

Altice Labs
Portfolio

Ultra-Fast Broadband

April, 2020



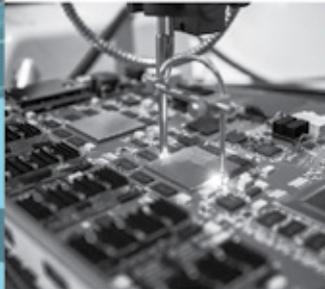
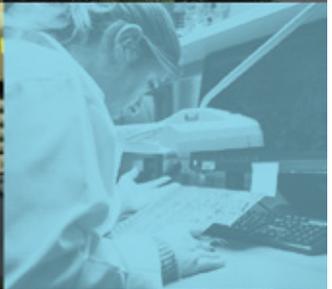
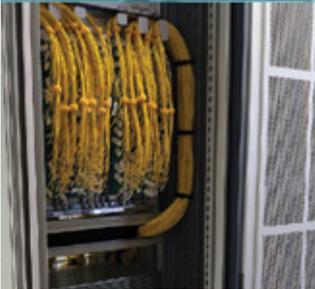
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Altice Labs

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.





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

Customer footprint



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



For the next decades

Services



Information



Infrastructure



Tools

- New services with optimized agents focusing on individuals
- Cross-Industry / Cross-layer Integrated communications
- Merging computing, navigation and perception

Trends

- Digital Life
- Mobility as a Service (MaaS)
- Mixed-reality
- User-centric service integration

- Data as the starting point
- Collected 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

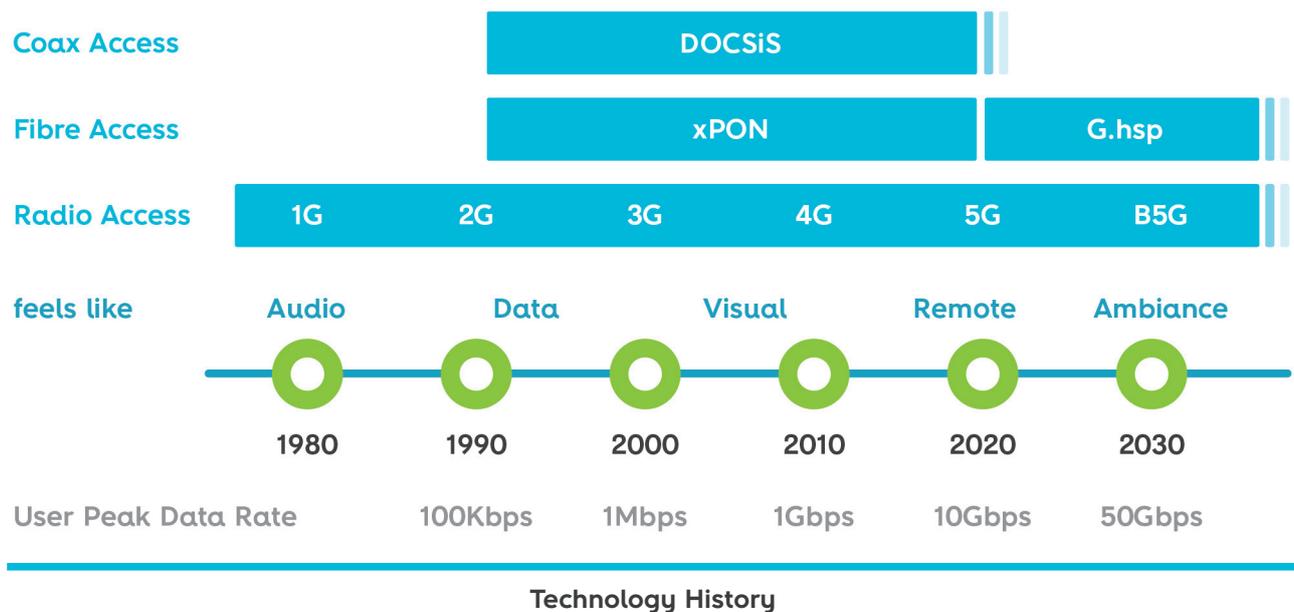
- Everything is connected and generates Data
- Open Network aims to bring new ecosystems
- Network as a commodity become part of the environment OS
- Fiber network at the bottom line

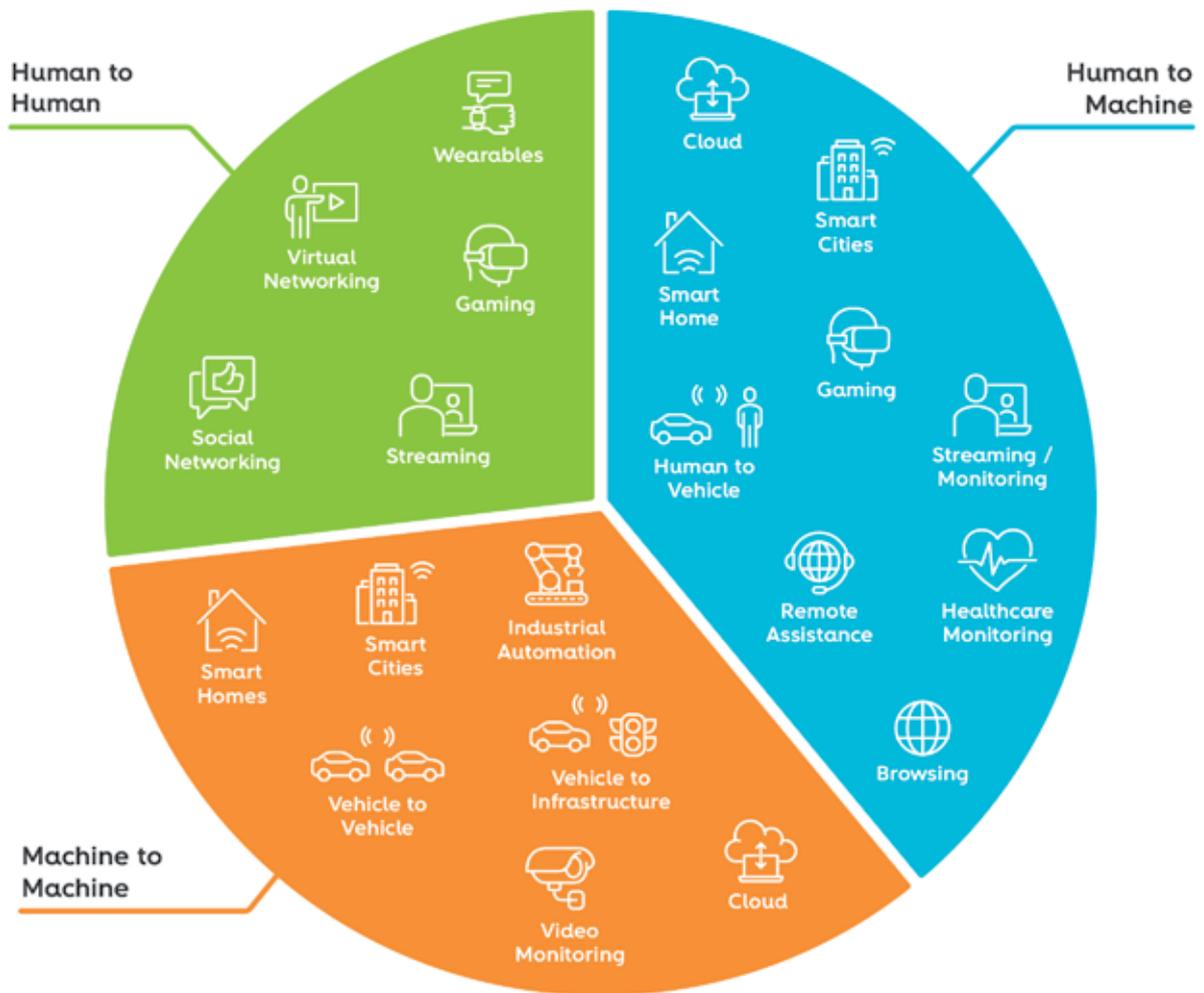
- Humans
- Devices
- Infrastructures

Technology and Service Evolution

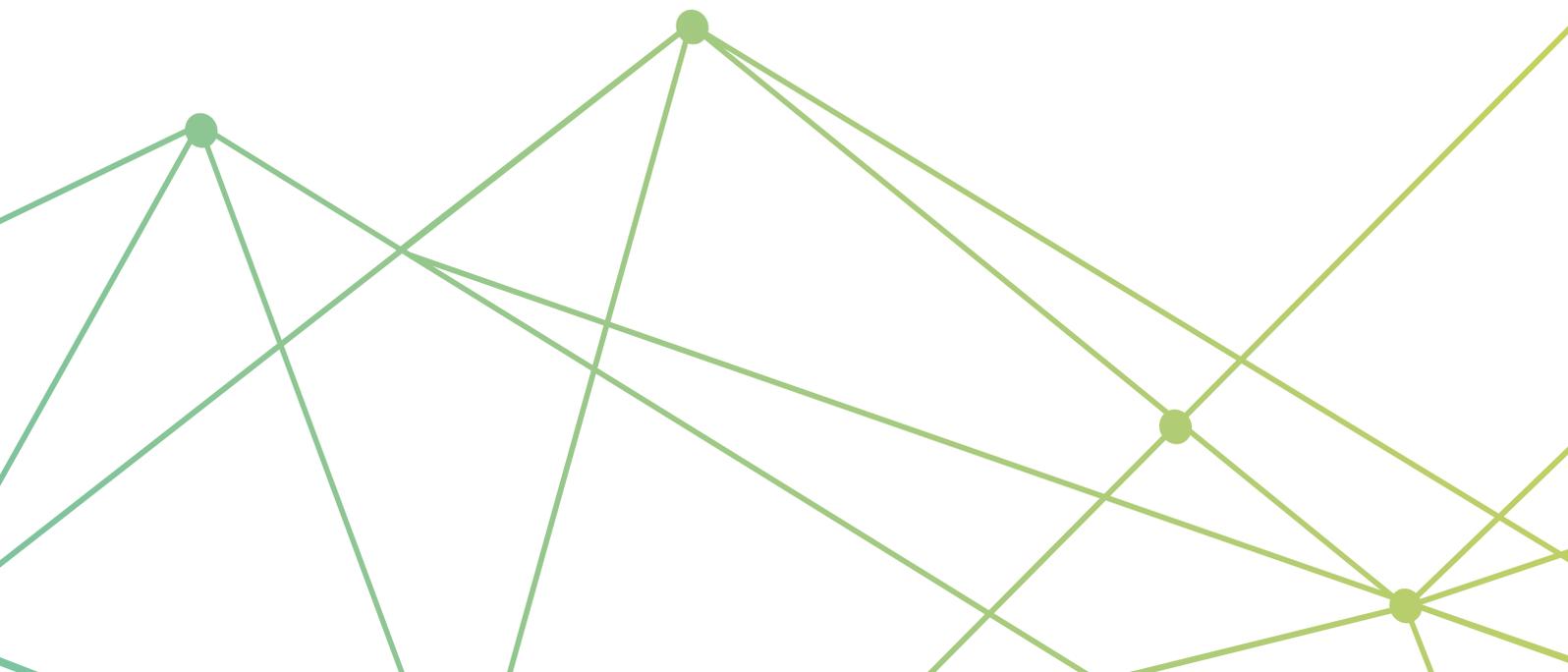
Telecom networks became commonplace for various everyday life activities and services.

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.





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

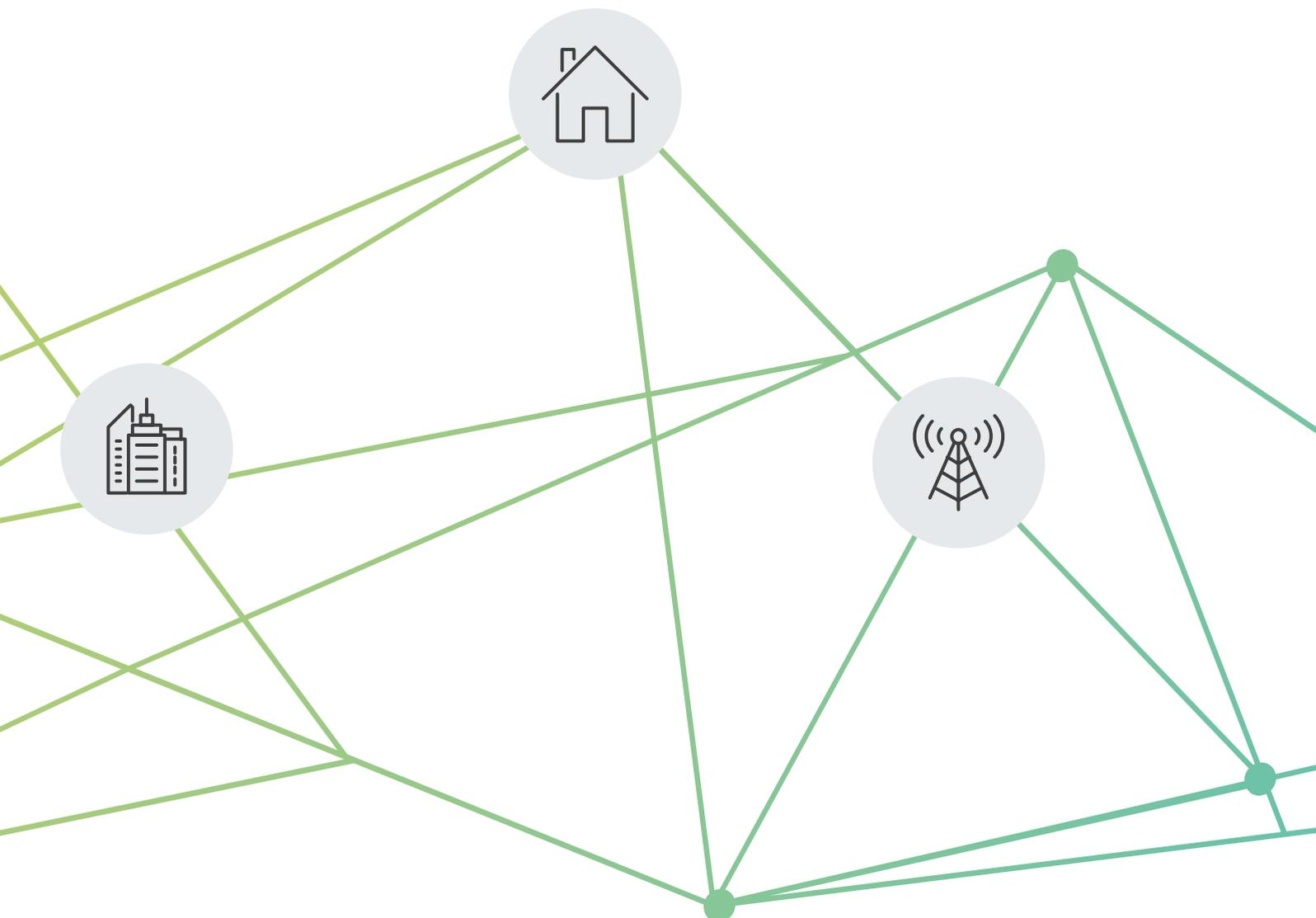
FTTx architecture	12
PON standard evolution	14
Central Office	16
Customer Premises Equipment	38
Outside Distribution Network (ODN)	58
Network Management System	68
Enabling 5G with FTTx	76
Test Labs and Quality Control	82
Operations Support Systems	86
Engineering Services	100
Maintenance and Support Services	104
Altice Labs Value Added Ecosystem	108

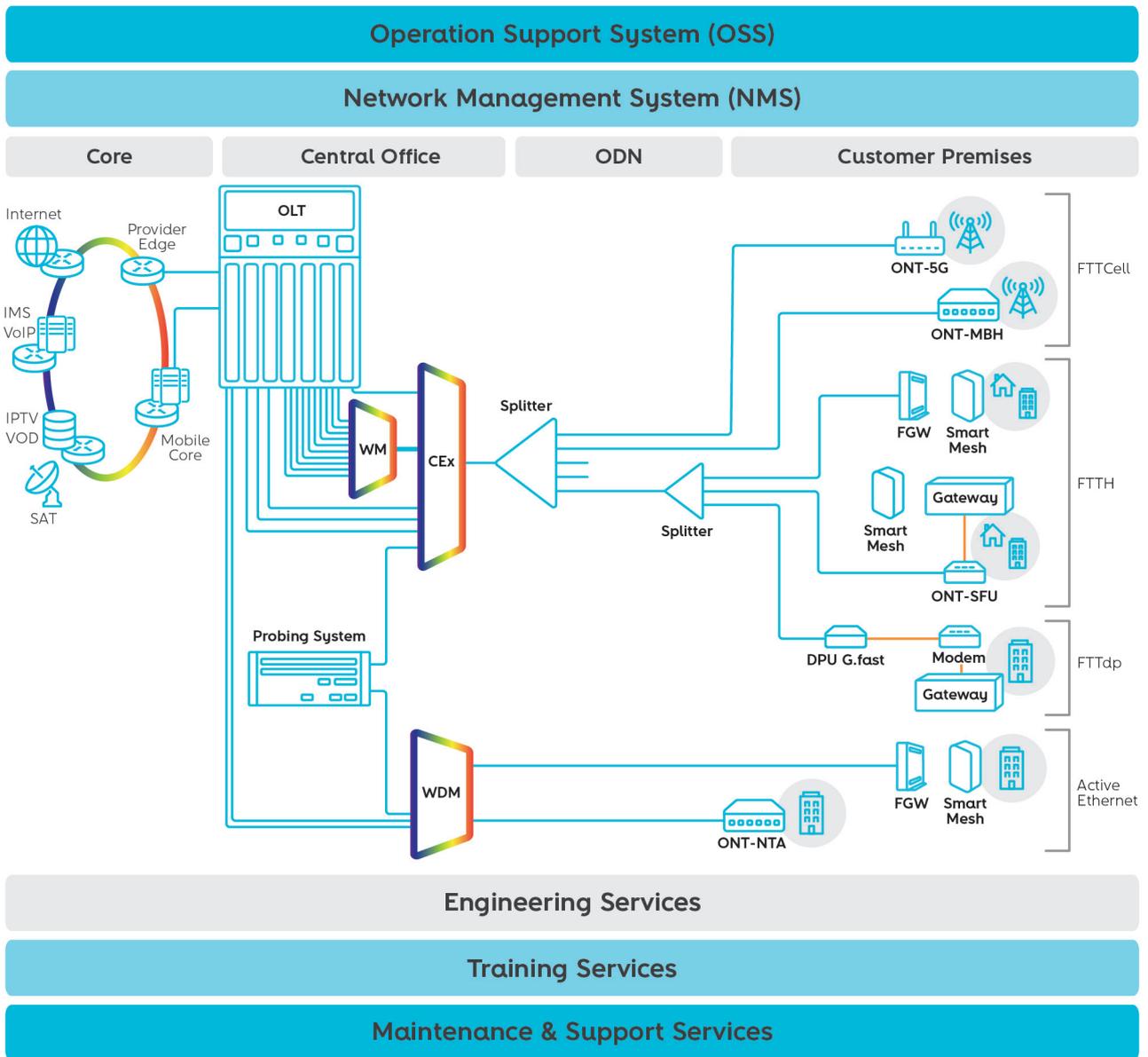


FTTx architecture

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.

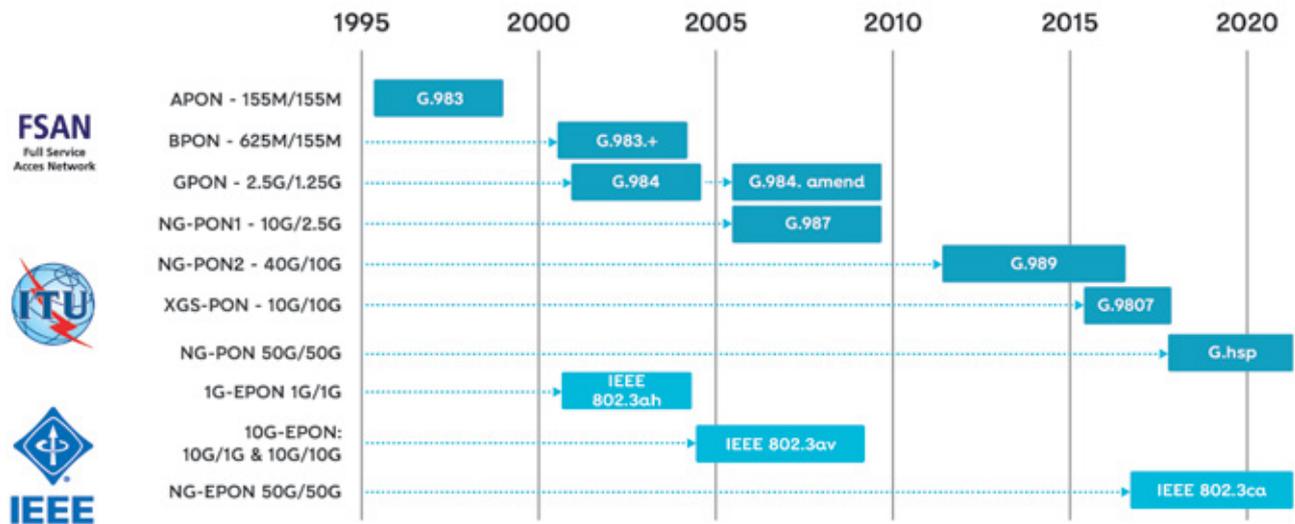
Altice Labs solutions are intended to solve the entire fibre access network domain, simultaneously attending **Residential**, **Business** and **Mobile** market segments.



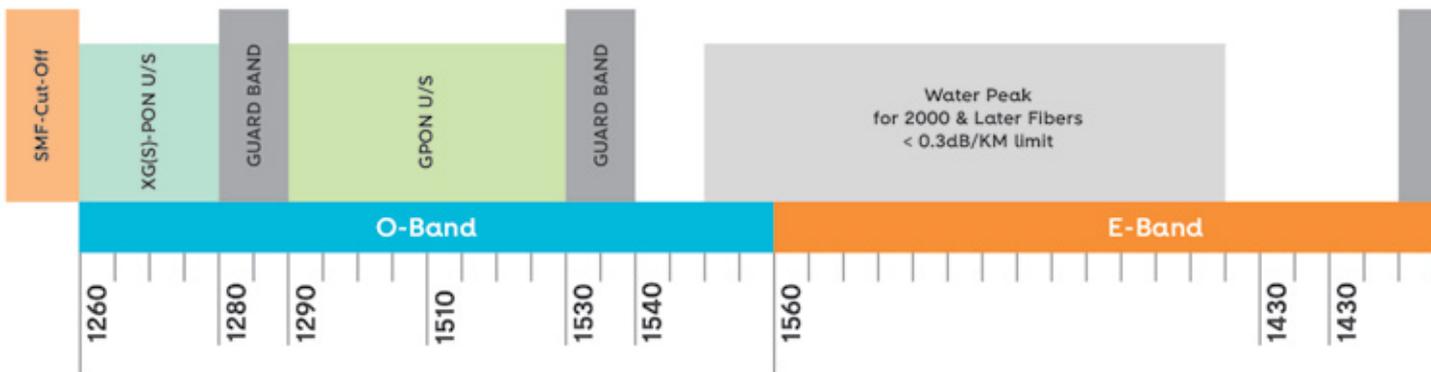


PON standard evolution

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



Coexistence along the ODN

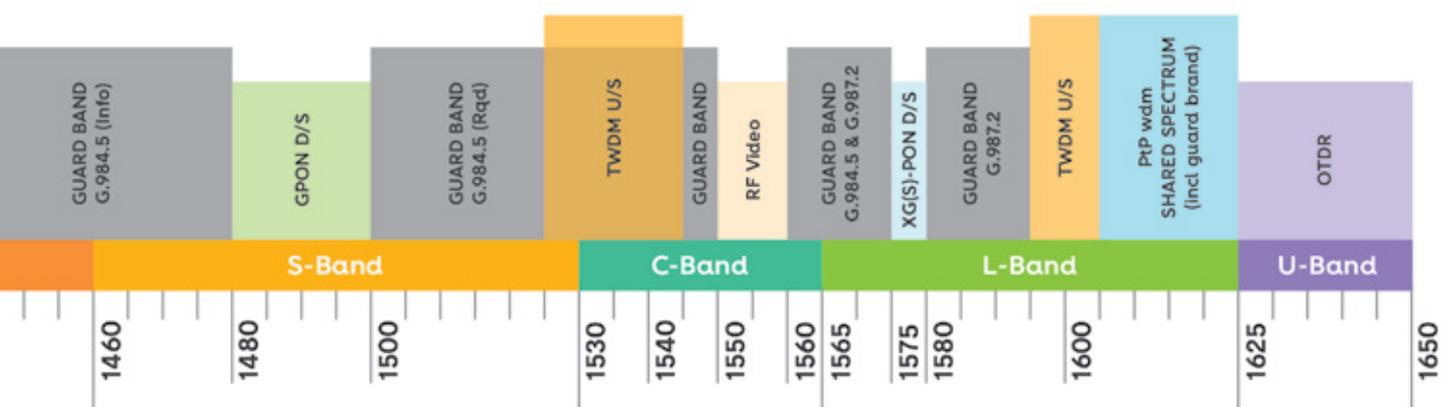
Altice Labs product portfolio is completely aligned with the reference standardisation bodies and other relevant technical forums always pursuing the best and most suitable technology selection together with a full product conformity.

