



# The communication platform for the Industrial Internet of Things



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Nowadays, fast development of industrial connectivity is opening new opportunities. This growth allows business applications to have access to operational data from the industrial plant floor.

However, it is not always easy or affordable to integrate this industrial data acquisition and take it to the company's business level. Unstable networks, unreliability of acquired data, security gaps or the high implementing costs, frequently put the brake on the industrial evolution.

## The solution to these hurdles is vNode

vNode is an industrial software platform that brings together the best of OT (Operations Technologies) and IT (Information Technologies) worlds to provide an out-of-the-box solution for the Industrial Internet of Things (IIoT).

### SECURITY

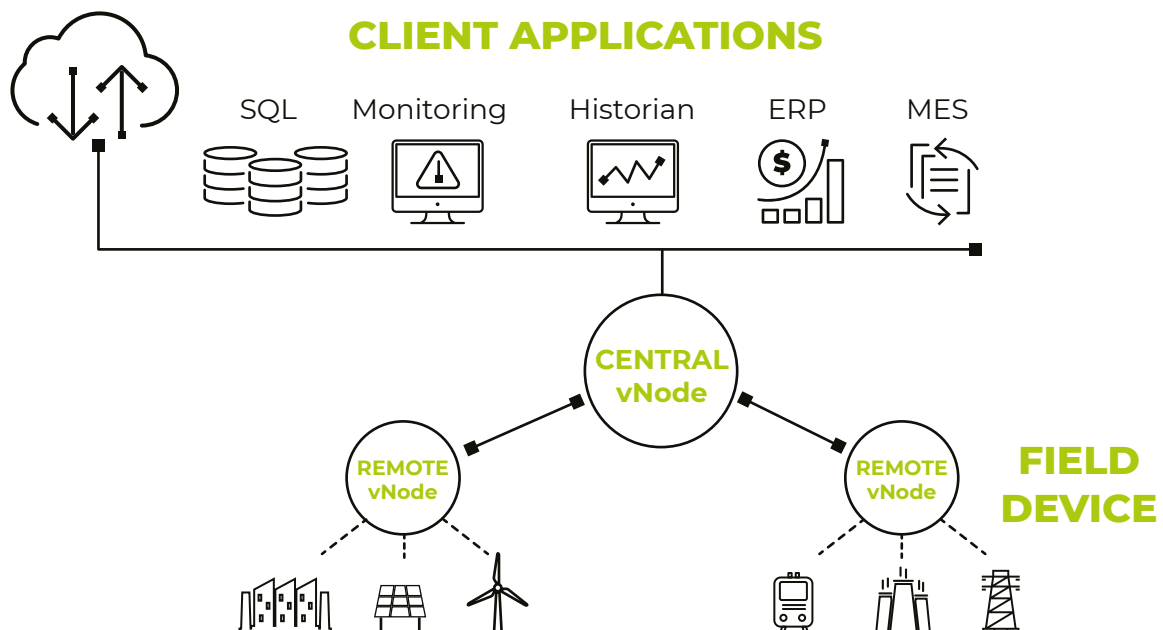
- Encryption
- Digital certificates
- Firewall friendly

### SCALABILITY

- Web technology
- Modular software
  - Multiplatform
  - Object oriented

### RELIABILITY

- Store & Forward built-in
- Compression algorithms
- Minimum Hardware Requirements
- Low cost hardware
  - ARM / Intel / AMD processors
  - Minimum 512 MB RAM





## Why vNode?

### RELIABILITY

vNode guarantees the reliability of the data transmission, even in the worst scenarios such as low bandwidth, high latency and unstable networks thanks to the following mechanisms:

- **Store & Forward:** The vNode platform itself incorporates Store & Forward functionality for automatic real time and historical data recovery after a communication outage.
- **Compression:** vNode always ensures a low bandwidth consumption thanks to its data compression algorithms.
- **Redundancy:** vNode platform ensures data integrity and high availability in critical environments by offering redundant connections between data sources and vNode nodes while keeping the store& forward functionality too.

