ELTEXALATAU
Complete solutions for networking

LTP-8X

Operation Manual

Version 3.24.1, 26.02.2016

Table of contents

Revision History

Issue 3b, 26 February 2016

— Manual is adjusted in accordance with LTP-8X R3.24.1 command system.

— Added Section 13.3 describing configuration ACS.

— Added Section 14.5 describing configuration terminal vlans.

— Updated chapters 19 and 20 due the models refactoring.

Issue 3a, 21 July 2014

— Manual is adjusted in accordance with LTP-8X R3.20.2 command system.

— Added Section 9.4 on group operations.

— Added Section 27 describing operations with ONT configuration templates.

Issue 1, 21.04.2014

— Added Section 11.1 describing configuration structure.

— Added Section 11.3 describing configuration autosave.

— Added Step 7 in Section 11.1 describing configuration of MAC addresses lifetime.

— Corrected the name of Table 18.1.

— Renamed Section 30.6 to Multicast Statistics View.

— Added Appendix A with Triple Play configuration example for the "VLAN for Subscriber" model.

— Added optical interfaces specification for Ligent Photonics LTE3680M-BC into Table 3.1.

18.04.2014

The first issue of the document.

Terms and Definitions

CBR	Constant bitrate
DBA	Dynamic bandwidth allocation
FW	Firmware
GPON	Gigabit PON
IGMP	Internet Group Management Protocol
IP	Internet protocol
OLT	Optical Line Terminal
ONT	Optical Network Terminal
ONU	Optical Network Unit
SNTP	Simple Network time protocol
SNMP	Simple Network Manazgement Protocol
SFP	Small Form-factor Pluggable
URI	Uniform Resource Identifier
TFTP	Trivial File Transfer Protocol

Part I General

Chapter 1.

Introduction

GPON is a network of passive optical networks (PON) type. It is one of the most effective state-of-the-art solutions for the "last mile" issue that significantly reduces the required amount of cable and provides information transfer with downstream rate up to 2.5 Gbps and upstream rate up to 1.25 Gbps. Being used in access networks, GPON-based solutions allow end users to have access to new services based on IP protocol in addition to more common ones.

The key GPON advantage is the use of one optical line terminal (OLT) for multiple optical network terminals (ONT). OLT converts Gigabit Ethernet and GPON interfaces and is used to connect a PON network with data communication networks of a higher level.

The range of OLT GPON equipment produced by Eltex comprises of LTP-8X terminal with internal Ethernet switch with 8 GPON ports and RSSI function.

The Operation Manual describes application, key specifications, installation, configuration, monitoring, and software retrofit for the devices.

Chapter 2.

Application

LTP-8X optical line terminal is designed to establish connection with upstream equipment and provide broadband access over passive optical networks. Ethernet connection is established through Gigabit uplink and 10G Base-X interfaces; GPON interfaces are used to connect to optical networks. Each interface can provide connection for 64 subscriber optical terminals through one fibre and supports dynamic bandwidth allocation (DBA).

The following services are provided to end users:

— voice communications;

— HDTV;

— VoIP telephony (based on SIP/H.323/MGCP protocols);

— high-speed Internet access;

— IP TV;

— video-on-demand (VoD);

— video conferencing; and

— online educational and entertainment programs.

The device has the following functions:

— dynamic bandwidth allocation (DBA);

— support of quality assurance mechanisms (QoS), GPON ports prioritization for different types of traffic according to 802.1p;

— security functions;

— ONT remote control, automatic detection of new ONT;

— FEC errors correction;

— power measurement support for signals received from each ONT (RSSI) 1

— VLAN organisation (VLAN ID range: 0-4094);

— MAC address filtering, 16,000 records in the MAC addresses table;

— support of IGMP snooping v1/2/3, IGMP proxy;

— support of DHCP snooping, DHCP relay agent; and

— support of PPPoE IA.

Chapter 3.

Delivery Package

The standard delivery package includes:

1. LTP-8X optical line terminal.
2. A mounting set for 19'' rack.
3. RS-232 DB9(F)–DB9(F) console cable.
4. A CD with Operation Manual and Quick Setting Guide.
5. Declaration of Conformity.
6. Device Certificate.

Chapter 4.

Specifications

Table 4.1 Key Specifications of Optical Line Terminal[1]

Interfaces		
Ethernet interfaces, pcs.	10	
Connector	RJ-45	SFP
Data rate, Mbit/sec	10/100/1000 duplex/half-duplex	1000/10000 duplex
Standards	10/100 Base-TX/ 1000 Base-T	1000 Base-X, 10GBase-X
GPON Interfaces, pcs.	8	
Connector type	SC/UPC (socket) complies with ITU-T G.984.2, FSAN Class B+, SFF-8472[1]	
Transmission medium	fibre optical cable SMF-9/125, G.652	
Standards	Digital RSSI[1]	
Splitting ratio	1:4, 1:8, 1:16, 1:32, 1:64[1]	
Transmitter	1490 nm DFB Laser[1]	
Data Rate	2488 Mb/s[1]	
Average Launch Power	1.5..+5 dBm[1]	
Spectral Line Width -20 dB	1.0 nm[1]	
Receiver	1310 nm APD/TIA Detector/Amplifier[1]	
Data Rate	1244 Mb/s[1]	
Receiver Sensitivity	-28 dBm[1]	
Receiver Optical Overload	-8 dBm[1]	
Processor		
Processor type	Marvell Sheeva, ARMV5TE architecture	
Clock frequency	800 MHz	
Number of cores	1	

[1] Optical parameters for Ligent Photonics LTE3680M-BC

Operating memory	256 MB 320 MHz
Non-volatile memory	2x32 Mb SPI Flash
Switch	
Ethernet switch	Marvell Packet Processor
Performance	128 Gbps
Table of MAC addresses	16,000 records
VLAN support	up to 4,000 according to 802.1Q
Quality of Services (QoS)	8 prioritized output queues for each port
Control	
Local control	Command line interfaces (CLI)
Remote control	CLI (SSH2, Telnet), SNMP
Monitoring	CLI, SNMP
Access restriction	Password, IP address
General parameters	
Power voltage	AC: 150–250 V, 50 Hz; DC: -36...-72 V
Power consumption	not more than 20 W
Operating temperature range	from +5 to +40 °C
Relative humidity	up to 80 %
Dimensions	with power supply module: 430×44×258 mm, 19" form-factor, 1U size
Weight	not more than 2.5 kg

Chapter 5.

Compatible SFP transceivers

Correct and error-free operation of GPON interface requires exact parameters to be chosen and set for each transceiver type. This can be done only under laboratory conditions by the terminal vendor. Table 6.1 lists SFP transceivers for which seamless terminal operation is guaranteed.

DDMI (Digital Diagnostic Monitoring Interface) provides information about transceiver parameters such as temperature, power voltage, etc. DDMI also measures the level of ONT signal (RSSI). All compatible transceivers support this function.

Table 6.1. The List of Compatible SFP Transceivers

Vendor	SFP transceiver model	Class	DDMI
NEOPHOTONICS	PTB38J0-6538E-SC	B+	+
NEOPHOTONICS	38J0-6537E-STH1+	C+ HP	+
NEOPHOTONICS	38J0-6537E-STH2+	C+ HP	+
NEOPHOTONICS	38J0-6537E-STH3+	C+ HP	+
Ligent Photonics	LTE3680M-BC	B+	+
Ligent Photonics	LTE3680M-BH	B+	+
Ligent Photonics	LTE3680P-BC	C+	+
Ligent Photonics	LTE3680P-BH	C+	+
Ligent Photonics	LTE3680P-BC2	C+ HP	+

Chapter 6.

Design

6. 1 Front Panel

The device has a metal case available for 19 form-factor rack-mount 1U shelf installation. The front panel of the terminal is shown in Fig. 6.1.

Table 4.1 lists sizes, LEDs, and controls located on the front panel.

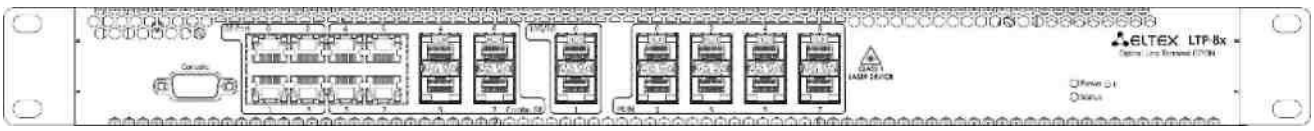

Fig. 6.1. Front Panel of Terminal

Table 4.1. Description of Connectors, LEDs, and Controls Located on the Front Panel

Component	**Description**
Console	RS-232 port for local control of the terminal
GE Port 0..3	4 RJ-45 connectors of 10/100/1000 Base-T Gigabit uplink interface to connect to IP network
Combo GE 4..7	4 chassis for SFP modules of 1000 Base-X uplink interface to connect to IP network
	4 RJ-45 connectors of 10/100/1000 Base-T Gigabit uplink interface to connect to IP network
10G/1G 0..1	2 chassis for SFP modules of 1000 Base-X uplink interface to connect to IP network
GPON	8 chassis for GPON SFP modules
Power	Power indicator of the terminal
Status	Operating indicator of the terminal

F	A functional key that reboots the terminal and resets it to factory settings: - pressing the key for less than 10 seconds reboots the terminal; - pressing the key for more than 10 seconds resets the terminal to factory settings.

4 electrical Ethernet and 4 optical interfaces are combined (Combo GE 4..7). The combined ports may have only one active interface at the same time.

6. 2 Rear Panel

The rear panel of the terminal is shown in Fig. 6.2 and 6.3.

Table 4.2 lists rear panel connectors.

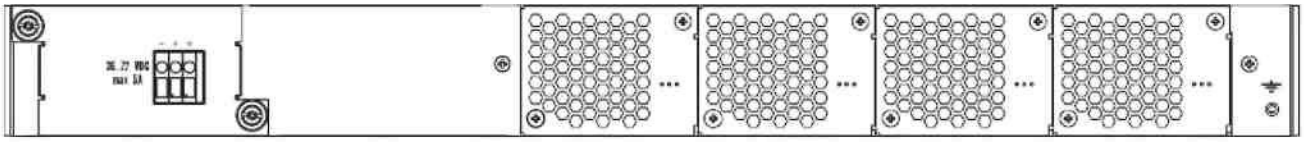

Fig. 6.2. Rear Panel of Optical Line Terminal (DC)

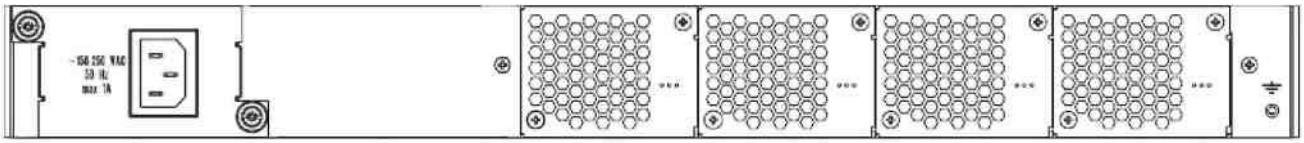

Fig. 6.3. Rear Panel of Optical Line Terminal (AC)

Table 6.2. Description of Connectors, LEDs, and Controls Located on the Rear Panel

Component	**Description**
36 .. 72 VDC, max 5A	Connector for DC power supply
150-250 V AC, 50 Hz, max 1 A	Connector for AC power supply
Fan0, Fan1	Ventilation units
Earth bonding point	Earth bonding point of the terminal

6. 3 Light Indication

The Status and Power LEDs located on the front panel indicate the current status of the terminal. Table 4.3 lists possible statuses of the LEDs.

Table 6.3. Light Indication of Terminal Status

LED	**LED Status**	**Terminal Status**
Status	Flashes green	Normal operation
	Flashes red	Critical failure
Power	Glows green	Power supply on terminal is on

6. 4 Temperature Sensors

2 temperature sensors are used to measure temperature inside the terminal case. Fig. 6.4 shows the sensor location on the PCB.

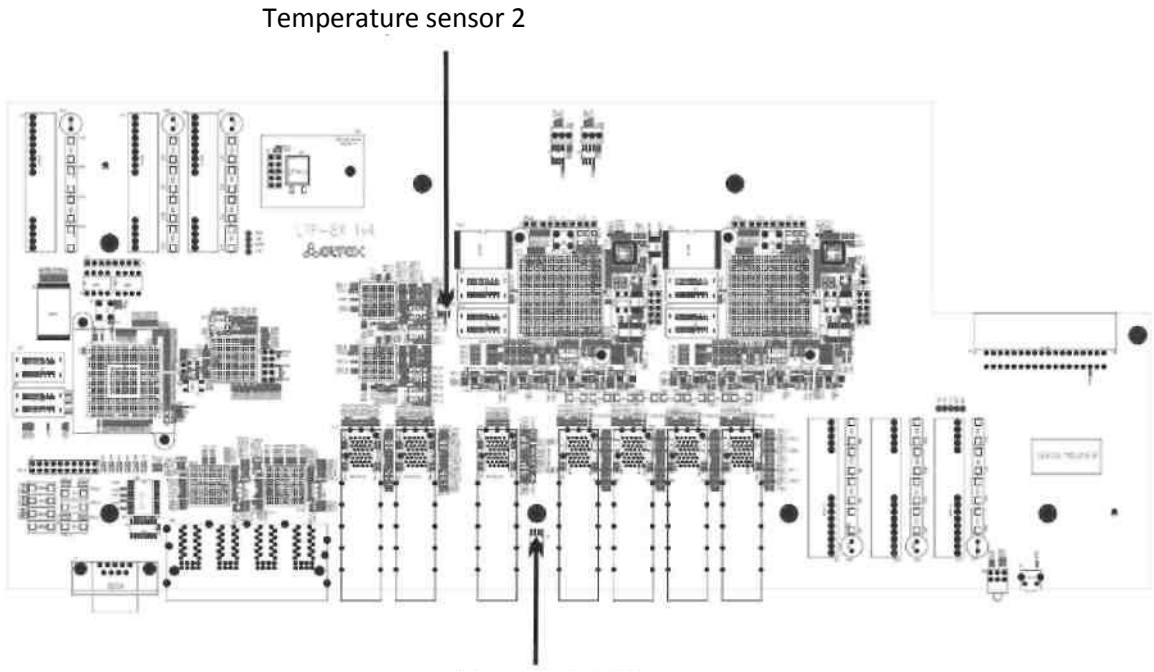

Fig. 6.4. Temperature Sensors Arrangement

6. 5 Ventilation System

The rear, front, and side panels of the terminal have ventilation grids for heat removal. The rear panel has four ventilation units installed (Fig. 6.2 and 6.3).

Air flows in through the perforated front and side panels, circulates through all internal components, cools them down, and then is removed with the help of ventilators located on the perforated rear panel.

The device incorporates 2 ventilators. The ventilation units are detachable. Procedure for dismantlement and installation is described in Chapter 33.

Chapter 7.

Safety precautions and installation procedure

Introduction

This chapter describes installation of the terminal into a rack and connection to a power supply.

7.1 Safety requirements

General

Any operations with the terminal should comply with *Safety Rules for Operation of Customers' Electrical Installations*.

Operations with the terminal should be carried out only by personnel authorised in accordance with the safety requirements.

1. Before operating the terminal, all engineers should undergo special training.
2. The terminal should be connected only to properly functioning equipment.
3. The terminal is to be operated 24/7 provided the following requirements are met:

a. ambient temperature from +5 to +40 °C;

b. relative humidity up to 80 % at +25 °C;

c. atmosphere pressure from 6.0×10^4 to 10.7×10^4 Pa (from 450 to 800 mm Hg).

4. The terminal should not be exposed to mechanical shock, vibration, smoke, dust, water, and chemicals.
5. In order to avoid components overheating which may result in terminal malfunction, do not block air vents or place objects on the terminal.
6. Prior to connecting the terminal to a power source, ensure that the terminal case is grounded with an earth bonding point. The earthing wire should be securely connected to the earth bonding point. The resistance between the earth bonding point and earthing busbar should be less than 0.1 Ohm.
7. PC and measurement instruments should be grounded prior to connection to the terminal. The potential difference between the terminal case and the cases of the instruments should be less than 1 V.
8. Prior to turning the terminal on, ensure that all cables are undamaged and securely connected.

9. Make sure the device is off, when installing or removing the case.

10. Power supply modules should be changed only when the device if off. Follow the replacement procedure given in Section 5.2.

11. Follow the instructions given in Chapter 32 to install or remove SFP transceivers. This operation does not require the terminal to be turned off.

7.2 Terminal Installation Procedure

Check the terminal for visible mechanical damage before installing and turning the terminal on. In case of any damage, stop the installation, fill in a corresponding document and contact your supplier. If the terminal was exposed to low temperatures for a long time before installation, leave it for 2 hours at ambient temperature prior to operation. If the terminal was exposed to high humidity for a long time, leave it for at least 12 hours in normal conditions prior to turning it on.

Support Brackets Mounting

The delivery package includes support brackets for rack installation and mounting screws to fix the terminal case on the brackets. To install the support brackets:

Step 1. Align four mounting holes in the support bracket with the corresponding holes in the side panel of the device.

Step 2. Use a screwdriver to screw the support bracket to the case.

Step 3. Repeat steps 1 and 2 for the second support bracket.

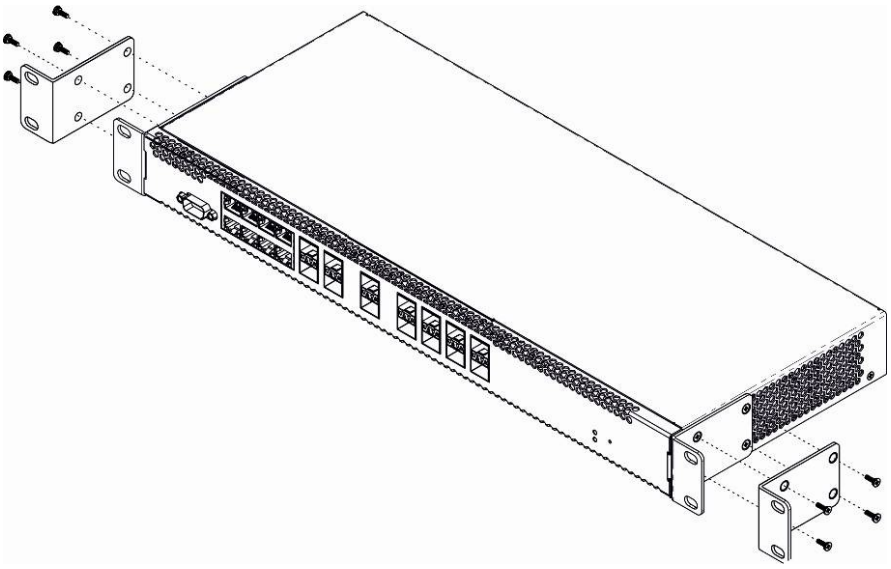

Fig. 7.1. Support Brackets Mounting

Terminal Rack Installation

To install the terminal to the rack:

Step 1. Attach the terminal to the vertical guides of the rack.

Step 2. Align mounting holes in the support bracket with the corresponding holes in the rack guides. Use the holes of the same level on both sides of the guides to ensure the terminal horizontal installation.

Step 3. Use a screwdriver to screw the terminal to the rack.

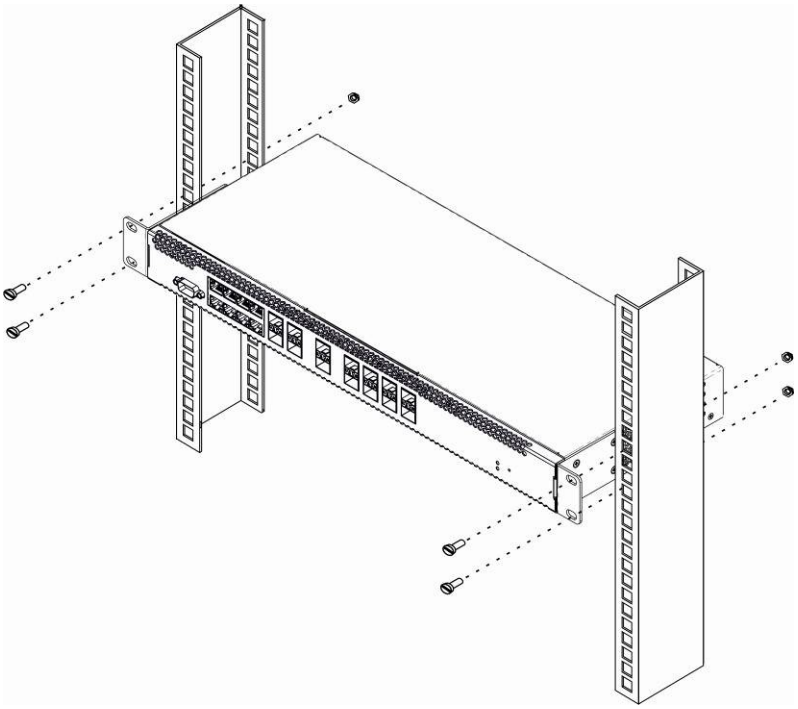

Fig. 7.2. Terminal Rack Installation

The terminal is horizontally ventilated. The side panels have air vents. Do not block air vents to avoid components overheating and subsequent terminal malfunction.

To avoid overheating and provide necessary ventilation of the terminal, sufficient space should be provided above and below the terminal, not less than 10 cm.

Power Supply Module Installation

Depending on power supply requirements, the terminal can be supplemented with either an AC power supply module, 220 V, 50 Hz, or a DC power supply module, 48 V. The location of the power supply module is shown in Fig. 7.3

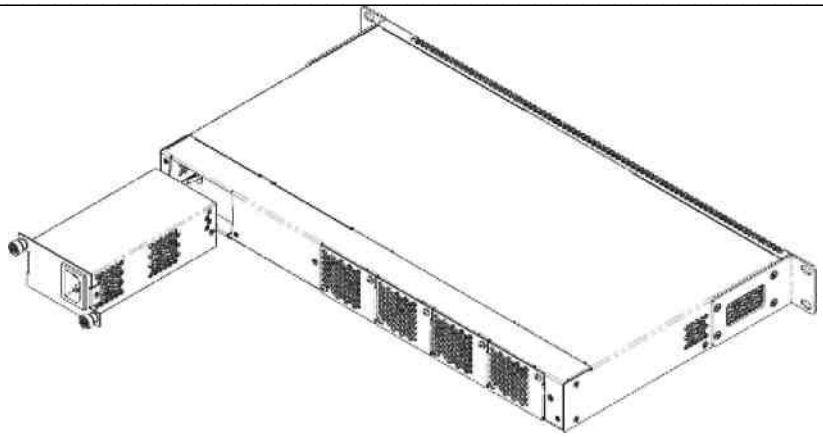

Fig. 7.3. Power Supply Module Installation

To install the power supply module:

Step 1. Install the module to the opening as shown in Fig. 7.3.

Step 2. Screw the module to the case.

Step 3. Follow the instructions in Section 7.2 to power on.

Connection to Power Supply

To install the device:

Step 1. Mount the device. In case of installation to a 19" form-factor rack, mount the support brackets from the delivery package to the rack.

Step 2. Ground the case of the device. This should be done prior to connecting the device to the power supply. An insulated multiconductor wire should be used for earthing. The device grounding and the earthing wire section should comply with Electric Installation Code. The earth bonding point is located at the right bottom corner of the side panel, see Fig. 7.3 and 7.2.

Step 3. If a PC or another device is supposed to be connected to the switch console port, the device should be also securely grounded.

Step 4. Connect the power supply cable to the device.

Step 5. Turn the device on and check the front panel LEDs to make sure the terminal is in normal operating conditions.

Part II Getting Started with the Terminal

Chapter 8.

Connecting to Terminal CLI

Introduction

This Chapter describes various connection methods for Command Line Interface (CLI) of the terminal.

A serial port (hereafter—COM port) is recommended for preliminary adjustment of the terminal.

8.1 CLI Views Hierarchy

This type of connection requires PC either to have an integrated COM port or to be supplied with a USB-COM adapter cable. The PC should also have a terminal program installed, e.g. Hyperterminal.

Step 1. Use the null modem cable from the delivery package to connect the console port of the terminal to the PC COM port as shown in Fig. 8.1.

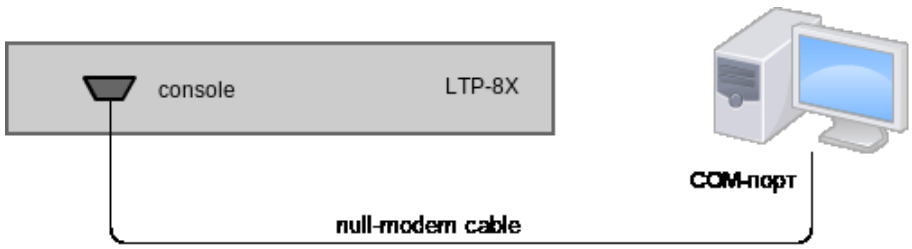

Fig. 8.1. Connecting the Terminal to a PC via COM Port

Step 2. Launch the terminal program and create a new connection. Select the corresponding COM port in the "Connect to" drop-down list. Assign the port settings according to Table 8.1. Click OK.

Table 8.1. Port Settings

Bit rate	115,200
Data bits	8
Parity	No

Stopping bits	1
Flow control	No

Step 3. Press Enter. Log into the terminal CLI. Factory settings: login: **admin**, password: **password**.

```
************************************
*   Optical line terminal LTP-8X     *
************************************
LTP-8X login: admin
Password: ********

Eltex LTP-8X software version 3.20.2 build 1814 on 18.06.2014 12:46
Technical support: http://eltex.nsk.ru/support Sat Jan  1 20:35:33 LOCAL 2000
LTP-8X#
```

8.2 Connecting to CLI with Telnet Protocol

The Telnet protocol connection is more flexible than the connection via COM port. Connection to CLI can be established directly at the terminal location or via IP network with the help of a remote desktop.

This section considers direct connection to CLI at the terminal location. Remote connection is similar, but requires changes in the terminal IP address which will be considered in details in Chapter 11, page 33.

In order to be connected to the terminal, a PC should have a NIC. The connection will additionally require the sufficient amount of network cable (Patching Cord RJ45) as it is not included in the delivery package.

Step 1. Connect one end of the network cable to any GE or Combo GE port of the terminal. Connect another end to the NIC on PC as shown in Fig. 8.2.

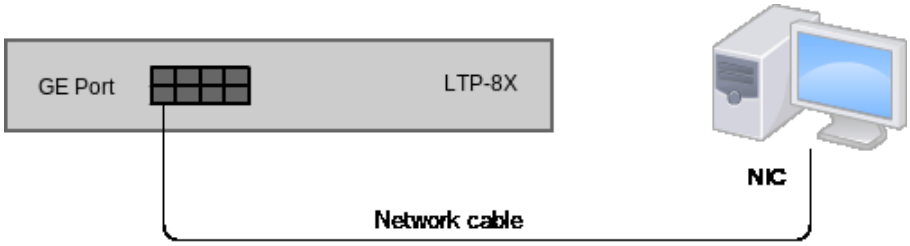

Fig. 8.2. Connecting the Terminal to a PC via Network Cable

Step 2. Assign IP settings for network connection. Set 192.168.1.1 as an IP address and 255.255.255.0 as a subnet mask.

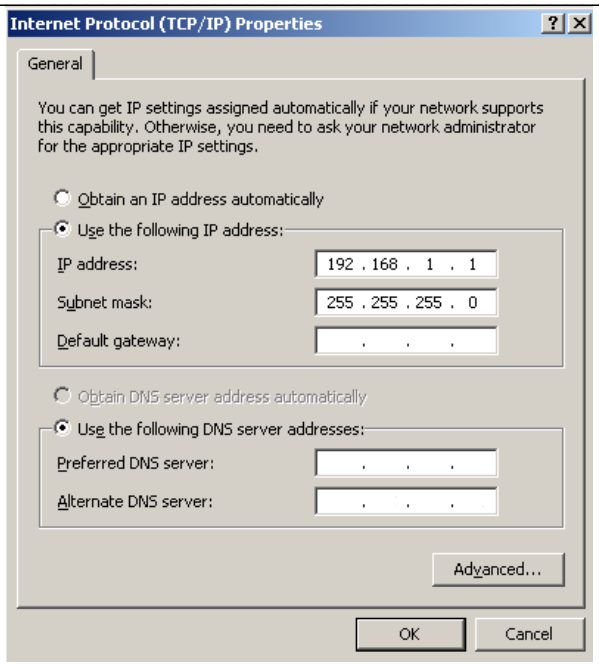

Fig. 8.3. Assigning Network Connection Settings

Step 3. Click **Start** -> **Run**. Enter **telnet** and the terminal's IP address. The factory setting for IP address is **192.168.1.2**. Click OK.

