

Cnix



<b>SOFTDCS</b> SOFTWARE BASED DISTRIBUTED CONTROL SYSTEM	<b>DAQ</b> DATA ACQUISITION SYSTEM	<b>LIVE EXCEL</b> INTERFACE TO EXCEL	<b>XGATE</b> INTERFACE TO EXTERNAL SYSTEMS
<b>PASCAL</b> DIGITAL TWIN SYSTEM	<b>XOPCUA</b> OPCUA GATEWAY	<b>C-ALARM</b> ANOMALY DETECTION	<b>XRESTAPI</b> INTERFACE TO EXTERNAL SYSTEMS OVER HTTP

# DATA SERVICE PLATFORM



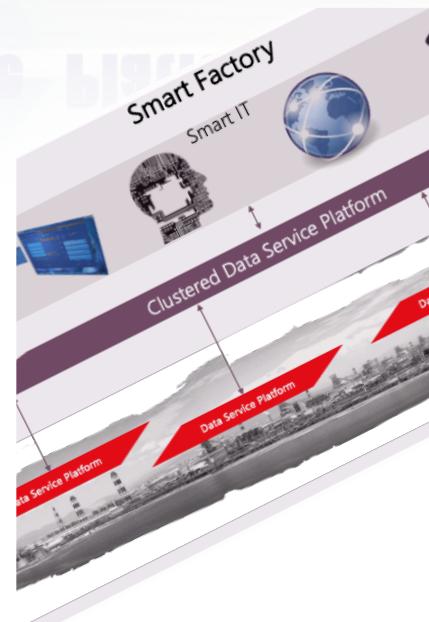
## Data Service Platform

**D**ata Service Platform integrates data from various devices, including PLCs, DCSs, and standalone controllers, providing a unified foundation for Smart Technologies through standard interfaces and uniquely named data structures. It also offers a reliable engineering framework by utilizing a software-based Distributed Control System (DCS).

SoftDCS, DAQ, Live Excel, Pascal, Xgate, and Xopcua are major components of the Data Service Platform, enabling users to simplify and extend their systems with ease.

The first essential step in building a Smart City or Smart Factory is the integration of all related data.

The Data Service Platform is the best choice to achieve this goal.



## SoftDCS

**S**oftDCS is a software-based Distributed Control System and a core component of the Data Service Platform. It connects to field devices and reads data via interface protocols provided by the supplier or through OPCUA.

SoftDCS enables direct data writing to field devices through its integrated engineering framework when engineering tasks are required. Its standout feature lies in the seamless integration and linkage of data from diverse device types.

As SoftDCS reads data from field devices, it attaches timestamps for each and calculates or updates metadata, including alarms, which can be monitored and controlled by users in real time.

SoftDCS offers a range of simple internal commands for reading and writing data during operation. External systems that are not natively compatible with the Data Service Platform can still interface with SoftDCS through Xgate and Xopcua.

All services provided by the Data Service Platform are powered by SoftDCS.



System Integration for Flight Safety Devices in 15 Airports and 11 Vortices

All required data from 1,400 devices across 130 different device types was integrated into a single Data Service Platform. This demonstrates the exceptional efficiency of the platform in integrating large-scale systems.



PSD Control System Integration

PSD doors installed at around 200 stations were integrated into the Data Service Platform.

## DAQ

**D**AQ is a high-performance system designed to archive all connected data within the user's system at unmatched speeds, including comprehensive metadata for each data point in the time domain. It delivers archived data through intuitive web interfaces, enabling users and external systems to easily access and utilize the stored information.

DAQ offers exceptional scalability, making it suitable for deployment in systems of any size—from small-scale installations to large, complex infrastructures. In particular, for systems distributed across multiple time zones, DAQ provides a powerful tool for data analysis, as all archived data is timestamped in UTC, ensuring consistency and accuracy.

## Live Excel

**L**ive Excel is an intuitive interface that connects the Data Service Platform with Microsoft Excel. Through this interface, users can monitor real-time data, review archived data, and automate office tasks efficiently.

All that is required is Microsoft Excel and the names of the data points to access.

With Live Excel, users no longer need to be experts in specific devices or systems. Simply knowing the names of the data you wish to view is enough. Users can seamlessly analyze and visualize their data using the diverse and powerful functions available in Microsoft Excel.

## Pascal2

**P**ascal2 is an artificial intelligence model designed exclusively for the Data Service Platform.

It is an advanced monitoring system equipped with a built-in SGDEngine that enables real-time machine learning training and anomaly detection.

PASCAL2 delivers exceptional performance in the domains of industrial control, data analysis, and anomaly detection. The system provides real-time data processing, on-the-fly model training, and highly flexible scalability — all seamlessly integrated with the Data Service Platform.

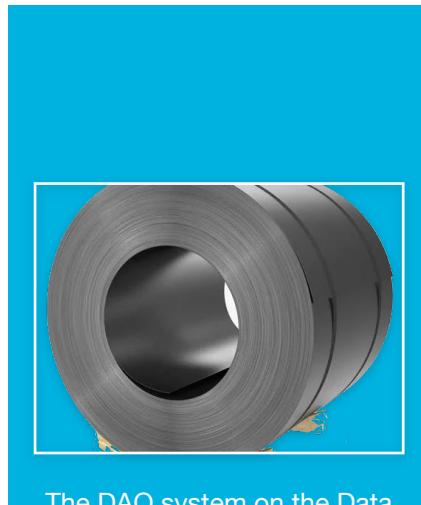
Unlike conventional traditional control systems, PASCAL2 incorporates a lightweight ML engine based on SGD (Stochastic Gradient Descent), enabling efficient operation even in edge computing environments. It realizes stable and intelligent monitoring directly at your industrial site.

Compared to existing AI systems, PASCAL2 eliminates the need for graphics cards, significantly minimizing deployment costs. It can operate on a wide range of hardware platforms—from embedded devices to enterprise servers. In particular, by utilizing real-time data supplied from the Data Service Platform directly as training data, it removes the need for a separate database system.

## Xgate

**X**gate is an interface that connects the Data Service Platform with external systems that do not natively support the required environments of the platform.

It offers two types of communication protocols: TCP/IP raw socket and WebSocket. External systems seeking to integrate data services from the Data Service Platform can easily utilize these interfaces.



The DAQ system on the Data Service Platform was tested and successfully deployed at POSCO.



Video Distribution System

---

Video data from CCTVs is integrated into the Data Service Platform and transferred to the designated monitoring staff. The system utilizes user-defined surveillance scenarios, which can be programmed online, to efficiently distribute video streams to monitoring personnel.

---

In addition, users can develop their own web servers to display data in real time via Xgate's WebSocket support. For local network applications, the TCP/IP socket interface provided by Xgate offers a reliable and efficient solution.

## Xopcuia

**X**opcuia is an OPCUA gateway embedded within the Data Service Platform. OPCUA is the standard interface for communication between industrial devices and SCADA systems.

The Data Service Platform integrates data from both OPCUA-compliant devices and non-OPCUA devices within the user's system, and delivers this unified data to IT systems via the OPCUA interface.

With Xopcuia, the scalability and interoperability of the Data Service Platform are virtually limitless.

## Gateway

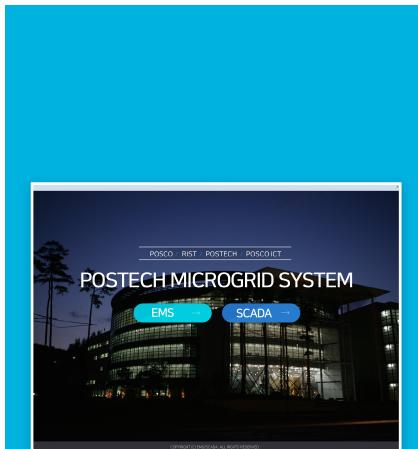
**T**he Gateway acts as a bridge between different networks, and reducing network load on the Data Service Platform. As the number of IT terminals connected to the Data Service Platform increases, network load will also increase. The Gateway helps protect the Data Service Platform from uncontrollable network traffic.

## C-Alarm

**C**-Alarm is an alarm server enhanced with an anomaly detection algorithm. Unlike conventional alarm systems, which may trigger alarms even when normal signals are momentarily overlaid with surges, C-Alarm is designed to minimize false alarms. Frequent and persistent false alarms caused by such noise can make alarm system maintenance difficult and may even disrupt production planning.

C-Alarm analyzes the waveform of incoming signals in real time. It only triggers an alarm when the signal deviates from the expected normal waveform—such as when noise like a surge is superimposed—thus ensuring higher reliability.

