



Grid Operation Excellence with Digital Enterprise Asset Management

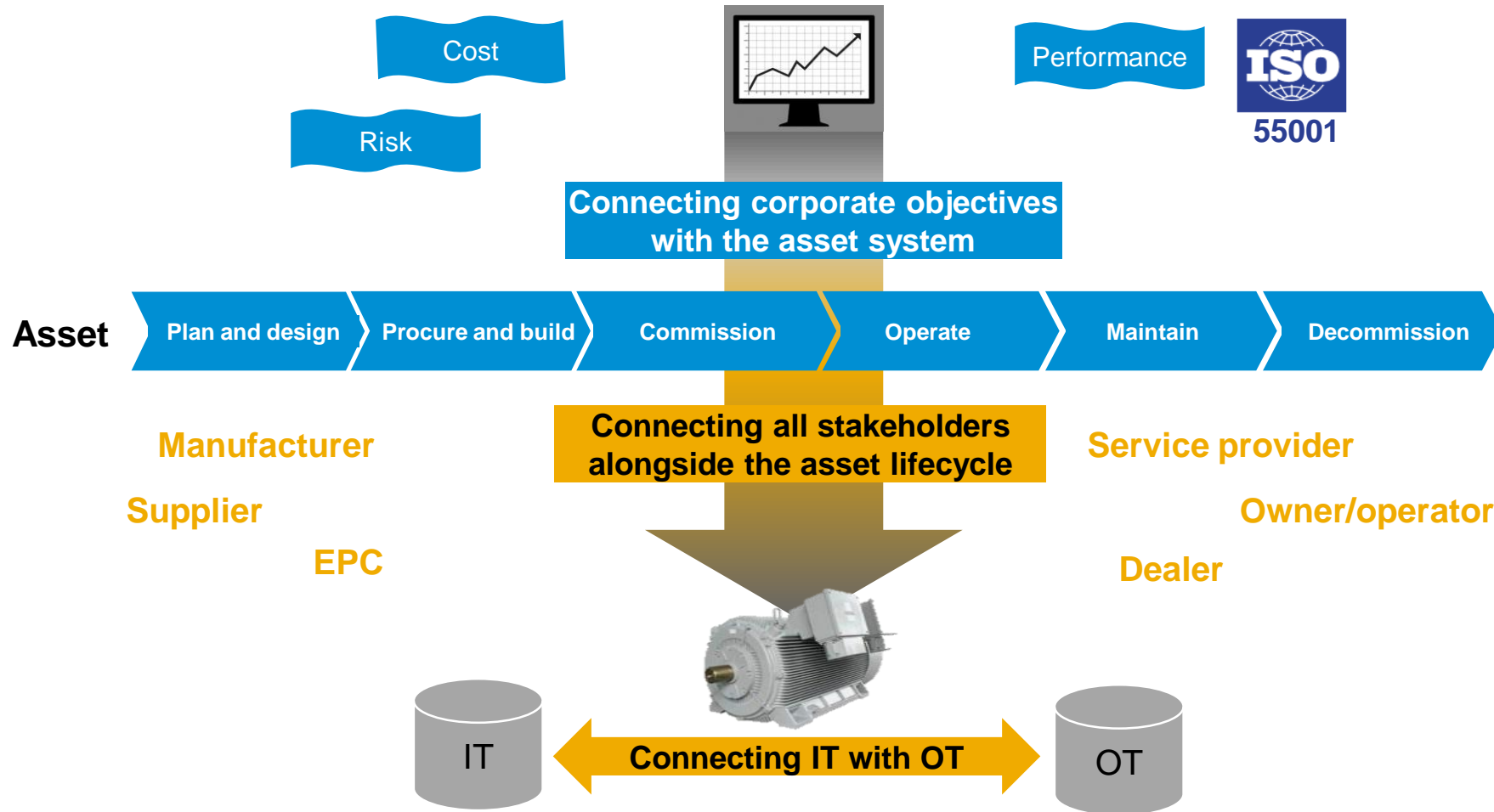
Gero Bieser, Chief Solution Expert, IBU Utilities, SAP SE

