

BD-EOS-GE-STM1 Dual-VCG channel Gigabit Ethernet Converter

User Handbook

V1.05

2015.8

Revision History

Version	Date	Description
V1.00	2014-9-24	Primarily Released
V1.01	2014-12-5	Changed description about Overview and Application
V1.02	2014-12-17	Changed Ethernet frame and chassis dimension,etc. Added 2 modes of QOS
V1.03	2014-12-26	Changed the application diagram; Added the note of " Make sure optical A of one NE must be connected with optical B of its neighboring NE."; Changed the power consumption.
V1.04	2014-12-26	Changed the application
V1.05	2015-8-28	Changed the simple CLI as CLI in section 5.9

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1 System Introduction

1.1 Overview

BD-EOS-GE-STM1 is a dual - VCG channel Gigabit Ethernet Converter, provides 4 gigabit Ethernet interfaces (3 copper and 1 fiber Ethernet interfaces) compliant with IEEE 802.3 series standard and 2 STM-1 optical interfaces, supports 1+1 optical path protection and 2+0 mode. In 1+1 mode, the 4 Ethernet interfaces share one VCG and the bandwidth is one VC4 (139Mb/s). In 2+0 mode, the 4 Ethernet interfaces share two VCG channels and the bandwidth is two VC4. Therefore, By GFP and EoS technology, BD-EOS-GE-STM1 can realize two 139Mb/s Ethernet traffic transmission over STM-1 optical line.

1.2 Feature

- Compact design with 1U height, 19 inch, 155mm depth, and can be installed on standard rack
- Optical interface
 - Two STM-1 optical interfaces; SFP optical module (LC interface); Hot pluggable
 - The line bit rate is 155Mb/s, single mode, ltransmission distance is optional (depend on the SFP optical module)
 - Supports real-time detection for the status of optical module
 - Supports Automatic Laser Shutdown(ALS) to protect operators from hurt
 - Supports Remote Power down Detect (RPD) function
- Ethernet interface
 - One fiber gigabit Ethernet interface and three copper gigabit Ethernet interfaces compliant with IEEE802.3 serial standard;
 - The copper gigabit Ethernet interfaces adopt RJ45 connector, support auto-negotiation, which can work in 1000M full-duplex, 100M full/half-duplex, 10M full/half-duplex mode; supports auto MDI/MDX function
 - The fiber gigabit Ethernet interface adopts 1.25G SFP module, which can work in 1000M full-duplex mode, transmission distance is optional (depend on the SFP optical module)
 - Provides two WAN port (inside and invisible), each corresponding to one VCG separately, the bandwidth of each VCG is a VC4.
- Management Interface
 - Any of the GE1-3, GX4 can be used as the Ethernet management interface (EMU)

- Provides one serial management interface (CONSOLE)
- Supports embedded DCN management channel to achieve inband management
- Ethernet Switch bridge
 - Supports unicast, multicast and broadcast frame
 - Supports 802.3x flow control and broadcast storm filtering control*
 - 8K MAC address table, with optional 12s / 300s ageing time configurable, the default is 300s
 - Supports MAC address dynamic learning function
 - Supports 256 items static MAC address configuration
 - Accepts frames with length between 64 and 1552/2048 bytes (otherwise filtering)
 - Supports port-based VLAN and IEEE802.1Q tag-based VLAN
 - Supports QinQ(Double Tag VLAN)
 - Supports up to 4K items VLAN table
 - Supports Link Aggregation for WAN and LAN port, supports up to 4 link aggregation groups
 - Supports IEEE 802.1P QoS
 - Supports Port Mirroring
 - Supports Dynamic ARL Table Learning and Searching
 - Supports port rate control
 - Provides performance statistic for each Ethernet interface;
- Loop back
 - Supports VC4 channel of STM-1 optical loopback towards line side
- Supports 1+1 path protection and Automatic Protect Switch (APS) with switching time less than 50ms
- Supports 2+0 mode, the transmission bandwidth available can be up to 2 VC4
- Compliant to ITU-T standards
 - GFP-F encapsulation , compatible with ITU-T G.7041 recommendation
- NE Management
 - Supports Simple Network Management Protocol (SNMP), compatible with V1 and V2C protocol
 - Supports FTP protocol and firmware download online without disturbance of existing traffic
 - Monitoring the alarms and status in real-time
- Supports hot-spare power, the power consumption is less than 10W

- -48V DC single power access
- 220V AC single power access
- -48V DC+220V AC double power access

*Note:

The ingress port mirroring function can be available Only when both the broadcast storm filtering function and ingress port rate control function are closed..

2 Components of BD-EOS-GE-STM1

Table 2-1 Components of BD-EOS-GE-STM1

Type	Specification	Description	Remarks
Metal chassis	BD-EOS-GE-STM1 Metal chassis	1U height, 19 inch width and 155mm depth; The color of the chassis is gray in default, it can be customized.	Required
Mainboard	BD-EOS-GE-STM1 Mainboard	dual - VCG channel Gigabit Ethernet Converter mainboard	Required
Power Converter	P-PBK	Connect the power module to the Motherboard, providing +5V for motherboard.	Required
ARM Card	CARM701 Card	Realize card management and network-based management	Required
155M SFP Optical Module	✧ 40Km, 1310nm ✧ 80Km, 1550nm ✧ 120Km, 1550nm ✧ Single mode, 1550/1310nm, 20Km	155M SFP Optical module	Optional
1.25G SFP Optical module	✧ 15Km, 1310nm ✧ 30Km, 1310nm ✧ 80Km, 1550nm ✧ 120Km, 1550nm	1.25G SFP optical module	Optional

	✧ Single mode,1550/1310nm, 15Km		
Power Module	✧ -48V DC single power ✧ 220V AC single power ✧ -48V DC +220V AC double power	PW15DC-K5V5, -48V to +5.5V power module (DC/DC) ; PW15AC-K5V5, ~220V to +5.5V power module(AC/DC);	Optional

Note : Items with '✧' symbol means optional.

3 Application

BD-EOS-GE-STM1 supports point-to-point application. In 1+1 mode, the 4 Ethernet interfaces share one VCG and the bandwidth is one VC4 (139Mb/s). In 2+0 mode, the 4 Ethernet interfaces share two VCG channels and the bandwidth is two VC4. Refer to section 5.3 for more.

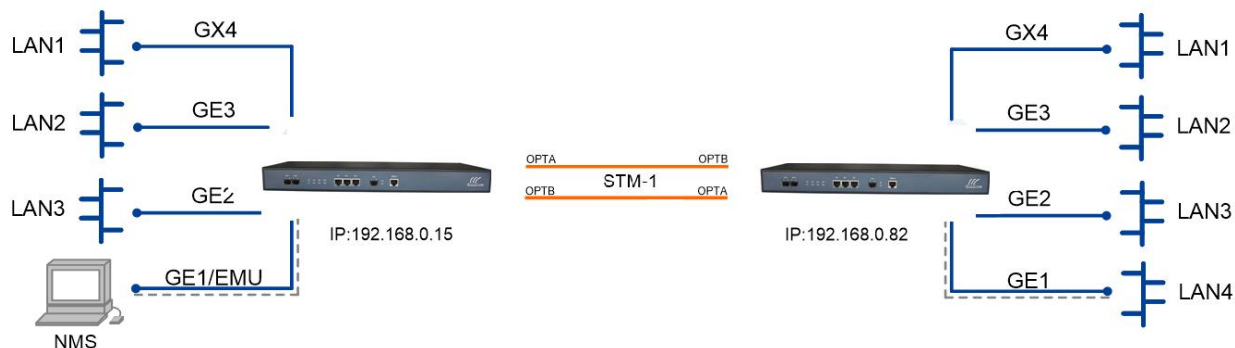


Figure 3-1 point-to-point application

Note: Make sure optical A of one NE must be connected with optical B of its neighboring NE.

