Valiant's VCL-MX Version 6, Voice & Data Multiplexer is the time-tested work-horse of Valiant Communications which continues to be used extensively by Power Utilities, Railways, Metro Networks as well as in the Oil and Gas industry to provide all types of communication interfaces and SCADA services. The VCL-MX Version 6 Multiplexer has an expanded interface option list that provides all types of legacy Voice, Data and C37.94 Teleprotection interfaces with a frequency synchronization precision which exceeds an ITU-T G.813 compliant SSU. The Packet-Optical Network Interface option allows a smooth migration from the traditional TDM based network to a Packet-Optical based network, when required, without sacrificing the comfort or the investment in the existing legacy voice or data interfaces. The Packet-Optical Transport Network option provides a cross-connect capacity of 9Gbps and is capable of providing transmission bandwidth of almost twice the capacity of an STM-16 (SDH) link.

The Packet-Optical Network Interface of the VCL-MX Version 6 Multiplexer provides its user the option of 1+1 link protection for transmission link redundancy. The "Packet-Optical Network Interface" of the VCL-MX Version 6, Voice & Data Multiplexer uses advanced IEEE-1588v2 PTP synchronization technology to provide time-of-day and frequency synchronization with +/-0.5 micro-second / +/-0.1 Hz accuracy - when synchronized to GPS based PTP Grandmaster. This makes it extremely suitable for integrating into all types of "Intelligent" communication networks, including the Smart Grid.

**Features and Highlights**

- **Voice & Data Multiplexer** with all types of Voice, Data, C37.94 Teleprotection and Layer 2 Ethernet Switch interface options
- Designed for seamless integration of the "Legacy" and the "Smart Grid".
- Provides a bridge and an easy migration path between the "legacy" and the "Intelligent" communication networks.
- Uses E1 over Packet-Optical technology to transport legacy Voice, Data, IRIG-B Time Code and Teleprotection Channels over Packet-Optical links.
- < 2ms latency for point-to-point E1 and Teleprotection channels.
- Delivers error free transmission of E1, 2-wire and 4-wire Voice, Synchronous and Asynchronous Data, C37.94 Teleprotection and IRIG-B time over Ethernet / IP / MPLS-TP networks with Stratum 2 level (with GPS synchronization), or with Stratum 3E level (without GPS synchronization) accuracy.
- Integrated IEEE C37.94 Optical Teleprotection Interfaces.
- Integrated IEC-60384-1 compliant, 4 x Command Teleprotection Interfaces with user selectable 110V DC / 220V DC Command and Switching Voltage options.
- Integrated, 4 x IRIG-B interfaces to provide time-of-day synchronization to IEDs and RTUs from a single central GPS source with 0.5 micro-second (500 nanosecond) accuracy.
- Uses IEEE-1588v2 PTP synchronization technology for Time-Of-Day and Frequency synchronization.
- 2.048 MBits and Phase-Locked 2.048 MHz Frequency Outputs for accurate synchronization clock distribution over the entire network.
- Multiple user side Fast Ethernet, Power over Ethernet (PoE) and Gigabit Ethernet Port options for audio (VoIP) and video conferencing applications.
- 1+1 Network Link Protection / Network Port Redundancy on both 'East' and 'West' side.
- Designed for use in Packet-Optical, MPLS and Wireless transmission networks. The transmission mediums can be either / both of the following:
  - Optical Fiber (1000Base SX/LX Optical Fiber Links)
  - Wireless (Ethernet Radio Links).

### Network and User Interfaces

**Uplink Network Interfaces**
- 4x100Base SX / LX

**User Side Interfaces**
- 8x10/100BaseT Ethernet (includes 4 x 10/100BaseT PoE - Power over Ethernet) Ports
- 8 x 100BaseFX Optical Ethernet Ports (SFP)
- 8x E1 Interfaces
- 4x IRIG-B outputs

**Voice Interface**
- FXO, FXS, E&M (2-Wire and 4-Wire), FXS-FXS.
- Hot-line, Ring Generator (75V RMS).

**Data Interface**
- Asynchronous: RS232 / RS485 / V.24 / RS422 / V.28
- Synchronous: G.703 / V.35 / V.36 / X.21 / RS530 / V.24 / V.11 / V.28
- Other: Relay I/O (Dry Contact).

**Teleprotection**
- C37.94 Optical Interfaces for direct connection to Optical C37.94 Distance Protection Relays
- 4 Command, IEC-60384-1 compliant, Integrated Teleprotection Card 4 x User selectable - 110V DC / 220V DC Teleprotection Commands

**Power Supply Options**
- Dual Redundant Power Supply Options
- 1+1 DC (-48V) power (40 to 72V DC).
- 1+1 DC 110-125V power (90 to 135V DC) - Using External DC-DC Converter.
- 1+1 AC power (100 to 240VAC, 50/60 Hz) - Using External AC-DC Converter.
- EMI/EMC compliant.
Management Features

- RS232 serial console port, USB console port
- In-band Ethernet (Telnet, SSH and TFTP) management
- Automatic updating of RTC (Real Time Clock) time - RTC shall update itself at user defined intervals from a GPS PTP Grandmaster or from an NTP Server
- Supports command line interface with predictive command completion.
- User friendly GUI (Graphical User Interface)
- Supports IEEE802.1x security, Password Protection.
- Maintains the history for all successful log-in and failed access attempts for security audit purposes
- SNMP V2 Traps.

Clock Synchronization

- IEEE-1588 Clock synchronization to an external GPS based PTP Grandmaster, or within the network in an automatic PTP Master / Slave mode
- 1 PPS from a qualified GPS source
- User selectable PTP IEEE-1588v2, Internal Clock, Adaptive, Loop-Timed and External 2.048 MBits Clock synchronization options
- User defined clock priority options.

External Alarms

- Dry Contact Relay.

Application Diagrams

Voice & Data over Packet Optical Transmission Links

- Uses PTP IEEE-1588v2 Technology for Synchronization
- < 4ms. Latency on TDM Circuits

Clock Synchronization

- Interfaces and Services available from each unit:
  - 8 x E1 / T1 Interfaces
  - Teleprotection IEEE C37.94
  - FXO, FXS, Hotline
  - E&M (2W/4W)
  - V.11, X.21, V.35, V.36, EIA530
  - RS232/RS422/RS485/V.24/V.28
  - 1 PPS from a qualified GPS source
  - User selectable PTP IEEE-1588v2, Internal Clock, Adaptive, Loop-Timed and External 2.048 MBits Clock synchronization options
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In a 1+1 Self-Healing Packet-Optical Fiber Ring

Over a “Hybrid” Wireless and Packet-Optical Network