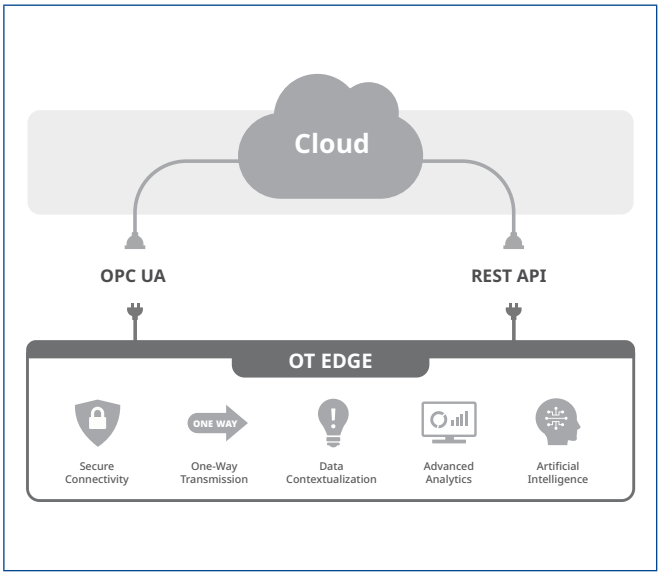
DeltaV™ Edge Environment

DeltaV™ Edge Environment provides easy and secure access to DeltaV and DeltaV SIS system data for use on premise or in the cloud for monitoring, analytics, reporting or other Enterprise applications to drive operational improvements.

- Easy and secure access to DeltaV and DeltaV SIS system data
- Out-of-the-box contextualization that reflects plant object hierarchy
- Secure sandbox to deploy and run applications close to the data source
- Easy maintenance that requires minimal field expertise



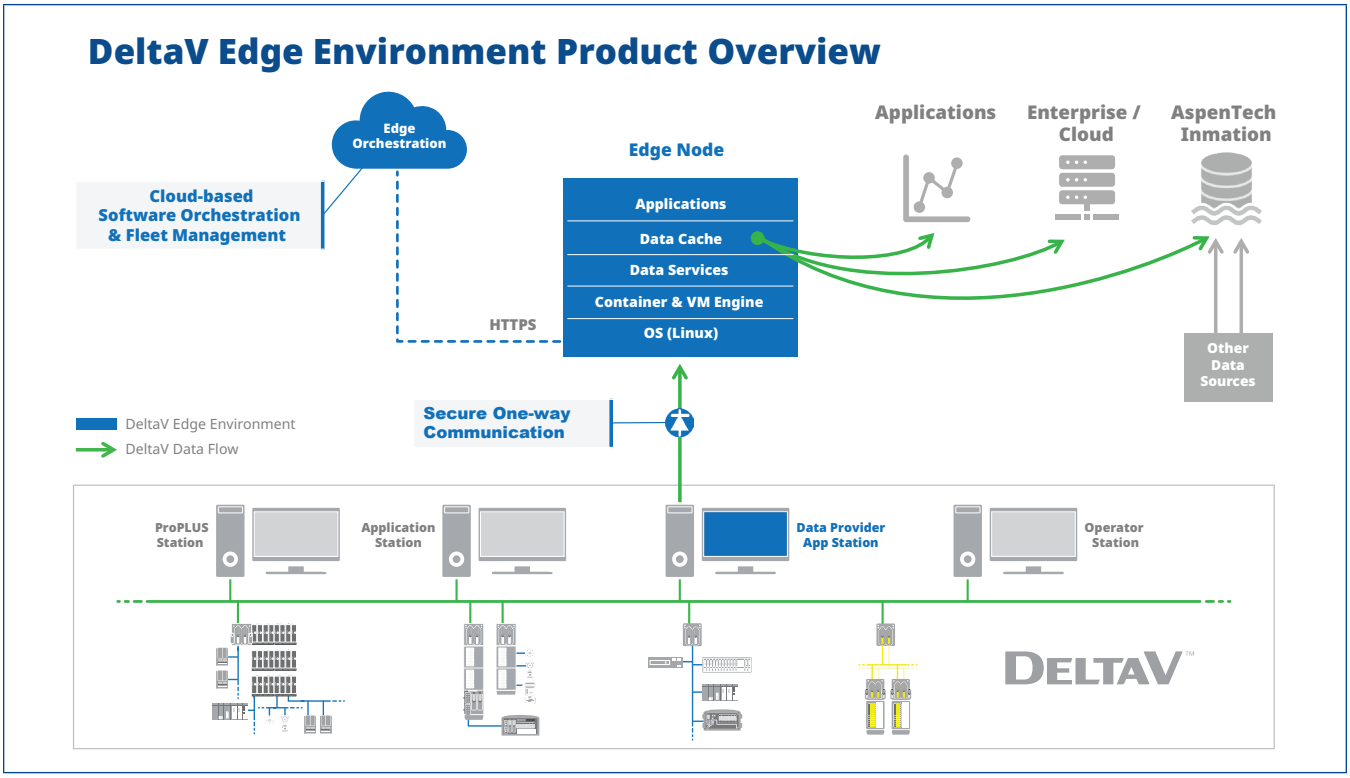
Introduction

DeltaV distributed control systems collect, generate, and aggregate large amounts of valuable data. This data is often used beyond just performing process controls. OT and IT applications rely on data from the DeltaV system to generate production and operations intelligence, monitors and tracks regulatory and other compliance data, computes and reports on plantwide KPIs, and drives sustainability and other digital transformation initiatives.

