Enabling Digital Continuity in the Factory of the Future

PDT Europe

25th October 2018

AIRBUS

Alcibiades GONZÁLEZ-NOVAL
Industrial Engineer
R&T Leader – Virtual Factory

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2012
Project Manager / PLM for Design

2015
Project Manager / PLM for Manufacturing Engineering

2016
R&T Project Leader / Virtual Factory and Industrial Digital Twin

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Airbus Challenges

Factory of the Future Vision

Digital Continuity

Building Bricks for Digital Continuity

Lessons Learnt & Opportunities

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Aviation drives our global economy.

Air traffic doubles every 15 years

3.6 billion
Passengers

62.7 million
Jobs supported

51.2 million
Tonnes of freight

$2.7 trillion
Global GDB annually

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Passion for aviation.

Commercial Aircraft's global workforce is united by a passion for aviation and restless desire to create better ways to fly.

7,265 Backlog

400 Operators

54,000 Employees

€49.2 billion
Annual revenue

AIRBUS

Our aircraft are a familiar sight around the world.

An Airbus takes off or lands every 1.4 seconds.

18,191
Aircraft sold

60
Produced monthly

25,000+
Daily flights
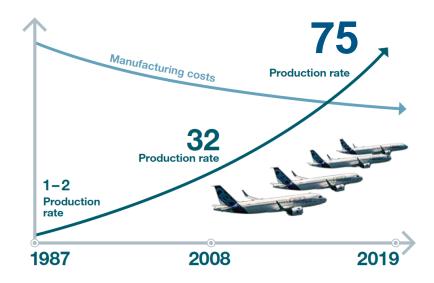
10,926
Delivered

Data to end
December 2017

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Challenges for the Industrial System

Manufacturing costs

75 Production rate

32 Production rate

1–2 Production rate

1987   2008   2019

- Continuous ramp up of production

- High customer specific configuration

- Different workload in production due to different customization

- Capacity and flexibility of supply chain

- Manual labor dominates assembly

- Inflexible automation solutions

- Need for large, purpose-build jigs and tools

The transition to a new Product at high Production Rates is an unprecedented challenge for the entire Industrial System!

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AIRBUS Today

**Too High VARIABILITY
&
Too low MODULARITY**

**Product PERFORMANCE
driven Processes**

**Engineering, Manufacturing,
Support SEQUENTIAL
PROCESSES**

**Not Optim SUPPLIER MODEL
Weak VALUE
CHAIN positioning**

**Complex
&
Competitive ENVIRONMENT**

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Factory of the Future Main Targets

Lead Time Reduction in Development

New Design Approach
New Integration Approach
Virtual Aircraft

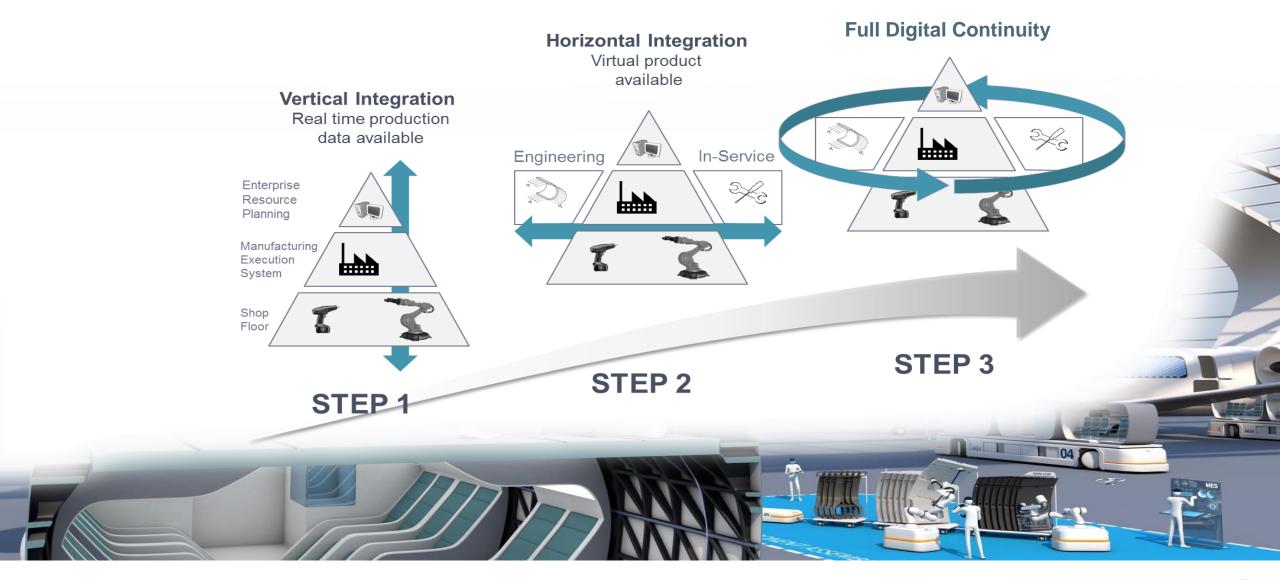...

