

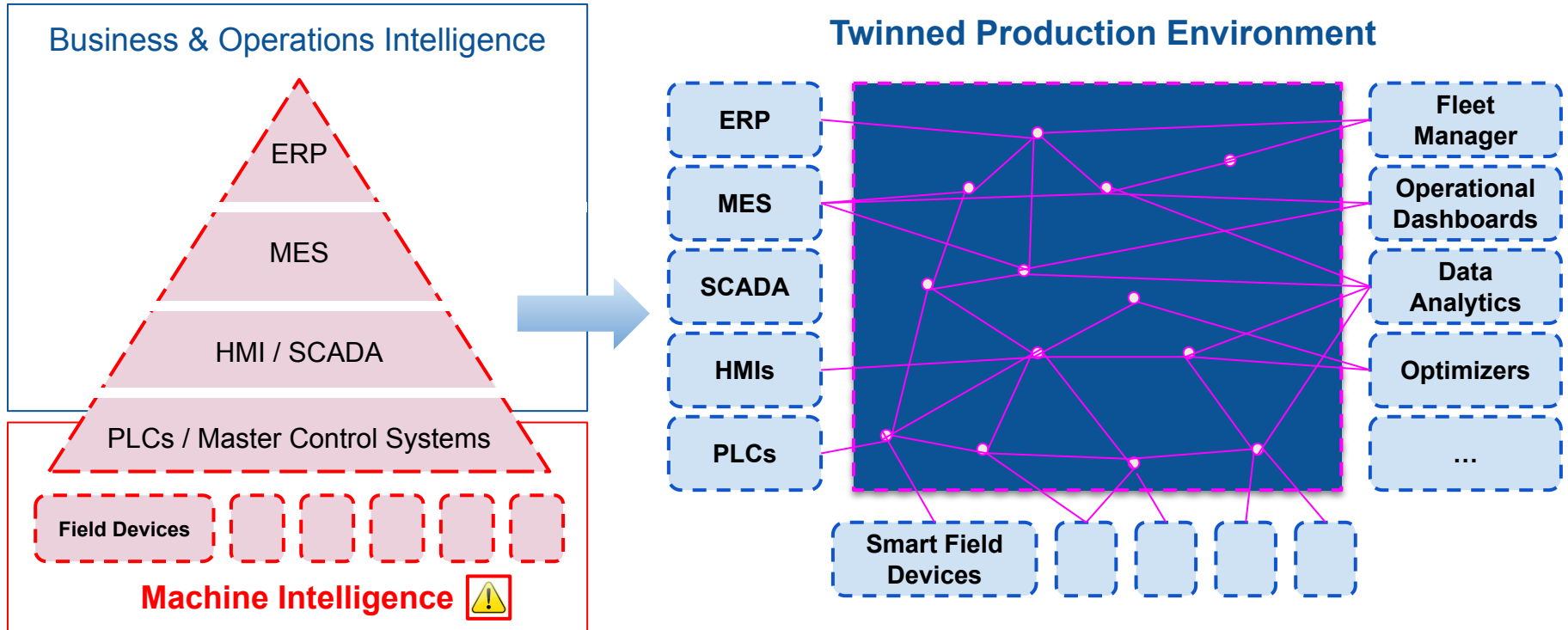
Open APIs  
for Open  
Minds

## Analysed Use Case: Smart Production Environments

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# Analysed Use Case: DTs for Smart Production Environments (Smart Intralogistics + Smart Manufacturing Operations)



# Analysed Use Case: Smart Production Environments (I)

## Digital Twins for Smart Intralogistics

### Production Order Mgmt

Schedule / Reports

### Transport Order Mgmt

Schedule / Commands / Reports

### AGV Fleet Management

Planned Routes

Time to Order Picking / Delivery

### Automated KPI Generation

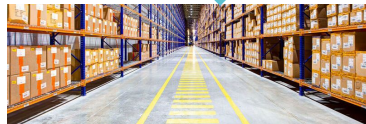
Stock & Material Inventory  
Lot Orders  
Material Requests  
Transport Order Requests  
Prepared Lots

**Main Requirements of  
DT Systems for  
Smart Intralogistics**

**ERP**

### Summary of Service Bus Features

Communication Pattern	Pub / Sub
IT Transport/Protocol	<b>MQTT</b> , OPC UA, & HTTP REST
Machine Intelligence Middleware	<ul style="list-style-type: none"> <li>- Closed, Custom</li> <li>- ROS 2 (DDS)</li> <li>- OPC UA</li> </ul>
Emerging Open Standard	VDA 5050 (AGV Control)



**Warehouse**

**AGV 1**

**AGV 2**

...

**Station  
1**

**Station  
...**

DCS: Distributed Control System



# Analysed Use Case: Smart Production Environments (II)

## Digital Twins for Smart Manufacturing Operations

### Production Order Mgmt

Schedule / Reports

### Work Order Mgmt

Schedules / Commands / Reports

### Production Cycle / Process Segment / Machinery Monitoring & Quality Control

Planned / Actual Working Schedules

Planned / Actual Production Quantity

Good / Bad Production Quantity

### Automatic KPI Generation

OEE, OLE, TEEP

Stock & Material Inventory  
Lot Orders  
Material Requests  
Transport Order Requests  
Prepared Lots

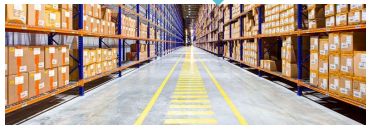
**Main Requirements of DT Systems for Smart Manufacturing Operations (Smart MES)**

**ERP**

### Summary of Service Bus Features

Communication Pattern	Request / Response
IT Transport/Protocol	Mostly OPC UA
Machine Intelligence Middleware	- Closed & Custom (serial) field middlewares for wired devices and PLCs
Emerging "Free / Open" Standards	OPC UA Companion & AAS Specifications

**Manufacturing Operations Management Bus**



**Warehouse**



**Control Unit**



**Machining Unit**



**Pick & Pack Unit**



**Conveyor**



**AGV**

RT Link ⚠️ RT Link ⚠️ RT Link ⚠️

RT Link to Station Control Unit ⚠️

Process Segment

RT Link → Master Control System with Real-time link (Mostly PLC based)



## Conclusion:

- **NGSI-LD is ready to cover a wide variety of scenarios in these use cases of DTs for production industries**
- Some of the value propositions from other approaches which go beyond NGSI-LD in the production domain are:
  - *Robust I/O links to HW platforms, Real-time QoSs, File Sharing & Offline Programming Enablers*

	OPC UA	AAS	MQTT	ROS 2 (DDS based)
Is it considered a protocol or transport method for Digital Twin Data in production industries ??	Yes (From people which looks at it from a machinery level angle)	No	Yes (It is often seen as the means to put the I4.0 service bus in practice)	Yes
Is it targeting the definition of a Digital Twin Data Management API?	Along with the AAS and OPC UA Companions	Yes (but extremely verbose)	No	No
Communication Pattern	Request / Response	REST API (WIP)	Pub / Sub	Pub / Sub Request / Response Request / multi-response
Real-time QoSs	WIP	No	No	Yes
Is it suitable for the exchange of large binary files?	WIP	WIP	No	No
Has the production industry adopted it as trusted I/O link to Machinery and CPS Systems?	Yes (OPC UA Servers)	No	Yes (MQTT Clients/Brokers)	No
Is it targeting the standardisation of I4.0 Production Data models?	Yes (Not fully open)	No	No	No

Thank you!

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