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 future ITU High Speed PON (HSP) normative.

	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)	GEM
XG-PON	10	2.5	1577	1270	Fixed Wavelength	N1 (29dB), N2a (31dB)	XGEM
XGS-PON	10	10	1577	1270	Fixed Wavelength	N1 (29dB), N2 (31dB)	XGEM
NGPON2	4x10	4x2.5	1596.34	1532.68	Fixed or Tunable Wavelength	N1 (29dB), N2 (31dB)	XGEM
	4x10	4x10	1597.19	1533.47			
	Could go till 8 wavelengths	Could go till 8 wavelengths	1598.04	1534.25			
			1598.89	1535.04			

PON technology comparison

* DS - Downstream, US - Upstream





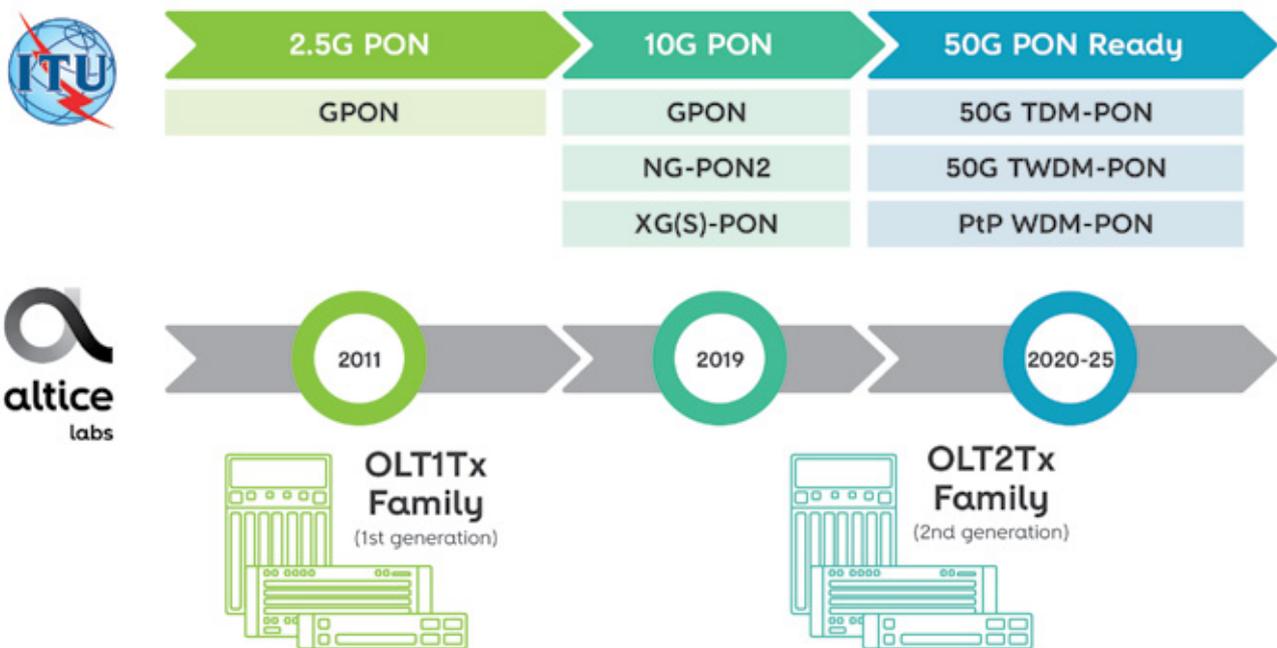
CENTRAL



OFFICE

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.

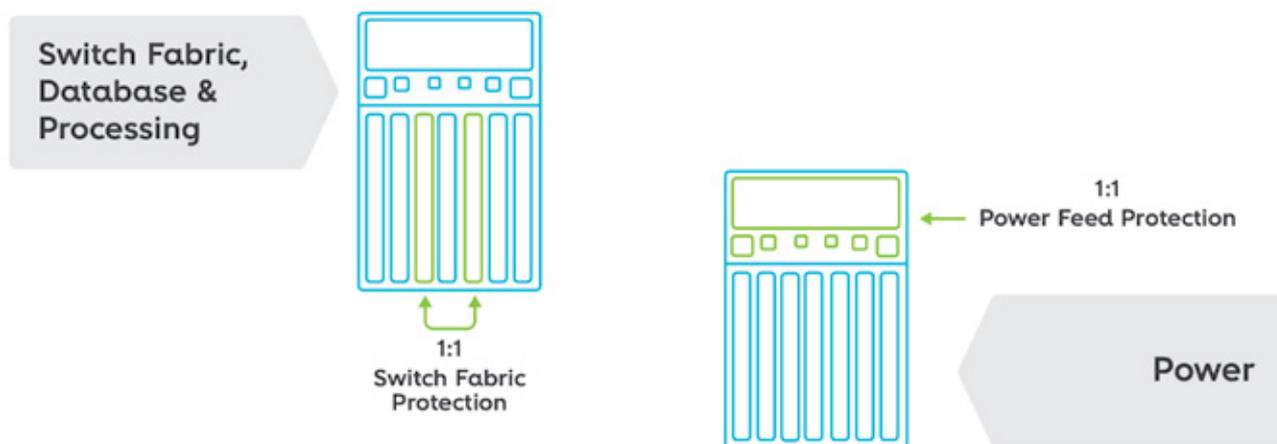


Altice Labs Central Office overview

Main benefits value added

Density	Leading density: 256 PON / 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 (1G, 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	Software Defined Access Node (SDAN) functionalities towards fully compliant SDN/NFV environment		Ready for virtualization
Future-Proof	Allowing next-gen 10G/25G/50G PON		Investment protection

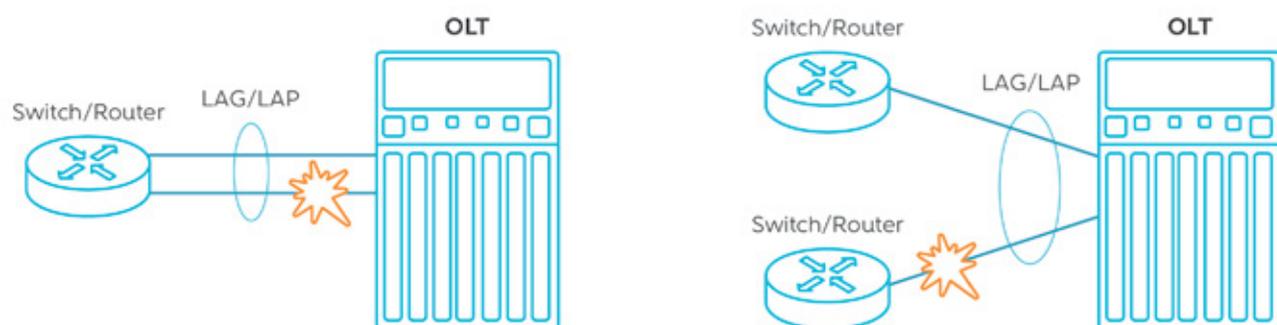
Common element protection



Common element protection

Automatic Protection Switching is achieved In less than 50ms!

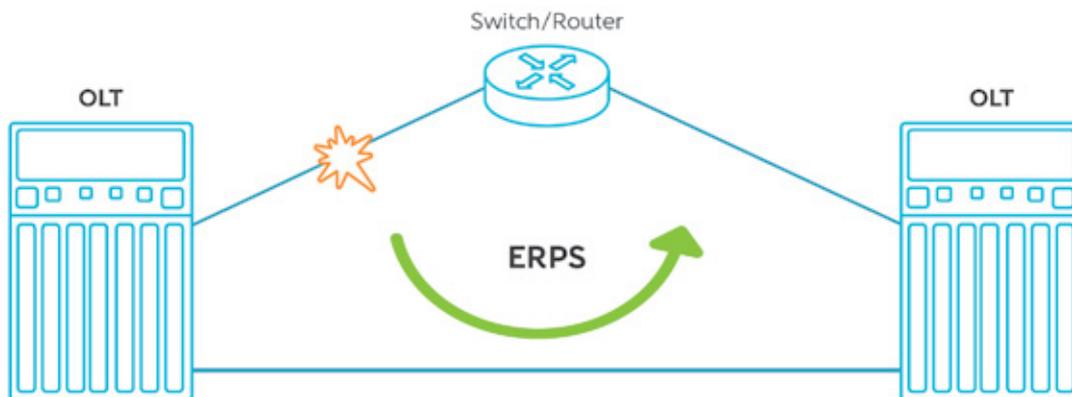
Link Aggregation



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.

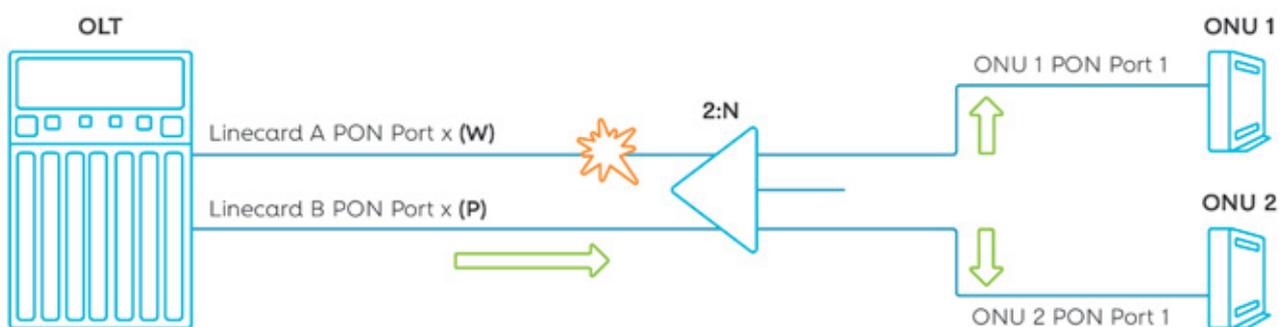
Ring Protection



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).

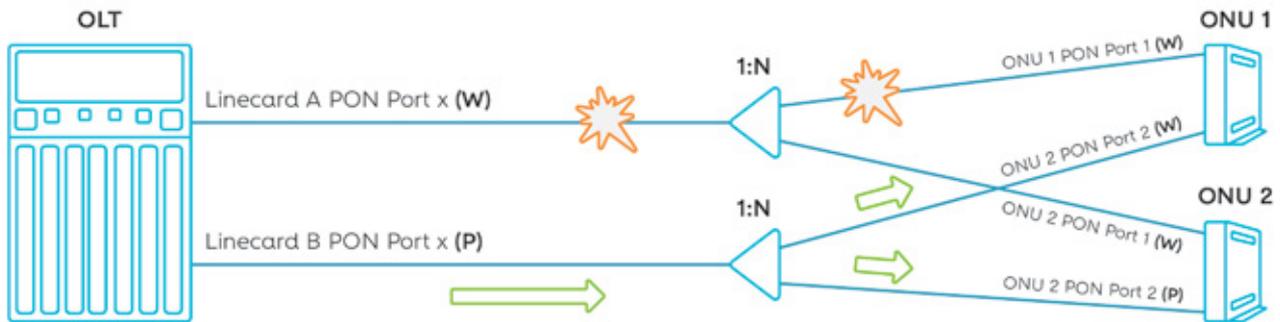
Type B Protection



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!

Type C Protection

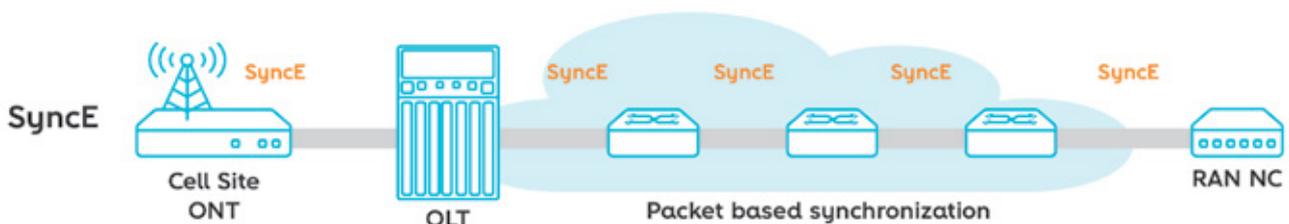


Type C Protection

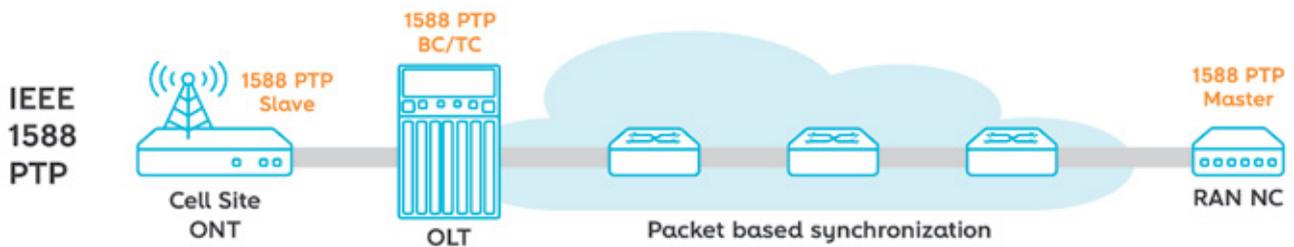
- The OLT and ONU uses both two PON ports (Working and Protection)
- Mesh ODN is needed
- Configure the Working (W) and the Protection (P) PON interfaces
- In case of LOS in W ports the traffic will automatically switch to P port in less than 50ms!

Synchronization

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



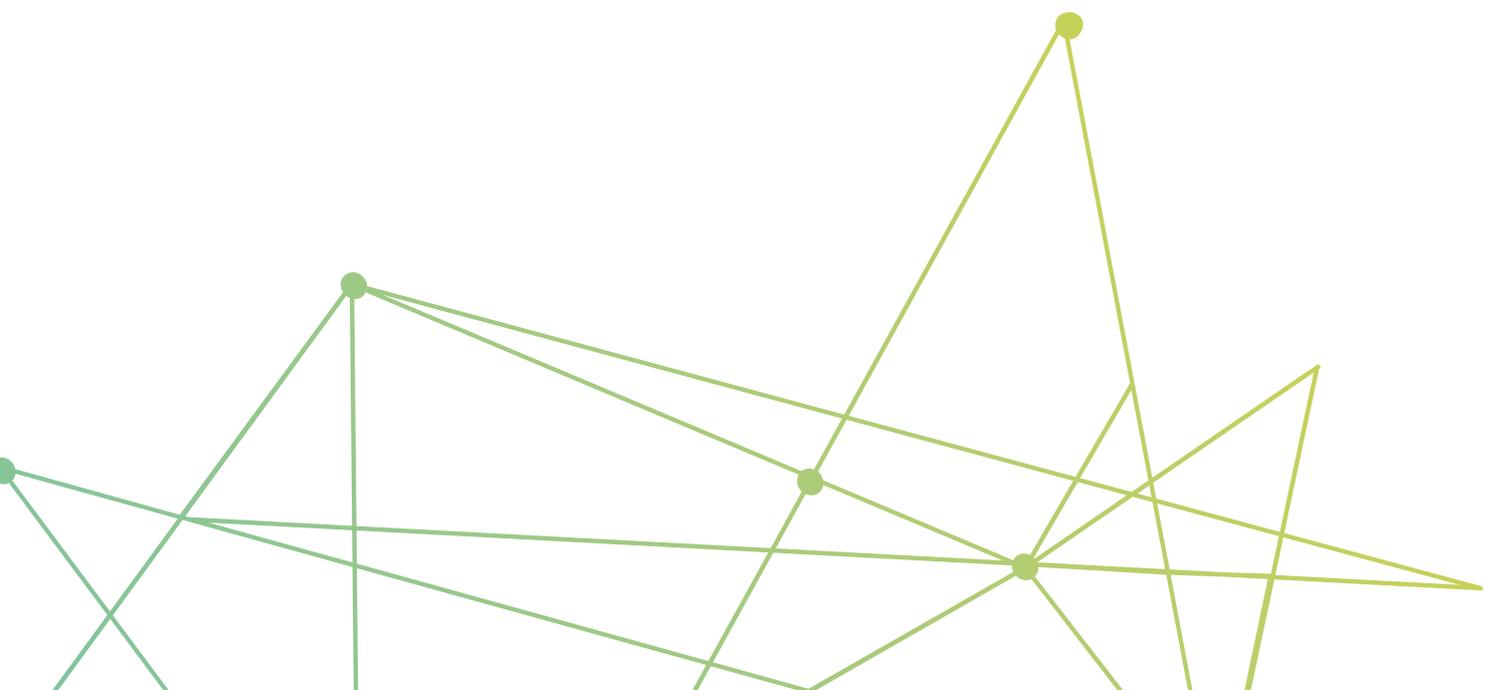
SyncE Synchronization



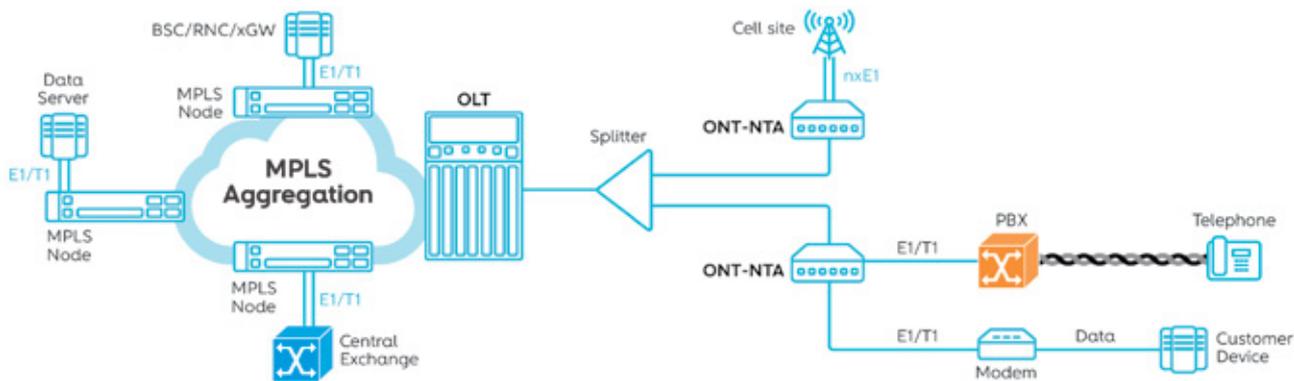
1588 PTP Synchronization - OLT as Border Controller (BC)

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). Constrains 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

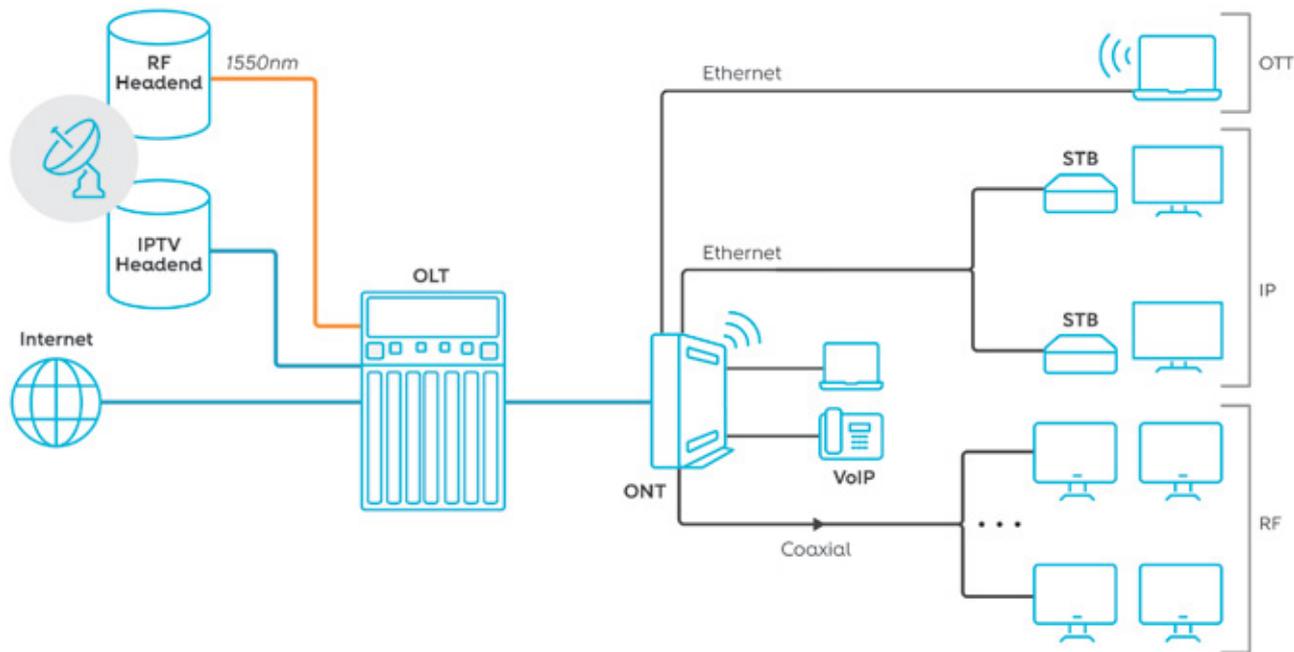


Circuit Emulation



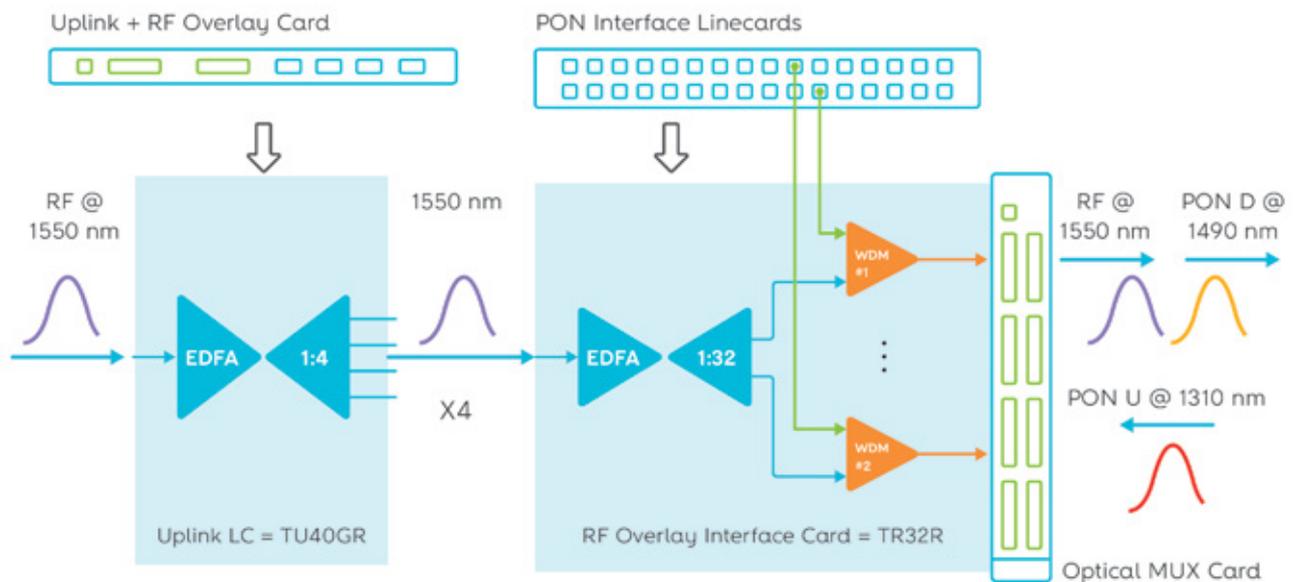
TDM E1/T1 circuit Emulation

TV Business Model



Video service delivery

RF Overlay Features



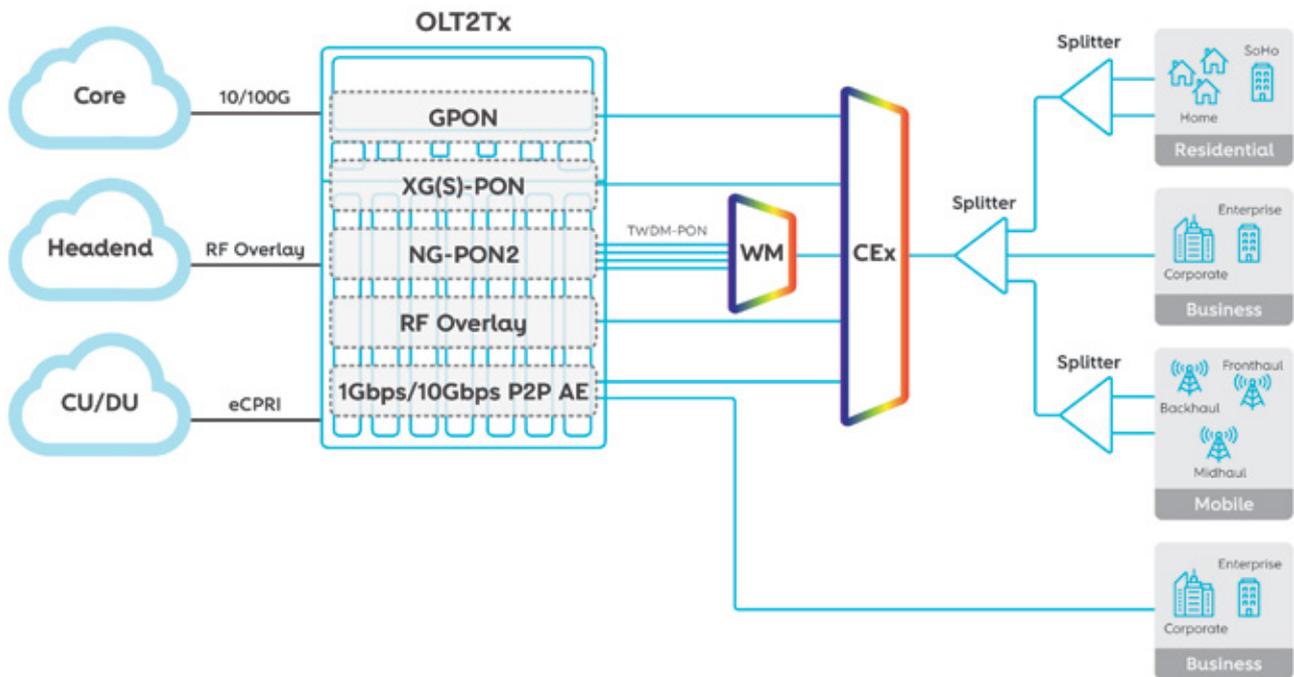
RF Overlay Capabilities (GPON use case)

