DATA SHEET

V8102

1 Product Overview

The V8102 is a 2RU height chassis GPON Optical Line Termination (OLT) which supports up to 32-Port GPON interfaces per chassis. You can insert or pull out the plug-in units to/from the chassis in easy and safe way.

The V8102 provides 7 slots for the plug-in units. Each type of interface unit contains different number of ports. The two slots are reserved for the SFU cards for management/switching. And two slots are reserved for the SIU for providing up to 32 GPON subscriber interfaces (SIU_GPON16) per chassis. Each SFU contains four 1G/10G ports (SFP/SFP+) as the uplink interfaces, and the remaining three slots are reserved for two power supply modules and fan unit. A console interface for CLI accesses as well as a RJ45 interface for out-of-band management is provided on the SFU's front panel. The two slots are reserved for the modular DC type power supply units to provide power redundancy and flexibility in various operating environments.

The V8102 is comprised of two GPON service modular units to deliver a wide range of full-featured and high-performance over FTTx applications. It is a high-density chassis system that supports up to 4,096 residential and business subscribers (ONTs) with 32 GPON ports (1:128 split ratio). The system also provides simultaneous services of GPON and Gigabit Ethernet. The V8102 features flexible and high capacity GPON access and 10GbE uplinks, scalability and line rate performance with 320Gbps non-blocked switch fabric.

The V8102 guarantees equipment-level reliability with full redundancy design concept of SFU/Power/GPON ports. Continuous traffic forwarding to the core network without failure is a substantial factor for aggregation switches to perform. The PON technology adds new features and functionality targeted at improving performance and interoperability. In addition adds support for new applications, services, and deployment scenarios. Among these changes are improvements in data rate and reach performance, diagnostics, and stand-by mode.

The V8102 introduces a point-to-multipoint concept with the PON technology, which enables a cost-effective FTTx service. PON is considered a cost-effective solution because it uses a passive splitter rather than an active switching system.

The benefits of the passive splitter:

- No power supply is needed.
- No maintenance is needed.
- The splitter does not need any fiber optic transceiver. The number of fiber optic transceivers in the network is minimized.

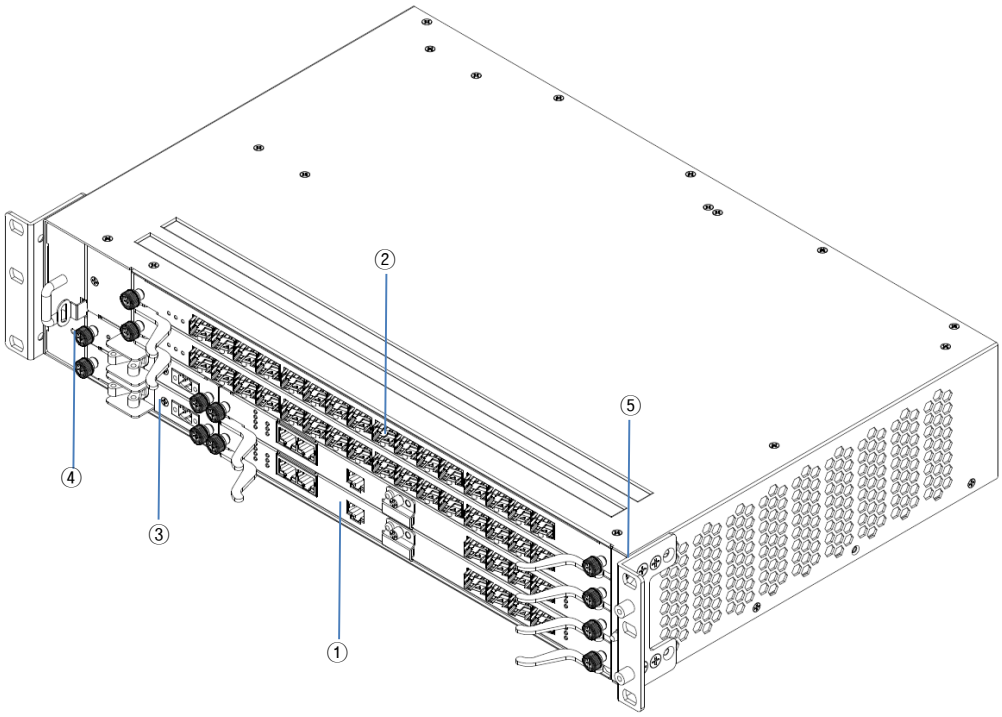

Figure 1 Front View of V8102

Items	# of Slot	Unit name	Connector type	Description
Basic Shelf	-	-		7 slots chassis with front access
① Switching card(SFU)	2 slots	SFU	- RJ45/RS232 SFP+	Switch fabric unit, 320Gbps switching capacity - MGMT port, Console port, micro SD, alarm port - 4-Port 10G optical uplink interfaces per module
② Service card (SIU)	2 slots	SIU_GPON16	SFP, SC/PC	16 GPON ports per service module
③ Power unit (PSU)	2 slots	PSU_DC	-	DC power module, -48/60Vdc
④ Fan unit	1 slot	FAN	-	Fan unit
⑤ Dust Filter	1 slot	Dust Filter	-	To prevent an inflow of dust into the shelf

Tab. 1.1 System Structure of the V8102

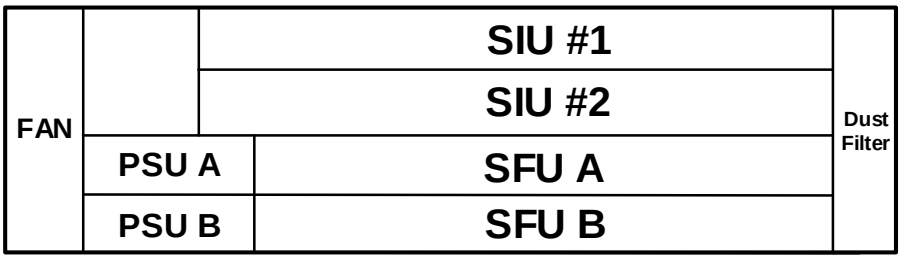

Figure 2 V8102 Slot Allocation

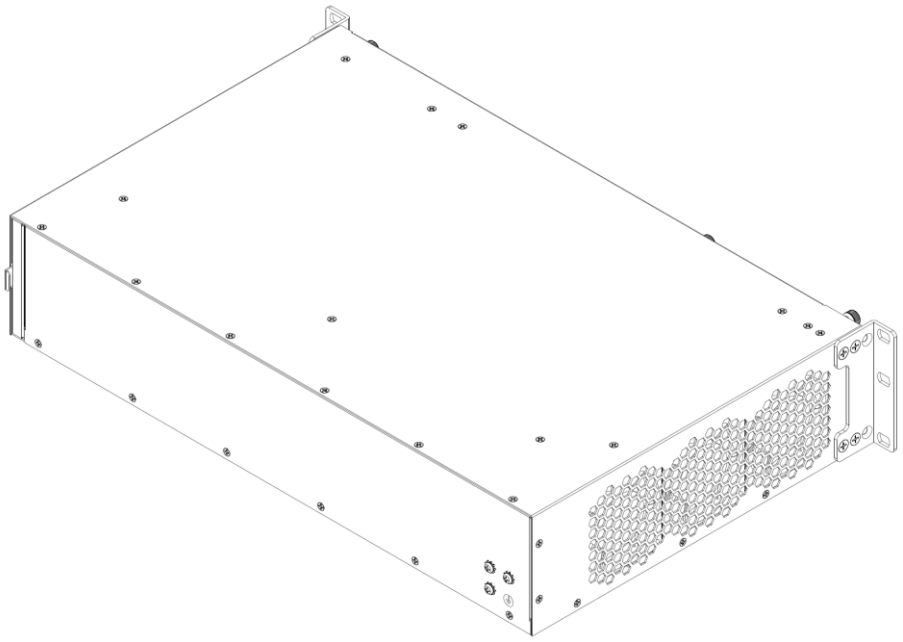

Figure 3 Rear View of V8102

1.1 Plug-in Units

1.1.1 Switch Fabric Unit (SFU)

The SFU, the switching fabric unit, plays the important role of switching the traffic and managing all components. The SFU processes the incoming traffic and forwards them to the proper interfaces via the main switching fabric. It also contains the visible alarm indicator, RS232 console access, and the out of band management interface to manage the system on the front panel of the SFU. It also provides one alarm input/output interface, micro SD slot and 4 10GBase-R ports.

