

Taller práctico de FTTH



Profesor: Henry Fumero.

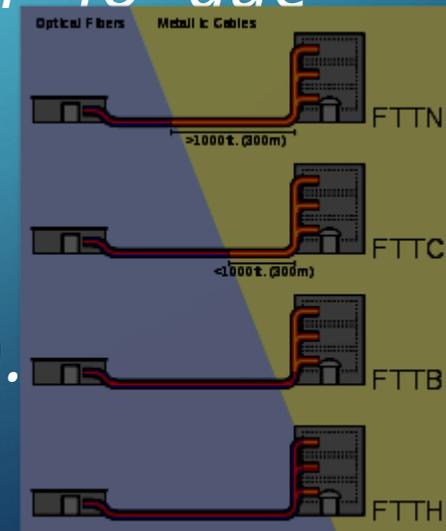
Contenido: FTTH y Configuración de Equipos.

2025.

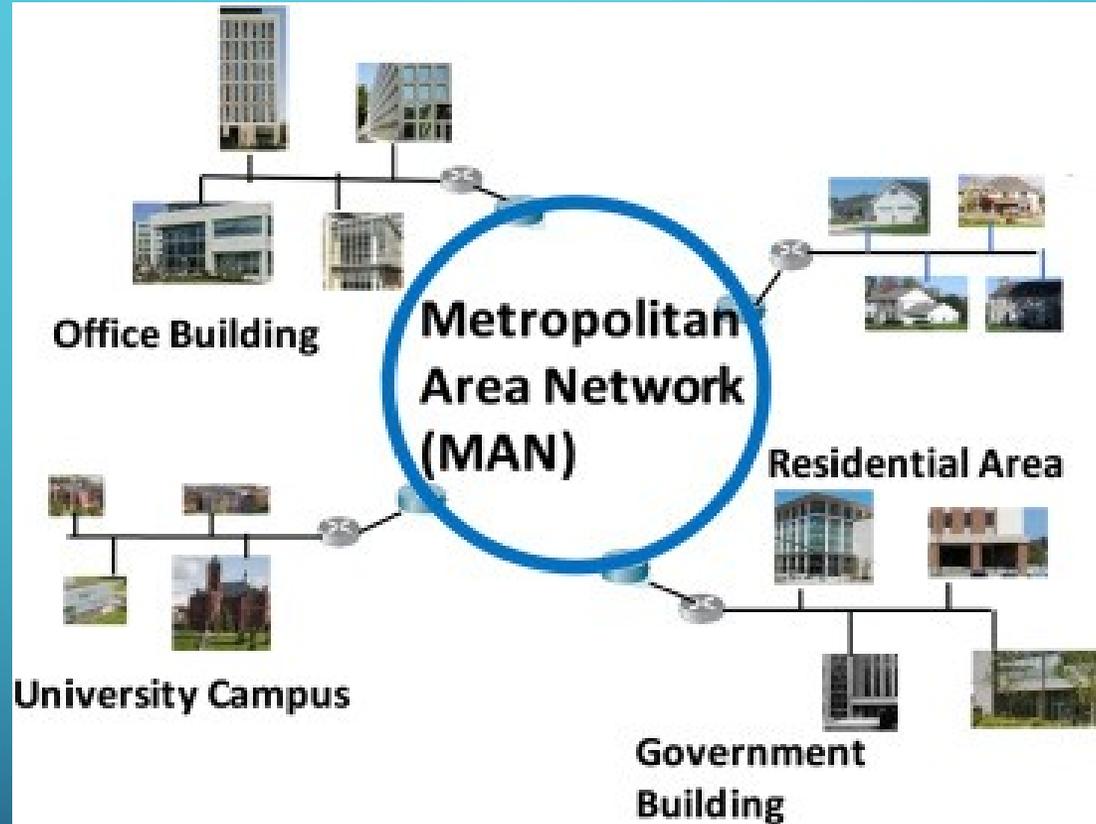
FTT_x

• *Se origina del inglés (Fiber To The x), o fibra hasta el x lugar. las industrias de telecomunicaciones los designa de acuerdo con la cercanía con el usuario final. por lo que tenemos entonces:*

- *FTTH: fibra hasta el hogar.*
- *FTTB: fibra hasta el edificio (Building).*



TIPOS DE REDES ÓPTICAS



Componentes

Derivador (Splitter): es un dispositivo óptico que se encarga de dividir la señal. Es comúnmente usado en instalaciones de FTTx, proporcionan la misma atenuación independientemente de la Longitud de Onda o la dirección. Ejemplo: 1x2 hasta 1x64.



Componentes

Derivador (Splitter): Valores de Atenuación:

Parameter	Specifications										
Operating Wavelength (nm)	1260 ~ 1650										
Type	1x2	1x4	1x8	1x16	1x32	2X2	2X4	2X8	2X16	2X32	2X64
Insertion Loss (dB) Max	<4.0	<7.3	<10.8	<14.0	<17.0	<4.2	<7.6	<11.2	<14.5	<18.2	<21.5

FTTH

Fiber Access Terminal (FAT), contienen:

- Interconexión con Splitter.
- Empalmes ópticos.
- Conectores
- Conexión de última milla con el Usuario.



Es también, conocido como NAP (Network Access Point)

Componentes

OLT (Optical Line Terminal): su función es distribuir la señal hasta la *ONT* desde la *Red de Acceso*.

Este modelo de *OLT* es para *Proveedores de Servicios de Internet y Telecom*. Este dispositivo ofrece servicios de *Triple-Play*, es decir, *Data, Telefonía, IPTV* para sus *Suscriptores*.



Componentes

Transceptor (Transceiver): también llamados Mini-Gbic, son dispositivos similares a los Media Converter, solo que estos se usan para agregarlo a dispositivos de Interconexión (Switch) en una interfaz adecuada para este fin, permitiendo tener un puerto para fibra óptica disponible.



Componentes

PON (Passive Optical Network): Se conecta dentro de la OLT al puerto SFP. en el área del Fibra hasta el Hogar (FTTH), equivalente de para las interconexión de equipos activos de la tecnología GPON como la salida para la conexión de las ONU.



Componentes

Punto de Red (Roseta) este tipo de *Punto de Conexión* o *Roseta* para Fibra Óptica.

Algunos también los llaman PTO (Punto Terminación Óptico), diseño bastante moderno, estético y tamaño pequeño para ser colocado superficialmente en la Pared, dentro de un gabinete o interna de un hogar.

:



Componentes

ONU: El dispositivo de terminación final de la Red es llamado *Unidad de Red Óptica* u *Optical Network Terminal (ONT)*. Otros las conocen como *ONU (Optical Network Units)*.

Su función es hacer de interfaz entre la Red de fibra óptica y el usuario final dentro del domicilio (*Abonado*), especialmente para la comunicación con la *OLT (Línea terminal Óptica)*.

:



GPON

El tipo una fibra SMF 9/125, con un sistema de comunicación Simplex de 1 hilo. Y además, también trabajan con 2 Ventanas de operación tal como Transmisor TX a 1490 nm y el Receptor RX a 1310 nm. Uso en n campo de FTTH, la Distancia máxima estimada son 20 Km y las cantidades de Usuarios que manejan por Puerto PON van entre 64 y 128 ONUs.

Las Normas en GPON, expresan la Potencia con diferentes Letras llamadas Clases y existen 3 grupos (A, B, C) donde Clase A que va desde 5 hasta los 20 dB. Clase B de 10 a 25 dB y Clase B de 15 a 30 dB. Como por ejemplo tenemos la Clase B+ con la Potencia mínima de salida óptica es de 1.5 dBm y la Potencia máxima es de 5 dBm.

GPON

Pero Sensibilidad en la Clase B+ de Recepción mínima es de - 28 dBm y la Potencia óptica de Sobrecarga es el Receptor es - 8 dBm.

Una de las diferentes notables, que se presentan entre ambas es la forma como se manejan las Velocidades de Carga y Descarga de la información. tenemos que el GPON son Asimétricos, es decir que tienen diferentes Velocidad, por ejemplo en la Velocidad de descargar es de 2.5 Gbps (Downstream).

GPON

UNA diferencias en las ONUs, es el tipo Puerto de Conexión SC que usualmente en el GPON es con un Conector SC/APC (Verde):



EPON

En campo de FTTH, la Distancia máxima estimada son 20 Km y las cantidades de Usuarios que manejan por Puerto PON van entre 64 y 128 ONUs.

las Normas en EPON expresan la Potencia en Clases con diferentes Números, como por ejemplo tenemos Clase 1, de Potencia Absoluta de Salida, como Mínimos entre -7 y Máxima 2 dBm. Mientras por ejemplo es EPON tenemos Clase 1, la Recepción contiene Sensibilidad de Entrada hasta -27 dBm.