The evolution of data analytics requires large amounts of data to be made available in context across different data types. In addition, consumers of this data often need it to be available on the business network, accessible through commonly used data protocols, and for consumption by off the shelf data analytical tools such as Power BI, Node-RED, Jupyter Notebook, Grafana, and so on. Furthermore, many users require analytics to be conducted at the edge and need to access the results or dashboards from their work PC via internet browser. The DeltaV Edge Environment is developed to deliver the capabilities that meet these needs and is the ideal source for accessing DeltaV data.

The DeltaV Edge Environment provides access to DeltaV system data through a unified solution architecture while satisfying IT cybersecurity, communications, and application requirements—all without disrupting the DeltaV system. It has been designed specifically to be user friendly to both IT and OT users to access DeltaV system data for use on premise or in the cloud.

DeltaV Edge Environment Architecture



The DeltaV Edge Environment solution consists of four major product components: Data Provider, Edge Node, Edge Orchestration, and an optional Data Diode.

Data Provider

The Data Provider resides on a dedicated DeltaV Application Station. It reads alarms and events information, configuration data, and real-time module and function block parameters and sends all of the data to the Edge Environment on a continuous basis. In addition, the Data Provider constantly assesses the latest configuration hierarchy based on DeltaV's configuration file and sends these updates to the Edge Node. The Data Provider also consolidates different data types and streams into one out-bound data flow.

The Data Provider can be easily configured to receive alarms and events, subscribe to real-time parameters, and extract DeltaV system configuration. To facilitate users defining the desirable parameters for subscription, a Data Provider Configuration Tool is included.

Edge Node

The Edge Node hosts and executes a series of software applications including data services, interfaces, databases, and analytical applications to create an on-demand digital twin replicating both DeltaV system data and the configuration hierarchy for data contextualization. The Edge Environment's Edge Data Service receives data from the Data Provider, recognizes the data characteristics, and pushes the data into specific database or database areas. The Edge Environment's internal database temporarily caches all received data for up to one year, after which persisted data on the Edge node is automatically deleted.

Both the runtime data and the cached data are accessible through the Edge Environment's egress interfaces, including OPC UA and REST API. The OPC UA server provides access to DeltaV runtime parameters, alarms and events, and cached data and also supports multiple aggregation methods to simplify comprehensive data queries. The Edge Environment's REST API is a web service that is based on HTTPS and provides data in JSON format. REST API and JSON are supported and used by modern data analytics applications.

To easily utilize data, you can deploy applications in the Edge Environment. For example, in addition to the above-mentioned Edge Environment services and applications, you can deploy Node-RED, Jupyter Notebook, Grafana, Power BI, and other third-party applications. These data analytics client applications are available out of the box and can access Edge Environment's data internally.

The Edge Environment's operating system is based on Linux kernel. All the software applications are deployed based on the Edge Environment operating system either as a virtual machine or a container.

Edge Orchestration

As a cloud-based software, the Edge Orchestration capability connects to the Edge Environment operating system and helps you manage your Edge Environments by providing visibility and control to both the software applications running within the Edge Environment and the underlying EVE-OS and computing resources. Edge Orchestration is the Edge Environment's control panel.

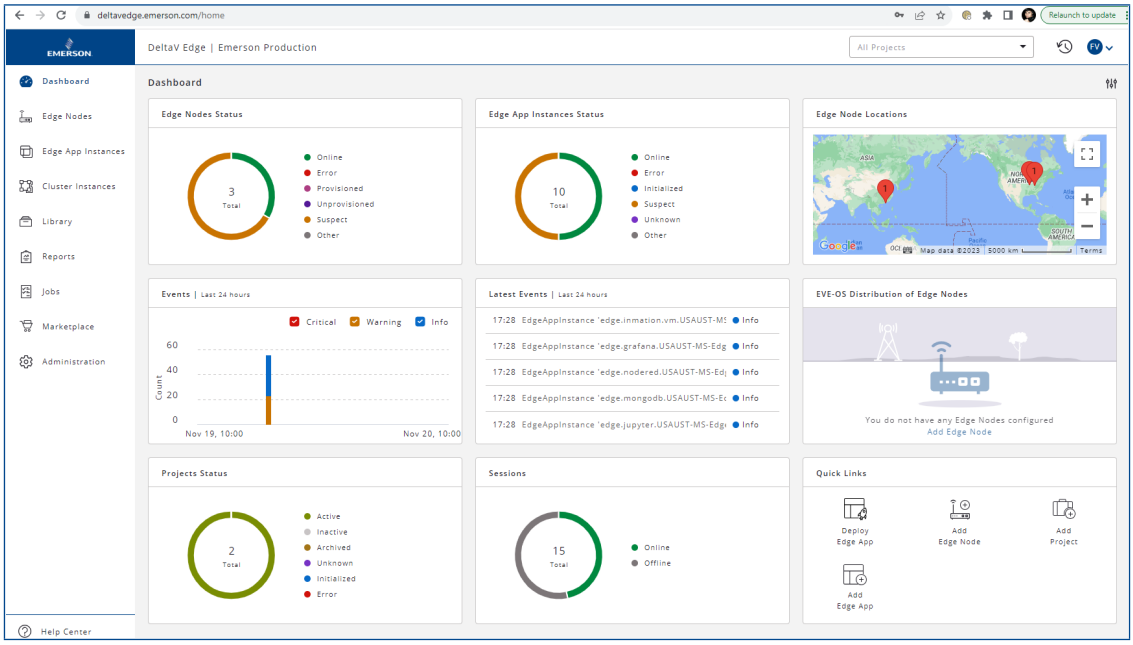
Edge Orchestration can:

- Display Edge Environment's configuration, status, diagnostics, and resource usage
- Activate, deactivate, and reboot the Edge Nodes
- Deploy, diagnose, and update applications
- Configure network setups, update operating system, and perform system-wide backup

The connection between the Edge Environment and Edge Orchestration is based on HTTPS, which is normally open at the enterprise network (Purdue Model Level 4) and the plant network (Purdue Model Level 3). The Edge Environment can stay connected with the Edge Orchestration so you can monitor the Edge Environment's working status and diagnostics on a constant basis. Alternatively, the Edge Environment may connect to the Edge Orchestration only when needed—the Edge Environment's normal operation does not depend on continuous connection to the Edge Orchestration.

Data Diode (Optional)

For additional security, an optional data diode can be deployed between the Data Provider and the Edge Environment. OPSWAT's NetWall Optical Diode is qualified for use with the DeltaV Edge Environment. The NetWall Optical Diode reliably transfers data over a hardware enforced one-way communications link enabling secure data sharing between isolated networks. Supporting a wide range of industrial protocols, NetWall is highly scalable and can transfer real time and historical data while ensuring the security and integrity of your critical assets.



DeltaV Edge Environment Dashboard.

Benefits

Easily and securely access DeltaV system data

To access data from a control system, users traditionally need to set up several servers on the control system level because each server represents one type of data such as real-time data, history, alarms and events, configuration data, etc. Each of those servers has an out-bound data flow going through the Purdue Model. This can be challenging given the requirements on network policies, security domains, encryptions, authentications, etc. and consumes time and resources for both initial setup and on-going maintenance.

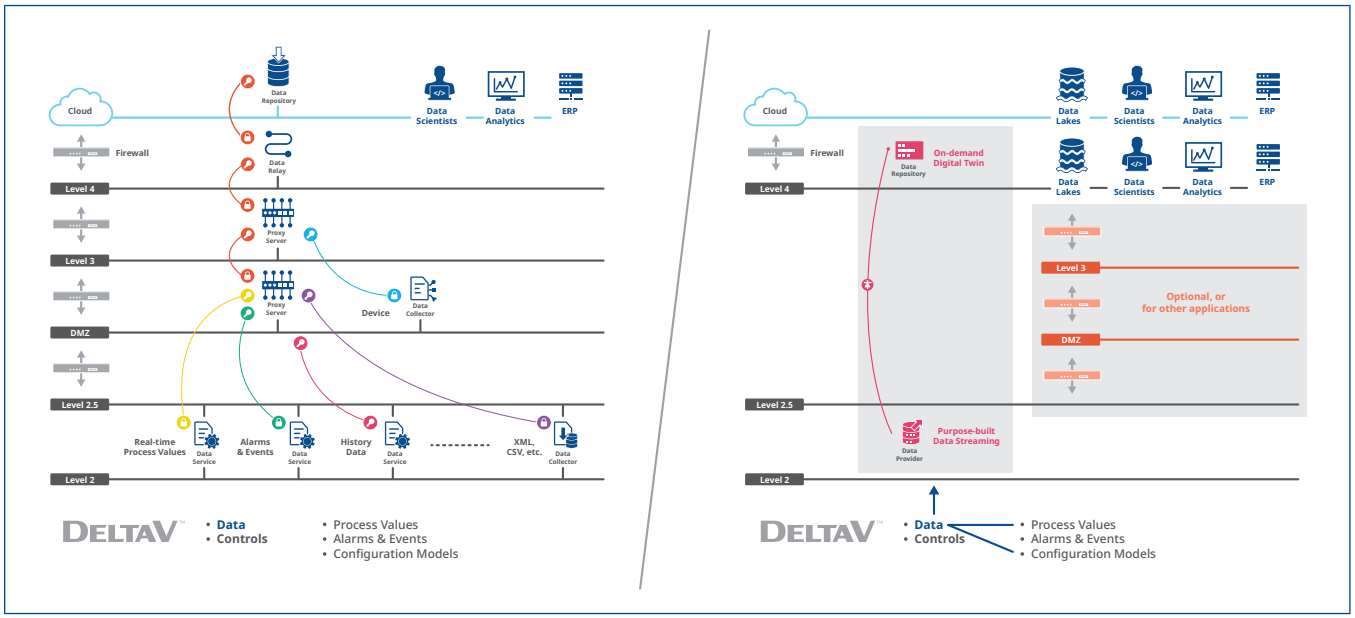
To solve these challenges, DeltaV Edge Environment simplifies connectivity by combining all the control system level data servers into one solution called the Data Provider. As a super data service that pulls all DeltaV data and only needs one data outbound flow to traverse the Purdue Model, network setup is drastically simplified. Optionally, data from DeltaV Edge environment can bypass the Purdue Model by directly connecting the Data Provider to the Edge Environment through a data diode which will further simplify the OT/IT network setup.

