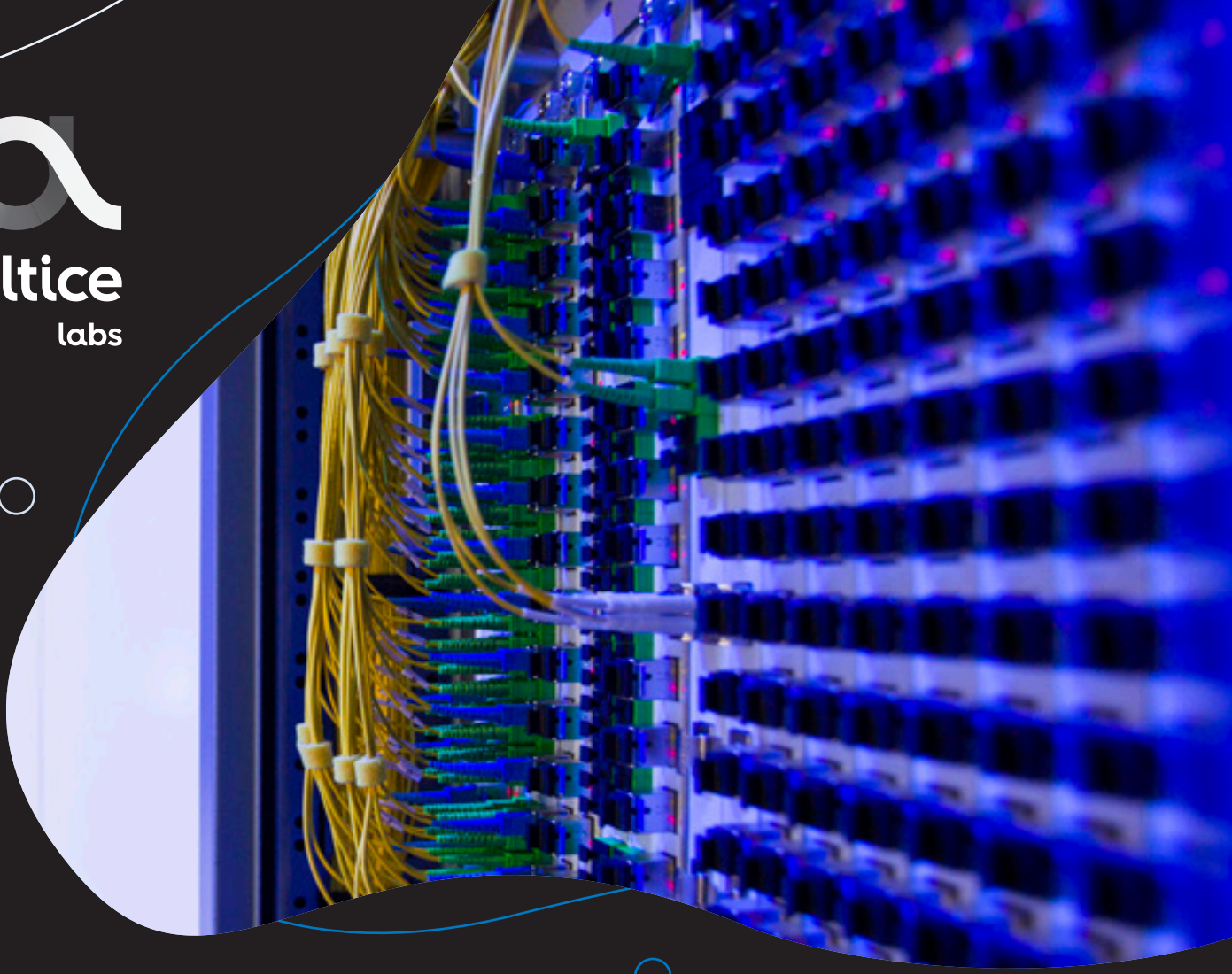
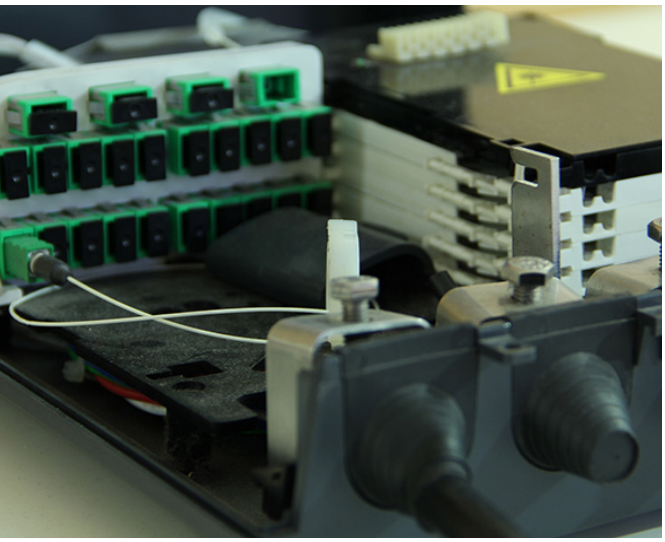
altice labs



Ultra-Fast Broadband



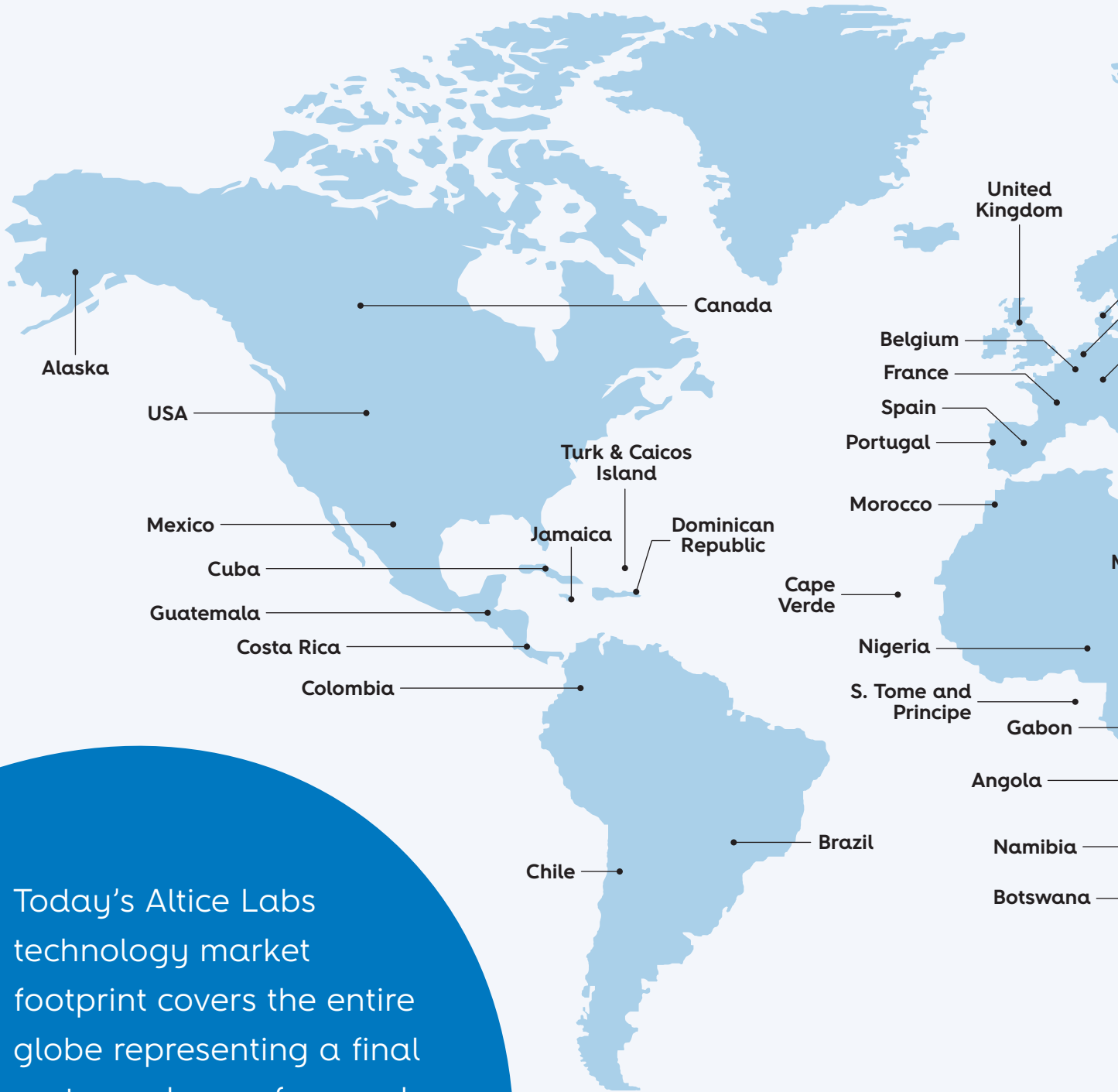
Altice Labs
Headquarters
and R&D Facilities,
Aveiro - Portugal

Altice Labs

Formally launched in January 2016, Altice Labs accumulates more than 70 years of technical expertise in the development of telecom solutions. Altice Labs is one of today's European reference suppliers for the telecom market in what relates to the access network domain.

Having built a dynamic innovation ecosystem along the past decades, Altice Labs also relies on a strong cooperation with key stakeholders including national and international Universities and Academia, R&D institutions, governmental and inter-governmental entities, regulatory and standardization bodies as well as with reference customers and market vendors in general.

Customer footprint



Today's Altice Labs technology market footprint covers the entire globe representing a final customer base of around 250 million end users.


Russia
Norway
Sweden
Denmark
Netherlands
Germany
Poland
Czech Republic
Slovakia
Hungary
Cyprus
Italy
Israel
Egypt
Malta
Macau
United Arab Emirates
India
Malasyia
Guam
Saudi Arabia
Singapore
Ethiopia
Kenya
Tanzania
East Timor
Fiji
Mauritius
Reunion
New Zealand
Malawi
Australia
South Africa
Mozambique

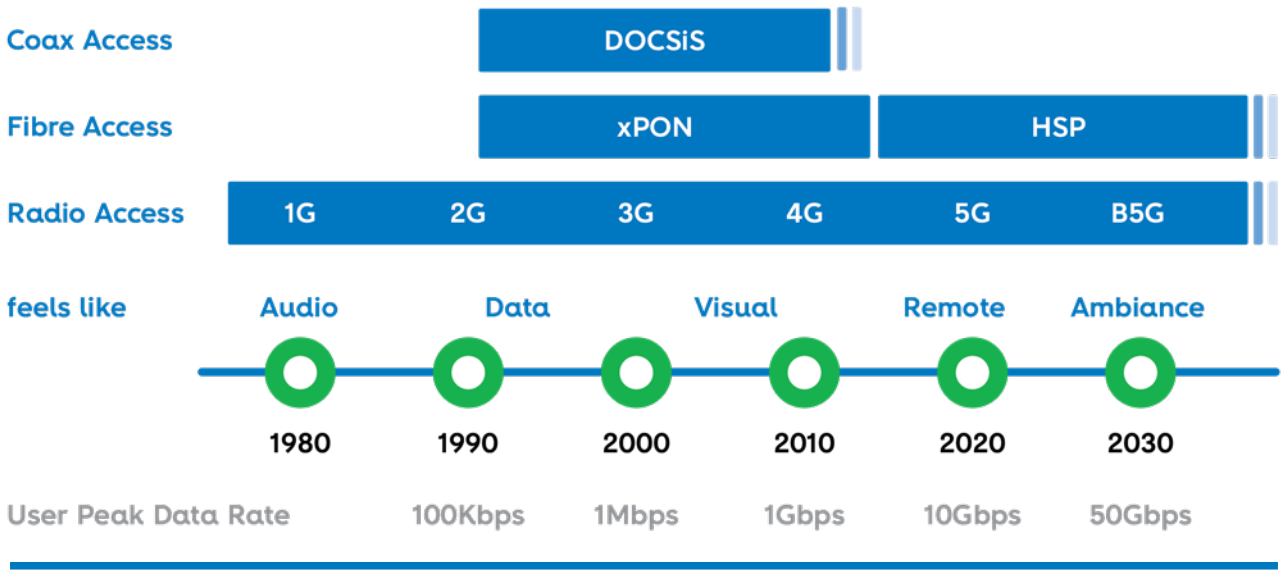
For the next decades

Tools	Trends
 • New services with optimized agents focusing on individuals • Cross-Industry / Cross-layer Integrated comunications • Merging computing, navigation and perception	• Smart cities • Mobility as a Service (MaaS) • Mixed-reality • User-centric service integration
 • Data as the starting point • Collect data will generate new values and promote new services • Rational decisions using Artificial Intelligence (AI) • Security	• Big Data • AI • Real Time Signal Processing • Pattern and Semantic data Analysis
 • Everything is connected and generates Data • Open Network aims to bring new ecosystems • Network as a commodity become part of the environment OS • Fiber network at the bottom line	• Humans • Devices • Infrastrusctures

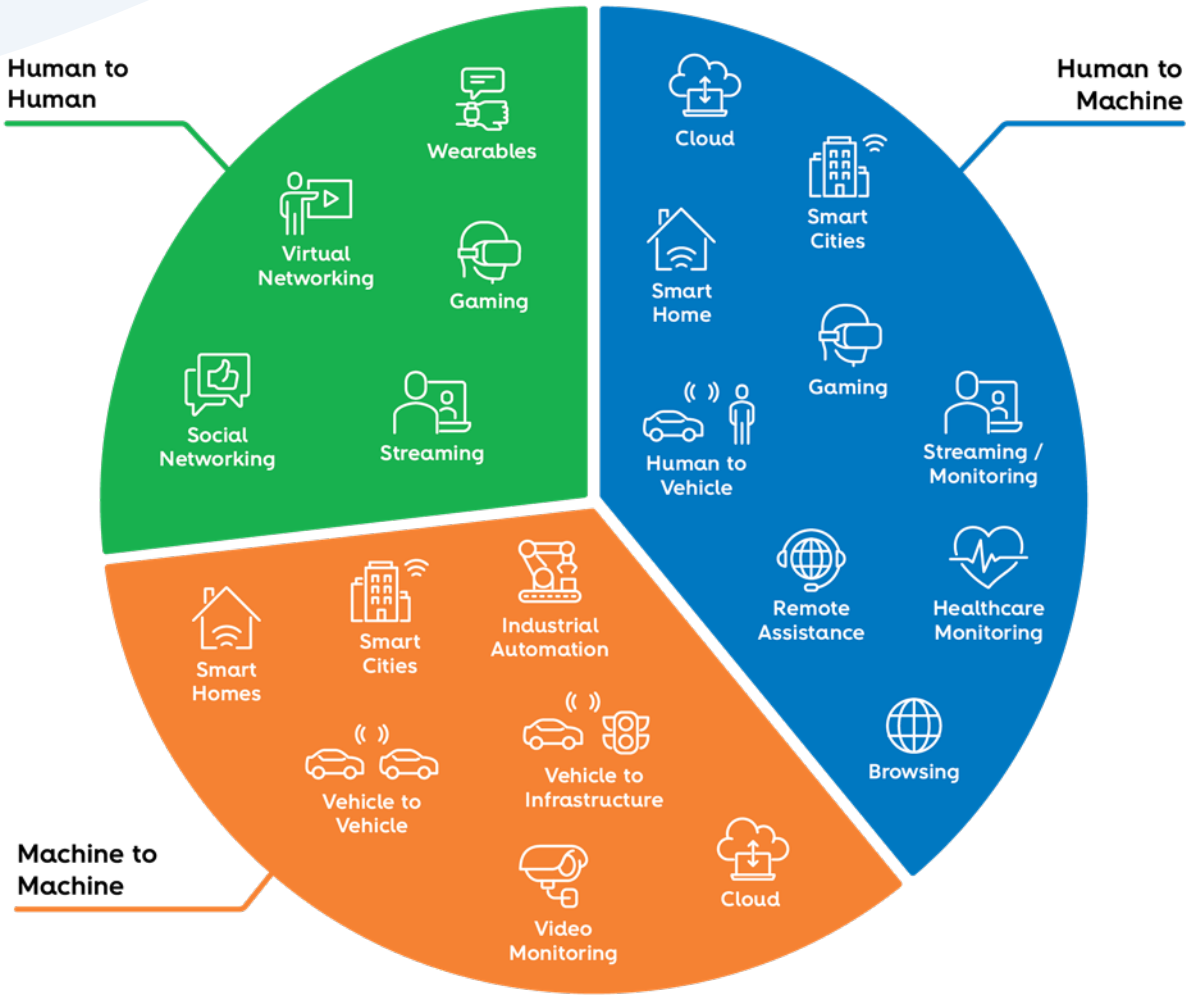
Technology and Service Evolution

Telecom networks became commonplace for various everyday life activities and services.

Extremely high availability performance is given for granted to businesses and individuals at the same time they totally rely on it for their present and future project plans.



Technology History

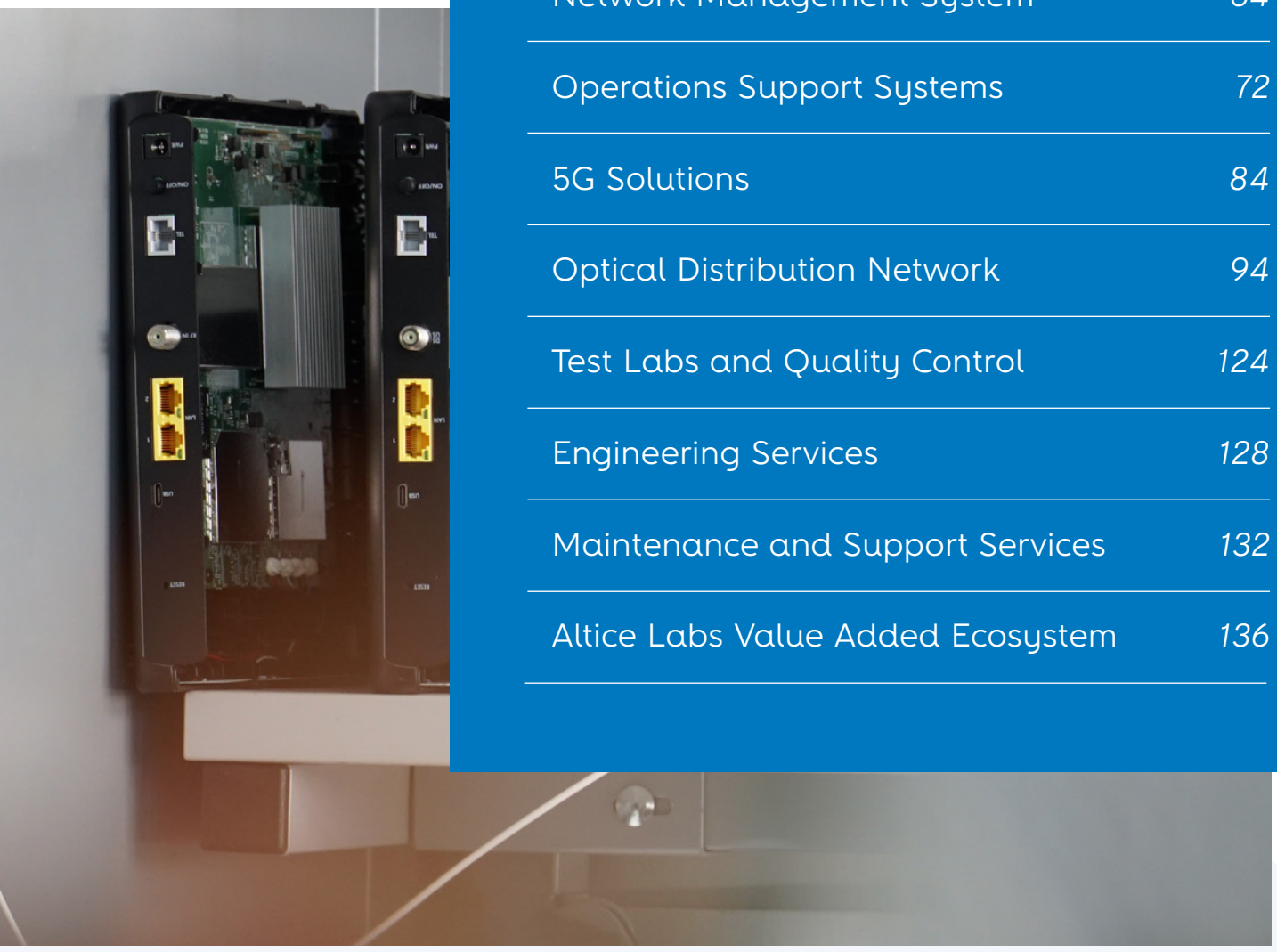


Service Portfolio

Single brand, full set of solutions

Portfolio items goes from central office active and passive hardware equipment, customer premises equipment, outside distribution network elements, Network Management System, Operation Support System and Professional Engineering Services (including delivery, setup, configuration, go live, training and Maintenance and support services 24/7).

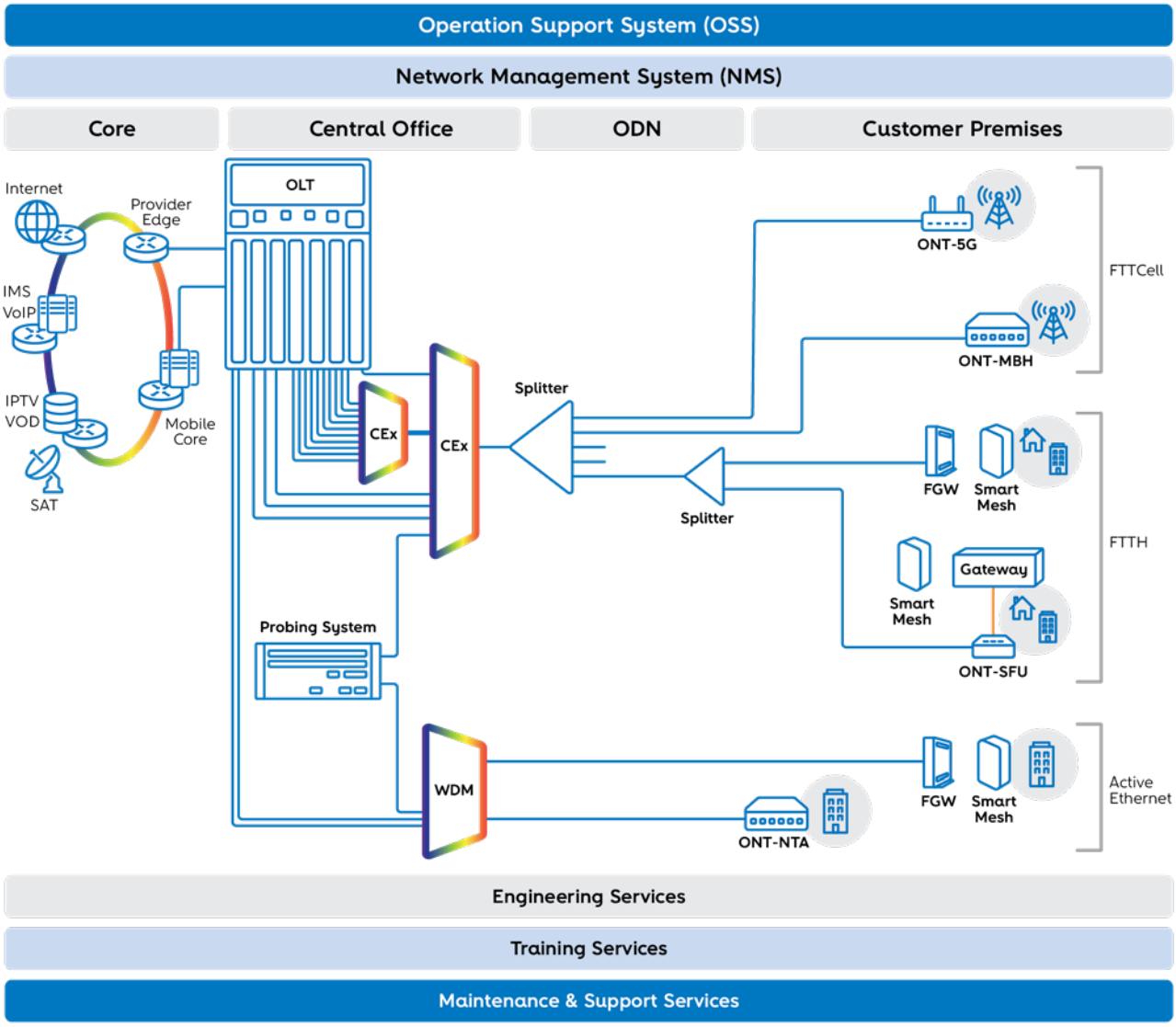
Table of contents



FTTx architecture

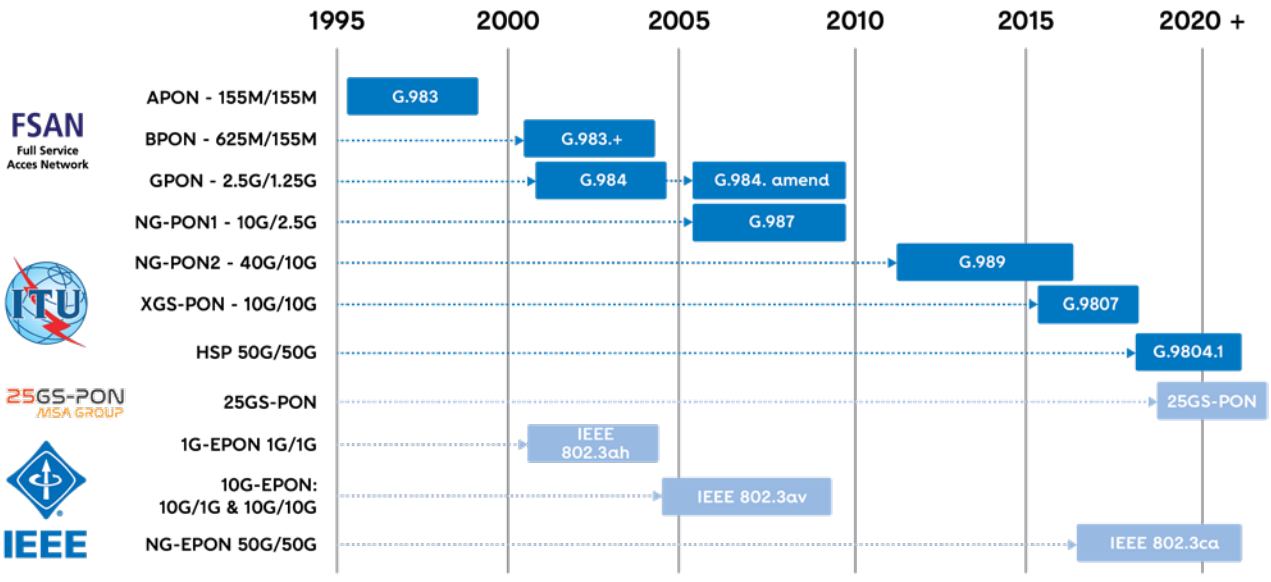
Altice Labs holds relevant experience in worldwide FTTx deployments, acting as a market vendor for a full suite xPON portfolio including hardware, software and highly skilled engineering services enabling resilient and future proof network implementations with optimized TCO.

Altice Labs solutions are intended to solve the entire fibre access network domain, simultaneously attending **Retail, Wholesale** and **Mobile** market segments.


Operation Support System (OSS)
Network Management System (NMS)
Core
Central Office
ODN
Customer Premises
Internet
Provider Edge
IMS VoIP
IPTV VOD
SAT
Mobile Core
OLT
CEx
CEx
Splitter
Splitter
Probing System
WDM
ONT-5G
ONT-MBH
FTTCell
FGW
Smart Mesh
Gateway
Smart Mesh
ONT-SFU
FTTH
ONT-NTA
FGW
Smart Mesh
Active Ethernet
Engineering Services
Training Services
Maintenance & Support Services

PON standard evolution

PON has been massively adopted for access network worldwide deployments, assuming to be today's most suitable and reliable option for FTTx networks. Due to resiliency and high capacity performance capabilities, it become the natural choice to support the ever increasing needs for services such as IPTV and OTT high quality video streaming as well as landline & mobile data increase.



PON standard evolution

Altice Labs product portfolio is completely aligned with the reference standardisation bodies and other relevant technical forums always pursuing the best and most suitable technology selection together with a full product conformity.

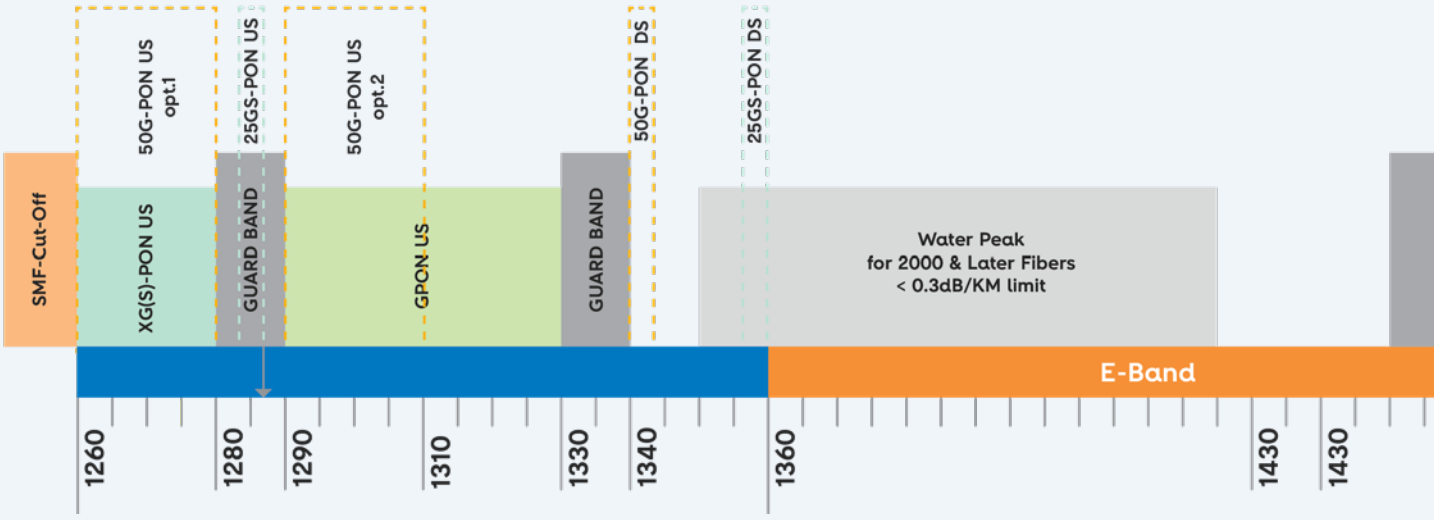
From the central office up to the customer premises, active equipment solutions from Altice Labs follow current xPON ITU recommendations supporting GPON (ITU-T G.984), XGS-PON (ITU-T G.9807) and NG-PON2 (ITU-T G.989). At the same time product roadmap is aligned with 25GS-PON from MSA group and Higher Speed PON HSP (ITU-T G.9804) recomendations.