Figure 4 shows the front view of the SFU.

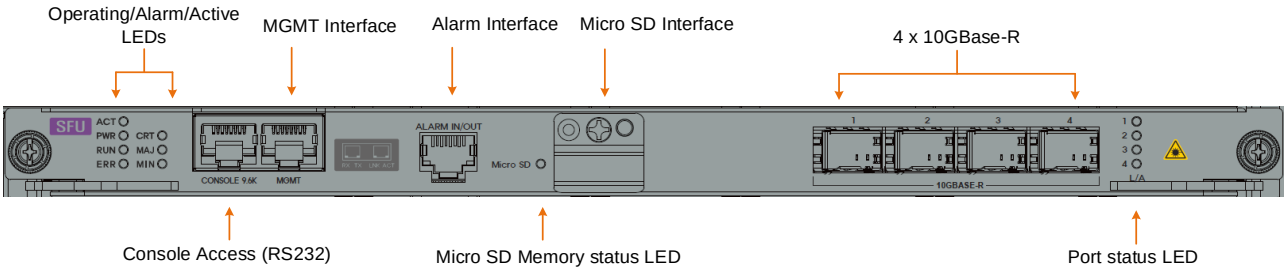

Figure 4 Front View of SFU

Item	Function	Connector Type
Operating/Alarm/Active LEDs	Indicator for system operating status including power, fault detection and booting state. Indicator for alarm status (critical/major/minor) and SFU status whether active or standby.	-
CONSOLE	CLI access to configure the functions for system operation	RJ45 (RS232)
MGMT	Out of band TMN-OS Interface	RJ45
Alarm Interface	Alarm input/output interface	RJ45
SD Memory LED	Indicator for micro SD memory status	-
SD Memory	Slot for micro SD memory card	Micro SD
Uplink Interface	4 x 1G/10GBase-R ports	SFP/SFP+

Table 1 Front Access Interfaces of SFU

1.1.2 Service Interface Unit (SIU)

The V8102 provides SIU_GPON16. Each SIU can be equipped in up to 2 slots of V8102 basic shelf.

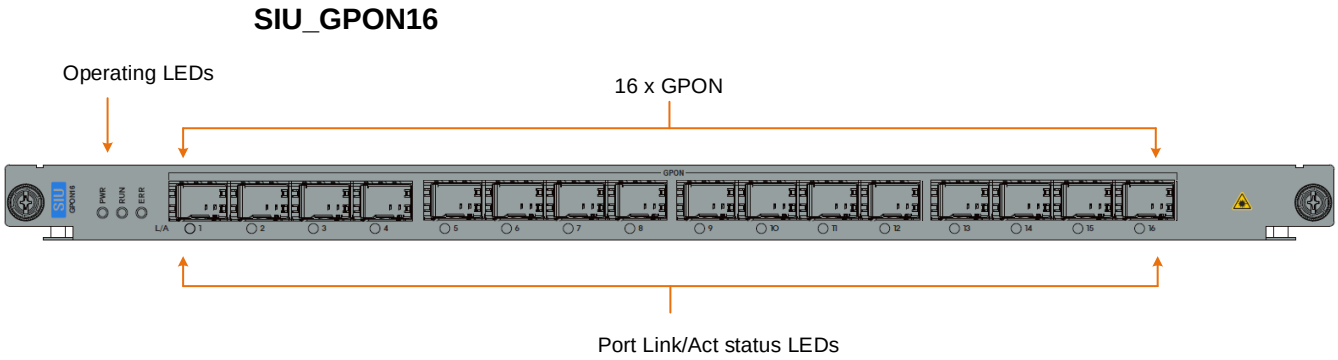

Figure 5 SIU_GPON16

Item	Function	Connector Type
Operating LED	Indicator for system operating status including power, fault detection and booting state.	-
Connections	16 x GPON ports	SFP, SC/PC
LNK/ACT LEDs	Indicator for port's link status and traffic activity.	-

Table 2 Front Access Interfaces of SIU_GPON16

1.1.3 Power Supply Unit (PSU)

The power supplied to the shelf is regulated first through the PSU. For redundant power supply, the second PSU has to be used.

The power regulated by the PSU is then supplied to the plug-in units through the backplane. The V8102 has a semi-decentralized power supply concept. DC/DC converters on the individual plug-in units convert the once-regulated input power to the proper voltages again. All plug-in units are hot-swappable.

Table 3 lists the electrical characteristics of the V8102.

Characteristic	Value
Nominal DC power voltage	-48/60Vdc
Maximum power consumption	206 W (PSU_DC)

Table 3 V8102 Electrical Characteristics

Figure 6 shows the front view of the PSU_DC.

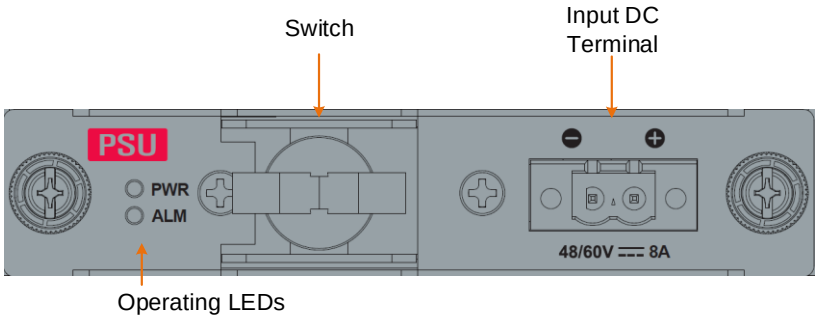

Figure 6 Front View of PSU_DC

1.1.4 FAN Unit

The V8102 is equipped with one fan unit, which contain three independent fans respectively. You can insert fan unit into a fan slot by slowly adjusting them to fit into the slot guidance. To prevent an inflow of dust into the shelf, the dust filter is mounted at the right side of the shelf. The fans are controlled in accordance with the measured temperature inside the system. The temperature sensor is located in the system, and the measured values are evaluated and the operation of the fan controlled accordingly.

Figure 7 FAN Unit

1.1.5 Dust Filter

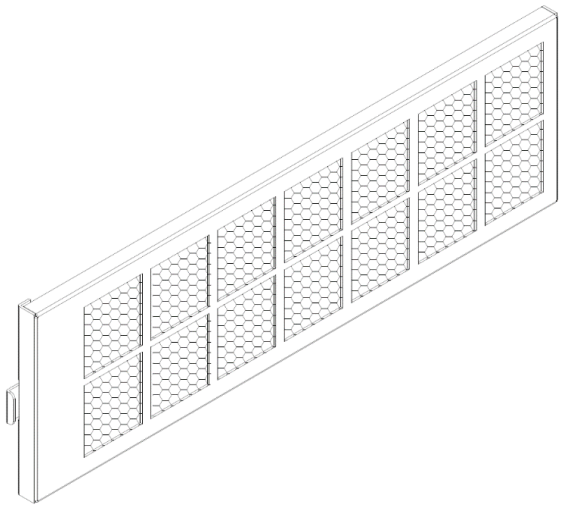

Figure 8 Dust Filter

1.2 Component Options for V8102

Bases

Name	Description	Maximum quantity
V8102	19 inches chassis with front access for V8102 - 2-slot: Switching Fabric Unit - 2-slot: Service Interface Unit - 2-slot: Power Supply Unit - 1-slot: FAN Unit - Overseas specification	1

Table 4 Base Option

Switch Fabric Options

Name	Description	Maximum quantity
SFU-V8102	Switching Fabric Unit for V8102 - Switching capacity: 320Gbps - NNI : 4 port 1/10GBase-R (SFP+) - 1-port RS232 for Console - 1-port TX for MGMT - 1-port Alarm In/Out - 1-slot microSD	2

Table 5 Switch Fabric Options

Subscriber Interface Unit

Name	Description	Maximum quantity
SIU_GPON16	16-Port GPON subscriber interface unit	2
SIU Blank Panel	Blank panel for subscriber interface unit	2

Table 6 Subscriber Interface Options

Power, Fan, etc. Options

Name	Description	Maximum quantity
FAN-V8102	Fan Module for V8102.	1
PSU_DC	DC power supply unit for V8102	2
Dust Filter-V8102	Dust filter for V8102	1

Table 7 Power and Fan Options

SFP Options

The following optical SFP modules are available and can be inserted into the dedicated slots of the SIU. Each SFP module contains one port.

