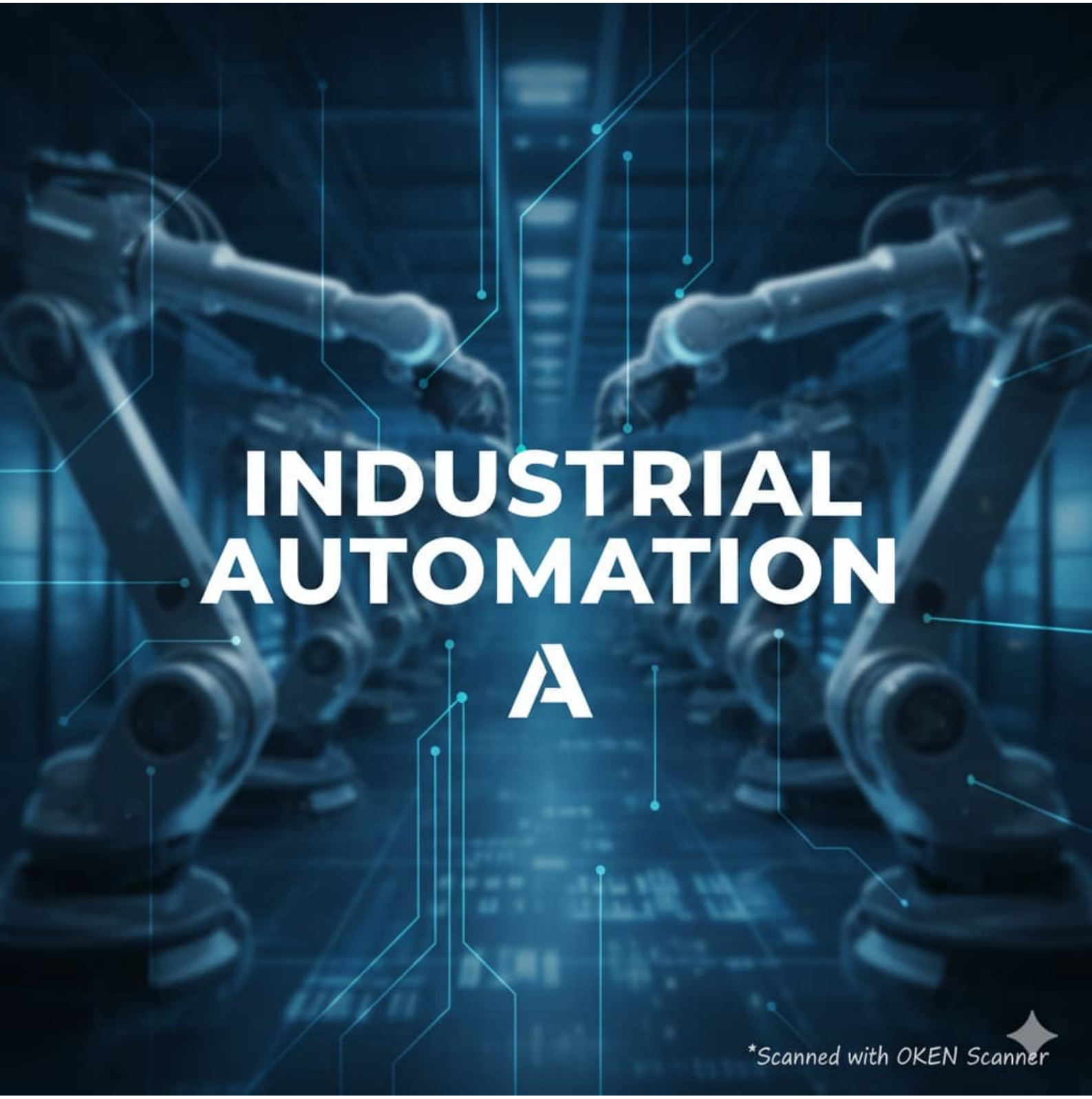
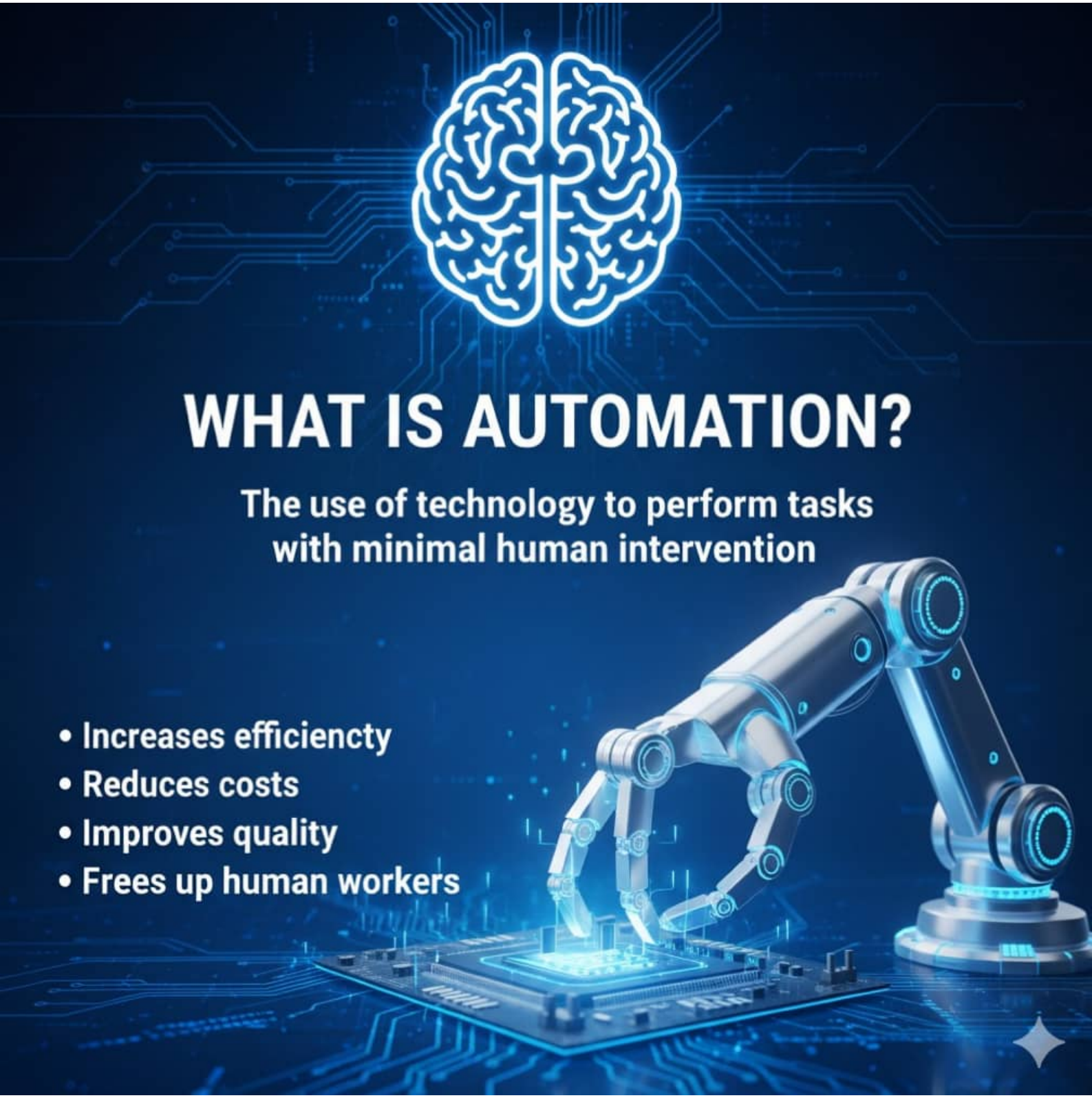

