FRACARRO

GPON SOLUTIONS

Technology
Devices
Assistance

GPON technology

To meet the continuing demand for broadband connectivity, today it is necessary to use fibre optic infrastructures, in order to create future-proof multi-service systems.
It is thus possible to convey not only the Satellite TV service, but even all those that the end user can request, such as the Internet, IoT, High Definition TV, etc.
To carry out these systems it is possible to use the **GPON technology (Gigabit Passive Optical Network)**, used also by telecom providers, which allows you to bring the **broadband to end users through the passive fibre optic network**.
It is a type of point-to-multipoint solution, ideal for **business and hospitality contexts such as hotels, campsites or tertiary sector**, which allows to provide DATA connectivity to end points, reaching a very high bandwidth capacity (up to 2.5Gbit/s in download and up to 1.25Gbit/s in upload).

The Fracarro GPON solution

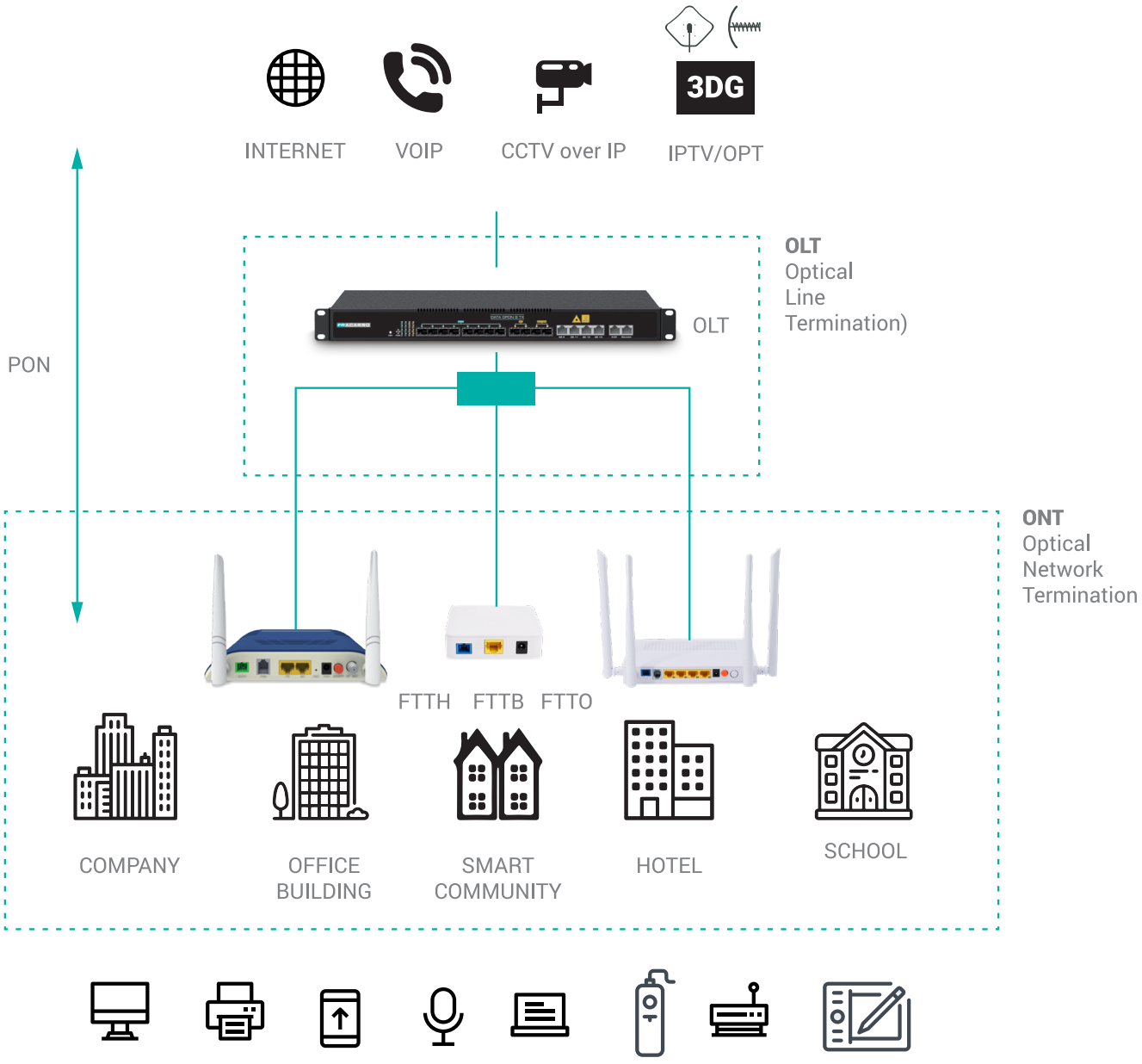
The Fracarro GPON solution exploits the FTTH (Fibre To The Home) to distribute data, video and voice over a single fibre optics, managing to provide a rich range of services and contents: Internet connectivity, VoIP, SAT-TV, UHDTV, DTT, IPTV, radio and data.
It is a **modular and scalable solution**, which guarantees a **high quality service** even in **large plants** and is made with high quality products, the result of over 20 years of research and development by Fracarro.

