



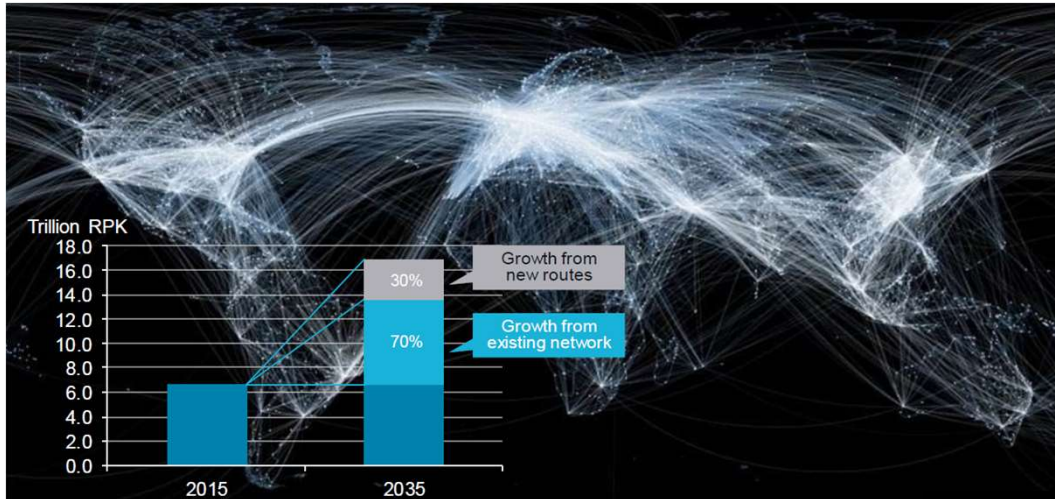
Big Data in the Future of Aerospace Airbus Vision

Jens Grafhs
VP Research & Technology

Forum Aerospace Innovation 2018 - Montréal

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Air travel growth



Demand for air transportation is growing fast..



