IKUSI by FAGOR ELECTRÓNICA

GPON Technology for hospitality

GPON technology for hospitality

Objective:

Introduce our GPON Solution in hospitality environments, such as Hotels, Hospitals, and so on, where a reliable and powerful telecommunications network is required to guarantee bandwidth demanding services as casting or internet connectivity.

Agenda:

- What is GPON ?
- Why use GPON ?
- GPON features
- Other technologies comparative: advantages/disadvantages
- GPON basic concepts
- GPON architecture
- GPON solution
- GPON recommended scenarios

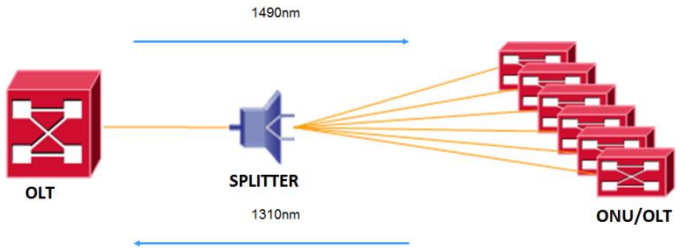
What is GPON ?

In the late 1990s, PON (Passive Optical Network) technology emerged, from which several standards such as EPON, GEPON and GPON subsequently derived, employing a passive optical network with a point-to-multipoint topology.

The GPON (Passive Optical Network with Gigabit Capability) standard is widely used by current Telecommunication Operators and is defined by ITU-T recommendations G.984.x.

GPON adopts division multiplexing technology at different wavelengths (WDM), facilitating two-way communication over a single fiber.

The link in a GPON network is done by a device located in the telecommunications rack called OLT (Optical Line Terminal) and the device that is placed on the user side called ONT (Optical Node Terminal). The ONT can also be called ONU (Optical Network Unit)



What is GPON ?

Currently GPON networks are successfully deployed in buildings, Hotels/Resorts, Hospitals, etc.

It is a growing market, because Hotels need to offer to the guest more and more bandwidth demanding services like streaming platforms, all unified into a common telecommunications infrastructure.

How does GPON work in a Hospitality environment?

Splitters (passive dividers) are used for deployment. This allows us to eliminate active hardware with power outlets, which is the norm in copper and coaxial networks.

With a single fiber cable per room, we provide all services to the guest, thus reducing maintenance costs and energy consumption of the hotel.

Subsequently, an ONT will be installed in each room, which will bring together all services: WiFi, Analog to SIP Telephony Conversion, Wired Internet Television, etc.

All this with very low installation costs compared to traditional networks, thus transforming the telecommunications of the hotel sector. Bandwidth allocation and QoS policies will be applied based on the services provided.

Why install GPON ? new requirements

The services offered to improve the guest experience in hospitality establishments are becoming more advanced and bandwidth demanding:

- ✓ In-room entertainment: casting to platforms such as Netflix, Amazon Prime, HBO...
- ✓ Internet connection: guests want a fast internet connection, therefore bandwidth must be shared equally
- ✓ Promotion of the services of the establishment with video content

The property also wants to improve their operational efficiency enhancing the staff management systems connectivity, with a PMS and communication between the employees.

Last, but not least, hospitality establishments need to integrate a greater number of networks as staff are increasingly connected and centrally managed: energy management, climate, home automation in the room, … They have become smart buildings where connectivity is a must.

Why install GPON ? GPON technology

- ✓ Integrates different services: IPTV, VoIP, CCTV, data, WIFI, IoT,…
- ✓ Provides high bandwidth
- ✓ Guarantees guest bandwidth (QoS)
- ✓ Has great coverage
- ✓ Is good value for money
- ✓ Is easy to install and set up
- ✓ Guarantees long-term infrastructure investment
- ✓ Complies with technology standards
- ✓ Is highly reliable
- ✓ Requires minimum maintenance

GPON features and main benefits

GPON (Gigabit Capable Passive Optical Network)

