

HMI, SCADA Systems IIOT based SCADA

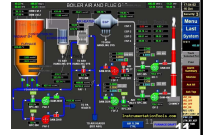
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HMI/SCADA

- HMI - Human Machine Interface
- SCADA - Supervisory Control and Data Acquisition
- Graphical Representation for monitoring and controlling
- Can communicate with the controlling device (PLC/MCU) on same protocol
- Converts the machine language (0 and 1 logic) into a unique graphical form



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HMI

- Human Machine Interface
- Interface to communicate with the machine/system/program
- Communicates with the PLC/MPUs to display data
- Low level (Operator) Monitoring and controls the data
- Can Track production time, trends, and tags
- Local to a machine
- Reduces the maintenance time and downtime of the machine
- Increased efficiency of the system

Monitoring

Control

Easy Interface

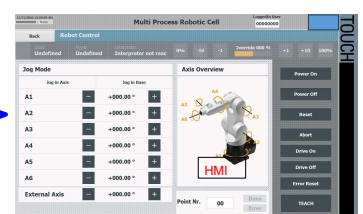
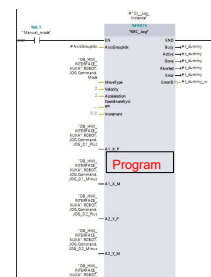
Communication

Diagnostic



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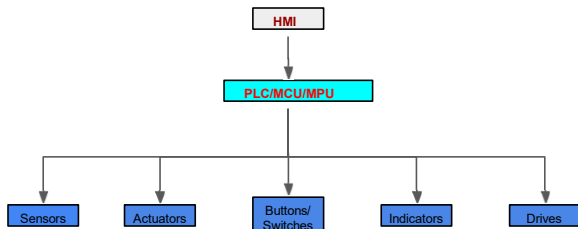
HMI



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HMI



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SCADA

Supervisory Control And Data Acquisition

- **Components:** Controllers, network interfaces, I/O modules, communication equipment, software.
- **Applications:** Manufacturing, production, development, fabrication.
- **Features:** Real-time monitoring, periodic meter readings, sensor status checks.
- **Benefits:** Efficiency, cost reduction, safety, minimal human intervention.



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SCADA

- **Supervisory Control and Data Acquisition**
- Interface to **communicate** with Plant/full site/Multiple remote locations
- **High level (Supervisor/Head)** monitoring and control - Ex: Energy usage, Amount of production
- **Multiple numbers of HMI** can be a part of SCADA system
- Can **Track production time, trends, and tags**
- Remote to a machine
- **Records and logs** event
- **Increased efficiency and progress monitoring** of a plant

Large Scale

High Level

Remote Locations

Communication

Storage

Reports and Alarms



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What is SCADA?

Supervisory Control And Data Acquisition

- Collect measurements and status data from the process
- Remotely intervene in the process
- Centralized system platform
- Based on distributed I/O

Applicable Processes

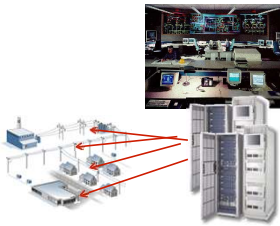
- Oil or Gas production facilities
- Pipelines for gas, oils, chemicals or water.
- Railway/Transportation Process
- Nuclear, Gas, Hyrdo generation plants



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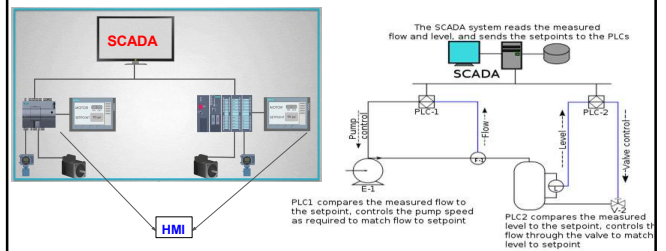
What is controlled by SCADA

- Tap changers
- Switching devices
- Shunt capacitor/reactor
- Generator setpoints
- Excitation & power output
- Sequential control



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SCADA



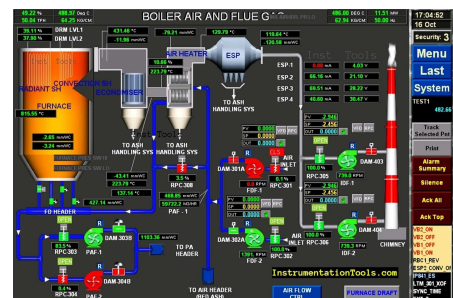
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The typical control



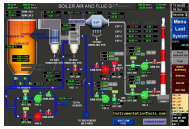
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SCADA



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SCADA Vs HMI



- Monitoring and Controlling of **large applications**
- System Composition - Servers and clients PC, Visualization, Reports, Historian
- **Expensive** than an HMI system
- Complex **engineering and deployment**
- Location - **Remote/ Server Room**
- Can be **scaled**
- **Storage capacity**

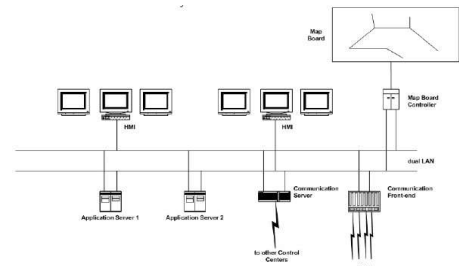


- Monitoring and Controlling of **small applications**
- System Composition - **One Device (HMI)**
- **Cheaper** than a SCADA system
- Easy **engineering and deployment**
- Location - **In the field/ Near machine**
- **Limited** scalability options
- **Low** storage capacity

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SCADA architecture



Reference: C37.1-2007 IEEE Standard for SCADA and Automation Systems

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How SCADA Systems Work?

Architecture

- Generally SCADA system is a **centralized system** which monitors and controls entire area.
- It is purely **software package** that is positioned on top of hardware.
- A supervisory system **gathers data** on the process and **sends the commands** control to the process.
- The SCADA is a remote terminal unit which is also known as RTU (Remote Terminal Unit)(MCU/MPUs)
- Most control actions are automatically performed by RTUs or PLCs.

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How SCADA Systems Work?

Architecture:

- The RTUs consist of programmable logic converter which can be set to specific requirement.
- The SCADA system allows operators to change the set point for the flow
- It enable alarm conditions in case of loss of flow and high temperature and the condition is displayed and recorded.
- The SCADA system is a centralized system to **communicate with both wire and wireless technology** to Clint devices.
- The SCADA system **controls can run** completely all kinds of industrial process.

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How SCADA Systems Work?

Hardware Architecture

- The generally SCADA system can be classified into two parts:
 - **Clint layer**: which caters for **the man machine interaction**
 - **Data server layer**: which handles most of **the process data activities**.

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How SCADA Systems Work?

Software Architecture

- Most of the servers are used for multitasking and real time database.
- The servers are responsible for data gathering and handling.
- The SCADA system consists of a software program to provide trending, diagnostic data, and manage information.
- It scheduled maintenance procedure, logistic information, detailed schematics for a particular sensor or machine and expert system troubleshooting guides.

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