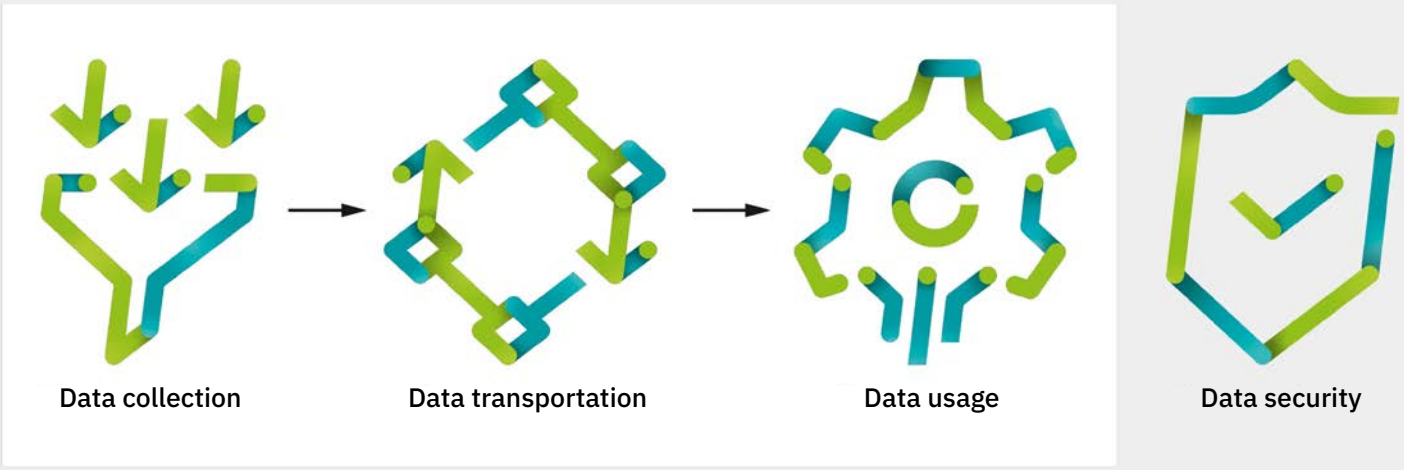


Lead image: The Digital Factory's smart data flow: From industrial data collection to reliable data transmission and intelligent data utilization.

IIoT framework for structured data aggregation and cross-system connectivity

Simplifying data acquisition and transmission

By Dario Bertoli and Thiemo Ludmann, both Solution Engineers at Phoenix Contact GmbH, Blomberg, Germany, and Noah Greene, Product Marketing Specialist – Automation, Phoenix Contact USA, Middletown, Pa.

Key takeaways:

- Connected production facilities need to make field data available at a central location almost instantly
- Phoenix Contact is integrating new connectors and the Telegraf app into its PLCnext Technology to open up new application possibilities
- This robust infrastructure supports monitoring, predictive maintenance, and other data-driven applications

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Introduction

As production facilities become increasingly digitized and networked, the need for a consistent, scalable, and robust data infrastructure is growing. In existing facilities, it is crucial to reliably retrieve information from various controllers, sensors, and field devices and make it centrally available.

Against this backdrop, Phoenix Contact is expanding its IIoT framework within the PLCnext Technology Ecosystem to include new connectors and the "Telegraf" app. This simplifies data acquisition and transmission between the field level and IT systems. As an OT/IT gateway, the IIoT framework serves as the connecting layer between automation components and higher-level IT systems. The gateway is designed to capture various measured values such as digital signals, analog process variables, or energy data.

