

# The Future of IEC 61499

## Open Discussion on the 2nd Edition

### **4DIAC / O<sup>3</sup>neida Workshop**

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CCN West, Level 2, Exhibition Centre Nuremberg  
Nuremberg, Germany

Wednesday, 25<sup>th</sup> November 2009

# Agenda

Time	Subject	Responsible
15:00 – 15:10	Welcome and Introduction	ACIN / PROF
15:10 – 15:30	Status IEC 61499 2nd Edition – Actual Work MT 15 Team	ACIN / PROF
15:30 – 15:55	ISaGRAF - Progress Report IEC 61499 Implementation	ISaGRAF
15:55 – 16:20	nxtControl - Progress Report IEC 61499 Implementation	nxtControl
16:20 – 16:40	Coffee Break	All
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# Goal of the Workshop

- Proposed time schedule for the 2<sup>nd</sup> Edition
- Presentation of the MT15 Team
- Presentation of the actual work of the MT15 Team
- Feedback from IEC 61499 developers and users
- Discussion of open issues and important extensions for the 2<sup>nd</sup> Edition

# Time schedule 2<sup>nd</sup> Edition

- IEC Procedure
  - Every 5 years maintenance of a IEC standard
- Time schedule
  - Community Draft (CD): 2010-04
  - Community Draft for Vote (CDV): 2010-12
  - Final Draft International Standard (FDIS): 2011-06
  - International Standard 2<sup>nd</sup> Edition (IS): 2011-12

# MT15 Team

- Mr Sushil Birla (US)
- Mr James H Christensen (US)
- Mr Marco Carlo Colla (CH)
- Mr Emmanuel Dela Hostria (US)
- Mr Christian Diedrich (DE)
- Mr Toshiharu Kagawa (JP)
- Mr Hindrik Koning (NL)
- Mr Robert J. Kretschmann (US)
- Mr Rainer Mittmann (DE)
- Mr Iko Miyazawa (JP)
- Mr Hans-Peter Otto (DE)
- Mr Francesco Russo (IT)
- Mr Hisashi Sasajima (JP)
- Mr Karlheinz Schwarz (DE)
- Mr Thomas Ignaz Strasser (AT)
- Mr Hirotsugu Tsunematsu (JP)
- Michael J Viste (US)
- Mr Valeriy Vyatkin (NZ)
- Mr Alois Zoitl (AT)

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# Overview of the Proposed Changes to IEC 61499-1

- General changes and corrections
- Improvements in the ECC behaviour description
- Local (temporary) variables in algorithms
- Network/Segment Types
- Interaction with Programmable Controllers

# General Changes and Corrections

- Correction of wrong references, formatting, etc.
- Added missing management command:  
RESET
- Allow non started FBs to be deleted
- Allow service sequence declarations for all FB types (as anticipated in IEC 61499-2)
- Clean up of the mapping syntax

# ECC Behavior

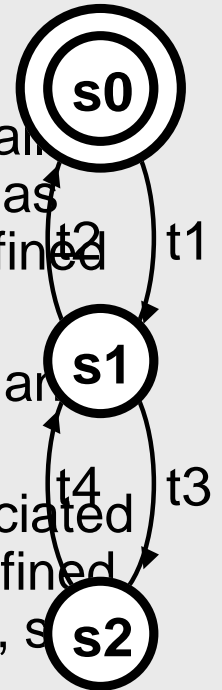
- Improve description to remove ambiguities
- New elements in Table 1:
  - a) The **resource shall ensure** that **no more than one input event** occurs at any given instant in time.
  - b) This operation consists of sampling (or its functional equivalent) of the input variables associated with the current input event by a WITH declaration as described in 5.2.1.2.

# ECC Behavior

- New elements in Table 1:
  - c) This operation consists of evaluating the transition conditions at the EC transitions following the active EC state and clearing the first EC transition (if any) for which a TRUE guard condition as defined in B.2.1 is found, according to the following rules:

# ECC Behavior / Transition Rules

1. Clearing the EC transition" shall consist of deactivating its predecessor EC state and activating its successor EC state.
2. The order in which the transition conditions are evaluated shall correspond to the order in which the transitions are declared as defined in Annex B.2.1, or equivalently in the XML syntax defined in IEC 61499-2.
3. The guard\_condition of a transition condition containing only an event\_input\_name shall have the default value TRUE.
4. If state s1 was entered via **t1**, only transition conditions associated with the **current input event** via its event\_input\_name as defined in B.2.1, or transition conditions with **no event associations**, shall be evaluated.
5. If state s1 was entered **via t4**, only transition conditions with **no event associations** shall be evaluated.