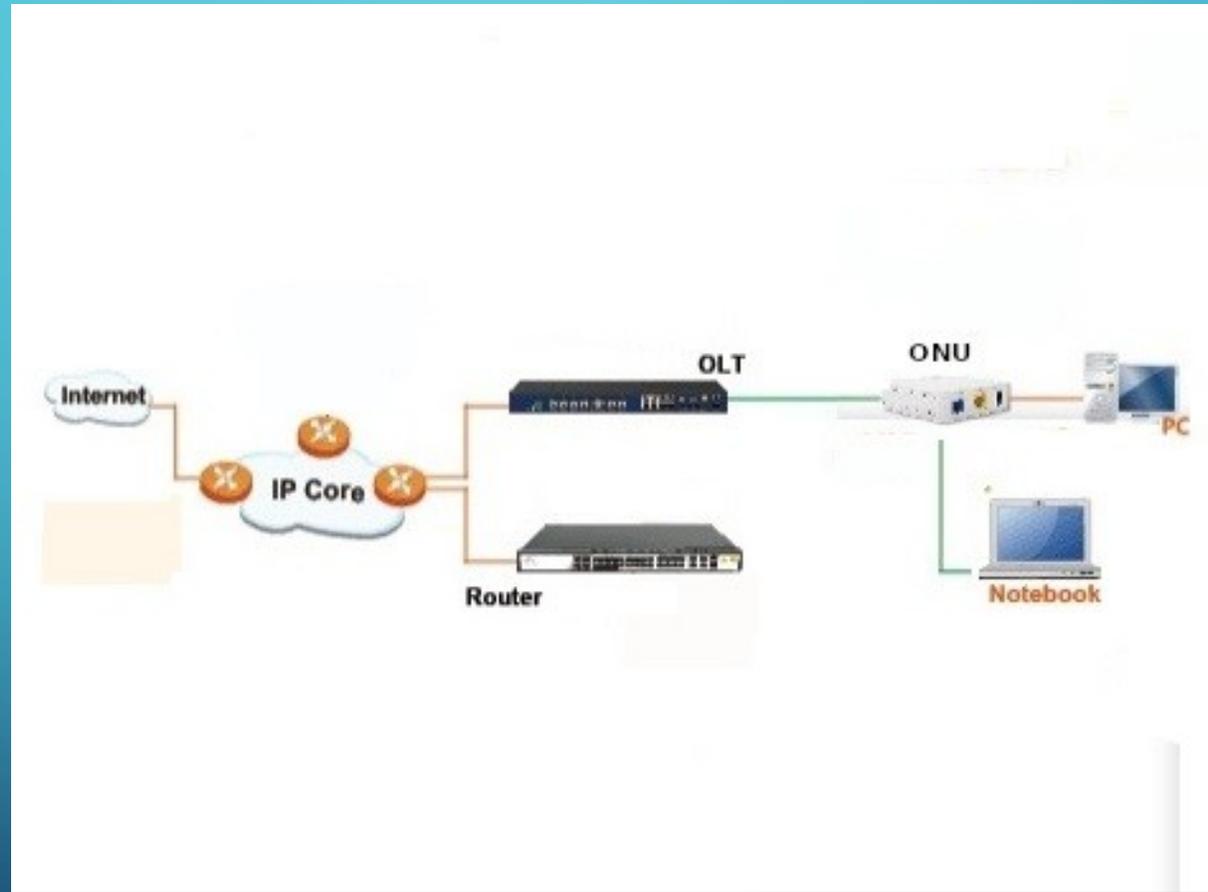
la Velocidad de subida esta en el orden de 1.25 Gbps (Upstream). Al contrario el EPON son Simétricos, es decir que tienen la misma Velocidad, por ejemplo en la Velocidad de descargar es 1.5 Gbps (Downstream) y la Velocidad de subida es de 1.25 Gbps (Upstream).

EPON

Las ONUs es el tipo Puerto de Conexión SC que usualmente en UPC (Azul):

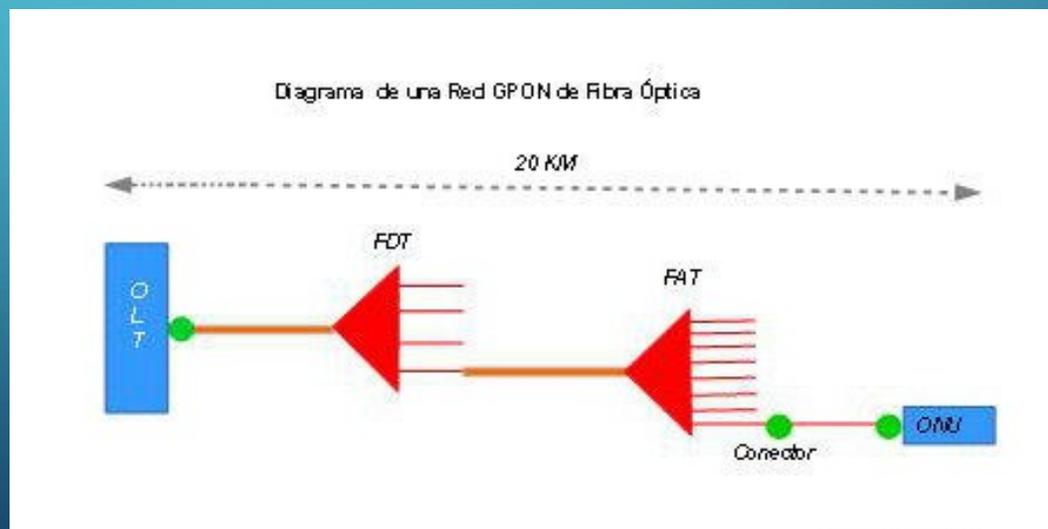


Componentes



Cálculos de Potencia:

- Potencia de Salida del Transmisor (PON): +7 dBm.
- Atenuación del Cable $0,25 \text{ dB/Km} \times 2 \text{ Km} = 0,5 \text{ dB}$.
- Conectores: $0,5 \text{ dB} \times 8 = 1,5 \text{ dB}$.
- Empalmes: $0,3 \text{ dB} \times 5 = 1,5 \text{ dB}$.
- Splitters: $10,5 \text{ dB} + 10,5 \text{ dB} = 21 \text{ dB}$.
- Total de Atenuación: $0,5 \text{ dB} + 4 \text{ dB} + 1,5 \text{ dB} + 21 \text{ dB} = 27 \text{ dB}$.
- Potencia de Recibida en el Emisor: $+7 \text{ dBm} - 27 \text{ dB} = -20 \text{ dBm}$.
- Rango de la ONU: -4 dBm a -28 dBm .



Ingresar a la Interfaz Web de la OLT:

CONFIGURACIÓN DE OLT.

OLT Web Management Interface x +

← → ↻ No seguro | 192.168.8.200/action/login.html

8007 Router 1.20 Speedtest Drive Paneles https://web.whatsa...

OLT Web Management Interface

Username

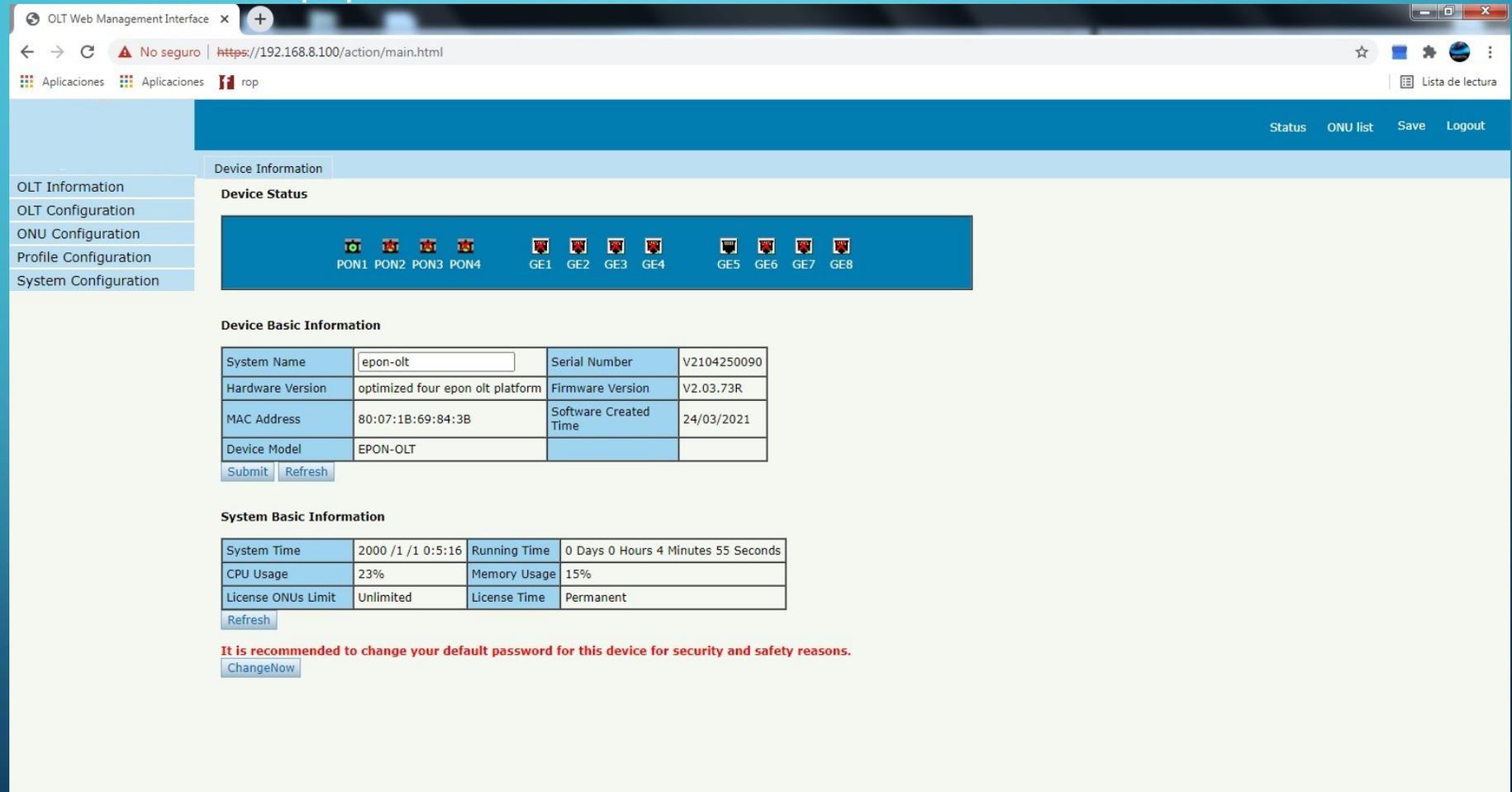
Password

y a t g g Verification Code

Copyright @ 2016 - 2028. All rights reserved.

CONFIGURACIÓN:

Información del Equipo:



The screenshot displays the OLT Web Management Interface in a browser window. The address bar shows the URL <https://192.168.8.100/action/main.html>. The page title is "OLT Web Management Interface". The interface includes a navigation menu on the left with options: OLT Information, OLT Configuration, ONU Configuration, Profile Configuration, and System Configuration. The main content area is titled "Device Information" and contains the following sections:

- Device Status:** A visual representation of the device's ports, showing PON1, PON2, PON3, PON4, GE1, GE2, GE3, GE4, GE5, GE6, GE7, and GE8.
- Device Basic Information:** A table containing the following data:

System Name	epon-olt	Serial Number	V2104250090
Hardware Version	optimized four epon olt platform	Firmware Version	V2.03.73R
MAC Address	80:07:1B:69:84:3B	Software Created Time	24/03/2021
Device Model	EPON-OLT		
- System Basic Information:** A table containing the following data:

System Time	2000 /1 /1 0:5:16	Running Time	0 Days 0 Hours 4 Minutes 55 Seconds
CPU Usage	23%	Memory Usage	15%
License ONUs Limit	Unlimited	License Time	Permanent

At the bottom of the page, there is a red warning message: "It is recommended to change your default password for this device for security and safety reasons." Below this message is a "ChangeNow" button.

