LITMUS

Buyer's Guide

SCADA Systems vs Industrial IoT Platforms

Setting the Right Foundation for Smart Manufacturing

S

IIoT

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SCADA systems and Industrial IoT platforms were developed at different times and for vastly different purposes. SCADA has been used for 50 years to monitor and control industrial equipment. Industrial IoT has matured over the past 10 years to connect to industrial equipment and harness data intelligence for learnings and predictions that improve operations.

Many manufacturers already have a SCADA system - they work well for their intended purpose. See a problem, fix it. Industrial IoT platforms go one crucial step further by sharing data intelligence across the business to enable change for productivity and efficiency gains. See a problem, analyze the data over time and learn how to predict and prevent it from happening.

While SCADA lives and breathes on the day-to-day plant floor, Industrial IoT shares data with OT, IT and data scientists who act on the data to make better decisions that improve manufacturing. This guide will compare the capabilities of SCADA systems versus IIoT platforms and explain how SCADA serves its purpose on the shop floor while an IIoT platform is essential to execute smart manufacturing.

What is a SCADA System

SCADA, or Supervisory Control and Data Acquisition systems, include both hardware and software used to monitor and control industrial processes locally or at remote locations. SCADA systems collect, process and display real-time production data, interact directly with devices such as sensors, valves and pumps through HMI software, and then record events into a log file.

HMI

Monitor and React to Real-Time Events

PLC / RTU

S

SCADA

Historian

Supervisory Control and Data Acquisition System

- **Control Industrial Processes**
- **Monitor, Gather, and Process Data**
- **Directly Interact with Devices (HMI)**
- **Record Events Into a Log File**
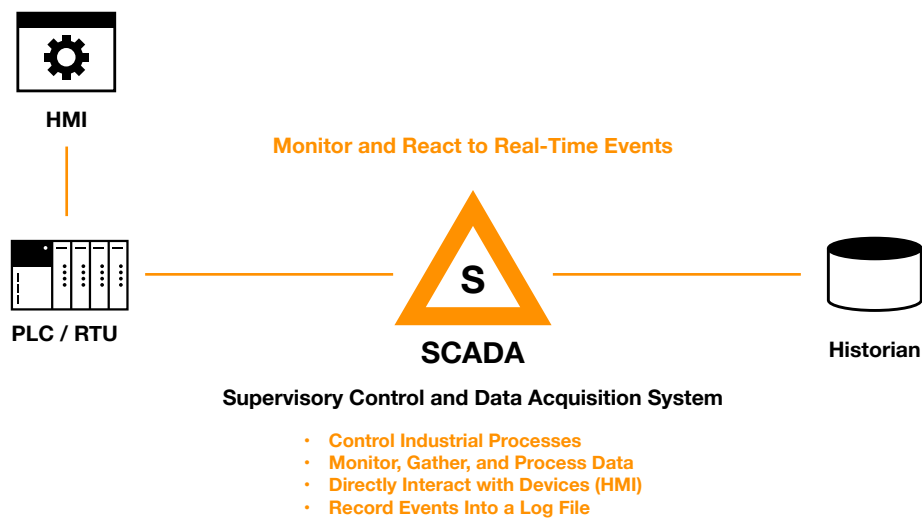
Data Acquisition

SCADA systems collect machine data through networked devices and sensors connected to a PLC or RTU and then route the data with SCADA software. These devices and sensors measure parameters such as temperature, speed or pressure as raw data. The SCADA software processes, distributes and displays the data.