This information is then consolidated in the Global Data Point Table (GDPT). There, all data points are converted into a uniform schema. For each data point, the device, name, value, unit, data type, and timestamp are stored, ensuring consistent and uniform data usage. A single system can process up to 1,000 data points, and this capacity can be expanded as needed. ■

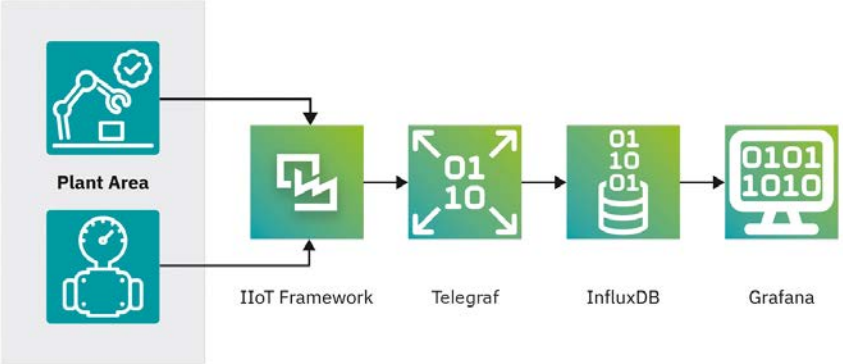


Figure 1: Seamless data flow from the system to the dashboard: capture, transmit, store, and visualize.

Data acquisition in distributed production environments

The development of an electronic device enclosure typically follows a structured process that begins with concept development and continues through prototyping, testing, and mass production. Each phase builds on the previous one. Early design choices can have a major impact on later manufacturing costs and complexity.

A key decision throughout this process is whether to build a fully custom enclosure or buy an existing enclosure platform. This make-versus-buy decision can influence speed-to-market, engineering workload, tooling investment, supply chain complexity, and long-term production costs.

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Figure 2: Numerous apps are available on the PLCnext Store digital marketplace.

Understanding these trade-offs early can help guide more efficient development and reduce risk as the product moves towards manufacturing.

Concept development

The harmonized data can be read directly via OPC UA, REST API, or gRPC, or forwarded to databases, cloud platforms, or visualization tools via the Telegraf service. Engineering effort remains minimal, because the local bus of the Axioline I/O system and the connected modules are automatically read.

The modules are then automatically assigned to the appropriate connectors. Configuration is performed entirely via a web visualization and is automatically saved in JSON files. This simplifies updates and backups. Thanks to the open architecture of the IIoT framework and the PLCnext Technology ecosystem, users can implement their own connectors in IEC 61131-3 if needed. Extensive prebuilt functions and blocks are available for this purpose, enabling straightforward implementation. ■

IIoT framework expansion with new connectors

With the new version 2025.0, the IIoT framework gains several additional connectors. The new S7_Comm connector enables direct communication with Siemens controllers from the S7-300, S7-400, S7-1200, and S7-1500 series. Various variables can be read directly from data blocks, regardless of their structure. Therefore, the S7_Comm connector is particularly suitable for modernization projects in which existing S7 controllers continue to be operated. Still, additional data must be provided for analysis, monitoring, or integration with IT systems. ■

Integration of multi-vendor controller landscapes

The new EtherNet/IP Adapter connector complements the IIoT framework, particularly for users with Rockwell or EtherNet/IP-based machines. The connector allows a PLCnext Control to be connected as an adapter to a scanner. Thanks to bit- and byte-precise mapping, even complex data structures can be accurately represented and transmitted. This results in a high degree of flexibility when integrating different machine architectures.

