

### Product Overview

Valiant's VCL-1400, STM-1/4/16/64 SDH Multiplexer with MPLS-TP is a compact POTP platform which is targeted for deployment in the edge and access part of a transport network. It can be configured both as a TDM MSPP as well as a Packet Switch. It supports both TDM and Ethernet as Line Interfaces. It offers full redundancy and comes with an expansion chassis for deployment in high drop locations and can be used in point-to-point, linear, ring, T, and mesh networks.

### Tributary Interfaces

- E1/DS1, E3/DS3
- FE/GigE (L1 & L2)
- STM-1/STM-4/STM-16

### Aggregate Interfaces

- STM-1, STM-4, STM-16, STM-64
- 1GigE (SFP based optical, 10/100/1000Base-T Electrical), 10GigE

### Highlights

- POTP Evolution: SDH, OTN & Ethernet Based line Interfaces
- High Capacity Micro POTP: 1U to 4U
- Packet Switching: High Capacity 60G Packet Fabric
- MPLS-TP : Traffic Engineered Pseudowires
- 50ms Protection on packet: ELPS, ERPS
- SFP based SDH and GigE ports, suitable for MM and SM fibre.
- Provides Fully diagnostic feature for each and every tributary including SFP.
- Packet Synchronization: SyncE, 1588v2
- Circuit Emulation: TDM over Packet
- Recent and historic performance monitoring for each object (SDH, PDH, AU, TU, Ethernet, VCG and SFP Transceiver
- TDM Switching: High capacity 60G LO Fabric for efficient transport of SDH & PDH
- Supports VC12, VC-3 and VC-4 granularity
- User programmable ALS option
- Completion of the OS- layers, RS, MS and VC-4
- Removing and inserting information communications SOH
- Synchronization system based on SCM (Ethernet Synchronization Message Channel)
- Front panel LED indication and connection for all tributaries.



VCL-1400 - 3 Slot



VCL-1400 - 7 Slot

- Provides high-density tributary card (63E1, 6E3/DS3, 8STM-1). Each interface is individually configurable.
- Supports Synchronization Status Messaging (SSM) as per ITU-T G.813 standards.

### Ideal Environment

VCL-1400 can be used in the edge and the access part of the optical networks. It can be deployed as BTS or NodeB transport element in mobile networks and to build access and aggregation rings upto 10Gbps capacity.

VCL-1400 3-slot chassis can be deployed for enterprise services as a CPE or an access box. As a CPE it can provide GigE interfaces to customers, and offer L2 VPNs with QoS.

It can be used to extend L3 VPN services from a service router at central location to customer premises. VCL-1400 can be used in Triple play as a transport box, backhauling all the traffic from a DSLAM or CMTS towards the core. With support for GigE client ports and multicast, it provides sufficient bandwidth to the DSLAM and for Video distribution.

### Key Benefits

- **POTP Evolution:** VCL-1400 can seamlessly transition from 100% TDM to 100% Packet Box. It can be deployed as a TDM MSPP in SDH networks and can transport data traffic using GFP and LCAS.
- On the other hand it can be configured as a Packet Switch and deployed in Ethernet based networks. It can offer TDM services on these networks through circuit emulation.
- VCL-1400 can be deployed at gateway locations between TDM & Packet Networks and can help a network operators transition their services slowly from TDM based to packet based.

### Flexibility:

Every operator and its network has its own needs and requirements. VCL-1400 with its modular architecture provides one platform which can fit into a variety of needs. This also enables a pay as you grow model. Base chassis variants of 1U (3 slot) and 2U (7 slot) along with an expansion chassis are available. A variety of line cards for both TDM and Packet help the operator arrive at the most optimal configuration for a particular requirement.

### MPLS-TP:

Label Switched Paths with MPLS-TP is becoming an important requirement for scaling the network for millions of subscribers and thousands of Services today. VCL-1400 provides MPLS-TP based pseudowires for traffic engineered traffic flows on trunks, which leads to better control over the packet traffic resulting in a more optimized network. This is key to lowering capex in today's cost competitive environments. MPLS-TP is also an enabler for path level protection and restoration on the network.

VCL-1400 also supports end-to-end sub-50ms path level protection by supporting ITU-T G.8031 standard on MPLS-TP tunnels.

### Advanced Ethernet Features:

VCL-1400 has best in class packet switching capabilities, in line with today's requirements. Ingress rate limiting ensures that every packet entering the network is within the SLA bounds agreed with the customer. This prevents one customer from congesting/choking the packet network. Each packet is classified, so that the appropriate network policies (like prioritization and scheduling) can be applied to each kind of traffic. Options for 8 CoS queues and scheduling algorithms ensure that there are sufficient options available to the network administrator to manage the data traffic efficiently. ERPS (Ethernet Ring Protection Switching) standardized by G.8032 provides 50ms protected packet rings for greater resiliency. Multiple ringlets can be configured, and multiple ring topologies of packet networks are supported.

