Topic:

# Cycle time and event-controlled automation environments

**IEC 61131 and IEC 61499 compared**


**Automation environments with distributed controllers represent the basis for IoT, Smart Grids and Industry 4.0.**

The traditional automation model according to IEC 61131, as used for example in PLC programming, is typified by cycle-based processing. The function blocks combined into the overall logic are processed at a fixed interval and the resulting signals and values stored in the internal process image after each cycle . Then depending on the type they are made available on the physical outputs of the controller or as internal variables and together with the signals on the input terminals represent the data-technical basis for the next processing cycle.

But as soon as the overall system consists of more than one controller, the traditional model reaches its limits. Here is where IEC 61499 applies, enabling a modeling of distributed systems. The corresponding cross-manufacturer controllers are for example linked to each other over Ethernet, use this medium to exchange their process data and in this way can be combined into a homogenous overall system. Since the real-time capability is lost due to the latent communication paths between the controllers, an event-based solution replaced the cycle time based approach in IEC 61499. The function blocks familiar from IEC 61131 were expanded with additional in- and outputs for event signaling and contact each other in this way. A function block is then only activated if it receives a trigger signal from another function block.

**IEC 61131 and IEC 61499 compared:**

| | **IEC 61131** | **IEC 61499** |
|---|---|---|
| Processing | Cycle time based | Event based |
| Scalability | Only by expanding the processing logic of the individual controller | Expanding the processing logic of individual controllers and adding additional controllers |
| real-time capability | Yes, since there are no latent communication paths | No, since communication between the controllers has a delay |
| Interoperability | Programming of the individual system according to manufacturer specifications | Central programming of the overall system using compatible project planning software |

When project planning the system the last step is to export the relevant function scope for each controller in the form of an XML configuration which is then loaded into the respective component. In this way controller sequences can be kept centrally and then distributed to the corresponding controllers and there activated. This approach is also convenient when it comes to later changes, since new rules can be used in a uniform system from task declaration to activation.

In addition to the programmable logic controllers, the use of correspondingly communications capable automation components without their own controller logic is possible. In an Ethernet-based automation environment therefore the Web-IOs from Wiesemann & Theis can also be used as decentralized IO modules in order to acquire analog and digital measurement values or switch corresponding actuators. Integration is carried out for example using the IoT protocols OPC UA or MQTT.

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Sample order

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## Could you use some assistance?

If you have any questions or would like assistance with these products, please feel free to contact me.


+49 202/2680-110 p.knabe@wut.de

**Patrick Knabe**


W&T

We are available to you in person:

Wiesemann & Theis GmbH
Porschestr. 12
42279 Wuppertal
Phone: +49 202/2680-110 (Mon.-Fri. 8 a.m. to 5 p.m.)
Fax: +49 202/2680-265
info@wut.de

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