GE-PON Optical Access Network

Features

- Symmetric 1.25Gbps for Up-Stream And Down-Stream Transmissions
- Implementing Point-to-Multi-Point Network Scheme
- Single OLT Port Fiber-Networking As Many As 32 ONU
- Fully Compliant to IEEE802.3ah
- Multiple Service Network Interfaces Available From OLT, Offering T1/E1 And GbE Interfaces
- Variety of ONU Types Offering Multiple User Network Interfaces for Multi-Dwelling Unit or Single Family House use, e.g. Single GbE port, Four 10/100BT Ethernet Ports, VoIP Voice Port.
- Powerful Techniques in Handling ONU's Quality of Service Fulfilling Triple-Play Application
- ONU Fully Complies to IEEE802.q for VLAN, IEEE 802.1p for Prioritizing, IGMPv1 And IGMPv2 for Snooping Satisfying the IPTV Industry

Applications

- Broadband Data Communications
- TDM/Voice Over IP Communications
- Video Over IP Network
- IP Surveillance Network
- Data, Voice, RF-overlayed Video, And IPTV Services for Triple-Play Network

OLT: Based on PON and point-to-multi-point networking technologies, AC's IEEE802.3ah compliant GE-PON equipments offer service providers the most cost-effective FTTP solutions. A single OLT chassis houses 64 PON interfaces connecting as many as 2048 ONUs.

ONU: For Customer Premise equipment ONU, AC offers a variety of user interfaces, i.e., single 10/100/1000Mbps Ethernet port, 4 10/100Mbps Ethernet ports, 2 VoIP user ports, and one RF-overlay CATV-Video user port. Besides following the industry standards, our GE-PON also utilizes DBA and QoS techniques to guarantee the best use of network bandwidth and quality of services, including IPTV to fulfill customers' demands in data, voice, and video applications.

GPON-5600 (OLT) series is AC's first contribution to the FTTP (Fiber-To-The-Premise) networking. Adapting Gigabit Ethernet over PON (Passive Optical Network) technologies, GPON-5600 provides Gigabit bandwidth for varieties of applications in FTTB (Fiber-To-The-Building), FTTC (Fiber-To-The-Curb), FTTH (Fiber-To-The-Home) networks. Compliant to IEEE802.3ah, the Gigabit Ethernet Over PON standard, GPON-5600 delivers multi-services to the customer premise to fulfill customer's need in bandwidths and quality of service. Operation in symmetric transmission at 1.25Gbps speed, GPON-5600 offers near 1Gbps throughput to guarantees the most use of bandwidth efficiency. Delivered by AC's GPON-5600 series, users have the chance to enjoy what a broadband world can bring to, e.g. Video-On-Demand, Multimedia-on-Demand, IP-TV, HDTV, high speed internet access, and VoIP services.

Each PON network from GPON-5600-OLT can be connected as many as 32 customer premise equipment (64 optional), ONU (Optical Network Unit). And, each ONU provides customers as much as 1Gbps bandwidth. Every PON network is up-linked by its own Gigabit Ethernet link for connection with Metropolitan networks, backbone networks, Router, or Layer-2/Layer-3 Switch. Accurate DBA (Dynamic Bandwidth Allocation) is applied to efficiently utilize the network bandwidth. The adapted powerful QoS (Quality of Service) rule guarantees varieties of services can be in-time delivered to prevent unacceptable delay.

OLT PHOTO (front view)

There are total 15 slots for OPC and LIU-A line cards insertions from front chassis, in which 14 slots for LIU-A and 1 for OPC.

OLT PHOTO (top view and bottom view)

A replaceable Fan draw at the top housing is optional installed, combined with the opened top and bottom side walls to provide the air ventilation for chassis. In addition, inside the bottom side wall, there is an air filter providing clean air flow to the chassis.

OLT PHOTO (rear view)

The rear side wall is equipped with 48VDC input terminals and ON/OFF switches with master and slave redundancy, OPC Alarm input and output terminal, Fan ON/OFF switch and power supply input terminal, and Alarm information output terminal.