### Packet Synchronization:

VCL-1400 also supports SyncE and 1588v2 for distribution of Synchronization information over pure packet networks. This is critical for deployment in mobile networks especially for LTE, where voice is packetized but synchronization is critical for cell handoff and for ensuring jitter-free voice calls.

### Circuit Emulation:

As networks move from TDM towards packet, a few TDM circuits are expected to be required for a long time due to legacy reasons. It's not cost effective to maintain an entire TDM network for this small amount of traffic. VCL-1400 supports SAToP and CESoPSN for carrying this TDM traffic over a pure packet infrastructure.

### 3 Slot Chassis

The 3 slot chassis supports 3 fabric + traffic slots. One or two slots can be used for the TDM crossconnect. A few SDH aggregate ports are available on the cross connect card itself. More STM1/4 tribs or E1, E3/DS3 or Ethernet cards can be jacked into the 3<sup>rd</sup> slot. In case redundancy is not required, the second slot is also available for tributary cards. If more interface density is required, the expansion chassis can be plugged in, which will give 5 additional slots. In addition to the 3 traffic slots, there are two dedicated slots for redundant power supplies.

For Pure Packet operation, the VCL-1400 can be populated with the centralized Packet Fabric. This card supports few 10GigE and GigE Interfaces. For dropping more Ethernet interfaces or for TDM (Circuit Emulation) the appropriate line card can be populated in the 3<sup>rd</sup> slot.

The 3 slot chassis is suitable for deployment as a CPE box or as an ADM element for building last mile aggregation rings. The GigE client interfaces can be connected to 3G/LTE base stations, DSLAMs or Enterprise Routers to give high speed data services. The integration of OAM functionality into the FTU helps save a slot and enables supporting more traffic carrying interfaces on the common cards.

### 7 Slot Chassis

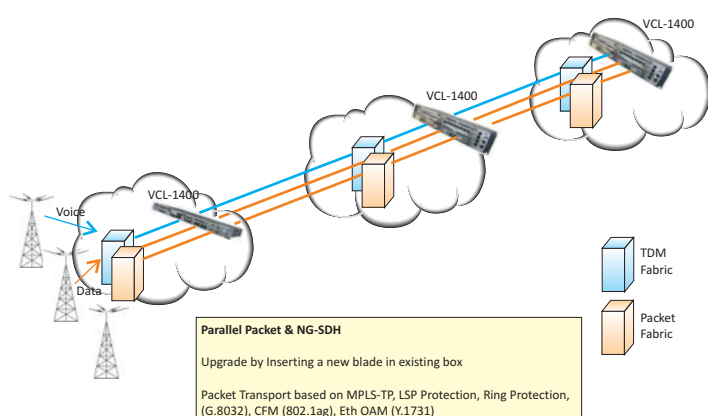
As the name implies, the 7 slot chassis offers 7 traffic slots in addition to the two redundant power supplies. Two of the slots can be used for the integrated fabric + aggregates + tributary interfaces, while the other 5 slots are used for tributary drops. Plugging in the expansion chassis gives another 5 slots, thus giving a total of 10 slots apart from the XC + Aggregate slots. The 7 slot chassis can be used to aggregate second level aggregation rings.

### Expansion Chassis

The expansion chassis is a pluggable 3U chassis that can be jacked on top of a VCL-1400 3 slot or a VCL-1400 7 slot chassis. It provides 5 tributary slots and 4 IO panels for PDH protection. The expansion chassis supports slots for putting redundant power supplies. If the number of cards is less, or lighter power consumption cards are populated, the expansion chassis can draw power from the main chassis itself.

The VCL-1400 with its multiple base chassis variants, expansion chassis, a choice of cross connect and packet fabrics and the sophisticated packet features meets all the expectations for a next generation POTP platform. It provides a build as you grow model, where the operator can start with a compact 1U 3 slot chassis, and expand using either the expansion chassis or replacing the node by a 7 slot Chassis. In migrating from a 3 slot chassis to 7 slot chassis, only the chassis needs to be changed and all the cards including the commons are reusable. VCL-1400 is truly a best in class micro-POTP platform.

### Application Diagram



### EOW (Engineering Order Wire)

- Supports 64 kbps voice channel / EOW between two network elements over E1 or E2 bytes of the SDH overhead
- EOW configurable as a shared line
- Using the band DTMF signals to call another EOW-Terminal
- Programmable integrated DTMF decoder for subscriber telephone number (1...3 digits) and 2 digit as segment number
- EOW based on Voice over IP (VoIP)
- EOW traffic must be routed through the channel management.