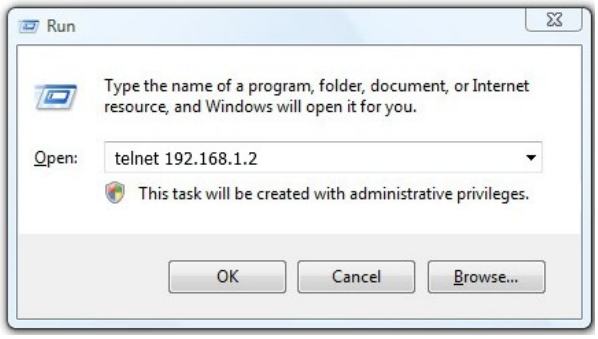

Fig. 8.4. Running the Telnet Client

Step 4. Log into the terminal CLI. Factory settings: login: **admin**, password: **password**.

```
login: admin
Password: ********
Eltex LTP-8X software version 3.20.2 build 1814 on 18.06.2014 12:46
Technical support: http://eltex.nsk.ru/support
Sat Jan 1 21:44:30 LOCAL 2000
LTP-8X#
```

8.3 Connecting to CLI with Secure Shell Protocol

Secure Shell connection (SSH) has functionality similar to Telnet protocol. However, as opposed to Secure Shell, Telnet encrypts all traffic data, including passwords. This enables secure remote

connection via public IP networks.

This section considers direct connection to CLI at the terminal location. Remote connection is similar, but requires changes in the terminal IP address which will be considered in details in Chapter 11, page 33.

In order to be connected to the terminal, a PC should have a NIC. The PC should have an SSH client installed, e.g. PuTTY. The connection will additionally require the sufficient amount of network cable (Patch Cord RJ45) as it is not included to the delivery package.

Step 1. Perform Steps 1 and 2 from Section 8.2.

Step 2. Run PuTTY. Enter IP address of the terminal. The factory setting for IP address is 192.168.1.2. Select port **22** and **SSH** protocol type. Click Open.

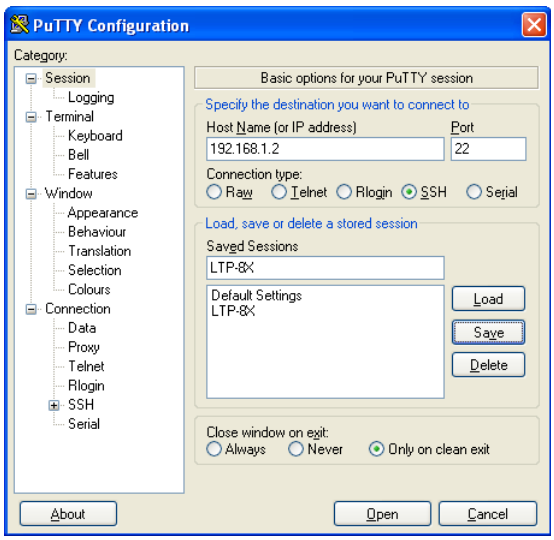

Fig. 8.5. Running SSH Client

Step 3. Log into the terminal CLI. Factory settings: login: admin, password: password.

```
login: admin
Password:


Eltex LTP-8X:rev.B software version 3.24.1 build 109 on 15.12.2015 12:01
Technical support: http://eltex.nsk.ru/support
Fri Jan  7 18:35:08 LOCAL 2000


LTP-8X#
```

Chapter 9.

Getting Started with Terminal CLI

Introduction

CLI is the main means of communication between user and the terminal. This Chapter considers general operations in CLI: commands grouping, automatic code completion, and history.

9.1 CLI Views Hierarchy

Views are used in the terminal CLI to group commands and optimise their length.
Fig. 9.1 shows a graphic chart of main views and their switch commands.

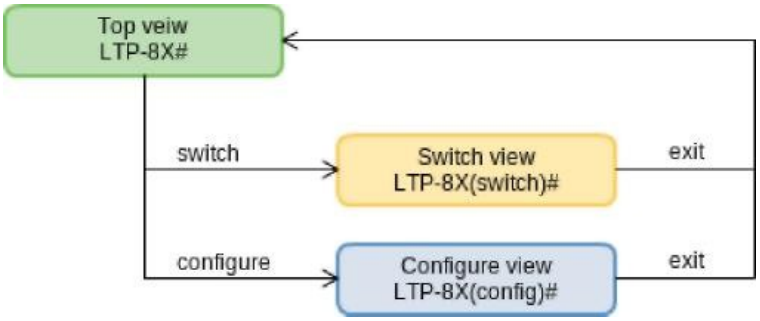

Fig. 9.1. CLI Views Hierarchy

The **Top view** includes global commands which refer to the device in general. For instance: view terminal parameters, firmware update reboot, etc. The **Switch view** is a group of switch-related commands: VLAN, GE interfaces, LACP, etc. The **Configure view** is a list of terminal configuration commands. For instance: user management, services configuration, GPON interface and ONT configuration, profile configuration, etc.

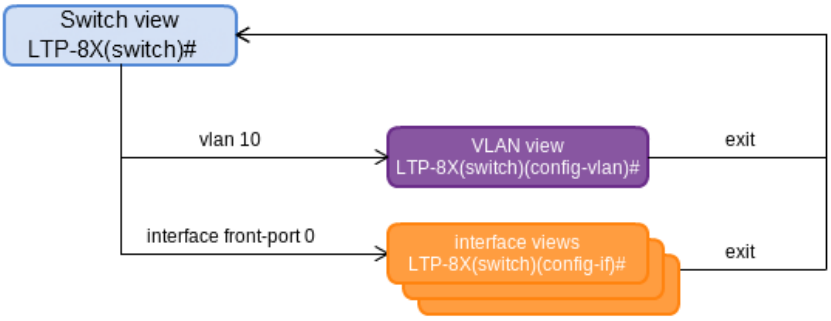

Fig. 9.2. Switch Views Hierarchy

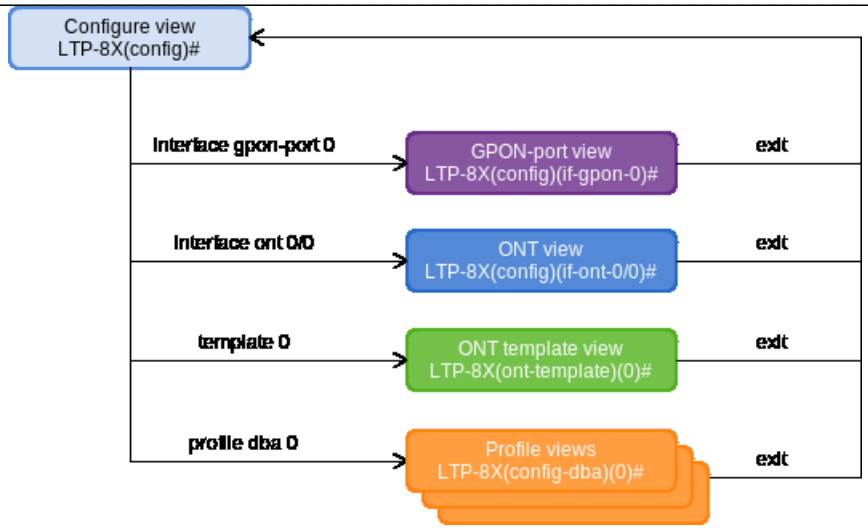

Fig. 9.3. Configure Views Hierarchy

Configuration view shown in Figure 9.3 and consists of four parts. **GPON-port view** to configure the GPON interfaces. **ONT view** to configure the ONT. Configuration templates are configured in the **ONT template view**. The profile of the terminal configuration is configured in the **Profile view.**

9.2 CLI Automatic Code Completion

In order to make work with CLI faster and easier, an automatic code completion is implemented. A good knowledge of CLI command system allows user to work with CLI as fast as with graphical interface.

For example, enter "ex" command in the **Top view** and press **Tab**:

```
LTP-8X# ex<Tab>
LTP-8X# exit
```

As this view has only one command with "ex" prefix, CLI automatically completes it.

If there are more commands with this prefix, CLI shows hints with possible options:

```
LTP-8X# co<Tab>
configure copy
LTP-8X# con<Tab>
LTP-8X# configure
LTP-8X# <?>
   !                Comments
   acs              Go to ACSD CLI
   clear            Clear alarms or system log
   commit           Commit changes of configuration
   configure        Enter configuration mode
   copy             Copy files
   date             Set system date
   default          Clear configuration and set default values
   delete           Delete ...
```

9.3 CLI Command History

Sometimes it may be necessary to execute the same set of operations several times. To make the work with repeating commands easier, the terminal CLI keeps the command history.

The list of previously entered commands can be seen either with the help of the **show history**

command:

```
LTP-8X# show history
    show management
    switch
    exit
    show uptime
LTP-8X#
```

By using cursor keys Up and Down to scroll the command history and Enter key to execute the selected command.

```
LTP-8X# <Up>
LTP-8X# show management <Up>
LTP-8X# switch <Up>
LTP-8X# exit <Up>
LTP-8X# show uptime <Up>
up 1 day, 23:44
```

9.4 Group operations

Group operations can be performed on such terminal configuration objects as interfaces and ONT. It is especially convenient, when you have to apply the same actions to multiple objects.

To perform group operations, select the range of object IDs instead of one object ID. This feature is supported by a majority of CLI commands.

For example, enable fec for all ONTs in a certain channel.

```
LTP-8X(config)# interface ont 0/0-63
LTP-8X(config)(if-ont-0/0-63)# fec
```

Or view the list of active on the first 4 GPON channels:

```
LTP-8X# show interface ont 0-3 online

GPON-port 0 has no online ONTs
GPON-port 1 has no online ONTs
GPON-port 2 has no online ONTs
GPON-port 3 has no online ONTs

Total ONT count: 0
LTP-8X#
```

Part III Configuring the Terminal

Chapter 10.

Network Settings

Introduction

This chapter describes adjustment of network settings for a terminal. Adjusting network settings enables remote control and integration with OSS/BSS systems.

10.1 Adjustments of network settings

Adjustments of network settings are recommended to be done via COM port connection. This will prevent issues with connection loss before the terminal being adjusted. Be very careful when using remote adjustment.

Step 1. Use the **show management** command to view the current network settings.

```
LTP-8X# show management
Network:
Hostname:                           'LTP-8X'
Ipaddr:                             192.168.1.2
Netmask:                            255.255.255.0
Vlan management:                    1
Gateway:                            0.0.0.0
Vlan prio:                          7
Dscp:                               63
```

Step 2. . Switch to the **configure view** and set the terminal name by using the **hostname** command.

```
LTP-8X# configure terminal
LTP-8X(config)# hostname LTP-8X-1
```

Step 3. Set the terminal IP address by using the **management ip** command.

```
LTP-8X(config)# management ip 10.0.0.1
```

Step 4. Set the subnet mask by using the **management netmask** command.

```
LTP-8X(config)# management netmask 255.0.0.0
```

Step 5. Set the default gateway by using the **management gateway** command.

```
LTP-8X(config)# management gateway 10.0.0.1
```

Step 6. Adjust the VLAN management of the terminal by using the **management vid** command, if necessary. Use the **management cos** to set the "P-bit" parameter for VLAN management.

```
LTP-8X(config)# management vid 9
LTP-8X(config)# management cos 5
```

Proper operation of the inband management function requires VLAN adjustment in the switch view as described in Chapter 14, page 52.

Step 7. Set the lifetime of MAC addresses by using the **gpon network mac-age-time** command. Pass time in seconds as a parameter.

```
LTP-8X(config)# gpon network mac-age-time 7200
```

Step 8. The network settings change as soon as the configuration is applied. No terminal reboot is needed.

```
LTP-8X(config)# do commit
```

10.2 AAA Configuration

The terminal provides an AAA model with TACACS+.

Step 1. Use the **tacacs-server host** command to specify TACACS+ server IP address.

```
LTP-8X(config)# tacacs-server host 192.168.16.40
```

Step 2. Use the **tacacs-server key** command to specify TACACS+ shared keyword.

```
LTP-8X(config)# tacacs-server key testing
```

Step 3. Use the **aaa authentication tacacs+** command to activate TACACS+ authentication.

```
LTP-8X(config)# aaa authentication tacacs
```

Step 4. Use the **aaa authorization tacacs+** command to activate TACACS+ authorization.

```
LTP-8X(config)# aaa authorization tacacs+
```

Step 5. Use the **aaa accounting [start-stop tacacs+] [commands tacacs+]** command to configure accounting.

```
LTP-8X(config)# aaa accounting start-stop tacacs+ commands tacacs+
```

Chapter 11.

Terminal Configuration

Introduction

The collection of all terminal settings is referred to as configuration. This chapter provides information about the parts configuration consists of. It also defines lifecycle of configuration and describes main operations which can be performed.

11.1 Configuration Structure

The terminal configuration can be conventionally divided into 7 parts. Fig. 10.1 shows the configuration structure.

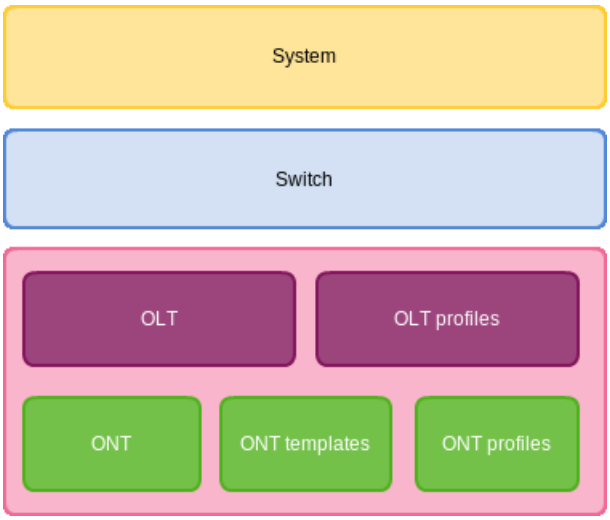

Fig. 11.1. Structure of Terminal Configuration

System is a general system part. This group includes such settings as those of the network, services configuration, user table, etc.

Switch represents switch configuration. This group includes configuration parameters for Ethernet interfaces of the front panel, as well as VLAN settings.

GPON contains 5 subparts. OLT—settings for GPON OLT and GPON interfaces. OLT profiles—OLT profile part. It contains profiles for address tables, VLAN, DHCP RA, and PPPoE IA. ONT—ONT configuration

base. ONT templates —ONT template part, ONT profiles—ONT profile part.

11.2 Configuration Lifecycle

The terminal configuration may have the following states:

— Running — an active configuration. It refers to the current configuration of the terminal.

— Candidate — a configuration under review.

— NVRAM — a configuration stored in non-volatile memory. The configuration will be used as RUNNING after the device is loaded.

The Running configuration is loaded to a new CLI session and becomes available for review (Candidate). After changing a Candidate configuration, user can either apply the configuration ("commit" command) to the CLI session or reject the changes ("rollback") and apply the current terminal configuration (Running). The "save" command saves the Running configuration into NVRAM of the terminal.

Fig. 11.2 shows a chart of the configuration lifecycle.

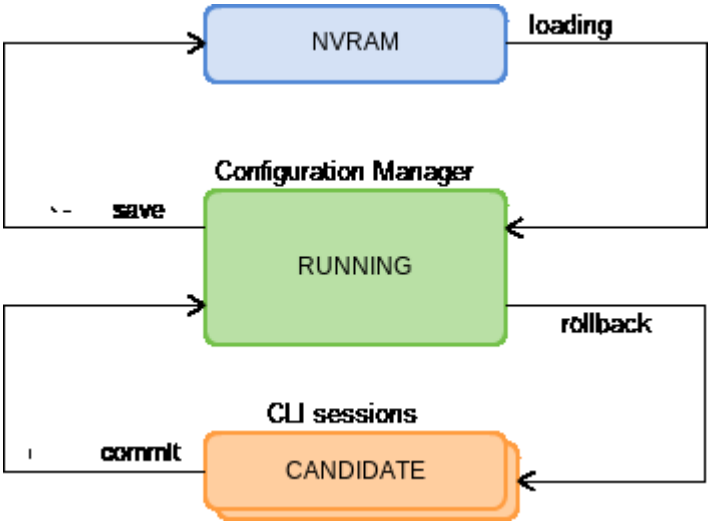

Fig. 11.2. Configuration Lifecycle Chart of the Terminal

11.3 Configuration Autosave

In some cases, for example, when several operators are working on the terminal or the terminal is automatically configured through OSS/BSS, it may be convenient to organise a centralised saving of the configuration into NVRAM at a specified time. The terminal allows this to be done with the help of a configuration autosave mechanism.

Step 1. Switch to the **configure** view and turn the autosave on with the help of the **config autosave enable** command.

```
LTP-8X# configure terminal
```

```
LTP-8X(config)# config autosave enable
```

Step 2. Use the "**config autosave-hour**" command to set the autosave time. Pass the hour of autosave as a parameter.

```
LTP-8X(config)# config autosave-hour 3
```

Step 3. Apply the amendments made.

```
LTP-8X(config)# do commit
```

Step 4. Check the entered data by using the **do show config** command.

```
LTP-8X(config)# do show config
    Config:
        Autosave:                                   enabled
        Autosave hour:                              3
LTP-8X(config)#
```

11.4 Creating Configuration Backup

Configuration backups allow the terminal operation to be quickly restored after abnormal situations or replacement. Manual or triggered (on events) creation of backups is recommended at a regular basis.

Terminal configuration is uploaded to a TFTP server available in control network. The copy command is used to upload the data. Pass the uploaded terminal configuration fs://config and destination URI as parameters.

```
LTP-8X# copy fs://config tftp://192.168.1.1/config
Upload backup file to TFTP-server..
```

To create backups automatically, triggered upload can be adjusted.

Step 1. Go to the **configure view** and select the URI for the configuration backup.

```
LTP-8X# configure terminal
LTP-8X(config)# backup uri tftp://192.168.1.1/config
```

Step 2. The terminal can be adjusted to upload configuration every time a configuration is saved if necessary.

```
LTP-8X(config)# backup on save
```

Step 3. The terminal can be adjusted to use timer for configuration upload if necessary. In this case, additionally set the timer period in seconds.

```
LTP-8X(config)# backup on timer
LTP-8X(config)# backup timer period 3600
```

Step 4. Apply the amendments made.

```
LTP-8X(config)# do commit
```

Step 5. Check the entered data by using the **do show backup** command.

```
LTP-8X(config)# do show backup
    Tftp:
        Backup on conf save:                          enabled
        Backup on timer:                              enabled
        Backup on timer period:                       3600
        Backup uri:                                   '192.168.1.1'
LTP-8X(config)#
```

11.5 Configuration Restore

Terminal configuration is restored from a TFTP server available in management network. The **copy** command is used to restore the data. Pass the restored configuration source **URI** and **fs://config** as parameters.

```
LTP-8X# copy tftp://10.0.105.1/config fs://config
 Download file from TFTP-server..
 Reading of the configuration file..
 Configuration have been successfully restored (all not saved changes was lost)
LTP-8X#
```

11.6 Configuration Reset

In order to reset a terminal configuration to factory settings, use the **default** command.

```
ltp-8x# default
  Do you really want to set up default configuration? (y/n) y
Configuration have been reseted to default. Terminal will be reloaded.
```

Resetting a configuration of a remote terminal also resets network settings. The terminal will not be available for operation until the network settings are reassigned.

Chapter 12.

User Management

Introduction

This Chapter is devoted to management of the terminal users.

The factory settings provide only for one user, i.e. the device administrator.

login: admin

password: password

When you start to configure the terminal, we recommend you to change the password of the "admin" user.

For security reasons, terminal users should be delegated with a strict rule set. For these purposes, each user gets his own access level. Level 0 corresponds to a minimum rule set, Level 15—to a maximum rule set.

CLI commands are ranked by the access level. Level 0 commands are available to all users. Level 15 commands are available only to Level 15 users. Thus, level of commands available to users will not exceed the user level. Table 12.1 contains the list of commands and the required access level.

Table 12.1. CLI commands and the required access level

Command	Level
clear ...	15
commit	15
configure	15
copy ...	15
date	15
default	15
delete firmware ont	15
mac ...	15

ploam-send ...	15
reboot	15
reconfigure ...	15
reset	15
restore	15
rf-port	15
rollback	15
save	15
schedule	15
switch	15
update ...	15
ping	0
show ...	0

12.1 User List Preview

In order to view the user list, use the **show users** command:

```
LTP-8X# show users
Existing list elements:
##           Name           Priority
1            root           15
2            admin          15
```

The "admin" and "root" users always exist and cannot be deleted or duplicated. The terminal supports up to 16 users.

12.2 Adding a New User

In order to operate effectively and safely, the terminal, as a rule, requires one or several additional users. For adding new users, use the **user** command in the **configure view**:

```
LTP-8X(config)# user  operator
LTP-8X(config)# do show users
##      Name          Priority
1       root          15
2       admin         15
3       operator      0
```

Pass the name of the new user to the user command as a parameter. The name should not be longer than 32 characters. The name should not contain special characters.

12.3 Changing User Password

For changing user's password, use the **user** command. Pass a user name and new password as a parameters.

```
LTP-8X(config)# user operator password newpassword
```

The password should not be longer than 31 characters. If the password contains a space, quotations should be used for the password.

12.4 Viewing and Changing User Access Rights

To manage user access rights, user priority system is implemented.

When a user is created, minimal rights are delegated to him:

```
LTP-8X(config)# user operator
LTP-8X(config)# do show users
##                                      Name          Priority
1                                       root          15
2                                       admin         15
3                                       operator      0
```

To change user password, use the **user** command. Pass the user name and the new password as parameters.

```
LTP-8X(config)# user operator priority 15
LTP-8X(config)# do show users
##                                      Name          Priority
1                                       root          15
2                                       admin         15
3                                       operator      15
```

12.5 Deleting a User

For deleting a user, use the **no user** command in the **configure view**. The command takes the user's name as a parameter:

```
LTP-8X# configure terminal
LTP-8X(config)# no user operator
```

Chapter 13.

Services Configuration

Introduction

This chapter describes configuration of integrated terminal services.

13.1 SNMPD Configuration

For working with the Eltex.EMS management system, the terminal should be configured to work with SNMP protocol.

Step 1. Switch to the **configure view.**

```
LTP-8X# configure terminal
```

Step 2. Enable SNMP agent of the terminal by using the **ip snmp enable** command.

```
LTP-8X(config)# ip snmp enable
```

Step 3. Enable ACL check by using the **ip snmp access-control** command if necessary. Add the record into a whitelist by using the **ip snmp allow ip <ip> [mask <mask>]** command. Pass the IP address of the host which will be used to connect to the SNMP agent as a parameter.

```
LTP-8X(config)# ip snmp access-control
LTP-8X(config)# ip snmp allow ip 192.168.16.0 mask 24
```

Step 4. If you want the management system to receive SNMP traps, adjust their replication. For example, add 2 replicators by using the **ip snmp traps <ip> [type <type>]** command. Specify that SNMP traps **v1** will be sent to **192.168.16.13** while **v2** will be sent to **192.168.16.130** and **inform** will be sent to **192.168.16.230.**

```
LTP-8X(config)# ip snmp traps 192.168.16.13 type v1
LTP-8X(config)# ip snmp traps 192.168.16.130 type v2
LTP-8X(config)# ip snmp traps 192.168.16.230 type informs
```

Step 5. If you has non-default snmp-communities, use the **ip snmp community {read|write} <name>** command.

```
LTP-8X(config)# ip snmp trap-community cm-traps
LTP-8X(config)# ip snmp community read cm-read
LTP-8X(config)# ip snmp community write cm-write
```

Step 6. Configure variable snmp parameters.

```
LTP-8X(config)# ip snmp location NSK-1-12
LTP-8X(config)# ip snmp contact operator
LTP-8X(config)# ip snmp ont-sn-format numerical
```

Step 7. The settings of SNMP agent change as soon as the configuration is applied. No terminal reboot is needed.

```
LTP-8X(config)# do commit
```

Step 8. Check the entered data by using the **show ip snmp** command.

```
LTP-8X(config)# do show ip snmp
    Snmp:
        Enabled:                          true
        Access control:                   true
        Allow ip [0]:
            Ip:                           192.168.16.0
            Mask:                         24
        Traps [0]:
            Type:                         informs
            Ipaddr:                       192.168.16.102
        Traps [1]:
            Type:                         v1
            Ipaddr:                       192.168.16.13
        Traps [2]:
            Type:                         v2
            Ipaddr:                       192.168.16.130
        Traps [3]:
            Type:                         informs
            Ipaddr:                       192.168.16.230
        Version:                          v2
        Communityro:                      'cm-read'
        Communityrw:                      'cm-write'
        Trap community:                   'cm-traps'
        Location:                         'NSK-1-12'
        Contact:                          'operator'
        Alias:                            <for showing use separate command>
        EngineID:                         0x4086E891E8582F2FE68B944C4B
```

Types and designation of SNMP traps are closely related to the active alarms log and described in details in Section 0, page 48.

13.2 NTPD Configuration

The terminal does not have integrated realtime clocks with a battery. For the events in system log to have correct time displayed and for automatised operations to be performed in time, time synchronisation should be adjusted with the help of the NTP protocol.

Step 1. Switch to the **configure view**.

```
LTP-8X# configure terminal
```

Step 2. Enable time synchronisation by using the **ip ntp enable** command. Specify the IP address to be used for synchronisation in the **ip ntp ip <ip>** command.

```
LTP-8X(config)# ip ntp enable
LTP-8X(config)# ip ntp ip 192.168.1.254
```

Step 3. Specify the synchronisation interval in seconds by using the **ip ntp interval** command.

```
LTP-8X(config)# ip ntp interval 3600
```

Step 4. Use the **ip ntp timezone** and ntp **daylightsaving** commands to set the time zone of your region and indicate whether it should be switched to daylight-saving time.

```
LTP-8X(config)# ip ntp timezone 7
LTP-8X(config)# ip ntp daylightsaving
```

Step 5. Apply the configuration by using the **do commit** command.

```
LTP-8X(config)# do commit
```

Step 6. Check the entered data by using the **do show ntp** command.

```
 LTP-8X(config)# do show ip ntp
     Ntp:
         Enabled:                                    true
         Ntpserver:                                  192.168.1.254
         Interval:                                   3600
         Timezone:                                   7
         Daylightsaving:                             true
```

13.3 ACSD and DHCPD Configuration

The terminal has an integrated autoconfiguring (provisioning) server (ACS)[1]. To provide the interaction between OLT and ONT, last of them should obtain ip-addresses for their management-interfaces. the integrated DHCP server solves this task. Both servers are linked and can not work separately.

13.3.1 ACSD configuration

Step 1. Switch to the **configure view**.

```
LTP-8X# configure terminal
```

Step 2. Turn on ACS server with **ip acs server enable** command.

```
LTP-8X# configure terminal
```

Step 3. Configure ip and vlan of the interface which the server will use

```
LTP-8X(config)# ip acs server ip 192.168.200.9
LTP-8X(config)# ip acs server mask 255.255.255.0
LTP-8X(config)# ip acs server vid 200
```

Step 4. If needed, you can use **https** protocol

```
LTP-8X(config)# ip acs server scheme https
```

Step 5. Configure login and password to be used for access ONT to ACS

```
LTP-8X(config)# ip acs server login acs
LTP-8X(config)# ip acs server password acsacs
```

13.3.2 DHCPD configuration

Step 1. Turn on DHCP server with **ip acs server enable** command.

```
LTP-8X(config)# ip dhcp server enable
```

Step 2. Configure the ip addresses range with **ip dhcp server range <start.ip> <end.ip>** command.

```
LTP-8X(config)# ip dhcp server range 192.168.200.10 192.168.200.150
```

Step 3. Configure the lease time with **ip dhcp server lease time** command.

```
LTP-8X(config)# ip dhcp server lease-time 3600
```

Step 4. Configure the option 43 to make ONTs use URL to connect to ACS server with **ip dhcp server option-43** command.

[1] Actual for rev.B and rev.C boards only

```
LTP-8X(config)# ip dhcp server option-43
```

Step 5. Apply the configuration by using the **do commit** command.

```
LTP-8X(config)# do commit
```

Step 6. Check the configured data by using the **do show ip acs server** command.

```
LTP-8X(config)# do show ip acs server
 ACS server:
        Enabled:                        false
        Ip:                             192.168.200.9
        Port:                           9595
        Mask:                           255.255.255.0
        Vid:                            200
        Scheme:                         'https'
        Login:                          'acs'
        Password:                       'acsacs'
        External fw ip:                 0.0.0.0
        External fw port:               9595
        Local fw port:                  9696
 ACS DHCP server:
        Enabled:                        true
        Max lease time:                 3600
        Insert option 43:               true
        First IP:                       192.168.200.10
        Last IP:                        192.168.200.150
 DHCP option 43 (will be generated automatically):
        URL:                            'https://192.168.200.9:9596'
        Login:                          'acs'
        Password:                       'acsacs'
```

13.4 LOGD Configuration

Introduction

System log collects terminal history data and allows to view it later. For adjustment of system log the terms "module", "filter level", and "output device" are used.

