VCL-E3OP-GE

DS3/T3 over IP / Packet / Ethernet

Version 2.3

Product Overview

CXR's 'VCL-E3OP-GE', DS3/T3 over IP / Ethernet equipment provides transmission of one, point-to-point, DS3/T3 link over an IP / Ethernet, MEF or MPLS Pseudo-wire networks.

The 'VCL-E3OP-GE', DS3/T3 over IP / Ethernet equipment is powered by a powerful PowerPC 400 MHz Processor which provides a highly reliable clock recovery mechanism for low jitter and wander control, even under variable network conditions.

The 'VCL-E3OP-GE', DS3/T3 over IP / Ethernet equipment provides 2 x GigE electrical ports along with 2 x Gigabit optical ports which allow the users to implement 1+1 Ethernet link redundancy (Rapid Spanning Tree Protocol and Ethernet Port Trunking) and QoS by implementing 802.1Q based VLAN, Differentiated Services (Diffserv / DSCP), Port based Priority and 802.1p packet priority classification protocols for network optimization.

Purpose of TDM over Packet technology

Telecom companies and enterprise users can save network and equipment cost and generate additional revenue by offering different types of (Gigabit Ethernet, T1 and T3/DS3) services over a single packet-switched infrastructure by the use of E3oP equipment. As the networks migrate to an IP based infrastructure, the DS3 over Ethernet equipment becomes a valuable tool for enabling DS3 services for inter-connecting legacy DS3 equipment over Gigabit Ethernet optical fiber links, or over wired / wireless Ethernet/IP networks.

How the TDM over Packet (DS3 over Ethernet) equipment works

The DS3 channel received from the customer side equipment on the DS3 interface of the DS3 over Ethernet equipment is converted by its DS3oP engine to Ethernet data packets (of a fixed size user configurable) and transported over the Ethernet network with UDP / IP, MEF or MPLS headers. At the receiving end the DS3 over Ethernet DS3oP equipment reconstructs the original data streams by removing the IP, MEF or MPLS headers and converts the Ethernet data packets back to DS3 frames using highly reliable and accurate clock recovery mechanism. The 'VCL-DS3oP', DS3 over IP/ Ethernet equipment uses standard SAToP, DS3 to packet and packet to DS3 conversion mechanism making it suitable for use over all types of Ethernet / IP or MPLS infrastructure.

Hardware Highlights

- 19-Inch rack mountable
- 1U form factor (44mm high)
- 1+1 Redundant Power Supplies, AC and DC, or AC plus DC
- Redundant power supply inputs
- Extended Temperature: -20^0 C to +60^0 C) Celsius
- Range: -4^0 F to +140^0 F) Fahrenheit
- EMI / EMC Complaint
- Real time battery backed clock with life in excess of 10 years

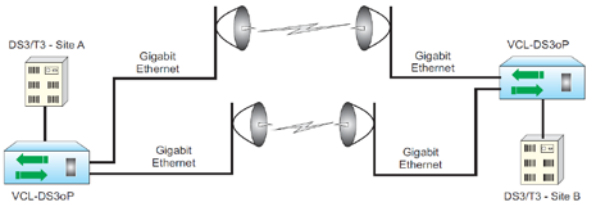
DS3 Clock recovery and synchronization techniques

- Adaptive Clock Recovery (ACLK)
- Recovered Clock (RCLK) / Loop-Timed Clock
- Asymmetrical (One-Clock and Two-Clock) Clock
- Synchronization to an External Clock (ECLK)
- Synchronization to an Internal Clock
- Automatic clock priority selection with fall back
- Plesiochronous Clocking.

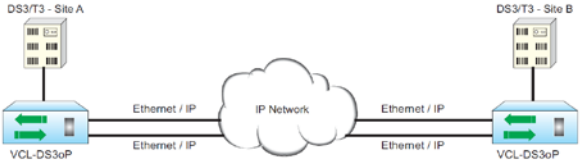
Application Diagram

LANs, WANs, MANs, IP Satellite and Wireless Ethernet

DS3 Link Redundancy - Using Port Trunking / Bonding



DS3 Link Redundancy - Using Spanning Tree Protocol



Key Features - DS3 and DS3oP Interface

- Each terminal supports one DS3 / T3 interface.
- Suitable for point-to-point applications.
- Internal, External, Adaptive and Recovered clock options for DS3 synchronization. Automatic clock priority selection with fall back.
- Supports DS3 Framed and Unframed formats.
- Supports SAToP transport mechanism.
- Supports network latency / packet delay variation / jitter buffer of up to 45ms.
- Supports IP, MPLS and MEF8 (Metro Ethernet) tagging.
- Jitter and Wander conforms to G.823 / G.824 and G.8261 and TDM specifications.
- Absolute and Differential times tamps.
- 75 Ohms BNC interface.
- DS3 Local and Remote (RLOOP) Loopback facility for testing and diagnostics.

