

Domain

Automation Systems Engineering

Application domain

Automotive Powertrain Assembly

Objectives

Seamless Virtual-to-Real Engineering

24 months | 4 Partners | 670k (350k funding)

Engineering
Solutions



Research
Innovation



Engineering
Services



End User
Requirements

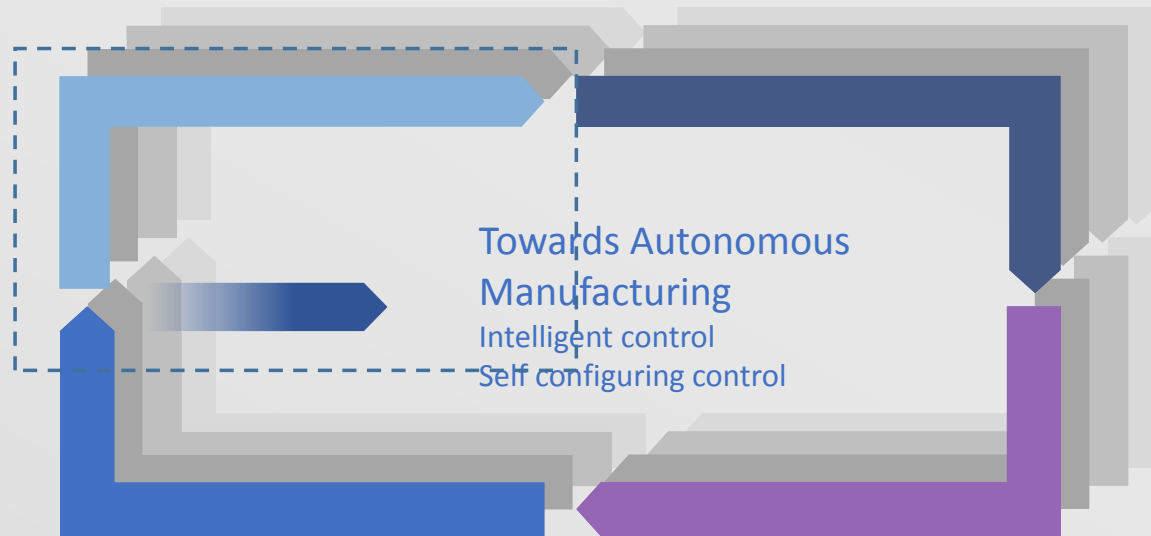


Innovate UK
Technology Strategy Board



Decision making
System Engineering

Data Processing
Data Analytics



IoT Devices
Data Source

Data Collection
Data Transport
infrastructure



PLC controlled Automation Systems Engineering

The gaps



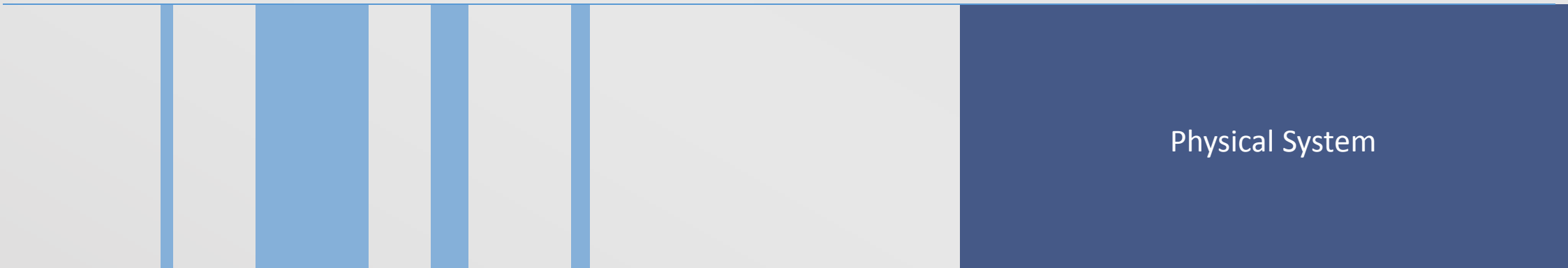
Engineer



Build



Operate



Physical System

Late ...