The system supports XOPCUA, allowing external systems to build customized C-Alarm clients using alarm configuration



Micro Grid System

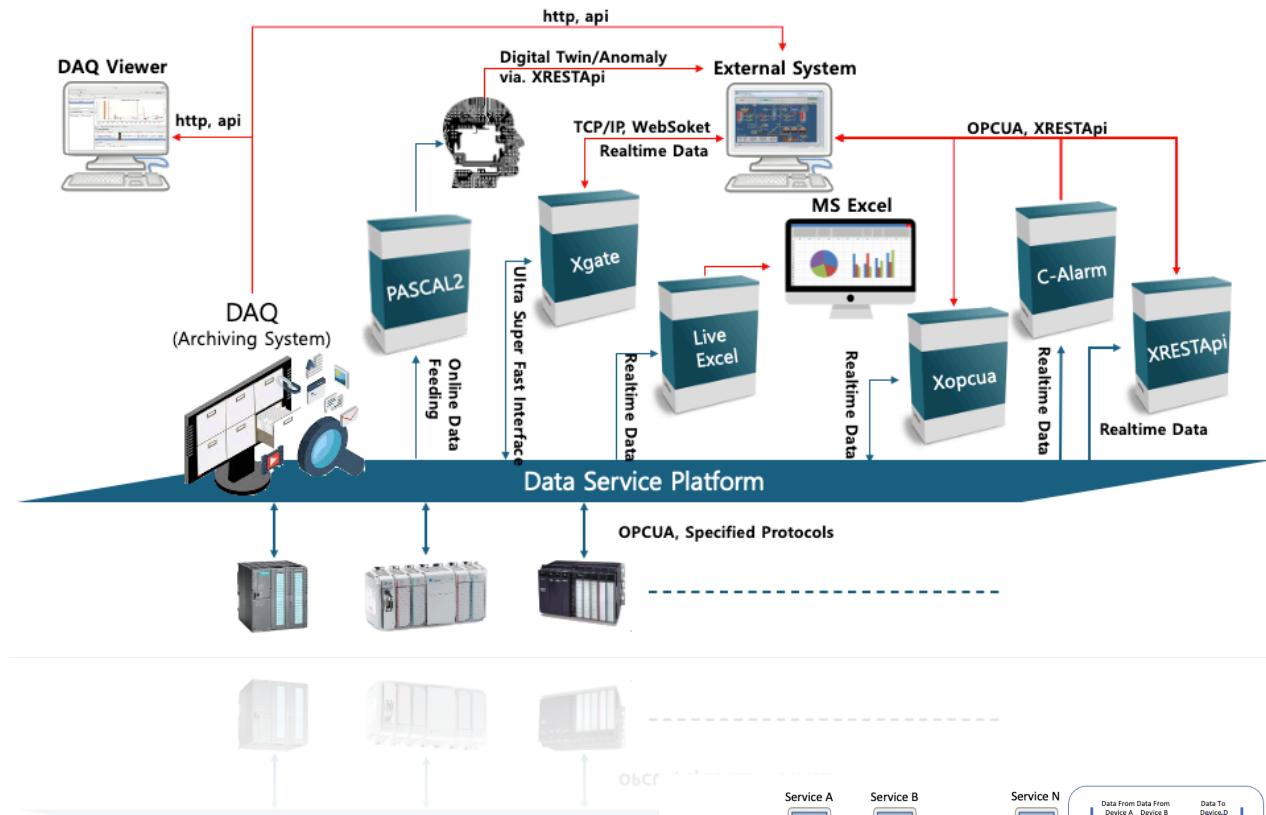
The Micro Grid System was built on the Data Service Platform. It provides DAQ performance faster than 3 MHz for data archiving and offers an easy way to connect field devices.

## XRESTApi

**X** RESTApi enables seamless interfacing with real-time data residing within the Data Service Platform. It allows any external system—regardless of its type—to effortlessly access and retrieve live system data with ease and speed.



# SYSTEM LAYOUT



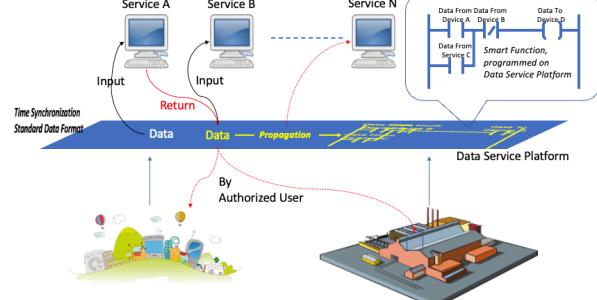
## System Layout

**D**ata Service Platform is designed to seamlessly integrate all devices across every system level, regardless of device type or interface protocol—provided the protocol is open.

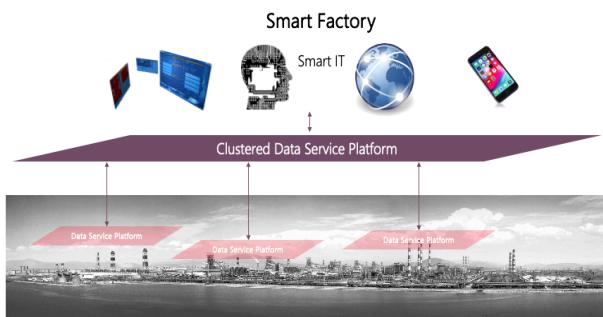
This means the Data Service Platform can transform factories and cities into unified virtual systems, enabling the realization of Smart Factories and Smart Cities.

The platform also empowers third-party IT service providers to develop front-end services by offering multiple interface options, such as TCP/IP raw sockets, WebSockets, and well-known industrial protocols like Modbus-TCP and OPC UA.

A key feature of the Data Service Platform is its ability to program, link, and process data from various devices within integrated engineering tools, even when the data originates from different systems.



Additionally, the Data Service Platform can be modularized into smaller units and clustered via gateways, enabling the integration of distributed systems into a single, cohesive virtual machine. This architecture allows data to travel seamlessly across distributed platforms, providing scalable and flexible system expansion.



# SOFTDCS

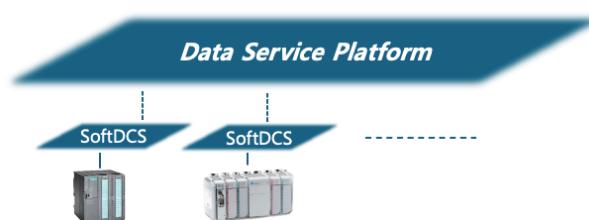
## SoftDCS

**S**oftDCS is the core module for building the Data Service Platform. It operates like a traditional Distributed Control System (DCS), but is entirely software-based. As a result, SoftDCS can be implemented on a wide range of hardware—from embedded devices like Raspberry Pi to enterprise-grade server computers.

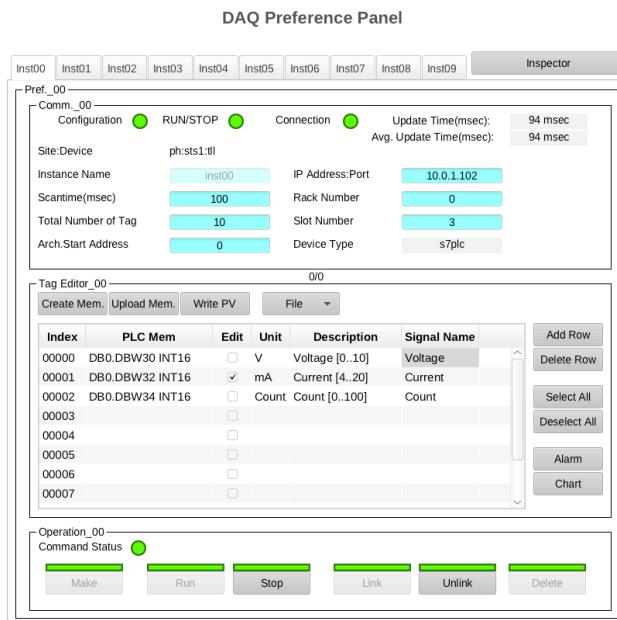
SoftDCS supports a feature called Composite Alarm for each tag. It allows you to create virtual alarms by combining multiple tags and executing user-defined functions. These functions can be configured manually online or through predefined settings.