4 Panel Description

4.1 Front Panel



Figure 4-1-1 Front panel

Table 4-1-1 Interface on front panel

Name	Description
OPTA/B	STM-1 optical interface A and B, for STM-1 optical signal transmitting and receiving ; SFP optical module, supports hot pluggable. Note: Before using fiber to connect two devices, the parameters of the optical interface (Mean launched power– maximum and Minimum overload) should be considered carefully, when the received power is over the minimum overload, the attenuator should be adopted.
GE1/2/3	Copper Gigabit Ethernet port 1/2/3, RJ45 connector, uses CAT-5 cross-over or straight-through cable. Refer to 5.1.2 ‘Ethernet Function’ for more.
GX4	Fiber Gigabit Ethernet Interface, adopt SFP optical module.
CONSOLE	RS232 serial management interface (RJ45 connector), used for CLI network management, refer to appendix 1 for more.

Note: Any one of GE1/2/3 or GX4 interface can be set to EMU(Ethernet management interface) by VLAN. By default, GE1 is used as EMU interface.

Table 4-1-2 Indicators on front panel

Name	Description
RUN	Running indicator, green. BLINK: Device works normally (the blink cycle is 0.4s) Quickly blink: Device initializing (the quickly blink cycle is 0.1s) Slowly blink: Data transferring from ARM to FLASH (the slowly blink cycle is 1s) ON or OFF: Abnormal working status

Name	Description
ALS	ALS indicator for OPTA,OPTB and GX4 port, green ON: ALS function of the OPTA, OPTB and GX4 ports are configured as enabled simultaneously by SNMP; OFF: ALS function of the OPTA, OPTB and GX4 ports are configured as disabled simultaneously by SNMP; Note: The ALS function of the OPTA, OPTB and GX4 ports must be configured as enabled or disabled simultaneously; only when the corresponding optical interface detects a Loss of signal and the ALS is enabled by SNMP, that particular optical interface will enter into the ALS state.
UALM	Urgent alarm indicator, red ON: Urgent alarm present OFF: No urgent alarm Note: 1) Refer to Table 5-8-1 to see more about urgent alarm. 2) The alarm shield by management software will not trigger the led UALM.
DALM	Non-urgent alarm indicator, yellow. ON: Non-urgent alarm present OFF: No non-urgent alarm or there is critical or major alarm Note: 1) Refer to Table 5-8-1 to see more about Non-urgent alarm 2) The alarm shield by management software will not trigger the led DALM
NOPA/B	Optical signal loss alarm indicator ,red ON: Optical signal loss is detected at port A/B OFF: SFP works normally or no SFP module present in the socket. Note: 1. When the fiber is broken, if ALS is enabled, the interface will start sending a laser pulse in a certain interval periodically. When the fiber is healed, the emitter will send laser after a while as ALS is enabled. Thus, if the fiber has already recovered, this indicator will still be ON for a short time, and then be OFF.(if ALS worked in short interval mode, the time delay

Name	Description	
	is about 12.5s; while if ALS worked in long interval mode, this time delay is about 100s). 2. No SFP optical module or RPD alarm will shield NOP alarm.	
RPDA/B	Remote power-down indicator, yellow ON: Remote power down Note: 1. RPD alarm will shield NOP alarm. 2. When no SFP optical module present in the socket, the RPD alarm of the corresponding optical interface will be shield and the LED will be OFF.	
GE1/2/3	LINK/ACT	1000M copper Ethernet link indicator, green. ON: Normal link but no data transmit or receive; Blink: Normal link and there are data transmitting and receiving; OFF: No link or the interface is damaged
	SPD	1000M copper Ethernet speed indicator, yellow. ON: operating with 1000M; OFF: operating with 100M or 10M
GX4	LINK	1000M optical Ethernet link indicator, green. ON: Normal link but no data transmit or receive; OFF: No link or interface is disabled or no SFP module present in the socket.
	NOP	Ethernet optical signal loss alarm indicator ,red ON: Optical signal loss is detected at GX4 port; OFF: SFP works normally or no SFP module present in the socket.

4.2 Rear Panel



Figure 4-2-1 BD-EOS-GE-STM1 rear panel

Table 4-2-1 Rear Panel

Name	Description
Power card socket	2 power card sockets, the power access can be single 220VAC, single -48VDC, and 220V AC&-48V DC double power.
~220V	AC 220V power input interface (input range:85~264V AC)
-48V	PGND: protected ground input terminal
	GND: work ground input terminal
	-48V: DC-48V power input terminal (input range:-36~-72V DC)
POWER	power switch "I": power on; "O": power off.
	Protective ground (PGND) screw, connect with the chassis. The PGND screw should be connected to the equipment room ground by the external PGND cord.

5 Functional Description

5.1 Interfaces

5.1.1 STM-1 optical interfaces

BD-EOS-GE-STM1 supports two STM-1 line interfaces with the bit rate of 155Mb/s, it adopts SFP optical module, supports hot-pluggable, the transmission distance is optional (depends on the SFP optical module).

Refer to table 7-1 for more.

5.1.1.1 ALS Function

In order to minimize or eliminate risk of exposure to laser radiation from fiber breaks, the optical interfaces in the BD-EOS-GE-STM1 support the Automatic Laser Shutdown (ALS) function.

When an optical interface detects a Loss of Signal (LOS) for 800ms, it will enter into an ALS state. The interface will then start sending a laser pulse in a certain interval periodically (10/100s cease and 2s transmit) in order to restore as the fiber is healed.

In default, ALS is disabled.

BD-EOS-GE-STM1 also supports manually send a laser pulse when ALS is enabled, using manual function to send restart pulse to restore the laser within 2s when fiber is healed; if fiber is still broken, the laser only lasts for 2s, after that, it will automatically send pulse in a certain interval again.

BD-EOS-GE-STM1 supports ALS configuration through SNMP , such as enable/ disable ALS, manual send pulse, long interval/short interval settings and so on.

Note:

- (1) Enable or disable ALS just means that the ALS function is effectively configured by SNMP , it does not mean that the laser enters into the ALS state. With ALS configured as enable, the alarm of Loss of optical signal will trigger ALS.
- (2) ALS should be disabled when measuring Average Optical Transmit Power and Receiving Sensitivity.

5.1.1.2 RPD Function

When the equipment runs in networks, both fiber broken and power down at remote will cause the optical signal loss. RPD is a technique to identify the fiber broken and power down at remote to make maintenance easily.

With the SNMP or the RPD alarm LED on the front of the device, the operator can view whether the RPD alarm presents.

Table 5-1-1-2 lists the corresponding alarm LED status in case of fiber broken or device power down.

Table 5-1-1-2 RPD and NOP case

Case \ LED	RPDA(B)	NOPA(B)
Power- off at remote and optical fiber is normal	ON	OFF
Remote is normal, optical fiber is broken	OFF	ON
Both remote and optical fiber are normal	OFF	OFF

5.1.2 Ethernet Interface

BD-EOS-GE-STM1 provides two electrical gigabit Ethernet interfaces (LAN interface), compatible with IEEE802.3ab 1000Base-T/ IEEE802.3u 100Base-TX/ IEEE802.3 10Base-T standard. Each interface supports auto-negotiation, which can work in 1000M full-duplex, 100M full/half-duplex, 10M full/half-duplex mode; it can also be set to 100M full/half-duplex, 10M full/half-duplex mode by force (the 1000M full/half-duplex mode cannot be set by force). The default is auto-negotiation.

