
Switching capacity:	600Gbit/s (300Gbit/s full duplex) switching capacity	600Gbit/s (300Gbit/s full duplex) switching capacity

FSP 150-XG480 variants			
			
Traffic ports:	40x 1/10G (SFP/SFP+) + 12x 10G (SFP+); 4x 100G (QSFP28)	40x 1/10G (SFP/SFP+) + 12x 10G (SFP+); 4x 100G (2 QSFP28, 2 CFP2)	40x 1/10G (SFP/SFP+) + 12x 10G (SFP+) + 8x 10G/25G (SFP+/SFP28); 2x 100G (QSFP28)
Switching capacity:	1.6Tbit/s (800Gbit/s full duplex) switching capacity	1.6Tbit/s (800Gbit/s full duplex) switching capacity	1.6Tbit/s (800Gbit/s full duplex) switching capacity

Services

- E-Line, E-LAN, E-Tree, E-Access
- VRF-Lite

Layer 2 features

- IEEE 802.1ad provider bridging (C-Tag and S-Tag)
- Acceptable client frame policy: tagged or untagged
- Port VLAN ID (pvid) and Priority VID
- MAC learning and switching with split-horizon
- MAC table limit per bridge domain
- Up to 500,000 MAC addresses with XG480 and 250,000 MAC addresses with XG404/418
- VLAN tag manipulation (push/pop and swap)
- CE-VLAN ID/EVC Map
- L2 control protocols disposition (MEF-45)
- Jumbo frame support
- IGMP snooping
- IEEE 802.1AX

IP Routing (VRF-Lite)

- Wire-speed L3 forwarding
- DHCP Relay Agent

- Static routes
- OSPFv2
- IS-IS
- BGP
- ECMP IPv4/IPv6
- VRRP

Network overlay

- MPLS layer 2 VPNs, E-LAN,
 - Static labels
- VxLAN

Ethernet OAM

- IEEE 802.3ah Link OAM
- IEEE 802.1ag connectivity fault management (CFM)
- ITU-T Y.1731 SLM/SLR and DMM/DMR
- ITU-T Y.1564 service activation testing (MEF-48/49)
- Port level and VLAN level loopback
- Link loss forwarding
- Dying gasp
- Port mirroring

Performance monitoring

- RFC 2819 RMON Etherstats on a per-port and per-service basis
- 15-min and 1-day performance data bins
- Threshold-setting and threshold-crossing alerts
- Physical parameters monitoring for optics
- Temperature monitoring and thermal alarms
- ITU-T Y.1731 dual-ended synthetic frame loss and delay measurement
- MEF-35 SOAM PM
- TWAMP sender/reflector

Management features

- Local LAN ports (RJ45)
- Console port
- USB Type A interface
- eSATA
- In-band management over management VLAN
- IPv4 and IPv6 protocol stacks, including dual-stack operation
- Telnet, SSHv2, https, SNMP (v1/v2c, v3)
- Netconf/YANG
- Netconf Zero Touch
- Database backup and restore
- System software download via FTP, https, SFTP or SCP (dual flash banks)
- Remote authentication via TACACS+/RADIUS
- Access control lists
- OSPF
- Network time protocol (NTP)
- Link layer discovery protocol (LLDP)
- Time of day + time zone
- Alarm log, audit log and security log (local and remote via syslog protocol)
- DHCP client

Traffic protection

- IEEE 802.1AX Link Aggregation with DRNI
- ITU-T G.8031 Ethernet linear protection switching
- ITU-T G.8032 Ethernet ring protection

Traffic management

- Port level broadcast/multicast rate limiting on receive
- Large flows policing (XG404 and XG480)
- Class of service identifier: 802.1P, IP-TOS/DSCP
- MEF-10.3 hierarchical metering with token-share envelopes
- Strict priority (SP) and weighted round robin scheduling mechanisms
- Congestion-avoidance mechanism WRED
- COS level shaping per-port and per flow point
- Hierarchical shaping per flow point
- Port level rate limiting on transmit
- L2-L4 ACLs