INDUSTRIAL
AUTOMATION
A
*Scanned with OKEN Scanner


WHAT IS AUTOMATION?
The use of technology to perform tasks with minimal human intervention
• Increases efficiencty
• Reduces costs
• Improves quality
• Frees up human workers

WHY AUTOMATION?

LABOR COST SAVINGS

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

PRODUCTIVITY

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

QUALITY IMPROVEMENT

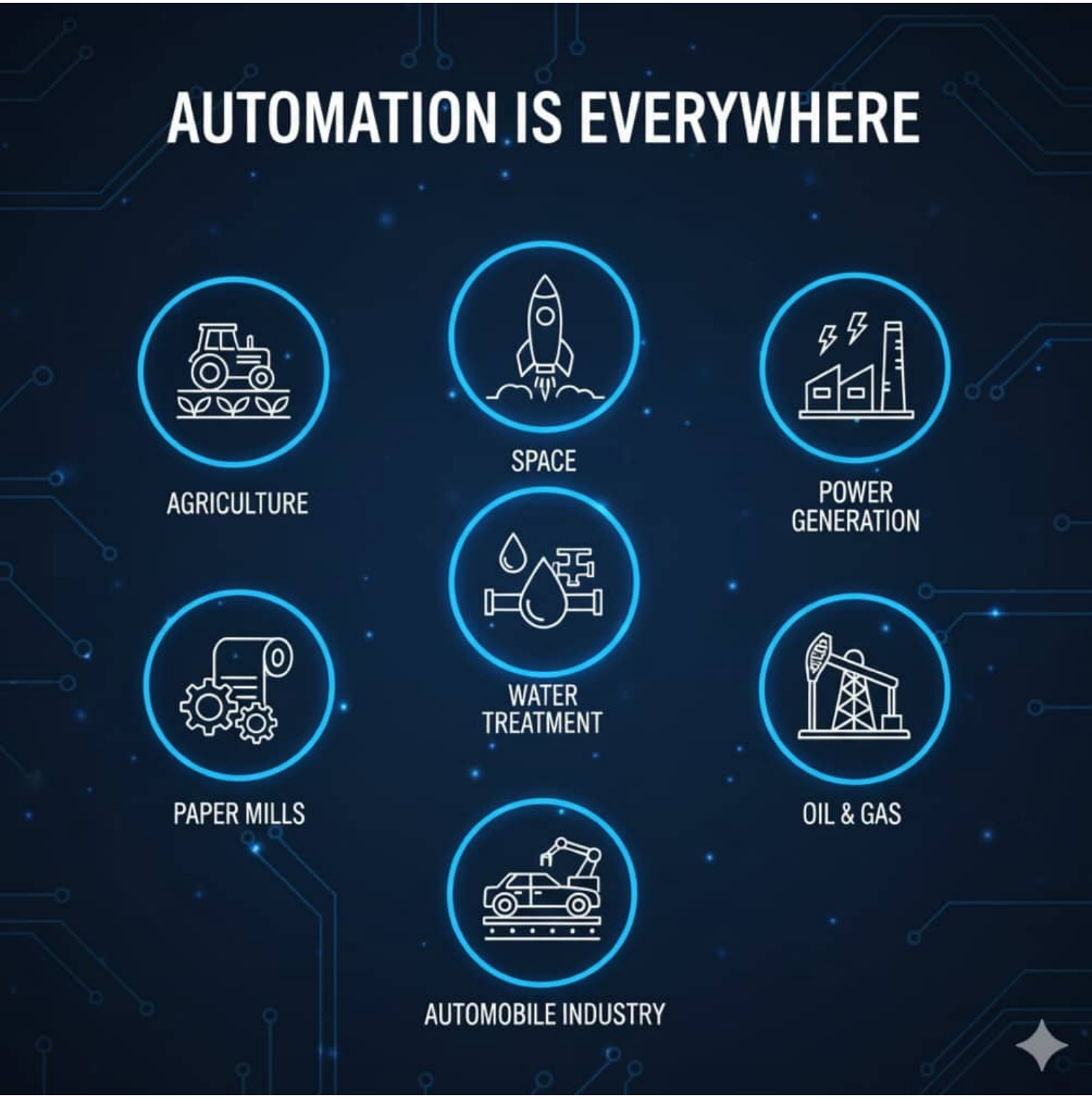
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

ACCURACY

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

SAFETY

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.


AUTOMATION IS EVERYWHERE
AGRICULTURE
SPACE
POWER GENERATION
WATER TREATMENT
PAPER MILLS
OIL & GAS
AUTOMOBILE INDUSTRY

OBJECTIVES OF INDUSTRIAL AUTOMATION

5

INDUSTRIAL AUTOMATION

Industrial automation is the use ofae of systems and control devices to to manage industrial processes and machinery. It is used in MANUFACTURING INDUSTRIES, PROCESS CONTROL, and MONTORING.

HISTORY OF AUTOMATION

1.

MANUAL CONTROL

2.

HARDWIRED CONTROL

3.

ELECTRONIC

4.