Optical transmitters and receivers for managing TV/SAT services (**Home Fibre and optical OPT-MBJ**) operate in second and third window, ensuring maximum flexibility for any type of installation.
3DGFlex Fracarro head-ends are suitable for local management and/or regeneration of SMATV signals/CATV/radio which, properly managed by the GPON system, are injected into the optical fibre distribution through the WDM technology (Wavelength Division Multiplexing).
Additional services from different sources, based on requirements of users, can be integrated easily, thanks to the system flexibility that allows different configurations.
An **integral part of the GPON solution is the consulting service by Fracarro**, which represents an important value starting from network design phase, up to implementation.

THE COMPONENTS OF THE GPON SYSTEM

In addition to the passive optical components (box, organizer, optical fibre, patch cord, etc.), the **GPON system consists of several fundamental hardware elements**:

- **OLT** (Optical Line Termination)
- **ONT** (Optical Network Termination)
- **SFP modules** (Small Form-Factor Pluggable)



OLT

The Optical Line Termination is the termination equipment, on the network side, and allows it to interface with the fibres in FTTH-FTTx fibre optic distributions.
In an FTTH network, an **OLT provides connectivity to one or more user (subscriber) endpoints called ONU or ONT**, using fibre optic networks in point-to-multipoint mode (GPON network). Normally, the OLT is installed in the technical room near the arrival of the telecom operator service.
In a nutshell, the **Fracarro OLTs are access nodes suitable for transporting high-speed data traffic through fibre optic distributions** and are able to meet the demand for data traffic and bandwidth needed in hospitality and corporate contexts but increasingly, even in structured residential contexts. Thanks to continuous technological evolutions, the range of products is constantly evolving to meet the needs of tomorrow.
OLTs are available in different types: **DATA GPON 4TX and DATA GPON 8TX** to adapt both to the number of subscribers to be served (ONT) and to the range of services to be distributed.

- **GPON** technology
- 19 "1U standard rack size
- Flexible: **4xPON or 8xPON**
- Each pon port can support up to **64 OLT (Class B+ SFP)** or **128 OLT (Class C++ SFP)**
- Compatible and **integrable with the different wavelengths used by HOME Fibre systems** (multisatellite + TV) and OPT-MBJ (IF-IF + TV)
- Advanced traffic management

ADVANTAGES:

- Meets the growing needs for **high-capacity data connectivity**
- Capable of serving up to over **1000 endpoints through a single OLT (DATA GPON 8 TX)**
- Dynamic bandwidth allocation
- Integration of Digital Terrestrial and multisatellite signals **(Home Fibre and OPT-MBJ solutions)**
- Space and energy savings compared to copper
- **Convergence of different applications** (voice, data, video, access control, video surveillance, etc.) on one single platform

DATA GPON 4 TX

DATA GPON 8 TX

CODE	ARTICLE	DESCRIPTION
287558	DATA GPON 4 TX	OLT (Optical Line Terminal) for the distribution of data on the optical fibre (4xPON, Uplink: 4xGE + 2xSFP 10GE, Double slot for power supply. Management via SNMP, WEB, CLI, Telnet). Dimensions 442x200x44mm.
287559	DATA GPON 8 TX	OLT (Optical Line Terminal) for the distribution of data on the optical fibre (8xPON, Uplink: 4xGE + 2xSFP GE + 2xSFP 10GE, Double slot for power supply. Management via SNMP, WEB, CLI, Telnet). Dimensions 442x200x44mm.

ONT

The Optical Network Termination (ONT) is an active terminal device connected to the fibre optic network **capable of providing data connectivity to the various user terminals** (PCs, smartphones, tablets, VoIP phones, etc.).
The ONT allows the optical/electrical adaptation between the FTTH network and the user and, during the configuration phase, allows the flexible management of the incoming and outgoing traffic dedicated to each single subscriber (**in a PON/GPON network, a single optical fibre supports multiplex traffic of multiple subscribers**). Its role is also to act as a **gateway between the FTTH/PON (fibre side) and Ethernet/IP (user network side)** protocols and to encapsulate the user's Ethernet frames to send them over the shared fibre network of a GPON network.
The features and functions of these devices are defined by the international standards **ITU G.984.1, G.984.2, G.984.3 and G.984.4**.

- **Gigabit Ethernet (GE) and Fast Ethernet (FE)** interfaces
- Wall or stand alone mounting
- **CATV output**
- Supports remote management and maintenance
- Available also a passive ONT version to manage the CATV signal
- **WIFI 802.11 b/g/n/ac**
- IPv4/IPv6

ADVANTAGES:

- Allows **Gigabit connectivity** to the various Ethernet devices
- Allows the flexible implementation of additional OLTs in the network, combining the advantages of fixed connectivity with wireless connectivity for 100% coverage of user needs
- Management of **DATA, CATV and Voice connectivity through a single device**
- Guarantees very high quality of service (Qos) and data security.