# Local Variables in Algorithms

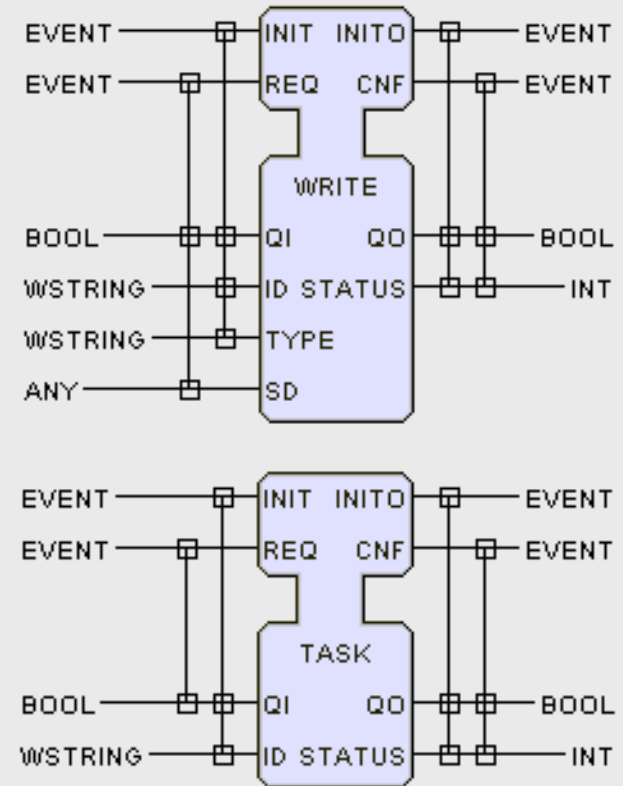
- The declaration of an algorithm may include the declaration of temporary variables that:
  - Are only visible in the body of the algorithm;
  - Are initialized upon each invocation of the algorithm;
  - May be used and modified during execution of the algorithm; and
  - Do not have values that persist between executions of the algorithm.

- Will be introduced as a new type element
- Similar to Device Types
- Proposal

```
<?xml version="1.0" encoding="UTF-8"?>  
<!DOCTYPE DeviceType SYSTEM "http://www.holobloc.com/xml/  
Segment.dtd" >  
<SegmentType Name="CAN" Comment="CAN Segment" >  
  <Identification Standard="61499 ITA" Description="CAN ..." />  
  <VersionInfo Organization="4DIAC-Consortium" Version="0.0"  
    Author="4DIAC-IDE" Date="2008-07-10" />  
  <VarDeclaration Name="Param" Type="WSTRING" Comment="Param" />  
</SegmentType>
```

# Interaction with Programmable Logical Controllers (PLC)

- Improve the interaction with IEC 6113-3 PLCs
- Communication FBs
  - READ
  - UREAD
  - WRITE
- Remote Action Triggering
  - TASK



# Proposed Changes to IEC 61499-2

- Examples of extended tool features:
  - E.g., Possibility to show ECC transition order in ECC
- DTD updates to correspond to new IEC 61499-1 textual syntax

# General Discussions

- Adapters usage in all FBs types
  - According to IEC 61499 allowed
  - However no definition on the usage semantics for non basic FBs
- Universal FB types
- Merging of adapter connections
- Namespaces
- Binary XML for management interface
- Hybrid IEC 61499 / IEC 61131-3 platforms

- Problem:
  - Different execution platforms result in different execution behavior
  - The standard can not be too restrictive
  - Different application domains have different requirements
- Proposed:  
**IEC 61499 Compliance Profile on Execution Models**

## 3 proposed Execution Models:

- Sequential
- Parallel
  - Synchronous
  - Asynchronous
- Cyclic
  - Event delivery
    - Same cycle
    - Next cycle
  - FB invocation
    - Each FB executed in each cycle
    - Only FBs with pending input events

# Getting Involved

- Critique is welcome, BUT better suggest your version!
- Just a starting point! Feel free to propose changes!

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***Thank you for your Attention!***

