

IEC 61499 Function Blocks for Embedded and Distributed Control Systems Design

Valeriy Vyatkin

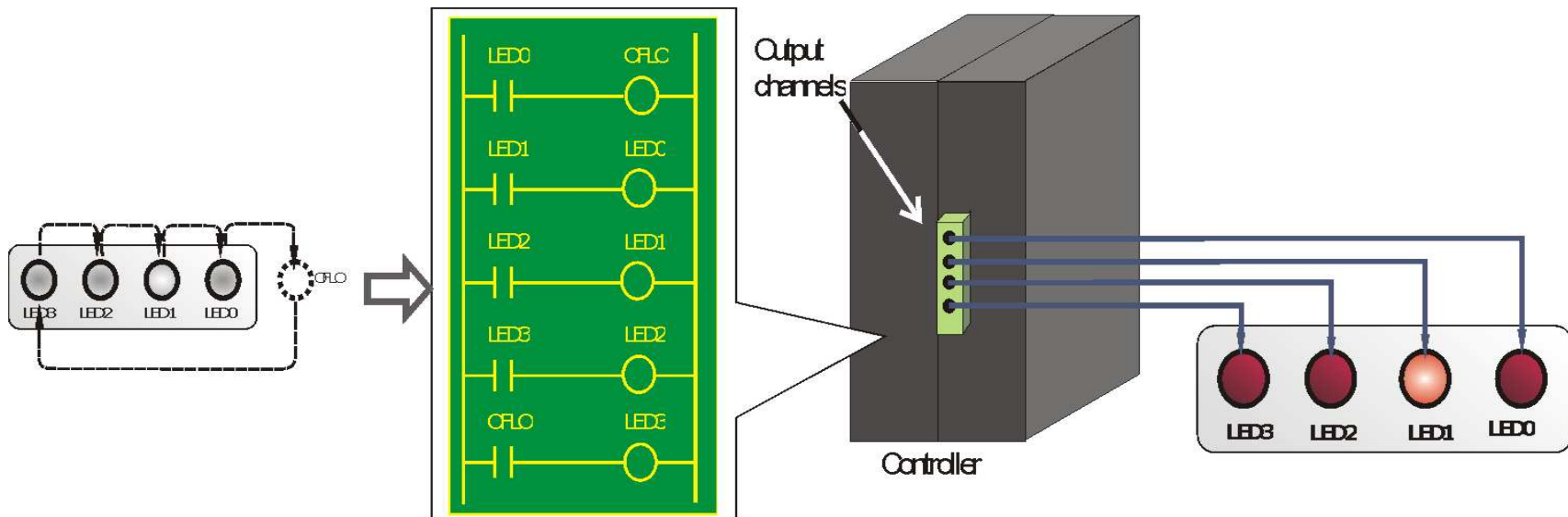


Lecture 2: Evolution of Automation Systems



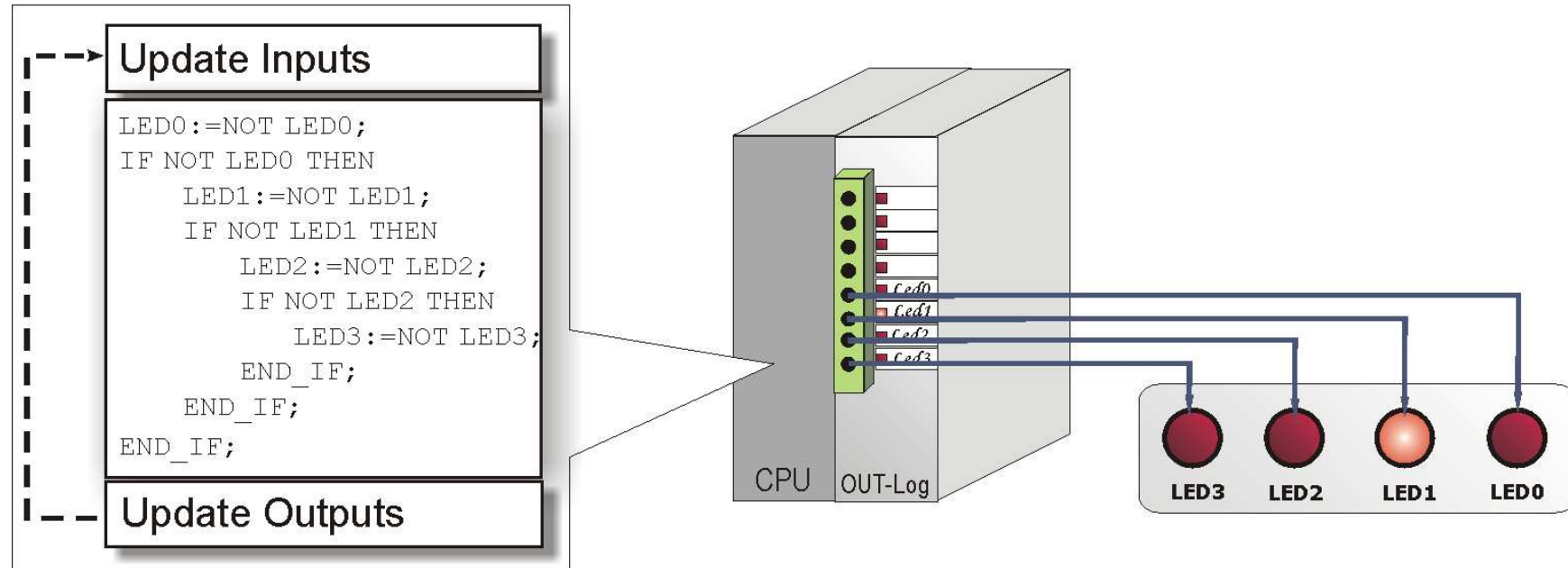
Valeriy Vyatkin © 2007