### VCL-EMS

VCL-EMS collects and represents management data from geographically dispersed network elements on to a centralized database (console) in a centralized Network Operations Center (NOC). The GUI part of VCL-EMS forms a single NOC. The framework depicted in VCL-EMS design is based on the **Open Systems Interconnect (OSI)**, **“FCAPS”** model of management functional areas (MFAs). EMS features are mainly based on Telecommunications Management Network (TMN) FCAPS functionality.

### Power Supply

- -48 V DC nominal, -36 V to 60 V
- Power consumption < 250W

### TMN (FCAPS) functionality

- **F-Fault Management:** This functionality has the ability to identify, locate and repair problems.
- **C-Configuration Management:** This functionality provides the service and resource provisioning.
- **A-Accounting Management:** This functionality enables the collection of data to support billing and asset management.
- **P-Performance Management:** This functionality enables gathering of statistics for planning, troubleshooting and providing customer reports.
- **S-Security Management:** This functionality enables the control of access to network resources to maintain reliability.

Alarms are raised to indicate faults in the node or the network. Alarms like Loss of Signal, Loss of Frame, Remote Defect Indication, Trace Identifier Mismatch, etc. are classified based on their severity, like:

- Critical
- Major
- Minor
- Warning

The security feature in VCL- EMS is designed on a user based security module. Different users are assigned different permissions (read, write, delete) on the tasks that they are authorized to perform. VCL-EMS defines certain terms such as actions, action table.

### Physical Dimensions

- **3 slot 19” rack mount chassis :**  
(H x W x D): 44 x 444 x 235mm
- **7 slot 19” rack mount chassis :**  
(H x W x D): 88 x 444 x 235 mm
- **Expansion 19” rack mount chassis:**  
(H x W x D): 132 x 444 x 235 mm

## Technical Specifications

### Switching Fabric

- TDM Fabric : 2.5G, 5G, 10G, 20G and 60G
- Fully Lower Order
- Packet Fabric: 60G

### Aggregate Interfaces

- STM4, STM16, STM64
- 1GigE, (SFP based optical / 10 / 100 / 1000Base-T Electrical), 10GigE

### Tributary Interfaces

- E1/DS1, E3/DS3
- FE/GigE (L1 & L2)
- STM-1/STM-4/STM-16

### Ethernet Switching

- VLAN Switching ( IEEE 802.1Q)
- Provider Bridges ( 802.1ad)
- Port Mirroring
- Ingress Rate Limiting at 64kbps granularity
- Programmable Committed and Peak Rates
- Programmable Committed and Peak Burst sizes
- Egress rate shaping on all ports
- Optical Ethernet connection: 1000Base-LX/SX and 100Base-FX (Optional)
- WAN Protocols: PPP, MLPPP
- Multi Protocol Label Switching - Transport Profile (MPLS-TP), Spanning Tree Protocol (STP) and Link Layer Discovery Protocol (LLDP)
- 8 classes of service as per IEEE 802.1p
- 2 Rate, 3 color marking
- Circuit Emulation (SATOP & CESoPSN)

### Connection Oriented Ethernet

- MPLS-TP

### Network Protection

- Ethernet Linear Protection Scheme as per ITU-T G.8031
- Ethernet Ring Protection Scheme as per ITU-T G.8032
- LCAS protection for Ethernet
- SNCP, 1+1 MSP for TDM Interfaces

### Other Features

- E1/DS1 Tributary Retiming
- In-band channel control

## Equipment Protection

- Power Supply Redundancy
- XC (cross-connect) and Aggregate Card Redundancy
- E1 tributary card redundancy

### Ethernet over SDH Features

- VCAT as per ITU-T G.707
- GFP F mapping according to ITU-T G.7041
- LCAS as per ITU-T G.7042
- 64ms differential delay
- Graceful degradation in Signal Fail/Signal Degrade

### Operations & Troubleshooting

- Performance Monitoring as per G.826 and G.784
- Remote Software Download
- User configurable for Local / Remote loop
- CFM as per 802.1ag
- Performance statistics for Ethernet & VCGs

### Management

- Valiant 5500 Network Management System
- Northbound SNMPv2 interface
- End-to-end management across Valiant POTP family
- Full Remote Management Capability over TCP/IP network
- Web based Local / Remote management
- V.24/V.28 modem interface (for remote Management)

### Synchronization

- SyncE, 1588 v2
- STMn, E1
- 2Mbps BITS Clock
- 2MHz TTL Clock
- Holdover, Internal

### Environmental

- **Operation**
  - Operating Temperature: 0°C to 50°C.
  - Relative Humidity: 10% to 90%, Non-condensing.
  - ETSI/EN 300386
  - EN 55022 Class A
  - FCC Part 15 Class A
- **Storage and transport**
  - Temperature range: - 25°C to 70°C
  - Humidity: max. 95% (non-condensing)

Technical specifications are subjects to changes without notice.

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