Smart solutions for smart networks

Version 3.3

VCL-DataDiode

Introduction

In today's digital business landscape, the risk of cyber-attacks has risen sharply. To protect organizational data and infrastructure, various network security technologies have emerged. Among these modern solutions, the data diode stands out as one of the most effective.

VCL-Data Diode is a hardware device for unidirectional network communication, enabling secure, one-way data transfer between isolated networks. It ensures data flows in one direction only, providing strong protection against data breaches, data thefts and cyber-attacks.

VCL Data Diode comprises of two elements.

a) VCL-5055, Network Side (ORANGE) Element.

b) VCL-5056, Protected Side (GREEN) Element.

The Network Side (ORANGE) Element shall connect to the Protected Side (GREEN) Element through a single, one-way, transmit only optical fiber which shall only allow the ONE-WAY flow of data from the Network Side (ORANGE) Element to the Protected Side (GREEN) Element, thereby creating a ONE-WAY data path.

Such a design ensures physical and electrical separation between source and destination networks. This architecture eliminates external entry points, blocking intruders and malicious elements from accessing the data secured by the VCL Data Diode. By securing data flow with the VCL Data Diode, the protected data is secure from malware transmission, unauthorized access, and harmful changes to an organization's data.

CXR's Data Diode finds it uses in applications and networks requiring highly secured protection of sensitive information, such as military, financial institutions, industrial design centres, utilities and critical infrastructure systems.

CXR's Data Diode allows critical infrastructure organizations to transmit and store real-time data securely. This technology protects valuable information and networks from data theft, tampering, destruction, and human error, preventing significant potential losses.

The VCL Data Diode allows the data to flow in only one direction. This ensures one-way information flow from secure areas to less secure systems (or vice versa), without reverse access. VCL data diodes have two sections, that are physically separated: the "send" or the ORANGE section, which can only send data, and the "receive" or the GREEN section, can only receive data. This configuration guarantees one-way data flow and prevents reverse transmission.

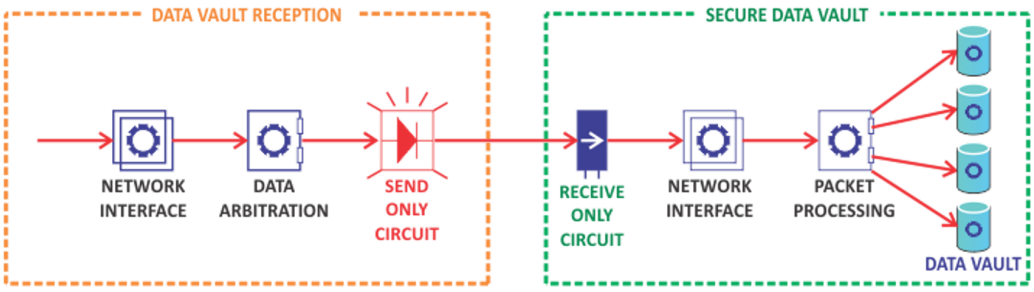
The VCL Data Diode creates a one-way data flow, establishing a physical barrier or "air gap" between two networks. This prevents data leakage, blocks malware threats, and protects the secured network from external threats. The one-way path also becomes a barrier between the sending and receiving domains, ensuring a unidirectional connection.

VCL Data Diode offers a unique protocol break or barrier feature, which terminates the original data transfer protocol, transmits the data payload via a different protocol, and then re-establishes the original protocol at the destination. This process conceals critical source network information, such as IP and MAC addresses, preventing any bad actors and external threats from accessing sensitive information. Additionally, the protocol break / barrier feature blocks the transmission of malicious data hidden in packet headers.

CXR Networks

VCL Data Diode can handle multiple inputs, such as servers or devices simultaneously without bottlenecks and are suitable for high availability architectures. While a unidirectional gateway can handle only one protocol or data type per connection, being based on technology designed for two-way communication, the VCL Data Diode can provide a protocol independent, one-way data transmission with un-paralleled and uncompromised security.

How does the VCL- Data Diode work – An Overview :



SECURE DATA VAULT OVERVIEW

Applications

Ransomware-Proof Backup

The VCL Data Diode can be used with the VCL-9090 NAS (Network Attached Storage) to back up data to a unidirectionally-protected repository that ransomware cannot access, encrypt or otherwise tamper with.

Tamper-Proof logs repository

The VCL Data Diode preserves copies of logs, packets and other data before and during a cyber attack.

Secure storage

The VCL Data Diode may be used to provide hardware-enforced unidirectional protection of logged data with encryption and authentication of logged information.

Secure data retrieval

The VCL Data Diode can only be accessed physically via a dedicated out-of-band port.

Hardware-Enforced protection – A summary of Key Features and Functions of Data Diodes:

1. **One-Way Data Transfer:**

The VCL Data Diode physically enforces unidirectional data flow, meaning data can only be transmitted from the source network to the destination network, but not the other way around. This ensures that any potential threats or malware cannot travel back from the destination network to the source network.

2. **High Security:**

By preventing bidirectional communication, data diodes eliminate the risk of external attacks on the source network. This makes them ideal for protecting critical systems and sensitive data.

3. **Hardware-Based Solution:**

Unlike software-based firewalls and other security measures, the VCL Data Diode may be used to enforce hardware-based data flow restrictions. This makes the network more robust and protected against software vulnerabilities and cyber threats.