Data Communications

Many SCADA systems use a wired network on the plant floor to communicate with devices, some modern systems use wireless communications to connect to devices and sensors spread over a wide geographical area. Common protocols include DNP3 and Modbus, and there are also numerous proprietary protocols specific to SCADA vendors.
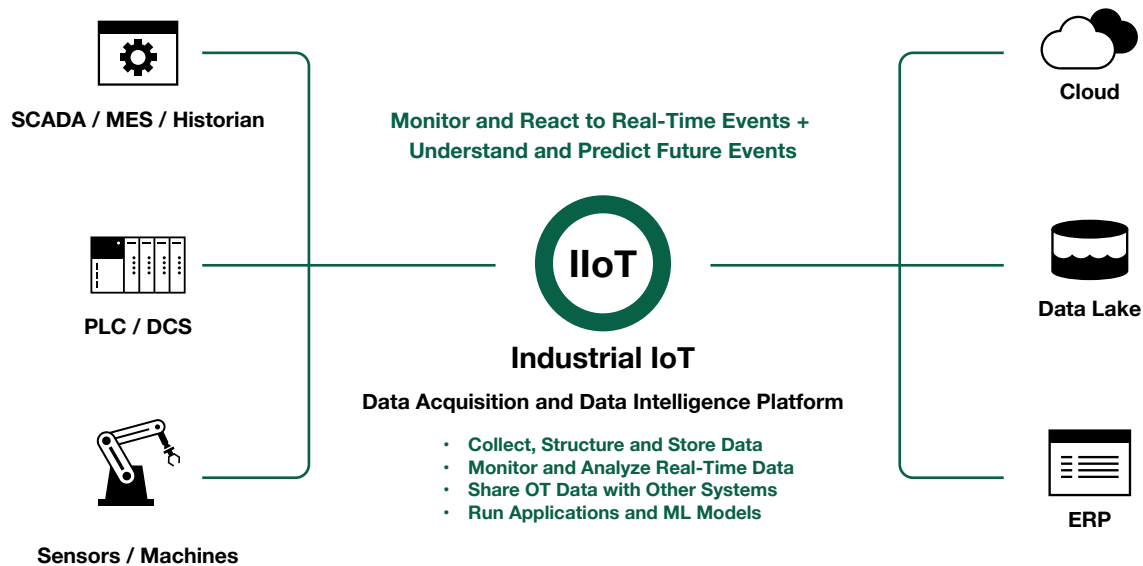
Data Presentation

SCADA uses an HMI, or Human Machine Interface, to present machine data to operators. The interface displays data visually and allows operators to track production time, trends and tags, oversee KPIs, and monitor machines. The data presentation lives on the shop floor via HMI, and is accessible for operators, system integrators and engineers.

Monitoring and Control

SCADA systems specialize in offering real-time monitoring and control of production processes. They use switches to operate devices and they can be turned on, off or modified based on an analog value through these switches. Most processes are automated based on user-defined parameters while other critical tasks may require human action.

What is an Industrial IoT Platform

An Industrial IoT platform collects, normalizes and stores data from all OT assets and systems locally. Ready-to-use data powers real-time analytics on the factory floor and can be shared securely with any cloud, enterprise or machine learning system for more strategic data initiatives. A complete IIoT platform can run any application, machine learning model and service at the edge, delivering the OT data intelligence needed to improve operations.

SCADA / MES / Historian

PLC / DCS

Sensors / Machines

Monitor and React to Real-Time Events +
Understand and Predict Future Events

IIoT

Industrial IoT

Data Acquisition and Data Intelligence Platform

- • **Collect, Structure and Store Data**
- • **Monitor and Analyze Real-Time Data**
- • **Share OT Data with Other Systems**
- • **Run Applications and ML Models**

Cloud

Data Lake

ERP

Device Connectivity

An IIoT platform handles the four essential parts to device connectivity – drivers, data collection, data normalization and data storage. IIoT platforms offer rapid data connectivity to all modern and legacy industrial systems with no coding required – then structure the data into a common format ready for use by edge and enterprise applications.

Edge Analytics

IIoT platforms perform analytics at the edge for insights that transform the factory floor and show quick ROI – from condition-based monitoring to better understand how assets are performing, to OEE to improve manufacturing productivity. Pre-built data visualizations and common KPIs like downtime and anomaly detection allow customers to realize rapid time-to-value.

Data Integration

IIoT platforms include dozens of pre-built integrations with leading cloud and enterprise systems. Instant and secure OT-IT connectivity enables rapid data sharing with applications, data lakes and machine learning systems. Advanced data sharing use cases such as sending select or change-only data can dramatically reduce cloud computing costs.

Application Deployment

An IIoT platform allows users to host and access public or private applications in a centralized repository, with the ability to deploy and run applications and machine learning models at the edge. IIoT platforms also stream normalized and structured data to any pre-built or custom application and run those same applications as close to the data source as possible.

Capabilities

Although SCADA systems and IIoT platforms were built for different purposes, they are often compared when companies are looking to implement smart manufacturing. The following capabilities are the essential building blocks for smart manufacturing and point out the key features of SCADA systems compared to IIoT platforms.