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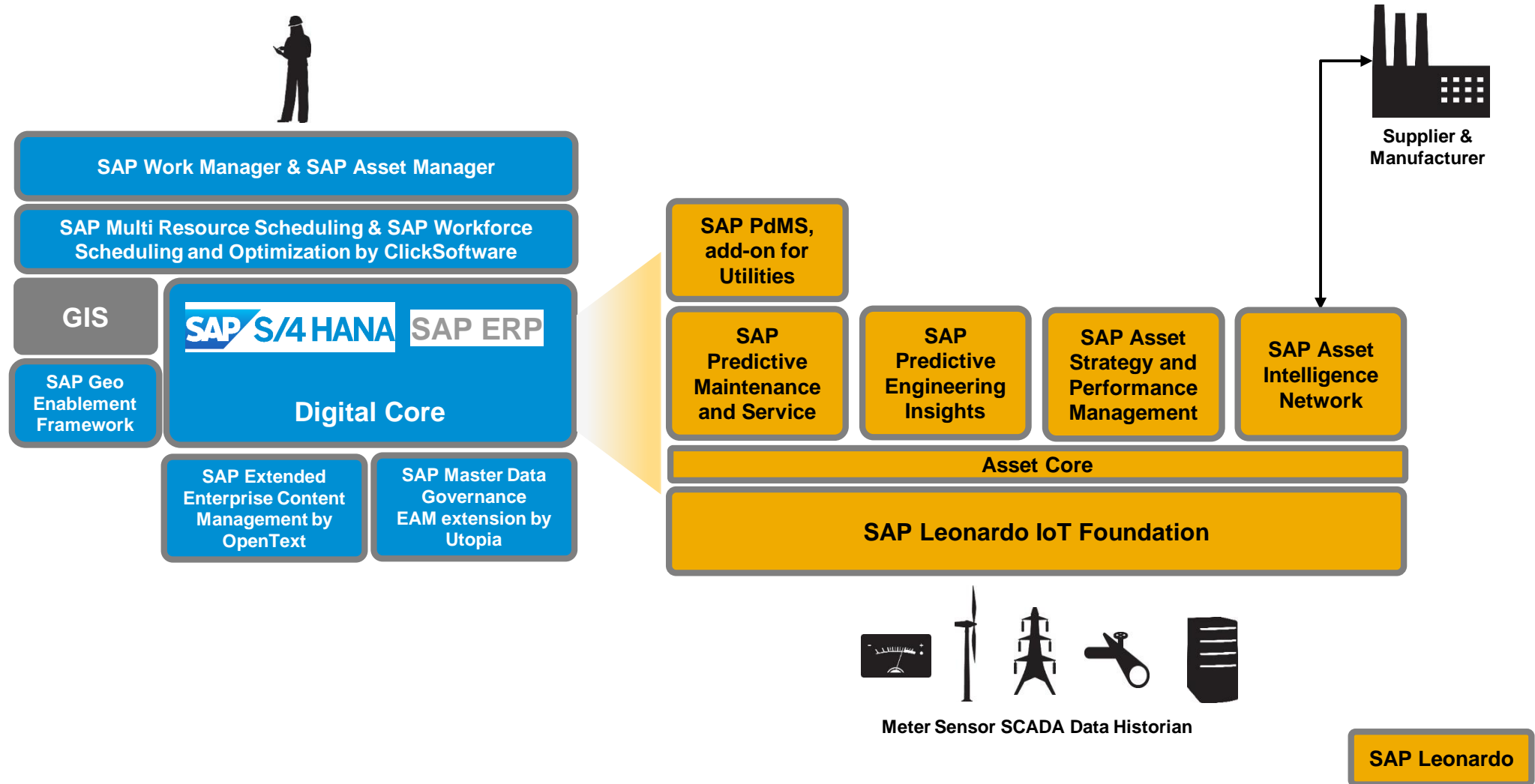
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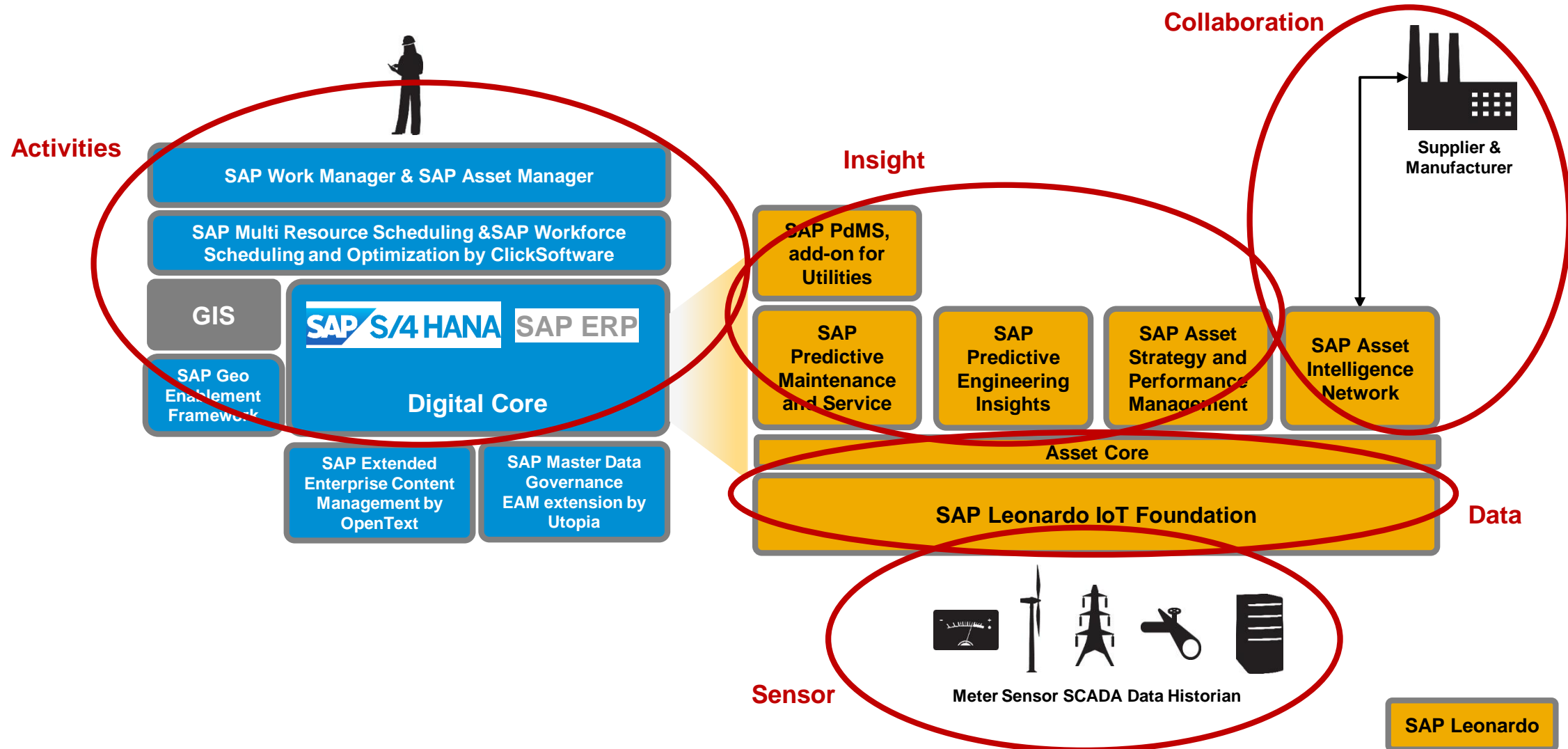
The Optimization of the Asset Life-cycle with Digital Enterprise Asset Management