Generation 1: Relay Ladder Circuits



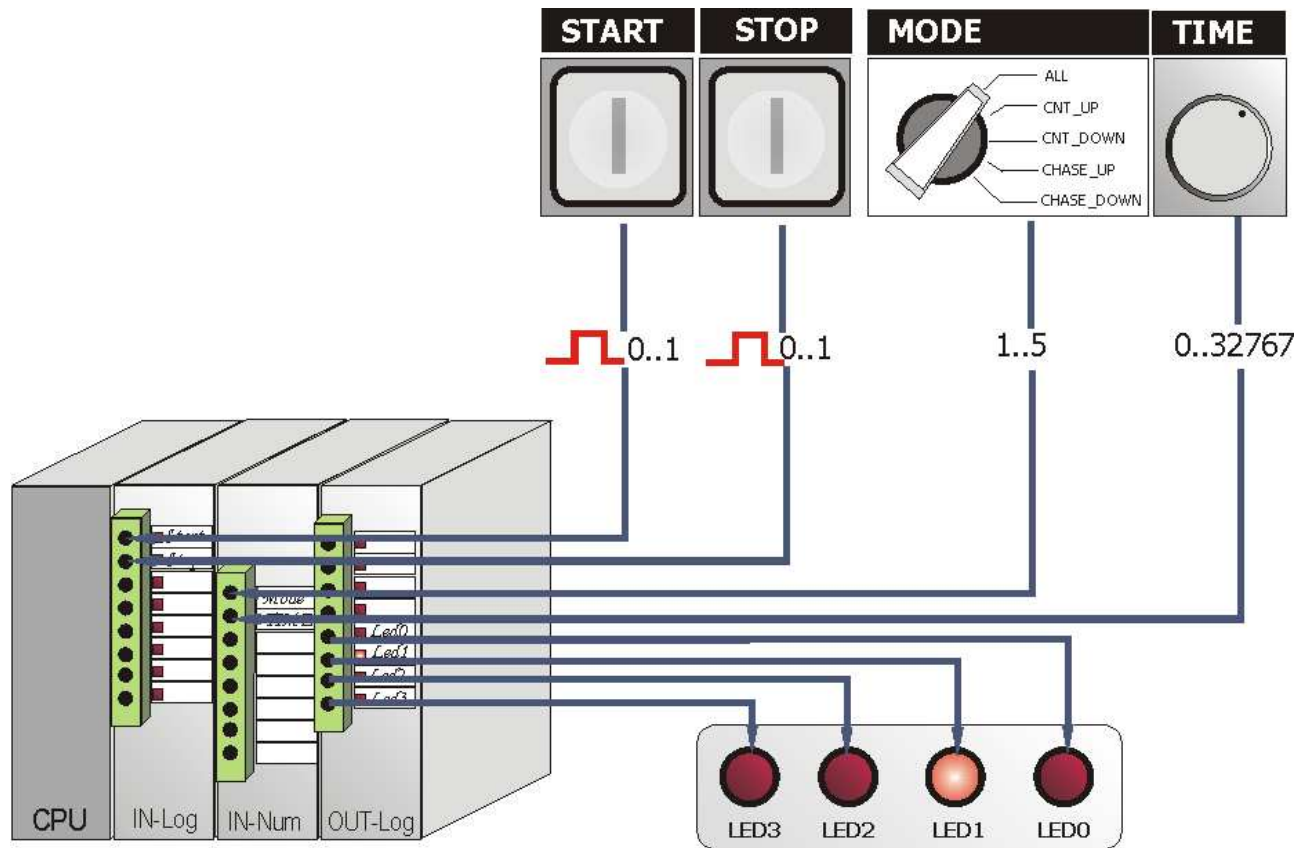
Hard-wired ladder logic circuits were widely used to control industrial equipment. This explains current popularity of the Ladder Diagram language for programming industrial controllers