### SPECIFICATIONS

- Communication with devices.
- Data Reading: Default
- Data Writing: Engineering Option
- Printing time stamp on each data when updated.
- Scan Algorithm: Event-Driven , Polling
  - Polling Interval(msec): 20, 50,100, 500,1000
  - Order based Polling Interval: up to microsecond.
- Tag Capacity:
  - Supported : 500 tags per instance, 10 instances per device
- Data Type:
  - Default: Binary, Analog
  - Additional: String, Array
- Alarm:
  - Binary Data: On/Off
- Analog Alarm: HH, HI,LO,LL
- Composite Alarm: supported
- Data Properties:
  - Programmable
  - Alarms
  - Calculation
  - Data Link
  - Timestamp
- Engineering:
  - Language: FBD, Text
  - Via provided commands and HMI online
- Monitoring Tools: Console Commands, HMI
- Supported Well-Known Protocol:
  - S7 Profinet
  - AB Controllogix EtherIP
  - Melsec(A, Q/L, iQ-R Series)
  - MicrexSx Series
  - Modbus TCP
  - OPCUA
  - BACNetIP
  - LS(XGT, GLOFA Series)
  - Omron

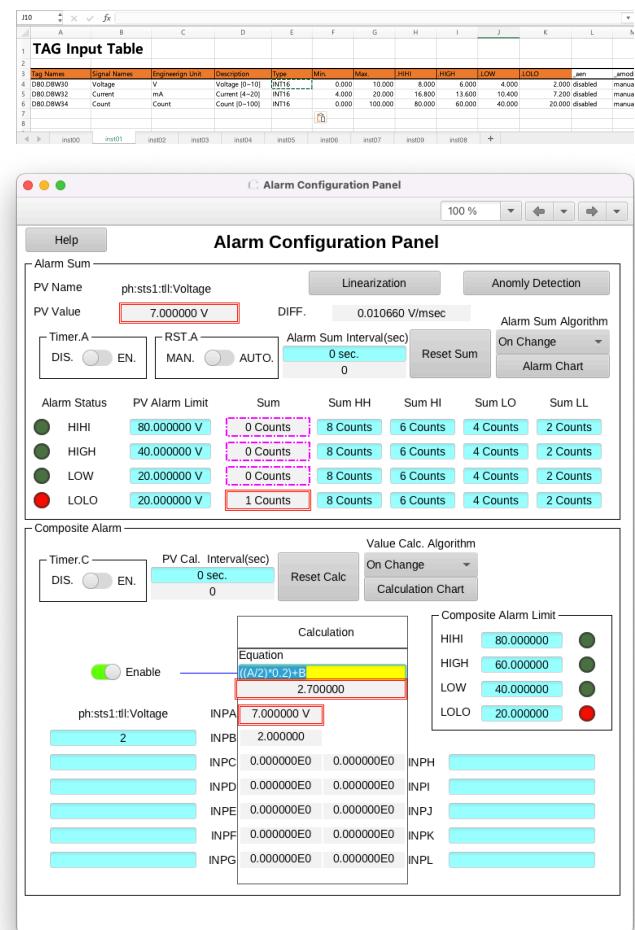


# SOFTDCS



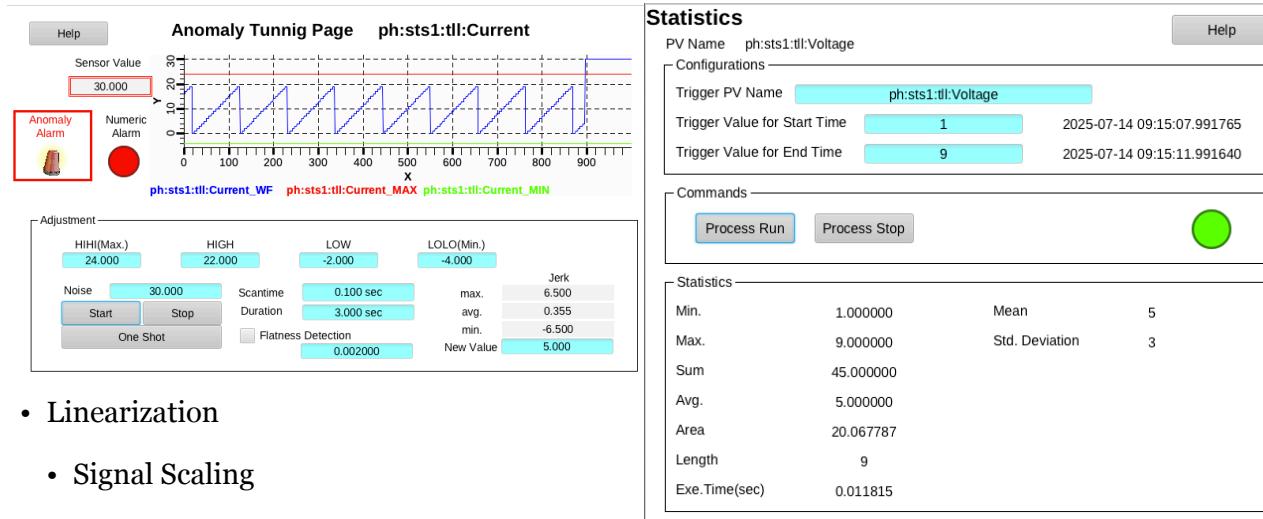
- Unsupported Protocols:
  - Interface development possible if protocol specification is provided in raw format
- Operating Environments:
  - OS: Linux, Mac OSX
  - HMI & Debugging: Cross-Platform (including Microsoft Windows)
- Preference Panel:
  - Excel Interface support
  - Device connection configuration panel
  - Tag editor support
  - Alarm configuration panel (Tag & Composite Alarm)
  - Upload/download tag and alarm configurations to/from SoftDCS
  - Link/unlink tags to DAQ for data archiving (DAQ required)
  - SoftDCS run/stop control

- SoftDCS creation/deletion
- Simple Chart for daily maintenance(DAQ required)
- Analysis Chart(DAQ required)
- Diagnosis information(DAQ required)



- Anomaly Detection (DAQ Required)
  - Pattern Detection
  - Flatness Detection
  - Save Anomaly Pattern

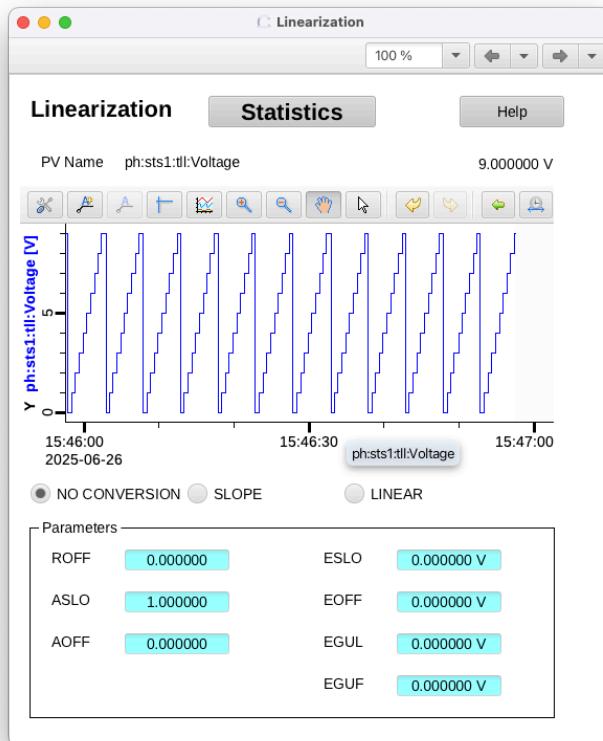
# SOFTDCS



- Linearization
  - Signal Scaling
  - Linearization

- Number of Data, Execution Time
- Enable/Disable individual tag.

- Event Forwarding
  - Forwarding Tag Event
  - Fanout: 8



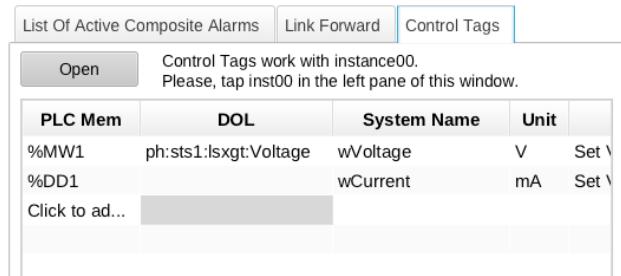
## Forward Link

Forward Link	
Link 01	cnix:get.PROC
Link 02	0
Link 03	0
Link 04	0
Link 05	0
Link 06	0
Link 07	0
Link 08	0

- Statistics (DAQ Required)
  - Triggered Statistics
    - Event Trigger
    - Min, Max, Sum, Avg, Area, Mean, Standard Deviation

- Configurable Output Tag
  - User Configurable
    - Manual Setting Output Tag
    - Automatic Output Tag Using Event Forwarding