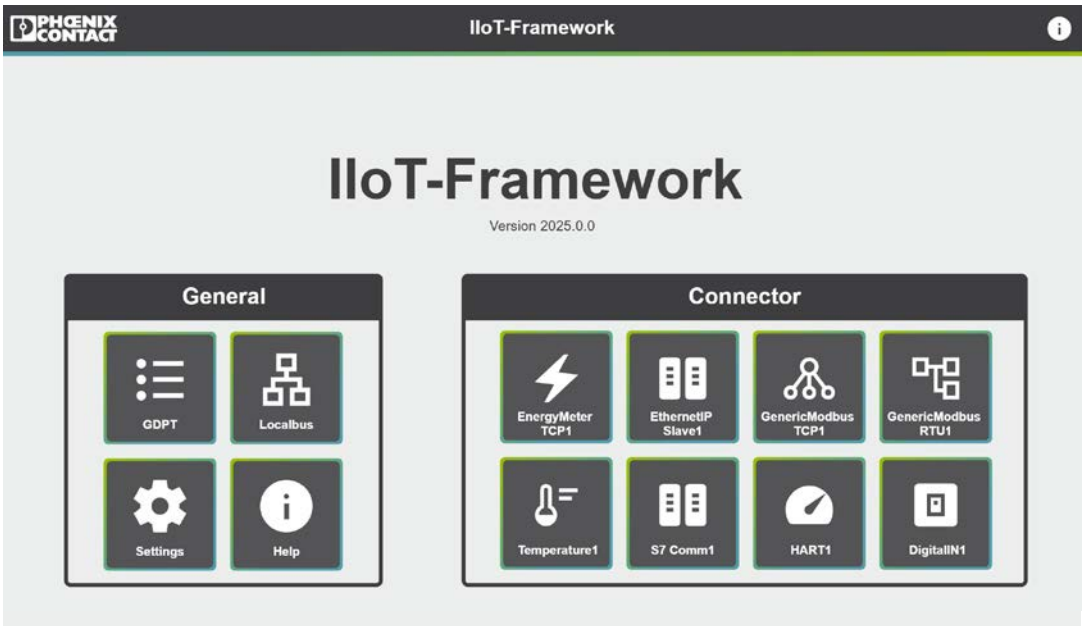


Figure 3: The connectors can be easily configured using the built-in web interface, without requiring any programming knowledge.

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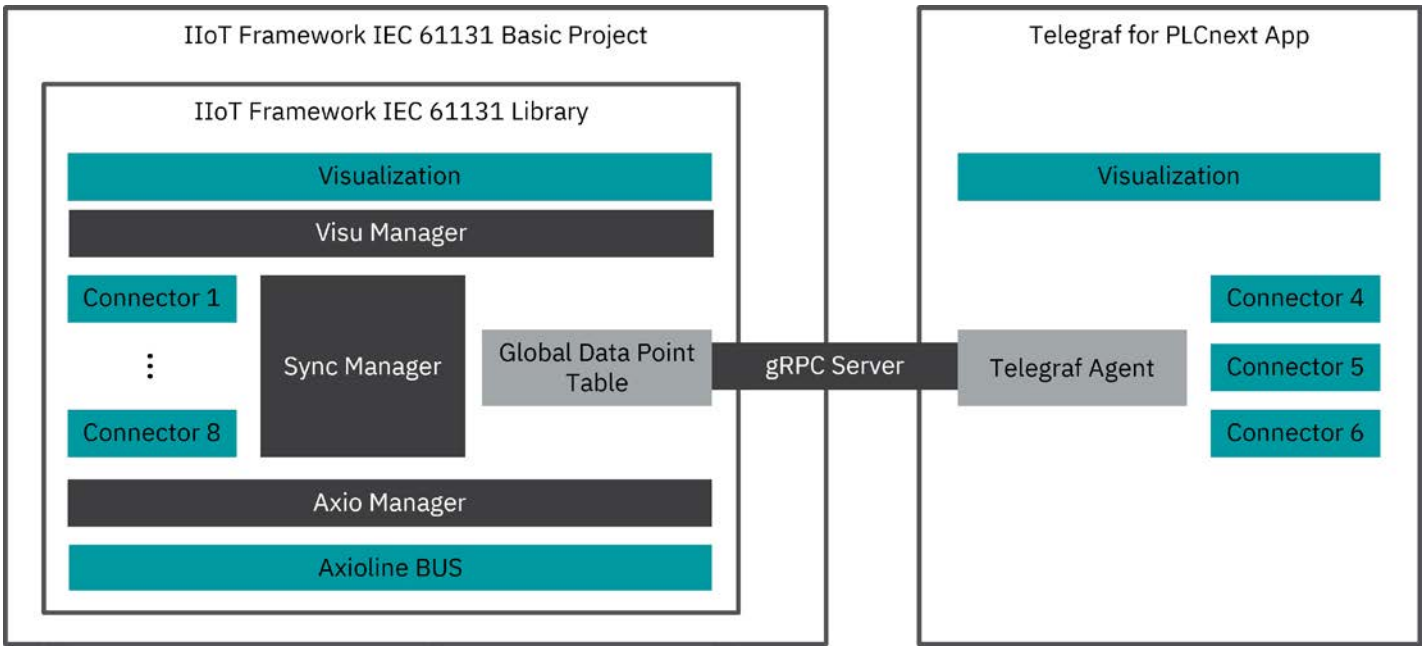


Figure 4: Architectural overview of the IIoT Framework with gRPC integration into a Telegraf app.

