E8120T Network Management Software Instruction

User's Manual

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Chapter 1 Product Overview

1.1 List of Items

Open the packing box of a switch with the following items in the box:

◆ An OLT

◆ A CD disk

◆ A single power cord

◆ A User's Manual

◆ A serial line

For loss or damage of the stated products and attachments, contact the supplier.

1.2 Description of Front Panel

The front panel of the OLT is equipped with a power socket and a switch button. As shown below:
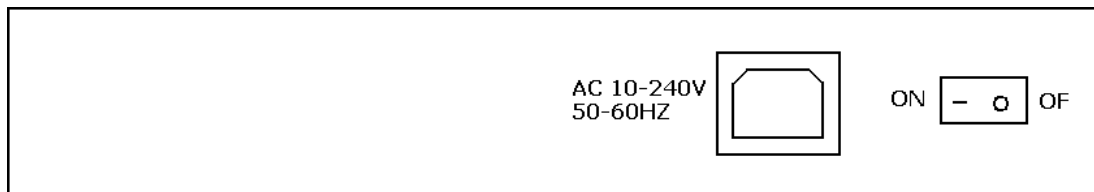
Picture 1.2 Front Panel

1.3 Description of the Back Panel

The back panel of the OLT is equipped with 21 indicators, 2 PON interfaces, 2 optical interfaces of upper connection, 2 RJ45 interfaces, 1 management interface, 1 serial interface and 1 reset switch from left to right. As shown below.
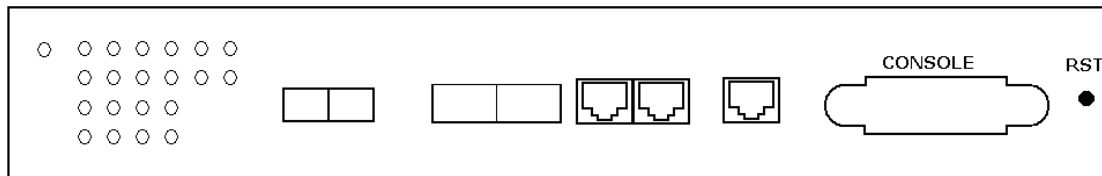
Picture 1.3 Back Panel

1.4 Description of Indicator

OLT is equipped with 16 indicators with meanings shown below from the left to right:

	LED	Color	Status	Description
Power indicator	POW	Green	On	When the power supply of the OLT is turned on, the corresponding power indicator is on.
		—	Off	Check the power interface or adapter to determine that the power supply has been properly connected.
PON	LINK	Green	On	ONU is normally connected to the corresponding port
		Green	Flash	ONU isn't normally connected to the corresponding port
	FALT	Green	On	Reserved
		—	Off	Reserved
	ALARM	Green	Flash	There is an alarm signal occurring to the corresponding PON interface
		—	Off	There isn't an alarm signal occurring to the corresponding PON interface
NNI	TX	Green	On	ONU is normally connected to the corresponding port
		—	Off	ONU isn't normally connected to the corresponding port

	100M	Green	On	Reserved
		—	Off	Reserved
	LINK1000	Green	On	There is an alarm signal occurring to the corresponding PON interface
		—	Off	There isn't an alarm signal occurring to the corresponding PON interface
MANAGE	LINK/ACT	Green	Flash	One ONU or OLT alarm signal occurs.
		—	Off	Works properly.
	LINK10	Green	Flash	One ONU or OLT alarm signal occurs.
		—	Off	Works properly.
ALARM1	/	Green	Flash	An alarm signal occurs to the OLT
	/	—	Off	No alarm signal for OLT
ALARM2	/	Green	On	OLT starts normally
	/	—	Off	OLT starts abnormally

1.5 Main Features

XDK-E8120T is a new generation of miniaturized GEPON equipment which is one kind of carrier-grade FTTH broadband access equipment for telecom operators. It features high integration, flexible application, high reliability, assurance of providing quality of service (QoS), manageability, flexible capacity expansion and networking. XDK-E8120T has integrated the EPON system based on the latest standard of IEEE802.3ah, of which the uplink and downlink rate of the optical line can reach 1.25Gb/s. With an optical fiber and 32 remote ONU equipment of EPON, each set of EPON systems can form a passive optical network to transmit the Ethernet data via an optical distributor with the maximum split ratio of 1:32. Moreover, it has the following advantages: large capacity of transmission, good confidentiality, flexible networking, saving optical link resources, and quantity of central office equipment.

XDK-E8120T mainly applies to the FTTH project (the realization of fiber to the home), which can complete the access of services, such as IP phone, broadband data, IPTV and so on. It has the functions below: performance management, fault management, configuration equipment, etc., for the equipment; and is generally placed in the machine room of telecommunication bureaus, sub-districts, or buildings. If the network is simple, the core equipment can be directly linked without the convergence layer.

Features:

● Compatibility

XDK-E8120T is one kind of small cassette equipment with the height of 1U. It can be linked with the access equipment of XDK-E8010U/XDK-E8011U EPON ONU.

● Long Distance

With the optical split ratio of 1:32, the coverage radius of XDK-E8120T can reach 20 kilometers and the line parts are made of passive devices, which can greatly solve the expenses of machine room construction and later maintenance for the operators.

● High Reliability

After the entire power supply of the equipment fails abnormally and restores, the system can rapidly resume normal work according to the stored configuration.

● Flexible Networking

The uplink interface of XDK-E8120T can provide 10/100/1000M self-adapting electrical interface, 1000M optical interface as well as multiple ways of networking, such as chain, star, and tree shapes.

● Comprehensive QoS Assurance

PON of each link can support up to 256 logical paths while the single ONU can provide multiple independent logical paths which provide good QoS for users; the AES-128 encryption can be adopted for each logical path; the strong dynamic bandwidth allocation (DBA) can be supported, the strong capacity of bandwidth sharing provided and the bandwidth availability ratio be effectively improved.

It is provided with the flexible capacity of bandwidth management. Moreover, its dual management modes based on SLA and priority level can effectively guarantee the user's minimum designated bandwidth requirement and low latency requirement of high-priority service, thus fully protecting the QoS of services.

- Strong OAM Features

XDK-E8120T supports ONU automatic discovery & registration, and user's line test; supports rich operational and manageable features for telecommunications, such as MAC address binding and filtering, IP address binding and filtering, bandwidth control, VLAN (based on two ways of division, port and 802.1Q), flow control, port aggregation, port mirroring, broadcast suppression, etc.

1.6 Technical Indicators

- Standards and protocols: IEEE802.3ah, IEEE802.3, IEEE802.3u, IEEE802.3x, IEEE802.3z, IEEE802.1d, IEEE802.1p, IEEE802.1q, IEEE802.1x, RFC1155, RFC1157, RFC1112, RFC1113, etc.

- Exchange capacity of backplane: 16G

- Step Length of Bandwidth Adjustment: 1Kbps

- Support 4K VLAN based on 802.1q and MAC address up to 8K

Physical Characteristics:

- Physical dimension: 440×207×43 (length×width×height, unit: mm)

- Machine frame: 19 inches with the height of 1U

- Power supply: 100V~240 V AC power supply

- Power consumption: 15W

- Temperature:

Working temperature: 0~50℃

Storage temperature: -30~60℃

Relative humidity: 10~90% (non-condensing)

- Weight: 5Kg

Chapter 2 Installation and Connection

2.1 Installation Notes

Make sure to provide a proper working environment and sufficient space before installing the machine. Pay attention to the installation requirements below:

- Power requirements: 100V-240V AC power supply. The power outlet and equipment shall be within 1.8m.

- The machine shall be placed in a ventilated and dry environment; and at least 10cm space shall be reserved in front and rear of the machine for ventilation.

- Make sure that there are sufficient vents around the machine to well diffuse the heat and that do not place heavy things on the switch.

Chapter 3 Software Installation

GUI enables setting and management of EPON configuration, such as SLA, bridge, VLAN mode, static list, etc. while enabling the firmware upgrading of OLT and ONU.

GUI is placed in the folder of PcHostGUI_Csharp. It can be available from the provided CD or downloaded from the Teknovus Customer Support Website. Moreover, the downloaded folder must be decompressed.

When the firmware of the new version is to be upgraded, the GUI consistent with the firmware version shall be used.

Steps below are used for installing and starting to apply GUI:

1) Copy the content of the CD or download the latest issued version to the computer from the Teknovus Customer Support Website and decompress the compressed files;

2) Find the folder for PcHostGUI_Csharp;

3) Find and double click PcHostGui.exe in the folder.

Note: firmware issuance 2.00 (R200) and update the version: the computer shall run the GUI with the latest version of Microsoft .NET framework. Clicking the file of PcHostGui.exe, the script will automatically run and check the framework. If installed, GUI will open it. If not, a web installer will automatically install it. After installation of the Framework, the GUI can open it.

Chapter 4 Description of Network Management Interface

4.1 Add OLT Connection

The host is connected to the equipment management port via a twisted pair; and the connection steps between the GUI and the equipment are shown below:

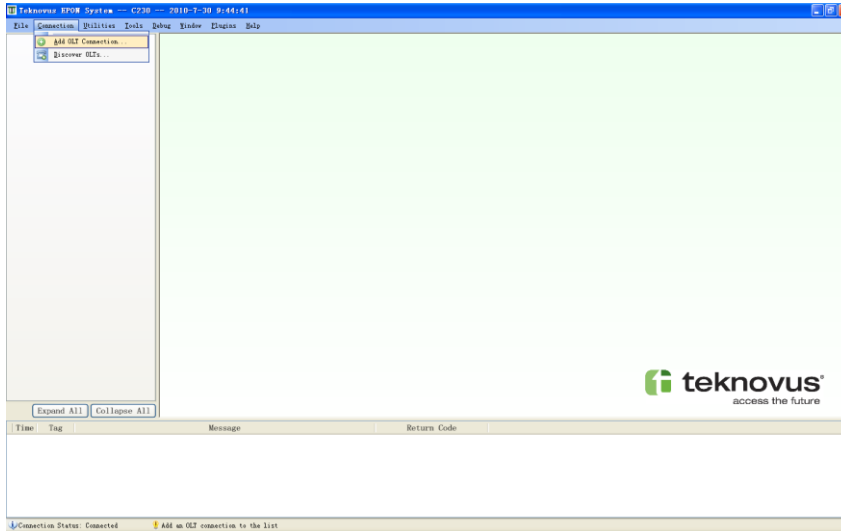1)   Select Connection/Add OLT Connection from the main menu bar of GUI shown in the Figure 2-1.

Figure 2-1 Add GUI Connection

2)   Modify the IP address of the Host and OLT which shall be consistent with the actual IP address stored in the FLASH. Here, the Host IP is default 192.168.1.100 while the OLT IP is 192.168.1.101 shown in the Figure 2-2.
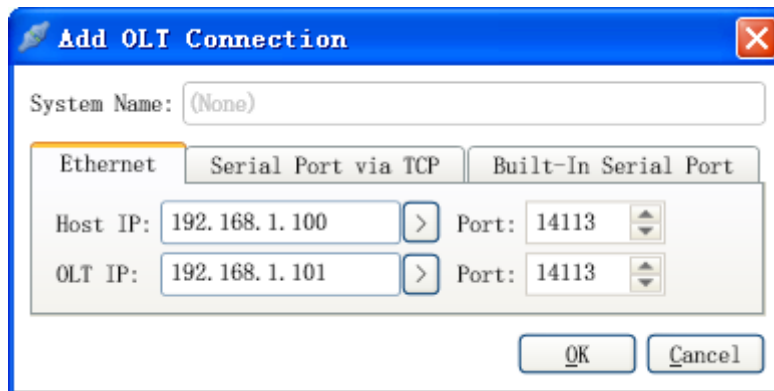
Figure 2-2 Add OLT Connection

3)   Click OK to connect successfully.

4.2 GUI Window Descriptions

GUI window descriptions are shown below:

✓   The left control panel displays two icons (1 OLT and 1 PON).

✓   Click the "►" on the left side of the PON icon, then it will display that the PON port is connected to the ONU; if there is no "►" displayed, then it indicates that the PON port isn't connected to any ONU. The Figure 2-3 displays 2 ONUs, and the GUI will display the quantity of ONU connected to the splitter.

✓   Click the "►" on the left side of the ONU icon, then it will display the LLIDs of ONU and a maximum 8 logical links are provided for each ONU. As shown in the Figure 2-4, there are two links below the ONU.

✓ The "►" is to display links connected or not; click the "►" to display links without connection; when links without connection don't exist, the "►" won't be displayed on the left side of the links.

✓ The MAC address is listed on the right side of each icon.

✓ Click the "►" on the left side of Domains, it will display to add Domain, delete Domain, etc.

✓ Expand All /Collapse All refers to expand or collapse the left list.

✓ A message window is displayed at the bottom of the window, in which details of message can be viewed. Double click it to display the window of message parse shown in the Figure 2-5.
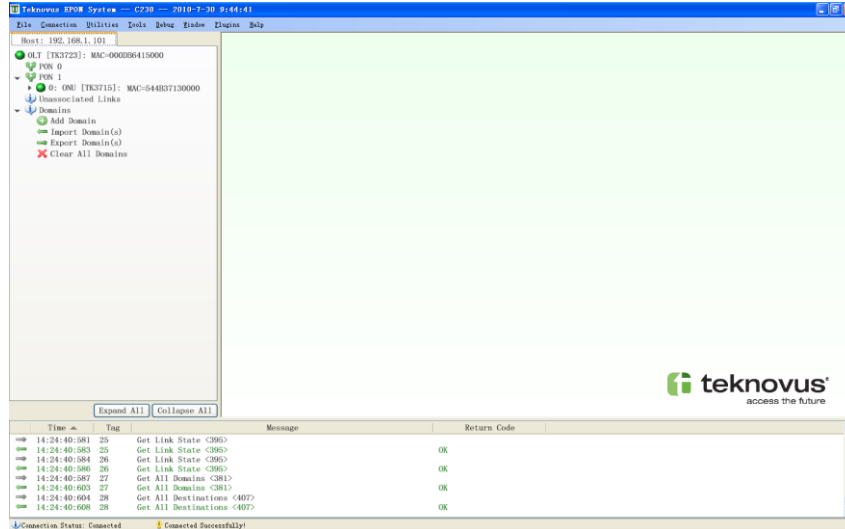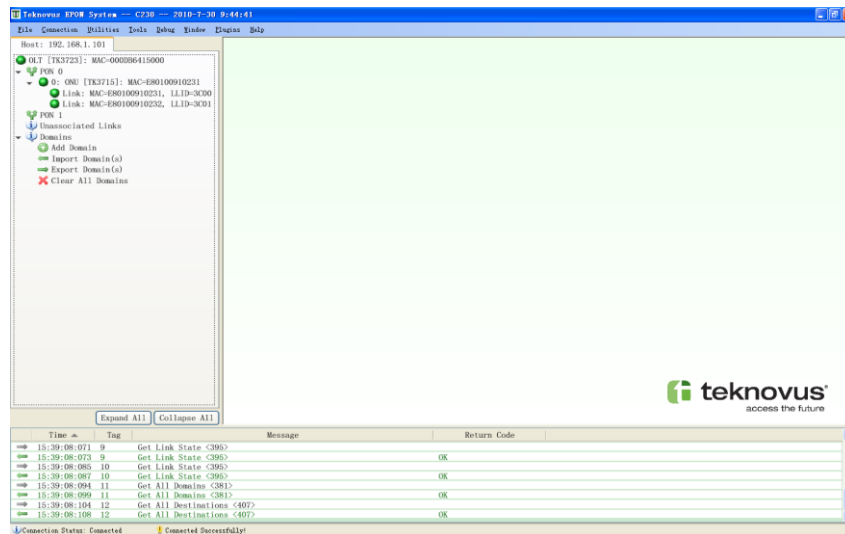

Figure 2-3 ONU Display in GUI

Figure 2-4 Link Display in GUI
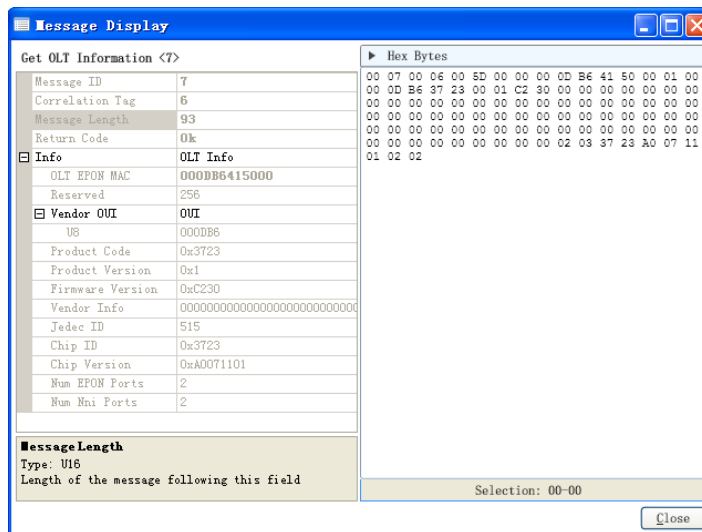
Figure 2-5 Message Parse Window

Notes:

1) When opening the GUI with problems or display errors, use the steps below to solve the problems:

   ✓ Determine the IP address of the Host and OLT;

   ✓ Determine the IP address of OLT via the ping;

   ✓ Close the GUI and re-open it.

