SECTION A

SCADA:

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Key Points

- *PLCs and RTUs are similar devices with somewhat differing functionality.*

Key Points

- *PLCs are best suited for wired applications and high speed networks while RTUs are most effective in wireless applications and operate well on both high and low speed networks.*

Key Points

- ***The major differences between PLCs and RTUs are in remote communications and data handling capabilities.***

REMOTE TERMINAL UNIT

- Most RTUs provide significant data logging capabilities so that data is retained during communications outages or for reporting purposes.
- RTU consists mainly from three major parts
  1.sensors,
  2.microprocessor or controller,
  3. Communications parts.

- Each R.T.U composed from the sensors that provide the required data for a certain application, the microcontroller which is the most important part of the R.T.U that collect the data from the sensors, process it and give it to the communication part for delivering it to the central unit.

Structure of PLC based systems
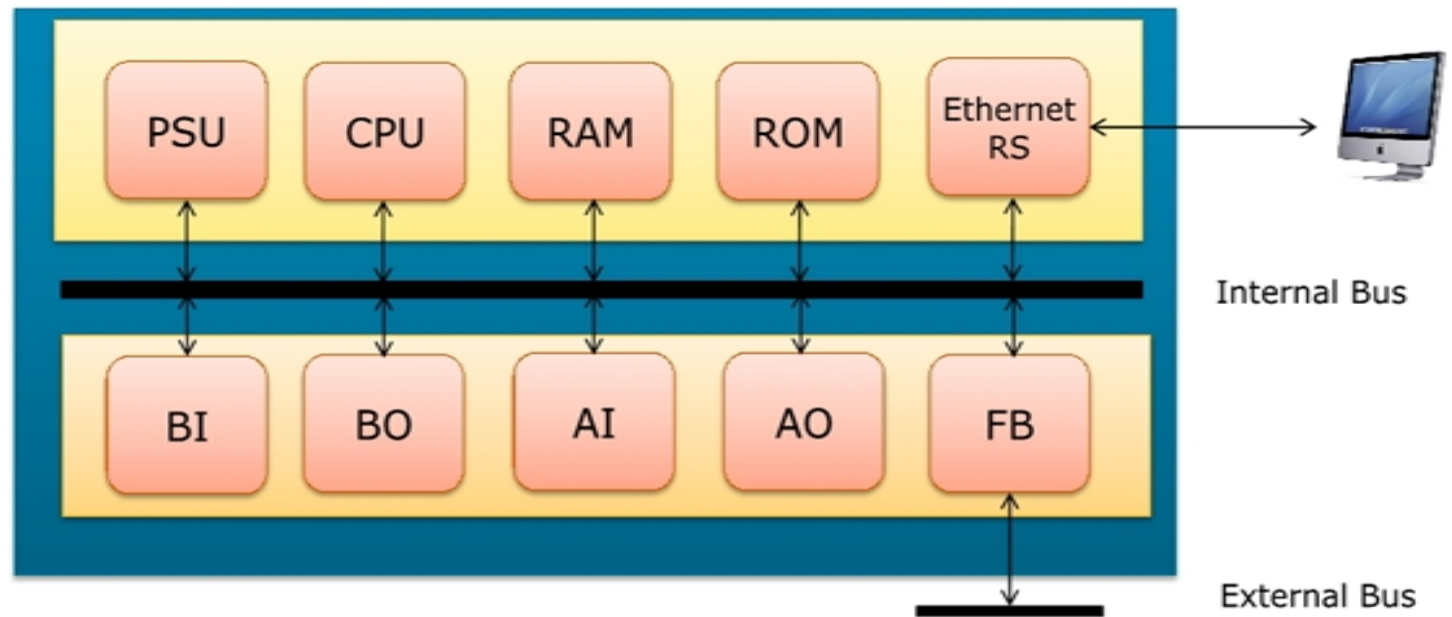
RTU BLOCK DIAGRAM
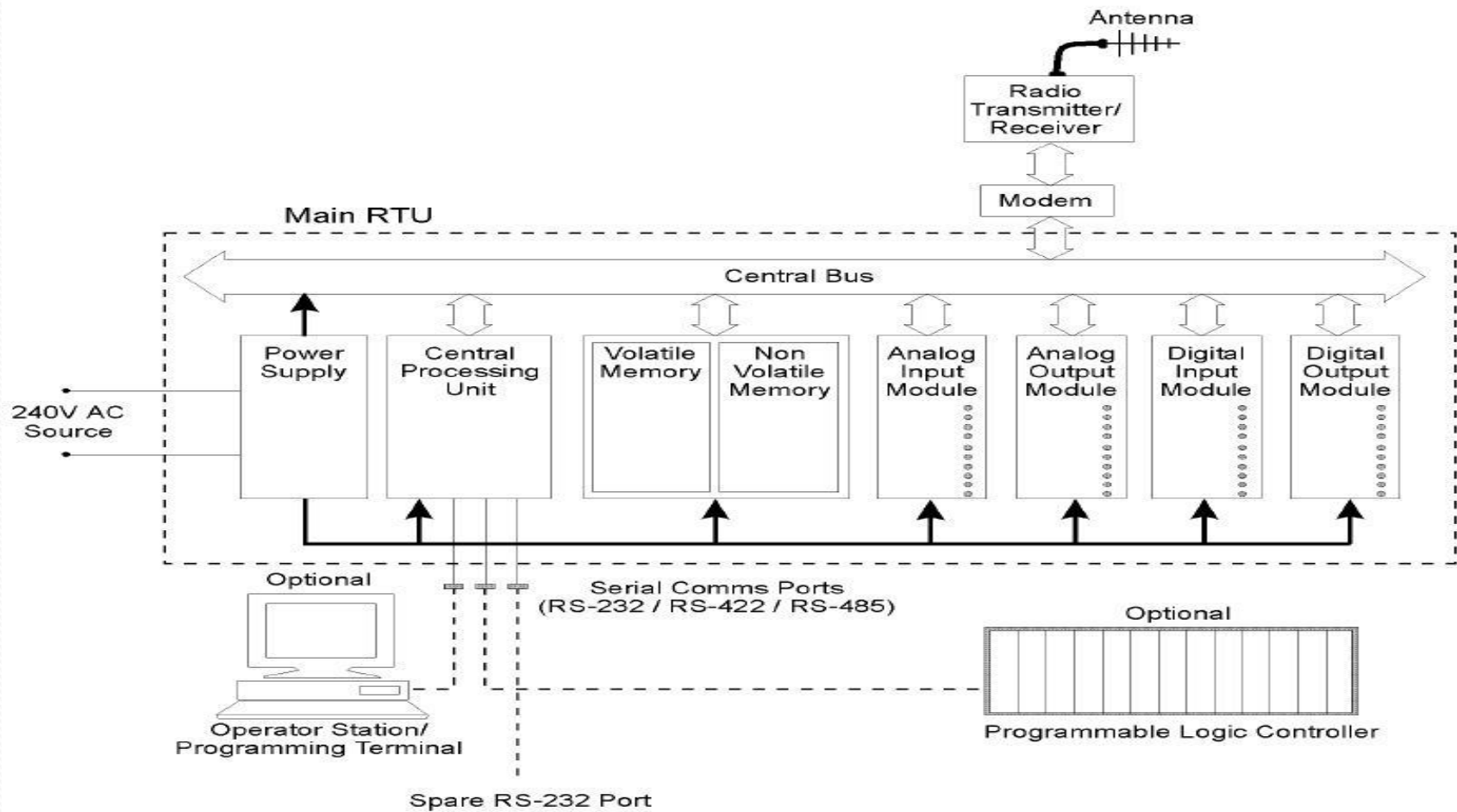
- *RTUs offer sophisticated RTU to SDADA/DCS, RTU to IED and RTU to RTU communications:*

  - Multiple SCADA protocols, proprietary and standard.
  - Multiple IED protocols for instrumentation, field controllers, meters, sensor networks, analyzers, etc.
  - Advanced peer to peer communications with store and forward as well as dynamic message routing capability.