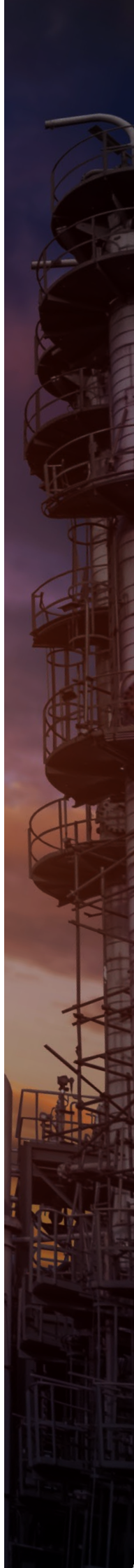
### SECURITY

vNode incorporates the most powerful built-in standard security mechanisms for Industrial Cybersecurity. Main features are:

- **Data encryption:** All of the communications are encrypted using SSL cryptographic protocols. All the communications are encrypted using TLS1.3 cryptographic protocol supporting AEAD and ECDH agreement protocol for public and private key pairs.
- **Authentication:** vNode authentications based on digital certificates.
- **Firewall friendly:** No open ports are required in the remote site

### INTEGRATION

- **IIoT out-of-the-box:** Most common IIoT solutions in the market are SDKs, which means huge amounts of hours of programming tasks. vNode is out-of-the-box: just install it and it is ready to run.
- **Object oriented configuration:** Save lots of configuration hours by focusing on device and tag templates through vNode's web user interface.
- **Scalability:** vNode has been developed to run from small local systems to large distributed architectures guarantying the most robust connectivity.
- **LDAP integration:** Connect your vNode instances to your Active Directory environment to manage user and roles based on your company's security policies.





## System Requirements

One of the most outstanding features of vNode is its high performance on reduced and low cost hardware. Currently, vNode is working in plants all over the world on any type of hardware, from reduced computers to big mainframes.

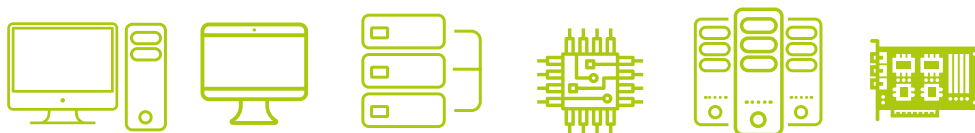
### Hardware

Starting from ARM 7, Intel Atom or AMD Geode processors (700 MHz – 1.2 GHz) and 512 MB RAM, any hardware is able to support the following **operating systems** to run vNode in production mode:

- **Windows:** Any version from Windows 7 to Windows 11, Windows 10 IoT Enterprise and Windows Server from 2008 to 2022.
- **Linux:** Ubuntu, Debian 6, 7, 8, 9 and 10, Raspbian and CentOS.

Some reduced hardware where vNode has been tested:

- Advantech UNO-2173A-AF / Advantech PCM-9375
- VS Vision Systems FlexRunner 3435
- SolidRun HummingBoard-Gate (Microsom i2ex)
- Techbase X500
- LogicSupply CL210G-10



This fact, together with the competitive prices of vNode modules, results in a drastic decrease of hardware and software connectivity costs.



From now, you can offer robust and long-reach industrial connectivity solutions just for a fraction of the price of the most used software until now. vNode is Industrial Internet of Things (IIoT).

## Edge Computing

### Derived Tags

The Derived Tags Module allow the creation of all kind of calculations between tags. This way only the result will be sent to the Control Center reducing the needed bandwidth.

### Scripting Module

vNode includes a Scripting Module to create all kind of logic including any NodeJS library.



## Data Acquisition

vNode has built-in connectivity drivers for standard industrial communication protocols. In addition, the partnership with MatrikonOPC allows vNode to get data from almost any device.

These are some of the most used Modules:

### OPC UA & OPC DA

Using these technologies, is easy to read from any device such as PLCs, DCSs, power meters, RTUs and any electronic device containing data.

### REST API

vNode includes a REST API Client able to connect to any Rest API Server embedded in a Webpage or application and collect data.

### Siemens S7 PLCs

The Siemens Client in vNode allows to connect to multiple Siemens PCLs S7 200, 300, 400, 1200 and 1500 series and read any memory position in the program.

### MQTT

The MQTT Module allows vNode to read or write data to any MQTT Broker.

### Custom data files

vNode can read csv or txt data files containing real time data or historical data. vNode will parse the content and collect the lines one by one using the original timestamp.