2) If the ONU fails to register into OLT, one or two circumstances can be seen:

   ✓ The ONU link light flashes, but they are not always on.

   ✓ The fault LED of optical fiber flashes or is always on.

3) Take the several steps below to correct the problems:

   ✓ Unplug and re-plug the optical fiber.

   ✓ Confirm that the attenuator is connected in a proper position.

   ✓ Confirm that OLT is enabled in the GUI.

   ✓ Confirm that the ONU link is in the "blocked" state in the GUI. (If it is in this state, click the right mouse button on each link and select "unblock".)

   ✓ Confirm that the insertion loss of the jumping wire is less than 1 dB.

   ✓ Confirm that the insertion loss of the splitter is less than 4 dB (1x2 splitter) or the level is equivalent to the splitter.

   ✓ Use an optical power meter to test and determine that the optical power received by each ONU is more than -24dbm.

Chapter 5 Upgrading and Configuration of OLT Software

5.1 Software Upgrading

This part mainly describes the operating instructions of firmware upgrading in GUI. The following are steps of upgrading ONU with GUI:

1) Open the GUI;

2) Click the ONU in the left hierarchical tree and the ONU window will display;

   Note: if the right panel displays the "No provisioning, please select", then click any link in the left hierarchical tree and the right panel will display the selected link information.

3) On the top of the hierarchical tree, select Misc/Commands. Miscellaneous Information/Commands window display is shown in the figure below; the existing version of ONU firmware can be seen shown in the Figure 3-1;
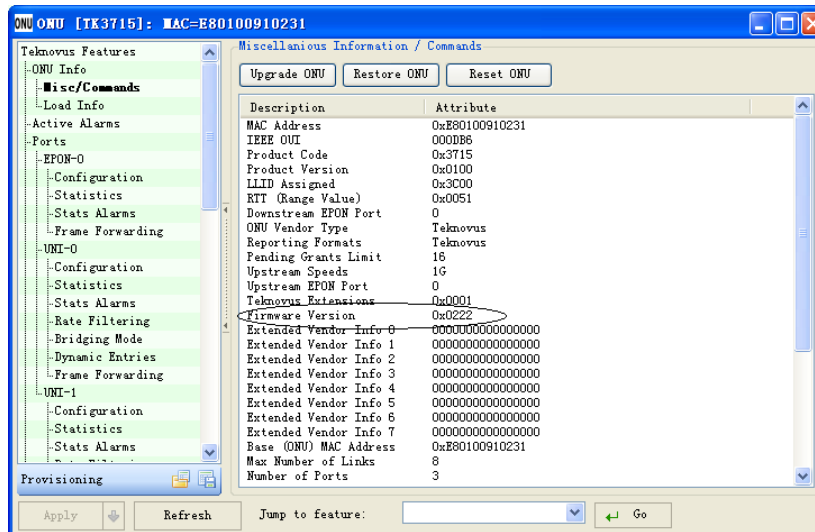
Figure 3-1 ONU Firmware Version

4) On the top of the window, click Upgrade ONU and find a file to be upgraded in the computer shown in the Figure 3-2;
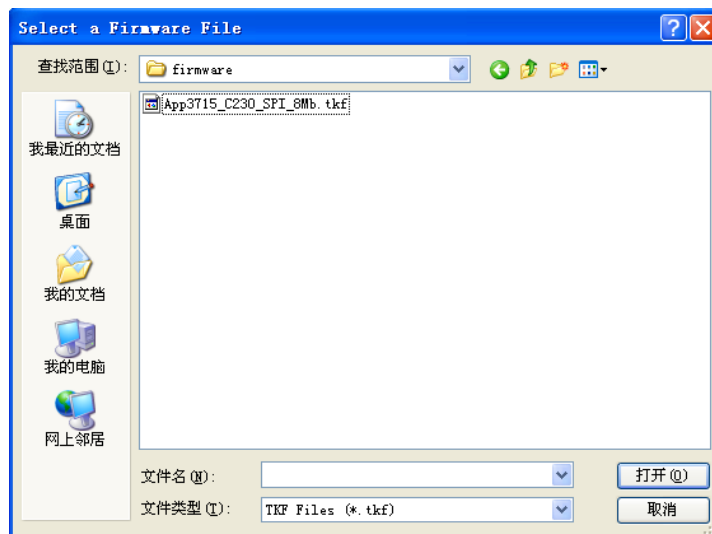
Figure 3-2 Window of Selecting a Firmware File

5) Select the file and click it to open. Start upgrading and a progress bar of upgrading will be displayed at the bottom of the ONU window;

6) When the upgrade completes, display the window of "Upgrade Successful" to remind the "Firmware upgrade successful！ Please reboot to apply changes.", which is shown in the Figure 3-3;

Figure 3-3 Window of Successful Upgrade

7) Click OK and close the window of Upgrade Successful;

Note: after rebooting the ONU, the new firmware can work. Immediately reboot or reboot it after upgrading all equipment.

Reboot the ONU with one of the two methods below:

✓ Click the Reset ONU on the top of ONU window in GUI.

✓ Press the RESET button on the back of the ONU.

In GUI, the ONU icon changes from green into red and re-changes into green after completion of rebooting.

8) At the bottom of the GUI, click Refresh and see the new firmware version.

Notes:

✓ This part only applies to TK3723 and the ONU of TK

✓ TK recommends upgrading ONU first and then OLT.

✓ When upgrading the firmware, the corresponding version of the GUI shall be installed. If the system installs the GUI of an old version, the new version shall be installed.

✓ The above are steps for upgrading the ONU with the GUI. As the method of upgrading OLT is the same as the ONU, we shall not repeat it here.

✓ Here, the GUI version is C230.

5.2 OLT Information

OLT information includes the basic information, load information and OAM setting.

✓ The basic information includes the ID information of the firmware, such as MAC address, model of products, version of products, version of firmware, etc. moreover, it can be used for polling the OLT firmware to decide whether it is ready to respond after rebooting. Buttons of Enable OLT, Disable OLT, Upgrade OLT, and Reset OLT on the top of the window can be used for enabling, disabling, upgrading and resetting OLT.

✓ The load information returns to some loaded version number of OLT and CRC; the version number of 0000 and FFFF is reserved which indicates that the load doesn't exist or is unavailable.

✓ The OAM setting can set the mode of OAM and the configuration of some parameters.

5.3 Alarm

The alarm means that the alarm is triggered and the alarm information generated which can be outputted to the network management or the alarm buffer via the deployment of the information center by comparing the sampling statistical average and threshold value at each cycle time of alarm monitoring for the system when the former is equal to or more than the latter.

All alarm information is automatic information. As shown in Figure 4-1, what displays on the right window panel is the real-time alarm message, message record and alarm parameter.

✓ The real-time alarm message displays the entity, tag of generating the alarm message and ID of alarm message. What can be selected on the top of the window is only the current OLT or the alarm of all equipment. The alarm records can be seen in the Alarm Log, including time of generating the alarm message, type of message, tag, ID, status and quantity of the alarm.

✓ For the soak times of the alarm, set the time of generating and clearing the alarm with the time range of 0-65400ms. Some alarm can be disabled. For example, in the system testing, many large ONU networks need to receive constantly occurring LOS alarms; thus, the Host can select disabling the LOS alarm. The following are descriptions of two kinds of alarm time:

Soak Time to Set: to limit how long the alarm conditions will work before generating the alarm information.

Soak Time to Clear: to limit how long the alarm conditions will work before automatically clearing the alarm information.
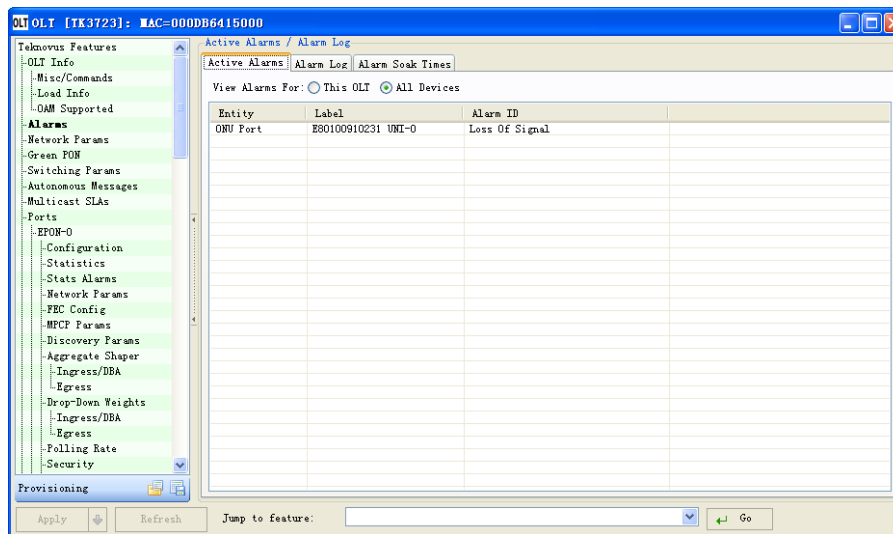
Figure 4-1 Alarm Information Window

When the alarm information generates, it is also displayed at the bottom of the message window; see the details of the alarm message with the three steps below:

✓ Select one message in the message window; click the right mouse button and the Select menu will appear shown in the Figure 4-2.
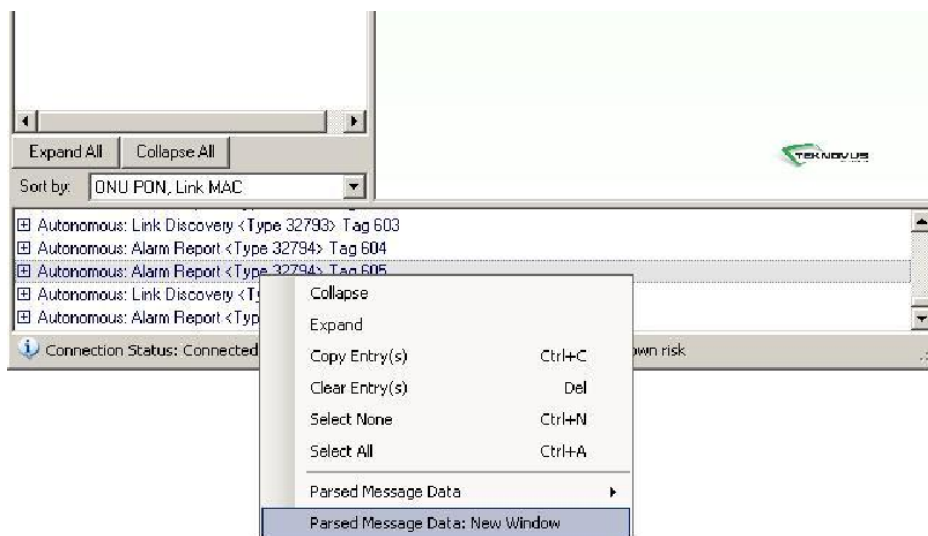
Figure 4-2 Message Select Menu

✓ Select the bottom of the menu and click Parsed Message Data: New Window; display the message parse window shown in the Figure 4-3.
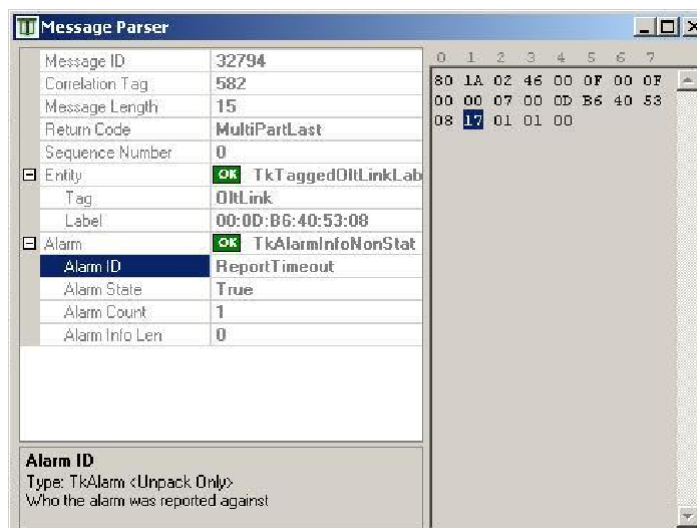
Figure 4-3 Message Parse Window

✓ The left side of Figure 4-3 displays the elements of alarm message format; select one element, then matching bytes will be automatically highlighted on the right window panel and the alarm type will display on the right side of Alarm ID. In the example of Figure 4-3, the type of alarm is MPCP timeout alarm with Alarm ID of 17.

5.4 Network Parameter

The network parameter settings of OLT include OAM configuration, loopback parameter and VLAN parameter.

✓ OAM configuration: set the minimum, maximum OAM rate and OAM response time of each link on the network. The OAM rate settings of all links for all PONs of all types of OLTs are default. When one link of OTL registers, the minimum and maximum OAM rates of the link will be set as the default. The OAM response timeout is the maximum time when the OLT waits ONU to respond and the parameter values are shown in Table 4-1.

Note: the default is designated by the IEEE802; if the Host modifies the default parameter, the system won't fully comply with the IEEE802.3ah.

✓ Loopback parameter: set the safety timeout value of loopback fault, which is the default timeout value of any loopback setting for all kinds of OLTs. The set value applies to all links of all PONs. The parameter values are shown in Table 4-1.

✓ VLAN parameter: the additional C-VLAN tag values of all port settings for all PONs of all kinds of OLTs (the Customer VLAN is relative to the Service VLAN). The firmware applies the default data frames with Ethernet-type resolution of 0x8100 and C-VLAN tag; the parameter values are shown in Table 4-1.

Note: when the OLT is disabled, the configured parameters can be applied.

Table 4-1 Network Parameter Values

Parameter	Unit	Default	Minimum	Maximum
Minimum OAM Rate	PDU/sec	1	0	255
Maximum OAM Rate	PDU/sec	30	0	255
OAM Response Timeout	sec	1	1	255
Loopback Timeout Value	100ms	600	1	65535
C-VLAN Ethertype		0x8100	>0x600	0xffff
S-VLAN Ethertype		0x88a8	>0x600	0xffff

5.5 Exchange Parameter

OLT settings of exchange parameters include the strict ACL mode, queue discard, ACL rule precedence, etc.

✓ Strict ACL mode: the strict ACL provides strict control by connecting in ACL and finding out the destination ID with MAC address. For the mode setting, received frames from the exact and learnt destination address can be passed while SA frames received from any other destination address will be discarded.

✓ Queue discard: select the methods for marking discarding frames via the automatic MAC ACL of the firmware.

✓ Allow traffic to the ONU: Under the default conditions, frames directly connected to the registered ONU link with MAC address will be discarded. Setting this option is valid to allow the frames directly providing MAC address with the ONU link from the network side of NNI port.

✓ ACL rule precedence: the ACL precedence parameters set the precedence of ACL rule operation, which is helpful to adjust the interaction between the automatic ACL rule and the access rules of other users.

✓ Misc options: when setting, it aims at improving the learning performance to enable the software algorithm with less loss of uplink and downlink frames. When it isn't set, the learning performance is slow for catalogue more than 8K MAC.

5.6 Port

PON Port

(1) Basic configuration of port

Port rate: set the port rate.

Port FEC: set the uplink and downlink FEC modes, Off, On, Per-Link and Per-ONU. In a single port, the Off and On of uplink and downlink FEC are different. However, when one of the two directions selects the setting of Per-Link or Per-ONU, then the same setting shall be selected in the other direction. For example, when the downlink FEC selects the Per-ONU, the uplink FEC shall also select the Per-ONU, but not support selecting Off, On or Per-Link.

The wrong bit number of SFEC/TFEC can be set in the FEC Config of the port.

For the environmental protection and energy saving, the green PON can be selected in the Green PON of OLT; the energy-saving mode of two PON ports for OLT set and relevant parameters set according to the actual needs.

(2) Statistical data

View a group of statistical data from the data and error count collected by the EPON equipment. For example, view the statistical data of OLT EPON LIF Receive:

✓ Click OLT and display the control panel of it;

✓ Select EPON-0/Statistics;

✓ Select the OLT EPON LIF Receive in the drop-down menu of the group;

✓ Tick in the front box of Include "0"Stats to view all statistics;

✓ Click Refresh to view the name, value, description and other details of the statistics shown in Figure 4-4.

Stats Alarms can be used for configuring the alarm based on the statistical data, view the name and detailed descriptions of statistical alarms.
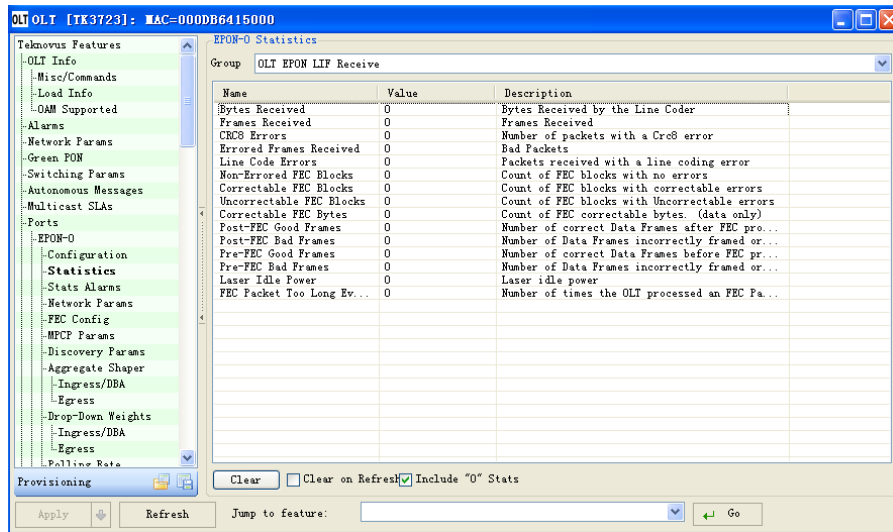
Figure 4-4 Statistical Data

(3)   Network Parameter

The parameter configuration of port network includes the link parameters, EPON loop timing and synchronization time with parameter values shown in Table 4-2.