CONFIGURACIÓN:

Crear VLAN:

The screenshot displays a network configuration interface. On the left is a vertical navigation menu with the following items: OLT Information, OLT Configuration, VLAN (highlighted), Uplink Port, PON, MAC, LACP, QoS, ACL, IPv6 ACL, IGMP, IPv6 MLD, STP, Loopback, DHCP, DHCPv6, IPv6 SLAAC, IP Route, IPv6 Route, ONU Configuration, Profile Configuration, and System Configuration. The main content area is titled 'New VLAN' and includes a 'Mode' dropdown menu set to 'single', a 'VLAN ID' input field with '(1-4094)' to its right, and a 'Description' input field. Below these fields are 'Add' and 'Delete' buttons. Underneath is a section titled 'VLAN Table' containing a table with the following data:

VLAN ID	Description	Edit	Delete
1	default		
100	vlan100		

CONFIGURACIÓN:

Configuración Puertos VLAN

The screenshot shows a network configuration interface with a navigation menu on the left and a main configuration area on the right. The navigation menu includes options like OLT Information, OLT Configuration, VLAN (selected), Uplink Port, PON, MAC, LACP, QoS, ACL, IPv6 ACL, IGMP, IPv6 MLD, STP, Loopback, DHCP, DHCPv6, IPv6 SLAAC, IP Route, IPv6 Route, ONU Configuration, Profile Configuration, and System Configuration.

The main configuration area is titled "Port VLAN Configuration" and is currently set for "VLAN 100". It features a table with columns for Port ID, Mode, Forbidden, Tag, and Untag. Below the table are "Submit" and "Reset" buttons.

Below the configuration table is a "Port VLAN Table" with columns for VLAN ID, Tag Ports, and Untag Ports.

Port ID	Mode	Forbidden	Tag	Untag
GE1	Hybrid	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
GE2	Hybrid	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
GE3	Hybrid	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
GE4	Hybrid	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
GE5	Hybrid	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
GE6	Hybrid	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
GE7	Hybrid	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
GE8	Hybrid	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
PON1	Hybrid	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
PON2	Hybrid	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
PON3	Hybrid	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
PON4	Hybrid	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>

VLAN ID	Tag Ports	Untag Ports
1		
100	PON1	GE5

CONFIGURACIÓN:

Conexión de UP-LINK:

The screenshot displays a network configuration interface. On the left is a vertical navigation menu with the following items: OLT Information, OLT Configuration, VLAN, Uplink Port (highlighted), PON, MAC, LACP, QoS, ACL, IPv6 ACL, IGMP, IPv6 MLD, STP, Loopback, DHCP, DHCPv6, IPv6 SLAAC, IP Route, IPv6 Route, ONU Configuration, Profile Configuration, and System Configuration. The main content area has two tabs: 'Information' (selected) and 'Configuration'. Below the tabs, there are two sections:

Optical Transceiver

Port ID	Temperature(°C)	Voltage(V)	Bias Current(mA)	Transmit Power(dBm)	Received Power(dBm)
GE1	0.000	0.000	0.000	0.000	0.000
GE2	0.000	0.000	0.000	0.000	0.000
GE3	0.000	0.000	0.000	0.000	0.000
GE4	0.000	0.000	0.000	0.000	0.000

Traffic Statistics

Port ID	Link Status	Speed	Rx Bytes	Rx Packets				Tx Bytes	Tx Packets				Collisions	Errors
				Packets	Unicast	Broadcast	Multicast		Packets	Unicast	Broadcast	Multicast		
GE1	Down	-	0	0	0	0	0	0	0	0	0	0	0	0
GE2	Down	-	0	0	0	0	0	0	0	0	0	0	0	0
GE3	Down	-	0	0	0	0	0	0	0	0	0	0	0	0
GE4	Down	-	0	0	0	0	0	0	0	0	0	0	0	0
GE5	Up	1000M Full	44960878	39575	39072	15	488	15386656	28827	28581	243	3	0	0
GE6	Down	-	0	0	0	0	0	0	0	0	0	0	0	0
GE7	Down	-	0	0	0	0	0	0	0	0	0	0	0	0
GE8	Down	-	0	0	0	0	0	0	0	0	0	0	0	0

At the bottom of the Traffic Statistics table, there are two buttons: 'Clear Counters' and 'Refresh'.

CONFIGURACIÓN:

Configuración Puerto GE:

Information **Configuration**

GE Configuration

Port ID	Description	Admin Status	Speed	Flow Control	Isolate	PVID	Storm(0 64-1000000fps)			Rate(0 64-1000000kbps)		MAC Limit(0-16384)
							Broadcast	Multicast	Unknown Unicast	Ingress	Egress	
GE1		<input checked="" type="checkbox"/>	Auto	<input type="checkbox"/>	<input checked="" type="checkbox"/>	1	512	0	512	0	0	0
GE2		<input checked="" type="checkbox"/>	Auto	<input type="checkbox"/>	<input checked="" type="checkbox"/>	1	512	0	512	0	0	0
GE3		<input checked="" type="checkbox"/>	Auto	<input type="checkbox"/>	<input checked="" type="checkbox"/>	1	512	0	512	0	0	0
GE4		<input checked="" type="checkbox"/>	Auto	<input type="checkbox"/>	<input checked="" type="checkbox"/>	1	512	0	512	0	0	0
GE5		<input checked="" type="checkbox"/>	Auto	<input type="checkbox"/>	<input checked="" type="checkbox"/>	100	512	0	512	0	0	0
GE6		<input checked="" type="checkbox"/>	Auto	<input type="checkbox"/>	<input checked="" type="checkbox"/>	1	512	0	512	0	0	0
GE7		<input checked="" type="checkbox"/>	Auto	<input type="checkbox"/>	<input checked="" type="checkbox"/>	1	512	0	512	0	0	0
GE8		<input checked="" type="checkbox"/>	Auto	<input type="checkbox"/>	<input checked="" type="checkbox"/>	1	512	0	512	0	0	0

Submit Reset

OLT Information
OLT Configuration
VLAN
Uplink Port
PON
MAC
LACP
QoS
ACL
IPv6 ACL
IGMP
IPv6 MLD
STP
Loopback
DHCP
DHCPv6
IPv6 SLAAC
IP Route
IPv6 Route
ONU Configuration
Profile Configuration
System Configuration

CONFIGURACIÓN:

Configuración de ONU:

The screenshot shows a web-based configuration interface for ONU (Optical Network Unit) management. On the left is a navigation menu with the following items: OLT Information, OLT Configuration, ONU Configuration, **ONU list** (highlighted), Authentication, Upgrade, Profile Configuration, and System Configuration. The main content area has three tabs: **ONU list**, ONU Status, and OPM Diag. Under the 'ONU list' tab, there is a section titled 'ONU Authentication Information' with the following fields and controls:

- Port ID: PON1 (dropdown menu) with a Refresh button.
- ONU Type: Authentication (dropdown menu) with Deregister, Reset, and Unauth buttons.
- MAC: (text input) with a placeholder (HH:HH:HH:HH:HH:HH) and a Search button.
- Description: (text input) with a Search button.

Below the form, a status indicator reads 'Online 1 ONUs / Total 1 ONUs'. A table displays the details of the single online ONU:

ONU ID	Status	MAC Address	Description	RTT(TQ)	Type	Auth Flag	Exchange	Auth Mode	Loid/Password	Action
EPON0/1:1	Online	00:6D:61:E9:5E:E0	N/A	56	1GE	Auth	Finish	None	N/A	Config MacInfo Profile Deregister Reset Unauth

CONFIGURACIÓN:

Información de la ONU:

The screenshot displays a network management interface. On the left is a navigation menu with the following items: OLT Information, OLT Configuration, ONU Configuration, **ONU list** (highlighted), Authentication, Upgrade, Profile Configuration, and System Configuration. The main content area has a top navigation bar with 'ONU list', 'ONU Status', and 'OPM Diag'. Below this is a sub-menu with 'Information', 'Bandwidth', 'Port', 'VLAN', 'QoS', 'IGMP', 'Alarm', 'WAN', 'DHCP Server', 'MAC Info', and 'Advance'. The 'Information' sub-menu is active, showing 'Basic Information'.

Below the sub-menu, there is a 'Description' field with an input box and a 'Submit' button.