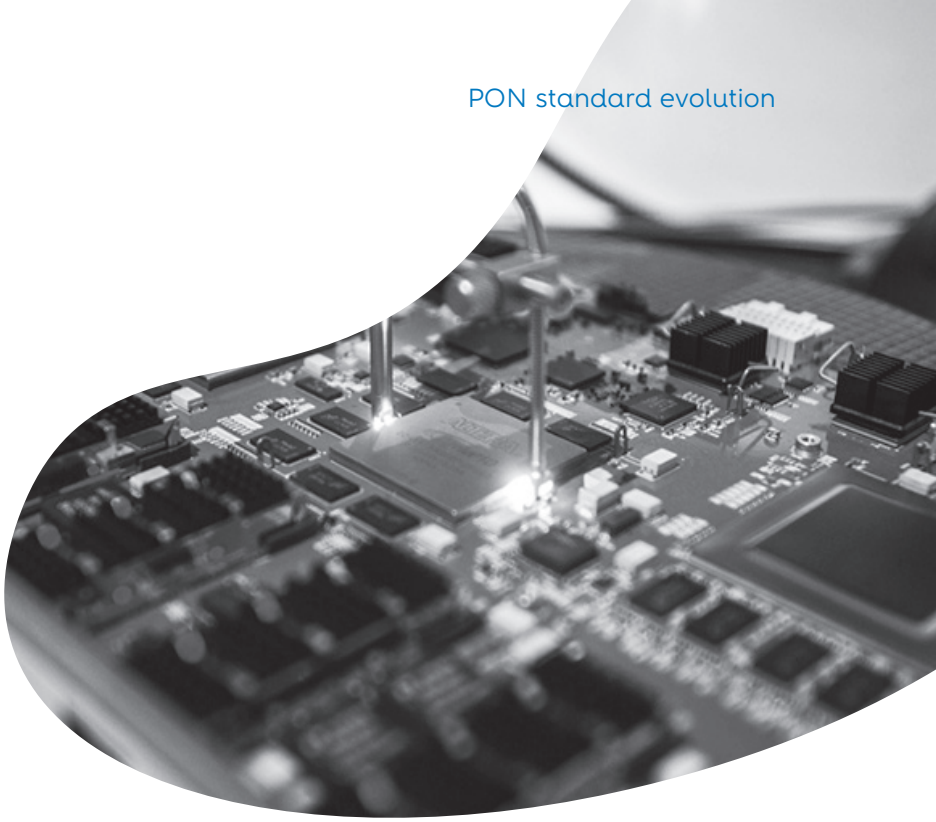
	Bit Rates Gbps (DS/US)*		Wavelengths (nm) (DS/US)*		Optics	Power Budget	Frame Structure
GPON	2.5	1.25	1490	1310	Fixed Wavelength	B+ (28dB) C+ (32dB) D (35dB)	GEM
XG-PON	10	2.5	1577	1270	Fixed Wavelength	B+ (28dB) C+ (32dB) D (35dB)	XGEM
XGS-PON	10	10	1577	1270	Fixed Wavelength	B+ (28dB) C+ (32dB) D (35dB)	XGEM
NGPON2	4x10 4x10 Could go till 8 wavelengths	4x2.5 4x10 Could go till 8 wavelengths	1596.34 1597.19 1598.04 1598.89	1532.68 1533.47 1534.25 1535.04	Fixed or Tunable Wavelength	N1 (29dB), N2 (31dB)	XGEM
25GS-PON	25	25/10	1358	1286 +1/-2	Fixed	N1 (29dB) N2 (31 dB)	XGEM
50G-PON	50	50/25/12.5	1342	1310 / 1270	Fixed	N1 (29dB) N2 (31 dB)	XGEM

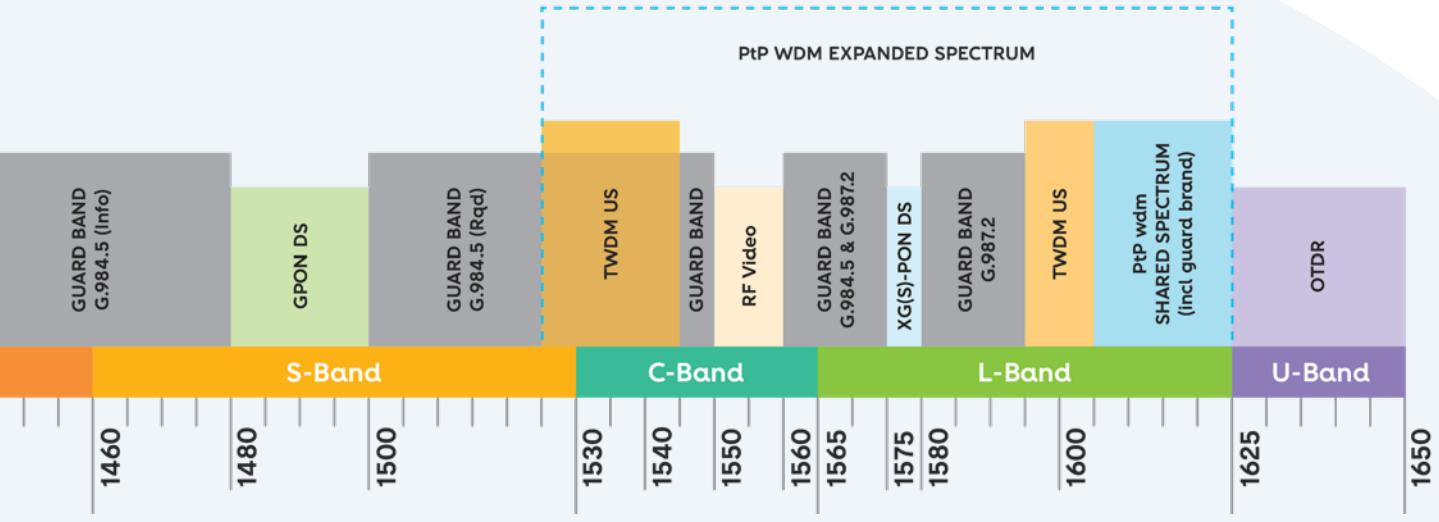
PON technology comparison

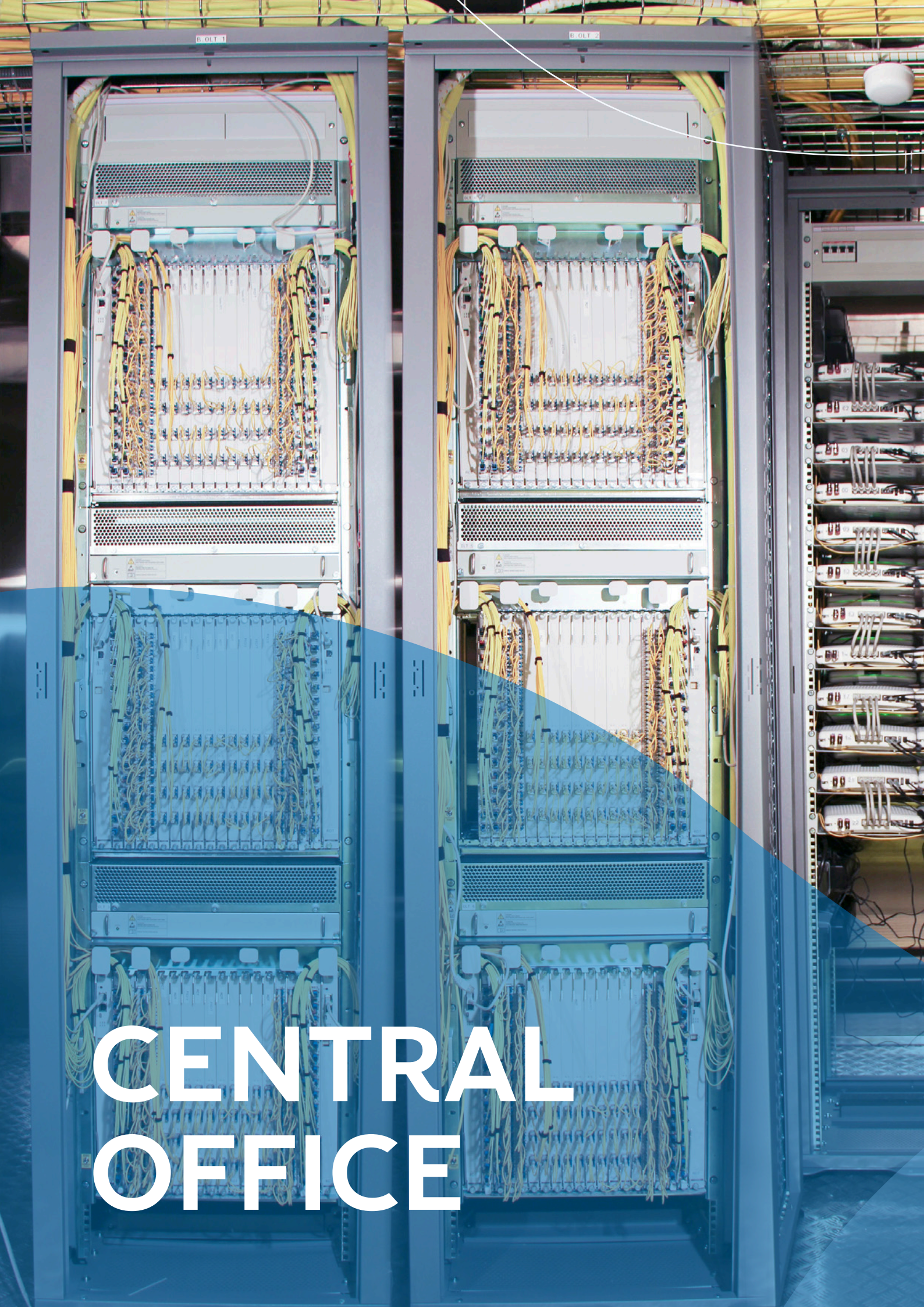
** DS - Downstream, US - Upstream*

Coexistence along the ODN

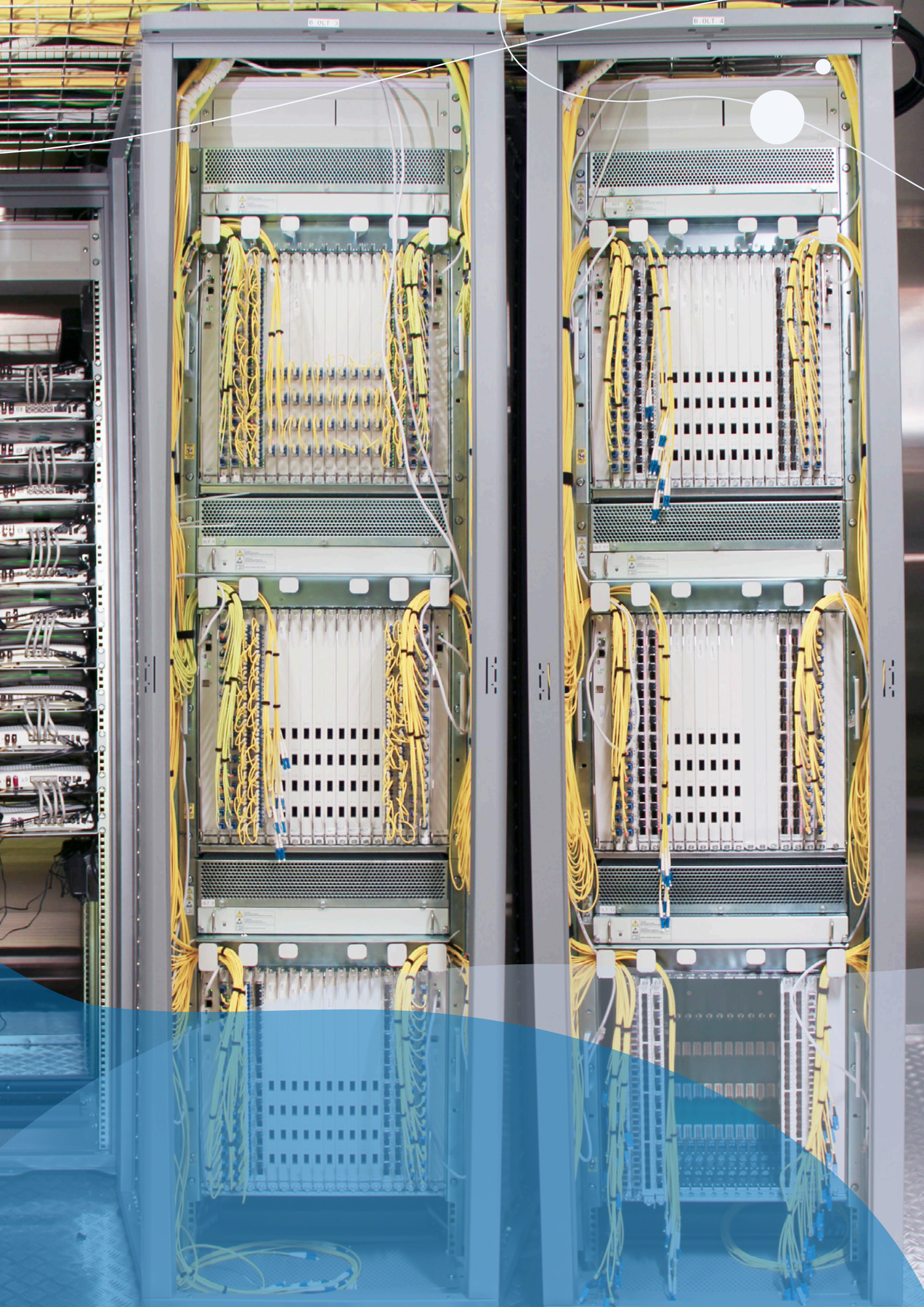





PtP WDM EXPANDED SPECTRUM
GUARD BAND G.984.5 (Info)
GPON DS
GUARD BAND G.984.5 (Rqd)
TWDM US
GUARD BAND
RF Video
GUARD BAND G.984.5 & G.987.2
XG(S)-PON DS
GUARD BAND G.987.2
TWDM US
PtP wdm SHARED SPECTRUM (incl guard brand)
OTDR
S-Band
C-Band
L-Band
U-Band
1460
1480
1500
1530
1540
1550
1560
1565
1575
1580
1600
1625
1650

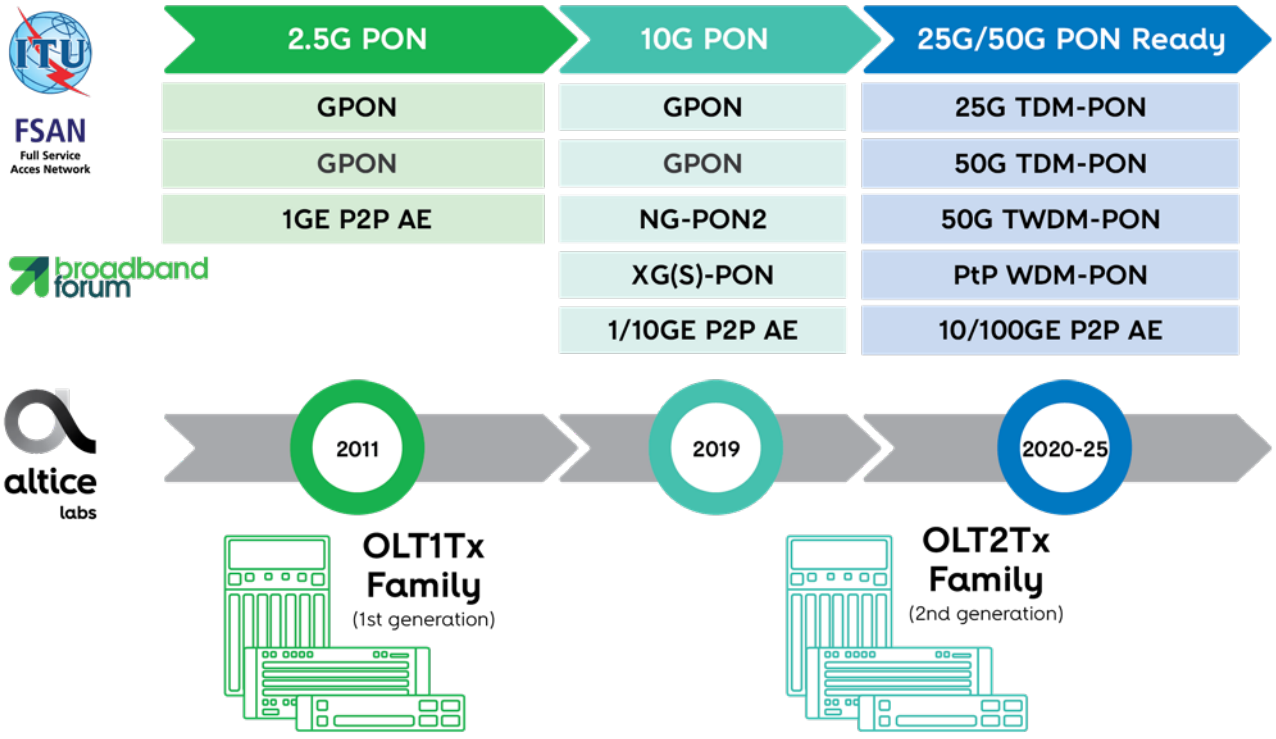


CENTRAL OFFICE


B-OLT-3
B-OLT-4

Altice Labs Central Office overview

Altice Labs Optical Line Terminal (OLT) equipment portfolio offers one of the most suitable and scalable solutions on today's market offering Network Operators and Service Providers a flexible and cost effective approach to implement passive optical networks (xPON). These equipment's are intended to handle all the fiber access needs in terms of Fixed, Mobile and Convergent networks supporting Video (IPTV, OTT TV and RF Overlay), Data (High Speed Internet - HSI) and Voice (VoIP) services. Initially based on the ITU-T G.984.x GPON recommendation, Altice Labs OLT solution fully supports next generation 10G PON architectures as defined by the ITU-T G.987.x (XG-PON1), ITU-T G.9807.1 (XGS-PON) and ITU-T G.989.x (NG-PON2) recommendations.



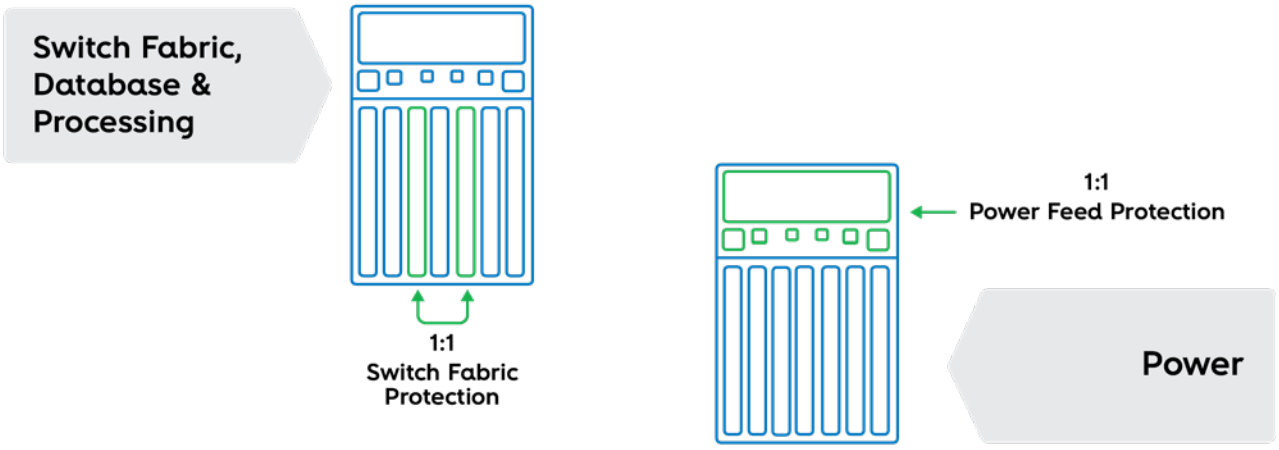
Altice Labs Central Office overview

Main benefits value added

Density	Leading density: 256 xPON / 256 10GE / 768 1GE ports from a single node		Improve cost efficiency & flexibility
Versatility	GPON, XG(S)-PON, TWDM-PON from the same chassis. Multi PON Modules (MPM) available. Ethernet P2P (1GE, 10GE) interfacing available		Manage all customers on the same platform
Redundancy	Common element protection, ring and link aggregation protection, Type B network protection		Extreme availability performance
Manageability	End-to-end Zero Touch Provisioning (ZTP) capabilities		Increase operation efficiency
Interoperability	Fully interoperable with 3rd Party ONTs		Freedom to choose: true multi-vendor
Virtualization	Seamless Evolution towards fully compliant SDN/NFV environment		Ready for virtualization
Future-Proof	Allowing next-gen 25G/50G PON		Investment protection

Altice Labs PON portfolio overview

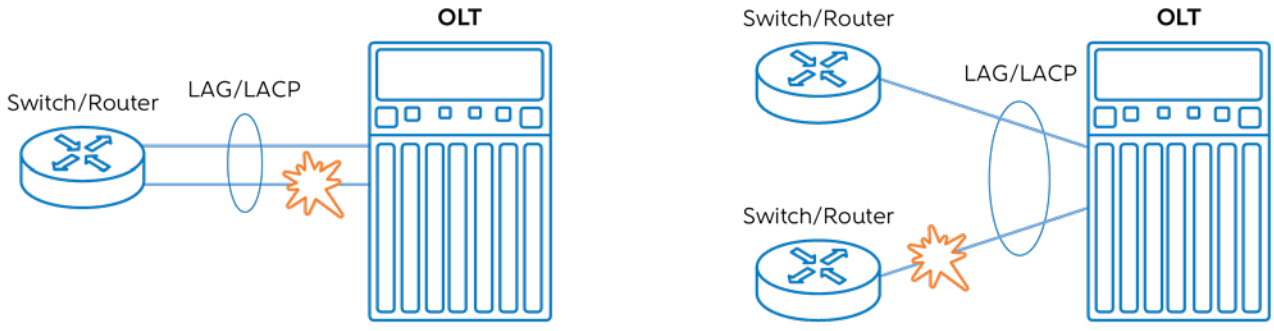
Common element protection



Common element protection

Automatic Protection Switching is achieved In less than 50ms!

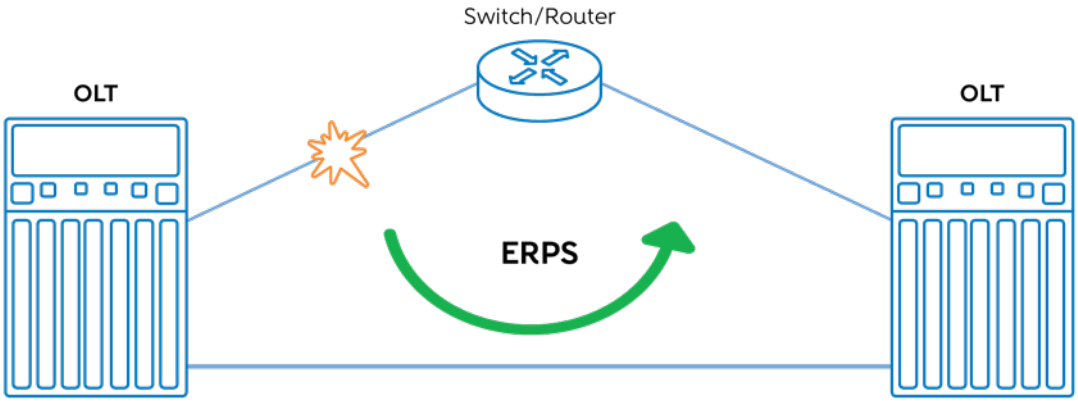
Link Aggregation



Link Aggregation

- The traffic at the uplink ports is configured to flow through different physical ports at the same time (typically 50/50).
- In case of LOS in one of the uplink ports, the traffic still flows even though with half of the capacity.

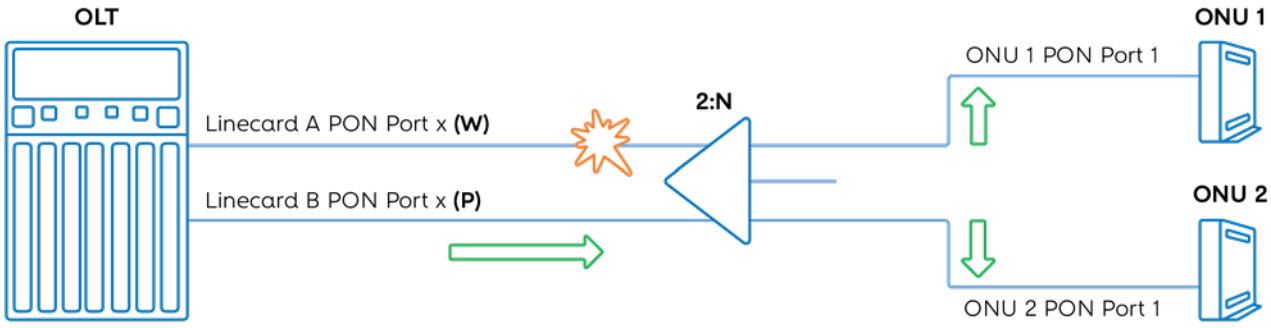
Ring Protection



Ring protection

When a LOS signal is detected within an OLT uplink port, the traffic is completely coursed through the opposite direction. Less than 50ms, according to Ethernet Ring Protection Switching (ERPS ITU-T G.8032).

Type B Protection

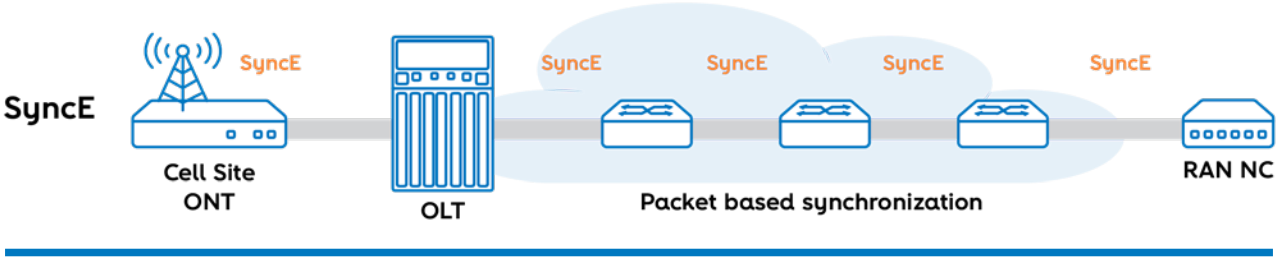


Type B Protection

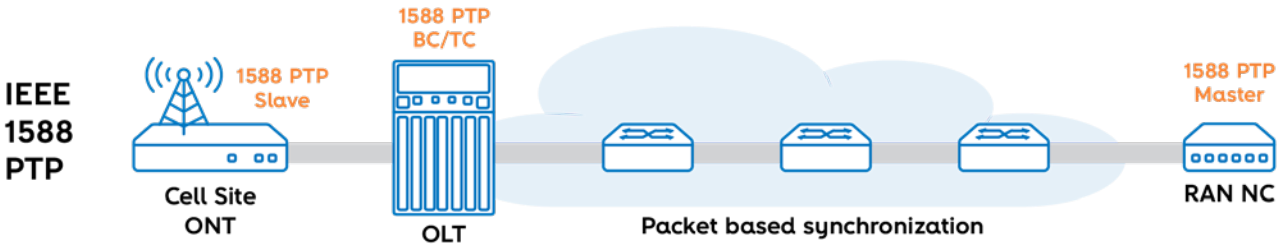
- The OLT uses two PON ports (Working and Protection)
- Configure the Working (W) and the Protection (P) PON interfaces
- In case of LOS in W port, the traffic will automatically switch to P port in less than 50ms!

Synchronization

Synchronization is a relevant aspect of all communication devices. The Synchronous Ethernet (SyncE) ITU-T G.826x and the Precision Time Protocol (PTP) of IEEE 1588v2, with relevant profile parameters attributes defined in ITU G.827X, are both available and ready to be configured to improve network timing performance parameters especially in critical application scenarios where latency variation and network consistency are prime issues.