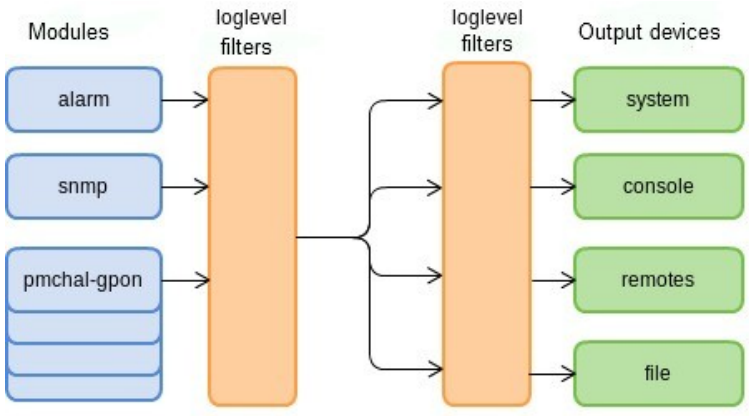

Fig. 13.1. Terminal system log

Messages of the system log are grouped into modules according to their functions. Configuration of the following modules is possible:

Table 13.1. System Log Modules

Module	Description
alarm	Alarms log messages
snmp	Messages from SNMP agent
pmchal-ipc	Messages from pmchal subsystem of interprocess communication
pmchal-gpon	GPON messages
pmchal-machine	Messages on operation of state machines for OLT, channels, and ONT
pmchal-olt	OLT general information
pmchal-gpon-port	Information about GPON interfaces
pmchal-ont	ONT information
pmchal-scheduler	Messages from scheduler subsystem
pmchal-rdn	Messages on GPON channels reservation
pmchal-dhcpra	Messages from DHCP Relay Agent
pmchal-pppoeia	Messages from PPPoE Intermediate Agent

A filtration level and additional display information can be specified for messages of each module.

The filtration level sets the minimum importance level of the messages to be displayed in the log. The used filtration levels are listed in Table 13.2.

Table 13.2. System Log Filtration Levels

Level	Description
emergency	Further operation of the system is not possible
alert	The system requires operation treatment
critical	Critical events
error	Operation errors
warning	Warnings
notice	Important events during normal operation
info	Information messages
debug	Debug messages

The emergency level is the maximum display level, the "debug" level is the minimum one.

The log subsystem allows display of the terminal log on different devices. All output devices can be used simultaneously.

Table 13.3. System Log Output Devices

Output Device	Name	Description
System log	System	The system log allows the log to be displayed locally or with the help of the syslog server.
Console	Console	Being used for log display, the console allows system messages to be visible as soon as they are received in the terminal connected to the Console port.
CLI sessions	Rsh	Being used for log display, CLI sessions allow system messages to be visible as soon as they are received in all CLI sessions connected via telnel or SSH.
File	File	Logging into a file allows system messages to be written directly to the file which can further be sent for analysis to support specialists.

13.4.1 Modules Configuration

Consider module configuration by the example of the pmchal-gpon module responsible for messages from GPON subsystem. Other modules have similar configuration process.

Step 1. Set a collecting level with the help of the **logging module pmchal-gpon level** command.

```
LTP-8X(config)# logging module pmchal-gpon loglevel debug
```

Step 2. Set a output devices' logging level with **logging system <device> debug** command.

```
LTP-8X(config)# logging system loglevel debug
LTP-8X(config)# logging rsh loglevel error
LTP-8X(config)# logging file loglevel errors
```

Every output device may have its own filter level or have the display disabled.

13.4.2 Configuring SYSLOG parameters

Step 1. Use the **loggin buffer** command to specify the memory size in bytes to be used for system log storage.

```
LTP-8X(config)# logging buffer 262144
```

Step 2. If needed, use the **logging romote** command to specify the IP address of the remote SYSLOG server to be used to display system log.

```
LTP-8X(config)# logging remote 192.168.1.43
```

Step 3. Apply the configuration by using the **do commit** command.

```
LTP-8X(config)# do commit
```

Step 4. Check the configured data by using the **do show logging** command.

```
LTP-8X(config)# do show logging
    Log:
        Remote syslog:                              192.168.16.33
        Size:                                       262144
        Destinations:
            System:                                 debug
            Console:                                debug
            Remote shells:                          error
            File:                                   error
```

13.5 ALARMD Configuration

Introduction

ALARMD is a terminal alarms manager. Alarms manager enables troubleshooting and provides information about important events related to terminal operation.

A record in active alarms log (an event) corresponds to an event which happened in the terminal. Types of events and their description are provided in Table 13.4.

Table 13.4. Types of Events in the Active Alarms Log

Event	Description	Threshold
load_average	Processor average load reached the threshold, estimated time is 1 minute	120 *
ram	The operating memory size decreased to the threshold	30 % *
login	User tried to log in or has already logged into his account	-
config_save	User has saved configuration	-
firmware_update	LTP-8X firmware update completed successfully / with errors	-
duplicate_mac	Two devices having the same MAC address detected	-
physical_layer_flapping	Flapping on Ethernet ports	-
free_space	Free space reduced to the threshold	30 % *
temperature	One of two OLT chips has a temperature exceeded the threshold	60
fan	Cooler fan rotation speed exceeds the safety operation threshold	4800 < X < 9000 *
pon_channel_no_ont	The first ONT connected / the last ONT disconnected on channel	-
ont_physical_layer	ONT connected/disconnected	-
olt_update	OLT chip firmware update completed successfully / with errors	-
ont_update	ONT chip firmware update completed successfully / with errors	-
channel flapping	Flapping of GPON interface	-
ont_flapping	ONT flapping	-
download	File download completed successfully / with errors	-
battery_power	Switch ONT to battery power	-
battery_low	ONT low battery	Is set in ONT
lan_los	ONT Ethernet port lost connection	-
ont_config	Connected ONT configuration valid / invalid	-
file_delete	File deleted successfully / with errors	-
physical layer errors	Physical layer errors on Ethernet ports	-
physical_layer_block	Ethernet port is blocked	-

Event	Description	Threshold
link	Ethernet port state changed (up/down)	-
logout	User logged out	-
ont_dying_gasp	Dying Gasp signal received from ONT	-
redundancy channel switch	Switch to redundant channel	-
redundancy master channel fail	Emergency switch to redundant channel	-
ont_rei	Remote Error Indication (REI)	-
ont_power_off	ONT power off	-
config_change	OLT configuration changed	-
shutdown	SNMP agent shut down	-
oms	OMS-MIB operation completed successfully / with errors	-
ont_state_changed	ONT state changed	-
ont_config_changed	ONT configuration changed	-
channel_state_changed	OLT channel configuration changed	-
pon_alarm_channel	An event related to OLT channel	-
pon_alarm_onui	An event related to ONT	-
ont_update_inprogress	ONT firmware is updating	-
olt_device_reset	OLT chip reset	-
ont_signal_degrade	Signal attenuation in line is too high for ONT	-28 dBm
ont_high_received_optical_power	Signal attenuation in line is too low for ONT	-8 dBm
olt_device_not_working	GPON OLT configuration was loaded successfully / with errors	-

* The value can be adjusted.

Every record in the active alarms log has the parameters specified in Table 13.5 which are specified for every event type.

Table 13.5. Parameters of Events in Active Alarms Log

severity	Describes the event severity. Has four states (info, minor, major, critical)
send-on-in	Specifies whether an SNMP trap should be sent when an event is added to the log. Has two states (true/false)
send-on-out	Specifies whether an SNMP trap should be sent when an event is deleted from the log. Has two states (true/false)
ttl	The time in seconds an event exists in the active alarms log (from 1 to 2,147,483,647). Is specified in seconds. The parameter has several special values. 0—the event exists in the log until a normalising event received. -1—SNMP trap is sent (if specified), but the event is not recorded to the alarms log.

13.5.1 Active Alarms Log Configuration

Step 1. To configure the active alarms log, switch to the **configure view**.

```
LTP-8X# configure
```

Step 2. Use the **alarm** command to specify the necessary event parameters. The event types are listed in Table 13.4, the parameters and possible values are given in Table 13.5.

```
LTP-8X(config)# alarm temperature severity critical
LTP-8X(config)# alarm temperature send-on-in true
LTP-8X(config)# alarm temperature send-on-out true
LTP-8X(config)# alarm temperature ttl 0
```

Step 3. Apply the changes by using the **do commit** command.

```
LTP-8X(config)# do commit
```

Chapter 14.

VLAN Configuration

Introduction

This Chapter describes VLAN configuration in the terminal switch.

VLAN (Virtual Local Area Network) is a group of devices which communicate on channel level and are combined into a virtual network that is connected to one ore more network devices (GPON terminals or switches). VLAN is a very important tool for creating a flexible and configurable logical network topology over the physical topology of a GPON network.

VLAN has two or more switch interfaces. A VLAN interface may be either tagged or untagged. An outgoing packet of a tagged interface has a VLAN tag. An outgoing packet of an untagged interface has no VLAN tags. For more details on interfaces configuration and rules refer to Chapter 15, page 54.

14.1 Adding a VLAN

Step 1. VLAN is configured in terminal's switch. Execute the **switch** and **configure** commands subsequently to switch to the config view.

```
LTP-8X> switch
LTP-8X(switch)# configure
LTP-8X(switch)(config)#
```

Step 2. Add a VLAN by using the **vlan** command. Pass VID as a parameter.

```
LTP-8X(switch)(config)# vlan 5
LTP-8X(switch)(config-vlan)#
```

CLI automatically switches view to work with the VLAN. The same command is used to configure existing VLANs.

14.2 VLAN Configuration

Step 1. Add tagged interfaces with the help of the "tagged" command. Pass interface type and number (or a range) as parameters. The interface types and numbers are given in Table 15.1, page 55.

```
LTP-8X(switch)(config-vlan)# tagged pon-port 0 - 1
```

Step 2. Add untagged interfaces by using the **untagged** command if needed. Pass interface type and number (or a range) as parameters.

```
LTP-8X(switch)(config-vlan)# untagged front-port 1
```

Step 3. Delete all unnecessary interfaces from VLAN with the help of the **forbidden** command. Pass interface type and number (or a range) as parameters.

```
LTP-8X(switch)(config-vlan)# forbidden 10G-front-port 0 - 1
LTP-8X(switch)(config-vlan)# forbidden front-port 0, front-port 2, front-port 3
```

Step 4. Enable IGMP snooping by using the **ip igmp snooping enable** command if necessary.

```
LTP-8X(switch)(config-vlan)# ip igmp snooping enable
```

Step 5. Enable IGMP querier by using the **ip igmp snooping querier enable** command if necessary. Specify the IP address of IGMP querier with the help of the **ip igmp snooping querier address** command.

```
LTP-8X(switch)(config-vlan)# ip igmp snooping querier enable
LTP-8X(switch)(config-vlan)# ip igmp snooping querier address 10.0.0.1
```

Step 6. For further convenience, specify VLAN name by using the **name** command. To clear the name, use the **no name** command. The default name is VID.

```
LTP-8X(switch)(config-vlan)# name iptv
```

Step 7. Apply the configuration by using the **commit** command.

```
LTP-8X(switch)(config-vlan)# exit
LTP-8X(switch)(config)# commit
```

14.3 IGMP Proxy Configuration

Step 1. Enable proxy IGMP report between VLAN with the help of the **ip igmp proxy report enable** command.

```
LTP-8X(switch)(config)# ip igmp proxy report enable
```

Step 2. Set proxy rules by using the **ip igmp proxy report enable** command. As parameters, pass a range of acceptable groups and the proxy direction as a VID pair.

```
LTP-8X(switch)(config)# ip igmp proxy report range 224.0.0.0 239.255.255.255
from 200 to 98
```

Step 3. Specify the IGMP version using **ip igmp version** command.

```
LTP-8X(switch)(config)# ip igmp snooping
```

Step 4. Configure timings and robustness of IGMP .

```
LTP-8X(switch)(config-vlan)# ip igmp query-interval 60
LTP-8X(switch)(config-vlan)# ip igmp query-response-interval 10
LTP-8X(switch)(config-vlan)# ip igmp last-member-query-interval 2
LTP-8X(switch)(config-vlan)# ip igmp robustness 3
```

Step 5. Enable IGMP snooping by using the **ip igmp snooping** command.

```
LTP-8X(switch)(config)# ip igmp snooping
```

IGMP snooping should be enabled both in VLAN source and VLAN receiver.

Step 6. Apply the configuration by using the **commit** command.

```
LTP-8X(switch)(config)# commit
```

14.4 Deleting a VLAN

Step 1. Delete a VLAN by using the **no vlan** command. Pass VID (or its range) as a parameter.

```
LTP-8X(switch)(config)# no vlan 5
```

14.5 Terminal VLANs

There are cases you wish to use a one VLAN for multiple ONT profiles. The way to make changes faster is bind a some name to the VLAN

Step 1. Switch to the **configure view.**

```
LTP-8X# configure terminal
```

Step 2. Use **gpon network terminal-vlan** command to **.**

```
LTP-8X(config)# gpon network terminal-vlan HSI vid 2000 cos 5
```

Step 3. Check the configured data by using the **do show gpon network** command.

```
LTP-8X(config)# do show gpon network
    Network:
        Mac age time:                                   600
        S-VLAN ethertype:                               0x88A8
        C-VLAN ethertype:                               0x8100
        Terminal VLAN "HSI":
            VLAN ID:                                    2000
            CoS:                                        5
```

Chapter 15.

Interfaces Configuration

Introduction

This Chapter describes interfaces configuration of the terminal.

Terminal interfaces can be divided into two groups: Ethernet interfaces and GPON interfaces. Ethernet interfaces are used for terminal connection to operator's network core. GPON interfaces are used for ONT connections.

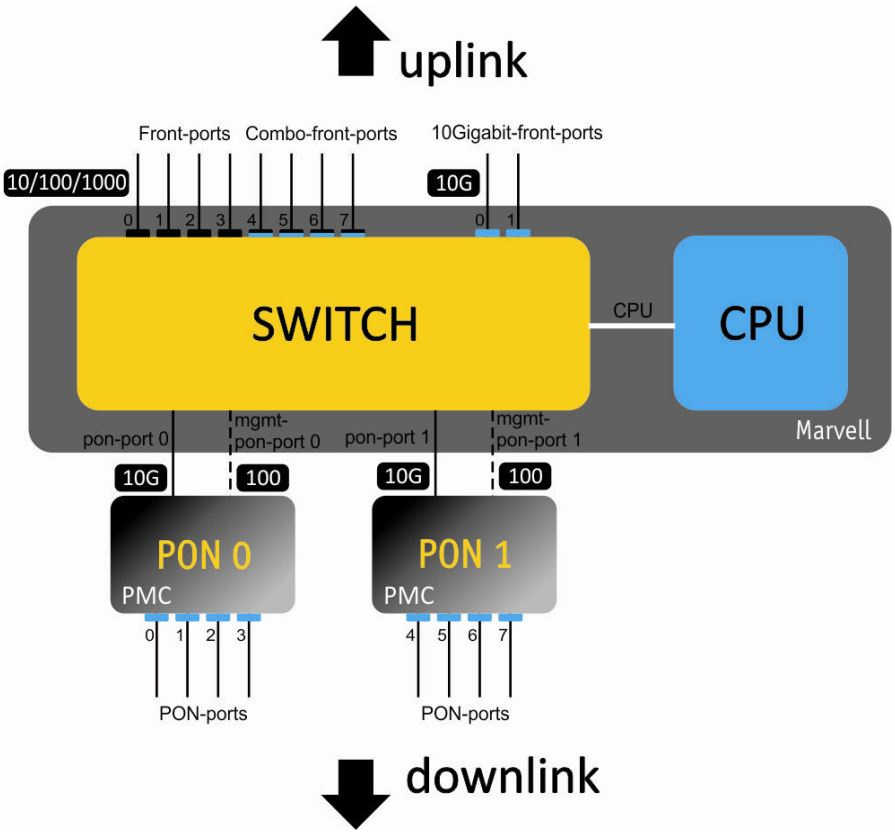

Fig. 15.1. A Set of Interfaces for a Terminal with PCB Rev. 1

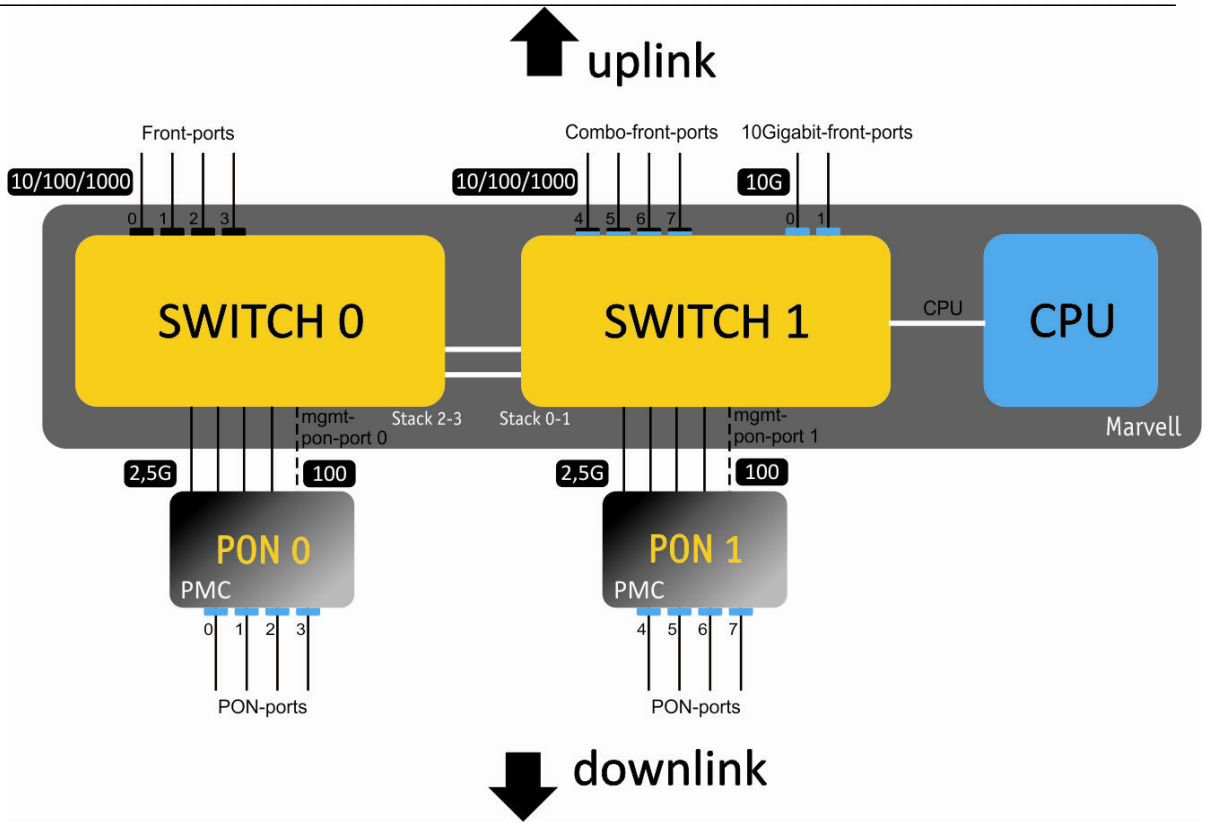

Fig. 15.2. A Set of Interfaces for a Terminal with PCB Rev. 2

Table 15.1 shows interface types of terminal's switch.

Table 15.1. Interfaces Types and Numbers

Interface	Quantity	Range	Note
10G-front-port	2	[0..1]	
front-port	8	[0..7]	
pon-port	2	[0..1]	for PCB rev. 1
pon-port	8	[0..7]	for PCB rev. 2

15.1 Ethernet Interfaces Configuration

Step 1. Switch to the view of the interface (of interface group) which settings should be changed.

```
LTP-8X> switch
LTP-8X(switch)# configure
LTP-8X(switch)(config)# interface front-port 0
LTP-8X(switch)(config-if)#
```

Step 2. Enable the interface by using the **no shutdown** command. The **shutdown** command disables the interface.

```
LTP-8X(switch)(config-if)# no shutdown
```

Step 3. Enable or disable flow control (IEEE 802.3x PAUSE) by using the **flow-control** command.

```
LTP-8X(switch)(config-if)# flow-control on
```

Step 4. Enable or disable ingress filtering by using the **ingress- filtering** command. Only the packets of the VLANs having this interface will pass the enabled filter. Other packets will be filtered out. If the filtering is disabled, a packet will be processed regardless of its VID field.

```
LTP-8X(switch)(config-if)# ingress-filtering
```

Step 5. Specify a rule for VLAN tags processing for incoming packets by using the **frame-types** command. As a parameter, specify the packets to be allowed: either **tagged** (tagged only) or **all** (both tagged and untagged).

```
LTP-8X(switch)(config-if)# frame-types tagged
```

Step 6. Specify port **pvid**, i. e. the VLAN which will accommodate untagged packets. Specify the **pup** value which is the priority of untagged packets.

```
LTP-8X(switch)(config-if)# pvid 100
LTP-8X(switch)(config-if)# pup 0
```

Step 7. If necessary, enable or disable the capability to send packets from this interface to another one (or a range of interfaces) by using the **bridging to** command. Pass interface type and number (or a range) as parameters. The interface types and numbers are given in Table 15.1.

All front-port interfaces are isolated by default, however data can be sent to any pon-port interface. The same is applicable to pon-port interfaces which are isolated from each other, but can send data to any front-port interfaces.

```
LTP-8X(switch)(config-if)# bridging to front-port 1
```

Step 8. If needed, use the **spanning-tree** command group to adjust STP protocol.

```
LTP-8X(switch)(config-if)# spanning-tree enable
LTP-8X(switch)(config-if)# spanning-tree priority 32
LTP-8X(switch)(config-if)# spanning-tree pathcost 0
LTP-8X(switch)(config-if)# spanning-tree admin-p2p auto
LTP-8X(switch)(config-if)# spanning-tree admin-edge
```

Step 9. If required, set band limits for Broadcast, Multicast, and Unicast traffic by using the **rate-limit bc**, **rate-limit mc**, and **shaper** commands correspondingly. As parameters, pass maximum band width in kbps and maximum length of uninterrupted transmission of packet batches in bytes.

```
LTP-8X(switch)(config-if)# rate-limit bc 1000 2048
LTP-8X(switch)(config-if)# rate-limit mc 1000 2048
LTP-8X(switch)(config-if)# shaper 100000 4000
```

Step 10. Set automatic determination of speed and duplex of the interface either by using the **speed auto** command or manually.

```
LTP-8X(switch)(config-if)# speed auto
```

15.2 GPON Interfaces Configuration

Step 1. Switch to the **configure view.**

```
LTP-8X# configure terminal
```

Step 2. Activate traffic encryption with the gpon olt encryption command, if necessary. Specify encryption key renewal period with the gpon olt encryption key-update command. Pass the time period in seconds as a parameter.

```
LTP-8X(config)# gpon olt encryption
LTP-8X(config)# gpon olt encryption key-update 60
```

Step 3. Specify ONT authentification method with the **gpon olt authentication** command.

```
LTP-8X(config)# gpon olt authentication both
```

Step 4. Switch to GPON interface configuration.

```
LTP-8X(config)# interface gpon-port 0-7
```

Step 5. Enable or disable interfaces with the no shutdown or shutdown command respectively, if necessary.

```
LTP-8X(config)(if-gpon-0-7)# no shutdown
```

Step 6. Activate FEC for the interface with the **fec** command, if necessary.

```
LTP-8X(config)(if-gpon-0-7)# fec
```

Step 7. Adjust time settings of optical transceiver if needed.

```
LTP-8X(config)(if-gpon-0-7)# optics use-custom
LTP-8X(config)(if-gpon-0-7)# optics ...
```

Optical transceiver should be adjusted only by agreement with Eltex Service Center.

Step 8. Apply the configuration by using the **commit** command.

```
LTP-8X(config)(if-gpon-0-7)# exit
LTP-8X(config)(if-gpon-0-7)# do commit
```

Chapter 16.

LAG Configuration

Introduction

This Chapter describes configuration of uplink interfaces aggregation.

Link aggregation (IEEE 802.3ad) is a technology that allows multiple physical links to be combined into one logical link (aggregation group). Aggregation group has high throughput and is very reliable.

Fig. 16.1. Multiple Physical Links Combined to an Aggregation Group

The terminal supports two interface aggregation modes: static and dynamic. Static aggregation implies that all communication links of a group are always active. As for dynamic aggregation, link activity is dynamically determined during operation via LACP protocol.

Table 16.1. Operation Modes of Aggregation Groups

Mode	Description
static	Link aggregation protocol is not used
lacp	LACP is used

The terminal has several algorithms to balance load within aggregation groups.

Table 16.2. Load Balance Modes

Mode	Description
ip	Based on IP address of sender and receiver
ip-l4	Based on IP address of sender and receiver, and L4
mac	Based on MAC address of sender and receiver

mac-ip	Based on MAC and IP addresses of sender and receiver
mac-ip-l4	Based on MAC address, IP address and L4 of sender and receiver

The terminal supports two LACP modes. Passive mode—the terminal does not initiate creation of a logical link, but processes incoming LACP packets. Active mode—the terminal creates an aggregated communication link and initiates parameters conformance. The parameters are coordinated in case equipment operates in active or passive LACP modes.

16.1 LAG Configuration

LAG configuration represents static aggregation configuration and LACP configuration. To configure LAG, perform the steps marked blue in Fig. 16.2. LACP configuration requires all steps to be performed.

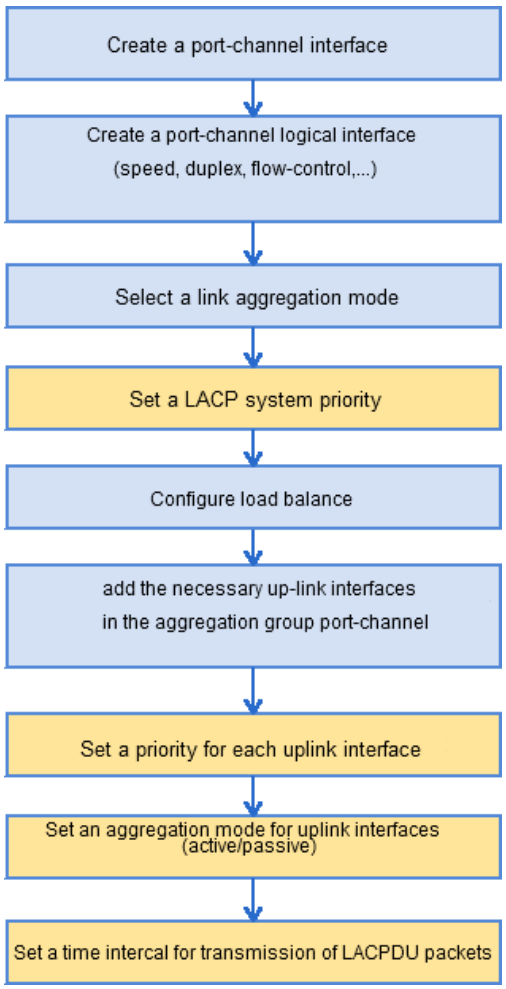

Fig. 16.2. LAG and LACP Configuration Procedure

Step 1. LAG is configured in terminal's switch. Execute the **switch** and **configure** commands subsequently to switch to the **config** view.

```
LTP-8X> switch
LTP-8X(switch)# configure
LTP-8X(switch)(config)#
```

Step 2. Create a **port-channel** logical interface by using the **interface port-channel** command.

As a parameter, pass the number of the interface being created. You can create up to ten logical interfaces.

```
LTP-8X(switch)(config)# interface port-channel 3
LTP-8X(switch)(config-if)#
```

Step 3. Set general interface parameters: speed, duplex, flow-control, etc. Interfaces configuration is described in details in Chapter 15, page 54.

Step 4. Set an aggregation mode by using the **mode** command. Pass the operation mode as a parameter. Operation modes are specified in Table 16.1.

```
LTP-8X(switch)(config-if)# mode lacp
```

Step 5. This step should only be performed for LACP configuration. Set a LACP system priority by using the **lacp system-priority** command. The **no lacp system-priority** command returns 32768 by default.

```
LTP-8X(switch)(config-if)# exit
LTP-8X(switch)(config)# lacp system-priority 32541
```

The **lacp system-priority** command can be executed in the configure view of the terminal's switch.

Step 6. Specify load balance rules with the help of the "port-channel load-balance" command if needed. Pass the balance mode as a parameter. Balance modes are specified in Table 16.2.

```
LTP-8X(switch)(config)# port-channel load-balance ip
```

The **port-channel load-balance** command can be executed in the configure view of the terminal's switch.

Step 7. Being used for load balance, L4 parameters require a long hash. Enable the long hash with the help of the **port-channel l4-long-hash enable** command.

```
LTP-8X(switch)(config)# port-channel 14-long-hash enable
```

The **port-channel l4-long-hash** command can be executed in the configure view of the terminal's switch.

Step 8. Add physical interfaces into the logical one by using the **channel-group** command. As a

parameter, pass the number of the logical interface.

```
LTP-8X(switch)(config)# interface front-port 0 - 4
LTP-8X(switch)(config-if-range)# channel-group port-channel 3
```

The **channel-group** command can be executed in the configure view of an interface (a range) of the switch.