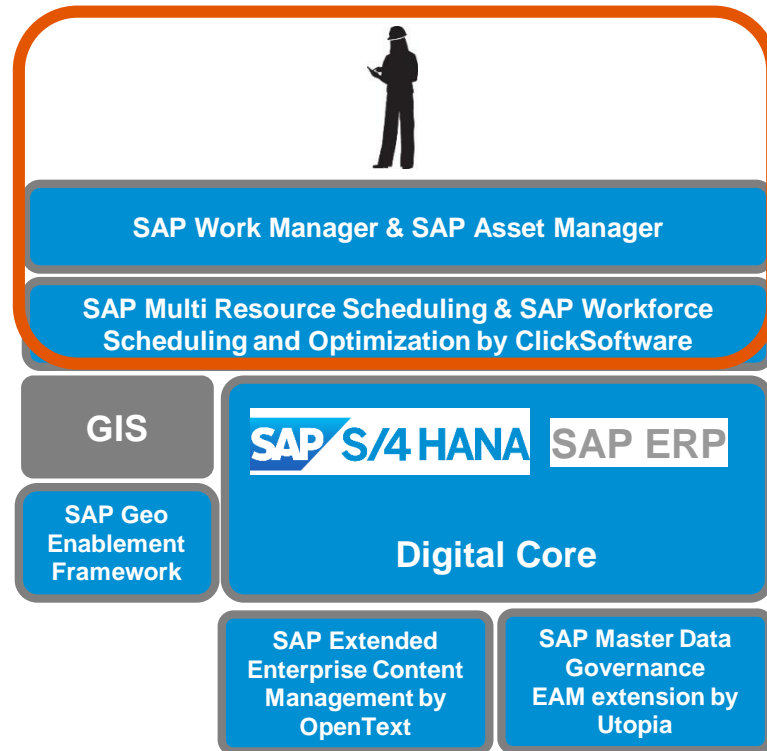
Digital Enterprise Asset Management with SAP: Solution Landscape



Digital Enterprise Asset Management with SAP: Solution Landscape



Digital Enterprise Asset Management with SAP: Solution Landscape



Energie Steiermark: Improving Mobile Maintenance and Projects with SAP® Solutions



Company or Organization
Energie Steiermark AG

Headquarters or Location
Graz, Austria

Industry
Utilities

Products and Services
Electricity, natural gas, district heat, and residual waste recycling

Employees
1,739

Revenue
€1.37 billion

Web Site
www.e-steiermark.com

Implementation Partner
ENERGY4U GmbH – An Atos Worldgrid Company



The company's top objectives

- Streamline operational processes for grid maintenance and projects
- Eliminate paper-based work order information for technicians
- Facilitate confirmation of work orders and master data changes, while streamlining back office processes

The resolution

- Installed and configured the SAP® Enterprise Asset Management solution and the SAP Multiresource Scheduling application for planning technicians during what was called the "Info Mobil" project
- Deployed the SAP Work Manager mobile app to display work order data and send confirmations
- Implemented a custom back office solution to allow back-office employees to review and release confirmation data sent from mobile devices

The key benefits

- Visual planning boards for better planning and improved visibility of technician work across all units
- Completely paperless work order process with full online and offline capabilities for technicians
- More efficient release confirmation process for work orders and other HR-related data, including overtime hours and travel expenses

"SAP Multiresource Scheduling and the SAP Work Manager mobile app have the smooth integration and flexible configuration capabilities our business needed. We worked with ENERGY4U, an Atos Worldgrid Company, on the implementation, which ensured the project's huge success. We have now gone paperless and our planning processes have improved significantly."

Thomas Balber, Project Manager for Info Mobil, Energie Steiermark AG

80

Technicians using the live solutions in the first pilot phase

7 months

Implementation time for the pilot

358

Technicians to be using the solutions by the end of the final roll out phase

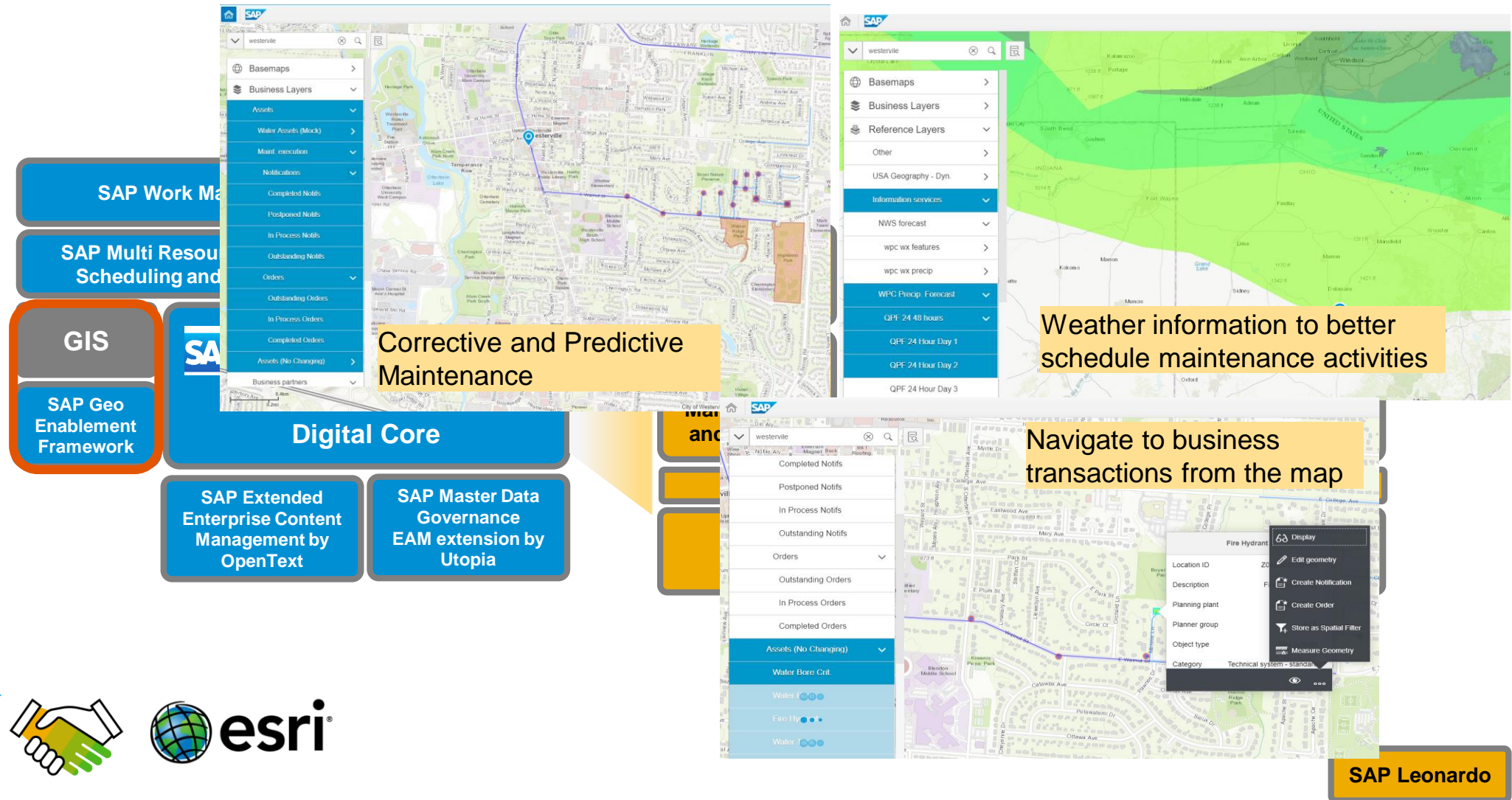
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Meter Sensor SCADA Data Historian

