VALIANT COMMUNICATIONS

VCL-PDC

Phasor Data Concentrator

Introduction:

VCL-PDC (Phasor Data Concentrator) is a high-performance platform for managing Synchrophasor data and processing streaming data in real-time. The VCL-PDC receives and time-synchronizes phasor data from multiple Phasor Measurement Units (PMUs) to produce real-time, time-stamped output data stream. A PDC can simultaneously store and send PMU data to multiple locations. By using multiple PDCs, customer can create multiple layers of concentration, within a Synchrophasor data system.

Various utilities are included to streamline the initial setup, configuration and testing process. The VCL-PDC is a very versatile and easy-to-use phasor data concentrator.

The VCL-PDC is used to validate, test and trouble-shoot connections and data streams from phasor measurement devices, as well as graphically visualize their Synchrophasor data in real-time. VCL-PDC provides utilities that can be used to verify the data stream from any known phasor measurement device is being received.

The VCL-PDC provides a “Historian Utility” to efficiently integrate and archive process control data, e.g., SCADA, Synchrophasor, digital fault recorder or any other time-series data used to support process operations. This Historian Utility is optimized to store and retrieve large volumes of time-series data quickly and efficiently, including high-resolution sub-second information that is measured very rapidly, e.g., many thousands of times per second.

The VCL-PDC, in addition to fulfilling the role of a data concentrator, is a flexible platform for processing high-speed time series data that can adapt with changing technology to provide a future-proof phasor data architecture. The VCL-PDC can be used as a managed phasor data bus to effectively distribute data (both real-time and historical / archived) for various downstream customized applications which also include event analysis and simulation, power quality monitoring and load management applications.

Features & Highlights

- Ruggedized, IEEE 61850-3 Compliant Hardware
- Fanless, High Reliability System
- Quad Core Pentium Processor with 8GB RAM
- 2 x Gigabit Ethernet Interfaces
- 1 x Gigabit Optical Ethernet Interface
- 1 x IRIG-B Input Port
- 1TB SSD (1024 GB) Internal Hard Disk for OS and Data Storage
- Data Storage Capacity of PMU data at 50 (M Class) Frames / Sec - 2,646 days / 7.25 years
- Data Storage Capacity of PMU data at 25 (M Class) Frames / Sec – 5,291 days / 14.49 years
- 1 x Mouse Port
- 1 x Keyboard Port
- Front access
- Configuration database MS SQL Server
- 32-Bit floating point to 16-Bit fixed integer format conversion
- 16-Bit fixed integer to 32-Bit floating point format conversion
- Automatic Data recovery with GEP (Gateway Exchange Protocol) support

Note: Storing data from multiple data streams from a PMU / multiple data streams from multiple PMUs shall correspondingly reduce the number of days for which the data shall be archived.

Inputs:

VCL-PDC supports the following protocols:

- IEEE C37.118-2005
- IEE C37.118.2-2011
- IEE C37.118 Draft 6
- IEC 61850-90-5
- IEEE 1344
- BPA PDC stream
- UTK F-Net
- SEL Fast Message
- Macrodyne
- Streaming Telemetry Transport Protocol
- Gateway Exchange Protocol (GEP)
- Modbus Poller
- DNP3 (Master)
- Wave Form Input Adaptor
- Virtual Device.

Archived Output Formats:

VCL-PDC can be used to retrieve data from its archive / storage for event analysis and simulation in the following outputs:

- CSV
- COMTRADE ASCII
- COMTRADE Binary

Monitoring

- Performance statistics are logged every 10 seconds and include latency, data quality, and time code errors as well as stream statistics for input and output streams.

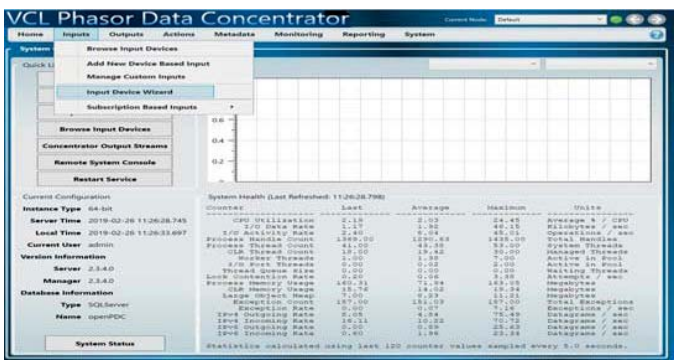
Data Format and Coordinate Conversion

- Multiple outputs can be fully configured individually.