Step 9. This step should only be performed for LACP configuration. Set a priority for the physical interface with the help of the **lacp port-priority** command if necessary. The **no lacp port-priority** command resets port priority to the default value of 32768; 1 is the highest priority.

```
LTP-8X(switch)(config-if-range)# no lacp port-priority
LTP-8X(switch)(config-if-range)# exit
LTP-8X(switch)(config)# interface front-port 0
LTP-8X(switch)(config-if)# lacp port-priority 256
```

The **lacp port-priority** command can be executed in the configure view of the terminal's switch.

Step 10. This step should only be performed for LACP configuration. Use the **lacp mode** command to set an active or passive LACP mode.

```
LTP-8X(switch)(config-if)# exit
LTP-8X(switch)(config)# interface port-channel 3
LTP-8X(switch)(config-if)# lacp mode active
```

Step 10. This step should only be performed for LACP configuration. In case of the active LACP mode, set an interval for transmission of LACP control packets with the help of the **lacp rate** command. Pass slow (30 seconds) or fast (1 second) as a parameter.

```
LTP-8X(switch)(config-if)# lacp rate slow
```

Step 11. Apply the configuration by using the **commit** command.

```
LTP-8X(switch)(config-if)# exit
LTP-8X(switch)(config)# commit
```

Chapter 17.

DHCP Relay Agent Configuration

Introduction

This Chapter describes configuration of DHCP Relay Agent in the terminal.

DHCP Relay Agent is used to provide a DHCP server with additional information about a received DHCP request. This may include information about the terminal running DHCP Relay Agent as well as information about THE ONT which sent the DHCP request. DHCP packets are modified by interception and further processing in terminal CPU.

The DHCP server analyses DHCP option 82 and identifies the ONT. DHCP Relay Agent allows the option to be both transparently transmitted from ONT as well as formed and rewritten according to a specified format. DHCP option 82 is especially useful for a network which has no private VLANs dedicated for each user.

DHCP Relay Agent supports configurable formats for both Circuit ID and Remote ID. The suboptions format is configured with the help of the tokens listed in Table 17.1. The placeholders will be replaced with corresponding values, while the rest of the words will be passed as is.

Table 17.1. DHCP Option 82 Tokens

%HOSTNAME%	The terminal network name
%MNGIP%	The terminal IP address
%GPON-PORT%	ID of the OLT channel the DHCP request arrived from
%ONTID%	ID of the ONT which sent the DHCP request
%PONSERIAL%	Serial number of the ONT which sent the DHCP request
%GEMID%	ID of the GEM port where the DHCP request arrived
%VLAN0%	External VID
%VLAN1%	Internal VID
%MAC%	MAC address of the ONT which sent the request
%OPT60%	DHCP option 60 received from the ONT
%OPT82 CID%	Circuit ID received from the ONT
%OPT82 RID%	Remote ID received from the ONT
%DESCR%	ONT description

In addition to DHCP option 82, DHCP Relay Agent has some more functions related to network security. It provides protection from DoS attacks by setting a threshold for intensity of DHCP messages which are received from ONT. Exceeding the threshold blocks DHCP requests. The blocking time can be configured. It also protects from illegal DHCP servers by controlling the source IP address of DHCP responses. Transmitted are only the DHCP responses which arrived from IP addresses of trusted DHCP servers.

17.1 DHCP Relay Agent Profiles Management

A set of profiles is used for DHCP Relay Agent configuration. All VLANs use profile 0 by default.

The configuration is flexible as it allows DHCP profiles to be assigned not only to a terminal on the whole, but separately to each VLAN as well. To assign a profile, the following steps should be taken.

Step 1. Assign the default profile for all VLANs with the help of the **gpon olt profile dhcpra add dhcp-ra-00** command.

```
LTP-8X# configure terminal
LTP-8X(config)# gpon olt profile dhcpra dhcp-ra-00
```

Step 2. Create a new DHCP Relay Agent profile with the help of the **profile dhcp-ra** command, if necessary. Pass profile name as a parameter.

```
LTP-8X(config)# profile dhcp-ra dhcp-ra-01
LTP-8X(config-dhcp-ra)("dhcp-ra-01")# exit
```

Step 3. Assign the newly created profile to the selected VLAN with the **gpon olt profile dhcpra dhcp-ra-01** command**.** As a parameter, pass the VID which requires individual configuration.

```
LTP-8X(config)# gpon olt profile dhcpra dhcp-ra-01 1000
```

Step 4. Check the changes by using the **show gpon olt configuration** command.

```
LTP-8X(config)# do show gpon olt configuration
        Block duplicated mac:                          enabled
        Ont block time:                                5
        Dhcpra shaper:                                 100
        Profile pppoe-ia:                              pppoe-ia-00
        OLT Profile PPPoE Intermediate Agent           0
        Profile dhcp-ra:                               dhcp-ra-00
        OLT Profile DHCP Relay Agent 0
        Profile dhcp-ra per VLAN 1000 [0]:
            Profile:                                   dhcp-ra-01
            OLT Profile DHCP Relay Agent               1
```

Step 5. Apply the changes by using the **do commit** command.

```
LTP-8X(config)# do commit
```

To apply the changes, OLT should be reconfigured.

17.2 DHCP Relay Agent Profiles Configuration

Step 1. Switch to the corresponding DHCP Relay Agent profile.

```
LTP-8X(config)# profile dhcp-ra dhcp-ra-01
```

Step 2. Enable DHCP traffic processing with the enable command.

```
LTP-8X(config-dhcp-ra)("dhcp-ra-01")# enable
```

Step 3. Enable insert/overwrite of DHCP option 82 with the help of the **overwrite-option82** command if needed.

```
LTP-8X(config-dhcp-ra)("dhcp-ra-01")# overwrite-option82
```

Step 4. Specify the DHCP option 82 format with the help of the **overwrite-option82 circuit-id** and **overwrite-option82 remote-id** commands if needed. A list of possible tokens is given in Table 17.1, page 66.

```
LTP-8X(config-dhcp-ra)("dhcp-ra-01")# overwrite-option82 circuit-id "%HOSTNAME%-%MAC%-
%OPT82_CID%"
LTP-8X(config-dhcp-ra)("dhcp-ra-01")# overwrite-option82 remote-id "%OPT82_RID%"
```

Step 5. Enable DoS attack protection with the help of the **dos-block** command if needed. Specify the threshold for DHCP queries intensity in seconds which will block the queries when exceeded. Use the **dos-block packet-limit** command for it. Use the **dos-block block-time** command to specify the blocking time in seconds.

```
LTP-8X(config-dhcp-ra)("dhcp-ra-01")# dos-block
LTP-8X(config-dhcp-ra)("dhcp-ra-01")# dos-block  packet-limit  200
LTP-8X(config-dhcp-ra)("dhcp-ra-01")# dos-block block-time 300
```

Step 6. Set a list of trusted DHCP servers with the help of the **trusted- primary** and **trusted-secondary** commands. Specify a response timeout for DHCP servers by using the **trusted-timeout** command. Activate filters with the help of the **trusted** command.

```
LTP-8X(config-dhcp-ra)("dhcp-ra-01")# trusted primary 10.0.0.1
LTP-8X(config-dhcp-ra)("dhcp-ra-01")# trusted secondary 10.0.0.2
LTP-8X(config-dhcp-ra)("dhcp-ra-01")# trusted timeout 100
LTP-8X(config-dhcp-ra)("dhcp-ra-01")# trusted
```

Step 7. Apply the changes by using the **commit** command.

```
LTP-8X(config-dhcp-ra)("dhcp-ra-01")# commit
```

To apply the changes, OLT should be reconfigured.

Chapter 18.

PPPoE Intermediate Agent Configuration

Introduction

This Chapter describes configuration of PPPoE Intermediate Agent of the terminal.

PPPoE Intermediate Agent is used to provide BRAS with additional information about a received PADI request. This may include information about the terminal running PPPoE Intermediate Agent as well as information about THE ONT which sent the PADI request. PADI packets are modified by interception and further processing in terminal CPU.

BRAS analyses vendor specific tag and identifies the ONT. PPPoE Intermediate Agent forms or rewrites a vendor specific tag using a specified format. Vendor specific tags are especially useful for a network which has no private VLANs dedicated for each user.

PPPoE Intermediate Agent supports configurable formats for Circuit ID and Remote ID. The suboptions format is configured with the help of the tokens listed in Table 18.1. The placeholders will be replaced with corresponding values, while the rest of the words will be passed as is.

Table 18.1. Vendor Specific Tag Tokens

%HOSTNAME%	The terminal network name
%MNGIP%	The terminal IP address
%GPON-PORT%	ID of the OLT channel the PADI request arrived from
%ONTID%	ID of the ONT which sent the PADI request
%PONSERIAL%	Serial number of the ONT which sent the PADI request
%GEMID%	ID of the GEM port where the PADI request arrived
%VLAN0%	External VID
%VLAN1%	Internal VID
%MAC%	MAC address of the ONT which sent the request

In addition to vendor specific tag support, PPPoE Intermediate Agent has some more functions related to network security. It provides protection from DoS attacks by setting a threshold for intensity of PADI messages which are received from ONT. Exceeding the threshold blocks PADI requests. The blocking time can be configured.

PPPoE Intermediate Agent also limits the number of simultaneous PPPoE sessions. The restriction can be set for both the total number of terminal sessions and for every ONT separately.

18.1 PPPoE Intermediate Agent Profiles Configuration

To configure a PPPoE Intermediate Agent profile, the following steps should be taken.

Step 1. Switch to the corresponding PPPoE Intermediate Agent profile.

```
LTP-8X# configure terminal
LTP-8X(config)# profile pppoe-ia pppoe-ia-00
LTP-8X(config-pppoe-ia)("pppoe-ia-00")#
```

Step 2. Enable PPPoE traffic processing with the **enabled** command.

```
LTP-8X(config-pppoe-ia)("pppoe-ia-00")# enable
```

Step 3. Specify the vendor specific tag format with the help of the **format circuit-id** and **format remote-id** commands. A list of possible tokens is given in Table 18.1, page 70.

```
LTP-8X(config-pppoe-ia)("pppoe-ia-00")# format circuit-id "%HOSTNAME%"
LTP-8X(config-pppoe-ia)("pppoe-ia-00")# format remote-id "%PONSERIAL%-%GEMID%"
```

Step 4. Enable DoS attack protection with the help of the **dos-block** command if needed. Specify the threshold for PADI queries intensity in seconds which will block the queries when exceeded. Use the **dos-block packet limit** command for it. Use the **dos-block block-time** command to specify the blocking time in seconds.

```
LTP-8X(config-pppoe-ia)("pppoe-ia-00")# dos-block
LTP-8X(config-pppoe-ia)("pppoe-ia-00")# dos-block packet-limit 200
LTP-8X(config-pppoe-ia)("pppoe-ia-00")# dos-block block-time 300
```

Step 5. Set the limits of PPPoE sessions by using the **sessions limit** command.

```
LTP-8X(config-pppoe-ia)("pppoe-ia-00")# sessions-limit 128 per-user 2
```

Step 6. Apply the changes by using the **do commit** command.

```
LTP-8X(config-pppoe-ia)("pppoe-ia-00")# do commit
```

To apply the changes, OLT should be reconfigured.

Part IV ONT Configuration

Chapter 19.

Service Models

This Chapter considers main terms and classification of service models.

Introduction

In general, a service model is based on a method which describes how the services are provided: "VLAN for Subscriber" or "VLAN for Service". The "VLAN for Service" architecture means that a service VLAN (S-VLAN) is used to provide all users with a certain service. The "VLAN for Subscriber" architecture, in its turn, implies that a client VLAN (C-VLAN) is used to provide a user with multiple services. These methods are often combined in practice and form a hybrid model which uses S-VLAN and C-VLAN simultaneously.

"VLAN for Subscriber" Architecture

A separate VLAN is used for each subscriber in the C-VLAN model. A dedicated C-VLAN is used to provide services to each user between OLT and service routers. Service GEM ports are created for every OLT service between ONT and OLT. When a service request is generated upstream, records are added to the MAC table in OLT according to C-VLAN. In case of downstream traffic, a corresponding GEM port is determined for a definite service according to the MAC table in OLT.

If destination address of downstream transmission is not known (broadcast or unknown unicast), i. e. the GEM port can not be determined, two options are available:

— transmission through a dedicated broadcast GEM port;

— transmission to all GEM ports which correspond to the services provided to the subscriber.

The destination address, in case it is unknown (broadcast or unknown unicast), will be determined based on the method implemented in a definite service model.

The architecture of this service model is shown in Fig. 19.1.

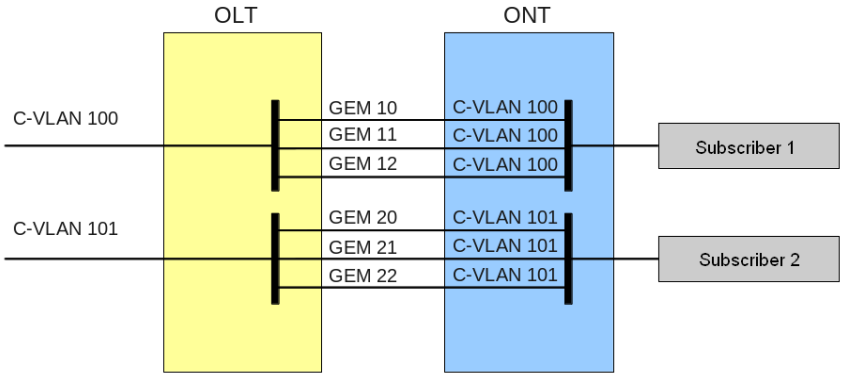

Fig. 19.1. "VLAN for Subscriber" Service Model Architecture

"VLAN for Service" Architecture

S-VLAN model has a separate VLAN for every service. Consider its operation on an example of an abstract S-VLAN 100 service.

S-VLAN 100 is used between OLT and service routers that is global for all subscribers in terms of this service. When a service request is generated upstream, records are added to the MAC table in OLT according to S-VLAN and subscriber's MAC address. In case of downstream traffic, a corresponding subscriber of the service is determined based on the MAC table.

If destination address of downstream transmission is not known (broadcast or unknown unicast), i. e. the GEM port can not be determined, two options are possible:

— transmission through a dedicated broadcast GEM port (traffic is transmitted to all subscribers);

— transmission to every subscriber through a GEM port corresponding to the service.

The destination address, in case it is unknown (broadcast or unknown unicast), will be determined based on the method implemented in a definite service model.

The architecture of this service model is shown in Fig. 19.2.

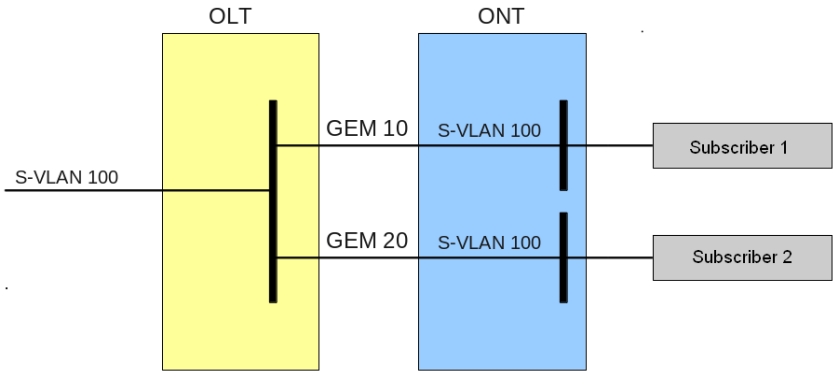

Fig. 19.2. "VLAN for Service" Service Model Architecture

19.1 Operating Principle

The "configuration model" concept is used for implementation of different service models of the terminal. A configuration model defines general principles for data communication channelling for both OLT and ONT.

— Model 1 is an implementation of the "VLAN for Subscriber" service model. The model does not have dedicated broadcast GEM ports, and uses U-VLAN on the ONT side.

— Model 2 is an implementation of the "VLAN for Subscriber" service model. The model differs from model 1 by using a dedicated broadcast GEM port and C-VLAN on the subscriber's side.

— As opposed to the first two models, model 3 is an implementation of the "VLAN for Service" service model. The model uses a dedicated broadcast GEM port.

Table 19.1. Service Models

	VLAN for Service	VLAN for Subscriber	Broadcast to Unicast GEM	Dedicated Broadcast GEM
Model 1		+	+	
Model 2	+			+
Model 3	+			+

19.2 Model 1

Consider a model 1 implementation example. The chart of this service model is shown in Fig. 19.3.

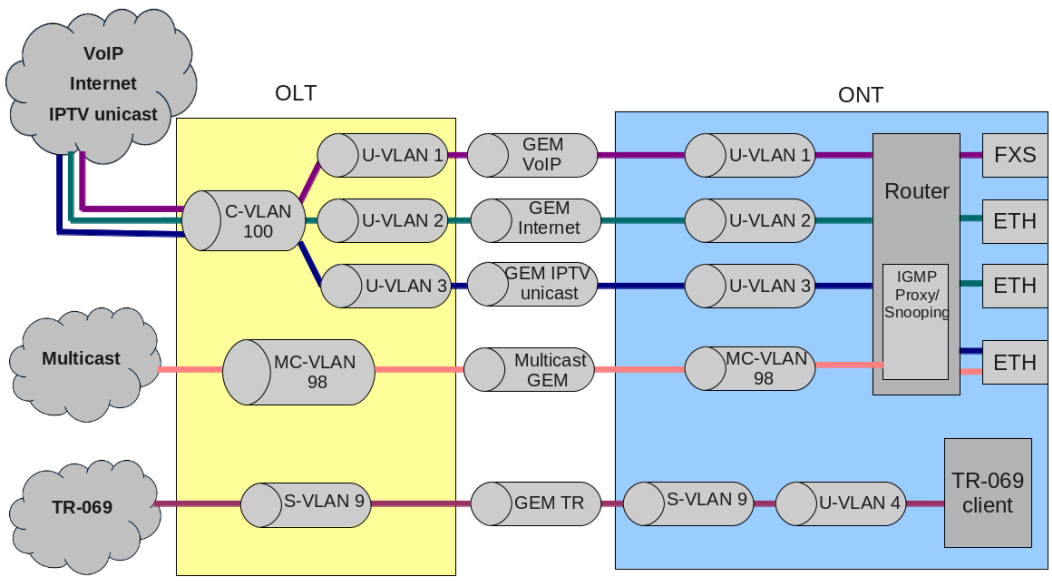

Fig. 19.3. Service Model 1 Chart

A C-VLAN is used between ONT and service routers (BRAS, VoIP SR) that encapsulate services for one subscriber (one ONT), such as VoIP, Internet, and IPTV unicast. An S-VLAN that is global for all subscribers (ONTs) is used for the TR-69 management service. Corresponding GEM ports are created for every OLT service between ONT and OLT. A dedicated MC-VLAN is used for multicast transmissions.

OLT casts C-VLAN (for VoIP, Internet, and IPTV unicast) or S-VLAN (for TR-069) for every service into a corresponding U-VLAN. ONT associates the U-VLAN with corresponding ONT interfaces or program modules. For example, a TR-069 service is associated with a TR-69 client with the help of a corresponding interface. VoIP, Internet, and IPTV unicast services can operate in the "router" or "bridge" modes depending on ONT configuration. The chart shows all services configured in the "router" mode.

Broadcast and unknown unicast traffic is transmitted in this model by replicating a corresponding packet (broadcast or unknown unicast) to OLT. C-VLAN replicates services to all associated GEM ports and at the same time translates data to corresponding U-VLAN for each service. TR-069 service is replicated between corresponding GEM ports of all subscribers (ONT). Thus, the model implements "VLAN for Subscriber" for VoIP, Internet, and IPTV unicast services, but uses "VLAN for Service" for TR-069 service.

19.3 Model 2

Consider a model 2 implementation example. The chart of this service model is shown in Fig. 19.4.

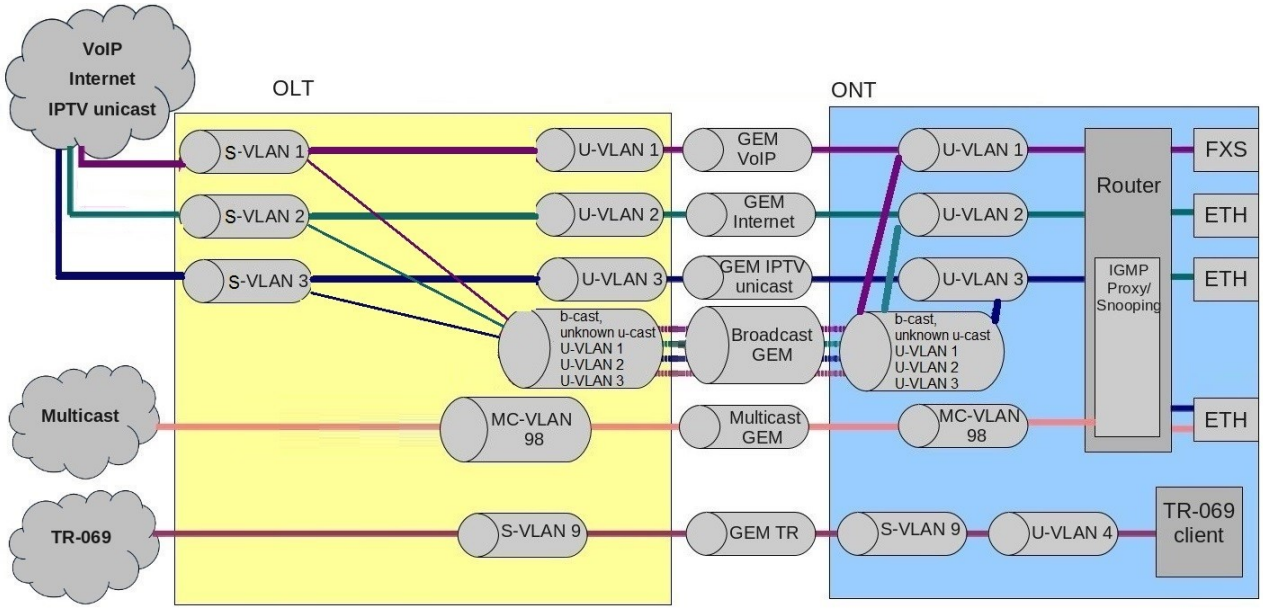

Fig. 19.4. Service Model 2 Chart

A S-VLAN is used between ONT and service routers (BRAS, VoIP SR) that encapsulate services for one subscriber (one ONT), such as VoIP, Internet, and IPTV unicast. An S-VLAN that is global for all subscribers (ONTs) is used for the TR-069 management service. Corresponding GEM ports are created for every OLT service by LTP-8X between ONT and OLT. A dedicated MC-VLAN is used for multicast transmissions.

VoIP, Internet, and IPTV unicast services are associated with C-VLAN in ONT. The TR-069 service is associated with S-VLAN in ONT. ONT casts C-VLAN (for VoIP, Internet, IPTV unicast) or S-VLAN (for TR-069) for every service into a corresponding U-VLAN. ONT associates the U-VLAN with corresponding ONT interfaces or program modules. For example, a TR-069 service is associated with a TR-069 client with the help of a corresponding interface. VoIP, Internet, and IPTV unicast services can operate in the "router" or "bridge" modes depending on ONT configuration. The chart shows all services configured in the "router" mode.

All broadcast and unknown unicast traffic is redirected to a dedicated broadcast GEM port in this model. Broadcast and unknown unicast packets are sent to C-VLAN (for VoIP, Internet, and IPTV unicast services) in ONT. These packets are replicated for all services in ONT with simultaneous transmission to U-VLAN. Broadcast and unknown unicast packets of the TR-069 service are sent to S-VLAN in ONT and then are transmitted to U-VLAN.

In general, the model is similar to model 3 except the one thing: transmission of C-VLAN to U-VLAN is performed on the OLT side; VoIP, Internet, and IPTV unicast traffic comes in U-VLAN to ONT.

Thus, the model implements "VLAN for Service" for VoIP, Internet, and IPTV unicast services and TR-069 service.

19.4 Model 3

Consider a model 3 implementation 3.The chart of this service model is shown in Fig. 19.5.

Dedicated S-VLANs are used between OLT and service routers (BRAS, VoIP SR) for each of the following services: VoIP, Internet, IPTV unicast, and TR-069. These S-VLAN are global for all subscribers (ONT). Corresponding GEM ports are created for every OLT service between ONT and OLT. A dedicated MC-VLAN is used for multicast transmissions.

VoIP, Internet, and IPTV, and TR-069 unicast services are associated with S-VLAN in ONT. ONT transmits S-VLAN into a corresponding U-VLAN for each service. ONT associates the U-VLAN with corresponding ONT interfaces or program modules. For example, a TR-069 service is associated with a TR-069 client with the help of a corresponding interface. VoIP, Internet, and IPTV unicast services can operate in the "router" or "bridge" modes depending on ONT configuration. The chart shows all services configured in the "router" mode.

All broadcast and unknown unicast traffic is redirected to a dedicated broadcast GEM port in this model. Broadcast and unknown unicast packets come to S-VLAN in ONT. These packets are transmitted into the corresponding U-VLANs on the ONT side. In this case broadcast and unknown unicast are replicated neither in OLT nor in ONT since every service has a separate S-VLAN for broadcast and unknown unicast traffic.

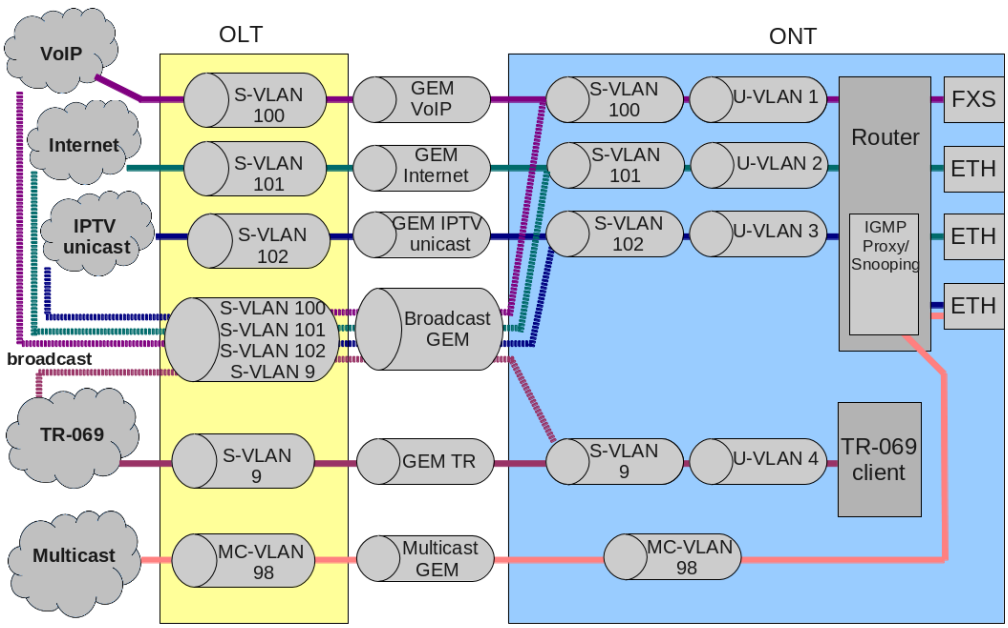

Fig. 19.5. Service Model 3 Chart

Thus, the model implements "VLAN for Service".

19.5 Model Configuration

Step 1. Check the current configuration with the help of the **show gpon olt general** command.

```
LTP-8X(config)# do show gpon olt configuration
        Block duplicated mac:                           enabled
        Ont block time:                                 5
        Dhcpra shaper:                                  100
        Profile pppoe-ia:                               pppoe-ia-00
        OLT Profile PPPoE Intermediate Agent 0
        Profile dhcp-ra:                                dhcp-ra-00
        OLT Profile DHCP Relay Agent 0
        Profile dhcp-ra per VLAN 1000 [0]:
            Profile:                                    dhcp-ra-01
        OLT Profile DHCP Relay Agent 1
        Datapath:
            Model:                                      model2
            Broadcast gem port:                         4095
            Multicast gem port:                         4094
        Encryption:
            Enable:                                     false
            Key update interval:                        1
        ONT authentication mode:                        serial
        Auto reconfigure ONT:                           true
        Auto reconfigure GPON-port:                     true
        Auto reconfigure OLT:                           true
        PLOAM password in alarm:                        true
```

Step 2. Set model by using the **gpon olt model** command.

```
LTP-8X# configure terminal
LTP-8X(config)# gpon olt model 1
```

Step 3. Apply the changes by using the **do commit** command.

```
LTP-8X(config)# do commit
```

To apply the change of the model correctly, you have to save configuration and reboot OLT.

Chapter 20.

ONT Configuration

Introduction

This Chapter describes general principles of ONT configuration. It also defines configuration profiles.