### Modbus

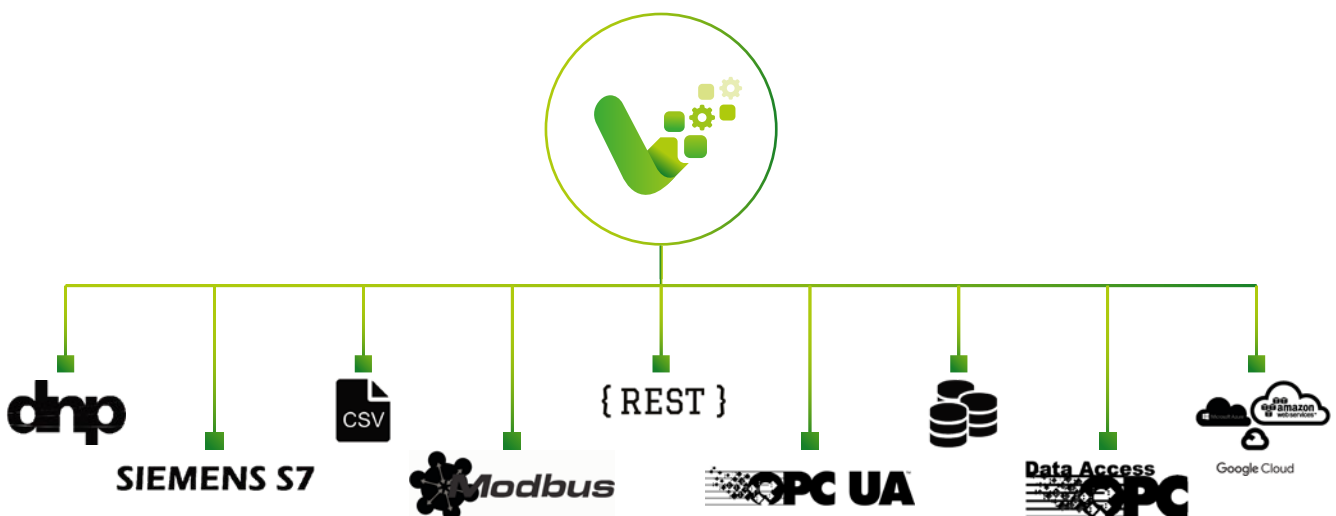
Modbus is the most used technology to collect data.

Both TCP and RTU, vNode can connect to multiple Modbus Slaves simultaneously.

### Custom Client

This module allows the user to design his own protocol.

Very usefull to read Analog and Digital Inputs, or connect to custom devices.





## Data Delivery

### OPC UA

As all the industrial applications allow data acquisition through the OPC UA technology, vNode incorporates the OPC UA module which is able to serve all the collected data through this standard technology.

### Open API

The RESTful Application Programming Interface is used for sharing data between applications over secure HTTP connections, which is essential for IIoT applications. vNode is ready for exchanging data through REST, both for sending data to client applications and for delivering tasks from applications to devices.

### SQL databases

The most used tools to get the best of data are the relational databases. With them, applications are built to allow the company to make right decisions. With vNode, you can store plant floor data to the most common SQL databases, and the decision making process gets easier and faster.

### NoSQL database

NoSQL databases, like MongoDB, are being used more and more in IIoT applications. Organizations of all sizes are using this kind of databases because of their high speed and big data storage capabilities. vNode connects and communicates seamlessly with MongoDB.