Scalability

- Distributed multi-node architecture supported for customers with need for high availability and throughput.
- Role-based security for configuration management with configuration change logging for CIP compliance.
- Administrator
- Editor
- Viewer

VCL-PDC, Phasor Data Concentrator - GUI (Graphical User Interface)



PDC Stream Storage using Historian (Version 1 and Version 2)

The Historian 1 is a back-office system designed to efficiently integrate and archive process control data, e.g., SCADA, Synchrophasor, digital fault recorder or any other time-series data used to support process operations.

The Historian 1 is optimized to store and retrieve large volumes of time-series data quickly and efficiently, including high-resolution sub-second information that is measured very rapidly, e.g., many thousands of times per second.

The Historian 2 is an advanced data archival utility and is available as a separate application. The Historian 2 utility is built using the GSF SNAPdb Engine - a key/value pair archiving technology developed to significantly improve the ability to archive extremely large volumes of real-time streaming data and directly serve the data to consuming applications and systems. Through use of the SNAPdb Engine, the Historian inherits very fast performance with very low lag-time for data insertion. The system comes with a high-speed API that interacts with an in-memory cache for very high speed extraction of near real-time data. The archive files produced by the Historian are ACID Complaint which create a very durable and consistent file structure that is resistant to data corruption. The Historian service also hosts the GSF Time-Series Library (TSL), creating an ideal platform for integrating streaming time-series data processing in real-time.

The Historian 2.0 has been optimized for:

- Assurance of archived data integrity / continuity
- Broad data source connectivity
- High performance data capture & retrieval
- Efficient, high-volume data storage
- High availability

Utilities:

Three utilities are installed alongside Historian.

- **Data Migration Utility -** Converts Historian 1.0 Archives to Historian 2.0 Format
- **Data Trending Tool -** Queries Selected Historical Data for Visual Trending Using a Provided Date/Time Range.
- **Data Extraction Utility -** Queries Selected Historian Data for Export to a CSV, ASCII or COMTRADE formats using a "Provided Date/Time Range" for easy data analysis.

Data Storage Calculation for 1 PMU Unit with 1TB Data Storage

Data usage of PMU on 50 Frames / Sec with M Class (Measurement Class)	
Data Rate @ 50Fps	33.6kbps 33600 bps
Data storage used in a day	2,903,040,000 bits
Available Data Storage (Disk) Space	960 GB
Days of storage	2,646

Data usage of PMU on 25 Frames / Sec with M Class (Measurement Class)	
Data Speed @ 25Fps	16.8 kbps 16800 bps
Data storage used in a day	1,451,520,000 bits
Available Data Storage (Disk) Space	960 GB
Days of storage	5,291

Note: All calculations are based upon the standard IEEE C.37.118-2011, M Class frame of 84 Bytes.

PMU Connection Tester Utility:

The PMU Connection Tester Utility is included with the VCL-PDC. This Utility is a Windows GUI application used to validate, test and trouble-shoot connections and data streams from phasor measurement devices as well as graphically visualize their Synchrophasor data in real-time. The PMU Connection Tester verifies that the data stream from any known phasor measurement device is being received. Device types that can be tested through the PMU Connection Tester application may include:

- Phasor Measurement Unit (PMU)
- Phasor Data Concentrator (PDC)
- Digital Fault Recorder (DFR)
- Power Quality Meter (PQ)

Operating System and Services

The VCL-PDC will run on a 64-bit Windows 10, operating system.

Data Quality Reporting Services

Monitoring the quality of the data from Synchrophasor measurement devices is a critical function for operators of large Synchrophasor data systems.

The default configuration for the VCL-PDC is to log hundreds of statistics every 10 minutes.
These statistics include metrics on the VCL-PDC itself such as CPU utilization, memory use, and I/O volume as well as metrics on contributing devices such as device errors, time errors and measurements received.

This daily report includes:

- Configurable levels to describe device performance
- Yesterday's performance compared to the last 4 calendar days
- A high-level summary of device availability for the last 365 days
- A detailed list of specific PMU performance for the day of the report.

VCL-PDC has the ability to automatically produce the daily report shown above to get a quick summary of the status of devices connected to the VCL-PDC. Implemented as a generic class in the Grid Solutions Framework this new capability is extensible for routine reporting on other performance metrics within the performance historian.