GPON RX W TV P


GPON RX WAC-P


GPON RX WAC-4GE


GPON RX BASIC


GPON RX LITE TV


GPON RX PASS TV

CODE	ARTICLE	DESCRIPTION
287615	**GPON-RX BASIC**	**ONT GPON**. GPON receiver with 1 RJ45 port (1xGE) Dimensions 82x82x25mm.
287616	**GPON-RX WAC 4GE**	**ONT GPON**. GPON receiver with 4 RJ45 ports (4xGE), 1 FXS phone port, 1 CATV port with IEEE802.11ac WiFi connectivity. Dimensions 178x30x120 mm.
287562	GPON-RX W-TV-P	**ONT GPON**. GPON receiver with 2 RJ45 ports (1xGE, 1xFE), 1 FXS phone port, 1 CATV port with IEEE802.11n WiFi connectivity. Dimensions 185x33x122mm.
287561	GPON-RX WAC-P	**ONT GPON**. GPON receiver with 2 RJ45 ports (2xGE), 1 FXS phone port, 1 CATV port with IEEE802.11ac WiFi connectivity. Dimensions 178x30x120mm.
287557	GPON RX LITE TV	**ONT GPON**. GPON receiver with 1 RJ45 port (1xGE) and 1 CATV port (47-1000MHz). Dimensions 82x82x25mm.
287556	GPON RX PASS TV	**ONT GPON**. GPON passive receiver with integrated WDM and and 1 CATV port (47-1000MHz). Dimensions 75x55x28mm.

SFP modules (PON and Ethernet)

SFP modules (small form-factor pluggable) are compact and "hot-pluggable" transceiver devices, designed to support various communication standards such as Ethernet 100/1000Mbps, Fibre Channel (PON). SFP transceivers support very high traffic speeds and are commonly used in applications such as telecommunications and data communications. **They are installed at the OLT level, both to ensure the connectivity to the ONTs and to manage the uplink connections.**

DATA SFP C++

DATA SFP GE

CODE	ARTICLE	DESCRIPTION
287560	DATA SFP C++	C++ Class SFP module
287555	DATA SFP GE	SFP module for uplink

FRACARRO SOLUTIONS

TO MIX THE TV/SAT SERVICE IN THE GPON NETWORK

HOME FIBRE

The HOME FIBRE solution allows the **"RF Overlay" distribution of SAT, Digital Terrestrial and radio signals using just one single-mode optical fibre (9/125µm) in GPON networks (FTTx)**. Transmitters are equipped with automatic gain control (AGC), can be installed in cascade, as occurs in a typical multiswitch system, and allow distributions with a high number of outputs. The optical wavelengths used by the devices also allow the flexible integration of multisatellite solutions not only in GPON infrastructures but also in future XG-PON and XS-GPON networks.

ADVANTAGES:

- Optical transmitters with different wavelengths available (**1310nm, 1510nm, 1530nm, 1550nm, 1570nm**)
- **High optical output level** (up to + 7dBm).
- **Independent automatic gain control circuits**, for each single satellite polarity
- Possibility of managing **up to 4 different satellites and mixing them to the DATA distribution in a single optical fibre** through the use of external passive CWDM diplexers
- **Compatible with GPON and XGPON**
- **Multicolor LED for diagnostics and receiver status**
- Perfect compatibility with dCSS systems (SKY Q)

(*): QDSA=Apartment Signal Distribution Panel

OPT-TX RP

OPT-TX

OPT-TX 15XX

CODE	ARTICLE	DESCRIPTION
270652	**OPT-TX RP**	Optical transmitter, 7dBm with FP SAT+TV+FM laser, wavelength 1310nm. Powered remotely through the AMP2000 power supply (recommended)
270694	OPT-TX DT	7dBm with FP SAT+TV+FM laser Wavelength 1310nm
270667	OPT-TX 1510	7dBm with DFB SAT+TV+FM laser Wavelength 1510nm
270668	OPT-TX 1530	7dBm with DFB SAT+TV+FM laser Wavelength 1530nm
270669	OPT-TX 1550	7dBm with DFB SAT+TV+FM laser Wavelength 1550nm
270670	OPT-TX 1570	7dBm with DFB SAT+TV+FM laser Wavelength 1570nm
dimensions OPT-TX: 230x230x50mm		

