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Industrial Controls (1)

By

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Lecture (3)

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ICS (Industrial Control System)

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IACS (Industrial Automation and Control Systems)

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What is Automation?

- Automation is basically the delegation of human control function to technical equipment for:

Increasing Productivity

Increasing Quality

Reducing Cost

Increasing Safety in working conditions

Types of Automation

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1. Building automation

- **Ex:** lifts, smoke detectors.

2. Office automation

- **Ex:** printers, cctv cameras.

3. Scientific automation

- **Ex:** rocket launching.

4. Light automation

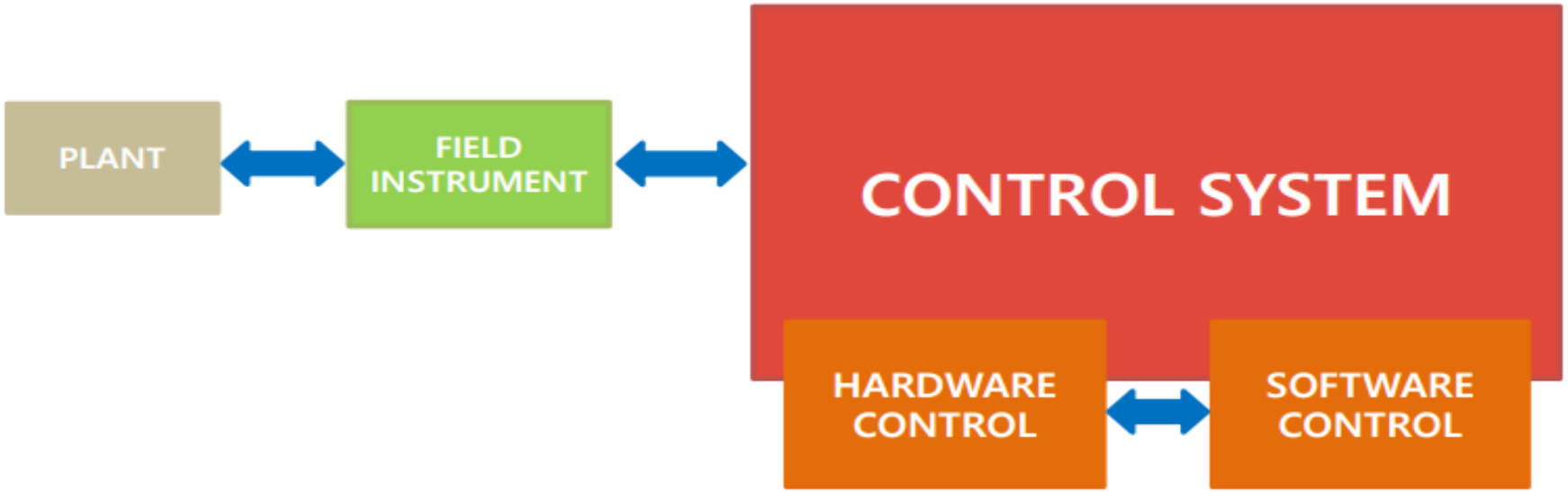
- **Ex:** street solar lighting.

