Arrowhead-T

An early idea for ECSEL 2018

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System of Systems tool gap

The GAP

Automation
System of Systems enabled by Arrowhead Framework

Legacy tools

Arrowhead-Tools

Crystal

Arrowhead Framework

iDEV40?
Hierarchical system implementation

Local automation cloud implementation
Local cloud meeting automation requirements

- Automation is local

- Local clouds shall provide
  - A protective fence
  - Against external communication
  - Inter cloud service exchange

- Thus protecting sensitive automation operations as
  - Real time closed control loops
  - Safety critical operations
Automation systems based on Arrowhead Framework

Local clouds
Can we build Arrowhead automation systems today?

Robust communication
IoT sensors, actuators, PLC:s, etc.
DCS and SCADA functionality
MES and ERP functionality
Cloud integration technology

**Engineering tools cloud automation**
Test tools and simulators

**Migration to cloud automation**
Suitable security

➡ Products on the market
➡ Some products on the market
➡ First products on the market
➡ First product on the market
➡ Some products on the market
➡ Demonstrated in industrial env.
➡ First products on the market
➡ Demonstrated in industrial env.
➡ Some products on the market
First idea of work content

- Requirements
- Integration to Legacy automation system engineering
- Work flow
  - Design time
  - Run-time
- Tools set and partitioning
- Tool architectures
- Integration approach/methodology OSCL (Crystal)
System of Systems services
Arrowhead Framework SoTA

PlantDescription system
Configuration system
Authorisation system
Orchestration system
System tools
Arrowhead Framework SoTA

MMI-Orchestrating
MMI-Authorisation

Management tool
TestTool
Engineering of System of Systems automation

Legacy tools

- Product design
- Manufacturing recipe
- Part supply
- Production infrastructure
  - Communication topology
  - Process design
  - Equipment location
  - Equipment capability/configuration
Legacy tools - system services

System services

• Codesys,
• Siemens Step7, DCS-7
  • TIA portal
• ABB Control builder, 800XA
Legacy tools - Communication topology

Comm topology
- Eplan-98,
- ElproCAD

Electrical wiring
- AutoCAD
- Solidworks
Legacy tools - Process design/Manf. recipe

ProDesign, PI&D	Process design

MES tools	Manufacturing recipe