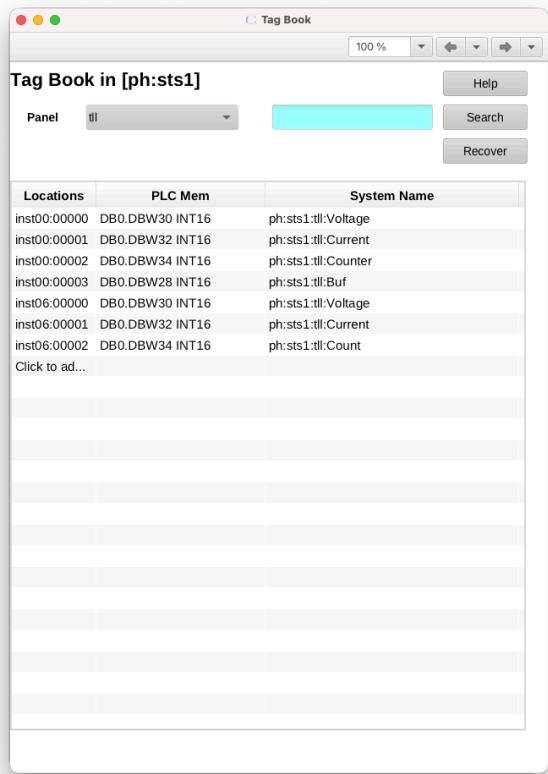
# SOFTDCS



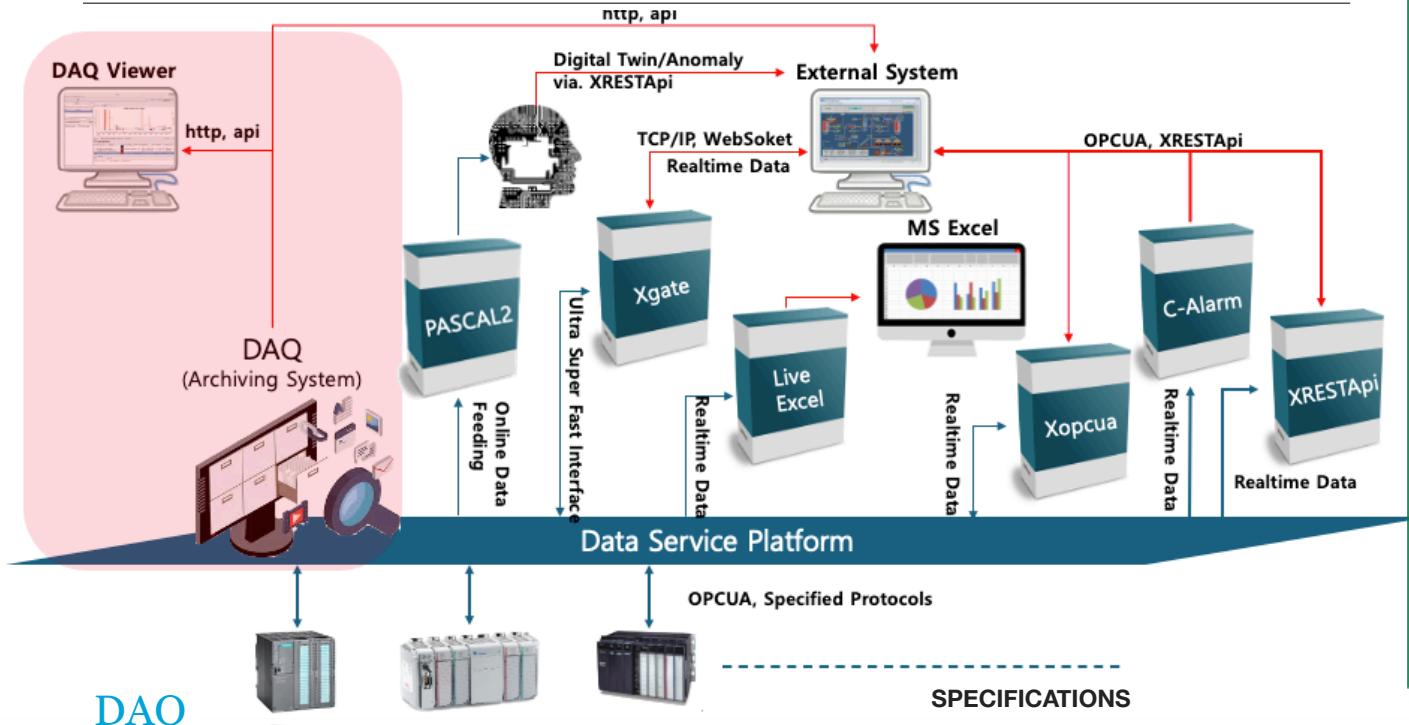
- Dynamic Alarm Configuration
  - Dynamically set tag alarm values using the event forwarding and output tag configuration functions.
- User Control Logging Function
  - When data is written to a tag by SoftDCS or an external system, information such as the host computer's IP address, hostname,

username, and data values are recorded in the log system.

- OS: Linux required.
- Tag Book Service
  - Retrieve all user-defined tag information in a single view.



# DAQ



**D**AQ is a high-performance Data Acquisition System that records defined data, including metadata such as timestamps and alarm severity, at ultra-fast speeds in the time domain.

The DAQ system provides an advanced data viewer. It includes a Trend Chart for multi-channel data insights and a Data Browser for detailed analysis. The charts support a variety of mathematical and statistical functions, allowing users to view basic statistical results such as average, minimum, maximum, and standard deviation values.

Additionally, the system supports exporting multiple datasets as CSV files via the data viewer or web interface. This enables users to analyze data on various platforms and easily share archived data with others.

When required, archived data in the DAQ system can be shared online via HTTP protocol in JSON format. This allows external systems, such as artificial intelligence platforms, to access the data for machine learning and other automated processes without interruption.

## SPECIFICATIONS

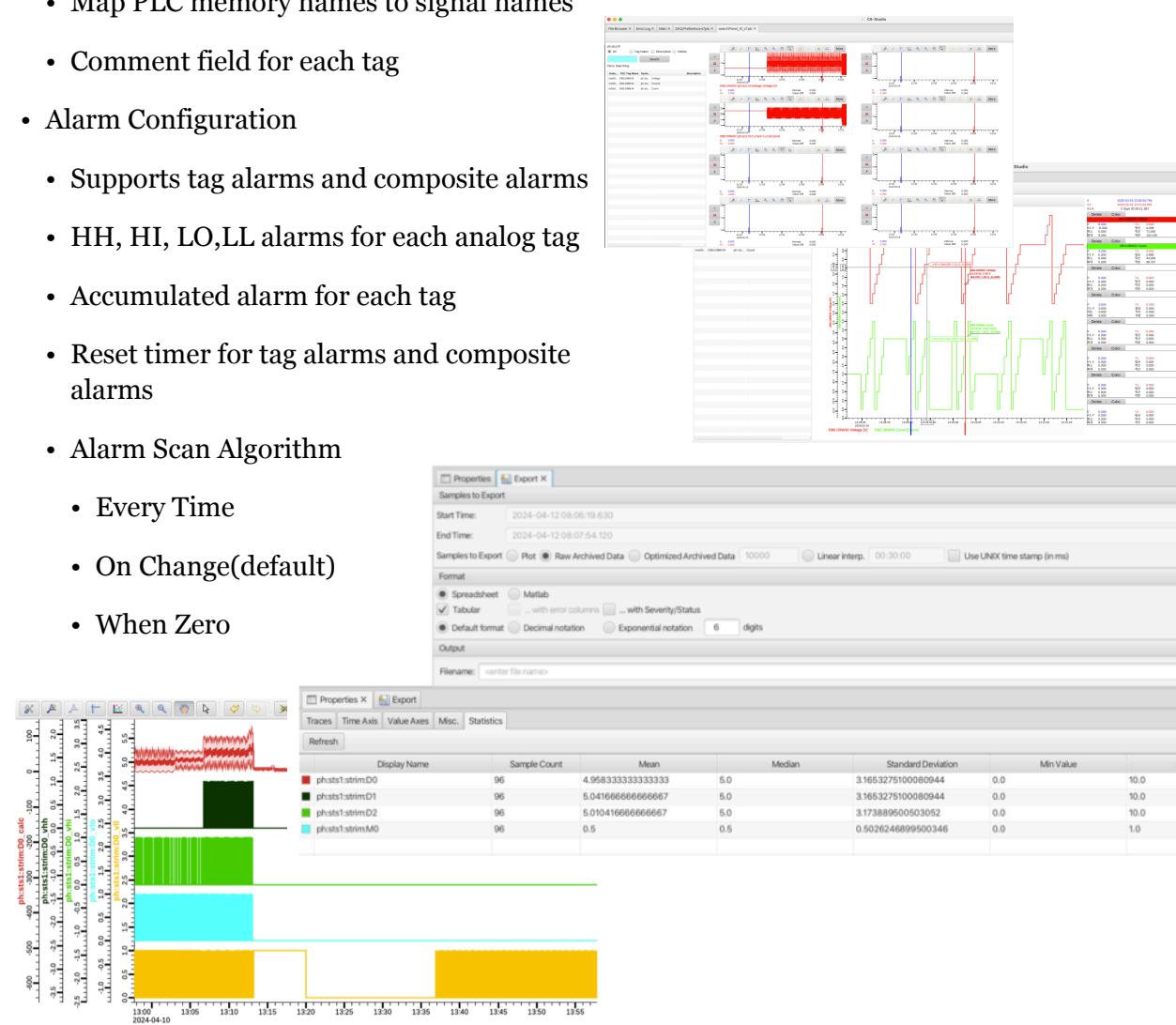
- Performance: faster than MHz.
- Meta Data: Value, Timestamp, Alarm Severity
- Time Resolution: Nanosecond precision
- Archiving Algorithm: Event-based, Polling, Trigger-based
- Tag Editing:
  - Editable in online mode
  - Manual and Auto editing supported
- Web Interface (Default):
  - Tag adding, editing, deletion
  - Chart View
  - Data download (CSV format)
  - Diagnostic statistics
- Supports URLs and API for external systems
- Custom HMI (Free):
  - Tag adding, editing, deletion
  - Chart View
  - Data download (CSV format)
  - Diagnostic statistics