There are three types of customer premise equipment available, GPON-400-ONU, GPON-1000-ONU , and GPON-400VP-ONU . GPON-400-ONU has a bandwidth manageable Layer-2 switch built-in to offer 4 Ethernet ports. As a result, customer is benefit to reduce the home equipment investment when multiple user ports are needed. In addition, service provider can control and manage the bandwidth at each user port to offer customers with varieties of services. Each type of ONU fully complies to IEEE802.q for VLAN, IEEE802 .1p for prioritizing, IGMPv1 and IGMPv2 for snooping to fulfill industry needs in serving IP-TV.

GPON-400-ONU PHOTOS:

GPON-400VP-ONU has all the features of GPON-400-ONU. In addition, it offers two RJ-11 ports for VoIP (Voice-Over-Internet-Protocol) service. Just hook up Plain Old Telephone set to any of VoIP ports, customer will start to enjoy low cost telephone service,   VoIP. GPON-400VP-ONU supports H.323 and SIP protocols to meet most of world standards in VoIP.

GPON-400VP-ONU PHOTOS:

For customers who need super bandwidth for imaging transmission, data communications, video transmission. etc. GPON-1000-ONU is the solution for those applications. GPON-1000-ONU has a single Ethernet port with manageable bandwidth up to 1Gbps. When connected with ex ternal Ethernet switch, GPON-1000-ONU is a perfect solution for MDU/MTU (Multi-dwelling Unit/Multi-Tenant Unit) network.

GPON-1000-ONU PHOTOS:

Detail physical spec and functional spec are listed as below.

System Functionalities

- **GPON-5600:**
  - ➢ Each PON interface supports at least 32 ONUs
  - ➢ Full 802.3ah Support for Multi Point Control Protocol (MPCP)
    - ■ Network Timestamp
    - ■ Ranging
    - ■ Discovery – Automatic Registration and Ranging
    - ■ Uplink Transmission Gate
    - ■ ONU Report Collecting
    - ■ Multiple point to point emulation
      - ◆ LLID Bridging – MAC ↔LLID address table management
      - ◆ LLID Allocation in a dynamic and stack regime
  - ➢ Switching functionality within the GE-PON compliant with 802.1D bridging
    - ■ Address table of 8K entries
    - ■ Optional peer to peer communication
    - ■ IGMP snooping
  - ➢ Spanning tree support
    - ■ Destination Address port filtering
    - ■ Source MAC addresses learning
    - ■ Flooding
    - ■ Bridge Protocol – Generating and parsing BPDUs
    - ■ Programmable limited number of addresses learned for each LLID
    - ■ The optional blocked traffic from these addresses
    - ■ LLID P2P configuration
    - ■ P2P access control
  - ➢ Tagging at logical link layer
    - ■ Logical Link-ID based tagging for port and service combination
    - ■ Up to 127 LLID for full support
    - ■ Single copy broadcast support
    - ■ 802.1p priority/IPv4 ToS/IPv6 ToS based classification for all unsent frames with 8 classes of services
    - ■ VLAN tagging of frames based on originating ONU
      - ◆ Not change
      - ◆ Exchange
      - ◆ Stack
    - ■ VLAN Ether-type supporting 0x8100, 0x9100, 0x88a8

- VLAN Ether-type supporting 0x8100, 0x9100, 0x88a8
- Enforcement of QoS policies orfront ends and GE-PON side
- 802.3ah Full OAM feature set
  - Network reliability achieved by integrated fault analysis and isolation
  - Auto-negotiation
  - Fault management
  - Link Status
  - Fault Isolation
  - Remote loop-back
  - Remote statistics query capability
  - Dying Gasp
  - Vendor specific:
    - Remote control of far-end ONUs
      - ✓ On/Off
      - ✓ UNI port configuration
      - ✓ Authentication and security
      - ✓ Port statistics
    - Ping request / response
    - Network configuration
- Guaranteed QoS achievable using scheduling mechanisms
  - Internal 8 classes priority queues in uplink and downlink
  - Internal Downlink traffic Policer
  - Internal peer-to-peer traffic Policer
- Enhanced Hardware accelerators for internal DBA algorithms
- 1600 octets maximal frame for VLAN nesting and multiple encapsulations
- Ethernet standards compliance
  - IBI PCS layer line coding/decoding
  - 802.1q VLAN tags supported
  - 802.3x flow control
- Integrated privacy and security
  - 128-bit AES encryption of downlink
  - 128-bit AES decryption of uplink
  - 128-bit AES encryption of downlink and uplink
  - Authentication
    - Supports the vendor defined specific internal authentication
    - Supports IEEE802.1x external authentication protocol
  - Key management
- Bandwidth Allocation
  - Static granting configuration
  - Dynamic Bandwidth Allocation (DBA)
    - OLT default internal DBA
    - Vendor Extension DBA