Rather than letting data sit within the control system and waiting for it to be accessed, DeltaV Edge Environment replicates DeltaV data and exposes the data replica as an on-demand digital twin. This valuable data is available on the plant or enterprise level network where analysts, data scientists, and data consumption applications reside.

Once the data lands on the enterprise level network, it opens a universe of data analytical capabilities. Through the standard data interfaces, such as OPC UA and REST API, DeltaV data in the DeltaV Edge Environment will be open* to all the data users across the organization's entire network. Data users can use their favorite tools (e.g. Power BI, Microsoft Excel, Jupyter Notebook, Node-RED) to access and analyze the data without causing any disturbance to the DeltaV control system and the production process.

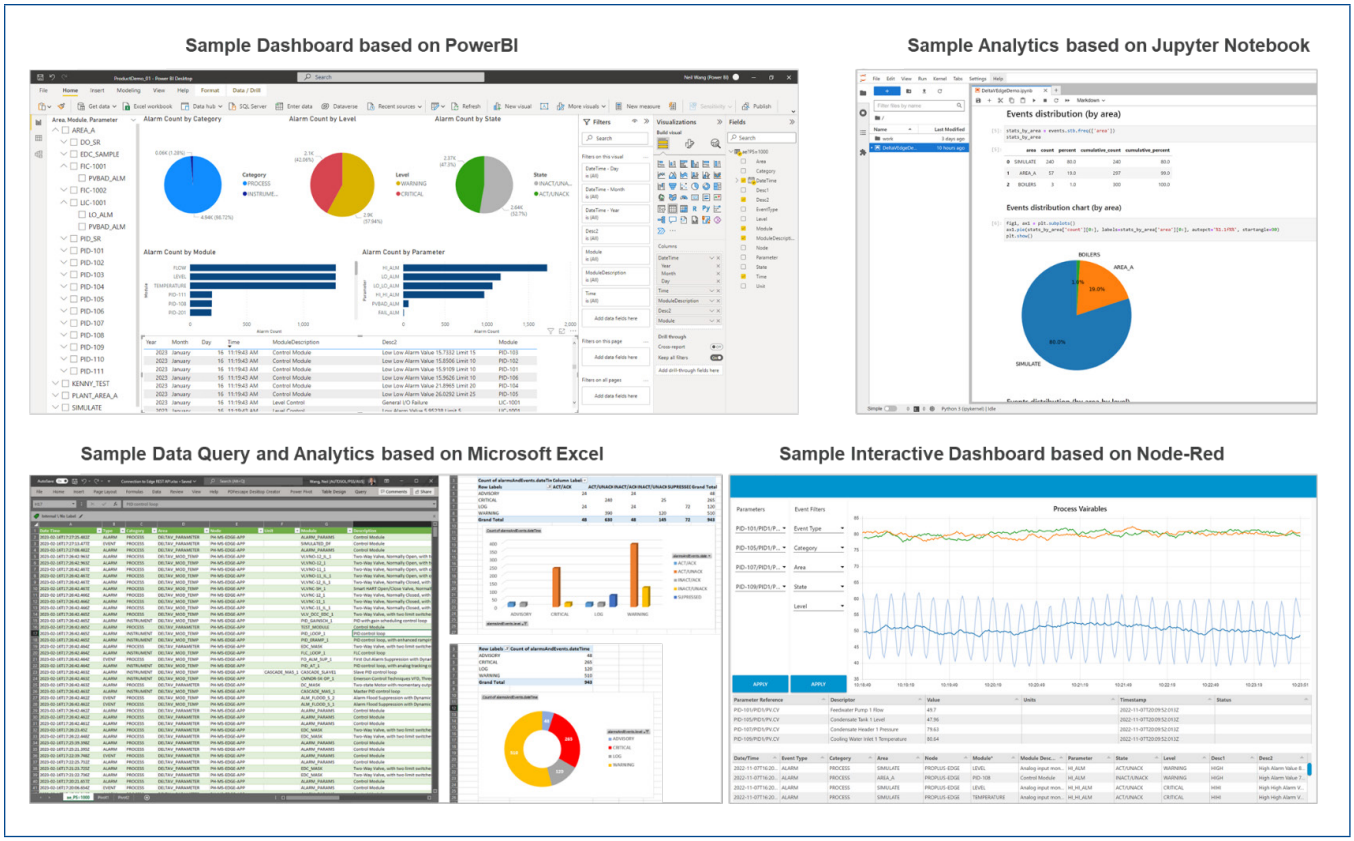
Out-of-the-box contextualization that reflects the plant object hierarchy