# DAQ

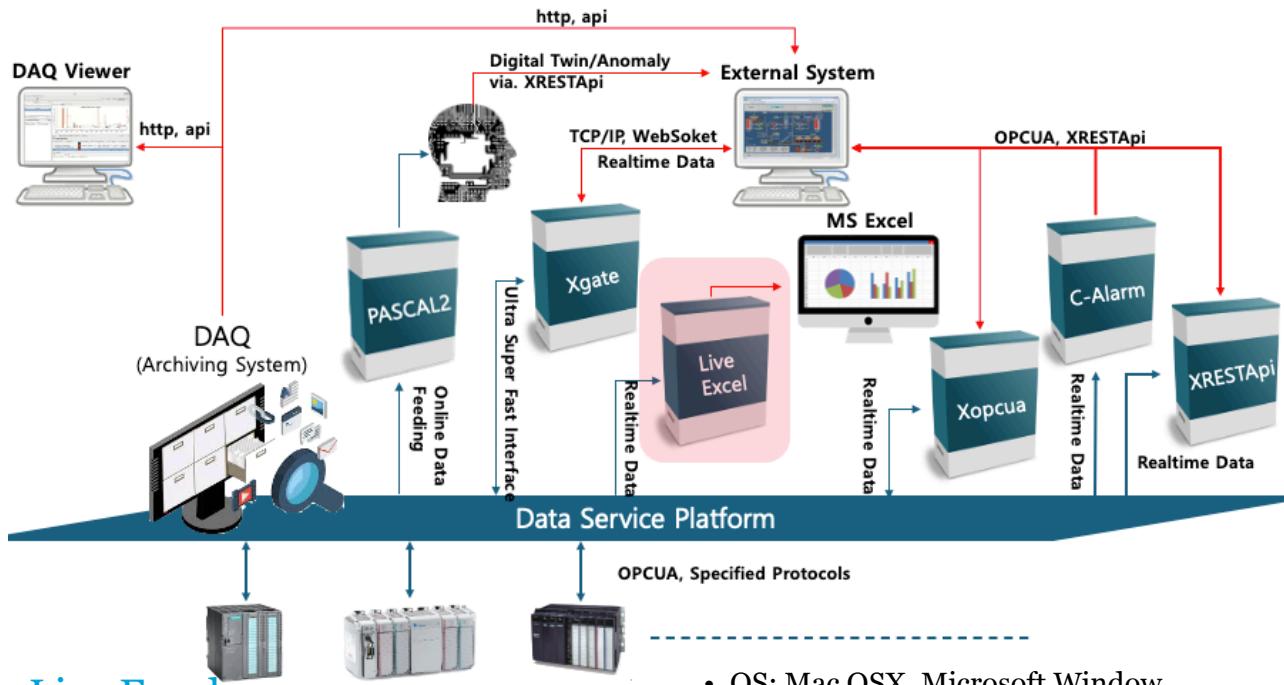
- Data processing using provided functions
- Chart Zoom In/Out
- Annotation support
- X-Y axis scrolling
- Data export in Microsoft Excel-compatible format (CSV)
- Statistics display
- Tag search by name, description, and all fields
- Time axis ruler for precise data analysis
- Tag Configuration
  - Map PLC memory names to signal names
  - Comment field for each tag
- Alarm Configuration
  - Supports tag alarms and composite alarms
  - HH, HI, LO, LL alarms for each analog tag
  - Accumulated alarm for each tag
  - Reset timer for tag alarms and composite alarms
- Alarm Scan Algorithm
  - Every Time
  - On Change(default)
  - When Zero
- When Non-zero
- Transition to Zero
- Transition to None-Zero

• Operating Environments:

- OS: Linux
- Memory: 128GB (256GB recommended)
- SSD: 256GB (512GB recommended) for short-term storage
- HDD: 1TB or more for long-term storage
- Web and Custom HMI: Cross-Platform, including Microsoft Windows



# LIVE EXCEL



## Live Excel

**L**ive Excel is a software interface for Microsoft Excel that allows users to read real-time values from devices and retrieve archived data from the DAQ system for analysis.

Microsoft Excel is an ideal tool for data monitoring and analysis, as it can easily read structured text files and offers a wide range of built-in functions for data processing and visualization.

Live Excel also supports free-format Excel sheets, enabling users to automate office tasks. Combined with management strategies and Excel formulas, users can predict events such as product delivery schedules and improve workflow efficiency.

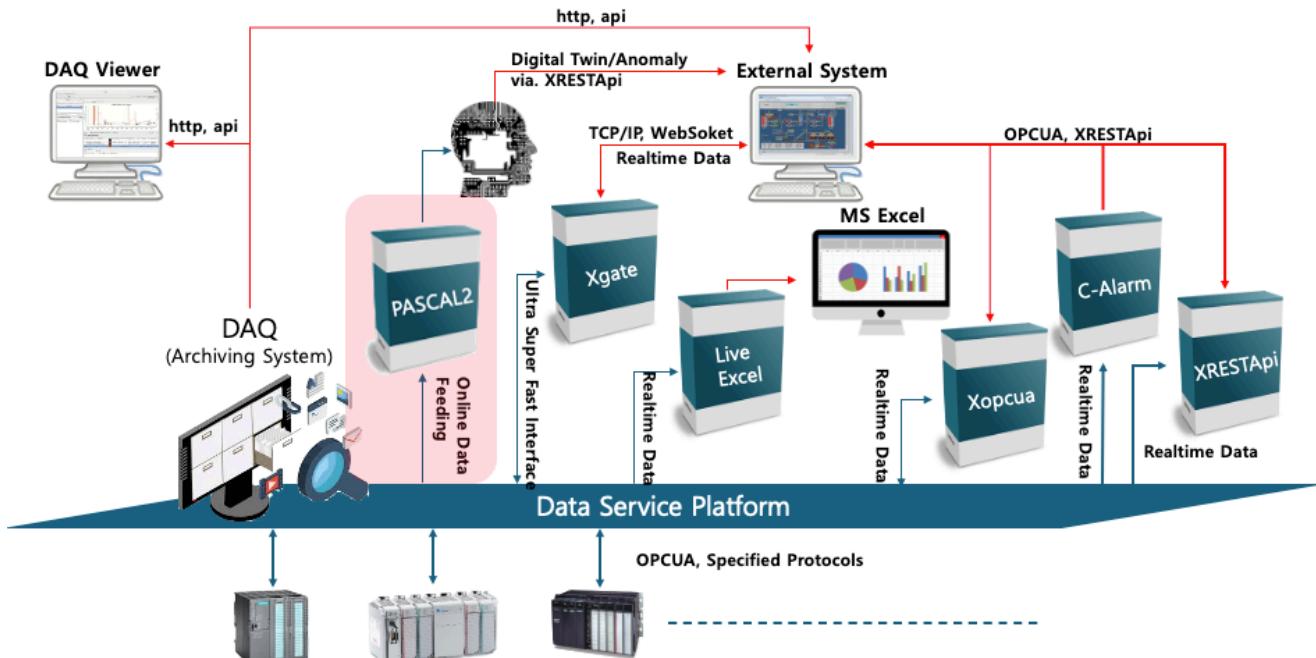
Anyone familiar with Excel and data naming conventions can use Live Excel to monitor and diagnose manufacturing devices with ease.

Live Excel simplifies your work.

## SPECIFICATION

- Operating Environments:

# PASCAL 2



## Pascal2

Pascal2 is an artificial intelligence model designed exclusively for the Data Service Platform.