OPT-RX SCD MICRO

OPT-RX QD MICRO

OPT-RX 4 MICRO

AMP 2000

PSU1506

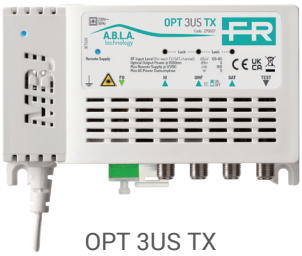
CODE	ARTICLE	DESCRIPTION
270660	OPT-RX SCD2 MICRO	Single cable 2 (SCD2) optical receiver equipped with 4 outputs, 2xSCR dCSS with 16 user band+TV for each output and 2 Legacy+TV outputs, SC/APC optical connector (dimensions 160x100x36mm)
270658	OPT-RX dSCR UK	Optical TV SAT dSCR receiver with 2 legacy 4SAT+TV+FM outputsand 2 dSCR outputs, SC/APC optical connector (dimensioni
270661	OPT-RX QD MICRO	Optical TV SAT receiver with 4 universal Legacy SAT+TV+FM outputs, SC/APC optical connector (dimensions 120x100x36mm)
270662	OPT-RX 4 MICRO	Optical TV SAT QUATTRO receiver with HL, VL, HH, VH, TV+FM outputs, SC/APC optical connector (dimensions 120x100x36mm)
270655	OPT-RX	Optical receiver of the OPT-MBJ family with remote feeding, equipped with TV+SAT output, A.G.C. and optical connector SC/APC (dimensions 135x82x39mm)
287155	PSU1506	Switching power supply 600mA@15V (recommended for OPT-RX SCD MICRO)
271139	AMP2000	Switching-mode power supply 24mA@14V (recommended for OPT-TX RP)

OPT-MBJ SOLUTION

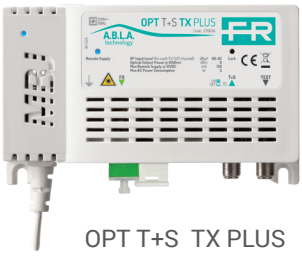
The "**Plug & Play**" **OPT MBJ Series** optical transmitters and receivers are able to mix the 3, UHF and SAT (IF-IF) bands and distribute them in optical fibre through the multiservice infrastructure in **medium-sized facilities**. They represent an excellent solution to manage the "**RF Overlay**" component on GPON infrastructures (FTTx).

ADVANTAGES:

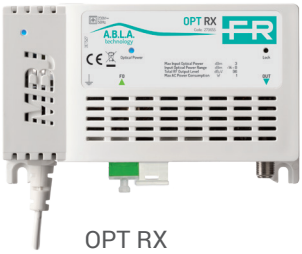
- "**Plug & Play**": no adjustment
- Ideal solution to **integrate Digital Terrestrial signals and one SAT (IF-IF) polarity into the GPON network in FTTH distribution**
- **A.B.L.A technology**: in the transmitters the optical signal is kept constant at the output if the RF levels of TV and SAT input are between **60dBµV and 85dBµV**;
- The **OPT RX receiver is equipped with Automatic Gain Control** which keeps the RF output constant if the received optical signal is within its working range.
- Plastic frame in fireproof ABS material (Class V0)
- **Very low current consumption**;
- LED signalling operation of A.B.L.A circuits for an immediate diagnosis of the RF input levels in the TX;
- Diagnostic LEDs of the **correct optical signal and the presence of the RF level in the OPT RX receiver**
- Wall or **DIN rail** mounting.



OPT 3US TX



OPT T+S TX PLUS



OPT RX

CODE	ARTICLE	DESCRIPTION
270657	OPT 3US TX	Optical Plug&Play transmitter with 3 separate independent inputs: VHF, UHF and SAT (IF-IF). Optical SC/APC output and coaxial test output. Output power 5dBm@1550nm; splitting up to 32 times when paired with the new OPT RX receiver. Remote feeding that can be enabled on the UHF input.
270656	OPT T+S TX PLUS	Plug&Play optical transmitter with 1 mixed TV/SAT (IF-IF) input. Optical SC/APC output and coaxial test output. Very high output power 9dBm@1550nm; splitting up to 64 times when paired with the new OPT RX receiver. Remote feeding that can be enabled on the TV+SAT input.
270655	OPT RX	Plug&Play optical receiver with SC/APC optical input (extended range from 0dBm to -14dBm), automatic gain control for stabilization of TV/SAT signals. It **can also be used as a replacement for the OPT RX TV (code 270696)**. Signaling LED for the presence of optical and RF signal.

OPT-MBJ dimensions: 135x82x39mm

OPTICAL AMPLIFIERS

EDFA optical amplifiers are necessary to bring the optical signal back within the correct operating range of optical receivers, especially in complex optical network situations. Fracarro's GPON solutions include two versions of EDFA optical amplifiers (Erbium Doped Fibre Amplifier) with high optical output power and integrated WDM 1310-1490-1550 diplexers.

- **EDFA amplifier (Erbium Doped Fibre Amplifier)** with high output power
- High input dynamics: **-8 to +10dBm (optical)**
- **Integrated WDM multiplexer** to mix the PON OLT outputs

ADVANTAGES:

- Two versions available to satisfy different types of distribution.
- **Local management** of the amplifier via display and keypad.
- Remote management via integrated **WEB interface (SNMP)**.
- Integrated redundant power supply.