	S **SCADA**	**IIoT** **Industrial IoT**
Connecting Devices Connecting to all OT assets, legacy and modern, for a complete data picture.	• Some PLC drivers, need another solution for complete connectivity • Connection setup is manual • Uses legacy DCOM and OPC DA technology that can be difficult to configure	• Wide range of native drivers to rapidly connect to any device or system • Automatic connectivity with no programming needed • Works natively with various protocols for flexibility and interoperability
Data Workflow Processing and structuring the data, then routing it via automated workflow.	• Data collection is based around PLC tags • Data is standardized across PLC types • Data workflow can be manipulated with manual coding	• Data collection includes meta, timestamp and source • Data is normalized and ready-to-use by third party systems • Drag and drop workflow for simple data manipulation and visualization
Data Analytics Monitoring and analyzing machine data with visualizations and analytics for key KPIs.	• Can build real-time visualizations on HMI • Good at providing raw data with some basic analytics such as averages • Can enable additional analytics with custom code or separate licenses	• Provides immediate data analytics for OEE, downtime, etc. • Can quickly build out custom visualizations using the process data • Can feed machine learning models to act upon data automatically
Send Data to the Cloud Sharing data with cloud and enterprise systems for advanced analytics and machine learning.	• Send data to the cloud via third party connectors or script • Exposing production systems to the cloud is risky • Cloud integration is possible with effort and maintenance	• IIoT was purpose built to bridge edge and cloud • Built-in connectors make sending data to the cloud easy with one click • Isolated data collection and integration allows for securely connecting and sending data to the cloud

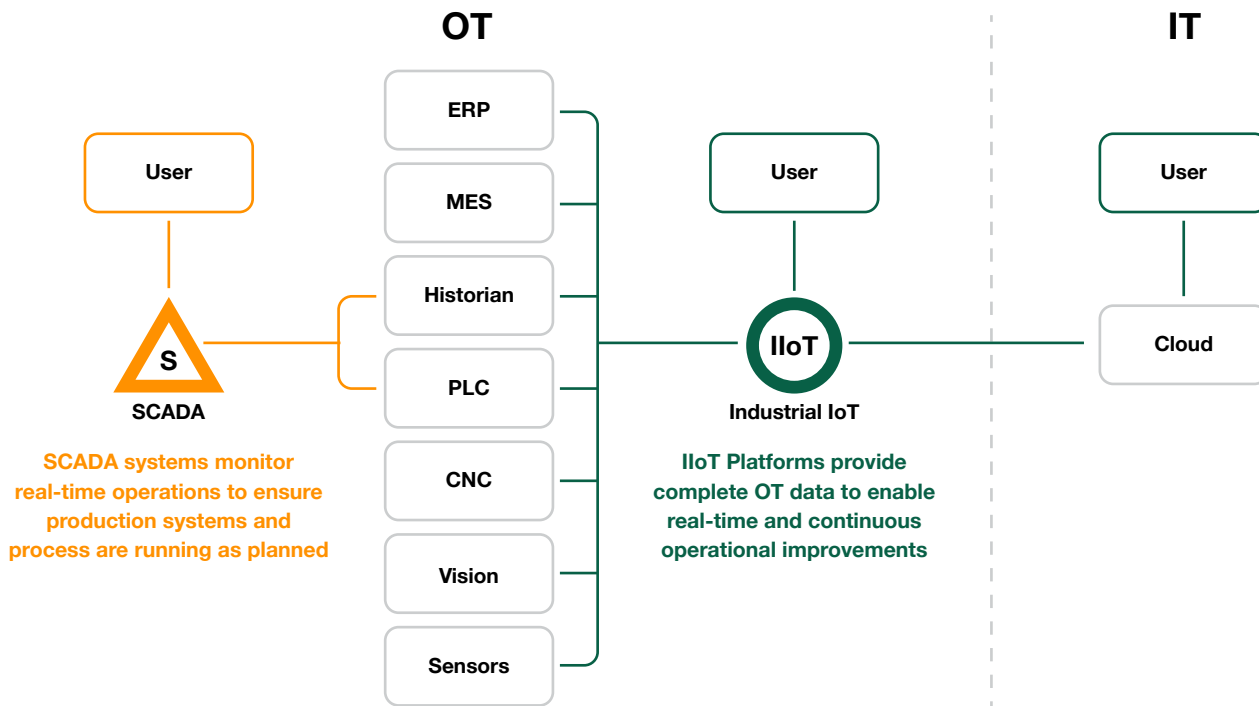|	**S** SCADA	**IIoT** Industrial IoT
Run Applications Feeding, accessing, deploying, running and maintaining applications at the edge.	• Can write your own applications and expose data to them • Write with the chosen language of the SCADA system • Deploying applications at scale is possible with manual work and maintenance	• Write, manage and orchestrate your own applications and expose data to them • Run any application regardless of coding language • Containerized applications for flexible and rapid deployment
Run ML Models Feeding machine learning models with data and then running those models back at the asset.	• Feed ML systems with data dumped into historian systems • Can be set up to run models outside of the SCADA system	• Feed ML systems with data stored in time-series database • Run ML models at the edge within the IIoT platform and deliver corrective actions • Strong ML Ops cycle – experiment on models
Centralized Management Achieving visibility and control over all distributed edge devices, applications and deployments.	• Designed primarily for individual plant floor industrial processes – within the four walls • Consider performance when accessing outside of the plant • Scale is possible	• Ideal for centralized management layer over all local deployments • Manage remotely and centrally manage devices, data and applications • Scale to any number of sites with ease
Security Performing Industrial IoT functions with a secure architecture that protects data and devices.	• Designed to be segregated from IT, sending data outside OT to the cloud can create security concerns • Security features must be added to keep systems protected from the Internet • Windows-based, requires ongoing security updates and patches	• Purpose built to protect operations and share OT data securely with third party systems • Secure protocols built-in including SSL and HTTPS • Hardened, secure Linux-based system