The main data is presented in three tables:

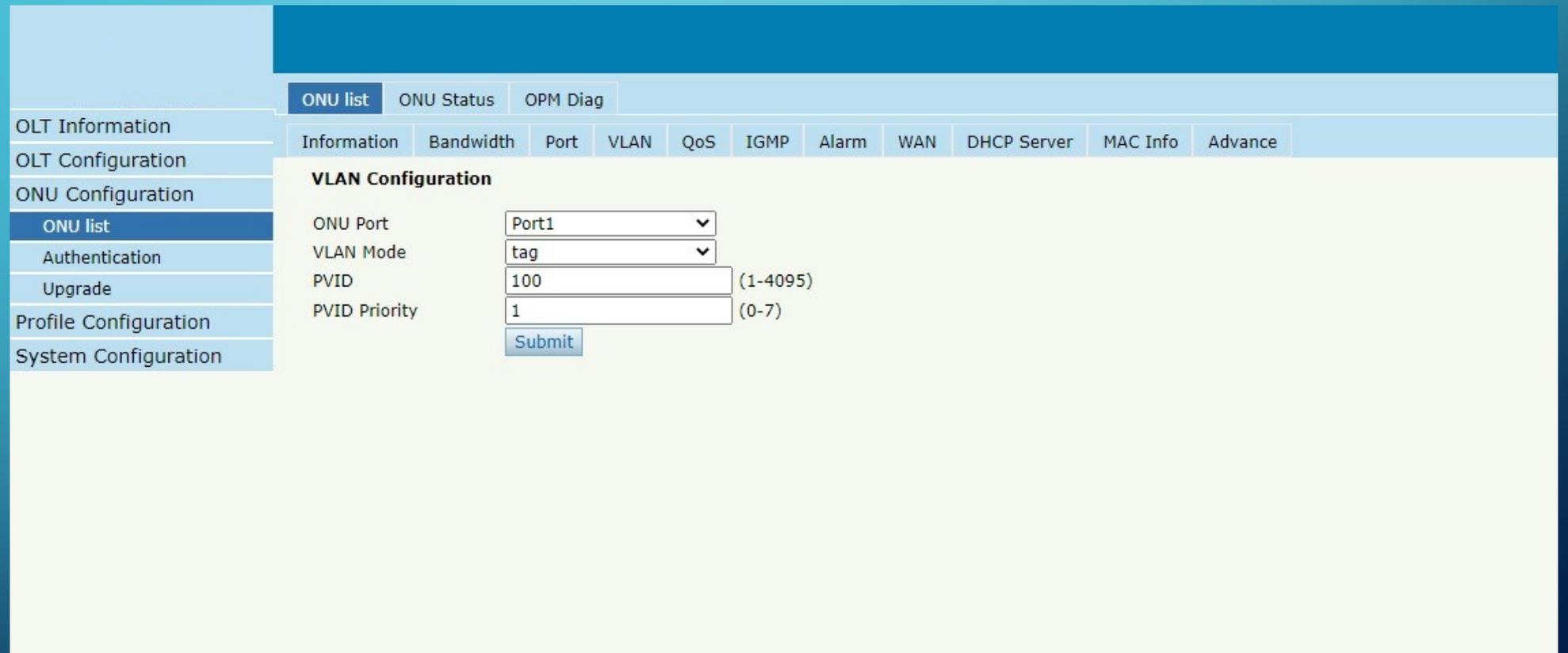
Basic Information			
Vendor ID	VSOL	Model ID	D401
ONU ID	006d61e95ee0	Hardware Version	V2.8S
Software Version	V6.0.1P1T8	Firmware Version	2019 08 08 09:04:46

Optical Module Information			
Temperature	28.50 °C	Supply Voltage	3.41 V
Bias Current	13.05 mA	Transmit Power	1.56 mW (1.93 dBm)
Receive Power	0.03 mW (-14.88 dBm)		

CAP2 Information			
ONU Type	SFU	Multi LLID	unsupport
Protection Type	unsupport	PONIF Count	1
Slot Count	0	Interface Type Count	1
Interface Type Port	GE(1);		

CONFIGURACIÓN:

Etiquetado de la ONU:



The screenshot displays a network management interface with a sidebar on the left and a main configuration area on the right. The sidebar contains the following menu items: OLT Information, OLT Configuration, ONU Configuration, ONU list (highlighted), Authentication, Upgrade, Profile Configuration, and System Configuration. The main area has a top navigation bar with tabs for ONU list, ONU Status, and OPM Diag. Below this is a sub-navigation bar with tabs for Information, Bandwidth, Port, VLAN, QoS, IGMP, Alarm, WAN, DHCP Server, MAC Info, and Advance. The 'VLAN Configuration' section is active, showing the following fields: ONU Port (dropdown menu with 'Port1' selected), VLAN Mode (dropdown menu with 'tag' selected), PVID (text input with '100' and a range '(1-4095)'), and PVID Priority (text input with '1' and a range '(0-7)'). A 'Submit' button is located at the bottom of the configuration area.

ONU Port	VLAN Mode	PVID	PVID Priority
Port1	tag	100 (1-4095)	1 (0-7)

CONFIGURACIÓN:

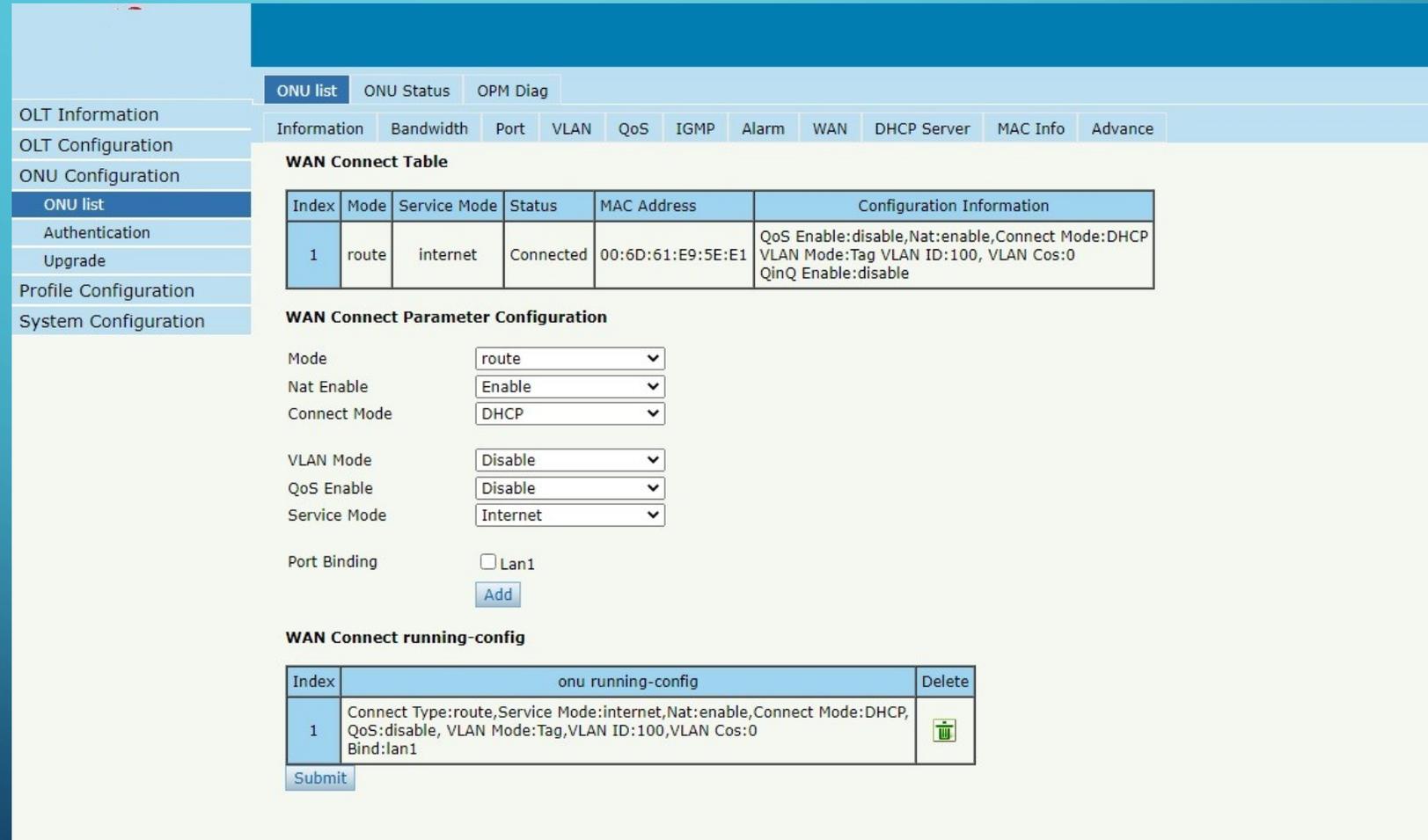
Valores de Potencia de la ONU:

The screenshot displays a network management interface with a sidebar on the left containing menu items: OLT Information, OLT Configuration, ONU Configuration, ONU list (highlighted), Authentication, Upgrade, Profile Configuration, and System Configuration. The main content area has three tabs: ONU list, ONU Status, and OPM Diag (selected). Under the OPM Diag tab, there is a section titled "ONU OPM Diag" with input fields for Port ID (set to PON1), MAC, and Description, each with a corresponding search or refresh button. Below these fields is a table with the following data:

ONU ID	MAC Address	Description	Distance(m)	Temperature(°C)	Supply Voltage(V)	TX Bias Current(mA)	TX Power(dBm)	RX Power(dBm)
EPON0/1:1	00:6D:61:E9:5E:E0		6	28.15	3.41	12.95	1.93	-14.88

CONFIGURACIÓN:

Configuración WAN de la ONU:



The screenshot shows a web-based configuration interface for an ONU. On the left is a navigation menu with options: OLT Information, OLT Configuration, ONU Configuration, ONU list (selected), Authentication, Upgrade, Profile Configuration, and System Configuration. The main area has tabs for ONU list, ONU Status, and OPM Diag. Below these are sub-tabs: Information, Bandwidth, Port, VLAN, QoS, IGMP, Alarm, WAN (selected), DHCP Server, MAC Info, and Advance. The 'WAN Connect Table' displays a single entry with index 1, mode 'route', service mode 'internet', status 'Connected', and MAC address '00:6D:61:E9:5E:E1'. The configuration information for this entry includes QoS Enable: disable, Nat: enable, Connect Mode: DHCP, VLAN Mode: Tag, VLAN ID: 100, VLAN Cos: 0, and QinQ Enable: disable. Below the table is the 'WAN Connect Parameter Configuration' section with dropdown menus for Mode (route), Nat Enable (Enable), Connect Mode (DHCP), VLAN Mode (Disable), QoS Enable (Disable), and Service Mode (Internet). There is also a checkbox for Port Binding (Lan1) and an 'Add' button. At the bottom, the 'WAN Connect running-config' table shows the current configuration for index 1, including Connect Type: route, Service Mode: internet, Nat: enable, Connect Mode: DHCP, QoS: disable, VLAN Mode: Tag, VLAN ID: 100, VLAN Cos: 0, and Bind: lan1. A 'Delete' button is present next to the entry. A 'Submit' button is located at the bottom left of the configuration area.