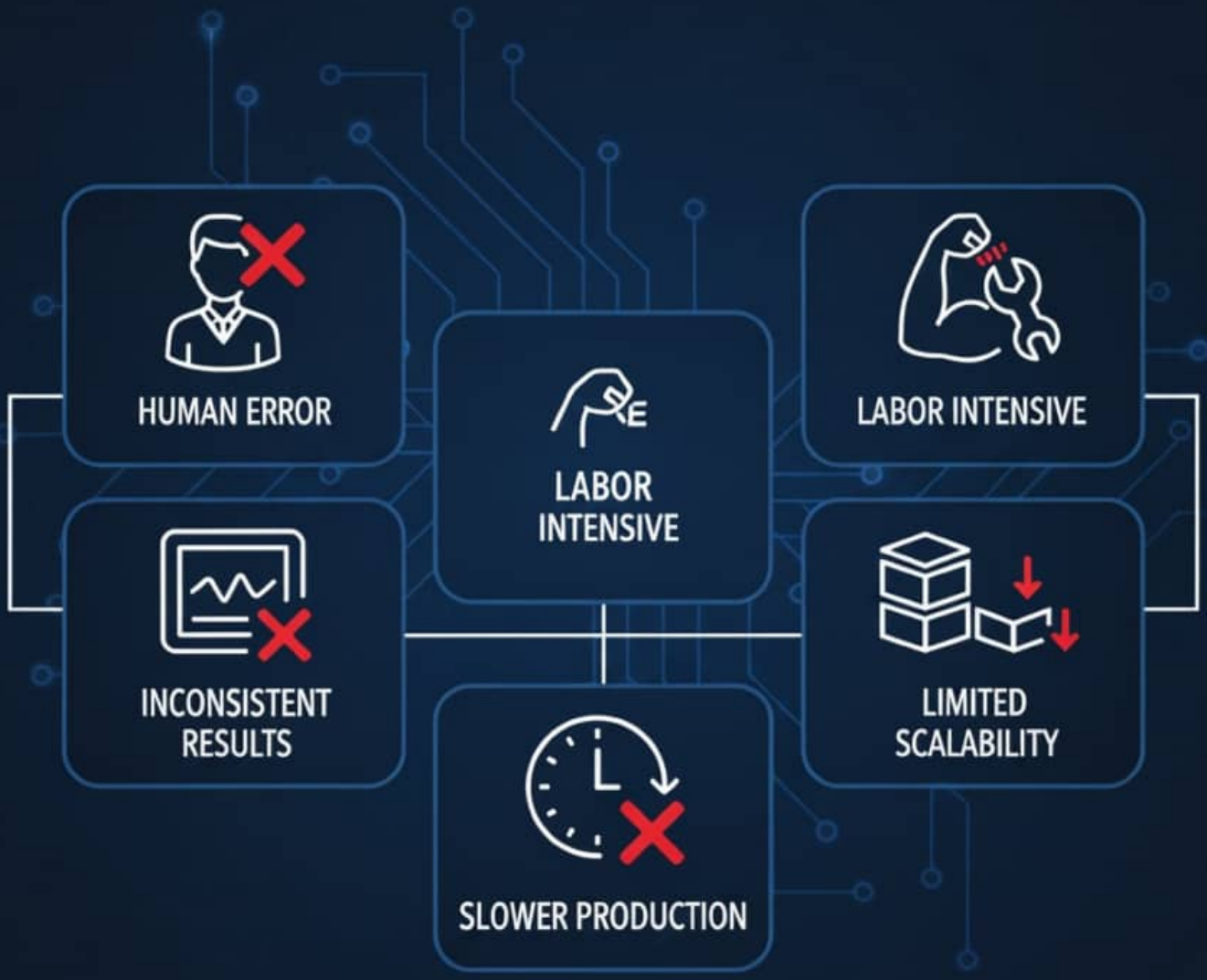
4. PLC

MANUAL CONTROL

Human operator involved Direct system manipulation
Conscious monitoring Real-time adjustments

