



universidade de aveiro
theoria poiesis praxis

REDES DE COMUNICAÇÕES 1

GUIDE 7

GPON Residential Scenario

Objectives

- Get to know Internet services over fiber (GPON)
- Apply know-how from previous guides.

Duration

- ♦ 1 week

What is GPON?

GPON, or Gigabit Passive Optical Network, is a technology used to deliver high-speed broadband internet and other telecommunication services over fiber optic cables. It is a type of passive optical network (PON), which means that it uses fiber optic cables and passive components such as splitter boxes to transmit data over a network.

In a GPON system, a central optical line terminal (OLT) is connected to a network of fiber optic cables that run to individual homes or businesses. The OLT sends data downstream to the fiber optic cables using a single wavelength of light, and the data is then split and distributed to multiple endpoints using passive splitters. The endpoints, such as homes or businesses, are equipped with optical network units (ONUs) that receive the downstream data and transmit upstream data back to the OLT using a different wavelength of light.

GPON is known for its high speed and efficiency, as it can transmit data at rates up to 2.5 Gbps downstream and 1.25 Gbps upstream. It is widely used by telecommunications companies to provide high-speed internet, television, and phone services to customers.

The maximum reach of a GPON system depends on a number of factors, including the type of fiber optic cables used, the strength of the signal, and the number of splitter boxes or other passive components in the network. In general, GPON systems can cover distances of up to 40 kilometers without the need for repeaters or other active components, although the actual reach may be shorter depending on the specific network configuration.

A typical split ratio for a GPON system is 1:64, which means that a single PON port on the OLT can serve up to 64 ONUs. However, it is possible to use splitters with higher (1:128) or lower split ratios to increase or decrease the number of ONUs that can be served by a single PON port, depending on the specific network configuration and the desired level of service.

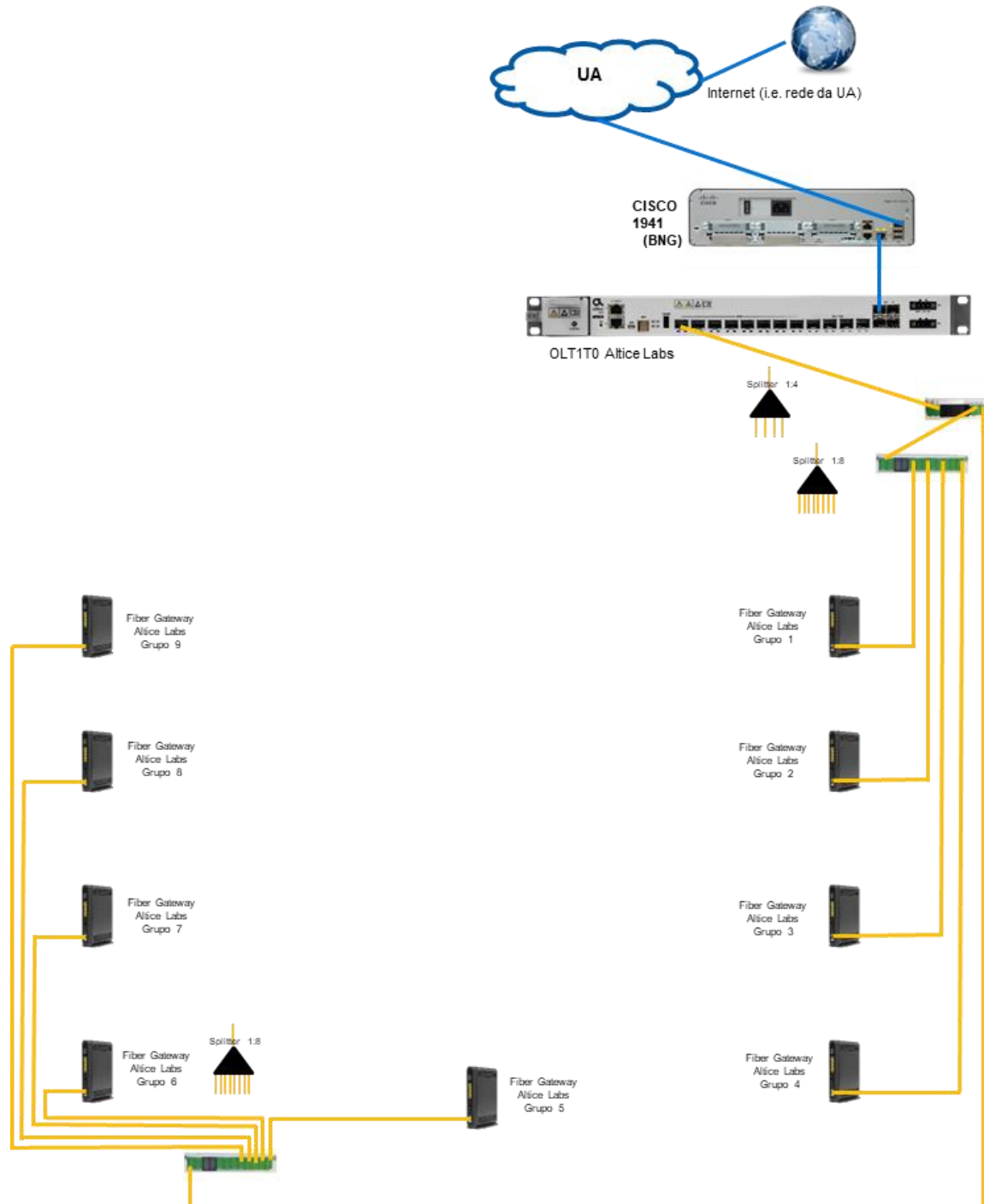
What is a BNG?