- Huge bandwidth
- Low energy consumption
- Durability > 30 tears
- Long distances 2Km-20Km
- Services Integration
- Robust
- Secure communications
- Quality of service
- Scalable
- Easy installation
- Interference inmunity
- Good quality/price relationship

GPON technical specifications

- **Multiservice Network:** TV, VoIP, data, CCTV, WIFI, IoT, ...
- **Bandwidth:** 2.5GBits/seg Downstream, 1.25GBits Upstream
- **Distances:** Up to 20Km to the ONT and 60Km as logic connection
- **Topology:** point to multi-point
- **Efficiency:** 92% against 72% in Ethernet
- **Splitting:** Up to 128 terminals (recommended 1:64)
- **Multiplexing:** WDM multiplexing y and time synchronization TDMA
- **Encapsulation:** GEM/ATM
- **QoS:** bandwidth by service and user, using DBA
- **Security:** download encryption AES-128
- **Monitoring and remote management:** following OMCI protocol

Comparative between technologies

Fiber Optic

GPON Standard

Ultimate technology for Hotels: more bandwidth, more services and better connectivity speed
For Hotels **with more than 70 rooms and long distances**

Structured Cable

ETHERNET Standard

For hotels with less that 70 rooms, reduced installations and low number of connections

Coaxial Cable

Data Over Coax

For hotels with an existing CATV network and without need of reforms

Comparative between technologies

CHARACTERISTICS	GPON	ETHERNET	DATA OVER COAX
BANDWIDTH	***	**	**
POWER CONSUMPTION	*** NETWORK: passive	* Red NETWORK: active	* Red NETWORK: active
DURABILITY	*** +30 years	*	*
DISTANCE	*** + 20 Km	* 100 m	**
RELIABILITY+ROBUSTNESS	***	*	**
SECURITY	***	*	*
SCALABILITY	***	*	*
INTERFERENCES INMUNITY	***	*	*
EASY INSTALLATION	***	**	***
ECONOMIC SAVINGS	**	**	***
RECOMMENDED ROOM Nº	+ 70 Rooms	- 70 Rooms	Not Apply

Very High: ***, High: **, Medium: *

GPON basic concepts

FTTH: Fiber to the Home.

- Point to point: one fiber to the final user
- Point – multipoint: one shard fiber for multiple users.

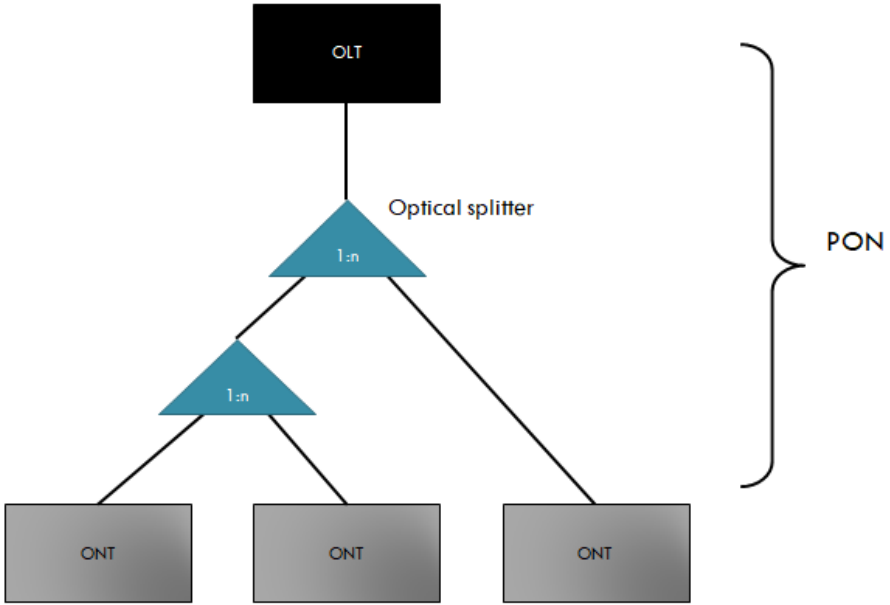
Other variants are: FTTN, FTTC, FTTB and the used in hospitality , one fiber to each room

GPON: ITU-T G.984.x set of recommendations describing techniques for sharing a common medium (FO) across multiple users, encapsulating information, and managing network elements, among other things.