4. **Applications - The VCL Data Diodes may be used to protect:**

- **Industrial Control Systems (ICS):** Used to protect control systems in power plants, water treatment facilities, and other critical infrastructure.
- **Military and Défense:** To store and protect sensitive military records and data.
- **Financial Services:** Used to securely store banking data, details of financial transactions and financial records.
- **Health Care:** To ensure secure storage of patient data and medical records.

5. **Performance:**

The VCL Data Diodes are designed to handle high data throughput and can support various types of data, including video, audio, and large files. They are typically optimized for low latency and high reliability.

Ensuring One-Way Data Flow with a VCL Data Diode.

The VCL Data Diode ensures one-way data flow between the NETWORK (ORANGE) ELEMENT and PROTECTED (GREEN) ELEMENT using protocols that support one-way (unidirectional) traffic.

Benefits of Using Data Diodes – Summary:

1. **Enhanced Security:**

By physically blocking data from flowing back into the source network, the VCL Data Diode provides a high level of protection against cyber threats.

2. **Regulatory Compliance:**

Many industries have strict regulations regarding data security and privacy. The VCL Data Diode helps organizations comply with these regulations by ensuring secure data transmission.

3. **Reliability:**

VCL Data Diodes are less prone to failure compared to software-based data security solutions, providing a reliable means of securing critical data.

4. Prevention of Data Leakage:

The VCL Data Diode prevent sensitive information from being exfiltrated from secure networks, thus protecting intellectual property and confidential data.

Common Use Cases:

Critical infrastructure operators, industrial companies, military commands, intelligence organizations, and even commercial companies such as financial institutions use data diodes to provide reliable, hardware-enforced security for their systems and networks.

1. Protecting SCADA Systems:
Supervisory Control and Data Acquisition (SCADA) systems used in industrial settings can be secured with data diodes to prevent unauthorized access and cyber-attacks.

2. Securing Classified Networks:
The VCL Data Diode can be used can be used by the military and other government agencies to ensure that classified information cannot be accessed or leaked through network connections.

3. Ensuring Data Integrity in Financial Transactions:
The VCL Data Diode can be used by banks and financial institutions to securely store customer account data and transaction records and ensure the integrity of financial records.

4. Power Generation Facilities:
Data diodes are commonly used in power generation facilities to protect turbines and other critical power generating infrastructure equipment.

Technical Specifications

Network Side (ORANGE) Element.

Minimum Number of Network Side Interfaces	4 x 100/1000BaseT Electrical
Link between the Network Side (ORANGE) Unit and the Protected Side (GREEN) Unit	1 x 100BaseFX Optical (Transmit only)

Protected Side (GREEN) Element.

Minimum Number of Protected Side Interfaces	4 x 100/1000BaseT Electrical
Link between the Network Side (ORANGE) Unit and the Protected Side (GREEN) Unit	1 x 100BaseFX Optical (Receive Only)

Supported Protocols:
UDP, TCP/IP, SNMP, SMTP, NTP, SFTP and FTP transfers (separately or simultaneously)

Local / Remote Management:
RS232
USB
10/100BaseT Ethernet RJ45
SSH - Secured access over an IP link using Secure Shell Protocol
CLI Control Interface (HyperTerminal or Vt100)
SNMPv2, SNMPv3 Traps (MIB provided)
Syslog, HTTP/HTTPS
TCP, UDP, FTP, SCP, SFTP.
Encrypted Password Protection with Password Strength Monitoring

Alarm and Indication:
Fan Failure Alarm Indicator LED.
High Temperature Alarm Indicator LED.
Numerical System Temperature Readout.

Time Synchronization:
IRIG-B (Un-Modulated)
NTP

MTBF:

MTBF in Years	11.41
MTBF in Hours	100,000

Environmental (Equipment):

Operational	0°C to +45°C (Typical: +25°C)
Cold start	10C
Storage	-25°C to +70°C
Humidity	95% non-condensing

Power Supply:
Dual Redundant 1+1 48V DC
Operating range +/- 25%
Reverse Polarity Protection

Power Consumption:
< 80W at ambient (steady state 24°C)

Mechanical Specifications:
H x W x D : 44 mm x 480 mm x 300 mm
19”, 21”, 23” Rack mounting options
IP Rating : IP20

EMI, EMC, Surge Withstand and other Compliances:

EN 50081-2	EN 50082-2	IEC 60068-2-29
IEC 61000-4-6 (Conducted Immunity)	IEC 60068-2-2	IEC 60068-2-78
IEC 60068-2-1	IEC 60068-2-14	IEC 60870-2-1
CISPR 32 / EN55032 Class A (Conducted Emission and Radiated Emission)		
IEC 61000-4-5	IEC 61000-4-2	IEC 61000-4-8
IEC 61000-4-3 (Radiated Immunity)	IEC 61000-4-4	

Electromagnetic Standards Compliance:

- EN 50081-2
- EN 50082-2
- IEC 61000-6-2 (Immunity)
- IEC 61000-6-4 (Emission)
- Complies to IEEE and IEC standards

CE Compliance:

- Low Voltage Directive 2014/35/EU
- Electromagnetic Compatibility 2014/30/EU