5. Industrial automation

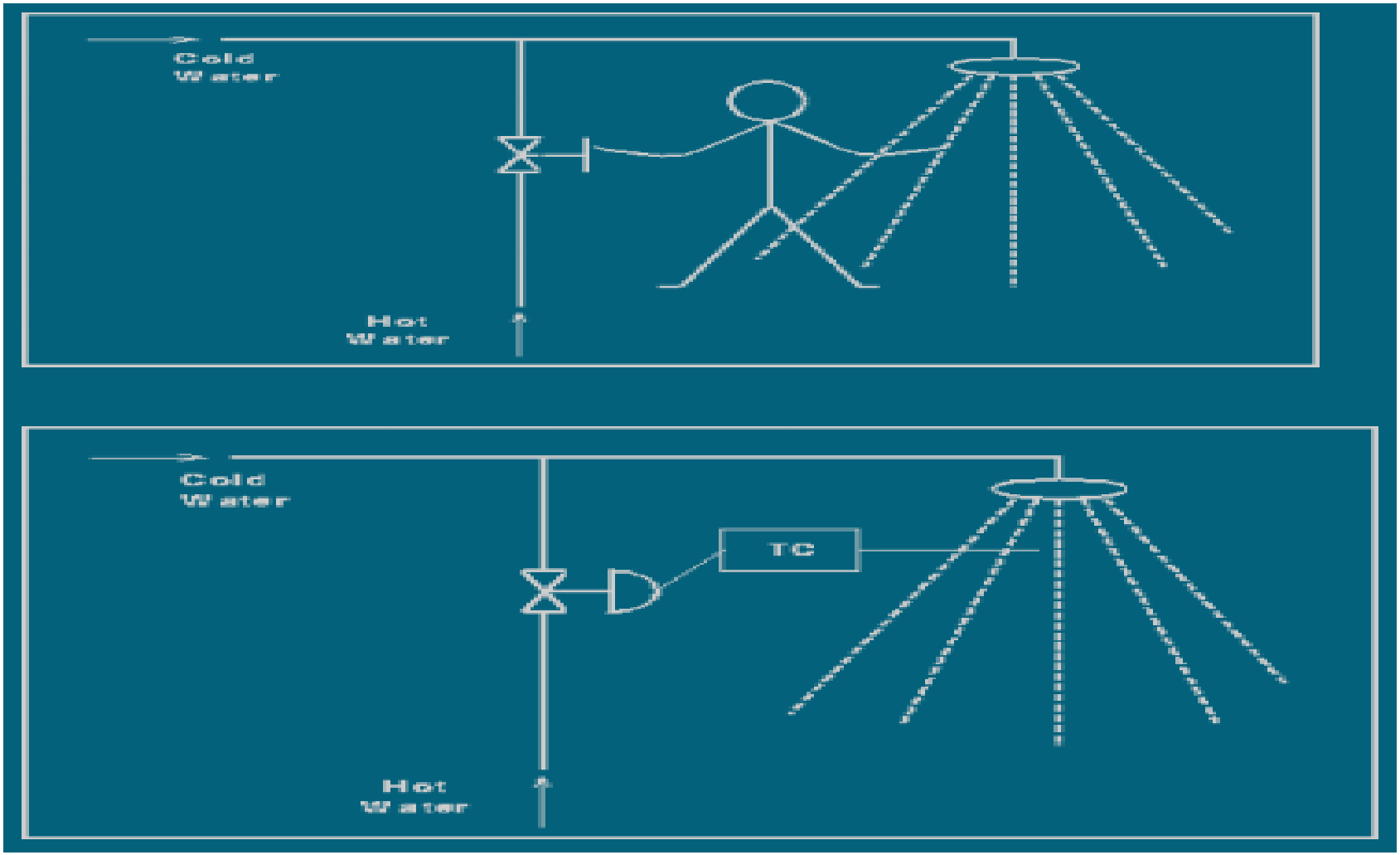
- **Ex:** automated bottle filling stations, steel factories.