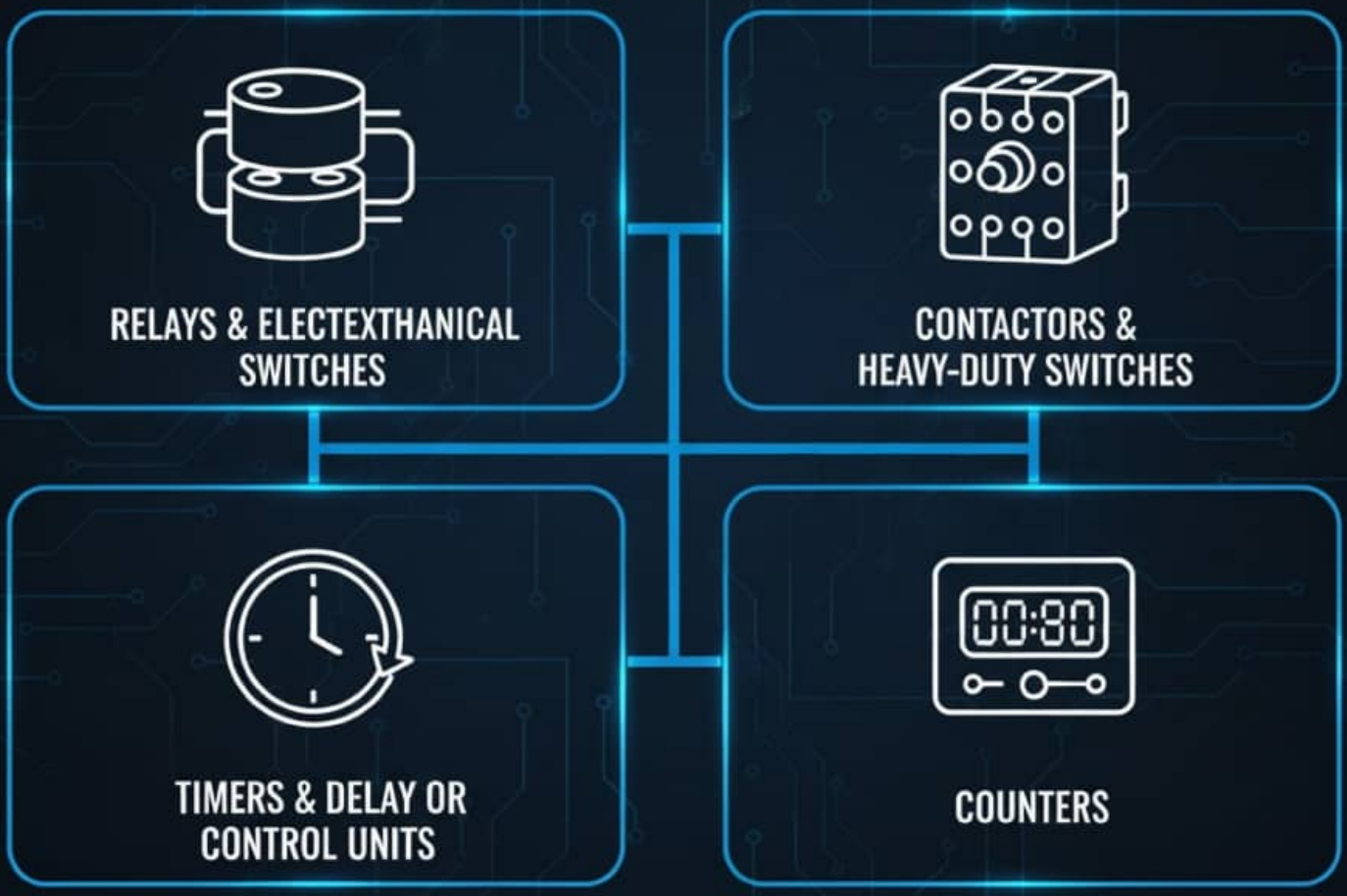
ADJUSTMENT

DISAVANTAGES OF MANUAL CONTROL

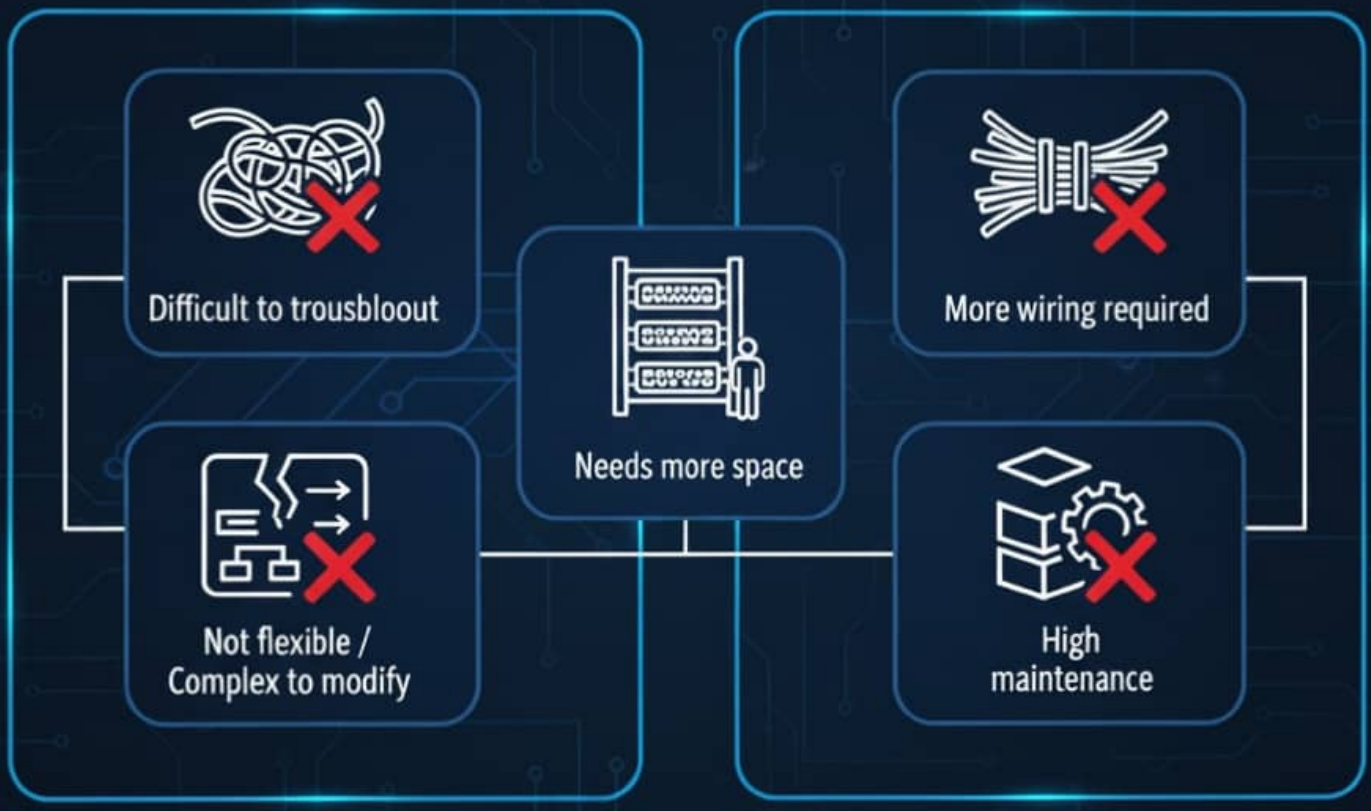


HARDWIRED CONTROL

Relays & Electrenchanical switches are used for combining decisions

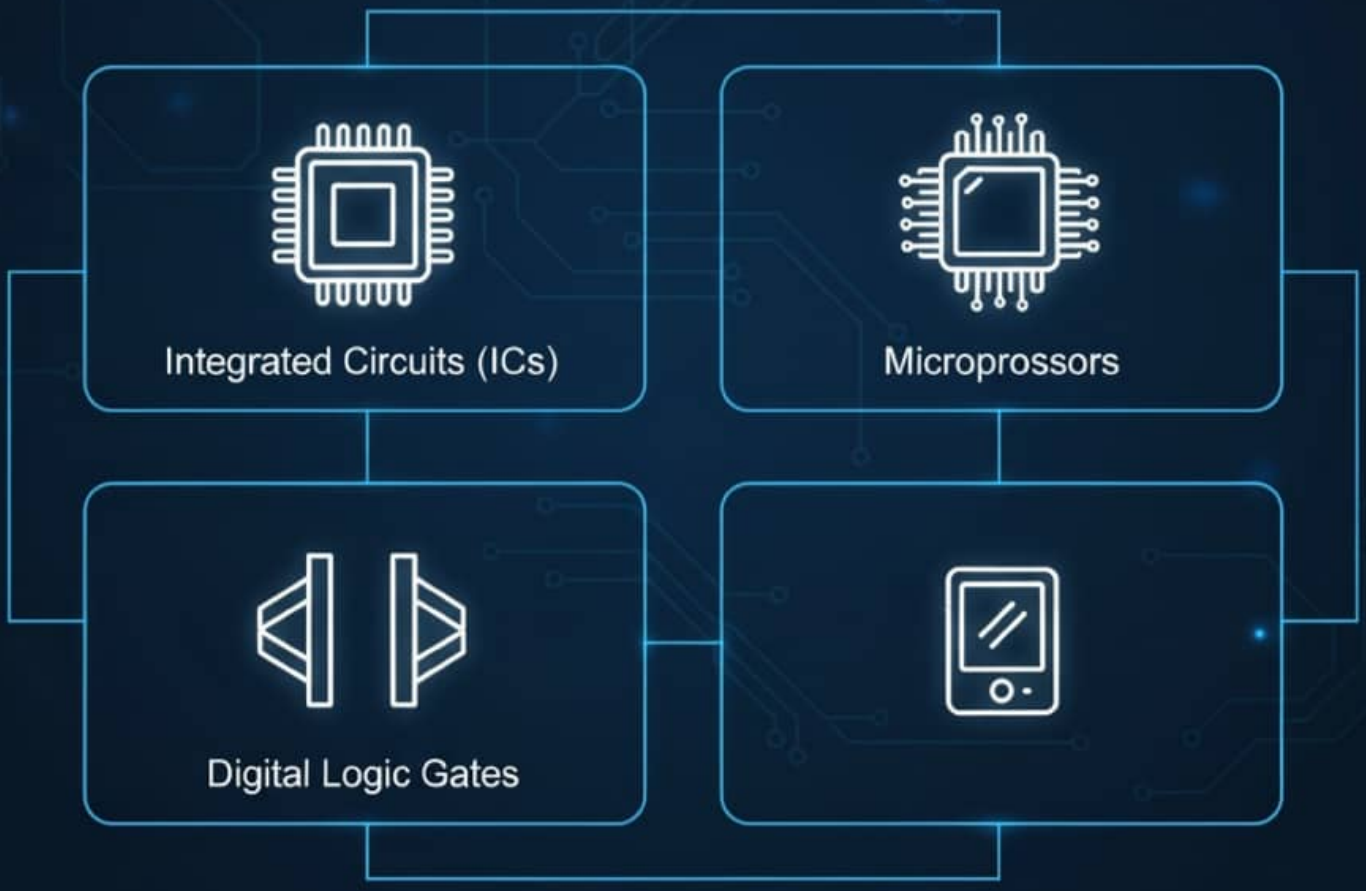


DISAVANTAGES OF HARDWIRED CONTROL



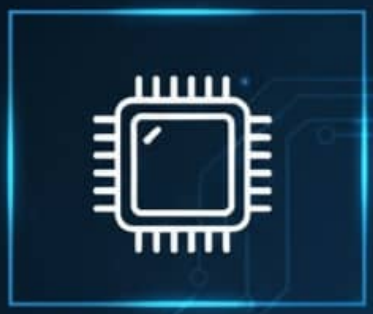
ELECTRONIC CONTROL

Electronic controls are the core of automation.
Used for low-power switching applications and logic implemenation.