Besides, BD-EOS-GE-STM1 provides one optical gigabit Ethernet interfaces (LAN interface), compliant with IEEE802.3z 1000Base-LX/SX standard, the optical gigabit Ethernet interface adopts SFP module, which can work in 1000M full-duplex mode. And this module supports ALS function.

BD-EOS-GE-STM1 provides two WAN interfaces(inside and invisible), each WAN port corresponds to a VCG channel with the bandwidth of one VC4.

Each LAN and WAN interface of BD-EOS-GE-STM1 supports flow-control separately.

5.2 Cross-Connection

BD-EOS-GE-STM1 supports cross-connection, by which, the Ethernet traffic can be assigned to any timeslot (VC4) of OPTA/B, the creation and deletion of cross-connection can be implemented by management software. If a new connection is set up, no modification is allowed, only when this connection is deleted.

Note:

By default, WAN1 is assigned to one VC4, WAN2 is free.

5.3 1+ Path Protection and 2+0 mode

BD-EOS-GE-STM1 supports 1+1 path protection mode(1+1 mode) and 2+0 non-protection mode(2+0 mode).

5.3.1 1+1 mode

In 1+1 mode, when auto protection is enabled the device adopts dual transmit, select receive protect mechanism: the traffic is transmitted over both port A and port B simultaneously, taking the same VC4. At the sink end, the normal traffic signal is selected from the better of the two ports. In the case of fiber break or alarm occurred, the device detects the fault and will automatically select the incoming traffic from the protection optical port.(this course is called automatic protect switch, and the switch time will be less than 50ms). In this course, errors may occur instantaneously, but will disappear rapidly.

The default switch condition of auto protection is: AU-AIS、AU-LOP、HP-AIS.

Figure 5-3-1 shows the point-to-point application in 1+1 mode, which is also the application when both the two equipment are in the factory default settings,that is: optical path 1+1 protection mode; LAN1 and IMP are in one VLAN; LAN2, LAN3,LAN4, WAN1 and WAN2 are in another one VLAN; WAN1 occupy one VC4; GE2,GE3,GE4 share one VC4 channel(139Mb/s); GE1 is used as EMU port, by EMU and optical overhead,both the local and remote equipment can be managed.

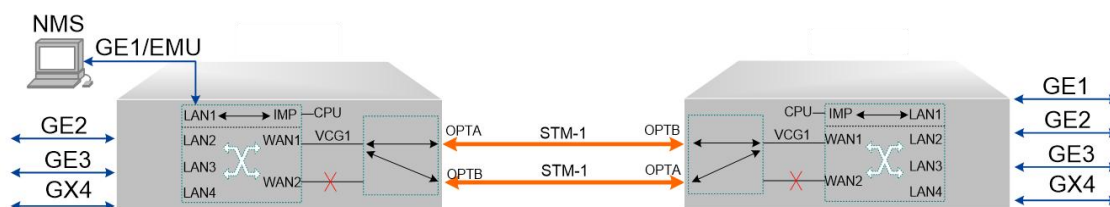


Figure 5-3-1 point-to-point application (1+1 protection)

5.3.2 2+0 mode

In 2+0 mode, the traffic is transmitted over the dedicated working path without protection path standby. There is no protection path so the path of port A and port B with the same VC4 No. can be transmitted to different client traffic, therefore, the transmission bandwidth available efficiency can increased double, that is the transmission bandwidth available can be up to 2x VC4.

Figure 5-3-2 shows the point-to-point application in 2+0 mode, WAN1 corresponds to VCG1 and WAN2 corresponds to VCG2, each bandwidth is VC4, respectively, by VLAN, GE1 and GE2 share one VC4, and GE3 and GX4 share another one VC4, thus, it can realize two 139Mb/s Ethernet traffic transmission over STM-1 optical line.

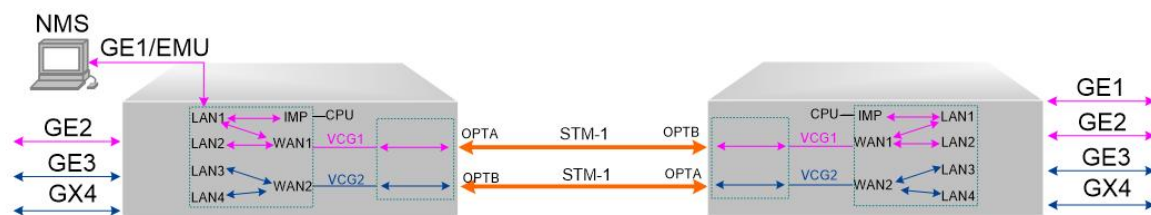


Figure 5-3-2 point-to-point application (2+0 mode)

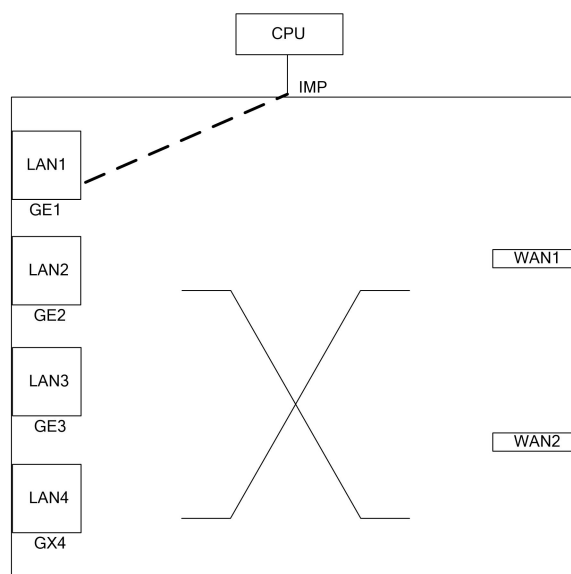
Note:

1. In figure 5-3-2, in order to prevent broadcast storm, we need to isolate the WAN ports each other, disable the MAC address learning function, and disable the broadcast storm filtering function.
2. Make sure optical A of one NE must be connected with optical B of its neighboring NE.

5.4 Ethernet Bridge

5.4.1 VLAN Function

BD-EOS-GE-STM1 supports 4 LAN ports (GE1, GE2, GE3 and GX4), one IMP port (In-band Management Port, corresponding to CPU), and 2 WAN ports (invisible).



BD-EOS-GE-STM1 supports three VLAN modes: 802.1Q tag-based VLAN, port-based VLAN and QinQ.

Note: By default, LAN1 and IMP are in the same LAN, while LAN2, LAN3, LAN4, WAN1 and WAN2 are in another LAN.

5.4.1.1 Port-based VLAN

Port-based VLAN is used to assign each port of one switch to a separate VLAN, or multiple ports to the same VLAN. Port-based VLAN can't across different switches.