ONT is configured with the help of a profile which defines high-level expression of data communication channels. All operations related to channel creation are performed automatically. The way the data communication channels are created depends on the selected service model (see Chapter 19, page 70).

ONT configuration includes assignment of configuration profiles and specification of ONT specific parameters. Configuration profiles allow general parameters to be set for all or for a range of ONTs. Profile parameters may include, for instance, DBA settings, configuration of VLAN operations in OLT and ONT, settings of Ethernet ports in ONT. Specific ONT parameters allow each separate ONT to have its own settings specified. Such settings include, for example, GPON password, subscriber's VLAN, etc.

20.1 General Configuration Principles

Service is the key term of ONT configuration. This term completely includes a channel through which data is transferred from the interfaces located on the front panel of the terminal (see Chapter 15, page 54) to users' ports of ONT. There are two service profiles: cross-connect and dba. The cross-connect profile creates a GEM service port, the dba profile allocates an Alloc-ID for this ONT and associates a corresponding GEM port to the Alloc-ID.

Table 20.1. ONT Profiles

Profile	**Description**
cross-connect	Defines VLAN transformation in OLT and ONT
alloc	Defines upstream traffic parameters
shaping	Defines restrictions for upstream and downstream service traffic
management	Defines TR-69 management service parameters

ports	Defines user port groups in ONT as well as IGMP and multicast parameters for user ports
scripting	Allows manual configuration with the help of GPON and OMCI primitives

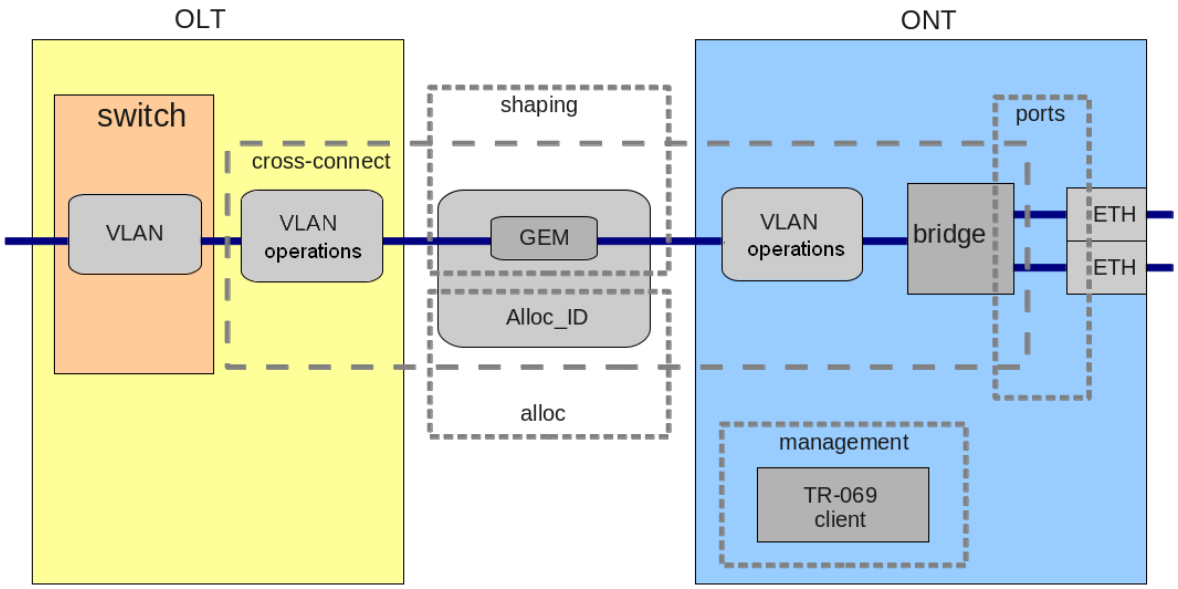

Fig. 20.1. ONT Scope of Operation

20.2 ONT Profiles Configuration

20.2.1. Cross-Connect Profile Configuration

Step 1. To configure a cross-connect profile, you need first to specify whether the service will be routed (transmitted through an ONT router) or bridged (use bridge connection). This can be done by changing the **model** parameter.

Step 2. Then you need to specify a service type in the **type** parameter. Some service types require the **iphost-eid** parameter to be set which allows you to choose a definite instance of IP interface in ONT.

Step 3. VLAN is configured in a cross-connect profile with the help of the following parameters: **tag-mode**, **outer-vid**, **outer-cos**, **inner-vid**, **u-vid**, and **u-cos**.

Step 4. tag-mode enables upstream Q-in-Q mode. **outer-vid**, **outer-cos**, and **inner-vid** specify internal and external Q-in-Q tags correspondingly. The CoS value of the internal tag is copied from the external one in this case. If the Q-in-Q mode is not used, only the **outer-vid** and **outer-cos** parameters are valid. The **u-vid** and **u-cos** parameters allow a tag to be specified which will be used on the ONT side.

Step 5. The **mac-table-entry-limit** parameter allows restriction of records number in the MAC table of OLT for this service.

Step 6. The **priority-queue** parameter allows allocation of all services of one T-CONT into queues with priorities (if ONT supports this method).

20.2.2. DBA Profile Configurationn

This profile configures dynamic bandwidth allocation (DBA). These parameters allow specification of any T-CONT type described in G.984.3.

Step 1. First of all, choose a **service-class**, which will define the basic DBA algorithm.

Step 2. After that configure **status-reporting** which defines a type of ONT queues status report.

Step 3. The **fixed-bandwidth**, **guaranteed-bandwidth**, and **besteffort-bandwidth** parameters define the fixed, guaranteed, and best-effort bandwidth correspondingly.

DBA configuration is described in details in Chapter 21, page 88.

20.2.3. Shaper Profile Configuration

Configuration of this profile allows restriction of upstream and downstream services.

Step 1. Downstream restriction in OLT uses the policing algorithm. The restriction can either use one policer for all services or individual policers for each separate service. This is specified in the **one-policer** parameter. When one policer is used for all services, only **policer 0** should be specified; otherwise policers for all services should be adjusted.

Step 2. Upstream restriction in ONT uses the shaping algorithm. You can specify either a global shaper or individual shapers for unicast, multicast, and broadcast traffic (ONT functionality).

20.2.4. Ports Profile Configuration

The "ports" profile allows you to group ports in ONT. The profile also contains IGMP and multicast setting as they are separately adjusted for each port.

You can adjust up to 4 Ethernet ports and a VEIP virtual port which will serve as a link between OMCI and RG domains in ONT.

Step 1. Ethernet ports are grouped with the help of the **bridge-group** parameter. Value 0 means that the port is associated with an RG domain (router). Other values means port association with an OMCI domain, i. e. the port can be directly used in OLT to establish a data communication channel.

Step 2. IGMP and multicast configuration is described in details in Chapter 24, page 105.

20.2.5. Management Profile Configuration

The management profile enables specific configuration of TR-069 management protocol, namely configuration of TR-client in ONT.

Step 1. The "enable-omci-configuration" parameter defines the TR client configuration which can be done either automatically with DHCP (all other parameters of the profile are not used in this case) or with OMCI using the profile settings.

Step 2. The "url" parameter corresponds to the address of the auto configuration server (ACS), whose access parameters are defined by the "username" and "password" parameters.

The TR-069 protocol configuration is described in details in Chapter 26, page 114.

20.3 ONT Configuration Procedure

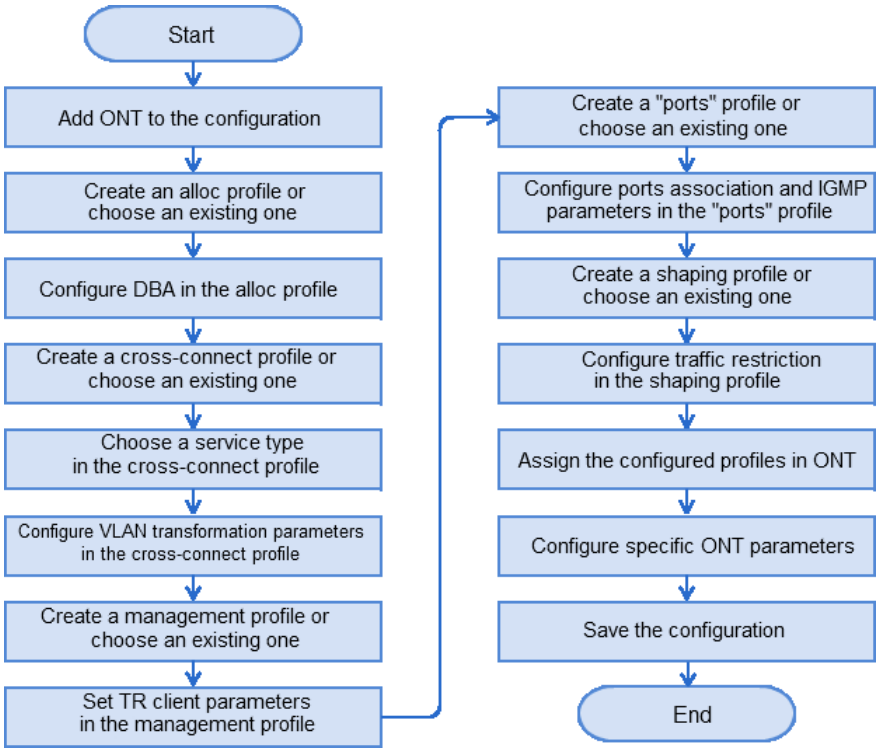

Fig. 20.2. ONT Configuration Procedure

Step 1. Prior to proceed to ONT configuration, add the ONT into an OLT configuration. For an ONT to be added and configured, it does not need to physically connected to OLT. You can view the list of unactived ONTs with the help of the **show interface gpon-port ont unactivated** command:

```
LTP-8X# show interface gpon-port 0 ont unactivated
---------------------------------
GPON-port 0 ONT unactivated list
---------------------------------
##      Serial                ONT ID  Channel Status        RSSI[dBm]      Version EquipmentID
1       ELTX5C00008C   n/a    0       UNACTIVATED           n/a            n/a     n/a
2       ELTX1A00001A   n/a    0       UNACTIVATED           n/a            n/a     n/a
Total ONT  count: 2
```

Step 2. To specify ONT settings, go to the corresponding view with the help of the interface ont command. Specify ONT serial number, password, or their combination.

```
LTP-8X# configure terminal
LTP-8X(config)# interface ont 0/0
LTP-8X(config)(if-ont-0/0)# serial ELTX5C00008C
LTP-8X(config)(if-ont-0/0)# password 0000000000
```

Step 3. Apply the changes by using the **do commit** command.

```
LTP-8X(config)(if-ont-0/0)# do commit
```

Step 4. OLT entry configuration has pre-defined ONT profiles which will be automatically assigned to ONT. View the ONT configuration with the help of the do show interface ont 0/0 configuration command.

```
LTP-8X(config)# do show interface ont 0/0 configuration

----------------------------------
[ONT0/0] configuration
----------------------------------

    Description:                ''
    Status:                     UP
    Serial:                     0000000000000000
    Password:                   ''
    Fec up:                     false
    Downstream broadcast:       true
    Ber interval:               none
    Ber update period:          60
    Rf port state:              enabled
    Omci error tolerant:        false
    Profile shaping:            shaping-00        ONT Profile Shaping 0
    Profile ports:              ports-00          ONT Profile Ports 0
    Profile management:         management-00     ONT Profile Management 0
    Profile scripting:          unassigned
    Custom model:               none
    Template:                   unassigned
```

20.3.1. Model 1

Consider configuration of a data communication channel which is based on model 1 and implements "VLAN for Subscriber". Fig. 20.3 shows a configuration of two abstract services with subscriber C-VLAN 200 and U-VLAN 10 and 11 for each service correspondingly.

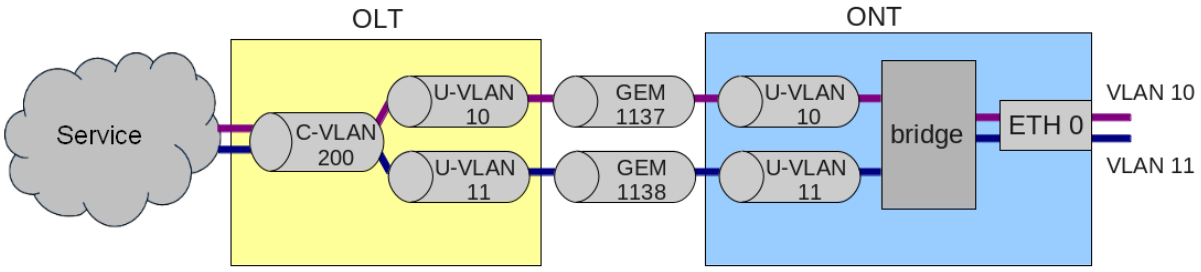

Fig. 20.3. Service Abstract Representation for Model 1

Step 1. Assign a service model:

```
LTP-8X# configure terminal
LTP-8X(config)# gpon olt model 1
```

Step 2. Create a Service1 cross-connect profile to configure the first service. Configure a bridged service and specify a bridged group which will be associated with an ONT port. Configure U-VLAN with the help of the **set u-vid** command (it equals 10 for the first service in this case):

```
LTP-8X(config)# profile cross-connect Servicel
LTP-8X(config-cross-conneot)("Servioel")# bridge
LTP-8X(config-cross-conneot)("Servioel")# bridge group 1
LTP-8X(config-cross-conneot)("Servioel")# user vid 10
```

Step 3. Check the changes made.

```
LTP-8X(config-cross-connect)("Service1")# do show profile cross-connect Service1
Name:                                 'Service1'
Description:                          'ONT Profile Cross Connect 1'
Model:                                ont
Bridge group:                         1
Tag mode:                             single-tagged
Outer vid:                            1
Outer cos:                            unused
Inner vid:                            -
U vid:                                10
U cos:                                unused
Mac table entry limit:                unlimited
Type:                                 general
Iphost eid:                           0
Priority queue:                       0
```

Step 4. By analogy with the described above, create another cross-connect profile (Service2) for the second service and configure it with U-VLAN 11:

```
LTP-8X(config)# profile cross-connect Servioe2
LTP-8X(config-oross-oonneot)("Service2")# bridge
LTP-8X(config-oross-oonneot)("Service2")# bridge group 1
LTP-8X(oonfig-oross-oonneot)("Service2")# user vid 11
```

Step 5. Check the amendments made.

```
LTP-8X(config-cross-connect)("Service2")# do show profile cross-connect Service2
Name:                                 'Service2'
Description:                          'ONT Profile Cross Connect 1'
Model:                                ont
Bridge group:                         1
Tag mode:                             single-tagged
Outer vid:                            1
Outer cos:                            unused
Inner vid:                            -
U vid:                                11
U cos:                                unused
Mac table entry limit:                unlimited
Type:                                 general
Iphost eid:                           0
Priority queue:                       0
```

Step 6. Specify DBA parameters. To do this, create an dba profile and adjust the corresponding settings. We set a value of guaranteed bandwidth for this example:

```
LTP-8X(config)# profile dba AllServices
LTP-8X(config-dba)("AllServices")# bandwidth guaranteed 500
```

Step 7. Check the amends made.

```
LTP-8X(config-dba)("AllServices")#  do  show  profile  dba  AllServices
Name:                                  'AllServices'
Description:                           'ONT Profile DBA 1'
Dba:
Sla data:
Service class:                         data
Status reporting:                      nsr
Alloc size:                            0
Alloc period:                          0
Fixed bandwidth:                       0
Guaranteed bandwidth:                  500
Besteffort bandwidth:                  1244000
```

Step 8. Associate a bridge port with an ONT port. To do this, create a "ports" profile and assign value 1 to the "bridge group" parameter for the "eth 0" port:

```
LTP-8X(config)# profile ports Portsl
LTP-8X(config-ports)("Portsl")# port 0 bridge group 1
```

Step 9. Check the changes made.

```
LTP-8X(config-ports)("Ports1")#  do  show  profile  ports  Ports1
...
Port [0]:
Bridge group:                                  1
Spanning tree for bridge group:                false
Multicast enable:                              false
Multicast port settings:
Upstream igmp vid:                             1
Upstream igmp prio:                            0
Upstream igmp tag control:                     pass
Downstream multicast vid:                      1
Downstream multicast prio:                     0
Downstream multicast tag control:              pass
Max groups:                                    0
Max multicast bandwidth:                       0
Shaper downstream:
Enable:                                        false
Commited rate:                                 1000000
Shaper upstream:
Enable:                                         false
Commited rate:                                 1000000
...
```

Step 10. Assign the created profiles in ONT.

```
LTP-8X(config)# interface ont 0/0
LTP-8X(config)(if-ont-0/0)# service 0 profile dba AllServices
LTP-8X(config)(if-ont-0/0)# service 0 profile cross-connect Service1
LTP-8X(config)(if-ont-0/0)# service 1 profile dba AllServices
LTP-8X(config)(if-ont-0/0)# service 1 profile cross-connect Service2
LTP-8X(config)(if-ont-0/0)# profile ports Ports1
LTP-8X(config)(if-ont-0/0)# do show interface ont 0/0 configuration
-----------------------------------
[ONT0/0] configuration
-----------------------------------
Description:                                   ''
Status:                                        UP
Serial:                                        ELTX5C00008C
...
Service [0]:
 Profile cross connect:          Service1           ONT Profile Cross Connect 1
 Profile dba:                    AllServices        ONT Profile DBA 1
Service [1]:
 Profile cross connect:          Service2           ONT Profile Cross Connect 2
 Profile dba:                    AllServices        ONT Profile DBA 1
...
```

```
 Profile ports:                  Ports1              ONT Profile Ports 1
```

Step 11. "VLAN for Subscriber" requires C-VLAN to be assigned for this ONT (subscriber). Assign C-VLAN 200 for both services by using the **service <x> custom vid** command:

```
 LTP-8X(config)(if-ont-0/0)# service 0 custom vid 200
 LTP-8X(config)(if-ont-0/0)# service 1 custom vid 200
 LTP-8X(config)(if-ont-0/0)# do show interface ont 0/0 configuration
 ...
 Service [0]:
 Profile cross connect:          Service1            ONT Profile Cross Connect 1
 Profile dba:                    AllServices         ONT Profile DBA 1
 Custom vlan:                    200
 Custom CoS:                     unused
 Service [1]:
 Profile cross connect:          unassigned
 Profile dba:                    AllServices         ONT Profile DBA 1
 Custom vlan:                    200
 Custom CoS:                     unused
…
```

Step 12. Apply the changes by using the **commit** command.

```
LTP-8X(config)(if-ont-0/0)# do commit
```

Step 13. Configure VLAN 200 in the switch view (see Chapter 14, page 52).

```
LTP-8X> switch
LTP-8X(switch)# configure
LTP-8X(switch)(config)# vlan 200
LTP-8X(switch)(config-vlan)# tagged front-port 0
LTP-8X(switch)(config-vlan)# tagged pon-port 0 - 7
LTP-8X(switch)(config-vlan)# exit
LTP-8X(switch)(config)# commit
LTP-8X(switch)(config)# exit
```

20.3.2. Model 2

Model 2 is Model 1 combined with Model 3. Configuration is the same as in Model 3.

20.3.3. Model 3

A service model which classified as model 3 implements the "VLAN for Service" principle. Fig. 20.4 shows an abstract service configured with S-VLAN 30.

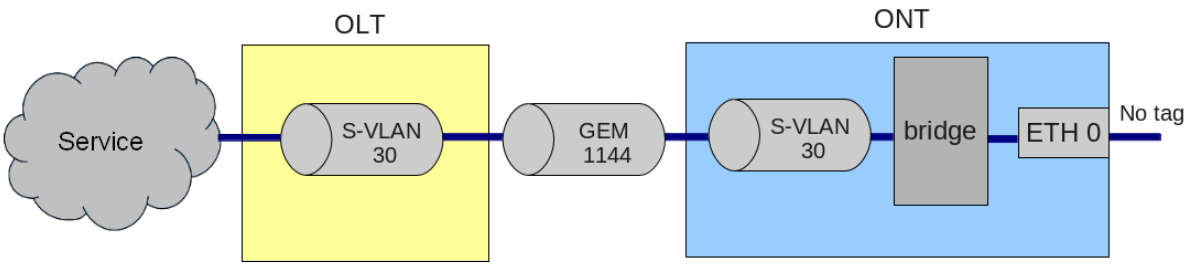

Fig. 20.4. Service Abstract Representation for Model 3

Step 1. Assign a service model:

```
LTP-8X# configure terminal
LTP-8X(config)# gpon olt model 3
```

Step 2. Create a Service3 cross-connect profile to configure the service. Configure a bridged service and specify the bridged group the ONT port will be associated with:

```
LTP-8X(config)# profile cross-connect Servioe3
LTP-8X(config-cross-conneot)("Servioe3")# bridge
LTP-8X(config-cross-conneot)("Servioe3")# bridge group  1
```

Step 3. To assign an S-VLAN, use the outer vid 30 command.

```
LTP-8X(config-cross-conneot)("Servioe3")# outer vid  30
```

Step 4. Specify U-VID in order to have untagged traffic coming from the ONT port.

```
LTP-8X(config-cross-conneot)("Servioe3")# user vid untagged
```

Step 5. Check the changes made.

```
LTP-8X(config-cross-connect)("Service3")# do show profile cross-connect Service3
Name:                       'Service3'
Description:                'ONT Profile Cross Connect 3'
Model:                      ont
Bridge group:               1
Tag mode:                   single-tagged
Outer vid:                  30
Outer cos:                  unused
Inner vid:                  -
U vid:                      untagged
U cos:                      unused
Mac table entry limit:      unlimited
Type:                       general
Iphost eid:                 0
Priority queue:             0
```

Step 6. Specify DBA parameters. To do this, create an dba profile and adjust the corresponding settings. We set a value of guaranteed bandwidth for this example:

```
LTP-8X(config)# profile dba AllServices
LTP-8X(config-dba)("AllServioes")# bandwidth guaranteed 500
```

Step 7. Check the changes made.

```
LTP-8X(config-dba)("AllServices")# do show profile dba AllServices
Name:                                       'AllServices'
Description:                                'ONT Profile DBA 1'
Dba:
Sla data:
Service class:                              data
Status reporting:                           nsr
Alloc size:                                 0
Alloc period:                               0
Fixed bandwidth:                            0
Guaranteed bandwidth:                       500
Besteffort bandwidth:                       1244000
```

Step 8. Associate a bridge group with an ONT port. To do this, create a "ports" profile and assign value 1 to the "bridge group" parameter for the "eth 0" port.

```
LTP-8X(config)# profile ports Portsl
LTP-8X(config-ports)("Portsl")# port 0 bridge group 1
```

Step 9. Check the changes made.

```
LTP-8X(config-ports)("Ports1")# do show profile ports Ports1
...
Port [0]:
Bridge group:                                          1
Spanning tree for bridge group:                        false
Multicast enable:                                      false
Multicast port settings:
Upstream igmp vid:                                     1
Upstream igmp prio:                                    0
Upstream igmp tag control:                             pass
Downstream multicast vid:                              1
Downstream multicast prio:                             0
Downstream multicast tag control:                      pass
Max groups:                                            0
Max multicast bandwidth:                               0
Shaper downstream:
Enable:                                                false
Commited rate:                                         1000000
Shaper upstream:
Enable:                                                false
Commited rate:                                         1000000
...
```

Step 10. Assign the created profiles in ONT.

```
LTP-8X(config)# interface ont 0/1
LTP-8X(config)(if-ont-0/0)# service 0 profile dba AllServices
LTP-8X(config)(if-ont-0/0)# service 0 profile cross-connect Service1
LTP-8X(config)(if-ont-0/0)# profile ports Ports1
LTP-8X(config)(if-ont-0/0)# do show interface ont 0/1 configuration
-----------------------------------
[ONT0/0] configuration
-----------------------------------
Description:                                    ''
Status:                                         UP
Serial:                                         ELTX5C00000C
...
Service [0]:
 Profile cross connect:                 Service3     ONT Profile Cross Connect 3
 Profile dba:                           AllServices  ONT Profile DBA 1
...
 Profile ports:                         Ports1       ONT Profile Ports 1
```

Step 11. Apply the changes by using the **do commit** command.

```
LTP-8X(config)(if-ont-0/1)# do commit
```

Step 12. You will also need to configure S-VLAN 30 in the switch view (see Chapter 14, page 52).

```
LTP-8X# switch
LTP-8X(switch)# configure
LTP-8X(switch)(config)# vlan 200
LTP-8X(switch)(config-vlan)# tagged front-port 0
LTP-8X(switch)(config-vlan)# tagged pon-port 0 - 7
```

```
LTP-8X(switch)(config-vlan)# exit
LTP-8X(switch)(config)# commit
LTP-8X(switch)(config)# exit
```

Chapter 21.

DBA Configuration

Introduction

This Chapter considers DBA configuration for ONT.

GPON technology implies that all ONTs of one GPON channel use common communication medium (fibre). It is necessary to provide a mechanism that will ensure data transfer from all ONTs without collisions. The mechanism is called dynamic bandwidth allocation (DBA) and ensures allocation of time intervals in OLT for data transfer to ONT.

A logical unit of the DBA algorithm is Alloc-ID (allocation) with a corresponding T-CONT (traffic counter) on the ONT side. Data transfer parameters (frequency, transmission window) are separately configured for every Alloc-ID (T-CONT) and are referred to as service level agreement (SLA).

G.984.3 provides several SLA combinations called T-CONT type. There are the following T-CONT types:

— T-CONT type 1 with a fixed bandwidth only. It is suitable for a traffic which is transferred at a constant speed (or with very low variations) and is sensitive to delays and jitter.

— T-CONT type 2 with a guaranteed bandwidth only. This type is suitable for a bursty traffic with a well defined upper bound, without strict delay and jitter restrictions.

— T-CONT type 3 is a counter with a guaranteed bandwidth and a possibility to allocate a best-effort bandwidth. This type is suitable for a bursty traffic with peak values that requires a certain throughput to be guaranteed.

— T-CONT type 4 allows allocation of a best-effort bandwidth without fixed or guaranteed bandwidths. This type is suitable for a bursty traffic with peak values that does not require any guaranteed throughput.

— T-CONT type 5 is a counter with fixed and guaranteed bandwidths and a possibility to allocate a best-effort bandwidth. This type summarises all other types and is suitable for most types of traffic.

Terminal is reserved 64 default allocation for official purposes. The terminal allows you to configure up to 192 per channel allocations for user data. Not in all cases, this will be enough to handle each service in its own allocation. Follow adhere to the rules of Amax = 192 / N, where Amax - the maximum number of allocations for a single ONT, and N - the number on the ONT channel. If the calculated amount of services exceeds ONT Amax, should undertake a combination of multiple services into a single allocation. More details in section 21.1.2.

DBA parameters are configured in the **dba** profile. These parameters allow specification of any T-CONT type described in G.984.3. First of all, choose a service class which will define the basic DBA algorithm. After that configure status reporting which defines a type of ONT queues status report. The "fixed-bandwidth", "guaranteed-bandwidth", and "besteffort-bandwidth" parameters define the fixed, guaranteed, and best-effort bandwidth correspondingly. Table 21.1 shows the correspondence between alloc profile configuration and T-CONT types.

Table 21.1. DBA Profile Configuration and T-CONT types

	T-CONT type 1	**T-CONT type 2**	**T-CONT type 3**	**T-CONT type 4**	**T-CONT type 5**
service-class	cbr	voip	type5	type5	type5
status-reporting	-	+	+	+	+
fixed-bandwidth	+	-	-	-	+
guaranteed-bandwidth	-	+	+	-	+
besteffort-bandwidth	-	-	+	+	+

The following rules apply to dba profile assignment:

— when an ONT service is assigned an dba profile, an Alloc-ID is created for the ONT on the OLT side, and a corresponding T-Cont is configured on the ONT side.

— if different ONTs are assigned the same profile, they will each have a separate Alloc-ID created with the same allocation parameters.

— if for different services of the same ONT assign profiles alloc and point allocation-scheme share-t-cont, then these services will work in the same allocation;

— if for different services of the same ONT assign profiles alloc and indicate allocate-new-t-cont, these services will work in different allocation, the number of Alloc-ID created for the ONT is the number assigned to a profile alloc.

21.1 DBA Profiles Assignment

21.1.1. Services in Different T-CONTs

Two Alloc-IDs will be allocated in an OLT for an ONT. Each service will operate in its allocation. There will be two T-CONT on the ONT side corresponding to the allocations.