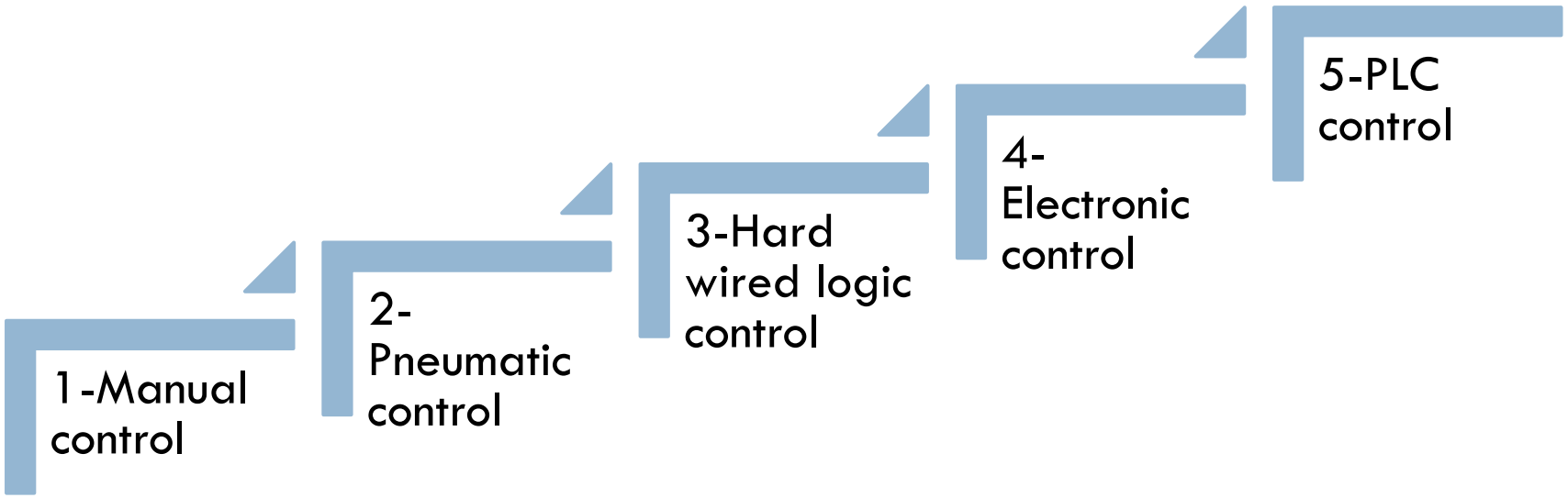
Industrial Automation

- Use of control systems, such as computers or robots, and information technologies for handling different processes and machineries.



History of Control System





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1. Manual control

- All the actions related to process control are taken by the operators.
- **Drawbacks:**

1. Likely human errors and consequently its effect on quality of final product.
2. The production, safety, energy consumption and usage of raw material are all subject to the correctness and accuracy of human action.

2. Pneumatic Control

- Industrial automation, with its machine and process control, had its origin in the 1920s with the advent of "Pneumatic Controllers".
- Actions were controlled by a simple manipulation of pneumatic valves, which in turn were controlled by relays and switches.
- **Drawbacks**

1. Bulky and Complex System.
2. Involves lot of rework to implement control logic.
3. Longer project time.

3. Hard wired logic control

- The contactor and Relays together with hardware timers and counters were used in achieving the desired level of automation.
- **Drawbacks**

1. Bulky panels.
2. Complex wiring.
3. Longer project time.
4. Difficult maintenance and troubleshooting.

4. Electronic Control using Logic Gates

- In 1960s with the advent of electronics, the logic gates started replacing the relays and auxiliary contactors in the control circuits.
- The hardware timers & counters were replaced by electronic timers.
- **Advantages:**