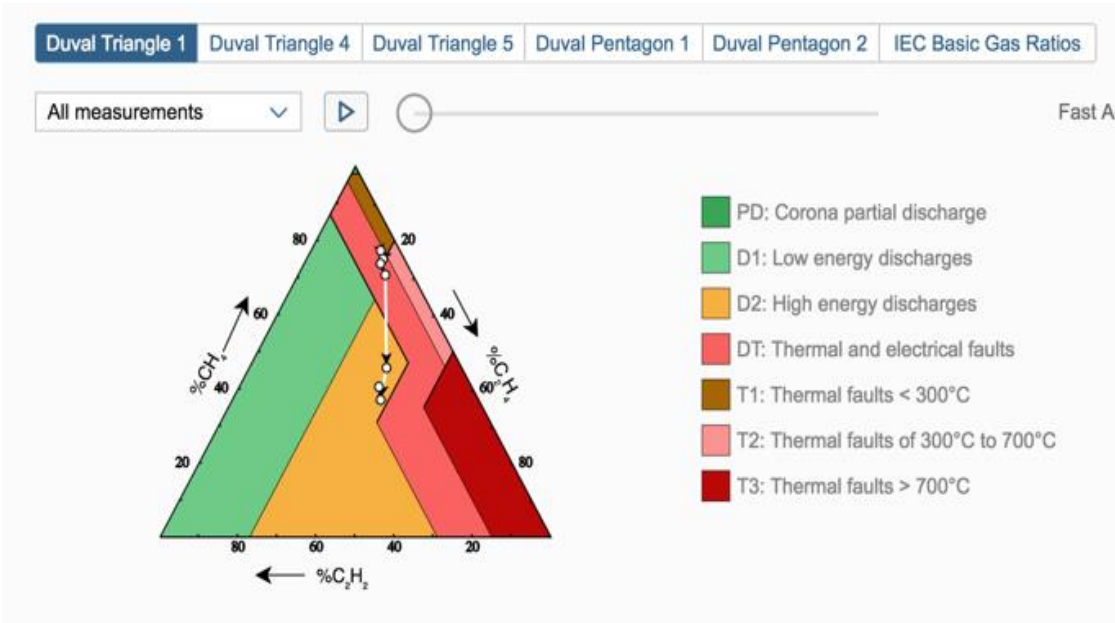
SAP Leonardo

Digital EAM: GIS Integration



SAP Leonardo

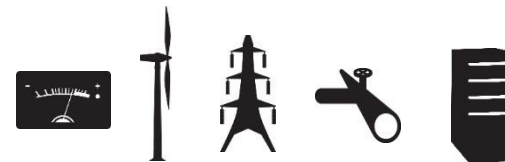
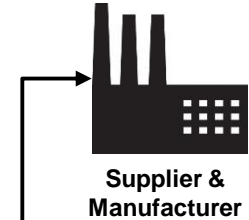
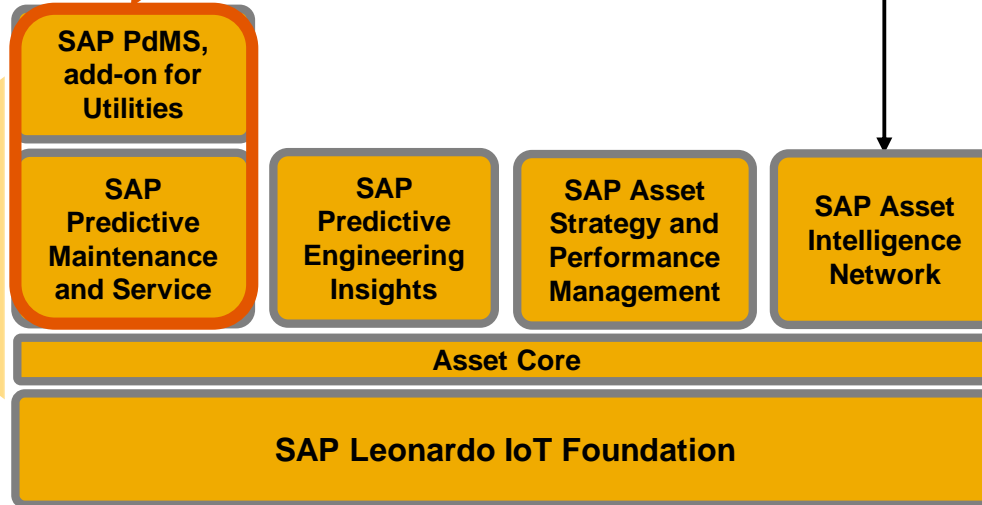
Digital EAM: Predictive Maintenance



Enterprise Content Management by OpenText | Governance EAM extension by Utopia

Calculate asset health and predict remaining life time

- For example based on gas concentrations in the transformer oil



Meter Sensor SCADA Data Historian

SAP Leonardo

Utility specific Requirements: Optimize Maintenance Strategy with detailed Transformer Analysis



Challenges

- Correlate and analyze sensor data
- Integrate data from various sources
- Calculate transformer loss of life for one year of 1-minute measurements at your fingertip
- Enable spatial analysis

Solution

- Data correlation, forecasting and spatial analysis with **SAP HANA** with **Predictive option**
- Implementation provided by **SAP**