Synchronization

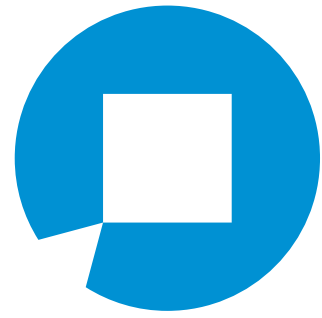
- ITU-T G.8261 / G.8262 / G.8264 Synchronous Ethernet on all traffic interfaces
- Synchronization status messages (ESMC)
- IEEE 1588-2008
- PTP Telecom Profiles (G.8275.1, G.8275.2)
- Telecom boundary clock, telecom transparent clock
- BITS-IN/OUT
- Combined 1PPS and ToD interface
- Stratum 3E OCXO

Environmental

- Dimensions (including mounting brackets)
 - Chassis variant without rear DC inlet (W x D x H): 482.6mm x 216mm x 88.1mm (XG480)
 - Chassis variant with rear DC inlet (W x D x H): 445.4mm x 216mm x 44.05mm (XG404/XG418)
 - Chassis variant with rear DC inlet (W x D x H): 482.6mm x 256.5mm x 88.1mm (XG480)
- Weight:
 - Chassis variant without rear DC inlet: 10Kg
 - Chassis variant without rear DC inlet: 10.4Kg
- Operating temperature: -40°C to 65°C
- Storage temperature: -40°C to +70°C
- Humidity: 5 to 90%, non-condensing
- Power supply: 750W (AC and DC)
- Max Power Consumption: 750W
- Typical power consumption: 440W

Compliance

- Safety: EN 62368-1, UL/CSA 62368-1, IEC 62368-1, emissions: AS/NZS CISPR 22: Class A, ICES-003, Issue Class A, EN 55022: Class A, VCCI Class A, FCC CFR 47 Part 15, Subpart B Class A
- Immunity: EN 300 386, EN55024, EN 61000-3-2, EN 61000 3-3, EN 61000-4-2, EN 61000-4-3, EN 61000-4-5, EN 61000 4-6, EN61000-4-8, EN61000-4-11
- EU RoHS compliant

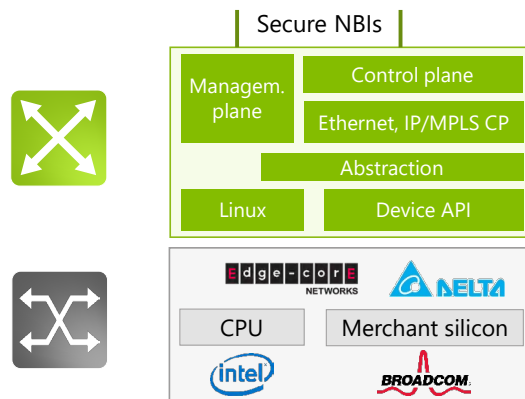


Ensemble Activator

Carrier-grade disaggregated network operating system

As innovation and growth in packet networks continues to accelerate, communication service providers (CSPs) no longer have time to wait for their vendors to come up with higher capacity devices that meet the latest feature requirements. Now there's a new way to grow networks that combines the agility of software-based feature development with the performance and economics of bare-metal switches. Scaling a network is now as simple as selecting a hardware component with higher capacity and installing the network operating system (NOS).

Our Ensemble Activator is a carrier-grade NOS for bare-metal switches, extending our comprehensive Ensemble software suite with a solution for open, scalable and agile packet networks. Built on ADVA's experience in the design and operation of transport networks, this solution is optimized for the operational needs of CSPs connecting customers to regional and central data centers. A rich set of CE 2.0- and MEF 3.0-compliant network interfaces is complemented with proven IP and MPLS protocols for the first true carrier-grade NOS. Our Ensemble Activator enables CSPs to grow their packet networks quickly and efficiently, closing distance and feature gaps between access networks and their data centers. This disaggregated NOS is managed by ADVA Ensemble Controller but can also easily be integrated through open SDN interfaces into standards-compliant orchestrators. networking and virtual hosting functionality at the customer premises, in the gateway between network clouds, and in the data center.