... and fragmented
Virtual Engineering

Gap between VE and
PLC controlled system
Commissioning phases



3Deployment project

Objectives



Engineer



Build



Operate



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

3Deployment
Direct Digital Deployment

Digital Models

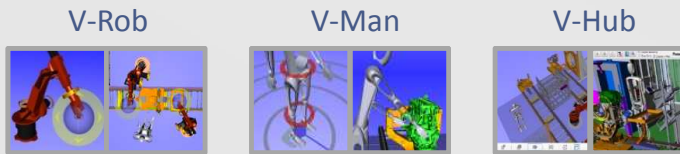
Virtual to Physical
Transition

Physical
System

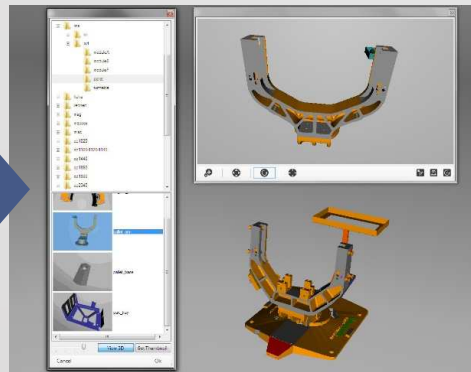
Engineering database
Library of re-usable
components

Virtual Engineering Tools
Processes Simulation
Processes Validation

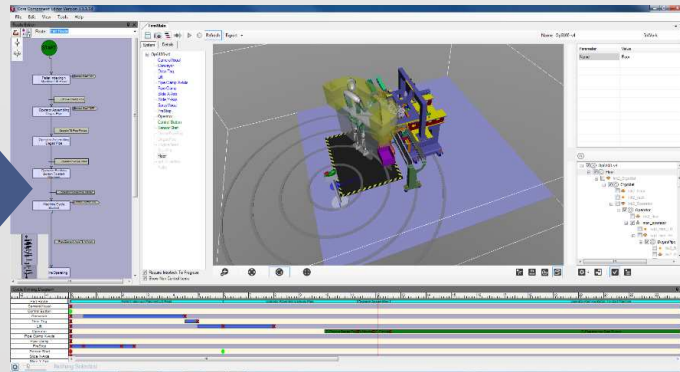
Control Code generation and Deployment
PLC control code
Auto, manual, dry cycles
Template based (Ford FAST)
HMI screens
Multi vendors



