Industrial automation, Industry 4.0 and the IIoT are the foundation for today’s operational processes – all realized by SCADA

SCADA eBook – Supervisory Control and Data Acquisition
SCADA

We are experiencing the age of digitalization. The Internet of Things (IoT) and Industry 4.0 are ubiquitous. The automation of many manufacturing operations and processes is now standard. It is therefore all the more important to have appropriate monitoring and control elements that are capable of optimally supervising, analyzing, documenting and controlling the increasingly complex processes. Many industrial organizations rely on supervisory control and data acquisition (SCADA) systems. SCADA lets organizations control various sized assets and entire facilities. Using a SCADA system, you can collect operational insights and make business decisions based on the data.
What is a SCADA system?

SCADA systems control equipment at facilities and plants. Organizations that use SCADA systems also often use the systems to record and collect data.

Usually, SCADA systems include hardware and software. Remote terminal units (RTUs) and programmable logic controllers (PLCs) are among the hardware that’s often part of a SCADA system. The PLCs and RTUs communicate with the facility’s equipment, collecting data to send to the control room. Human operators in the control room supervise the RTUs and PLCs using HMIs. All SCADA systems include human Human Machine Interface (HMI) elements, such as the screens people use to interact with the system.

A SCADA system lets an organization control processes from a remote or local location. Interaction between motors, sensors and other pieces of equipment is centralized. The systems can also be automated and can control equipment based on data.

The history of SCADA systems

Like HMIs, SCADA systems have a relatively long history. The first systems were created in the 20th century.

- **The 1900s**: Some of the earliest versions of SCADA systems came about in the early 20th century. The concept of relay logic was developed around 1900 and adopted widely in factories through the 1920s. Relay logic paved the way for PLCs.

- **The 1960s and 1970s**: The proto-SCADA systems continued to evolve through the first half of the 20th century. In the 1960s, the system that is considered the first real SCADA system came into existence. Called monolithic systems, these early SCADA systems were built on mainframes. They were standalone systems, as they couldn’t connect to each other. They could connect to RTUs to send data to and from a master computer.

- **The 1980s and 1990s**: The next generation of SCADA systems, known as distributed SCADA, allowed different systems to communicate. Several stations could be linked and share real-time data. Compared to monolithic SCADA systems, distributed SCADA systems were considerably smaller and had a lower price. Distributed systems also introduced HMIs, communication processors and databases.

- **The 2000s to today**: Industrial automation led to the development of the most recent SCADA generation, networked SCADA. Networked SCADA systems use an open system architecture, eliminating vendor dependence associated with the earlier generations. Networked SCADA systems can be distributed over a wide area network (WAN) rather than just a local area network (LAN). The integration of common communication protocols and services, such as the TCP/IP allowed the utilization of SCADA in flexible network architectures, built upon modern networking equipment, such as routers and switches. Today, this allows for the secure and effective migration of certain SCADA services into the IT services infrastructure of companies. As the journey continues, SCADA services and solutions are increasingly offered for deployment in Internet and cloud computing environments.
Applications of SCADA systems in today’s factories

The SCADA systems used in factories today can be massive and complex or compact and straightforward. The complexity and size of the system depend largely on the organization’s needs and the applications connected to the system.

Today’s factories use a SCADA system to:
- Connect machinery
- Monitor and process collected data
- Remotely or locally control processes
- Log data and events

SCADA systems allow organizations to get a real-time view of their processes. The system lets a company verify that its machinery is operating correctly. A company can also use the data produced by a SCADA system to determine how to make improvements or adjustments to equipment to maximize productivity or efficiency. The adjustments can be made on-site or remotely. Depending on the system’s size, an organization can adjust single machines, individual processes or entire facilities.

Using a SCADA system, an organization can centrally store data sourced from various locations. The system can combine the data, process it and format it for use in other systems. SCADA systems help minimize downtime by improving efficiency and decision-making.

The zenon SCADA solution offers several benefits to organizations. It allows for:
- Reduced downtime
- Improved efficiency
- Increased operational visibility
- Automated and streamlined engineering
- Remote usability
- Ease of integration

What the future of SCADA looks like

SCADA systems are continuing to evolve and advance. They will continue to adopt and embrace modern standards for the interconnection of massive IoT device networks, data modelling and storage and cyber security. Flexibility and platform independence are becoming increasingly important. High scalability, to not limit the company’s growth, is becoming more and more a basic requirement. The adoption of web-based standards will enhance the user-friendliness and accessibility of SCADA systems. State-of-the-art solutions use HTML5, which streamlines the process of dashboard configuration and data processing, creating a secure, productive and efficient SCADA system.