It is an advanced monitoring system equipped with a built-in SGDEngine that enables real-time machine learning training and anomaly detection.

PASCAL2 delivers exceptional performance in the domains of industrial control, data analysis, and anomaly detection. The system provides real-time data processing, on-the-fly model training, and highly flexible scalability – all seamlessly integrated with the Data Service Platform.

Unlike conventional traditional control systems, PASCAL2 incorporates a lightweight ML engine based on SGD (Stochastic Gradient Descent), enabling efficient operation even in edge computing environments. It realizes stable and intelligent monitoring directly at your industrial site.

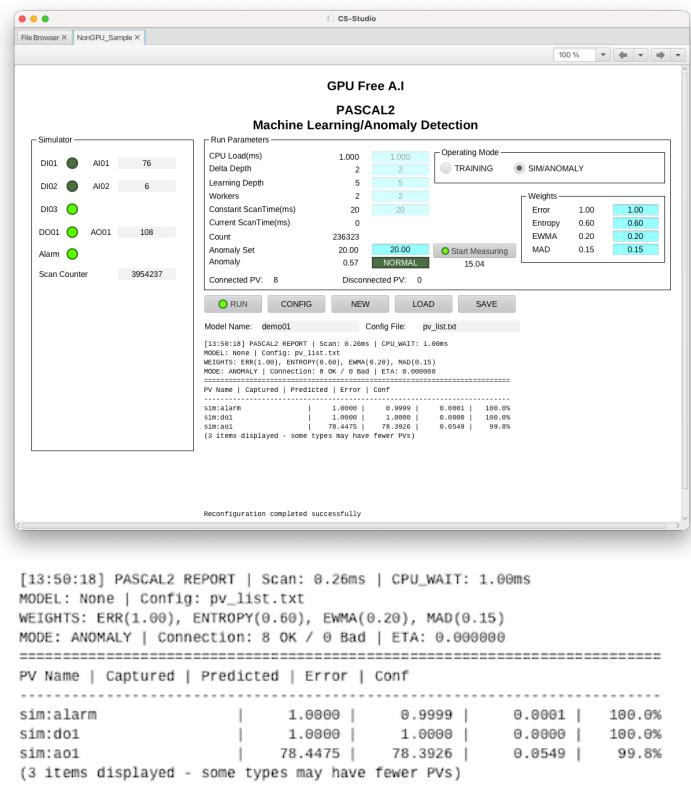
Compared to existing AI systems, PASCAL2 eliminates the need for graphics cards, significantly minimizing deployment costs. It

can operate on a wide range of hardware platforms—from embedded devices to enterprise servers. In particular, by utilizing real-time data supplied from the Data Service Platform directly as training data, it removes the need for a separate database system.

### SPECIFICATION

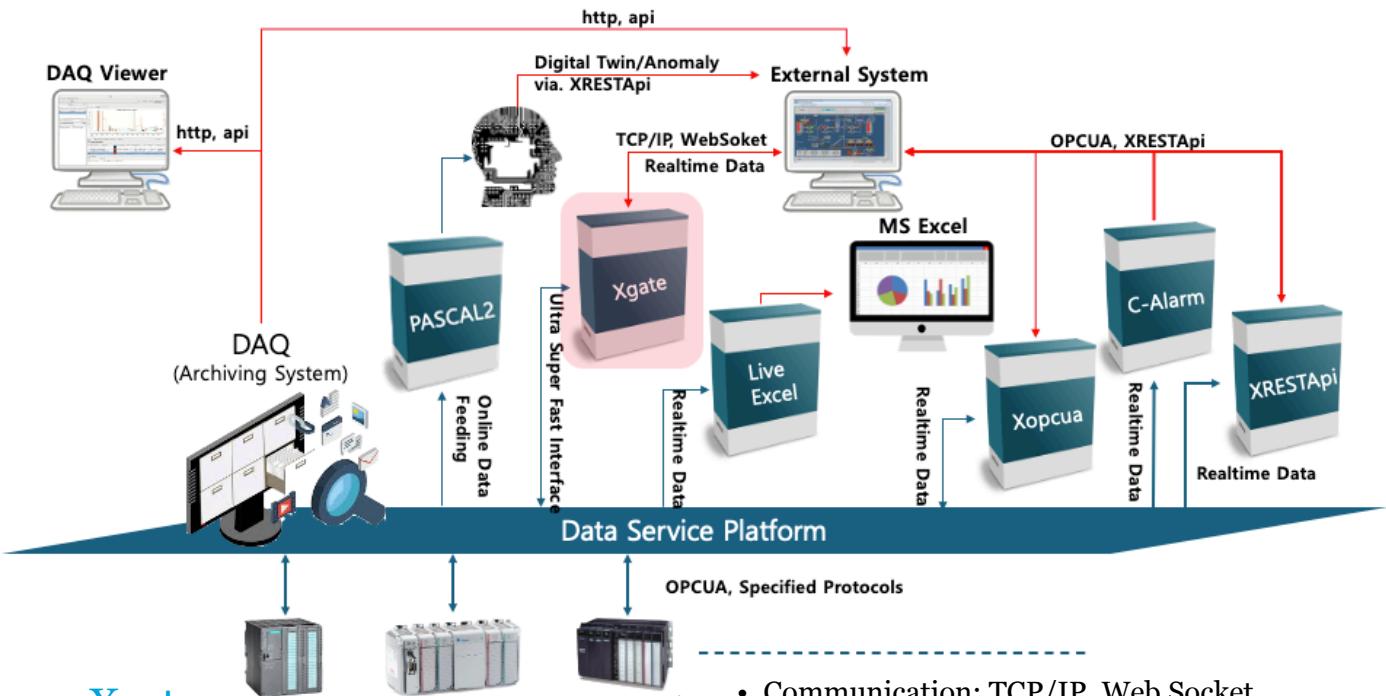
- Operating Environments:
  - Hardware: Intel CPU i5 or higher, multi-core CPU (or compatible multi-core processors)
  - Operating System: Debian Linux
  - Required: Data Service Platform
- Real-time Data Acquisition & Processing
  - Maximum: 10,000 Tags
  - Time-series data change tracking
  - Input data normalization and statistical update
- Machine Learning-based Training & Prediction

- Online SGD training supported via SGDEngine → Learning rate decay, L2 regularization, type-specific optimization (DO / DI / AO / AI)
- Parallel processing with OpenMP support → significantly improved training/inference speed for large-scale models (up to 128 models simultaneously)
- Prediction error calculation + anomaly detection based on EWMA (Exponential Weighted Moving Average) and MAD
- Multi-model operation supported
- Adaptive to seasonal pattern changes
- Anomaly Detection & Alarm System
  - Multi-metric anomaly score calculation combining: Error-norm, Entropy, EWMA, MAD (Median Absolute Deviation) with weighted integration
  - Alarm activation and log storage when threshold is exceeded
  - Long-term data pattern analysis using RollingBlock (rolling statistics)
- Model Management & Scalability
  - Model save / load functionality
  - Multi-instance management (multi-core support)
  - Multiprocessing workers + shared memory for high-speed processing
  - CPU wait-time control and update-rate fine-tuning
- Training & Inference Performance
  - 10 features:  $\leq 1$  ms
  - 100 features:  $\approx 1$  ms
  - 1,000 features:  $\approx 20$  ms
- Supported Interfaces
  - External sharing of system variables to support customer-developed custom UI



- XRestApi

# XGATE



## Xgate

Xgate is a lightweight message relay software designed for external systems that do not natively support the Data Service Platform environment. Despite its simplicity, Xgate includes all the essential functions required to communicate with the Data Service Platform.

Within the Data Service Platform, data is transmitted at high speeds using an efficient interface protocol that external systems cannot access directly. However, by using Xgate, external systems can leverage the high efficiency of the Data Service Platform interface.