Siloed and fragmented data with no relation to each other is difficult to use. The silos are often caused by the fact that data pulled from control systems are stored in a flat format and different types of data are pushed into different data repositories. To deal with the silo, users often construct a separate data hierarchy as a bolt-on solution separately hosted in a database infrastructure parallel to the data repositories. However, this bolt-on solution requires significant engineering efforts to design and implement. In addition, it needs to be constantly updated for changes made to the control system.



Traditional connections lead to complex security and configuration VS easy and secure connectivity providing data to all users.

*DeltaV Edge Environment provides user account managed access to data via admin tools.



The design, engineering, and on-going updating of the data hierarchy often consumes large amounts of time and resources.

To solve this problem, the DeltaV Edge Environment replicates DeltaV's configuration hierarchy together along with DeltaV data. The source data model is preserved under the context of the DeltaV configuration and is available out of the box. It is also synchronized with DeltaV's latest configuration so any added changes will be automatically reflected. DeltaV's configuration hierarchy always reflects the actual process setup because operators rely on that hierarchy to operate the process and hence is the ideal data contextualization framework.

Secure sandbox to deploy and run applications close to the data source

The DeltaV Edge Environment solution can host data analytical applications. Users do not need to worry about establishing another PC and the associated network connections. Applications hosted internally in the Edge Environment Node can locally connect to the data interfaces reducing the potential latency. This can further reduce complexity since the connection happens within the Edge Environment Node.

Easy maintenance that requires minimal field expertise

Through the Edge Orchestration capability, DeltaV Edge Environment can be used as a managed appliance. That means users can focus on using the data without worrying about the underlying infrastructure. Emerson support is available to apply updates as well as to remotely diagnose, troubleshoot, and resolve issues through the Edge Orchestration.