SFP Module	Description
SFP-GE-SX	SFP GE SX - Wavelength: 850 nm / Distance: 550 m / Mode: multi-mode - Connector: LC / Data rate: 1.25Gbit/s / Core type: Dual Core - Operating Temperature: 0 °C - 70 °C
SFP-GE-LX10	SFP GE LX10 - Wavelength: 1310 nm / Distance: 10 km / Mode: single-mode - Connector: LC / Data rate: 1.25 Gbit/s / Core type: Dual Core - Operating Temperature: 0 °C - 70 °C
SFP-GE-LX20	SFP GE LX20 - Wavelength: 1310 nm / Distance: 20 km / Mode: single-mode - Connector: LC / Data rate: 1.25 Gbit/s / Core type: Dual Core - Operating Temperature: 0 °C - 70 °C
SFP-GE-LX40	SFP GE LX40 - Wavelength: 1310 nm / Distance: 40 km / Mode: single-mode - Connector: LC / Data rate: 1.25 Gbit/s / Core type: Dual Core - Operating Temperature: 0 °C - 70 °C

Table 8 SFP Modules for the Uplink Interfaces

SFP Module	Description
SFP-GPON-OLT20	SFP GPON OLT -. Wavelength: 1490nm/1310nm / Distance: 20km / Mode: singlemode -. Connector: SC/PC / Data rate: 2.5Gbit/s (Down), 1.25Gbit/s (Up) -. Core type : Single Core / Operating Temperature : 0 °C ~ 70 °C

Table 9 SFP Module for the SIU_GPON16

i Other types of SFP module can be also available upon customer request.

The following different optical SFP+ modules are available and can be inserted into the dedicated slots of the SFU. Each SFP+ module contains one port.

SFP+ Module	Description
SFPP-10GE-SR	SFP+ 10GE SR -. Wavelength: 850nm / Distance : 300m / Mode : Multimode -. Connector: LC / Data rate: 10.3125 Gbit/s / Core type: Dual Core -. Tx Power: -5 ~ -1 dBm, Rx sensitivity: -11.1 dBm -. Operating Temperature : 0°C ~ 70 °C
SFPP-10GE-LR	SFP+ 10GE LR -. Wavelength: 1310nm / Distance : 10Km / Mode :Singlemode -. Connector : LC / Data rate : 10.3125 Gbit/s / Core type : Dual Core -. Tx Power: -8.2 ~ +0.5 dBm, Rx sensitivity: -12.6 dBm -. Operating Temperature : -5°C ~ 70 °C

SFPP-10GE-ER	SFP+ 10GE ER -. Wavelength : 1550nm / Distance : 40Km / Mode :Singlemode -. Connector : LC / Data rate : 10.3125 Gbit/s / Core type : Dual Core -. Tx Power: -4.7 ~ +4.0 dBm, Rx sensitivity: -14.1 dBm -. Operating Temperature : 0°C ~ 70 °C
SFPP-10GE-ZR	SFP+ 10GE ZR -. Wavelength : 1310nm / Distance : 70Km / Mode :Singlemode -. Connector : LC / Data rate : 10.3125 Gbit/s / Core type : Dual Core -. Tx Power: +3 ~ +6 dBm, Rx sensitivity: -22 dBm -. Operating Temperature : 0°C ~ 70 °C

Table 10 SFP+ Modules

1.3 System Architecture

The V8102 is a shelf based modular multi-platform GPON OLT. It features highly flexible hardware configurations with multiple GPON units as well as Gigabit Ethernet units, so that user can fully customize it for GPON OLT and fiber to the premises network can be achieved.

The non-blocking switching feature provides up to 320Gbps switching capacity and 238Mpps throughput which enables the V8102 to work in a high speed networking environment.

The PON layer is terminated on the interface unit and translated to the Ethernet uplink to be transported through an Ethernet/IP environment. The V8102 can be equipped with up to 2 Subscriber Interface Units (SIUs). For improved system reliability, it adopts the design of a full redundancy architecture with dual PSUs and SFUs

When dual SFUs are used, the system decides the running mode of SFUs between active and standby. The first inserted and booted SFU runs in active mode and the second SFU will run in standby mode.

The active SFU is internally linked to all subscriber interface units (SIUs) and network interfaces. They receive traffic from IUs and update their own Forwarding Database (FDB) in the same manner so that they can keep identical data to make forwarding decisions. The active SFU can send traffic back to the SIUs and receive traffic from the SIUs for address learning.

The power feeding the V8102 is provided by a Power Supply Unit (PSU). There are two slots for dual PSUs to provide redundancy. Dual PSUs can be installed to guarantee system uptime.

1.4 Service Scenario

A PON consists of an Optical Line Termination (OLT) located at the Central Office and a set of Optical Network Units (ONUs), Multi Dwelling Units (MDUs) or Optical Network Terminals

(ONTs) located at the customer's premises. Between the Central Office and the customer premise is the optical distribution network (ODN) comprising of fibers and passive optical splitters or couplers. A splitter is a device that divides an optical signal into two or more signals. The OLT connects the PON to the IP network, controls and manages the PON clients. MDU (ONT) connects the user's network to the PON. The ONT can be occupied by a single subscriber and also can be a gateway of the local network.

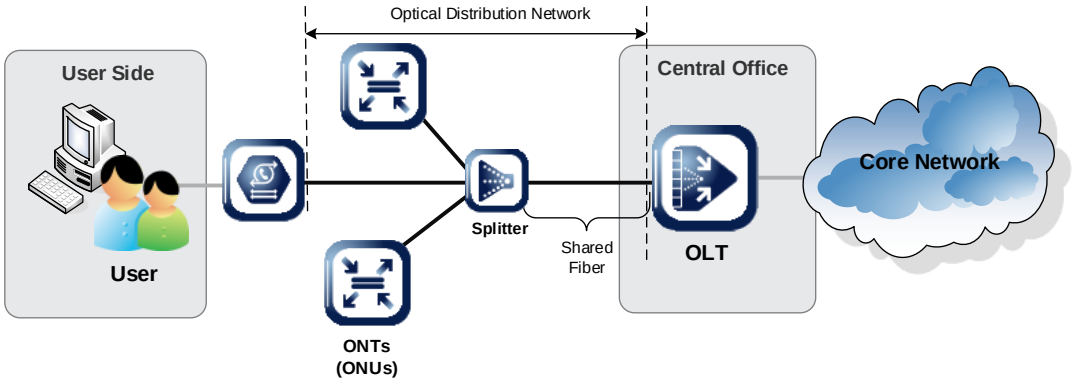

Figure 9 Optical Distribution Network by PON Architecture

The V8102 is a network element, which supports the delivery of multiple types of services, such as Ethernet, IP telephony, and video services.

The V8102 GPON OLT system is one element in this end-to-end solution. We are able to provide the complete next generation broadband access network with a video integration solution where full interoperability is ensured. Up to 64 (max.128) termination points for GPON can be attached to an OLT via passive optical splitter.

There are multiple deployment topologies for GPON networks. Each deployment topology is different from each other depending on the place the optical fiber is terminated. The subscriber type and desired topology of the network determines what the operator may adopt: FTTH (fiber to the Home), FTTB (fiber to the Building), FTTN (fiber to the neighborhood) or FTTC (fiber to the Curb). If there is a high bandwidth requirement per user, scenarios without splitters offering 2.5Gbps/1.25Gbps (downstream/upstream) data rate can also be deployed by connecting only the single user on a GPON port.