Your benefits

- ✓ **Carrier-grade NOS**
 Changing bare-metal switches into high-performance multi-layer packet switches, leveraging scale and economics of high-volume ODMs
- ✓ **Comprehensive Ethernet and IP protocols**
 Combining ADVA competence in CE services with a proven and comprehensive set of IP and MPLS protocols for a wide range of underlay and overlay applications
- ✓ **Open standardized northbound interfaces**
 Simplifying integration with open-source and commercial multi-domain controllers and end-to-end orchestrators
- ✓ **From data centers to public networks**
 Leveraging data-center NOS technology in public transport networks with sophisticated OAM capabilities and automation
- ✓ **Applying open source tools**
 Benefit from proven and well-established open source tools for efficient operation and maintenance of packet transport networks
- ✓ **Designed for high-growth markets**
 Aligned with TIP Distributed Cell Site Gateway project requirements for demanding mobile transport networks

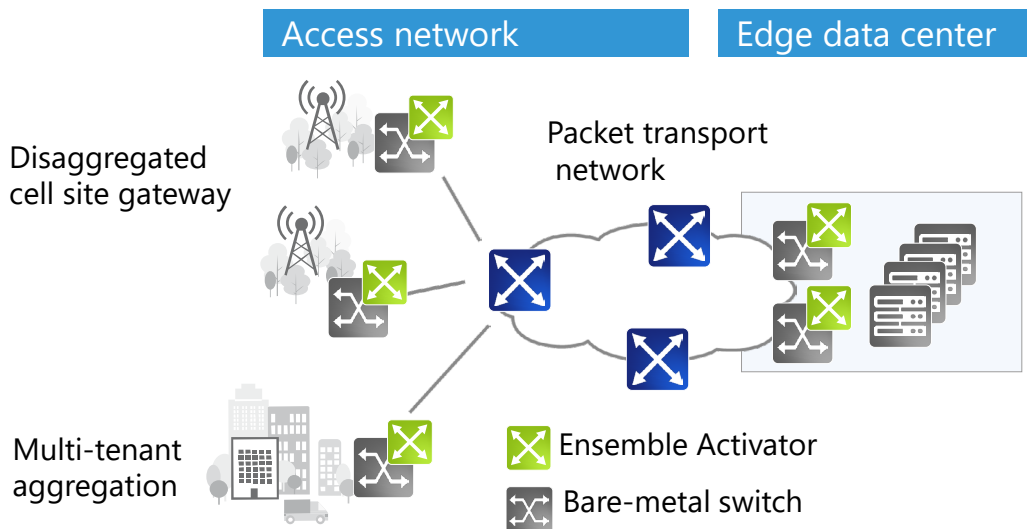
High-level specifications

<p>Ethernet connectivity</p> <ul style="list-style-type: none"> • CE 2.0- and MEF 3.0-compliant interfaces and services • Comprehensive set of OAM and resilience capabilities • QoS assurance with hierarchical policing and deep buffers 	<p>IP and MPLS protocols</p> <ul style="list-style-type: none"> • Highly scalable IPv4/IPv6 routing • Supporting various IGP and EGP routing protocols • MPLS signaling with LDP and RSVP • L2 and L3 VPNs 	<p>HW compatibility</p> <ul style="list-style-type: none"> • Verified with Broadcom StrataDNX family for deep-buffer applications • Open software architecture for adoption of other merchant silicon technologies • Operated with bare-metal switches from industry-leading ODM vendors
<p>Security and synchronization</p> <ul style="list-style-type: none"> • MACsec for securing data and management plane • Access control and protected management communication using Radius and TACACS+, SSH • Synchronization with SyncE and 1588 	<p>Open management & control</p> <ul style="list-style-type: none"> • Standardized NETCONF/ YANG simplify integration into orchestrators • Zero touch provisioning and mass ZTP installation with ONIE • Prepared for intelligent control with telemetry streaming using gRPC / gNMI 	<p>Application domains</p> <ul style="list-style-type: none"> • Connecting regional data centers supported by comprehensive set of networking protocols • Meeting scale, sync and security requirement of disaggregated cell site gateway

Applications in your network

Carrier Ethernet and IP networking on bare-metal switches

- Disaggregated cell site gateway, compliant with TIP DCSG specifications
- Connectivity to and among edge data centers
- Multi-tenant edge aggregation



For more information please visit us at www.adva.com
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Product specifications are subject to change without notice or obligation.

