Domain

Automation Systems Engineering

Application domain

Automotive Powertrain Assembly

Objectives

Seamless Virtual-to-Real Engineering

24 months | 4 Partners | 670k (350k funding)
Towards Autonomous Manufacturing
Intelligent control
Self configuring control

Data Collection
Data Transport infrastructure

IoT Devices
Data Source

Data Processing
Data Analytics

Decision making
System Engineering

Engineer
Build
Operate

Cyber Physical loop
PLC controlled Automation Systems Engineering - The gaps

... and fragmented Virtual Engineering

Gap between VE and PLC controlled system Commissioning phases

Physical System
3Deployment project

Objectives

Physical System

Engineer

Build

Operate

3Deployment Project Scope

Digital Models (cyber system)

Digital to Physical Transition

Physical System

Eng. Data Re-use

Collaborative platform for Virtual Engineering

PLC Control Code Auto-Generation

Direct control code deployment

3Deployment Project Scope
**Digital Models**

**Engineering database**
Library of re-usable components

**Virtual Engineering Tools**
Processes Simulation
Processes Validation

**Virtual to Physical Transition**

**Control Code generation and Deployment**
PLC control code
Auto, manual, dry cycles
Template based (Ford FAST)
HMI screens
Multi vendors

**Physical System**

**V-Lib**
 vueOne Editor
 vueOne Mapper
 Logic Engine
Virtual Engineering case study

**Engine Assembly Stations**
(Ford UK, Fox, Puma programs)

- Oil pan rundown
- Block load
- Trigger wheel assembly
- Engine offload
- Manifold rundown
- Coolant cavity leak test
- Ball seal and cup plug
- Clutch assembly
- Intake tappet selection
- Exhaust tappet selection
- Tappet verification
Automation System Workbench
(WMG, University of Warwick)

8 Modular stations
8 Automatic stations
2 manual / semi-auto stations
Tooling: Festo, SMC, purpose made
ABB and Mitsubishi 6R robots
Control: Schneider, Mitsubishi, Siemens, ...
1 AGV
Energy Monitors
Battery Pack Assembly process
Ubisens UWF position tracking system

...
Project Technical Outputs

- Library of re-usable component for OEM
- Library of VE Studies for OEM production station
- Direct deployment of Control code from VE models
- Auto generation of HMI screens
- PLC code compliant with Industry Standards (Ford FAST Template)
- Lightweight, open, deployable Virtual Engineering tool set
- Common visualisation platform for collaboration
Commercial outputs / Funding opportunities

- Improved Engineering Solution  - (FDS vueOne software)
- New Engineering Services  - (FDS, HSSMI)
- Extended OEM partner’s VE capabilities  - (Ford)
- New VE-based collaboration platform across supply chain
- VE solution for SMEs  - (All)
- Extended research scope and new funding opportunities  - (All)
- Development of UK engineering capabilities
- Opportunities for spin off- businesses  - provision of engineering services
Questions - Contacts

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Manufacturing System Lifecycle

Engineer

Build

Operate

Virtual Engineering
Virtual Validation

Automation
Industrial Robots
Human process
Layout

Towards Autonomous Manufacturing
Intelligent control
Self configuring control

Component Library
Design Knowledge management
Engineering data re-use

Common Data model

Cyber-Physical System Loop

Mobile application
Cyber-Physical Interfaces
IoT devices integration
Web services architecture

Data capture / management
Energy monitoring
Sensor data
PLC data
IoT Devices