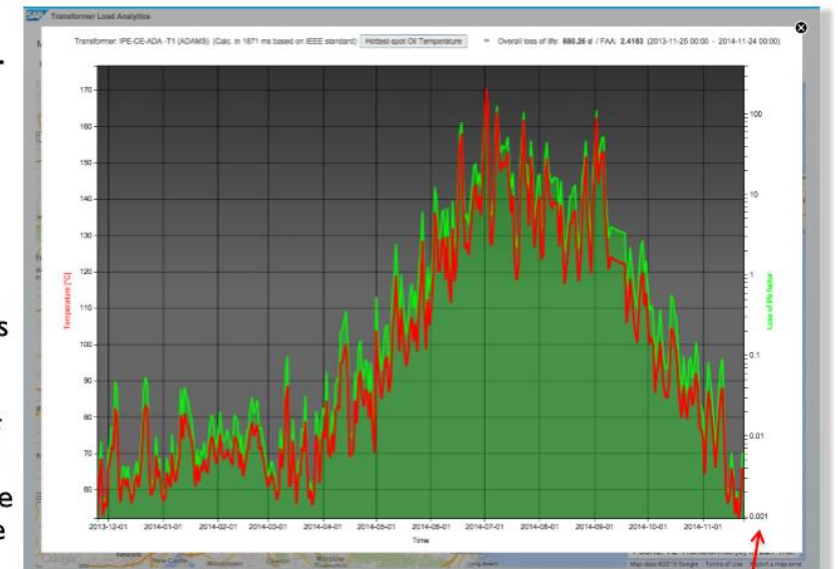
Value

- Calculate true age of the transformer and thus drive replacement strategy
- Take forecasted data and data from other sources (for example PM system) into account



Transformer Loss-of-Life Calculation

- ▶ Calculate transformer loss-of-life using IEEE C57.91-2011 (for 1 year with 1-minute measurements 1.8 seconds)
- ▶ Use load or (here) transformer oil temp measurements (top-oil and winding)
- ▶ See development of resulting hottest-spot oil temperature (red) and loss-of-life factor (green) over the year



22

Asset Strategy



exponential scale!

1/28/2015

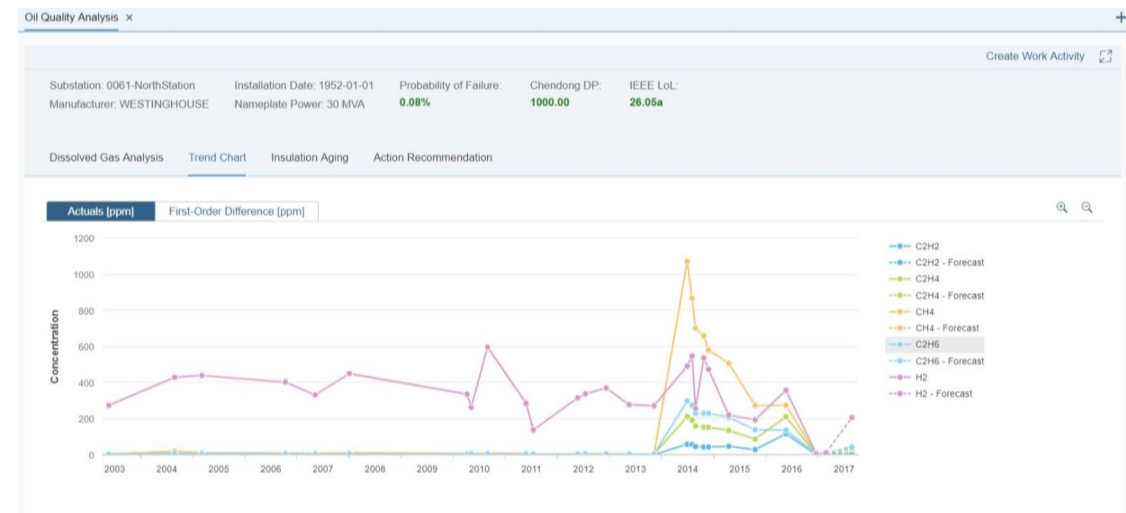
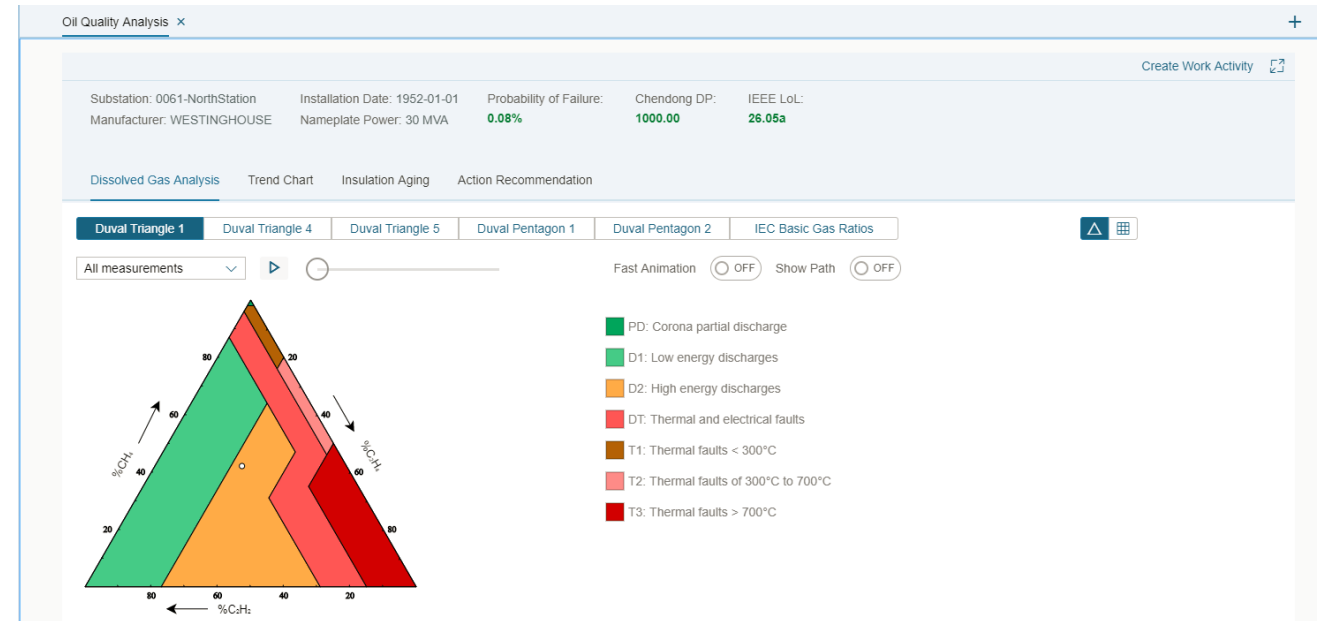
SAP PdMS, add-on for Utilities: Oil Quality Analysis Tool