✓   Link Parameters: limit the number of links registered into each PON port.

✓   EPON Loop Timing: change the parameters of EPON loop timing according to the length of optical fiber loop; the loop timing parameters can be used for specifying the maximum loop length and ONU delay of PON port; the default is suitable for loop of 20km. The parameter values are shown in the table below.

   Note: loop timing more than 20km will affect the handling capacity and forwarding delay of the system.

✓   EPON Sync Time: the synchronization time is required for EPON optics which is used for MPCP authorization and registration. It allows the OLT to add extra idle time before the uplink burst data reaches.

✓   Clear to personality default: used for clearing values set by users and restoring them to the default. The default is read out from the personality.

Table 4-2 Network Parameter Values

Parameter	Unit	Default	Minimum	Maximum
Max Links on PON		150	0	256
Minimum Propagation Delay	16 ns TQ	0	0	25573
Maximum Propagation Delay	16 ns TQ	6250	0	25573
ONU Delay	16 ns TQ	3125	3125	25573
OLT Up/Down Delay Offset	16 ns TQ	0	-32768	32767

Note: when the OLT is disabled, the configured parameters can be applied.

(4)   MPCP parameter

✓   MPCP deregistration timeout: in such a period of time, OLT will deregister the ONU after the ONU fails to send the MPCP report. The MPCP deregistration timeout can be separately set on each PON port.

✓   MPCP initial registration gate timing: control the way of the ONU authorization by OLT during the period of MPCP registration. The behavior of registration and authorization can be separately set on each PON port.

(5) Discovery parameter

Set the discovery progress of parameter control. The parameters are found out to be separately set on each PON port. The Host can designate, generate, discover authorization for OLT, and announce the time period of size of discovery window. The parameter values are shown in Table 4-3.

Table 4-3 Discovery Parameter Values

Parameter	Unit	Default	Minimum	Maximum
Discovery Period	ms	1000	10	65530
Discovery Grant Length	Bytes	16319	84	131070

Note: fill in the progress number of discovery and than display the specific contents of parameter configuration.

(6) Shaping

Set the maximum allowable aggregate bandwidth for each EPON port. When the parameter setting is zero, the aggregate bandwidth control will be disabled. The shaping parameters restrict the inlet and export flow of EPON port; and the parameter of outlet/inlet flow is shown in Table 4-4.

Table 4-4 Inlet Flow Parameter Values

Parameter	Unit	Default	Minimum	Maximum
Aggregate per port Bandwidth in Kbps	Kbps	0	256	1000000
Maximum Burst Size in Kbytes	KBytes	0	1	256

Table 4-4 Outlet Flow Parameter Values

Parameter	Unit	Default	Minimum	Maximum
Aggregate per port Bandwidth in Kbps	Kbps	0	256	2000000
Maximum Burst Size in Kbytes	KBytes	0	1	256

(7) Drop-down Weights

Set a drop-down weight for the DBA precedence. The DBA on each EPON port can be independently operated; and only configure the DBA drop-down weights in the uplink direction. If the parameter is zero, it indicates a strict precedence, but the strict precedence isn't recommended in OLT. The parameter values are shown in Table 4-5.

Table 4-5 Drop-down Weight Parameter

Type	Unit	Default	Minimum	Maximum
Drop-down to level 1	1 KB	16	0	256
Drop-down to level 2	1 KB	16	0	256
Drop-down to level 3	1 KB	16	0	256
Drop-down to level 4	1 KB	16	0	256
Drop-down to level 5	1 KB	16	0	256
Drop-down to level 6	1 KB	16	0	256
Drop-down to level 7	1 KB	16	0	256

(8) Polling rate

The polling rate is the minimum authorized frequency received by a LLID. Each precedence is specified with a polling rate. All LLIDs with the same precedence have the same polling rate. The parameters are shown in Table 4-6.

Table 4-6 Polling Rate Parameter Values

Type	Unit	Default	Minimum	Maximum
Polling interval 0	65.5us	15	0	0xFFFF
Polling interval 1	65.5us	30	0	0xFFFF
Polling interval 2	65.5us	60	0	0xFFFF
Polling interval 3	65.5us	60	0	0xFFFF
Polling interval 4	65.5us	60	0	0xFFFF
Polling interval 5	65.5us	60	0	0xFFFF
Polling interval 6	65.5us	60	0	0xFFFF
Polling interval 7	65.5us	60	0	0xFFFF

Note: the polling interval of TK shall be 50ms or below as a large polling interval may violate the IEEE standard.

(9)   Security

When the encryption is enabled, select the encryption mode for PON. The encryption mode applies to all logical links of PON, which includes the encryption algorithm and key exchange protocol.

When the OLT registers a new link, the designated encryption mode will be applied to the link and the corresponding default key exchange timer will be allocated. However, if there is other information provided to the link, the OLT will replace the default with that information. If the information provided to the link is declined by ONU, the OLT will fail to set the encryption mode for the link. In this case, the OLT will generate a link alarm.

The time range of key exchange timeout is 0~65535s with the encryption mode shown in Table 4-7.

Table 4-7 Encryption Mode

Name	Algorithm	Key Length
AES CFB (TK OAM)	AES CFB	128
Triple Churning (CTC OAM)	3x Churning	72

(10) Optical Power Detection

The new configuration will affect the monitoring below until the OLT is rebooted. If the NVS is enabled, the configuration will affect all problems, even after rebooting the OLT.

The configuration won't require disabling the OLT. Usually, it will come into force immediately. However, the configuration won't come into force immediately under these three circumstances:

✓   If the NVS is enabled, storage configuration is done after the OLT reset.

✓   If the previous configuration is "Optical monitoring not supported on this hardware", then it can be changed until the rebooting state. The statistical data will continue reporting "Not Supported" until the OLT reset is implemented.

✓   If the new configuration is "Optical monitoring not supported on this hardware", then it can be completely changed until the reset state of the OLT. Before reset, the statistical data won't report the "Not Supported", but the collection of the statistical data will be immediately stopped.

See the Table 4-8 for the operation of controlling the sampling function of the received optical power.

Table 4-8 Operational Mode

Name	Description
Off	Stop collecting the received power and accounting the idle power
On	Start collecting the received power and accounting the idle power over the entire range of links
No Idle	Stop collecting the received idle power (useful for configuring the Rx Idle Power link for another purpose)
Idle	Only monitor the received idle power
Single	Continue collecting the received power for the single link

NNI Port

1) Basic configuration of port

✓ Port flow control: after the flow control function is enabled for the port and the end equipment, if the local equipment is blocked, it will send a message to the end equipment and give notice for it to stop sending a message temporarily; after the end equipment receives the message, it will stop sending a message temporarily to the local equipment. Vice versa, thus the occurrence of message loss can be avoided. Only the flow control function is enabled for the port and the end equipment, the flow control of Ethernet port for the local equipment can be realized; and the flow control parameters are shown in Table 4-9.

Note: when the flow control is enabled, the OLT shall be firstly disabled and the configuration can come into force.

Table 4-9 Flow Control Parameter

Parameter	Unit	Default	Minimum	Maximum
Queue Size	KBytes	90	1	640
High-water Mark	% of size	75	1	100
Low-water Mark	% of size	25	0	99

✓ Port auto-negotiation function: the duplex state and rate of the port can be automatically negotiated with the end port by configuring the auto-negotiation function of the port.

✓ Port rate: the port rate can be set; when the port rate is set as the auto-negotiation state, the port rate can be automatically negotiated with the end port.

✓ Duplex state of the port: when the port is provided with the full duplex property, it can send the data package while receiving the data packet; when the port is provided with the half-duplex property, the port can only send or receive the data packet at the same time; when the port is in the auto-negotiation state, the duplex state of the port can be determined through the automatic negotiation between the port and the end port.

✓ MDI mode of the port: the port has two kinds of cables, the parallel and cross cable.

✓ Loopback function of the port: the user can open the loopback test function of the Ethernet port to check that the port can work normally. When the test is carried out, the port won't forward the data packet normally.

View the statistical data and error count collected with the EPON equipment for the port in the port statistics.

2) IPv4 Parameter

When the OLT is used for configuring L3 operation, this parameter will be used for setting the IPv4 parameter allocated to the OLT LNP port. Moreover, the OLT will use the IP source address of frames generated by the OLT IPv4 DHCP replay agent function.

3) Shaping

Set the maximum allowable aggregate bandwidth for each NNI port to restrict the outlet flow of the NNI port. When the parameter setting is zero, the aggregate bandwidth control will be disabled. The parameter is shown in Table 4-10.

Table 4-10 Outlet Flow Parameter

Parameter	Unit	Default	Minimum	Maximum
Aggregate per port Bandwidth in Kbps	Kbps	0	256	1000000
Maximum Burst Size in Kbytes	KBytes	0	1	256

4) Drop-down Weights

Configure the drop-down weights for the shaping precedence; the shaping drop-down is independently configured in the uplink and downlink direction; each output port has an independent shaping supply; and the parameter is shown in Table 4-11.

Table 4-11 Drop-down Weight Parameter

Type	Unit	Default	Minimum	Maximum
Drop-down to level 1	1 KB	0	0	256
Drop-down to level 2	1 KB	0	0	256
Drop-down to level 3	1 KB	0	0	256
Drop-down to level 4	1 KB	0	0	256
Drop-down to level 5	1 KB	0	0	256
Drop-down to level 6	1 KB	0	0	256
Drop-down to level 7	1 KB	0	0	256

5.7 Path

The path is identified by the exclusive path ID. The path automatically created by the firmware receives the path ID selected by the firmware. The Host software and firmware use a different ID scope to avoid ID conflict. The scope of Path ID is shown in Table 4-12.

Each link only supports one path. The path ID shall be designated when a path is created. There are two terminal points for each path corresponding to the two ports in the corresponding paths. The first terminal point is addressed via the path ID while the second terminal point adds 1 addressing via the path ID.

Path termination point: when it comes to two different ports, the port in a smaller size shall be designated as port A while the port in a larger size shall be designated as port B. For example, EPON port 1 (port number)=1) is set as the port A while the NNI port 0 (port number=2) is set as the port B.

The path termination point is the OLT port with zero or multiple queues. The port can define the queue to flow anywhere. For example, the termination point of a path may be {NNI0, {16}}, which means that the size of the single queue is 1 with data sent out from the NNI0.

A path can specify the source port of the termination point for the path. For example, {EPON0, {0}}{NNI0, 1, {16}} indicates that there is one path from the EPON0 to NNI0 with the NNI0 as the sending end. At the port of NNI0, there is one queue in size of 16 while there isn't any queue at the port of EPON0. Therefore, it can't be sent out, as at least one path shall be known.

For the convenience of creating a path, the path may have the queue with two termination points of path. For example, {EPON0, 1, {32}} {NNI0, 1, {16}} refers to create a path from the EPON0 to NNI0. The stream can be sent from the NNI0 to EPON0 via a queue in size of 32 which can also be sent from the EPON0 to NNI0 via a queue in size of 16.

Table 4-12 Scope of Path ID

Path ID	Description
0-510	OLT Firmware Reserved
2, 4, 6, 8	Broadcast
512-8190	Automatic generation of OLT firmware
8192-16382	Available ID allocated to the Host software

In the Path/Queue Stats, the statistic information of path and queue can be viewed, including the queue number, name, value and details.

5.8 Flow Management

Set the forwarding mode of the logical link, inlet restrictions of MAC address learning list, and the destination NNI port. The logical link can be configured as the single-bridging mode or various supported VLAN-bridging modes.

The learning coverage of MAC address can be controlled after filling the list of link learning; and how the SA learning works. After setting the option, a new MAC address will be used for covering the old and learned MAC address. When the discarded and unknown MAC address is set, the OLT will be made to discard the downlink unknown data stream of DA. In the single-bridging mode, the data stream with a vlan tag can be set as being passable.

The rule of flow classification can use the precedence of ToS (Type of Service) field for IP message header to identify the flow with different precedence features; moreover, the network administrator can set the strategies of the flow classification, such as the comprehensive source address, destination address, MAC address, IP protocol or port number of the application.

Filtering, classification, access control and flow modification rule for the OLT can be set as different levels of interval and dimension in OLT.

✓ Port rule: applies to all flows entering the specific port. They are used to perform network strategies, such as blocking the entire protocol, which can also be used for capturing some types of frames by the Host. The purpose is to analyze or perform the protocols which are not handled by the OLT firmware. Each port of the OLT contains one list which supports up to 64 entries.

✓ Link rule: applies to all frames of the specific logical links which are mostly used in the upstream. Usually, they are used for filtering each user or destination.

Editing fields can set and analyze the field of each frame; and these frames are used for filtering or classifying the LUE rule. At each port of OLT, there is a LUE which is used for handling the frame received by the port. Each LUE has some fixed and programmable field selectors which are integral to all OLT ports. TK3723 supports 24 field selectors in a whole, of which 4 (20-23) selectors can be programmed by users via the information setting. For the programmable fields for users, the Host shall use the obtained information to read the existing configuration. When sent, these configurations shall contain the message setting. Each field is programmed via the field code; it describes an analysis of the frames in such aspects: protocol layer, data-word of the frame, bit start, bit width, etc.

The window contains the fields below:

✓ Layer: one layer is composed of 5 bits.

✓ DWORD: a 32-bit word. The DWORD offset is like this: the former 32 bits display DWORD offset=0 while the next 32 bits display DWORD offset=1 and so on. The DWORD offset is a 4-bit field.

✓ Bit Offset: the value means the bit number in the field selected from the right side. It is composed of 5 bits.

✓ Bit Width: the bit width is smaller that the actual width of a filed. As the field width can't be zero but in 5 bits, the code width allowed by the protocol can reach 32 bits. It is composed of 5 bits.

In the L2 Entries, the dynamic bridge entry can be obtained and the static bridge entry can be added, deleted and obtained.

Obtain all static entries provided by the entry retrieval of the static bridge. Obtaining the dynamic bridge entry will return to the automatically learnt MAC address of given logical link tag. The dynamic option will be deleted in such circumstances:

✓ The SLA of the link is disabled or enabled

✓ The bridge mode changes

✓ The link leaves the network

✓ The uplink SLA is modified, such as change of precedence.

✓ The testing of link loopback hasn't test the option of "Retain Dynamic Entries".

Until the new frame reaches, the dynamic option will be re-learnt.

5.9 Layer 3

IEEE802.3ah is the standard for L2 MAC and the EPON chip of the TK is mainly for the L2equipment. However, the hardware and firmware are both capable of handling the F3 (IP) frame. When the network is mainly used for IP, the L3 newly added to the EPON system adds the security and network control.

This part mainly describes the OLT L3 transformation parameters. Some L3 functions can be configured, including DHCP Snooping, DHCP option 82 insertions, DHCP IP/MAC address learning, and direct or agent ARP/RARP, etc.

Note: only when the OLT is disabled, can the L3 mode be modified;

Only after enabling the DHCP services, other relevant DHCP configuration can be enabled.

1)   IPv4

When the DHCP snooping is enabled, the OLT can be set as the DHCP relay agent. It can serve as an agent to intercept the DHCP data packet in two directions and add the option82 data to the DHCP discovery and/or response message.

When the OLT is configured for the learning of IPv4, the bound setting can obtain all dynamic and static client bound MAC/IPv4 on the OLT. If a static IP isn't bound to the client (via the ARP), the returned client's MAC address/forwarding MAC address may be zero. This setting can bind multiple dynamic and/or static clients' MAC/IPv4 to the OLT. The static option sign is the lease time=0 while the dynamic option shall have a non-zero lease time.

When the OLT is configured for the DHCP Snooping and learning of IPv4, the bound log indicates that the dynamic IP/MAC binding has been completed, which is completed via the DHCP dialogue between the DHCP server and the client. It can also indicate that the dynamic bound IP/MAC has been moved from the OLT due to DHCP releasing from the client, expiration of DHCP lease or different IP updated. The IPv4 configuration parameter is shown in Table 4-13.

Table 4-13 IPv4 Configuration Parameter

Parameter	Unit	Default	Minimum	Maximum
maximum bound clients/IPs		0	0	8192
DHCP timer update interval	seconds	2	1	60
DHCP server response timeout	seconds	30	1	255
maximum DHCP lease time	seconds	0	0	2^{32}

2)   IPv6

IPv6 setting is used for enabling DHCPv6/NDP mode and configuring the IPv6 parameters. The OTL can be configured to provide some L3 IPv6 functions, including DHCPv6 Snooping, DHCPv6 Option 18 insertions, IPv6/MAC address learning, and direct or agent NDP.