Communications examples

- ***Standard polling***

  The master station continuously requests the real-time data values.

- ***Exception reporting (RBE)***

  The RTU is polled but only reports values that have changed since the prior poll

- ***Push Communications***

  The RTU initiates messages on and event or time basis.

- ***Peer to peer communications***

  RTUs can communicate with the master station and also with each other (peer to peer) if there is a communications path.·

Key Points

- *Most RTUs provide fully integrated communications hardware in the form of dedicated communications modules (with options for communications redundancy) or integral modems.*

PLC VS RTU

Use a PLC in applications:

- In plant
- Remote with:
  - Wired Ethernet WAN
  - Utility power or large solar panels
  - Serial communications
  - No legacy protocols
  - Integral communications equipment not required

Use an RTU in applications:

- Remote with:
  - No infrastructure
  - Multiple IED interfaces
  - Legacy protocol support
  - Data logging or reporting
  - Complex communications
  - Multi media communications
  - Antenna height issues
  - RBE or Push communications
  - Integral packaging

Selection of RTU's

RTUs need to:
• communicate with all on-site equipment

• survive an industrial environment. **Rugged construction** and ability to withstand **extremes of temperature and humidity** (it needs to be the most reliable element in your facility).

• have **sufficient capacity** to support the equipment at a site (though should support expected growth over a reasonable period of time).

• have a **secure, redundant power supply** for 24/7 working, support battery power and, ideally, two power inputs.

• have **redundant communication ports** e.g. secondary serial port or internal modem to keep the RTU online even if the LAN fails (multiple communication ports easily support a LAN migration strategy)

• have **nonvolatile memory (NVRAM)** for storing software and/or firmware. New firmware downloadable over LAN to keep RTU capabilities up to date without excessive site visits

Remote telemetry units (RTUs).

- These are small computerized units deployed in the field at specific sites and locations.

- RTUs serve as local collection points for gathering reports from sensors and delivering commands to control relays.
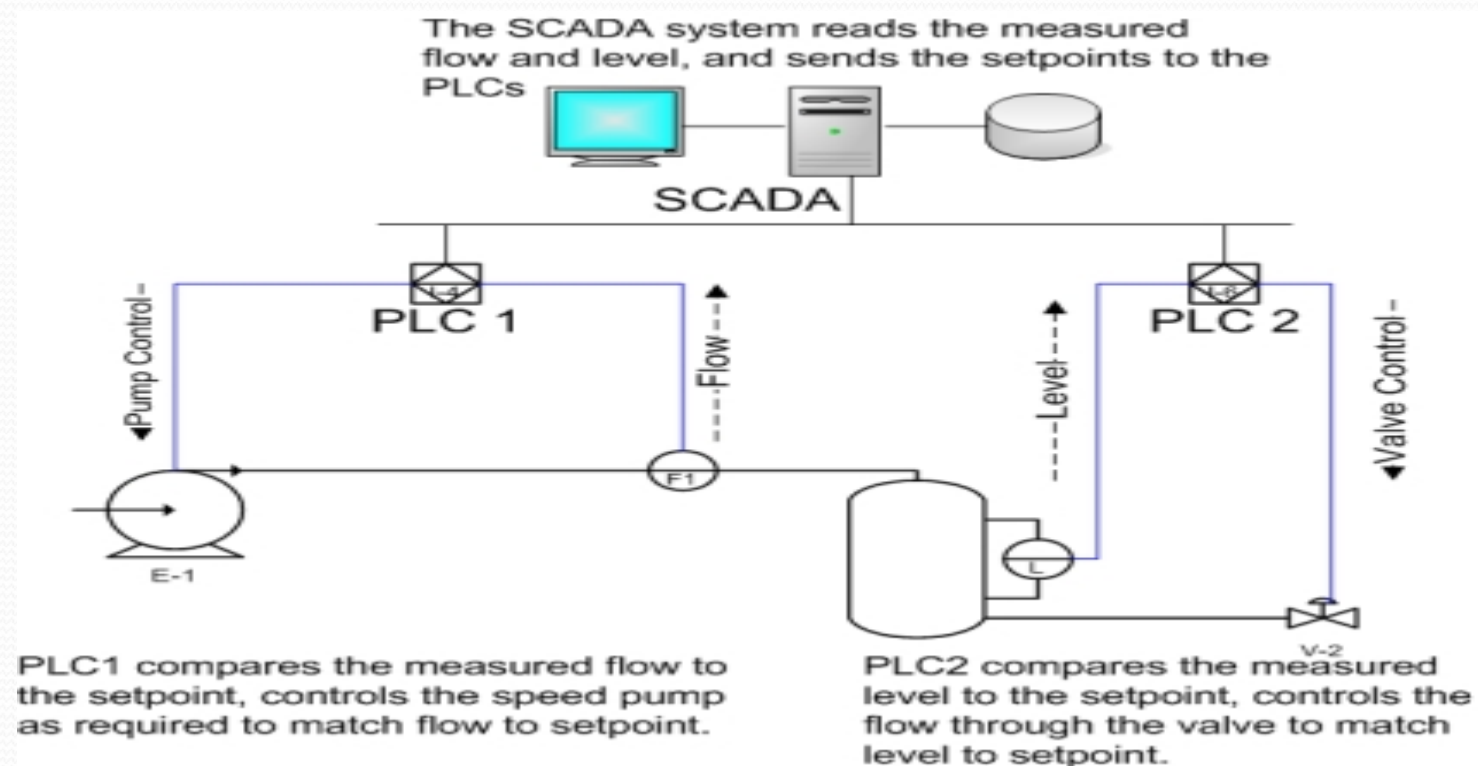
APPLICATIONS of SCADA