SyncE Synchronization



1588 PTP Synchronization - OLT as Border Controller (BC)

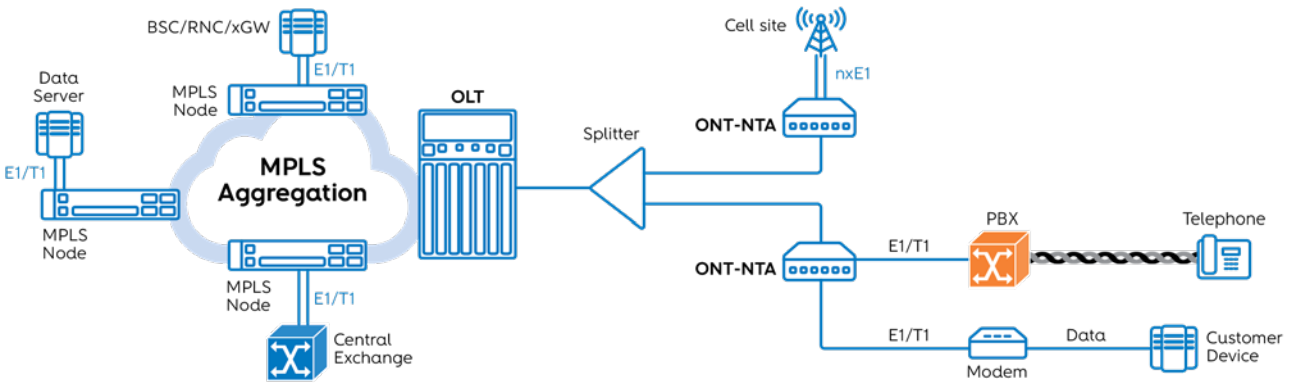
Time and phase Synchronization over PON - OLT as telecom boundary clock (T-BC)

SyncE	IEEE 1588V2 (PTP)
Initially deployed to save dedicated sync TDM E1 circuits	Initially deployed for critical sync industrial applications
Delivers Frequency reference	Delivers Frequency, Phase and Time references
Ethernet Physical Layer Dependent (PHY Ethernet Layer)	Physical Layer independent
Not affected by packet network traffic constrains	Affected by packet network traffic constrains (e.g. Frame delay)
Not for legacy networks (hardware/interfaces need to be upgraded). Contrains between operators and national borders	v2 came to improve latency and jitter resiliency achieving nanoseconds high precision
Both may coexist (SyncE for frequency reference delivery and IEEE 1588 for time reference delivery)	

PON technology comparison

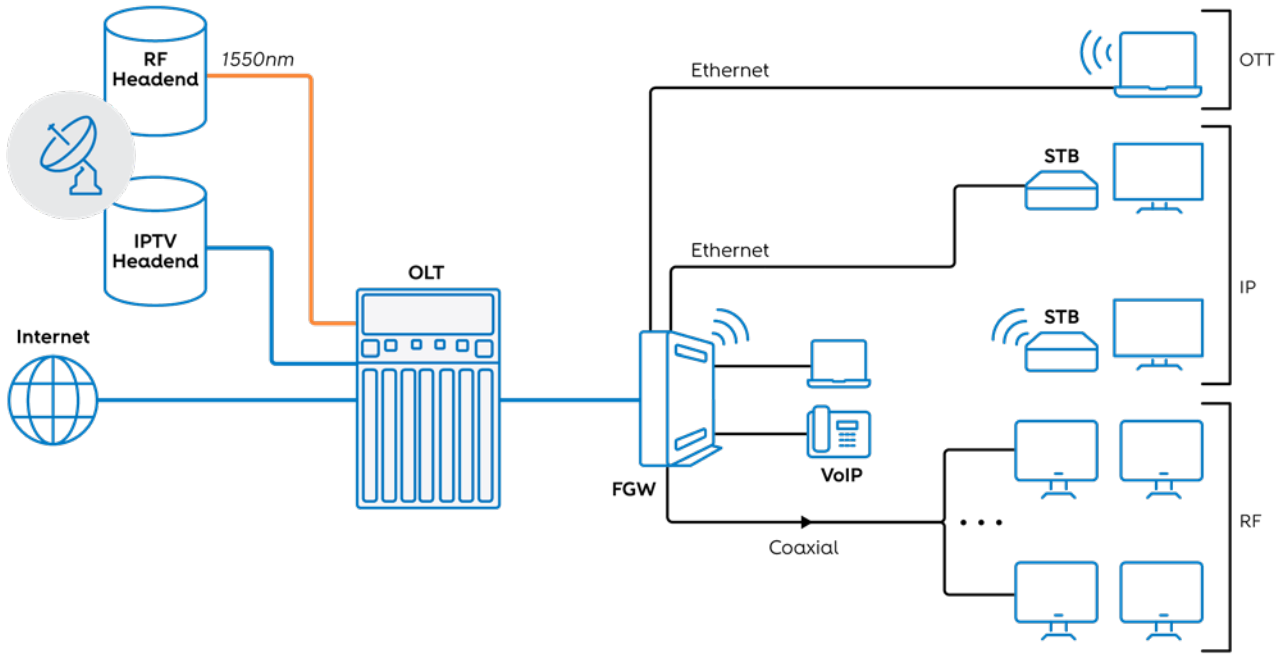
SyncE and PTP are necessary to support restringent Midhaul/Fronthaul scenarios

Circuit Emulation



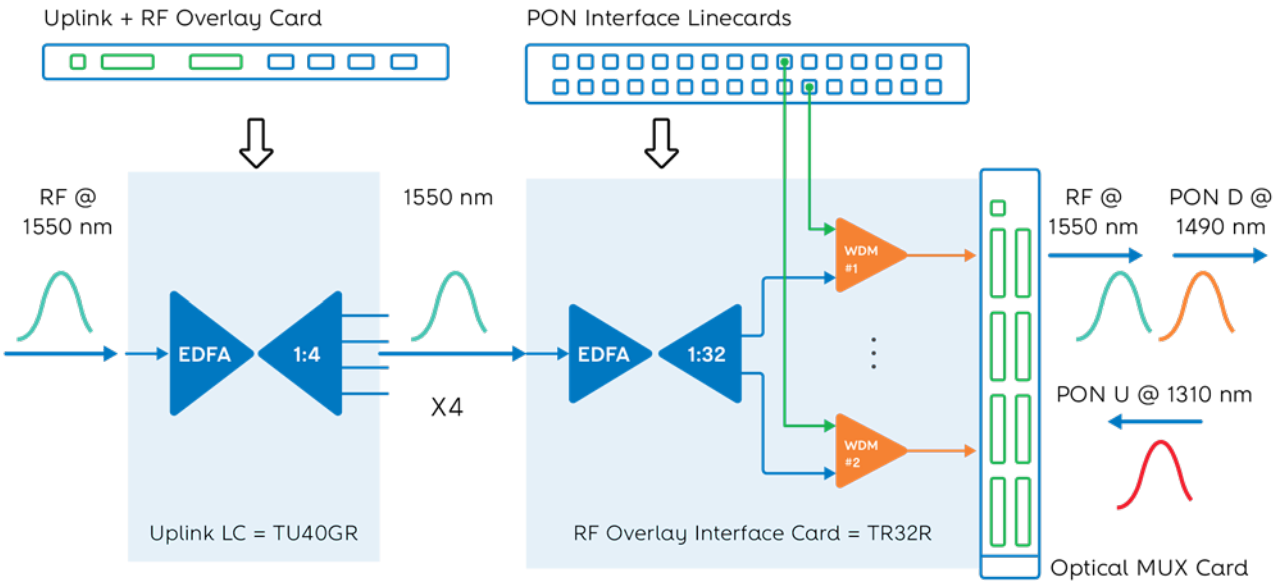
TDM E1/T1 circuit Emulation

TV Business Model



Video service delivery

RF Overlay Features

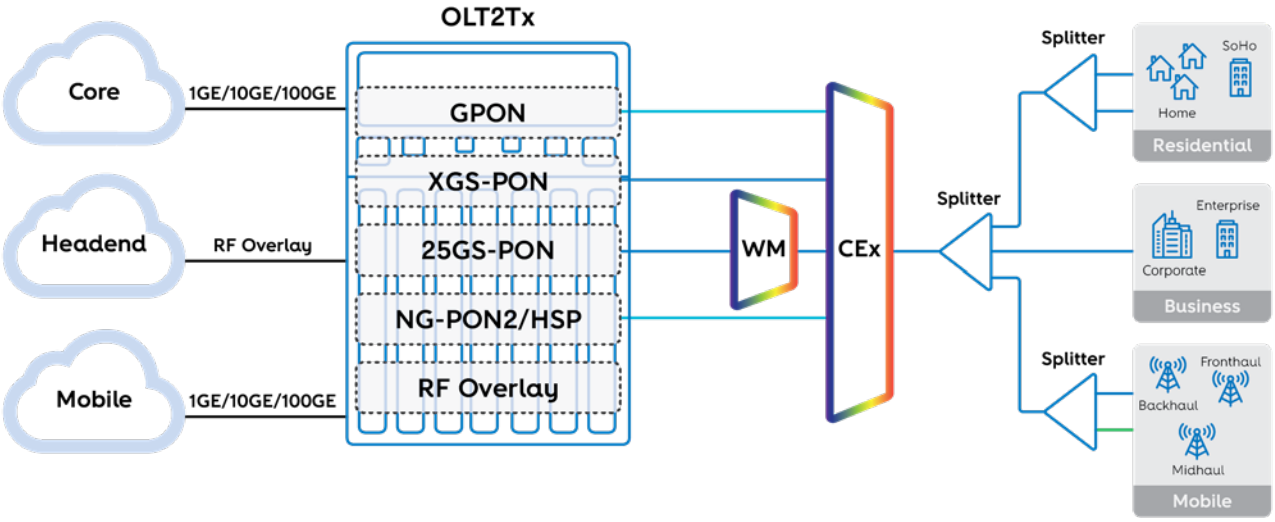


RF Overlay Capabilities (xPON use case)

The 1550nm optical RF Overlay signal received at the OLT is preamplified, split and multiplexed with xPON signal that is after delivered to the outside distribution network (ODN).

- RF Overlay optical distribution over xPON using integrated functions of the OLT.
- Up to 128 xPON ports with integrated RF Overlay.

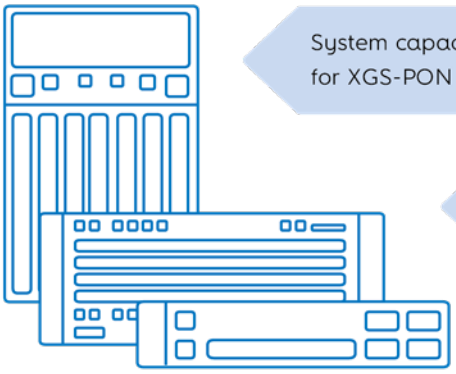
OLT2Tx Interconnection



OLT2Tx Central Office

OLT2Tx supports GPON, XG(S)-PON, NG-PON2, PtP 1GE/10GE to solve the entire needs of the access network domain meaning Residential, Business and Mobile market segments. OLT2Tx chassis is also prepared for next generation PON technologies as 25GS PON (MSA) or 50G PON (g.hsp).

OLT2Tx Future Proof Platforms



System capacity increase towards native support for XGS-PON and NG-PON2 technologies

Single node service integration (B2C, B2B and MBH)

Multi-Terabit Optical Access

Ultra-high bandwidth

- High Speed PON ready (25GS-PON/50G PON)
- Up to 400Gbps/slot backplane capacity
- Nx100GE Uplink Interfacing
- NG-PON2 / XGS-PON / GPON
- Active Ethernet (PtP) 10G/1G

High reliability

- Common parts redundancy (Power / Switch Fabric/Uplinks)
- LAG / LACP Uplink Protection
- Type B Protection for the ODN side

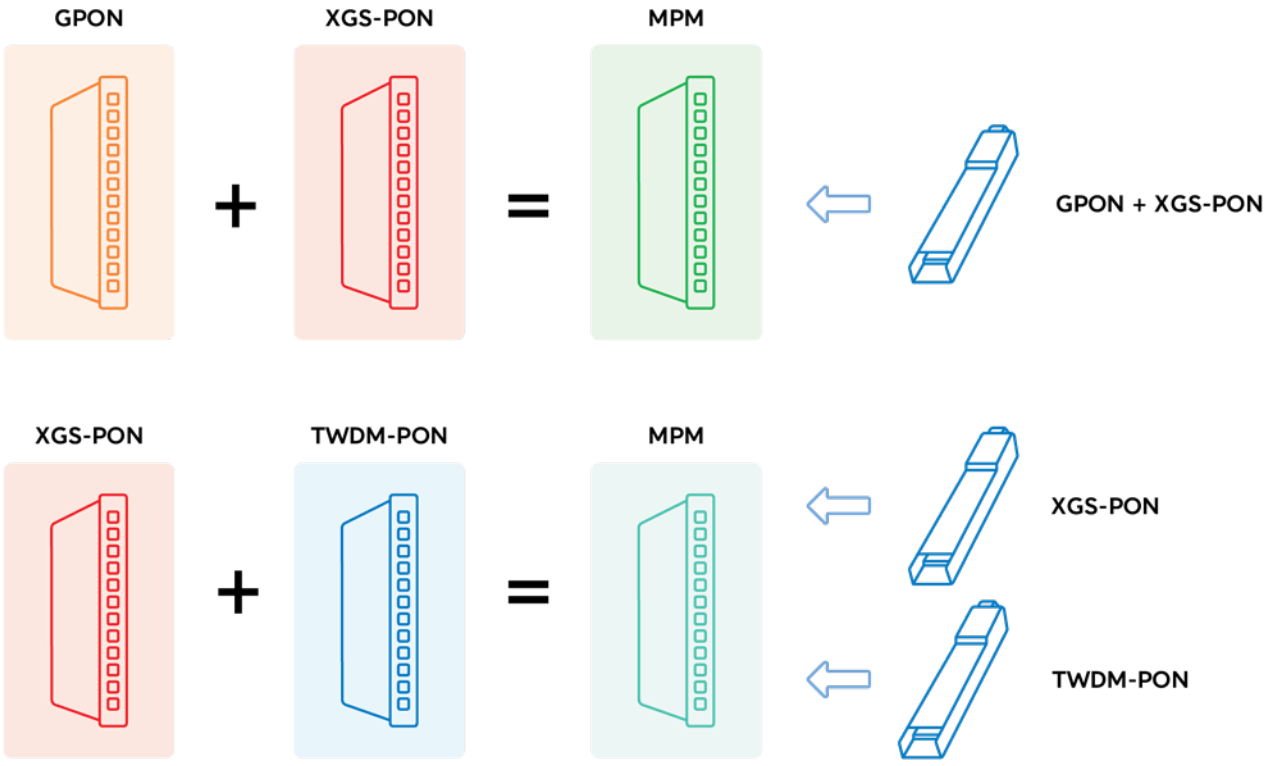
SDN

- Seamless migration towards Software Defined Access Node (SDAN)

OLT2Tx motivation requirements

High level of flexibility Multi PON Modules

Save your investments and achieve a smooth technology migration by delivering more than one technology within the same linecard.

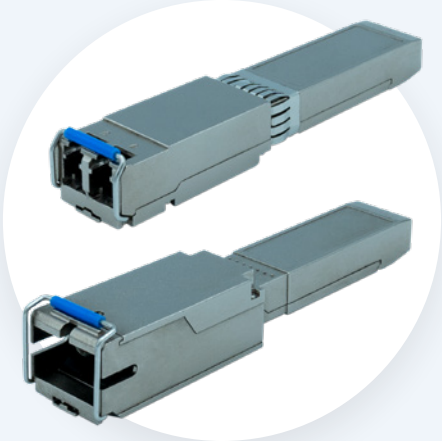


High level linecard flexibility

High Density PON

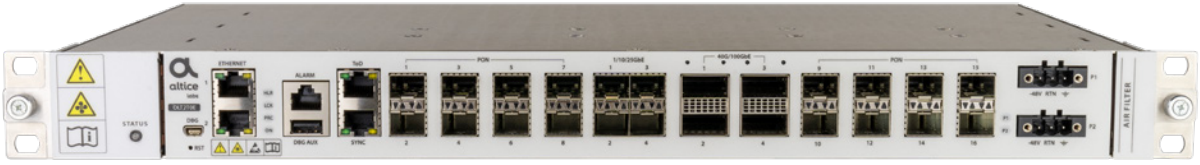
Altice Labs has recently revealed a market patented novel Dual SFP that is able to duplicate PON port density over a regular GPON or XGS-PON interface.

- The first PON SFP in the market with double density;
- Combination of two OLT transceivers in a single SFP housing;
- For the GPON technology it employs two 1490 nm CW downlink DFB laser operating at 2.488Gbps and two 1310 nm optical burst mode receivers incorporating ADP/TIA optics for maximum sensitivity;
- For the XGSPON technology it employs two 1577 nm CW downlink EML laser operating at 9.953 Gbps and two 1270 nm optical burst mode receivers incorporating ADP/TIA optics for maximum sensitivity.



As an exemple, our OLT2T0E 1 rack unit equipment will then be able to deliver not 16 but 32x GPON or 32x XGSPON interfaces.

OLT2T0E



32x GPON or 32x XGSPON

10G PON Central Office

Download datasheet
Scan the QR code to view more information

OLT2T4

- Multi-Terabit Optical Access Shelf / Dual Star High Availability Architecture
- Dual redundant switch fabric modules of 1.6Tbps (Active / Standby)
- BK Uplink | Access capacity: 400Gbps per slot | 200Gbps per slot
- 16 Service slots | 2 Network slots | 2 Switch fabric slots
- 19” x 15RU x 240mm/9.4’’ (WxHxD) of size
- Redundant power supply and Removable FAN tray
- Controlled Environment Humidity/Temperature Range: 5% - 95% / -5°C to +45°C
- Service slots: 256x GPON/XG(S)-PON, 256x NGPON2, 768x FE/GE, 192x 10GE

10G PON Central Office

Download datasheet
Scan the QR code to view more information

OLT2T2

- Multi-Terabit Optical Access Shelf / Dual Star High Availability Architecture
- Dual redundant switch fabric module of 600Gbps (Active / Active)
- BK Uplink | Access capacity: 400Gbps per slot | 200Gbps per slot
- 4 Service slots | 2 Network/Switch fabric slots
- 19" x 4RU x 240mm/9.4" (WxHxD) of size
- Redundant power supply and Removable FAN tray
- Hardened Environment Humidity/Temperature Range: 5% - 95% / -40°C to +65°C
- Service slots: 64x GPON/XG(S)-PON, 64x NGPON2, 192x FE/GE, 48x 10GE

Download datasheet
Scan the QR code to view more information

OLT2T0E

- Compact Optical Access Shelf
- 19" x 1RU x 240mm/9.4" (WxHxD) of size
- Redundant power supply and Removable FAN tray
- Hardened Environment Humidity/Temperature Range: 5% - 95% / -40°C to +65°C
- Service slots: 16x GPON/XG(S)-PON

10G PON Central Office

Download datasheet
Scan the QR code to view more information

OLT2T0

- Compact Optical Access Shelf
- Embedded Switch fabric module of 80Gbps
- 19” x 1RU x 240mm/9.4’’ (WxHxD) of size
- Redundant power supply and Removable FAN tray
- Hardened Environment Humidity/Temperature Range: 5% - 95% / -40°C to +65°C
- Service slots: 8x GPON/XG(S)-PON

GPON Central Office

Download datasheet
Scan the QR code to view more information

OLT1T3

- Multi-Terabit Optical Access Shelf / Dual Star High Availability Architecture
- Dual redundant switch fabric module of 640Gbps (Active / Standby)
- BK Uplink | Access capacity: 40Gbps per slot | 20Gbps per slot
- 18 Service/Network slots ("Any Card / Any Slot") | 2 Switch fabric slots
- 19" x 14RU x 240mm/9.4'' (WxHxD) of size
- Redundant power supply and Removable FAN tray
- Controlled Environment Humidity/Temperature Range: 5% - 95% / -5°C to +45°C
- Service slots: 256x GPON, 768x FE/GE

GPON Central Office

Download datasheet
Scan the QR code to view more information

OLT1T1

- Multi-Terabit Optical Access Shelf / Dual Star High Availability Architecture
- Dual redundant switch fabric module of 160Gbps (Active / Standby)
- BK Uplink | Access capacity: 40Gbps per slot | 20Gbps per slot
- 3 Service slots | 2 Network/Switch fabric slots
- 19” x 3RU x 240mm/9.4’’ (WxHxD) of size
- Redundant power supply and Removable FAN tray
- Hardened Environment Humidity/Temperature Range: 5% - 95% / -40°C to +65°C
- Service slots: 48x GPON, 144x FE/GE

Download datasheet
Scan the QR code to view more information

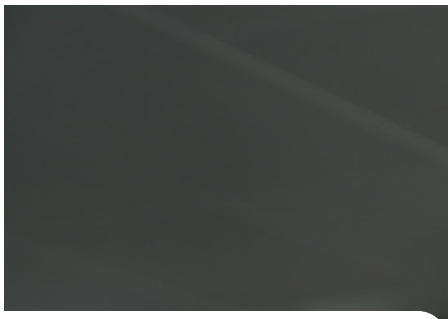
OLT1T0

- Compact Optical Access Shelf
- Embedded Switch fabric module of 64Gbps
- 19” x 1RU x 240mm/9.4” (WxHxD) of size
- Redundant power supply and Removable FAN tray
- Hardened Environment Humidity/Temperature Range: 5% - 95% / -40°C to +65°C
- Service slots: 8x GPON

CUSTOMER PREMISES EQUIPMENT

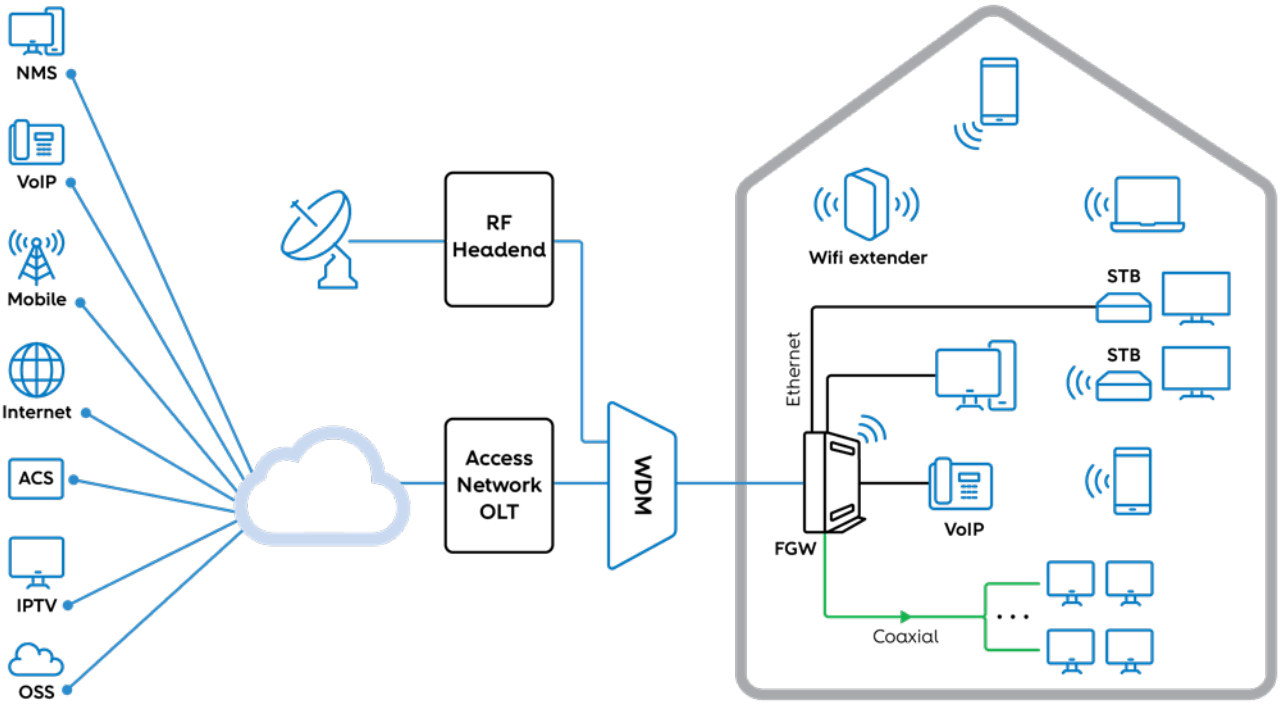

PON
INTERNET
WPS
WIFI
TEL
POWER
WPS
WIFI

Customer Premises Equipments



The Altice Labs holds a large experience on developing Customer Premises Equipment solutions targeting the home, business and mobile environments. Mainly focused on passive optical network (xPON) terminal equipment.

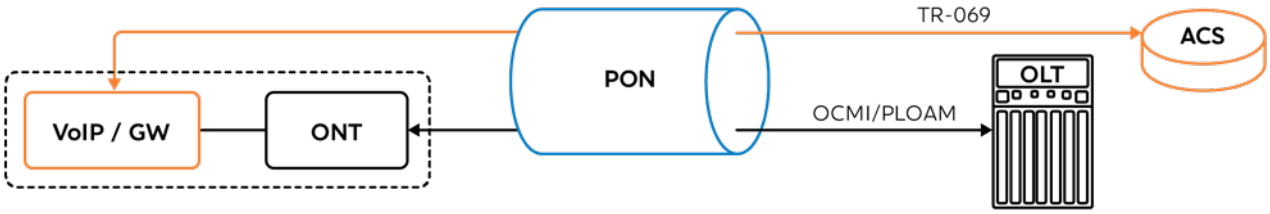
At the xPON level, our ONT equipment support multi-play services based on ITU-T rec. G.984 (GPON), G.987 (XG-PON), G.9807.1 (XGS-PON) and G.989 (NG-PON2) standards, enabling High Speed Internet (HSI), IPTV, VoIP, RF Overlay and Wi-Fi services via standardized interfaces. Network scenarios such as Mobile and Wi-Fi.



In-house networking


RESET
TEL
LAN
USB
ON/OFF
PWR
PON
altice
Wi-Fi EXTENDER
D2150G
PWR
LAN
12VDC/1A
1
2

At the management level the ONT Management and Control Interface (OMCI) is available according with the corresponding ITU standards. TR-069 protocol is also available and allows for L3 features to be mass remotely configured, troubleshoot and managed by an Auto Configuration Server (ACS).

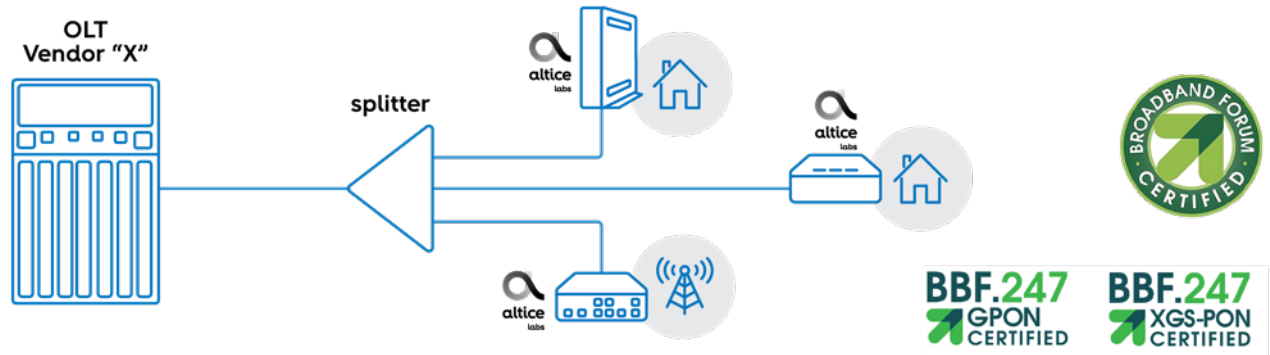


Remote management through TR-069

Mass remote management through OMCI and TR-069 standards, thus offers a full remote control without user intervention; TR-142 defines a Virtual UNI between the OMCI and TR-069 management domains.

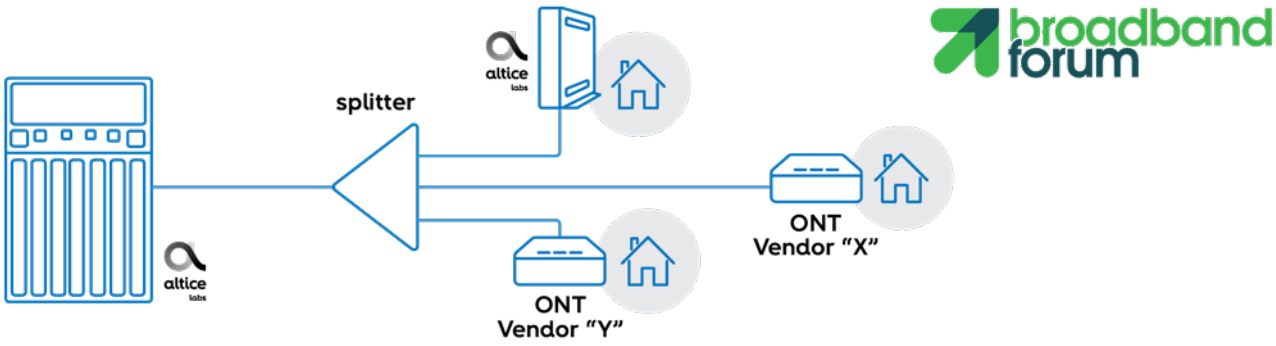
NADM is the Altice Labs ACS platform specially devoted for retail and wholesale markets with the ability to manage millions of devices in real-time basis.

Altice Labs was one of the first worldwide vendors to achieve Broadband Forum BBF.247 certification at ONT level, allowing and promoting a truly multi-vendor environment that can easily be configured to differentiate the residential and business offers.



ONT interoperability scenario

The other way around multi-vendor ONT scenario, as defined by Broadband Forum WT-255, is also supported by Altice Labs OLT portfolio.



OLT interoperability scenario

Regardless of 1G PON and 10G PON equipment families, Altice Labs deployment scenarios fits from Fiber-to-the-Home (FTTH), Fiber-to-the-Cell (FTTCell) and Fiber-to-the-Distribution Point (FTTDP) at the same time that Active Ethernet scenario may be simultaneously covered for some of our CPE devices. The ONT portfolio may also be classified into three different equipment segments:

Bridging Family (simple L2 bridging devices) - This equipment family is very suitable for low cost xPON fast deployments offering the opportunity to deliver a reliable service using a third party gateway or even delivering a network termination point for mobile backhaul scenarios.

Gateway Family (with L2/L3 gateway features) - This equipment family is the right choice for full in-house multi-play service delivery, enabling Voice, Video and Data over a PON single terminal equipment. This equipment family has built-in routing features that avoid the need for an external third party gateway. It also shows several Wireless standard interface options that are essential for a full and enhanced in-house / in-building Wi-Fi coverage. Wi-Fi 802.11 b/g/n/ac/ax standards are available covering 2.4GHz, 5GHz and 6GHz band complying with Wi-Fi 6E standard.

Dedicated Services Family (legacy traffic transport) - This equipment family is particularly devoted to bring dedicated terminals into next generation xPON infrastructures. Circuits like E1/T1 as well as IoT standardized interfaces may be collected and transported over a point-to-point / point-to-multipoint logical circuit scenario. Also dedicated synchronous protocols as SYNC-E and PTP1588v2 are available for mobile backhaul as for wholesale applications.

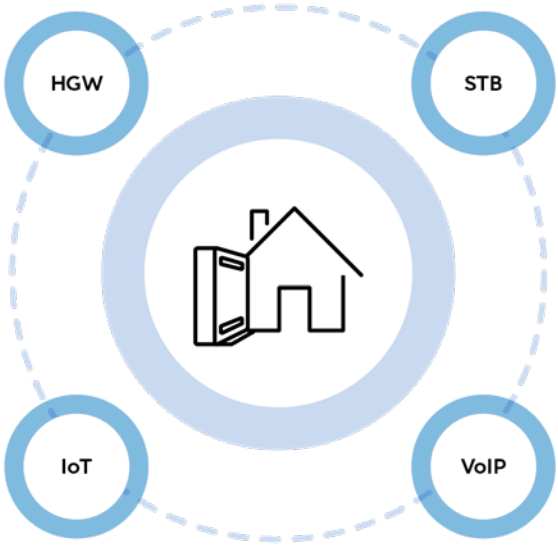
Device Management Solution

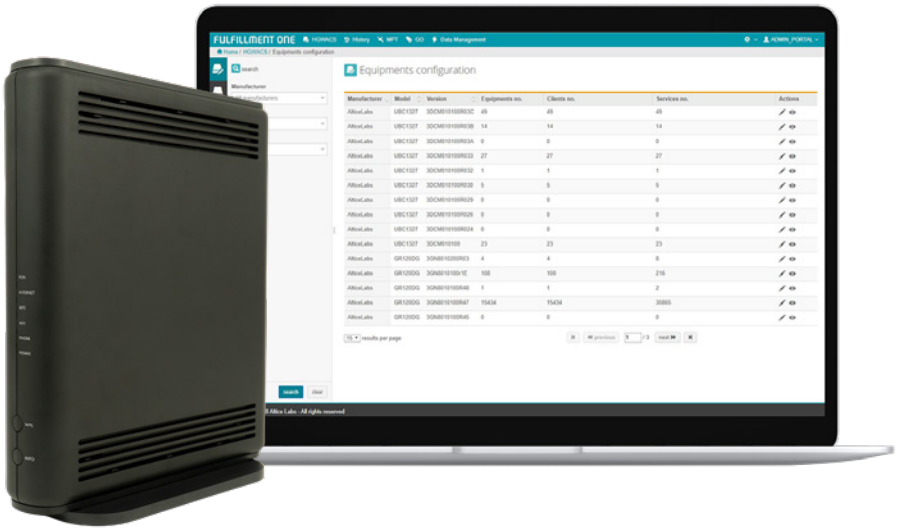
Altice Labs Device Management solution applies to both residential and corporate networks. It supports several device types and vendors enabling the management of millions of devices in real time.

