IoT Examples from around the world

Rudolf Held, Vice President, Global Head of SAP Co-Innovation Labs, SAP SE
Moscow, June 10, 2015
Helicopter Maintenance

Information

Functional Location: SKYESH090000-xx
Description: Marenco SKYe SH 09
Enrollment No.: HB-X-SH09
Condition Code: WNX-12
Homebase: Mollis (CH)

Flight Hours

0 20 40
Marenco Helicopter Maintenance using Augmented Reality
SAP Co-Innovation Lab DACH

Supporting small helicopter operators with cloud-based mobile service for helicopter maintenance and support assuring legal requirements for documentation using Augmented Reality-enhanced 3D visualization elements.

Engaged partners

*formerly Marenco Swissconsulting

Background:

- Marenco Swisshelicopters is a new producer for a multi-purpose light single-engine helicopter
- End customers are often very small operators (1 helicopter, 1-2 staff) with paper driven maintenance processes and documentation. Legal requirements for maintenance documentation in the aviation industry are very strict.
- Idea: Provide cloud-based mobile service for helicopter maintenance and support assuring legal requirements for documentation using Augmented Reality-enhanced 3D visualization elements.
- Based on SAP’s mobile platform, using Wikitude’s AR technology.
- First prototype presented at various events such as SAP TechEd Berlin 2014
SKYe SH09 – Marenco’s helicopter
Roll-out of first prototype 22.11.2013
SKYe SH09 – Marenco’s helicopter
First flight of first prototype 02.10.2014
SKYe SH09 – Marenco’s helicopter
Product configuration management
SAP Visual Enterprise as key to success

- Visual Manufacturing
- Visual Engineering
- PLM
- MES
- The Visual Enterprise
- ERP
- MRO
- Visual Quality Management
- Visual Service & Support
- Visual Parts Catalog
- Visual Mobile Service
- Visual Analytics
- Visual Marketing & Sales
- Visual Maintenance
SAP Visual Enterprise & Augmented Reality
A multitude of requirements for the operator

► Secured configuration management for the complete fleet.
► Retaining the pilot’s flight manual.
► Retaining the performance data for all aircrafts and special systems.
► Status code monitoring during operation
► Secure maintenance in all situations.
► Maintenance planning aligned with order situation.
► Flight planning and flight order planning.
► Continuous information readiness towards authorities.
► Consideration of human factors.
Open Integrated Factory
A Complete end-2-end Connected Plant / Industry 4.0 scenario with tangible products and manufacturing line showcasing with 6 partners together the highest flexibility in the production through resilient factory and lot size of ONE capabilities

Business Issues & Addressed Problems

- Seamless integration of machine with the control layer process using communication standards
- Configure, Price, Quote (CPQ), manufacture and deliver (engineering-) complex products
- Cloud-based Predictive Maintenance and Services on a real-world manufacturing line
- Energy monitoring and analytics in production

Customer & Business Value

Shop floor to Top floor integration without line / production cell servers. Means:

- No need for (costly) additional software layer
- Simplified processes without redundant master data maintenance and reduction of set-up times
- Optimized customer satisfaction with end2end configure, price, quote complex products delivery with higher flexibility regarding lot-size

Target Groups & Market Potential

- Solution is designed for all discrete manufacturing industries within most regions
- Showcased scenarios include both very automated steps e.g. robot, sensors and human-managed operations
- Can be used at industry machine components manufacturers as well as automotive, aerospace & defense and high tech suppliers
Movie
OIF and Industrie 4.0 along Systems & Business Partners

Integration Scenarios
1. Shop Floor to Top Floor
3. e-commerce Integration
4. Machine Cloud
5. Direct Replenishment
6. …
The Connected Open Integrated Factory at Hannover Fair 2015

**Initialization**

**Start Process**

- **Process**: Magazine Initialization
- **Activity**: Drilling

**Robot Cell for Assembly**

- **Process**: Camera Quality Check
- **Activity**: Rework & Repair

**Switch**

- **Process**: Packing Station

**Production warehouse**

- **Activity**: Back-loading, Front-picking

**Special assembly at bypass switch**

**Electric meter**

**Camera detects circuits on tray with respective colors**

**Slot configuration of fuses with batch number**

**Determination of WIP by color until assembly in robot cell**

**Release of SFC depending on circuit availability on tray in robot cell**

**Nonconformance and repair workstation with disassemble defect part and assemble new part (fuse) and document batch data**

**Mobile screen for posting goods receipt from components production to production supply area**

**Microsoft Kinect instructs and supervises pick process from production storage**

**SAP ME at milling cutter executes production with CNC program**

**CAD design creates CNC program and makes it available to the milling cutter**

**Milling Cutter**

**Trigger for reload of tray.**

**Picking of circuit for assembly**

**Release of SFC depending on circuit availability on tray in robot cell.**

**Determination of WIP by color until assembly in robot cell.**

**Camera detects circuits on tray with respective colors.**

**Slot configuration of fuses with batch number.**

**Determination of WIP by color until assembly in robot cell.**

**Trigger for reload of tray.**

**Picking of circuit for assembly.**

**Release of SFC depending on circuit availability on tray in robot cell.**

**Determination of WIP by color until assembly in robot cell.**

**Camera detects circuits on tray with respective colors.**

**Slot configuration of fuses with batch number.**

**Determination of WIP by color until assembly in robot cell.**

**Trigger for reload of tray.**

**Picking of circuit for assembly.**
**Storyboard**

FESTO and SAP Showcase with Integrated Business Processes leveraging lot size ONE

