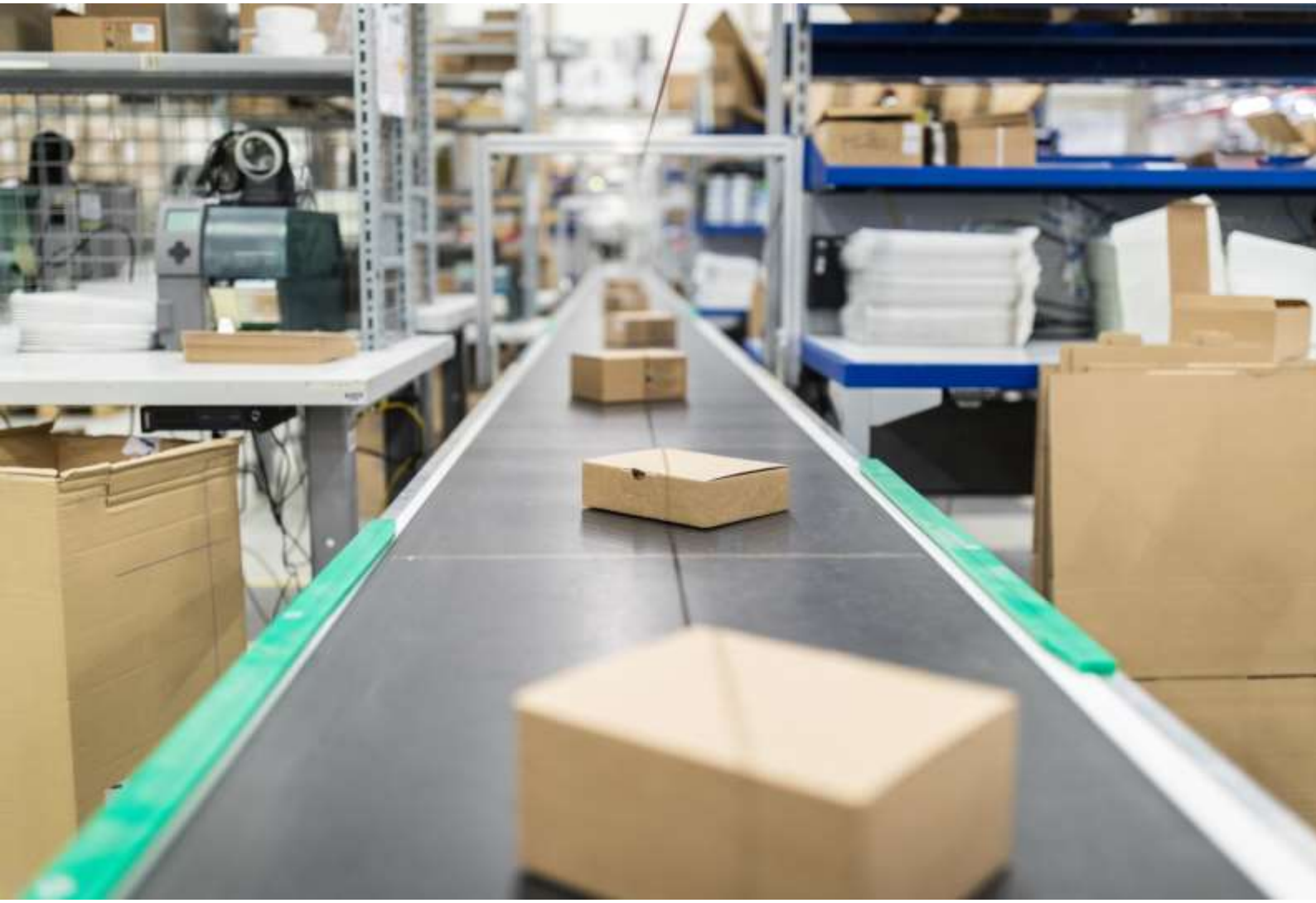


What is SCADA?