The solution is ready to support CPE virtualization scenarios (vCPE, uCPE), where it is able to combine the configuration of the physical (PNF) and virtual (VNF) components of the device, allowing to compose services that span across both domains in a transparent and seamless approach.

The solution provides APIs for easily integrate with OSS fulfillment and assurance processes.

- CPEs Management
- Easy deploy of new services supported on CPEs
- Optimized Bulk Operations
- Complete protocol support for integrations
- Ready for virtualization of CPE functions - NFV

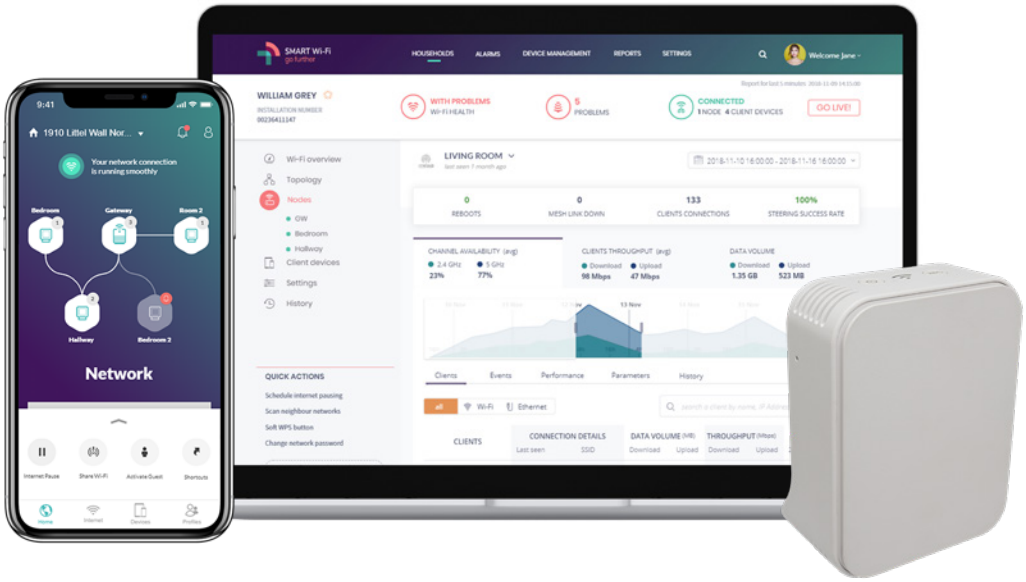


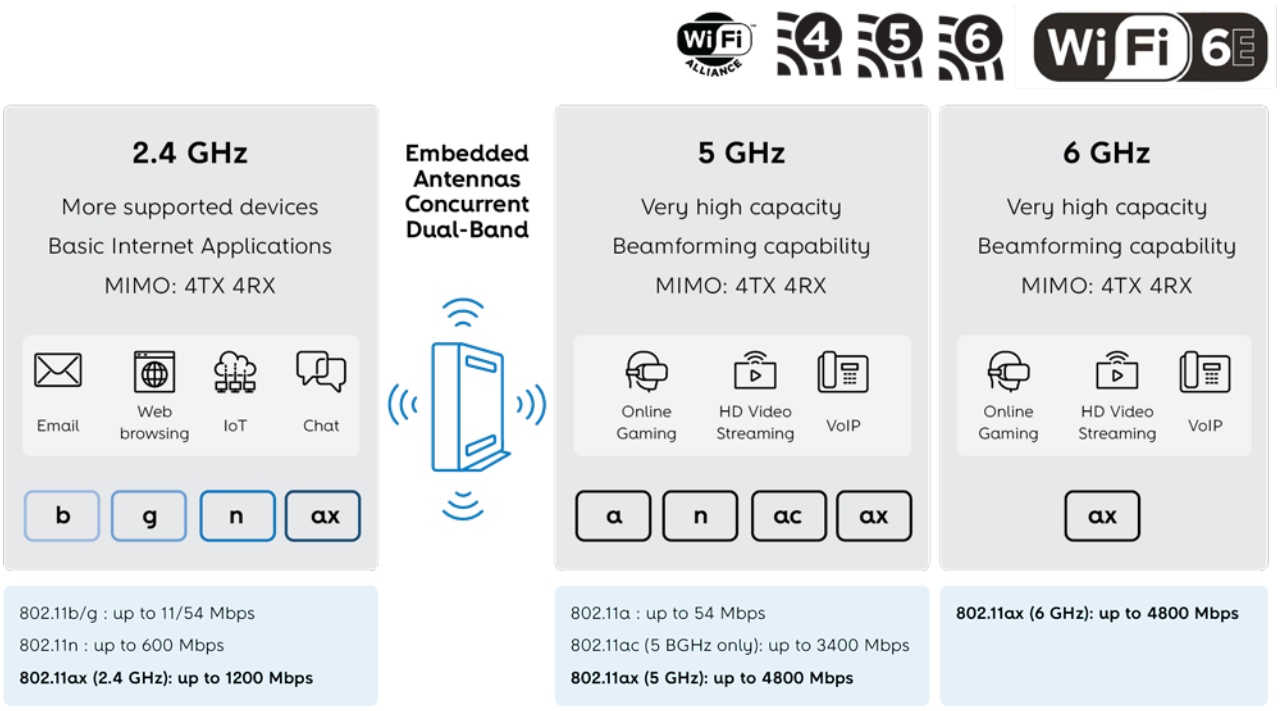


Smart Wi-Fi Solution

Today Wi-Fi is an indispensable service in every home that has to ensure fast and reliable access without penalizing the quality of experience. For the operator, Wi-Fi service is challenging because within consumers' homes the visibility of quality and problem-solving is always more limited. Altice Labs' Smart Wi-Fi solution bridges the gap with a cloud platform that can provide high visibility into Wi-Fi service in every home. It allows you to leverage Wi-Fi remote control services, made available from an intuitive mobile app and cloud portals available for both operator and consumer profiles.

- Cloud Management Platform for Wi-Fi mesh networks
- Monitoring, diagnosis and optimization in real-time
- Improvement of steering algorithms through analytics & machine learning
- Controls for operator and end customers
- Extenders & HGW device management





Wi-Fi specifications

In the context of a continuous improvement and enrichment of Altice Labs CPE portfolio specifications, RDK-B software framework has been added to the new Fiber Gateway Wi-Fi 6 (802.11ax) equipment family. RDK-B is an open source software development framework actually corresponding to a market reference for the network operators.

Having RDK-B running inside CPEs product family, Altice Labs looks forward to optimize and unify the CPE software development procedures along the Wi-Fi, xPON, and DOCSiS products as well as take the major profit from its main technical advantages.

Having RDK-B running on our CPE product line drastically increases flexibility and unification at the product development cycle at the same time that decreasing the product Time-to-Market. This new feature is also an opportunity for CPE enrichment with IoT, Analytics, SDN as well as other 3rd party applications that are now available for a straightforward integration within the box.

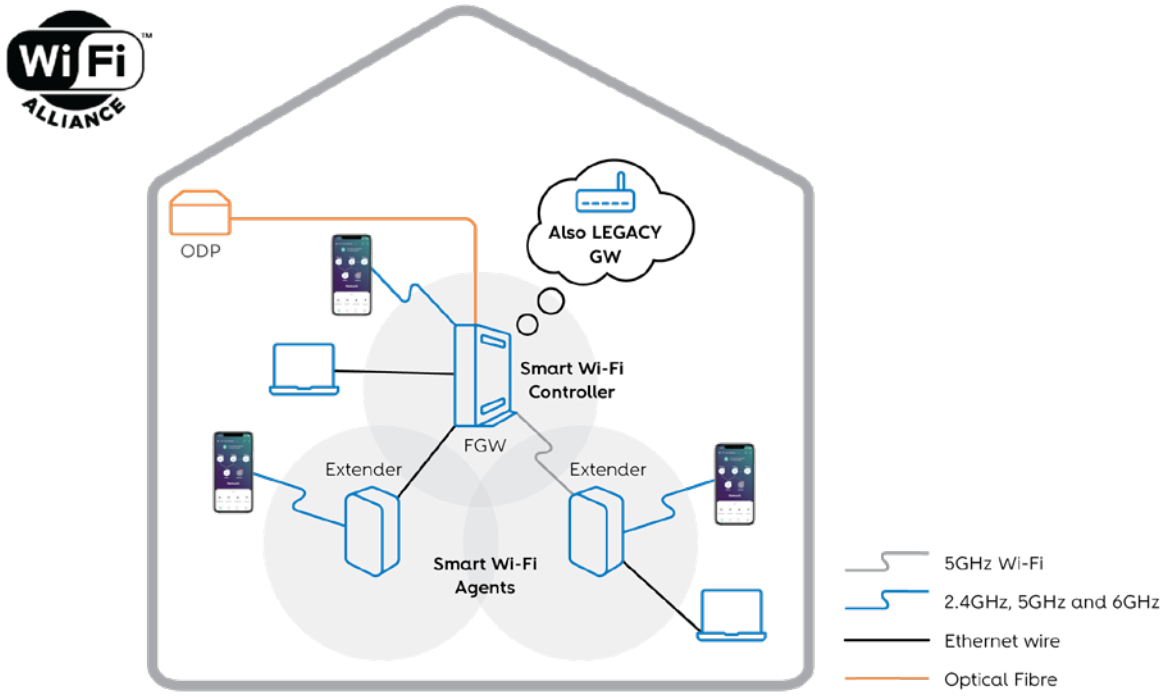
Smart Mesh Wi-Fi enhanced wireless experience

The massive increase in connected devices has resulted in drastic demand for Wi-Fi connectivity throughout the home. Consumers own multiple mobile devices, including IoT and smart home connected products that claim for quality airtime at the home and outdoor areas with uniform Wi-Fi coverage. Traditionally, home Wi-Fi deployments include a single Wi-Fi access point (AP) or router, which may or may not fully envelop the desired capacity and coverage area. Increased mobility and throughput, improved efficiency and capacity, reduced interference, and easier AP placement and network configuration are key enhancements for Wi-Fi networks.

Altice Labs has dedicated major attention to the in-house Wi-Fi coverage scenarios and has developed a Smart Mesh Wi-Fi certified solution based on Wi-Fi EasyMesh™ from Wi-Fi Alliance®. The solution incorporates hardware (main router eg. FGW and Smart Mesh Wi-Fi AP extenders), a mobile user APP (Android &iOS) and a unified portal cloud based to configure, manage and report the Wi-Fi mesh ecosystem. Both FGW and Smart Mesh Wi-Fi APs will run local software (local Controller, local Agent and a Smart Mesh Wi-Fi Management agent) to provide high performance state-of-art Wi-Fi network.

Wi-Fi EasyMesh™ networks utilize multiple APs that work together to ensure complete Wi-Fi coverage in all areas of the home with full user mobility keeping at same time consistent performance and high quality user experience.

Smart Mesh Wi-Fi Cloud Platform & Mobile App



Smart Mesh Wi-Fi network topology

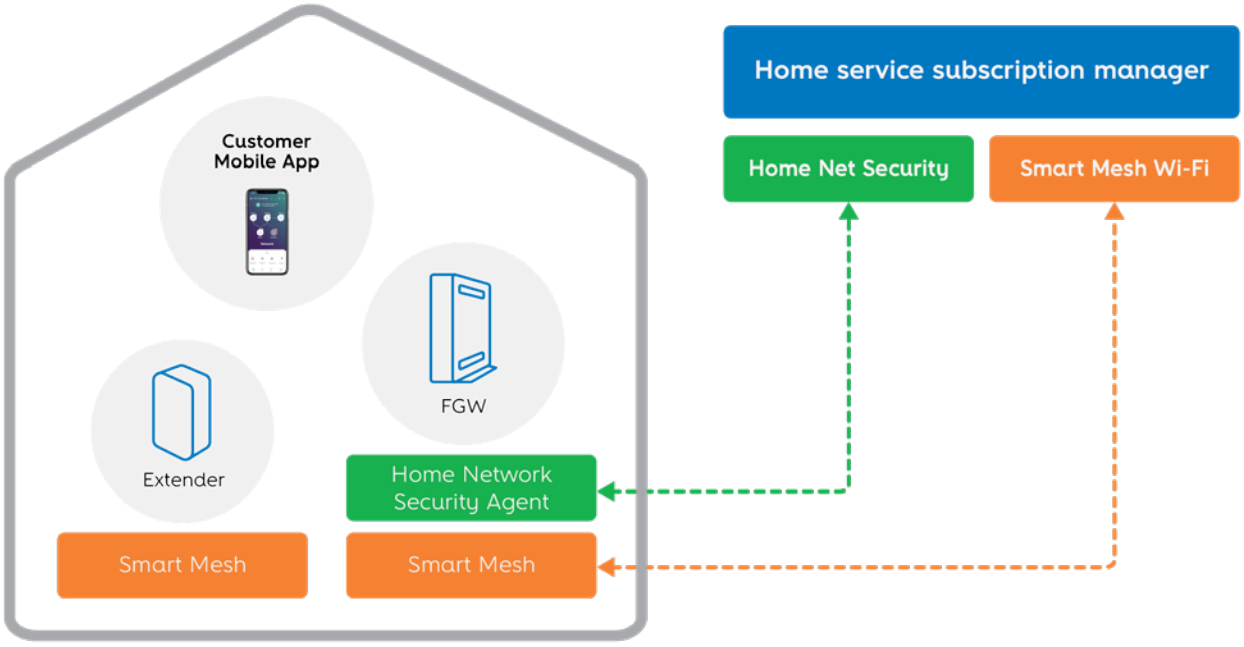
Hardware Extenders

- High performance HW solution based on the new IEEE 802.11ax @ 2.2.4GHz, 5GHz and 6GHz
- Interoperable mesh solution compliant with Wi-Fi ®Alliance Multi-AP specification
- Optimal QoS and throughput performance
- Both wireless and wireline (Ethernet) backhaul connections are be used to link extenders to the FGW
- Patented enhanced steering and traffic load balance features.

Cloud Platform & Mobile App

- Cloud platform for central monitoring, diagnostics and optimization of the smart mesh Wi-Fi
- Monitors, diagnoses and optimizes the mesh Wi-Fi
- Remote control of network devices
- Provides intelligence to mesh Wi-Fi through analytics
- Live troubleshooting, device management and full visibility for Home networks and CPEs
- Smart Wi-Fi management though mobile App everywhere inside /outside home network

Home Network Security (HNS)



On top of the Smart Mesh Wi-Fi functionalities dealing with service connectivity and monitoring aspects, the Home Network Security component allows the addition of new security features as:

- Device Fingerprinting
- Anti-Virus Integration
- Browsing protection
- Virtual Hot Patching
- Home LAN protection
- Internet Parental Control
- On-the-go Security

This same features may be enabled and controlled through the Customer Mobile App that uses the Home Service Subscription Manager as the real time service broker.

GPON

ONT-SFU

- L2 Based service
- Multi-play support
- ITU-T G.984.x and G.988 compliant
- 35/1.4 x 143/5.6 x 103/4.1 (HxWxD mm/")
- 158 g / 0.35 lb

Download datasheet
Scan the QR code to view more information

Specifications

Model	Ports						
	FXS	Ethernet	RF	PON			
		1GE		Type	Class	Bit rate (Gbps)	Wavelength (nm)
GS0100G	-	1x	-	GPON	B+, C+, D	DS: 2.488 US: 1.244	DS:1480-1500 US:1260-1360
GS0110G	-	1x	1x				
GS1000G	1x	-	-				
GS1100G	1x	1x	-				

GPON

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Scan the QR code to view more information

Fiber Gateway Wi-Fi 5

- Wi-Fi 5: Wi-Fi 802.11 b/g/n @2.4GHz (3x3 20dBm EIRP) + 802.11 n/a/ac @5GHz (4x4 30dBm EIRP)
- L2 + L3 Based service
- Multi-play support
- Embedded Voice, RF Overlay, Wi-Fi and USB interfacing
- Mass remote management through OMCI (G.988) and TR-069 standards, thus offering a full remote control without user intervention
- 245.8/9.7x44.8/1.8(80.6/3.2 including base) x210.0/8.3 (HxWxD mm/")
- 834 g / 1.84 lb

Specifications

Model	Ports									
	FXS	Ethernet	RF	Wi-Fi Dual Concurrent		USB	PON			
		1GE	Band: (47 ... 870MHz)	Antennas	Power (dBm EIRP)	2.0	Type	Class	Bit rate (Gbps)	Wave-length (nm)
GR241AG	2x	4x	1x	2.4GHz: 3x3 Mimo 5GHz: 4x4 MIMO	2.4GHz: up to 20 5GHz: up to 30	1x	GPON	B+, C+, D	DS: 2.488 US: 1.244	DS:1480-1500 US:1260-1360

GPON

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Scan the QR code to view more information

Fiber Gateway Wi-Fi 6

- Wi-Fi 6: Concurrent Mode 2.4GHz + 5GHz via internal antennas
- 2.4GHz: Compliant with IEEE 802.11 b/g/n/ax with 4x4 MIMO; Wi-Fi Power configurable up to +20dBm EIRP (ETSI) or up to +34dBm EIRP (FCC) (country regulation dependent)
- 5GHz: Compliant with IEEE 802.11 a/n/ac/ax and with 4x4 MIMO; Wi-Fi Power configurable up to +30dBm EIRP (ETSI) or up to +34dBm EIRP (FCC) (country regulation dependent)
- L2 + L3 Based service
- Multi-play support
- Embedded Voice, Wi-Fi, RF Overlay and USB interfacing
- Mass remote management through OMCI (G.988) and TR-069 standards, thus offering a full remote control without user intervention
- 245.8/9.7x44.8/1.8(80.6/3.2 including base) x210.0/8.3 (HxWxD mm/")
- <800g / 1.76 lb

GPON

Specifications

Model	Ports									
	FXS	Ethernet	RF	Wi-Fi 6 Dual Concurrent		USB	PON			
		1GE	Band: (47 ... 870MHz)	Antennas	Power* (dBm EIRP)	Type C	Type	Class	Bit rate (Gbps)	Wave-length (nm)
GR141DG	1x	4x	1x	2.4GHz: 4x4 Mimo 5GHz: 4x4 MIMO	2.4Ghz: up to +20 (ETSI) or up to +34 (FCC) 5GHz : up to +30 (ETSI) or up to +34 (FCC)	1x	GPON	B+, C+, D	DS: 2.488 US: 1.244	DS:1480-1500 US:1260-1360
GR140DG	1x	4x	-	2.4GHz: 4x4 Mimo 5GHz: 4x4 MIMO	2.4Ghz: up to +20 (ETSI) or up to +34 (FCC) 5GHz : up to +30 (ETSI) or up to +34 (FCC)	1x				

*Wi-Fi power upper limit value depends on the country

GPON

Download datasheet
Scan the QR code to view more information

Interfaces

PON	GPON Class B+,C+,D
Wi-Fi 2.4 GHz 802.11b/g/n/ax Wi-Fi 5 GHz 802.11a/n/ac/ax Wi-Fi 6 GHz 802.11ax	2.4 GHz @ 2x2 5 GHz @ 4x4 6 GHz @ 4x4 band-concurrent
USB Type A	1
FXS Ports	2
ETH Ports	4x2.5GE

Fiber Gateway Wi-Fi 6E

- Wi-Fi 6E: Concurrent Mode 2.4GHz + 5GHz + 6GHz via internal antennas
- 2.4GHz: Compliant with IEEE 802.11 b/g/n/ax with 3x3 MIMO; Wi-Fi Power configurable up to +20dBm EIRP (ETSI) or up to +34dBm EIRP (FCC) (country regulation dependent)
- 5GHz: Compliant with IEEE 802.11 a/n/ac/ax and with 4x4 MIMO; Wi-Fi Power configurable up to +30dBm EIRP (ETSI) or up to +34dBm EIRP (FCC) (country regulation dependent)
- 6GHz: Compliant with IEEE 802.11 ax and with 4x4 MIMO; Wi-Fi Power configurable
- L2 + L3 Based service
- Multi-play support
- Embedded Voice, Wi-Fi and USB interfacing
- Mass remote management through OMCI (G.988) and TR-069 standards, thus offering a full remote control without user intervention
- 244/9.61 x 35/1.38 x 202/7.95 (HxWxD mm/”)
- <800g / 1.76 lb

10 GPON

XSS0200I / XSS0200J

XSS0200I

XSS0200J

ONT-SFU

- L2 Based service
- Multi-play support
- ITU-T G.9807.1 (XGS-PON) and G.988 compliant
- Mass remote management through OMCI (G.988) and TR-069 standards, thus offering a full remote control without user intervention
- 40/1.6 x 210/8.3 x 210/8.3 (HxWxD mm/")
- 483 g / 1.06 lb

Download datasheet
Scan the QR code to view more information

Specifications

Product		LAN Ports		WAN Ports			
Model	Description	Ethernet		PON			
		2.5G BASE-T	GE/2.5GE/ 10GE	Type	Class	Bit rate (Gbps)	Wavelength (nm)
XSS0200I	SFU-XGS-2G5-10G-SFP	1x	1x SFP+port (10GBASE-X/-T)	XGS-PON	B+, C+, D	DS: 9.95328 US: 9.95328	DS: 1575-1580 US: 1260-1280
XSS0200J	SFU-XGS-2G5-10G	1x	1x RJ45 port (10GBASE -T)	XGS-PON	B+, C+, D	DS: 9.95328 US: 9.95328	DS: 1575-1580 US: 1260-1280

10 GPON

Download datasheet
Scan the QR code to view more information

Fiber Gateway Wi-Fi 6

- Wi-Fi 6: Concurrent Mode 2.4GHz + 5GHz via internal antennas
- 2.4GHz: Compliant with IEEE 802.11 a/b/g/n/ax with 4x4 MIMO; Wi-Fi Power configurable up to +20dBm EIRP (ETSI) or up to +34dBm EIRP (FCC) (country regulation dependent)
- 5GHz: Compliant with IEEE 802.11 a/n/ac/ax and with 4x4 MIMO; Wi-Fi Power configurable up to +30dBm EIRP (ETSI) or up to +34dBm EIRP (FCC) (country regulation dependent)
- L2 + L3 Based service
- Multi-play support
- ITU-T G.9807.1 (XGS-PON) and G.988 compliant
- Embedded Voice, Wi-Fi and USB interfacing
- Mass remote management through OMCI (G.988) and TR-069 standards, thus offering a full remote control without user intervention
- 245.8/9.7x44.8/1.8(80.6/3.2 including base) x210.0/8.3 (HxWxD mm/")
- <800g / 1.76 lb

10 GPON

Specifications

Interfaces			Models	
			XSR150DX	XSR151DK
PON	Type		XGS-PON	
	Class		N1,N2,E1,DD20	
	Tx/Rx Type		Fixed	
	Wavelength (nm)	DS	1575 - 1580	
		UP	1260 - 1280	
	Bitrate (Gbps)	DS	9.95328	
		UP	9.95328	
FXS Ports			1x	
LAN Ports	10/100/1000 BASE-T		4x	
	1 / 2.5 / 5 / 10G	BASE-X (SFP/SFP+)	1x	-
		BASE-T (RJ45)	-	1x
RF Overlay (CATV)	47MHz - 870MHz	F Connector; 75 Ω (nominal)	-	1x
Wi-Fi 6	2.4GHz 802.11 b/g/n/ax	MIMO 4x4	√	
		Power* (EiRP)	up to +20dBm (ETSI) or up to +34dBm (FCC)	
	5GHz 802.11 a/n/ac/ax	MIMO 4x4	√	
		Power* (EiRP)	up to +30dBm (ETSI) or up to +34dBm (FCC)	
USB			1x	

*Wi-Fi power upper limit value depends on the country

10 GPON

Download datasheet
Scan the QR code to view more information

Interfaces

PON	XGS-GPON Class B+,C+,D
Wi-Fi 2.4 GHz 802.11b/g/n/ax Wi-Fi 5 GHz 802.11a/n/ac/ax Wi-Fi 6 GHz 802.11ax	2.4 GHz @ 3x3 5 GHz @ 4x4 6 GHz @ 4x4 band-concurrent
USB Type A	1
FXS Ports	2
ETH Ports	4x1GE + 1x1/ 2.5/5/10GE

Fiber Gateway Wi-Fi 6E

- Wi-Fi 6E: Concurrent Mode 2.4GHz + 5GHz + 6GHz via internal antennas
- 2.4GHz: Compliant with IEEE 802.11 b/g/n/ax with 3x3 MIMO; Wi-Fi Power configurable up to +20dBm EIRP (ETSI) (country regulation dependent)
- 5GHz: Compliant with IEEE 802.11 a/n/ac/ax with 4x4 MIMO; Wi-Fi Power configurable up to +33dBm EIRP (ETSI) (country regulation dependent)
- 6GHz: Compliant with IEEE 802.11 ax with 4x4 MIMO; Wi-Fi Power up +23dBm EIRP (ETSI) (antenna gain included) or up to +27dBm EIRP (FCC) (antenna gain included)
- L2 + L3 Based service
- Multi-play support
- ITU-T G.9807.1 (XGS-PON) and G.988 compliant
- Embedded Voice, Wi-Fi and USB interfacing
- Mass remote management through OMCI (G.988) and TR-069 standards, thus offering a full remote control without user intervention
- 244/9.61 x 35/1.38 x 202/7.95 (HxWxD mm/”)
- <800g / 1.76 lb

10 GPON

Download datasheet
Scan the QR code to view more information

ONT-MBH

- 9” Rack Mounting Business ONT-SFU MBH GPON/XGS-PON (GPON/XGS-PON compliant)
- L2 Based service
- GPON/XGS-PON Enabled: ITU-T G.984.x (GPON);ITU-T G.987.x (XG-PON); ITU-T G.9807.1 (XGS-PON); ITU-T G.988
- 45/1.8 x 315/12.4 x 205/8.1(HxWxD mm/”)
- 0.994 g / 2.19 lb

10 GPON

Specifications

<table>
<tr><th colspan="2">Product</th><th colspan="2">LAN Ports</th><th colspan="2">WAN Ports</th></tr>
<tr><th rowspan="2">Model</th><th rowspan="2">Description</th><th colspan="2">Ethernet</th><th colspan="2">PON</th></tr>
<tr><th>2.5G BASE-T</th><th>1/10GBASE-X SFP/ SFP+</th><th>Type</th><th>Class</th></tr>
<tr><td rowspan="6">XSS0200X</td><td rowspan="6">SFU-MBH-SFP</td><td>1x</td><td>1x</td><td>SFP+ cage: GPON/XGS-PON</td><td>B+, C+, D</td></tr>
<tr><td colspan="4">WAN Ports</td><td rowspan="3">Synchronization</td></tr>
<tr><td colspan="4">PON</td></tr>
<tr><td colspan="2">Bit rate (Gbps)</td><td colspan="2">Wavelength (nm)</td></tr>
<tr><td>GPON</td><td>DS: 2.488
US: 1.244</td><td>GPON</td><td>DS:1480-1500
US:1260-1360</td><td rowspan="2">SyncE
PTP/IEEE 1588v2</td></tr>
<tr><td>XGS-PON</td><td>DS: 9.95328
US: 9.95328</td><td>XGS-PON</td><td>DS: 1575-1580
US: 1260-1280</td></tr>
</table>

Smart Mesh Wi-Fi

Wi-Fi 5 Extender

- Wi-Fi 5: Wi-Fi 802.11 b/g/n @2.4GHz (2x2 20dBm EIRP) + 802.11 n/a/ac @5GHz (4x4 30dBm EIRP)
- Wi-Fi Alliance® Multi-AP Specification Embedded
- 2GE
- Access Point + Station Features
- Beamforming, 802.11r Fast Roaming, 802.11e Wi-Fi Multimedia (WMM), 802.11v, 802.11k
- Wi-Fi 802.11 b/g/n @2.4GHz (2x2 20dBm EIRP) + 802.11 n/a/ac @5GHz (4x4 30dBm EIRP)
- 113/4.45 x 86/3.39 x 40/1.57 (HxWxD mm/")
- <200g / 0.44 lb

Download datasheet
Scan the QR code to view more information

Smart Mesh Wi-Fi

Wi-Fi 6 Extender

- Wi-Fi 6 : Wi-Fi 802.11 b/g/n/ax @2.4GHz (2x2 20dBm EIRP) + 802.11 n/a/ac/ax @5GHz (4x4 30dBm EIRP)
- Wi-Fi Alliance® Multi-AP Specification Embedded
- Access Point + Station Features
- Beamforming, 802.11r Fast Roaming, 802.11e Wi-Fi Multimedia (WMM), 802.11v, 802.11k
- 2GE
- Wi-Fi 802.11 b/g/n/ax @2.4GHz (2x2 20dBm EIRP) + 802.11 n/a/ac/ax @5GHz (4x4 30dBm EIRP)
- 113/4.45 x 86/3.39 x 40/1.57 (HxWxD mm/")
- <200g / 0.44 lb

Download datasheet
Scan the QR code to view more information

Smart Mesh Wi-Fi

Download datasheet
Scan the QR code to view more information

Wi-Fi 6E Extender

- 2x2 MIMO (2.4GHz) + 2x2 MIMO (5GHz) + 4x4 MIMO (6GHz)
- Max EIRP 2,4 GHz up to +20dBm; Max EIRP 5GHz up to +30dBm; Max EIRP 6GHz up to +27dBm (FCC) (antenna gain included)
- 802.11b/g/n/ax @ 2.4GHz + 802.11a/n/ac/ax @ 5GHz + 802.11ax @ 6GHz
- IEEE802.11 a/b/g/n/ax; 802.11r Fast Roaming, 802.11e (WMM), 802.11v, 802.11k
- WPA, WPA2, WPA3, WPS
- EasyMeshTM, Wi-Fi Alliance® multiple AP specification

NETWORK MANAGEMENT SYSTEM

Network Manager and Controller

AGORA is the Altice Labs SDN Network Management & Control Solution that manages Altice Labs product lines for access, aggregation and transport state-of-the-art technologies, such as xPON, minimizing capital investments at the Network Operational Centers (NOC).

Offering a suite of web-based applications supported by current industry standard technologies, AGORA aims to provide a set of key features for all network management operations like network provisioning, maintenance, and monitoring, providing all Fault, Configuration, Administration, Performance and Security (FCAPS) functionalities for legacy, SDN native or third-party devices. A fully featured standardized set of Northbound Interfaces (NBI) is a key enabler for network programmability and automation as well as easy integration with third-party systems.