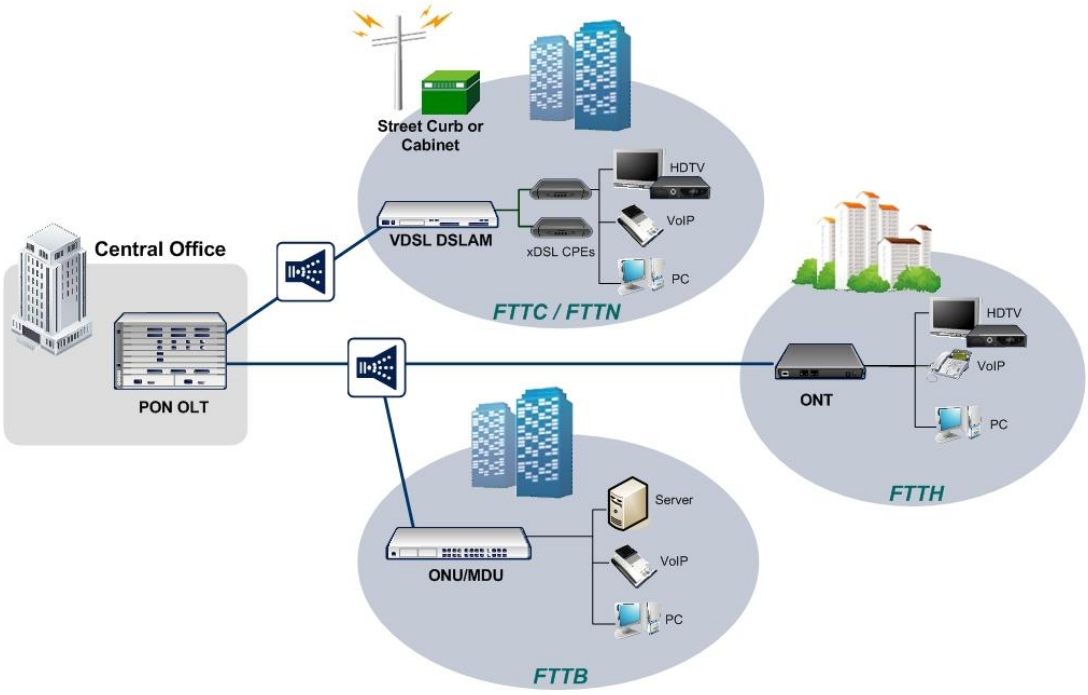

Figure 10 FTTx Service Deployments of GPON OLT

2 Product Specifications

2.1 System

The V8102 supports the following system features:

- 320Gbps switching capacity
- 2-Slot for switching fabric unit + uplink interface units:
  – Console command line interface (CLI) via RS232
  – Out-of-band management port via 10/100/1000Base-T
  – 1-port (RJ45) of alarm input/output
  – 4-port of 1G/10GBase-R optical interfaces (SFP/SFP+)
- 2-Slot for subscriber interface units (SIUs):
  – 16-port of GPON interfaces (SIU_GPON16)
- Redundant and load-balanced dual power supply unit (PSU)
- Hot swappable FAN unit
- LED alarm indicator
- Visible alarm indicator

2.2 Physical Specifications

V8102 chassis

Number of slots	7 (2 SFUs + 2 SIUs +2 PSUs + Fan)
Dimensions (W x H x D)	443.8 x 88.5 x 280 mm
Minimum free space above shelf	50 mm
Minimum free space below shelf	50 mm
Heat transfer	
Air inlet	− on the right side of the shelf
Air outlet	− on the left side of the shelf
Operating temperature	5~131°F (-15~55°C)
Storage temperature	-40~158°F (-40~70°C)
Operating humidity	0 to 90 % (non-condensing)
Operating altitude	up to 4,000m
Power voltage	DC type: −48/60V
Maximum power consumption	Approximately 206 W
Flash Memory	8MB Boot, 64MB NOS (dual)
SDRAM	2GB DDR3

SFU

Dimensions (W x H x D)	297 mm x 20.5 mm x 252.5 mm
Ethernet i/f for local management	10/100/1000Base-T
Serial i/f, CLI	RS232
External memory i/f	Micro SD
Alarm input/output i/f	RJ45
4-port uplink interfaces	1G (SFP) or 10GBase-R (SFP+)

SIU_GPON16

Dimensions (W x H x D)	362mm x 20.5mm x 252.5mm
Interface Parameter	16 x GPON (SC/PC, SFP)

Power Supply Unit (PSU)

Dimensions (W x H x D)	99mm x 20.5mm x 250.5mm

PSU_DC

DC input voltage	-48/60VDC
Input current	max.8A
Output voltage	-48VDC

FAN unit

Dimensions (W x H x D)	30mm x 85mm x 257.4mm
Number of fans	3

Dust Filter

Dimensions (W x H x D)	10.4mm x 84.8mm x 264 mm

2.3 SW Capabilities

System Performance	
MAC Address	
Max. MAC Addresses: 176K (UFT)	
Concurrent VLAN	
Max. VLANs: 4K (1~4094)	Up to 4K stacked VLANs
IP Scalability	
Max. No. of L3 Route Entries:	• IPv4/IPv6 Host -64K, IPv4 LPM – 8K • IPv6 LPM – 6K (64bit)
Equipment Performance	
Cold Startup Time: max. 2 min	
Ethernet Functions	
Ethernet Switching	
Switching / Bridging acc. to 802.1D and 802.1Q	Packet Format: Ethernet-II and 802.3
Address Learning with Auto Aging	Jumbo Frames up to 12K
Configurable Aging Time	Auto-negotiation
ITU-T Y.1731 Ethernet OAM	G.8032 Ethernet Ring Protection Switching
Link Aggregation Control Protocol (LACP)	
MAC Address based LACP	IP Packet based (Address based) LACP
Link Aggregation (LAG) acc. to 802.3ad	
VLAN Handling	
Untagged Port Configuration	Port / Protocol based VLAN
VLAN Tagging	tagged and untagged frames at mixed at uplink port (outgoing)
Multicast VLAN Registration (MVR)	VLAN QinQ
VLAN Translation	Independent VLAN Learning (IVL)
Tagged User Frames	
Hierarchical Functions	
VLAN Stacking per port (.1Q in .1Q) (VLAN can be set by port)	Configurable Ethernet type for VLAN
VLAN Stacking (.1Q in .1Q) (single tagging / stripping)	
Ethernet Multicast / Broadcast	
Ethernet Multicast	Block unknown Multicast flow based on system/Port Basis
IP Functions	
IP Routing	
IPv6 Routing (RIPng, OSPFv3)	IPv4 Routing
IP forwarding (static routing)	OSPFv2
BGPv4	VRRP
OSPF ECMP (equal cost multi-path protocol)	RIPv1/v2

IP Multicast	
IGMP v1/v2/v3	IGMP Filtering (filtering of join and leave messages)
IGMP Snooping with single VLAN tagged	IGMP Filtering and Throttling
IGMP Snooping	IP Multicast Routing Protocols (PIM-SM)
PIM-SSM(Source Specific Multicast)	Fast IGMP leave and fast join
MLDv1/v2	
CoS / QoS Functions	
Strict Priority	8 queues per port
WRR	HW-based internal Classes of Service (CoS)
DRR	Ingress Policer per VLAN & port
QoS Mapping based on ingress port	ingress Policer Per VLAN per CoS
QoS Mapping based on 802.1q (VLAN tag)	ingress Policer Per IP SA/DA
QoS Mapping based on 802.1p Priority	ingress Policer Per DSCP
QoS Mapping based on IP TOS/DSCP	Egress Shaper per Port
QoS Mapping based on IP DA/SA	Policing in 128 Kbps, 256 Kbps and 512 Kbps up to 1 Mbps Bit Rate
QoS Mapping based on L4 Info	Minimum granularity at ingress and egress port: 64 kbit/s
CoS/802.1p Marking based on Ethertype	Granularity per traffic class: 64 kbit/s
CoS/802.1p Marking based on IP SA	Policing in 64kbps Steps up to 100 Mbps Bit Rate
Tagging/Overwriting 802.1p acc. to QoS Mapping	Policing in 64kbps Steps from 100 Mbps to 1 Gbps Bit Rate
Tagging/Overwriting TOS/DSCP to QoS Mapping	Shaping, Policing, Classification, and Prioritization acc. to IETF Diffserv RFC 2474
Traffic Protection (L2)	
Load Sharing inside LAG Group	IEEE 802.1s (MSTP)
IEEE 802.1D (STP)	IEEE 802.1w (RSTP)
GPON Interface	
Fully compliant with ITU-T G.984.1, G.984.2, G.984.3, G.984.4 GPON standards	GPON Encapsulation Method (GEM)
OMCI for ONU management	SNMP for OLT management
PON OLT redundancy	Automatic ONT ranging
Max Splitter Ratio : 64 (max.128)	ONU remote upgrade and management
Max Transmission Distance: 60km	GPON VLAN translation
L2 Isolation between ONUs	ONU Auto-discovery
Service Layer	
Multiple Services on a single Customer Access	DHCP Relay Agent Option 82 for User Traffic
Security Services for Traffic Interfaces	
Access Control List (ACL) based on Port	Port based Authentication acc. to 802.1x for Traffic Interfaces
ACL based on MAC Addresses	MAC based Authentication acc. to 802.1x for Traffic Interfaces