Port-based VLAN doesn't require its bridge to recognize the VLAN-tagged frames or to look up the VLAN table; Packets received from a port will only go forward to its associated ports - port members, so you must define the port member for each port, that is, to define the final destination ports allowed for each port, as Figure 5-2-1-1 shows:

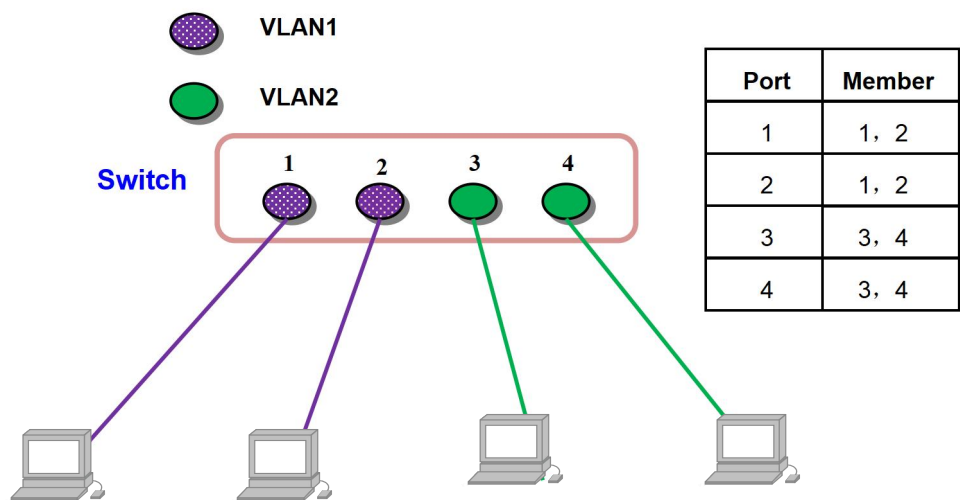


Figure 5-4-1-1 Port-based VLAN

Figure 5-4-1-1 is the diagram for a switch with 4 ports, while BD-EOS-GE-STM1 provides a switch with 7 ports at most (4 LAN ports, 1 IMP port and 2 WAN ports). BD-EOS-GE-STM1 supports Port-based VLAN function.

5.4.1.2 802.1Q Tag-based VLAN

The 802.1Q Tag-based VLAN requires its bridge to recognize frames with a VLAN tag; lookup the VLAN table to find out the record whose VLAN ID is identical with the packet tag; forward packet according to both the record of VLAN table and the port members.

The 802.1Q Tag-based VLAN is used to achieve VLAN across switches, that is, it allows the ports of different switches be assigned to the same VLAN, as Figure 5-4-1-2 shows;

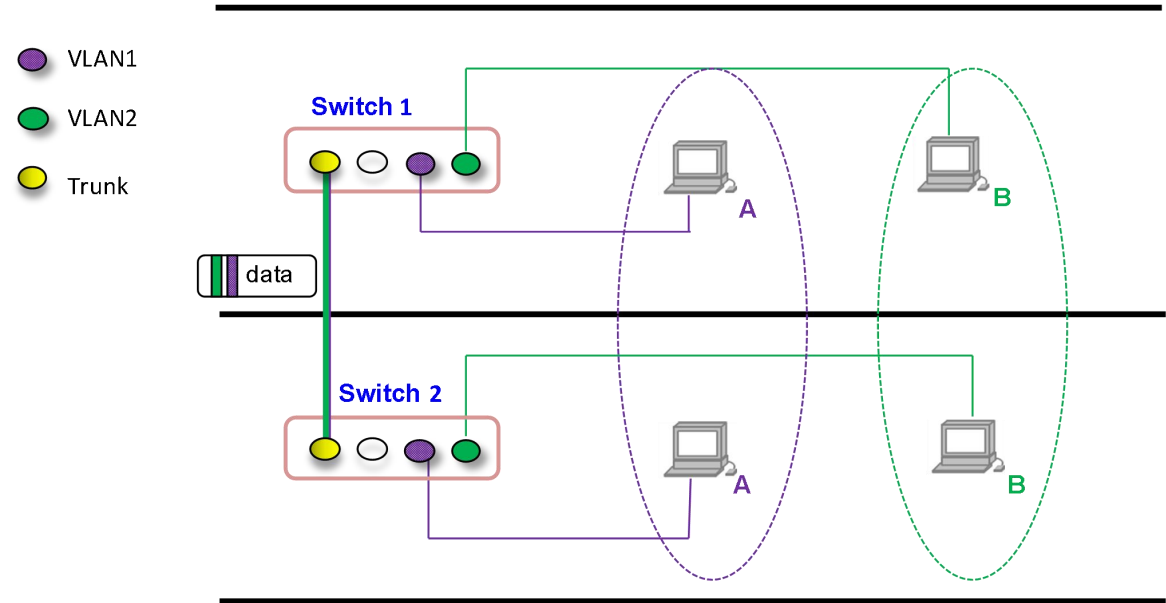


Figure 5-4-1-2 802.1Q Tag-based VLAN

BD-EOS-GE-STM1 supports IEEE802.1Q Tag-based VLAN, which can be configured by SNMP. The VLAN ID is between 1~4094.

5.4.1.2.1 802.1Q Tag-based VLAN Term

- Tag:** 802.1Q VLAN Tag header, which is a field within a frame that identifies the VLAN.
- Tagged frame:** A data frame that contains 802.1Q VLAN tag header.
- Untagged frame:** A data frame that does not contain 802.1Q VLAN tag header.
- VLAN ID:** VLAN IDentification, a unique number (between 1 and 4094) that identifies a particular VLAN. The default VLAN ID is '1'. (VLAN ID=0 is NULLVLAN, 4095 is reserved.)
- PVID:** Port default VLAN ID, a unique number (between 1 and 4094), the default PVID for all the ports is '1'.
- Access:** The port mode for VLAN, when an Ethernet port is connected with terminal device such as a PC, this port mode is recommended. refer to Table 5-4-2-1 for more.
- Trunk(Tag-aware):** The port mode for VLAN, It is also called Trunk port mode; When an Ethernet port is connected with device that can distinguish and deal with VLAN tag such as SWITCH with VLAN function, this mode is recommended, refer to Table 5-4-2-1 for more.

Table 5-4-1-2-1 VLAN port mode

Port Mode	On the ingress of the port		On the egress of the port
	when the untagged packet received on the port	when the tagged packet received on the port,	
Access	the packet will be added on PVID tag, then go forward to the specific VLAN according to the PVID;	if the VLAN ID is consistent to the port PVID, the packet will be forward; otherwise, the packet will be discarded;	the tag will be removed before forwarding to the end station.
Trunk (Tag-aware)	If the PVID is permitted in the VLAN ID, the untagged packet received will be added on PVID tag and forwarded to the specific VLAN according to the PVID; otherwise, the packet will be discarded;	if the tag is permitted in the VLAN ID, the packet will be forward; otherwise, the packet will be discarded;	If the tag is allowed in the VLAN table, the tagged packet will be transmitted directly.

5.4.1.3 QinQ Function

BD-EOS-GE-STM1 supports QinQ function. QinQ is also called VLAN stacking, it is based on IEEE 802.1q protocol, a VLAN tag (outer VLAN tag) is added to the original VLAN tag (inner VLAN tag), the outer VLAN tag can shield the inner VLAN tag. Currently, BD-EOS-GE-STM1 only supports port-based QinQ, called “basic QinQ”, to achieve user data frame transparent transmission over the service provider network only.