Key Features - Ethernet / IP Network Interface

- Switching Capacity up to 6 Gbps, non-blocking
- 4 GigE Ports.
- Optical SFP based (1000Base-FX) and Electrical (10/100/1000Base-T) Ethernet port options.
  - 2 x 10/100/1000BaseT Copper Ports.
  - 2 x 1000BaseFX Optical Fiber Ports.
- Port Control Ingress Rate Limiting.
- 1+1 Ethernet link redundancy
  - Rapid Spanning Tree Protocol.
  - Ethernet Port Trunking
- Point-to-point applications
- User configurable MTU (E3oP payload) packet size up to 1800 Bytes.
- Switch supports jumbo frame sizes of up to 9000 Bytes.
- Supports 802.1Q based QoS, 802.1p based packet priority.
- Port Based Priority (Classifying Services)
- DSCP and 802.1Q / 802.1p based packet tagging and prioritization
- Flow Control in an Ethernet Packet Networks: (Regulating Traffic)
- Port / Customer based bandwidth allocation (Port Rate Limiting)
- MPLS, MEF and UDP tagging for Ethernet traffic.
- Separate IP Address for TDM traffic and equipment management
- VLAN tagging for TDM traffic and equipment access / management
- Single / Double 802.1 VLAN tagging (Q in Q VLAN Tagging) - User configurable.
- UDP-specific “Special” Ethernet type.
- In band VCCVARP.
- Broadcast DA.

Key Features explained

- **Port Based Priority (Classifying Services)** - Port based Priority feature allows the user to assign priority to the individual Ethernet ports, so that traffic can be regulated according to the port on which that service is connected. The user may also assign highest priority to TDM (T1/DS3/T3) traffic and Ethernet services on a lower priority.
- **VLAN Based Priority (Classifying Services)** - VLAN based Priority feature allows the user to assign priorities to different VLANs carrying various types of services / traffic according based on user categories and preferences. The user may assign highest priority to TDM (T1/DS3/T3) traffic and Ethernet services on a lower priority. User may also configure which TDM link should be given preference over the other TDM links when the uplink bandwidth falls below a particular threshold.
- **Flow Control in an Ethernet Packet Networks (Regulating Traffic)** - Flow Control feature allows the user to regulate Ethernet traffic flow to minimize packet loss due to data bursts.
- **Port / Customer based bandwidth allocation (Port Rate Limiting)** - Port based Ingress Ethernet Rate Limiting allows the user to assign the bandwidth as per port / service requirements, in addition to provisioning traffic by using 802.1Q and 802.1p VLANs and packet priority.

System Management, Monitoring and Alarm Interfaces

- NMS (Network Management System) to monitor multiple units from single Central Location.
- External Alarm - Dry contact relay alarms are also available at rear of the system to connect the system to an external alarm.
- Supports system temperature monitoring with High Temperature threshold and Low Temperature threshold alarms and SNMP Traps.
- Supports SNMP V2 Monitoring and Traps
- Self-test for checking system errors upon system bootup.
- Event Logging.
- Clock Performance Alarms.
- Network Performance Alarms.
- Network Performance Monitoring and Diagnostics.
- Online / remote upgrade of firmware.

System Access, Control and Management Options

- Telnet
- CLI Control Interface (HyperTerminal or VT100).
- SNMP V2 Traps (MIB File provided).
- Windows based GUI (Graphical User Interface) for easy configuration, management and access. Ability to monitor multiple units from a single NMS.
- Password Protection.

OAM: Operation and Management Ports

- RS232 Serial Port.
- USB COM Port.
- 10/100/1000BaseT Ethernet Management for In-band remote access.