ACL based on Ether Type	Anti-spoofing mechanism
ACL based on IP SA/DA	Storm control
ACL (for IGMP) based on IP Multicast Address (multicast filtering)	ACL based on L4
Limit Number of MAC Addresses per any kind of port	Check IP/MAC Address provided by DHCP Relay Agent
Blocking of STP BPDUs at ingress	Suppression of Broadcast & Multicast Frames
DHCP filtering	
Management & Control	
TMN Embedding	
Element Management by CLI	
Management Interfaces - Layer 1 - 4	
Out-of-band RS232 with 9600 Baud Rate	DHCP Server
Out-of-band 10/100Base-TX acc. to 802.3	IP Forwarding (routing tables per VLAN)
Loopback IP Address per Switch	DHCP Option82
Dynamic ARP	DHCP Simplified Option82
Static Routing Table	DHCP Snooping
Support of static IP Addresses	DHCP Relay Agent
DHCP Client	DHCPv6 Server/Relay/Client/Snooping/Filtering
Management Interfaces - Layer 5 - 7	
CLI	ICMP RFC 792
SNMPv1/v2C/v2	Telnet Server
SNMPv3	SNTP Client V3 RFC 2030
Security	
Disable / Enable in-band Management Traffic for a given port	SSH v1/v2
Password Management for NE	User Password must be stored in an encrypted Mode
2 Levels of access privileged	2 Levels of Community Strings
MIBs	
Same Set of Standard MIBs for all NE	DASAN IGMP Snooping MIB
Configuration Database / Log	
Current Configuration File	Manual Reset of Configuration Log
Retrieval of all historical Configuration Log Entries	
Performance & Traffic Related Alarms	
Link State up/down	Resource Threshold
Alarm Event Filtering	
Filter outgoing alarms acc. to precedence	
Alarm Thresholds	
Threshold for Traffic Counters and Resource Status	
Equipment Related Fault Types	

Temperature of the chassis threshold	Fan Failure
NE fault	NE component
Optical parameter alarms	PSU failure alarm
Automatic switchover on failure detection	
Fault Log	
Retrieval of all current Transmission / Equipment Alarm Entries (Using syslog)	Log Files for Events and Alarms
Alarm Log Size of (at least) 500 Entries using FIFO Principle	Manual Reset of entire historical Alarm Log
Retrieval of all historical Alarm Log Entries	
Ethernet Performance Monitoring	
Packet Counting	No. of Bytes per Port
Packets per Port/CoS	Errors acc. to MIB (CRC, truncated, etc.)
Drop Packets per Port/CoS	
Maintenance, Supervision & Diagnostics	
Transmission Diagnostics - Monitor Points	
Service Interface Mirroring	
Transmission Diagnostics - LEDs Supervision	
LED Indication of Power Status	LED Indication of link activity per port
LED Indication of Equipment Failure Status (e.g. fan)	Temperature Sensor
Transmission Diagnostics - Self Monitoring / Diagnostic Functions	
Power up Self Test	Watch Dog Function for autonomous SW Reset
Equipment Diagnostics	
Error messages must be easy to read and self-explanatory.	HW Fault Indication down to individual in-field exchangeable Module / card
Monitoring of CPU, Memory and Overload	Tech Support (console/remote)
Equipment Inventory	
Factory Module Label in non-volatile memory	Automatic Detection of SFPs capability
Standard Compliance	
Layer 2 - Switching	
IEEE 802.1d. Local and Metropolitan Area Networks - Media Access Control (MAC) Bridges	IEEE 802.1x (MAC/port based Authentication)
IEEE 802.1q tagged frame	RFC 1305 - NTP
RFC 826 ARP	IEEE 802.3x Flow Control
IEEE 802.1v (VLAN Classification by protocol and port)	IEEE 802.3ad LACP
Layer 3 - Routing	
RFC 2328 OSPF v2 (including MDS authentication)	RFC 1587 OSPF NSSA Option
RFC 1765 OSPF Database Overflow	RFC 2370 OSPF Opaque LSA Option
RFC 1771 Border Gateway Protocol 4	RFC 1965 Autonomous System Confederations for BGP
RFC 1966 BGP Route Reflection	RFC 1997 BGP Communities Attribute

RFC 1745 BGP/OSPF Interaction	RFC 2385 TCP MDS Authentication for BGPv4
IP Multicast	
RFC 1112 IGMPv1	RFC 2362 PIM-SM
RFC 2236 IGMPv2	IGMP Monitoring (in meaning of IGMP querier, same features as 3089)
IGMPv3	IGMP Termination
Management - SNMP & MIBs & Others	
RFC 1155 Structure of MGMT Information (SMI v1)	RFC 1901 - 1907 SNMP Version 2c, SMIv2 and Revised MIB-II
RFC 1493 Bridge-MIB (D-Bridge)	RFC 1354 IP v4 Forwarding Table MIB
RFC 1757 RMON 4 Groups: Stats, History, Alarms, and Events	RFC 2922 Physical Topology MIB
Siemens Enterprise MIB (SLE)	RFC 2934 PIM MIB
RFC 1157 SNMP v1/v2c	RFC 854 Telnet
RFC-1212, RFC-1213, RFC-1215 MIP-II & TRAPs	RFC 2030 Simple Network Time Protocol v4 (SNTP)
Security	
RFC 1492 TACACS+	Radius Client
RFC 2138 RADIUS Authentication	RFC 2267 Network Ingress Filtering

3 Product Features and Benefits

The V8102 supports the following main features.

- GPON functionality
- Dual Switching fabric and power redundancy
- Hitless Software Upgrade (HSU)
- Software Features
- SFU Overview
- INAS EMS for Network Management

3.1 GPON Functionality

The Gigabit Passive Optical Network (GPON) is a high-speed optical access method that has been defined in ITU-T Recommendation G.984.x GPON carries a two-fold promise of both higher bit rates and higher efficiency when carrying multiple services over the PON.

The V8102 GPON system provides additional network services at no extra cost, while EPON systems require additional equipment for TDM. It also offers more available bandwidth for the entire range of applications. The V8102 introduces a point-to-multipoint concept the several GPON mechanisms, which enables efficient and flexible FTTx services.

3.1.1 GPON Introduction

GPON Features

V8102 provides the following GPON features.

ONT Management over OMCI

OMCI (ONT Management and Control Interface) protocol defined in ITU-T G.984.4, specifies the format of interactive messages, and the mechanism of information exchange between the OLT and ONT. Based on the OMCI protocol, GPON terminal management enables an OAM service to provide a standard way to discover ONT capabilities, and to manage and control them. OMCI operates on a dedicated bidirectional Port-ID between the management station and the ONT. In addition, OMCI subdivides the ONT service module, and defines a series of management entities used for service description.

The V8102 manages and configures various GPON terminals such as ONTs, MDUs or ONUs through the OMCI protocol. It provides MIB access that replicates the OLT information database and connected ONTs. The management information between OLT and connected ONTs flow is exchanged via an OMCI channel. The ONTs send upstream a PLOAM message with the serial number of the ONT. Both PLOAM and OMCI channel provide full control of the optical network and the management of the customers' ONTs.

User Data Encapsulation

GPON Encapsulation Method (GEM) is a scheme of encapsulating user frame data for transport of the GPON network. Although any type of data can be encapsulated, actual types depend on service situation. The GEM protocol is used to provide delineation of the user data frames inside the GPON partitions and the port identification for multiplexing. It can also permit fragmentation of frames over partition boundaries.

