**What Is SCADA?**

SCADA systems have been a fixture of industrial automation for decades. They are used to monitor and control complex systems by collecting data from sensors and displaying it in a central user interface (HMI – Human Machine Interface). A classic example of SCADA usage is in a wastewater treatment plant, where pumps, valves, and other components must be coordinated to maintain operations.

**Was ist IoT?**

The Internet of Things (IoT), on the other hand, is a more modern approach aimed at connecting devices and machines over the internet. IoT systems not only collect data but also use it to make intelligent decisions. By integrating cloud technologies, data analytics, and AI, IoT systems can identify patterns, make predictions, and optimize processes.

An example of IoT in industry is the remote monitoring of machines. Sensors on a machine send real-time data to a cloud platform where it is analyzed. If a problem is detected, the system can automatically send an alert or even request maintenance.

**SCADA vs. IoT: The Differences**

**1. Real-Time Capabilities**

* SCADA systems are often real-time capable, meaning they can guarantee that certain tasks are completed within a specified time frame. This is particularly important in critical applications such as robot control in automotive manufacturing, where delays of milliseconds can lead to serious errors.
* IoT systems, on the other hand, are generally not real-time capable as they rely on internet connections that are not always reliable. IoT is therefore better suited for applications where slight delays are acceptable, such as environmental monitoring or remote control of heating systems.

**2. Data Analysis**

* SCADA systems collect and store data but often offer limited options for analysis. The data is usually stored locally and must be manually evaluated.
* IoT systems, on the other hand, use cloud-based technologies to analyze data in real time. By using AI and machine learning, IoT systems can recognize patterns, make predictions, and even make automated decisions. This makes IoT particularly attractive for applications that require analyzing large amounts of data, such as predictive maintenance.

**3. Flexibility and Scalability**

* SCADA systems are typically static and difficult to expand. When new components are added, the software often needs to be adjusted, which can be time-consuming and costly.
* IoT systems, in contrast, are flexible and scalable. By using cloud technologies and microservices, IoT systems can be easily expanded and adapted to new requirements. This makes IoT ideal for companies that are growing quickly or continuously optimizing their processes.

**4. Cost**

* SCADA systems are often associated with high acquisition and maintenance costs, especially if they come from large manufacturers like Siemens or ABB. In addition, there are often annual licensing fees.
* IoT systems, on the other hand, benefit from the cost efficiency of the cloud. Since the infrastructure is provided by third parties, many of the high upfront investments are eliminated. Additionally, there are many open-source solutions that can further reduce costs.

**How Do SCADA and IoT Complement Each Other?**

Although SCADA and IoT follow different approaches, they can often complement each other. Some companies use SCADA systems to control critical processes, while using IoT technologies for data analysis and remote monitoring. This allows them to take advantage of both systems: the reliability of SCADA and the flexibility of IoT.

An example of this is the remote monitoring of production facilities. The SCADA system monitors and controls the machines on-site, while the collected data is transmitted to the cloud via IoT platforms. There, the data can be analyzed to identify optimization potential or predict maintenance needs.