● **GPON-5600-NMS (Network Management System)**

➢ CLI (Command Line Interface)
- There is a RS-232 port for connection with CIT (Craftsman Interface Terminal) for equipment maintenance. There is only one user allowed to access GPON-5600-OLT system.
- By connection the Ethernet port at the OPC board of GPON-5600-OLT, Telnet is also another way to access the GPON-5600-OLT system for maintenance purpose, while maximum five users are allowed to access.
- Support SNMP V1.0, V2.0, and V3.0 as well as full MIB operation.
- Support Provision Management, Alarm Management, Performance Management, Maintenance Management, and Security Management.
- Provision Management includes system provision, data base redundancy, software download and upload, etc.
- Alarm Management includes Alarm settings, e.g. severity, monitoring, filtering, invert and threshold setup, and store current alarm information.
- Performance Management is to report the performances at SNI and UNI ports for the duration of current 15-minute, historical 15-minute record, historical 24-hour record, and threshold settings.
- Maintenance Management includes Loopback Test, Diagnosis Test, etc.
- Security Management is to verify and approve the logging users.
- There are three levels of user authentication, allowing authorized users to manage the GPON-5600 system and its network elements.
    - ◆ SUPER-USER, the highest level authorized user, is allowed to manage all of the settings and provisions, overseeing all the lower level users. Users at this level cannot be deleted but password change is allowed.
    - ◆ ADMINISTRATOR, the second highest level authorized user, is also allowed to manage all of the settings and provisions, overseeing all the next lower level managers, MAINTAINER.
    - ◆ MAINTAINER, the lowest level authorized user, is only allowed to monitor the settings and provisions, performance reports, alarm information, disallowed to make any change to the provisions.

- ➢ NMS (Network Management System):
  - ■ GUI (Graph User Interface) based on Windows Server operation system is provided for ease of operation and maintenance.
  - ■ Java-base is provided to support powerful database.
  - ■ Manage at least 100 GPON-5600-OLT and 50,000 units of ONU as combination of GPON-400-ONU, GPON-1000-ONU, and GPON-400vp-ONU.
  - ■ Support SNMP V1.0, V2.0, and V3.0 as well as full MIB operation.
  - ■ Support Provision Management, Alarm Management, Performance Management, Maintenance Management, Security Management, and Diary Management.
  - ■ Provision Management includes system provision, e.g. service management and bandwidth provision, data base redundancy, software download and upload, etc.
  - ■ Alarm Management includes Alarm settings, e.g. severity, monitoring, filtering, invert and threshold setup, and store current alarm information, as well as record historical alarms and traps.
  - ■ Performance Management is to report the performances at SNI and UNI ports for the duration of current 15-minute, historical 15-minute record, historical 24-hour record, and threshold settings.
  - ■ Maintenance Management includes Loopback Test, Diagnosis Test, etc.
  - ■ Security Management is to verify and approve the logging users.
  - ■ Diary Management major records the logged-on users' information and all the users' operations.
  - ■ There are four levels of user authentiation, allowing authorized users to manage the GPON-5600 system and its network elements.
    - ◆ SUPER-USER, the highest level authorized user, is allowed to manage all of the settings and provisions and overseeing the operation status. In addition, use at this level is authorized to manage the lower level users. Users at this level cannot be deleted but password change is allowed.
    - ◆ ADMINISTRATOR, the second highest level authorized user, is also allowed to manage all of the provisions and settings, as well as overseeing the operation status.
    - ◆ OPERATOR, the third level authorized user, is allowed to manage only the provisions and overseeing the operation status.
- ➢ MAINTAINER, the lowest level authorized user, is only allowed to monitor the provisions, performance reports, alarm information, while not authorize to make any change to any of the system provisions, settings, etc.