How They Work Together

With more and more companies investing in smart manufacturing, the need for both SCADA and IIoT is becoming clear. Use cases have evolved from simple machine monitoring to using data intelligence to make predictions and create models that drive operational improvement at scale. SCADA is critical for supervisory control, but simply can't go far enough to enable smart manufacturing use cases. Adding an IIoT platform extends the use of OT data intelligence without disrupting critical processes.

OT

ERP
MES
Historian
PLC
CNC
Vision
Sensors

User

S
SCADA

SCADA systems monitor real-time operations to ensure production systems and process are running as planned

User

IIoT
Industrial IoT

IIoT Platforms provide complete OT data to enable real-time and continuous operational improvements

IT

User

Cloud

The Role of SCADA

A SCADA system should be used to monitor production systems in a closed and secure environment on the shop floor with no way for the outside world to access or control those systems. SCADA provides a real-time view of machines and processes and is connected to critical operations so additional use cases and data users should not be introduced since they may affect production.

The Role of Industrial IoT

An Industrial IoT platform should be used to collect complete data at the edge and then act as a flexible and secure bridge to share that data intelligence between OT and IT systems. Industrial IoT adds a layer on top of OT systems so users can easily experiment on the data with new use cases without ever disrupting production systems, then act on the data to make continuous improvements.

Strengths of a SCADA System vs Industrial IoT Platform

While they appear similar and an IIoT platform can perform many SCADA functions and vice versa, the reality is they are two very different systems that each play their own important roles. Consider the strengths of each as you roll out a smart manufacturing initiative.

S **SCADA**	**IIoT** **Industrial IoT**
✓ **Provides plant-level control over industrial processes**	✓ **Provides complete, unified OT data to improve operations**
✓ **Real-time dashboards and HMI**	✓ **Instant value with edge analytics**
✓ **Secure isolated system**	✓ **Connects securely to all OT and IT systems**
✓ **Visualizes the layout of the plant**	✓ **Allows for a centralized view of data from all plants**
✓ **Provides critical alarms to monitor what is happening in the plant in real-time**	✓ **Provides complete data access to any stakeholder from OT to IT to data science**
✓ **Data drives quick reaction to issues and improved operation of the plant**	✓ **Data drives real-time decisions and enables strategic insights using ML to improve operations**
✓ **Extend capabilities with add-on products and manual coding**	✓ **Takes data, puts it into context and provides fast ROI out-of-the-box**
✓ **Reliable and robust system**	✓ **Flexible and scalable platform**

Getting Started

If you already have a SCADA system in place, it is easy to add an IIoT platform to take your shop floor to the next level for digital transformation. Continue to run the SCADA and deploy an IIoT platform to unify and share OT data for edge and cloud analytics, and to start to enable more advanced use cases like predictive maintenance or AI.

If you have neither a SCADA nor IIoT platform in place, where to begin depends on the end goal. If you want to look at trends and perform analytics, you can move faster with an IIoT platform. Deploy rapidly via gateway or VM, connect to all OT assets, get visualizations going and integrate with the cloud in minutes. Deploying a SCADA is much more time and resource intensive from a deployment standpoint so you can add one later if you decide you need additional control and alarming.

Watch the Webinar: Will Industrial IoT Platforms Replace SCADA Systems?
https://litmus.io/resource/will-industrial-iot-platforms-replace-scada-systems/

Watch the Litmus Edge Platform Demo
https://litmus.io/litmus-edge/demo/

Talk to a Litmus Industrial IoT Platform Expert
https://litmus.io/get-started/

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The Industrial IoT Edge Platform

Litmus.io