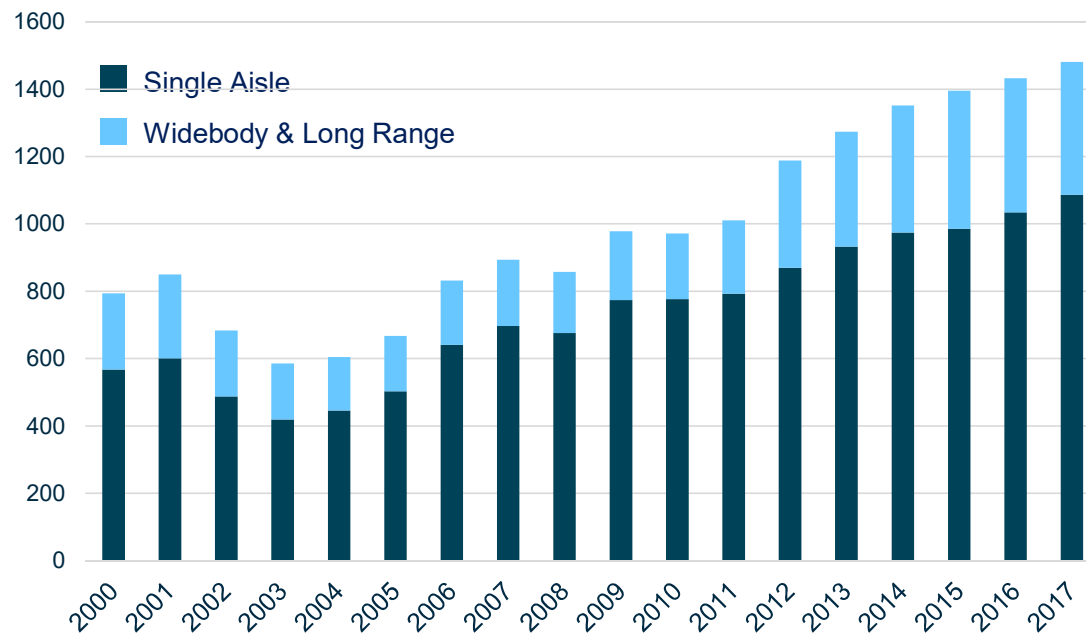
.. doubling every 15 years

Need for more than **35,000 new A/C** in the next 20 years

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Fulfilling the needs

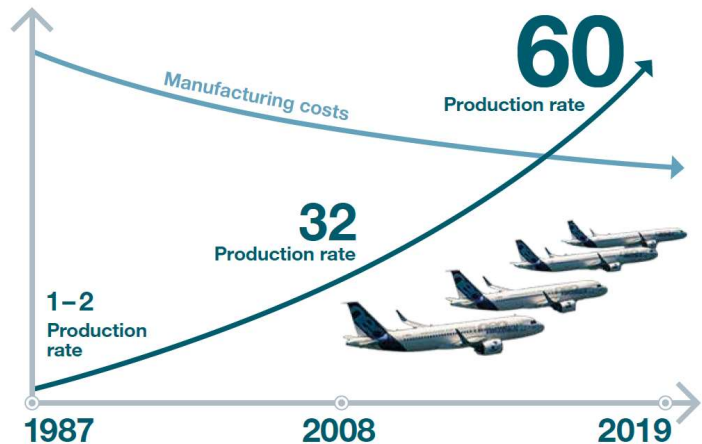
Global 130+ Seater Aircraft Yearly Deliveries



Annual Production & Deliveries have doubled in the last 12 years

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Challenges for the Industrial System



- 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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Digital Development & Industrialisation – 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

...

