

# 20.1 IEC 61499

IEC 61499-1 defines the architecture for distributed systems. In IEC 61499 the cyclic execution model of IEC 61131 is replaced by an event-driven execution model. The event-driven execution model allows for an explicit specification of the execution order of function blocks. If necessary, periodically executed applications can be implemented by using the E\_CYCLE function block for the generation of periodic events.

IEC 61499 enables an application-centric design, in which one or more applications, defined by networks of interconnected function blocks, are created for the whole system and subsequently distributed to the available devices. All devices within a system are described within a device model. The topology of the system is reflected by the system model. The distribution of an application is described within the mapping model. Therefore, applications of a system are distributable but maintained together.

Like IEC 61131-3 function blocks, IEC 61499 function block types specify both an interface and an implementation. In contrast to IEC 61131-3, an IEC 61499 interface contains event inputs and outputs in addition to data inputs and outputs. Events can be associated with data inputs and outputs by WITH constraints. IEC 61499 defines several function block types, all of which can contain a behaviour description in terms of service sequences:

Service interface function block – SIFB: The source code is hidden and its functionality is only described by service sequences;

- Basic function block - BFB: Its functionality is described in terms of an Execution Control Chart (ECC), which is similar to a state diagram (UML). Every state can have several actions. Each action references one or zero algorithms and one or zero events. Algorithms can be implemented as defined in compliant standards.
- Composite function block - CFB: Its functionality is defined by a function block network.
- Adapter interfaces: An adapter interface is not a real function block. It combines several events and data connections within one connection and provides an interface concept to separate specification and implementation.
- Sub application: Its functionality is also defined as a function block network. In contrast to CFBs, sub-applications can be distributed.

To maintain the applications on a device IEC 61499 provides a management model. The device manager maintains the lifecycle of any resource and manages the communication with the software tools (e.g., configuration tool, agent) via management commands.

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