- **GPON-5600-OLT**
  - ➢ LIU-A   (A-type Line Interface Unit) Board
    - ■ Maximum 14 LIU-A boards per chassis
    - ■ 4 GE-PON ODI (Optical Distribution Interface) ports per LIU-A board
      - ◆ Single-fiber bi-directional symmetric transmission at 1.25Gbps speed
      - ◆ As many as 64 optical splits per GE-PON network
      - ◆ 1490nm downstream operation wavelength at continuous mode
      - ◆ 1310nm upstream operation wavelength at burst mode
    - ■ 4 GE SNI (Service Network Interface) ports per LIU-A board
      - ◆ SFP interface supporting optical SFP module and electrical SFP module
      - ◆ Supporting 1000 Mbps/100Mbps/10Mbps auto-negotiation mode
      - ◆ Supporting 802.1q VLAN standard
      - ◆ Supporting 802.1s Multiple Spanning Tree Protocol
      - ◆ Supporting 802.1D Traffic class Expediting and conditioning, dynamic multicast filtering
      - ◆ Supporting 802.1W Rapid Spanning Tree protocol
    - ■ LED indications:
      - ◆ Board operation status (normal: flash green, fail: dark)
      - ◆ PON transmission status alarm (normal: dark, fail: solid red)

  - ➢ OPC (OPeration Control) Board
    - ■ one 10/100BT port for EMS
    - ■ one RS-232 CLI (Command Line Interface) port for Craftsman Interface Terminal
    - ■ LED indications:
      - ◆ Board Power status (normal: solid green, fail: dark)
      - ◆ Board operation status (normal: flash green , fail: dark)
      - ◆ System Reset status (resetting: flashing green , normal: dark)
      - ◆ System Operation status (normal: dark, alarm: solid red)

- **GPON-1000-ONU**
  - ➢ Providing one 10/100/1000Mbps port as UNI (User Network Interface)
    - ■ GE-PON ODI port:
      - ◆ Full duplex transmit and receive GE-PON port operating at 1.25Gbps
      - ◆ Fully support 802.3ah MPCP
      - ◆ Support 802.3z, 802.3ah and 802.3x standards
      - ◆ Operation Wavelengths: Rx: 1490nm; Tx: 1310nm
    - ■ One 10/100/1000Mbps UNI port:
      - ◆ Support 10/100/1000Base-T auto-negotiation
      - ◆ Support 802.3 and 802.3ab standards
      - ◆ User bandwidth manageable, with bandwidth granularity

- **GPON-400-ONU**
  - ➢ Providing 4 10/100Mbps ports as UNI
    - ■ GE-PON ODI port:
      - ◆ Full duplex transmit and receive GE-PON port operating at 1.25Gbps
      - ◆ Fully support 802.3ah MPCP
      - ◆ Support 802.3z, 802.3x, 802.3ah standards
      - ◆ Wavelength: Rx: 1490nm; Tx: 1310nm
    - ■ 4 10/100Mbps UNI ports:
      - ◆ Support 10/100Base-T
      - ◆ Support 802.3 and 802.3ab standards
      - ◆ User bandwidth manageable, with bandwidth granularity

- **GPON-400VP-ONU**
  - ➢ Providing two VoIP ports as UNI in addition to GPON-400-ONU
    - ■ 2 POTS (VoIP) UNI ports:
      - ◆ High quality of service (QoS)
      - ◆ Support H.323 and SIP protocols (H.245, H.225, Q.931, H.450)
      - ◆ Support G.711 (μ law/A law), G.729A, G.723.1 (6.3K/5.3K), GSM and NetCoder codec
      - ◆ Support FoIP, T.38 protocol, and for fax, G3 up to 14.4kbps
      - ◆ Support voice activity detection (VAD) and silence suppression, compliant to G.729B and G.723A
      - ◆ Comfort noise generation (CNG)
      - ◆ Support echo cancellation and G.168 protocol (25ms, maximum 32 ms)
      - ◆ DTMF signal and other tone detection and generation