

# GPON-Extender

## Description

**GPON Extender** is an optoelectronic repeater developed to extend the range in a GPON Passive Optical Network. This card uses reshaping, retiming and re-sample to carry upstream (1310nm) and downstream (1490nm) lambdas including an optional EDFA gain block of low-noise factor. This amplifier transports any digital or analogical signal at 1550nm.

### Digital diagnostic

When this card is inserted in a managed chassis (MetroSAE/MiniSAE), it is possible to monitor fiber fails and to change all optical parameters of optical amplifier (RX power, TX power, temperature, gain, etc).

### Low noise factor

Noise addition in fibre is avoided by using optical reshaping in signal conditionings, unlike it occurs in other PON extender implementation RSOA based. When TELNET GPON EXTENDER includes amplification block, an optical filter limits amplification noise in 1550nm lambda, without effect on 1310 and 1490nm channels.

### Supports All PON parameters

GPON Extender is capable of working under all the possibilities defined on the ITU-T G.984.2 standard. Tested against the most restrictive parameters: 32 bits guard time, 5 bytes preamble on ranged mode.

### Extender Cascading

It is possible to link several GPON Extenders to increase even more the PON range.



## Features

### PON Extender

This card can be inserted at any point of the PON and allows to extend a GPON signal up to 60Km maintaining additionally a 1550nm downstream overlaid lambda

### Optional Optical amplifier inside

This card performs a reshaping of 1490 and 1310 GPON optical signals and integrates an optical EDFA hi-efficiency amplifier (Gain 20dB) and low-noise factor (NF<5dB). It permits to amplify a 1550nm downstream signal (CATV/digital)

### Remote management

GPON Extender can be managed via SNMP when the card is inserted in a MiniSAE/MetroSAE chassis. Standalone configurations are also possible using a MicroSAE chassis.

### RSOA alternative

The electro-optical conversion performed by GPON EXTENDER does not add noise to the fibre link. It is an interesting and economical alternative to other devices developed using RSOA technology. It is possible to add multiple repeater in cascade relaxing GPON preambles in OLT.

### SC/APC vs SC/PC

Card connectorization can be selected according deployment between SC/APC (recommended) and SC/PC.

### Extending a GPON network from 20Km to 60Km

There are times when it's wanted to cover a residential area or a rural area that is located more than 20km from the nearest central where an OLT can be placed. Through GPON signal regeneration, the length of a GPON network can be extended to reach these points, reaching a distance of up to 60km by eliminating the attenuation due to distance.

These are the 60km maximum logical distance that can exist in a GPON network between the OLT and furthest ONT, and can be achieved by concatenating several GPON-Extender, since each of the network equipment will extend approximately 20km, always depending on the particular characteristics of each link.

In this deployment model, we extended the distance where the users are located to up to 60km from the plant, allowing to lower both CAPEX and OPEX, by removing an otherwise necessary OLT nearer to the deployment area.

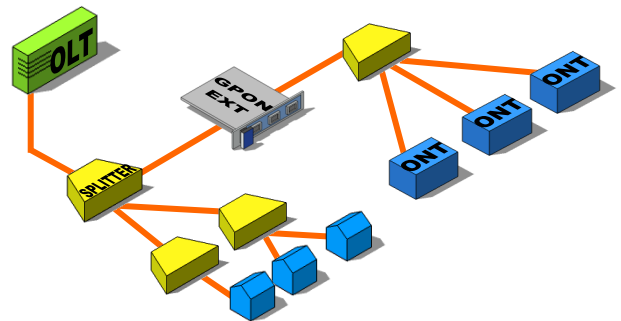
If necessary, several GPON-Extenders can be chained to achieve the desired distance and signal strength adequate for the number of users and subsequent splitting level.

### Extending the number of users in a GPON network from 64 to 128

In the following case study, assume a GPON network in which we want to provide service to 128 users. This implies that after passing through the passive splitters, the signal would have a power of 1/128 times the power emitted by the OLT, without the added attenuation by distance and by connectorization.

In this scenario, a GPON-Extender regenerator can be placed after the first level of splitting into one or more branches of the network, regenerating and amplifying the signal completely and thus allowing that they may be in turn re-divided into other branches, each in a new optical division level and thus reaching up to the 128 users the standard is prepared for.

In this way the investment is maximized by achieving the maximum use of network coverage and service to give the maximum number of users it can support the ITU-T G.984 protocol, since otherwise the number of users that can be given service would be limited by the optical budget, having to find other solutions to enlist new potential users in the area of the GPON network.

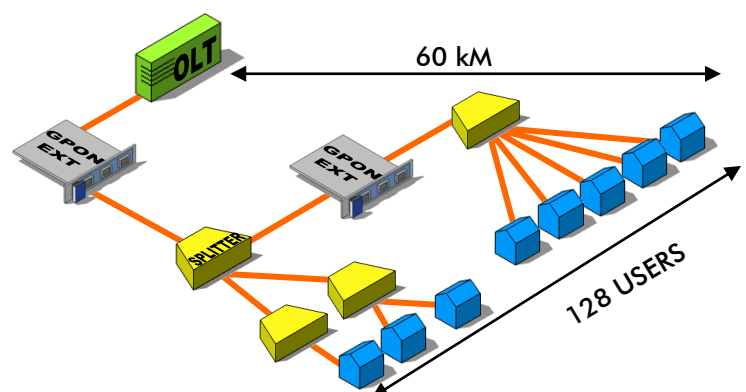


### Extending the branches of a GPON network

There are times when it is wanted to cover a new residential area close to one in which there is already implemented a GPON network in which users can be added. However the new area is not large enough to profitably deploy a new GPON network for this area.

In these cases, we would not need to install a new OLT for the new community, but, if distances allows and the number of available users is enough, a branch of the already deployed for GPON can be used and, through GPON-Extender, extend and create a new branch of splitting level to give service to the new community we want to include in the GPON network.

This will significantly lowers the cost of deployment and operation in the new area to cover, while allowing to amortize and maximize the investment previously made in the deployment of the existing GPON network, using its infrastructure to give service to the new community.



## Technical Specifications

### General features

- Extends GPON signal to up to 60 kilometers
- Extends the users of a GPON network to up to 128
- Able to work on all the possibilities defined in the standard UIT-T G.984.2.
- It does not add noise to the fiber link
- Several repeaters can be added in cascade
- Several GPON Extenders can be linked to further increase scope of the PON network

### Technical specifications

- Regeneration of the signal and clock to transport the lambdas in upstream (1310nm) and downstream (1490nm)
- Optional high-efficiency (20dB gain) and low noise figure (NF <5dB) EDFA 1550nm amplification
- Remote management via SNMP
- SC/APC or SC/PC conectorization
- Compatible with TELNET MetroSAE and TriSAE chassis



Parameter	Time parameters				
	Sym.	Min	Typ	Max	Unit
Hi/lo Ratio	Hi/Lo		15		dB
Packet-to-packet spacing	Tg	25			Ns
BM RX Stabilization Period	Ts			8	Ns
Optical Delay via repeater					
Downstream	t		9		Ns
Upstream	t		2		

Optical budget power	
zParameters	TypeB
RX Sensitivity in DS	-28/-8 dBm
RX Sensitivity in US	-26/-10 dBm
TX Power in DS	2.0 dBm
TX Power in US	1 dBm
Extinction ratio of TX in US	>20 dBm

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