PON Aware QoS

QoS schemes in a GPON network. ONT plays a key role in ensuring QoS for all traffic because it is the ingress and egress point for all network traffic. The ONT can have different types of service ports, including one or more analog voice ports and one or more Ethernet ports. It can also perform service classification based on the physical port and map it to 802.1p p-bits. For example, traffic flows from voice ports can be assigned the highest priority.

As part of this service differentiation, the ONT associates different traffic flows with a specific GPON Encapsulation Method (GEM) Port ID. Each physical port in a given ONT can have a maximum of eight GEM-ports. 802.1p allows a maximum of eight classes of service (CoS) based on p-bit marking. The GEM-Port IDs and the p-bit marking together define a specific service. Traffic from each physical port can be queued up to eight separate queues after traffic flow classification. Traffic scheduling is done to serve these queues based on their priority levels.

In the upstream direction, the traffic is classified at the ONT and then mapped into one out off 4 T-CONT types supported. All the traffic flows from the ONTs are identified by their GEM-Port IDs.

The GPON upstream QoS provides the following advantages:

- Bandwidth grant is out-of-band (No effect on revenue BW)
- SLA based on T-CONT
  - No BW effect with having T-CONT per service per ONT
- Supports fragmented payloads (good for delay and efficiency)

Dynamic Bandwidth Allocation (DBA)

The V8102 supports both NSR and SR DBA (G.984.3), piggy-back DBRu report mode 0, including concurrent support for DBR mode 0 and “idle GEM” mode.

Through Dynamic Bandwidth Allocation (DBA), a PON can be oversubscribed for upstream traffic. In GPON, DBA algorithms are based on two kinds of methods: Non Status Reporting (NSR) and Status Reporting (SR).

- Status reporting DBA

The OLT requests information about the status of each MDU (or ONU) when applying status reporting. SR DBA is based on MDU (or ONU) reports via the Dynamic Bandwidth Report upstream (DBRu) field.

The V8102 uses the piggy-back reporting mode in the DBRu:

- Allows MDUs to continuously update the traffic status of a specific T-CONT
- Consists of a message that specifies the amount of data waiting in the T-CONT buffer corresponding to the Alloc-ID that triggered the DBRu transmission
- Mode 0: single field reports that use the number of ATM cells or GEM blocks waiting in the T-CONT buffer as its basic unit

- Non status reporting DBA

When applying non status reporting, the OLT determines the bandwidth demands indirectly. Each MDU sends Idle GEM frames to fill its whole time slot, if there is not enough user data to be transmitted.

3.1.2 PON Benefits

PON Benefits

The PON provides the following advantages in general:

- Minimal maintenance (only passive splitter)
- Low deployment and maintenance costs
- High scalability of full-service solutions
- Deployments of FTTx environments
- Savings in the fiber infrastructure due to the lowest number of fibers required

GPON Benefits

The GPON provides the following advantages in specific:

- Support a very high fiber splitting factor of up 1:64 (max. 1:128)
- Support a very high bandwidth (bit rate up to 2.5Gbit/s for US/DS)
- Use in multi-service applications such as data/video/voice (most flexible payload concept)
- In the GPON TC layer, the maximum logical reach is defined as 60km
- ONU Activation (Discovery & Ranging)
- Embedded OAM messages (PLOAM)
- Standardized:
  - 3rd wavelength for video overlay
  - AES for downstream encryption security
  - Forward Error Correction (FEC) on Downstream/Upstream
  - Fiber protection between the OLT and the splitter

GPON Features

The V8102 provides the following advantages in specific:

- Support ITU-T G.984.4 ONT Management & Control Interface (OMCI)
- Remote ONT/MDU management
- Automatic ONT ranging
- Multiple T-CONTs per MDU (ONT)
- Support both NSR and SR DBA (G.984.3)
- Supports up to 64 (max.128) connections over a single fiber
- 2.5Gbps downstream and 1.25Gbps upstream applications
- Max. transmission distance: 60Km
- Support DDM (Digital Diagnostics Monitoring)
- Max. 4096 GEM Port IDs per GPON port: 0 to 4095
  - OMCI GEM Port ID: 0 to 127 (max.128 reserved)
  - Internal Reserved (Multicast / Broadcast / MAC learning) : 3 dummy GEM Port IDs
- Maximum number of Alloc-IDs/T-CONTs per GPON port
  - Default alloc-IDs: 0 to 253 (assignable range: 0 to 127, equal to ONU-ID)
  - Broadcast alloc-ID: 254
  - Unassigned alloc-ID: 255
  - Up to 384 dynamic T-CONTs: 256 to 639
  - Up to 384 fixed T-CONTs: 640 to1023

3.2 Redundancy

The key features of the V8102 are its flexibility and extremely high reliability that result from the redundancy design concept. The V8102 meets carrier's requirements, which is a substantial factor for aggregation switches to perform traffic forwarding to core network. It provides equipment-level reliability including Switching Fabric Unit (SFU) and power redundancy.

Switching Fabric Interface Redundancy

There are two slots for SFUs in the V8102 base chassis. A redundant SFU could be equipped into either slot. This switch can perform normal switching operation with a single SFU, but also can accommodate dual SFUs to ensure stable operation.

When dual SFUs are used, the system decides the running mode of SFUs between active and standby. The first inserted and booted SFU runs in active mode and the other SFU that follows runs in standby mode.

Both SFUs are internally linked to SIUs. They receive traffic from SIUs and update their own Forwarding Database (FDB) in the same manner so that they can keep identical data to make a forwarding decision. However, only the active SFU can send traffic back to the SIUs; the standby SFU can just receive traffic for address learning.

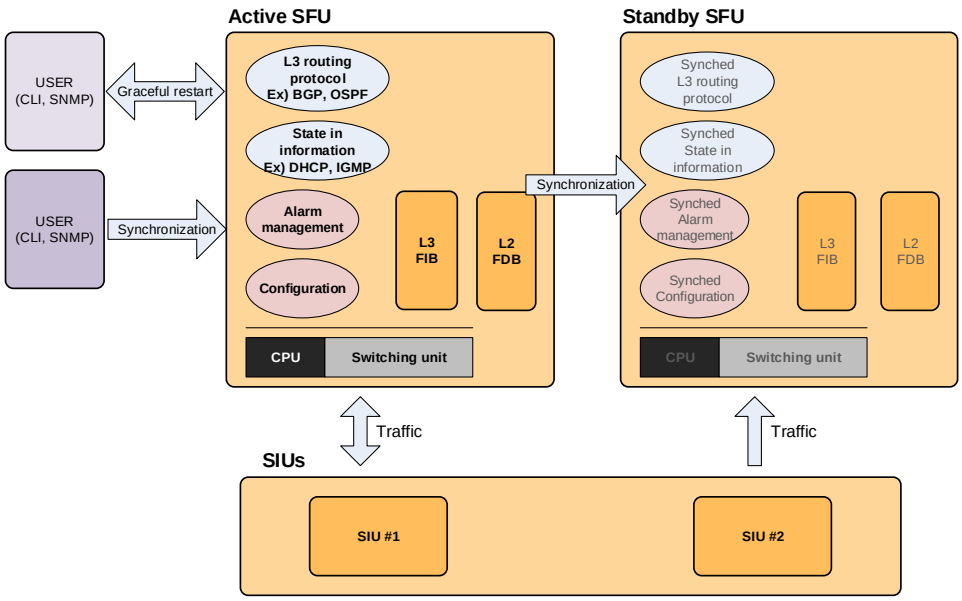

Figure 11 SFU Redundancy Scheme

In a redundancy scenario, only the active SFU is working in the system and contains user configurations via SNMP or CLI and dynamically-learned state information such as DHCP snooping, IGMP snooping, L3 protocols, STP states, etc. But the standby SFU does not have that information. Thus, there is a mechanism to synchronize between the active SFU and standby SFU. The active SFU periodically sends state information to the standby SFU through an interlinked 100MB channel.

Software or hardware failure and accident can cause an automatic switchover from active SFU to standby SFU. Also, a static switchover by network operator could be made due to software upgrade, equipment exchange, or network construction. If the switchover happens, the standby SFU can start working.

