SAP Predictive Maintenance and Service, on-premise edition
Technical Architecture
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Business Applications built on Modular Analytics

Predictive Maintenance and Service On-Premise Edition

- Asset Health Control Center (AHCC)
- Asset Health Fact Sheet (AHFS)

Insight Provider
- Geo-Spatial Insight Provider
- Key Figure Insight Provider
- 3D Visualization Insight Provider
- Asset Explorer Insight Provider
- Work Activities Insight Provider
- Derived Signal Insight Provider
- Additional Custom Insight Provider

Data Science Services
- Remaining Useful Life Prediction
- Distance-Based Failure Analysis
- Anomaly Detection with Principal Component Analysis

Insight Provider Runtime Services
- Lifecycle Management
- Data Management

Product Integration

IoT Applications
- Connected Assets
  - Devices, machines, sensors
  - Integration possible with Telit DeviceWise, SAP PCo

Operationalized Analytics and Data Science Services

IoT Base Services

Big Data Platform
- SAP HANA Enterprise Edition
- SAP IQ
- SAP ESP*
- SAP Predictive Analysis*
- SAP Lumira*
- *Optional components

Process Automation
- Closed-loop business process integration into SAP PM and SAP MRS

Customer
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The Lambda Architecture builds the basis of the PdMS On-Premise Edition to handle the massive amount of data efficiently.

The Lambda architecture has three layers from a very high level perspective – batch layer, speed layer and serving layer.

1. All data entering the system is dispatched to both the batch layer and the speed layer for processing.

2. The batch layer has two functions: (i) managing the master dataset (an immutable, append-only set of raw data), and (ii) to pre-compute the batch views.

3. The serving layer indexes the batch views so that they can be queried in low-latency, ad-hoc way.

4. The speed layer compensates for the high latency of updates to the serving layer and deals with recent data only.

5. Any incoming query can be answered by merging results from batch views and real-time views.
Building blocks of PdMS On-Premise Edition system architecture
1. Device Connectivity

Transfer data from the devices using various protocols to the central storage system
Offers the network connectivity, device management and monitoring capabilities
Supported transmission types – Batch, Burst, Stream
Integration with SAP Device Management for IoT by Telit & SAP Plant Connectivity
2. OT Data Ingestion

OT Ingestion processes are customer specific and requires flexible tools based on types of data transmission.

Ingestion pipelines consist steps for parsing, transformation, enrichment, cleansing and processing of incoming data.

**SAP HANA Smart Data Streaming** is recommended for setting up streaming based ingestion pipelines.

**SAP Data Services** is recommended for setting up batch based ingestion pipelines.

After the data is ingested, raw data are moved to low-cost archive.
Flexible architecture for integration of timeseries storage systems like OSISoft PI and SAP IQ using HANA Smart Data Integration

Aggregated TimeSeries data is replicated into PDMS on HANA using stored procedures on scheduled basis

The aggregated data is stored in HANA in the PDMS data model

Supports a wide range of data volumes

• < 2 TB of data – HANA
• > 2 TB and < few PB – SAP IQ, OSISoft PI
The IT data is replicated from a business system (SAP as well as non-SAP ERP/CRM systems) into PDMS.

The replication can be trigger based real-time replication or periodically scheduled.

**SAP Data Services** is recommended for setting up periodically scheduled replication jobs from both SAP and non-SAP business systems.

**SAP LT Replication Server** (SLT) is recommended for setting up real-time replication from both SAP and non-SAP business systems.
4. PDMS Data Model

The **Thing Model** provides a generic data model for modeling types of things and metadata of things like master data and timeseries data properties.

The **TimeSeries data** (events and continuous readings) are aggregated to coarse granular time interval to reduce memory footprint in HANA.

**Transactional data** like work activities are replicated from the business system.

The Thing Model configuration and on-boarding of Things is done using Configuration REST API.
5. Insight Providers

Insight Providers are **micro-services** that provide pieces of the analytical functionalities.

Typically three tier **XSA** application with UI layer (**UI5, JavaScript**), Service layer (**node.js, java**) and Persistence layer (**HANA using HDI**).

Insight Providers consume the data from PDMS data model using **HANA views**.

The configuration is stored in HANA.

New Insight Providers can be implemented using the **SDK**.

Insight Providers are extended through well defined extension concept supported by SDK.
Asset Health Control Center application provides the user interaction shell and is dynamically composed with Insight providers. The communication between insight providers is orchestrated through an application container. Standard and custom insight providers are integrated into the application. The backend process integration is triggered from the application. The Launchpad application provides single entry point for launching asset health control center application as well as configuration for Insight providers.
5. Data Science

Data Science functionality is provided in PDMS using HANA and R

The input data for model creation is prepared using HANA Smart Data Integration

Data Scientist uses Configuration UI to create predictive models and trigger model learning

The model scoring is scheduled and scores are stored in PDMS data model

Support for adding custom data science algorithms

The two system PDMS setup (production and engineering systems) is recommended for explorative data science
The Data Flow - how to combine raw OT data from devices and with IT data from business systems to generate insights