AGORA applications and services can be deployed either in bare metal, Virtual Machine (VM), or cloud-based environments. Given the diversity of markets and businesses, AGORA may be customized to meet each client specific needs via a modular and scalable package delivery system.

Scalable

Adjustable as the network grows

Programmable

Easy automation and integration with third-party systems

Modular

Customized to each client needs

Simple

Abstraction of the underlying complexity

Future proof

Supported on the main Open Source Projects and Standards

High availability

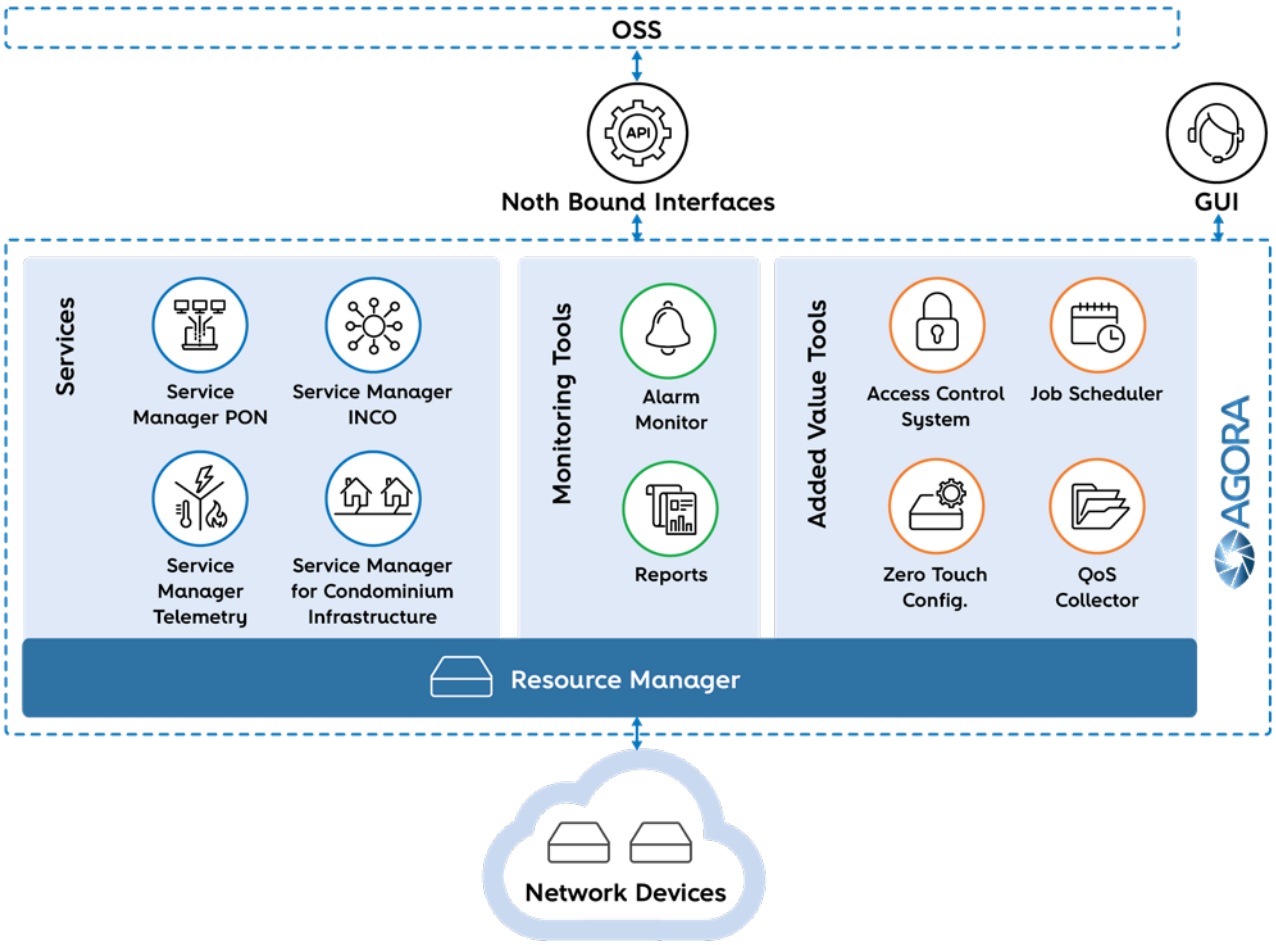
Ensure continuous operation

Automation

Built in massive configuration and automatic provision

AGORA user-centric approach provides a simplification and abstraction of the network elements, offering several services and a complete set of tools, which can be exposed to external applications (OSS, automation scripts as others) through a full featured REST API.

A user-friendly web-based GUI is also available allowing direct access to all supported features.



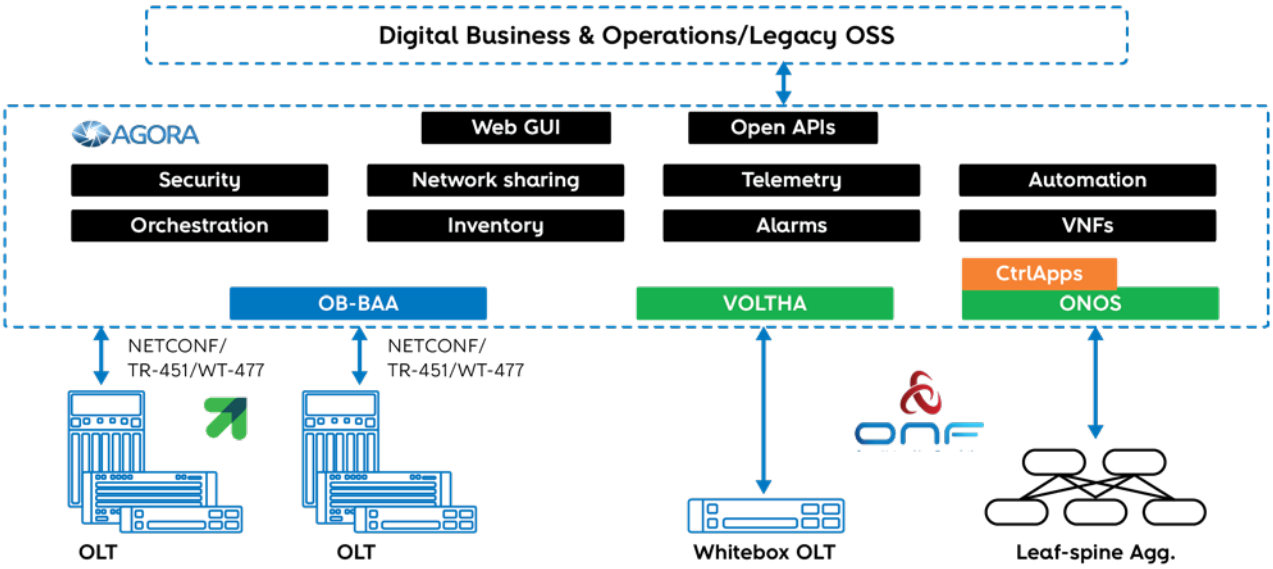
General Architecture

Software Defined Networking

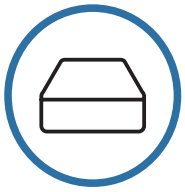
Altice Labs has always been committed to follow up and incorporate the most relevant standards in its products and platforms. Altice Labs owns today a complete and well-established portfolio of FTTx products and services and is supports the evolution of networks to fully virtualized environments. It is one of Altice Labs major statements to achieve a seamless co-existence and evolution, rather than a disruption, between the past, present and future xPON field deployments, in total alignment with major relevant technical forums such as the Broadband Forum (BBF) and the Open Networking Foundation (ONF).

To be able to explore new business opportunities, today's Central Office (CO) requires a major transformation towards increased flexibility, agility, and performance. To address such transformation, network functions are gradually emerging as disaggregated software components running on top of IT infrastructure rather than being boxed into dedicated hardware network elements.

Having multiple ISPs sharing and accessing the same network infrastructure at the same time, also pushes for new flexibility requirements at the access and aggregation domains. Softwarization and scalability become an evident need for the future access networks.



Product components



Resource Manager

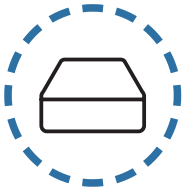
Configures and monitors all resources

- Network discovery
- Hierarchical organization and topology
- Resources configuration, state and performance management
- Firmware management
- High availability
- Network device abstraction

Service manager PON

xPON technology support and abstraction

- Point-to-Multipoint xPON technologies
- Point-to-Point active Ethernet technology
- Simplified network provisioning



Software defined networks

- BBF cloudCO compatible architecture
- ONF VOLTHA support
- Network function virtualization/disaggregation support and management
- Network Sharing for Virtual Network Operators support

Alarm monitor

Network alarms monitoring

- Alarm pre-processing with configurable filtering, actions and rules
- Real-time pending alarms with severity and acting urgency information
- Advanced filters and search capabilities
- User action on alarms (acknowledge, unacknowledge, close, comment)
- Configurable and flexible alarm forwarding

Reports

Exploring all stored information

- Inventory, alarms, performance and auditing reports
- User-defined basic and advanced search queries
- Inline functions support (count, average, maximum, having, etc)
- Export result data as file

Zero touch provisioning (ZTP)

Automated OLT/ONU commissioning

- Automatic OLT/ONU discovery and insertion
- Automatic firmware upgrade
- Customizable template-based scripts for automatic configuration

Service manager telemetry

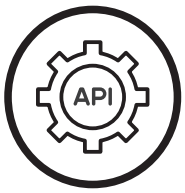
Environment Monitor and Control System

- Telemetry technology support and abstraction
- Location management
- Multiple sensor types support
- High level integrated dashboard

Service manager INCO

Intelligent condominium

- High technology abstraction
- Infrastructure management
- Services management (service providers and residential services)



Northbound interfaces

Enabling easy integration and automation

- Full featured management CRUD oriented API
- REST based with JSON objects

GUI

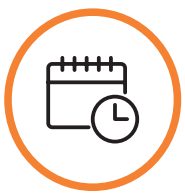
A user-centered interface

- Adjustable, user-friendly and cross-browser web interface
- Simple, intuitive and coherent for an easy and fast learning curve
- Inline validations and helpful hints
- Customizable user dashboards

Access control system

User management service

- Authentication, authorization and accounting (AAA)
- Single sign-on
- High granularity authorization control
- User preferences persistence



Job scheduler

Offline operations scheduler

- Periodic tasks execution management
- User defined system scripts
- Cron trigger based

OPERATIONS SUPPORT SYSTEM

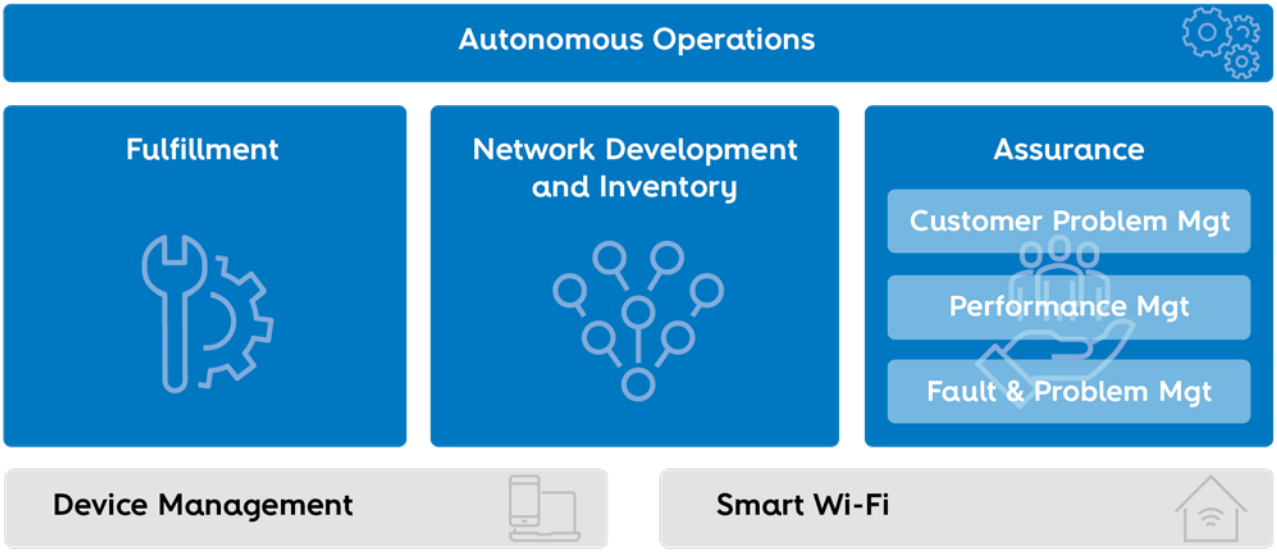
NOSSIS One

Overview

NOSSIS One is a new generation of Altice Labs OSSs that focuses in Agility, Operations Efficiency and Customer Experience in order to help the operator to achieve the digital transformation.

Supported in a centralized and open technical catalog, NOSSIS One provides a dynamic Inventory that supports network project & development activities, including intelligent project execution activities with manual development tasks when needed, with a more lighter, agile and automatic business logic validation and as-build activities. The Fulfillment component is responsible for the Technical Provisioning of Services, in an integrated and automatic way (providing a near-zero-touch provision approach), exposing standard APIs for a rapid end-to-end integration. Completing the Operational cycle is the Assurance solution supporting a wide set of Monitoring and Repair activities in several areas like Fault and Problem management, Customer Problem management and Performance management.

NOSSIS portfolio includes also specific solutions to address scenarios for Device Management of the new home networks and CPEs (including TR069 and other dedicated protocols), as well as new emerging technologies like Smart Mesh Wi-Fi with a Smart Wi-Fi Management solution.



NOSSIS One architecture

With the new architecture and paradigms NOSSIS One is ready for the challenges that the Management of the new Ultra-Fast Broadband technologies and services will request. The main benefits that a more evolved OSS solution provides (enabling autonomous and intelligent operations) are the following:

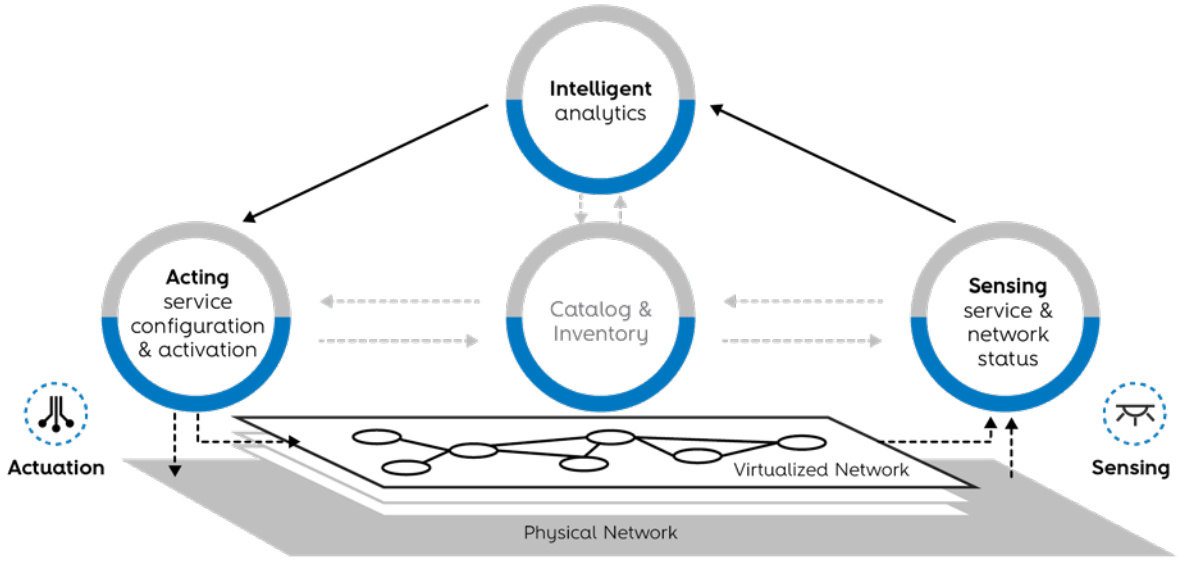
- **High flexibility** and **cost effective** solutions built in a cloud-native platform
- Complete OSS functional areas enabling **Closed Loop** operations
- **Time-to-market** delivery speed supporting new services and technologies
- **Operational automation** enabled by Intelligence
- **Dynamic Catalog** brings flexibility to the **onboard** of new **services**
- Ready for **5G** and **virtualization**
- **OOTB Technology Packs**
- **Standard APIs** for fast integration
- Prepared for the **Physical and Virtualized domains**

The Autonomous Operations concept

The main target of all operations is to increase its efficiency and at the same time be able to evolve to a more demanding ecosystem that arises with the introduction of the new digital era, 5G, and Ultra-Fast Broadband Technologies. With a huge increase of managed devices (like in IoT for instance) and the increase of related management information, operations must at the same time be able to act in real-time and take management decisions, in order to, at least, maintain the level of expected customer experience.

For every operation it is important to identify the most relevant scenarios where, in current operations, human intervention has an important role and where the use of massive collection and processing of information enables real-time complex decisions, critical for the operation of the business. These scenarios might come from different domains like problem detection and handling, predictive analyses, diagnose, corrective activities, etc, and are the real candidates where new solutions based on Big Data and Artificial Intelligence technologies can be adopted with high value for the CSP.

These are the main drivers for introducing an "Autonomous Operations" concept into the OSSs in place, gaining more efficiency, agility and autonomy compared with the more traditional human based interventions. The figure bellow represents this operation's add-on that integrates with the Assurance Solutions (for collecting relevant data) and Fulfillment Solutions (for acting) to provide scenarios that will "close the loop".

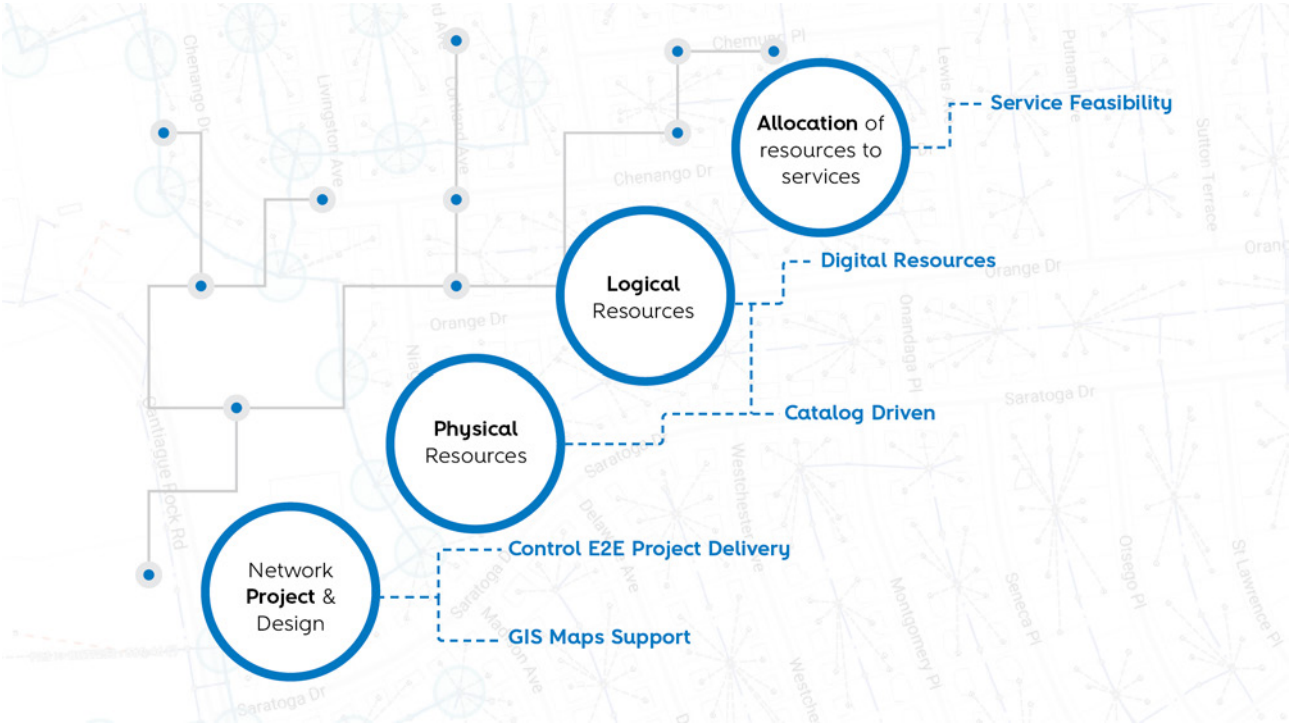


"Autonomous Operations" concept

Network Development & Inventory

With a centralized and unified Catalogue to support all Services and Resources (from "traditional" CSPs and Digital Services) enables agile on-board of new service offers for the new Ultra-fast BB.

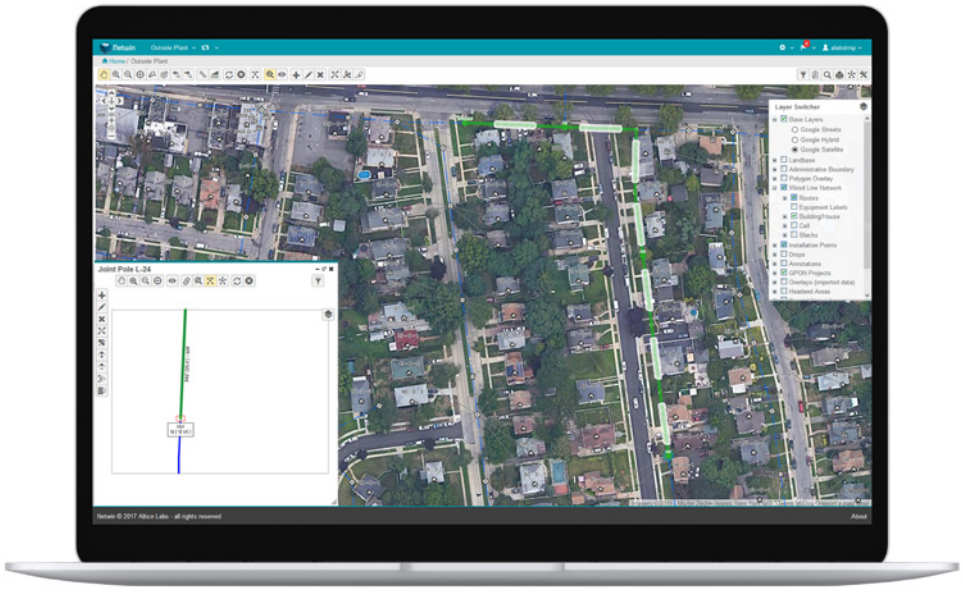
Using an Intelligent Network Development support tool, whenever new (physical) infrastructures are needed, will increase Operational Efficiency.



Based on a Dynamic Inventory with on-time up-to-date information, supports new virtualized networks and provides real-time data, exposing APIs to be used by all operational activities and automated processes.

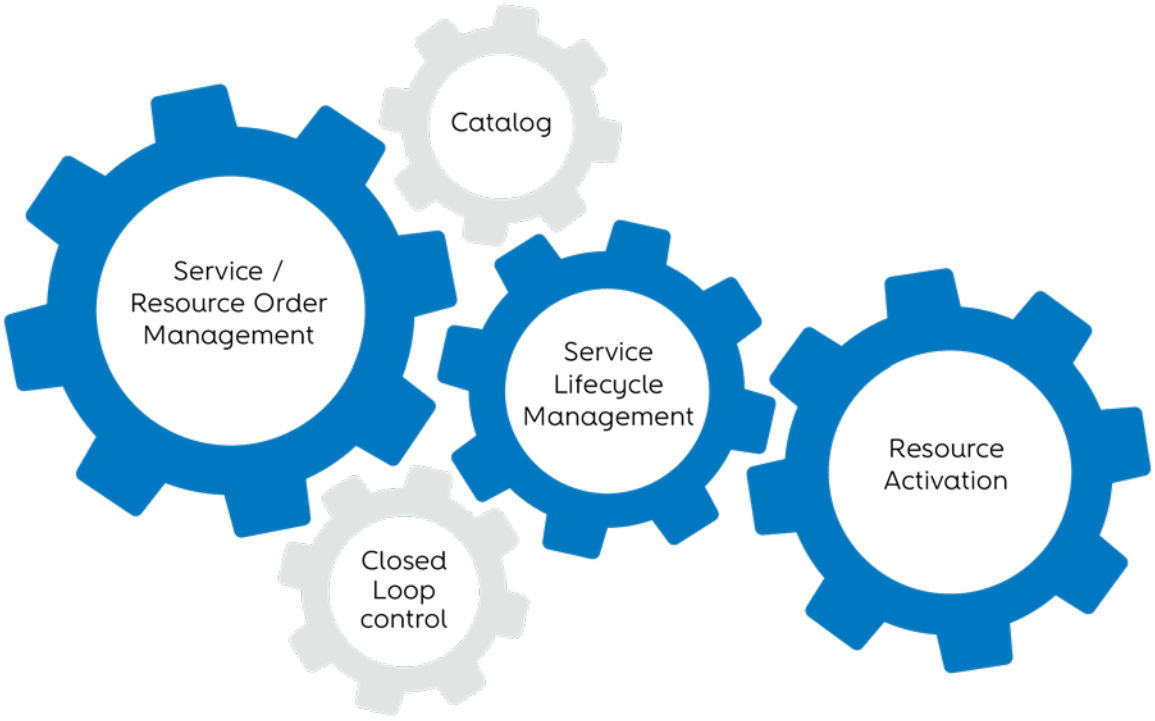
Main Features for UltraFast BB

- Service & Resource Catalogs
- Intelligent network planning & designing tools
- Multilayer inventory from physical to logical resources
- Multi-technology for both physical & virtualized networks
- Feasibility and Resource Allocation
- Exposed APIs for Resource/Service Inventory



Service Fulfillment

Designed to cover end-to-end activities starting from a Customer Order (coming from customer requests via self-provisioning portals or other customer channels), covering automatic and manual activities (when needed) up to the correct delivery of a service or group of services (bundle), including the new Digital Services, it is a full stack prepared for the new Ultra-Fast BB Provision needs.

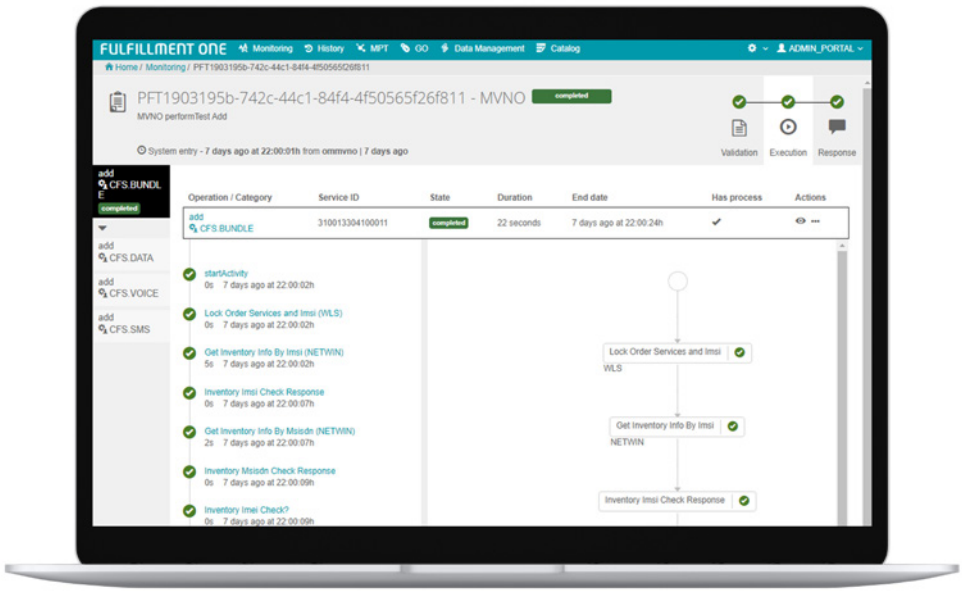


With a Future proof client provisioning cycle, complemented with lighter Fulfillment cycles for automated closed loop operations, when agility is needed (including self-use cases), supports also the new virtualized networks.

Relies on a modular architecture enabling fast on-board for new services, using exposed APIs enabling OOTB integrations.

Main Features for UltraFast BB

- Multi domain Service/Resource Order Orchestration
- End to end service lifecycle management
- Service Catalog Driven
- Workflows Definition and Management
- Manual Tasks and manual error handling support
- Closed loop control, auto-repair and self-healing
- Multi protocol service activation plug-ins
- Open NBI APIs enabling easily integration

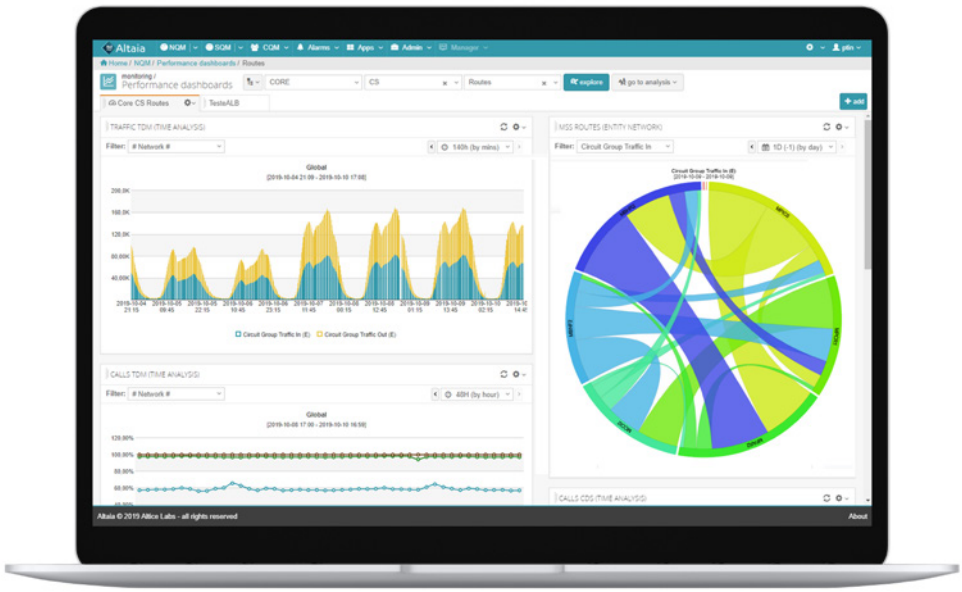


Service Assurance

Covering all processes and activities for problem management (promoting self-care customer interactions for agility) and quality of service areas (including real-time monitoring and analysis), the architecture is ready for the new Digital Services.

Assurance cycles, with increasing near-real-time monitoring (supporting the new virtualized networks) and intelligence analytics for automated closed loop decisions (including self-use cases), enhances Customer Experience and Operational Efficiency.