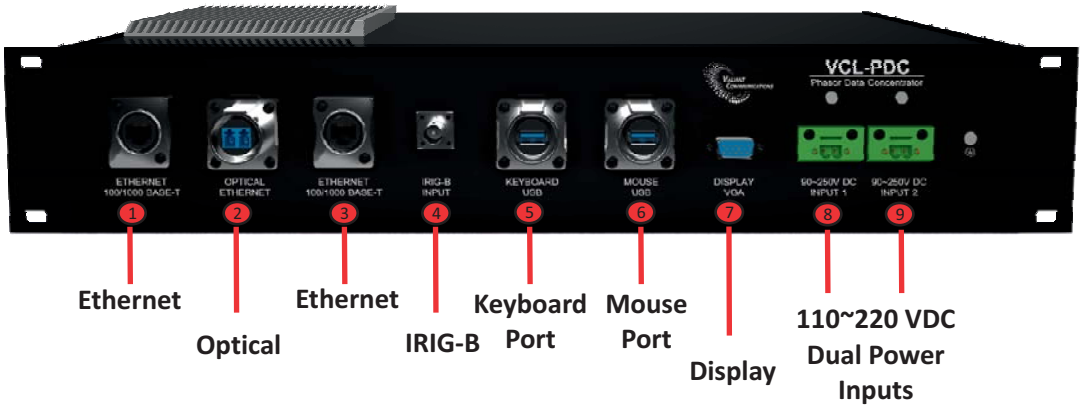
Automatic Data recovery with GEP (Gateway Exchange Protocol) support

As shown above configuration options in the VCL-PDC Manger for this report include:

- Turning on automated daily reporting
- Selecting the location to save the report
- Running ah-hoc reports for any day.

Through the configuration setup file, the break points for "fair" and "poor" can be set. Default values are: 99% and above of expected measurements received places a device in the "Good" level; 90% and below of expected values results in a "Poor" level device.

Connections:



Technical Specifications

Specifications

Form Factor	19 inch, 2U High Rack Mount
Dimension (DxWxH)	297mm x 484mm x 90mm
Drive Bays	Internal 2.5" :1
PSU Form Factor	2 Pin Terminal Block (Redundant)
Indicators	2 x Power Input
Front Control	1 x Mouse Port, 1 x Keyboard Port, 2 x Gigabit Ethernet Port, 1 x IRG-B Port, 15 Pin VGA Port, 2 x Power Input
MTBF (hours)	101292
Net Weight	5.0 kg
Gross weight	10.0 kg

Environmental

Operating Temperature	32°F ~ 149°F (0°C ~ 65°C)
Storage Temperature	-4°F ~ 167°F (-20°C ~ 75°C)
Operating Humidity	10%~80% relative humidity, non-condensing
Storage Humidity	10%~80% @40°C; non-condensing

***Note:** No stock available. Delivery time for this product is minimum 9 months.*

EMI, EMC, Surge Withstand and other Compliances

EN 50081-2	EN 50082-2	IEC 60068-2-29
IEC 61000-4-6 (Conducted Immunity)	IEC 60068-2-6	IEC 60068-2-2
IEC 60068-2-78	IEC 60068-2-1	IEC 60068-2-14
CISPR 32 / EN55032 Class A (Conducted Emission and Radiated Emission)		
IS 9000 (Part II Sec. 1-4, Part III Sec. 1-5, Part IV, Part 14 Sec. 1-3)		
IEC 60870-2-1	IEC 61000-4-5	
IEC 61000-4-3 (Radiated Immunity)	IEC 61000-4-8	
IEC 61000-4-2	IEC 61000-4-11	Telcordia
IEC 61000-4-4	GR-1089 Surge and Power Contact	

Ordering Information

VCL-PDC	VCL-PDC, Phasor Data Concentrator 19" Rack Mount Version Support: - IRIG-B Port - Management: Telnet (RJ45) (F) Port) - Graphical User Interface (GUI) - Installation Kit: System Core Cables, Mounting Hardware, - Documentation, User Manual - Add *Power Supply options

*Power Supply Options (1+1 Redundant Option Available)

DC024	1 x 24V (9~32) DC Power Supply Input
DC048	1 x 48V (18~60) DC Power Supply Input
DC110	1 x 110V (80~150) DC Power Supply Input
DC220	1 x 220V (180~290) DC Power Supply Input
AC220	1 x 110VAC / 240VAC (90~260), 50/60Hz AC Power Supply Input

Revision – 2.1, August 10, 2020

U.K.
Valiant Communications (UK) Ltd
Central House Rear Office,
124 High Street, Hampton Hill,
Middlesex TW12 1NS, United Kingdom
E-mail: gb@valiantcom.com

U.S.A.
Valcomm Technologies Inc.
4000 Ponce de Leon Blvd.,
Suite 470, Coral Gables,
FL 33146, U.S.A.
E-mail: us@valiantcom.com

INDIA
Valiant Communications Limited
71/1, Shivaji Marg,
New Delhi - 110015,
India
E-mail: mail@valiantcom.com