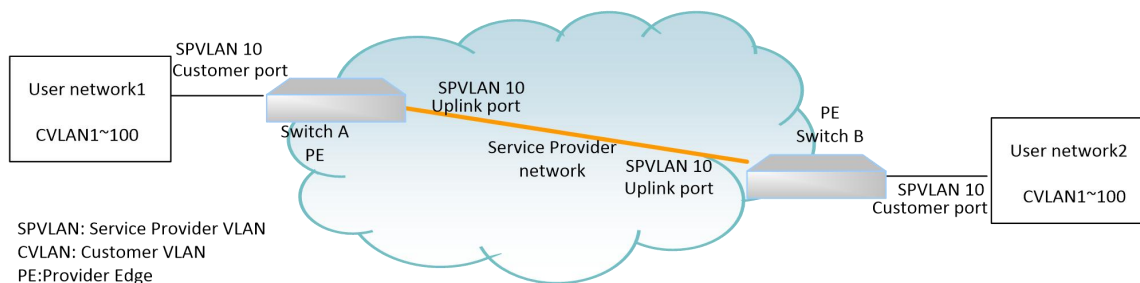


Figure 5-4-1-3 QinQ networking

The QinQ packet is with double VLAN Tag during transmission in the service provider network (public network), the inner VLAN Tag is for private network, and the outer VLAN Tag is for the public network. The packet frame

structure is as Fig. 5-4-1-3 shows:

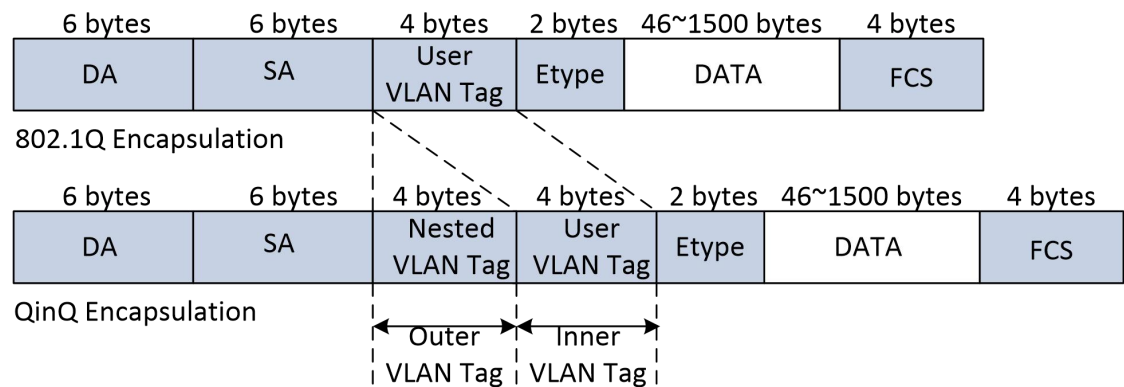


Figure 5-4-1-3 QinQ frame structure

BD-EOS-GE-STM1 supports basic QinQ configuration below, by SNMP:

- Enable/disable QinQ

In default, the QinQ function is disabled.

Note: the QinQ of each unit can be enabled/disabled independently, if QinQ of unit1 is enabled, it means QinQ of all the 16 WAN ports of unit 1 are enabled simultaneously.

- Configure ISP port
- Configure TPID

TPID (Tag Protocol Identifier) is a field of VLAN Tag, indicate the protocol type of VLAN Tag, it is 0x8100 specified in IEEE 802.1Q protocol. On devices of different vendors, the TPID of the outer VLAN tag of QinQ frames may have different default values. Users can set or modify this TPID value, so that the QinQ frames, when arriving at the public network, carries the TPID value of a specific vendor to allow interoperation with devices of that vendor.

The TPID in an Ethernet frame has the same position with the protocol type field in a frame without a VLAN tag. To avoid chaotic packet forwarding and receiving, users cannot set the TPID value to any of the values in the table 5-2-1-3 below.

Table 5-2-1-3 Reserved protocol type value

Protocol	Type Value
ARP	0x0806
PUP	0x0200
RARP	0x8035

IP	0x0800
IPv6	0x86DD
PPPoE	0x8863/0x8864
MPLS	0x8847/0x8848
IPX/SPX	0x8137
IS-IS	0x8000
LACP	0x8809
802.1x	0x888E
Cluster	0x88A7
Reserved	0xFFFD/0xFFFE/0xFFFF

5.4.2 MAC address aging

In order to meet the user's various requirements, BD-EOS-GE-STM1 supports the following three MAC address table aging modes, which can be configured by SNMP:

- 1) Quick aging: The MAC address learning is enabled and the aging time is 12s;
- 2) Standard aging: The MAC address learning is enabled and the aging time is 300s;
- 3) Close aging: The MAC address learning is disabled. (Suitable for fault testing).

5.4.3 Port Rate Control

BD-EOS-GE-STM1 supports port rate control function, user can control the port bandwidth of the ingress and egress traffic on each port, to protect regular traffic from an overabundance of the broadcast or multicast traffic.

BD-EOS-GE-STM1 support the port bandwidth setting by SNMP: the bandwidth can be set as 2M, 3M, 4M...100M (lower than or equal to 100M); it also can be set as 110M, 120M, 130M....1000M (higher than 100M); the system will automatically select the integer lower and proximate to the settings as the bandwidth.

The port rate control will be disabled when setting 0 or 1000M.

5.4.4 Link Aggregation

Link aggregation means several ports can be grouped together as a single logic link between two switches, to increase the transmission capacity and the connection reliability.

As Figure 5-4-4-1 illustrated, if the link aggregation of both the GE1 and GE2 ports are configured as enabled, the two ports will be aggregated into one port logically, serve as a single logical port, with transmission bandwidth of 2G; within the link aggregation, the two physical link carry the same traffic to provide redundancy, if one of the interfaces failed, the other can take over.

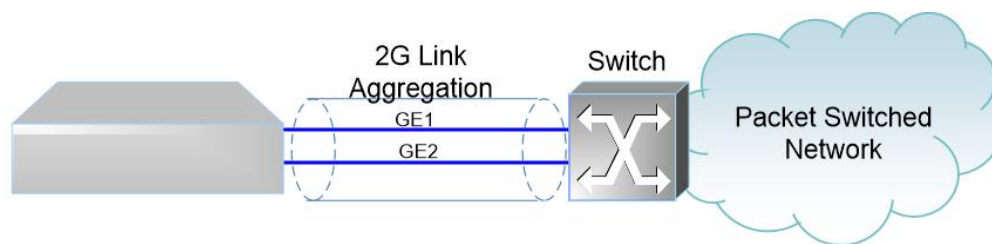


Figure 5-4-4-1 Link aggregation illustration

The link aggregation function can be configured by SNMP.

Note:

- (1) The port of the link aggregation must be connected to the same switch or router
- (2) The rate of all the members of the same link aggregation group must be identical, and the duplex mode must be full-duplex.
- (3) The VLAN configuration of all the members in the same link aggregation group must be identical.
- (4) The LAN port and WAN port can not be the members of the same link aggregation group simultaneously.
- (5) BD-EOS-GE-STM1 supports up to 4 aggregation groups

5.4.5 Port Mirroring

BD-EOS-GE-STM1 supports port mirroring functions, which allows ingress and egress traffic to be monitored by a single port.

Frames that are received on a port (defined as the ingress monitor source port) can be copied to the port defined as the ingress monitor destination. Frames that are transmitted out a port (defined as the egress monitor source port) can be copied to the port defined as the egress monitor destination.

The monitor source and destination port can be enabled by SNMP, respectively. The factory default setting is disabled.

Note:

- 1) If one port is configured as the monitor source port, it can not be configured as the monitor destination port again.
- 2) If one port is configured as the monitor destination port, it can not be configured as the member of link aggregation.

5.4.6 Dynamic ARL Table Learning and Searching

ARL (Address Resolution Logic) table has stored some information associated with MAC address. By inputting a MAC address to the RayView management software, the associated record such as Port ID and VLAN ID can be searched and displayed.

5.4.7 QoS

QoS (Quality of Service) is the safety mechanism in network, which is used to solve network delay and traffic blocking. BD-EOS-GE-STM1 supports QoS configuration, including QoS priority mode, traffic class and Queue Preempt.