The generic Modbus connectors – “GenericModbus_TCP” and “GenericModbus_RTU” – expand the framework with a flexible option for retrieving data via Modbus/TCP or Modbus/RTU from a wide variety of devices. In this way, both simple sensors and complex field devices can be integrated into the network.

The “Temperature” connector directly captures temperature values from Pt100 and Pt1000 sensors. It supports two-, three-, and four-wire sensors, allowing the integration of different installation and wiring configurations. The new “HART” connector expands access to smart process sensors. It allows reading of analog-measured values as well as the sensors’ HART variables (PV, SV, TV, and QV). ■

IIoT framework and scalable data pipelines

With the Telegraf app, the PLCnext Technology ecosystem gains a resource-efficient data agent that integrates into industrial IT and OT architectures. With more than 200 available plug-ins, Telegraf is suitable for both simple machine connectivity and complex data pipelines. The tool is particularly effective on PLCnext Control controllers: raw data is buffered and preprocessed locally. This reduces the load on the controller and enables reliable forwarding of large volumes of data to IT systems or cloud services. ■

Edge data processing and visualization

The integration of IIoT apps from the PLCnext Store creates a consistent edge data platform: "InfluxDB" serves as a time-series database on the controller, "Grafana" enables visualizations without external infrastructure, and "MariaDB" supplements the system with relational data storage.

Together with the IIoT framework and the harmonized GDPT data structure, this creates a consistent, time-based data foundation. Telegraf extends this architecture with scalable data pipelines that aggregate and normalize data, making it available for monitoring tasks and machine learning processes such as anomaly detection or predictive maintenance. ■

IIoT framework for retrofit and brownfield integration

The new connectors in the IIoT framework enable a wide range of applications, particularly in brownfield environments. Existing S7 controllers, Modbus devices, and HART measurement points can be integrated into modern data landscapes without modifications to the control technology. This simplifies the retroactive implementation of energy monitoring, condition monitoring, and operational data collection. ■

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Data-driven optimization based on unified data models

Combined data sources, such as energy meters, HART sensor values, or temperature measurements, provide a unified basis for consumption analysis, peak load assessment, and condition monitoring of systems. The Telegraf app expands these capabilities with flexible data pipelines at the edge. It filters, buffers, and aggregates data, then forwards it via more than 200 plug-ins to local databases, visualizations, or cloud platforms. This creates a scalable, consistent database that supports monitoring concepts and enables data-driven optimization approaches.

With the new connectors and the integration of the Telegraf app, the IIoT framework evolves into a unified data platform that covers the entire path from field devices to IT and cloud systems. Different sensors, controllers, and measurement points can be connected, harmonized, and evaluated centrally with reduced effort. The standardized GDPT ensures a uniform data foundation, while Telegraf provides flexible data pipelines for storage, analysis, and visualization. This results in a robust infrastructure that supports monitoring tasks and data-driven applications, including predictive maintenance. ■

More information:

https://www.plcnextstore.com/permalinks/apps/latest/60002172000354

https://www.plcnextstore.com/permalinks/apps/latest/60002172000636

https://www.plcnextstore.com/permalinks/apps/latest/60002172000934[

About Phoenix Contact

Since 1923, Phoenix Contact has created products to connect, distribute, and control power and data flows. Our products are found in nearly all industrial markets. Sustainability and responsibility guide every action we take, and we are proud to collaborate with our customers to empower a smarter and better world for future generations. Together, we are creating a sustainable world based on our passion for technology and innovation.

For more information about Phoenix Contact or its products, visit **www.phoenixcontact.com**, call technical service at **800-322-3225**, or email **us-info@phoenixcontact.com**.



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