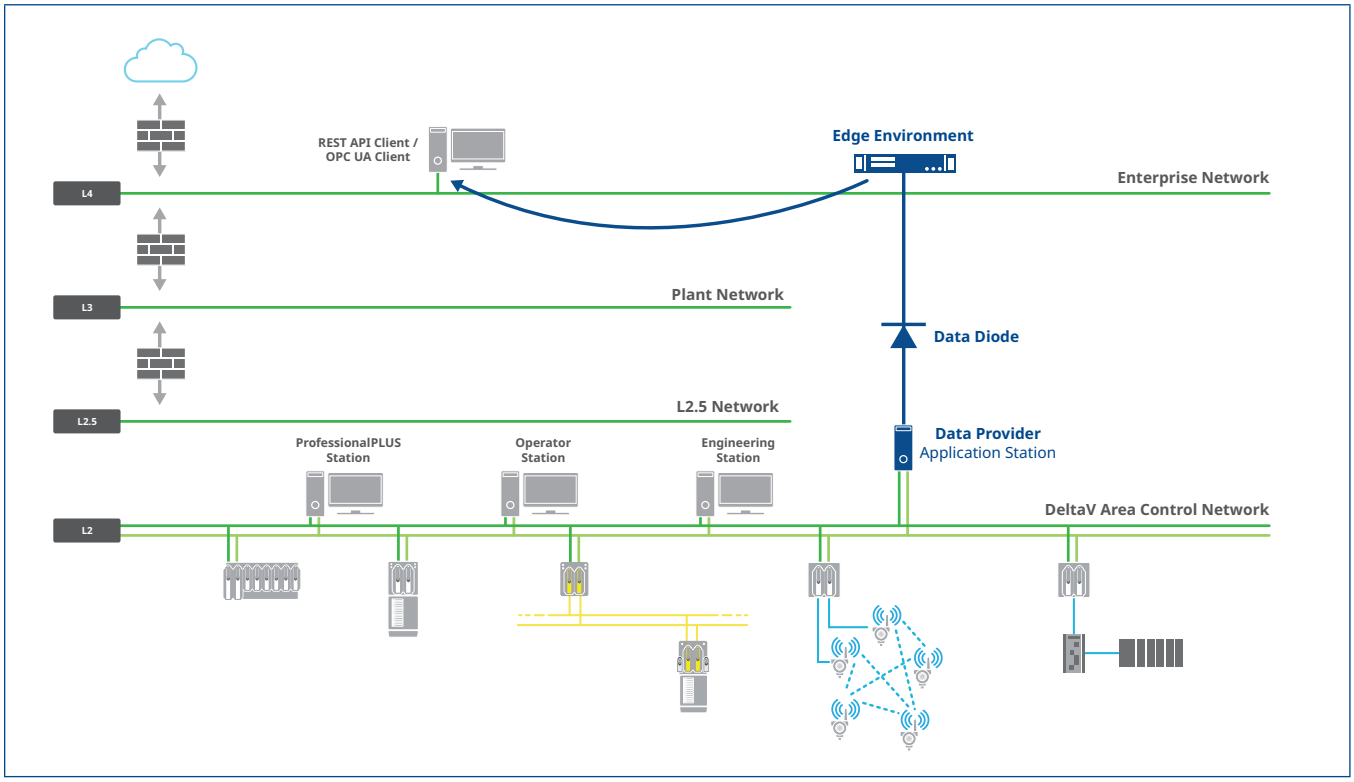
Built-in Security

Network deployment

DeltaV Edge Environment supports both Purdue Model and data diode-based network connections. Users have two options to deploy the DeltaV Edge Environment solution. With both options, DeltaV Edge Environment's Data Provider remains inside of the DeltaV system based on a DeltaV Application Station and the Edge Node can be placed at the Level 3 Plant Network or Level 4 Enterprise Network.

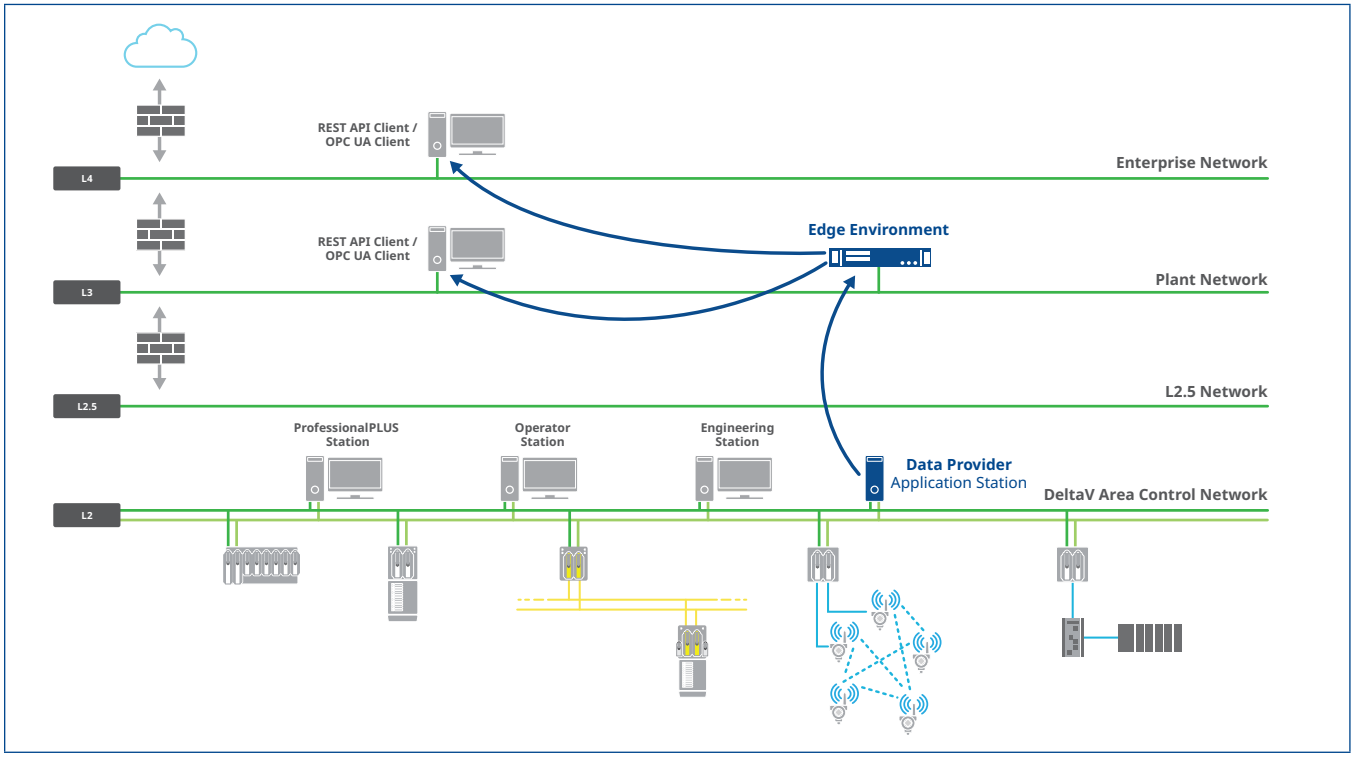
Option 1: A data diode is used to directly connect the Data Provider on Level 2 and the Edge Node on Level 4. Because the data diode allows data to travel in only one direction out from the Data Provider, there is no possibility for external intrusion or data being written back to DeltaV. This direct connection using the data diode can bypass the firewalls and security rules required in the traditional IT network setup and further simplify the network based security.