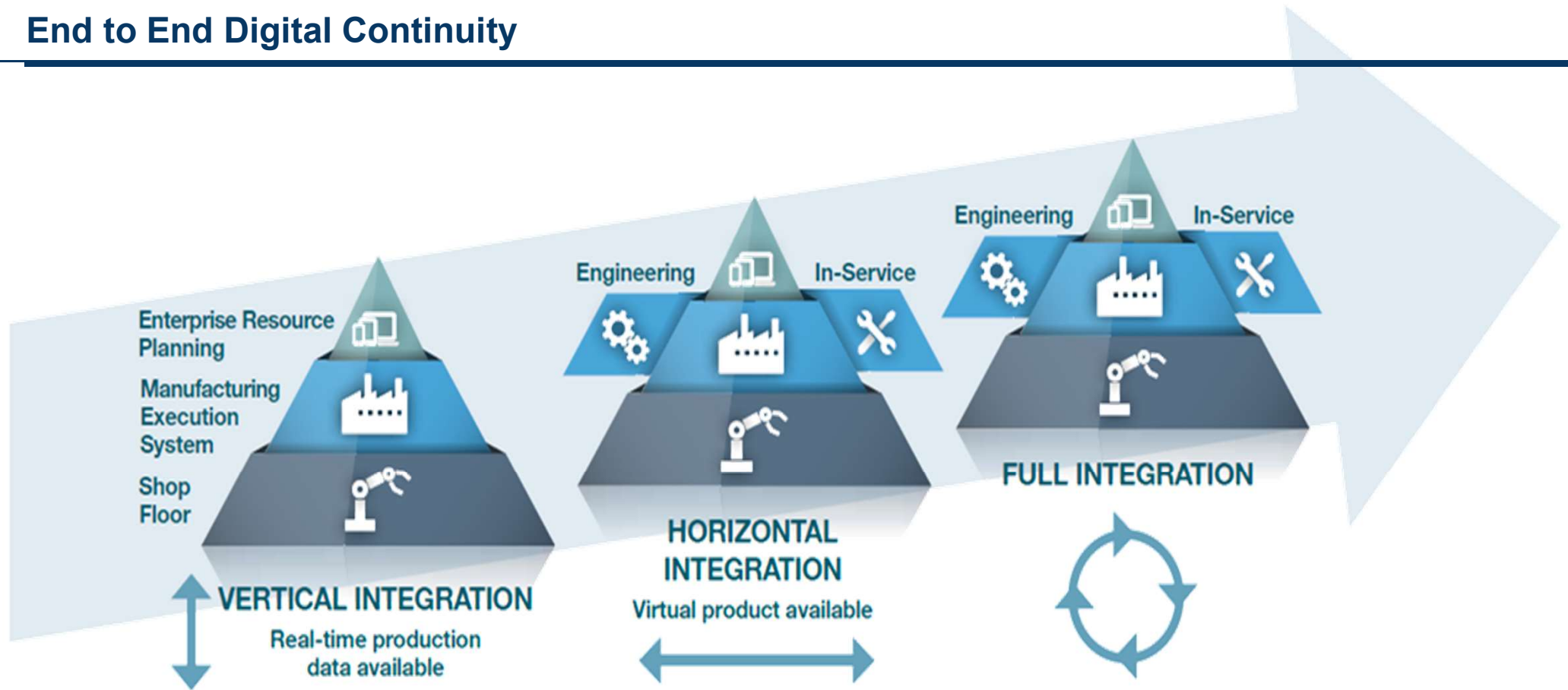


RC Reduction

Automation
Support Systems
Testing and measurement

...

End to End Digital Continuity

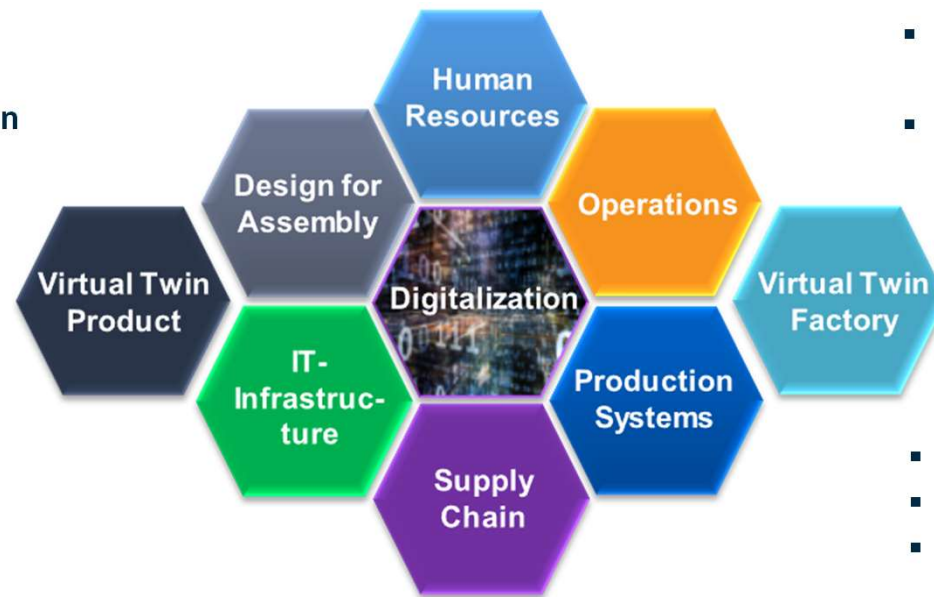


Implementation of full digital continuity throughout the organization is scheduled in 3 steps

Digital Factory – Implementation strategy

- Coverage of the 3 dimensions: Technology, Human, and Organization
- Changed drivers for future workplaces and qualification

- Standardization & modularization
- Functionally integrated part design



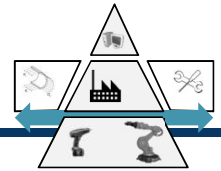
- Virtual product
- Digital twin product & factory
- Cyber security

- Dynamically controlled line balancing system based on real-time data
- IT/DMU-supported assembly

- Secure human to machine interaction
- 3D online measurement technologies
- Flexible automation

- E2E data management based on cloud technologies
- Dynamic demand planning across the supply chain

Lead Time Reduction in Development: Virtual Product

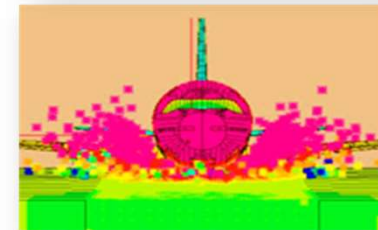


Key Enablers

- Highly multi-disciplinary simulation platform
- Model Based System Engineering
- Off-cycle development



Virtual design
(geometrical integration)



Simulation / Virtual testing
(functional integration)



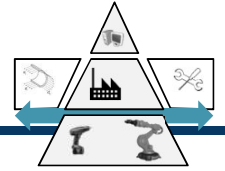
Design to automation
(industrial integration)