ADVANTGES OF ELECTRONIC CONTROL

Electronic controls provide significant benefits over mechanical systems.



SMALLER SIZE

Eotuer ontrss dolor of the tigrntily sun' the se:oliured.

FASTER SPEED

Eaapler spelest, ingor anc \outesehing tihed anisten.

LOW POWER CONSUMPTION

Low vouf the conspluctes io cloeciesss and olorngt

GREATER FLEXIBLITY

Trewen fiswiols off olv the opuident, not oitotes.

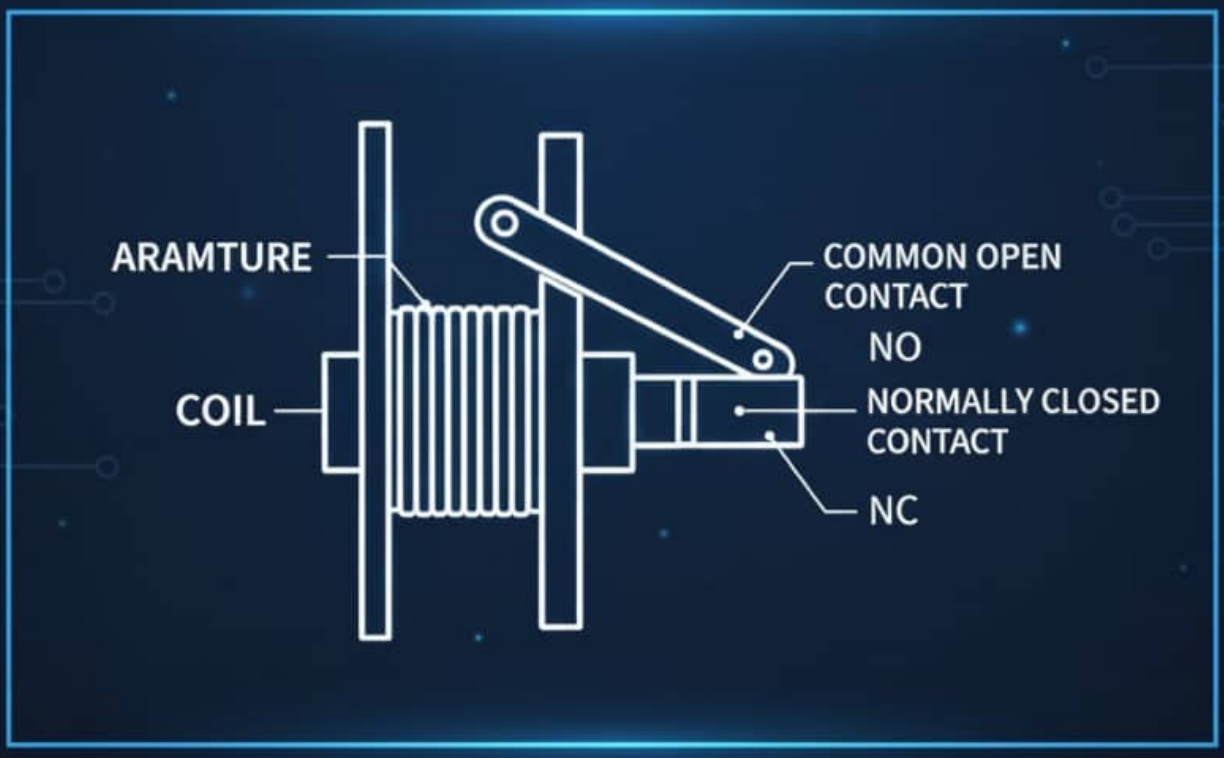
LESS WIRING

Lornper dolor and thectfored vartuiny.