Index	Mode	Service Mode	Status	MAC Address	Configuration Information
1	route	internet	Connected	00:6D:61:E9:5E:E1	QoS Enable:disable,Nat:enable,Connect Mode:DHCP VLAN Mode:Tag VLAN ID:100, VLAN Cos:0 QinQ Enable:disable

WAN Connect Parameter Configuration

Mode:

Nat Enable:

Connect Mode:

VLAN Mode:

QoS Enable:

Service Mode:

Port Binding: Lan1

WAN Connect running-config

Index	onu running-config	Delete
1	Connect Type:route,Service Mode:internet,Nat:enable,Connect Mode:DHCP, QoS:disable, VLAN Mode:Tag,VLAN ID:100,VLAN Cos:0 Bind:lan1	

CONFIGURACIÓN:

Servidor DHCP de la ONU:

The screenshot displays a web-based configuration interface for an ONU. On the left is a vertical navigation menu with the following items: OLT Information, OLT Configuration, ONU Configuration, ONU list (highlighted), Authentication, Upgrade, Profile Configuration, and System Configuration. The main content area has a top navigation bar with tabs: ONU list (selected), ONU Status, and OPM Diag. Below this is a secondary navigation bar with tabs: Information, Bandwidth, Port, VLAN, QoS, IGMP, Alarm, WAN, DHCP Server (selected), MAC Info, and Advance. The central panel is titled "DHCP Server Configuration" and contains the following fields:

LAN IP Address	<input type="text" value="192.168.1.1"/>
LAN Subnet Mask	<input type="text" value="255.255.255.0"/>
DHCP Server	<input type="text" value="Enable"/>
Preference Time	<input type="text" value="86400"/> (0-4294967295)
Beginning IP Address	<input type="text" value="192.168.1.2"/>
Ending IP Address	<input type="text" value="192.168.1.254"/>
Pool Type	<input type="text" value="PC"/>
Master DNS	<input type="text" value="192.168.1.1"/>
Slave DNS	<input type="text" value=""/>
Gateway	<input type="text" value="192.168.1.1"/>

At the bottom of the configuration area is a "Submit" button.

CONFIGURACIÓN:

Perfil de Ancho de Banda de la ONU:

OLT Information
OLT Configuration
ONU Configuration
Profile Configuration
DBA Profile
Service Profile
VoIP Profile
Alarm Profile
Bind Profile
System Configuration

Add/Commit **Bandwidth**

DBA Profile Bandwidth

Profile ID

Type	Active	Configuration content	
Upstream Configuration	<input checked="" type="checkbox"/>	Upstream FIR	<input type="text" value="1024"/> (0-950000Kbps)
		Upstream CIR	<input type="text" value="1024"/> (1-950000Kbps)
		Upstream PIR	<input type="text" value="1024"/> (512-1000000Kbps)
		Upstream Weight	<input type="text" value="1"/> (1-20)
Downstream Configuration	<input checked="" type="checkbox"/>	Downstream PIR	<input type="text" value="1024"/> (0-1000000Kbps)
		Downstream Weight	<input type="text" value="1"/> (1-16)

CONFIGURACIÓN:

Vincular Perfil en la ONU:

Information Configuration

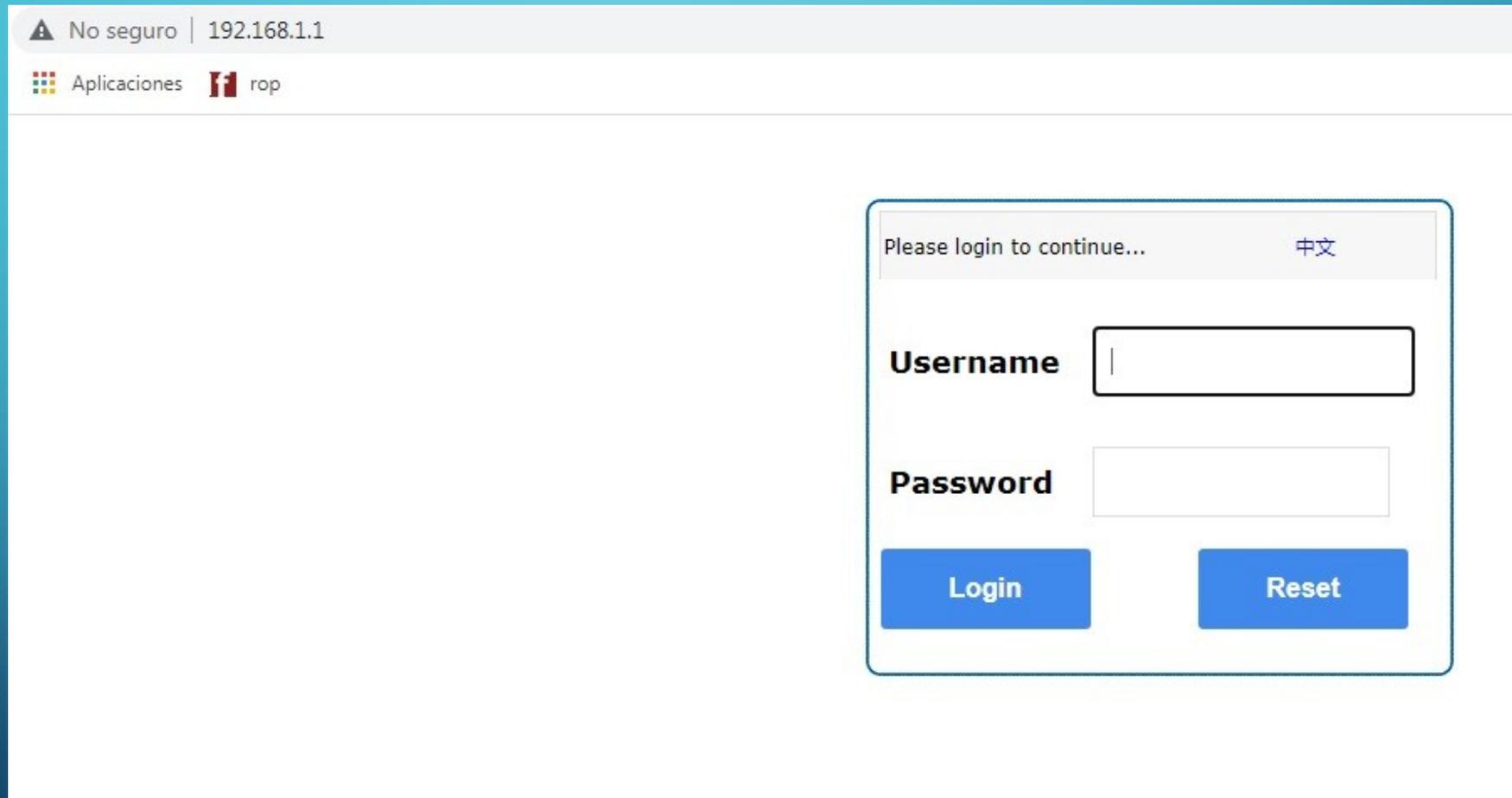
Bind Profile Information

Port ID

ONU ID	MAC Address	Type	Profile ID					Bind
			DBA	Service	VoIP	Alarm	Default Service	
1	00:6D:61:E9:5E:E0	1GE	1024	0	0	32771	0x8003	Config

CONFIGURACIÓN DE ONU:

Ingresar a la Interfaz Web de la ONU:

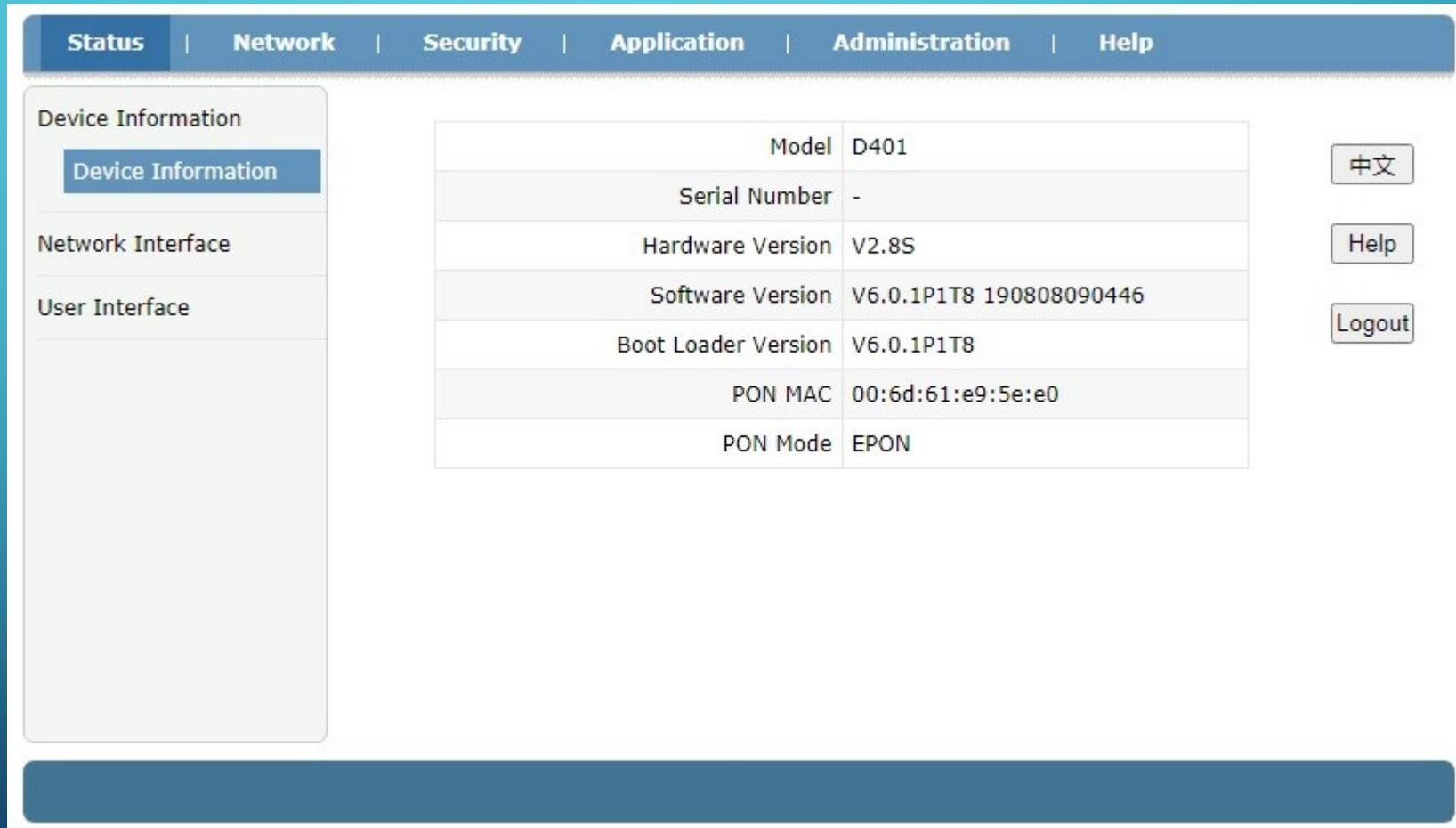


The image shows a web browser window with the address bar displaying "No seguro | 192.168.1.1". The browser's address bar also shows "Aplicaciones" and "rop". The main content area of the browser displays a login form with the following elements:

- A header bar with the text "Please login to continue..." and a language selector "中文".
- A "Username" label followed by an input field.
- A "Password" label followed by an input field.
- Two blue buttons: "Login" and "Reset".