PON: (Passive Optical Network) is a point-to-multipoint optical network in which there are no active elements from the OLT to the user terminal equipment (ONT).

OLT: (Optical Line Terminal) is the optical network element in charge of propagating traffic, allocating bandwidth... other functions.

ONT/ONU: (Optical Network Terminal) is the element located on the customer's premises.

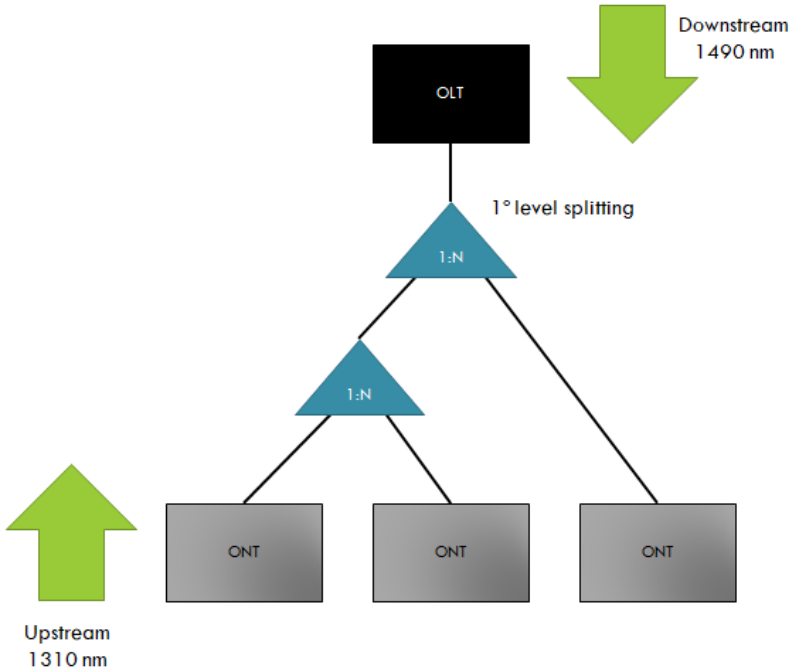


GPON basic concepts

The fiber that leaves the OLT is divided through the splitters and so on until it reaches the last endpoint, the ONT (point-to-multipoint architecture).

This division can be up to 128 fibers, although it is not recommended. At most, it is recommended using an optical splitting or splitting up to 64 terminal points, though the standard has a limit of 128 .

The down and up data is multiplexed into different optical wavelengths



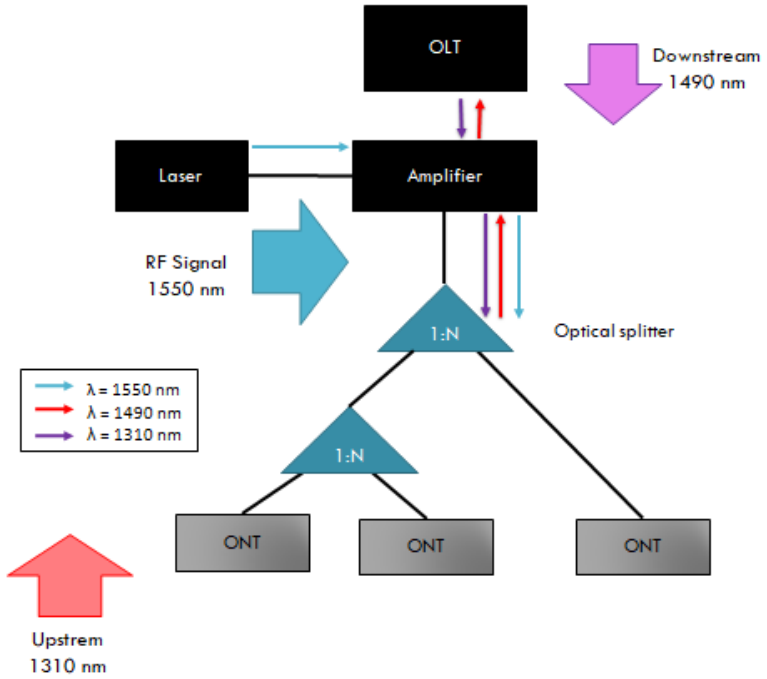
GPON basic concepts

RF Overlay:

Through optical modulation, it is possible to transport TV transparently (CATV 80-862MHz and Satellite 950-2150MHz) over the 1550nm lambda.

The ONT must have an RF port.

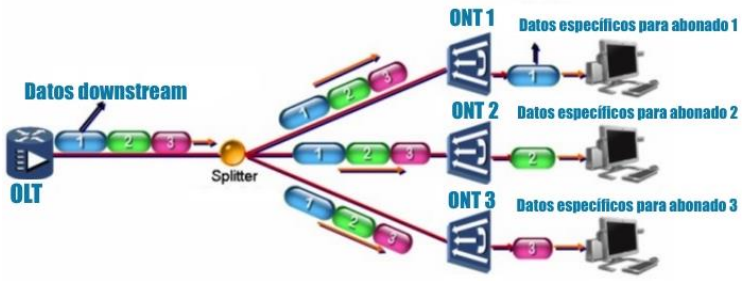
Laser emitting equipment is needed to convert the RF signal into optical signal, in addition to a WDM amplifier-multiplexer, which combines the different wavelengths, 1490nm-1310nm of the OLT PON and 1550nm from the laser emitter.

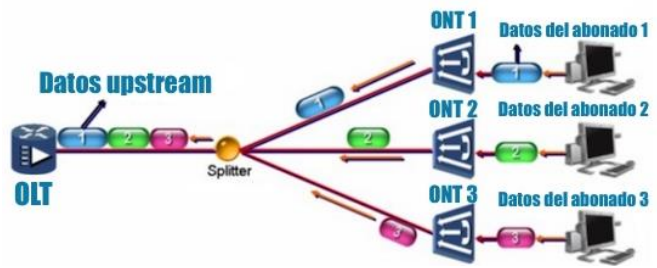


GPON basic concepts

Access to the common medium is shared, so a reliable system is required to prevent collision between ONTs and ensure bandwidth.

- The OLT sends frames continuously (in broadcast mode) to all ONTs, that is, traffic generated by users who share the fiber. It is the ONT itself that filters the traffic and allows the corresponding to each user in.
- The ONT bursts frames, when using Time-Division Multiple Access (TDMA). All items are synchronized to a common time reference to avoid collision between ONTs.





GPON architecture: active components

OLT: Optical Line Terminal

Responsible for the transmission and control of two-way traffic over the passive optical distribution network.

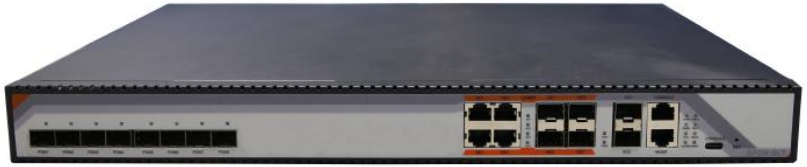
In the downstream, the OLT injects voice, video and data from service providers and distributes them to all ONT termination points in the optical network.

In the upstream, the OLT receives the traffic from the ONTs.

It uses the 1490nm wavelength to transmit down and down listens to the 1310nm

You can have multiple PONs, which are the outputs/inputs of the OLT to the optical distribution network.

It has Ethernet connectors to connect to the IP services present in the telecommunications network.



GPON architecture: active components

SFP GPON Adapter:

Bidirectional optical transceiver that transmits and receives signals of different wavelengths entering the OLT and ONTs, allowing optical communication between them.