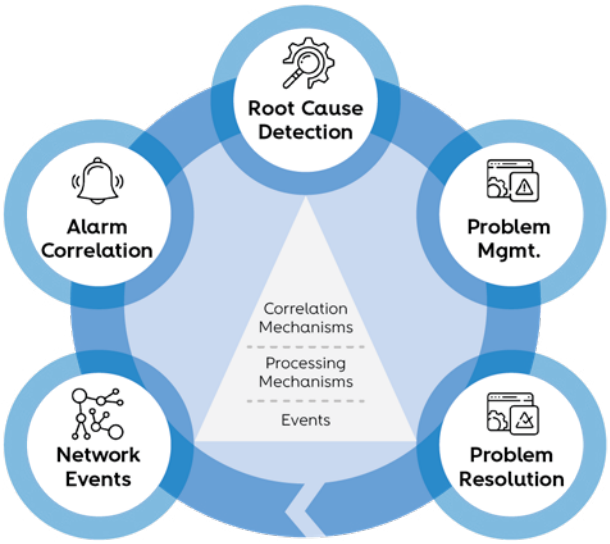
Using Big-Data architecture enables efficient, scalable and on-time decision making and actions.



Main Features for UltraFast BB

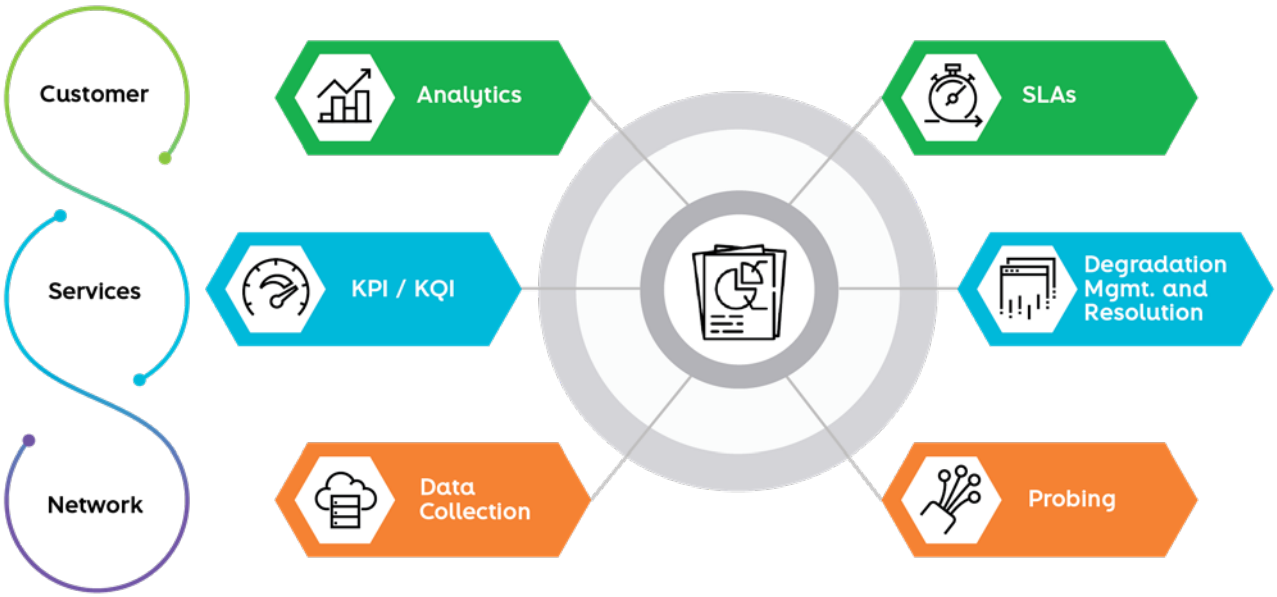
Fault and Problem Management

- Heterogeneous events acquisition
- Centralized collection and filtering
- Alarm processing with flapping detection
- Alarm correlation for root-cause detection
- Enabling Prediction scenarios with intelligence
- Toolkits for Self-customization of new data sources and correlation rules
- TTK creation and integration
- Management of all operational tickets
- Highly configurable & strongly auditable
- User customized reporting and SLAs



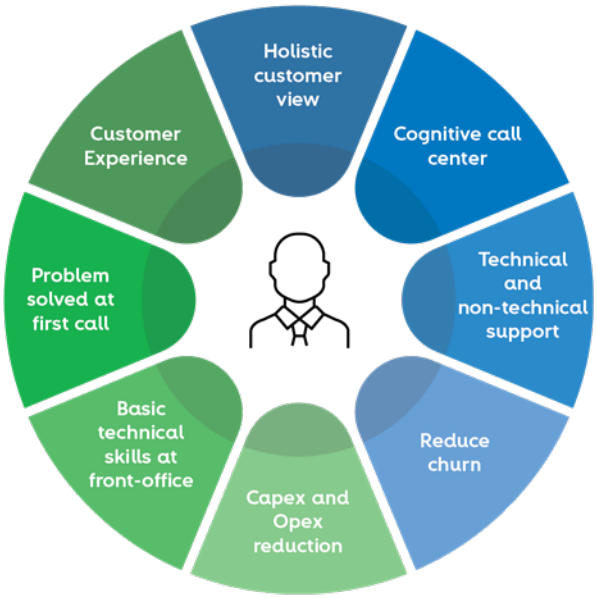
Performance, QoS

- Intelligent E2E monitoring & performance management
- Powerful analytics through KPIs/KQIs
- Off-the-shelf Performance Packs
- SLAs Monitoring and Violation detection
- Proactive supervision
- Toolkit for Data Collection (Network Telemetry)



Test & Diagnostic

- Automated E2E Diagnostic
- Tests & Diagnostics in real time
- Specialized frontends for FO, BO and Field Force
- Guiding scripts for Problem Solving
- Suggestions for automated repair actions
- Off-the-shelf BOTs, IVR and Self Care Integrations




5G SOLUTIONS

A novel approach to boost 5G deployments

The next decade is expected to be profoundly impacted by 5G, thus, the evolution towards 5G represents a landmark in terms of convergence of infrastructures, networks, services and applications.

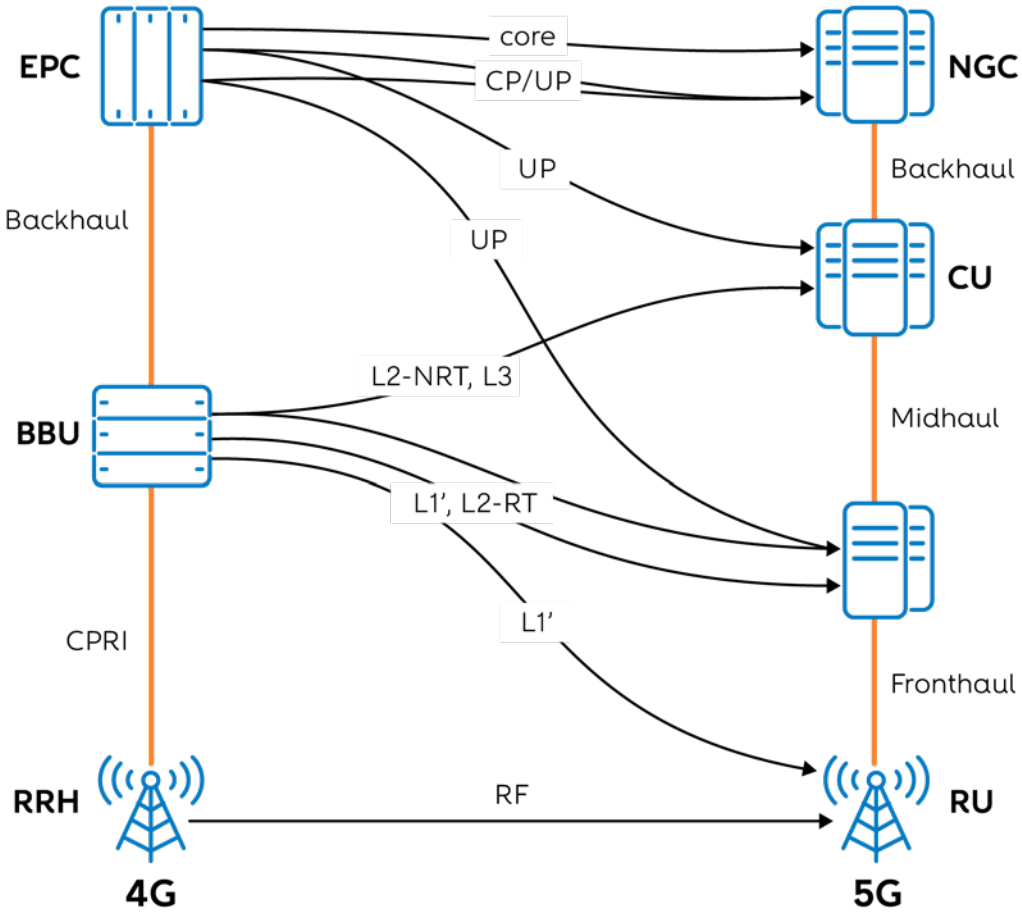
Enabling the entire 5G environment present challenges on network topologies and supporting technologies as both Fixed and Mobile Networks and infrastructures need to evolve to accommodate the upcoming needs.

In order to guarantee the desired Quality of Service (QoS), mainly in terms of throughput, latency and capacity demands, it has become clear that 5G technology deployment must make use a combination of low and high-frequency spectrum, requiring a much higher degree of cell densification – smaller cell size and, consequently, a higher number of cell sites required to provide coverage for the same geographical area. Promoting an easy and cost efficient 5G network densification becomes a key enabler for the (mass) deployment of small cells and micro coverage scenarios foreseen as part of 5G and Beyond 5G (B5G) fast rollout.

Furthermore, the flexibility in 5G Radio Access Network (RAN) architecture and virtualization will put additional pressure on the landline infrastructure in terms of capillarity and capacity – converged transport architectures (xHaul) and, in particular, fiber structures and technologies naturally become the strongest ally of 5G and B5G technologies in order to cope with these demands.

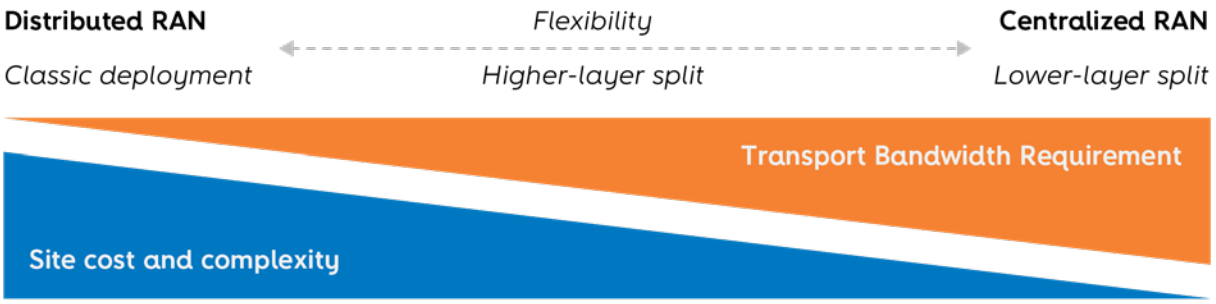
Evolving from 4G to a 5G architecture

The mobile network evolution from the 4G eNB architecture will promote a disaggregation of the 5G gNB into Central Unit (CU), Distributed Unit (DU) and Radio Unit (RU) network components. This new architecture facilitates Radio Access Network (RAN) virtualization, flexibilizes the assignment of computing resources across network entities and, also, allows for increased flexibility in the fronthaul/midhaul line rates requirements and in the solution complexity, while meeting latency and capacity demands. This new architecture also builds upon the deployment of the RAN using open interfaces (Open Radio Access Network) to promote interoperability between the several RAN components.



Evolution from 4G eNB to 5G gNB based on ITU-SG15 Q2

The optimal location of each RAN network component is basically a trade-off between coordination gain from functional centralization and latency and bandwidth requirements in transport network, as shown in figure below. Centralizing RAN functions requires high transport capabilities (both high bandwidth and low latency), allowing centralization of all high layer processing functions and coordination gain. On the opposite side, a distributed RAN architecture makes the transport requirements soft, but implies higher site cost and complexity and limited coordination between cells.



Complexity/Cost vs. Transport Bandwidth requirements trade-off based on the functional splitting point

	Fronthaul Split 7.2	Fronthaul Split 6	Midhaul	Backhaul
Medium	eCPRI	eCPRI	Ethernet	IP
Protocol	Open Fronthaul interface 7.2x	nFAPI	F1 Interface	NG/S1 Interface
Range	Up to 20 kms	Up to 80 km	Up to 80 km	Up to 200 kms
Latency	< 250µs	< 250µs	< 1ms	< 40ms
Bandwidth	Up to 86 Gbps	Up to 4 Gbps	Up to 4 Gbps	Mostly, user data traffic

5G main architecture options to be considered

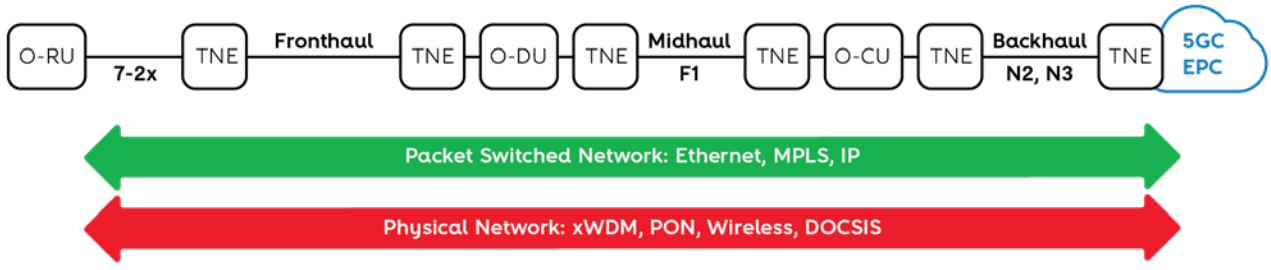
5G networks will enable a new set of services that can be categorized in three different classes: enhanced Mobile Broadband (eMBB); Ultra Reliable Low Latency Communications (URLLC); and massive Machine Type Communications (mMTC). This diversity of new services and its different (and, oftentimes, antagonist) requirements will drive the need for new or enhanced incarnations of RAN and transport networks.

These requirements will have significant impacts on the underlying network. In order to achieve the foreseen massive 5G deployment of the number of cell sites necessary to meet the demand of new eMBB services, the MNOs need to rely, as much as possible on the expansion and capillarity of the transport network. To host new uRLLC and mMTC applications efficiently the MNOs will face additional challenges in terms of latency and reliability demand while managing very large numbers of connected devices - it will need to be able to integrate regional data centers and distributed compute seamlessly - closer to the endpoints in the network.

The consensus on the most flexible and efficient transport architecture to meet these requirements relies on a converged transport network architecture, comprising the fronthaul, midhaul and backhaul – the xHaul.

Transport Slice	Description	Transport Flows	Bandwidth Requirement	Timing Sensitivity Requirement	Reliability Requirement
TS-1	Fronthaul	7.2x CUS-plane, RoE	High	High	High
TS-2_1	Data plane for Backhaul of URLLC service of Operator A	F1-U, S1-U, N3, X2/Xn-U	Medium	High	High
TS-2_2	Data plane for Midhaul, Backhaul of Operator A	F1-U, S1-U, N3, X2/Xn-U	Medium	Medium	High
TS-3	Control plane for Midhaul, Backhaul, Management plane	7.2x M-Plane, F1-C, S1-C, N2, X2/Xn-C, Management	Low	Low	Low

There are different ways the transport network could be deployed to support an Xhaul architecture, either solely using packet switched solutions (deployed from cell site to core network, e.g., MPLS, Ethernet or IP based) or mixing it with other technologies (e.g., xWDM, PON, DOCSIS or Microwave radio links in the access to devise the end-to-end network).

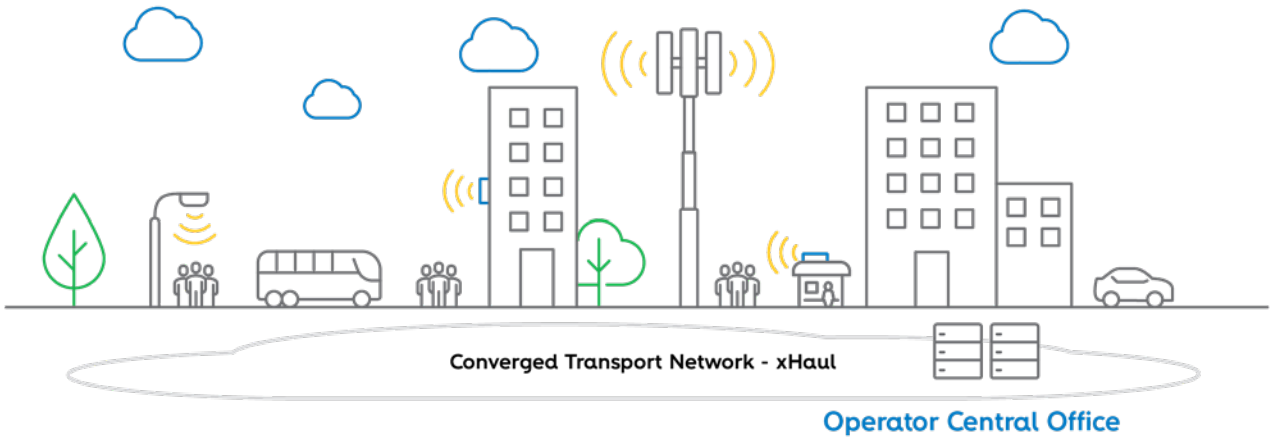


5G small cells deployment scenarios

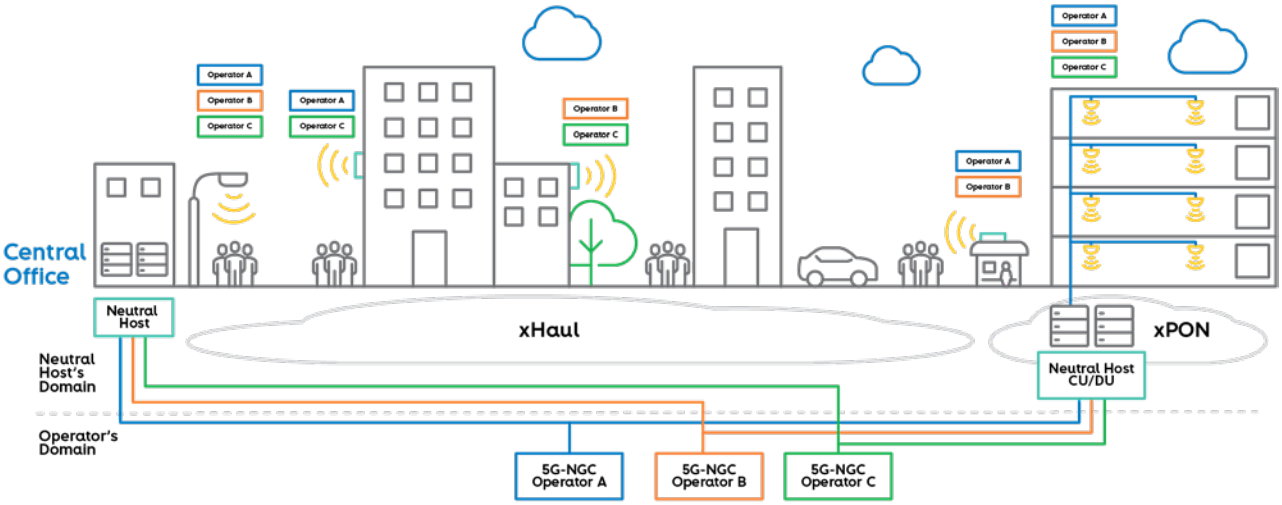
There are many relevant practical use cases where the aforementioned 5G deployment approach can play a relevant role. Besides network operators aiming to promote 5G cell densification and extend the coverage of their current mobile networks, Neutral Host Providers (NHP) and private networks owners are two additional interested parties.

Network operators will rely on small cell deployment in order to capitalize on:

- the possibility for an easier and less costly 5G network densification through the deployment of outdoor 5G small cells;
- the increased network flexibility (capacity/coverage enhancement and interoperation with installed technologies) and reduced network expansion complexity (easier to deploy and adaptable to aesthetically sensible areas – concealable solution).

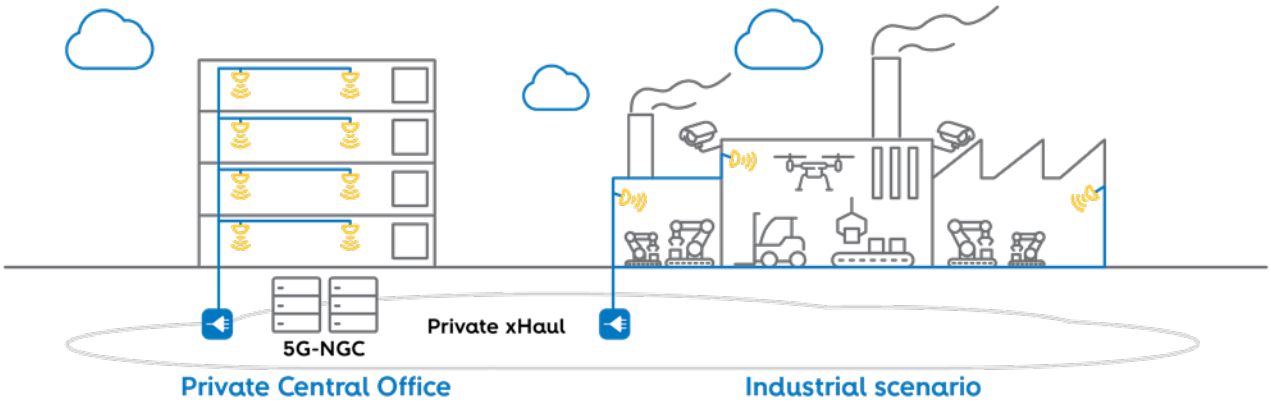


NHP, a third-party non-operator entity, will arise specially to deploy 5G small cells in urban centers, historical downtowns or public buildings. In many of these cases there is no business case for large MNOs to invest in their own network densification or, there are local entities or regulation constrains. This is an opportunity for NHP to deploy a network to be rented to the different MNOs and can also potentially reduce operators' OPEX and CAPEX.



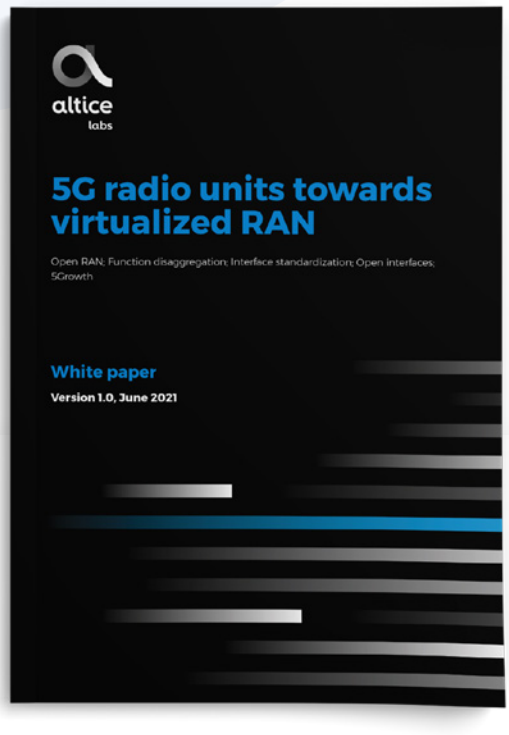
Additionally, many large enterprises, businesses and public entities who want to take control over security or to guarantee QoS are exploring private 5G networks, independent E2E small/medium-sized 5G networks, recurring to the 5G small cells. This may be of interest particularly in following context:

- Industrial centers that require critical communications - availability, reliability, QoS and security;
- Large companies and facility owners that requires secure networks, high throughput and QoS;
- Municipalities aiming to deploy smart cities solutions.



Altice Labs is positioned to deliver an efficient, scalable and integrated xHaul architecture, agnostic to the adopted transport technology, providing a complete end-to-end 5G small cell solution and leveraging in-house developed 5G Radio Units to cope with fully flavored 5G and Beyond 5G (B5G) mobile networks.

White Paper
"5G radio units towards virtualized RAN"



The arrival of the 5G is being regarded as the engine to enable Communication Service Providers (CSPs) to reconsider the traditional models. CSPs are exploring innovations and new operating models to drive fundamental changes in the way new networks are built.

In this context, virtualization of radio access network (RAN) and the adoption of open interfaces are hot topics where we see growing market interest.

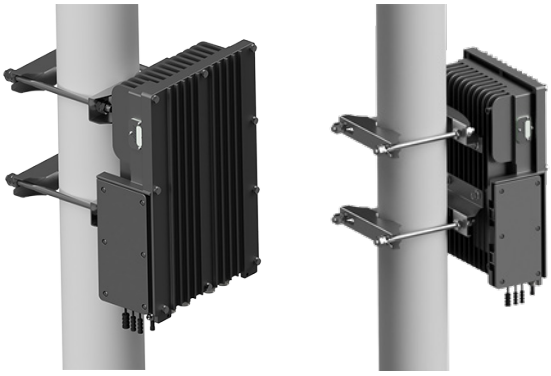
Download whitepaper
Scan the QR code to read this whitepaper

5G Small Cells

Download datasheet
Scan the QR code to view more information

5G-A700A2/5G-A700B2/5G-A700C2

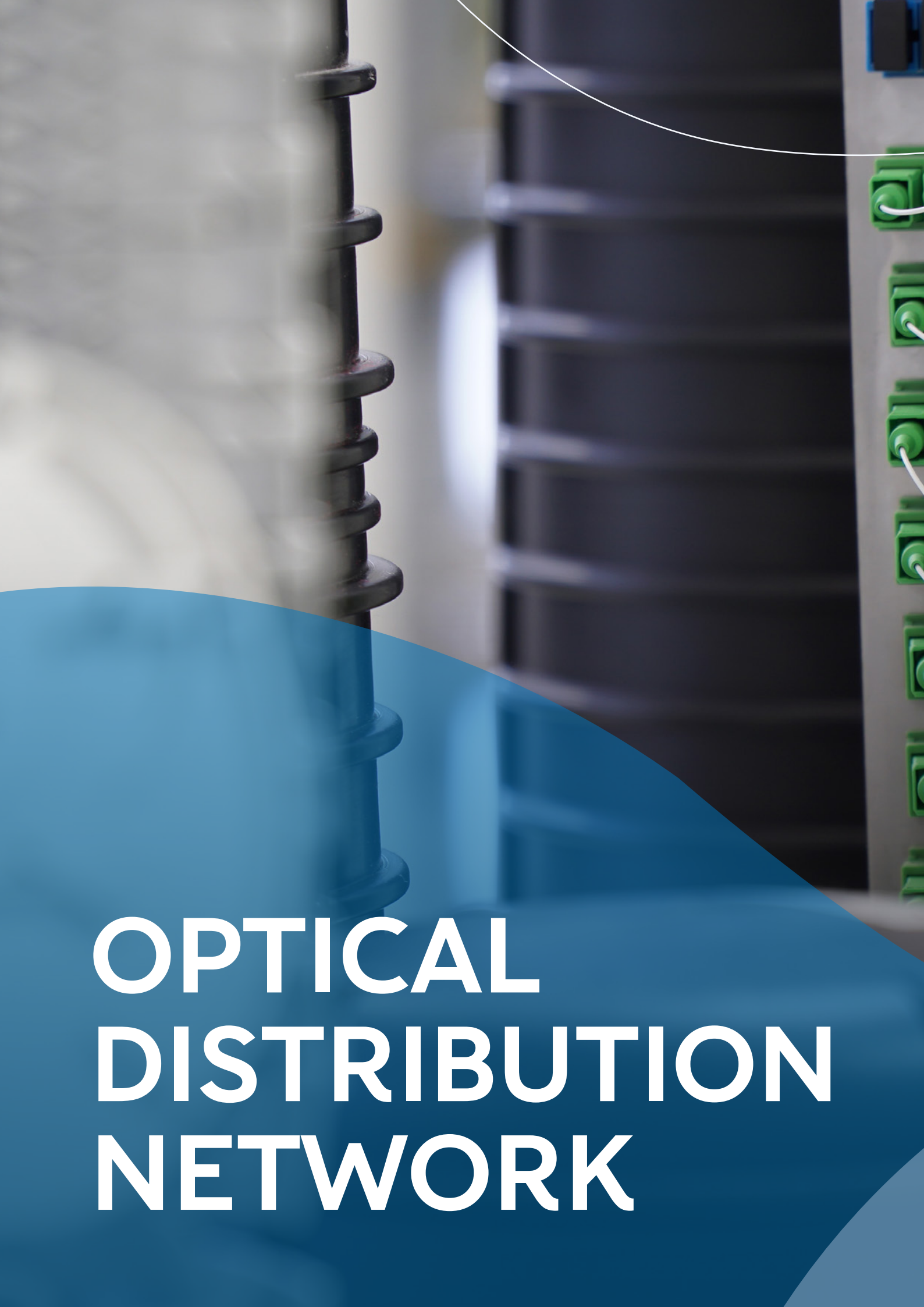
- Indoor 5G small cells for n78 band
- MIMO 4x4 (BW up to 100MHz)
- 256QAM / 64QAM (DL/UL)
- Electrical (RJ45) and optical (SFP+) interface for fronthaul (split7.2@O-RAN)
- Sync: LLS-C3 (PTP)
- Integrated antennas
- 235/9.25 x 235/9.25 x 69/2.72 (HxWxD mm/")
- <2.15Kg / 4.74lb