CONFIGURACIÓN DE ONU:

Información del Equipo:



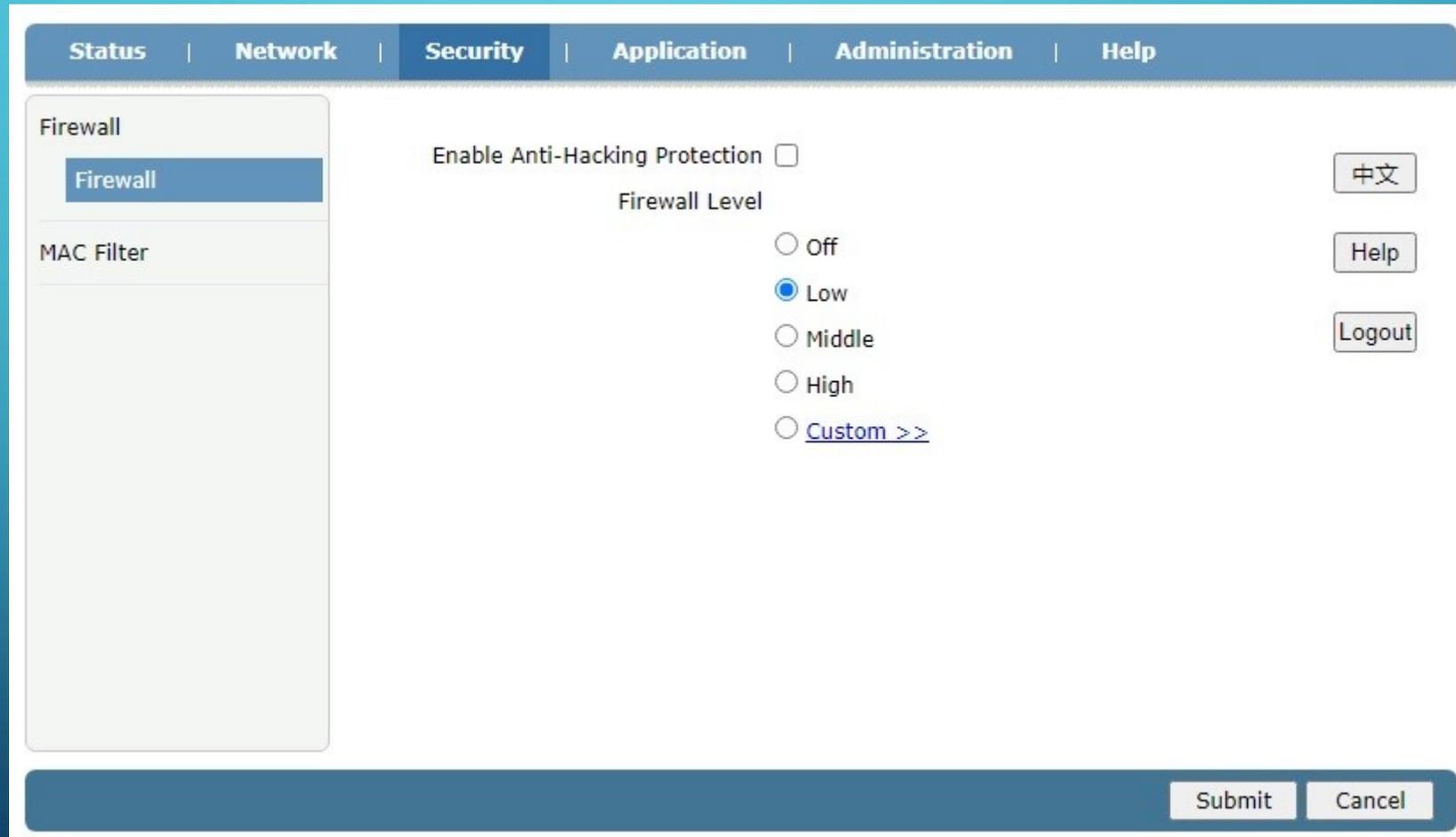
The screenshot displays the configuration web interface for an ONU. The top navigation bar includes tabs for Status, Network, Security, Application, Administration, and Help. The left sidebar contains menu items for Device Information, Network Interface, and User Interface. The main content area shows a table of device information with the following details:

Model	D401
Serial Number	-
Hardware Version	V2.85
Software Version	V6.0.1P1T8 190808090446
Boot Loader Version	V6.0.1P1T8
PON MAC	00:6d:61:e9:5e:e0
PON Mode	EPON

On the right side of the interface, there are three buttons: 中文 (Chinese), Help, and Logout.

CONFIGURACIÓN DE ONU:

Activar Firewall en Nivel Bajo (Low):



The screenshot displays the configuration interface for an ONU, specifically the Security section. The interface features a top navigation bar with tabs for Status, Network, Security, Application, Administration, and Help. The Security tab is currently active. On the left side, there is a sidebar menu with options for Firewall and MAC Filter. The Firewall section is expanded, showing the following settings:

- Enable Anti-Hacking Protection:
- Firewall Level:
 - Off
 - Low
 - Middle
 - High
 - [Custom >>](#)

On the right side of the configuration area, there are three buttons: 中文, Help, and Logout. At the bottom right of the interface, there are two buttons: Submit and Cancel.

CONFIGURACIÓN DE ONU:

Habilitar en la WAN el Servicio de DHCP:

The screenshot shows a network configuration page with a navigation menu at the top: Status, Network, Security, Application, Administration, and Help. The 'Network' tab is active. On the left, a sidebar lists LAN services: DHCP Server (selected), RA Service, DHCP Server(IPv6), and Port Service(IPv6). The main content area contains the following settings:

- NOTE: 1. The DHCP Start IP Address and DHCP End IP address should be in the same subnet as the LAN IP.
- LAN IP Address: 192.168.1.1
- Subnet Mask: 255.255.255.0
- Enable DHCP Server:
- DHCP Start IP Address: 192.168.1.2
- DHCP End IP Address: 192.168.1.254
- Assign IspDNS:
- DNS Server1 IP Address: 192.168.1.1
- DNS Server2 IP Address: (empty)
- DNS Server3 IP Address: (empty)
- Default Gateway: 192.168.1.1
- Lease Time: 86400 sec

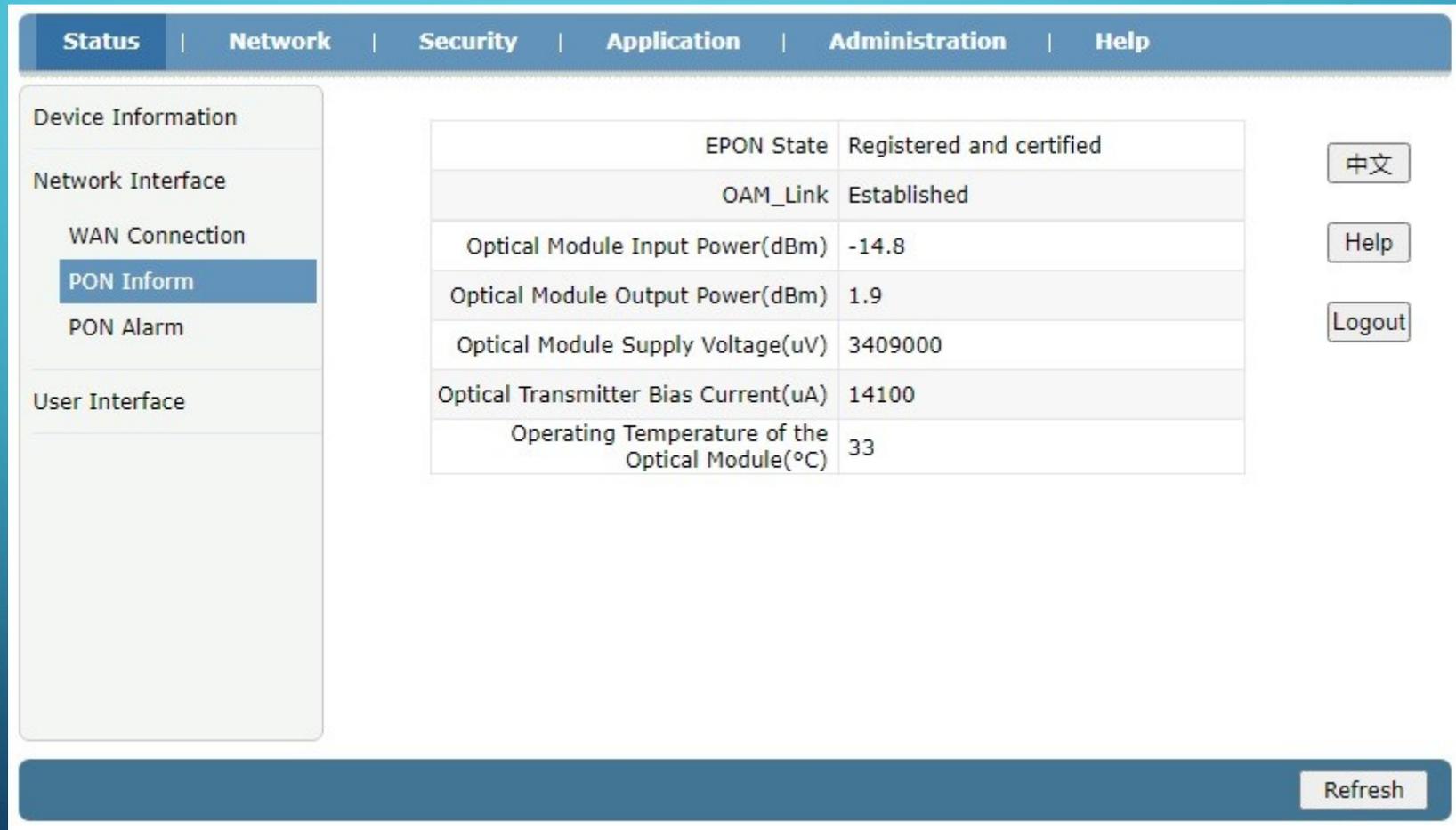
On the right side, there are buttons for '中文', 'Help', and 'Logout'. At the bottom right, there are 'Submit' and 'Cancel' buttons.