Power Supply Redundancy

The power feeding of the V8102 is provided by Power Supply Unit (PSU). Dual PSUs can be installed to guarantee constant system running.

PSUs provide the stable and proper voltages to the system with the redundant and load-balanced power processing. A failure of the feeding line (e.g. due to an external fuse break) does not cause system breakdown.

GPON Redundancy

GPON has one fiber to support up to 64 (max.128) ONTs which in turn accommodates more subscribers in case of FTTC or FTTB. The failure of one GPON port would lead to service interruption of multiple subscribers. G.984.1 says several types of redundancy and V8102 supports two redundancy solutions.

Redundancy type B allows GPON redundancy by either port or card basis. The port redundancy can be configured between port #A and port #B within the same line card or different line card. It also allows redundancy by card basis. For example, GPON redundancy can be configured between slots 1 and 2 within the same chassis.

The 2:N splitter is utilized to make redundant fiber path from OLT to the first splitter. The different GPON OLT MACs are attached to each fiber; one is configured as active and the other is configured as standby. When switch-over condition happens over active link, OLT changes standby link to active.

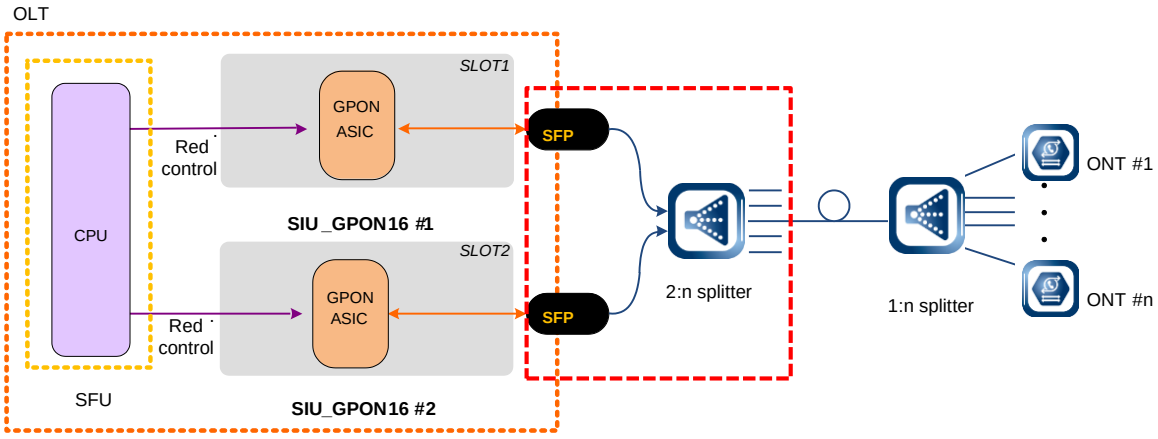

Figure 12 SIU_GPON16 Redundancy Scheme (Type B)

3.3 Hitless Software Upgrade (HSU)

The V8102 supports Hitless Software Upgrade (HSU) feature that allows a software upgrade on the SFUs of the V8102 without taking it out of service. When you install two SFU modules in a V8102 chassis, one assumes the role of active and the other assumes the role of standby mode. If you download the new software image at the active or standby SFU, the image is saved in a backup bank of the flash. The standby SFU reloads the new software version to ensure that the new image runs properly in the system. If the new software image has a problem to implement at the standby SFU, it downgrades to the previous software version. Otherwise, the new software image file at standby SFU starts to be synchronized with an active SFU without an error of the software operation. After the synchronization of SFUs, a standby SFU takes an active SFU's place by their automatic switchover while an active SFU has being reloaded the new software image.

3.4 Software Features

- **High Scalability & Flexibility of Full-service Solutions**
  With line card slots for Interface Units (IUs) and a wide range of user-selectable port types, provide easy scalable expansion as your network needs grow. Designed for maximum flexibility and scalability, user can select a subscriber interface module with GPON ones according to their network circumstances. It enables network managers to build adaptable networks with maximum customized solution and easy management.

- **Modular Software System**
  The software of V8102 chassis is designed to support distributed multithreaded processing on SMPS, multi-core CPUs, and distributed line card processors. The modularity can improve maintainability by enforcing logical boundaries between SIUs.

- **Quick development of enhancements and bug fixes**
  In case V8102 needs to be updated with new software features or be released to new firmware due to unexpected problems, modular fixes can be developed, tested, and delivered in a short time span. The software release of each module allows new features, enhancements, and problem fixes to be integrated into the software quickly.

- **Advanced Security**
  The V8102 supports a comprehensive set of security features for connectivity and access control, including RADIUS (Remote Authentication Dial-In User Service), TACACS+ (Terminal Access Control System), IEEE 802.1x and others. It also supports SSH (Secure Shell) protocol for secure remote network management.

3.5 SFU Overview

The switch fabric unit (SFU) is a central switching fabric unit, which is equipped in the front mounting slot of the shelf. The SFU holds a switching fabric, system internal data interfaces to the interface units within the shelf, and also management interfaces such as console/MGMT and LEDs indicating the status of system and SFU.

System management and configuration can be performed by connecting to the serial port on the SFU to create a console session. Or, out of band management can be set up by connecting to the MGMT port, which is through SNMP or Telnet.

The system LEDs are mounted to the SFU. The LED indicates the operating status of the system, SFU, power and alarms. User can easily monitor and see the system status with LED lights.

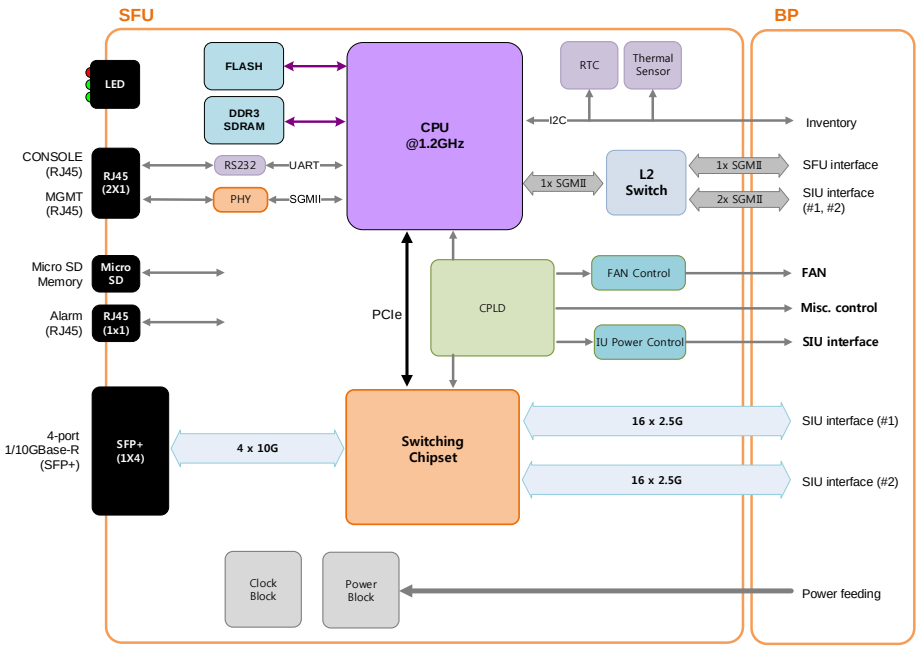

Figure 13 SFU Block Diagram

Switching Board

The SFU contains the following components:

- Gigabit layer 3 switch
- 4 x 1G/10GE uplink interface per SFU board
- SerDes interface
  The SerDes is the system internal data interface to all interface units. The SFU implements the internal star topology as a set of point-to-point links between the SFU and each interface unit using this internal interface.
- Glue PLD which provides the system interface, interrupt processing, LED control, I^2C support, processor bus adaptation, reset control and GPIO for SFU hardware control
- A serial EEPROM for storing the information for system boot
- NVRAM and flash memory
- 1 x GE communication interface for management access
- 1 x RS232 interface for console access
- 1 x micro SD interface for log
- 1 x Alarm interface.
- Digital thermometer for board temperature measurement

Controller Board

The SFU contains the central controller function for all interface units in the shelf and for the configuration and control of the SFU on-board components.