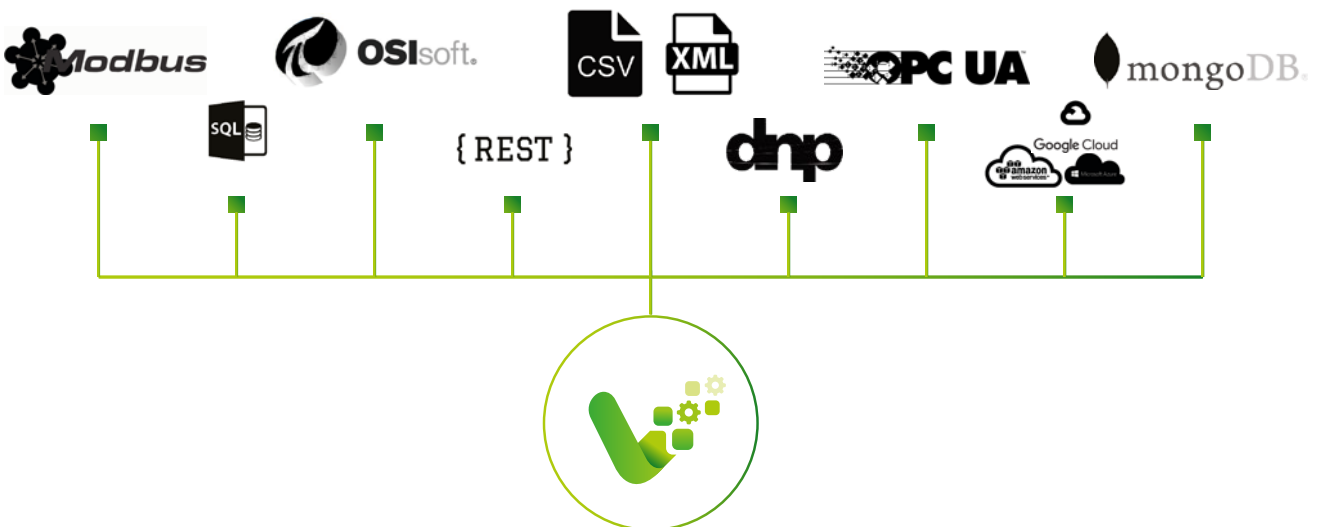
### Custom data files

vNode can move data from plant floor to all kind of applications using csv, xml or txt type files containing historical data.

### MQTT

Using this technology, vNode interacts with any MQTT Broker both as Publisher and Subscriber.

vNode includes AWS and Azure's payload profiles for easy deliver data to these popular Clouds.

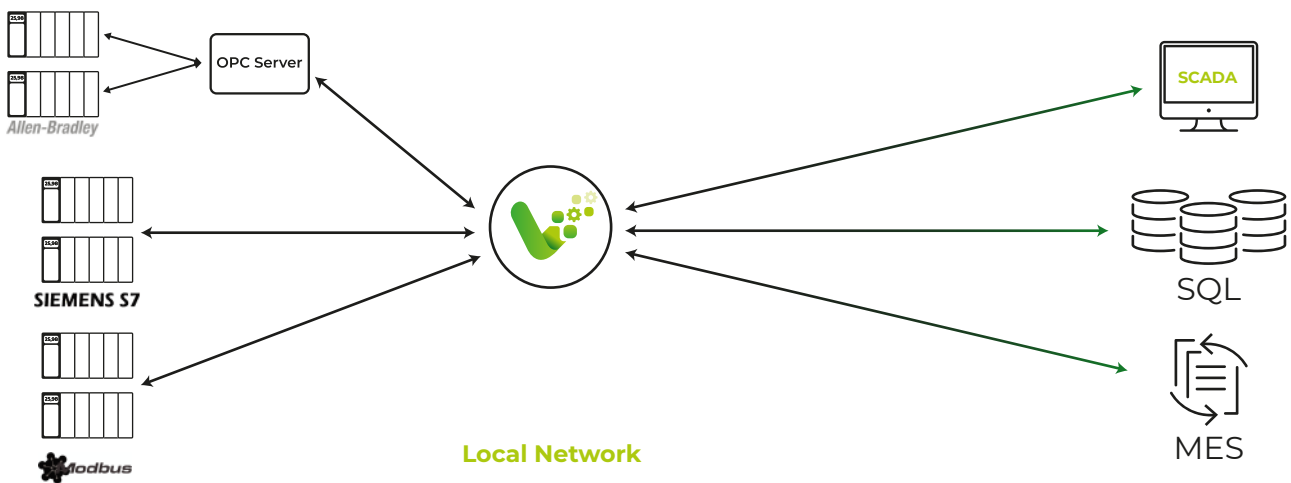


## Use cases

The following architectures are some use cases scenarios where vNode is used in real projects:

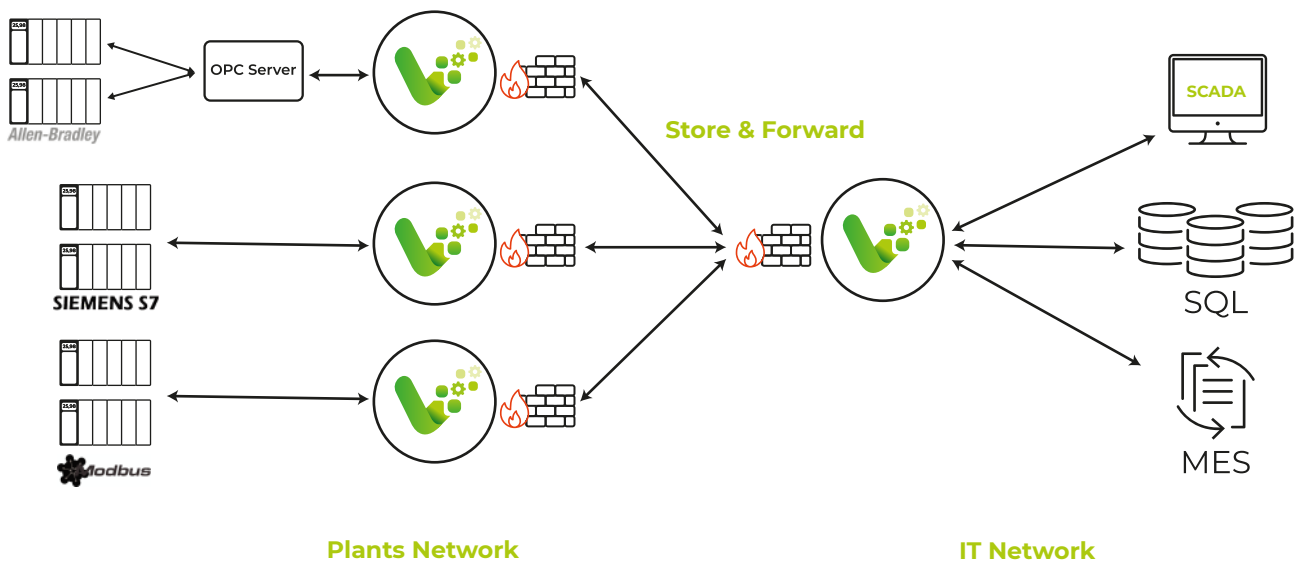
### Basic Architectures

1) Standalone vNode collecting data from the local network and serving data to applications in the local network. vNode works as a data concentrator.



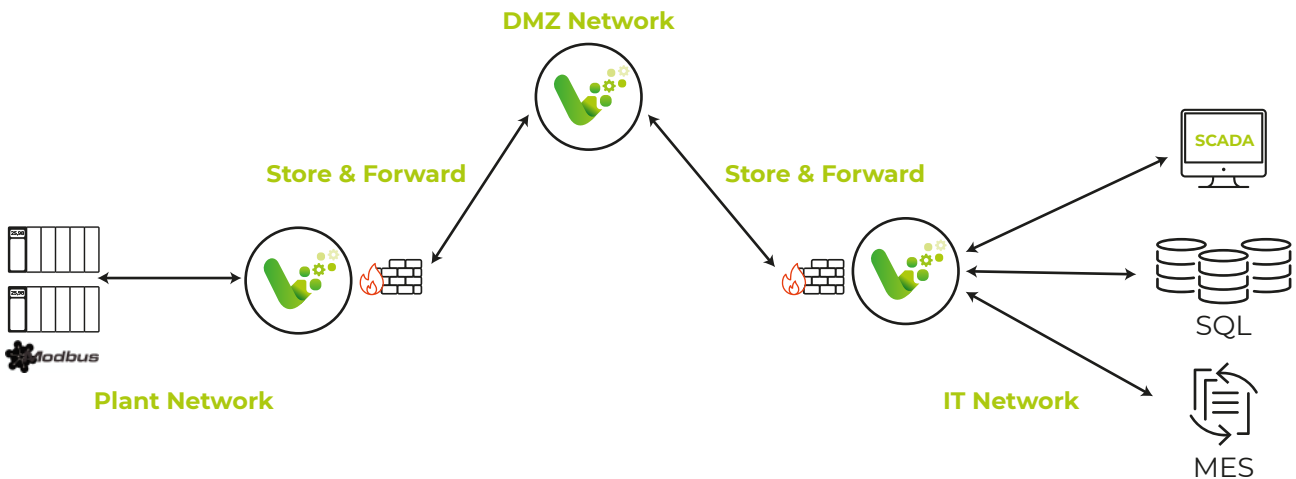
2) Linked Nodes between different networks.

vNode can be configured to open the connection from the distributed Plant vNodes to the central IT vNode. Therefore there are no open ports at the Plant Firewalls.

