What is Leonardo IoT and how does it integrate?

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Intelligent Enterprise

SAP Cloud Platform as a key pillar

Business Technology Platform
Intelligence

Any database / any data store connectivity

Open environment and runtime

Any database / any data store connectivity

Intelligence

Analytics

Augmented BI
Collaborative planning
Predictive analytics
Data warehousing

Database & Data Management

Data pipelining
Data virtualization
Data governance
Storage and processing
Connection mgmt.
Data orchestration
Metadata mgmt.

Application Development & Integration

Foundation Platform Services

Security | identity management | auditing | logging | metering

Intelligent Technologies

Flexible deployment: cloud, on-premise, hybrid, edge

Data-driven insights
Intelligent RPA
Artificial intelligence
IoT cloud & edge

Integration suite
Intelligent BPM
Enterprise extensions
Digital experience

Business Technology Platform
SAP Leonardo IoT as key enabler of the intelligent enterprise
SAP Leonardo IoT – From Internet of Things Data to Business Outcomes

SAP Leonardo IoT

- Event Services
- Analytic Services
- Streaming Rules & Rules on Persisted Data
- Data Ingestion & Big Data Storage
- Enablement of the Digital Twin

SAP Leonardo IoT Edge

IoT embedded Intelligent Suite

IoT enabled Customer Apps

Standalone IoT enabled Business Apps

- T-Systems
- AT&T
- Cellular Clouds
- Amazon Web Services
- Microsoft Azure
- Cloud Providers
- Smart Connected Devices
SAP Leonardo IoT – From Internet of Things Data to Business Outcomes

SAP Leonardo IoT

- Event Services
- Analytic Services
- Data Ingestion & Big Data Storage

Actions, Integration & Decision Support Services

Streaming Rules & Rules on Persisted Data

Enablement of the Digital Twin

SAP Leonardo IoT Edge

Standalone IoT enabled Business Apps

IoT embedded Intelligent Suite

IoT enabled Customer Apps
The business context of an IoT enabled asset

Example: The business context of a silo

Sensor Measurements
- Distance
- Temperature
- Humidity
- Pressure

Geographical Location
- Postal address
- Latitude / Longitude
- Altitude

Material stored in Silo
- Types of Grains
- Types of Cement
- Food Ingredients
- Types of Animal Feed

Organizational Structure
- Company Code
- Plants
- Storage Locations

Asset Tag
- Material Master in S/4
- SLAs, Warrenties
SAP Leonardo IoT – From Internet of Things Data to Business Outcomes
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Standalone IoT enabled Business Apps

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Cellular Clouds

Cloud Providers

Smart Connected Devices

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SAP Leonardo IoT – From Internet of Things Data to Business Outcomes

- SAP Leonardo IoT
  - Event Services
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  - Enablement of the Digital Twin

- IoT embedded Intelligent Suite
- IoT enabled Customer Apps

- SAP Leonardo IoT Edge
Recent Innovation: Decision Support Service

**Sensors**
- Sensor data from smart flow meter

**SAP Leonardo IoT**
- Rule based monitoring of sensor data
- Anomaly event detected
  - Human decision taking required
- Decision Support instance generated incl. business context
- Business user takes informed decision and executes recommended action

**Business Layer**
- Create maintenance work order in S4
- Create service ticket in SAP Cloud for Customer
- Launch partner flow meter application
Main Components of the Decision Support Service

1. Runtime
   Business Service generates recommended actions out of IoT sensor data and business context.

2. UI Template
   Preconfigured Fiori Smart Element based UI building block offered through Web IDE to easily consume business service (e.g., developer can add UI building block to any S/4 object detail page)
   Direct consumption of service is welcome (e.g., API based consumption outside of Fiori)

3. Configuration App
   Configuration App to be used by administrators or key users to configure invoked backend services such as S/4 Stock Transfer, S/4 Purchase Order Create, S/4 Inbound Delivery Cancellation, C/4 Service Ticket Creation

4. Connectivity Component
   - ABAP add-on component to securely consume the decision support business service in SAP business applications
   - S/4 Situation Handling Framework can securely consume the decision support business service.
Delivery Disruption of VJ_GEN01 Material due to High Temperature; Sales Order 0002991190/00010 impacted.

Reefer Details
- Reefer Number: M90D4C02000
- Reefer Description: 10 ft ISO Reefer Container
- Product: VJ_GEN01
- Product Description: VJ_GEN01 Material

Failure Information
- Current Temperature: 12
- Minimum Temperature: 5
- Maximum Temperature: 10
- Delivery Number: 008009530/00010
- Sales Order Number: 0002991190/00010
- Customer: Customer Sum1 Name

Action Options
- Inform Customer about the Delivery Disruption
  Send Email Notification to Customer informing of Delivery Disruption of 10 ft ISO Reefer Container of Sales Order 0002991190/00010
- Create a Rush Order for Replacement
  Create a Sales Order for Material VJ_GEN01 Material
**SAP Leonardo IoT Business Outcomes**

SAP Leonardo IoT brings intelligence to the enterprise by offering multiple paths to innovation, accompanied by a comprehensive set of industry-specific business services and IoT capabilities:

1. **EMBED**: Embed telemetry data into SAP LoB applications, like S/4 HANA, C/4HANA or Digital Supply Chain, for an IoT enabled Intelligent Enterprise Suite.