Step 1. The ONT should have two services in different T-CONTs. Assign two dba profiles by using the **profile dba** command.

```
LTP-8X(config)# profile dba ServiceInternet
LTP-8X(config-dba)("ServiceInternet")# exit
LTP-8X(config)# profile dba ServiceVoIP
LTP-8X(config-dba)("ServiceVoIP")# exit
```

Step 2. Specify individual distribution scheme allocations by using the **allocation-scheme** command.

```
LTP-8X(config)# profile dba ServiceInternet
LTP-8X(config-dba)("ServiceInternet")#allocation-scheme allocate-new-t-cont
LTP-8X(config-dba)("ServiceInternet")# exit
LTP-8X(config)# profile dba ServiceVoIP
LTP-8X(config-dba)("ServiceVoIP")# allocation-scheme allocate-new-t-cont
LTP-8X(config-dba)("ServiceVoIP")# exit
```

Step 3. Assign the profiles to services by using the **service <id> profile dba** command.

```
LTP-8X(config)(if-ont-0/0)# service  0 profile dba ServiceInternet
LTP-8X(config)(if-ont-0/0)# service 1 profile dba ServiceVoIP
```

You will have the following configuration:

```
LTP-8X(config)(if-ont-0/0)# do show interface ont 0/0 configuration
...
Service [0]:
   Profile cross connect:             ServiceInternet ONT Profile Cross Connect 0
   Profile dba:                       ServiceInternet ONT Profile DBA 1
Service [1]:
   Profile cross connect:             ServiceVoIP ONT Profile Cross Connect 1
   Profile dba:                       ServiceVoIP ONT Profile DBA 2
```

Step 4. Apply the changes by using the **do commit** command.

```
LTP-8X(config)(if-ont-0/0)# do commit
```

21.1.2. Services in One T-CONT

One Alloc-ID will be allocated in an OLT for an ONT. One T-CONT will be configured in the ONT. The T-CONT will be used to transfer traffic from multiple services. Traffic priority will be based on the value of the "priority-queue" field of the corresponding cross-connect profiles.

Step 1. The ONT should have three services in one T-CONT. Assign an dba profile by using the **profile dba** command.

```
LTP-8X(config)# profile dba AllServices
```

Step 2. It is necessary for the ONT to have all services in one T-CONT. To do this, determine the allocation scheme by using the **allocation-scheme** command.

```
LTP-8X(config-dba)("AllServices")# allocation-scheme share-t-cont
```

Step 3. Assign the profile to three services by using the **service <id> profile dba** command.

```
LTP-8X(config)(if-ont-0/1)# service 0 profile dba AllServices
LTP-8X(config)(if-ont-0/1)# service 1 profile dba AllServices
LTP-8X(config)(if-ont-0/1)# service 2 profile dba AllServices
```

You will have the following configuration:

```
LTP-8X(config)(if-ont-0/1)# do show interface ont 0/1 configuration
...
Service [0]:
   Profile cross connect:               ServiceInternet ONT Profile Cross Connect 0
   Profile dba:                                AllServices ONT Profile DBA 3
Service [1]:
   Profile cross connect:               ServiceVoIP ONT Profile Cross Connect 1
   Profile dba:                                AllServices ONT Profile DBA 3
Service [2]:
   Profile cross connect:               ServiceIPTV ONT Profile Cross Connect 1
   Profile dba:                                AllServices ONT Profile DBA 3
```

Step 4. Apply the changes by using the **do commit** command.

```
LTP-8X(config)(if-ont-0/1)# do commit
```

21.1.3. One Profile for Multiple ONTs

This represents a typical scenario for most cases, when similar services require the same DBA parameters on different ONTs.

Step 1. Assign an dba profile by using the **profile dba** command.

```
LTP-8X(config)# profile dba ServiceInternet
```

Step 2. Assign the profile to a corresponding service of every ONT by using the **service <id> profile dba** command.

```
LTP-8X(config)# interface ont 0/0-1
LTP-8X(config)(if-ont-0/0-1)# service 0 profile dba ServiceInternet
```

You will have the following ONT configurations:

```
LTP-8X(config)(if-ont-0/0-1)# do show interface ont 0/0-1 configuration
-----------------------------------
[ONT0/0] configuration
-----------------------------------
...
 Service [0]:
   Profile cross connect:                    ServiceInternet
   Profile dba:                              ServiceInternet ONT Profile DBA 1
...
-----------------------------------
[ONT0/1] configuration
-----------------------------------
...
 Service [0]:
   Profile cross connect:                    ServiceInternet
   Profile dba:                              ServiceInternet ONT Profile DBA 1...
```

Step 3. Apply the changes by using the **config commit** command.

```
LTP-8X(config)(if-ont-0/0-1)# do commit
```

Profiles Assignment Example

Consider two ONTs which need to have the following three services: Internet, VoIP, and Alarm. The VoIP service should operate in a separate allocation (a definite throughput should be ensured). The Internet and SecurityAlarm services may operate in one allocation.

This configuration implies that an OLT allocates two Alloc-IDs to each ONT. The Internet and SecurityAlarm services operate in one allocation, the VoIP service uses another one. Each ONT has two T-CONT configured which correspond to the Alloc-IDs of the ONT. Traffic priority between the Internet and SecurityAlarm services on the ONT side is based on the "priority-queue" value of the "ServiceInternet" and "ServiceAlarm" cross-connect profiles, which were assigned to the services.

For "Internet" service and "SecurityAlarm" service required to make the calculation of parameters SLA. This is done by adding the appropriate parameters for both services. Below is an example of calculation

of SLA parameters.

SLA parameters	Internet	SecurityAlarm	Sum
bandwidth fixed	0	0	0
bandwidth guaranteed	10048	1024	11072
bandwidth besteffort	329984	20096	350080

Read more about the appointment of SLA parameters in section 21.2.

Step 1. Assign two dba profiles by using the **profile dba** command.

```
LTP-8X(config)# profile dba ServiceVoIP
LTP-8X(config-dba)("ServiceVoIP")# exit
LTP-8X(config)# profile dba OtherServices
```

Step 2. Specify individual distribution scheme allocations by using the **allocation-scheme** command.

```
LTP-8X(config)# profile dba ServiceVoIP
LTP-8X(config-dba)("ServiceVoIP")# allocation-scheme allocate-new-t-cont
LTP-8X(config-dba)("ServiceVoIP")# exit
LTP-8X(config)# profile dba OtherServices
LTP-8X(config-dba)("OtherServices")# exit
```

Step 3. Assign the profiles to corresponding services of every ONT by using the **service <id> profile dba** command.

```
LTP-8X(config)# interface ont 0/0-1
LTP-8X(config)(if-ont-0/0-1)#  service  0  profile  dba  OtherServices
LTP-8X(config)(if-ont-0/0-1)#  service  1  profile  dba  ServiceVoIP
LTP-8X(config)(if-ont-0/0-1)#  service  2  profile  dba  OtherServices
```

You will have the following ONT configurations:

```
LTP-8X(config)(if-ont-0/0-1)# do show interface ont 0/0-1 configuration
-----------------------------------
[ONT0/0] configuration
-----------------------------------
...
Service [0]:
  Profile cross connect:                ServiceInternet ONT Profile Cross Connect 0
  Profile dba:                          OtherServices ONT Profile DBA 4
Service [1]:
  Profile cross connect:                ServiceVoIP ONT Profile Cross Connect 1
  Profile dba:                          ServiceVoIP ONT Profile DBA 2
Service [2]:
  Profile cross connect:                SecurityiAlarm ONT Profile Cross Connect 5
  Profile dba:                          OtherServices ONT Profile DBA 4
```

Step 4. Apply the changes by using the **commit** command.

```
LTP-8X(config)(if-ont-0/0-1)# do commit
```

21.2 DBA Configuration

21.2.1. T-CONT Type 1 Configuration

Consider configuration of a 100 Mbps fixed bandwidth.

Step 1. Specify a T-CONT type by using the **sla class** command.

```
LTP-8X(config)# profile dba dba-00
LTP-8X(config-dba)("dba-00")# sla class cbr
```

Step 2. Specify a type of status reports for ONT queues by using the **sla status-reporting nsr** command.

```
LTP-8X(config-dba)("dba-00")# sla status-reporting nsr
```

Step 3. Set fixed bandwidth parameters by using the **bandwidth fixed** command. Set other bandwidth parameters to 0.

The bandwidth has a value in Kbps (1000 bps) and is not rounded down to 64 Kbps.

```
LTP-8X(config-dba)("dba-00")# bandwidth fixed 100000
LTP-8X(config-dba)("dba-00")# bandwidth guaranteed 0
LTP-8X(config-dba)("dba-00")# bandwidth besteffort 0
```

Step 4. Use the **show** command to check the parameters.

```
LTP-8X(config-dba)("dba-00")# do show profile dba dba-00
Name:                                    'dba-00'
Description:                             'ONT Profile DBA 0'
Dba:
Sla data:
Service class:                           cbr
Status reporting:                        nsr
Alloc size:                              0
Alloc period:                            0
Fixed bandwidth:                         100000
Guaranteed bandwidth:                    0
Besteffort bandwidth:                    0
```

Step 5. Apply the changes by using the **do commit** command.

```
LTP-8X(config-dba)("dba-00")# do commit
```

21.2.2. T-CONT Type 2 Configuration

Consider configuration of a 100 Mbps guaranteed bandwidth.

Step 1. Specify a T-CONT type by using the **sla class** command.

```
LTP-8X(config)# profile dba dba-00
LTP-8X(config-dba)("dba-00")# sla class voip
```

Step 2. Specify a type of status reports for ONT queues by using the **sla status-reporting** command.

```
LTP-8X(config-dba)("dba-00")# sla status-reporting nsr
```

Step 3. Set guaranteed bandwidth parameters by using the **bandwidth guaranteed** command. Set other bandwidth parameters to 0.

The bandwidth has a value in Kbps (1000 bps) and is not rounded down to 64 Kbps.

```
LTP-8X(config-dba)("dba-00")# bandwidth guaranteed 100000
LTP-8X(config-dba)("dba-00")# bandwidth fixed 0
LTP-8X(config-dba)("dba-00")# bandwidth besteffort 0
```

Step 4. Use the **show** command to check the parameters.

```
LTP-8X(config-dba)("dba-00")# do show profile dba dba-00
Name:                                   'dba-00'
Description:                            'ONT Profile DBA 0'
Dba:
Sla data:
Service class:                          voip
Status reporting:                       nsr
Alloc size:                             0
Alloc period:                           0
Fixed bandwidth:                        0
Guaranteed bandwidth:                   100000
Besteffort bandwidth:                   0
```

Step 5. Apply the changes by using the **do commit** command.

```
LTP-8X(config-dba)("dba-00")# do commit
```

21.2.3. T-CONT Type 3 Configuration

Consider configuration of a 100 Mbps guaranteed bandwidth with a possibility of allocation of a 200 Mbps best-effort bandwidth.

Step 1. Specify a T-CONT type by using the **sla class** command.

```
LTP-8X(config)# profile dba dba-00
LTP-8X(config-dba)("dba-00")# sla class type5
```

Step 2. Specify a type of status reports for ONT queues by using the **sla status-reporting** command.

```
LTP-8X(config-dba)("dba-00")# sla status-reporting nsr
```

Step 3. Set guaranteed bandwidth parameters by using the **bandwidth guaranteed** command. Set best-effort bandwidth parameters by using the **bandwidth besteffort** command. Set other bandwidth parameters to 0.

The bandwidth has a value in Kbps (1000 bps) and is not rounded down to 64 Kbps.

```
LTP-8X(config-dba)("dba-00")# bandwidth fixed 0
LTP-8X(config-dba)("dba-00")# bandwidth guaranteed 100000
LTP-8X(config-dba)("dba-00")# bandwidth besteffort 200000
```

Step 4. Use the **show** command to check the parameters.

```
LTP-8X(config-dba)("dba-00")# do show profile dba dba-00
Name:                                   'dba-00'
Description:                            'ONT Profile DBA 0'
Dba:
Sla data:
Service class:                          type5
Status reporting:                       nsr
Alloc size:                             0
Alloc period:                           0
Fixed bandwidth:                        0
Guaranteed bandwidth:                   100000
Besteffort bandwidth:                   200000
```

Step 5. Apply the changes by using the **do commit** command.

```
LTP-8X(config-dba)("dba-00")# do commit
```

21.2.4. T-CONT Type 4 Configuration

Consider configuration of a 200 Mbps best-effort bandwidth without allocation of a guaranteed bandwidth.

Step 1. Specify a T-CONT type by using the **sla class** command.

```
LTP-8X(config)# profile dba dba-00
LTP-8X(config-dba)("dba-00")# sla class type5
```

Step 2. Specify a type of status reports for ONT queues by using the **sla status-reporting** command.

```
LTP-8X(config-dba)("dba-00")# sla status-reporting nsr
```

Step 3. Set best-effort bandwidth parameters by using the **bandwidth besteffort** command. Set other bandwidth parameters to 0.

The bandwidth has a value in Kbps (1000 bps) and is not rounded down to 64 Kbps.

```
LTP-8X(config-dba)("dba-00")# bandwidth fixed 0
LTP-8X(config-dba)("dba-00")# bandwidth guaranteed 0
LTP-8X(config-dba)("dba-00")# bandwidth besteffort 200000
```

Step 4. Use the **show** command to check the parameters.

```
LTP-8X(config-dba)("dba-00")# do show profile dba dba-00
Name:                                   'dba-00'
Description:                            'ONT Profile DBA 0'
Dba:
Sla data:
Service class:                          type5
Status reporting:                       nsr
Alloc size:                             0
Alloc period:                           0
Fixed bandwidth:                        0
Guaranteed bandwidth:                   0
Besteffort bandwidth:                   200000
```

Step 5. Apply the changes by using the **do commit** command.

```
LTP-8X(config-dba)("dba-00")# do commit
```

21.2.5. T-CONT Type Configuration

Consider configuration of a 100 Mbps fixed bandwidth and a 200 Mbps guaranteed bandwidth with a possibility of allocation of a 1244 Mbps best-effort bandwidth.

Step 1. Specify a T-CONT type by using the **sla class** command.

```
LTP-8X(config)# profile dba dba-00
LTP-8X(config-dba)("dba-00")# sla class type5
```

Step 2. Specify a type of status reports for ONT queues by using the **sla status-reporting** command.

```
LTP-8X(config-dba)("dba-00")# sla status-reporting nsr
```

Step 3. Specify fixed bandwidth parameters in the **bandwidth fixed** command, guaranteed bandwidth parameters in the **bandwidth guaranteed** command, and best-effort bandwidth parameters in the **bandwidth besteffort** command.

The bandwidth has a value in Kbps (1000 bps) and is not rounded down to 64 Kbps.

```
LTP-8X(config-dba)("dba-00")# bandwidth fixed 100000
LTP-8X(config-dba)("dba-00")# bandwidth guaranteed 200000
LTP-8X(config-dba)("dba-00")# bandwidth besteffort 1244000
```

Step 4. Use the "show" command to check the parameters.

```
LTP-8X(config-dba)("dba-00")# do show profile dba dba-00
Name:                                   'dba-00'
Description:                            'ONT Profile DBA 0'
Dba:
Sla data:
Service class:                          type5
Status reporting:                       nsr
Alloc size:                             0
Alloc period:                           0
Fixed bandwidth:                        100000
Guaranteed bandwidth:                   200000
Besteffort bandwidth:                   1244000
```

Step 5. Apply the changes by using the **do commit** command.

```
LTP-8X(config-dba)("dba-00")# do commit
```

Chapter 22.

RG ONT

Introduction

This Chapter considers issues related to configuration of Residential Gateway (RG) ONT. The Chapter uses the terms of "bridges" and "routed" services.

Consider the concept of OMCI and RG management domains. These terms are defined in TR-142 Issue 2. In terms of management domains, ONT is considered as a device which operates in an OMCI domain only. The devices which operate in both management domains (i. e. have an integrated router) are denoted ONT/RG. Everything that refers to OMCI domain can be applied to both ONT and ONT/RG devices. For this reason, we will further denote ONT/RG as ONT. If an ONT is configured without an RG domain (without a router), skip all steps concerning RG.

Fig. 22.1 shows ONT/RG scheme and its management domains.

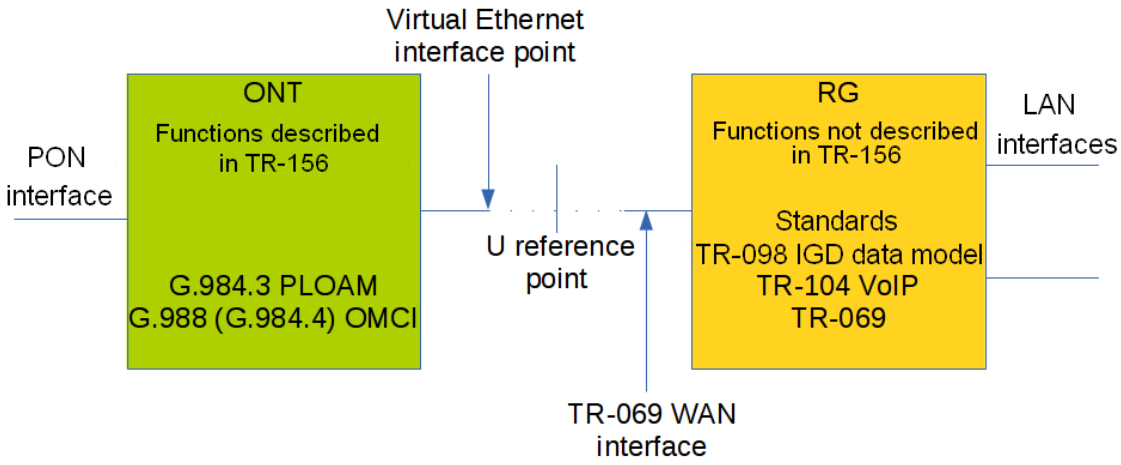

Fig. 22.1. ONT/RG Management Domains

Bridged service is a service which configuration requires OMCI management domain only, i. e. it can be completely configured with the help of the OMCI protocol in ONT.

Routed service is a service which configuration requires both OMCI and RG management domains.

In addition to configuration in terminal, a routed service requires an RG domain to be configured by using one of the following methods:

1. Pre-defined configuration—subscriber is provided with an ONT having fixed configuration.

2. Local ONT configuration using WEB interface.

3. ONT configuration using TR-069 protocol and auto configuration server (ACS).

Contact ONT vendor for information about RG domain configuration.

ONT is connected to RG using a Virtual Ethernet interface point (VEIP), which corresponds to TR-069 WAN interface (described in TR-098) on RG the side. VEIP is represented by a virtual port in terminal parameters. The port has the same configuration procedure as Ethernet ports in the "ports" profile.

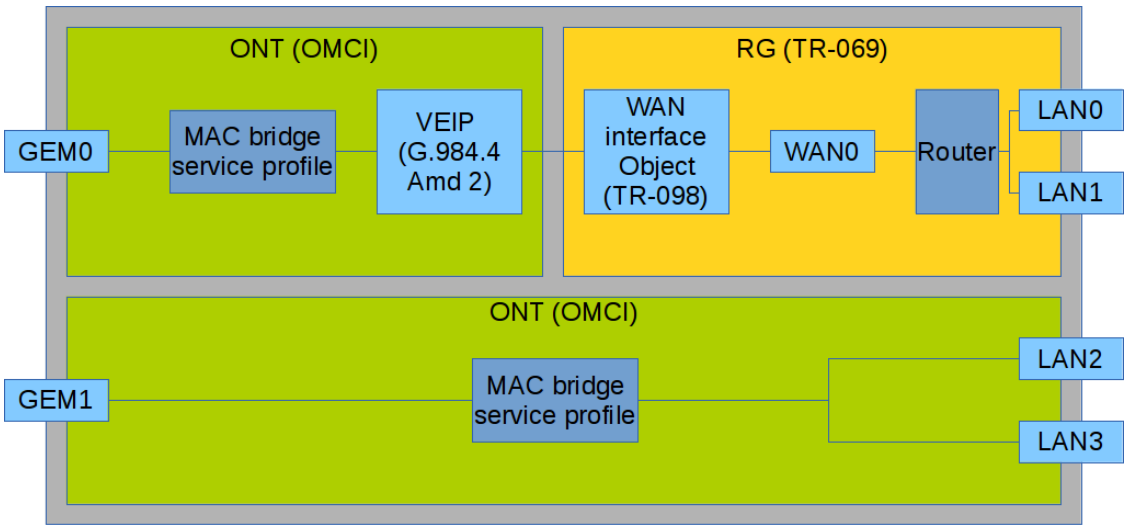

Fig. 22.2. Services Configuration in ONT and RG Domains

Fig. 22.2 shows two services (each with a corresponding GEM port on the ONT side), with one of them being **routed** and using both OMCI and RG management domains, and another one being **bridged** and using only OMCI for configuration. Terminal configuration includes configuration of bridge interfaces (green areas in the figure) and distribution of LAN ports between management domains.

The **bridge** parameter of the **cross-connect** profile is responsible for association of a service with a management domain. **Bridge** parameter creates a **bridged service** (the **bridge-group** parameter is the bridge number in this case). **No bridge** parameter creates a **routed service** (there is only one bridge associated with the RG; it has a special bridge number—0).

22.1 Services Combined Configuration

Consider an example of ONT configuration which simultaneously uses both management domains. Port numbers and internal structure are shown in Fig. 22.2.

Step 1. Create a VLAN for services on switch. VLAN configuration is described in details in Chapter 14, page 52.

```
LTP-8X(switch)(config)# vlan 20
LTP-8X(switch)(config-vlan)# tagged front-port 0
LTP-8X(switch)(config-vlan)# tagged pon-port 0 - 1
LTP-8X(switch)(config-vlan)# exit
LTP-8X(switch)(config)# vlan 30
LTP-8X(switch)(config-vlan)# tagged front-port 0
LTP-8X(switch)(config-vlan)# tagged pon-port 0 - 1
```

Step 2. Specify "3" service model that corresponds to "VLAN for Service" by using the **gpon olt model** command.

```
LTP-8X# configure terminal
LTP-8X(config)# gpon olt model 3
```

Step 3. Create **cross-connect** profiles for services.

```
LTP-8X(config)# profile cross-connect RG-service
LTP-8X(config-cross-connect)("RG-service")# exit
LTP-8X(config)# profile cross-connect OMCI-service
```

Step 4. Create an dba profile. DBA parameters are not important for the purposes set forth in this Chapter, so we will not configure DBA here and simply use default values. We will also assign one profile to both services that means that upstream services will operate with one T-CONT. DBA configuration is described in details in Chapter 21, page 88.

```
LTP-8X(config)# profile dba basic
LTP-8X(config-dba)("basic")# exit
```

Step 5. Create a "ports" profile.

```
LTP-8X(config)# profile ports 2RG-2OMCI
LTP-8X(config-ports)("2RG-2OMCI")# exit
```

Step 6. Configure a routed service. Use one VLAN 20 on both the OLT and ONT sides. Set the **routed service** by using the **bridge** command. Configure a cross-connect profile for the routed service.

```
LTP-8X(config)# profile cross-connect RG-service
LTP-8X(config-cross-connect)("RG-service")# no bridge
LTP-8X(config-cross-connect)("RG-service")# type general
LTP-8X(config-cross-connect)("RG-service")# tag-mode single-tagged
LTP-8X(config-cross-connect)("RG-service")# outer-vid 20
LTP-8X(config-cross-connect)("RG-service")# outer-cos unused
LTP-8X(config-cross-connect)("RG-service")# user vid untagged
LTP-8X(config-cross-connect)("RG-service")# mac-table-limit unlimited
LTP-8X(config-cross-connect)("RG-service")# priority 0
```

Step 7. Configure a bridged service. Use one VLAN 30 on both the OLT and ONT sides. Set the **bridged**

service by using the **bridge** command.Set the OMCI bridge number to 1. Configure a cross-connect profile for the bridged service.

```
LTP-8X(config)# profile cross-connect OMCI-service
LTP-8X(config-cross-connect)("OMCI-service")# bridge
LTP-8X(config-cross-connect)("OMCI-service")# bridge group 1
LTP-8X(config-cross-connect)("OMCI-service")# type general
LTP-8X(config-cross-connect)("OMCI-service")# tag-mode single-tagged
LTP-8X(config-cross-connect)("OMCI-service")# outer-vid 30
LTP-8X(config-cross-connect)("OMCI-service")# outer-cos unused
LTP-8X(config-cross-connect)("OMCI-service")# user vid untagged
LTP-8X(config-cross-connect)("OMCI-service")# mac-table-limit unlimited
LTP-8X(config-cross-connect)("OMCI-service")# priority 1
```

You specified different **priority-queue** values for the services. The routed service will have a higher priority than the **bridged service** as they work with one T-CONT.

Step 8. Configure a **ports** profile. According to Fig. 22.2, we need to associate the first two LAN ports with an RG management domain, with another two being associated with an OMCI domain and bound to bridge 1.

```
LTP-8X(config)# profile ports 2RG-2OMCI
LTP-8X(config-ports)("2RG-2OMCI")# port 0 bridge group 0
LTP-8X(config-ports)("2RG-2OMCI")# port 1 bridge group 0
LTP-8X(config-ports)("2RG-2OMCI")# port 2 bridge group 1
LTP-8X(config-ports)("2RG-2OMCI")# port 3 bridge group 1
```

Step 9. Create an ONT configuration. ONT management is described in details in Chapter 20, page 76.

```
LTP-8X(config)# interface ont 0/0
```

Step 10. Assign the created profiles. Assign the **cross-connect RG-service** profile to service 0 and the **cross-connect OMCI-service** profile to service 1.

```
LTP-8X(config)# serial ELTX10203040
LTP-8X(config)(if-ont-0/0)# service 0 profile cross-connect RG-service
LTP-8X(config)(if-ont-0/0)# service 0 profile dba basic
LTP-8X(config)(if-ont-0/0)# service 1 profile cross-connect OMCI-service
LTP-8X(config)(if-ont-0/0)# service 1 profile dba basic
LTP-8X(config)(if-ont-0/0)# profile ports 2RG-2OMCI
```

Step 11. Use the **show interface ont <id> configuration** command to check the created configuration.

```
LTP-8X(config)(if-ont-0/0)# do show interface ont 0/0 configuration
----------------------------------
[ONT0/0] configuration
----------------------------------
Description:                        ''
Status:                             UP
Serial:                  ELTX10203040
....
Service [0]:
Profile cross connect:                RG-service    ONT Profile Cross Connect 1
Profile dba:                               basic    ONT Profile DBA 2
Service [1]:
Profile cross connect:                RG-service    ONT Profile Cross Connect 1
Profile dba:                               basic    ONT Profile DBA 2
...
Profile ports:                         2RG-2OMCI    ONT Profile Ports 1
```

Step 12. Apply the changes by using the **do commit** command.

```
LTP-8X(config)(if-ont-0/0)# do commit
```

As a result, you will have the ONT combined configuration. One of the services is completely managed by the OMCI domain (the bridged service), LAN2 and LAN3 ports are connected as bridges in ONT. The second service is managed by both OMCI and RG (the routed service; RG domain can be configured, for instance, through WEB interface in ONT). LAN0 and LAN1 ports are connected to RG ONT.

Chapter 23.

High Speed Internet Configuration

Configuration of the High Speed Internet (HSI) service does not have any peculiarities and can be easily performed as described in Chapter 20, page 76.

Chapter 24.

Multicast Configuration

Introduction

The Chapter describes peculiarities of IPTV service configuration.

Internet Group Management Protocol (IGMP) is used in hosts and routers for multicasting support. It provides all systems of a physical network with relevant information: which hosts are included in groups and which group corresponds to a host.

IGMP snooping is a technique that allows network devices of the channel level (switches) to snoop IGMP requests from hosts to a group router in order to decide whether group traffic transmission to the corresponding interfaces should be started or stopped. When a switch snoops a host's IGMP request for connection to a multicast group, it adds the port the host is connected to into the group (for group traffic retranslation). And vice versa, having snooped a "leave_group" request, the switch removes the corresponding port from the group.

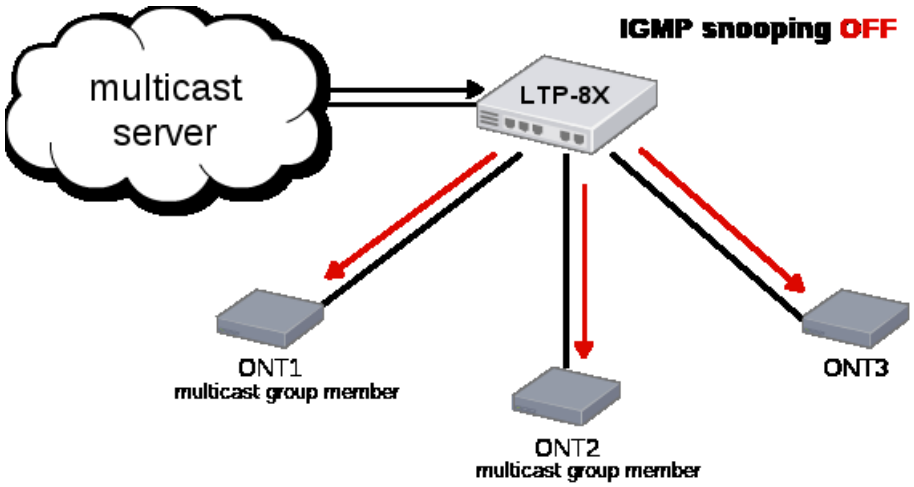

Fig. 24.1. IGMP Snooping Is Disabled

Fig. 24.1 shows multicasting of IGMP traffic regardless of whether an end host needs the traffic or not.