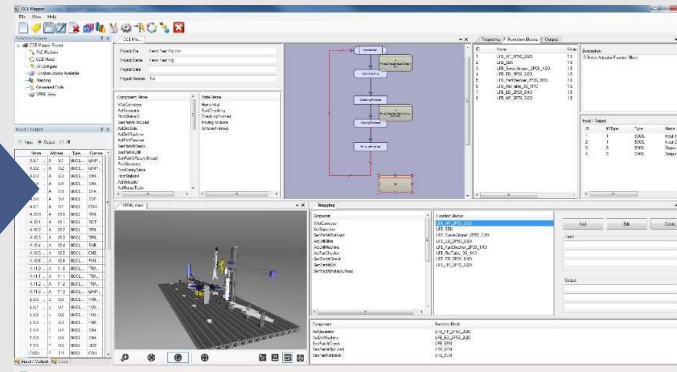
HMIs



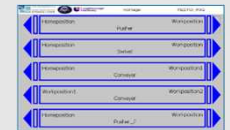
V-Lib



vueOne Editor

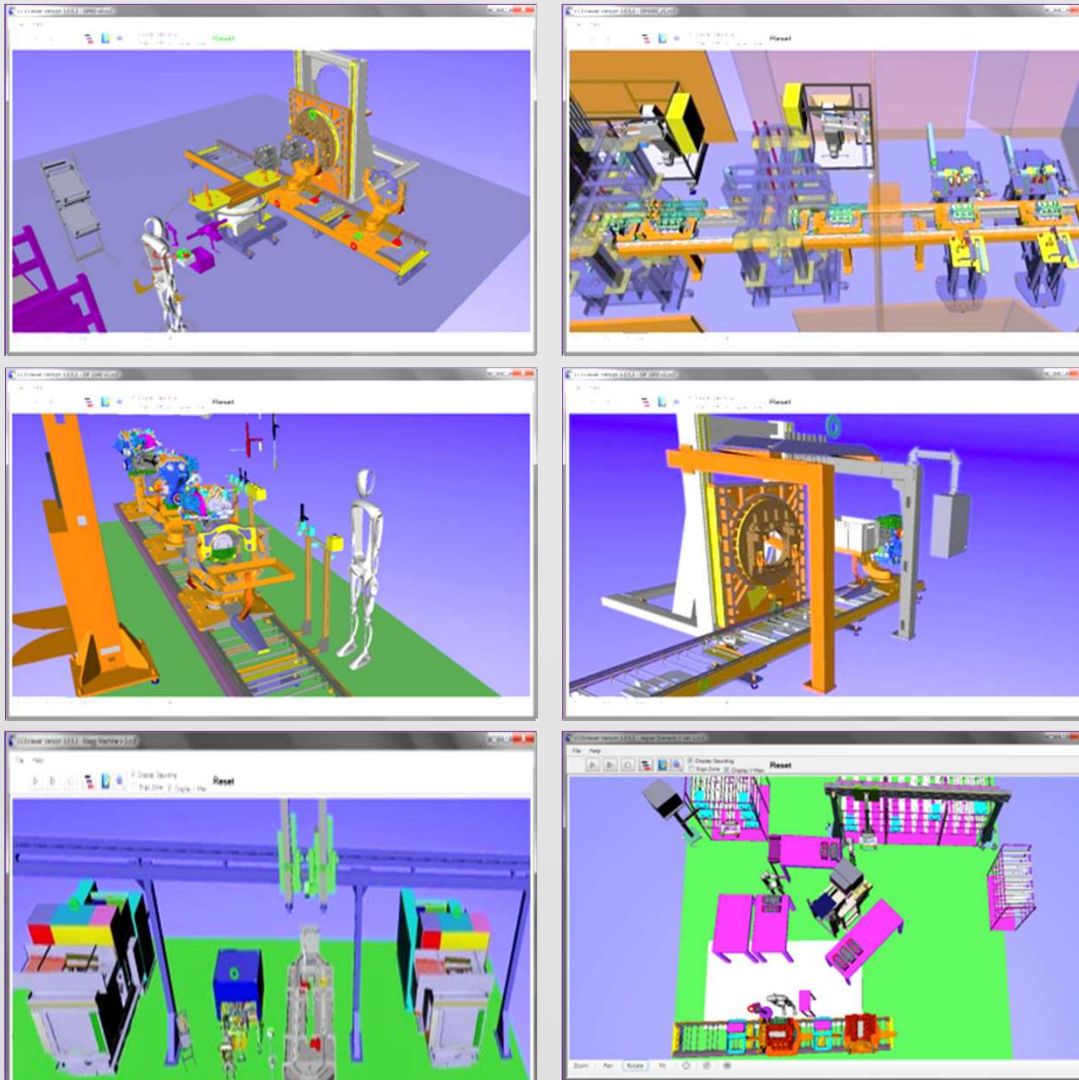


vueOne Mapper



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

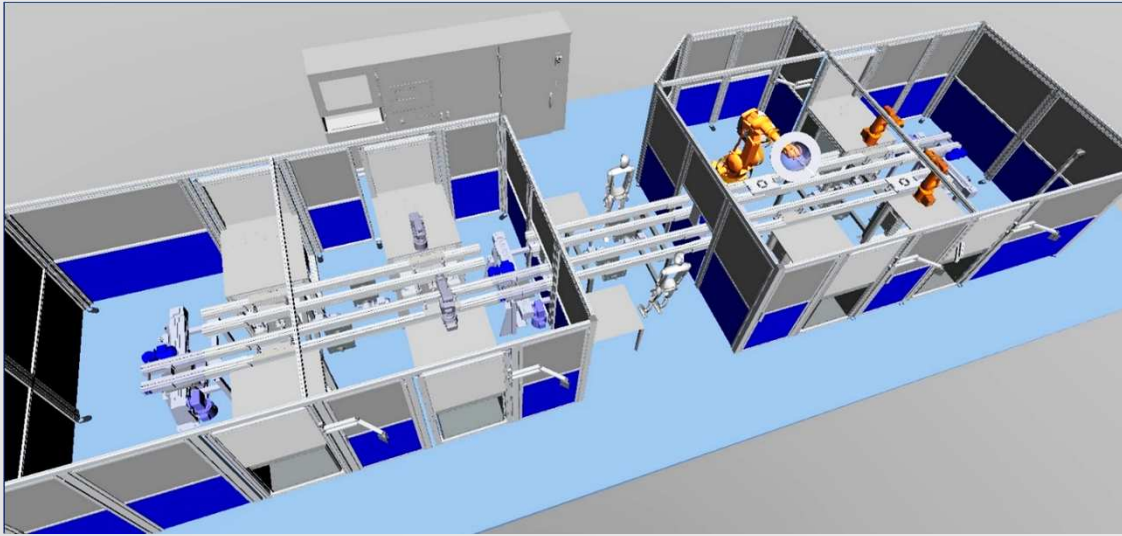
Clutch assembly

Intake tappet selection

Exhaust tappet selection

Tappet verification

Control code deployment test platform



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

...