2. **EXTEND**: Enable developers to extend existing SAP business processes by gaining information and insights from previously unconnected devices (e.g. machines, products, assets), thereby extending the value of existing SAP applications and processes.

3. **TRANSFORM**: Empower partners and customers to pursue open innovation and create new IoT enabled business models, in the context of SAP business systems, while keeping core business processes stable.

4. **ENABLE BUSINESS PROCESSES AT THE EDGE**: Provides intelligent data processing at the Edge orchestrated from the cloud. SAP Leonardo IoT runs business transactions correlated with device data, close to the source of IoT data, at the Edge.
**Manufacturer of access control and time recording solutions**

<table>
<thead>
<tr>
<th>Industry</th>
<th>Devices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discrete Manufacturing</td>
<td>Access Control Devices</td>
</tr>
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**Business Drivers**

- **Transform by complementing physical products with innovative digital services**
  - Digital offering for access control and time recording tightly integrated to SAP Success Factors and Employee Central.
  - The solution is based on SAP Cloud Platform and the SAP Leonardo IoT.
  - Customers will benefit from a best-in-class solution – fully integrated into the HR backend.
Manufacturer of stainless steel containers

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<td>Discrete</td>
<td>Steel Containers</td>
<td>Transform by complementing physical products with innovative digital services</td>
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- Enable their customers to control conditions of their containers like fill level, temperature, geo location, etc.
- Customers can monitor the status of their tanks and integrate this data into their business processes.
- Customers have better control and can secure appropriate transportation conditions for their customers
Manufacturer of flow meters used in process industry

Industry | Devices
---|---
Discrete Manufacturing | Flow Meters

**Business Drivers**

- Transform by complementing physical products with innovative digital services
- Platform to make technology more accessible to customers
- Unlock the wealth of information in sensors and connect this information to business processes
- Creation of new IoT-enabled service offerings to customers
SAP Leonardo IoT Business Outcomes

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Extend the Intelligent Enterprise to the edge with SAP Edge Services
Drivers for edge computing

Physical edge locations close to the source of IoT data
How Big is Edge Computing?

40+%
of organizations’ cloud deployments will include edge computing by 2022

25%
of endpoint devices and systems will execute AI algorithms by 2022

25B
Connected Things by 2021

Sources:
2. Gartner Identifies Top 10 Strategic IoT Technologies and Trends (November 7, 2018)
SAP Leonardo IoT Edge
Brings together local compute, persistency, and business transactions at the Edge

SAP Edge Services enables powerful microservices to be deployed at the edge of computing devices to *extend the processing power* of the cloud to the edge.

**Policy Service**
- Deployment and lifecycle management of edge services

**Essential Business Functions Service**
- Provides business context (data and processes) at the edge

**Streaming Service**
- Analyze IoT data streams in real-time based on business logic

**Persistence Service**
- Locally store IoT data on IoT gateways

**Custom Edge Services**
- Deploy, execute, and update custom edge services at the edge, e.g. predictive analytical models

* SAP Cloud Platform Internet of Things for the Cloud Foundry Environment
SAP Edge Services
Essential Business Functions Service for ERP, S/4HANA and C/4HANA

Essential Business Functions Service provides business context data and transactions at the edge from ERP, S/4HANA and C/4HANA

Extend business functional areas to the edge:

SAP ERP and S/4 HANA
- Plant Maintenance (PM)
- Inventory Management (IM)
- Materials Management (MM)
- Environment, Health, and Safety Management (EHS)

C/4 HANA
- Field Service Management (FSM)

Extensibility
- Repeatable architectural foundation and methodology to extend other SAP and non-SAP functional areas to the edge

* SAP Cloud Platform Internet of Things for the Cloud Foundry Environment
SAP Edge Services C/4HANA Field Service Management (FSM) Demo

Automatically trigger field service call at Edge

<table>
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<tr>
<th>Personas</th>
<th>Business Scenario</th>
<th>Value Drivers</th>
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<tbody>
<tr>
<td>Lisa, Equipment Operator at Silicon Valley Power</td>
<td>Monitor all equipment onsite, and ensure equipment operational issues are resolved by service provider in a timely manner</td>
<td>1. Turn service call generation from a manual process triggered by customer self-reporting to an automatic process driven by SAP Edge Services</td>
</tr>
<tr>
<td>Eric, Edge Services Citizen Developer at Alpha Boiler Inc.</td>
<td>As a service provider, configure Edge Services for his customers, so that when abnormal conditions are detected, service call will be automatically generated</td>
<td>2. Enrich Service Call with relevant IoT context to help dispatching agent quickly assess the nature of the issue</td>
</tr>
<tr>
<td>Rita, Planning and Dispatching Agent at Alpha Boiler Inc.</td>
<td>Dispatch service calls to appropriate technicians using SAP FSM app.</td>
<td>3. Enable Service Technician to locally access IoT data stored at Edge to more effectively start an investigation</td>
</tr>
<tr>
<td>John, Service technician at Alpha Boiler Inc.</td>
<td>Accept a service call assigned to him and travel to customer site to provide repair, maintenance service</td>
<td></td>
</tr>
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**SAP Edge Services**
- Automatically create a service call in SAP Field Service Management
- Enables service technician to locally access equipment IoT data at Edge