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

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



OLT2Tx Interconnection

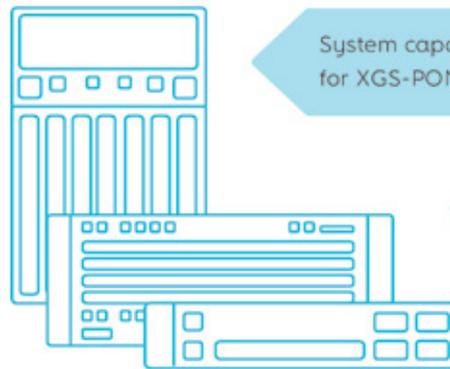


OLT2Tx Central Office

OLT2Tx supports GPON, XG(S)-PON, NG-PON2, PtP GE/10GE as well as overlay eCPRI 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 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 (50G PON)
- Up to 400Gbps/slot backplane capacity
- Nx100GE Uplink Interfacing
- NG-PON2 / XGS-PON / GPON
- Active Ethernet (PtP) 10G/1G

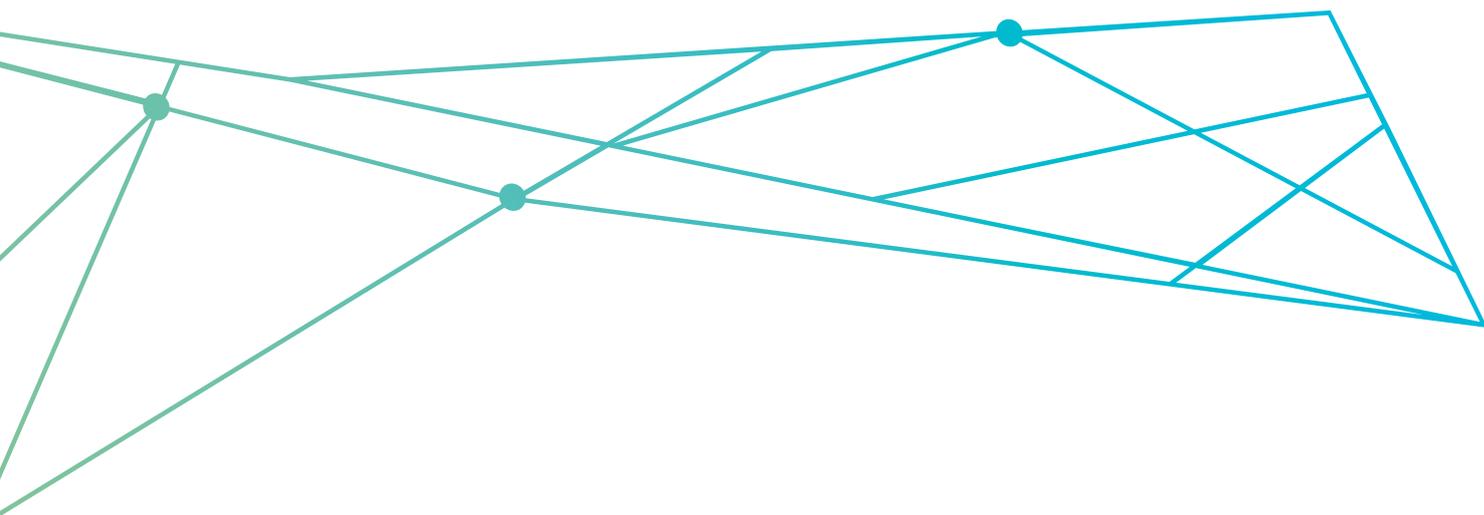
High reliability

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

SDN

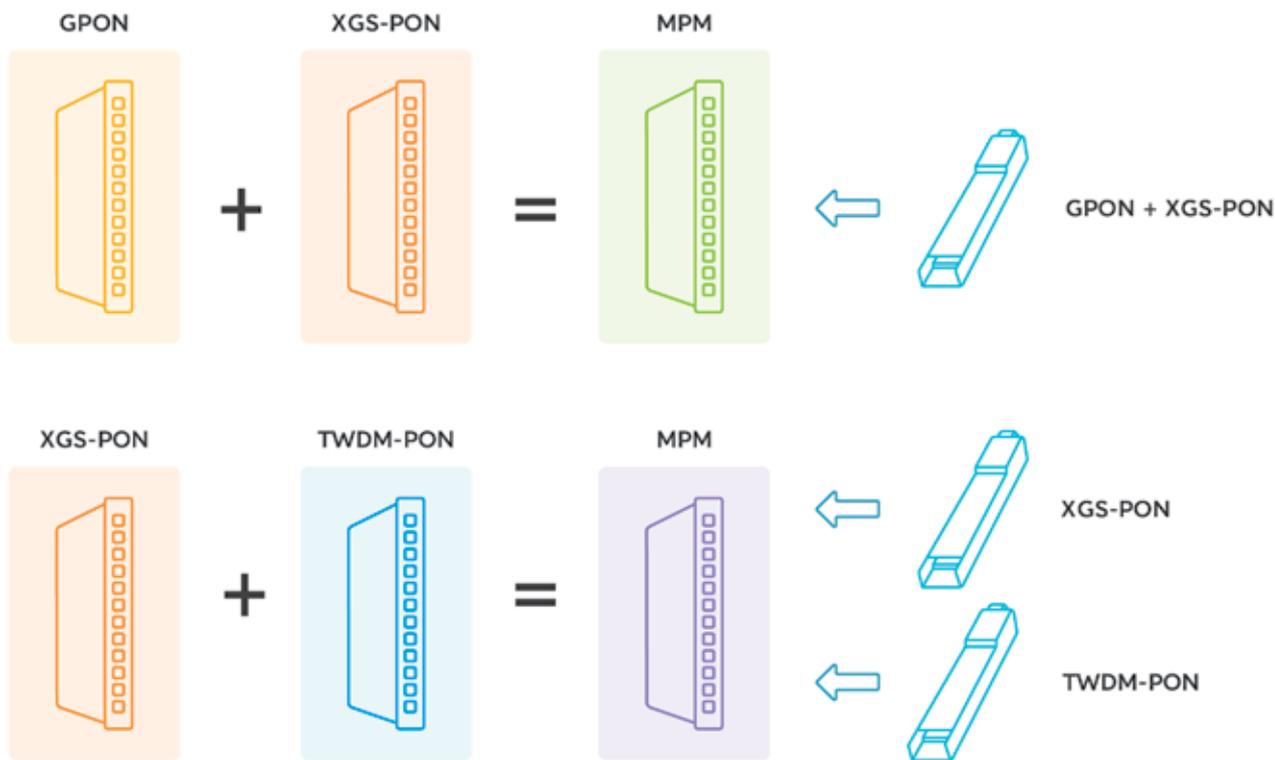
- Seamless migration towards Software Defined Access Node (SDAN)

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



Evolution towards SDAN (Software Defined Access Node)

To be able to explore new business opportunities, the Central Office (CO) needs a major transformation to make it more agile and flexible in the termination of access networks and first aggregation stages. To address such transformation, “softwarization” of the CO is a key factor that can be achieved through software-defined networks (SDN) and network function virtualization (NFV) concepts.

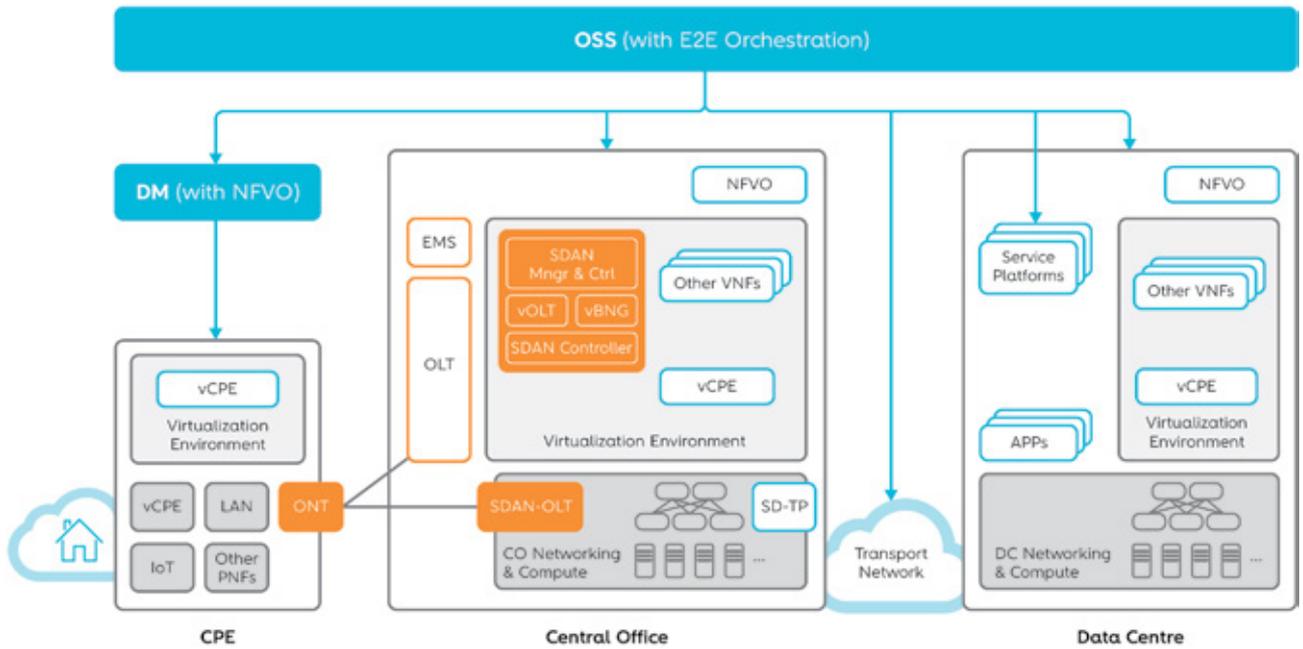
Many network functions are gradually stopped being boxed into network elements and emerge now as disaggregated software pieces running on top of IT infrastructure. Those network functions are moved to an IT centered CO working as a common termination for access networks and at the same time connecting to a number of data resources that are resident at cloud data centres that extends from the edge to the core network.

On the referred scenario, the CO is the space where the advantages of “softwarization” become evident for access networks: common network functions running as software on standard IT infrastructure may serve passive optical networks (PON), cable, mobile or other access networks, regardless of their different domain.

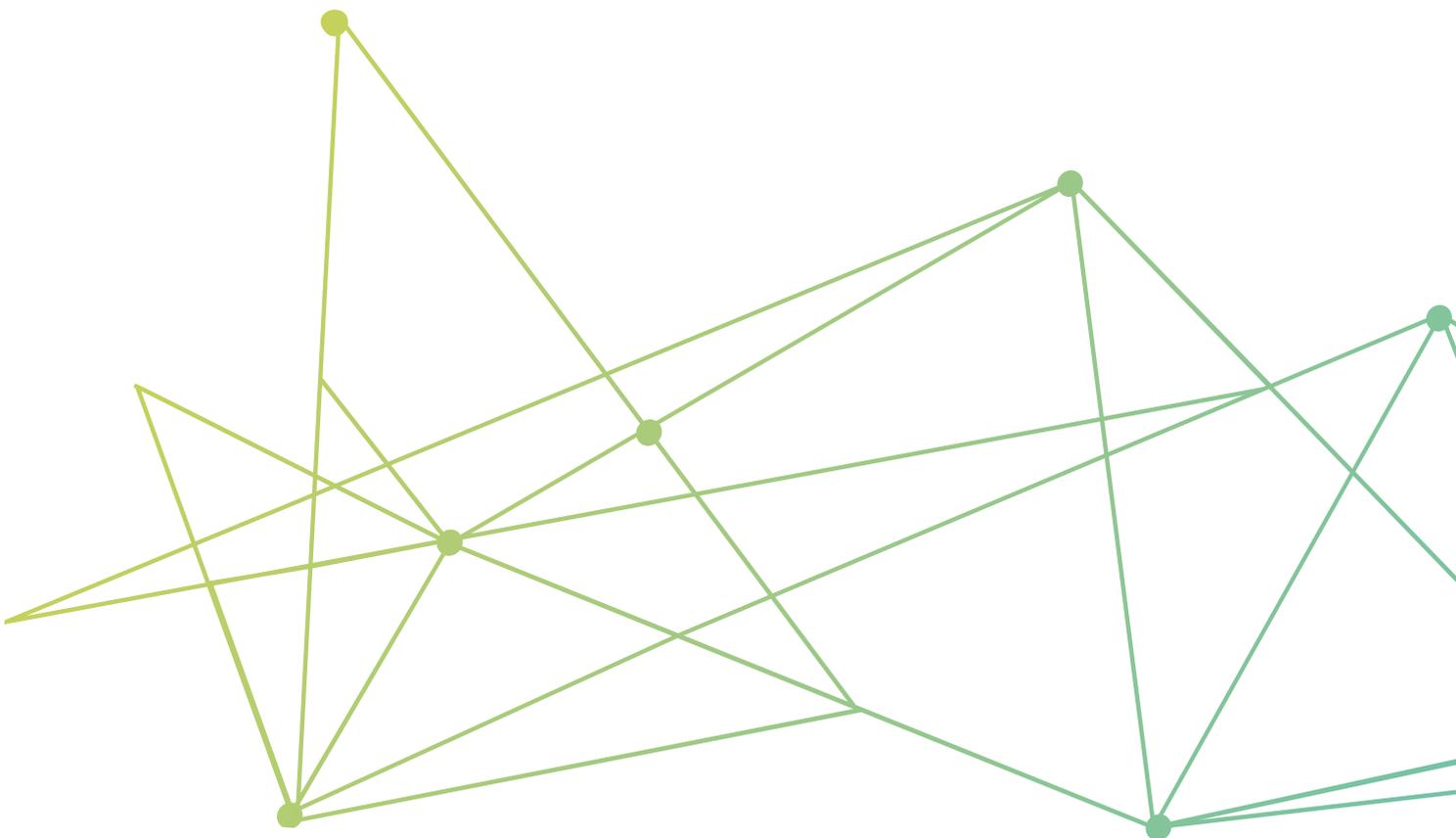
To materialize the upper referred vision, an SDN/NFV based approach is underway:

- Specific physical aspects of access networks are addressed by the software-defined access nodes (**SDAN**), like the SDAN-OLT. This physical element converts the access media to Ethernet, interfacing to the central office switching fabric;
- Most management and control functions will be virtualized and disaggregated, running on the computing infrastructure. Other functions, usually virtualized network functions (**VNF**), may be orchestrated to be instantiated both in the data plane and in the control plane, performing various roles that span from service-specific network functions to 3rd party functions like customer VNF, e.g. those that have to be run on the network edge to enforce ultra-low latency requirements;
- The “softwarization” of many functions is making it possible to distribute them more rationally, dynamically running them where (and when) they are most needed, more efficient, or less expensive, be it at the CO, customer premises equipment, or core data centres.





Altice Labs virtualization ecosystem (PON scenario)



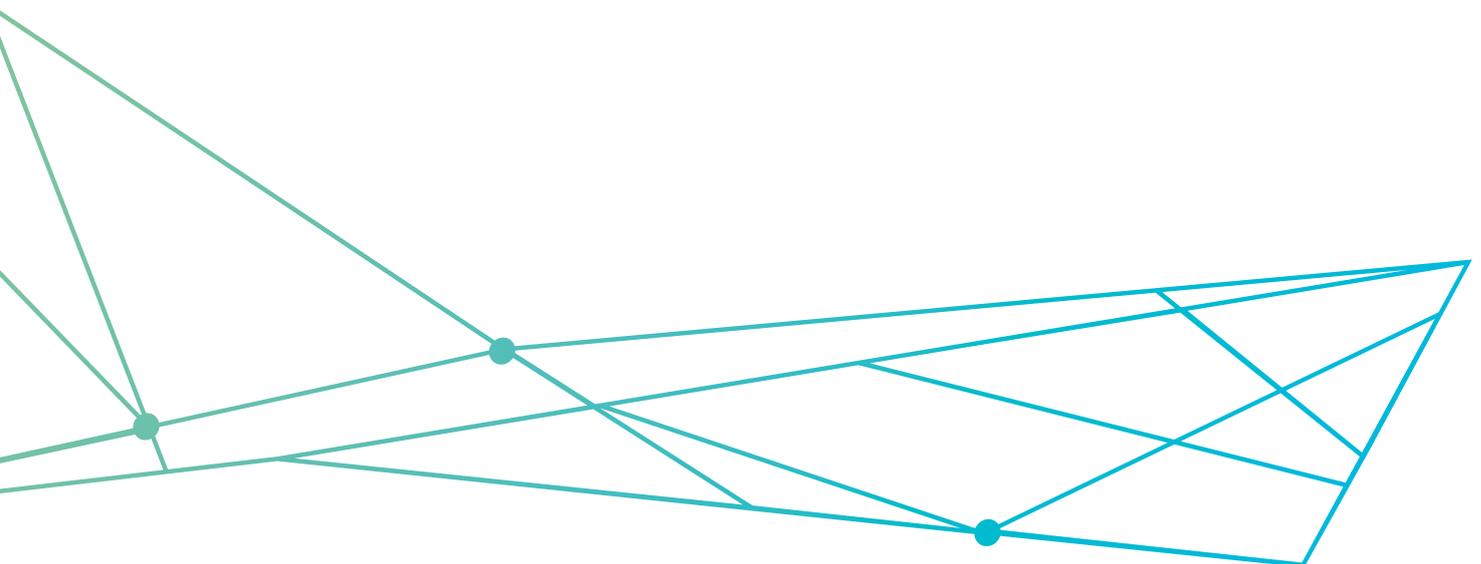
Previous figure represents Altice Labs vision towards the abovementioned digital transformation of the CO.

A set of disaggregated functions are orchestrated to perform the duties of the OLT and BNG control planes. These include authentication, multicast control, session control, service control, address management, etc. All time-critical data and control planes functions are still implemented in the physical SDAN-OLT.

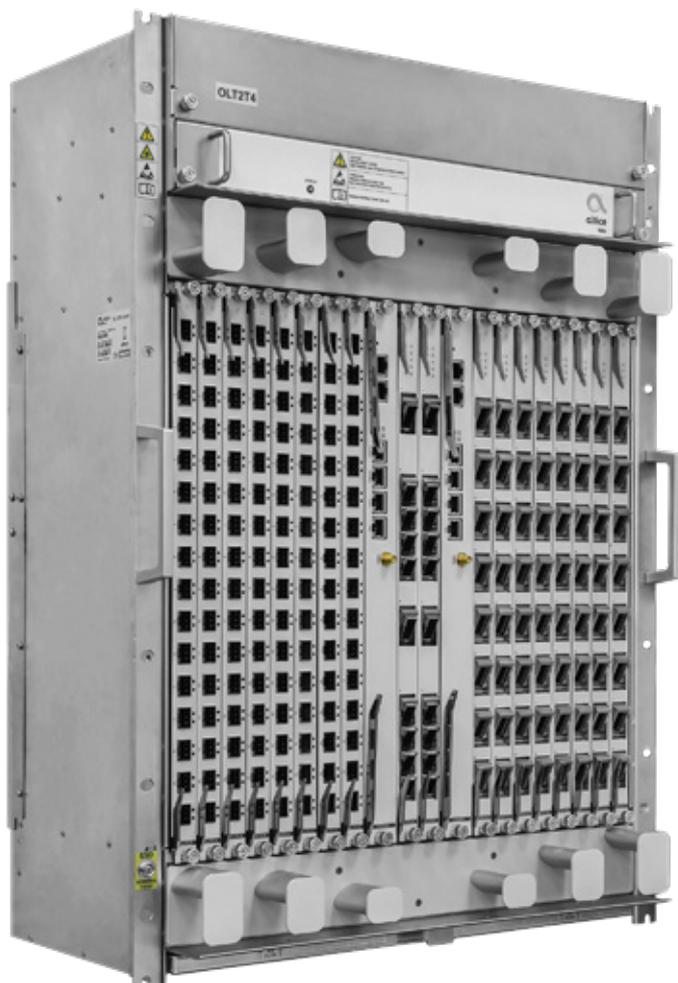
The SDAN Manager & Controller exposes a common API for controlling the Access Network and is responsible for configuring the overall flows across the user plane, accounting, performance measurement and security management.

For the shared resource management, the Altice Labs OLT2Tx equipment family delivers the wholesale VLAN Business Ethernet Services / Transparent VLAN Services (VBES/TLS) service model where several service VLANs may be configured for different Virtual Network Operators (VNOs) sharing the same active and passive infrastructure. In the context of resource sharing/slicing architecture, Altice Labs is committed with Broadband Forum TR-370 (Fixed Access Network Sharing - Architecture and Nodal Requirements).

Moreover, at the management layer, for the integration with 3rd party Operation Support Systems (OSS), the AGORA NMS offers a complete suite of Northbound Interfacing (NBI) HTTP/REST and SNMP Alarm APIs. Those APIs are available for Provisioning, Inventory, Performance and Fault management and may be acquired for direct and highly reliable interconnection with 3rd party upper layer OSSs.