When the L3 switch is enabled, the OLT can be configured as the DHCP relay agent. It can serve as an agent to intercept the DHCP data packet in two directions and add a link address field to the relay forwarding frame. The OLT can also add the packaged relay forwarding frames of option18 and/or other options.

When the OLT is configured for the learning of IPv6, the bound setting can obtain all dynamic and static client bound MAC/IPv6 on OLT. If a static IP isn't bound to the client (via the NDP request/notice), the returned client's forwarding MAC address may be zero. This setting can bind multiple dynamic and/or static clients' MAC/IPv6 to the OLT. The static option sign is the lease time=0 while the dynamic option shall have a non-zero lease time.

When the OLT is configured for the IPv6 Snooping and learning, the bound log indicates that the dynamic IP/MAC binding has been completed which is completed via the DHCPv6 dialogue between the DHCPv6 server and the client. It can also indicate that the dynamic bound IP/MAC has been removed from the OLT due to DHCPv6 releasing from the client, lifelong expiration of DHCPv6 or different IP updated. The IPv6 configuration parameter is shown in Table 4-14.

Table 4-14 IPv6 Configuration Parameter

Parameter	Unit	Default	Minimum	Maximum
Max Learned Clients		0	0	8192
Max Learned Addresses		0	0	8192
Max Addresses per Client		4	1	8
IP Header Hop Limit		4	1	32
Relay Forward Hop Limit		32	1	32
Relay Agent IPv6 DA		0		
Relay Agent MAC DA		0		
Server Response Timeout	seconds	30	1	255
Timer Update Interval	seconds	1	1	60

3) L3

The OLT can be configured to provide some L3 functions, including DHCP Snooping, DHCP option 82 insertions, DHCP IP/MAC address learning and direct or agent ARP / RARP.

When the L3 switch is enabled, OLT can be configured as the DHCP relay agent. It can serve as an agent to intercept the DHCP data packet in two directions, add the option82 in the uplink direction, and strip the option82 in the downlink direction.

When the OLT is configured via the L3 operation, the L3 dynamic option can be used for obtaining the entire client binding MAC/IP of dynamic learning (via the DHCP Snooping) on the given logical link. The L3 static option can be used for obtaining the entire client binding MAC/IP of static configuration on the given logical link. If the static IP hasn't been bound to the client's MAC address (via the ARP request/response), the returned client's MAC address may be zero. The L3 configuration parameter is shown in Table 4-15.

Table 4-15 L3 Configuration Parameter

Parameter	Unit	Default	Minimum	Maximum
Max Learned IPs		0	0	3839
DHCP Timer Interval	Seconds	10	1	655
DHCP Response Timer Ticks (DHCP Timer Intervals)	Ticks	3	1	254
ARP Retry Ticks (for Static IP ARPs sent to client)	Ticks			
DHCP Relay Agent IP SA		0		
Max DHCP Lease Time	Seconds	0	0	$2 \wedge 32$

5.10 IP Multicast

IP multicast management is one kind of technology providing the voice and video services via the Ethernet and access network. The group management of an IP multicast is defined as a group in which the IP data packet is transmitted to users. The group management of an IP multicast can be easily achieved by applying two protocols, IGMP and MLD.

The implementation of an IP multicast for the Teknovus Company aims at effectively distributing the multicast frame to avoid the waste of sending the network bandwidth of the frames used by users.

Based on the Proxy and Snooping of TK IP multicast for the EPON system, there are several advantages below:

- Support IGMP Versions 1, 2 and 3

- Support MLD Versions 1 and 2

- Rapid response time of channel change

- Efficient use of network bandwidth

Here, the maximum value range of the multicast group is defined as 0-4096. When the value is set as zero, the OLT IP Proxy function will be completely disabled; and determine the maximum quantity of multicast group according to the used forwarding selection and group address. If the group is only forwarded by L2 DA with restriction of 4096, then it will be restricted as 4095 for other forwarding selection.

The Pool value range of an IP multicast bandwidth is 0-2000000Kbps which applies to all agent domain examples for the OLT. When it is set as zero, no group can be added into any agent domain due to insufficient available bandwidth.

5.11 PPPoE Parameter

PPPoE (Point-to-Point Protocol over Ethernet) uses the Ethernet to form a network with massive Hosts; it is connected to the Internet via remote access equipment, and realizes the control and billing functions for each accessed Host. The PPPoE protocol packages the PPP message into the Ethernet frame and provides the point-to-point connection on the Ethernet by means of the Client/Server with parameters shown in Table 4-16.

Table 4-16 PPPoE Parameter

Parameter	Unit	Default	Minimum	Maximum
maximum number of learned PPPoE client MAC address		0	0	8192
maximum number of PPPoE sessions per PPPoE client		4	1	4
PPPoE timer update interval	seconds	2	1	60
PPPoE server response timeout	seconds	30	1	255
PPPoE session inactivity timeout	ms	0	0	4294967295
PPPoE+ TAG Type		0x110		

Note: when the OLT is disabled, the PPPoE mode can be modified.

Chapter 6 ONU Parameter Configuration

6.1 ONU Information

Basic information and load information of ONU:

✓ Basic information of ONU: ID information and other configuration information of ONU, such as MAC address, model of products, version of products, version of firmware, etc. Buttons of Upgrade ONU, Restore ONU and Reset ONU on the top of the window can be used for upgrading, restoring the default and resetting ONU.

✓ The load information of ONU: indicates some loaded version number on the ONU and CRC; the version number of 0000 and FFFF is reserved which indicates that the load doesn't be installed or is unavailable.

View the real-time alarm information of the equipment in the Active Alarms, in which the entity, tag of generating the alarm message, and ID of alarm message can be viewed.

For the Green PON setting part of the ONU, the energy saving of the ONU optical power can be enabled and parameters related to it can be set to reach the purpose of environmental protection, energy-saving and cost-reducing.

6.2 Port

1) PON Port

✓ Duplex state of the UNI port: when the port is provided with the full duplex property, it can send the data package while receiving the data packet; when the port is provided with the half-duplex property, the port can only send or receive the data packet at the same time; when the port is in the auto-negotiation state, the duplex state of the port can be determined through the automatic negotiation between the port and the end port.

✓ UNI port rate: the port rate can be set; when the UNI port rate is set as the auto-negotiation state, the port rate can be automatically negotiated with the end port.

View the statistical data and error count collected by the EPON equipment in the port Statistics. Stats Alarms can be used for configuring the alarm based on the statistical data, view the name and detailed descriptions of statistical alarms.

2) UNI Port

Basic configuration of UNI port:

✓ Duplex state of the UNI port: when the port is provided with the full duplex property, it can send the data package while receiving the data packet; when the port is provided with the half-duplex property, the port can only send or receive the data packet at the same time; when the port is in the auto-negotiation state, the duplex state of the port can be determined through the automatic negotiation between the port and the end port.

✓ UNI port flow control: after the flow control function is enabled for the UNI port and the end equipment, if the ONU is blocked, it will send a message to the end equipment and tell it to stop sending a message temporarily; after the end equipment receives the message, it will stop sending a message temporarily to the local equipment, thus avoiding the occurrence of message loss.

✓ UNI port rate: the port rate can be set; when the UNI port rate is set as the auto-negotiation state, the port rate can be automatically negotiated with the end port.

✓ UNI port auto-negotiation function: the duplex state, type of cable, and rate of the UNI port can be automatically negotiated with the end port by configuring the auto-negotiation function of the UNI port; after configuring the forced auto-negotiation function, UNI port will be automatically re-negotiated.

View the statistical data and error count collected by the EPON equipment in the port Statistics. Stats Alarms can be used for configuring the alarm based on the statistical data, view the name and detailed descriptions of statistical alarms.

The Rate Filtering of the port can set the limit of broadcast frame number received by the Ethernet interface of ONU. For the maximum allowable broadcast packet in 1s, the default is 2097151 (2^{21}-1).

The bridging mode of a port sets the learning mode of uplink MAC address for the ONU user port. Before these entries are automatically deleted from the table (aging exits), the number of entries learned by the port can be set together with the time. When the Automatic Learning Entry Limit is set as the zero, the address learning is prohibited. When the Learned Entry Age Limit is set as the zero, the aging is prohibited.

The forwarding mode can be set as the MAC access control. In this mode, the port can learn the mode allowable addresses through the entry learning limit, but the frames of MAC addresses which are not learned will be discarded by the port. This mode is useful for the MAC address number limited to the PON. The default mode is the forwarding mode; namely, the forwarding doesn't have the learning address. In the Dynamic Entries, the MAC address of the given port self-learning can be returned. The parameter setting is shown in Table 5-1.

Table 5-1 Bridge Parameter

Parameter	Unit	Default	Minimum	Maximum
Automatic Learning Entry Limit	Entries	64	0	64
Learned entry age limit	8.75 ms	8192	0	32768

6.3 Broadcast Queue

The broadcast queue in the downlink direction can set the number of downlink broadcast queue for each UNI port, in which the automatic broadcast operation is prohibited when the number of queue is 255. In the Queue Statistics, the information of queue statistics can be viewed.

If the queue allocated to the broadcast for disposal is larger than the configured queue of the port which actually works, the ONU firmware will disable forwarding the rules of broadcast frame.

6.4 Classification

1) Editing field

Terms and conditions of field use decide the destination of the data frame. Therefore, the field is a typical part of the data frame, such as the address, any precedence field, or the protocol type of different layers.

Editing fields can set and analyze the field of each frame; and these frames are used for filtering or classifying in the LUE rule. At each port of OLT, there is an LUE which is used for handling the frame received by the port. At each port of ONU, there is an LUE which is used for handling the flow received by the port. Each LUE has some filed selectors supported by the firmware. For example, each LUE of the TK3701 has 8 fields while the TK3711 has 12 fields. Each field is programmed via the field code; it describes an analysis of the frames in such aspects: protocol layer, data-word of the frame, bit start, bit width, etc.

2) Queue configuration

Here, the ONU queue configuration can be set, including settings for the size of the ONU queue, number of logical links, and connectivity of Queue. For the configuration only for the user queue, the ONU firmware requires that some resources are used for the system operation. The reserved number of the queue assumes that the maximum number of logical links is registered and each logical link of the ONU has its own OAM queue. If a rare link is registered, these OAM queues can be used in the user data.

One configuration specifies the number of ONU links to be registered and the number of queue is specified in each link; in each link, the size of the queue is specified. In the downlink direction, the number of ports being applied is specified; for each port, the number and size of the queue are specified. The queue parameter is shown in Table 5-2.

Table 5-2 Queue Parameter

Property	Value
virtual WPON MACs (LLIDs)	8
Upstream Queues	
Total Buffer Space	256KB.1024KB

System Buffer Space	18x4KB
User Data Buffer Space	184KB.952KB
Queue Size Units	1KB
Total Queue	20
Reserved Queue(1..max links)	3..10
User Data Queue(1..max links)	17..10
Downstream Queue	
Total Buffer Space	256KB.1280KB
System Buffer Space	32KB
User Data Buffer Space	224KB.1248KB
Queue Size Units	1KB
Total Queue	20
Reserved Queue	4
User Data Queue	16

Note: after applying the new queue configuration, the ONU shall be rebooted.

3) Rules

The Host sets the rules in the LUE which can set the flow path and forwarding to form the rule for classification; these rules may also discard the selected flow as the rule for filtering; moreover, they can modify VLAN tags, etc.

A rule contains many clauses; the result of each clause is a logical AND to decide whether the rule matches the flow. If all clauses are true in the rule, it can be said that the rule matches the flow which may be used in the flow.

Each rule has one behavior. If the rule matches the flow, the behavior will take effect. The filtering rule contains a behavior of discarding the flow. The classification rule contains a behavior of forwarding flow; namely, in which queue the flow shall be forwarded; and extra behaviors can be selected, such as insertion of deletion of a VLAN tag.

Each rule has a precedence value. All rules in the LUE match each flow without a clear description of sequence. It may have multiple rules matching the single flow and the rule may specify different and contradictory behaviors. The precedence is used for handling the condition that multiple rules match one flow. The precedence with a small number indicates that the precedence of the rule is higher; and the precedence zero indicates that the precedence of the rule is the highest. Conflicts shall be avoided when setting the rules of link and queue.

The rule mark changes easily, so it won't be saved in the NVS which shall not be restored after ONU reset.

6.5 IGMP

1) Snooping Parameter

Snooping parameter controls the IGMP Snooping behavior of the ONU.

✓ Robustness count (robust coefficient of a searcher): the robust coefficient of a searcher specifies the query times of IGMP general group. Once a group is removed, the multicast stream with the address of the removed group won't be forwarded to the UNI port through the ONU. If the robust coefficient is zero, it indicates that the specified group will be removed if it fails to respond to the query of any common group.   The parameter is shown in Table 5-3.

✓ Last member query count (query times of a specified group): this parameter defines the query times of a searcher for the IGMP specific group if there is no corresponding IGMP Report responding before the group leaves. Once a group is removed, the multicast stream with the address of the removed group won't be forwarded to the UNI port through the ONU. Of which, the zero is a special value which enables the rapid leave option of the ONU. The parameter is shown in Table 5-3.

✓ Number of IP multicast ports: the number of multicast ports depends on the chip of the ONU.

✓ IP multicast group forwarding: the parameter defines the standard of forwarding IPMC group through the ONU. One of the destination addresses shall be always selected and it is unnecessary to select multiple DAs.

✓ Auto-forwarding to CPU: by setting this parameter, the users can stop the IGMP frame from being automatically forwarded to the internal processor. When the internal processor receives the snooping IGMP frame, the administrators can define their standards.

✓ IGMP leave forwarding: set the forwarding behavior; discard the group without the multicast address known; forward all groups; forward the group with an effective multicast address or the group with a blank address (0.0.0.0).

Table 5-3 snooping Parameter

Parameter	Default	Minimum	Maximum
Robustness Count	2	0	12
Last Member Query Count	2	0	12

2) Group

Add or delete the configuration of the IGMP group in the ONU and the address of the multicast group, VID, and the acting user port can be set. Singly adding or deleting a message can contain 18 groups at a maximum. If required, the Host can send some orders to set or delete more groups.

3) IPMC VLAN

The monitored vlan list is provided via the function of ONU IGMP Snooping. The IPMC VLAN parameter is shown in Table 5-4.

Action for Unmanaged Groups defines that the role of the snooping function is to capture any other unmanaged vlan list in all IGMP frame message. The IGMP flow with other vlans may be discarded or ignored (forwarded as the specific vlan data to other users). When the snooping is enabled based on the forwarding setting of L2 DA+VID, the ONU will discard any unmanaged downlink IPMC flow of VID.

The maximum allowable group is the maximum number of a group. Those groups may be added into each VLAN through the ONU. If the maximum group is zero, the ONU won't be added into any group while discarding all IGMP flows with the VLAN.

Currently, the ONU firmware doesn't support VID transformation and the EPON and user's VLAN ID shall be the same.

Table 5-4 IPMC VLAN Parameter

Parameter	Default	Minimum	Maximum
Number of IGMP VLANs	0	0	16
EPON VLAN ID (0 = untagged)		0	4096
User VLAN ID (0 = strip)		0	4096
Max Allowed Groups	0	0	255

Note: the number of VLANs shall be set first and the specific parameter setting can be displayed.

6.6 Multicast

IGMP is the Internet Group Management Protocol for short. It is a protocol in the TCP/IP protocol group which is responsible for the member management of IP multicast and used for establishing & maintaining the member relationship of multicast group between the IP Host and multicast router directly adjacent to it.

So far, there are three versions of IGMP:

✓ IGMPv1 (defined by the RFC 1112)

✓ IGMPv2 (defined by the RFC 2236)

✓ IGMPv3 (defined by the RFC 3376)

MLD is the Multicast Listener Discovery Protocol for short which is used for discovering the multicast listeners by the IPv6 router on the directly connected network segment. The Multicast Listener is the Host node for those who wish to receive the multicast data.

So far, there are two versions of MLD:

✓ MLDv1 (defined by the RFC 2710) from the IGMPv2

✓ MLDv2 (defined by the RFC 3810) from the IGMPv3

IGMP and MLD modes are independent. Therefore, each OLT agent can deal with two protocols, IGMP and MLD at the same time.

Parameter descriptions：

✓ Robustness count: the robust coefficient of a searcher specifies the query times of the IGMP general group. The larger the robust coefficient of a searcher is, the IGMP searcher is more "Robust", but the time required by the multicast timeout is longer. If the robust coefficient is zero, it indicates that the specified group will be removed if it fails to respond to the query of any common group. The parameter is shown in Table 5-5.

✓ Last member query count: this parameter defines the query times of a searcher for the IGMP specific group if there is no corresponding IGMP Report responding before the group leaves. Of which, the zero is a special value which enables the rapid leave option of the ONU. The parameter is shown in Table 5-5.

✓ Rapid leave function: the rapid leave for a port means that when the switch receives the message of IGMP leave group sent by the Host from some port, directly delete the port from the corresponding exit port list of the forwarding entries. Afterwards, when the switch receives the message query of IGMP specific group for the multicast group, it won't forward the message to the port.

