



Provide a concise introduction into the IEC 61499 programming language. Consider that I am already familiar with IEC 61131-3. Provide a list of their key differences. Create a list of five references to get more information.



IEC 61499 is a standard for distributed industrial process measurement and control systems, which extends and complements IEC 61131-3, the well-known standard for industrial control programming. It was specifically designed to address the challenges of distributed automation systems and the need for greater interoperability, flexibility, and reusability. The primary goal of IEC 61499 is to enhance the modularity, portability, and configurability of control systems by defining a function block model, execution models, and an event-driven approach to communication.

Key differences between IEC 61131-3 and IEC 61499:

1. Execution Model: While IEC 61131-3 uses a cyclic execution model, IEC 61499 introduces an event-driven execution model, allowing for more responsive and dynamic control systems.
2. Function Blocks: IEC 61499 employs a more advanced function block model, where each block encapsulates both data processing and event handling, as opposed to IEC 61131-3's separation of function blocks and execution control.
3. Distributed Systems: IEC 61499 provides explicit support for distributed control systems by defining a model for communication and configuration, while IEC 61131-3 focuses on centralized control systems.
4. Portability: IEC 61499 emphasizes the portability and reusability of control software through its open, device-independent architecture, whereas IEC 61131-3 is more closely tied to specific hardware implementations.
5. Configuration Language: IEC 61499 introduces a new configuration language (XML-based) for specifying system structure and deployment, whereas IEC 61131-3 uses a text-based language.

Five references to get more information:

1. Vyatkin, V. (2013). IEC 61499 Function Blocks for Embedded and Distributed Control Systems Design. Wiley-IEEE Press.
2. Thramboulidis, K. (2017). The 4th Industrial Revolution: Responding to the Impact of Artificial Intelligence on Business. Springer International Publishing. (Chapter 3 focuses on IEC 61499)
3. Lewis, R. (2001). Modelling Control Systems Using IEC 61499. IET.
4. International Electrotechnical Commission (IEC). (2012). IEC 61499-1: Function blocks - Part 1: Architecture. IEC.
5. International Electrotechnical Commission (IEC). (2012). IEC 61499-2: Function blocks - Part 2: Software tool requirements. IEC.