Synchronizing a Network of Digital Twins

Lars Olson, SAP
Original digital twin defined as a ‘one-to-one’ relationship

Physical asset in real space

Digital asset in virtual space

Digital twin

Data

Info

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“Think of humans having digital twins. To understand how the body works and improve its health, your digital twin must model more than the physical parts of the body. It must model how your entire body works together.”

The digital twin of you

Social

Financial

Conditional

Professional

Medical

Commercial
The network of digital twins
Connected relationships between digital twins to drive business outcomes

SAP’s position

- As markets shift to mass customization and new service delivery models, manufacturers, operators, producers, and service companies have to be far more dynamic and agile to satisfy customer expectations while ensuring efficiency in their design, manufacturing, and service processes.

- The network of digital twins synchronizes the virtual, physical, conditional, and commercial definitions of assets and products in real time to accelerate innovation, optimize operating performance conditions, predict service requirements, improve diagnostics, and enhance decision-making throughout the value network.

- The network of digital twins creates a “relationship between digital twins” to enable secure and distributed systems of record; real-time collaboration with suppliers, partners, and 3rd-party service providers; new business model delivery; and advanced analytics.
The network of digital twins
Digital, physical, conditional, commercial

Manufacturer
Product intelligence
Predictive engineering and R&D

Operator
Asset intelligence
Predictive maintenance and service

Product view of the digital twin
- Design network
- Project network
- Sourcing network
- Distributed manufacturing

Digital twin of one

3D design and simulation data
Production and quality data
Component/ingredient data
Service and maintenance data
Cost and profitability data

- Project and portfolio management
- Compliant product lifecycle management
- Project and product intelligence

- Asset strategy and performance
- Asset prediction and optimization
- Asset intelligence
SAP S/4HANA Cloud for intelligent product design

SAP S/4HANA cloud for intelligent product design helps to **accelerate product innovation** with **instant collaboration**, **requirement-driven product development**, and **actionable live insights** across the extended enterprise.

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**Engineering**
- Systems engineer cockpit
- Embedded SW
- Requirements management
- Functional structure management
- Where-used analysis
- Compatibility management
- Test validation
- IOT analytics

**Collaboration**
- Engineering collaboration
- Collaborative documents and 3D visual design
- Simple task/worklist management
- Change management integration

**SAP Cloud Platform services**

**SAP Cloud Platform**

**SAP HANA**

**Future**
- Manufacturing cloud services
- IoT/AIN
- SAP Ariba

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A digital representation of all industrial equipment used in the field with secure, controllable sharing rights across business partners to enable customer insights, performance analytics, and new digital services.
SAP Asset Intelligence Network
What it looks like – how it works

Ease of use
SAP Asset Intelligence Network is a cloud-based business network with a consumer-grade user experience, smoothly integrated with SAP Fiori and SAP Fiori launchpad.

Simple and secure onboarding
- For manufacturers; operators; engineering, procurement, and construction (EPC) firms; and service providers

Powerful business content and analytics
- Introduce a digital twin to represent each physical machine or product along its asset lifecycle
- Standardize equipment management through asset master data and spare-parts information available for update from the network
- Streamline maintenance through access to the latest documents and service bulletins on maintenance strategies
- Achieve collaborative design and execution for complex installation or maintenance procedures
Technically synchronizing a network of digital twins
SAP Asset Intelligence Network supports the RAMI 4.0 administration shell

- One single source of truth for the asset/equipment
- Information about the utilization of the asset
- Accessible through APIs, based on a service-oriented architecture
- Information about different application aspects (installation, business partners, condition monitoring, tickets, spare parts, …)
- Support for unique identifiers, types, and instances
- Manufacturer- and operator-specific attributes

Reference architecture model Industrie 4.0 (RAMI 4.0)

Source: http://www.plattform-i40.de/i40/Redaktion/EN/Downloads/Publikation/structure-of-the-administration-shell.pdf?__blob=publicationFile&P=fe4e45
Smart air strategy execution
Business model KAESER SIGMA SMART AIR

KAESER SIGMA SMART AIR

- KAESER is responsible for operations and maintenance of the compressed air station
- Service level agreements for the production of compressed air
- Monthly settlement based on consumption of compressed air

Improve overall equipment effectiveness (OEE)

- Avoid planned and unplanned downtime – High availability
- Improve energy efficiency
- Reduce service costs by optimizing maintenance and eliminating incidents

Consulting

- Adapt compressed air station to changing customer demand during the lifecycle
Usage information is the basis for value-added services

5. Operations
   - Maintenance services
   - Calibration services
   - Performance as a service
   - ...

4. Commissioning
   - Commissioning services
   - ...

3. Installation
   - Machine fingerprint, installation certification, ...

2. Procurement
   - E-procurement services
   - Digital twin as USP
   - ...

1. Engineering
   - Engineering services
   - 3D model conversion
   - ...

KAESER SAP Digital Transformation Network
KAESER smart asset management

SAP Manufacturing Execution → SAP Asset Intelligence Network → SAP Predictive Maintenance and Service

Customers and partners
Service processes
Reporting

Kaeser
Service processes
Product improvement

Business partners
Equipment registry
Model database
Connect the dots and go for operational excellence
Network of digital twins to drive business outcomes

Progressive products – based on trends, requirements, configurations, and collaboration

New services – aligned to customer need, industry value, and operational expectations

Opportunity expansion – new products, new services, new industries
Thank you.

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