When IGMP snooping becomes enabled, the multicasting situation changes as follows: the switch will

analyse all IGMP packets between connected devices and the routers the multicast traffic comes from. When the switch receives a consumer's IGMP request for connection to a multicast group, it adds the port the consumer is connected to into the group. And vice versa, having received a request for leaving a group, the switch removes the corresponding port from the group.

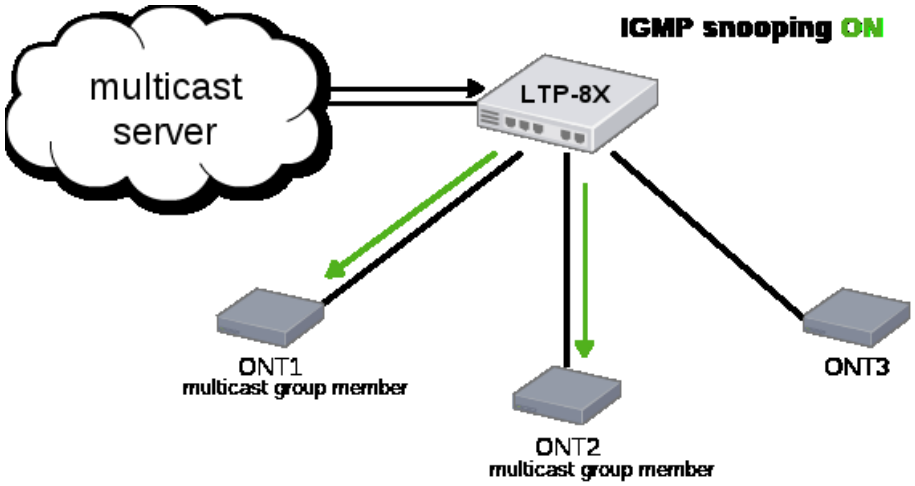

Fig. 24.2. IGMP Snooping Is Enabled

As you may see from Fig. 24.2, LTP-8X with enabled IGMP snooping translates multicast traffic only to the hosts which are member of the IGMP group.

IGMP proxy is an IGMP client and group router at the same time (IGMP router). On the one hand, proxy requests an upstream router for group channels; on the other hand, it receives join/leave requests from hosts and replicates upstream traffic to the corresponding interfaces.

24.1 Model 1 Multicast Configuration

Let us configure a multicast service for model 1.

An STB, which works in VLAN 14, is connected to an ONT port in this example. Upstream IGMP packets arrive at VLAN 14 though a GEM port and the OLT changes VLAN 14 to subscriber's VLAN 200.

As we have a multicast server in VLAN 98 in our example, we need to configure a proxy in switch to translate IGMP packets from VLAN 200 to VLAN 98 (see 14.3). The multicast service comes downstream to the ONT port in VLAN 98 and changes to VLAN 14.

For more details on general configuration principles of data communication channel refer to Chapter 20, page 76.

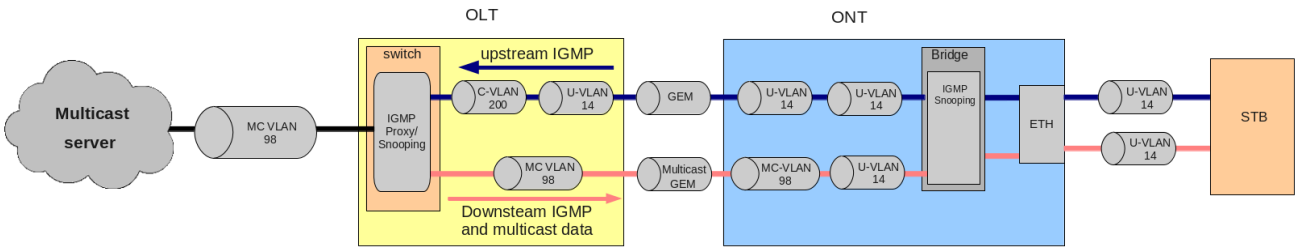

Fig. 24.3. Model 1 Multicast

Step 1. Specify ONT serial number in configuration.

```
LTP-8X# configure terminal
LTP-8X(config)# interface ont 0/0
LTP-8X(config)(if-ont-0/0)# serial ELTX01234567
LTP-8X(config)(if-ont-0/0)# exit
```

Step 2. Assign a service model:

```
LTP-8X(config)# gpon olt model 1
```

Step 3. Create a "UsIGMP" cross-connect profile to configure the service which will be used to send IGMP requests upstream. Configure a bridged service and specify the bridged group (it equals 1 in our example) the ONT port will be associated with. Specify U-VLAN 14:

```
LTP-8X(config)# profile cross-connenct UsIGMP
LTP-8X(config-cross-connect)("UsIGMP")# bridge
LTP-8X(config-cross-connect)("UsIGMP")# bridge group 1
LTP-8X(config-cross-connect)("UsIGMP")# user vid 14
LTP-8X(config-cross-connect)("UsIGMP")# do show profile cross-connect UsIGMP
datatype GChar_t value UsIGMP Name:    'UsIGMP'
Description:                           'ONT Profile Cross Connect 1'
Model:                                 ont
Bridge group:                          1
Tag mode:                              single-tagged
Outer vid:                             1
Outer cos:                             unused
```

```
Inner vid:                              -
U vid:                                  14
U cos:                                  unused
Mac table entry limit:                  unlimited
Type:                                   general
Iphost eid:                             0
Priority queue:                         0
```

Step 4. Associate a bridge port with an ONT port. To do this, create a "ports" profile and assign value 1 to the "bridge group" parameter for the LAN1 port:

```
LTP-8X(config)# profile ports Ports1
LTP-8X(config-ports)("Ports1")# port 1 bridge group 1
```

Step 5. Enable multicast and configure VLAN replacement rules for ONT:

```
LTP-8X(config-ports)("Ports1")# port 1 multicast
LTP-8X(config-ports)("Ports1")# port 1 igmp downstream vid 14
LTP-8X(config-ports)("Ports1")# port 1 igmp downstream tag-control replace-vid
LTP-8X(config-ports)("Ports1")# port 1 igmp upstream vid 14
LTP-8X(config-ports)("Ports1")# port 1 igmp upstream tag-control replace-vid
```

Step 6. You also need to configure VLAN 98 multicast and specify the group range:

```
LTP-8X(config-ports)("Ports1")# igmp multicast dynamic-entry 0 vid 98
LTP-8X(config-ports)("Ports1")#  igmp  multicast  dynamic-entry  0  group  224.0.0.0
239.255.255.255
LTP-8X(config-ports)("Ports1")# do show profile ports Ports1
Igmp settings:
Version:                              3
Mode:                                 snooping
Immediate leave:                      false
Robustness:                           2
Querier ip:                           0.0.0.0
Query interval:                       125
Query response interval:              100
Last member query interval:           10
Multicast dynamic entry [0]:
Vlan id:                              98
First group ip:                       224.0.0.0
Last group ip:                        239.255.255.255
...
Port [1]:
Bridge group:                         1
Spanning tree for bridge group:       false
Multicast enable:                     true
Multicast port settings:
Upstream igmp vid:                    14
Upstream igmp prio:                   0
Upstream igmp tag control:            replace vid
Downstream multicast vid:             14
Downstream multicast prio:            0
Downstream multicast tag control:     replace vid
Max groups:                           0
Max multicast bandwidth:              0
Shaper downstream:
Enable:                               false
Commited rate:                        1000000
Shaper upstream:
Enable:                               false
Commited rate:                        1000000
...
```

Step 7. Assign the created profiles in ONT. Configure a custom-cross-connect profile, specify C-VLAN 200

and apply the configuration:

```
LTP-8X(config)# interface ont 0/0
LTP-8X(config)(if-ont-0/0)# service 0 profile cross-connect UsIGMP
LTP-8X(config)(if-ont-0/0)# profile ports Ports1
LTP-8X(config)(if-ont-0/0)# service 0 custom vid 200
LTP-8X(config)(if-ont-0/0)# do commit
```

Step 8. Add VLAN 98 and VLAN 200 in the switch view. Enable IGMP snooping.

```
LTP-8X> switch
LTP-8X(switch)# configure
LTP-8X(switch)(config)# vlan 200
LTP-8X(switch)(config-vlan)# tagged front-port 0
LTP-8X(switch)(config-vlan)# tagged pon-port 0 - 7
LTP-8X(switch)(config-vlan)# ip igmp snooping enable
LTP-8X(switch)(config-vlan)# exit
LTP-8X(switch)(config)# vlan 98
LTP-8X(switch)(config-vlan)# tagged front-port 0
LTP-8X(switch)(config-vlan)# tagged pon-port 0 - 7
LTP-8X(switch)(config-vlan)# ip igmp snooping enable
LTP-8X(switch)(config-vlan)# exit
```

Step 9. Configure IGMP proxy for IGMP packets transmission from VLAN 200 to VLAN 98. Apply the configuration.

```
LTP-8X(switch)(config)# ip igmp proxy report enable
LTP-8X(switch)(config)# ip igmp proxy report range 224.0.0.0 239.255.255.255 from 200
to 98
LTP-8X(switch)(config)# ip igmp snooping
LTP-8X(switch)(config)# commit
```

24.2 Model 2 (3) Multicast Configuration

Let us configure a multicast service for model 2. The multicast service operates in VLAN 98 in our example, an STB operating in VLAN 14 is connected to an ONT port. Upstream IGMP packets come to VLAN 14 in the ONT where VLAN 14 is replaced with VLAN 98, and then the data is further transferred upstream through the GEM port. The multicast service comes downstream to the ONT port in VLAN 98 and changes to VLAN 14. For more details on general configuration principles of data communication channel refer to Chapter 20, page 76.

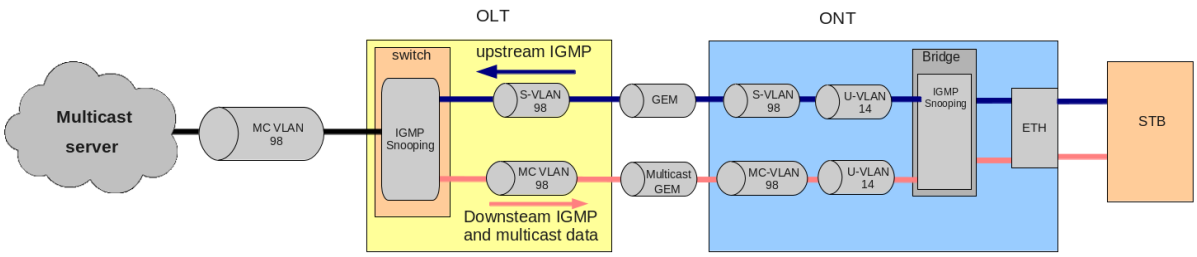

Fig. 24.4. Model 3 Multicast

Step 1. Add an ONT to the configuration.

```
LTP-8X# configure terminal
LTP-8X(config)# interface ont 0/0
LTP-8X(config)(if-ont-0/0)# serial ELTX01234567
LTP-8X(config)(if-ont-0/0)# exit
```

Step 2. Assign a service model.

```
LTP-8X(config)# gpon olt model 3
```

Step 3. Create a "UsIGMP" cross-connect profile to transfer upstream IGMP requests. Configure a bridged service and specify the bridged group (it equals 1 in our example) the ONT port will be associated with. Specify U-VLAN 14 and S-VLAN 98:

```
LTP-8X(config)# profile cross-connenct UsIGMP
LTP-8X(config-cross-connect)("UsIGMP")# bridge
LTP-8X(config-cross-connect)("UsIGMP")# bridge group 1
LTP-8X(config-cross-connect)("UsIGMP")# outer vid 98
LTP-8X(config-cross-connect)("UsIGMP")# user vid 14
LTP-8X(config-cross-connect)("UsIGMP")# do show profile cross-connect UsIGMP
datatype GChar_t value UsIGMP
Name: 'UsIGMP'
Description: 'ONT Profile Cross Connect 1'
Model: ont
Bridge group: 1
Tag mode: single-tagged
Outer vid: 98
Outer cos: unused
Inner vid: -
U vid: 14
U cos: unused
Mac table entry limit: unlimited
Type: general
Iphost eid: 0
Priority queue: 0
```

Step 4. Associate a bridge port with an ONT port. To do this, create a "ports" profile and assign value 1 to the "bridge group" parameter for the LAN1 port:

```
LTP-8X(config)# profile ports Ports1
LTP-8X(config-ports)("Ports1")# port 1 bridge group 1
```

Step 5. Enable multicast and configure VLAN replacement rules for the ONT port (upstream and downstream):

```
LTP-8X(config-ports)("Ports1")# port 1 multicast
LTP-8X(config-ports)("Ports1")# port 1 igmp downstream vid 14
LTP-8X(config-ports)("Ports1")# port 1 igmp downstream tag-control replace-vid
LTP-8X(config-ports)("Ports1")# port 1 igmp upstream vid 98
LTP-8X(config-ports)("Ports1")# port 1 igmp upstream tag-control replace-vid
```

Step 6. You also need to configure VLAN 98 multicast and specify the group range:

```
LTP-8X(config-ports)("Ports1")# igmp multicast dynamic-entry 0 vid 98
LTP-8X(config-ports)("Ports1")#  igmp  multicast  dynamic-entry  0  group  224.0.0.0
239.255.255.255
LTP-8X(config-ports)("Ports1")# do show profile ports Ports1...
Igmp settings:
Version:                                    3
Mode:                                       snooping
Immediate leave:                            false
Robustness:                                 2
```

```
Querier ip:                                     0.0.0.0
Query interval:                                 125
Query response interval:                        100
Last member query interval:                     10
Multicast dynamic entry [0]:
Vlan id:                                        98
First group ip:                                 224.0.0.0
Last group ip:                                  239.255.255.255
...
Port [1]:
Bridge group:                                   1
Spanning tree for bridge group:                 false
Multicast enable:                               true
Multicast port settings:
Upstream igmp vid:                              98
Upstream igmp prio:                             0
Upstream igmp tag control:                      replace vid
Downstream multicast vid:                       14
Downstream multicast prio:                      0
Downstream multicast tag control:               replace vid
Max groups:                                     0
Max multicast bandwidth:                        0
Shaper downstream:
Enable:                                         false
Commited rate:                                  1000000
Shaper upstream:
Enable:                                         false
Commited rate:                                  1000000
...
```

GEM ports will be created automatically and do not require any additional configuration.

Step 7. Assign the created profiles in ONT and apply the configuration.

```
LTP-8X(config)# interface ont 0/0
LTP-8X(config)(if-ont-0/0)# service 0 profile cross-connect UsIGMP
LTP-8X(config)(if-ont-0/0)# profile ports Ports1
LTP-8X(config)(if-ont-0/0)# do commit
```

Step 8. Add VLAN 98 in the switch view and enable IGMP snooping:

```
LTP-8X> switch
LTP-8X(switch)# configure
LTP-8X(switch)(config)# vlan 98
LTP-8X(switch)(config-vlan)# tagged front-port 0
LTP-8X(switch)(config-vlan)# tagged pon-port 0 – 7
LTP-8X(switch)(config-vlan)# ip igmp snooping enable
LTP-8X(switch)(config-vlan)# exit
LTP-8X(switch)(config)# ip igmp snooping
LTP-8X(switch)(config)# commit
```

Chapter 25.

VoIP Configuration

Introduction

The Chapter describes peculiarities of VoIP service configuration.

The terminal supports several methods of VoIP configuration:

— VoIP configuration in OMCI management domain;

— VoIP configuration in RG management domain.

A methods is chosen based on service model and ONT functionality.

25.1 VoIP Configuration in OMCI Management Domain

VoIP is a special bridged service. It has all general properties of a bridged service. Operator's actions required for services configuration are described in details in Chapter 20, page 76.

As opposed to other bridge services, VoIP has the **iphost** type in the **cross-connect** profile to terminate traffic in internal virtual IP interface. That also requires the **Iphost eid** parameter to be specified. As a rule, it should equal 1. Contact your ONT vendor for information about the "Iphost eid" value VoIP should have.

Step 1. Configure a cross-connect profile to be used as VoIP.

```
LTP-8X(config)# profile cross-connect VoIP
LTP-8X(config-cross-connect)("VoIP")# bridge
LTP-8X(config-cross-connect)("VoIP")# type iphost
LTP-8X(config-cross-connect)("VoIP")# bridge group 2
LTP-8X(config-cross-connect)("VoIP")# iphost eid 1
```

Step 2. Check the changes made.

```
LTP-8X(config-cross-connect)("VoIP")# do show profile cross-connect VoIP
...
Type:                       iphost
Iphost eid:                 1
Priority queue:             0
```

Step 3. Apply the changes by using the **config commit** command.

```
LTP-8X(config-cross-connect)("VoIP")# do commit
```

25.2 VoIP Configuration in RG Management Domain

In case a VoIP client is located after the U point (i. e. in an RG management domain), a VoIP service has the same configuration procedure as all other routed services. The procedure is described in details in Chapter 20, page 76. All general steps of service configuration apply to VoIP.

Chapter 26.

TR-069 Protocol Management Configuration

Introduction

This Chapter describes configuration of data communication channel for a CPE management service via the TR-069 protocol.

Two modes are available to establish an ONT management channel: Inband and OutOfBand. Inband is a preferred mode as it is simpler. Contact your ONT vendor for information about operation capabilities of both modes.

ONT TR-069 management is a special service. All general steps of service configuration apply to TR-069 management. Operator's actions required for services configuration are described in details in Chapter 20, page 76.

As opposed to other services, a management service has the "management" type specified in the "cross-connect" profile. You also need to specify the "Iphost eid" parameter. As a rule, it should equal 0.

26.1 Configuration of a TR-069 Inband management channel

This mode is characterised by its simple implementation. Management traffic goes through the same bridge as user traffic. Fig. 26.1 shows a part of OMCI scheme. Arrows show the traffic flow.

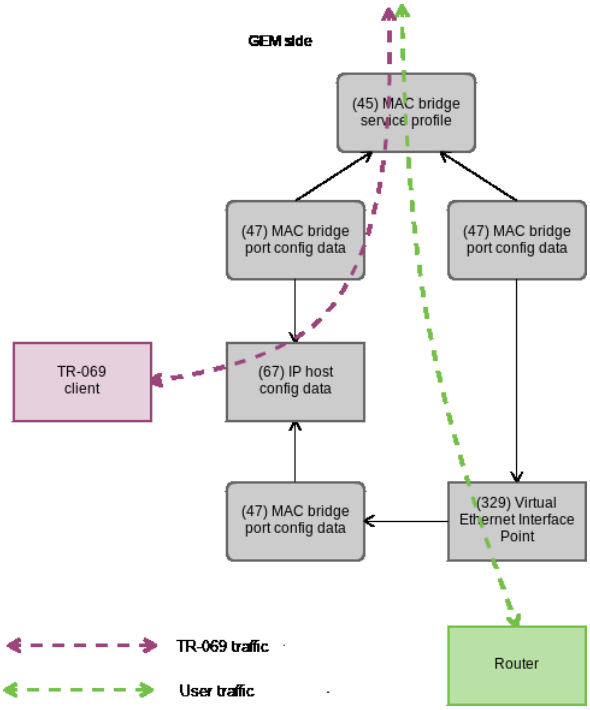

Fig. 26.1. TR-069 Inband Management Channel

Step 1. Set the "management" type in the "cross-connect" profile.

```
LTP-8X(config)# profile cross-connect TR069
LTP-8X(config-cross-connect)("TR069")# type management
```

Step 2. Set the "ont-rg" model of the "cross-connect" profile.

```
LTP-8X(config-cross-connect)("TR069")# no bridge
```

Step 3. Set the "IP Host" identifier to 0.

```
LTP-8X(config-cross-connect)("TR069")# iphost eid 0
```

Step 4. Check the changes.

```
LTP-8X(config-cross-connect)("TR069")# do show profile cross-connect TR069
Name:                           'TR069'
Description:                    'ONT Profile Cross Connect 1'
Model:                          ont-rg
Bridge group:                   -
Tag mode:                       double-tagged
Outer vid:                      1105
Outer cos:                      unused
Inner vid:                      -
U vid:                          untagged
U cos:                          unused
Mac table entry limit:          unlimited
Type:                           management
Iphost eid:                     0
Priority queue:                 0
```

Step 5. Apply the changes by using the **do commit** command.

```
LTP-8X(config-cross-connect)("TR069")# do commit
```

26.2 Configuration of a TR-069 OOB Management Channel

Not all ONT vendors support TR-069 Inband management channel. An OutOfBand alternative management channel is developed for this case. The main peculiarity of the mode is that is uses a separate bridge for management. Provided below is a part of the OMCI scheme. Arrows show the traffic flow.

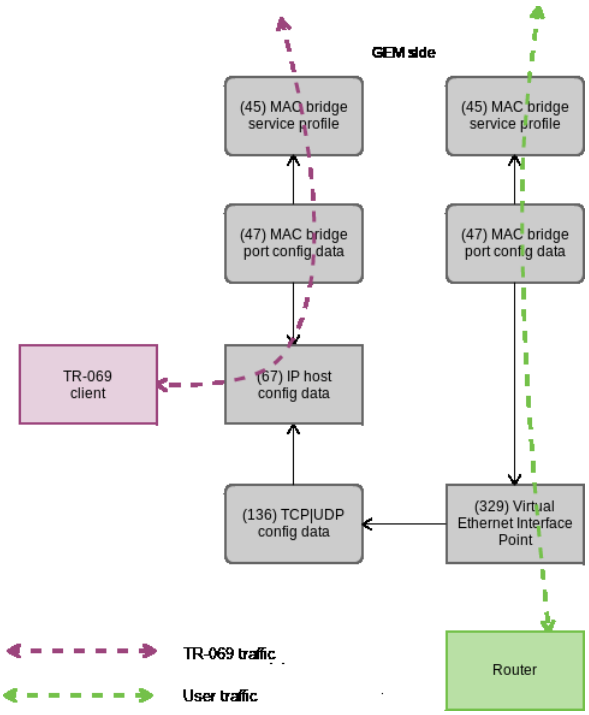

Fig. 26.2. TR-069 OutOfBand Management Channel

Step 1. Set the "management" type in the "cross-connect" profile.

```
LTP-8X(config)# profile cross-connect TR069
LTP-8X(config-cross-connect)("TR069")# type management
```

Step 2. Set the "ont" model of the "cross-connect" profile. Specify a separate bridge-group.

```
LTP-8X(config-cross-connect)("TR069")# bridge
LTP-8X(config-cross-connect)("TR069")# bridge group 20
```

Step 3. Set the "IP Host" identifier to 0.

```
LTP-8X(config-cross-connect)("TR069")# iphost eid 0
```

Step 4. Check the changes by using the **do show** command.

```
LTP-8X(config-cross-connect)("TR069")# do show profile cross-connect TR069
Name:                                  'TR069'
Description:                           'ONT Profile Cross Connect 1'
Model:                                 ont
Bridge group:                          20
Tag mode:                              double-tagged
Outer vid:                             1
Outer cos:                             unused
Inner vid:                             -
U vid:                                 untagged
U cos:                                 unused
Mac table entry limit:                 unlimited
Type:                                  management
Iphost eid:                            0
Priority queue:                        0
```

Step 5. Apply the changes by using the **do commit** command.

```
LTP-8X(config-cross-connect)("TR069")# do commit
```

26.3 TR-069 Client Configuration

The **management** profile is used for TR-069 client configuration.

```
LTP-8X# show profile management management-00
Name:                                  'management-00'
Description:                           'ONT Profile Management 0'
Enable omci configuration:             true
Url:                                   ''
Username:                              ''
Password:                              ''
```

If DHCP server transfers TR-069 parameters using option 43, there is no need in sending the parameters to OMCI. Set the Disable this phrase by using no omci-configuration command.

Otherwise, parameters of the TR-069 client require explicit specification.

Step 1. Enable TR-069 configuration.

```
LTP-8X(config)# profile management management-00
```

```
LTP-8X(config-management)("management-00")# omci-configuration
```

Step 2. Specify connection parameters.

```
LTP-8X(config-management)("management-00")# url http://acs.tele.com:9595/acs
LTP-8X(config-management)("management-00")# username acs
LTP-8X(config-management)("management-00")# password acsacs
```

Step 3. Check the changes.

```
LTP-8X(config-management)("management-00")# url http://acs.tele.com:9595/acs
LTP-8X(config-management)("management-00")# do show profile management management-00
Name:                           'management-00'
Description:                    'ONT Profile Management 0'
Enable omci configuration:      true
Url:                            'http://acs.tele.com:9595/acs'
Username:                       'acs'
Password:                       'acsacs'
```

Step 4. Apply the changes by using the **do commit** command.

```
LTP-8X(config-management)("management-00")# do commit
```

Chapter 27.

ONT Configurations Templates

Introduction

It is not always convenient, especially for large scale operators, to build ONT configuration from separate profiles for each subscriber. This process is painstaking and risky in a certain sense as it is highly prone to operator error.

As a rule, such companies employ at least one service plan with pre-defined ONT profiles. This Chapter describes ONT templates—an effective solution to simplify the work of subscriber service center specialists.

The essence of configuration templates is simple. Network administrator prepares required quantity of templates for the quantity of service plans. Configuration template contains detailed profile list and a set of ONT parameters. Subscriber service center specialist or OSS/BSS system assigns the template to ONT and identifies additional configuration parameters, if necessary. As a rule, configuration assignment is performed in one click or by using one command.

27.1 ONT Configuration Templates

Step 1. Define ONT Configuration Template.

```
LTP-8X(config)# template HSI-100-CaTV
LTP-8X(ont-template)("HSI-100-CaTV")#
```

Step 2. Set an ONT configuration. Template configuration process does not have any peculiarities and exactly follows ONT configuration process described in Chapter 20, page 77.

```
LTP-8X(ont-template)("HSI-100-CaTV")# service 0 profile dba AllServices
LTP-8X(ont-template)("HSI-100-CaTV")# service 0 profile cross-connect Service1
LTP-8X(ont-template)("HSI-100-CaTV")# service 1 profile dba AllServices
LTP-8X(ont-template)("HSI-100-CaTV")# service 1 profile cross-connect Service2
LTP-8X(ont-template)("HSI-100-CaTV")# profile ports Ports1
....
```

Step 3. Disable all configuration parameters that should be specified explicitly for ONT with the undefine

command, if necessary.

```
LTP-8X(ont-template)("HSI-100-CaTV")# undefine rf-port-state
....
```

Step 4. Apply the changes made

```
LTP-8X(ont-template)("HSI-100-CaTV")# do commit
```

27.2 ONT Configuration Templates Assignment

Step 1. Switch to the ONT view. For group operations, you can use the range of ONT IDs, if necessary.

```
LTP-8X(config)# interface ont 0/0-10
LTP-8X(config)(if-ont-0/0-10)#
```

Step 2. Assign configuration template to ONT by using the template command.

```
LTP-8X(config)(if-ont-0/0-10)# template HSI-100-CaTV
```

Step 3. Define individual ONT parameters not specified in the template, if necessary.

```
LTP-8X(config)(if-ont-0/0-10)# rf-port-state enabled
```

Step 4. Apply the changes made

```
LTP-8X(config)(if-ont-0/0-10)# do commit
```

27.3 ONT Configuration Preview with Templates

ONT configuration viewing is performed by using the **show interface ont <id> configuration** command. [T] markers (Template) allow to discriminate template configuration parameters from the general ones. In this example, Rf port state is the only general parameter

```
LTP-8X(config)(if-ont-0/0-10)# do show interface ont 0/0 configuration
----------------------------------
[ONT0/0] configuration
----------------------------------
Description:                          ''
Enabled:                              true
Serial:                               ELTX5C00008C
Password:                             ''
[T] Fec up:                           false
[T] Downstream broadcast:             true
[T] Ber interval:                     100000
[T] Ber update period:                60
Rf port state:                        enabled
[T] Omci error tolerant:              false
Service [0]:
[T] Profile cross connect:            Service1     ONT Profile Cross Connect 1
[T] Profile dba:                      AllServices  ONT Profile DBA 1
Service [1]:
[T] Profile cross connect:            Service2     ONT Profile Cross Connect 2
[T] Profile dba:                      AllServices  ONT Profile DBA 1
Service [2]:
[T] Profile cross connect:            unassigned
[T] Profile dba:                      unassigned
Service [3]:
```

```
[T] Profile cross connect:              unassigned
[T] Profile dba:                        unassigned
Service [4]:
[T] Profile cross connect:              unassigned
[T] Profile dba:                        unassigned
Service [5]:
[T] Profile cross connect:              unassigned
[T] Profile dba:                        unassigned
Service [6]:
[T] Profile cross connect:              unassigned
[T] Profile dba:                        unassigned
Service [7]:
[T] Profile cross connect:              unassigned
[T] Profile dba:                        unassigned
[T] Profile shaping:              shaping-00          ONT Profile Shaping 0
[T] Profile ports:                      ports-00            ONT Profile Ports 0
[T] Profile management:                 management-00       ONT Profile Management 0
[T] Profile scripting:                  unassigned
Custom model:                           none
Template:                               HSI-100-CaTV        ONT Template 1
```

Part V Terminal Monitoring

Chapter 28.