Product Line Approach

- Modular architecture
- Transversal & collaborative PLM tool
- Scalable modules / interfaces / concepts

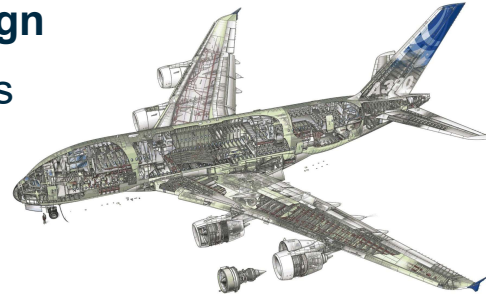
Virtual product development enables faster and more cost efficient development of new aircraft technologies

Co-Design for Customer & Business Value



Concurrent structured parametric design

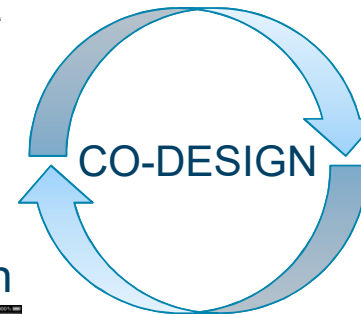
- Co-design of product & industrial means & operations
- manufacturing friendly design for faster ramp-up
- increased products commonality
- Co-design of services
- Multi-criteria optimisation



Product



Manufacturing



Operation

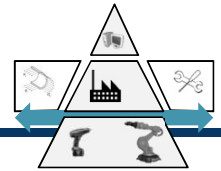


Services

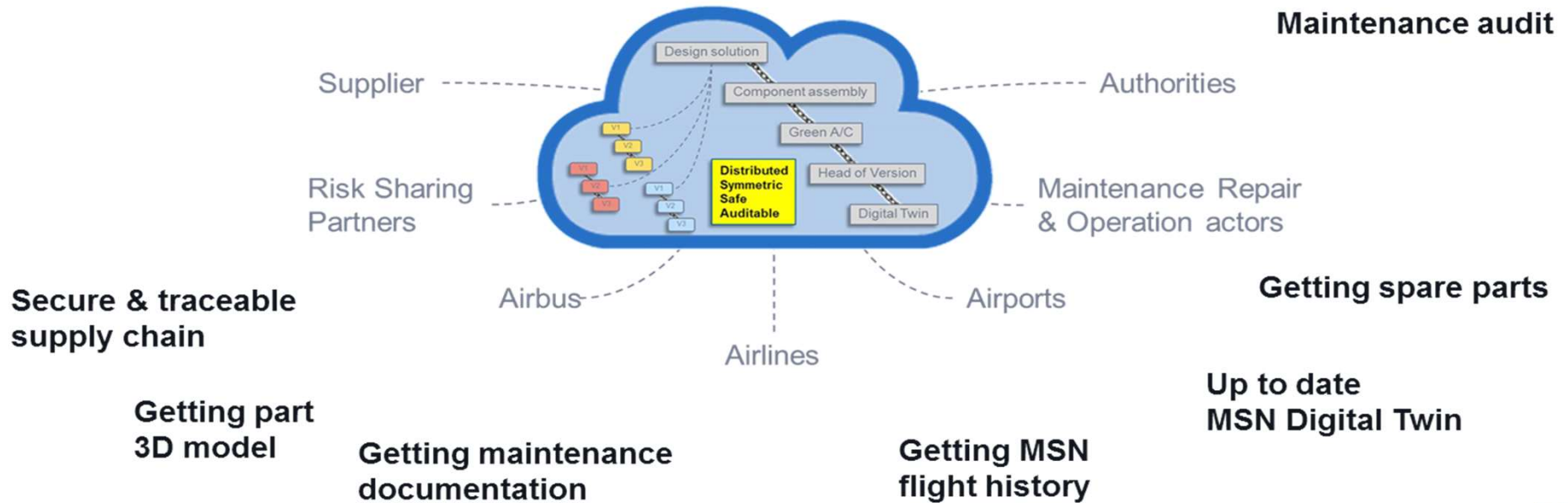


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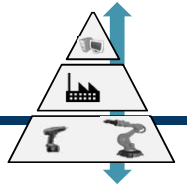
Digital Continuity