EDFA 4 WDM

EDFA 8 WDM

CODE	ARTICLE	DESCRIPTION
287554	EDFA 4 WDM	EDFA optical amplifier with integrated WDM diplexer. 5xSC/APC 1550nm input/output. 4xSC/PC for data mixing. Output power 29dBm (4x22dBm). Management via keyboard and front display, WEB interface or SNMP. SC connectors with flap. 1U Rack Mount. Dimensions: 370x486x44mm
287553	EDFA 8 WDM	EDFA optical amplifier with integrated WDM diplexer. 9xSC/APC 1550nm input/output. 8xSC/PC for data mixing. Output power 31dBm (8x21dBm). Management via keyboard and front display, WEB interface or SNMP. SC connectors with flap. 2U Rack Mount. Dimensions: 422x486x88mm

APPLICATION EXAMPLES

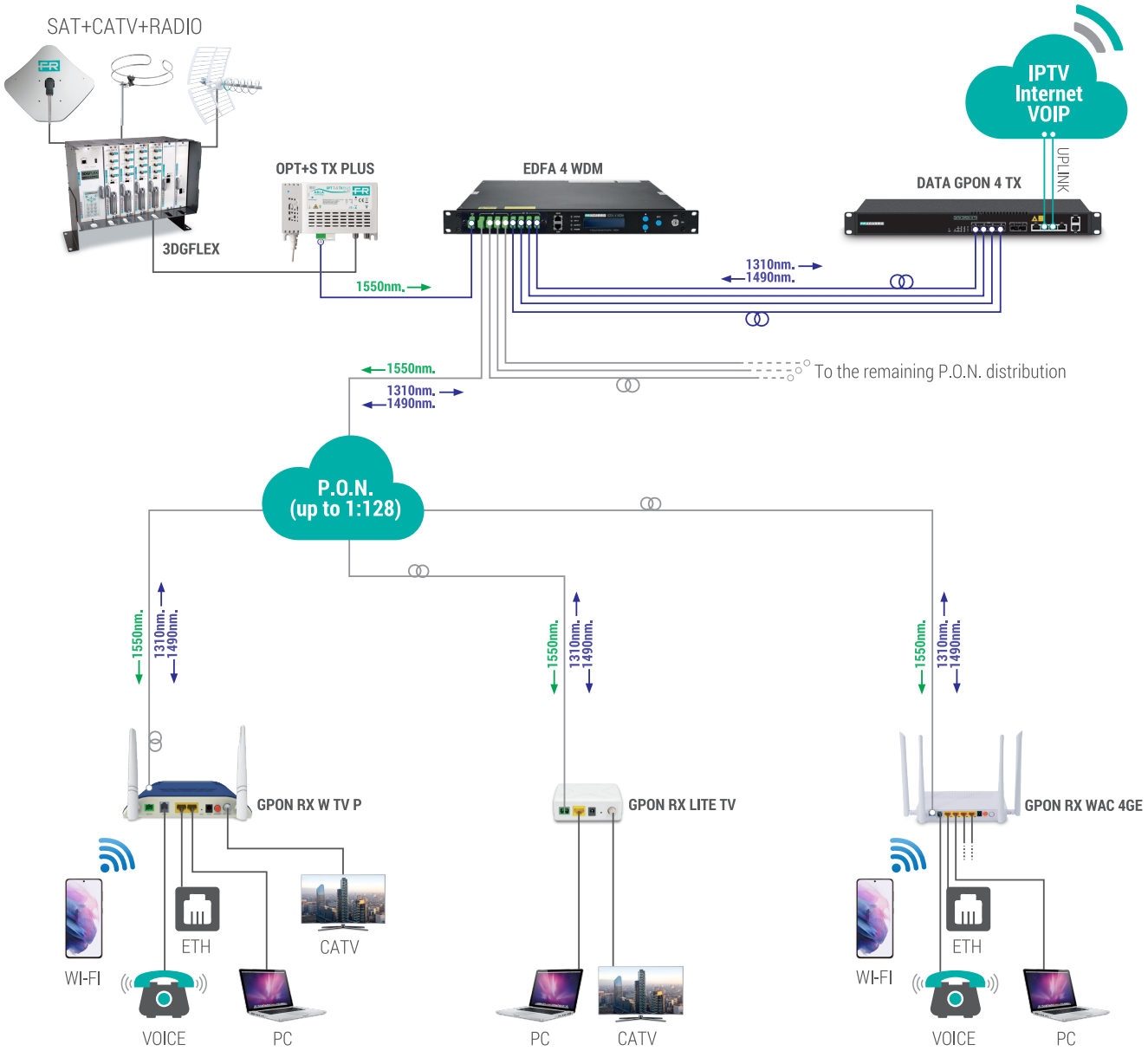
GPON (Internet+DATA+IPTV+VoIP) + CATV

Distribution of IP-based services and CATV programs coming from a FRACARRO head-end.

The RF signal, available at head-end's output, is converted into an optical signal by means of an OPT-MBJ transmitter and is subsequently amplified by an EDFA (optical amplifier). The optical signals available at the various SFP outputs of the GPON transmitter (OLT - Optical Line Terminal) are mixed via the WDM diplexers available on board the EFDA amplifier before being sent to the PON passive optical distribution.

Each output resulting from the combination of GPON and CATV can be split by a PON optical splitting system up to 128 times.

This allows all injected services (Data) and CATV programs to reach the various ONT (Optical Network Terminal) receivers at the terminal points, where they are converted back to their original form. All IP based services are available on the Ethernet ports, on any telephone output and via the WiFi network; all CATV programs are available on the coaxial output, ready to be connected to the TV.