10G PON Central Office



[Download datasheet](#)

Scan the QR code to view more information about this

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



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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



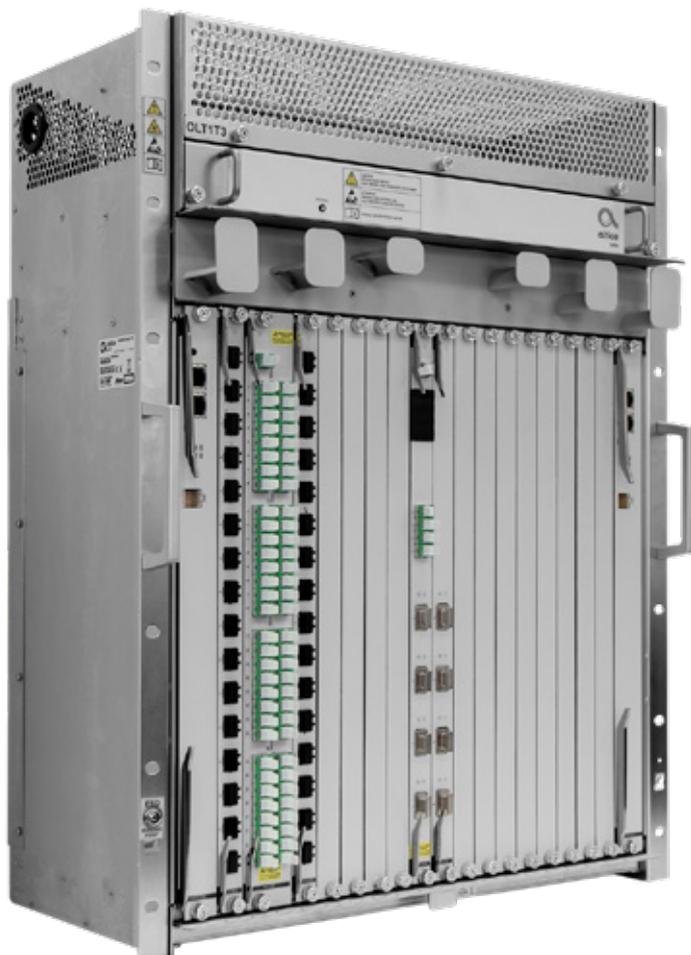
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OLT2T0

- 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



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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



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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



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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

GPON Central Office

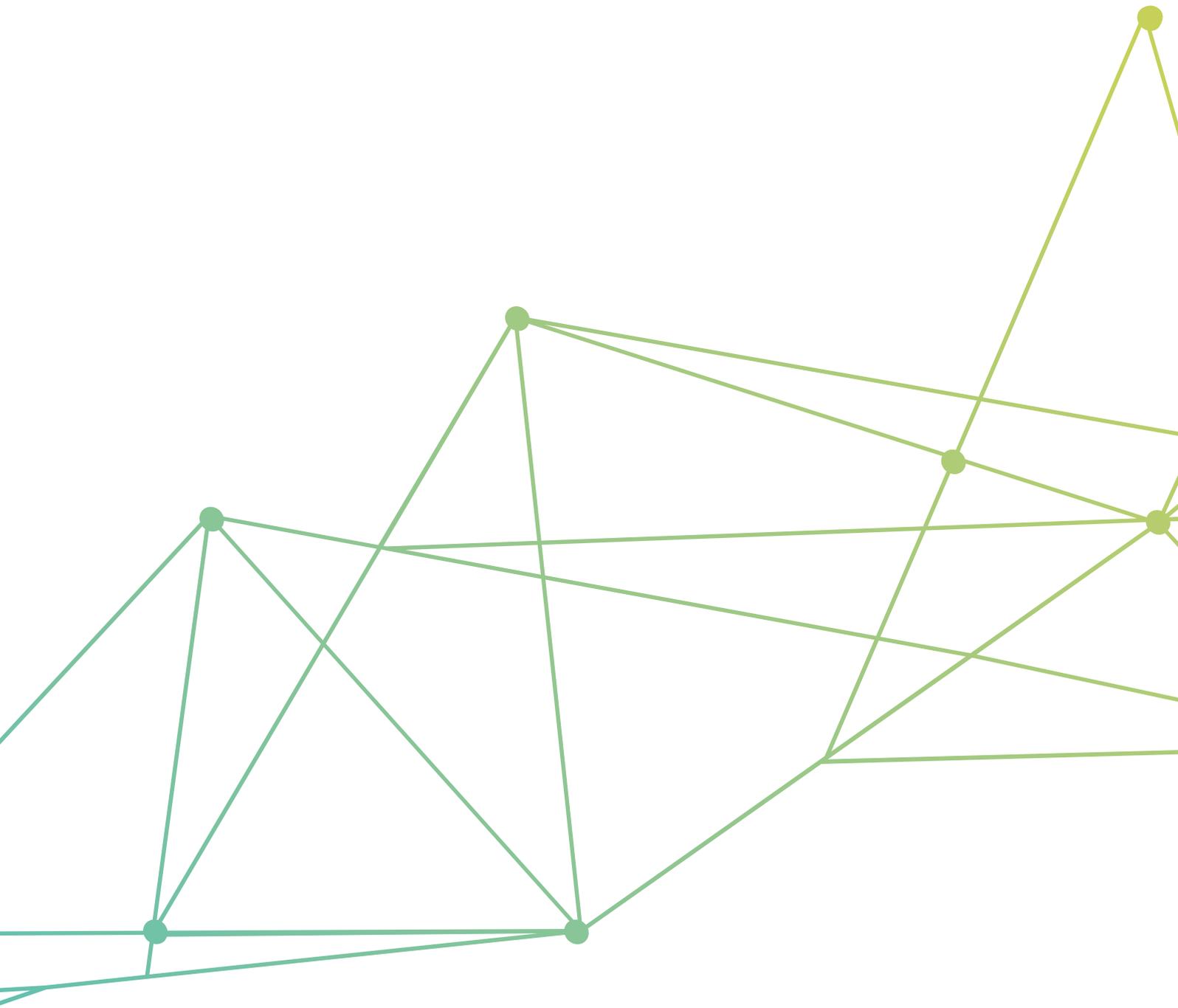


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OLT1T0E

- 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: 16x GPON





CUSTOMER EQUIPMENT



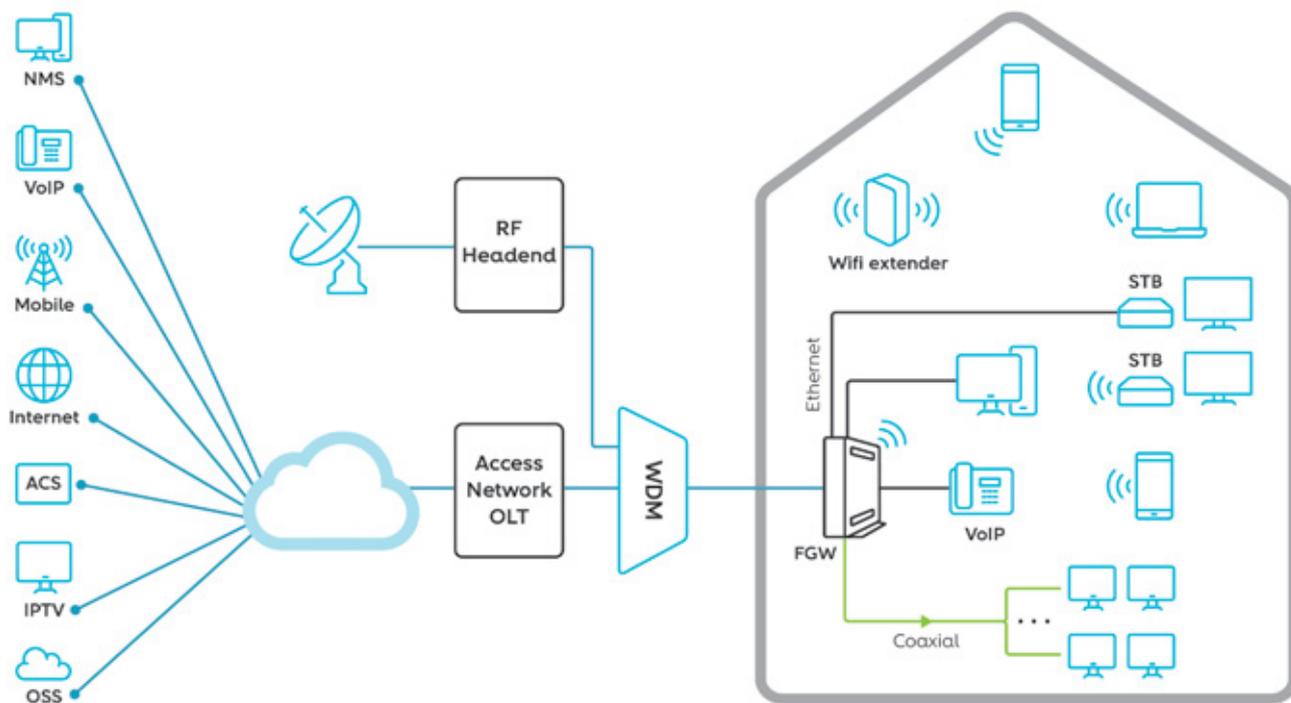
Customer Premises

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Customer Premises Equipments

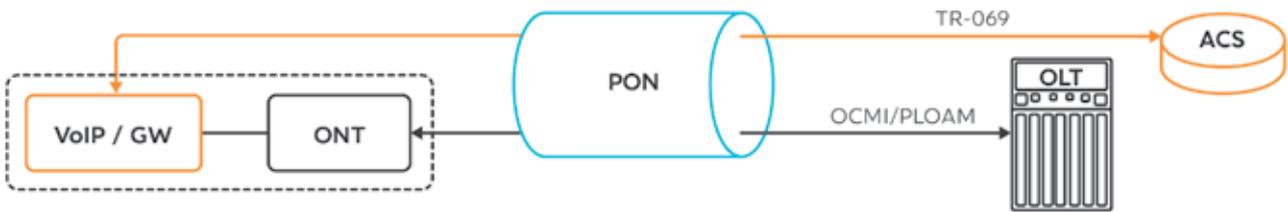
The Altice Labs holds a large experience on developing Customer Premises Equipment solutions targeting the home, business and mobile environments. Mainly focused on passive optical network (xPON) terminal equipment, Altice Labs portfolio also has put relevant effort in other communication technologies like fiber Active Ethernet and coaxial cabling DOCSIS.

At the xPON level, our ONT equipment support multi-play services based on ITU-T rec. G.984 (GPON), G.987 (XG-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 backhaul as well as dedicated TDM links for business service delivery are also available.



In-house networking

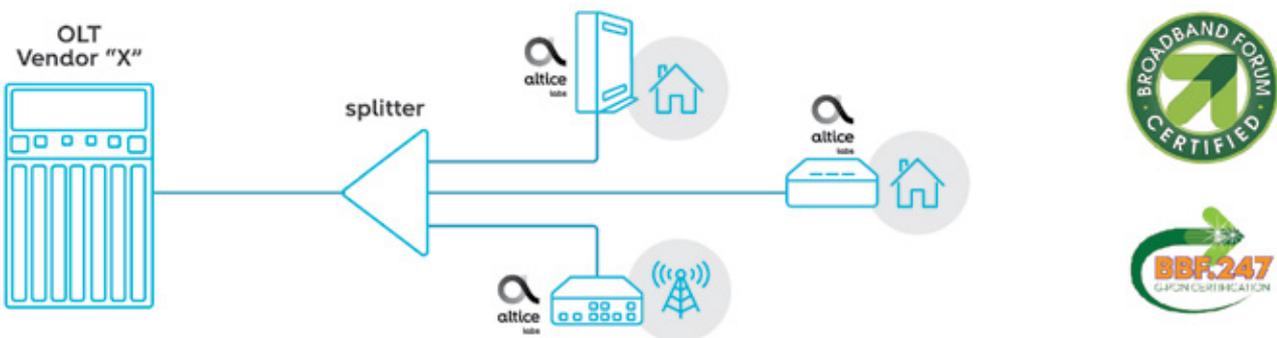
At the management level the ONT Management and Control Interface (OMCI) is available according with the corresponding ITU standards. TR-069 protocol is also available and allows for L3 features to be mass remotely configured, troubleshoot and managed by an Auto Configuration Server (ACS).



Remote management through TR-069

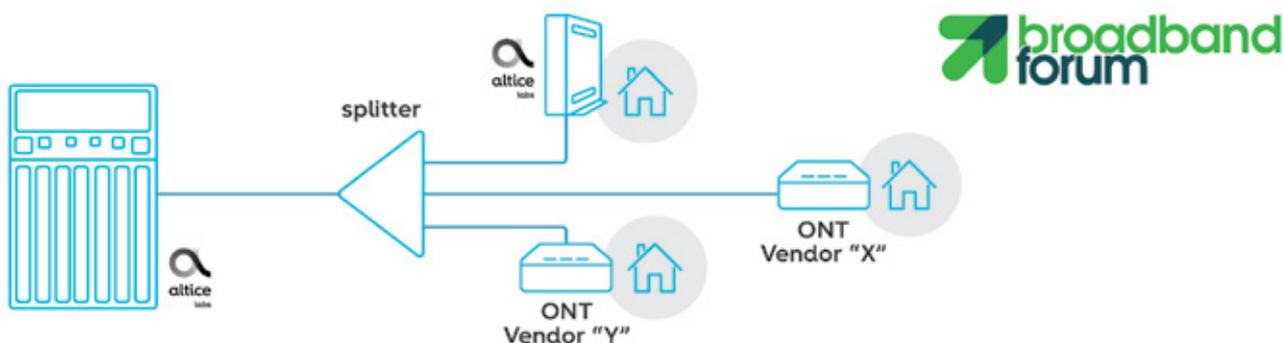
Mass remote management through OMCI and TR-069 standards, thus offers a full remote control without user intervention; TR-142 defines a Virtual UNI between the OMCI and TR-069 management domains.

Altime 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 Altime Labs OLT portfolio.



OLT interoperability scenario

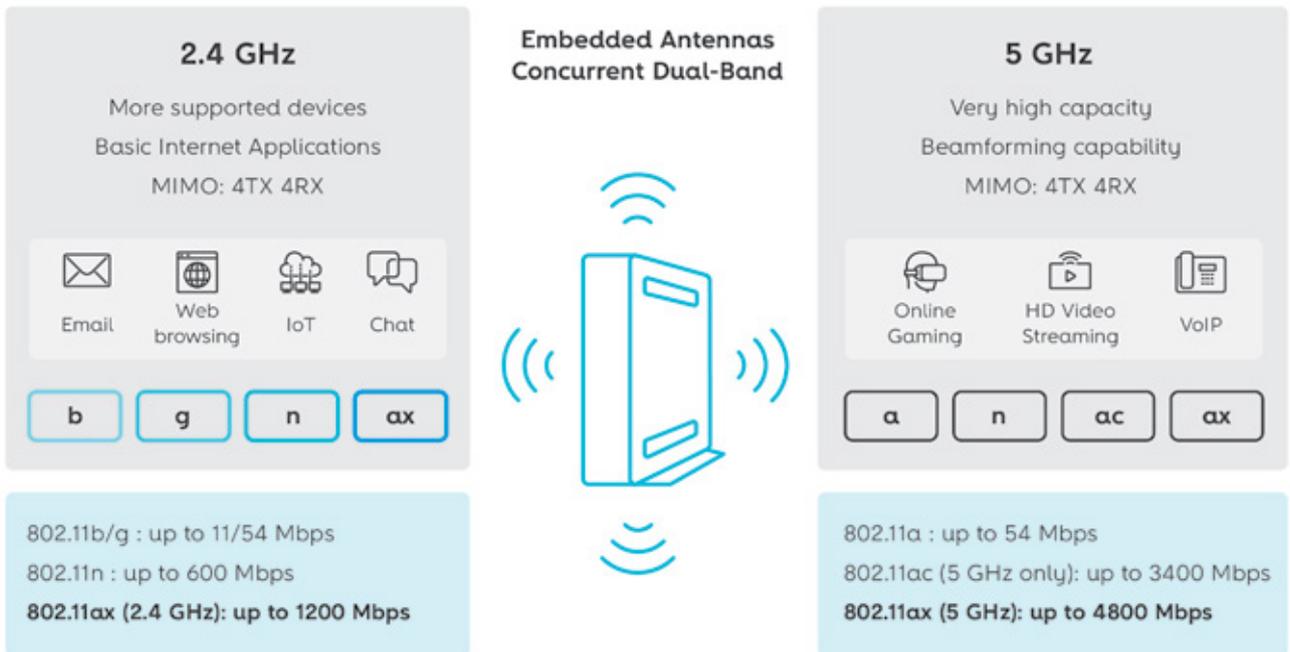
Regardless of 1G PON and 10G PON equipment families, Altice Labs deployment scenarios fits from Fiber-to-the-Home (FTTH), Fiber-to-the-Cell (FTTCell) and Fiber-to-the-Distribution Point (FTTDP) at the same time that Active Ethernet scenario may be simultaneously covered for some of our CPE devices. The 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 on both 2.4 GHz and 5 GHz frequencies and with best of breed MIMO options.

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.





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.

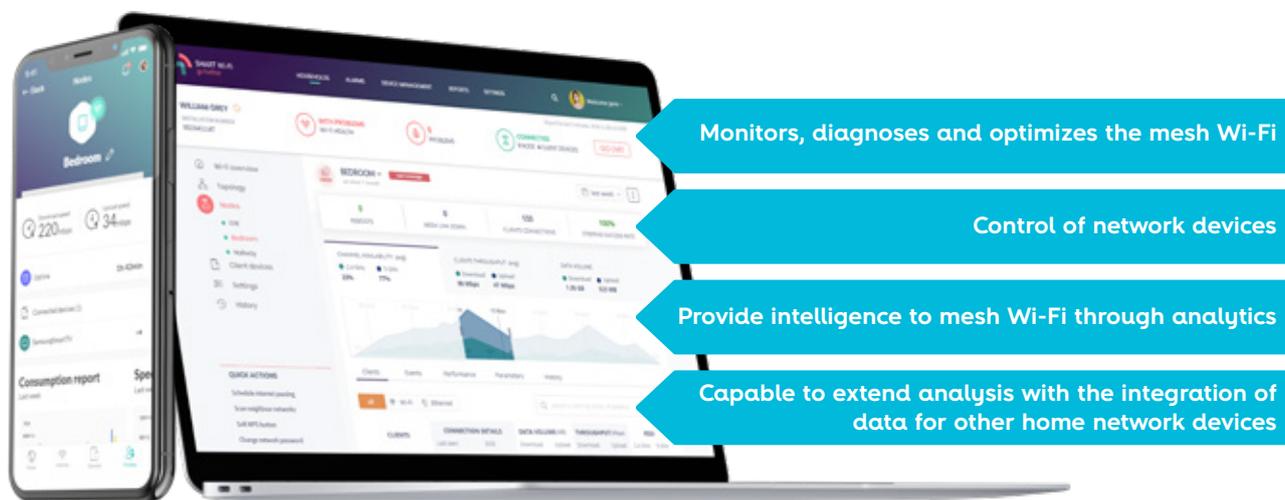


Smart Mesh Wi-Fi enhanced wireless experience

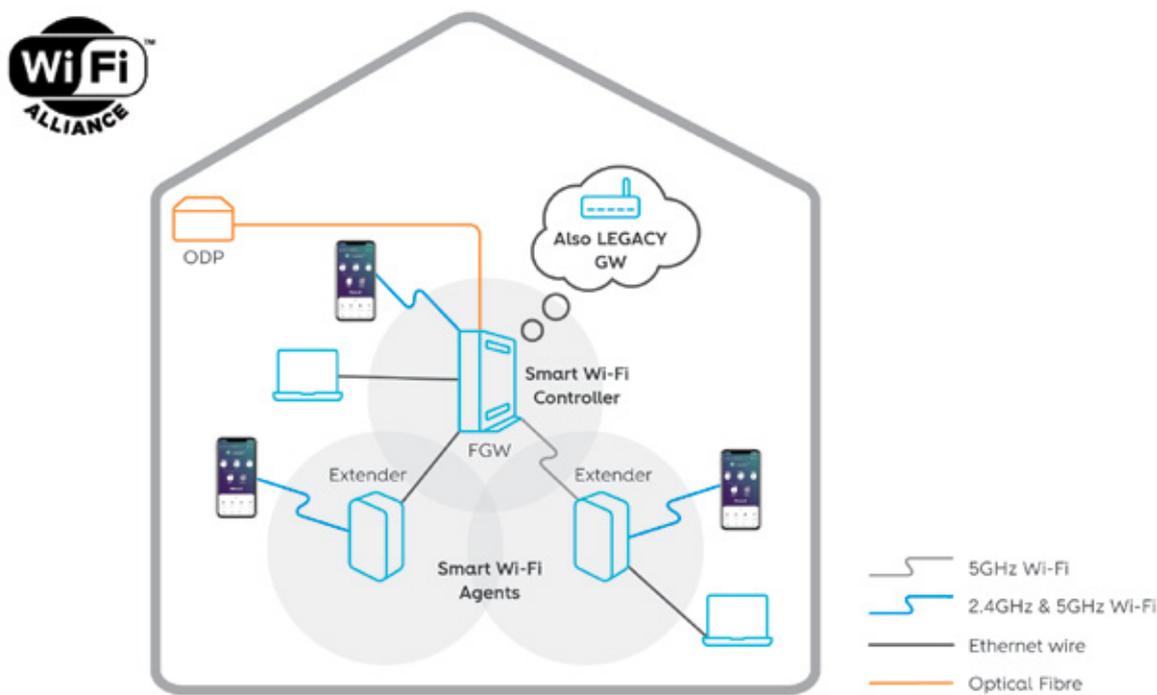
The massive increase in connected devices has resulted in drastic demand for Wi-Fi connectivity throughout the home. Consumers own multiple mobile devices, including IoT and smart home connected products that claim for quality airtime at the home and outdoor areas with uniform Wi-Fi coverage. Traditionally, 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 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 incorporate hardware (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) supported on high performance state of the art Wi-Fi interfacing.

Wi-Fi EasyMesh™ networks utilize multiple APs that work together to ensure all areas of the home have complete Wi-Fi coverage and enable changing network conditions to deliver a consistent, 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 @ 2.4GHz & 5GHz.
- Interoperable mesh solution compliant with Wi-Fi @Alliance Multi-AP specification
- Optimal QoS and throughput performance
- Both wireless and wireline (Ethernet) connections may be used to link FGW and Extenders while FGW acts as a WLAN controller to the extenders

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
- Provide intelligence to mesh Wi-Fi through analytics
- Cloud platform that can extend to provide full visibility for Home networks and CPEs
- Mobile app control inside/outside home network

GPON

ONT-SFU



GS1000GH

- L2 Based service
- Voice interfacing
- 1POTS
- 35/1.4 x 143/5.6 x 103/4.1 (HxWxD mm/")
- 158 g / 0.35 lb



Download datasheet

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GS0100GH

- L2 Based service
- Multi-play support
- GE Wirespeed
- 1GE
- 35/1.4 x 143/5.6 x 103/4.1 (HxWxD mm/")
- <700g / 1.5 lb



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GPON



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GS0110GH

- L2 Based service
- Multi-play support
- Embedded RF Overlay interfacing
- 1GE + 1RF
- 35/1.4 x 143/5.6 x 103/4.1 (HxWxD mm/")
- 158 g / 0.35 lb



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GS1100GH

- L2 Based service
- Multi-play support
- Embedded Voice interfacing
- 1POTS + 1GE
- 35/1.4 x 143/5.6 x 103/4.1 (HxWxD mm/")
- 158 g / 0.35 lb

GPON

ONT-RGW



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GR2410P

- L2 + L3 Based service
- Multi-play support
- Embedded Voice, Power over Ethernet (PoE) and USB interfacing
- 2POTS + 4GE + 1RF + 2USB(2.0)
- 3PoE 6.5W 802.3af + 1PoE 27W 802.3at
- 40/1.6 x 210/8.3 x 210/8.3 (HxWxD mm/")
- 555 g / 1.22 lb



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GR2402G

- L2 + L3 Based service
- Multi-play support
- Embedded Voice, Wi-Fi and USB interfacing
- 2POTS + 4GE + Wi-Fi + 2USB(2.0)
- Wi-Fi 802.11 b/g/n @2.4GHz (2x2 20dBm EIRP)
- 40/1.6 x 210/8.3 x 210/8.3 (HxWxD mm/")
- 483 g / 1.06 lb

GPON



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GR2412G

- L2 + L3 Based service
- Multi-play support
- Embedded Voice, RF Overlay, Wi-Fi and USB interfacing
- 2POTS + 4GE + 1RF + Wi-Fi + 2USB(2.0)
- Wi-Fi 802.11 b/g/n @2.4GHz (2x2 20dBm EIRP)
- 40/1.6 x 210/8.3 x 210/8.3 (HxWxD mm/")
- 490 g / 1.08 lb

Fiber Gateway



[Download datasheet](#)

Scan the QR code to view more information about this

GR241AG

- L2 + L3 Based service
- Multi-play support
- Embedded Voice, RF Overlay, Wi-Fi and USB interfacing
- Wi-Fi Alliance® Multi-AP Specification
- 2POTS + 4GE + 1RF + Wi-Fi + 1USB(2.0)
- Wi-Fi 802.11 b/g/n @2.4GHz (3x3 20dBm EIRP) + 802.11 n/a/ac @5GHz (4x4 30dBm EIRP)
- 244/9.61 x 35/1.38 x 202/7.95 (HxWxD mm/")
- 834 g / 1.84 lb

GPON



GR240BG

- L2 + L3 Based service
- Multi-play support
- Embedded Voice, Wi-Fi and USB interfacing
- Wi-Fi Alliance® Multi-AP Specification
- 2POTS + 4GE + Wi-Fi + 1USB(2.0)
- Wi-Fi 802.11 b/g/n @2.4GHz (4x4 34dBm EIRP) + 802.11 n/a/ac @5GHz (4x4 34dBm EIRP) US Normative
- 244/9.61 x 35/1.38 x 202/7.95 (HxWxD mm/")
- 858 g / 1.89 lb



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GR140DG

- L2 + L3 Based service
- Multi-play support
- Wi-Fi Alliance® Multi-AP Specification
- Embedded Voice, Wi-Fi and USB interfacing
- 1POTS + 4GE + Wi-Fi + 1USB (C Type)
- Wi-Fi 802.11 b/g/n/ax @2.4GHz (4x4 20dBm EIRP) + 802.11 n/a/ac/ax @5GHz (4x4 30dBm EIRP)
- 244/9.61 x 35/1.38 x 202/7.95 (HxWxD mm/")
- <800g / 1.76 lb



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GPON



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GR141DG

- L2 + L3 Based service
- Multi-play support
- Wi-Fi Alliance® Multi-AP Specification
- Embedded Voice, Wi-Fi, RF Overlay and USB interfacing
- 1POTS + 4GE + 1RF + Wi-Fi + 1USB (C Type)
- Wi-Fi 802.11 b/g/n/ax @2.4GHz (4x4 20dBm EIRP) + 802.11 n/a/ac/ax @5GHz (4x4 30dBm EIRP)
- 244/9.61 x 35/1.38 x 202/7.95 (HxWxD mm/")
- <800g / 1.76 lb



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GR140EG

- L2 + L3 Based service
- Multi-play support
- Embedded Voice, Wi-Fi and USB interfacing
- Wi-Fi Alliance® Multi-AP Specification
- 1POTS + 4GE + Wi-Fi + 1USB (C Type)
- Wi-Fi 802.11 b/g/n/ax @2.4GHz (4x4 34dBm EIRP) + 802.11 n/a/ac/ax @5GHz (4x4 34dBm EIRP) US Normative
- 244/9.61 x 35/1.38 x 202/7.95 (HxWxD mm/")
- <800g / 1.76 lb

GPON

ONT-MBH



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- L2 Based service
- Mobile backhaul support
- Redundant power feed
- 1GE
- 45/1.8 x 315/12.4 x 205/8.1 (HxWxD mm/"), 19" rackmount option
- 994 g / 2.19 lb

ONT-NTA



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GB04004GA

- L2 + L3 Based service
- Legacy continuity support
- Circuit Emulation Service over Packet-Switched Network (CESoPSN) and Structure Agnostic TDM over Packet (SAToP)
- Embedded E1/T1 and USB(2.0) interfacing
- 4GE + 4E1/T1 + 2USB 2.0
- 45/1.8 x 315/12.4 x 205/8.1 (HxWxD mm/"), 19" rackmount option
- 1751g / 3.86 lb