- **Electric power generation, transmission and distribution: Electric utilities use SCADA**
- **Water, Waste Water Utilities and Sewage**
- **Buildings, facilities and environments**
- **Oil and Gas Trans & Distributions**
- **Wind Power Generation**
- **Communication Networks**
- **Industrial Plans and Process Control**
- **Manufacturing:. Mass transit and Railway Traction**
- **Traffic signals:**

Operation of MTU

- Master terminal units (MTU) in SCADA system is a device that issues the commands to the Remote Terminal Unit (RTUs) which are located at remote places from the control, gathers the required data, stores the information, and process the information and display the information in the form of pictures, curves and tables to human interface and helps to take control decisions.

Internet-based SCADA:
The New Era in Communication Technology

The SCADA system reads the measured flow and level, and sends the setpoints to the PLCs

SCADA

PLC 1

PLC 2

Pump Control

Flow

Level

Valve Control

F1

E-1

V-2

PLC1 compares the measured flow to the setpoint, controls the speed pump as required to match flow to setpoint.

PLC2 compares the measured level to the setpoint, controls the flow through the valve to match level to setpoint.

Benefits OF internet based SCADA System

- Reduces operational costs
- Provides immediate knowledge of system performance
- Improves system efficiency and performance
- Increases equipment life
- Reduces costly repairs
- Reduces number of man-hours (labor costs) required for troubleshooting or service
- Frees up personnel for other important tasks
- Facilitates compliance with regulatory agencies through automated report generating

Internet-based, secure, real-time SCADA is now a reality

- Provides corporate-wide solution that integrates new and legacy SCADA equipment
- Flexibility – choose equipment and systems based on price/performance rather than compatibility with installed base
- Scales quickly from a few sites to thousands
- Single solution is suitable for both local and enterprise-wide applications
- Subscription service contract option available
- No capital investment is required

Major components of SCADA:

- A collection of equipments that is provide the operator at remote location with enough information to determine the status of particular piece of equipment or entire substation or a plant or a dynamic network and cause actions to take place regarding that equipment or network without being physically present.

- An arrangement for operator control and separation of remotely located apparatus using multiplexing techniques once a relatively small number of interconnecting channels.

- Collecting Data from remote electrical equipment and controlling then through suitable communication medium.