GPON (Internet+DATA+IPTV+VoIP) + Satellite + DTT

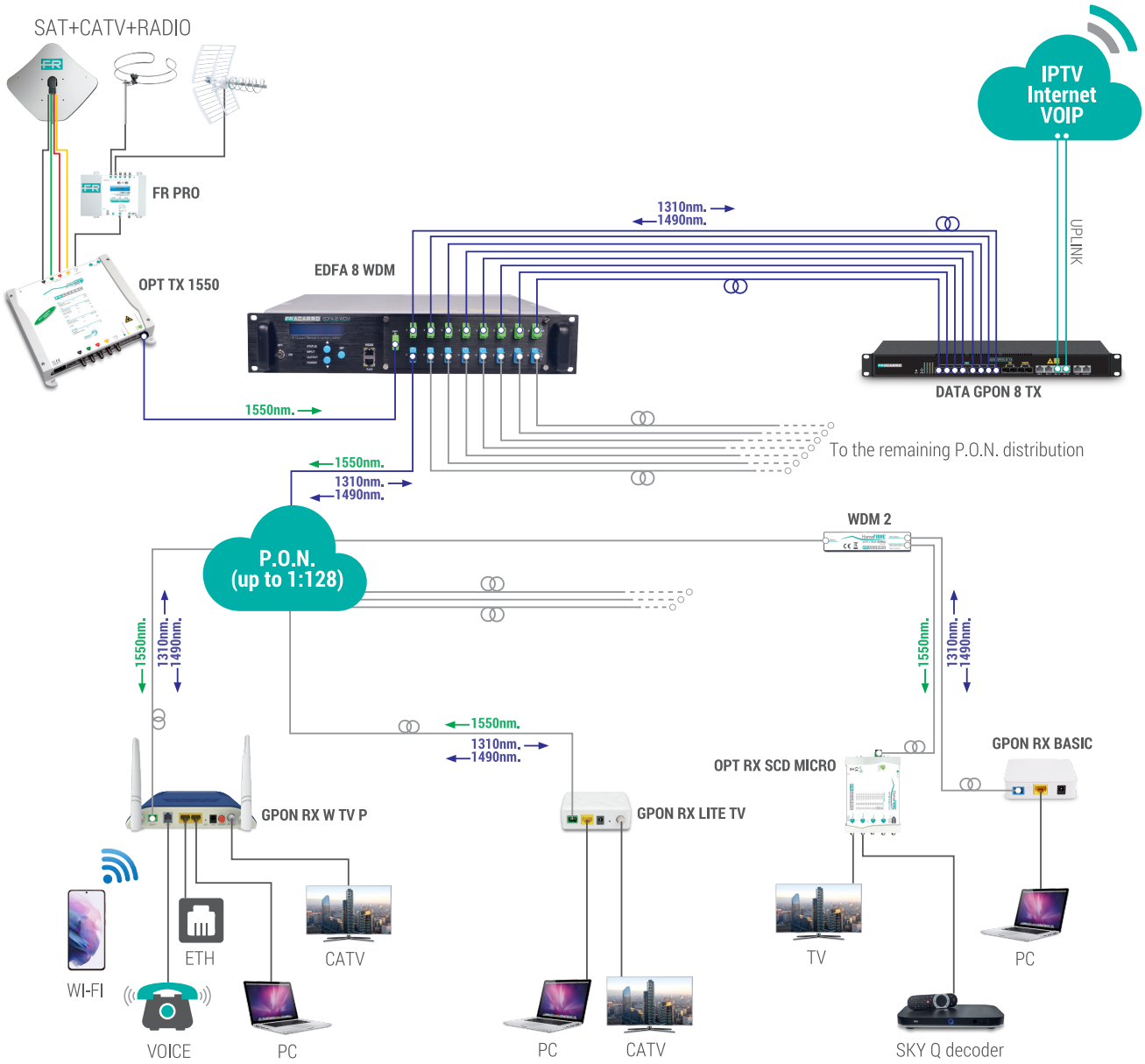
In addition to IP-based services, this GPON configuration includes the distribution of 4 satellite polarities (DVB-S2/S) and DTT signal.

The RF signal (Satellite + DTT), available at the output of the Home Fibre optical transmitter, is subsequently amplified by an EDFA (optical amplifier). The optical signals available at the various SFP outputs of the GPON transmitter (OLT - Optical Line Terminal) are mixed via the WDM diplexers available on board the EFDA amplifier before being sent to the PON passive optical distribution.

Each output resulting from the combination of GPON and CATV can be split by a PON optical splitting system up to 128 times.

This allows all the injected IP services and the Satellite and Digital Terrestrial contents to reach the ONT receivers or the Home Fibre Optical Receivers in the rooms where they are reconverted to their original form.

All IP-based services are available on the Ethernet ports, on eventual telephone output or on the WiFi network; all DTT programs are available on the coaxial output on board the ONT and the SAT+TV ones on the relative Home Fibre optical receiver, ready to be connected to the TV or satellite set top box.