- **Integrated digital thread** to secure digital continuity across extended enterprise ecosystems
- Distributed product **Digital Twin**, enabling all actors to jointly manage configuration

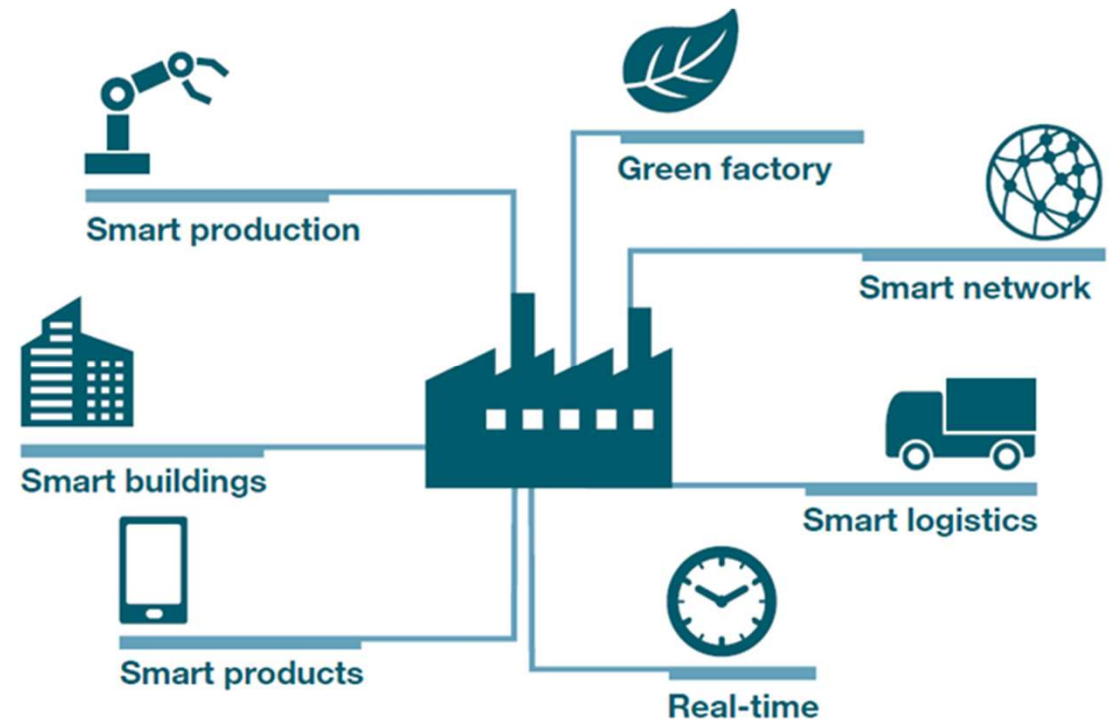


Lead Time & Cost Reduction in Production

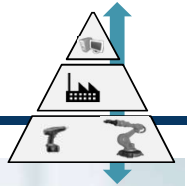


The Smart Industrial System

- **Flexible manufacturing**, precise resources planning according to their availability
- **Balanced tasks and operations** at the final assembly line (FAL), according to their needs
- **Live Tracking of Logistics** delivery in real-time
- **Autonomous processes** and SMART production equipment



Digital Factory: Artificial Intelligence in Production and Logistics



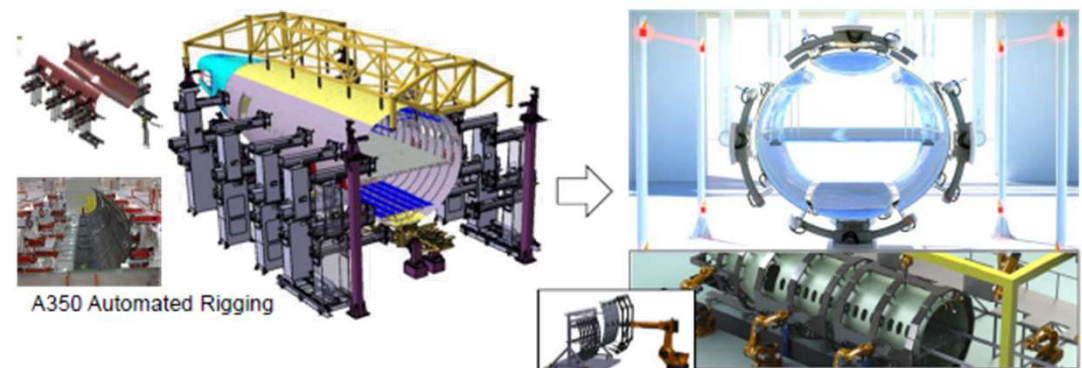
Smart planning & control

- Tasks are planned and controlled autonomously and SMART based on real-time data
- Big Data analytics based on production history are knowledge base for the planning