General

28.1 Information on Terminal Software Current Version

To view information on the current version of terminal software, use the **show version** command.

```
LTP-8X# show version
Eltex LTP-8X:rev.B software version 3.24.1 build 109 on 15.12.2015 12:01
```

28.2 Terminal Information Preview

To view terminal information, use the **show system environment** command.

```
LTP-8X# show system environment
    System information:
        CPU load average (1m, 5m, 15m):   0.14  0.18  0.29
        Free RAM/Total RAM (Mbytes):      295/495
        Temperature (sensor1/sensor2):    27C  44C

        Fan configured speed, %:          auto
        Fan minimum speed, %:             15
        Fan speed levels, %:              15 27 39 51 64 76 88 100

        Fan state (fan0/fan1):            5640rpm  5760rpm
        TYPE:                             LTP-8X:rev.B
        HW_revision:                      2v4
        SN:                               GP28000328
        MAC:                              A8:F9:4B:89:B1:8C
```

Table 28.1. Terminal Parameters

Parameter	Description
CPU load average	Number of waiting processes
Free RAM / Total RAM	Free/total operating memory
Temperature	Temperature of sensors 1 and 2
Fan state	Fans state and rpm value

28.3 Information on Terminal Operating Time

To view terminal operating time, use the **show uptime** command.

```
LTP-8X# show uptime
7 days, 20:11
```

28.4 Network Connection Check

To check network connection, use the **ping** command. As a parameter, pass the IP address of the unit to be check.

```
LTP-8X# ping 192.168.22.4
PING 192.168.22.4 (192.168.22.4): 56 data bytes
64 bytes from 192.168.22.4: seq=0 ttl=64 time=0.422 ms
64 bytes from 192.168.22.4: seq=1 ttl=64 time=0.426 ms
64 bytes from 192.168.22.4: seq=2 ttl=64 time=0.360 ms
64 bytes from 192.168.22.4: seq=3 ttl=64 time=0.397 ms
64 bytes from 192.168.22.4: seq=4 ttl=64 time=0.404 ms

--- 192.168.22.4 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max = 0.360/0.401/0.426 ms
```

Chapter 29.

Terminal Operation Log

To view a local terminal operation log, use the **show log** command.

```
LTP-8X# show log
...
Jan 1 00:00:49 LTP-8X pmchal: notice: [OLT] OLT reset successfully
Jan 1 00:01:05 LTP-8X pmchal: notice: [PPPOEIA] PPPoE IA initialized successfully
Jan 1 00:01:05 LTP-8X pmchal: notice: [DHCPRA] DHCP RA initialized successfully
Jan 1 00:01:11 LTP-8X pmchal: notice: [OLT] OLT initialized successfully
Jan 1 00:01:11 LTP-8X pmchal: notice: [OLT] OLT0 FW version 2.3.37.1008
Jan 1 00:01:11 LTP-8X pmchal: notice: [OLT] OLT0 FW is up to date
Jan 1 00:01:11 LTP-8X pmchal: notice: [OLT] OLT1 FW version 2.3.37.1008
Jan 1 00:01:11 LTP-8X pmchal: notice: [OLT] OLT1 FW is up to date
...
```

You can apply a filter to log messages. To do this, use the **show log grep** command. The command takes a string as a parameter that is used for search in the log. Only the messages containing the string will be displayed on the screen.

```
LTP-8X# show log grep pmchal
```

If console output or output to CLI sessions is configured for the log messages, the messages will be output to these devices automatically as soon as they are generated. User does not need to perform any additional operations.

When a remote syslog server is used, use the log display tools provided by the server.

Chapter 30.

Active Alarms Log

To view the active alarms log, use the **show alarms** command. Pass an event type (see Table 13.4) and/or their severity (see Table 13.5).

```
LTP-8X# show alarms all all
Active alarms (3):
##        Type      Severity      Description
0         Fan       Critical      FAN0 stopped (0 rpm)
```

Chapter 31.

GPON Monitoring

31.1 GPON OLT State

Step 1. To view GPON OLT state, use the **show gpon olt state** command.

```
LTP-8X# show gpon olt state
    Device count:            2
    Gpon-ports per device:   4
    Driver version:          1.2.561
    Device 0:
        Firmware version:    2.3.37.1015
        Hardware version:    5211.2
    Device 1:
        Firmware version:    2.3.37.1015
        Hardware version:    5211.2
```

Table 31.1 shows description of the displayed GPON OLT parameters.

Table 31.1. GPON OLT Parameters

Parameter	Description
Device count	The number of OLT chips
Channels per device	The number of channels in one OLT chip
Firmware version	OLT chip firmware version
Hardware version	OLT chip hardware version

31.2 GPON Interface State

Step 1. To view the state of GPON interfaces, use the **show gpon olt state** command..

```
LTP-8X# show interface gpon-port 0-7 state
    Reading:  ........
Gpon-ports status information:
Gpon-ports:                      0     1            2     3     4     5     6     7
State:                          OK    OK           OK    OK    OK    OK    OK    OK
ONT count:                       0     0            1     0     0     0     0     0
SFP vendor:                    n/a   n/a       Ligent   n/a   n/a   n/a   n/a   n/a
SFP product number:            n/a   n/a  LTE3680M-BC   n/a   n/a   n/a   n/a   n/a
SFP vendor revision:           n/a   n/a          1.0   n/a   n/a   n/a   n/a   n/a
SFP temperature [C]:           n/a   n/a           59   n/a   n/a   n/a   n/a   n/a
SFP voltage [V]:               n/a   n/a         3.34   n/a   n/a   n/a   n/a   n/a
SFP tx bias current [mA]:      n/a   n/a        18.42   n/a   n/a   n/a   n/a   n/a
SFP tx power [dBm]:            n/a   n/a         3.20   n/a   n/a   n/a   n/a   n/a
```

Table 31.2. Parameters of GPON Interfaces

Parameter	Description
Channel	Channel number
State	Channel state
ONT count	The number of ONT in the channel
SFP vendor	SFP vendor
SFP product number	SFP model
SFP vendor revision	SFP revision
SFP temperature	SFP temperature in Celsius degrees
SFP voltage	SFP voltage in Volts
SFP tx bias current	Bias current in mA
SFP tx power	Transmission power in dBm

Table 31.3. States of GPON Interfaces

State	Description
INITED	Channel initialized
CFGINPROGRESS	The channel configuration is in progress
CFGFAILED	The channel configuration completed with error
OK	The channel is in operation
FAILED	The channel is out of operation
DISABLED	The channel is disabled

Step 2. To view the state of only GPON interface, execute the **show interface gpon-port <ID>** state command.

```
LTP-8X# show interface gpon-port 2 state
Channel status information:
State:                                        OK
ONT count:                                     1
SFP vendor:                               Ligent
SFP product number:                  LTE3680M-BC
SFP vendor revision:                         1.0
```

```
SFP temperature [C]:                              59
SFP voltage [V]:                                3.31
SFP tx bias current [mA]:                      18.42
SFP tx power [dBm]:                             3.29
```

31.3 MAC Table Preview

Step 1. To view the table of MAC addresses, execute the **show interface gpon-port 0 mac** command.

```
LTP-8X# show interface gpon-port 0 mac
-----------------------------------
GPON-port 0 MAC table (3 records)
-----------------------------------
Address table total (4), satisfy the query (4):
##      ONT Serial   ONT ID Channel      GEM    CVID   SVID   MAC
1 ELTX1A025A08 2      0      336    10     301    14:D6:4D:87:C0:A2
2 ELTX1A025A08 2      0      337    12     301    14:D6:4D:87:C0:A1
3 ELTX1A025A08 2      0      340    1164   9      14:D6:4D:87:C0:A0
4 ELTX1A025A08 2      0      352    1152   15     A8:F9:4B:6E:A3:46
```

31.4 Statistics for GPON Interfaces

Step 1. To view statistics of GPON interfaces, execute the **showinterface gpon-port counters** command.

```
LTP-8X# show interface gpon-port counters
##  Downstream counters for channels:          0        1          2      ...

2   RX DS octets                    1627665    1627665  1627665
3   RX DS packets                   21044      21044    21044
5   RX DS octets for channel        1627665    0        0
6   RX DS packets for channel       21044      0        0
8   TX DS octets                    13585411   0        0
9   TX DS packets                   266867     0        0
11  DS octets                       1422563    0        0
12  DS packets                      20261      0        0
13  DS unicast packets              18424      0        0
14  DS multicast packets            958        0        0
15  DS broadcast packets            879        0        0
16  DS packet dropped               383        0        0

##  Upstream counters for channels:  0         1        2

2   TX US octets                    1704580    0        0
3   TX US packets                   19966      0        0
5   US octets                       1457760    0        0
6   US packets                      19560      0        0
7   US unicast packets              18709      0        0
8   US multicast packets            400        0        0
9   US broadcast packets            451        0        0
10  US packed dropped               50         0        0
11  Packet dropped (CRC)            0          0        0
13  TX US octets reassembly         17909382   0        0
14  TX US packets reassembly        265915     0        0
```

31.5 Statistics for OLT Ethernet Interfaces

Step 1. To view statistics of OLT Ethernet interfaces (connected to the terminal switch), execute the **show interface gpon-port counters v-interface** command.

```
## Downstream counters for channels:  0     1     2     3     4     5     6     7

 1 RX Alignment errors                 0     0     0     0     0     0     0     0
 2 RX Pause frames                     0     0     0     0     0     0     0     0
 3 RX CRC-32 errors                    0     0     0     0     0     0     0     0
 4 RX Oversize errors                  0     0     0     0     0     0     0     0
 5 RX Bad FCS                          0     0     0     0     0     0     0     0
 6 RX Too long frames                  0     0     0     0     0     0     0     0
 7 RX Undersize errors                 0     0     0     0     0     0     0     0
 8 RX Range errors                     0     0     0     0     0     0     0     0
 9 RX Ok frames                      286   151   151   151   151   151   151   151
10 RX total frames                   286   151   151   151   151   151   151   151
11 RX 64 octets frames                 0     0     0     0     0     0     0     0
12 RX 65-127 octets frames           286   151   151   151   151   151   151   151
13 RX 128-255 octets frames            0     0     0     0     0     0     0     0
14 RX 256-511 octets frames            0     0     0     0     0     0     0     0
15 RX 512-1023 octets frames           0     0     0     0     0     0     0     0
16 RX 1024-1518 octets frames          0     0     0     0     0     0     0     0
17 RX 1519-MAX octets frames           0     0     0     0     0     0     0     0
18 RX Total unicast packets            0     0     0     0     0     0     0     0
19 RX Total multicast packets        286   151   151   151   151   151   151   151
20 RX Total broadcast packets          0     0     0     0     0     0     0     0
22 RX Total octets                 19448 10268 10268 10268 10268 10268 10268 10268
24 RX Ok octets                    19448 10268 10268 10268 10268 10268 10268 10268
25 RX FIFO overflow errors             0     0     0     0     0     0     0     0
26 RX Bad FCS and <64 octets           0     0     0     0     0     0     0     0
27 RX Frame errors                     0     0     0     0     0     0     0     0

## Upstream counters for channels:     0     1     2     3     4     5     6     7

 1 TX frames without errors            0     0     0     0     0     0     0     0
 2 TX valid pause frames               0     0     0     0     0     0     0     0
 3 TX frames with errors               0     0     0     0     0     0     0     0
 4 TX good unicast packets             0     0     0     0     0     0     0     0
 5 TX good multicast packets           0     0     0     0     0     0     0     0
 6 TX good broadcast packets           0     0     0     0     0     0     0     0
 8 TX octets                           0     0     0     0     0     0     0     0
```

31.6 Multicast Statistics

Step 1. To view statistics of MC flows, execute **show gpon olt igmp** command. As a parameter, pass the channel number or "all" to view statistics of all channels.

```
LTP-8X# show interface gpon-port igmp groups

All IGMP groups (4):
#    Channel Serial        Multicast address Start                 Stop
1    0       ELTX1A025A08  239.255.255.250   2014.04.17 13:54:54   2014.04.17 14:22:07
2    0       ELTX1A025A08  239.255.255.250   2014.04.17 14:26:06   2014.04.17 14:32:48
3    0       ELTX1A025A08  239.255.255.250   2014.04.17 14:36:35   2014.04.17 14:42:53
4    0       ELTX1A025A08  239.255.255.250   2014.04.17 14:46:57   2014.04.17 15:37:05
```

Chapter 32.

ONT Monitoring

32.1 ONT Configurations List

Step 1. To view ONT active configurations, execute the **show interface ont 0-7 configured** command.

```
LTP-8X# show interface ont 0-7 configured

-----------------------------------
GPON-port 0 ONT configured list
-----------------------------------

##    Serial           ONT ID  GPON-port  Status   RSSI[dBm]  Version  EquipmentID  Description
 1    0000000000000000 0       0          OFFLINE  n/a         n/a          n/a
 2    ELTX1A001593     1       0          OFFLINE  n/a         n/a          n/a
 3    ELTX1C001684     2       0          OFFLINE  n/a         n/a          n/a
 4    ELTX5D0001C0     4       0         OFFLINE   n/a         n/a          n/a

GPON-port 1 has no configured ONTs
GPON-port 2 has no configured ONTs
...
```

32.2 Active ONT List

Step 1. To view ONT empty configurations, execute the **show interface gpon-port ont unconfigured** command.

```
LTP-8X# show interface ont 0-7 unactivated

GPON-port 0 has no unactivated ONTs
GPON-port 1 has no unactivated ONTs
GPON-port 2 has no unactivated ONTs
GPON-port 3 has no unactivated ONTs
GPON-port 4 has no unactivated ONTs
GPON-port 5 has no unactivated ONTs
GPON-port 6 has no unactivated ONTs
GPON-port 7 has no unactivated ONTs

Total ONT count: 0
```

32.3 Online ONT List

Step 1. To view online ONT list, execute the **show show interface ont 0-7 online** command.

```
LTP-8X# show interface ont 0-7 online
-----------------------------------
GPON-port 0 ONT online list
-----------------------------------
## Serial ONT ID Channel Status RSSI[dBm] Version EquipmentID
```

```
1 ELTX5C00008C 3 0 OK -23.19 3.50.2.1157 NTU-RG-1402G-W
2 ELTX1A00001A 2 0 OK -24.44 3.21.1.1928 NTP-RG-1402G-W:rev.C
GPON-port 1 has no online ONTs
GPON-port 2 has no online ONTs
GPON-port 3 has no online ONTs
GPON-port 4 has no online ONTs
GPON-port 5 has no online ONTs
GPON-port 6 has no online ONTs
GPON-port 7 has no online ONTs
Total ONT count: 2
```

Table 32.1. Description of ONT States

ONT State	Description
UNACTIVATED	ONT has no configurations
ALLOCATED	ONT detected
AUTHINPROGRESS	ONT authentication is in progress
AUTHFAILED	Authentication failed
AUTHOK	Authentication successfully completed
PRECONFIG	Preparing ONT for configuration
CFGINPROGRESS	ONT configuration is in progress
CFGFAILED	Configuration failed
OK	ONT is in operation
BLOCKED	ONT is blocked
MIBRESET	ONT MIB reset
FAILED	ONT has a critical failure
FWUPDATING	ONT firmware update is in progress
DISABLED	ONT is disabled (technically blocked)

32.4 Offline ONT List

Step 1. To view the list of disconnected ONTs, execute the **show show interface ont 0-7 offline** command.

```
LTP-8X# show interface gpon-port ont offline
---------------------------------
GPON-port 0 ONT offline list
---------------------------------
## Serial ONT ID Assigned channel Description
1 0000000000000000 0 0
2 ELTX0F000129 1 0
GPON-port 1 has no offline ONTs
GPON-port 2 has no offline ONTs
GPON-port 3 has no offline ONTs
GPON-port 4 has no offline ONTs
GPON-port 5 has no offline ONTs
GPON-port 6 has no offline ONTs
GPON-port 7 has no offline ONTs
Total ONT count: 2
```

32.5 ONT Statistics

To view ONT statistics, use the **show interface ont 0/0 counters** command. Pass the number of requested statistical data (see Table 32.2) and ONT ID as parameters.

```
LTP-8X# show interface ont 0/0 counters gem-port-performance-monitoring
---------------------------------
[ONT0/0] counters
---------------------------------
Downstream counters for cross-connects:   0      1      ...    7      MC      BC
Finished intervals                        23     ---    ...    ---    ---     23
Received GEM frames                       0      ---    ...    ---    ---     0
Received payload bytes                    0      ---    ...           ---     0

Upstream counters for cross-connects:     0      1      ...    7      MC      BC

Finished intervals                        23     ---    ...    ---    ---     23
Transmitted GEM frames                    0      ---    ...    ---    ---     0
Transmitted payload bytes                 0      ---    ...    ---    ---     0
```

Table 32.2. ONT Statistical Data Types

Data Type	Description
gem-port-performance-monitoring	
gem-port-nctp-performance-monitoring	
ethernet-performance-monitoring-history-data	
ethernet-performance-monitoring-history-data2	
ethernet-performance-monitoring-history-data3	
gal-ethernet-performance-monitoring-history-data	
fec-performance-monitoring-history-data	
ethernet-frame-extended-performance-monitoring	
multicast-subscriber-monitor	

32.6 ONT Bit Error Rate

Bit error rate (BER) is the rate of errors in data transmission.

To view BER on example of ONT, execute the **show interface gpon-port <id> downstream-ber** command. As a parameter, pass the number of the GPON interface.

```
LTP-8X# show interface gpon-port 0 downstream-ber
---------------------------------
GPON-port 0 BER table
---------------------------------
##    Ch/ Id   Errors   Intervals BER Interval   BER
1     0/ 2       0        0        100000         0
2     0/ 3       0        0        100000         0
```

Part VI Terminal Maintenance

Chapter 33.

SFP Transceivers Replacement

SFP transceivers can be installed when the terminal is turned on or off. The front panel has pairs of slots: even slots in the upper line, odd slots at the bottom. For each pair of slots SFP transceivers are symmetrically installed.

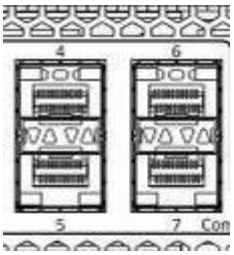

Fig. 33.1. SFP Ports View

Step 1. Insert an SFP transceiver into a slot with its open side down (open side up for the bottom line of slots).

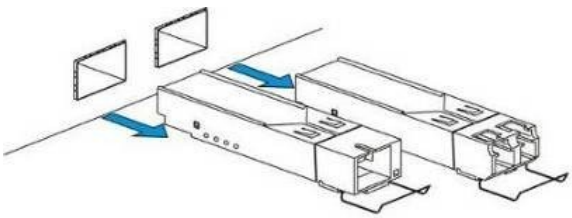

Fig. 33.2. SFP Transceivers Installation

Step 2. Press the module until it fits with a click.

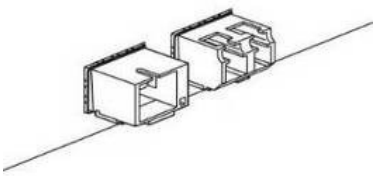

Fig. 33.3. Installed SFP Transceivers

To remove a transceiver, perform the following actions:

Step 1. Unlock the module's latch.

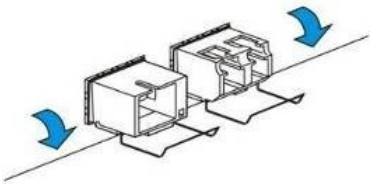

Fig. 33.3. Opening the Latch of SFP Transceivers

Step 2. Remove the module from the slot.

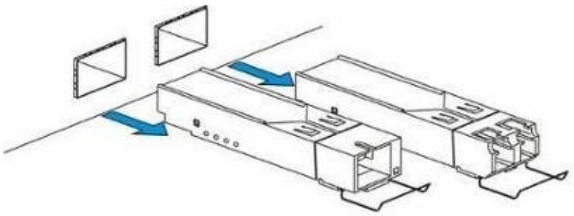

Fig. 33.4. Removing SFP Transceivers

Chapter 34.

Ventilation Units Replacement

The terminal design allows ventilation units replacement even when the terminal is on.

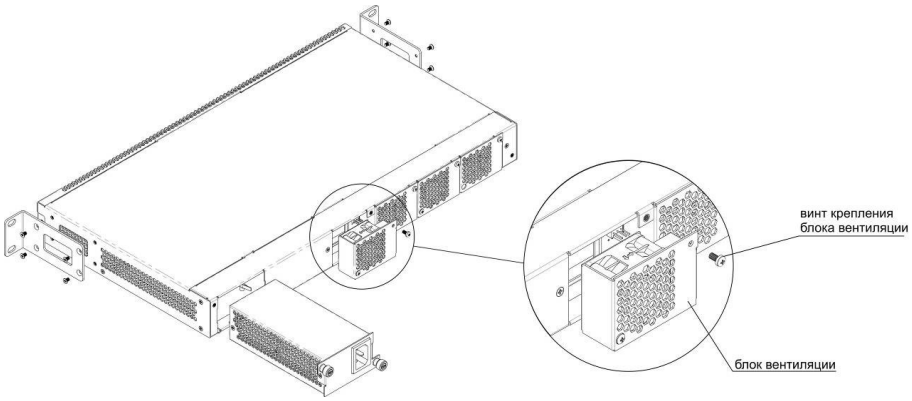

Fig. 34.1. Ventilation Unit. Installation to the Case

To remove a ventilation unit, perform the following actions:

Step 1. Use a screwdriver to remove the right screw connecting the ventilation unit with the rear panel (see Fig. 34.1).

Step 2. Carefully pull the unit until it is removed from the case.

Step 3. Disconnect the unit from the terminal socket (see Fig. 34.2).

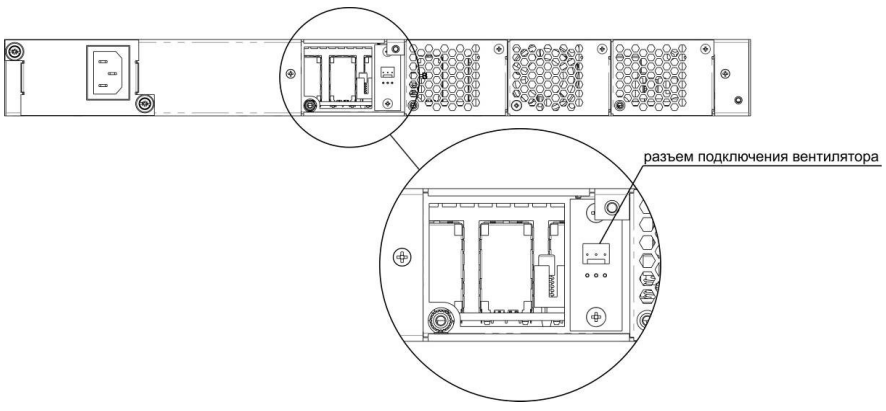

Fig. 33.2. Ventilation Unit Connector

To install a ventilation unit, perform the following actions:

Step 1. Connect the unit to the terminal socket (see Fig. 34.2).

Step 2. Lay the connection cable in a special tray on the inner side of the unit.

Step 3. Insert the unit into the terminal case.

Step 4. Screw the ventilation unit to the rear panel (see Fig. 34.1).

Chapter 35.

OLT Firmware Update

This Chapter describes the terminal firmware update procedure. To download the firmware file, use the TFTP server available in the terminal management network.

Step 1. Copy the firmware file into the root folder (or any other known folder) of the TFTP server.

Step 2. Update the firmware by using the "update system" command. Pass the firmware file name (and the folder if you copy it to a folder) and the IP address of the TFTP server.

```
LTP-8X# update system ltp-8x-3.20.2.123.fw.bin 10.0.105.1
Downloading system firmware..
.....................................................
System firmware successfully downloaded
Updating system firmware..
Current board version:            1
Current firmware version:         3.20.1.950
New firmware version:             3.20.1.951
Update device mtd5
Erase flash...
**********************************************************************
**********************************************************************
**********************************************************************
*******************************************
Done.
Write data...
Done.
Success
Update device mtd1
Erase flash...
******************************
Done.
Write data...
Done.
Success
System firmware successfully updated
```

Step 3. Reboot the terminal to start the new firmware.

```
LTP-8X# reboot
Are you sure? (y/n) y
```

Chapter 36.

ONT Firmware Update

Introduction

This Chapter describes different methods of ONT firmware update using the OMCI protocol.

36.1 ONT Firmware Update Download

ONT firmware update can run automatically for all ONTs or for a specified ONT. To start the update, download the firmware update file to the line terminal. To download the file, use the **copy** command and pass the file name and the address of the TFTP server as parameters:

```
LTP-8X# copy tftp://192.168.1.100/ntp-rg-r3.20.2.123.fw.bin.bin fs://ont-firmware
Download file from TFTP-server..
.............................................................
.............................................................
.............................
ONT firmware vendor is Eltex Corporation, version 3.20.1.1111
Write downloaded file to flash memory..
.............................................................
.............................................................
.............................
```

36.2 ONT Firmware Custom Update

To update firmware of a specified ONT, you need to create a corresponding task and specify the ONT ID and the firmware file name. There are two types of ONT firmware update tasks: single try or multiple tries.

To create a single try update task, use the **update ont** command and specify the ONT ID and file name of the firmware:

```
LTP-8X# update ont 0/0 ntp-rg-r3.20.2.123.fw.bin
Task for updated successfully created. ONT firmware will be updated in 20 minutes or
more
```

As a result, the single try update task will be created for the ONT having the specified serial number. This method is used to update the ONTs which are in the OLT channel at the time of update. The task will

end with an error for ONTs which are not connected.

To create a multiple tries update task, use a scheduler. This method is generally used to update the ONTs which are not in the OLT channel at the time of the update. The task you create in the scheduler will be executed as soon as a corresponding ONT connects to the channel. To create, delete or view tasks in the scheduler and use the **schedule ont** command. To create an ONT firmware update task, use the **schedule ont update** command and specify ONT ID and the firmware update file:

```
LTP-8X# schedule ont update 0/0 ntp-rg-r3.20.1.1111.fw.bin
Task created for [ONT0/0]
```

To view scheduled tasks, use the **schedule ont update firmware show** command:

```
LTP-8X# show schedule ont update
Existing tasks (1):
## Serial Ch/ Id Operation Status Tries remained
0 --- 0/ 0 ont_update scheduled 5
```

You can delete some of the created tasks by using the **schedule ont update firmware delete** command with ONT serial number or ID:

```
LTP-8X# no schedule ont update 0/0
Task deleted for [ONT0/0]
```

To clear the scheduler, use the **schedule ont update firmware clear** command:

```
LTP-8X# clear schedule ont update
All tasks cleared
```

The tasks created in the scheduler will continue running until the update completes successfully or the number of tries is reached (the "tries remained" parameter).

36.3 ONT Firmware Autoupdate

To enable firmware autoupdate for all ONTs, use the auto-update ont command and specify update type (immediate or postpone).

Step 1. Specify FW ONT autoupdate mode. Immediate mode enables immediate firmware autoupdate for all connected ONTs. In postpone mode, ONT firmware update will be performed upon the ONT connection.

```
LTP-8X# config
LTP-8X(config)# auto-update ont postpone
```

Step 2. Apply the changes by using the commit command:

```
LTP-8X(config)# do commit
```

Step 3. To enable ONT firmware autoupdate process, you have to specify update rules. Specify ONT model, its current firmware version and the name of the firmware file to be flashed. To do this, use

auto-update ont record command.

Create an update1 autoupdate rule. Pass ONT **XXX** type, current FW **YYY** version and the file name **ZZZ.bin** as parameters.

```
LTP-8X(config)# do show auto-update ont
Auto-update ONT: postpone
```

"Match" keyword indicates that ONT version number should match the specified number, in this case YYY.

To ease and simplify the process, you can create records to perform firmware autoupdate on ONTs, even if their firmware versions differ from the specified. Use **not-match** parameter when creating the rule:

```
LTP-8X(config)# auto-update ont record update2 equipment-id TYPE fw-version not-
match V2 filename V2.bin
Record was added successfull
```

As the result, update2 record will be created in the table, where ONT with the type of TYPE and the version not equal to V2 will be autoupdated with V2.bin file. It will allow to update all ONTs with the required V2 version.

If there are several records in the table for some ONT type, autoupdate will be performed by the rule, recorded last for this ONT type.

Step 4. You can view the created records by using the show auto-update ont records command:

```
LTP-8X(config)# do show auto-update ont records
Name EquipmentID FWVersion FileName
update1 TYPE V1 V2.bin
update2 TYPE !V2 V2.bin
```

Step 5. You can delete the created record by using the no auto-update ont record command and specifying the record name:

```
LTP-8X(config)# no auto-update ont record update1
Record was deleted successfully
```

To clear the record table, use the **no auto-update ont records** command:

```
LTP-8X(config)# no auto-update ont records
Records cleared successfully.
```