Option 1: Use A Data Diode to Simplify Edge Connection



Option 2: Edge Environment node is placed on Level 3 or Plant Network and the Data Provider connects to the Edge Environment through a firewall. The connection between the Data Provider and Edge Environment is HTTPS.

Option 2: Edge Environment Node on Level 3 Plant Network



Security Best Practices Between Data Provider and Edge Environment

The Data Provider's out-bound data flow is built following cybersecurity best practices including Transport Level Security (TLS) and Endpoint Authentication to ensure the data is encrypted and secured both in motion and at rest. The Data Provider's outbound communication only sends data out which means it does not read back external data or information. The communication between Data Provider and Edge Environment is based on HTTPS, where a TLS certificate is required to establish the communication. The one-directional communication, together with TLS, perfectly protects DeltaV from external intrusion risks.

Edge Environment Data Access Security

The Edge Environment OPC UA Server supports secure access via administrator-defined user accounts and anonymous access with a server self-signed certificate. Users can configure the OPC UA Server to allow either or both access methods. The anonymous option is intended to help users simplify the initial connection setup process.

The Edge Environment REST API can be authenticated through an organization's Active Directory Server. Permitted users can be set up as groups by the IT Department and DeltaV Edge Environment will verify with the Active Directory Server to authenticate a user's access. The DeltaV Edge Environment Manager allows users to manage the Active Directory synchronization for REST API.

Edge Orchestration and User Data Security

The provided Edge Orchestration has been architected with a security-first, zero-trust model approach. For key features of the Edge Orchestration solution, please reference the Whitepaper at: **https://zededa.com/white_papers/zededa-security-architecture/**

Capacity

Data Provider Egress to Edge Environment	
Parameters Data	30K parameter data/second, 300K parameter data
Alarms and Events	100 events/second, 4K peak alarms handling*
Transportation	HTTPS

*In an alarm flood situation, a spike of 4K alarms generated within 1 second will still be sent to the Edge Environment on top of the regular 300/second events flow, without data loss; notice a spike is defined as a sudden and non-repetitive alarms or events burst.

Technical Specifications

Edge Server (Dell PowerEdge R650xs)

DeltaV Edge Environment v1.0 uses Dell PowerEdge R650xs server as the hosting hardware platform.

DeltaV Edge Environment Server based on Dell PowerEdge R650xs Rack Mounted Server			
Part Number	O/S	Edge Environment Compatibility	Warranty
SE2741C01	EVE-OS	v1.0	5 Years

- Dual CPU Intel Xeon Gold 5315Y 3.2G, 8C/16T, 11.2GT/s, 12M Cache, Turbo, HT (140W) DDR4-2933
- 128GB Memory - Two 64GB RDIMM, 3200MT/s, Dual Rank 16Gb BASE x8
- 12TB SSD - Seven 1.92TB Hot-plug Read-intensive Solid State Drives 6Gbps 2.5” in a RAID5 Array
- PERC H745 RAID Controller, Front
- Dual, Hot-Plug, Redundant Power Supply (1+1), 600W
- No pre-installed operating system
- Ethernet ports: 6
- Includes drop-in/stab-in combo rails without cable management arm
- 1U, Height 42.8mm (1.68in), Width 482mm (18.97in), Depth 748.79mm (29.47in)

Data Diode (OPSWAT NetWall Optical Diode)

The OPSWAT NetWall Optical Diode is the tested and validated solution for users that need to egress data from the DeltaV system through DeltaV Edge Environment via data diode. The NetWall Optical Diode provides access to real-time OT data and enables secure data transfer to make DeltaV data accessible at the enterprise. For DeltaV Edge Environment, NetWall 100MB and 1GB data transfer rates are supported options. This solution allows the Data Provider to be directly connected to the Edge Node for a secure and simplified IT network solution.

OSPSWAT NetWall Optical Diode			
Firmware	Power Supply	Power Consumption	Voltage
1.2.1	250W	Typical - 150W	100-240VAC. auto ranging

You will receive a package from OPSWAT containing the following:

- Two 19” 1U servers
- Mounting rail kits
- Two power cables
- Fiber Optic cables (OS2 LC-LC Single Mode Fiber Patch Cable | Simplex 9/125 LC to LC Singlemode Jumper Cord)
- Two USB security dongles
- SFP modules (2x Single Mode TX only 10G SSFP+, 2x Single Mode RX only 10G SFP+) Field or factory Upgradeable by software licensing.

Data Diode (Other Brands and Models)

We are open to qualify alternative data diodes upon request. We will evaluate its specifications to ensure compatibility and optimal performance with DeltaV Edge Environment’s system requirements.

Data Diode Support

For any issues with the data diode, please reach out directly to the manufacturer for support.

OPC UA Compatibility Notice

The platform employs dynamic typing within the OPC UA framework, enabling flexible interpretation of data types at runtime to adapt to changing data structures. This feature may introduce compatibility challenges specifically with older OPC UA client versions or certain configurations. To enhance compatibility with older OPC UA applications, an update is being progressed.