The QoS mode includes disabled, COS or DSP. When COS is selected, the port-based priority, 802.1p priority, TOS/DSCP priority will be enabled; when DSP is selected, the port-based priority, 802.1p priority will be disabled, the TOS/DSCP priority will be enabled.

The traffic class mode can be 4WRR, 1HQP+3WRR, **2HQP+2WRR** and **4HQP**. The default is 4WRR.

Queue preempt is the sending proportion of the 4 queues when traffic blocking is happen, the value can be 1-31. The default is 1,2,4,8. All the port can be unified configured.

Table 5-4-7-1 QoS term

Item	Description
Port-based priority	Each port can be configured to different priority, the value can be 0-7, when traffic is blocked, the packet received on the port that has higher priority will be forward first.
802.1p priority	VLAN tag has 3 bit for priority field, the Ethernet packet which has higher priority can be forward first
TOS/DSCP priority	The higher 6bit of ToS byte in the IP packet is DSCP priority, the value can be 0-63, the Ethernet packet with higher priority will be forward first.
Queue	Each Ethernet port has 4 queues, the packet with different priority will be mapped to different queues, the sending proportion of the 4 queues will be rest with the traffic class mode
4WRR	4 queues High Queue Preempt,
1HQP+3WRR	queue 4 High Queue Preempt, queue 1-3 Weighted Round Robin, queue 4 has the higher priority.
2HQP+2WRR	queue 4,3 High Queue Preempt, queue 2,1 Weighted Round Robin
4HQP	4 queues High Queue Preempt, queue 4 has the higher priority.
Mapping relationship	Port-base priority and 802.1p priority 0-1 mapped to queue 1 2-3 mapped to queue2 4-5 mapped to queue3 6-7 mapped to queue4 TOS/DSCP priority 0-15 mapped to queue 1 16-3 mapped to queue2

	32-47 mapped to queue3 48-63 mapped to queue4
--	--

5.5 Ethernet Encapsulation -- GFP-F

GFP-F (Frame-mapped Generic Framing Procedure) is a protocol specified in the ITU G.7041 which mapping variable length payload into an octet-synchronous transport container. As shown in Figure 5-5-1, the Ethernet frame (not contain of Preamble and Start of Frame Delimiter) is encapsulate into the GFP frame, the GFP FCS, GFP extension header is optional field and the Type is configurable.

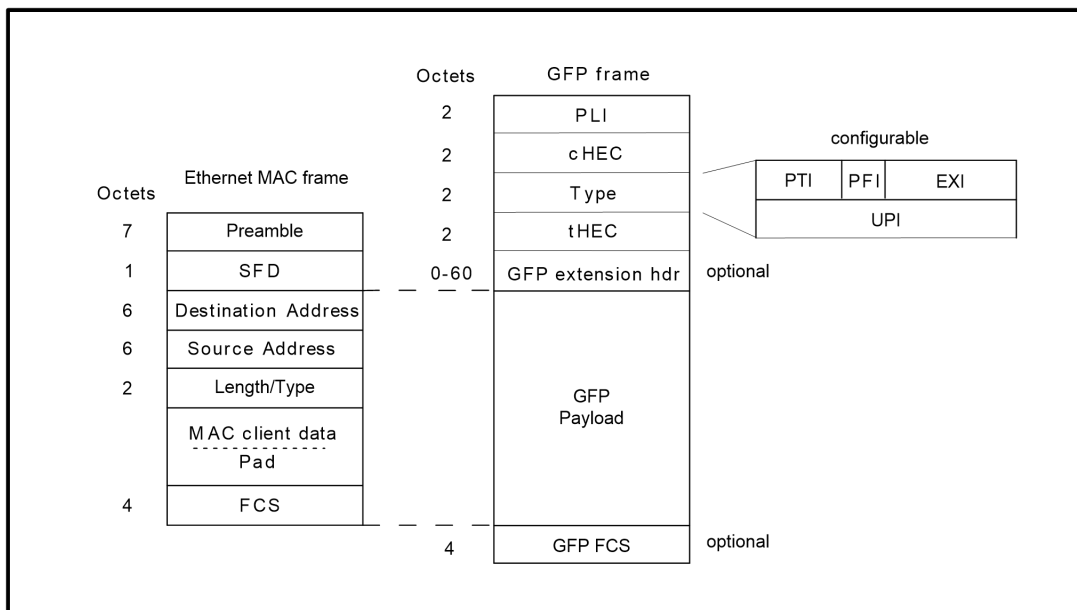


Figure 5-5-1 GFP frame Structure

Each WAN port of BD-EOS-GE-STM1 supports encapsulation configuration independently, In order to communicate with equipment from other vendors, BD-EOS-GE-STM1 supports the following configuration for GFP frame implemented by management software :

- PFI (Payload FCS Indicator): it is used to indicate the presence or the absence of the payload FCS filed.
Enable PFI: use the payload FCS filed;
Disable PFI: Not use the payload FCS filed.
Default value: Disable PFI.
- EXI (Extension Header Identifier): it is used to identify the type of extension header, Null header or linear header is optional.
Default value: Null header

Note: keep the default value of the GFP configuration when communicating with the same equipment; when

communicating with equipment from other vendors, change the default value appropriately to guarantee the normal communication between the two different equipments.

5.6 Troubleshooting

BD-EOS-GE-STM1 supports various loop back modes configured by management software for fault localization and failure analysis. The loopback point is shown as Figure5-6-1:

- ①: VC4 of Optical port loopback to optical line side;
- ②: MAC loopback to line side;

Note: The default configuration is no loop. The loopback configuration will be lost after restarting device (or the device is power off).

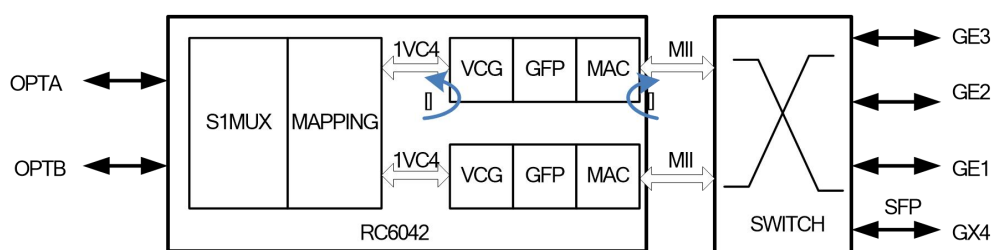


Figure 5-8-1 loopback

5.7 Loop Detection

When the WAN of the Ethernet is looped back (this is often caused by optical line loop-back, or remote Ethernet loop), broadcast storm may happen in the LAN network.

The device provides loop detection to prevent the broadcast storm of the LAN Ethernet: When the WAN Ethernet data is detected as looped back (for example, the optical port is looped back by fiber or loop-back configuration), the WAN Ethernet data transmitted to LAN will be discarded, therefore the broadcast storm is avoided.

This function can be enabled/disabled through RayView management software. The default is enabled. It will be restored to factory settings after power on.