Download datasheet
Scan the QR code to view more information

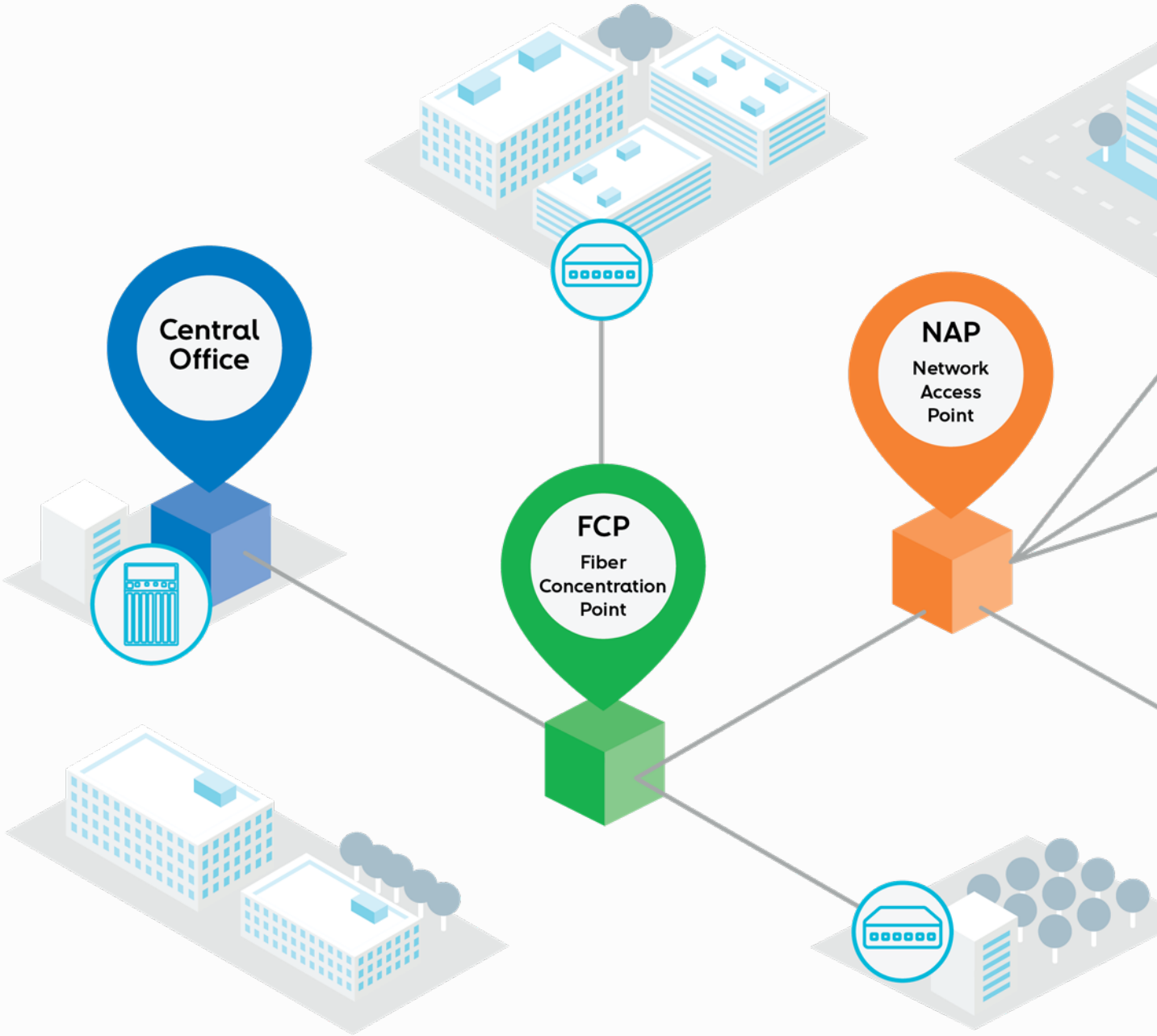
5G-Y720A3/5G-Y720B3/5G-Y720C3

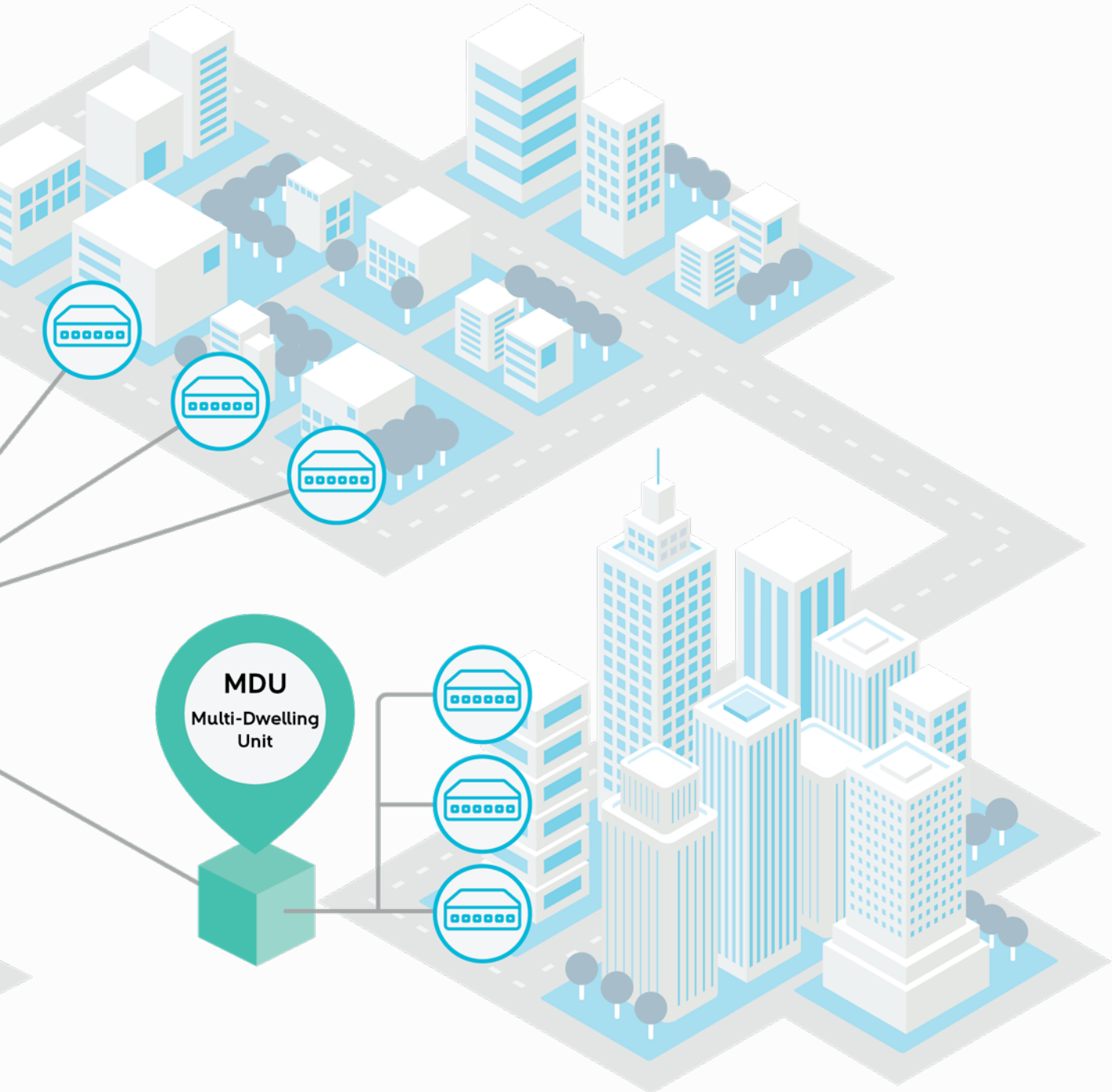
- Outdoor 5G small cells for n78 band
- MIMO 4x4 (BW up to 100MHz)
- 256QAM / 64QAM (DL/UL)
- 2x SFP+ (10Gbps interface)
- Sync:LLS-C3 (PTP)
- 385x250x120 mm
- 8/17.6 (9/19.8 with mounting kit)



OPTICAL DISTRIBUTION NETWORK

Optical Distribution Network (ODN) Products



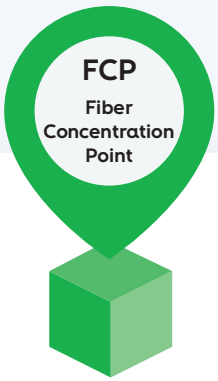

MDU
Multi-Dwelling
Unit

ODN Products

Optical Distribution Network (ODN) is a base of communication path that's affects the performance, reliability and scalability. Altice Labs provides a comprehensive range of products with high customization service capability.

Central Office

- Racks, Sub-Racks;
- Splitters;
- Optical Distribution Frames (ODF);
- Outside Cabinets for Distributed Central Office.



Fiber Concentration Point

- Feeders to distribution networks;
- Splitting and splicing closures;
- Pole, duct or cabinet mounting;
- Modular solutions extensible up to 1120 splices.

Network Access Point

- Distribution to drop networks (ODP);
- Modular solutions extensible up to 144 splices;
- G.652D cabling compatible;
- IP54 / IP67 dust and water intrusion certified.

Multi Dwelling Unit

- Single or multi-operator;
- Extensible Modular solutions (48 up to 192 splices, 12 to 144 SC/APC);
- G.652D cabling compatible;
- IP54 / IP67 dust and water intrusion certified.

Central Office

The Central Office (CO) is the main point on the network, it will start all the fiber cables and host the active equipment such as OLTs and others. It will be designed to optimize resources and be flexible to simplify any expansion in the future.

General features:

- Scalability;
- Compact solutions;
- Easy installation and maintenance;
- Integrated fiber management/patching;
- ETSI;19/21" standards.

Standardized or highly customized solutions:

Co-created with our customers and optimized over several years of field operation.

Central Office

Racks

OLT Rack

- Applications: fully customizable to OLT systems;
- Features: integrated power distribution unit;
- Power and alarm cabling system;
- Different locking system possibilities;
- Cabling management;
- Color: customizable (std: RAL7035).

Download datasheet
Scan the QR code to view more information

Type	Dimensions(HxWxD)mm	Capacity
33000NG	2000x600x300mm	42RU 19”
36000NG	2200x600x300mm	47RU 19”
B300	2200x600x300mm	47RU 19”
B600	2200x600x600mm	47RU 19”

Central Office

Racks

Datacenter Rack

- Applications: datacenter;
- Features: front doors with removable side covers;
- Roof and bottom with adjustable opening and protective foam for cable entry,
- Adjustable feet;
- Manufactured in accordance with IEC 60297-1, DIN 41494, BS 5954 e EIA-310-D;
- Left side mats, with socket strip fixation in all height;
- Maximum capacity of 500Kg with wheels and 1300 Kg with feet;
- Color: customizable (std: RAL9005).

Download datasheet
Scan the QR code to view more information

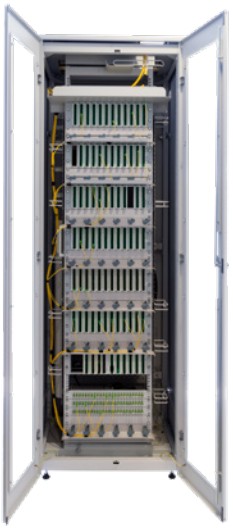
Type	Dimensions(HxWxD)mm	Capacity
Datacenter	2200x800x1100mm	47RU 19”
Datacenter	2200x800x1200mm	47RU 19”
Datacenter	2200x600x1100mm	47RU 19”
Datacenter	2000x800x1100mm	42RU 19”
Datacenter	2000x600x1000mm	42RU 19”
Datacenter	2000x800x1000mm	42RU 19”

Central Office

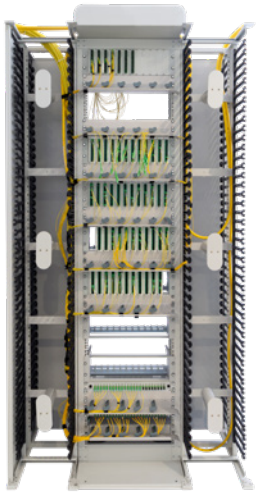
Racks

Optical Distribution Rack

- Applications: optical distribution frames;
- Features: double frontal door system with transparent glass or mesh holes and with key lock;
- Lateral and back panels removable for easy access;
- Optical fiber guidance with R > 30mm;
- Frontal patch cord organizers;
- Ceiling for cable input with adjustable opening and protective foam;
- Inner rotating structure for ease of user access to installed equipment;
- Color: customizable (std: RAL7035).



BSP / ODF Series



OGC Series

Download datasheet
Scan the QR code to view more information

Type	Dimensions(HxWxD)mm	Capacity
720 BSP/ODF	2000x800x600mm	38RU 19”
720 OGC	2000x800x600mm	38RU 19”
1150 BSP/ODF	2200x800x600mm	43RU 19”
1150 OGC	2200x800x600mm	43RU 19”
OGC RT	2200x1000x600mm	43RU 19”

Central Office

Wall Mounting Rack

Rack Mounting 6/9 RU | Rack Wall Fixing 3/5 RU

- Applications: to install telecommunications equipments;
- Features: material zincor/ galvanized steel;
- Prepared for wall mounting/fixing;
- Color: customizable (std: RAL7035).

Download datasheet
Scan the QR code to view more information

Rack Mounting 6RU

Rack Wall Fixing 3/5 RU

Type	Dimensions(HxWxD)mm	Capacity
Rack Mounting	350x555x500mm	6RU 19”
Rack Mounting	400x600x500mm	9RU 19”
Rack Wall Fixing	146x487x352mm	3RU 19”
Rack Wall Fixing	234x487x352mm	5RU 19”

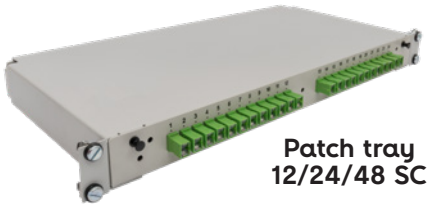
Central Office

Patch/ Splice/ Split Panels

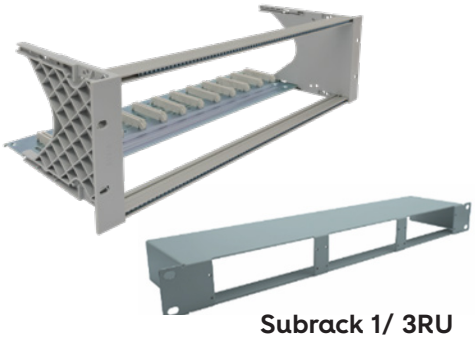
Patch tray 12/24/48 SC | Subrack 1/ 3RU - 4/ 7/ 14 HP | Patch panel 24 SC

- Applications: fiber termination / patching/ splitting shelfs;
- Features: material plastic/zincor;
- Fitted with or without optical adapters;
- Port identification;
- Fixing accessories;
- Color: customizable (std: RAL7035).

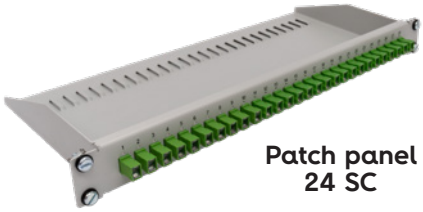
Download datasheet
Scan the QR code to view more information



Patch tray 12/24/48 SC



Subrack 1/ 3RU - 4/ 7/ 14 HP



Patch panel 24 SC

Type	Dimensions(HxWxD)mm	Capacity
Patch tray	44x490x230mm	1RU 19” 12/24 or 48
Subrack	44x490x50mm	1RU 19” 24HP for splice/split modules
Subrack	130x490x200mm	3RU 19” 84HP for splice/split modules
Patch panel	44x490x200mm	1RU 19” 24

Central Office

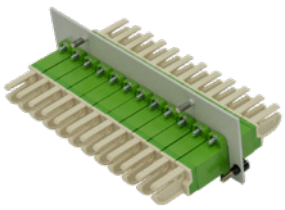
Patch/ Splice/ Split Modules

Splice Mod 3RU 4/ 7HP 12SC | Patch Mod 3RU 7HP 12Adapt | Split Mod 3RU 4/ 7/ 14HP | Split Mod 3RU 4/ 7HP Pre-connect

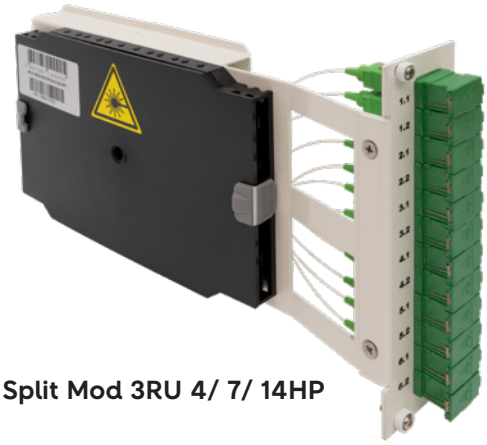
- Applications: fiber termination, patching and splitting frames;
- 4, 7 or 14HP options;
- Features: includes pigtails, adapters, splice tray or splitters;
- Port identification customizable;
- Fixing accessories.

Download datasheet
Scan the QR code to view more information

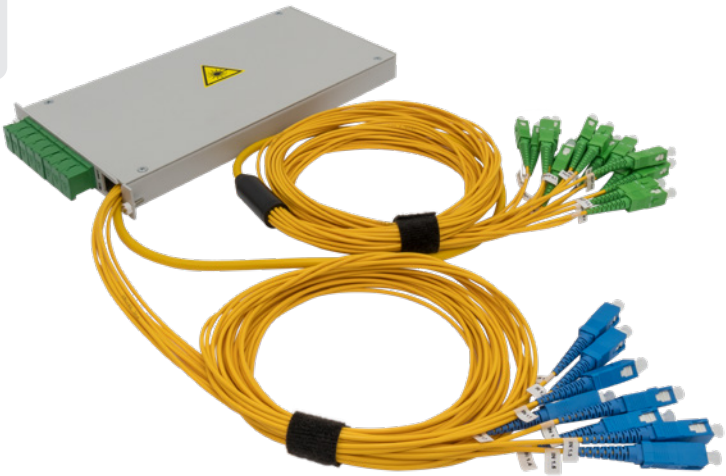
Splice Mod 3RU 4/ 7HP 12SC



Patch Mod 3RU 7HP 12Adapt



Split Mod 3RU 4/ 7/ 14HP



Split Mod 3RU 4/ 7HP Pre-connect

Central Office

Patch/ Splice/ Split Modules

Type	Dimensions(HxWxD)mm	Capacity
Splice mod	130x35x220mm	3RU 7HP with 12 SC/APC adapters G.652D
Splice mod	130x35x220mm	3RU 7HP with 12 SC/APC adapters G.657A1
Splice mod	130x20x220mm	3RU 4HP with 12 SC/APC adapters G.652D
Splice mod	130x35x220mm	3RU 7HP with 12 E2000 adapters G.652D
Split mod	130x35x230mm	3RU 7HP with 6x2:2 SC/APC
Split mod	130x70x230mm	3RU 14HP with 1x2:16 SC/APC
Split mod	130x35x230mm	3RU 7HP with 2x1:2 SC/APC
Split mod	130x70x230mm	3RU 14HP with 1x1:32 SC/APC
Split mod	130x35x120mm	3RU 7HP with 2x1:4 SC/APC in 2mm patch cord with 3M in ABS box
Split mod	130x35x120mm	3RU 7HP with 1x1:32 SC/APC in 2mm patch cord with 3M in ABS box
Split mod	130x20x220mm	3RU 4HP with 8x2:2 with SC/UPC and SC/APC connectores
Split mod	130x20x220mm	3RU 4HP with 8x1:2 with SC/UPC and SC/APC connectores
Patch mod	130x20x200mm	3RU 4HP 19” with 12 SC/APC adapters
Patch mod	130x35x200mm	3RU 7HP 19” with 12 SC/APC adapters
Patch mod	130x35x200mm	3RU 7HP 19” with 12 E2000/APC adapters

Central Office

Cable Management

Fiber Organizer 19” | Fiber Subrack | Fiber Storage Tray

- Applications: install splice or split modules;
- Features: fiber management system;
- Material: Plastic, zincor or steel sheet;
- Supports for fiber R>30mm;
- Fixing accessories;
- Color: Customizable (std: RAL7035).

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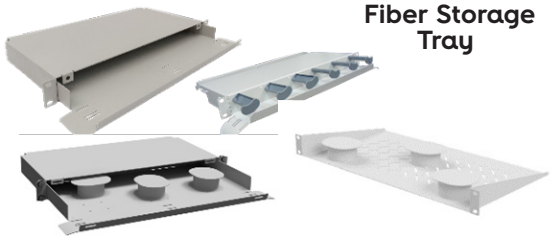
Fiber Organizer 19”

Fiber Subrack

Fiber Storage Tray



Type	Dimensions(HxWxD)mm	Capacity
Fiber organizer	55x515x75mm	1RU 19”
Fiber Subrack	178x515x222mm	Subrack 3RU 19” 84HP for splice/split modules plus 1RU Fiber storage tray
Fiber storage tray	50x483x292mm	1RU 19”, Fiber storage subrack rear
Fiber storage tray	47x483x300mm	1RU 19”, Fiber storage subrack front
Fiber storage tray	44x481x236mm	1RU 19”, Fiber storage slide tray with spools and fiber routing for left and right sides
Fiber storage tray	44x482x243mm	1RU 19”, Fiber storage tray with spools and fiber routing

Central Office

Decentralized service deliver in high or low populations density areas.

Cover the selected area with all services.

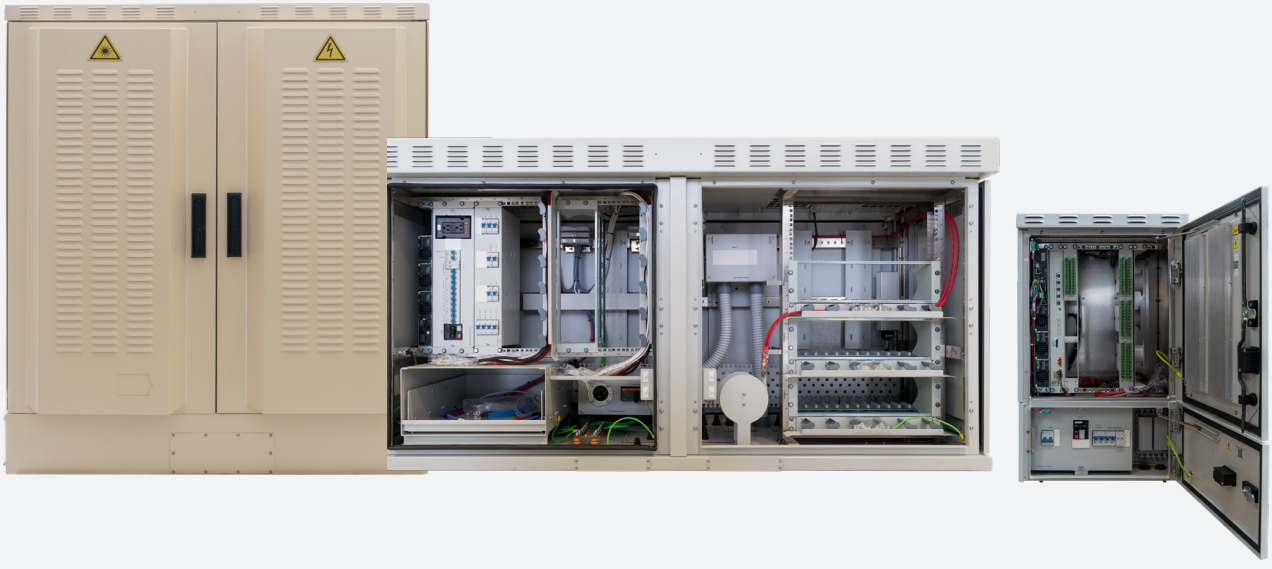
It's providing robustness, security and scalability. It´s resistant to damage from both the environment and vandalism and provides protection against insect, rodent attacks and other similar threats.

General features:

- Compact solution;
- Modular design with hard body double walls;
- Multiple colors;
- Pole, wall or floor installation..

Standardized or highly customized solutions:

Customization for several markets (USA, France, ETC).



Central Office

Outdoor Cabinets

GPON OUTDOOR CABINET 3000V2

- Applications: Compact Active equipment;
- Designed for one OLT2T0 equipment.
- Features: Suited for service deliver in low density;
- Even being small in its size;
- Provides robustness, security and flexibility;
- Heat exchange climate control;
- Modular design;
- Thermal and electrical efficiency;
- Hard body double wall;
- Open door locking system;
- Door locking by 3 points;
- IP55 protection level;
- 2 Sub-Rack for splitting and splicing of optical fiber terminations;
- Pole, wall installation and floor installation possibilities;
- Working temper ature between 40°C to 55°C.

Download datasheet
Scan the QR code to view more information

Type	Dimensions(HxWxD)mm	Capacity
Outdoor Cabinet 3000V2	800x500x400mm	Max. Equipment capacity 19”/9RU (320mm equip. depth)

Central Office

Outdoor Cabinets

GPON OUTDOOR CABINET 6000

- Applications: active equipment;
- Features: compact solution;
- Embedded heat exchange and climate control;
- Modular design;
- Hard body double walls;
- AC/DC converter with battery backup;
- Power distribution unit;
- 4 Sub-rack for split/splice/WDM/Cex;
- Incorporated cabling management;
- IP55 protection level.

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Scan the QR code to view more information

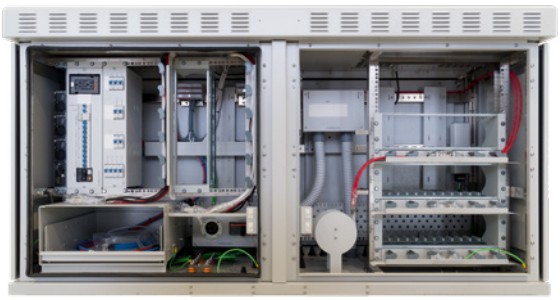
Type	Dimensions(HxWxD)mm	Capacity
Outdoor Cabinet 6000	1326x1250x580mm	20RU in 19/21" + 20RU in 19/21"

Central Office

Outdoor Cabinets

GPON OUTDOOR CABINET 6001

- Applications: active equipment;
- Features: compact solution;
- Embedded heat exchange climate control;
- Modular design;
- Hard body double walls;
- Open panels locking system;
- Panels locking system with 2 points with duo high security cam locks;
- Isolated batteries compartments;
- 1 Sub-rack for primary;
- 3 Sub-rack for split/splice/WDM/CEx;
- Incorporated cabling management;
- IP55 protection level.



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Type	Dimensions(HxWxD)mm	Capacity
Outdoor Cabinet 6001	900x1829x600mm	17+16RU in 19”

Central Office

Outdoor Cabinets

GPON OUTDOOR CABINET 18000

- Applications: active equipment;
- Features: compact solution;
- Modular design;
- Air conditions system up to 4000W;
- Hard body double walls;
- Door locking system with 2 points and prepared to receive the special operator key lockers;
- Incorporated cabling management;
- Module for up 12 batteries 12V/170Ah;
- IP55 protection level.

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Scan the QR code to view more information

Type	Dimensions(HxWxD)mm	Capacity
Outdoor Cabinet 18000	1825x2180x716mm	2x33 + 4x18RU in 19/21”

Fiber Concentration Point

OSP network is divided by transition points: FCP; NAP and MDU components, that's create flexibility points across feeder, distribution and access network.

General features:

- Flexibility and scalable solutions;
- Modular design;
- Multi-access enclosures;
- Pole, wall or manhole installation.

Standardized or highly customized solutions:

Customization for several markets (USA, France, ETC).

Fiber Concentration Point

Cabinets

FCP SRO-18RU | FCP SRO-288OF PRE- CONNECTORIZED | FCP SRO-25RU | FCP MINI-SRO-152OF

- Applications: optical distribution for FTTx networks;
- Features: modular solutions;
- Built-in cabling management;
- Standard splitter modules;
- Pole or ground installation accessories;
- IP54 protection rating;
- Color: customizable (std: RAL7035).

Download datasheet
Scan the QR code to view more information

FCP SRO-18RU

FCP MINI-SRO-152OF

Fiber Concentration Point

Cabinets

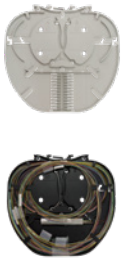
Type	Dimensions(HxWxD)mm	Capacity
SRO 432 1D RT	1200x750x500mm	18RU 19”
SRO 288 1D RT	1200x750x500mm	18RU 19”
SRO 144 1D RT	1200x750x500mm	18RU 19”
SRO 576 RT + Cable	1100x750x500mm	25RU 19”
SRO 288 1D RT + Cable	1200x750x500mm	288OF + 7/14HP splitter modules
SRO 576 1D RT	1100x750x500mm	25RU 19”
SRO 432 1D RT	1100x750x500mm	25RU 19”
Mini SRO PM	680x520x450mm	152OF + 4HP splitter modules

Fiber Concentration Point

Split Enclosures

JSO-ORG/SPLIT | JSO-144/ 288/ 432/ 720 | JRO-128/34 SC | JFO 24-144OF

- Applications: multi-access optical enclosures;
- Features: modular solution;
- Splicing capacities from 24 to 720OF;
- Different ports configurations: 4+1; 6+1;
- Mechanical port or shrink sleeve port options available;
- Fiber management compliant G652 (R<=30mm)
- Multi color trays;
- Installation on wall, pole, manhole or strand;
- Protection level IP68;
- Customizable (std: RAL9005).



JSO-ORG SPLIT

JSO-144 288 432 720

JRO-128/34 SC

JFO 24-144OF

Download datasheet
Scan the QR code to view more information

Fiber Concentration Point

Split Enclosures

Type	Dimensions(HxWxD)mm	Capacity
JRO 6+1 PM	610x Ø 225mm	128SC + Up to 360OF
JRO 34SC/APC 1:32 PWM 2+2+1M	480x Ø256mm	120OF + splitter 1x1:32
JSO288 SC PWM	630x Ø225mm	288 to 432OF
JSO720 SC PWM	790x Ø225mm	720OF
JSO288 144FO SC SM(6+1)M	480x Ø210mm	144 to 288OF
JSO720 SC PWM P4+1	790x Ø225mm	720OF
JSO432 SC PWM P4+1	630x Ø225mm	432OF
SPLICE ORG JSO SC 12OF GR	124x132x4,5mm	12OF
SPLIT ORG JSO 1:4 BK	124x132x4,5mm	1x1:4
SPLIT ORG JSO 1:8 BK	124x132x4,5mm	1x1:8
SPLIT ORG JSO 1:16 BK	124x132x4,5mm	1x1:16
SPLIT ORG JSO 1:32 BK	124x132x4,5mm	1x1:32
JFO144 24OF SE PWM 4+1	450x Ø230mm	24 to 144OF
JFO48 SC PL SM 4+1	480x Ø180mm	48OF
JFO144 SC PL SM 6+1	450x Ø180mm	144OF

Network Access Point

ODP Boxes

ODP-12/24 EXTERNAL | ODP-16 EXTERNAL IP67 | ODP-34SC/APC 1:32 EXTERNAL | ODP-12 INTERNAL | HUP16/2

- Applications: distribution network and drop connection to the client;
- Features: scalability;
- 8,12,16, 24, 32 customers;
- Several configurations available according to the client needs: with or w/o adapters; with or w/o locker; with or w/o splice trays, splitters... ;
- Mechanical fastening for easy opening/ closing;
- Wall, pole or manhole mounting accessories.