Licensing

DeltaV Edge Environment is a term-based offering with 3 tiers of performance as measured by the number of parameter data recorded—20K, 100K, and 300K.

Version Compatibility

DeltaV Edge Environment v1.0 is compatible with DeltaV v14.LTS, v14.FP1, v14.FP2, v14.FP3, and v15.LTS.

Ordering Information

Description	Model Number
Base Subscription	
DeltaV Edge Environment Base Subscription: xxxK parameter data ■ DeltaV Edge Environment software infrastructure: Data Provider software, DeltaV Edge Environment software platform ■ 1 Administrative User and 1 User Reserved for Emerson Support ■ Data Ingress: Configuration Hierarchy, Alarms & Events, Parameter and SIS Module Data ■ Data Egress: REST API ■ Edge Orchestration	VFDVEESwBPSxxx_YyFYzz*
Required Add-ons	
DeltaV Edge Environment Server – Perpetual Dell PowerEdge R650xs; otherwise known as the "Edge Node"	SE2741C01
DeltaV Edge Application Station License – Perpetual This is the DeltaV software license to be installed on the dedicated DeltaV Application Station for the DeltaV Edge Environment Data Provider.	VFDVEEPDVAPPS01
***DeltaV Application Station Server** – Perpetual This is the dedicated application station that only runs the "Data Provider" software without any other services (e.g., historian, OPC server, other applications). This can either be a physical or virtual application station. Any existing server-class application station that supports DeltaV versions 14 and 15.LTS may be selected.	Varies, reference release notes of targeted DeltaV release for supported servers
Optional Add-ons	
DeltaV Edge Environment OPC UA Server – Subscription (Per Year)	VFDVEESwOPCUAS01_YyFYzz*
1 Additional Admin User – Subscription (Per User / Per Year)	VFDVEESwAUSERS01_YyFYzz*

These model numbers are for the initial subscription term only; part numbers for renewals end with -R and are sold separately.

*w represents the length of the subscription term in years (1, 3, or 5).

*xxx represents the capacity of the license (020 for 20K parameter data, 100 for 100K parameter data, or 300 for 300K parameter data).

*y represents the specific year of the subscription term (1, 2, 3, 4, or 5).

*zz represents a two-digit indicator of the year of purchase (e.g. 23).

Optional Data Diode from OPSWAT	Model Number
Perpetual License	
OPSWAT NetWall Optical Diode, 100Mbps	MD-NW-OPT-100Mbps-PERP
OPSWAT NetWall Optical Diode, 1Gbps Upgrade	MD-NW-1GBPS-UG-PERP
Subscription License	
OPSWAT NetWall Optical Diode, 100Mbps	MD-NW-OPT-100Mbps-SUB
OPSWAT NetWall Optical Diode, 1Gbps Upgrade	MD-NW-1Gbps-UG-Sub
Support and Warranty	
Appliance Maintenance, Support and Warranty Additional year of software updates, support, and advanced replacement warranty for any OPSWAT appliance (i.e., any OPSWAT product that consists of hardware and software). Can be purchased in multi-year options. Limited to Years 2 and 3 of the hardware life (i.e., two years maximum).	APPLIANCE-MNT-SUPPORT-WARRANTY
Silver Support Silver Support provides access to OPSWAT's technical support team from 7AM to 7PM (based on the time zone designated by your company). Additional details available at **https://www.opswat.com/support**	SILVER-SUPPORT-ENTERPRIS

This hardware enforced one way transfer solution serves as an industrial firewall that can't be compromised. The model number for 100Mbps includes the hardware, software and first year support plus warranty. Dell 340 or equivalent server on for Blue and Red server with redundant power supplies.

To increase the platform bandwidth from 100Mbps to 1Gbps, an additional license for 1Gpbs is needed. This is a software upgrade that can be done in the factory or in the field.

Although for DeltaV Edge Environment v1.0, the 100Mbps has been tested to be sufficient to transmit the maximum supported parameter data, 300K with a 30K throughput per second, for futureproofing, it is recommended to go with 1Gbps.

Licensing can either be perpetual or a multi-year subscription.

Product Support
DeltaV Edge Environment product support is included with all base package subscription purchases and delivered through Guardian. With your product subscription, you can access 24/7 call support, hotfixes, patches, minor and major releases, and empower your team for action with a direct connection to our Guardian platform.

Related Products

For detailed information about the following applications, refer to the appropriate product data sheet:

DeltaV OPC UA Servers and Clients is an interoperability standard that allows for a secure and reliable exchange of real-time and historical data between the DeltaV system and other systems, applications and enterprise users.

DeltaV Application Station Software Suite gives you the ability to integrate DeltaV and off-the-shelf applications into your enterprise.

DeltaV Virtualization Hardware for Hyperconverged Infrastructure (HCI) improves productivity in development/training environments and with HCI you can take advantage of high availability options for on-line production environments.

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DELTAV™

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