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SCADA (Supervisory Control and Data Acquisition)

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SCADA is an acronym of Supervisory of Control & Data Acquisition. Critical plans of the nation's infrastructure like Oil and gas, Power generation & Distribution, Water, Waste management Et Cetera all are done using the Supervisory of Control & Data Acquisition software.

SCADA ensures the monitoring of the fields and provides the required data field in real-time. SCADA is a kind of a system where individual messages and/or commands are sent to the external world. SCADA systems are at their fundamental level of Industrial Control Systems. They are computer software/design based control systems which monitors and control industrial process that are available in the physical world.

SCADA systems can be found in manufacturing facilities, oil production and processing, pharmaceuticals, energy, water treatment and distribution, and the list goes on. They are the best to control methods for processes that have huge amount of data which needs to be gathered and analysed, or are spread for over large area of distances and require critical controls in fast and paced processes.

The technical development has become these days as an in auguring the door for other Technologies to take place on the both sides of scientific and practical areas, and whenever increasing the techniques used in any field, the importance of integration with each other will be increase to work as one unit more efficient, effective and availability to solve.

The problems facing that field the integration among the different techniques became one of the most important requirements that must be considered when developing any technology to take advantage of all the features available, and the rest of other technologies. SCADA has contributed to open new horizons in the management of water utilities despite the presence of some challenges facing this integration.

Obviously, SCADA is not a complete/full control system. Its main focus is on the level of supervisory. This software is positioned on top of hardware and to which it is interfaced, via the Programmable Logic Controllers aka PLC's, or other commercial and economical hardware modules available in the market.

SCADA similar systems are routinely seen in some factories, treatment plants Et Cetera. These are also referred to as the Distribution Control Systems (DCS). DCS have functions similar to that of SCADA Basically; SCADA is a computer system for gathering and analysing the real time data.

SCADA provides the operational data about the status of these facilities in real-time though the continual monitoring using sensors to measure and collect data required for analysis that make it easier for decision makers to take appropriate decision at the appropriate time during the operation and maintenance, which helps effectively in improving the management level of water system utilities and gives an opportunity to provide better services.

SCADA in Process Control:

Supervisory of Control & Data Acquisition (SCADA) is an automation system which is used widely for any remote control and/or data collection for the status of the field assets of the any system through sensors located in remote locations and to transmit data to a central location either for control or monitoring, and based on data which are collected, supervisory commands be issued to the controllers in the field, which are usually called (field devices). SCADA system generally includes the following components:

- Sensors for measuring the data, which are also known to be field devices
- Local processors who collects the data and communicates with the site's instruments and operating equipment called Programmable Logic Controller (PLC), Remote Terminal Unit (RTU).
- Host computers using wired or wireless network connections.
- Short range communications among local processors, instruments.
- Host computer as central point of human monitoring and control of the processes, storing databases, and display of statistical control charts, and reports.
- Long range communications among local processors

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Tag or Points:

SCADA is the foundation for the distribution automation system. The SCADA system actually implements a distributed database, commonly known as a tag database, it contains data elements called points or sometimes tag.

A point represents the single unit input or output value monitored or we can say controlled by the system.A typical SCADA system consists of I/O signal hardware, software, controllers, Networks & communications.

Points can be both **‘hard’** or they can be **‘soft’**. A soft point signifies or represents the result of logic which is applied to other hard or soft point. Whereas, a hard point is the representation of a real input or output connected to the system. This helps effectively in improving the management level of water system utilities and gives an opportunity to provide better services.

SCADA Systems:

A typical SCADA system is known to perform the following four functions:

- Data Acquisition.
- Data Presentation.
- Networked Data Communication
- Control

Some of the work which can be done via the Information and Control system you get from SCADA is mentioned below:

- Detecting and correcting the problems immediately.
- Accessing quantitative and qualitative measurements of some important processes, both immediately or/and over time.
- Measuring trends with time.
- Controlling larger and more complex procedures with a smaller and a less specialized staff.
- Discovering and eliminating bottlenecks and inefficiencies.

These all functions are done by the following four kinds of SCADA equipment’s:

1. **Sensors** which are digital or they can be analogue along with the **Control relays** directly interface with the managed system.
2. **Remote Telemetry Units (RTU’s):** These are very small computerized units which are developed in fields at specific sites and locations.
3. **SCADA master units**: These are huge computer consoles that are used to provide the centralized processing of this system. These units also provide the human interface to the system and automatically manage the system. This is done in response to the sensor units.
4. **The Communications Network** is used to connect the master unit of SCADA directly to the field via the RTUs.

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Evolution of SCADA:

- **1890’s** Remote Control and Remote Indication

- **1920's** Tele command and control
- **1930**'s Check Before Operate (CEO)Systems

Based on Electro Mechanical Technology:

- **1960's** Supervisory Control Systems (Remote Control & Status Indication)
- **1960's** Data Acquisitions gaming Popularity (DAS) SCADA came into being.
- **1980's** Load Dispatch Centre and Control
- **1990's** Energy Control Centre
- **2000's** Energy Management Systems

Usage of SCADA:

Accomplishing all kinds of equipment's and performing certain tasks is done by SCADA. Typically, it automates the highly complex industrial process; such processes have very low/difficult human control. For example, in many systems there are additional control factors which are unable to be completed and succeeded by the operators sitting in the control centre. Many SCADA systems are used on a daily basis for the control in these domains:

1. **Electric power generation, distribution and transmission:** Many electronic utilities use this system and detect the line voltages, flow of current etc. Also, they monitor and perform operation and working of the circuit breakers, to take some sections of power grids to both online and offline.
2. **Water and sewage:** Many state-owned and municipality water utilities uses SCADA software and monitors and controls the flow of water, tank and reservoir levels, pressure of pipe and many-many other factors.
3. **Buildings, facilities and their environments:** Many facility managers also use SCADA and controls HVAC, cooling and other refrigeration units. Also, lights and entry system.
4. **Manufacturing:** The SCADA systems are used to manage the lists of the parts for just-in-time manufacturing, and regulate all kinds of industrial mechanization. It also monitors the process and quality of control.
5. **Mass transit:** Many transit authorities use SCADA' and regulate the electricity to subways; this automates the traffic signals for the railway systems. Also used to track the trains and other vehicles and to controls railroad crossing gates.
6. **Traffic signals:** SCADA is also used to regulate the traffic lights. It does so by controlling the traffic flow and detecting the faulty signals.

This assignment provides you with the introduction to SCADA. It tells you about many features of the SCADA software. I also discusses about the benefits and applications related to it. SCADA is known to have many applications in various fields.

It is used for monitoring and control in real time. One main application of SCADA is a challenge and subsequent sections which describe the design and the development of this software. It is used for computerized monitoring and also for controlling many power systems. It is widely used in the field of Electrical Engineering.

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