Smart assembly

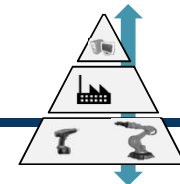
- As-is properties of parts and components are captured during or after manufacturing
- Algorithms calculate the installation of a “best fit” component while compensating for tolerances



A350 Automated Rigging

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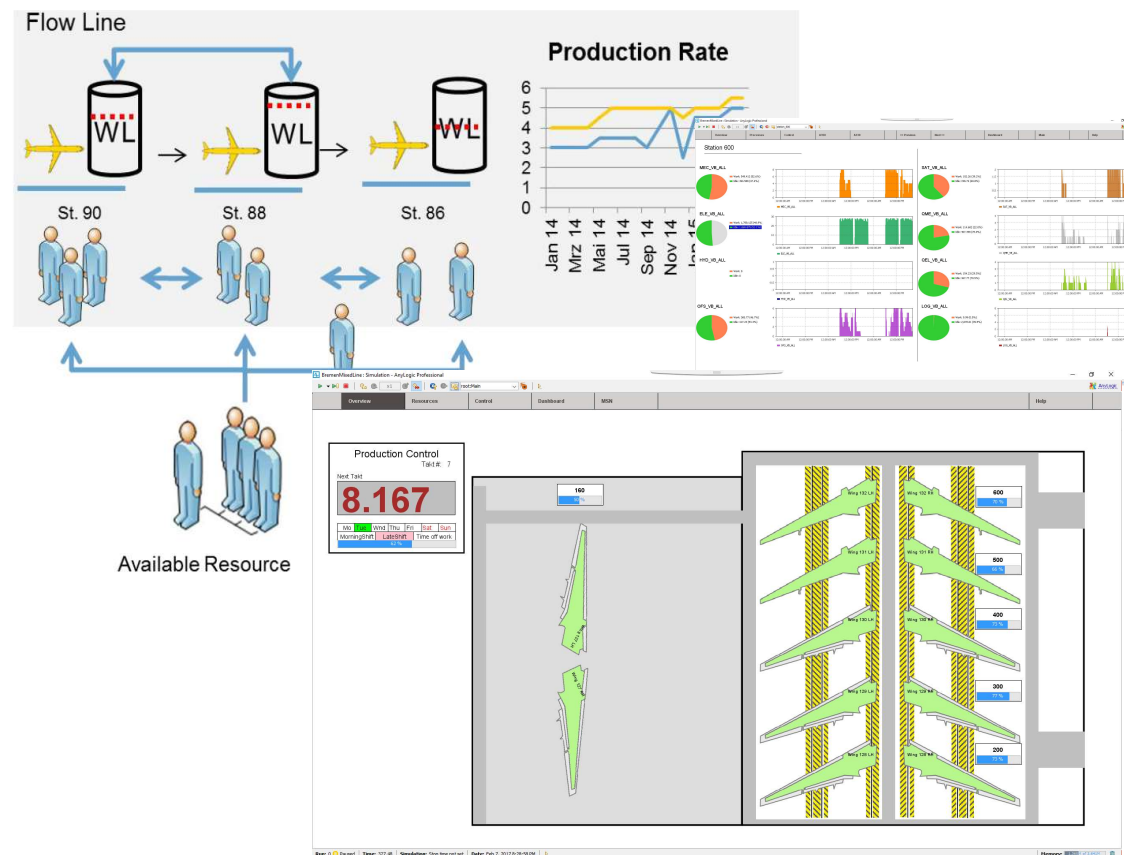
SMART Production planning & control