Generation 2: Programmable Logic Controllers (PLCs)



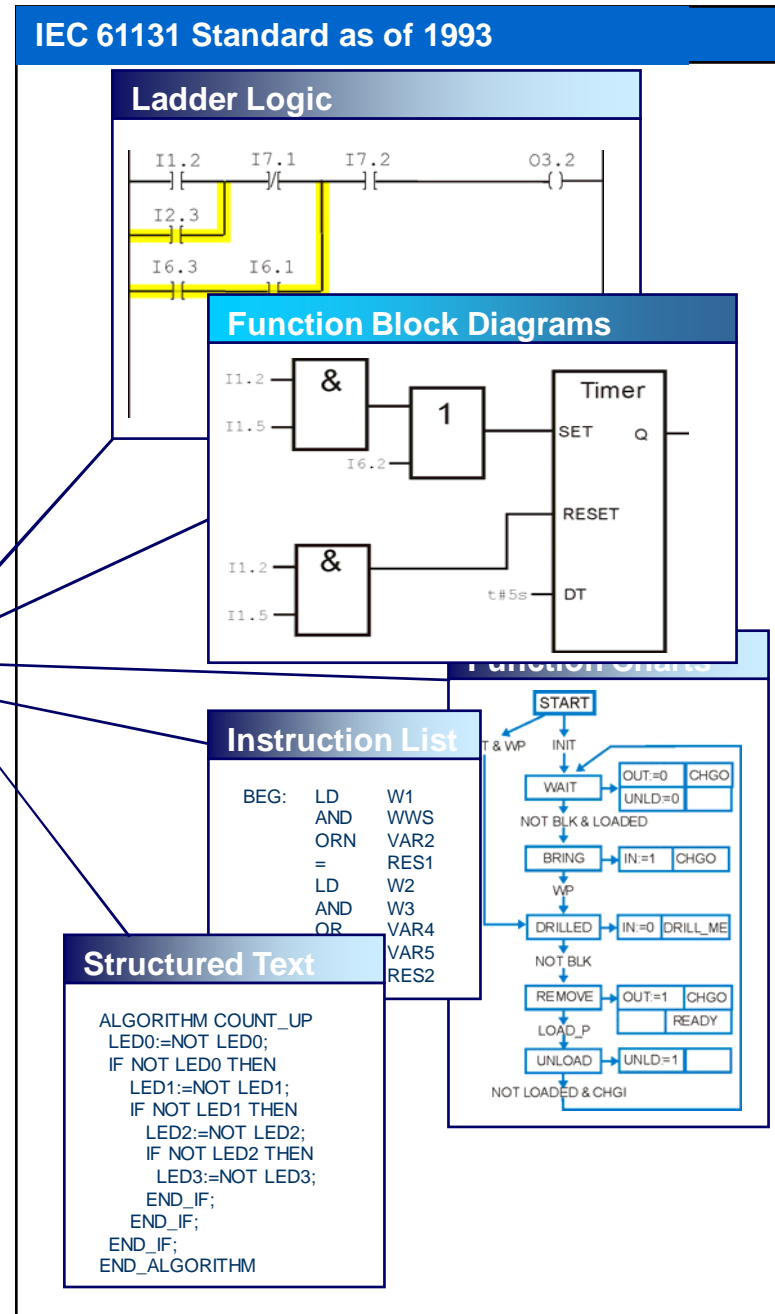
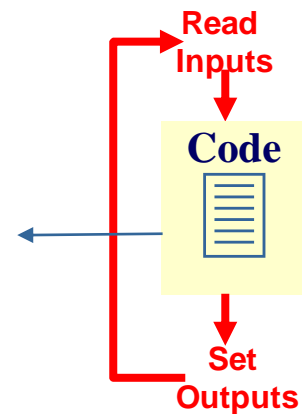
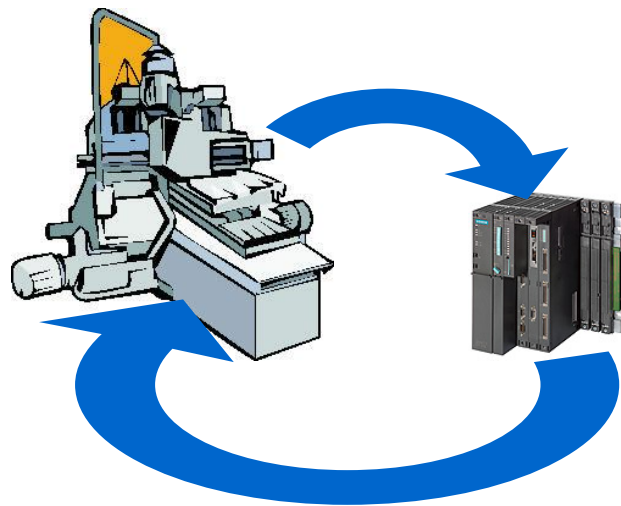
PLCs – specially hardened industrial computers - tremendously improved flexibility of automation systems