Table 5-5 Multicast Parameter

Parameter	Default	Minimum	Maximum
Robustness Count	2	0	12
Last Member Query Count	2	0	12

In the Domains, one or multiple multicast Domains of ONU can be set. If the application of this configuration has precedence over the ONU IP multicast Snooping parameter configured by the ONU, it will cause the ONU to return an error message. In the multicast group, adding or deleting the multicast group in the ONU and the SA, DA, addition status, acting port, etc., can be set.

6.7 RSTP

After the RSTP of the ONU is enabled, the protocol can eliminate the loops between the UNI port and in the user's network by blocking the redundant links. The parameter is shown in Table 5-6.

The precedence size of the equipment can decide that the equipment can be selected as the root bridge of a spanning tree. The smaller the numerical value is, the precedence is higher; by configuring the precedence with smaller value, the purpose of specifying some equipment ad the root bridge of a spanning tree can be reached.

For the root bridge control, there are three important time parameters in the STP calculation:

✓ Maximum age: the maximum life cycle of the configuration information saved in the equipment and the parameter to judge whether the retention time of the configuration information saved in the equipment is "Timeout"; and the equipment will discard the timeout configuration information.

✓ Hello time: the cycle of sending the configuration information which is used for detecting that the link fails by the equipment. The equipment will sent a hello message to the surrounding equipment every Hello Time period to determine that the link fails.

✓ Forward delay: The delay of port state transition which is the delay time of the equipment state transition. The link failure will cause the network to recalculate the spanning tree of which its structure will change correspondingly. However, the new configuration information obtained by recalculation can't be immediately spread throughout the network. If the newly selected root port and specific port immediately start data forwarding, the temporary loop may be caused. For this, the STP adopts a mechanism of the state transition, in which the newly selected root port and specific port shall enter the forwarding state after experience the forwarding delay of 2 times. The delay guarantees that the new configuration information has spread throughout the entire network.

The port precedence is an important basis to determine whether the port can be selected as the root port. Under the same condition, a port with the higher precedence will be selected as a root port. Generally, the smaller the configured value is, the precedence of the port is higher.

Path cost is a parameter related to the link rate connected with a port. The equipment can automatically calculate the default path cots of a port while users can directly configure the path cost of a port.

Table 5-6 RSTP Parameter

Parameter	Default	Minimum	Maximum	Unit
Maximum age	2000	600	4000	10ms
Hello time	200	Limit can't be set	Limit can't be set	10ms
Forward delay	1500	400	3000	10ms
Port priority	128	0	255	
Path cost	0	0	0xFFFFFFFF	

In the Status, information such as the current status of a spanning tree, parameter setting can be viewed.

6.8 FEC

After opening the FEC (Forward Error Correction), the downlink error correction of OLT and uplink error correction of the ONU can be realized, thus reducing the error rate and increasing the distance of optical signal transmission. As an error correcting code is added in the message, the effective uplink bandwidth of the ONU won't reach the value specified by the user.

For an unregistered ONU, the OLT applies this setting to provide the FEC mode. FEC Abilities can query the ONU to determine that it can provide the FEC. FEC instruction allows the ONU to ignore the FEC mode setting if required and the Audit queries the actually returned and practical setting for ONU.

6.9 Loopback Test

The loopback function is similar to the ping function in an IP layer, which is used for validating the connection status between the local equipment and remote equipment. The way of realizing the function is: the maintenance end point sends the LBM (Loopback Message) to the remote maintenance point and check the link state according to the LBR (Loopback Replay) returned by the end. LBM and LBR are unicast messages and the receiving condition reflects that the link between two points is connected.

OLT performs the connectivity and link quality test on the logical link. For the loopback test of a port, at least one rule shall be set as the forwarding frame without IP. Without this rule, the frame returned from the port will be discarded. The rule precedence shall be higher than the default precedence 15 of discarded rule. The parameter is shown in Table 5-7.

Table 5-7 Loopback Test Parameter

Parameter	Unit	Default	Minimum	Maximum
Number of frames	Frames	100	1	65535
Payload length	Bytes	100	46	1500
VLAN Tag		0	0	4094

Chapter 7 LLID Parameter Configuration

7.1 Basic Information of Link

This page displays the link and ONU information; the display message bar lists the type of description and its attributes, such as MAC address, model of products, version of products, allocated links, etc.

In the Active Alarms, the alarm information of the logical link can be viewed which is the default alarm information of the current link; All Devices can also be selected which will display the alarm information of all equipment.

7.2 SLA

Here the available methods of SLA configured by the TK EPON system are described. The advanced flow management capacity of the TK EPON system provides a very precise SLA scheduler, shaping and DBA.

Each link in the uplink and downlink directions independently configures the SLA which specifies four parameters, the minimum guaranteed bandwidth, maximum allowed bandwidth, burst size and delay tolerance.

In the downlink direction, the OLT provides LLID and services with the scheduler and shaping. In the uplink direction, the OLT DBA provides the PON system with the uplink burst scheduler. Moreover, the OLT provides LLID and services with the uplink scheduler and shaping.

The flow shaping ensures that the maximum allowed bandwidth and burst size won't exceed the SLA specification; and the system allows multiple services, such as the voice, video, and data coexisting in the system, efficient sharing of the network resources.

The schedule level sets the LLID with precedence which performs services with the polling scheduling. The precedence of the LLID is determined by its SLA. The low latency connection will be mapped to the LLID with the highest precedence (the precedence is zero). The anti-latency connection will be mapped to the minimum precedence.
The DBA supports 8 precedences. The number of the precedence can be configured with a total of 256 LLID supported.

Each LLID specifies the tokens or weights in Kbytes. On an LLID with precedence, it will be biased. It will be reflected in the higher handling capacity obtained by the LLID. The DbaTokens represents the number of tokens allocated to each LLID. The number of tokens is calculated considering the bandwidth requirement of the LLID. DBA weights parameter is the maximum number of available tokens configured for each LLID for each grant cycle. OLT DBA tokens can be set as 2K to avoid the excessive OAM delay and OAM timeout of 256kbit SLA.

The queue SLA parameter is shown in Table 6-1 while the link SLA parameter is shown in Table 6-2.

Table 6-1 Queue SLA Parameter

Parameter	Unit	Default	Minimum	Maximum
Minimum Shaper				
Minimum Guaranteed Bandwidth	Kbps	0	256	1000000
Maximum Burst Size	KBytes	0xffff	1	256
Scheduler Level		0xff	0	7
Weight	KBytes	0xffff	2	64
Maximum Shaper				
Maximum Allowed Bandwidth	Kbps	100000	256	1000000
Maximum Burst Size	KBytes	100	1	256
Scheduler Level		2	0	7
Weight	KBytes	2	2	64

Table 6-2 Link SLA Parameter

Parameter	Unit	Default	Minimum	Maximum
Polling Interval Select		2	0	7
TDM Rate	TBD	0	1	4000
TDM Grant Length	Byte	0	84	131072
Minimum Shaper				
Minimum Guaranteed Bandwidth	Kbps	0	256	1000000
Maximum Burst Size	KBytes	0xffff	1	256
Scheduler Level		0xff	0	7
Weight	KBytes	0xffff	2	64
Maximum Shaper				
Maximum Allowed Bandwidth	Kbps	100000	256	1000000
Maximum Burst Size	KBytes	255	1	256
Scheduler Level		2	0	7
Weight	KBytes	4	2	64

7.3 Bridge Parameter

Set the forwarding mode of the logical link, inlet restrictions of the MAC address learning list, and the destination NNI port. The logical link can be configured as the single- bridging mode or various supported VLAN- bridging modes. The entry limit range is 0~15K with the default of 64.

The OLT maintains a single MAC address list which may contain 4,095 dynamically learned or statically allocated MAC addresses for the downlink bridge mode and other purposes. For the bridge mode which has learnt the MAC address list, the OLT can learn the SA of the upstream based on the LLID. When the total number of the statically allocated or dynamically learned addresses reaches the LLID limit, the extra MAC addresses won't be learned even if there is a space in the list. The overall size of all LLID MAC lists may exceed the available size of firmware list (4,095). For such a configuration, the new entries in all LLID entries will be replaced if the entry learning list is full.

TK recommends each network administrator provide required paths rather than the default paths which are mainly used for initial registration of the links.

The bridge mode for the vlan tag can forward the flow at least one VID is set.

If there is conflict between the configured links with different bridge modes, the data packet will be discarded.

7.4 FEC

After opening the FEC (Forward Error Correction), the downlink error correction of OLT and uplink error correction of the ONU can be realized, thus reducing the error rate and increasing the distance of optical signal transmission. As an error correcting code is added in the message, the effective uplink bandwidth of the ONU won't reach the value specified by the user.

For the unregistered link, the OLT applies this setting to provide the FEC mode. FEC Abilities can query the ONU to determine that it can provide the FEC. FEC instruction allows the ONU to ignore the FEC mode setting if required and the Audit queries the actually returned and practical setting for the link.

7.5 Security

Data in the downlink direction of the OLT is transmitted to each ONU by means of the broadcast. To prevent malicious users intercepting the information of other users and improve the security of user data, each LLID in the EPON system has an independent key which is regularly updated.

Here the encryption key exchange mode provided by the TK firmware is described; and the encryption is performed by the special firmware. Enabling and disabling each logical link encryption are independent; each link has its own exclusive key setting which is generated and exchanged by the defined protocols by means of the encryption. Each link at least has two keys which can guarantee the smooth transition between two keys. The time range of key exchange timeout is 0~65535s with the encryption mode shown in Table 6-3.

Table 6-3 Encryption Mode

Name	Algorithm	Key Length
AES CFB (TK OAM)	AES CFB	128
Triple Churning (CTC OAM)	3x Churning	72

7.6 OAM Rate

The setting is the maximum and minimum rate sent by the OAM PDU n one link. The setting can be selectively used in disabling the OAM heartbeat to reduce the link cost. The maximum rate of the OAM PDU setting will be sent to each link; the maximum rate – zero is a special value which indicates that there is no rate control. As the heartbeat rate, the minimum specifies to send a heartbeat PDU within the specified time interval with parameter values shown in Table 6-4.

Table 6-4 OAM Parameter

Parameter	Unit	Default	Minimum	Maximum
Maximum OAM rate	PDU/100ms	3	0 (Unlimited)	25
Minimum OAM rate	Number of 100ms periods between PDUs	10	0 (no OAM heartbeat)	10

7.7 Flow Management

1) DHCP

Option 82 is known as the relay agent information option which records the location information of the DHCP client. After the DHCP relay or the DHCP Snooping equipment has received the request message that the DHCP client sends to the DHCP server, it will add the Option 82 in the message and forward it to the DHCP server.

The administrator can obtain the location information of the DHCP client from the Option 82 to locate the DHCP client, thus realizing the security and billing control for the client. The server supporting the Option 82 can develop the IP address & allocation strategies of other parameters based on the option, and provide more flexible address allocation plan.

The Host enables the DHCP Relay Agent function of the link and defines the OLT to add the option 82 data in the uplink direction of each link.

2) L3 dynamic entry

When the OLT configures the L3 operation, the operation can obtain the customer bound MAC/IP address learned by the dynamic learning for the specified logical link.

3) L3 static entry

When the OLT configures the L3 operation, the operation can obtain the customer bound MAC/IP address learned by the static learning for the specified logical link.

7.8 LACP Pass Through

LACP (Link Aggregation Control Protocol) is one kind of protocol based on the IEEE802.3ad standard. The LACP protocol exchanges information with the end port through the LACPDU (Link Aggregation Control Protocol Data Unit).

A port in the dynamic aggregation group can automatically enable the LACP protocol; it will notice the end port with the precedence of the system LACP protocol, the system MAC, LACP protocol precedence of the port, port number and the operational Key by sending the LACPDU. After the end port receives the LACPDU, it will compare the information with the information received by other ports to select the port which can be in the Selected state, thus both parties can reach an agreement on the Selected state the port is in.

Here, which kind of the path for the given source address can pass through the LACP data stream can be determined. Each link can set forwarding to all, part or non-user port(s) while the upstream can configure forwarding to all, part or non-link(s).

Chapter 8 Domains

The domain is a logical network in place of the PON system. In a domain, the address must be unique. In L2, usually one VLAN corresponds to a domain while a domain may contain many VLANs.

The broadcast LLID may be used in the dispersing link of a domain which may use the multicast LLID. The multicast LLID is allocated through the OLT and allocated to the proper ONU via the OAM message.

The Multi-VID domain may be allocated to many ONU. In the Multi-VID domain, any VID may appear in the diffusion channel. However, one or many VIDs may not be planned for each ONU in the domain. Therefore, the ONU shall be configured to filter the data stream based on the VID and LLID.

In the TK3723, the domain range of 1025-5119 is supported. Domain ID 1025 is a specific ID used for a user domain without a tag.

Each domain has a related setting of the stream processing rules which apply to all streams in the domain. Rules automatically created by the firmware are used for setting the default link and queue for the diffusion path and domain; and the user rules of the domain are usually used for modifying or filtering flow.

Most common rules of a domain are rules for modifying the vlan tag of a flow. The VLAN tag is usually modified symmetrically; namely, the VLAN tag is added in the uplink direction and one tag is inserted to use the core network to convert the frame. As tags are irrelevant to the users, they will be removed in the downlink direction. For other examples, the VLAN tags may be converted to different VID values. They may also be ignored by the OLT and further forwarded to users with equipment, such as the home gateway.

Domains are configured in the Domains on the left control panel of the GUI in which there are four options: add, import, export and delete the Domain. For example, a Domain can be created with several steps below:

1) Click Add Domain and display the window shown in the Figure 7-1;
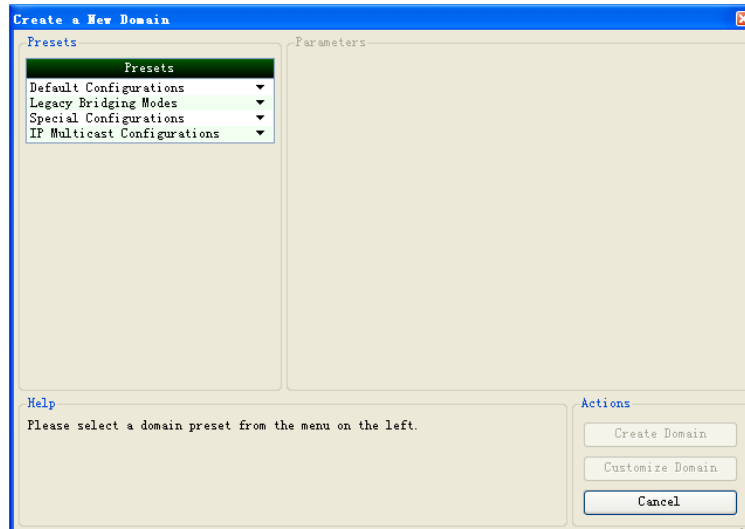
Figure 7-1 Add Domains

2) Selected the domain to be created as required; for example, here select the Single VID (One PON) in the Default Configuration and the window on the left will display the corresponding configuration parameters; fill in the Domain ID and VID, and click the Create Domain button at the lower left corner shown in the Figure 7-2;
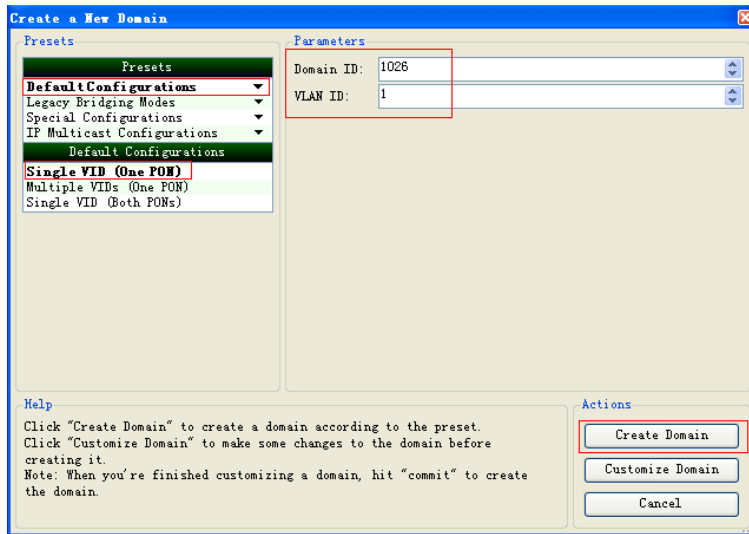
Figure 7-2 Create a New Domain

3) After creating, the left control panel will display a newly created Domain; click Domain1026 and the right control panel will display the option of Domain parameter configuration shown in the Figure 7-3; modify the parameters according to the actual requirements.
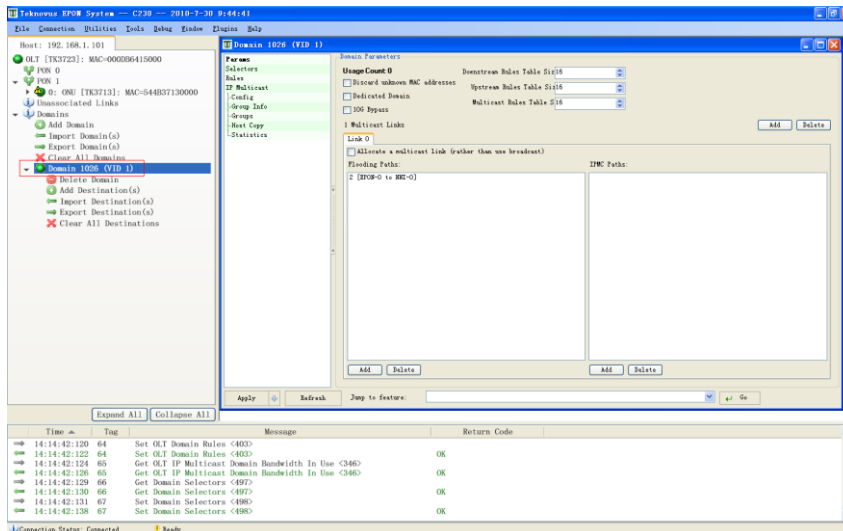
Figure 7-3 Domain Parameter Modification