10G PON

ONT-SFU



T/XSS0200X

- L2 Based service
- 10G TWDM-PON (NG-PON2) / XGS-PON Enabled
- 1GE/2.5GE + 1SFP+(10GE)
- 40/1.6 x 210/8.3 x 210/8.3 (HxWxD mm/“)
- 483 g / 1.06 lb



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XSR150DX

- L2 + L3 Based service
- Multi-play support
- Wi-Fi Alliance® Multi-AP Specification Embedded
- 10G XG(S)-PON Enabled
- Embedded Voice, Wi-Fi and USB interfacing
- 1POTS + 4GE + 1SFP+(10GE) + Wi-Fi + 1USB 3.1
- Wi-Fi 802.11 b/g/n/ax @2.4GHz (4x4 20dBm EIRP) + 802.11 n/a/ac/ax @5GHz (4x4 30dBm EIRP)
- 244/9.61 x 35/1.38 x 202/7.95 (HxWxD mm/“)
- <800g / 1.76 lb



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10G PON



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XSR151DX

- L2 + L3 Based service
- Multi-play support
- Wi-Fi Alliance® Multi-AP Specification Embedded
- 10G XG(S)-PON Enabled
- Embedded Voice, Wi-Fi and USB interfacing
- 1POTS + 4GE + 1SFP+(10GE) + Wi-Fi + 1USB 3.1 + 1RF
- Wi-Fi 802.11 b/g/n/ax @2.4GHz (4x4 20dBm EIRP) + 802.11 n/a/ac/ax @5GHz (4x4 30dBm EIRP)
- 244/9.61 x 35/1.38 x 202/7.95 (HxWxD mm/")
- <800g / 1.76 lb



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XSR150EX

- L2 + L3 Based service
- Multi-play support
- Wi-Fi Alliance® Multi-AP Specification Embedded
- 10G XG(S)-PON Enabled
- Embedded Voice, Wi-Fi and USB interfacing
- 1POTS + 4GE + 1SFP+(10GE) + Wi-Fi + 1USB 3.1
- Wi-Fi 802.11 b/g/n/ax @2.4GHz (4x4 34dBm EIRP) + 802.11 n/a/ac/ax @5GHz (4x4 34dBm EIRP) US Normative
- 244/9.61 x 35/1.38 x 202/7.95 (HxWxD mm/")
- <800g / 1.76 lb

Smart Mesh



Download datasheet

Scan the QR code to view more information about this

D2150G

- 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 about this

D2260G

- 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

DOCSiS Gateway



CR12CDG

- L2 + L3 Based service
- Multi-play Service
- DOCSiS 3.0 enabled
- Embedded Voice, Wi-Fi and USB interfacing
- 1POTS + 2GE + Wi-Fi + 1USB 3.1
- Wi-Fi 802.11 b/g/n @2.4GHz (3x3 20dBm EIRP) + 802.11 n/a/ac @5GHz (4x4 30dBm EIRP)
- 244/9.61 x 35/1.38 x 202/7.95 (HxWxD mm/")
- <800g / 1.76 lb



Download datasheet

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CR12CEG

- L2 + L3 Based service
- Multi-play Service
- DOCSiS 3.0 enabled
- Embedded Voice, Wi-Fi and USB interfacing
- 1POTS + 2GE + Wi-Fi + 1USB 3.1
- Wi-Fi 802.11 b/g/n @2.4GHz (3x3 34dBm EIRP) + 802.11 n/a/ac @5GHz (4x4 34dBm EIRP) US Normative
- 244/9.61 x 35/1.38 x 202/7.95 (HxWxD mm/")
- <800g / 1.76 lb



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DOCSiS Gateway



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CR12DDG

- L2 + L3 Based service
- Multi-play Service
- DOCSiS 3.1 enabled
- Embedded Voice, Wi-Fi and USB interfacing
- 1POTS + 2GE + Wi-Fi + 1USB 3.1
- Wi-Fi 802.11 b/g/n/ax @2.4GHz (4x4 20dBm EIRP) + 802.11 n/a/ac/ax @5GHz (4x4 30dBm EIRP)
- 244/9.61 x 35/1.38 x 202/7.95 (HxWxD mm/")
- <800g / 1.76 lb

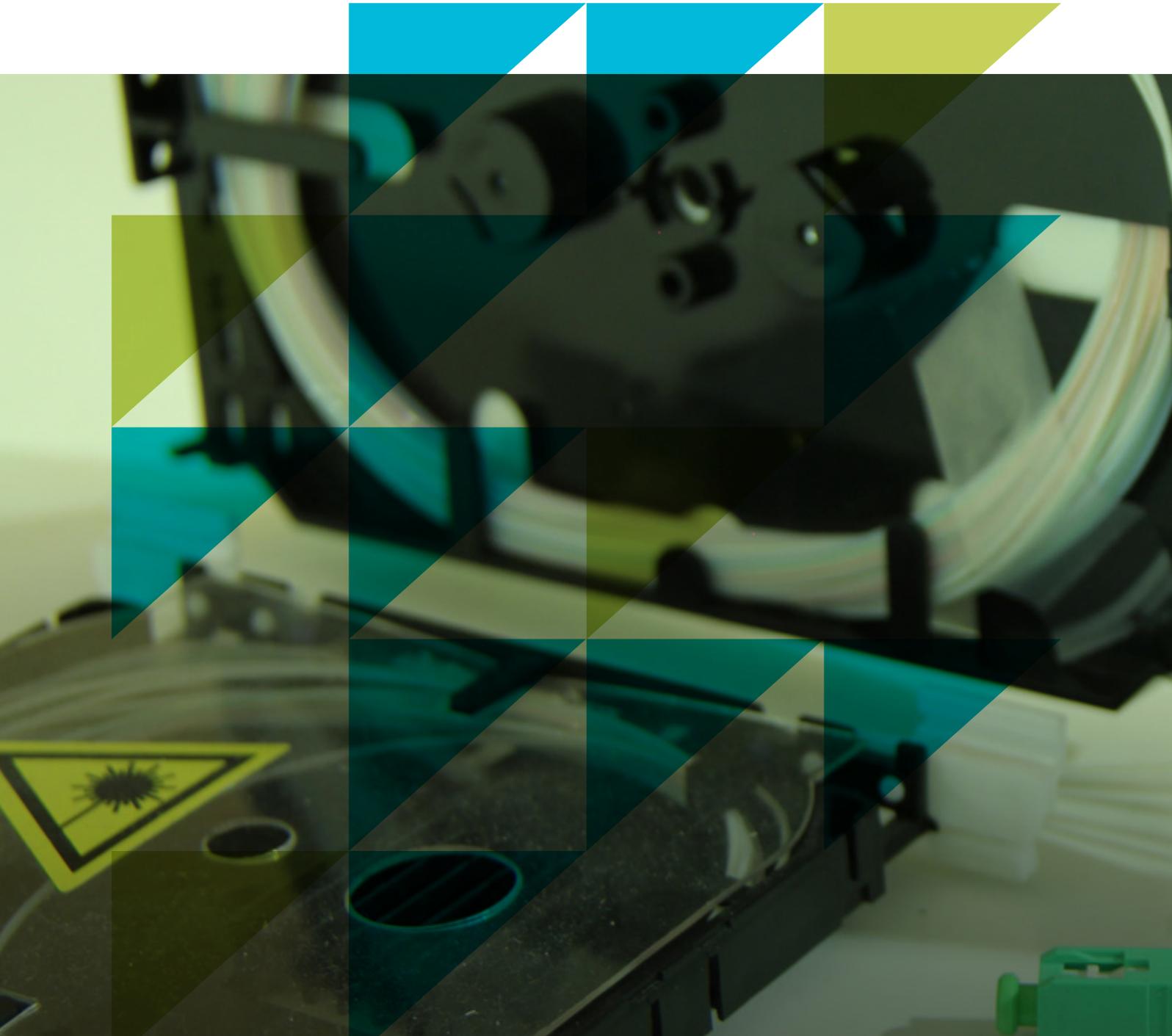


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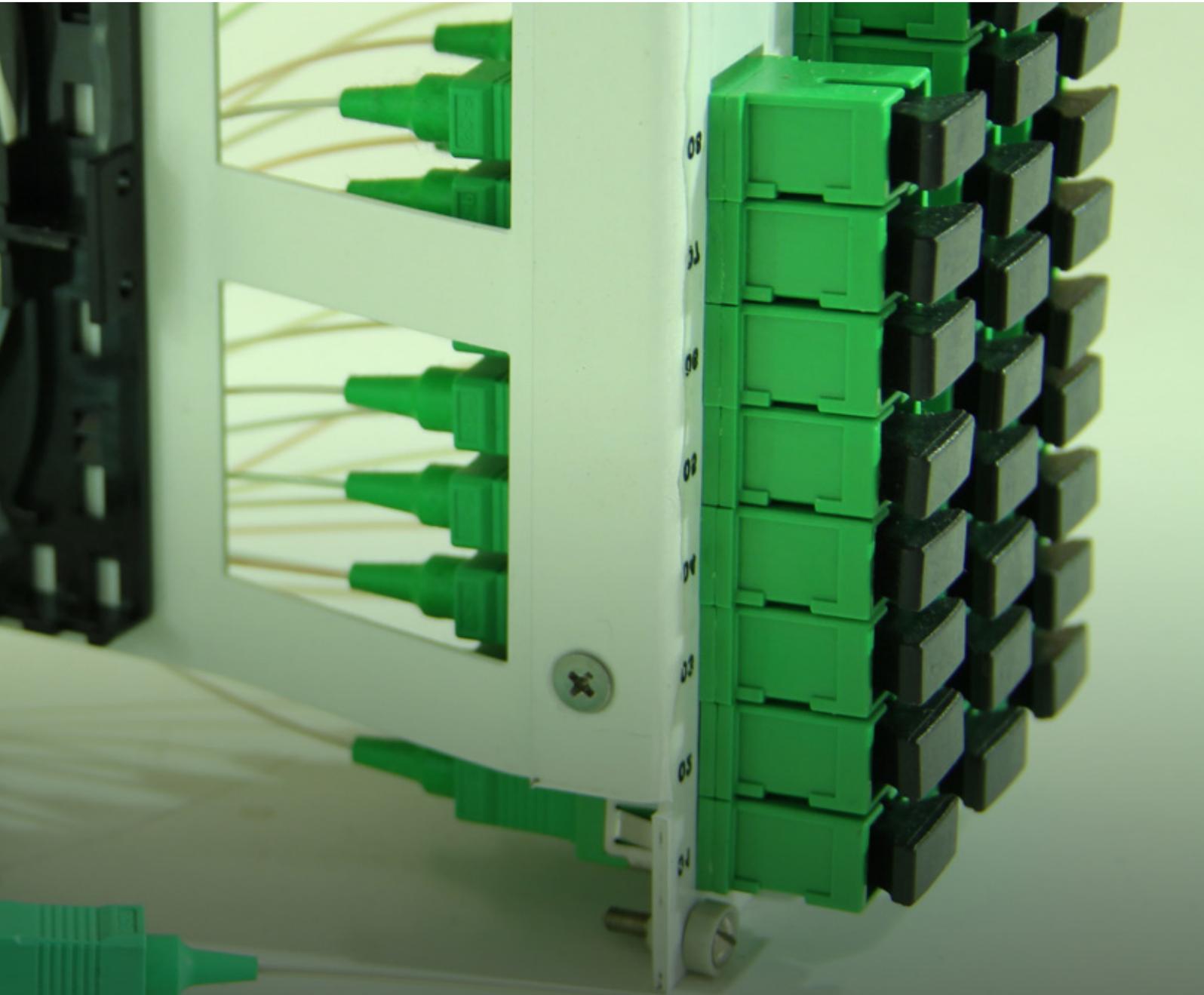
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CR12DEG

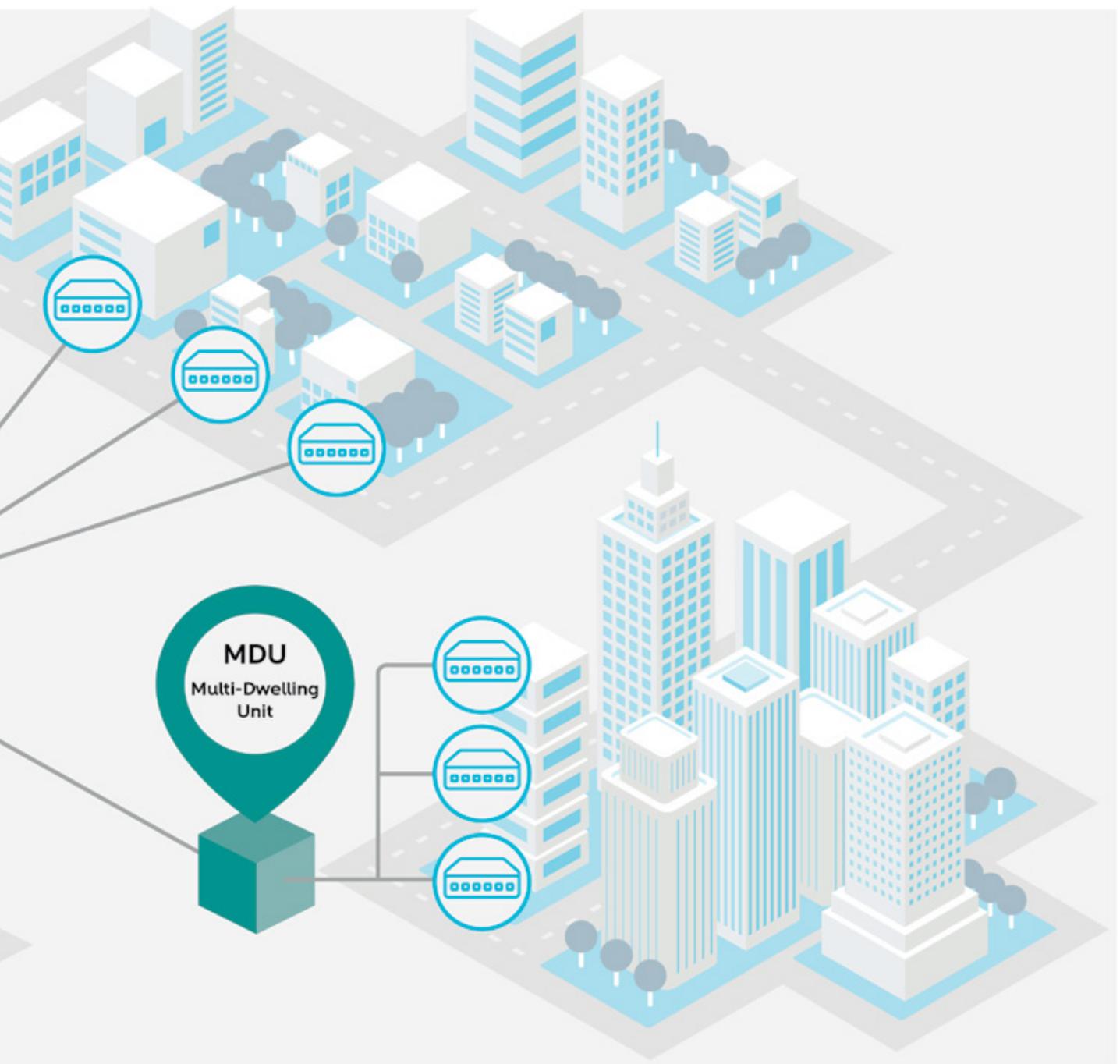
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- Multi-play Service
- DOCSiS 3.1 enabled
- Embedded Voice, Wi-Fi and USB interfacing
- 1POTS + 2GE + Wi-Fi + 1USB 3.1
- Wi-Fi 802.11 b/g/n/ax @2.4GHz (4x4 34dBm EIRP) + 802.11 n/a/ac/ax @5GHz (4x4 34dBm EIRP) US Normative
- 244/9.61 x 35/1.38 x 202/7.95 (HxWxD mm/")
- <800g / 1.76 lb



OUTSIDE DIS NETWORK (



STRIBUTION (ODN)



ODN

Central Office

Fiber Concentration Point

Network Access Point

Multi-Dwelling Unit

Central Office



Rack 3600NG

- Applications: 2 systems OLT2T4 + 1 OLT2T2
- Size (HxWxD)mm/" : (2200x600x300)mm / (86.6x23.6x11.8)"
- Capacity: 47 RU's in 19"
- Features: Heat and cold corridor or bottom/top

Rack 3300NG

- Applications: 2 systems OLT2T4
- Size (HxWxD)mm/" : (2000x600x300)mm / (78.7x23.6x11.8)"
- Capacity: 42 RU's in 19"
- Features: Heat and cold corridor or bottom/top



Rack 1150 BSP/ODF

- Applications: Optical distribution frame
- Size (HxWxD)mm/" : (2200x800x600)mm / (86.6x31.5x23.6)"
- Capacity: 43 RU's in 19"
- Features: 19" rotary frame; 1150 splices; G.652D

Rack 720 BSP/ODF

- Applications: Optical distribution frame
- Size (HxWxD)mm/" : (2200x800x600)mm / (86.6x31.5x23.6)"
- Capacity: 38 RU's in 19"
- Features: 19" rotary frame; 720 splices; G.652D

Central Office



Rack 2300HD OGC

- Applications: Optical Gigabyte Combiner
- Size (HxWxD)mm/" : (2300x1200x300)mm / (90.6x47.2x11.8)"
- Capacity: 49 RU's in 19"
- Features: Hi-density patching; 2300 SC/APC; G.652D



Rack 19" 47U DTC

- Applications: Data Center
- Size (HxWxD)mm/" : (2200x800x1200)mm / (86.6x31.5x47.2)"
- Capacity: 47 RU's in 19"
- Features: Door air flow (88% open area); Load 1300Kg



xPON Outdoor Cabinet 3000

- Applications: 3 systems OLT2T0; 1-OLT1T1*; 1-OLT2T2*
- Size (HxWxD)mm/" : (800x500x400)mm / (31.5x19.7x15.7)"
- Capacity: 9 RU's in 19"
- Features: Compact solution; pole/wall mounted; heat exchanger embed; AC/DC system with backup batteries

Central Office



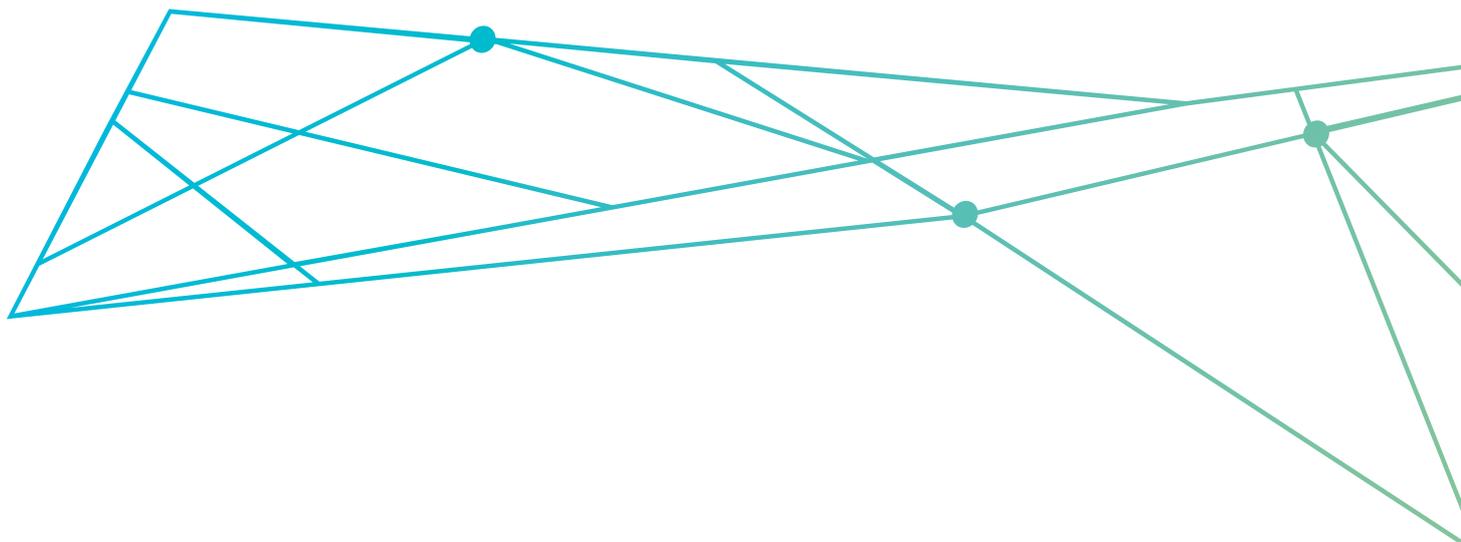
xPON Outdoor Cabinet 6000

- Applications: 2 systems OLT2T2
- Size (HxWxD)mm/" : (1300x1250x500)mm / (51.2x49.2x19.7)"
- Capacity: 26+19 RU' in 19"/21"
- Features: Multiple colors; compact solution; heat exchanger embed; AC/DC system with backup batteries
- Supply aprox. 6000 xPON costumers



xPON Outdoor Cabinet 18000

- Applications: 1 system OLT2T4 or 1 OLT1T3 +2xOLT2T2
- Size (HxWxD)mm/" : (1825x1830x620)mm / (71.9x72.0x24.4)"
- Capacity : 4x26 RU in 19"
- Features: Modular solution; AC; AC/DC system with backup batteries
- Supply aprox. 18000 xPON costumers



Fiber Concentration Point



SRO 432FO

- Applications: ODN - Feeder to distribution networks
- Size (HxWxD)mm/" : (1200x750x500)mm / (47.2x29.5x19.7)"
- Capacity: 18 RU's in 19"
- Features: Modular solution; Use the same components from ODF/BSP/OGC; rotary frame



JSO432 SC PWM

- Applications: ODN - Feeder to distribution networks
- Size (ØxH)mm/" : (225x 630)mm / (8.9x24.8)"
- Features: Modular solution can grow up to 1120 spli-ces; multi-access enclosure; multiple trays colors

Network Access Point



PDO 24SC/APC EXT PL 72FO

- Applications: ODN – Distribution to drop networks
- Size (HxWxD)mm/" : (265x235x90)mm / (10.4x9.3x3.5)"
- Features: Up to 144 splices; 24 SC/APC; G.652D; IP54

Solution

Solution for derivation, splitting and fiber termination which replaced three different equipment



PDO24 IP67 24+96FO SM(24+1)M

- Applications: ODN – Distribution to drop networks
- Size (HxWxD)mm/" : (380x245x130)mm / (15.0x9.6x5.1)"
- Features: Mechanical glands; up to 144 splices; G.652D



Multi-Dwelling Unit



MDU 12-48 MULTIOP

- Applications: ODN – Distribution to drop networks
- Features: Up to 84 splices; 48 SC/APC; G.652D; IP44

Splice (up to)	Included splice trays	Size (HxWxD)mm/”	SC/APC adapters
48	1	(155x330x75)mm / (6.1x13.0x3.0)”	12
84	2	(155x330x105)mm / (6.1x13.0x4.1)”	24
48	2	(155x330x75)mm / (6.1x13.0x3.0)”	24
84	4	(155x330x105)mm / (6.1x13.0x4.1)”	48



MDU 36-144 MULTIOP (metal box)

- Applications: ODN – Distribution to drop networks
- Features: Up to 192 splices; 96 SC/APC; G.652D; IP44

Splice (up to)	Included splice trays	Size (HxWxD)mm/”	SC/APC adapters
192	3	(268x340x108)mm / (10.6x13.4x4.3)”	36
192	8	(268x340x108)mm / (10.6x13.4x4.3)”	144



NETWORK MANAGEMENT SYSTEM



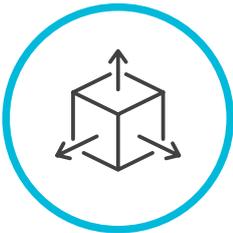
EVENT

Network Management System (NMS)

AGORA is the Altice Labs Network Management System (NMS) that manages Altice Labs product lines for state-of-the-art technologies, such as xPON, as well as Ethernet, minimizing capital investments at the Network Operational Centers (NOC).

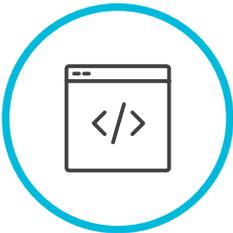
Offering a suite of GUI applications, AGORA aims to provide a set of key features for all network management operations like network provisioning, maintenance and monitoring, providing all FCAPS functionalities (Fault, Configuration, Administration, Performance and Security). A fully featured standardized set of Northbound Interfaces (NBI) is a key enabler for network programmability and automation as well as easy integration with third-party management/information systems. AGORA runs on LINUX, over general purpose HW, and it's layered by a modern Java EE stack and a top GUI layer supported by current industry web standard technologies.

Given the diversity of markets and businesses, AGORA may be customized in order to meet each client specific needs via a modular and scalable package delivery system.