Generation 3: Multifunctional PLCs

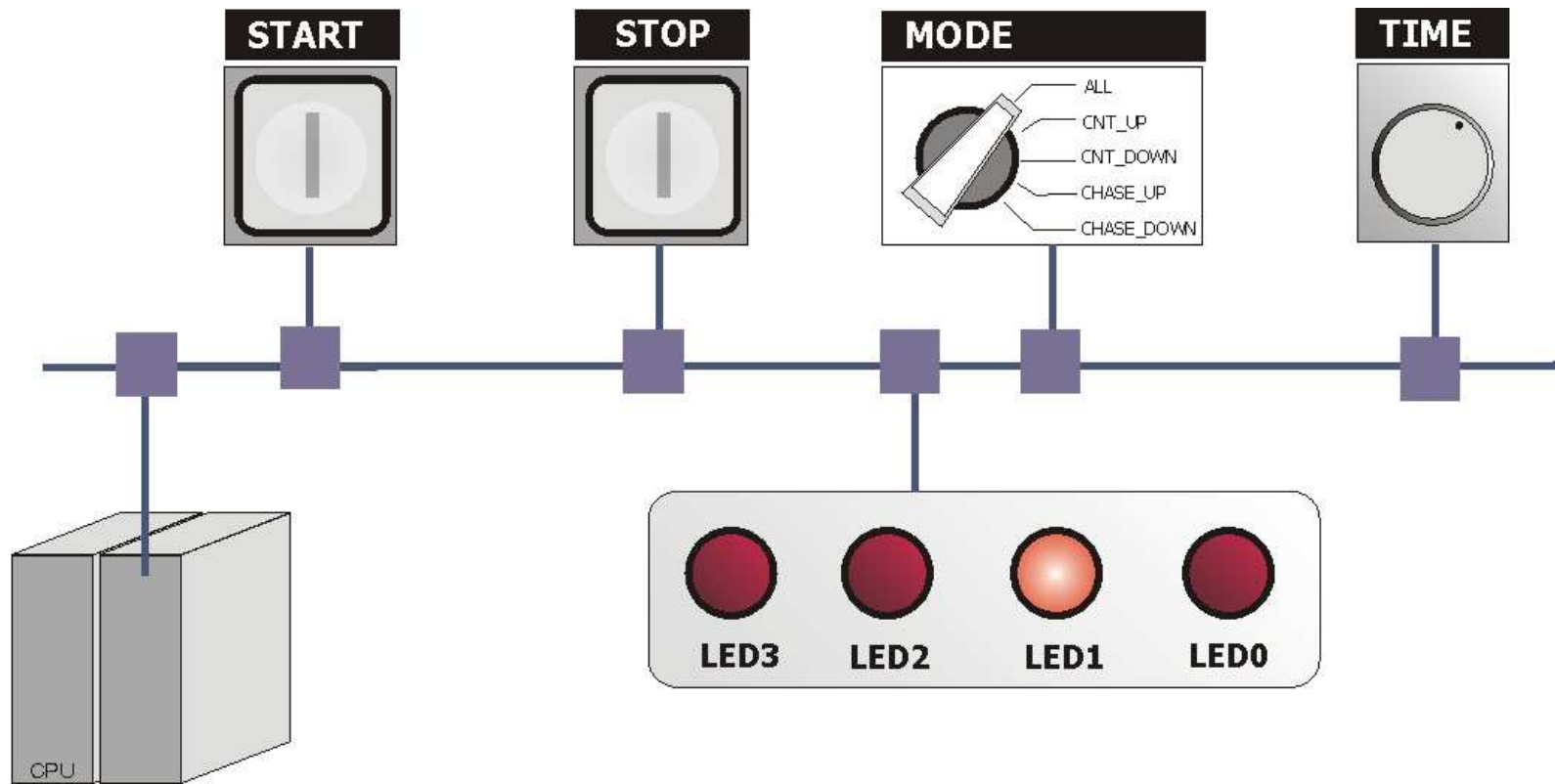


Modern PLCs know many programming languages and have versatile and easily expandable architecture.

Traditional Software Architecture of PLCs (IEC 61131)

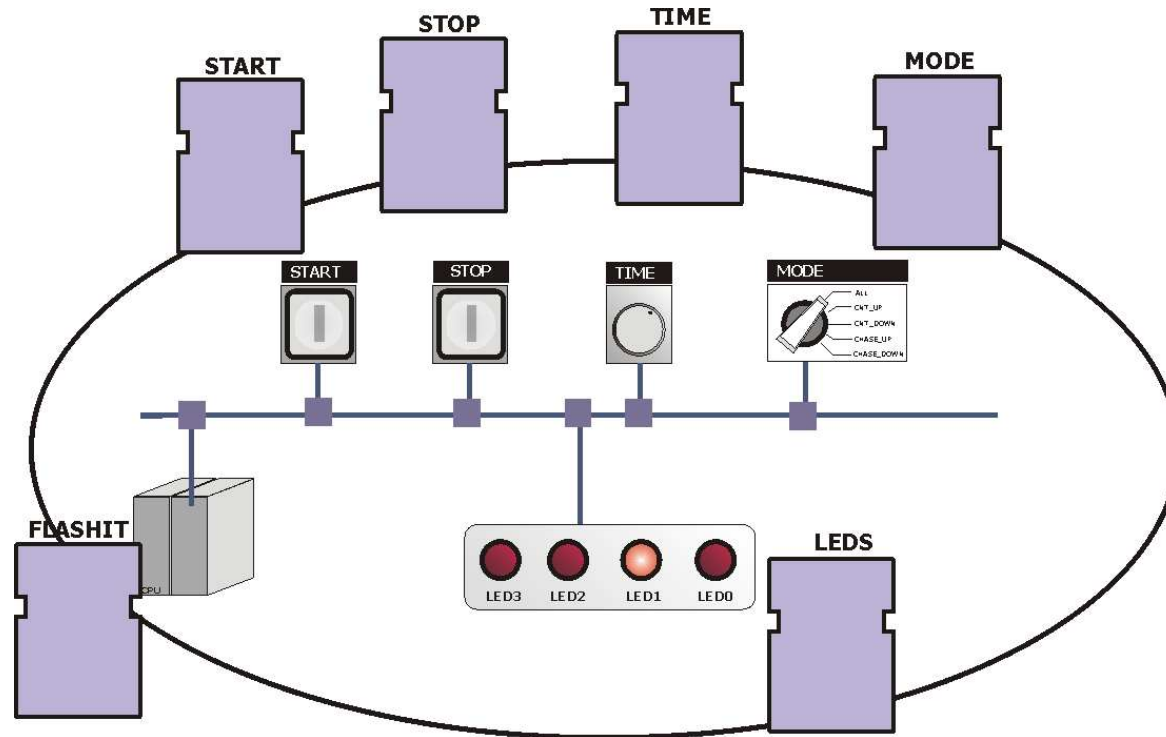


Generation 4: Distributed Automation Solutions



Distributed automation solutions are based on networking. Central processor receives information from sensors and sets actuators via field - area networks (fieldbuses)

Object-Oriented Design of Software



Highest flexibility can be achieved when software is structured similarly to the physical structure of a system, i.e. one software component corresponds to one physical unit

Conclusions

- The frontier of automation technology is characterized by the ability of automated machines to adapt to the ever changing environment conditions.
- Industrial automation technology has evolved through several generations.
- Each next generation, along with higher efficiency, brought a new degree of flexibility to automation systems.
- The legacy of past generations is present in next generations; for example, many controllers are still programmed in ladder logic