Chapter 9 Attachment: Configuration Examples

✓ **OLT ADD Rule Configuration**

1. OTL Field Selector

Steps for creating the field selector configured by users:

1) In the GUI, click OLT to display the OLT window; select Edit field on the left panel of the window and open the window of Edit OLT Field Selectors shown in the Figure 8-1;
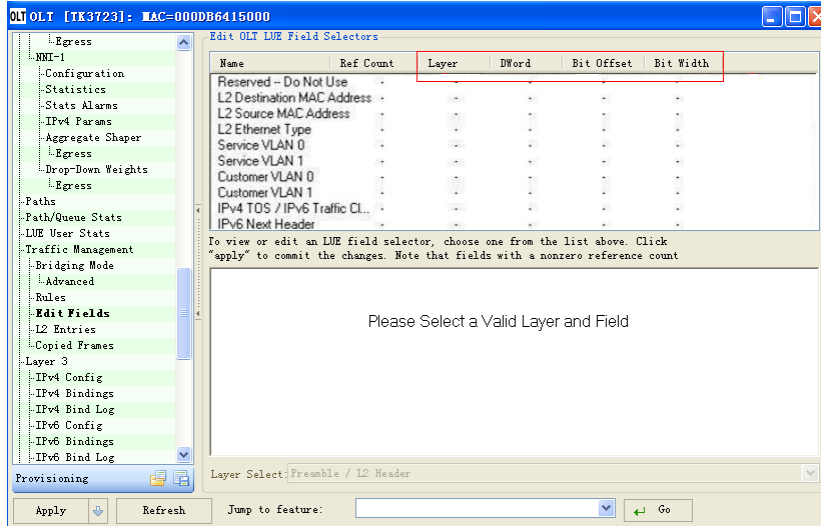
Figure 8-1 Window of Edit OLT Field Selectors

2) Select one of the unused selectors on the top of the right operation panel shown in the Figure 8-2;
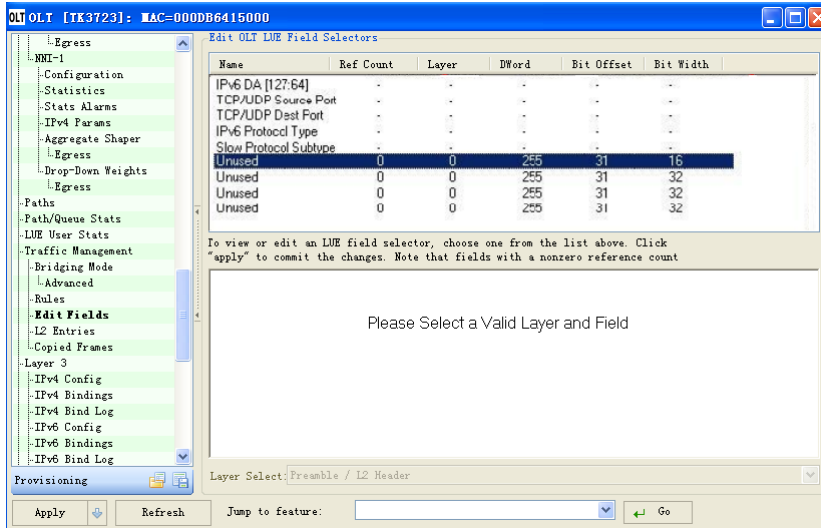
Figure 8-2 Unused Field Window

3) In the lower part of the window, click the Layer Select drop-down box to display options and select the required layer. For example, L3 IPv4 Header, the lower part of the window will display a chart shown in the Figure 8-3;
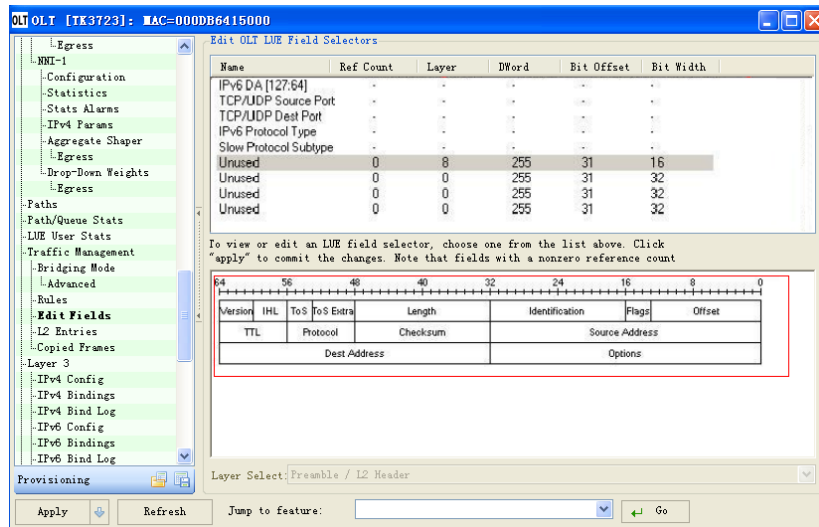
Figure 8-3 L3 IPv4 Header Chart

4) In the chart, for example, select the Flags field and drag it from one side to the other side with a cursor in the Flags box to display a selector with high brightness which matches with the items selected in the drop-down box of Layer Select. The selector shall be one which doesn't match with any item of the previous filed selectors shown in the Figure 8-4;
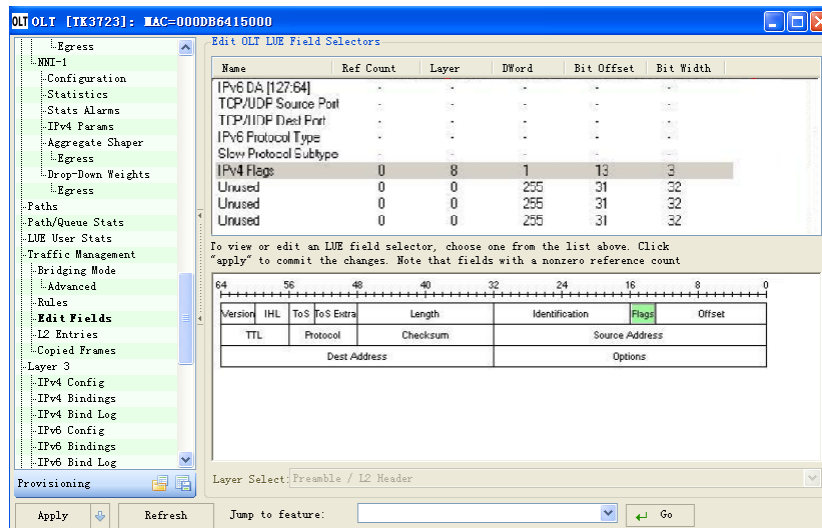
Figure 8-4 Flags Selector

5) Click Apply on the left side of the bottom of the window. Close the chart and create a new selector; the IPv4 Flags lists on the top panel of the window of which the previous name is Unused. Select IPv4 Flags to re-display the chart.

2. Create Rules

Select to create rules based on a port or link on the top window of the OLT rule; click Add at the bottom of the window to display the edit window shown in the Figure 8-5.
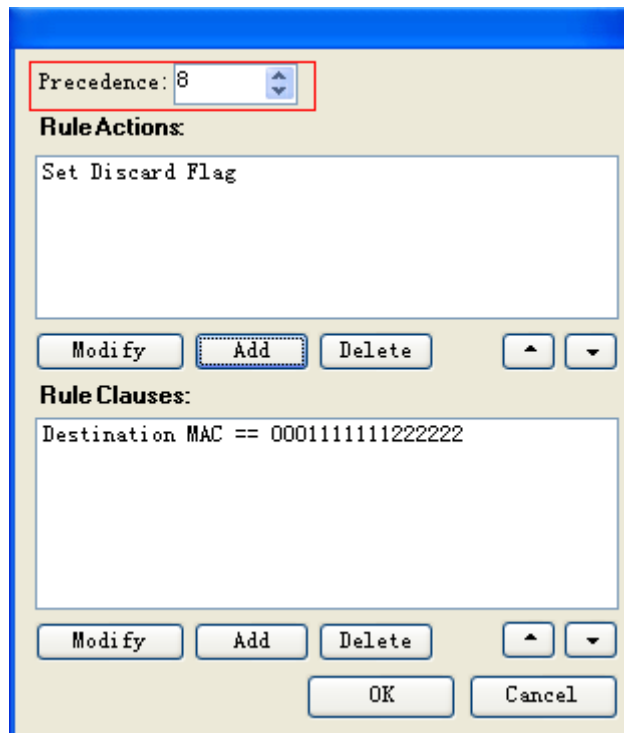
Figure 8-5 Edit Window

1) Precedence sets the precedence of rules which is set in the red area of the Figure 8-5;

2) Add rule actions:

    a. In the display part of Rule Actions, click Add to display the action window; select an Action from the drop-down menu: for example, select Add VLAN Tag shown in the Figure 8-6;
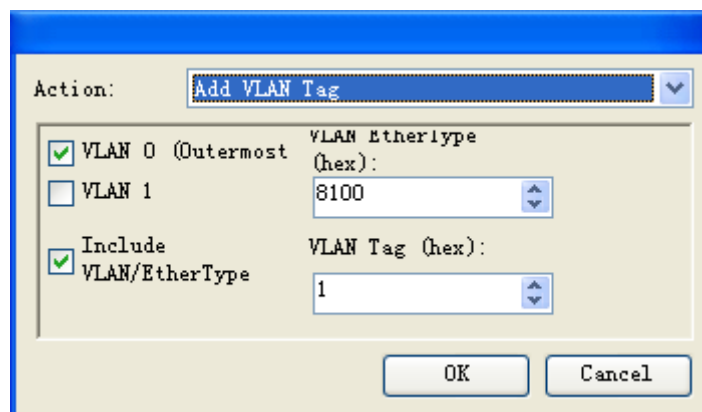
Figure 8-6 Add Actions

    b. If the parameter setting is displayed, set it as required;

    c. Click OK to close the Action window and view the previously selected Action in the display part of Rule Actions shown in the Figure 8-7;
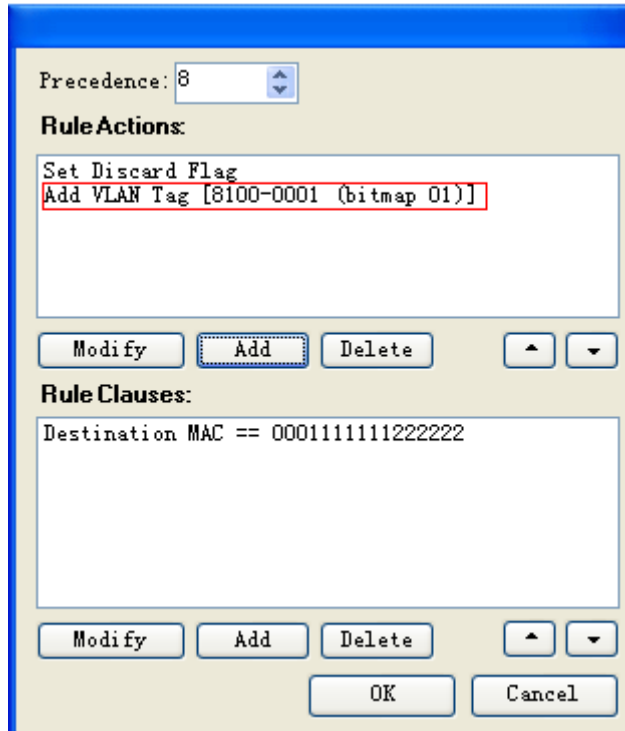
Figure 8-7 Rule Actions Display

d. Repeat the above steps to add more Actions;

e. Change the sequence of displayed Action and selected the Action to be moved; and then move Action with the Up and Down buttons at the lower right corner of the window;

f. Modify the displayed Action, select Action and click Modify to display the Action window; and then modify the parameters as required and click OK;

g. Delete the displayed Action, select Action and click Delete.

3) Add rule Clause:

h. In the display part of Rule Clauses, click Add to display the Clause window. click the drop-down menu of the arrow button and create a Clause as required, such as EtherType=0x0800 shown in the Figure 8-8;
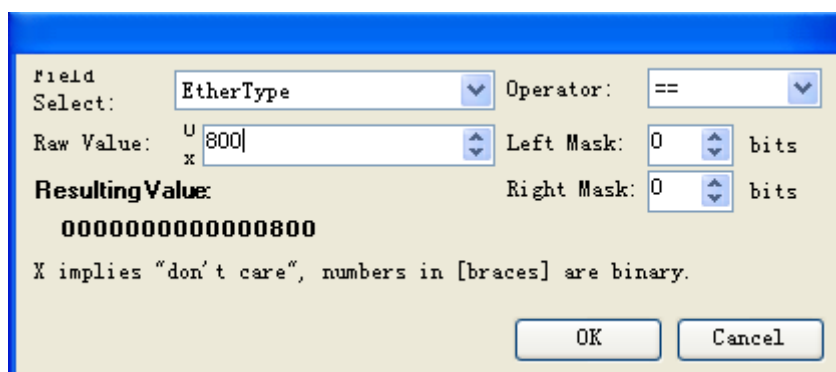
Figure 8-8 Add Clauses

i. Click OK to close the Clause window and the Clause will be displayed in the display part of Rule Clauses;

j. Repeat the above steps to add more Clauses;

k. Change the sequence of displayed Clauses and selected the Clauses to be moved; and then move Clauses with the Up and Down buttons at the lower right corner of the window;

l. Modify the displayed Clauses, select Clauses and click Modify to display the Clauses window; and then modify the parameters as required and click OK;

m.   Delete the displayed Clauses, select Clauses and click Delete.

✓   **ONU Link Rule Configuration**

1.   Add Link

There are two links by default; if another link to be added, operate it in the ONU according to the steps below:

1)   In the ONU window, select Queue Config to display the window of link configuration shown in the Figure 8-9;
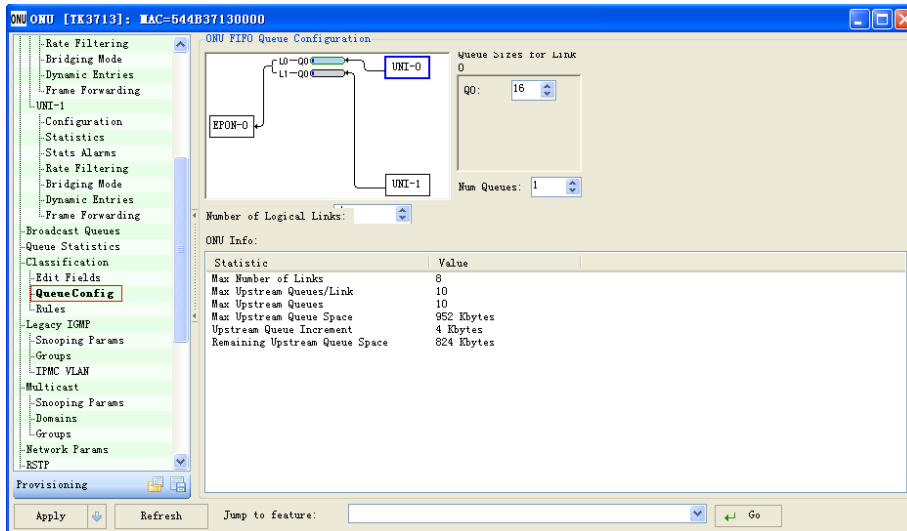
Figure 8-9 Link Configuration Window

2)   In the option of Number of Logical Links, select the number of links to be added with the arrow buttons (the maximum link is 8): for example, add a link L2 and fill in 3 for the number of links, the structural chart on the top of window will display the links to be added shown in the Figure 8-10;
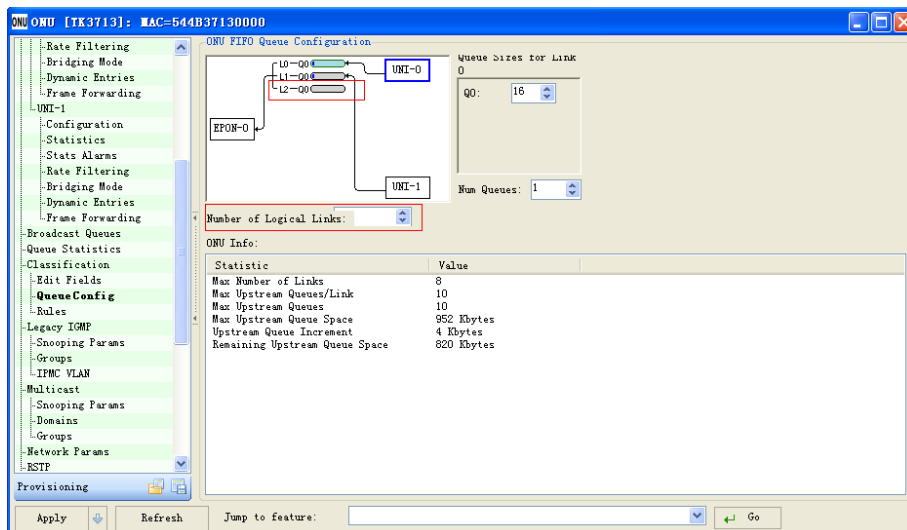
Figure 8-10 Add Links