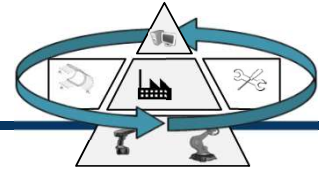
- Tasks in the FAL are planned and controlled autonomous and SMART based on real-time data

- Delivery status
- Work progress
- Part & component quality
- And resource availability

- Bid Data analytics based on production history are knowledge base for the planning



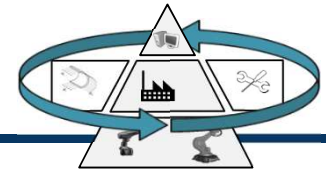
Artificial intelligence in the component assembly



- The as-is properties of parts and components is captured during or after manufacturing and shared with the manufacturing engineering
- The properties of the fuselage is measured
- Algorithms calculate the installation of a “best fit” component into the fuselage compensating tolerances

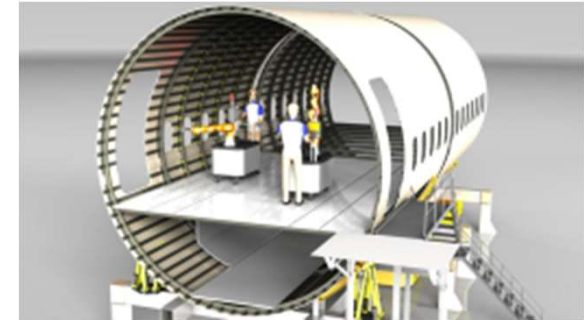


Digital Factory



Validation Platform – Pilot Digital Factory

- Simulated production environment to ensure full maturity by handover
- Demonstrates full end-to-end process including simulation and testing
- Demonstrators testing new technologies in industrial environment



Virtual Co-Design

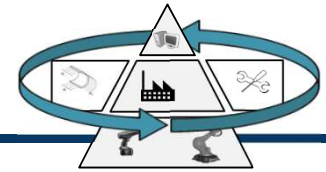
Virtual simulation

Phys. / Virtual
Work order prep. phase

Phys. Use Cases

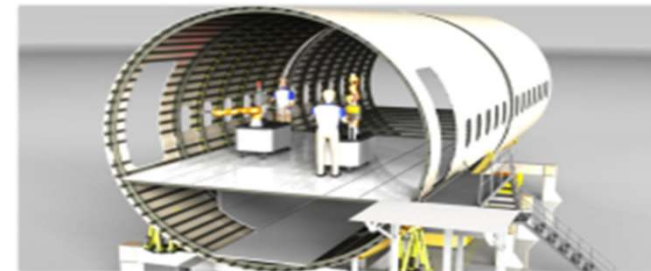
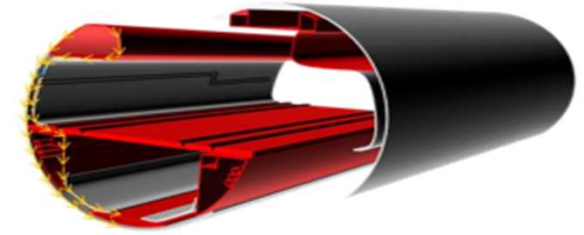
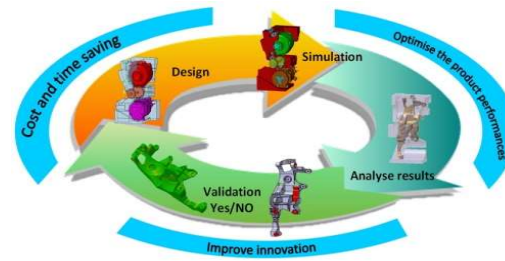
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Summary

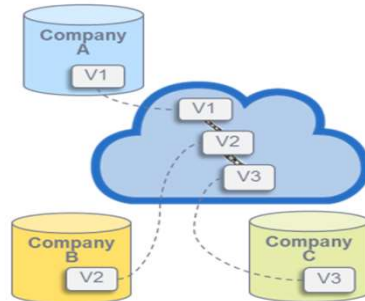


The Digital Factory and Product will support

- faster development process
- automation ready products
- more flexible and automated production
- better ergonomics at workplaces
- end to end data for complete product life cycle



Virtual parts



Thank you