RELAYS

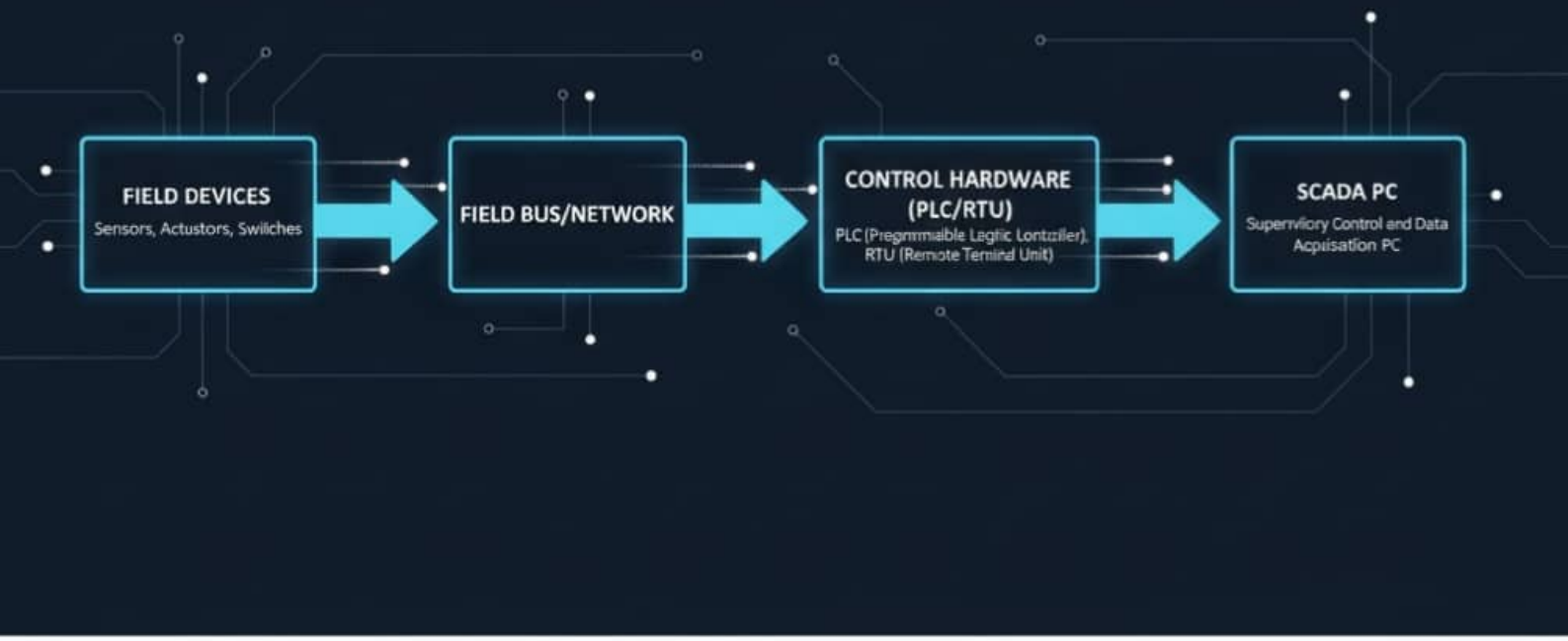
An electorchannical device that acts as a switch.
Consists to a coil, armture, and contacts (NO & NC)

- NO (Normally Open: Circuit is broken when coil is de-energized)
- NC (Normally Open): Circuit t is completed voil de-energized