Lead time Reduction in Production

Design for Assembly
Plan and Control
Virtual Factory

...

RC Reduction
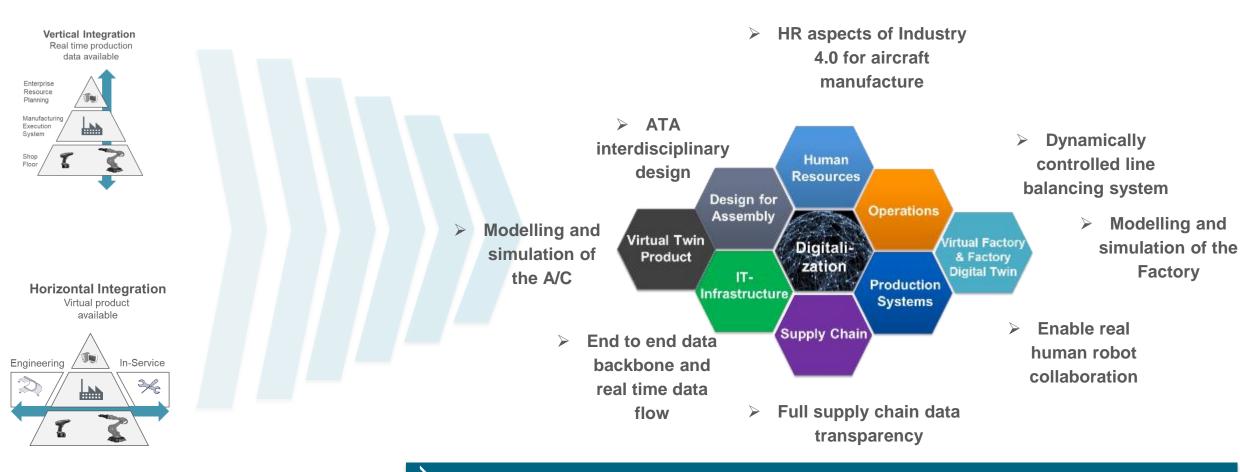
Automation
Support Systems
Testing and measurement

...

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PLM Vision for Factory of the Future

Vertical Integration
Real time production data available

- Enterprise Resource Planning
- Manufacturing Execution System
- Shop Floor

STEP 1

Horizontal Integration
Virtual product available

Engineering   In-Service

STEP 2

Full Digital Continuity

STEP 3

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Factory of the Future Strategy