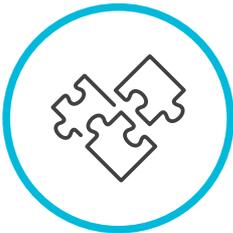
Scalable

Performance and Reliability guarantee



Programmable

Easy automation and integration with third-party systems



Modular

Customized to each client needs

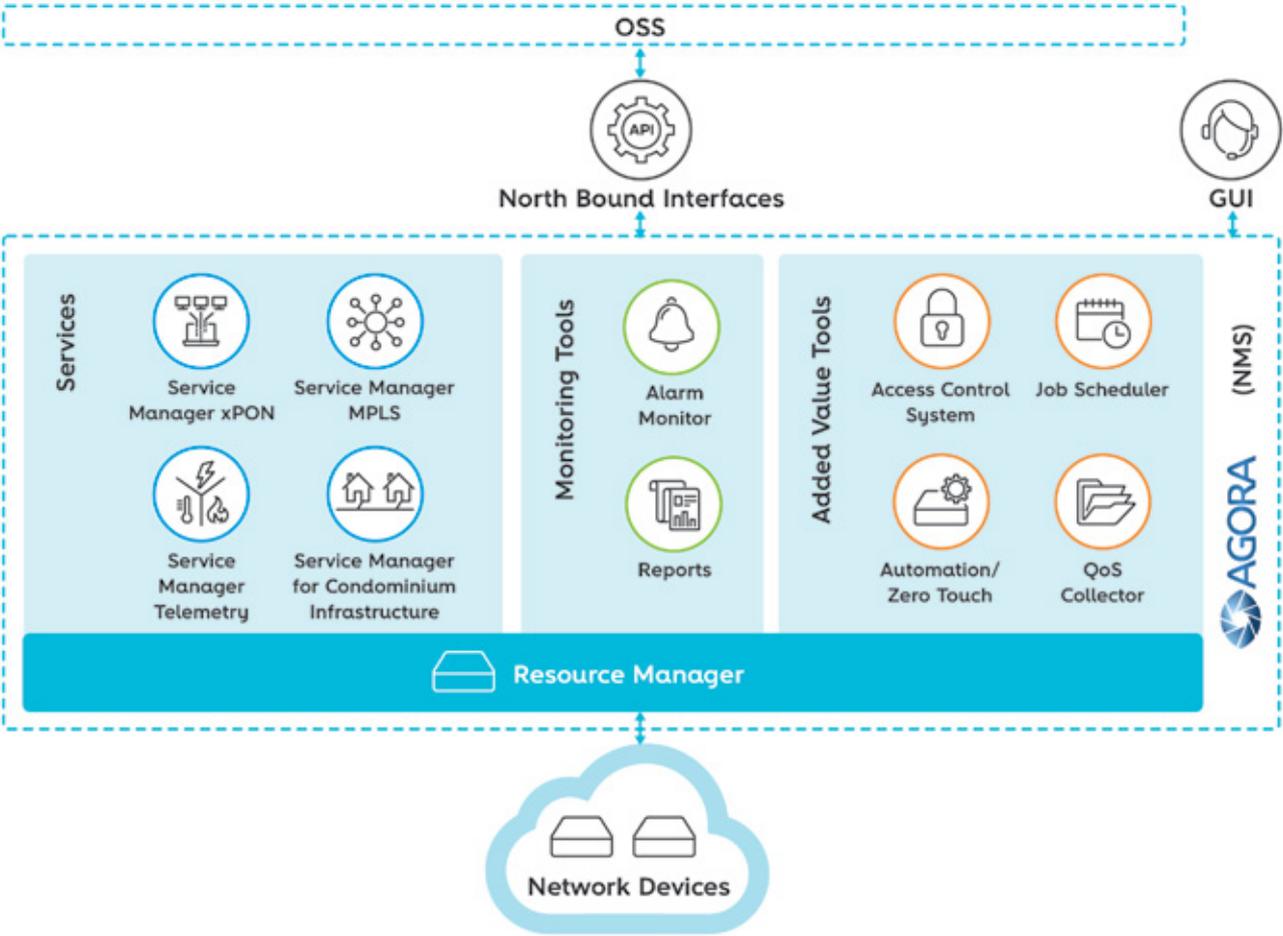


Simple

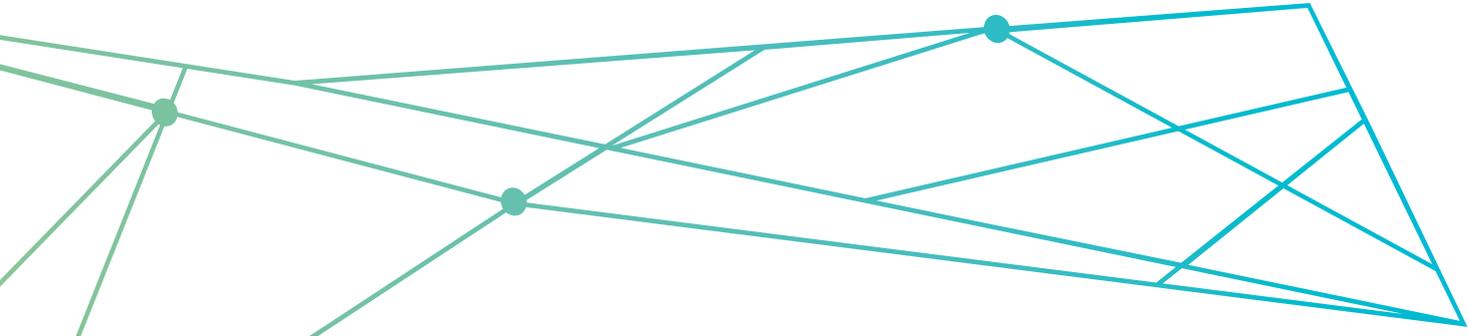
Abstraction of all the existing complexity



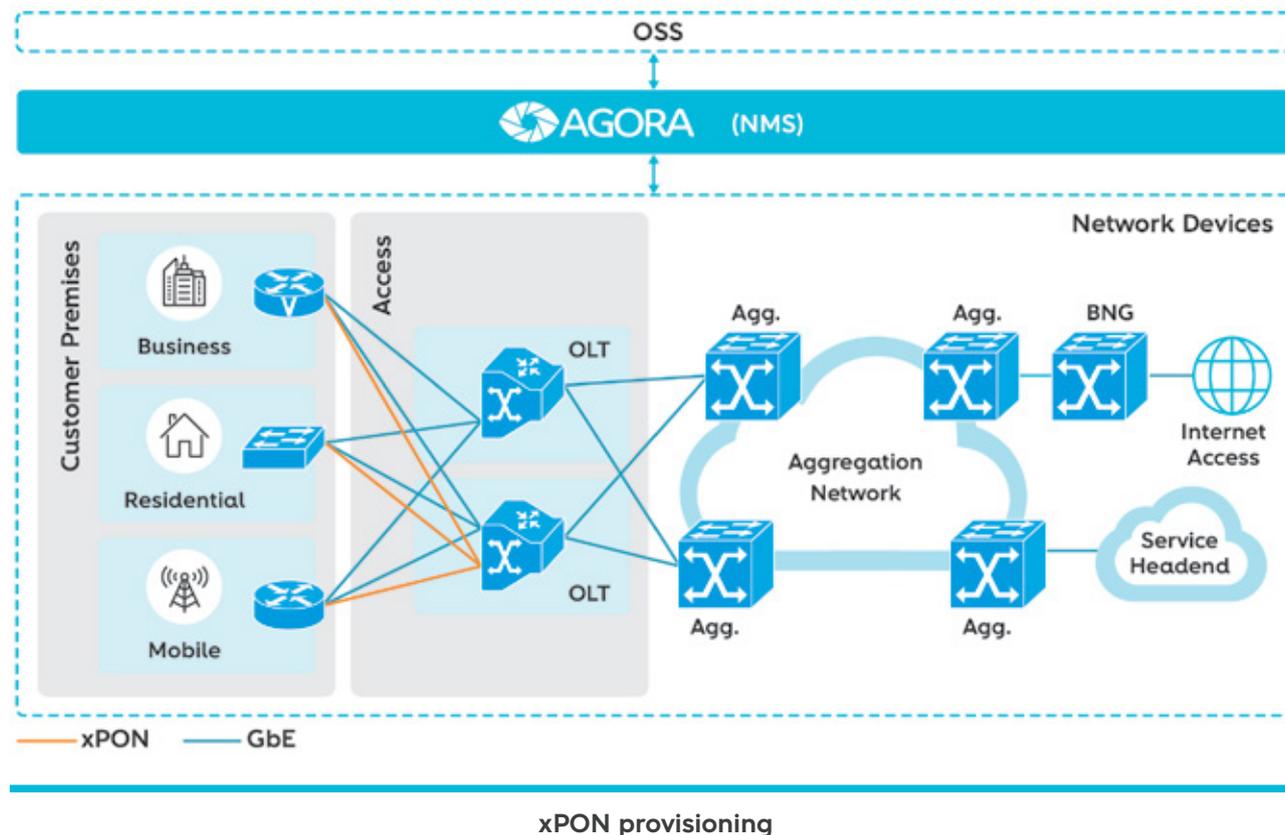
The AGORA NMS is composed by different applications and components, as represented in the following architecture diagram, which complement each other to achieve a full management experience. It provides a simplification and abstraction of the Network Elements, offering several services and a complete set of tools, which can be exposed to higher order Applications such as OSS or even external SDN applications. The GUI interface allows a direct access to AGORA by the operator, allowing a user-friendly provisioning and monitoring of the global managed resources.



General Architecture



From the xPON provisioning point of view:



Product components



Resource Manager – Configure and monitor all resources

- Resources configuration, state and utilization management
- Resources inventory management
- High granularity authorization control
- Firmware manager
- Information resilience and recovery



Service Manager xPON – Global resources configuration and monitoring

- Support of access technologies such as GPON, NGPON2, G.fast and others
- Resources abstraction (PMA and PMAA) and virtualization
- Simplified service model
- Bulk operations



Service Manager for Condominium Infrastructure – Intelligent condominium

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



North Bound Interfaces – Integration | Programmability

- Full featured management API
- REST based with JSON objects
- Easy integration and network programmability



GUI – A user centric interface

- User-friendly web interface
- Simple, intuitive and coherent for an easy and fast learning
- Flexible and efficient, focused on network configuration and monitoring



Alarm Monitor – Network alarms monitoring

- List of pending alarms with severity and acting urgency information
- Quick and advanced filters and search capabilities | Alarm fields setup

- Alarms actions (Detail | Acknowledge | Unacknowledge | Close | Comment)
- Forwarding Rules and notifications



Reports – Network inventory

- Inventory, alarms, performance and user auditing reports
- Basic and advanced filters for easy custom result views (tabular and graphical)
- Report scheduling and customization
- Multiple file export formats (PDF or CSV)



Access Control System – Authentication service

- Authorization, authentication, accounting (AAA)
- Single Sign On
- Centralized management of users and their access rights profiles



Job Scheduler – Operations scheduler

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



Automation

- Automatic CPE configuration procedure (ZTC – Zero touch configuration)
 - Automatic OLT discovery and provisioning (ZTP - Zero Touch Provisioning)
 - Programmable user macros
- 



QoS Collector - Quality of Service

- Continuous collection of performance data
- Export data to northbound Analytics Applications





ENABLING WITH FTT



G 5G
X

xPON to boost 5G deployments

The evolution towards 5G represents a landmark in terms of convergence of infrastructures, networks, services and applications.

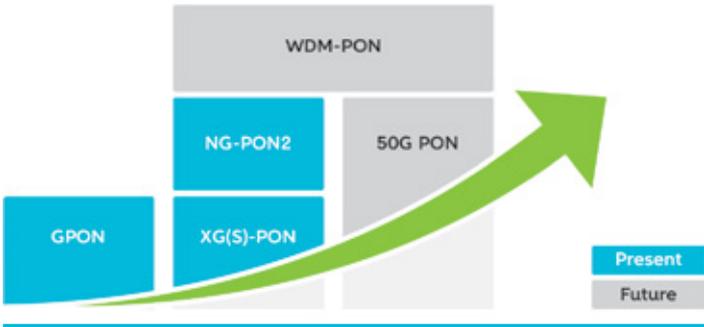
Enabling entire 5G environment present challenges on network topologies and supporting technologies as both Fixed and Mobile Networks and infrastructures need to evolve to accommodate the upcoming needs.

	4G	5G	B5G
Peak Throughput (Gbps)	1	10 ~ 20	>100
Antenna Density (/Km ²)	1 ~ 10	10 ~ 100	>>100
Latency (msec)	0	1	0.1

Mobile Network Requirements

As antenna throughput increases, is expected a smaller cell size and consequently more cell sites are needed to cover for the same geographical area. Thus mass deployment of small cell / micro coverage scenarios are foreseen as part of 5G and B5G fast rollout deployments.

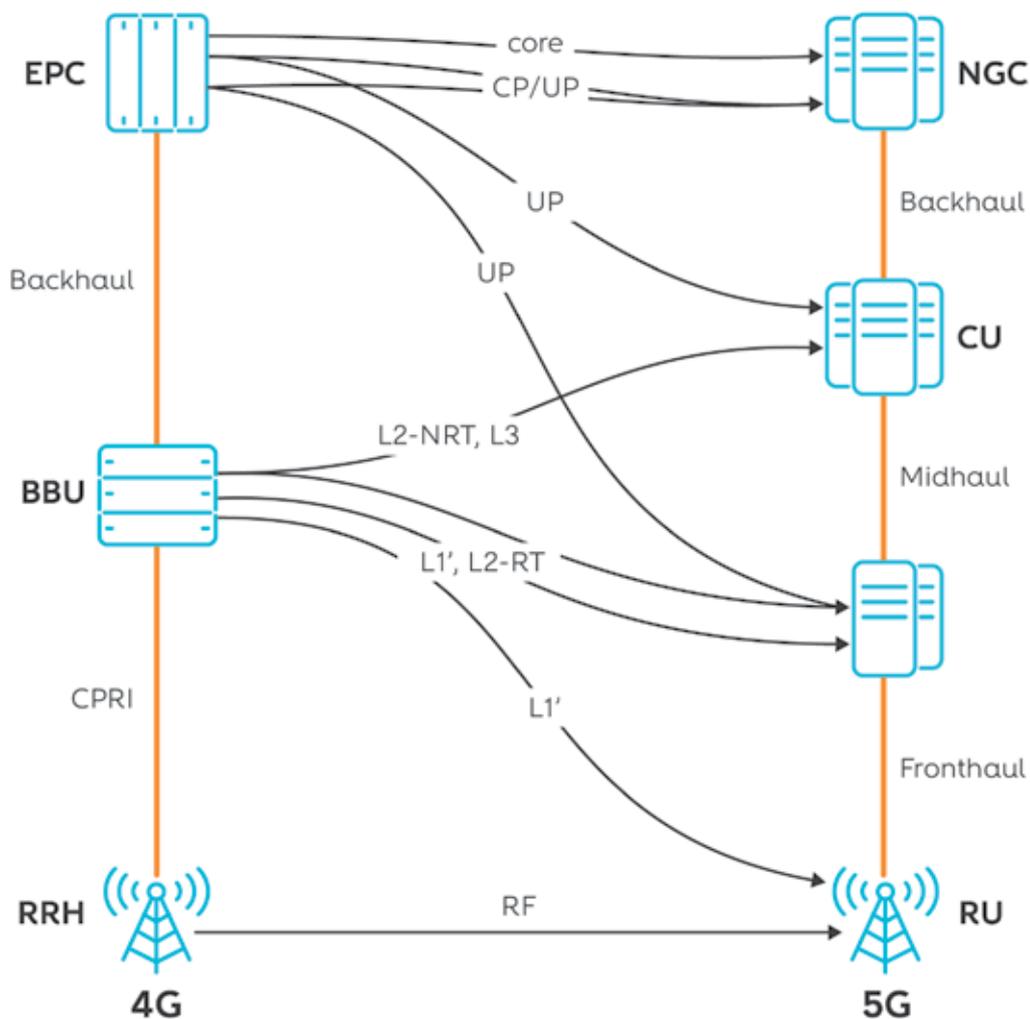
Also the need for higher frequencies (eg. mmW and THz) at the Radio Access Network (RAN) and the centralization of the Remote Radio Head (RRH) at the edge office will pressure the landline infrastructure in terms of capillarity and capacity. Fiber infrastructures and technologies became the strongest ally of 5G and Beyond 5G (B5G) technologies in order to cope with the extreme KPI demands.



Candidate PON Technologies to support Mobile capacity increase

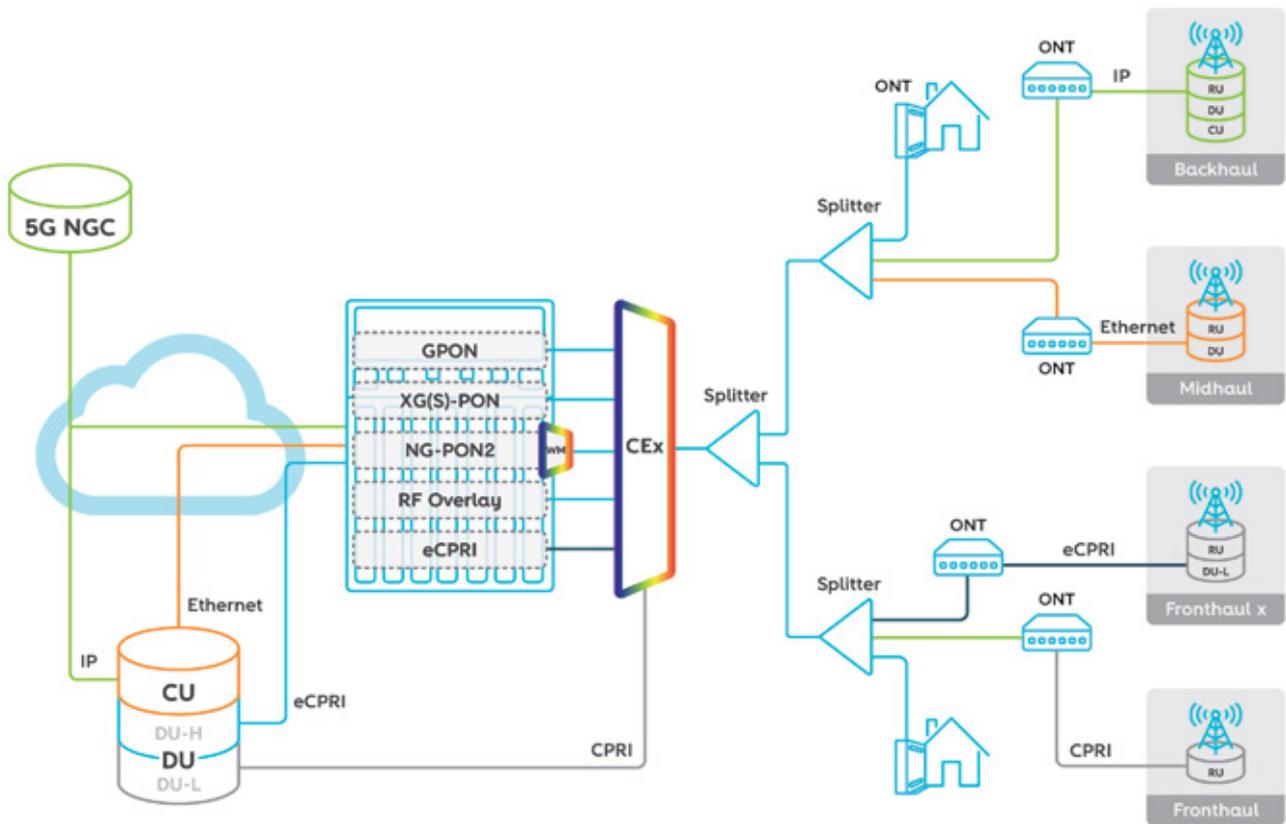
Evolving from 4G to a 5G architecture

The mobile network evolution from the 4G eNB architecture will promote a desegregation of the 5G gNB into a Central Unit (CU), Distribution Unit (DU) and Remote Unit (RU) network components. New architecture facilitates radio access network (RAN) virtualization and also allows for decreased fronthaul/midhaul line rates, while meeting latency and capacity demands.

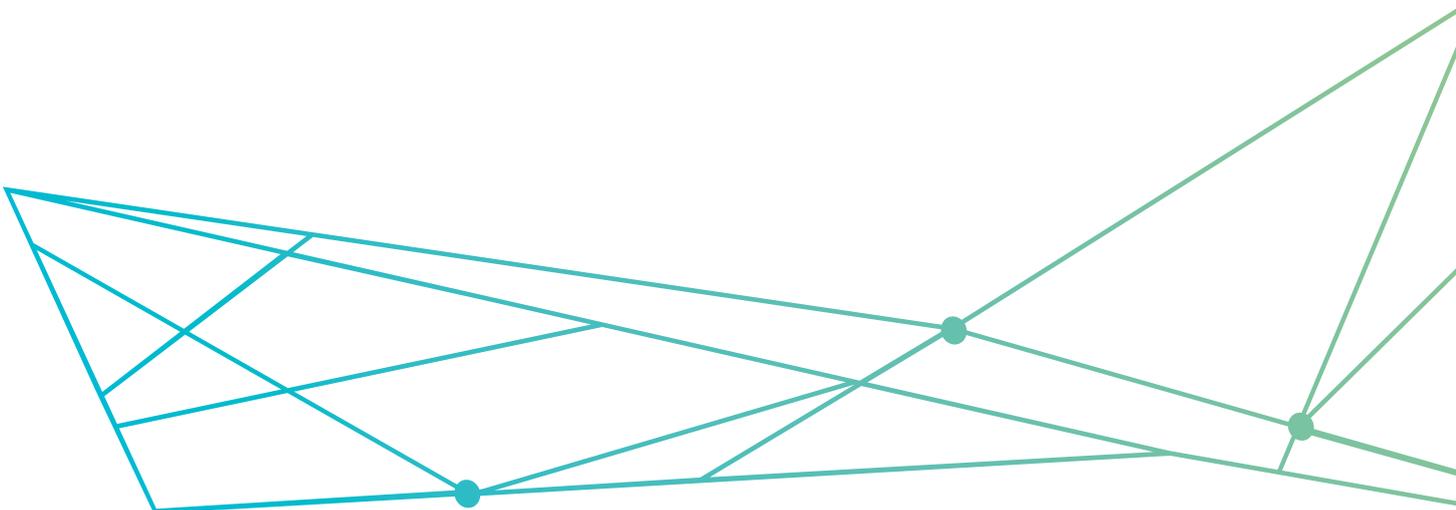


Evolution from 4G eNB to 5G gNB based on ITU-SG15 Q2

Different network architectures including Backhaul, Midhaul and Fronthaul over PON are available connectivity alternatives for 5G deployments.



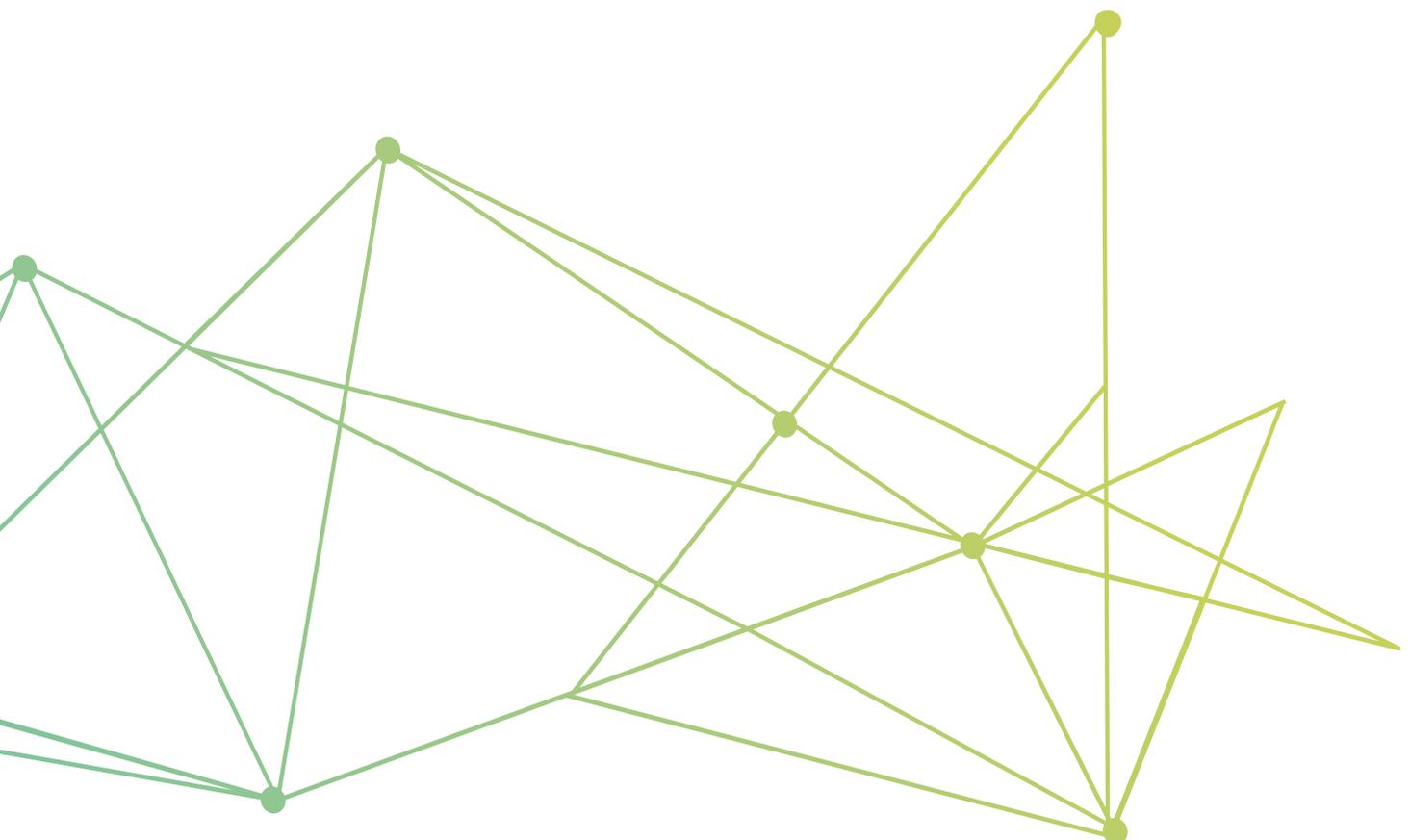
Backhaul, Midhaul and Fronthaul over PON



Altice Labs is currently positioned to deliver efficient, flexible and scalable xPON packet based mobile backhaul, midhaul and fronthaul architecture components in order to cope with fully flavour 5G and Beyond 5G (B5G) mobile networks.