1. Reduced space requirements.
2. Energy saving.
3. Less maintenance & greater reliability

- **Drawbacks:**

1. Changes in control logic not possible.
2. More project time

5. Programmable Logic Controllers (PLC)

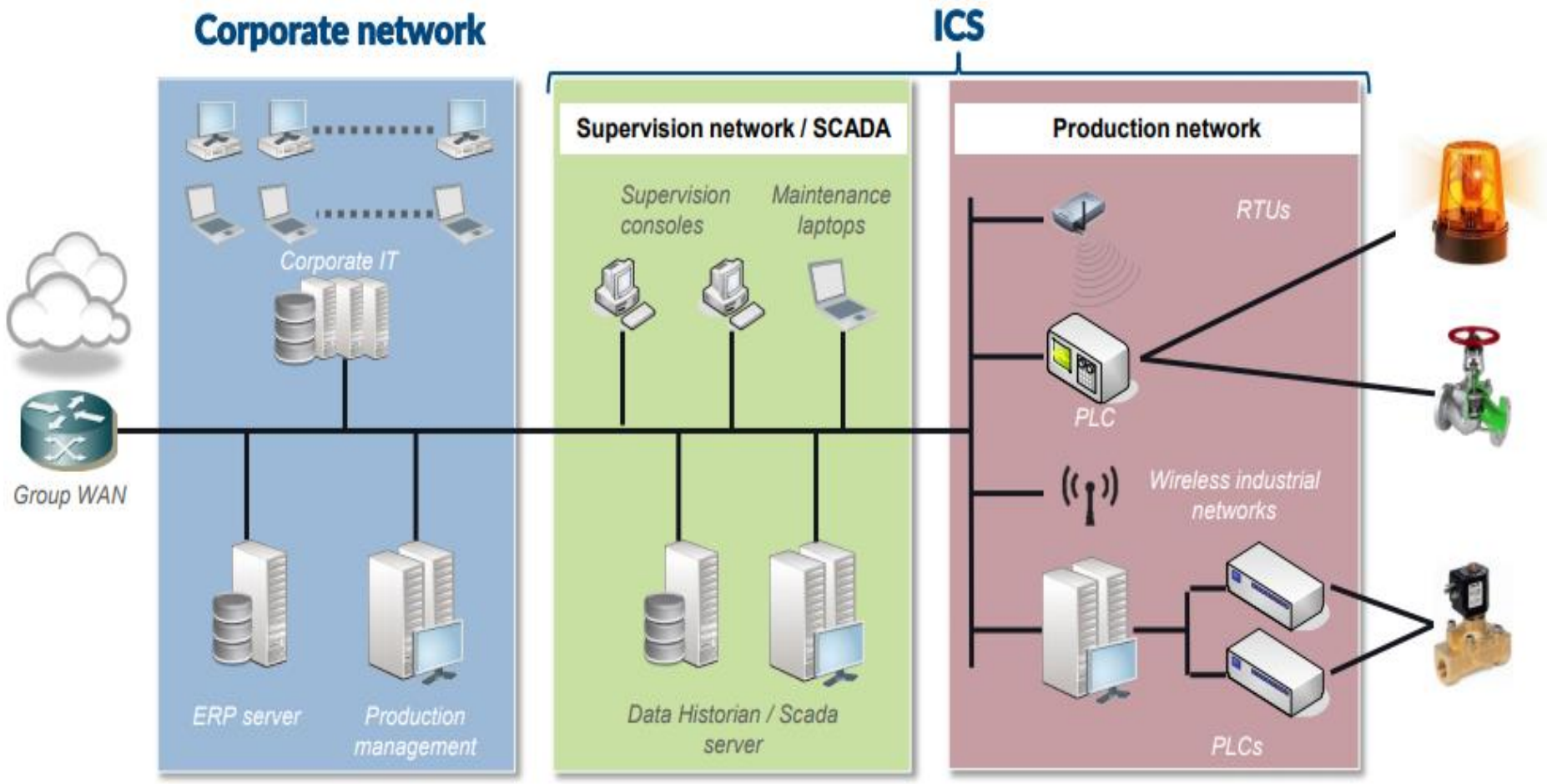
- In 1970s with the coming of microprocessors and associated peripheral chips, the whole process of control and automation underwent a radical change.

- Instead of achieving the desired control or automation through physical wiring of control devices, in PLC it is achieved through a program or say software.

- The programmable controllers have in recent years experienced an unprecedented growth as universal element in Industrial Automation.
- It can be effectively used in applications ranging from simple control like replacing small number of relays to complex automation problems.
- **Advantages:**

1. Reduced space, Energy saving, and Ease of maintenance.
2. Economical.
3. Greater life, reliability, and Tremendous flexibility.
4. Shorter project time.
5. Easier storage, archiving and documentation

What is an Industrial Control System (ICS)?



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ICS Components

1. Sensors and actuators:

- allow interaction with the physical world (pressure sensor, valves, motors, …).

2. Local HMI:

- Human-Machine Interface, permits the supervision and control of a sub process.

3. PLC:

- Programmable Logic Controller : manages the sensors and actuators

4. Supervision screen:

- remote supervision of the industrial process.

5. Data historian:

- Records all the data from the production and Scada networks and allows exporting to the corporate IS

What is Wrong with current ICS Security?

ORGANIZATION & AWARENESS

NETWORK SEGMENTATION

VULNERABILITY MANAGEMENT

SECURITY IN PROTOCOLS

THIRD PARTY MANAGEMENT

SECURITY SUPERVISION

Thank You For Your Attention

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