Allocated Address

MAC Address	IP Address	Remaining Lease Time	Host Name	Port
d8:d3:85:13:52:da	192.168.1.2	82037	PC1-PC	LAN1

CONFIGURACIÓN DE ONU:

Valores de Potencia:



The screenshot displays the configuration interface of an ONU (Optical Network Unit). The interface is divided into several sections:

- Navigation Menu:** Status | Network | Security | Application | Administration | Help
- Left Sidebar:** Device Information, Network Interface, WAN Connection, PON Inform (highlighted), PON Alarm, User Interface.
- Main Content Area:** A table displaying various power and operational parameters.
- Right Side:** Language selection (中文), Help, and Logout buttons.
- Bottom:** A Refresh button.

EPON State	Registered and certified
OAM_Link	Established
Optical Module Input Power(dBm)	-14.8
Optical Module Output Power(dBm)	1.9
Optical Module Supply Voltage(uV)	3409000
Optical Transmitter Bias Current(uA)	14100
Operating Temperature of the Optical Module(°C)	33

CONFIGURACIÓN DEL ROUTER:

Ingresar a la Interfaz Web del Router:

File Tools

Connect To: Keep Password
 Open In New Window

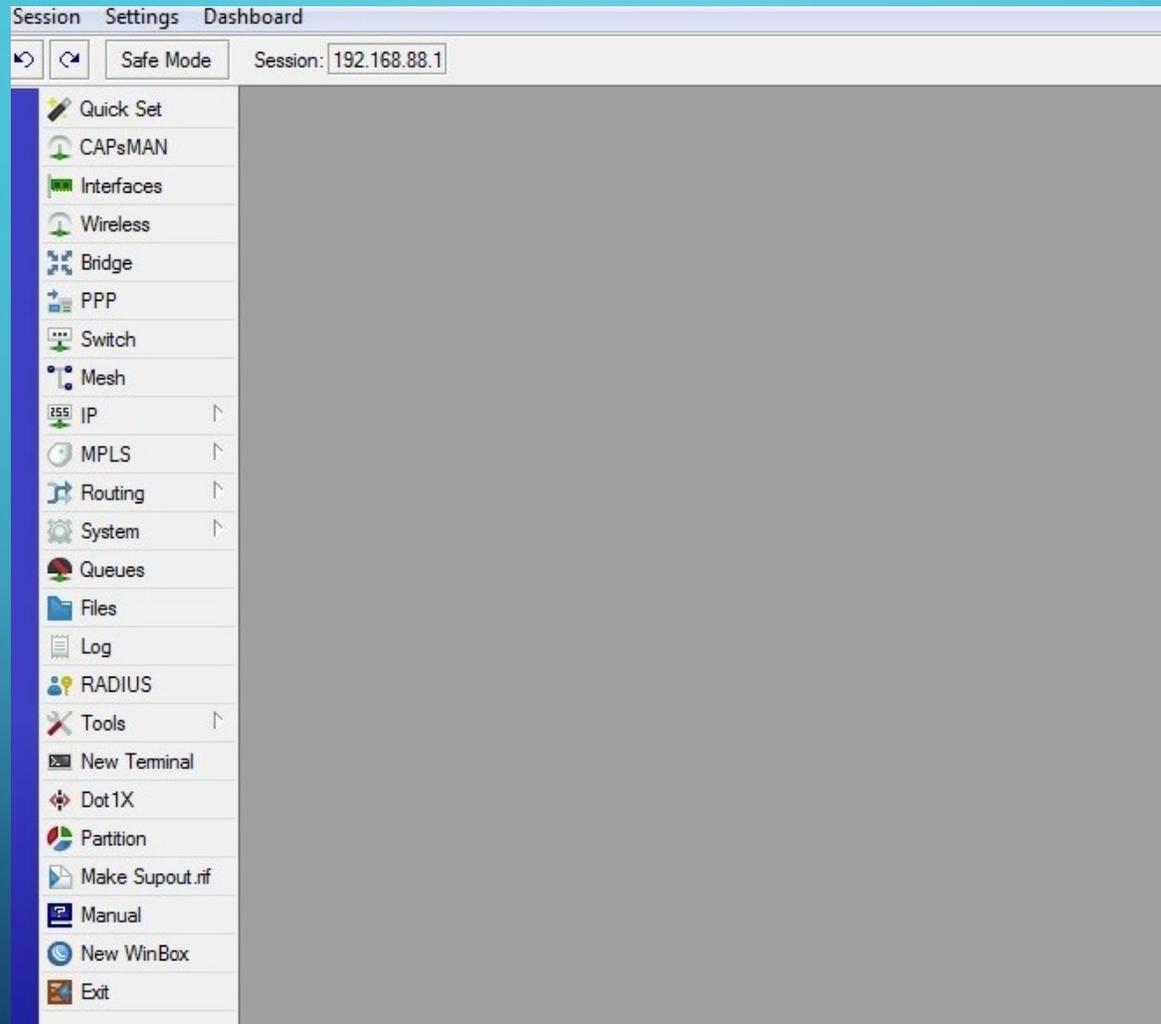
Login:

Password:

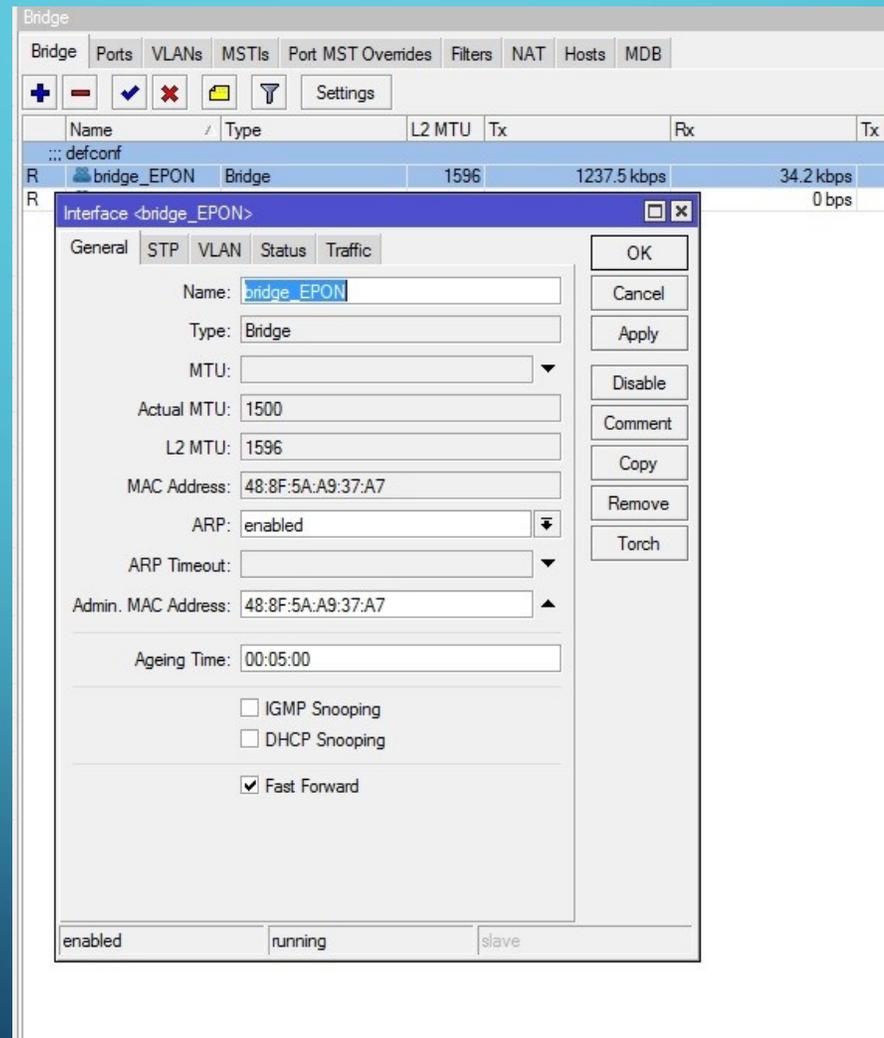
Managed Neighbors

MAC Address	IP Address	Identity	Version	Board	Uptime
48:8F:5A:A9:37:A7	192.168.88.1	MikroTik	6.47.1 (st...	RB750Gr3	00:18:11