<table>
<thead>
<tr>
<th>Step</th>
<th>Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>e-commerce Hybris</td>
</tr>
<tr>
<td>02</td>
<td>Sales order</td>
</tr>
<tr>
<td>03</td>
<td>MRP</td>
</tr>
<tr>
<td>04</td>
<td>PLM</td>
</tr>
<tr>
<td>05</td>
<td>Engineering Control Center</td>
</tr>
</tbody>
</table>

**01:**
START on a web frontend (Hybris) with creating individual customized product with individual parameters. By running configuration the quote is done and displayed.

**02:**
Hybris creates a sales order in ERP.

**03:**
The demand of the customer order is inserted in the system, By running the MRP a planned order for production is created.

**04:**
The CAD design is adapted according to the individual customer requirements (in our case the name initials to be inserted in the top case)

**05:**
After the design was adapted the CNC program is created and attached to the planned order. The planned order is released into a production order and sent to MES.
## Storyboard

**FESTO and SAP Showcase with Integrated Business Processes leveraging lot size ONE**

<table>
<thead>
<tr>
<th>Step</th>
<th>Module</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>06</td>
<td>SAP MES</td>
<td>Two production levels: a) Standard FESTO line with production of the individualized base with board and b) FESTO milling machine for production of top case with individualized name initials.</td>
</tr>
<tr>
<td>07</td>
<td>SAP MES</td>
<td>MES orchestrates and manages the production. For individualized production we have high priority orders with self regulation M2M before initialization of product carrier. Manufacturing analytics in real time.</td>
</tr>
<tr>
<td>08</td>
<td>SAP MES</td>
<td>Individual designed product will be moved on the line into a special assembly area and wait for the special top case. Standard use cases from 2014 will also be leveraged and additional details including mobile screen for SAP ME transactions.</td>
</tr>
<tr>
<td>09</td>
<td>SAP MES</td>
<td>The production of the individualized top case is started by SAP ME. The special CNC program is loaded by starting the order in the milling machine.</td>
</tr>
<tr>
<td>10</td>
<td>SAP MES</td>
<td>After milling machine produced the top case, label is printed and storage in production warehouse is done via mobile application (JANAM device).</td>
</tr>
</tbody>
</table>
Storyboard
FESTO and SAP Showcase with Integrated Business Processes leveraging lot size ONE

11. SAP MES | Special assembly
Operator checks if required top case arrived a production warehouse. We have a Microsoft Kinect application checking operator action. By wrong picking visual and acoustic signal is given.

12. SAP MES | FESTO Standard
MES orchestrates and manages the production. For individualized production we have high priority orders with self regulation M2M before initialization of product carrier.

13. HCP IoT | Predictive
Sensors at the conveyor belts capture electric consumption and behavior. Data is transferred by PCo into HANA and analyzed. Predictions are done and visualized.

14. HCP IoT | Predictions
Resource health projected and the impact on production plan is visualized.

15. HCP IoT | Instructions
Instructions where and how the defect can resolved before asset shuts down, leveraging 3D VE
**SAP Co-Innovation Lab**

**IoT Partner Programs**

**Identify use-case**
- Partners identify and provide customer vetted IoT use case
- Partner builds a business case
- SAP Validates

**Prepare**
- Partner identifies integration of semiconductors, networking/connectivity needs
- SAP provides SAP IoT enablement
- Partners signs cooperation agreement with SAP

**Build**
- SAP Provides SAP IoT infrastructure, Coaches, provides support in the development cycle
- Partner develops IoT solution
- Partner deploys right skills to develop application

**Showcase**
- SAP Events and Forums
- Special IoT events
- Certification**

**Go-To-Market**
- Solution visibility with SAP Field team
- Market Unit/GPO connects
- GTM and pricing models

Create New Business value, with **SAP IoT Technology**
Partner Facts

- Rolta, existing OEM partner for SAP including OneView™ Dashboard solution
- Mtell, emerging and now SAP HANA certified partner to bring machine learning to SAP Hana IoT
- SAP O&G IBU, validation of core requirements and primary architect for partner Strategy for O&G Ops Integrity solution

Project Activities

- 3 day design thinking workshop with MTELL, Rolta and an O&G customer
- COIL Kickstarter contract establishes agile co-innovation framework
- COIL and project team leadership engaged with SAP partner program stakeholders to develop and execute IoT GTM strategy
- Establishing landscape framework with HCP IoT team to evolve output for an HCP IoT solution

Solution

- Machine Intelligence underscoring Prescriptive Asset Integrity Management
- Rolta OneView™ for visualizing collective intelligence to a single dashboard

Reduced risk in 3 key areas

- Safety of employees and the public,
- Environmental
- Financial risk from items such as product quantity and quality