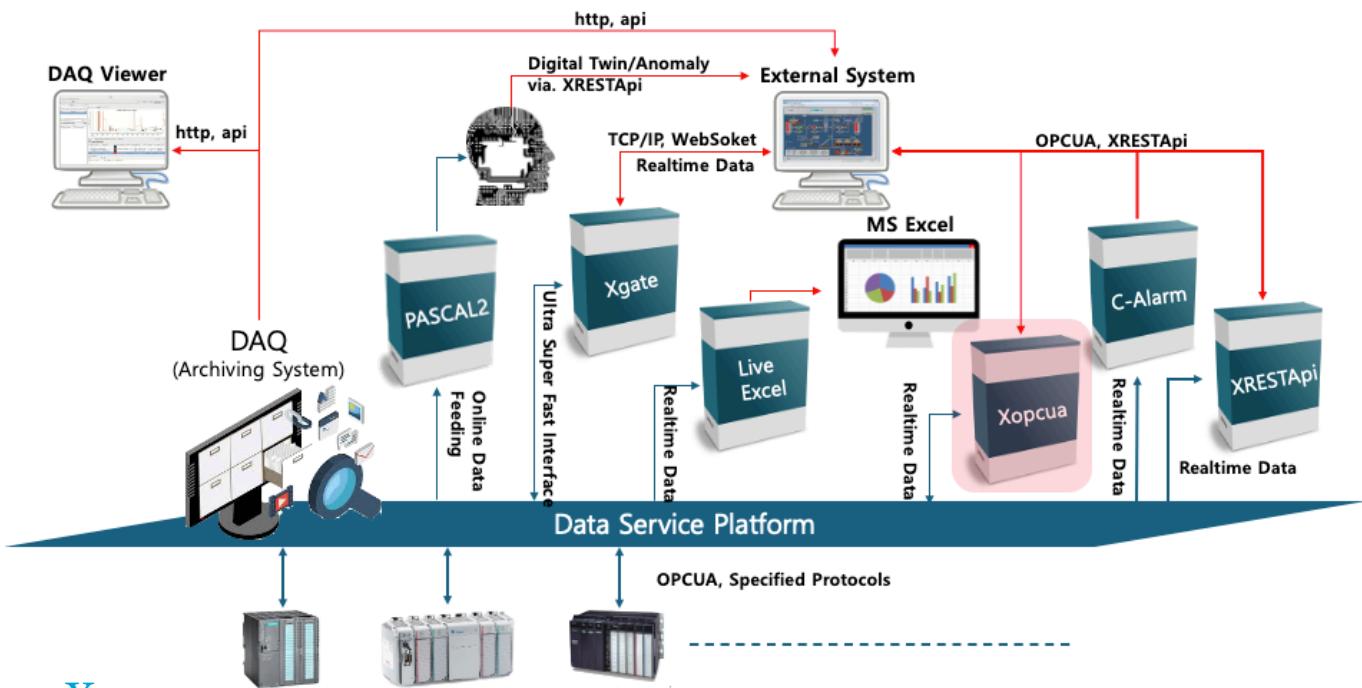
Xgate also provides a WebSocket interface, enabling users to easily develop their own web services for Smart Factory and Smart City applications.

### SPECIFICATIONS

- Operating Environments:
  - OS: Linux, Mac OSX
  - Message Structure: Json Data Format

- Communication: TCP/IP, Web Socket
- Data Type: Scalar, Array
- Functions:
  - Read Data Information
  - Read Data Values
  - Write New Values
  - Monitor Events

# XOPCUA



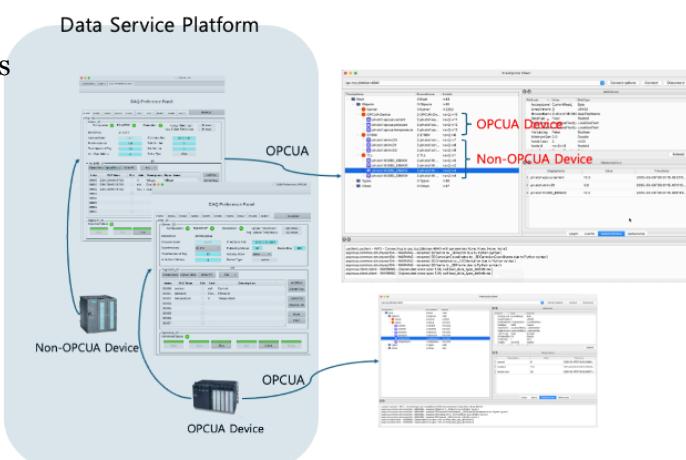
## Xopcuia

Xopcuia is a communication module of the Data Service Platform that connects to devices and IT systems supporting the OPC UA (Open Platform Communications Unified Architecture) interface.

As the OPC UA interface becomes increasingly popular in the industrial sector, the Data Service Platform has integrated it as a dedicated module. This expands the platform's compatibility and extends its coverage to a wider range of devices and systems.

If field devices support the OPC UA interface, the Data Service Platform can seamlessly connect to them. Likewise, if IT systems support OPC UA, the Data Service Platform can deliver all connected data directly via OPCUA to them.

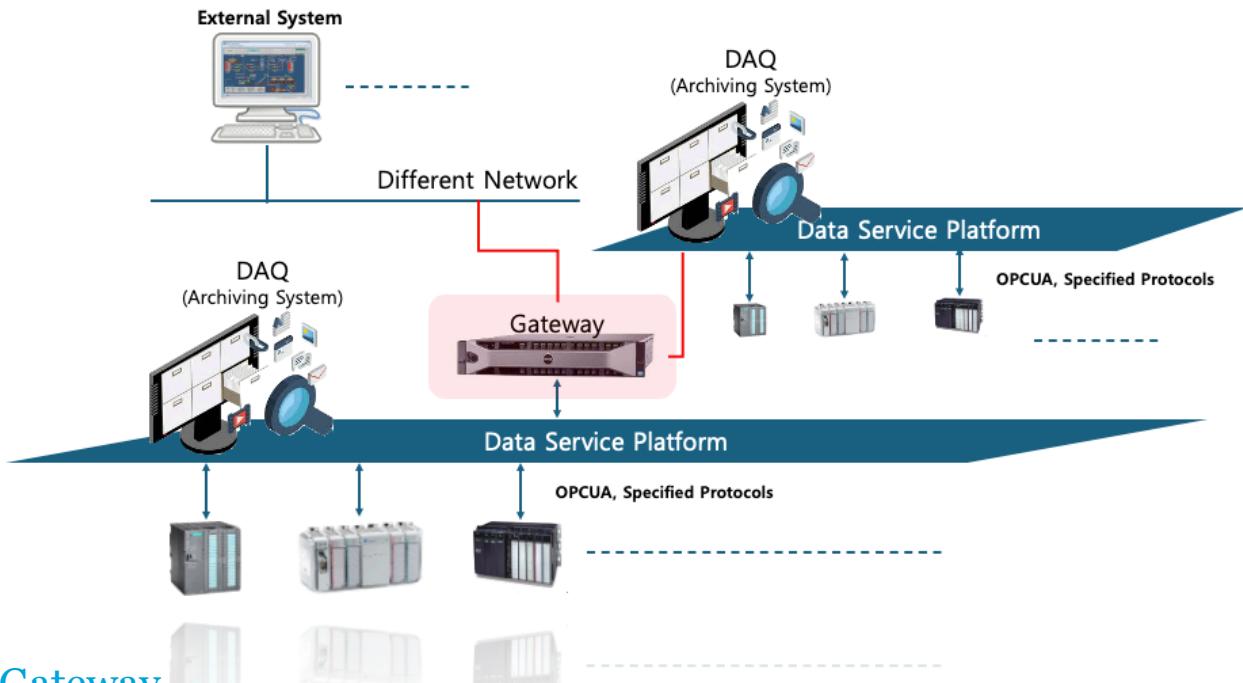
- Server: XML configuration.
- Client: SoftDCS configuration.



## SPECIFICATIONS

- Operating Environments:
  - OS: Linux, Mac OSX
- Configuration:

# GATEWAY



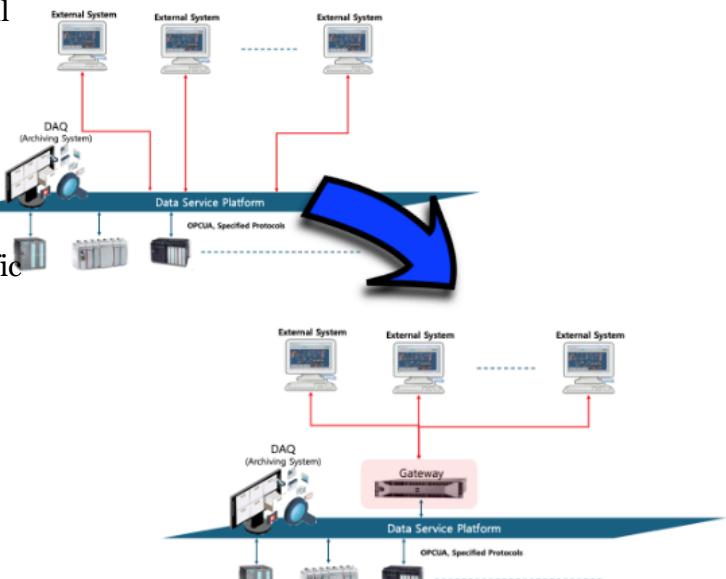
## Gateway

Gateway is a dedicated software solution for the Data Service Platform that connects different networks and manages network traffic, preventing potential issues that could impact on system performance.

