ISaGRAF and IEC 61499

Nicolas Jouvray
IEC 61499 is a complement to IEC 61131, not a replacement.
Key decisions in implementing IEC 61499

The ECC is programmed using SFC, a language known to all automation engineers, and not a new language. Although the ECC is programmed using SFC, it follows the ECC rules and not the SFC rules for execution.
Key decisions in implementing IEC 61499

- FB are linked together graphically, data is exchanged with its corresponding events.
- Events are implemented as USINT, the variation of the event variable indicates the occurrence of an event.
- Events are continuously sent from one block to another, ensuring that no event is lost and that the inability to process an event can be detected and handled. This approach is also fault tolerant.
- Events and their related data are sent in one message, ensuring data integrity.

Binding

- Used for exchanging data between Resources.
- Either locally within the same Configuration, or through the network.
- Producer-Consumer model.
- Each VM can cycle at a different rate from each other.
- Data is produced at every scan.

Producer-Consumer

VM: Subscribed list of interest from various consumers
Resource 1: Network or Shared memory
Driver - Clark: Declared list of interest to various producers
VM: Resource 2

Driver - Consumer
Each IEC 61499 block has an instance and is hosted by a resource in the assigned device. It inherits the properties of the resource for execution.

Assignment of a block to a resource can be done or modified at any time.

There is no need to program a service interface FB, IEC 61499 communications are automatically implemented within ISaGRAF projects. Communication with 3rd party IEC 61499 FB is done through service interface FB.
ISaGRAF 6 is built to support multiple projects with multiple devices. It allows users to build small (few devices) to huge IEC 61499 application (500+ devices).

Several views are available for easy and improved navigation.
ISaGRAF 6 provides a specific view, called “Deployment View”, for deploying devices over the network. Every network can be defined and any configuration tool can be called from this view. Not only does it help users deploy and configure their devices and network, but it also supports filters so that users can look at different layers of the IEC 61499 architecture, such as the application or sub-application views.
ISaGRAF 6 provides users with different views and ways to monitor their entire application. Users can monitor their application from the 61499 Application View or use the system event monitoring tools for firmware logs and controller status, or use the Deployment View to get a synoptic view of the device status.
ISaGRAF 6 has improved debugging capabilities, it allows users to monitor and debug applications at all levels. Users can navigate and debug their entire application from the Application View, and then drill down to the sub-application, to the composite function block, to the basic function block, to the SFC code and to the function block. Users can debug their entire application as well as choose which devices and resources to debug while the other devices stay offline.
Large applications are usually split between several engineers. In these cases, third-party tools are often used for effective collaboration. To simplify collaboration, ISaGRAF 6 provides a Version Source Control that allows users to share their code by using commands such as check-in, check-out, lock, compare, get version, etc.
ISaGRAF 6 automatically performs event detection by generating a call to the appropriate function block, depending on the selected event. SFC includes the ability to select event input and the function block is automatically instantiated within preceding steps or within the transition.
Virtual blocks are essentially basic or composite non-ISaGRAF-based IEC 61499 function blocks. Based on standardized XML, users are able to import any third-party IEC 61499 FB definition to ISaGRAF 6 and visualize them using the application view.
Based on service interface FBs described in the IEC 61499 standard, ISaGRAF automatically generates service interface FBs for ISaGRAF 5 CAM binding. During the development of an IEC 61499 application, service interface FB are hidden. However, during the test and validation phase, they can be shown so that each FB can be validated individually before getting the FB integrated into the IEC 61499 application.
ISaGRAF 6 provides a global IEC 61499 library that allows end users to drag and drop any of the FB into an IEC 61499 application. This library allows users to visualize every basic or composite FB and even FBs from any project or any device.
OEM will develop IEC 61499 function block for dedicated devices. Their aim is not to develop an application, but to offer a library of IEC 61499 FBs that will be distributed with their hardware.

---

A program is created with automatic external binding interface. OEM will be able to test these blocks individually by forcing binding variables.
End users only consume FBs that have been provided to them, unless they wish to create their own IEC 61499 FBs for developing complex IEC 61499 applications.

Using the IEC 61499 library, end-users will simply select all available IEC 61499 FB and drag & drop them into their IEC 61499 application editors. The resource that will execute the logic will be selected at the same time.

Create application containing one or several devices.

All instances are created automatically in the following diagram.

Users will be able to visualize the whole system and deploy it as they wish. From there they will be able to download, monitor…

Each block will be instantiated in each resource and all service interface for binding will be created.
IEC 61499 Day at SPS/IPC/DRIVES 2011

23rd of November 2011, Nuremberg, Germany
9:30 – 16:00, open door policy with prior registration
Organizer: Prof Valeriy Vyatkin, University of Auckland, New Zealand
Sponsors: ISaGRAF and NxtControl

Program:
1. Workshop “Industrial experiences of IEC 61499 application”;
2. Lunch-time presentations by leading researchers;
3. Hands-on training on ISaGRAF and NxtControl tools;

The workshop will reflect industrial experiences, in particular of Tessmar (Austria), ITIA-CNR (Italy), Glidepath (New Zealand), PROFACTOR (Austria), Visual Components Oy (Finland), Turomas Group (Spain) and Energex (Australia) in applying IEC 61499 technology provided by software tools of ISaGRAF (Canada), 4DIAC (Austria) and NxtControl (Austria) and using off-the-shelf hardware of Advantech, Beck, Beckhoff, FESTO, SIEMENS, Wago and other suppliers.

• Admission: Free for SPS/IPC/Drives visitors and exhibitors
• To register please contact: iec61499day@gmail.com
Thank you

Nicolas Jouvray – Sales Manager Europe