In a broadband network, the BNG is often referred to as a broadband network gateway (BNG). It is typically located in a central office or data center and serves as the entry point for all traffic that is destined for or originates from the customer's network.

The BNG is a critical component of a broadband network, as it enables the service provider to control and monitor the traffic that passes between its network and the customer's network. It also enables the service provider to apply various policies and controls to the traffic, such as rate limiting, Quality of Service (QoS), and security measures.

Laboratory GPON scenario

- One CISCO 1941 acting as BNG
- One Altice Labs OLT1T0 with 8 PON ports (only one will be used), 4x 1GbE + 4x 10GbE uplink ports
- A cascade of splitters (one 1:4, followed by two 1:8)
- 9 ONUs (MEO Fiber Gateways, powered by Altice Labs)

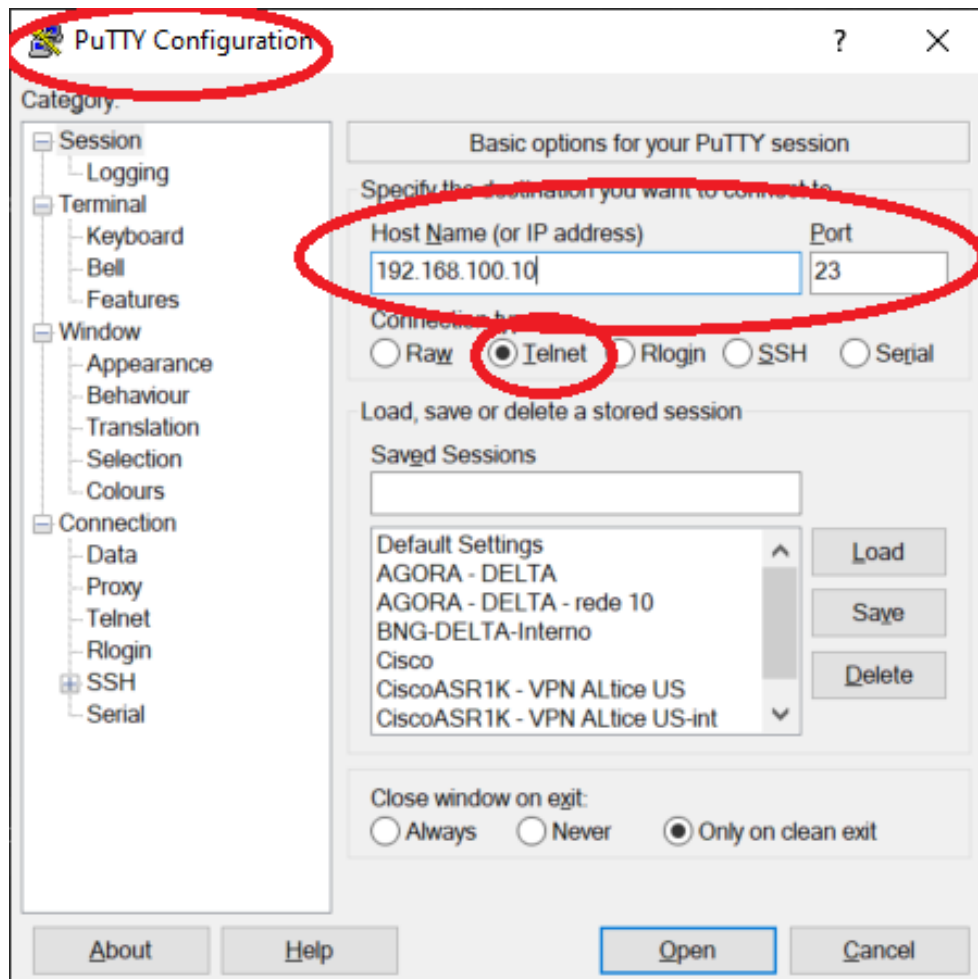


What are you going to do?