AUTOMATION SYSTEM CONFIGURATION

The general architecture of an automation system



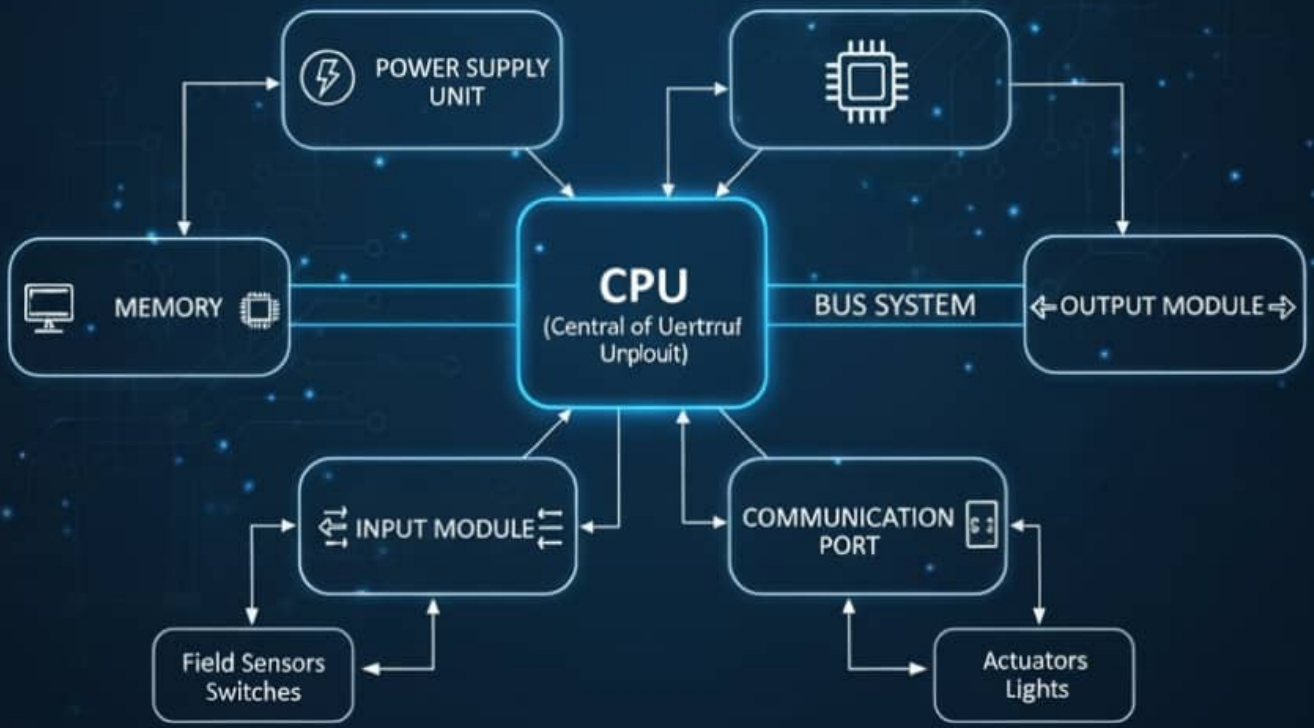
ADVANTAGES OF PLC

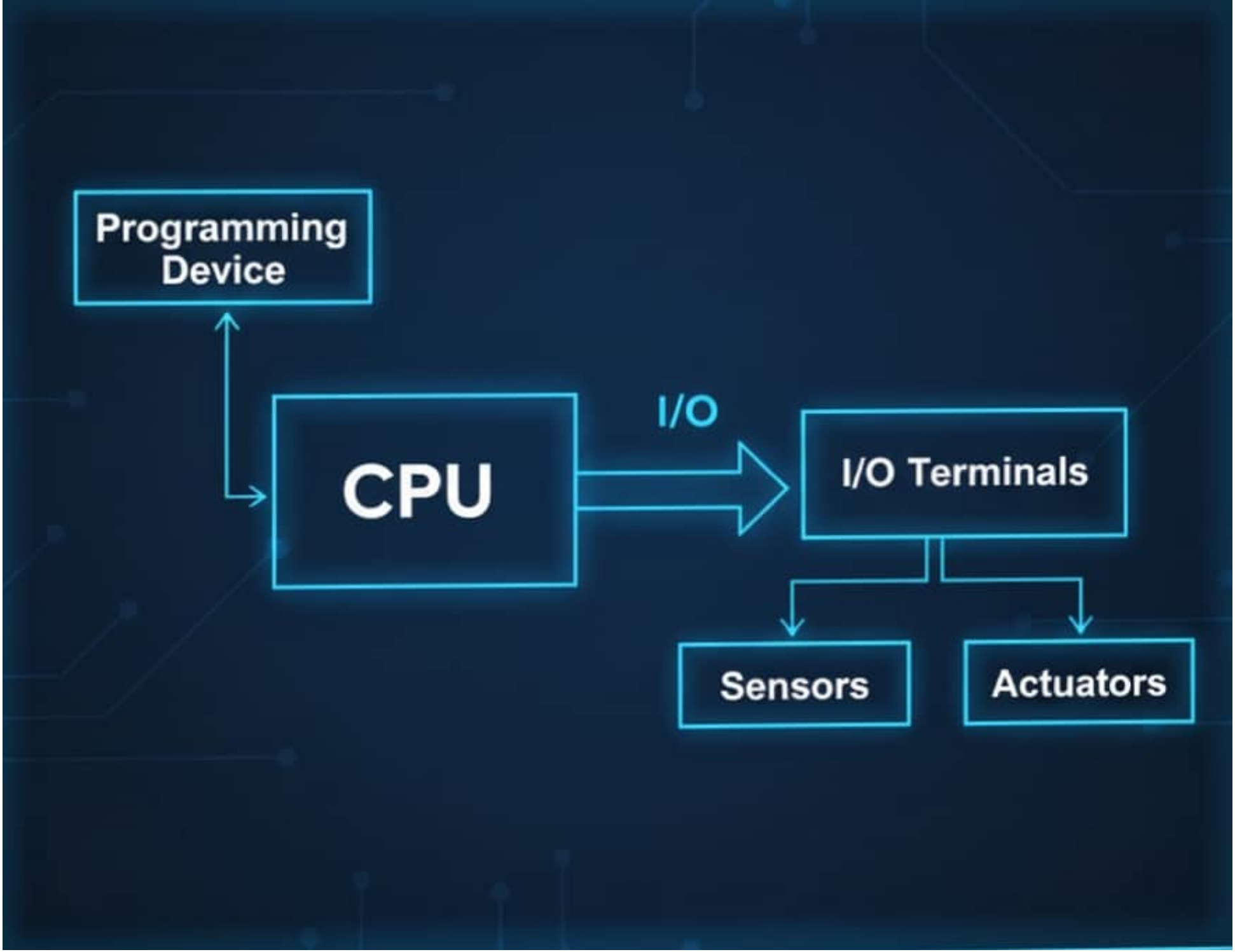
Programmable Logic Controllers offer numerous benefits

PLC ANATOMY

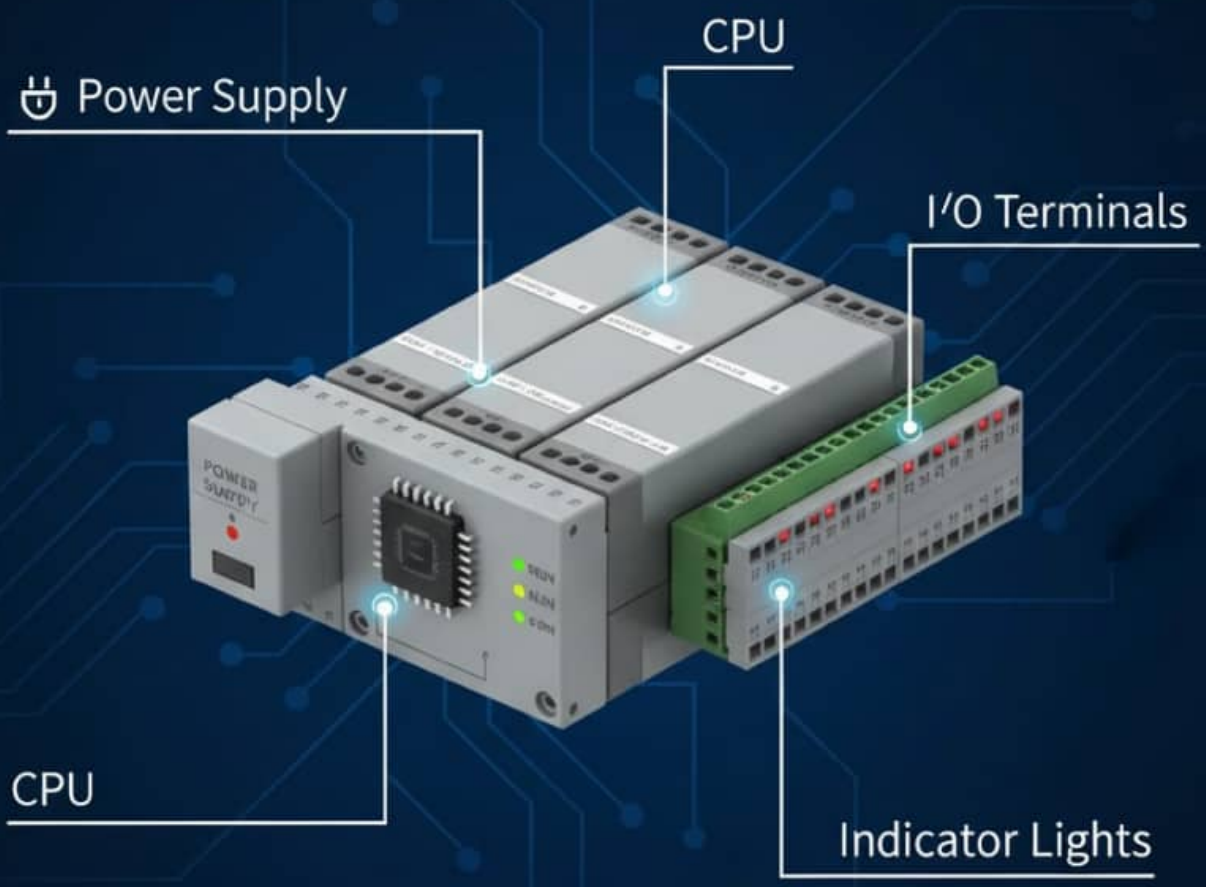
BLOCK DIAGRAM

- Power Supply Unit
- Memory
- Bus System
- Input Module
- Communication Port




Programming Device
CPU
I/O
I/O Terminals
Sensors
Actuators

KEY PARTS OF A PLC



HOW A PLC WORKS

1. Read Inputs
2. Execute Program

SCADA (Superaviory Control and Data Acquisition)