3)   Open the Rules window, add the links to the UNI-0 (the links can also be added to the UNI-1) and select UNI-0 and link L2 in the structural chart; and then click Add to display the window of edit link rules shown in the Figure 8-11;
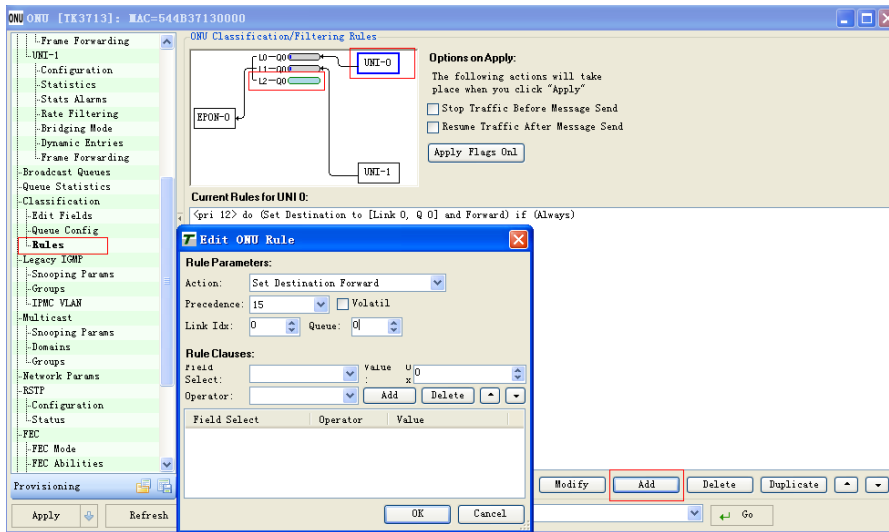
Figure 8-11 Edit Link Rules

4) In the Rule Parameters, select Set Destination Forward with the drop-down arrow; for example, the precedence is set as 10, Queue as 0 and Link Idx as 2 (link Idx and queue are the number of the current link and queue);

5) In the Rules Clauses, set Field Select as Ethernet DA, Operator as Always Match and value as 0 and click Add; then click OK shown in the Figure 8-12;
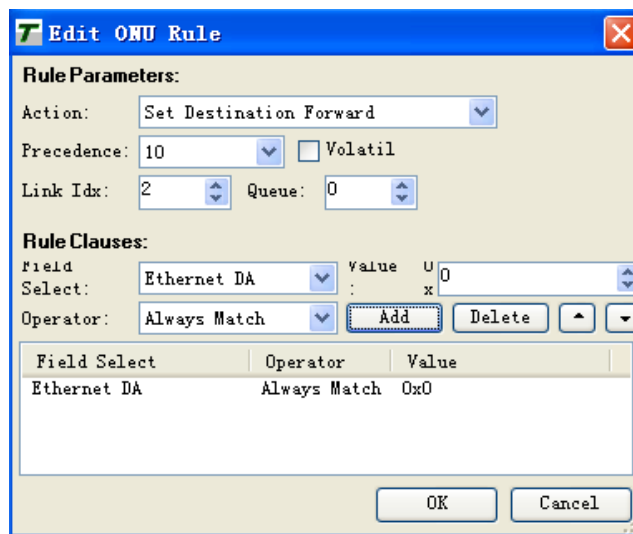
Figure 8-12 Rule Setting

6) Display a rule in the main window, connect the link L2 and UNI-0 in the structural chart on the top of the window shown in the Figure 8-13.
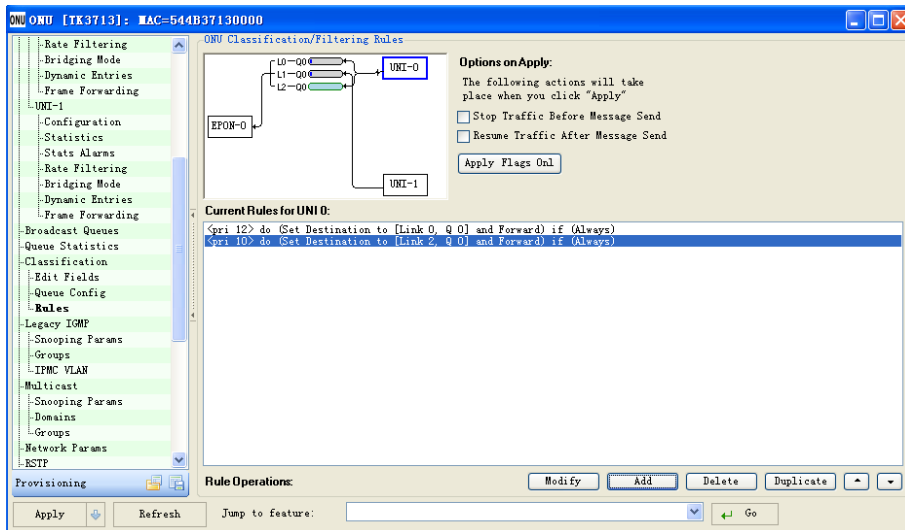
Figure 8-13 New Rule Display

2. Modify the upstream rules of the default ONU

In the rule window of the ONU, modify the default rules as follows:

1) Select UNI-0 in the structural chart;

2) Select the default link and then click Modify to display the window of Edit ONU Rule shown in the Figure 8-14;
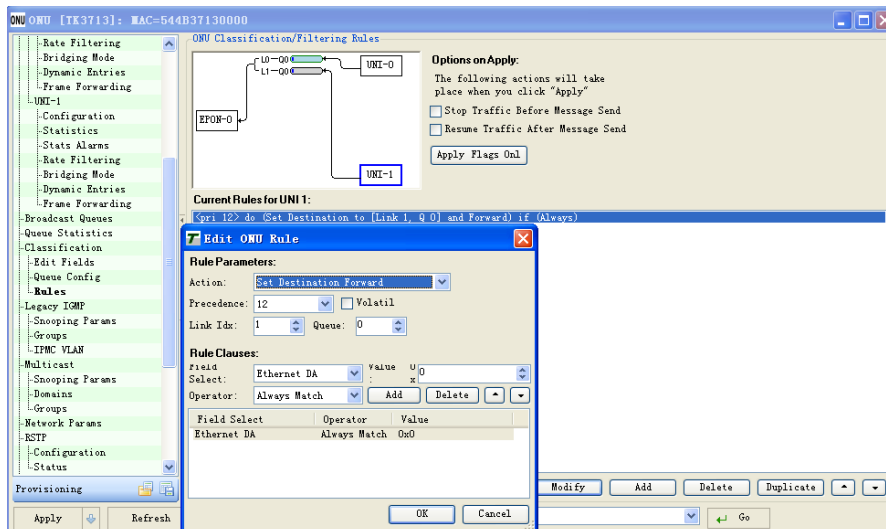
Figure 8-14 Modify Rules

3) For the Action part, change the Set Destination Forward as Set Destination with the drop-down arrow; click OK and display the new setting in the main window shown in the Figure 8-15. The current configuration of the UNI-0 port is the flow which discards the uplink unknown MAC address.
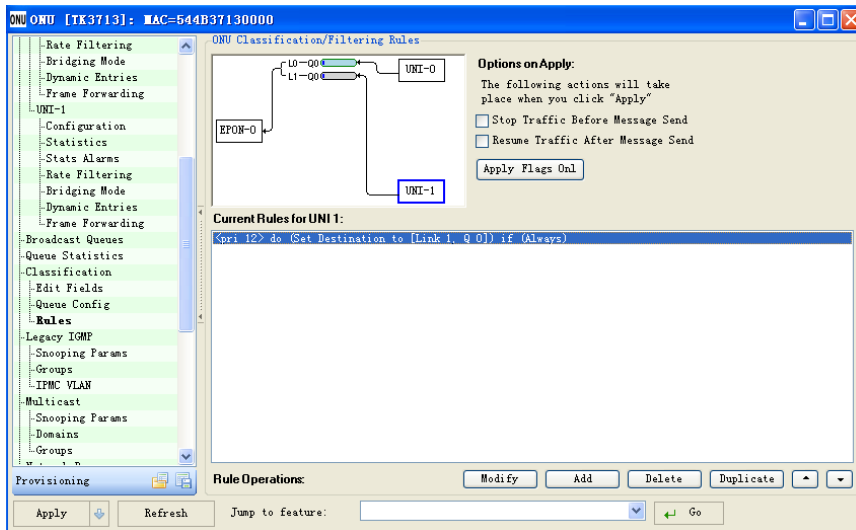
Figure 8-15 New Rule Display

3.   Add queues

One link only has a queue Qo by default, but queues can be added in the links as required. For example, add a queue in the link L0.

1)   In the Queue Config, select one link and selected the number of queues (the maximum number of queue is 10) to be added with the arrow button in the Num Queues option; modify the size of corresponding queues in the option box of Queue Sizes for Link. For example, add a queue Q1 in the link L0 and set the size of the queue as 20 shown in the Figure 8-16;
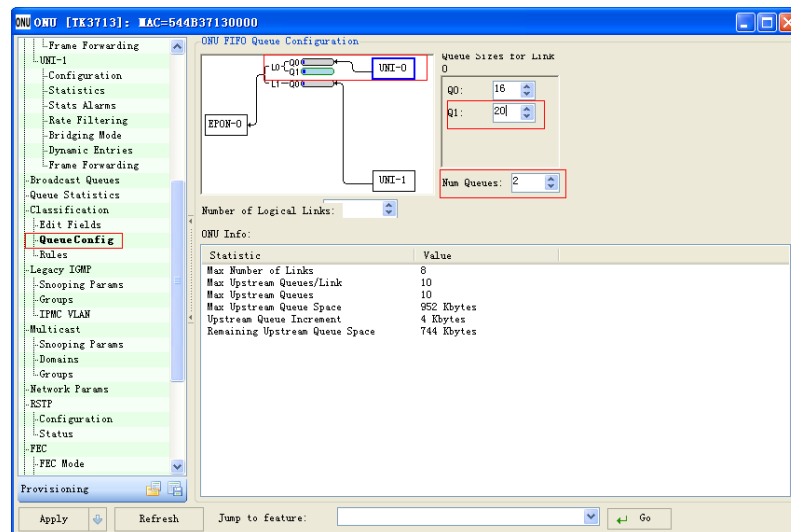
Figure 8-16 Add Queues

2)   In the Rules and structural chart, select Q1 and click Add to display the window of Edit ONU Rule shown in the Figure 8-17;
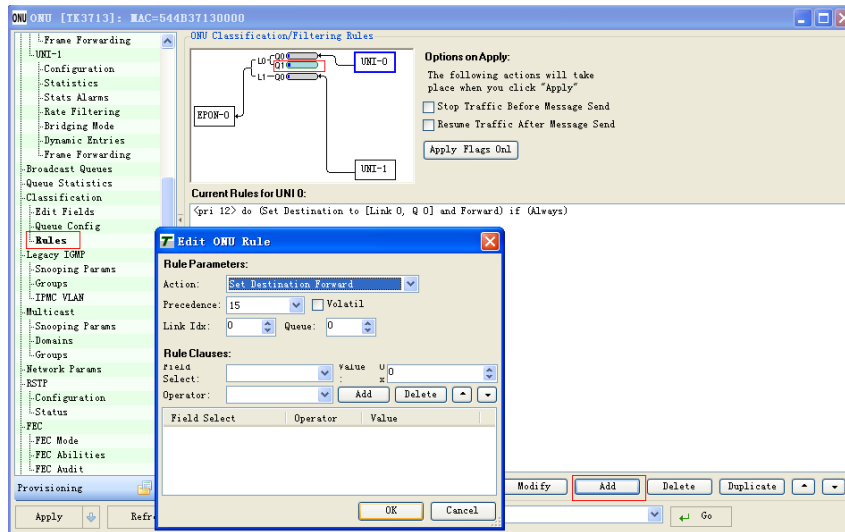
Figure 8-17 Edit Queue Rules

3) Set the rule parameters and Clause; for example, as shown in the Figure 8-18, the queue always forwards the flow of Ethernet DA as 1;
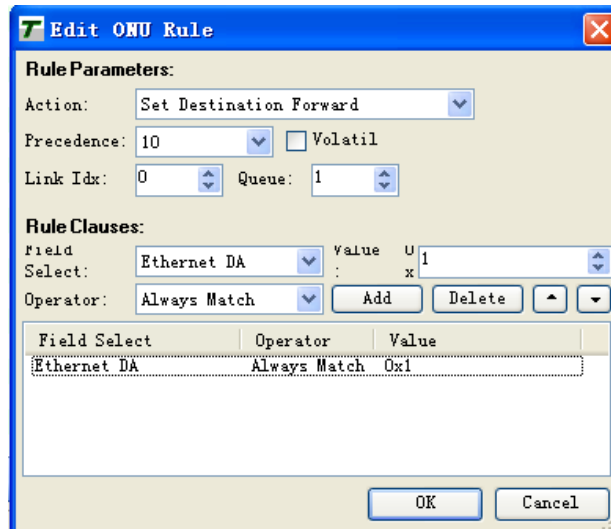
Figure 8-18 Queue Rule Setting

4) After setting, click Ok and the main window will display the new configuration; then the queue Q1 of the link L0 is also connected to the Uni-0 shown in the Figure 8-19.
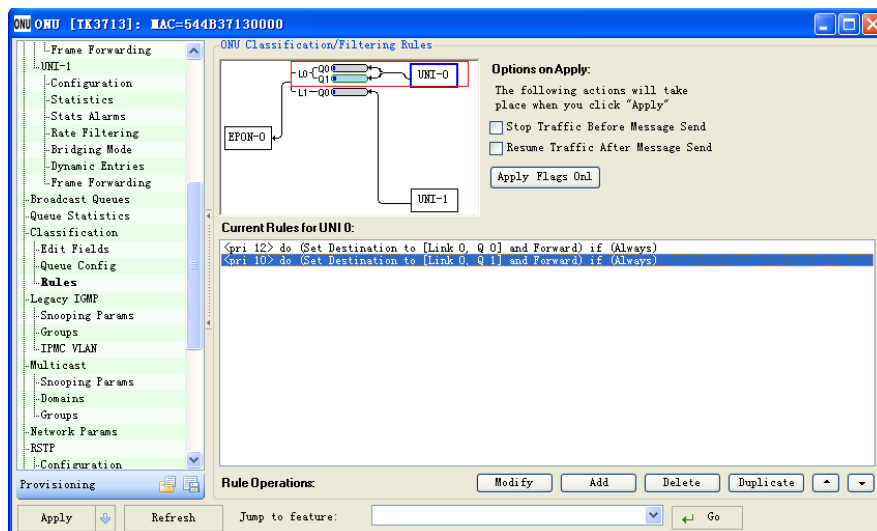
Figure 8-19 New Rule Display

✓ **Link SLA Configuration**

1. Set SLA

1) Set the SLA parameters of the links, including the DBA and DBA shaper parameters. Comply with the algorithm below:

✓ The minimum, maximum shaper bandwidth, and the scheduler level parameters shall match with the bandwidth and scheduler level parameters of the uplink queues.

✓ The SLA shaper weights of the links shall be set between 4 and 32. If the minimum and maximum shapers are set, the shaper weights shall be the same.

✓ The burst parameter shall be set as 255Kbytes.

✓ Force Report bit shall be set.

✓ The polling interval is used for selecting the data frequency for the OTL polling the ONU.

2) Set the queue SLA for the uplink and downlink queues of the links, and apply the SLA message of the queues.

2. Modify SLA

In the TK3723, the default SLA uplink of the link is 100Mbps and 1,000Mbps for the downlink. In the GUI, it is still 100 Mbps when the data rate sent in the uplink direction is more than 100 Mbps. If the data rate sent in the uplink direction is more than 100 Mbps, the SLA of ONU for the TK GUI shall be modified.

Modify the SLA with several steps below:

1) In the GUI, click the first link icon below the ONU on the left panel to display the first link window with the SLA list in it;

Note: in the ONU, the PORT1 of the first link by default connection is a port in 1,000Mbps (the PORT2 of the second link by default connection is a port in 100Mbps. PORT2 is limited to 100Mbps).

2) Set a new rate;

3) Whether the new rate is less than 300Mbps?

If yes, click Apply to test with the new rate.

If not, continue the step 4.

4) In the uplink SLA window, click the Advanced button. The Scheduler Weights in the SLA window will be displayed.

5) Modify the Scheduler Weights value as 16, click Apply and then test with the new rate.

