1. Introduction

Centralised Control

Distributed Control

Automation Systems Design

Traditional Programmable Logic Controller (PLC)

Standard approach in many industries
Easy to design with well-supported tools
Difficult to match controllers and devices from different vendors

At Scenario 1:
Need to modify or rewrite the entire control program

At Scenario 2:
Difficult to reuse or duplicate previously written software

Consider following scenarios:

Scenario 1: Configuration Change
Scenario 2: Duplicated Devices

Under both scenarios:
- No need to modify the entire program
- Software reusable
- Design can be vendor-independent
- Low level of industrial acceptance
- Complexity in design
- Hard to validate the design

These can be achieved by using IEC61499 Function Blocks.

3. IEC61499 Function Blocks

The International Electrotechnical Commission (IEC) established a new standard, IEC61499, introducing the “Function Blocks” concept.

The controller programs are now stored as a network of Function Block modules, which can be directly compiled and loaded into controllers.

4. Solution

Even though the distributed control approach improves the flexibility and reconfigurability of the automation systems, it has some drawbacks.

One solution to these problems is an integrated software development and validation environment that allows design and simulation of the systems based on Function Blocks. This environment can be used to check the correctness of the system design.

5. Results

A motor model has been tested with the model transformation approach. By using UDP socket communication with the same controller, the output from the transformed Function Block model produces the same outputs as the original Simulink model.

6. Conclusion

A software environment is established, which allows design and simulation of control systems based on Function Blocks. This environment eases the design process and potentially improves the industrial acceptance.