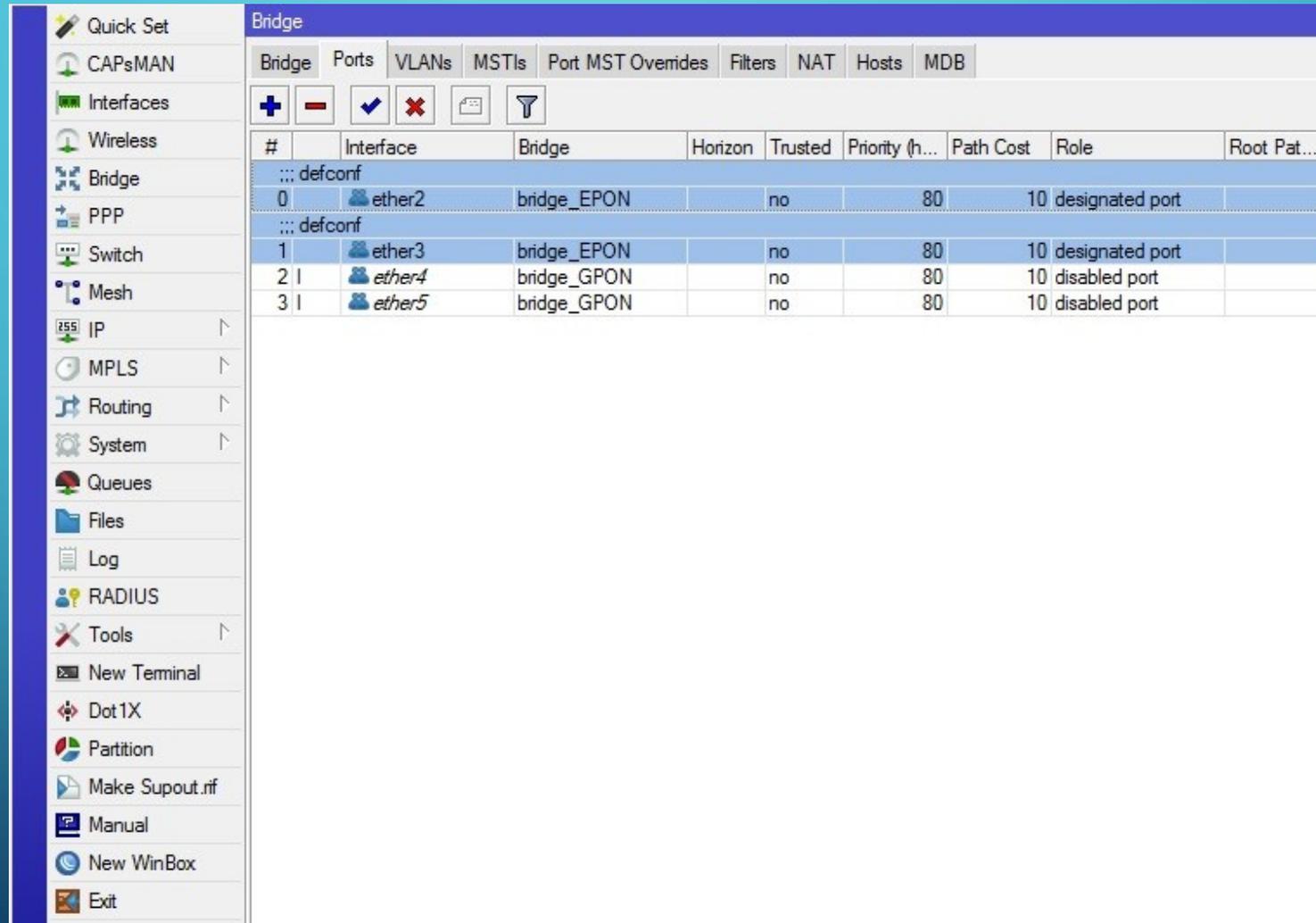
CONFIGURACIÓN DEL ROUTER:



CONFIGURACIÓN DEL ROUTER:



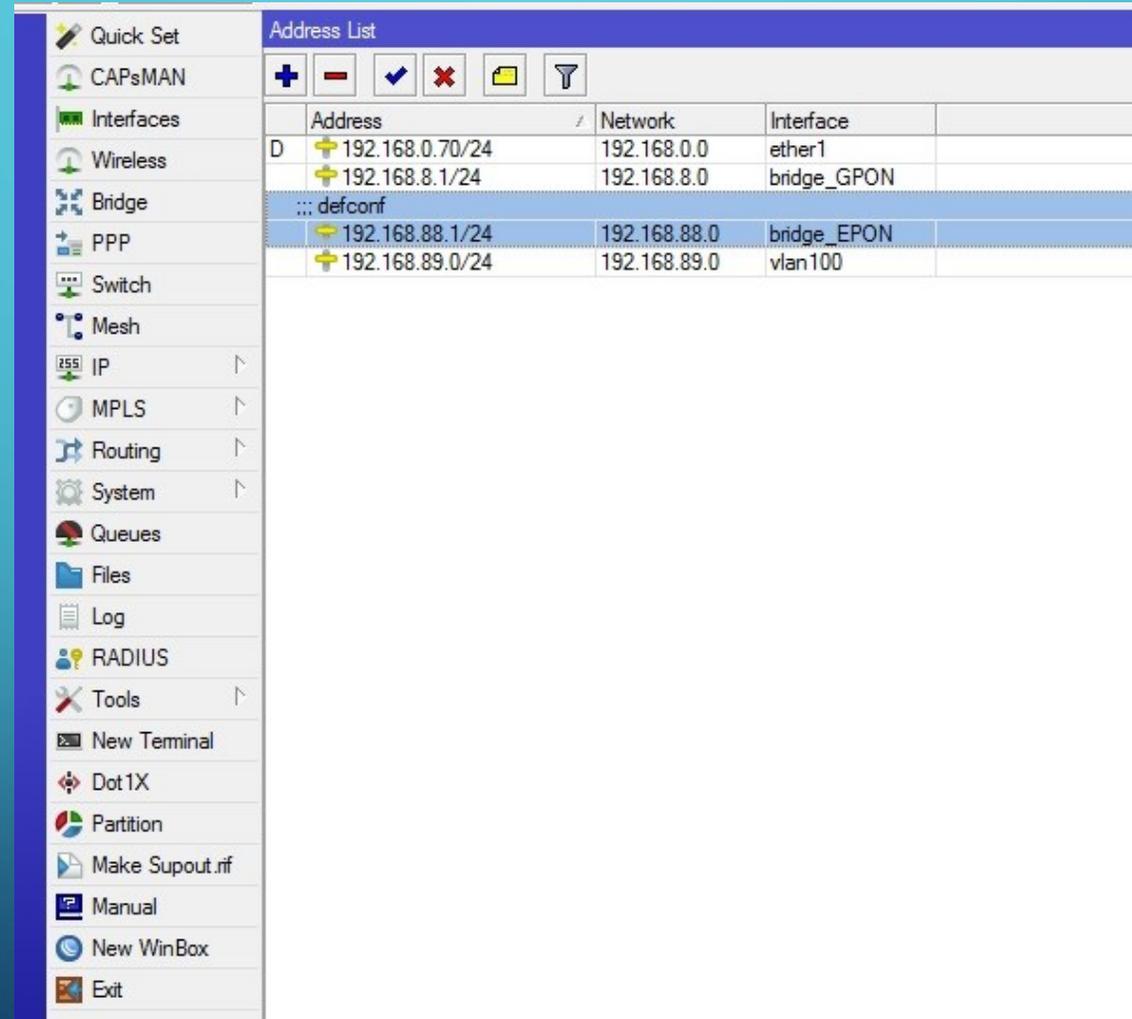
CONFIGURACIÓN DEL ROUTER:



The screenshot shows the Mikrotik WinBox interface for configuring a bridge. The left sidebar contains a menu with options like Quick Set, CAPsMAN, Interfaces, Wireless, Bridge, PPP, Switch, Mesh, IP, MPLS, Routing, System, Queues, Files, Log, RADIUS, Tools, New Terminal, Dot1X, Partition, Make Supout.tif, Manual, New WinBox, and Exit. The main window is titled 'Bridge' and has tabs for Bridge, Ports, VLANs, MSTIs, Port MST Overrides, Filters, NAT, Hosts, and MDB. Below the tabs are control buttons for adding, deleting, and filtering entries. A table displays the bridge configuration with columns for #, Interface, Bridge, Horizon, Trusted, Priority, Path Cost, Role, and Root Pat... The table contains four rows of configuration data.

#	Interface	Bridge	Horizon	Trusted	Priority (h...	Path Cost	Role	Root Pat...
::: defconf								
0	ether2	bridge_EPON		no	80	10	designated port	
::: defconf								
1	ether3	bridge_EPON		no	80	10	designated port	
2	ether4	bridge_GPON		no	80	10	disabled port	
3	ether5	bridge_GPON		no	80	10	disabled port	

CONFIGURACIÓN DEL ROUTER:



The screenshot shows the Mikrotik WinBox interface. The left sidebar contains a tree view with the following items: Quick Set, CAPsMAN, Interfaces, Wireless, Bridge, PPP, Switch, Mesh, IP (selected), MPLS, Routing, System, Queues, Files, Log, RADIUS, Tools, New Terminal, Dot1X, Partition, Make Supout.rf, Manual, New WinBox, and Exit. The main window is titled 'Address List' and contains a table with the following data:

	Address	Network	Interface	
D	192.168.0.70/24	192.168.0.0	ether1	
	192.168.8.1/24	192.168.8.0	bridge_GPON	
	::: defconf			
	192.168.88.1/24	192.168.88.0	bridge_EPON	
	192.168.89.0/24	192.168.89.0	vlan100	

CONFIGURACIÓN DEL ROUTER:

The screenshot shows the Mikrotik WinBox interface for configuring a DHCP Server. The main window is titled "DHCP Server" and has tabs for "DHCP", "Networks", "Leases", "Options", "Option Sets", "Vendor Classes", and "Alerts". The "DHCP" tab is active, showing a table of DHCP servers and a configuration dialog for the selected server.

Name	Interface	Relay	Lease Time	Address Pool	Add AR...
defconf	bridge_EPON		00:10:00	default-dhcp	no
			00:10:00	dhcp_pool2	no
			00:10:00	dhcp_pool3	no

The configuration dialog for the selected server "defconf" is open, showing the following settings:

- Name: defconf
- Interface: bridge_EPON
- Relay: (empty)
- Lease Time: 00:10:00
- Bootp Lease Time: forever
- Address Pool: default-dhcp
- DHCP Option Set: (empty)
- Src. Address: (empty)
- Delay Threshold: (empty)
- Authoritative: yes
- Bootp Support: static
- Client MAC Limit: (empty)
- Use RADIUS: no
- Always Broadcast
- Add ARP For Leases
- Use Framed As Classless
- Conflict Detection

Buttons for "OK", "Cancel", "Apply", "Disable", "Copy", and "Remove" are visible on the right side of the dialog. The status "enabled" is shown at the bottom of the dialog.