It incorporates a laser transmitter in 1490nm and an optical receiver in 1310nm

There are two types of transceivers: class B+ and class C+ with capacity to support up to 64 ONTs.

Transceiver Type	B+ Class		C+ Class	
	Transmision Power	Maximum Sensibility	Transmision Power	Maximum Sensibility
GPON OLT SFP	1.5-5 dBm	-28 dBm	3-7 dBm	-32 dBm
Wavelenght OLT SFP	1480-1500 nm	1260-1360 nm	1480-1500 nm	1290-1330 nm

GPON architecture: active components

ONT: Optical Network Terminal

It is the element located at the termination of the passive optical network and performs optical- electrical conversion into the end user, where the different services multiplexed in the fiber are received: video, voice and data.

There are different types of ONTs depending on the services required by the customer:

- Ethernet ports 100/1000BaseT
- POTs (analog phone signal to VoIP)
- WIFI
- RF (TV Output)

It receives at 1490 nm and emits at 1310nm. In case you have an RF output, you also receive at 1550nm, and it has an important feature bandwidth management on each of its interfaces.

Complexity can range from being co-behaved as a simple transparent bridge to performing routing between different interfaces and the optical network.

ONT is the term used by ITU-T while the term UN is that used by IEEE.

GPON architecture: active components

An option to offer traditional TV in the GPON standard, sending it as an additional wavelength (1550nm) multiplexed with all other wavelengths

Laser Transmitter

It is the element that receives the RF signal and converts it into an optical signal with a highly linear laser at a wavelength of 1550nm.

EDFA/EYDFA Amplifier

It is responsible for amplifying and multiplexing the 1550nm output of the optical emitter with each of the PON of the OLT, so that in the distribution fiber there are GPON wavelengths for data and TV.

The difference between the two types of amplifier is in the doping to achieve amplification. In the first one, doping is with Erbium, whereas in the second the combination is Erbium-Ytterbium.

Optical Receiver

Extracts the RF-shaped TV from the 1550nm wavelength. There are models that also de-multiplex GPON signals to connect an ONT.

GPON architecture: passive components

PLC Rack 19”Splitters

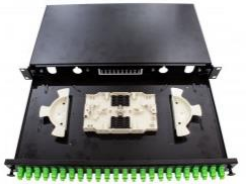
1:16.1:32,1:64, SC-APC

PLC splitters

GPON architecture: passive components

Components for GPON distribution

Optical Rack Distribution Tray 19"



Fusion protector

Optical distribution boxes

Optical PAUF

Optical fiber

GPON architecture: IP network

In addition to the elements of the GPON network, other elements are needed to manage the services that we want to transmit over the network

There are projects where these elements are already present in the telecommunications network, provided by the System Integrator.

Services Management Router:

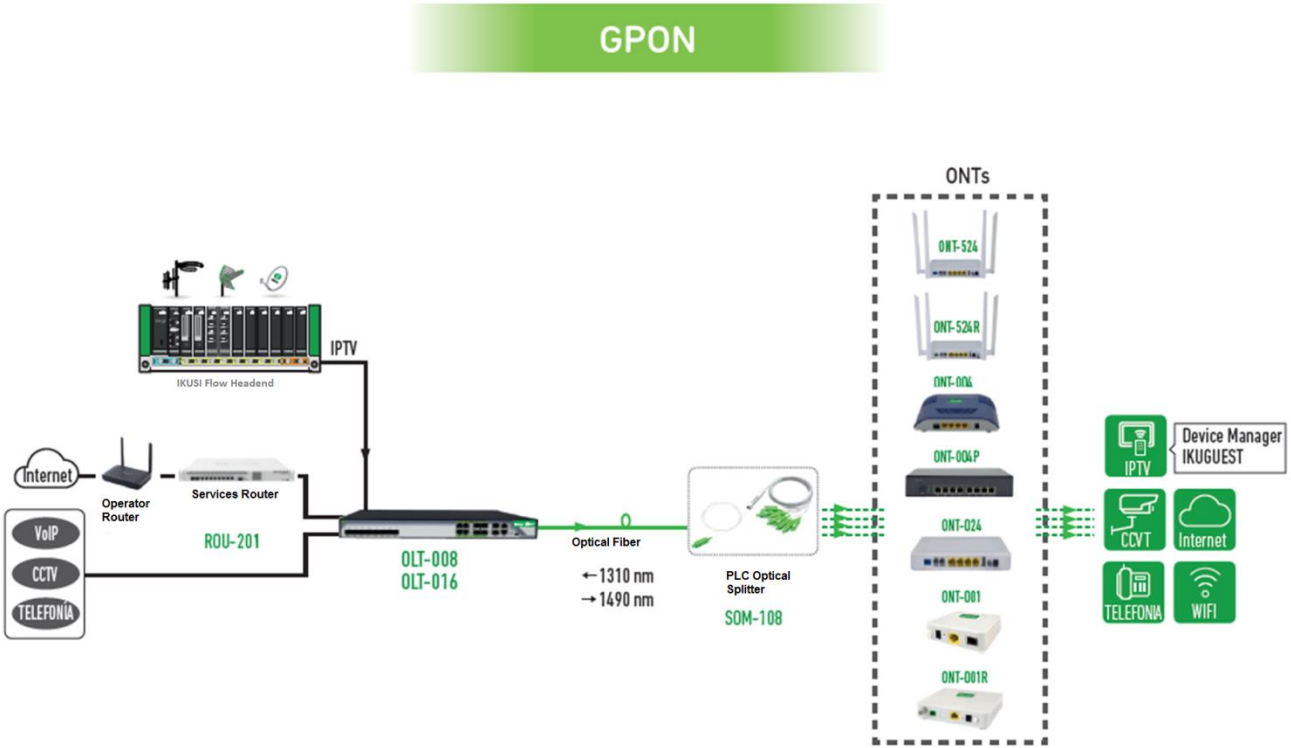
It is responsible for managing telecommunications at the IP level, facilitating functions such as: VLANs, DHCP, load balancing, routing, firewall,...

It allows the remote connection by VPN, facilitating the remote support of the elements that make up the GPON solution

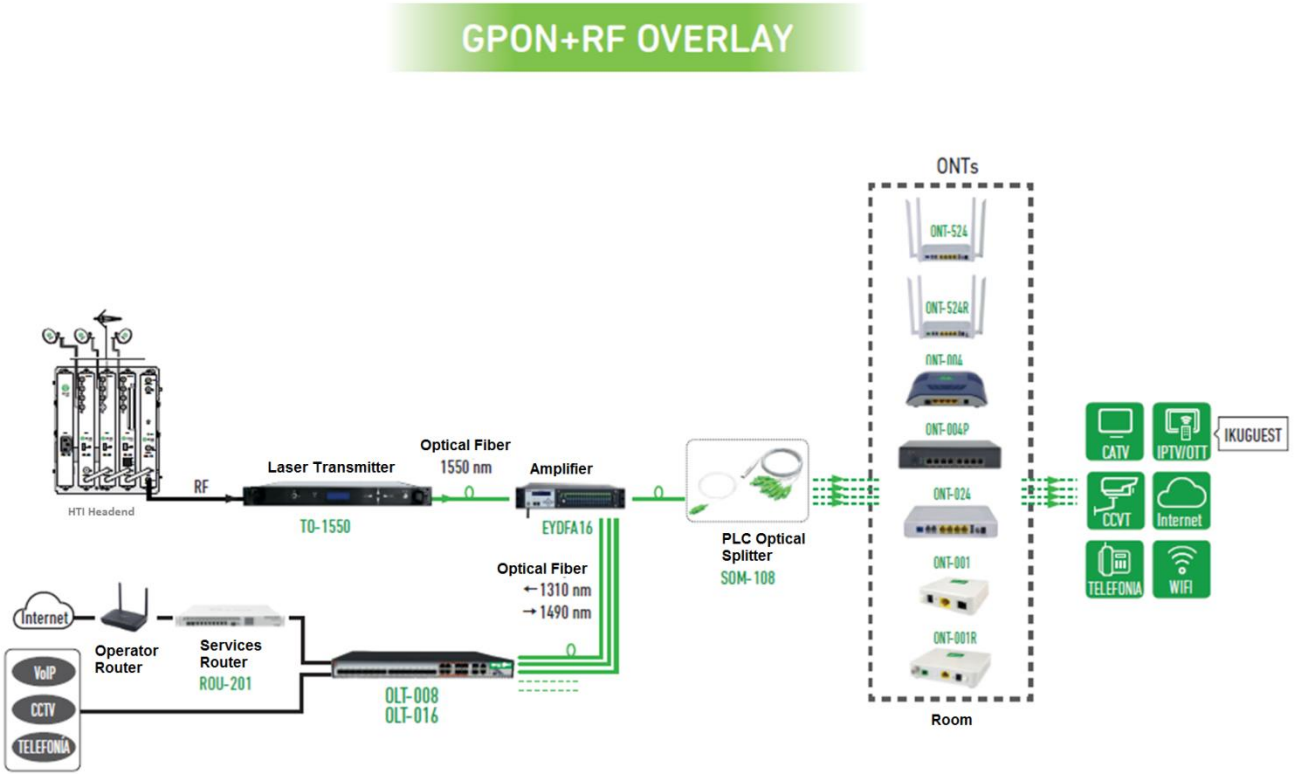
Services Aggregation switch:

Optionally, in projects where you have to combine different types of services as IPTV TV, VoIP Switchboard, Camera Network, WIFI, ... It includes an aggregation switch where these services are interconnected before to send them to the OLT GPON.

GPON solution: common scheme



GPON solution: common schemes



GPON solution: references

PRODUCTS FOR GPON CONNECTIVITY SOLUTIONS		
Ref.	**Model**	**Description**
GPON HEADEND		
OLTs		
8302	OLT-008	OLT 8 PON, 1U
8303	OLT-016	OLT 16 PON, 1U
8305	SFP-125	GPON OLT SFP C+
8306	DTM-10G DOM	10G Base Transceiver
8304	LFD-100	Duplex LC/UPC-LC/UPC Multimode optical fiber cable
8562	ROU-201	Service management router
8307	TO-1550	Optical transmitter 1550 nm
8308	EYDFA08	EYDFA 8x22 dBm WDM 1U 19" Amplifier
8309	EYDFA16	EYDFA 16x22 dBm WDM 1U 19" Amplifier
8312	SOR-116	Optical Splitter 1:16 rack 19" 1U
8313	SOR-132	Optical Splitter 1:32 rack 19" 1U
8473	SOR-164	Optical Splitter óptica de 1:64 rack 19" 1U
8297	PFO-124	19" telescopic fiber tray with front 24 SC/LCdx, 2 trays x 12 fusions
8327	LPA-050	SC/PC-SC/APC 0.5 m fiber optic cable
8328	LPA-100	SC/PC-SC/APC 1 m fiber optic cable
8329	LPA-200	SC/PC-SC/APC 2 m fiber optic cable
8330	LPA-300	SC/PC-SC/APC 3 m fiber optic cable
GRPON DISTRIBUTION		
OPTICAL SPLITTERS		
8239	RSE-006	Fiber distribution eclosure with tray, 12 fuse holder 160x110x30 mm. White, indoor
8240	RSE-012	Fiber distribution eclosure with 2xtray 6 fuse holder 180x255x60 mm. Beige,indoor
8295	RSE-121	Fiber distribution eclosure with tray 12 fuse holder 126x200x50 mm. White,indoor
8294	CTO-032	Multioperator eclosure 32 ports SC/APC (Oper/Client space) 320x150x110 mm, indoor
8293	CTO-048	Multioperator eclosure 48 puertos SC/APC (Oper/Client space) 450x180x150 mm, indoor
8459	SOM-102	PLC Optical splitter 1:2 without box
8460	SOM-104	PLC Optical splitter 1:4 without box
8461	SOM-108	PLC Optical splitter 1:8 without box
8459	SOM-116	PLC Optical splitter 1:16 without box
8463	SOM-132	PLC Optical splitter 1:32 without box
FIBER OPTIC CABLES		
8040	CFA-102D	Cable hose with 2 optical fibers SM G657A2 LSZH-FR-UV indoor/outdoor. black. CPR Dca
8042	CFA-012D	Cable hose with 12 optical fibers SM ajusted LSZH-FR-UV indoor/outdoor. black. CPR Dca
8043	CFA-024D	Cable hose with 24 optical fibers SM ajusted 4 tubes x6 fibers LSZH-FR-UV indoor&outdoor. black. CPR Dca