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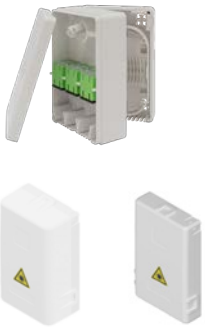
ODP-12/24 EXTERNAL

ODP-16 EXTERNAL IP67

ODP-34SC/APC 1:32 EXTERNAL



ODP-12 INTERNAL HUP16/2

Network Access Point

ODP Boxes

Type	Dimensions(HxWxD)mm	Capacity	Note
PDO12 EXT PL 48FO PWM	265x150x71mm	48OF	(2x24)48 splices/Max. 96 splices (4x24)
PDO16 SUB PL 72FO PWM	450x Ø230mm	72OF	Loop possibility
PDO24 EXT PL 72FO 4+2	265x235x90mm	Up to 144OF	4 splice trays R30 for network distribution and 2 trays for network drop
PDO12 SC/APC INT PL 12OF	153x105x66mm	12OF	With 12 SC/APC adapter
CRO 34SC/APC 1:32 WM 4+2+1M CQ	380x245x130mm	Up to 60OF + 1x1:32 splitter	With 34 SC/APC adapter
HUP16/2	173x111x(64 or 32mm)	8/2 ANT crimp splice protector	With LC Duplex Adapt

Multi-Dwelling Unit

MDU12/24 SC ADAPT | MDU24 SPLICE | MDU24/48 SC ADAPT | MDU72/144 SC ADAPT

- Applications: building terminal box or optical distribution point for networks FTTH;
- Features: stackable with similar boxes;
- 2 compartments: one for fiber termination other for patching;
- Several configurations available according to the client needs: with or w/o adapters; with or w/o locker;
- Cable strength member fixing;
- Wall mounting accessories included;
- Customizable (std: RAL9001).

MDU24/48 SC ADAPT

Download datasheet
Scan the QR code to view more information

Type	Dimensions(HxWxD)mm	Capacity
PDO24 INT P 24 SC/APC 24OF 2LK	155x330x75mm	24OF
PDO24 INT P 12 SC/APC 12OF 2LK	155x330x75mm	12OF
PDO48 INT P 48 SC/APC 48OF 2LK	155x330x105mm	48OF
PDO48 INT P 36 SC/APC 36OF 2LK	155x330x105mm	36OF
PDO12 INT M 96OF	268x340x108mm	96OF
PDO12 INT M 72OF	268x340x108mm	72OF

Multi-Dwelling Unit

Terminal boxes

DROP BOX SC ADAPT | DROP BOX SPLICE | OUTLET2 SC ADAPT | OUTLET2 SPLICE

- Applications: transition point between external network and the active equipment;
- Compact design and easy installation;
- Features: drop cable entrance allowance;
- Several configurations available according to the client needs: with or w/o adapters;
- Includes accessories for wall fixing;
- Fast cover fitting (screwless).

Download datasheet
Scan the QR code to view more information

DROP BOX SPLICE

OUTLET2 SC Adapt

OUTLET2 LC Duplex

Multi-Dwelling Unit

Terminal boxes

Type	Dimensions(HxWxD)mm	Capacity
DROP BOX SC/APC	40x110x20mm	1 splice /SC Adapt
DROP BOX SPLICE	40x110x20mm	1 splice
OUTLET2 1SC/APC INT PL WM	14,3x83,6x80,4mm	Max. 2 splices
OUTLET2 2SC/APC INT PL WM	14,3x83,6x80,4mm	2 splices
OUTLET2 1FO WM	14,3x83,6x80,4mm	Max. 2 splices
OUTLET2 2FO WM	14,3x83,6x80,4mm	2 splices/SC or LC Duplex Adapt

TEST LABS AND CONTROL

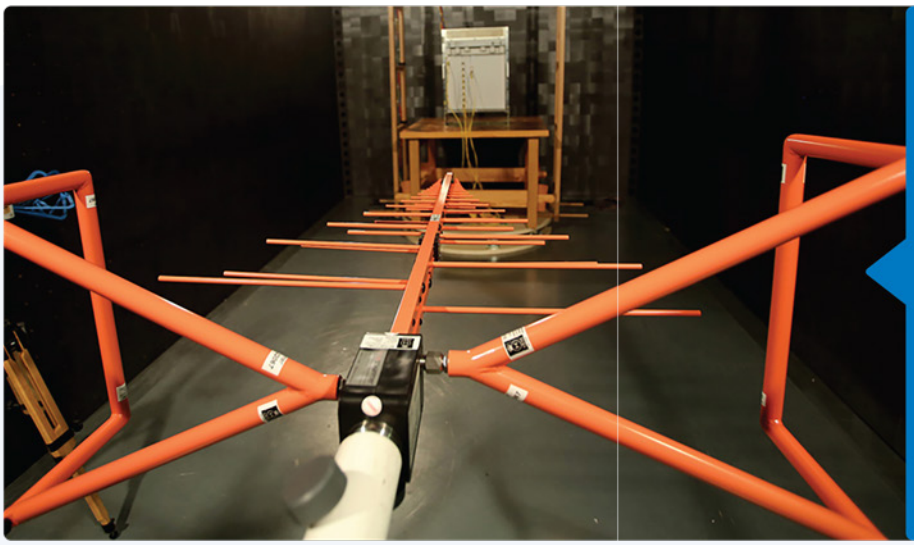
Test Labs and Quality Control

Development Design

After product specification, the development process starts with schematics and PCB (Printed Circuit Board) design, followed by micro-electronics development and simulation, prototypes bring-up and unitary tests. Altice Labs develops PCBs which are among the most complex in the world.

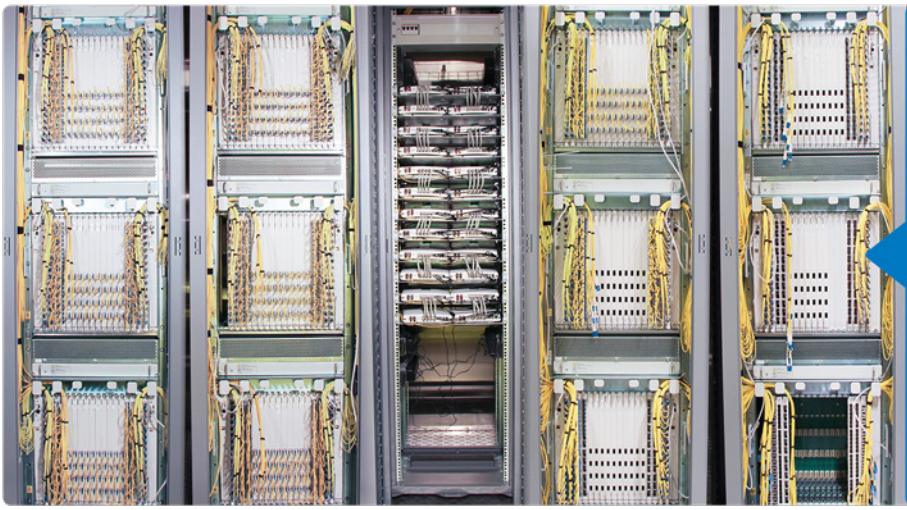
Test & Industrialization

Quality assurance is guaranteed by hardware, software and systems validation in simulated highly loaded networks, according to specific functional and non-functional requirements.



Conformance and Interoperability

Electromagnetic compatibility testing (EMC), CWMP – CPE WAN management protocol (TR069), GPON interoperability, Wi-Fi, ADSL/ADSL2+ interoperability, interworking compatibility with telecommunication networks, acoustic – voice terminals and CWMP – CPE WAN management protocol (TR069). This Lab is also used to certify CPEs from different vendors.



Reliability Demonstration

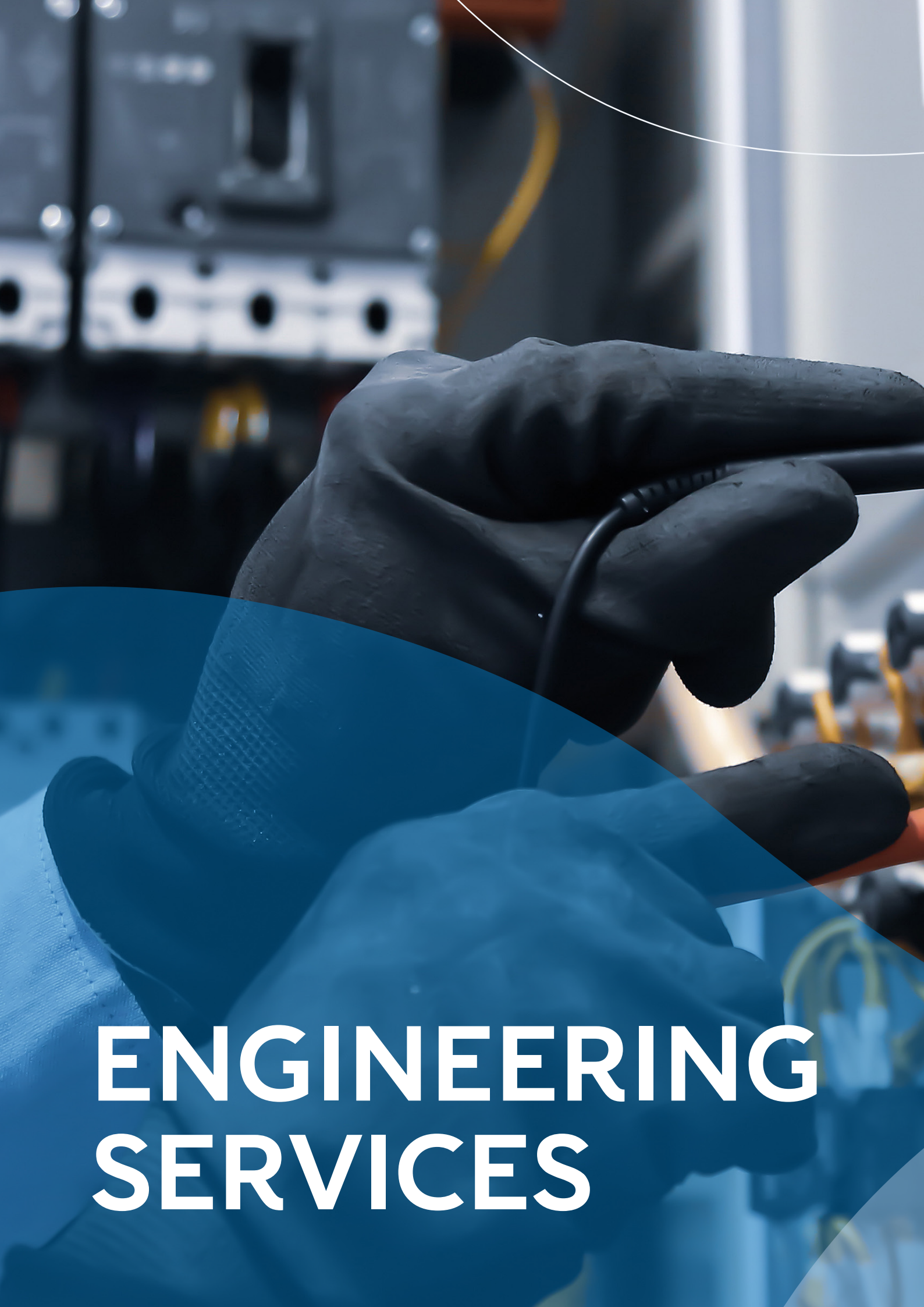
Products reliability demonstration test (RDT) is a process to demonstrate that calculated MTBF (mean time between failures) is coherent with system life cycle behavior. This process is achieved through accelerated aging by continuous temperature cycling, with simulated traffic and being continuously monitored by external test equipments, through automation.

Environmental and Mechanical

Certification: user safety testing (IEC 60950-1), environmental (Ka, climatogram), mechanical (vibration), resistibility. This Lab is also used to certify products from different vendors.

Prototype Production

Complete assembly line designed for prototypes and pre-series, with high flexibility to improve down time to change between productions and capable to handle all kind electronic parts. Fully automated for surface mounted devices and semi-automated for conventional components. Assembly quality assured by automatic optical inspection.

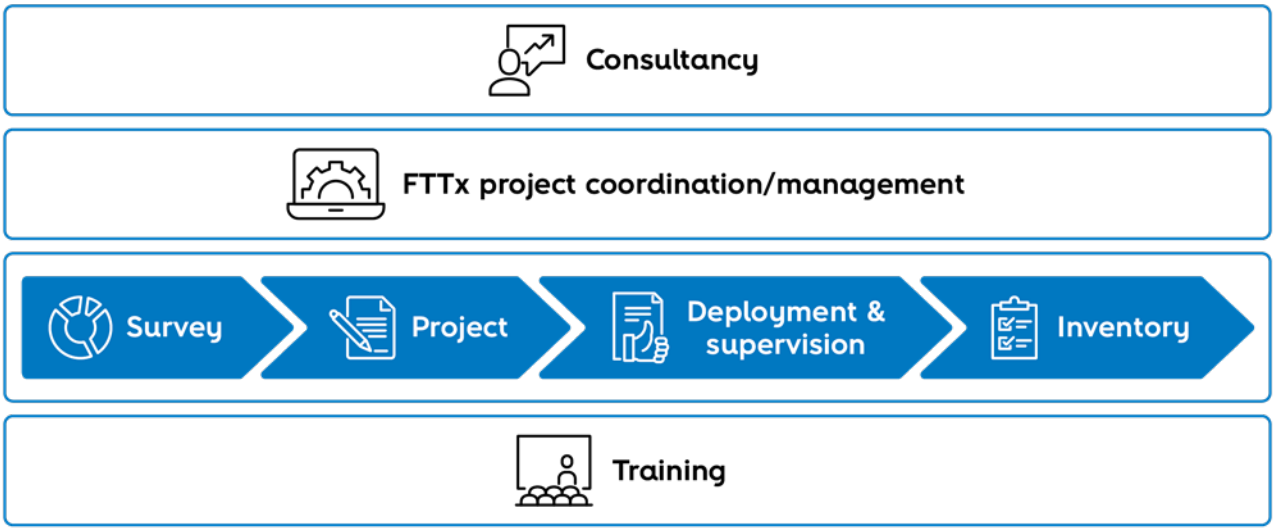


ENGINEERING SERVICES

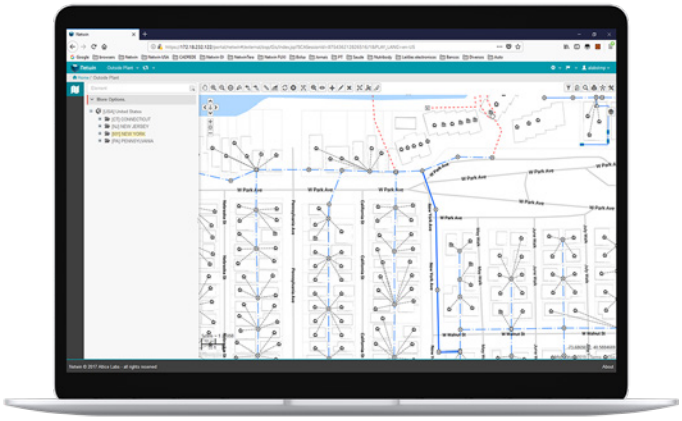
Highly skilled team with proven track record

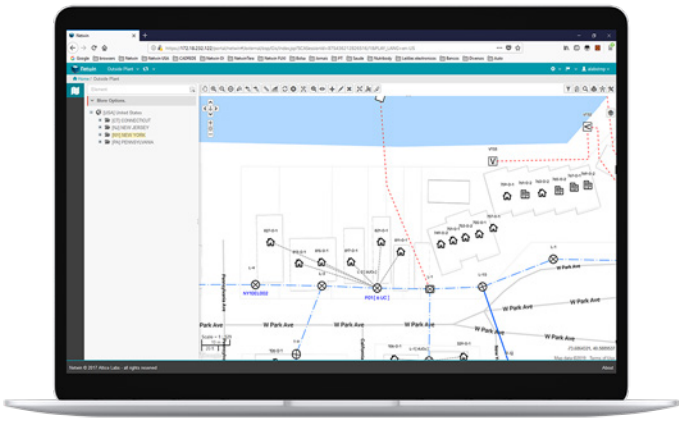
Altice Labs has a proven track on highly skilled engineering service delivery. From the very beginning of the FTTx project plan up to the field deployment rollout, Altice Labs teams look for excellence always pursuing for the best practices and the best tools looking forward to a successful business plan for all stakeholders.

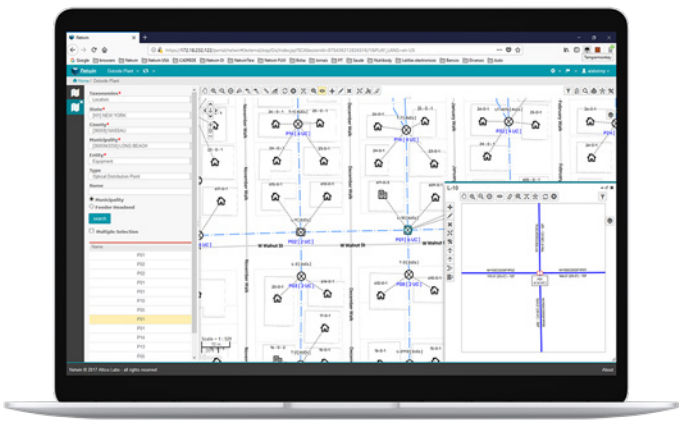
- Consultancy, Audit and Network Design of P2P and P2MP Outside Distribution Network
- Special skilled team for Project Coordination, Project Management and Contract Supervisory
- Full cycle of FTTx service operational tasks including: Survey, Project, Deployment and Inventory
- Rollout speedup & Total Cost of Ownership (TCO) optimization
- Pay-as-you-grow | Future-proof | HW optimization
- Comprehensive Training programs



Engineering Services Portfolio







Altice Labs uses the best of breed market tools to follow all the Survey, Project, Deployment & Supervision, Inventory and Audit phases. That is a recursive cycle that will be put in place looking forward the delivery of a differentiated and added value service. Part of the referred tools are also part of the Altice Labs Operation Support Systems portfolio as explained on previous catalogue chapter.

MAINTENANCE SUPPORT SERVICES

Highly skilled support team relevant know-how and experience

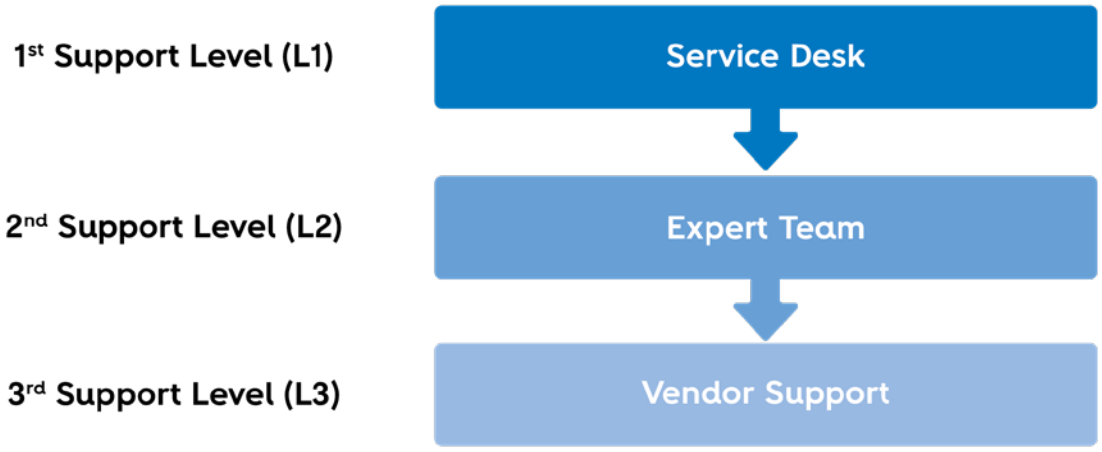
The After-Sales services are provided by highly skilled technicians with the support of the best market tools according to dedicated contract specifications.

The following After-Sales **service components** are available:

- **Maintenance and Support** service – reactive activity for failure recovery and defects/errors correction of the object under contract.
- **Preventive Maintenance** service – proactive activity designed to early detect and avoid potential failures in the object under contract.
- **Operation** service – configuration, parameterization and administration activities over the object under contract.
- **Hardware Repair** service – reactive assistance in case of hardware failure.
- **Advanced Hardware Replacement** service – fast hardware replacement of faulty hardware through the use of spares. This service includes adequate spares management procedures.

Round-the-clock (24h/7d) post sale service portfolio

According with Information Technology Infrastructure Library (ITIL), Altice Labs has defined three levels of support for incident management that should be contextualized within the operation procedures of our networks.



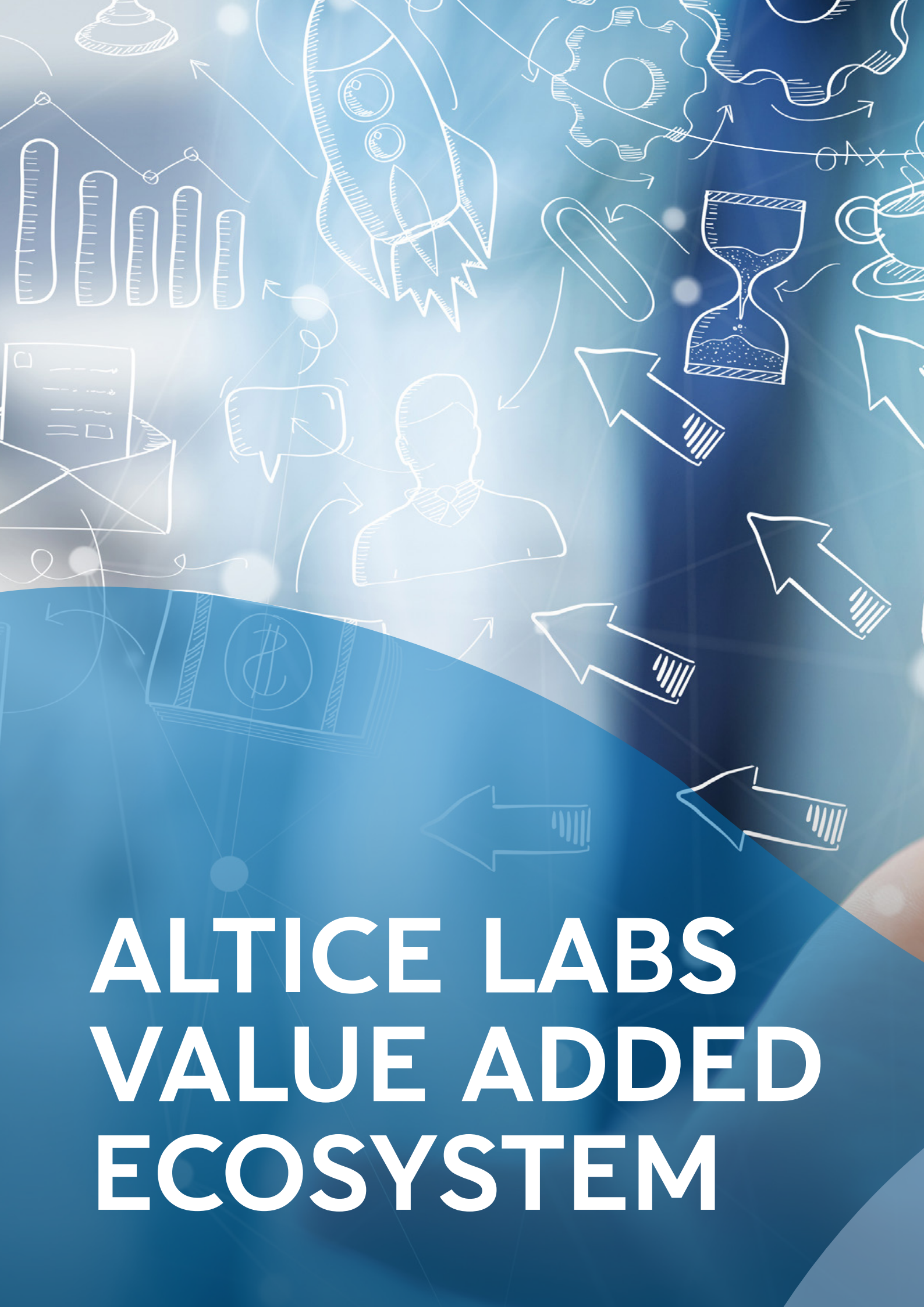
Incident management support levels

Several service grades may also be selected taking into account the corresponding SLA availability and response times.

Gold

Silver

Bronze



ALTICE LABS VALUE ADDED ECOSYSTEM


МАЭТ

Value Added Ecosystem

Along the past years our development teams have been experiencing new challenges and achievements towards complete technology portfolios. Our today's PON product line is the result of all past experience translated over strong FPGA and ASIC expertise.

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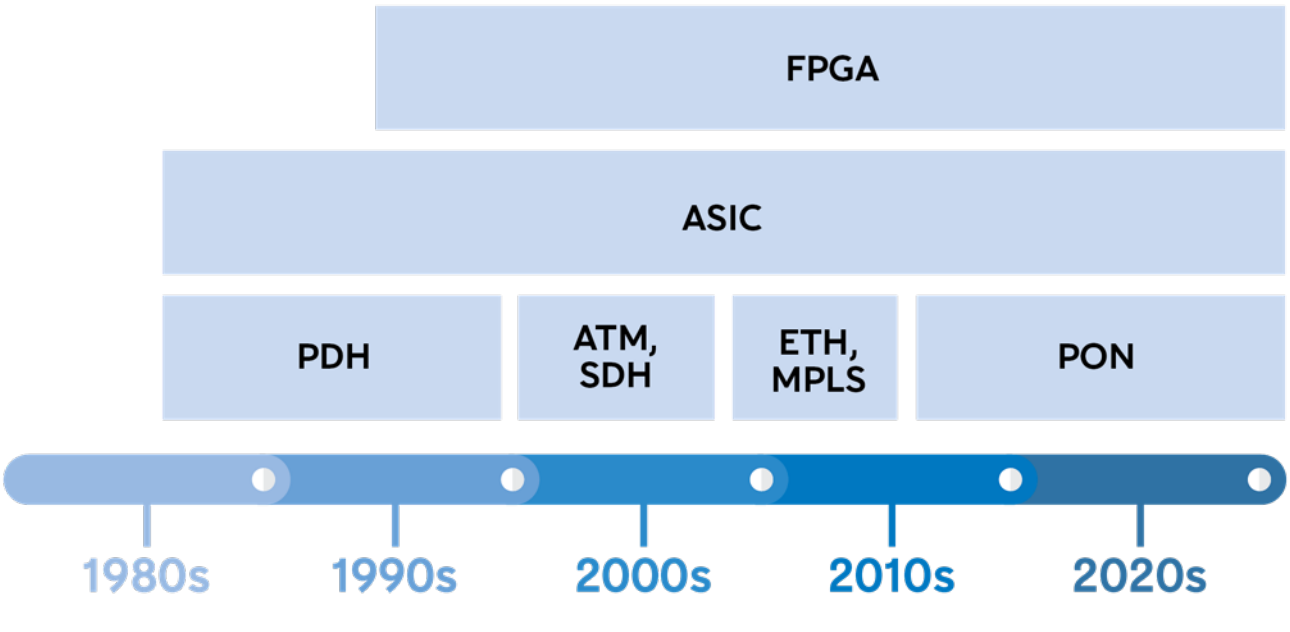
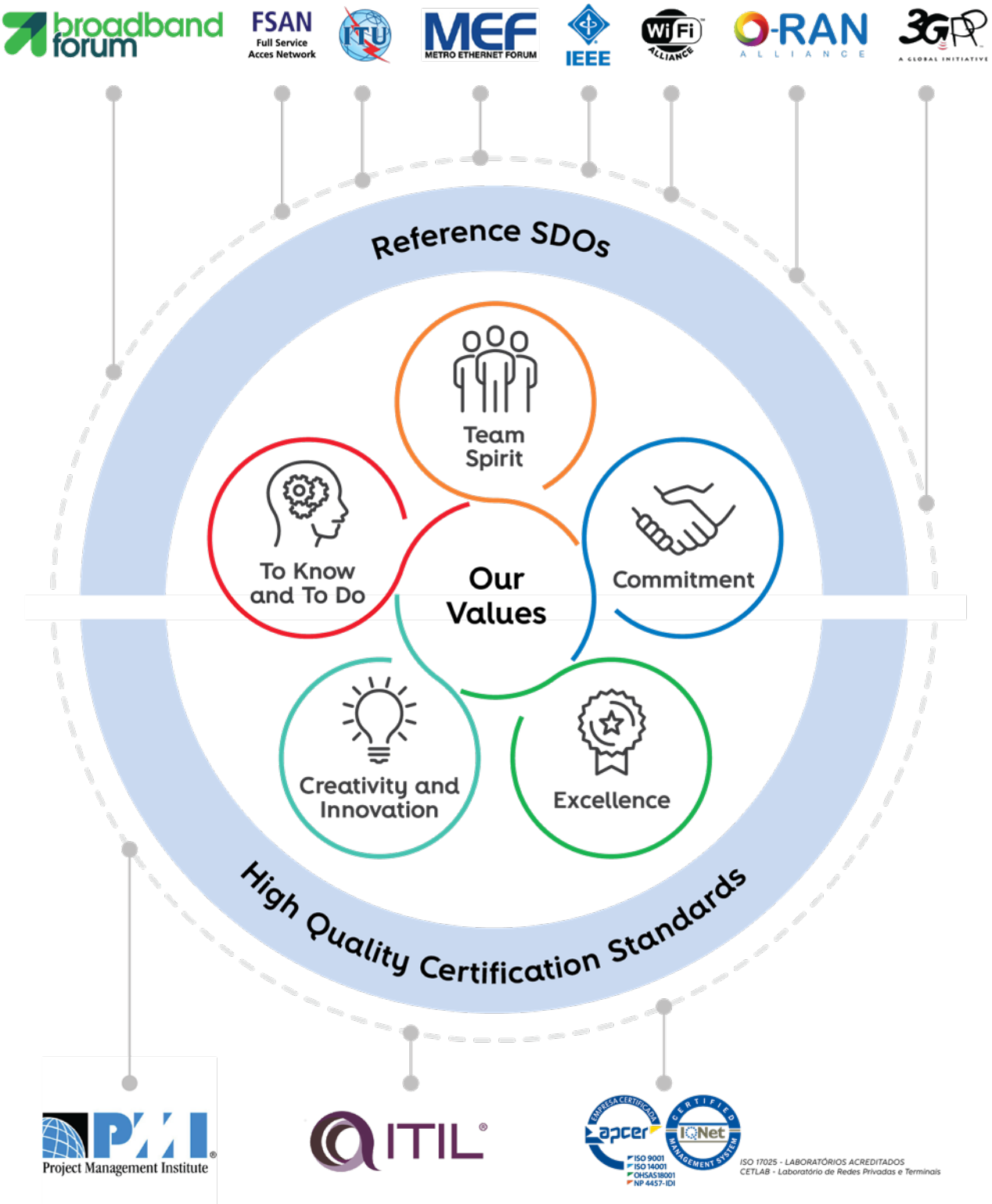


Altice Labs Major Technology Enrollements

As a telecom market vendor or as a valuable technological partner, Altice Labs current market position is with total and close commitment to each customer solution and excellence service delivery.



altice labs

About Altice Labs

Delivering key telecommunications technologies since 1950, Altice Labs has been shaping the future of technology, enabling Communications Service Providers and Enterprises to offer advanced and differentiated services to their customers and users.

Altice Labs is an innovation and transformation catalyst supported on a strong and dynamic Innovation Ecosystem. Through technology, we are committed to improve people's lives and the way in which companies do business.

www.alticelabs.com