$ € ¥

- Addressable predictive maintenance market of $5.3B
- On target for solution to capture Oil&Gas market share
- Strong IBU forecast for 2015; expanding pipeline of opportunity
Revolutionary IoT Solutions for the Connected Mine
Illumiti, Vandrico & SAP in COIL Silicon Valley

Partner Facts

- Illumiti is an existing Gold VAR partner for SAP with strong experience in the Mining Industry
- Vandrico, startup and new SAP partner opportunity with its CANARY solution focusing on 2 way safety communications with wearable devices in mining and related industries
- SAP Mining & Metals IBU, endorsed the use case and partners

Project Activities

- 3 day Design Thinking workshop with Illumiti, Vandrico, with strong inputs and participation from mining customers
- COIL Kickstarter contract establishes agile co-innovation framework
- Hybrid COIL and HCP landscape framework for HCP IoT team
- Project output directed at parallel GTM discussions
- Conference and customer events as anchors to maximize client engagement and “use case” identification through the completion of discovery days

Solution

- Intelligent Real-time Messaging and situation awareness in the Mine
- Help people inside a mine to identify and respond appropriately to dangerous situations?
- Packaged software solution ready for GTM after 90 day cycle at COIL
- Extensible, expandable to add predictive and prescriptive analytics and leverage future wifi and other network communications and wearables

$ € ¥

- Targeting customers and prospects in mining (30+ mines)
SAHANA – Partner-delivered HANA Applications
A high touch co-innovation partner engagement initiative in India

Enable and coach selected partners to define, implement and deliver high-impact native applications and drive revenue on SAP HANA Platform

Executed in waves

2013 2014 2015

TECHED

Project Type
- Adoption Initiative
- Showcase

Deliverables
- HANA applications
- Demos and marketing collaterals
- Certified Apps

Team
- SAP Co-Innovation Lab
- SAP Labs Bangalore
- SAP India

© 2015 SAP SE or an SAP affiliate company. All rights reserved. Public
**FAME - Fleet Analytics Mobile Enabled**

**IoT in Automotive in India**

- Transfer on-board device generated data using internet/GPS
- Currently data is going to 3rd party server in proprietary format, then extracted to HANA.
- Data can be directly fed to the HANA server for real-time analysis and workflows

- Geo location & vehicle status (moving/stalled/stopped)
- Real time individual vehicle alerts and diagnostics
- Integrated work flow for service order
- Historical insights on vehicle health and driver behavior
- Reducing Fuel consumption and maintenance down time

![Diagram showing flow of data](image-url)
Flood Real-time Monitoring
Co-Innovated IoT application from India

- Station Sensors
- Canal Sensors
- Reservoir Sensors
- SCADA System
- SAP HANA
- SAPUI5
- Manual data entry
- Extract and Store
- Alerts
- Technical Analyst
- Command Center
- Alert Bulletin
- Chief Engineer
- Principal Secretary
- Public Cloud-Weather
- Rainfall
EDopt
Energy Demand Optimizer

- Forecasting engine
- Smart meter collection server
- Weather data
- Spot market prices

SAP HANA

- Single exponential Smoothening
- Customer Baseline
- K-Means Clustering
- Arima Time Series
- Price Elasticity
- Maximization

EDopt Account Manager

- Strategizes demand response programs
- Cost benefit audit
- Manages INC customer
- Customer Conflict resolution
- Manages Team Leads

EDopt Consumer

- Register to a program
- Receive incentives for meeting targets
- Cost benefit analysis

© 2015 SAP SE or an SAP affiliate company. All rights reserved.
No part of this publication may be reproduced or transmitted in any form or for any purpose without the express permission of SAP SE or an SAP affiliate company.

SAP and other SAP products and services mentioned herein as well as their respective logos are trademarks or registered trademarks of SAP SE (or an SAP affiliate company) in Germany and other countries. Please see http://global12.sap.com/corporate-en/legal/copyright/index.epx for additional trademark information and notices.

Some software products marketed by SAP SE and its distributors contain proprietary software components of other software vendors.

National product specifications may vary.

These materials are provided by SAP SE or an SAP affiliate company for informational purposes only, without representation or warranty of any kind, and SAP SE or its affiliated companies shall not be liable for errors or omissions with respect to the materials. The only warranties for SAP SE or SAP affiliate company products and services are those that are set forth in the express warranty statements accompanying such products and services, if any. Nothing herein should be construed as constituting an additional warranty.

In particular, SAP SE or its affiliated companies have no obligation to pursue any course of business outlined in this document or any related presentation, or to develop or release any functionality mentioned therein. This document, or any related presentation, and SAP SE’s or its affiliated companies’ strategy and possible future developments, products, and/or platform directions and functionality are all subject to change and may be changed by SAP SE or its affiliated companies at any time for any reason without notice. The information in this document is not a commitment, promise, or legal obligation to deliver any material, code, or functionality. All forward-looking statements are subject to various risks and uncertainties that could cause actual results to differ materially from expectations. Readers are cautioned not to place undue reliance on these forward-looking statements, which speak only as of their dates, and they should not be relied upon in making purchasing decisions.