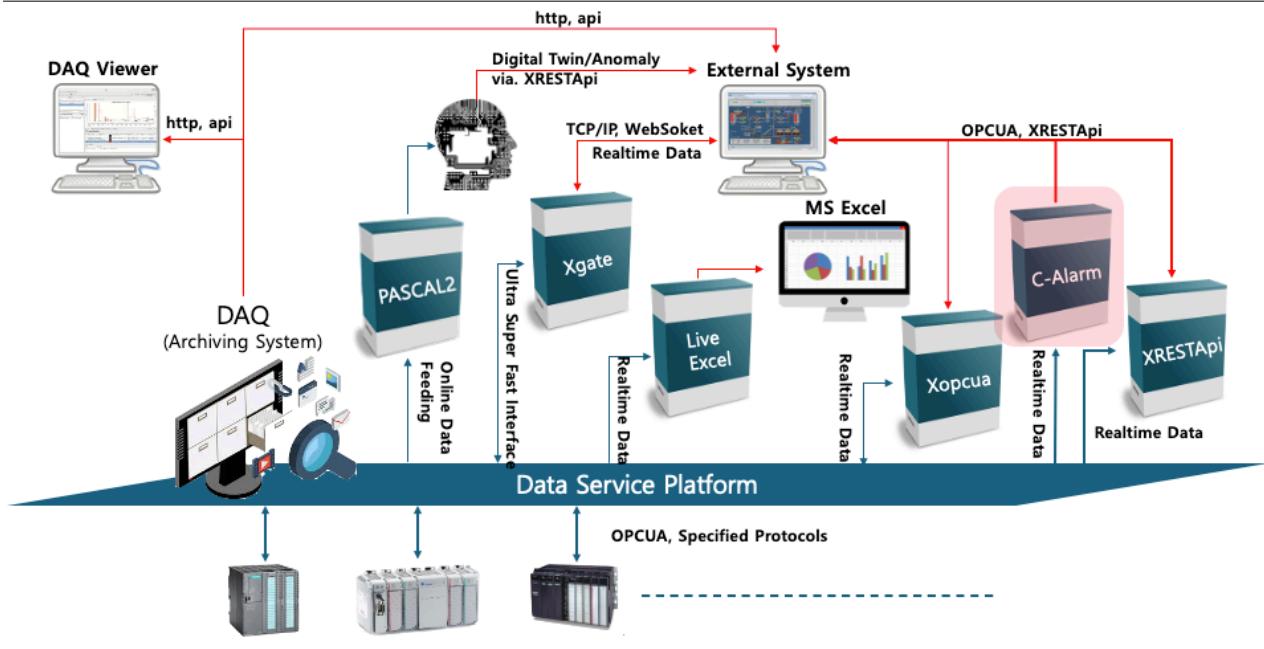
It allows the Data Service Platform to scale without limitations by efficiently managing network connections. Gateway also protects the system from uncontrollable network traffic by sharing a single data connection with multiple clients, ensuring stable and reliable performance.

### SPECIFICATIONS

- Operating Environments:
  - OS: Linux, Mac OSX
  - NIC: more than 2
- Security
  - Access control based on username and data name patterns
  - Write control based on username and data name patterns



# C-ALARM



## C-Alarm

**C**-Alarm is Cnix's alarm system powered by an advanced anomaly detection algorithm. It filters out sudden surges and generates alarms only when anomalies may potentially affect equipment, thereby minimizing impact on both machinery and production processes.

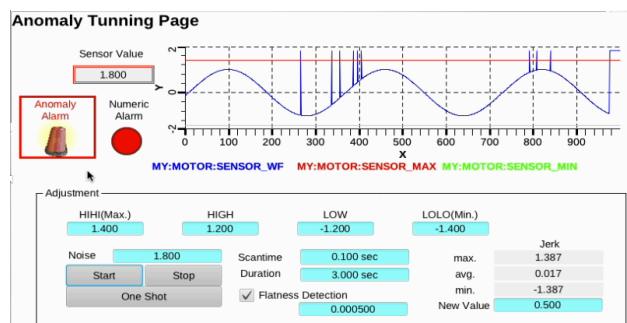
C-Alarm can be integrated with a DAQ system to store and retrieve waveform data associated with alarms. For external system interfacing, it also supports XOPCUA, enabling seamless connectivity and data exchange.

### SPECIFICATIONS

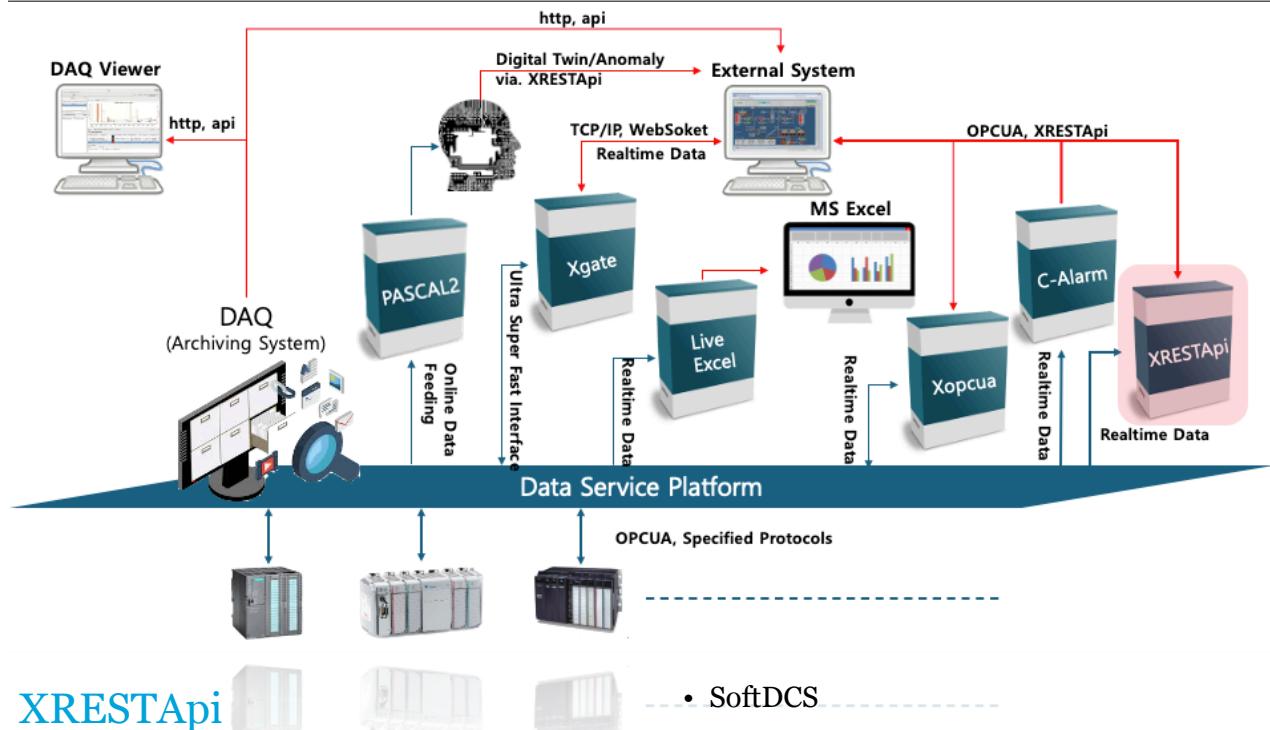
- C-Alarm Server Operating Environment:
  - OS: Linux
  - Memory: 64GB +
  - NIC: Minimum 2 required
  - Requirement: SoftDCS
- C-Alarm Client Operating Environment (*Optional*):
  - OS: Linux, Mac OSX, Windows

### • Interfaces (*Optional*):

- XOPCUA: OPCUA supported
- Data Storage System(*Optional*):
  - DAQ
- Supported Interface Signals
  - Target Signal, Analyzed Waveform, Scan time, Alarm Duration Time, Alarm Level(HIHI, HIGH, LOW, LOLO), Rate of change acceleration(Min., Max., Avg., Configuration), Flatness detection(Selectable, threshold-based), Anomaly Alarm



# XRESTAPI



## XRESTAPI

**X** RESTAPI is a web-based interface that enables external systems to read, write, and monitor real-time data available on the Data Service Platform.

It is an extremely useful interface when building web-based or cloud-based manufacturing environments, allowing dynamic access by data name to all data points across manufacturing equipment.

Through XRESTAPI, seamless data connectivity can be achieved between production sites and all-level systems.

### SPECIFICATIONS

- XRESTAPI Operating Environment:**
  - Operating System: Linux
  - Memory: 64GB +
  - NIC: minimum 2 required
- XRESTAPI Client Operating Environment:**
  - Operating System: Linux, Mac OSX, Window
- Required Component:**