	Fronthaul	Fronthaul x	Midhaul	Backhaul
Medium	Dark fiber or dedicated wavelength	Ethernet	Ethernet	IP
Protocol	eCPRI	FAPI Interface	F1 Interface	NG/S1 Interface
Range	Up to 10 kms	Up to 80 km	Up to 80 km	Up to 200 kms
Latency	< 100µs	< 100µs	< 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





TEST LAB QUALITY



S 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.

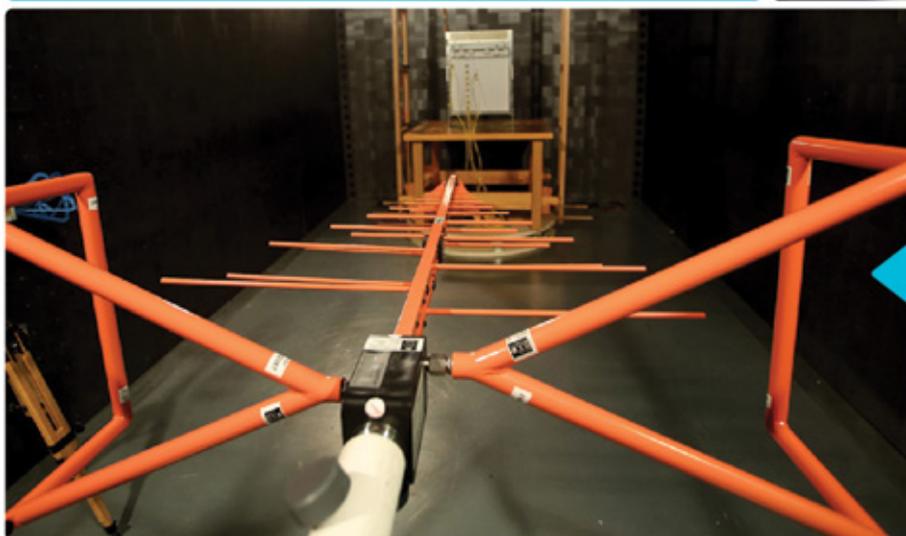
Test & Industrialization

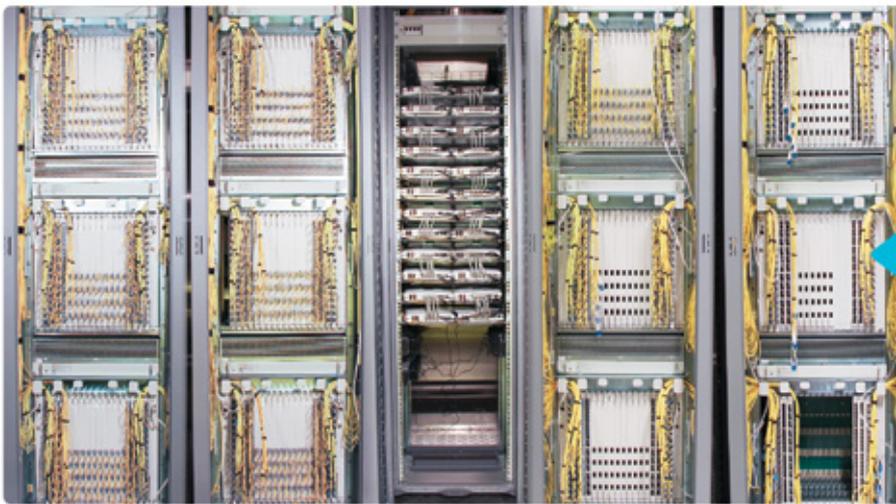
Quality assurance is guaranteed by hardware, software and systems validation in simulated highly loaded networks, according to specific functional and non-functional requirements.



Conformance and Interoperability

Electromagnetic compatibility testing (EMC), CWMP – CPE WAN management protocol (TR069), GPON interoperability, Wi-Fi, ADSL/ADSL+ 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.



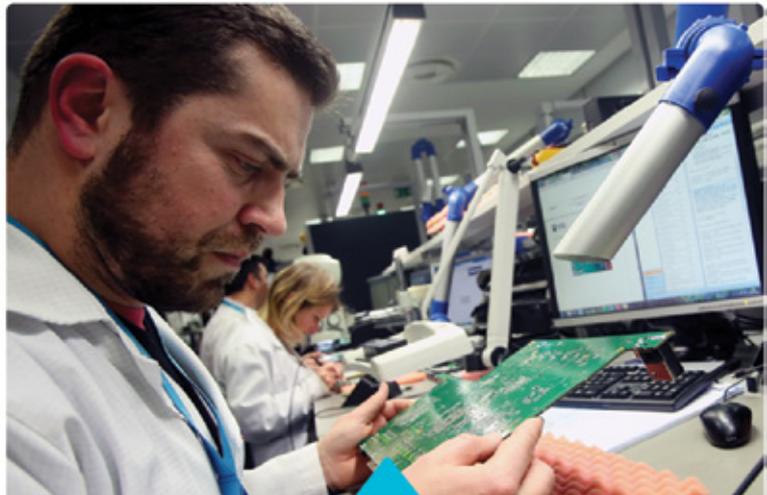


Reliability Demonstration

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.

The background features a dark blue grid of squares. Overlaid on this is a glowing blue network diagram with nodes and connecting lines. A hand is visible on the right side, interacting with the interface. The text 'OPERATION SYSTEMS' is prominently displayed in white at the bottom.

OPERATION SYSTEMS



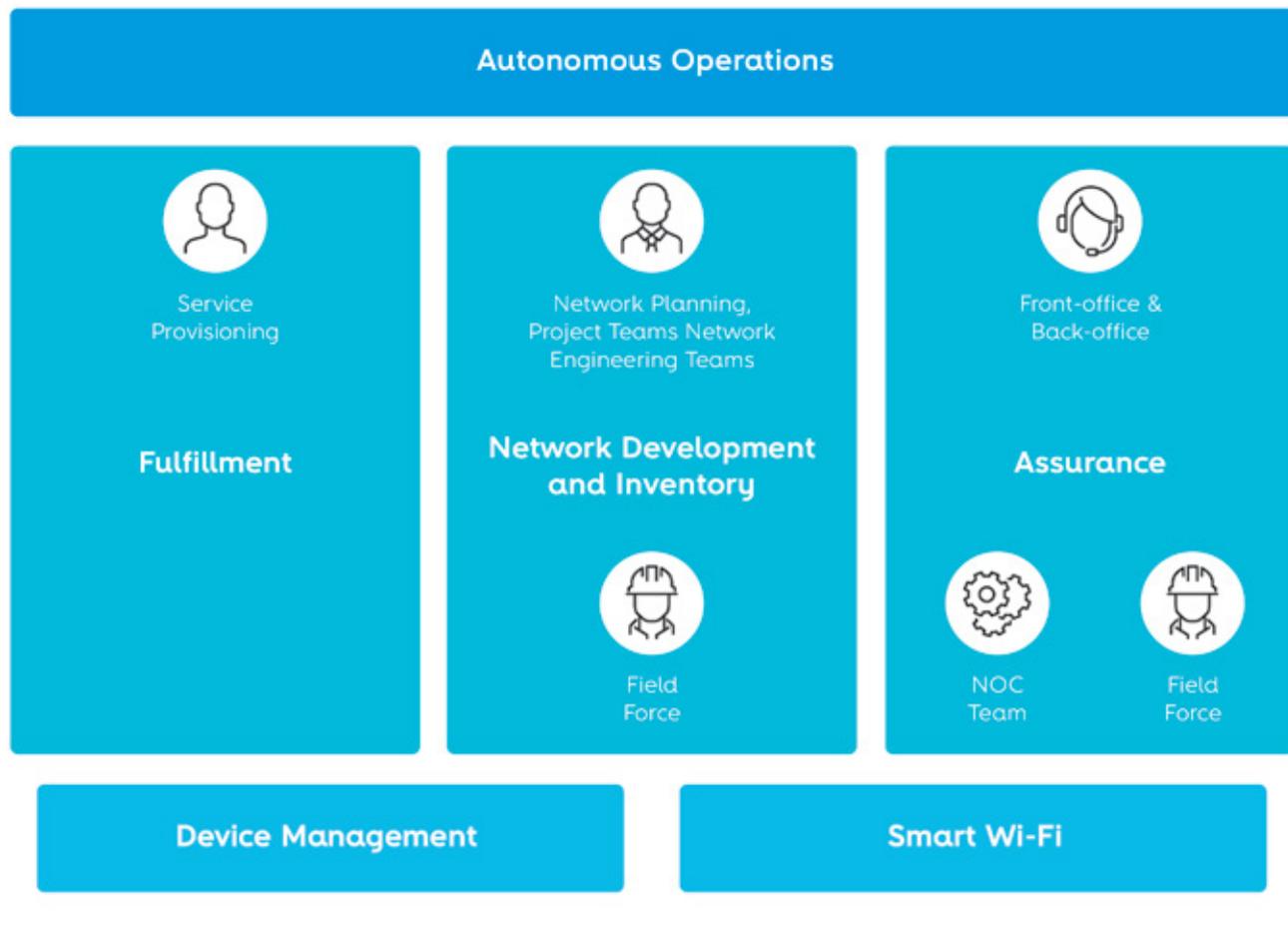
S SUPPORT

Altice Labs NOSSIS

Overview

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

The core activity of a Service Provider needs to be supported by an open and modular architecture taking part of the Asset to Cash cycle at the Service Operations level, including Service Fulfillment, Network Development and Inventory and Service Assurance.



NOSSIS One architecture

NOSSIS One provides the capabilities to implement Autonomic & Intelligent Mechanisms through the application of an “always sensing, learning and acting” paradigm that enables Autonomous “Closed Loop” Operations. The main steps includes:

- **Sensing:** collection of service and network conditions from all layers (Physical NE’s, Virtual Infra, SDN Controllers, ...) to feed assurance activities;
- **Analysis:** Near Real Time and Non Real Time Analytics: crossing network information with other sources, creating service and network health information;
- **Decisioning:** Intelligent Decisioning Mechanisms determine actions for self-optimization, self-healing and self-protection;
- **Actuation:** Fulfillment process end-to-end orchestration with service configuration & activation actions transversally over physical NE’s, Virtualized Network Functions, Virtualized Infrastructure Managers (VIM) and SDN Controllers.

Complementing these “Core Activities” NOSSIS portfolio includes also specific solutions to address scenarios for Device Management of the new home networks and CPEs as well as new emerging technologies like Smart Mesh Wi-Fi with a Smart Wi-Fi Management solution.

Main benefits

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:

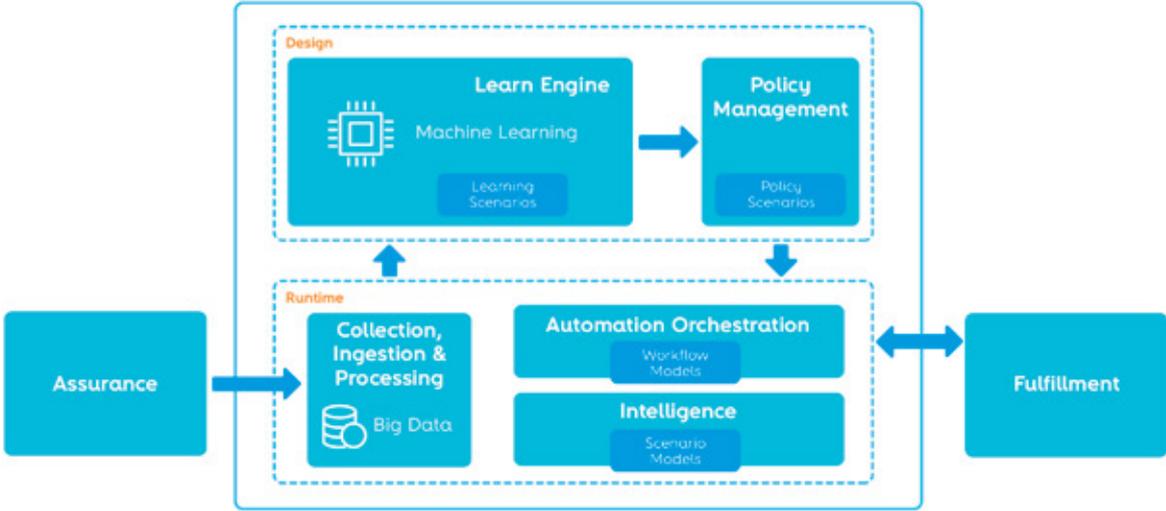
- Enables Business Agility at the Engineering and Operational level, increasing process automation and self-management (provisioning, problem handling);
- Contributes to enhance Customer Experience with real-time intelligent analyses, “closing the loop” from Assurance to Fulfillment (Self-Use Cases);
- Simplifies the “Order-to-Cash” stream line, by technology consolidation and integration, reducing CAPEX and OPEX for this IT stream;
- Supports the smooth evolution from traditional CSPs to new Digital Services, with a non-disruptive roadmap approach;
- Converges both physical and virtual networks and services, through an unified solution for multi-technology and business (enabling the evolution to network slicing management).

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 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 below 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

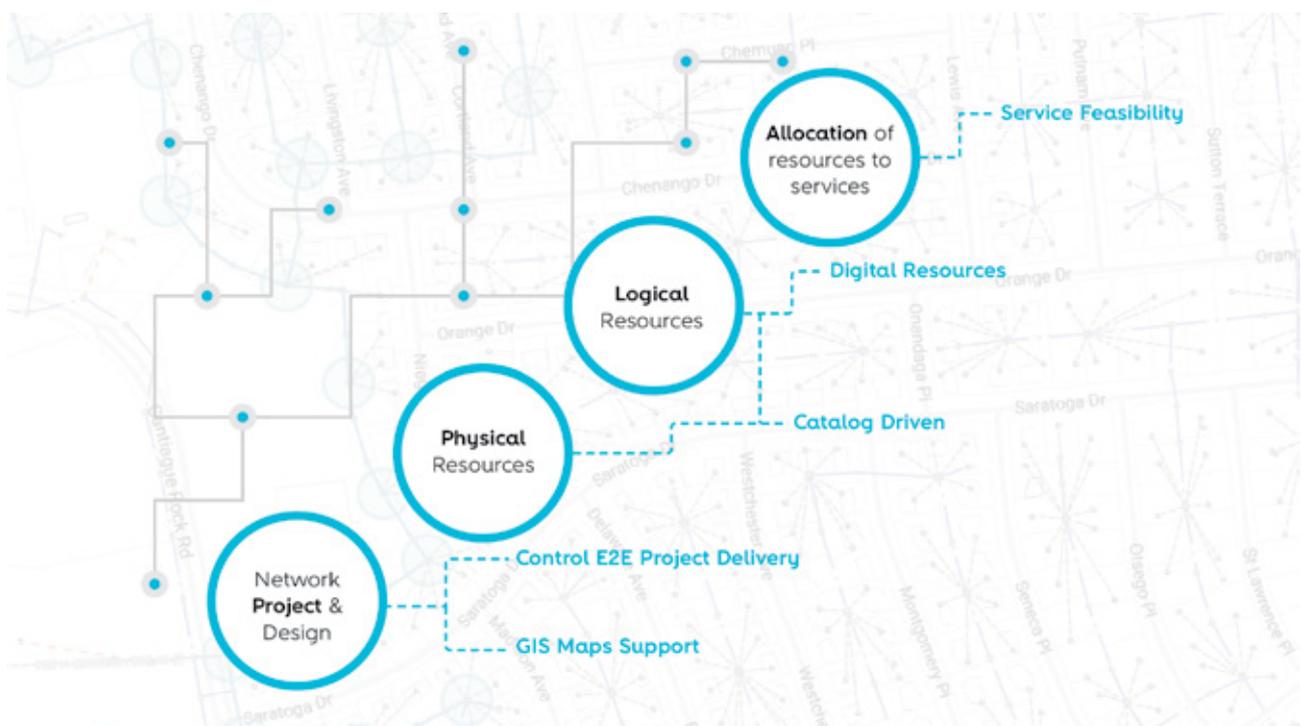
The two main components are:

- The Design: where it is needed to learn about the selected scenarios, using machine learning technologies to analyze relevant collected data and apply policy decisions in order to decide how to program and influence run-time automation decisions.
- The Run-time: where all the data is collected, stored and processed enabling the execution of programmed workflows for the identified “closed-loop” scenarios and supported on intelligence decision rules available for those scenarios.

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.

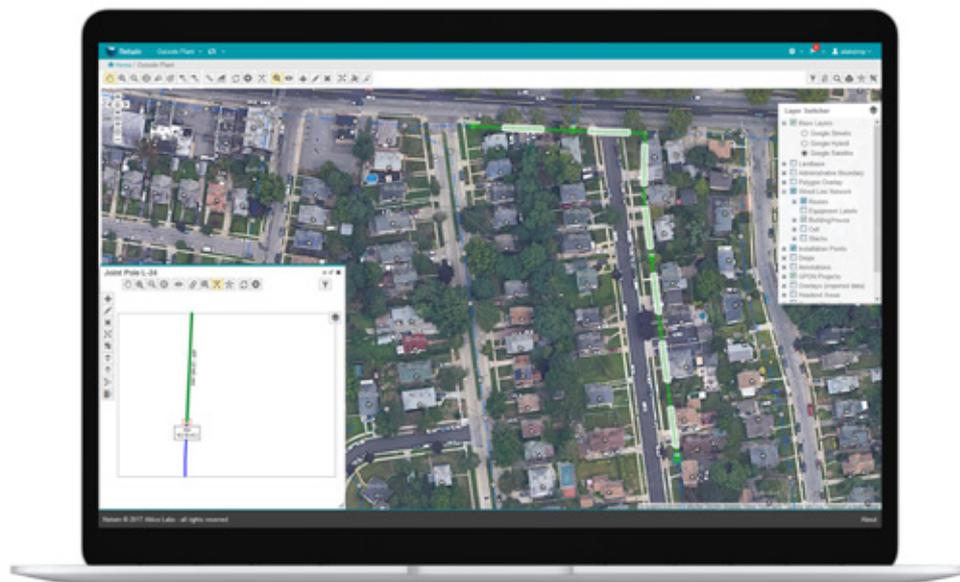
Using an Intelligent Network Development support tool, whenever new (physical) infrastructures are needed, will increase Operational Efficiency.



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.

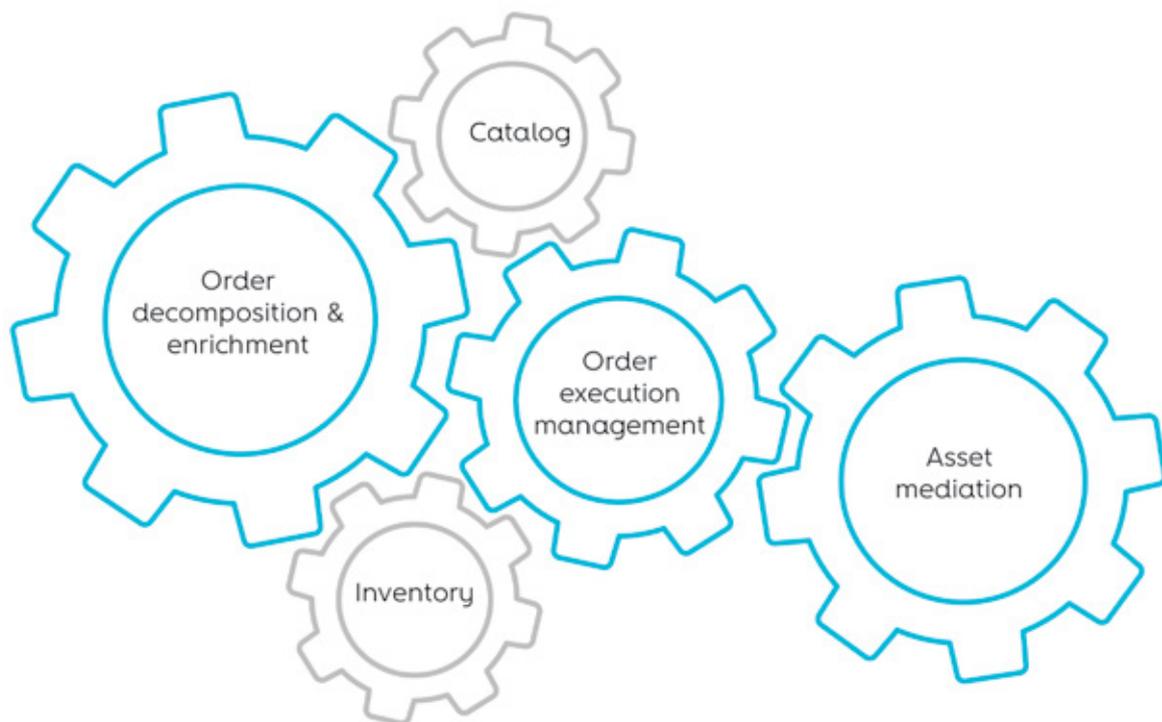
Main Features for UltraFast BB

- Service & Resource Catalogs
- Intelligent network planning/designing tools
- Multilayer inventory from physical to logical resources
- Multi-technology supporting virtualized and hybrid networks
- Integration APIs for Assets/Services inventory
- Fulfillment & Assurance support
- Capacity management



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.

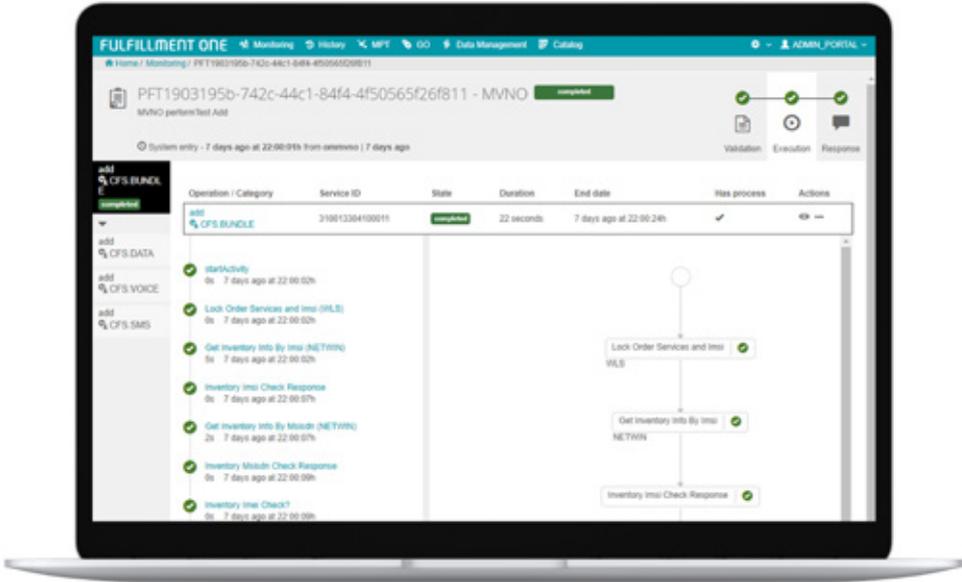


With a Future proof client provisioning cycle, complemented with lighter Fulfillment cycles for automated closed loop operations, when agility is needed (including self-use cases), supports also the new virtualized networks.