This article defines SCADA (Supervisory control and data acquisition) and the demand for edge computing to support SCADA systems. Across heavy industries, automation and analytics are transforming process management and OT, integrating intelligence into the operations of enterprise. Due to its specific compute demands, SCADA benefits hugely from the computational and security benefits of edge computing.

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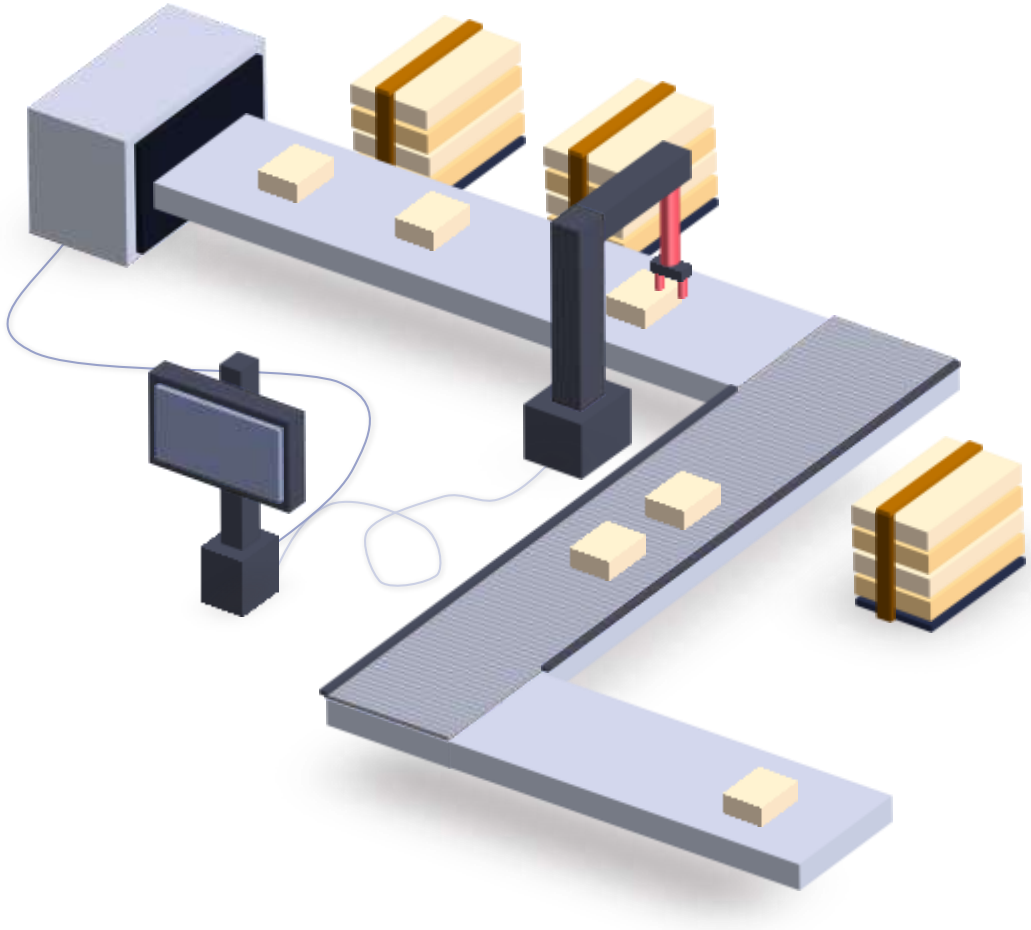
SCADA, or Supervisory Control and Data Acquisition, is a system that combines software and hardware to control and monitor industrial processes. It allows operational teams to:

- Manage industrial processes
- Collect data from machines
- Monitor and control machines through human-machine interface (HMIs) software and programmable logic controllers (PLCs)

SCADA systems are essential for maintaining efficiency, making informed decisions based on data, and mitigating system issues to minimise downtime in industries such as energy, manufacturing, oil and gas, transportation, and more. SCADA systems serve as a centralised hub, gathering inputs from various sources within industrial environments. Inputs collected from IoT devices on valves, pumps, motors etc. and are synthesised by logic contained within the PLC programmable logic controllers (PLCs).