You are going to configure an interface on the BNG that will enable the Internet Service on your ONU (Fiber Gateway).

1 - First, connect your PC to the LabCom WiFi network

2 – Then, you will do a telnet (e.g. using Putty in Windows or picocom in Linux – see next picture) to the BNG. The BNG IP address is 192.168.100.1Y (lab 33Y) (192.168.100.10 or 192.168.100.11).



Username: labcom

Password: labcom

```
BNG-LabCom> enable
```

```
Password: labcom
```

```
BNG-LabCom#
```

3 – Then you will configure the BNG interface that serves your ONU (Fiber Gateway).

Check the interface configuration:

Lab 33Y, Group X:

```
BNG-LabCom# show run interface GigabitEthernet0/1.1133YX
interface GigabitEthernet0/1.1133YX
  description Sala33Y GrupoX
  encapsulation dot1Q 11 second-dot1q 3YX
  ip virtual-reassembly in
```

Configure the correct IP address of the interface and configure NAT inside:

Lab 33Y, Group X:

```
BNG-LabCom# configure terminal
BNG-LabCom (config)#
BNG-LabCom (config)# interface GigabitEthernet0/1.1133YX
BNG-LabCom (config-if)# ip address 172.3YX.1 255.255.255.0
BNG-LabCom (config-if)# ip nat inside
BNG-LabCom (config-if)# exit
```

Configure a DHCP pool to provide IP Addresses, router information and DNS server to your ONU (Fiber Gateway):

Lab 33Y, Group X:

```
BNG-LabCom (config)# ip dhcp pool VLAN3YX
BNG-LabCom (config-dhcp)# network 172.3YX.0 255.255.255.0
BNG-LabCom (config-dhcp)# default-router 172.3YX.1
BNG-LabCom (config-dhcp)# dns-server 172.3YX.1
BNG-LabCom (config-dhcp)# exit
```

Add your Gateway network to the 100 access-list

Lab 33Y, Group X:

```
BNG-LabCom (config)# access-list 100 permit ip 172.3YX.0 0.0.0.255 any
BNG-LabCom (config)# exit
BNG-LabCom # write
```

4 – Check Internet on your MEO Fiber Gateway

Turn the Fiber Gateway power on.

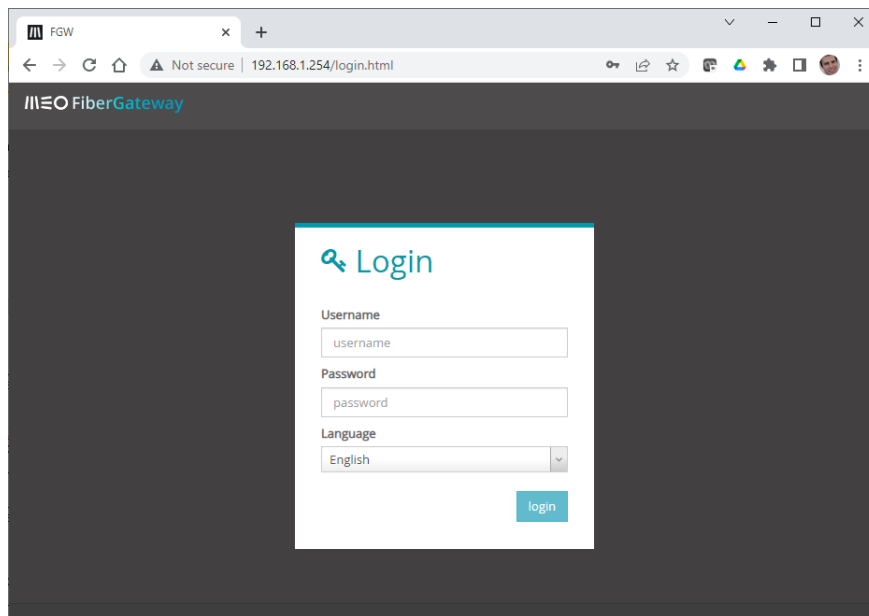
Wait for about 2 minutes (until the LEDs are stable)

Connect your PC (LAN port or WiFi through the credentials on the label below it)

Access the Web Interface at: <http://192.168.1.254>

Username: meo

Password: meo



Go to the WAN interface and verify if it acquired an IP from the pool you configured.
Try to access the Internet from your PC, connected to the Fiber Gateway.