As systems enhance their data collection capabilities, security becomes key – even more than it is today. Employees can now access live data anywhere and anytime from their smartphones. But how do they know that only authorized employees have access to current production figures and to data in the cloud? Smart Factories and IIoT require expert knowledge to ensure software is as secure as possible and to prevent unauthorized access. And each additional gateway is a potential target for attacks.
How are HMI and SCADA systems similar and different?

HMI and SCADA are often linked together, but it’s important to note that the two aren’t the same thing. An HMI is either hardware or software that lets a human operator interact with a controller. The simplest way to understand the difference between HMI and SCADA is to recognize that one is part of the other. An HMI is often part of a SCADA system. However, a SCADA system is not part of an HMI.

You’re likely to have multiple features or components within a SCADA system. These include HMIs, RTUs and PLCs, among others. When operating a SCADA system, an individual uses an HMI, such as a touchscreen, to interact with the system. An HMI lets you access and use the features of a SCADA system. The system itself delivers the functionality.

With the latest generation of SCADA systems, it’s possible to connect an extra HMI to the system. This will certainly cause significant engineering effort, as visual design but also data connections need to be engineered and maintained in a separate system. But, for improved usability and efficiency, organizations often find that it’s better to use an integrated platform, such as an HMI purpose-built for a specific SCADA system. Using an HMI designed to integrate easily with your organization’s existing SCADA system allows you to consolidate data pipelines and create a holistic management system.
Learn more about COPA-DATA’s SCADA solutions

COPA-DATA has decades of experience providing solutions to industrial manufacturers. The zenon Software Platform integrates HMI with SCADA to provide organizations with the ability to analyze, automate, control and monitor their processes.

When you use zenon as a SCADA system, you gain enhanced operational visibility, plus greater control over processes. The platform allows you to collect real-time data and distribute it to authorized users. When you implement zenon, you’ll notice the difference as it:

- **Develops projects rapidly**: Setting up an automation project with zenon is as easy as its gets. No coding needed. The product philosophy of “setting parameters instead of programming” makes it possible to complete even complex projects with minimum fuss. An extensive library of pre-designed graphical elements and other visualization features provides all necessary elements out of the box. zenon also offers a wide range of wizards, which are saving time and preventing users from errors.

- **Connects heterogeneous hardware landscapes**: In structures that have developed over time, old and new production systems from a range of different manufacturers often run in parallel. zenon offers hardware independence at field level. Over 300 native drivers and communication protocols ensure a free choice of hardware and incorporation into existing systems. Additionally, zenon’s built-in IEC 61131-3 solution can be used as a soft PLC for controlling equipment.

- **Saves even big data securely**: With zenon Historian, data is recorded and preprocessed without interruption, so even when data volumes are high, zenon delivers high-performance reporting. Because it is fully integrated, calling up real-time data and accessing historical data at the same time is incredibly easy. zenon can be used to secure large volumes of data cost-effectively and safely in a public or private cloud. The data can then be retrieved from the cloud, as required.

- **Increases overview and shortens response time**: Quick overviews, flexible input and location-independent alerts guarantee an optimal level of control over the facility. Alarm administration is integrated consistently in zenon. The triggering of too many unnecessary alarms is prevented with functions such as threshold values and dynamic alarm limits. Load Management enables users to visualize energy consumption trends. If the software forecasts load peaks that exceed a set limit, zenon recommends switching actions or takes action automatically, keeping energy costs low.

- **Improves access across your organization**: zenon makes data accessible to people of all technical skill levels by making the plant status easy to understand and the interface easy to interact with, from horizontal machinery integration to vertical incorporation of production and management data. zenon also supports multiple languages and measuring units, so users can easily create projects for international use.

Thanks to its several hundred communication protocols and cloud and ERP interfaces, you can also make zenon a core component of your organization’s IIoT. Incorporating zenon’s SCADA solutions will help your organization move toward Industry 4.0. Contact us today to learn more about zenon and our industrial SCADA solutions.