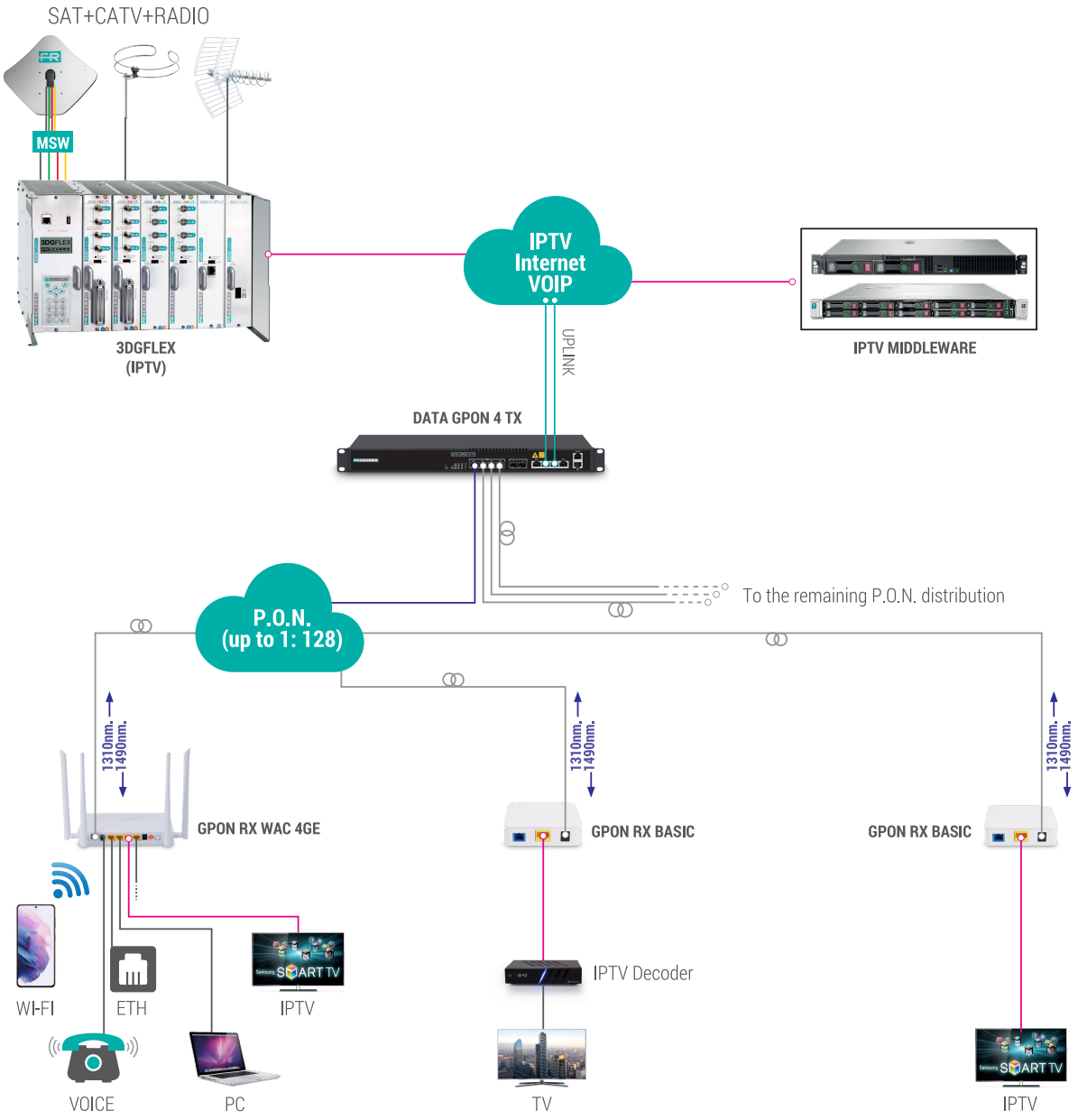
GPON (Internet+DATA+VoIP) + FULL IPTV

Distribution of a combination of IP-based services and Satellite and DTT programs converted into a Full IPTV solution.

In addition to the Data services (Internet, VoIP, etc.), the IPTV output from a 3DGFLEX head-end and the Middleware system (that deals with the management of IPTV terminals, i.e. IPTV decoders or Smart TV's with IPTV tuner on board) is conveyed to the Uplink ports of the OLT transmitter. The optical signals available at the various SFP outputs of the GPON (OLT - Optical Line Terminal) transmitter are sent to the PON passive optical distribution.

This allows all injected IP services, including Satellite and DTT contents, suitably transformed into IPTV streaming by the 3DGFLEX head-end, to reach the ONT receivers where they are reconverted to their original form to be made available to the user terminal (Set-top- IP box or Smart TV with IPTV tuner on board depending on the solution used).

All IP-based services are available on the Ethernet ports, on any telephone output or on the WiFi network. Depending on the type and brand of IPTV Middleware used, you will consider IP Set-Top-Boxes at ONT's output or the signal can be connected directly to the Ethernet port of the Smart IPTV.