Technical Specifications

DS3oP Specifications

Max number of logical Link	One point-to-point logical link
Max DS3 payload MTU Size	User configurable from 1 to 1800 Bytes
Supported Transport Mechanisms	IETF-PWE3 and SAToP
Supported PSN (Packet Switched Networks) type	UDP, IP, MPLS and MEF
QoS	802.1q, 802.1p packet priority

DS3 Interface

Number of Ports	One
Framing Formats	Framed, Unframed (User selectable)
Framing	B3ZS and G.832 framing modes (user selectable)
Line Coding	Meets ANSI T1.404 M13 or C-bit parity
Line Impedance	75 Ohms

Gigabit Ethernet Switch Interface

Number of Ports	4 Ports - 2 Gigabit optical ports and 2 GigE (electrical) ports. Complies with IEEE802.3, 802.1Q and 802.1P
Electrical	10/100/1000 Auto-negotiation / MDI-X (Auto-sensing), Full-Half Duplex, RJ45 Electrical Connector
Optical	1000Base-FX (Gigabit Ethernet), SFP
Protection	ESD protection
Maximum Frame Size	9000 Bytes (Jumbo Frames)
Switching Capacity	Upto 6 Gbps, Non-blocking

Gigabit Ethernet Optical Interface Specifications

Optical Interface Type	SFP
Compliance	- Compliant with 1000Base-LX - MSA Compliant - RoHS - EMI - ESD - DDM
Safety	Class 1 Laser Safety / IEC-60825 Compliant
Bit Rate	1.25 Gbps
Wavelength	1310 / 1550 nm
Distance	550m to 80Kms, as per order
Optical Connector	LC

Power Consumption

Power Consumption	< 18 Watts

Power Supply Options

- Dual Redundant (AC + DC)
- 1+1 AC power (100 to 240VAC, 50/60 Hz)
- 1+1 DC (-48V) power (40 to 72V DC)
- 1+1 DC (-24V) power (18 to 40V DC)
- AC or DC

Command Language

- Windows based GUI (Graphical User Interface).
- Command Line Interface (English text commands)

Management and Control Interfaces

- COM Port (RS232 Serial Port)
- USB Port
- 10/100/1000BaseT Ethernet Port (each multiplexer may be assigned an IP address and connected to a LAN / IP network for remote access and management through the 10/100/1000BaseT Ethernet Port for in-band configuration, management and access).
- Telnet
- SNMP V2 Monitoring
- Windows based GUI.

Environment

Temperature for operation	(-20^{0}C ~ +60^{0}C) Celsius (-4^{0}F ~ +140^0 F) Fahrenheit
Storage	(-40^{0}C ~ +70^{0}C) Celsius (-40^{0}F ~ +158^0 F) Fahrenheit
Humidity	5% to 95% (35^{0}C) Non-condensing

Regulatory Compliance

- Safety - IEC 60950 Safety - IEC 60950
- CE
- RoHS
- Complies to ANS/IEC standards
- Complies with Telecom Part 68, FCC Part 15 and CISPR 22 Class A
- EMC EN55022: 1998 + A1 and A2
- EMC EN55024,
- Operation ETS 300 019 Class 3.2
- Storage ETS 300 019 Class 1.2
- Transportation ETS 300 019 Class 2.3

Technical Specifications

AC Power Supply Specifications

Input AC Voltage	110 / 220 Volts AC
Range of input AC voltage	100 V to 240 V AC, 50Hz/60Hz.
AC Input Connector	IEC Connector

24V DC Power Supply Specifications

Power Supply	24V DC
Range of input	18V to 40V DC
Input voltage reversal protection	Provided
Under voltage protection	< 4.85V
Over voltage protection	> 5.15V
Efficiency at full load	> 90% @ 5V/8A (When input voltage 24V)
Ripple at full load	< 5mVrms
Spike at full load	< 50mV

48V DC Power Supply Specifications

Power supply	-48V DC
Range of input	-40V DC to -72V DC
Under voltage protection	< 4.85V
Over voltage protection	> 5.15V
Efficiency at full load	> 91% @ 5V/10A (When input voltage -48V)
Ripple at full load	< 5mVrms
Spike at full load	< 50mV

External Alarms

- Dry Contact Relay - 2 Form C
- Rated up to 72V DC, 1 Amp.

Chassis

- 1U High (44mm)
- 19-inch rack-mounting shelf
- Also available in Desktop / Table Top Version.