Various methods to analyse asset health and the probability of failure and to optimize maintenance:

- Duval Triangle & Pentagon
- IEC Basic Gas Ratios
- Chendong Degree of Polymerization
- IEEE Aging Acceleration Factor
- Ofgem Asset Indices (planned for Q3/2018)
- Trend Chart
- Action Recommendation
- Work Activity Creation

Machine Learning content:

- Prediction of gas concentrations in oil samples using a neural network (nnetar)
- Predicted fault zones
- Displays of future values in trend charts



Utility specific Requirements: Asset Health Management of the Distribution Grid



Challenges

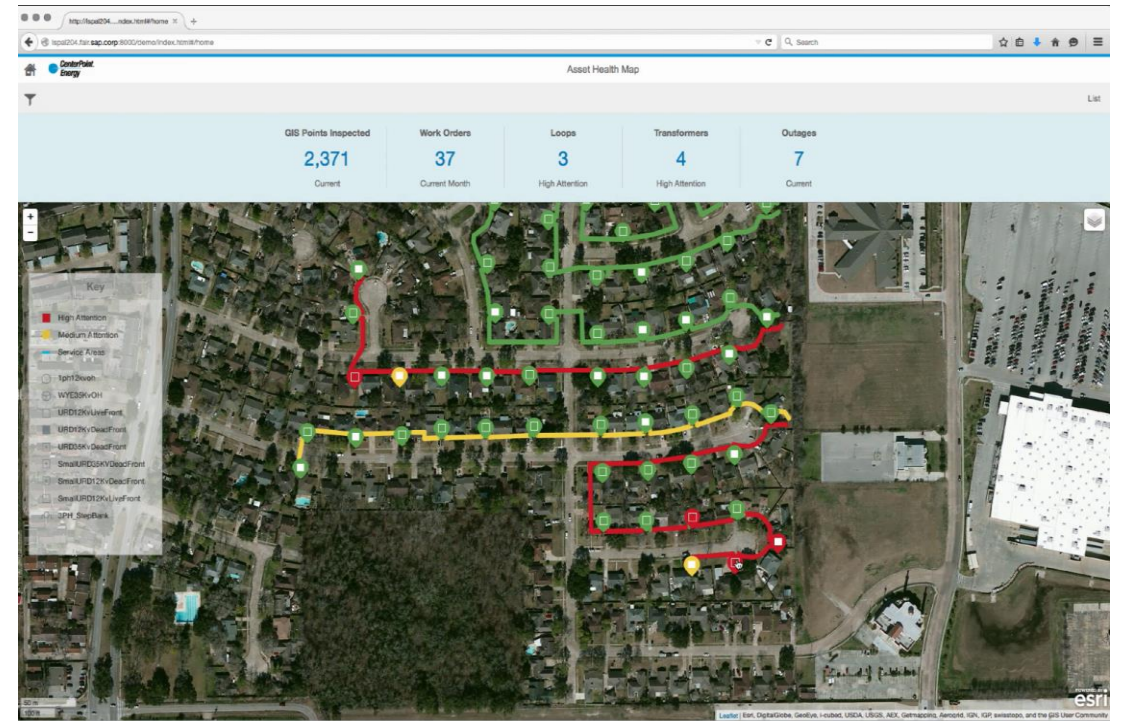
- Optimize asset investment program
- Reduce risk of outage
- Increase safety of crews

Solution

- Asset Health Management application based on the **SAP Predictive Maintenance and Service Foundation**
- Implementation provided by **SAP Custom Development** and **Accenture**

Value

- Determine true age of the assets and likelihood to fail. Concentrate on high priority assets
- Long-term planning for asset maintenance and replacement
- Prepare crew with regards to condition and site



SAP PdMS, add-on for Utilities: Linear Asset Analytics

Overview of the health status and relevant details of linear assets (e.g. electricity, gas and water networks)

- Health Indicator & Probability of Failure
- Formula Explanations
- Filtering on Asset Types
- Work Activity Creation

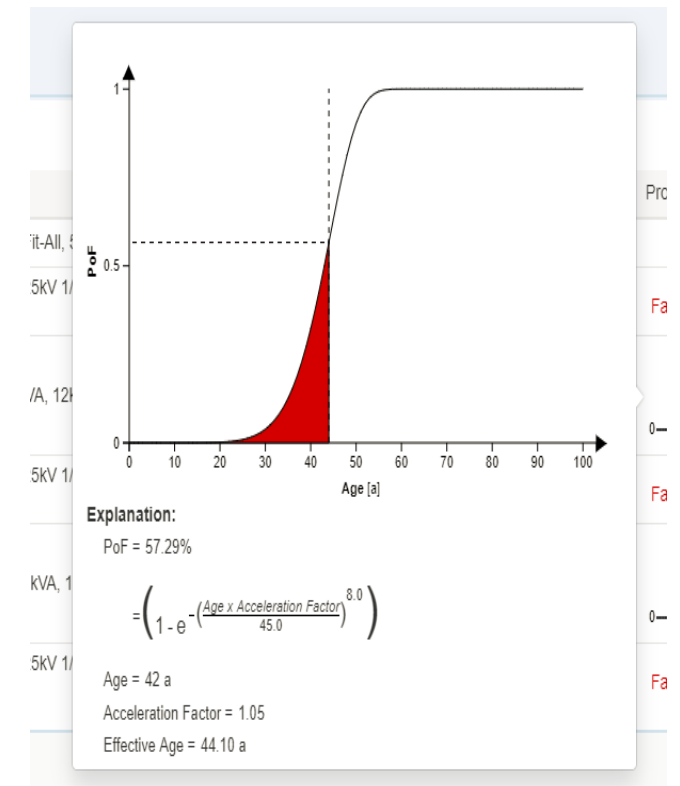
Utilities Linear Assets Analytics ×

Circuit: 2192 Total Length: 632.6m Probability of Failure: **54.57%** Spans Failed: **100.00%**
 Installation Year: 1976