Given the local nature of these data sources, SCADA systems lend themselves to on-prem computing, allowing the real-time capture and analysis of data whilst also ensuring data remains secure for these often mission-critical use cases.

Figure 1: SCADA systems are used to manage industrial processes



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A growing demand for automated systems is transforming SCADA

With the increase of demand for intelligent automation across industries, HMIs are being replaced by automated orchestration platforms, lowering response time, and using APIs to manage the production line. With the rapid adoption of generative artificial intelligence for business operations, there are a growing number of enterprises looking to use data captured through SCADA systems to train proprietary models that will further optimise management and maintenance of operational workflows.

These models require heavy compute capabilities such as those found in cloud data centres. The use of SCADA data with AI models hosted in cloud-like data centres opens new horizons for data-driven decision-making. By exposing real-time, machine data collected by SCADA to historical, cloud-based IT data, enterprises gain access to a broader set of information, insights, and analytics, ensuring intelligent SCADA models can increase productivity, simplify systems, and, importantly, reduce downtime across the site.

For a manufacturing site, this may mean passing this data to a model that performs calculations based on historical data to assess a potential leakage within the pipeline. In financial services, the data can be passed into a repository which is then used by data groups to develop forecasts in real-time. No matter the vertical, collection and analysis of SCADA data creates an opportunity to create real business value.

Storing SCADA data in the cloud creates issues around speed, security, and cost…

Given the greater availability of computational power in the public cloud, the logical first instinct is to transfer industrial systems like SCADA to a cloud environment. However, adoption of cloud for operational workloads presents two core challenges:

- **Latency:** when combined with automated responses, the demand for real-time data analysis precludes most cloud-based models because the round-trip time is too great. Increasing the response time drastically decreases the ROI of automated SCADA and could ultimately lead to failures across the production line.
- **Cultural reticence around public cloud:** operational teams and site managers are often cited as wary of cloud environments because of the lack of a control. These teams, accustomed to managing their workloads on-site in controlled environments, are years behind their equivalent IT departments who have been operating in the cloud for over a decade.
- Data volumes: the large amount of data points being produced by production line machines contributes to the complexity and cost of cloud storage. For particularly large and complex sites, SCADA systems can easily produce terabytes of data every single day. Transferring this data into the cloud would be extremely inefficient and costly to the enterprise.

…whilst edge computing can economically provide compute and security

Edge computing, through its geographically distributed footprint, reduces the latency round-trip by handling the analytics and subsequent outcome execution at the node closest to the data source. Given the ubiquity of SCADA systems across heavy industry, this therefore represents a strong potential use case for edge computing.

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Housing these models in edge computing sites is also considered a safer alternative to public cloud sites where the autonomy and control of the enterprise itself is limited to the rules set by the cloud provider. Although most cloud providers are able to offer sufficient security measures, a significant hesitancy remains across operational teams in many industries (particularly those with extreme data protection protocols i.e. oil and gas, healthcare, pharmaceuticals, etc.).

Although private cloud offers a solution to concerns around data vulnerability, operational teams are likely to only store operational data at a site where they can control who accesses the site. Edge data centres give them the control of on-premise compute whilst also leveraging the greater computational power of cloud infrastructure.

As a result, many of these institutions are already beginning to explore either enhanced on-premise infrastructure (managing their own powerful data centres) or leveraging third-party compute managed at the edge.

Takeaways:

- SCADA systems combine software and hardware to control and monitor industrial processes, enabling operational teams to manage processes, collect data, and monitor/control machines.
- Integration of SCADA data with cloud-based business intelligence optimises outcomes, enhances operational efficiency, and enables data-driven decision-making.
- Edge computing offers a potential solution for SCADA systems, reducing latency, providing control, and addressing data complexity concerns, particularly for industries with strict data protection protocols.

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