

## **IEC 61499 Application Model**

### **Definitions**

The IEC 61499 standard defines a distributed model for splitting different parts of an industrial automation process and complex machinery control into functional modules called function blocks. These function blocks can be distributed and interconnected across multiple controllers.

**System:** A collection of devices interconnected and communicating with each other by means of a communication network consisting of segments and links.

**Device:** An independent physical entity capable of performing one or more specified functions in a particular context and delimited by its interfaces.

**Resource:** A functional unit having independent control of its operation, and which provides various services to applications including scheduling and execution of algorithms.

**Application:** A software functional unit that is specific to the solution of a problem in industrial-process measurement and control. An application may be distributed among devices and may communicate with other applications.

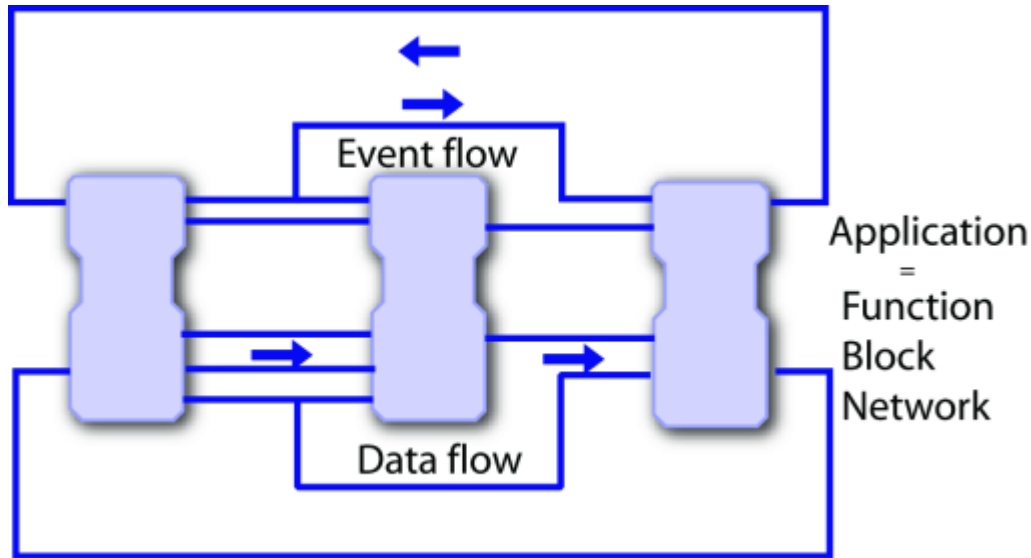
**Function block:** A software functional unit that is the smallest element of a distributed control system. It utilizes an execution control chart (ECC) state machine to control the execution of its algorithms.

### **Overview**

An Application Model represents parts included in a measurement and control application. Figure 1 shows these parts of a measurement and control application. Many function blocks are connected together with a data/event interface and are part of an application. The device is a self-contained hardware capable of executing an application distributed across one or multiple resources.

A resource is considered to be a functional unit contained in a device. The functions of a resource are to accept inputs from the process interface (IO driver) or the communication interface (Shared memory, communication network), process the data, and return outputs to these interfaces.

An automation and process control application runs in a resource or splits the load across multiple resources to use the special features of each resource.



**Figure 1:** IEC 61499 Application Model

An application may consist of one or more function blocks where the input sampling is performed in one function block, control processing is performed in a second function block, and output conversion is performed in a third function block. This distributed application may run function blocks within one resource or across multiple resources. These resources are part of one or many devices.

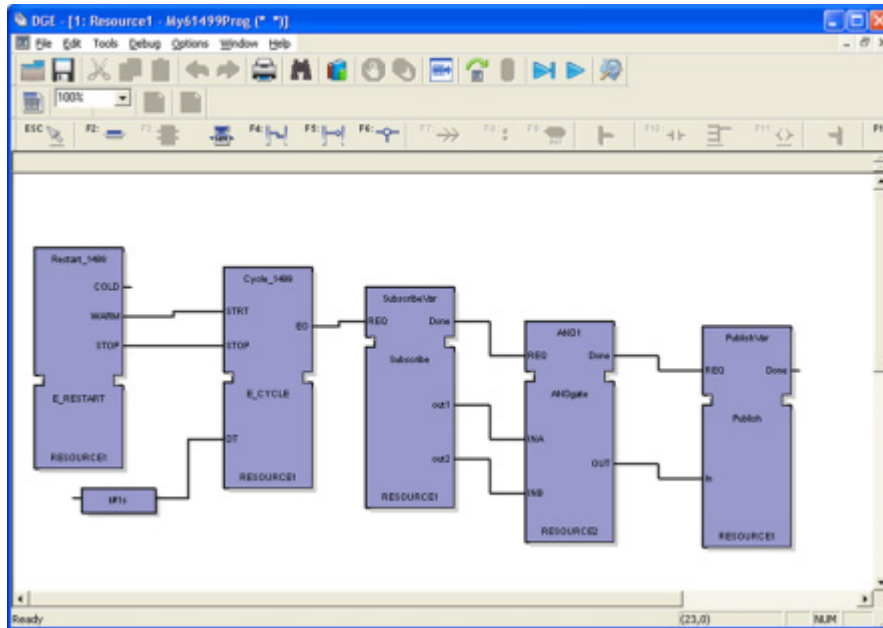
An application is defined by function block networks specifying event and data flow throughout function block instances. The event flow determines the scheduling and execution of the function blocks' algorithms.

In **ISaGRAF**, each program can be a distributed application. Figure 2 shows distributed function blocks within an application. This is the Application Model displayed by the **ISaGRAF** toolset.

A distributed application exchanges data across the communication interface. The **ISaGRAF** elements use the communication interface transparently. Building and compiling the application generates all required link parameters. Each distributed element of an application is connected to the others across the communication interface. When building an **ISaGRAF** application, the distributed application generator automatically links together these distributed elements.

Figure 2 displays function blocks, links between function blocks, and service interface function blocks. The Publish and Subscribe function blocks are service interface function blocks. These interface the application with the

communication interface and the process interface. All other function blocks are basic, composite custom build, or pre-defined function blocks from the library.



**Figure 2: ISaGRAF Application Model Viewer**

## References

- International Electrotechnical Commission: Function Blocks Part 1 - Architecture (61499-1 © CEI:200X).
- ICS Triplex ISaGRAF Inc.: ISaGRAF User's Guide. November 2005.