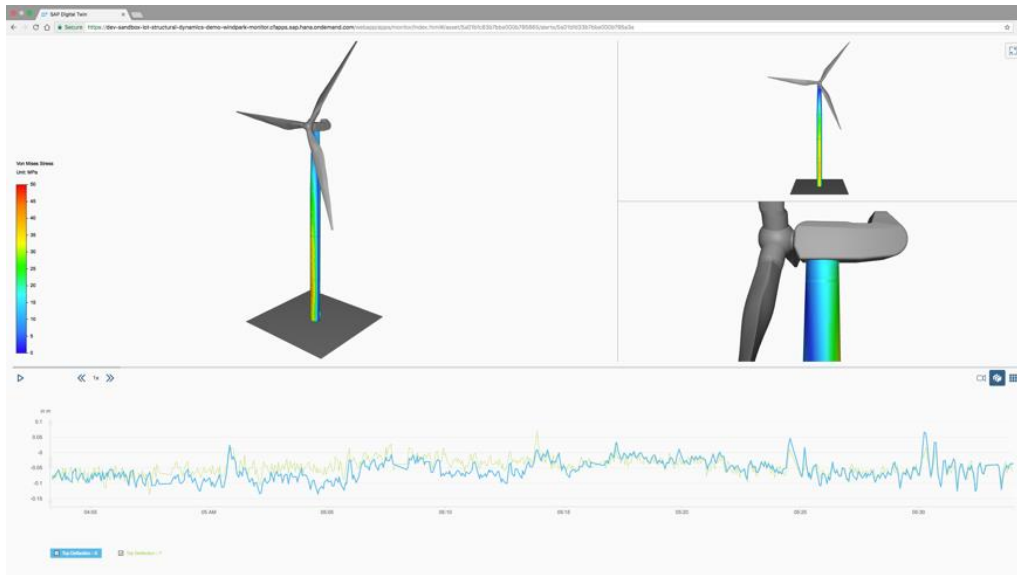
[Risk Analysis](#)

Assets (9) ⌵ [Create Work Activity](#)

Asset	Asset Type	Description	Health Indicator	Information	Probability of Failure
<input type="checkbox"/> F41	Fuse	Kearney K, Fit-All, 5A		NC, Fast	
<input type="checkbox"/> F41-T189645	Span	SouthWire, 25kV 1/0 AL Stranded	⊗ R1	Length 184.9m, Ins. Thickness 220mm	Failed
<input type="checkbox"/> T-189645	Transformer	Cooper, 25kVA, 12kVA- 240V	⚠ Medium	Live Front, NC	
<input type="checkbox"/> T189645-T189646	Span	SouthWire, 25kV 1/0 AL Stranded	⊗ R1	Length 122.9m, Ins. Thickness 220mm	Failed
<input type="checkbox"/> T-189646	Transformer	Cooper, 37.5kVA, 12kVA- 240V	🟢 High	Live Front, NO	
<input type="checkbox"/> T189646-T189647	Span	SouthWire, 25kV 1/0 AL Stranded	⊗ R2	Length 143.9m, Ins. Thickness 220mm	Failed

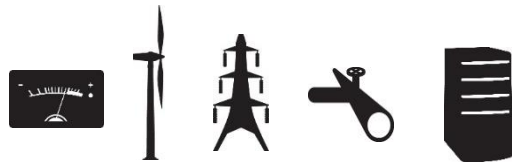
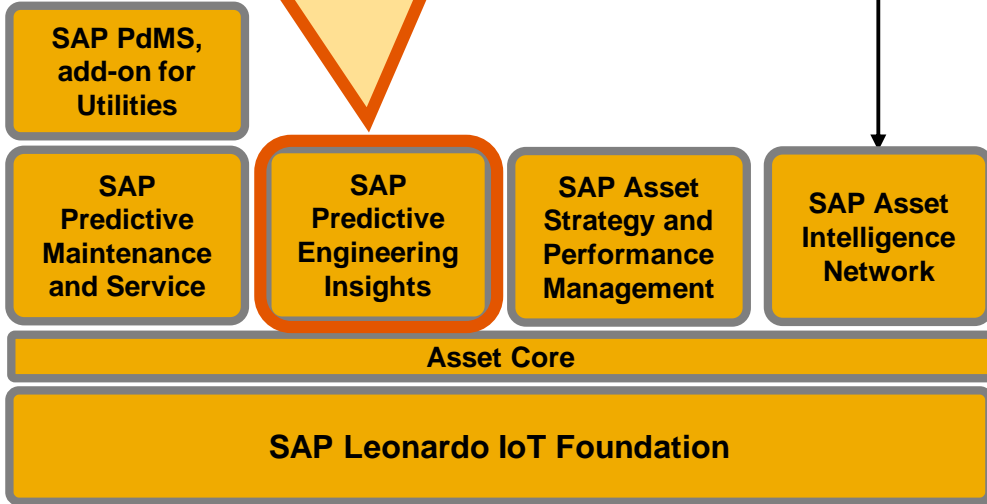
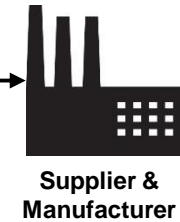


Digital EAM: Finite Element Analysis



Calculate forces and stresses in structures & simulate extended operation scenarios

- For example for wind turbines



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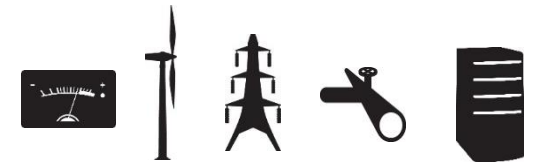
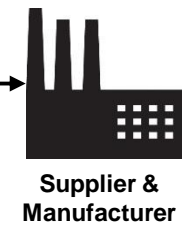