5.8 Alarm and Performance

5.8.1 Alarm List

BD-EOS-GE-STM1 provides abundant alarms, as Table 5-8-1 shows:

Table 5-8-1 Alarm List

Alarm Name	Alarm Description	Severity	U/DALM
Alarm for Optical Port (A/B)			
RPD	Remote power down	Minor	DALM
NOP	Loss of Optical Signal on the receive line	Critical	UALM
*TF	Transmit Fault	Critical	UALM
*TD	Transmit Degraded Signal (bias-current excessive)	Major	UALM
*RPL	RX Power Low	Minor	DALM
*RPH	RX Power High	Major	UALM
*LPL	TX Power Low	Minor	DALM
*LTH	Laser Temperature High	Minor	DALM
Alarm for Regenerator Section (RS)			
OOF	Out Of Frame	Critical	UALM
LOF	Loss Of Frame	Critical	UALM
RS-TIM	Regenerator trace identifier mismatch	Critical	UALM
RS-EXC	Regenerator Section Excessive error	Major	UALM
RS-DEG	Regenerator Section Degraded signal defects	Minor	DALM
RS-15min-TCA	Regenerator Section 15 minutes performance threshold exceed alarm	Major	UALM
RS-24hour-TCA	Regenerator Section 24 hours performance threshold exceed alarm	Major	UALM
Alarm for Multiplex Section (MS)			
MS-RDI	Multiplex Section Remote Defect Indication	Minor	DALM
MS-EXC	Multiplex Section Excessive error	Major	UALM
MS-DEG	Multiplex Section Degraded signal defects	Minor	DALM
MS-AIS	Multiplex Section Alarm Indication Signal	Minor	DALM
AU-LOP	Loss of Pointer of Administrative Unit	Critical	UALM
AU-AIS	Alarm Indicator Signal of Administrative Unit	Minor	DALM
MS-15min-TCA	Multiplex Section 15 minutes performance threshold exceed alarm	Major	UALM
MS-24hour-TCA	Multiplex Section 24 hours performance threshold exceed alarm	Major	UALM
AU-15min-TCA-PJP	AU positive pointer adjustment performance exceeding threshold within 15 minutes	Major	UALM
AU-15min-TCA-PJN	AU negative pointer adjustment performance exceeding threshold within 15 minutes	Major	UALM
AU-24hour-TCA-PJP	AU positive pointer adjustment performance exceeding threshold within 24 hours	Major	UALM
AU-24hour-TCA-PJN	AU negative pointer adjustment performance exceeding threshold within 24 hours.	Major	UALM
Alarm for High-Order Path (HOPL)			

HP-UNEQ	High-order Path Unequipped	Critical	UALM
HP-TIM	High-order Path trace identifier mismatch	Critical	UALM
HP-PLM	High-order Path payload mismatch	Critical	UALM
HP-RDI	High-order Path Remote Defect Indication	Minor	DALM
HP-EXC	High-order Path Excessive error	Major	UALM
HP-DEG	High-order Path Degraded signal defects	Minor	DALM
HP-AIS	High-order Path Alarm Indication Signal	Minor	DALM
TU-LOM	Tributary Unit Loss Of Multiframe	Critical	UALM
HP-15Min-TCA	HP 15min performance threshold exceed alarm	Major	UALM
HP-24Hour-TCA	HP 24 hours performance threshold exceed alarm	Major	UALM
Ethernet alarm			
GFP-LOF	GFP loss of frame	Critical	UALM
LINKDOWN	Ethernet physical interface LINK_DOWN	Critical	UALM
LINE-MACLOOP	Ethernet line side loopback	Critical	UALM

Note:

(1)Table 5-8-1 shows the alarm severity in default, which can be changed by RayView software ; when the severity is changed, the corresponding U/DALM will be certainly changed.

(2) The urgent alarm will inhibit Non-urgent alarm.

(3)The alarm with * means: if the SFP optical module does not support DDM function, these alarms will not be viewed.

5.8.2 Performance Statistic

BD-EOS-GE-STM1 supports performance statistic, as Table 5-8-2-1, 5-8-2-2 shows:

Table 5-8-2-1 Channel performance statistic

Performance Item	Definition	Standard
Regenerator Section (RS)		
EB	EB	EB
BBE	BBE	BBE
ES	ES	ES
SES	SES	SES
UAS	UAS	UAS
CSES	CSES	CSES
Multiplex Section (MS)		

Local EB	Local EB	Local EB
Local BBE	Local BBE	Local BBE
Local ES	Local ES	Local ES
Local SES	Local SES	Local SES
Local UAS	Local UAS	Local UAS
Local CSES	Local CSES	Local CSES
Remote EB	Remote EB	Remote EB
Remote BBE	Remote BBE	Remote BBE
Remote ES	Remote ES	Remote ES
Remote SES	Remote SES	Remote SES
Remote UAS	Remote UAS	Remote UAS
Remote CSES	Remote CSES	Remote CSES
High-order Path (HP)		
Local EB	Local EB	Local EB
Local BBE	Local BBE	Local BBE
Local ES	Local ES	Local ES
Local SES	Local SES	Local SES
Local UAS	Local UAS	Local UAS
Local CSES	Local CSES	Local CSES
Remote EB	Remote EB	Remote EB
Remote BBE	Remote BBE	Remote BBE
Remote ES	Remote ES	Remote ES
Remote SES	Remote SES	Remote SES
Remote UAS	Remote UAS	Remote UAS
Remote CSES	Remote CSES	Remote CSES
PJP	PJP	PJP
PJN	PJN	PJN

Table 5-8-2-2 Ethernet performance

Performance Item		Definition
LAN port and WAN port	RX Byte Count	Ethernet byte counter for the receiving client data frames
	RX Packet Count	Ethernet packet counter for the receiving client data frames
	TX Byte Count	Ethernet byte counter for the transmitting client data frames
	TX Packet Count	Ethernet packet counter for the transmitting client data frames
	Drop packet Count	Packets discarded (including oversize packets, undersize packet , CRC error packet and so on)
	Drop Byte Count	The bytes of dropped packets

Note that the ETH performance can be statistic by bytes or packets; Refer to “RayView User Guide” for more.

5.9 System Management

BD-EOS-GE-STM1 supports management via CLI command based on serial RS232 port (CONSOLE) and telnet (EMU interface).

BD-EOS-GE-STM1 also supports network management platform based on SNMP (V1 and V2C) to complete configuration management and kinds of alarm monitoring.

Note: The IP address of PC and the equipment should be in the same IP network segment.

Table 5-9-1 Default Management Configuration

No.	Item	Factory Settings	CLI management	RayView
			CONSOLE	
1	MAC address	fixed and unique	Read/write	Read only
2	IP Address	192.168.0.155	Read/write	Read/write
3	Subnet mask	255.255.255.0	Read/write	Read/write
4	gateway	192.168.0.1	Read/write	Read/write
5	TRAP IP	127.0.0.1	Read/write	Read/write

6 Equipment installation and notice

- I Open the package, check out the package contents such as equipment and parts according to the packing list; for any damage, contact with the supplier instantly;
- II Mount the device in a 19-inch rack with screwdriver
- III Connect the interfaces with cable
 - ✓ Connect the optical interfaces with fiber.
 - ✓ Connect the user LAN to the RJ-45 connector designated Ethernet
 - ✓ Connect the control terminal to the front panel CONSOL connector
- IV Connect to the power
 - ✓ Always set the power switch at OFF position first and then connect the power.
 - ✓ Connect the power cable. For AC power supply, the accessory power cable can be used; for DC power supply, please take caution of the connector's polarity, reverse connection is forbidden.
 - ✓ Connect the PGND connector on the rear panel to the earth of the telecommunication house in a reliable way.

Notice:

- a. Before hot plugging the SFP optical module, both the operator and the device must be connected to the same earth in a reliable way! Otherwise, the device may be damaged!
- b. Before using fiber to connect the two devices, the parameters of STM-1 optical interface (Mean launched power— maximum and Minimum overload) should be considered carefully.