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

Main Features for UltraFast BB

- Service Order Orchestration
- End to end service lifecycle management
- Service Catalog Driven
- Order decomposition
- Provisioning execution and monitoring
- Manual Tasks and manual error handling support
- Multi protocol service activation plug-ins

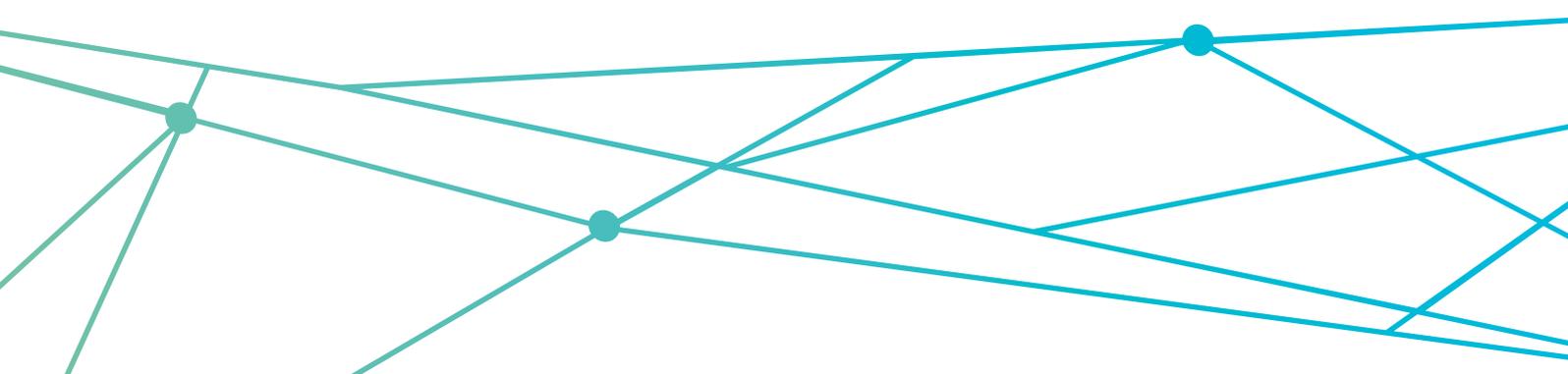
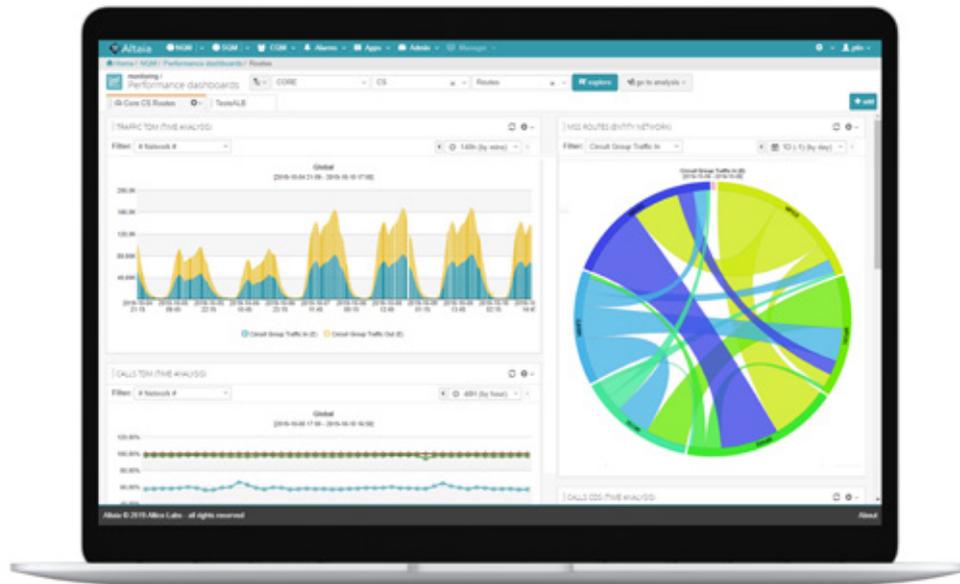


Service Assurance

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.

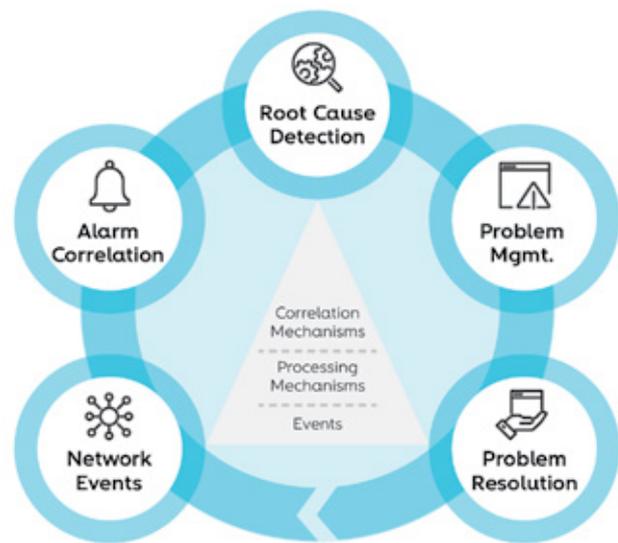
Using Big-Data architecture enables efficient, scalable and on-time decision making and actions.



Main Features for UltraFast BB

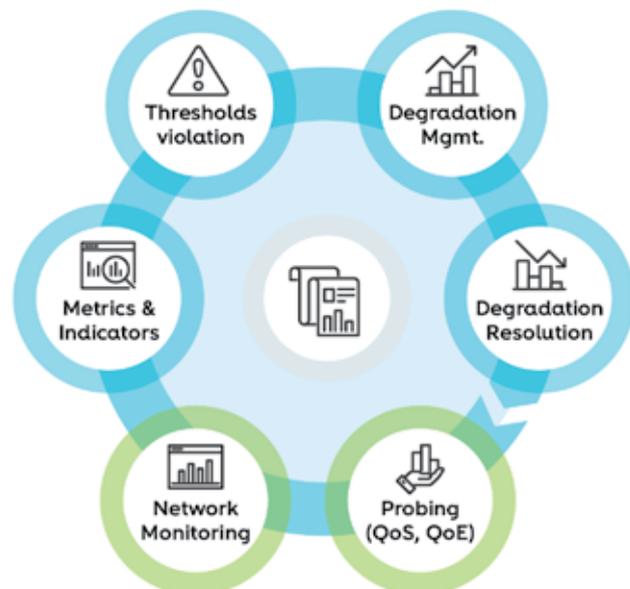
Fault and Problem Management

- Heterogeneous events acquisition
- Centralized collection and filtering
- Alarm processing with flapping detection
- Alarm correlation for root-cause detection
- TTK creation and integration
- Management of all operational tickets
- Highly configurable & strongly auditable
- User customized reporting and SLAs



Performance, QoS and Probing

- End-to-end performance analytics for Network, Service and Customer perspectives
- Performance and experience indicators with easy configuration
- Real time data processing and monitoring
- Advanced analytics able to learn, detect and predict abnormal behaviors
- Complementary fiber optic probes with point-multipoint or point-to-point network testing



Test & Diagnostic

- Automated end-to-end Diagnostic, available through customer channels
- Check common faults impacting the service
- Guiding scripts for Problem Solving
- Suggests automated repair actions
- Tests/diagnostics in real time (front/back office, field force)
- Problem solved at first call
- Track record of Customer Problem



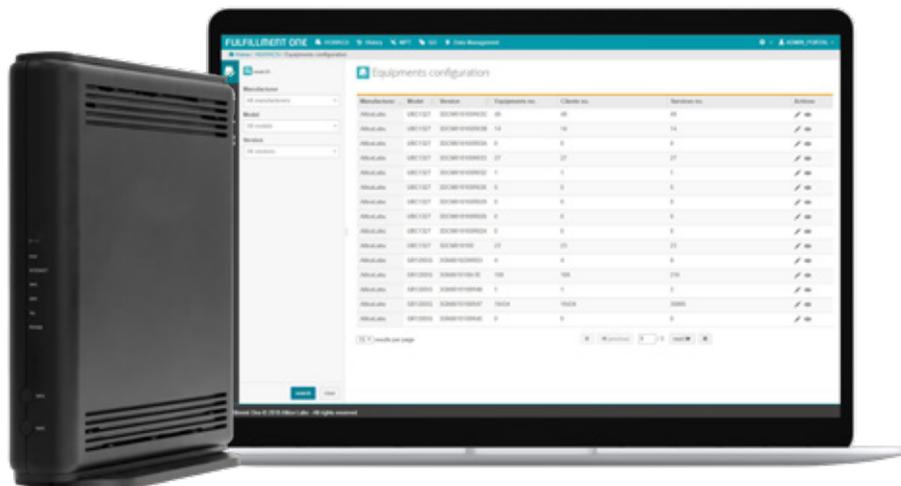
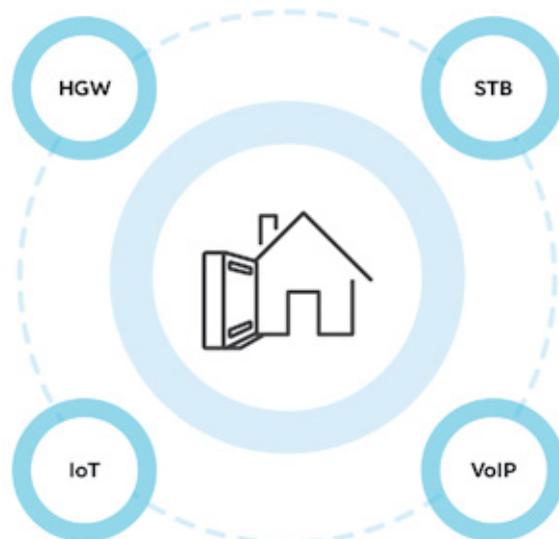
Device Management Solution

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.

- Simplify and speed up device operations
- Easily deploy new services supported on CPEs
- Integrate device management on end-2-end service design
- Technology independent device management platform (protocol independent, not limited to TR-069)
- Apply bulk actions over device groups, like firmware upgrade
- Workflow engine for gateway auto configuration and self-healing

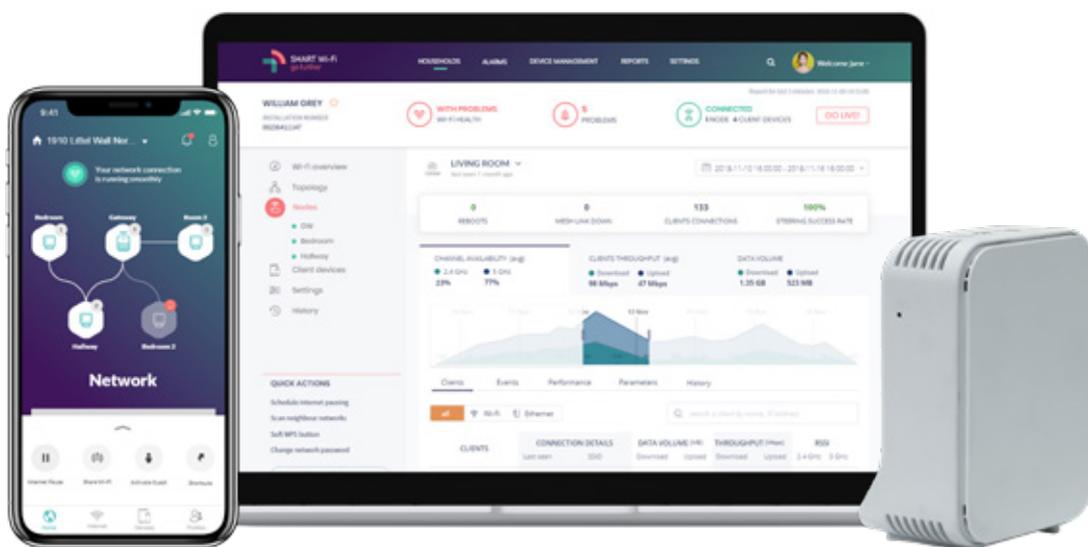


Smart Wi-Fi Solution

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.

- High visibility of home Wi-Fi performance, improving OpCo troubleshooting capabilities with low granularity data collection
- Proactive capabilities to detect abnormal behavior on every household and suggest actions, delivered to the customers
- Artificial intelligence algorithms that improve Wi-Fi performance over the time based on learning patterns
- Support mobile app inside/outside the house with multi house management capabilities
- Household and global based analytics to support several OpCo processes
- Remote management of extenders supporting device management capabilities

For more information about the global smart Wi-Fi solution including Altice Labs certified EasyMesh extenders please go to [section "Smart Mesh Wi-Fi enhanced wireless experience"](#).





ENGINEERING SERVICES

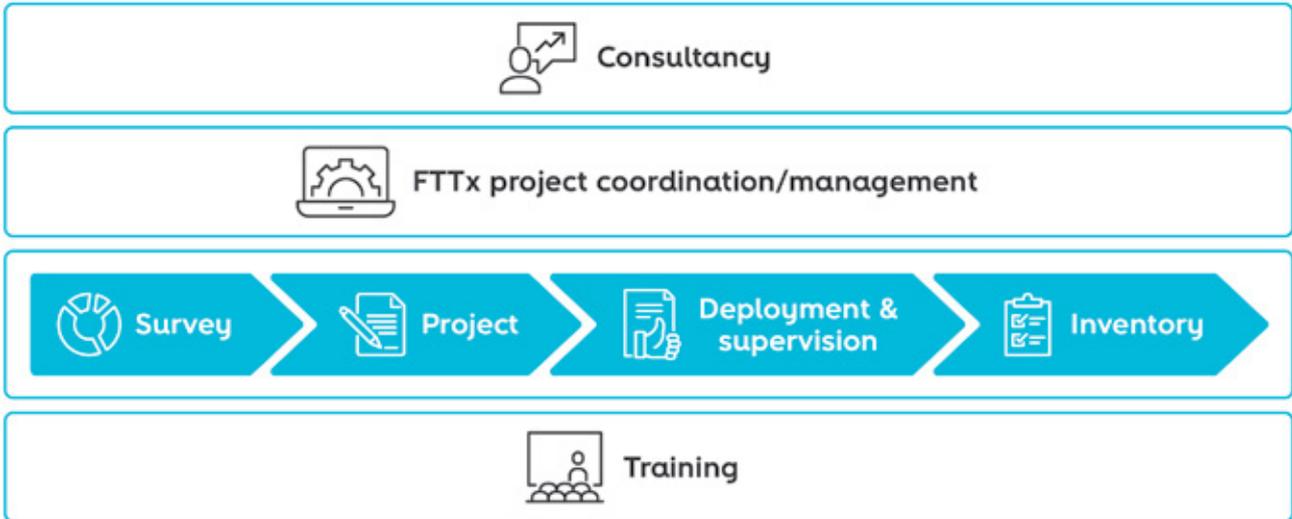


NG

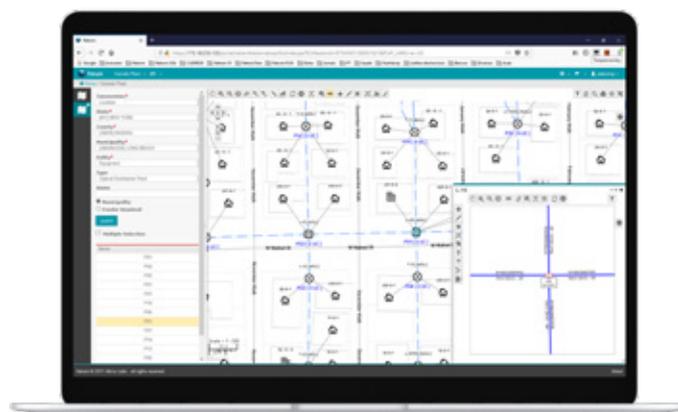
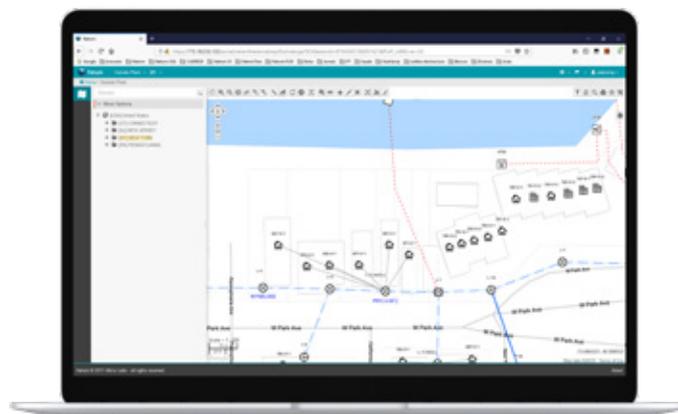
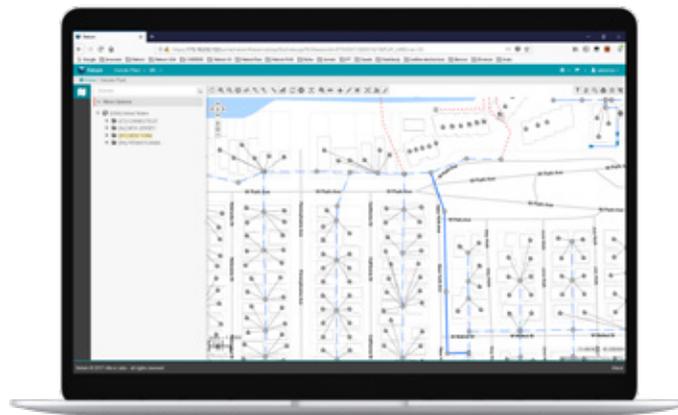
Highly skilled team with proven track record

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



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 S



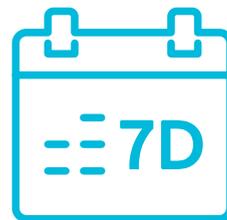
MAINTENANCE & SUPPORT SERVICES

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.

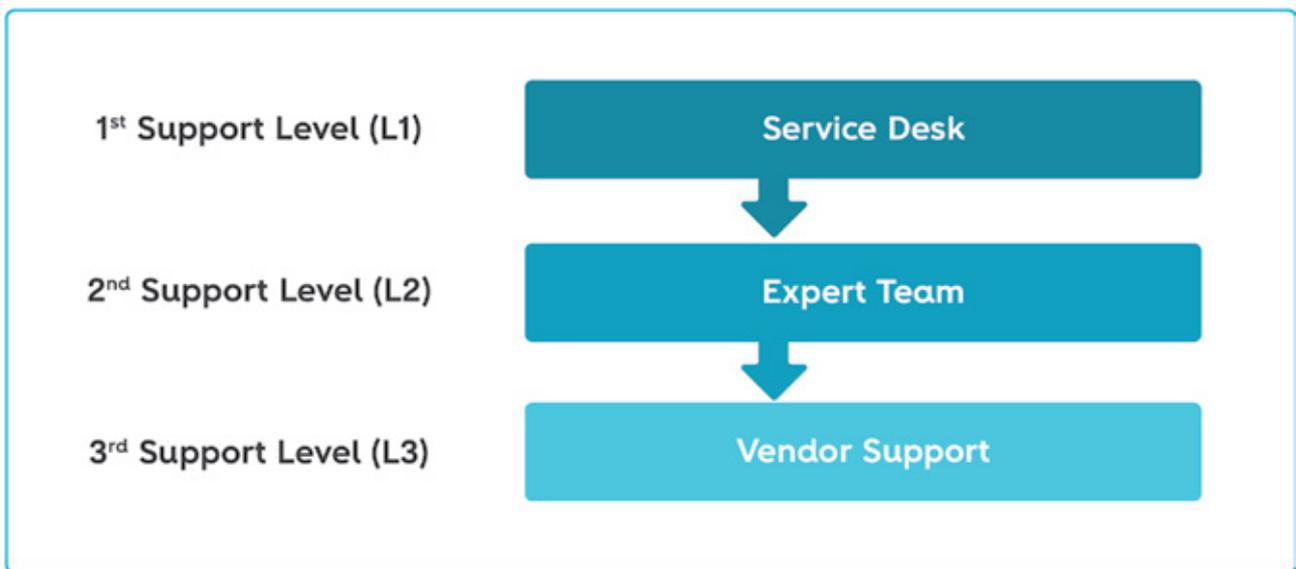
The following After-Sales **service components** are available:

- **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

ADDED ECO

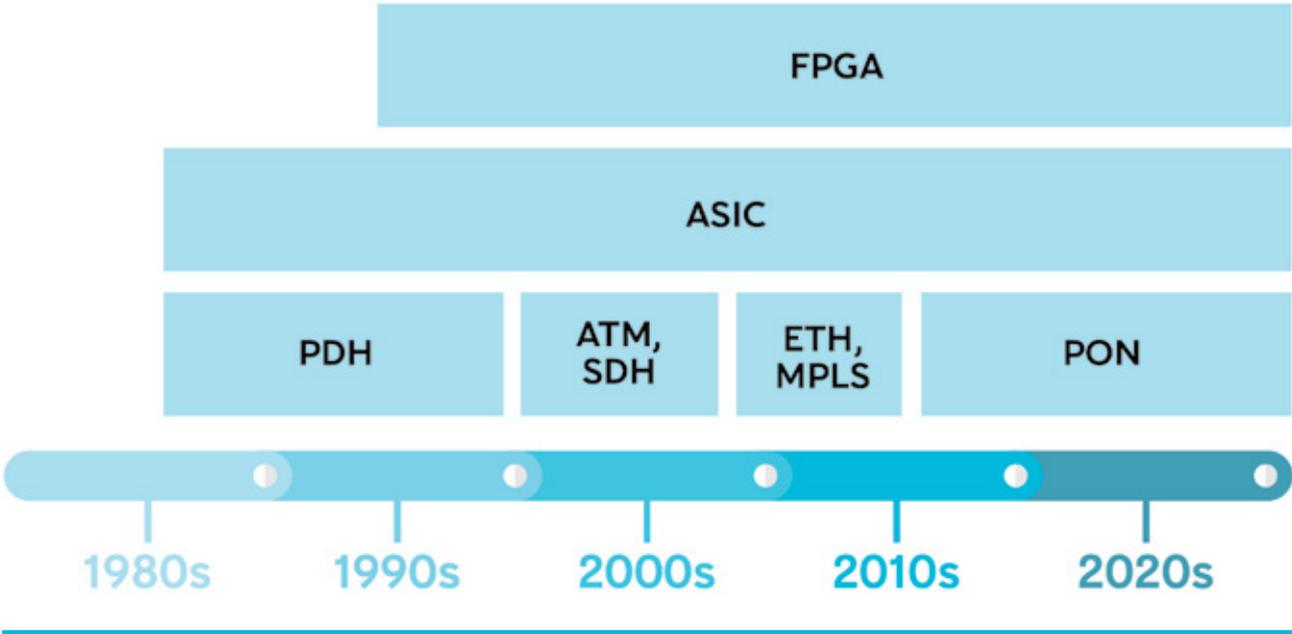


S VALUE SYSTEM

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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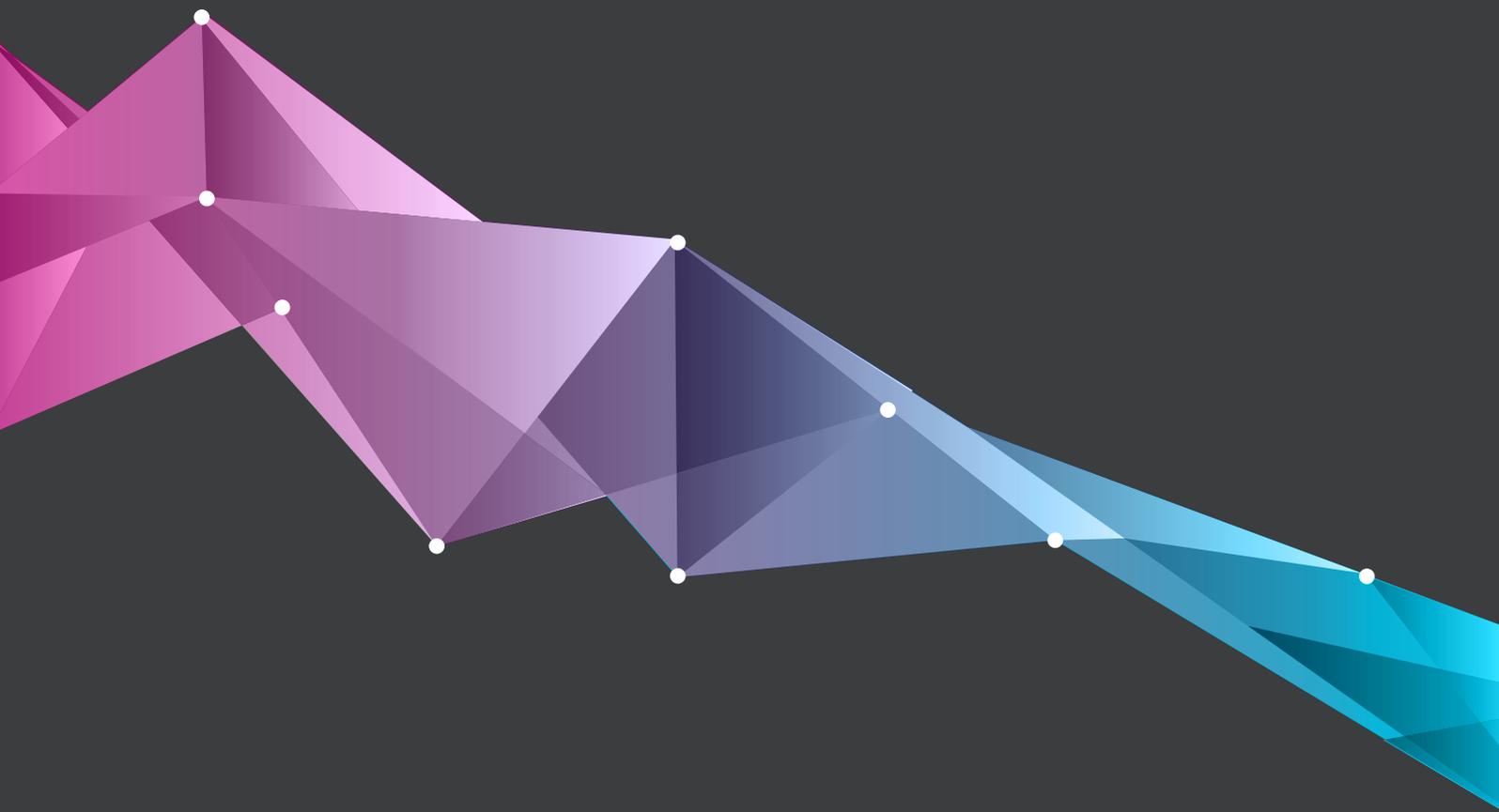


Altice Labs Major Technology Enrollements



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.





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