NMS (with Telnet) OAM port Specifications

Network Interface	RJ-45 10/100/1000BaseT (Auto sensing)
Compatibility	Ethernet Version 2.0 IEEE802.3
Protocols supported	ARP, UDP/IP, TCP/IP, Telnet, ICMP, SNMP
LEDs	10Base-T and 100Base-TX Activity, Full/half duplex
Management	SNMP, Serial login, Telnet login
EMI Compliance	- Radiated and conducted emissions complies with Class B limits of EN55022:1998 - Direct and Indirect ESD complies with EN55024: 1999 - RF Electromagnetic Field Immunity complies with EN55024:1998 - Electrical Fast Transient/Burst Immunity complies with EN55024:1998 - Power Frequency Magnetic Field Immunity complies with EN55024:1998 - RF Common Mode Conducted Susceptibility complies with EN55024:1998

Mechanical Specification

Height	44 mm (1U)
Depth	260 mm
Width	480 mm (19 inch rack mountable)
Weight	4 Kgs.

Ordering Information

S. No.	Part #	Product Descriptions	Remarks

1	VCL-DS3oP
	GE-2OE-2110
		VCL-DS3 over Ethernet Multiplexer (TDM over IP)
		19-inch 1U High Rack Mount version
		Supports:
		- 1 x DS3 [75Ω 2xBNC (F)]
		- 4 x Ethernet Ports (1000Mbps, Gigabit)
		  - 2 x Electrical Ethernet Ports [RJ45 (F)]
		  - 2 x Optical Ethernet Ports [SFP based / without SFPs]
		- High Stability Timing, Ultra Low Noise OCXO
		- OAM [SNMP, Telnet (RJ45 Port) and Serial Port (USB and DB-9 COM Port)]
		* Add Power Supply Option from below
			CORE UNIT without PSUs.

Power Supply Options

1	AC220	1 x 100-240V AC Power Supply Input	Any One Option.
2	DC048	1 x (-) 48V DC Power Supply Input	
3	ACDC	1 x 100-240V AC Power Supply Input 1 x (-) 48V DC Power Supply Input	
4	AC220R	2 x 100-240V AC Power Supply Input [Redundant]	
5	DC048R	2 x (-) 48V DC Power Supply Input [Redundant]	

Gigabit Ethernet SFP Options

1	VCL-EMOD 0206	1.25Gbps SFP Transceiver Duplex LC, 850nm, 550m, MMF	Maximum 2 SFPs per CORE UNIT.
2	VCL-EMOD 0205	1.25Gbps SFP Transceiver Duplex LC, 1310nm, 10Km, SMF	
3	VCL-EMOD 0231	1.25Gbps SFP Transceiver Duplex LC, 1310nm, 20Km, SMF	
4	VCL-EMOD 0255	1.25Gbps SFP Transceiver Duplex LC, 1310nm, 40Km, SMF	
5	VCL-EMOD 0155	1.25Gbps SFP Transceiver Duplex LC, 1550nm, 40Km, SMF	
6	VCL-EMOD 0256	1.25Gbps SFP Transceiver Duplex LC, 1550nm, 80Km, SMF	

Cables and Accessories Options

1	VCL-HRNS 1247	75 Ohms Connectorized Cable [BNCM-BNCM, 3m]	As per Site Requirement.
2	VCL-HRNS 1229	Optical Patch Cord Connectorized Cable [2LC-2LC, 3m, SM]	
3	VCL-HRNS 1238	Optical Patch Cord Connectorized Cable [2LC-2LC, 10m, SM]	
4	VCL-HRNS 1242	Optical Patch Cord Connectorized Cable [LC-FC, 10m, SM]	
5	VCL-HRNS 1243	Optical Patch Cord Connectorized Cable [2LC-2FC, 10m, SM]	
6	VCL-HRNS 1239	Optical Patch Cord Connectorized Cable [LC-SC, 10m, SM]	
7	VCL-HRNS 1258	Optical Patch Cord Connectorized Cable [2LC-2SC, 10m, SM]	
8	VCL-ECON 1172	Connector (Attenuator LC-LC (10 db.))	
9	VCL-ECON 1173	Connector (Attenuator LC-LC (20 db.))	
10	VCL-ECON 1186	Connector (Attenuator FC-FC (10 db.))	
11	VCL-ECON 1187	Connector (Attenuator FC-FC (20 db.))	
12	VCL-ECON 1197	Connector (Attenuator SC-SC (10 db.))	
13	VCL-ECON 1198	Connector (Attenuator SC-SC (20 db.))	

Note: 1. SPFs to be added if 1000BaseSX/LX (Optical) Ethernet Ports are required.
2. Redundant power supply to be added, if required.

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Revision 2.3 - September 10, 2018