3Deployment
Direct Digital Deployment

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



Daniel Vera

daniel.vera@fullydistributedsystems.com



Robert Harrison

robert.harrison@warwick.ac.uk



Fahim Syed

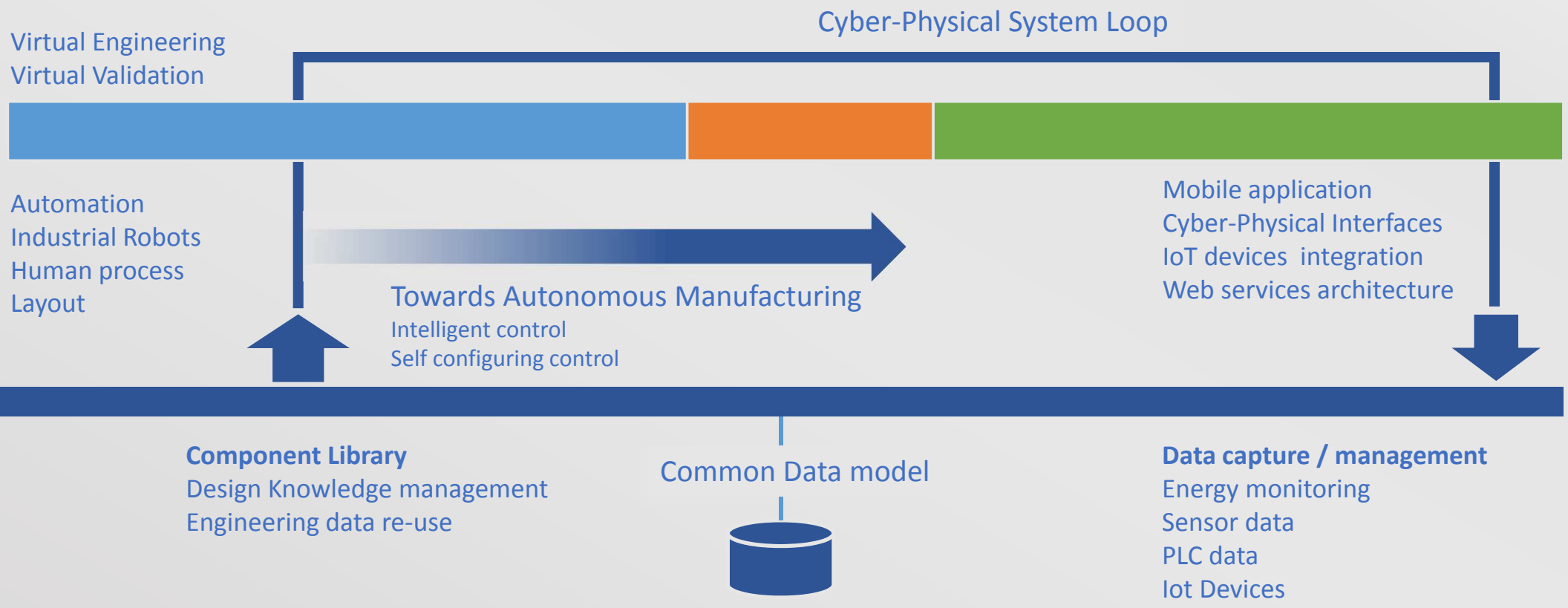
fahim.syed@hssmi.org



Andy Baker

abaker5@ford.com

Manufacturing System Lifecycle



Virtual Engineering
Virtual Validation

Cyber-Physical System Loop


Automation
Industrial Robots
Human process
Layout

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

Towards Autonomous Manufacturing
Intelligent control
Self configuring control

Component Library
Design Knowledge management
Engineering data re-use

Common Data model



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