Vertical Integration
Real time production data available

- Enterprise Resource Planning
- Manufacturing Execution System
- Shop Floor

Horizontal Integration
Virtual product available

- Engineering
- In-Service

➤ HR aspects of Industry 4.0 for aircraft manufacture

➤ ATA interdisciplinary design

➤ Modelling and simulation of the A/C

➤ Dynamically controlled line balancing system

➤ Modelling and simulation of the Factory

➤ End to end data backbone and real time data flow

➤ Enable real human robot collaboration

➤ Full supply chain data transparency

Human Resources

Operations

Design for Assembly

Virtual Twin Product

Digitali-zation

Virtual Factory & Factory Digital Twin

IT-Infrastructure

Production Systems

Supply Chain

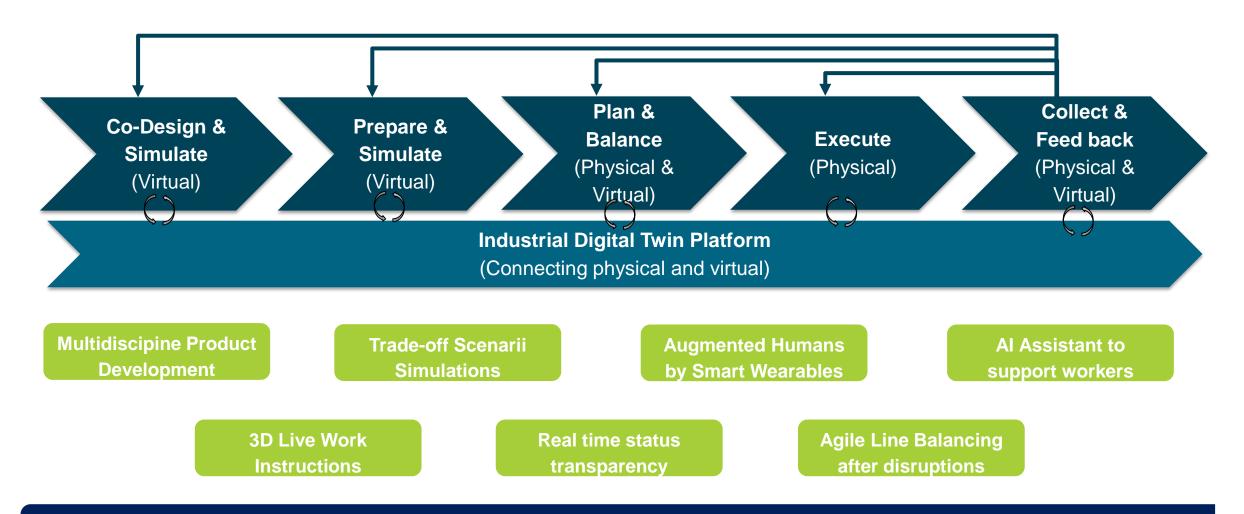> 8 key clusters supporting current aircraft and future products

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Factory of the Future Vision

Digital Continuity

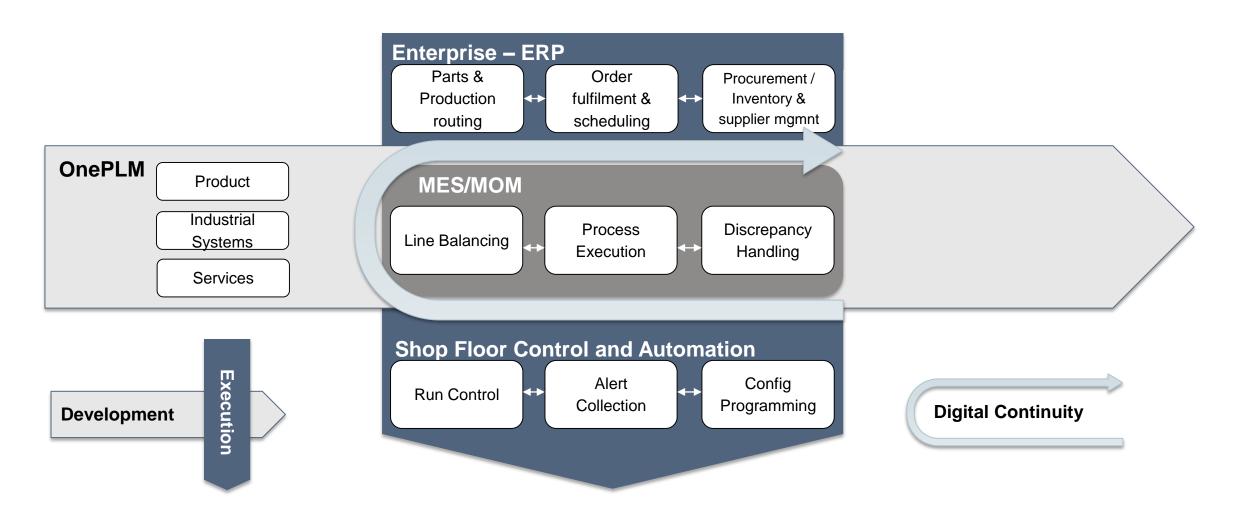Building Bricks for Digital Continuity

Lessons Learnt & Opportunities

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Digital Twin along the Product and Production Lifecycle

Co-Design & Simulate (Virtual)	Prepare & Simulate (Virtual)	Plan & Balance (Physical & Virtual)	Execute (Physical)	Collect & Feed back (Physical & Virtual)

Industrial Digital Twin Platform
(Connecting physical and virtual)

- Multidiscipine Product Development
- Trade-off Scenarii Simulations
- Augmented Humans by Smart Wearables
- AI Assistant to support workers
- 3D Live Work Instructions
- Real time status transparency
- Agile Line Balancing after disruptions

The Digital Twin is evolving along all product and production lifecycle phases.