The SFU controller board provides the internal communication to all interface units in the shelf. The system internal communication is implemented as inband communication over the internal FE interface.

The fan operation is controlled depending on measurement results of the shelf temperature.

The SFU controller core consists of the following components:
- Switching fabric for SIU management
- Clock block
- I^2C control
- Power supply block
- CPLD for redundancy control

The controller board performs the following functions:
- Internal communication to all shelf interface units over the internal FE interface
- Central controller functions for all plug-in units in the shelf
- Central HW maintenance (including reset generation and plug-in detection) for all plug-in units in the shelf
- Connection handling for the V8102 system
- Reset generation for all plug-in units in the shelf
- Collection of performance monitoring data

3.6 SIU Overview

The Subscriber Interface Unit (SIU) is used to concentrate traffic originated from access infrastructures through its Gigabit Ethernet ports and carries traffic delivery to the uplink core network.

OLT Controller Board

The SIU_GPON16 contains the OLT controller unit that consists of integrated GPON device (DBA engine, embedded CPU, DDR controller, etc). This unit manages overall GPON process and controls the SIU_GPON16 on-board components.

The GPON OLT controller consists of the following components:
- Integrated GPON control plane
  - G.984 GPON stack
  - Optics diagnostics and management
  - Inband management
  - Two independent Inter-Integrated Circuit (I^2C)
  - Embedded CPU subsystem which provides two independent I^2C, SPI and UARTs.
- Clock unit
- DDR II Controller
- DBA engine for fairness algorithm bandwidth allocation per T-CONT
- CBA MAP engine for static T-CONTs bandwidth assignments

- ITU-T G.984 compliant MAC

The GPON OLT controller board provides the following features:

- Enable low-cost, high density OLTs
- Low power consumption
- PON aware QoS traffic management features
- Flexible Ethernet/GPON interworking
- FEC for upstream and downstream
- Downstream AES encryption and key exchange process

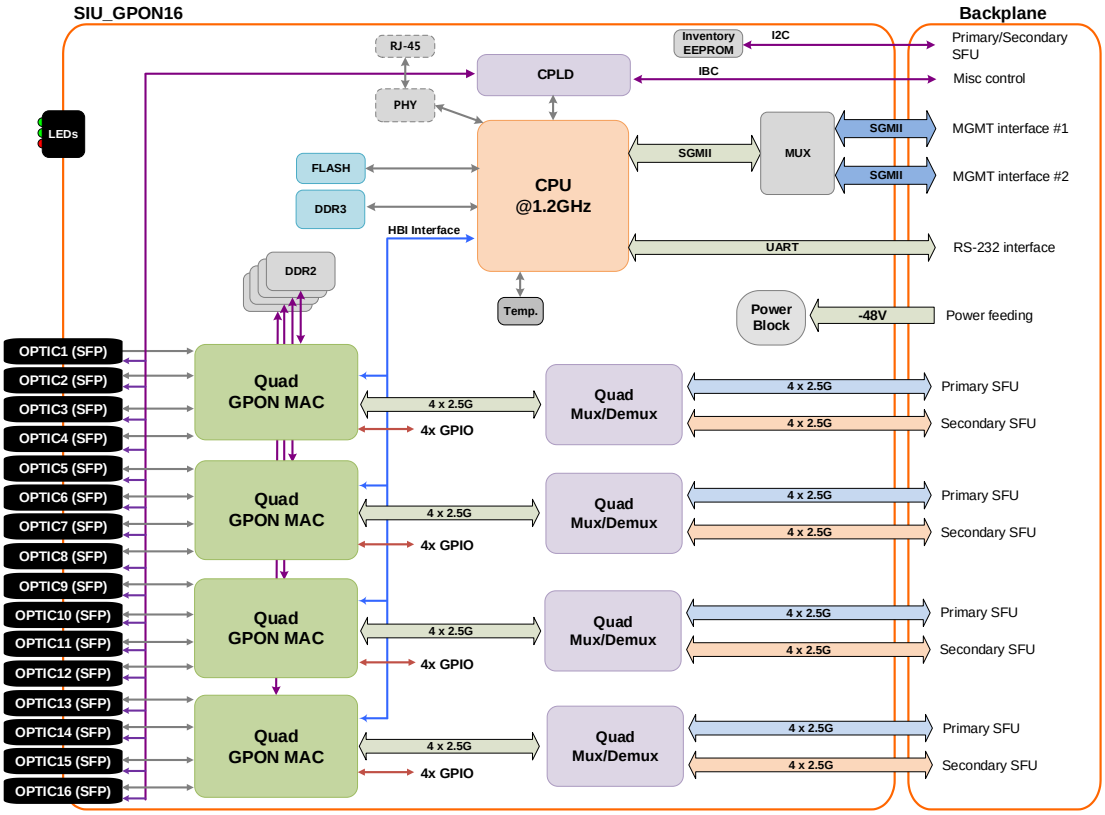

Figure 14 SFU Block Diagram

3.7 INAS EMS for Network Management

The Integrated Network Administrator System (INAS) Element Management System (EMS) is a comprehensive network management system with an intuitive graphical user interface. Service providers can optimize network usage, reduce operating costs and implement new services quickly and easily.

The INAS EMS is designed to meet the demanding operating and security requirements of large operators while delivering the same benefits to mid-size and smaller services providers. The Dasan's EMS allows you to control your network to efficiently discover your network, roll

out new equipment, provision and activate services, as well as diagnose key issues. It provides subscribers with progressive service levels, value adding premium services such as Virtual LANs and intuitive auto-provisioning capabilities, robust policy settings.

Using IP-based management for network discovery in real-time, the EMS detects network failovers, and helps to monitor and maintain a stable network environment. It also provides the real-time fault management and configuration for all SNMP available nodes, and displays the status of their port, slot and power.

There can be distinguished among the following main operational tasks:

- Network provisioning: setting up the network topology including VLAN management prior to service provisioning
- GPON service provisioning: provisioning of end user services by configuring the subscriber port, assigning or configuring the VLAN and assigning the customer.
- Network supervision: examining events or errors about the equipment, which are shown in alarm lists, in the topology map, or in the correlated to VLAN and services.

EMS & NMS Detail Feature Concept

EMS Feature

- System Management & Network Management
  - Upgrade, Backup/Restore, Hardware, SFP, DMI, SSH, Login, Time, System, Slot
  - Alarm, LED, SNMP, Syslog, RMON
- Bridge
  - Filter, LAG, Security, Port, QinQ, STP, VLAN
- Multicast & QoS
  - IGMP, Snooping, MVR, Flow, Class, Policer, Policy
- GPON
  - OLT, ONU, Profile (Traffic, ONU, DBA, PM, MC, VoIP, TDM), Extended VLAN

NMS Feature

- Configuration
  - NE Discovery, Node (Virtual), Group, Model, Topology
- Fault
  - SNMP Trap Define, Alarm Window/Sound, Real-time Event, Severity, Effect
- Performance
  - Traffic/CPU/Memory Monitoring, Day/Week/Month/Year Report
- Security
  - User, Group, Authority, License Policy

Ordering Information

Bases	
19 inches chassis with front access for V8102 - 2-slot: Switching Fabric Unit - 2-slot: Service Interface Unit - 2-slot: Power Supply Unit - 1-slot: FAN Unit - Overseas specification	
Switch Fabric Options	
V8102_SFU - Switching capacity: 320Gbps - NNI : 4 port 1/10GBase-R (SFP+) - 1-port RS232 for Console - 1-port TX for MGMT - 1-port Alarm In/Out - 1-slot microSD - Overseas specification	V8102_SFU_Blank Blank panel for switching fabric unit
Service Interface Options	
V8102_SIU_GPON16 16-port GPON Interface Unit for V8102	V8102_SIU_Blank Blank panel for subscriber interface unit
Power, Fan, etc Options	
V8102_FAN V8102_PSU_DC V8102_PSU_Blank V8102_Dust Filter	
SFP Options	**SFP+ Options**
SFP-GPON-OLT20 SFP GE-SX SFP GE-LX10 SFP GE-LX20 SFP GE-LX40	SFP+ 10GE-SR SFP+ 10GE-LR SFP+ 10GE-ER SFP+ 10GE-ZR