Ref.	**Model**	**Description**
USER ACCESS		
ONTs		
8321	ONT-001	ONT 1 GE
8711	ONT-001R	ONT 1 GE+1RF
8319	ONT-524	ONT 4 GE, 2 POTS, Wifi 802.11a/b/g/n/ac
8418	ONT-524R	ONT 4 GE, 2 POTS, 1 CATV, Wifi 802.11a/b/g/n/ac
3818	ONT-004P	ONT 4 GE PoE
8317	ONT-004	ONT 4 GE
8618	ONT-024	ONT 4 GE, 2 POTS
SC/APC FIBER OPTIC CABLE		
8323	LAA-050	SC/APC-SC/APC 0.5 m fiber optic cable
8324	LAA-100	SC/APC-SC/APC 1 m fiber optic cable
8222	LFO-002	SC/APC-SC/APC 2 m fiber optic cable
8326	LAA-300	SC/APC-SC/APC 3 m fiber optic cable
PAUFs		
8221	PAUF-002	Fiber optic outlet with fusion tray + 2x SC/APC adapters
8201	PAUF-110	PAU optic + pigtail 10m SC/APC
8202	PAUF-120	PAU optic + pigtail 20m SC/APC
8203	PAUF-130	PAU optic + pigtail 30m SC/APC
8204	PAUF-140	PAU optic + pigtail 40m SC/APC
8205	PAUF-150	PAU optic + pigtail 50m SC/APC
8206	PAUF-160	PAU optic + pigtail 60m SC/APC
8207	PAUF-170	PAU optic + pigtail 70m SC/APC
ACCESORIOS		
VARIOS		
8243	ADF-102	Zirconia adapter SC/APC with side bindings, simplex
8292	ADF-103	SC-SC APC SM adapter without screw binding , simplex, zirconia, green for CTO box
8315	PEM-060	Fusión protector 60 mm length 100 units bag
8223	PTI-015	Pigtail SC/APC G657A2 900 um. Length 1,5 m. LSZH-FR
SERVICES		
8507	SER-C01	IKUCONNECT EQUIPMENT CONFIGURATION SERVICE
8521	SER-M01	IKUCONNECT EQUIPMENT MAINTENANCE SERVICE

GPON recommended scenarios

Scenario 1: Hotels > 70 rooms due for an integral reform or need to implement a telecommunications network by integrating voice, TV and data in the rooms. The higher the number of services in the room, the more competitive the fiber compared to structured cabling.

Scenario 2: Hotel that wants to improve WIFI within the room to provide more services, such as sending premium content to the TV.

Scenario 3: Resort with large distances to the apartments/cabins.

Scenario 4: Hotels > 200 rooms, where structured cabling is extremely complex.

Scenario 5: Hotels where access to traditional TV is needed, but also good WIFI coverage in the room (RF Overlay).

Scenario 6: Industry sector with long distances and interference with machinery, Industry 4.0.

Scenario 7: Shopping centers with long distances.

Scenario 8: Nautical sector of large cruise ships.

Scenario 9: Hospitals with a great number of rooms.

In short, anywhere you want to deploy a high-capacity future-proof telecommunications network and service integration.