**Business Scenario**
- IoT Gateway Edge
- Equipment (Boiler) at Customer Site (Edge Location)
- Temperature & Pressure exceed threshold!
Enable customers to run business processes on hyperscaler edge infrastructure

Deploy and run Essential Business Functions service on hyperscaler’s edge

Integration of SAP and hyperscaler’s cloud components
- A hyperscaler’s edge customer subscribing to SAP Edge Services can get the docker container for Essential Business Functions Service from SAP Container Registry.
- The Policy Service retrieves existing IoT edge device topology from Hyperscale’s device management cockpit.

Integration of SAP and hyperscaler’s edge components
- Hyperscaler IoT Edge provides device connectivity, and device management functionalities.
- Sensor data is analyzed in hyperscaler’s data stream analytics component
- SAP Essential Business Functions (EBF) Service runs as a docker container on Hyperscaler edge runtime.
- Once an alert for abnormal device data is raised, EBF Service can trigger the business process locally at edge (e.g. create a Service Call in SAP C/4HANA Field Service Management)

*We are currently working with Microsoft Azure and AWS Greengrass on edge interoperability*
SAP Leonardo IoT Edge Interoperability Scenario with Azure IoT Edge

**Use Case:** Alpha Boiler Inc. operates many customer sites with boilers. Some of their customers have chosen Azure IoT Edge as device connectivity and device management solution. Sensor data is analyzed by rules in MS Azure Streaming Analytics (ASA) deployed onto the Azure IoT Edge Device.

Anomaly events trigger service call creation in the Essential Business Functions service regardless of intermittent connectivity, bandwidth and latency.

The service call is enriched with IoT data from Azure IoT Edge and business context from SAP to help assign appropriate service technician and improve customer experience.
Edge Use Cases & Customer Case Studies

Overview

Example Edge Use Cases

- Manufacturing Equipment Analytics
- Continuous Statistical Process Control
- Golden Batch
- Plant Maintenance
- Extend EH&S Incident Reporting to the Edge
- Connected Inventory for Smarter Retailing
- Extend Field Service Management to the Edge
- Extend AIN to the Edge

Customers across Industries

- High Tech
- Provider of Packaging Material Machines
- Offshore Drilling Contractor
- Top Private Shipping Group
- Railway Products & Stell Forging
- Large Retailer
- Automotive Parts Manufacturer
- Defense & Security
- Akzo Nobel Sailing Team @ Volvo Ocean Race
Industry
Discrete Manufacturing

Devices
Processing and Packaging Machines

Business Drivers

Transform by complementing physical products with innovative digital services

- Improve product consumption visibility and trigger product replenishment
- Gain insights on product utilization and usage patterns
- Identify anomalies and alert technicians instantly about problematic machines
- Increase technician productivity and lower costs via remote configuration of machines
Customer: Large Retailer

Extend SAP Core (ECC) transactions to 3400+ stores at scale, without dependency on latency on connectivity

- Get sub-second response time for transactions ranging from product scans, shelf space allocation planning, to ordering and receiving
- Achieve scalability with million+ daily synchronizations between 3400+ edge locations (stores) and SAP Core (headquarters)
- Operate business transactions uninterrupted, without dependency on connectivity or latency issues.
New Learning Journey Available on SAP Edge Services
12 units recorded in 6h: Positioning, case studies & hands-on installation & configuration

Unit 1: Why Edge Computing?
Unit 2: What is SAP Edge Services?
Unit 3: SAP Edge Services in Action
Unit 4: Where is SAP Edge Services Used?
Unit 5: How to Install SAP Edge Services?
Unit 6: How does the Streaming Service Work?
Unit 7: How does the Policy Service Work?
Unit 8: How does the Persistence Service Work?
Unit 9: How does the EBF Service Work?
Unit 10: How does Interoperability with Hyperscalers Work?
Unit 11: How does the Predictive Analytics Service Work?
Unit 12: How does the Edge-Cloud-Hybrid Work?
Purchasing the required subscription for the SAP Learning Hub
Customer and partner access to the new eLearnings on SAP Edge Services

The new eLearning on SAP Edge Services is included in

- SAP Leonardo Internet of Things Learning Journey
- IoT Learning Room.

Please use this [direct link](https://training.sap.com/learninghub) to the eLearning, if you have already a subscription for the SAP Learning Hub.

The content currently is available in both,

- [SAP Learning Hub professional edition](https://training.sap.com/learninghub)
- [SAP Learning Hub, solution edition for IoT and Digital Supply Chain](https://training.sap.com/learninghub)

You can purchase these editions at [https://training.sap.com/learninghub](https://training.sap.com/learninghub)
Thank You.

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