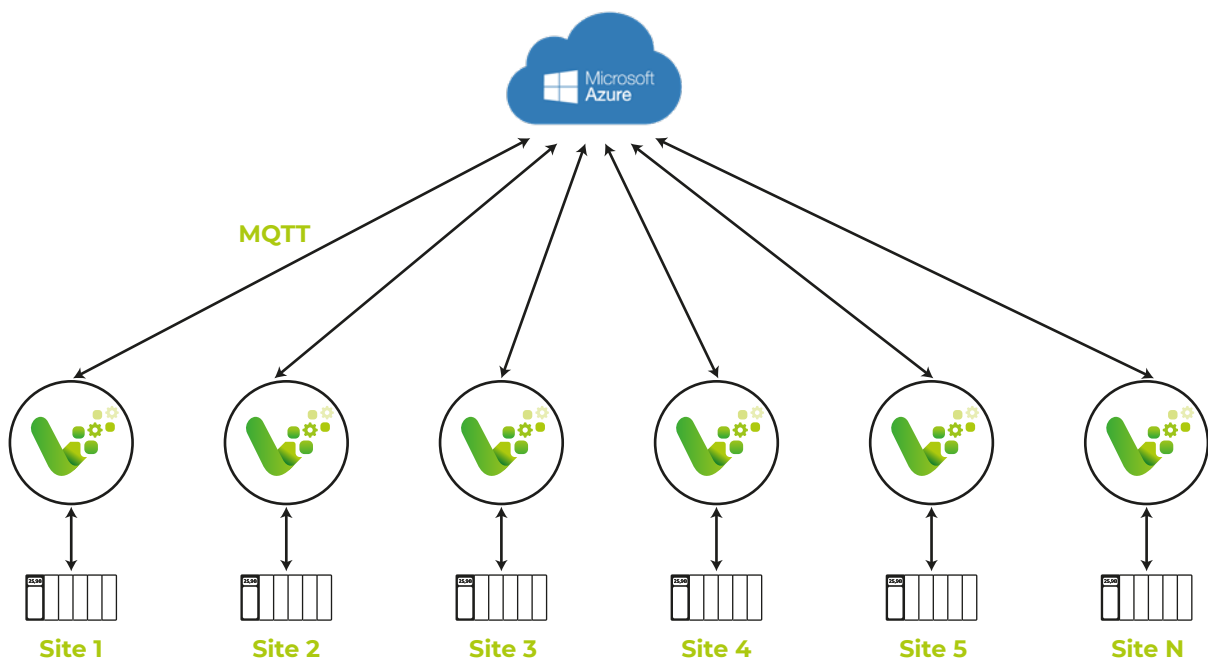


## Use cases

3) Linked Nodes between different networks, through a secure DMZ. vNode can be configured to open the connection from the distributed Plant vNodes and from the central IT vNode to the DMZ vNode. Therefore there are no open ports in any Firewall.



4) Remote vNodes running in isolated locations. Each vNode is collecting local data and sending it straight to the Cloud.







## Modules

vNode is a modular platform, meaning that its functionality can be adapted to the specific needs of each project using different modules. The following Modules are divided in 3 categories: Input Modules, Output Modules and Internal Modules.

Modules are continuously updating and improving. On September 2021 this is the updated list:

### Input Modules:

- **AcquisuiteXmlCollector:** HTTP collector for the Acquisuite-XML protocol. Receives and extracts data from the XML files received from Acquisuite dataloggers.
- **CID Gateway:** Connections to KEPServerEX and TOPServer through their CID gateway.
- **CustomClient:** User-configurable client driver to build any communication protocol. This module can connect to any device through RS232, RS485, TCP/IP or straight to Windows or Linux as a CMD command.
- **Datalmporter:** Reads data from CSV files containing Real Time data or Historical Data. All read data will be sent to the database using the original Timestamp.
- **DNP3 Master:** Reads from multiple DNP3 slaves through TCP/IP.
- **Laetus WT Client:** Client driver for Laetus WT industrial machinery.
- **Marchesini Client:** Client driver for Marchesini industrial packaging machines.
- **Mettler Toledo Client:** Client driver for Mettler Toledo SICS and Garvens machines.
- **MQTT Client:** MQTT publisher/subscriber compatible with AWS, Azure, Google Cloud or any standard MQTT broker.
- **Siemens Client:** Siemens S7 TCP client driver. Enables direct bidirectional connections to any Simatic S7 PLC (S7 300, 400, 1200 and 1500 series).
- **ModbusClient:** Modbus TCP/RTU client driver.
- **Rest API Client:** This module can perform GET, PUT and POST commands to interact with REST API Servers and extract all data from the response. Supports JSON and XML formats.
- **DataExporter:** XML and CSV files data aggregator and file exporter. Files can be uploaded automatically to an FTP Server.
- **OPC DA Client:** OPC DA client driver. Allows the connection to any OPC DA Server. This way is possible to connect to any device through a 3dr party OPC Server.
- **OPC XML DA Client:** Allows the connection to any OPC DA XML Server typically used in Windfarms. This way is possible to connect to any device through a 3dr party OPC Server.
- **OPC UA Client:** OPC UA client driver. Allows the connection to any OPC UA Server including the ones embedded in hardware.
- **SQL Client:** Read data from Microsoft® SQL Server, PostgreSQL, MySQL or MariaDB.
- **SMA Client:** Communicates to SMA solar inverters using the legacy SMA Sunny Net.
- **Vdma Xml Client:** Communicates with devices using VDMA-XML TCP protocol.
- **Xantrex Client:** Client driver for Xantrex GT-5XX solar inverters.



## Modules

- ABB VIP client: straight connectivity to ABB controller models AC400, 450, 500 and 800 over VIP protocol.
- Domino Client: supports TCP & Serial communication for Domino Industrial printers using Codenet protocol.
- IEC 102: pull data from electrical meters over IEC 60870-5 -102 protocol.
- Aurora Client: client driver for PowerOne, ABB and filmer solar PV inverters that supports Aurora protocol.
- Farell Client: Connectivity to UMB and TAF Farell RTUs.
- CAISO ADS Client: Straight connectivity to the California Independent System Operator Supporting ADS API V8.

### Output Modules:

- DataExporter: XML and CSV files data aggregator and file exporter. Files can be saved to a local/network folder or uploaded automatically to an FTP Server.
- OPC UA Server: Exposes all the tags in vNode to external OPC UA Clients. Connections can be Signed and Encrypted using Digital Certificates.
- RestAPI Server: REST server interface real-time data, historical data and system status. All data in vNode and all data in the Historian can be requested through a REST API call.
- UFL Exporter: Exports the data to files ready to be consumed by Osisoft PI® UFL Module.
- SQL Client: Every value data change in vNode will be sent in realtime to Microsoft® SQL Server, PostgreSQL, MySQL or MariaDB.
- MQTT Client: MQTT publisher/subscriber compatible with AWS, Azure, Google Cloud or any standard MQTT broker.
- DNP3 Slave: Exposes all vNode tags to any DNP3 Master.
- Modbus Server: Exposes all vNode tags to any Modbus Client.
- Data Diode: allows to send and receive secure data through hardware data diode by using UDP unidirectional connectivity.
- Sparkplug Client: Publishes data to any MQTT Broker using sparkplug format.

### Internal Modules:

These modules provide additional functionality for visualization and edge computing:

- DerivedTags: Configurable derived and aggregated data generator using expressions and data aggregation.
- Historian: High-performance time-series data storage using a local MongoDB instance.
- LinkedTags: Configurable data linker. Moves real time data from one data source to another.
- Scripting: Advanced scripting based on NodeJS.



## Modules

- WebUI: Web interface for configuration and visualization. Users are able to visualize Trend graphics and real time data through the Web.
- Web Vision: Web SCADA environment. Using the default components, the user can create many windows showing graphics, reports, alarms and interacting with the incoming and stored data. Both development and visualization is web using HTML5 technology.
- Fleet Manager: Allows to manage and control all vNode instances from one single environment over internet (<https://portal.vnodeautomation.com>).
- Redundancy Agent: Allows vNode to communicate to a redundant pair of datasources such as PLCs, OPC UA Server, Databases and many others.
- Alarm Notifier: Permits vNode to receive and generate alarm notifications over email or SMS.

### **Custom module development:**

Our development team is open for custom developments.

If your project needs a specific driver or functionality, please contact your Account Manager.



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