Digital EAM: Criticality and Risk Assessment



Identify critical assets and define maintenance strategy

- Risk assessment with a focus on safety, finance, security of supply



Meter Sensor SCADA Data Historian



Digital EAM: Business Network

Pump Unit Mega CPK QKD-4711 PU Mega CPK QKD-4711

Manufacturer: SAP Manufacturer External IDs Phase / System Status: Partially Operational/Redundant Status: In Revision Shared With: 2 Partners

INFORMATION STRUCTURE AND PARTS DOCUMENTATION MONITORING CUSTOMER SERVICE TIMELINE

Highlights

- Object Images:** Total: 10
- Tagged Images:** Total: 3
- Completeness:**
 - Overall: 79%
 - Installation Data: 100%
 - Attributes: 68%
 - Instructions: 100%
 - Documents: 59%
- Announcements (Last 2 Weeks):** 3 Unread (Total: 3)
- Documents (Last 2 Weeks):** 7 Unchanged, 1 Added (Total: 17)
- Tickets:** 1 Immediate Priority (Open: 3, Total: 3)

Attributes

All Attributes	65	Changed Attributes	2	Attributes Without Values	7
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Operating Statistics

Run Hours	18 Hour
Temperature range	8 - 80 Degree Celsius Normal: 77 Degree Celsius

Site Installation Photos

Installation Position	Vertical Loop
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Sensor Data

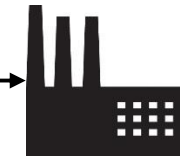
Longitude	8 - 9 Set
Latitude	1 - 80 Set Normal: 45 Set

Motor

OpenText Utopia

Collaborate with suppliers on maintenance procedures and strategies

- Share asset documents, service bulletins, sensor readings



Supplier & Manufacturer

SAP PdMS, add-on for Utilities

SAP Predictive Maintenance and Service

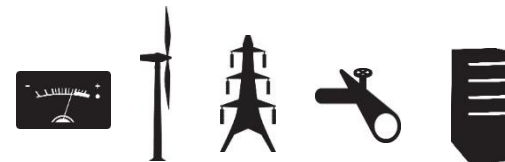
SAP Predictive Engineering Insights

SAP Asset Strategy and Performance Management

SAP Asset Intelligence Network

Asset Core

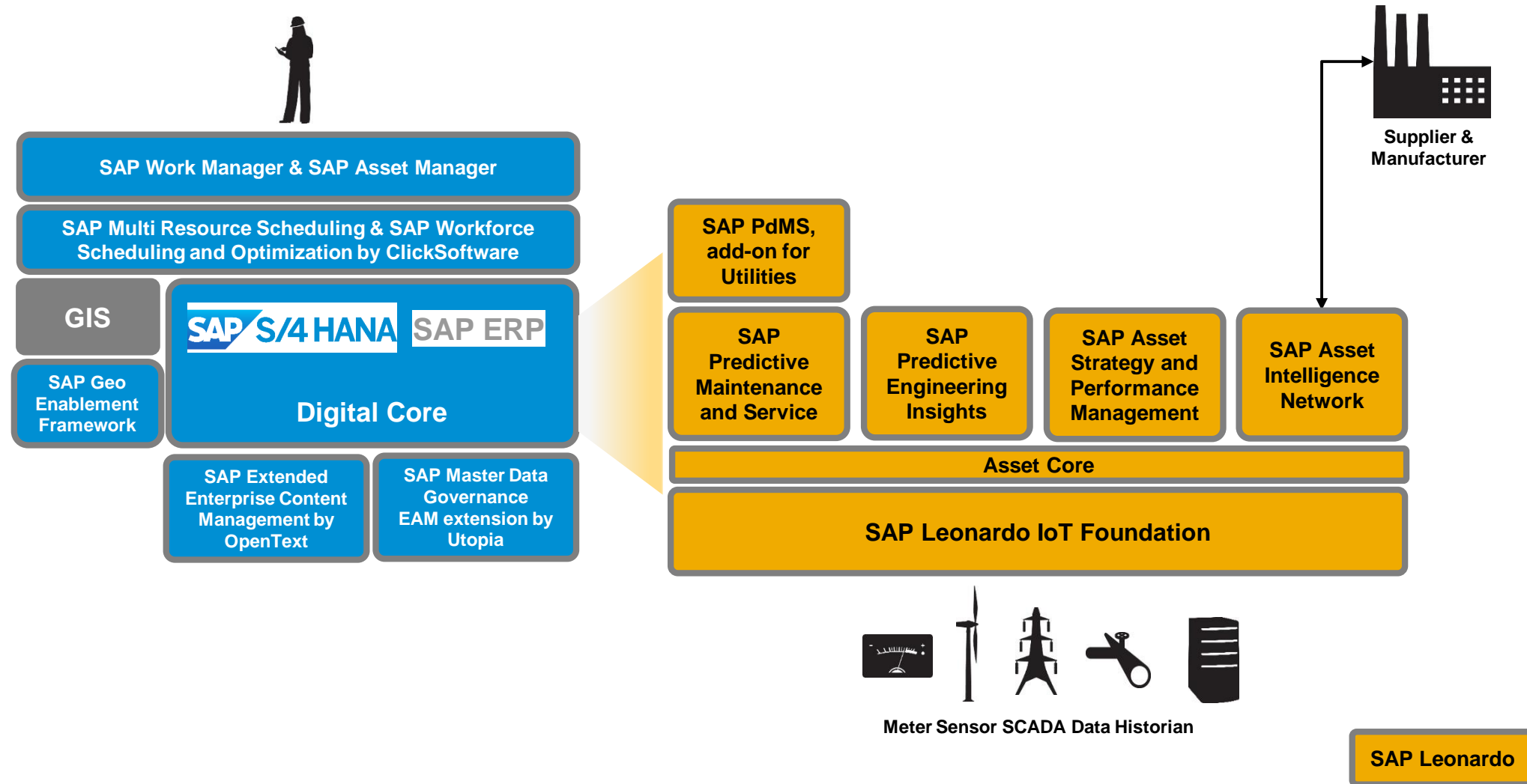
SAP Leonardo IoT Foundation



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SAP Leonardo

Digital Enterprise Asset Management with SAP: Solution Landscape



Thank you.

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