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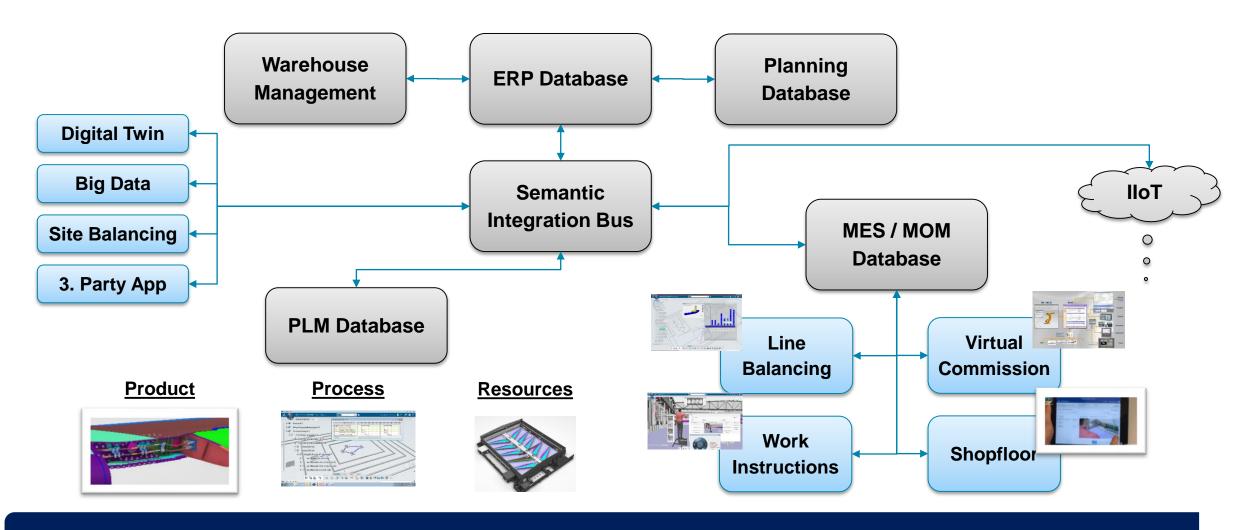
Digital Backbone to enable Digital Continuity

OnePLM

- Product
- Industrial Systems
- Services

Development → Execution

Enterprise – ERP

- Parts & Production routing ↔ Order fulfilment & scheduling ↔ Procurement / Inventory & supplier mgmnt

MES/MOM

- Line Balancing ↔ Process Execution ↔ Discrepancy Handling

Shop Floor Control and Automation

- Run Control ↔ Alert Collection ↔ Config Programming

Digital Continuity

Digital Continuity enabled by consistent integration of PLM, ERP, MOM and IIoT

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Semantic Integration for the Digital Continuity

Semantics is the glue between the different systems. Focus on ontology federation.

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Dynamic Operating Environment for Bremen Wing Equipping (LuFo 5.3)

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A4Blue Alpha Demonstration for Double Tightening (Horizon 2020)

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Lessons Learnt

Integration as a MUST
Avoid projects going for independent use cases and force them to get integrated

From PoC to Pilot
Prototypes in Lab environments are very important to validate ideas and fail (or succeed) quickly
but the real problems are in the production.
Start small and scale quickly keeping the end-target in mind.

Network Segregation
Still complex to bridge industrial and corporate networks to correlate data from Shop Floor and
data from apps/corporate processes

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Opportunities

Investigate corporate private Marketplace

Move towards a private IOT service provider, with ready-made connectors to custom shopfloor systems to be consumed by any project

Young Talents

Very young and motivated team working on the topic. Empower your young innovators to try out fresh and new ideas. They do not know why things cannot work ☺

Move to scale

Geolocalization tags are to be deployed at scale during 2019 in the Bremen factory, a great opportunity to evaluate IIoT & Semantics scalability (more devices, more triples)

Investigate IIoT as a light MES solution

IoT platform allows all functions of a basic MES, monitoring shop floor execution so long as all production means are connected as things

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Thank you

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