Complete GPON system + RF overlay distribution

Complete Fracarro GPON solution installed in a standard 19" rack cabinet. The 3DGFlex head-end takes care of transmodulating and managing the desired digital RF programs that will be received from the appropriate satellite positions and from the terrestrial antenna system.
The RF signals received by the dishes and antennas are organized in a suitable section containing the OPT-TX optical transmitter, the DTT signal processing unit and the suitable multiswitch to supply the correct signals to the coaxial inputs of the 3DGFlex head-end.
Using the EDFA optical amplifier, the signals from the outputs of the GPON OLT transmitters are mixed and the optical signal from the OPT-TX transmitter is amplified to the correct level in order to be sent to the passive optical distribution (PON). Downstream, at the user arrival point, the reverse process will take place.
The GPON (FTTH) solution described here allows the integration of different types of services in all types of installations that use the fiber optic backbone.

3DGFlex head-end
Transmodulation of satellite DVB-S2 and terrestrial DVB-T2 signals (FTA and encoded) into DVB-T/C or IPTV output and related distribution through the coaxial infrastructure or the multicast ethernet network.
DRM administration (Digital Right Management) included.

IPTV Streamer
Optional: multicast IPTV services sent over the IP network; 1Gbit/s for each module.

Management of SAT and TV antenna signals and optical transmitter
Organization system for the optical transmitter and the products for the processing of the TV signal (programmable control units, head multiswitches and optical transmitter).

EDFA optical amplifier
Optical amplifier necessary for re-amplification of the RF Overlay signal and for mixing the optical outputs from the OLT (DATA).

OLT transmitter
TV, Data and Voice signals. GPON OLT (Optical Line Terminal) primary and backup optical termination unit; Gigabit transmission up to 1024 users.

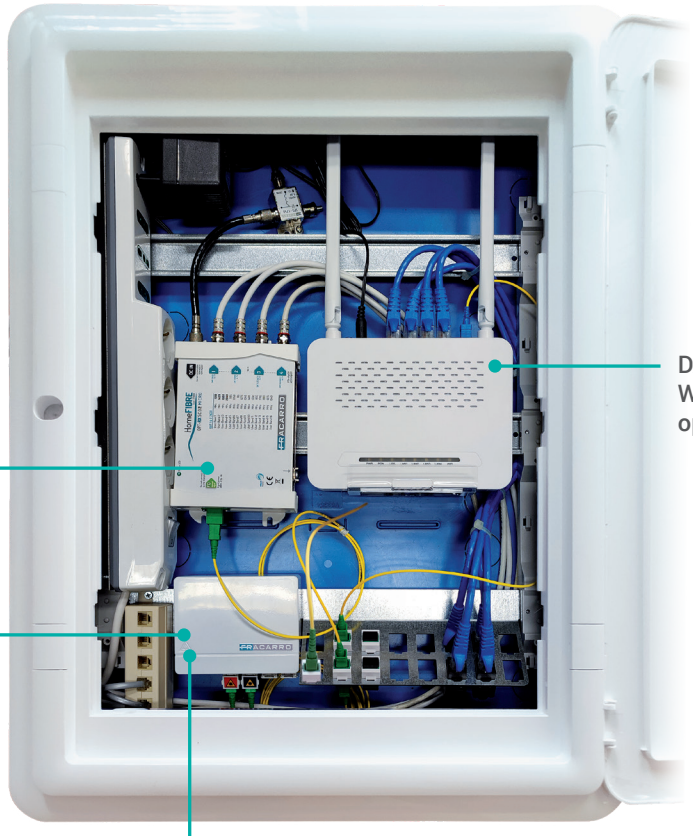
Optical splitting and fibre organization
Management system and accessories for the organization of optical fibres.

QDSA (Apartment Signal Distribution Panel) or peripheral communication cabinet.

In the premises of the end user, a single FTTH GPON fibre is connected to the termination unit in which **all services, once converted, are "ready for use"**.
According to customer needs, using the same GPON infrastructure, it is possible to provide the following configurations:

- IP-based services based and TV/SAT programs (CATV + SAT or MULTISAT)
- IP-based services and digital terrestrial programs (only CATV)
- only IP-based services (DATA + VOICE)
- TV/SAT services only (DTT or CATV+SAT)

The image shows the fibre termination unit (STOA), the ONT optical terminal receiver, the OPT-RX optical receivers for managing TV/SAT signals and a radial multiswitch. The GPON Fracarro solution allows maximum flexibility and integration of all digital services according to user needs, with an interesting cost optimization.



DATA SERVICE
WiFi modem/router with fibre optic input

TV/SAT SERVICE
Fibre optic receivers

FIBRE OPTIC
4-fibre optic cable from the CSOE

STOA
Termination box for the optical fibre arriving from the CSOE

FRACARRO SERVICES

Creating a **GPON Fracarro plant** means having the most advanced technologies, with a **complete range of equipment** suitable for any type of plant. but not only. Fracarro also offers a series of important services to support installers:

PROJECT SUPPORT

Our professionals are available to design the system scheme suitable for your installation, complete with a list of materials.

REMOTE SUPPORT

From Monday to Friday, from 8:30am to 6:00pm (CET) for any technical request, information or programming of the system that you are developing.

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GPON folder EN - 200 - 03/22

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