7 Technical Specification

Table 7-1 Parameters specified for STM-1 optical interfaces

Subject		Unit	Values			
Digital signal		kbit/s	STM-1 155520			
Nominal bit rate						
Application code		-	L-1.1	L-1.2	-	-
Operating wavelength range		nm	1280-1335	1480-1580	1480-1580	1310/1550 1550/1310
Distance (km)		Km	40	80	120	20
DDM		-	Available	Available	Available	Available
Type of interface		-	LC	LC	LC	LC
Type of fiber		G.652	G.652	G.652	G.652	G.652
Transmitter at reference point S	Source type	-	MLM	SLM	SLM	MLM
	Spectral characteristics -maximum RMS width (σ)	nm	3	-	-	-
	Spectral characteristics -maximum 20 dB width	Nm	-	1	1	-
	Spectral characteristics -minimum side mode	dB	-	30	30	-
	Mean launched power– maximum	dBm	0	0	5	-8
	Mean launched power– minimum	dBm	-5	-5	0	-15
	Minimum extinction ratio	dB	10	10	10	10
Optical path between S and R	Attenuation range	dB	10-28	10-28	10~31	10-28
	Maximum dispersion	ps/nm	246	NA	NA	96
	Minimum optical return loss of cable plant at S, including any connectors	dB	NA	20	NA	NA

	Maximum discrete reflectance between S and	dB	NA	-25	NA	NA
Receiver at reference point R	Minimum sensitivity	dBm	-34	-34	-34	-34
	Minimum overload	dBm	-10	-10	-10	-10
	Maximum optical path penalty	dB	1	1	1	2
	Maximum reflectance of receiver, measured at R	dB	NA	-25	NA	NA

Table 7-2 Ethernet optical parameters (dual fiber, 15Km)

Subject	Description
Bit rate	1.25Gb/s
Connector	SFP optical module
Wavelength	1310nm
Optical power	-3~-9dBm
Overload input optical power	-3dBm
Receiving sensitivity	Better than -22dBm
Dynamic range	Larger than 14dB
Transmission distance	15Km
Standard	SFP MSA (INF-8074i, ITU-T G.695, FC-P1 V2.0, IEEE802.3z 1000Base-LX/SX standard)

Table 7-3 Ethernet optical parameters (dual fiber, 30Km)

Subject	Description
Bit rate	1.25Gb/s
Connector	SFP optical module
Wavelength	1310nm
Optical power	-3~-8dBm
Overload input optical power	-3dBm

Receiving sensitivity	Better than -22dBm
Dynamic range	Larger than 14dB
Transmission distance	30Km
Standard	SFP MSA (INF-8074i, ITU-T G.695, FC-PI V2.0, IEEE802.3z 1000Base-LX/SX standard

Table 7-4 Optical parameters (dual fiber, 80Km)

Subject	Description
Bit rate	1.25Gb/s
Connector	SFP optical module
Wavelength	1550nm
Optical power	0~5dBm
Overload input optical power	-3dBm
Receiving sensitivity	Better than -24dBm
Dynamic range	Larger than 24dB
Transmission distance	80Km
Standard	SFP MSA (INF-8074i, ITU-T G.695, FC-PI V2.0, IEEE802.3z 1000Base-LX/SX standard

Table 7-5 Optical parameters (dual fiber, 120Km)

Subject	Description
Bit rate	1.25Gb/s
Connector	SFP optical module
Wavelength	1550nm
Optical power	0~5dBm
Overload input optical power	-9dBm
Receiving sensitivity	Better than -31dBm
Dynamic range	Larger than 31dB
Transmission distance	120Km

Standard	SFP MSA (INF-8074i, ITU-T G.695, FC-PI V2.0, IEEE802.3z 1000Base-LX/SX standard
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Table 7-6 Optical parameters (single fiber, 15Km)

Subject	Description
Bit rate	1.25Gb/s
Connector	SFP optical module
Wavelength	1550nm/1310nm
Optical power	-10~-3dBm
Overload input optical power	-3dBm
Receiving sensitivity	Better than -22dBm
Dynamic range	Larger than 13dB
Transmission distance	15KM
Standard	SFP MSA (INF-8074i, ITU-T G.695, FC-PI V2.0, IEEE802.3z 1000Base-LX/SX standard

Note:

1. The overload input optical power requirement must be obeyed ; otherwise the optical module may be damaged!
2. The SFP optical module is optional for users, and the parameters above is just an reference value; if users select the SFP module supplied by us, the parameters of the SFP module is as the above tables shows; if users purchase other types of SFP optical module by themselves, the parameters may be different.

Table 7-7 Copper Ethernet Interface

Subject	Description
Speed	10/100/1000M
Connector	RJ-45
Standard	IEEE802.3ab 1000Base-T /IEEE802.3u 100Base-TX / IEEE802.3 10Base-T

Bandwidth	in default, the bandwidth is not allocated
-----------	--

Table 7-8 Ethernet Parameters

Subject	Description
MAC address Table	8K
VLAN table capacity	4K
Minim frame length	64 bytes
Maximum frame length	Configured by management software , optional 1552/2048 bytes
MAC address Table aging time	Default:5 minuets
Work mode of copper Ethernet interface	Supports auto-negotiation mode and forced mode. The default is auto-negotiation mode
Work mode of fibber Ethernet interface	1000M full-duplex mode
Flow control	Default: enabled

Table 7-9 RS232 network management interface (CONSOLE)

Subject	Description
Baud rate	19200
bits	8
Stop bit	1
parity check	None
Electricity level	EIA-RS232 standard
Connector	RJ45

Table 7-10 Power supply

Subject	Description
Input DC voltage	-36~-72V DC
Input AC voltage	85~264V AC

Table 7-11 Dimensions

Subject	Description
Dimension	434mm×44mm×155mm（width × height × depth）
Power consumption	10W±10%

Table 7-12 Environment requirements

Subject	Description
Working temperature	-5℃～50℃
Storage temperature	-40℃～70℃
Relative Humidity	≤95%，no condensation

Appendix1 Serial management (CONSOLE) interface

Table A-1 Console cable definition

Pin	Definition	Remarks
PIN1	-	Null
PIN2	-	Null
PIN3	-	Null
PIN4	-	Null
PIN5	-	Null
PIN6	GND	Ground
PIN7	RSNM-IN	Serial network management channel input
PIN8	RSNM-OUT	Serial network management channel output

The CONSOLE cable adopts RJ45 connector at one end to connect the front panel of equipment, and DB9 connector at the other end to connect PC, the diagram is as Figure A-1-1 shows:

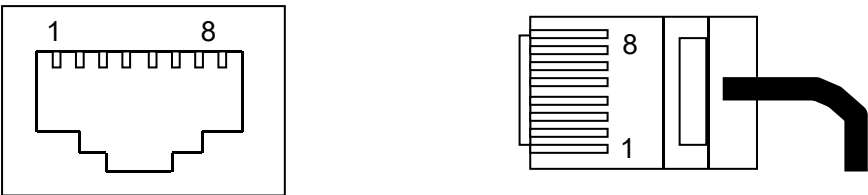


Figure A-1-1 RJ45 connector

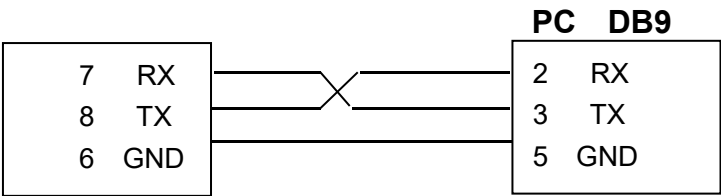


Figure A-1-2 Connections