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✓ **Optical Power Detection**

The optical power can be tested with several steps below:

1. In the Ports part of OLT for the GUI, select Optical Monitoring and click Control to display the operation window shown in the Figure 8-20.
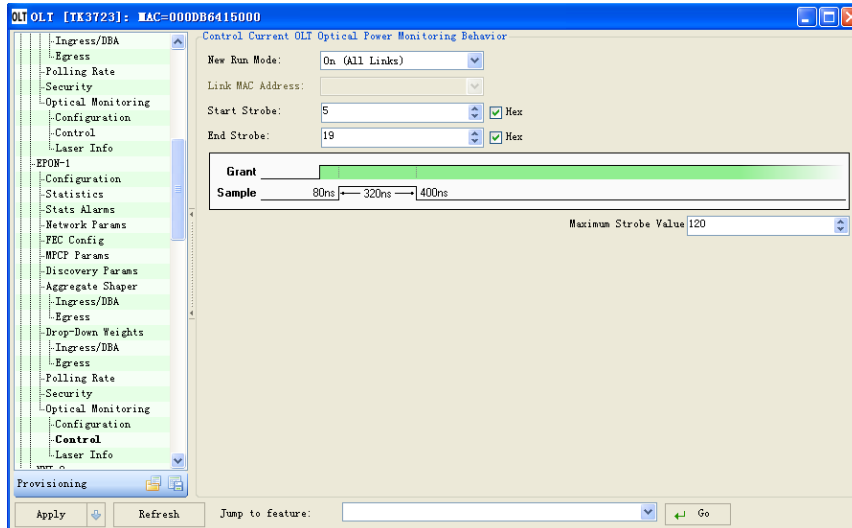

Figure 8-20 Operation Window

2. Make the following settings:

1) A new mode of operation

✓ Select one of the following options with the drop-down menu:

Close: do not perform sampling.

Open (all links): perform the sampling of all links.

No idle: do not perform the sampling in the idle period.

Only idle: perform the sampling only in the idle period.

Single link: perform the sampling for one specific single link.

✓ When the Single Link is selected, the Link MAC Address will be enabled.

2) Link MAC address

✓ Enter the link MAC address to be sampled.

3) Start and close the gate

✓ Set the values with the arrow button; closing the gate in the chart will reflect a change.

✓ The value can be manually changed in the chart; move the start or end value, click and drag the corresponding vertical line to the expected value. Do not move the samples by changing the interval; click and drag the interval value, and then the value will be changed in corresponding fields.

4) The maximum gate value

✓ Set the value with the arrow button.

3. Click Apply.

View the testing results of the optical power with several steps below:

1. Results in the OLT:

1) In the Ports part of the OLT located in the EPON port (EPON-0 or EPON-1), click Statistics to display the window shown in the Figure 8-21.
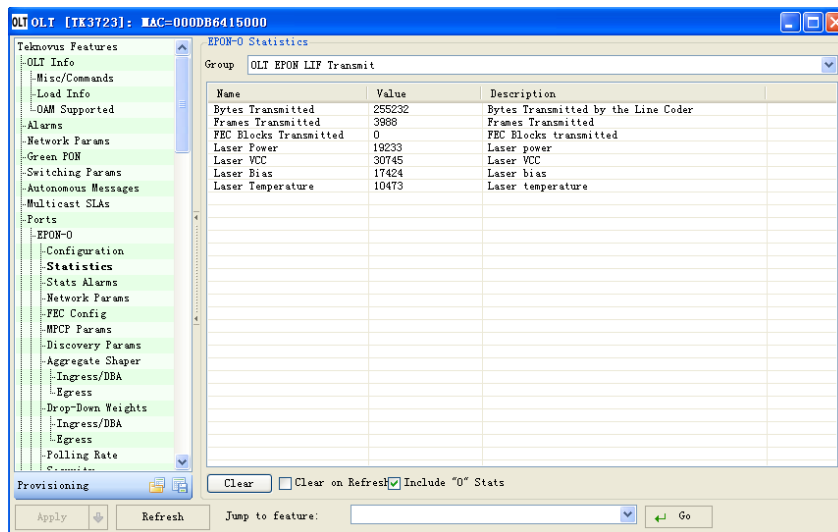
Figure 8-21 OLT Statistics Window

2) In the drop-down menu of the Group, select one group to display the statistics describing the optical power detection:

✓ OLT EPON LIF Transmit

Laser Power: records the laser power sent in 0.1 uWatt.

Laser VCC: records the laser supply voltage in 100 uVolt.

Laser Bias: records the laser bias current in 2 uAmp.

Laser Temperature: records the temperature of a transceiver in 1/256 degree celsius showing the linear scale.

✓ OLT EPON LIF Receive

Laser Idle Power: records the laser power in the idle period of the PON.

✓ OLT EPON Link Receive

Laser Power: records the laser power received during the transmission period of logical links selected by the ONU.

2. Results in the ONU:

In the Ports part of the ONU located in the EPON port (EPON-0 or EPON-1), click Statistics to display the window. The Statistics window of the ONU is similar to that of the OLT which contains two options that display the statistics describing the optical power detection:

✓ ONU EPON Transmit

Laser Power: records the laser power sent in 0.1 uWatt.

Laser VCC: records the laser supply voltage in 100 uVolt.

Laser Bias: records the laser bias current in 2 uAmp.

Laser Temperature: records the temperature of a transceiver in 1/256 degree celsius showing the linear scale.

✓ ONU EPON Receive

Laser Power: records the laser power of the downlink received signal in 0.1uW.

The sampling is the number of seconds for automatically restoring one time according to the number of links. For example, when 5 links are sampled, restore once for every 5 seconds of sampling. When 60 links are sampled, restore once every one minute of sampling.

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✓ Link VLAN Configuration

Set the bridging modes of the links; the EPON has multiple bridging modes, such as configuration of Translated VLAN.

1. In the Link part of the GUI, click Bridging Params and display the window shown in the Figure 8-22;
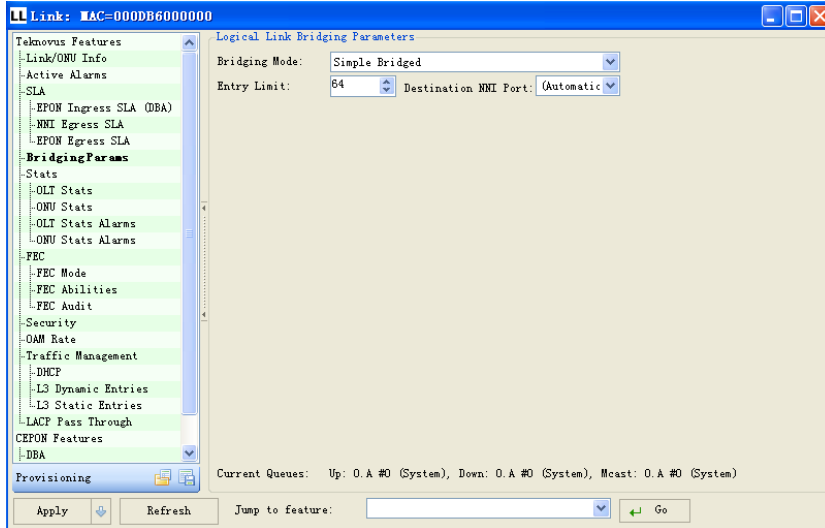

Figure 8-22 Window of Bridging Parameter Configuration

2. In the Bridging Mode, select Translated VLAN to display the configuration parameters shown in the Figure 8-23;
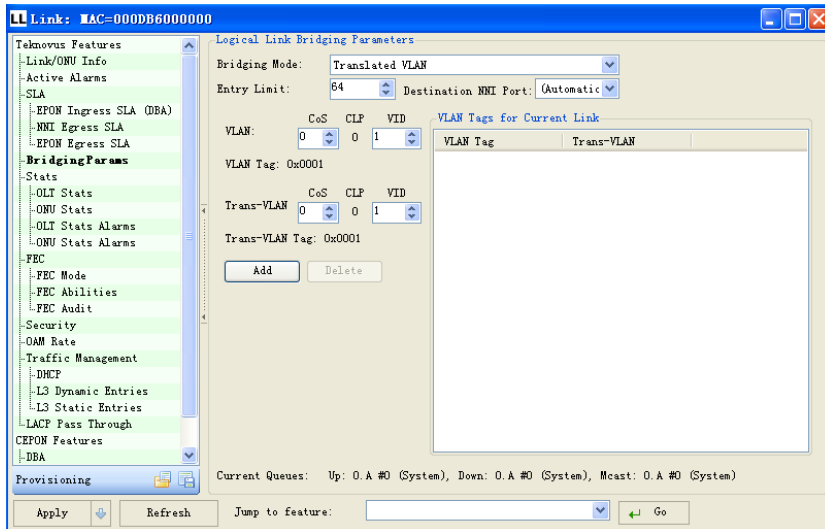

Figure 8-23 Bridging Mode Selection

3. In the VLAN and Trans-VLAN, set the VID values respectively. For example, in the VLAN, set the VID as 5 while setting the VID as 10 in the Trans-VLAN; click Add and then Apply shown in the Figure 8-24. (In the VLAN, set the VID as 5 while setting the VID as 10 in the Trans-VLAN; namely, send the flow (VID=10) in the uplink direction and the OLT port will receive the flow (VID=5); send the flow (VID=5) in the downlink direction and the ONU port will receive the flow (VID=10).
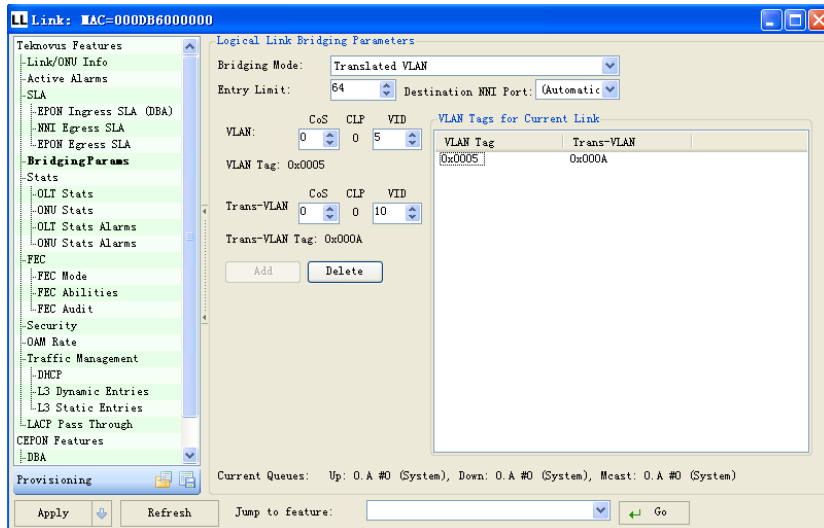
Figure 8-24 Add VID Value

✓ **Modify IP Address**

Modify the address of the Host and management IP with the several steps below:

1. connect the PC and OLT with a serial line;

2. Open the Pers3723_C230.tkp with the installed tkPersEditor.exe shown in the Figure 8-25;
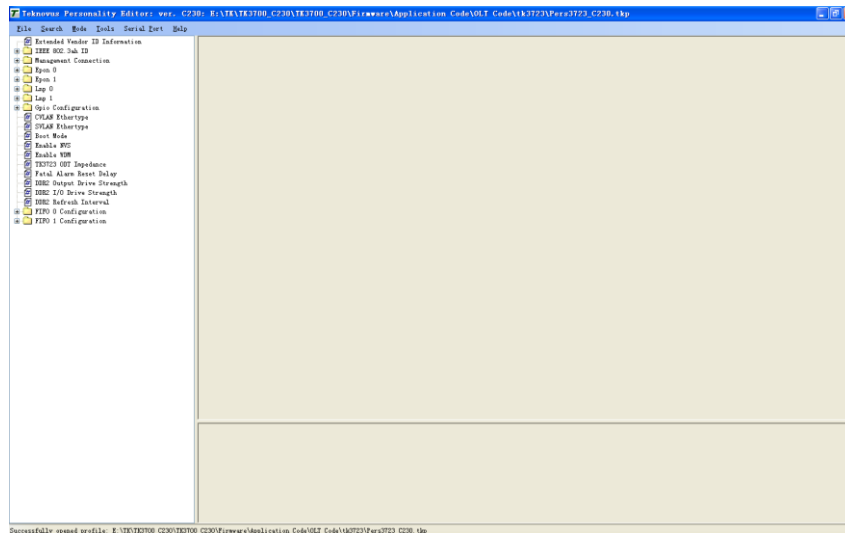

Figure 8-25 PersEditor Interface

3. Connect the serial port and select Serial Port/Connect in the menu bar to display the window shown in the Figure 8-26; fill in the parameters according to the actual conditions and click Connect;
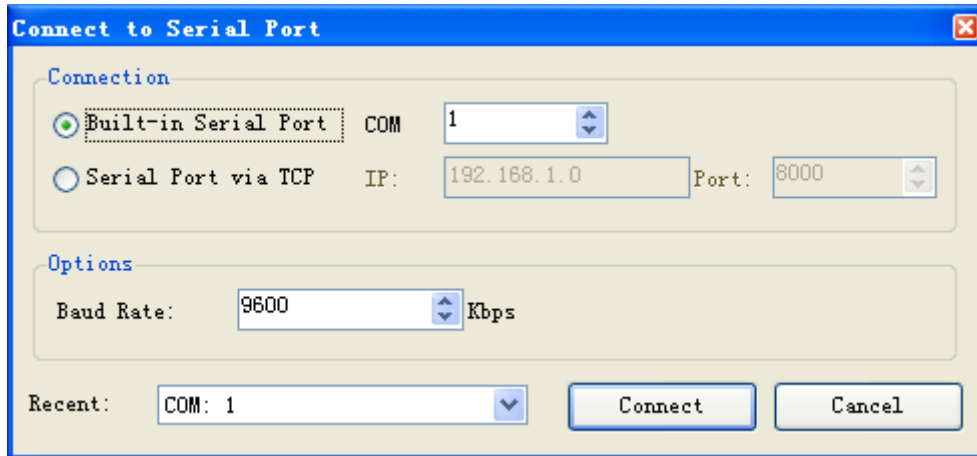
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Figure 8-26 Set Connection Parameters

4. Obtain the OLT properties files and select Tools/OLT CLI Read in the menu to display the window shown in the Figure 8-27, and then click Load from Device;
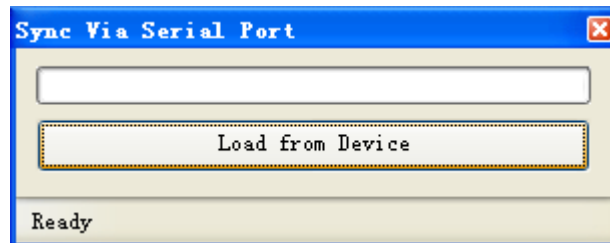

Figure 8-27 Obtain Data

5. After completion of loading, display the window shown in the Figure 8-28 and click "OK";

Figure 8-28 Successful Download

6. Click Management Connection on the left side of the main window and display the detailed parameters on the right side shown in the Figure 8-29;
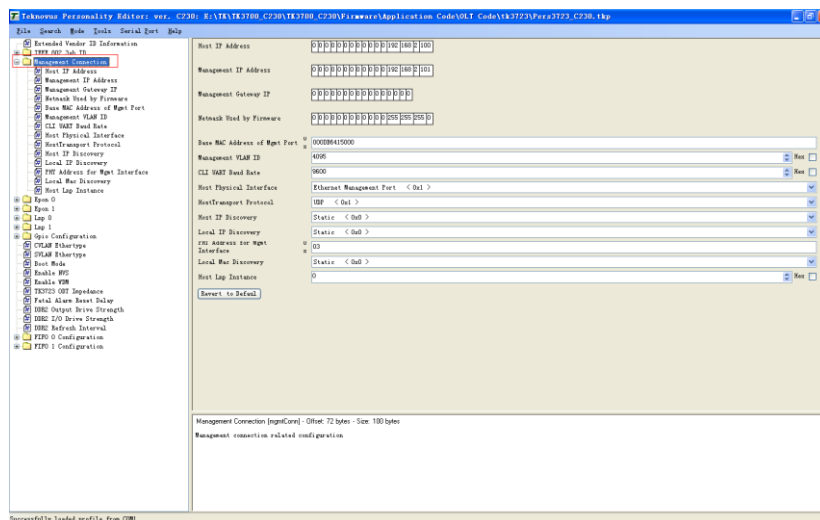

Figure 8-29 Configuration Parameters

7. Modify the Host IP Address and Management IP Address as required and save data after completion of modification; select the Tools/OLT CLI Write in the menu to display the window shown in the Figure 8-30 and click Send to Device;
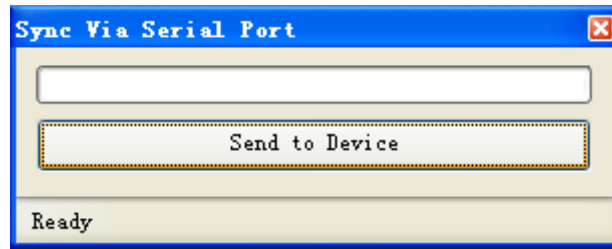

Figure 8-30 Save Data

8. After completion of saving, display the window shown in the Figure 8-31 and click "Yes" and the new IP address will take effect after rebooted.

Figure 8-31 Completion of Saving Data