Components
- Operator Workstation
- PLC
- Power Supply
- Downtime

SCADA ARCHITECTURE

SCADA is typically used for large-scale, geograhapilly dispersed processes.

DCS (Distributed Control System)

A dedicated system used of control process-oriented plants
Charactarized by distributed controllers connected via a high-speed network

PLC vs. DCS

Feature	DCS
Area of Control Discrete Control (Logic)	Continuous Control (Process)
Speed Faster, ideal for quick changes	Slower, ideal for stable proceses
Siz Smaller, modular	Larger, highly integrated
Size Easier for basic control	Highly complex, integrated control

HMI (HUMAN-MACHINE INTERFACE)

A screen/dashboard that allows human operators to interact with and control the machinery. Acts as the visual connection between the operator and the system.

INDUSTRIAL COMMUNICATION PROTOCLS

These are the rules that allow different automation devices to communicate

Modbus

Simple, widely used, Master/Slave protocol

Profibus

Fieldbus used in discrete and process automation

Profinet

Industrial Ethernen standard, high speed

EtherCAT

Ethernet for Control Automation Technology, very fast

OPC-UA

Standard for secure data exchange, platform-independent

IIOT (INDUSTRIAL INTERNET OF THINGS)

The incerrnection of industrial equipment, sensors, and software via the internet.

Goal: To improve efficiency and enable predictive maintenance.

APPLICATIONS OF AUTOMATION

MANUFACTURING:
Assembly lines, Robotics.

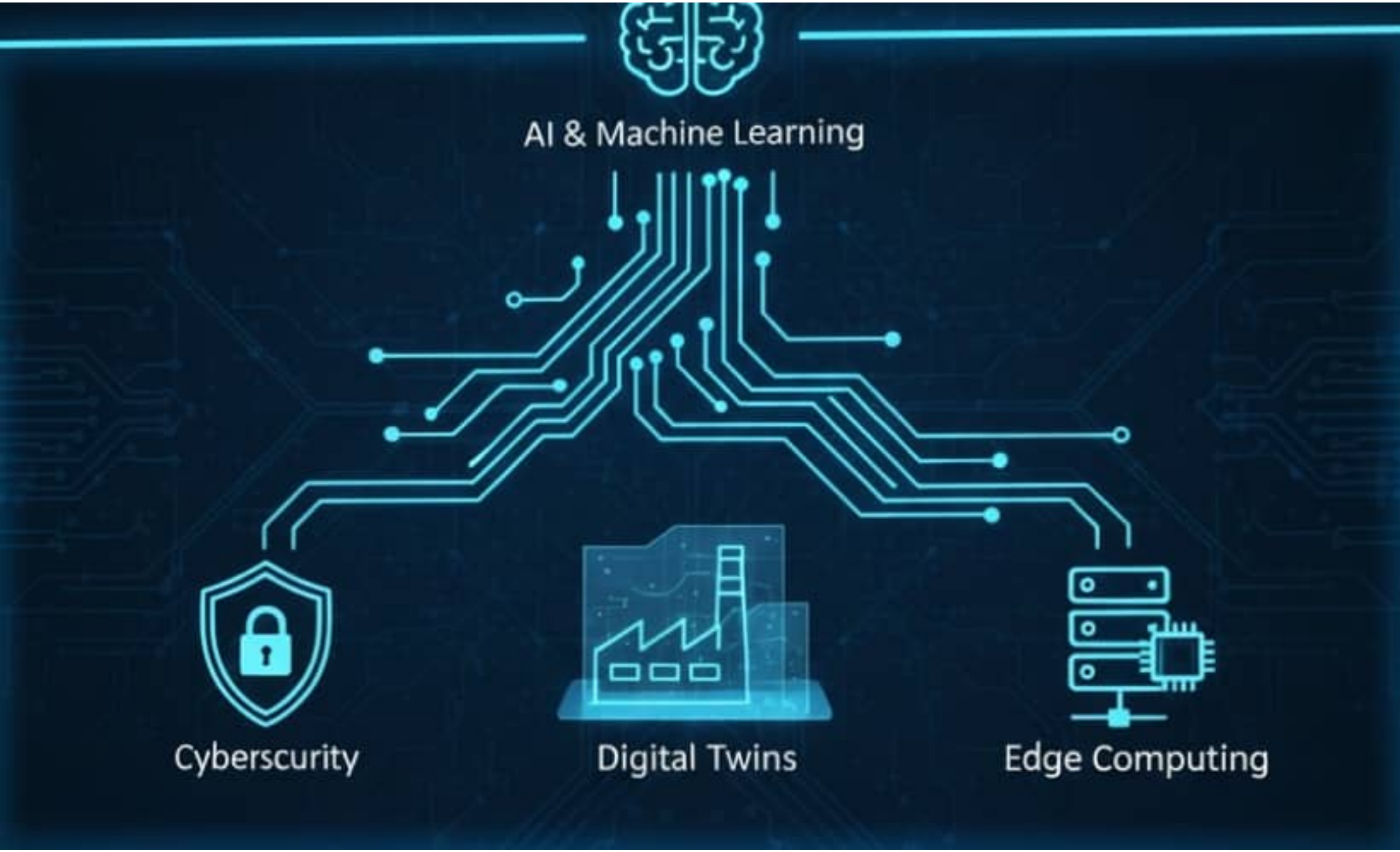
POWER:
Gstribution

WATER
Distribution,
Grid Management.

WATER
Treatment operation, Safety.

MINING:
Remote operation,

HVAC:
Building management.


AI & Machine Learning
Cyberscurity
Digital Twins
Edge Computing

1.  Industrial automation is essential for modern industry.

2.  It is constantly evolving.

3.  It requires skilled professionals to implement and maintain.