THE POWER OF THREE

Smart Factory Data Platform

The Data & Analytics Platform for Smart Manufacturing powered by the Snowflake Data Cloud
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Manufacturing processes bear business potentials by data utilization...

**TRADITIONAL**
- Monolithic pyramid

**TODAY/TOMORROW**
- Converging IT and OT using a hybrid edge-to-cloud architecture

**CENTRALIZED DATA**
- Unified access to manufacturing data

**VALUE OF DATA INSIGHTS**
- Enhanced GenAI-driven manufacturing processes

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...but face challenges

**Data acquisition and management**
- Manufacturing data sets are often poorly utilized and inconsistent

**Data product management**
- Interoperability between IT and OT data sets is difficult to achieve

**Access to requisite skills**
- Required services that build the foundation for data & analytics

**Time to value**
- Executives often struggle with realizing ROI on smart manufacturing initiatives
Smart Factory IT/OT data ingestion options

Snowflake and its’ ecosystem partners offer comprehensive options for IT/OT data ingestion into a single cloud data platform.

**Data Sources**
- OT: Historians, Machines, PLC, SCADA, RTU’s, PLC
- IT: ERP, Maintenance, Quality Management, Asset Management, Maintenance, Logistics

**Data Gateway**
- Factory connectivity
- Middleware components & cloud services
  - OT Data ingestion options
    - AWS IoT Greengrass
    - AWS IoT Core
    - AWS S3 Storage
    - MQTT Server + Cirrus MQTT Transmission Module
    - IGNITION + Cirrus MQTT
  - IT Data ingestion options
    - HighByte Intelligence Hub
    - Third party data ingestion solution providers e.g.: dbt, Informatica, Fivetran, matillion & SNP
    - Snowflake native data ingestion with Snowpark

**Data Core**
- Smart Factory Data Platform
  - IT/OT RAW DATA SETS
    - Event based cloud storage integration
    - Auto-create tables & views based on MQTT Sparkplug metadata
  - DATA PRODUCTS
    - Overall Equipment Effectiveness
    - Production Throughput
    - Root Cause Analysis
    - Forecasting
    - Predictive Quality
    - Energy Peak Load
    - Asset Performance
  - Harmonize data formats & build analytical data model
  - Data Engineering
  - Secure Data Storage
Smart Factory IT/OT data ingestion options

Our approach utilizes the best of breed set of technologies to foster the IT/OT convergence towards a centralized data platform.

1. Centralization of all required IT/OT data sets sourced by a variety of industry-specific systems within a single cloud data platform.

2. Integration of industry-leading data ingestion technologies tailored to your specific situation to foster IT/OT convergence.

3. High-performance cloud data platform at scale to utilize the full breadth and depth of your manufacturing process data.
Smart Factory Data Applications

Based on Snowflake’s advanced analytics capabilities we utilize GenAI/LLM services to understand production anomalies in our use case demonstration.

### Smart Factory Data Platform

**Data Core**

**Advanced Analytics**

**OT Data Ingestion**

- **RAW DATA SETS**
  - OT sensor data (Sourced by AWS S3 Bucket)
  - Snowpark data engineering

- **DATA PRODUCTS**
  - Mixer
  - Reactor
  - Bottling

**IT Data Ingestion**

- **Service report information** (Sourced by ServiceNow)
- **Cortex functions**
- **Production line master data** (Sourced by SAP MES)
- **Harmonized IT master data**

**Understanding Production Anomalies with an AI Co-Pilot**

- **Streamlit Data Application** for OT data visualization and GenAI interactions
- **PLM Data Product Sharing**
- **BI/Visual Analytics Queries**
- **Streamlit Data Applications**
- **Cortex GenAI/LLM Services**
- **Document AI Content Extraction**
- **Data Science Notebooks**

Cortex GenAI/LLM services to co-pilot the root cause analysis for production anomalies.
Solution architecture Smart Factory Data Platform

Centralized IT/OT data in Snowflake’s data cloud drive smart factory and manufacturing business outcomes enabled by advanced analytics capability

**Data Sources**

- **IT**
  - ERP
  - Maintenance
  - Quality Management
  - Asset Management
  - Maintenance
  - Logistics

- **OT**
  - Historians
  - Machines
  - PLC
  - SCADA
  - RTU’s
  - PLC

**Data Gateway**

- **Data Acquisitions**
  - Data Lake
- **Data Streaming**
  - OT Systems
- **Data Engineering**
  - Python, Java, Scala

**Data Core**

- **Data Acquisitions**
  - IT Systems
- **Data Collaboration**
  - B2B Data Sharing & Third Party Data
- **Data Engineering**
  - Third party data
- **Data Collaboration**
  - Syndicated data

**Smart Factory Data Platform**

- **RAW DATA SETS** (Representatives)
  - Snowpipe
    - Streaming & batch file ingestion
- **OT data**
- **IT data**
- **Third party data**
- **Syndicated data**

**DATA PRODUCTS** (Representatives)

- Overall Equipment Effectiveness
- Production Throughput
- Root Cause Analysis
- Forecasting
- Predictive Quality
- Energy Peak Load
- Asset Performance

**DATA GOVERNANCE**

- Secure data access with data masking
- Metadata for data classification and tagging

**Advanced Analytics**

- PLM Data Product Sharing
- BI/Visual Analytics Queries
- Streamlit Data Applications
- Cortex GenAI/LLM Services
- Document AI Content Extraction
- Data Science Notebooks

**Business Outcomes**

- Improved yield & quality
- Optimized energy & sustainability
- Reduced unplanned downtime
- Increased output
- Reduced production cost & working capital
- Streamlined root cause analysis
Solution architecture Smart Factory Data Platform

Our platform approach enables a variety of data-driven value-adds for business throughout the production lifecycle management value chain.

1. Data foundation on a unified cloud data platform to enable a variety of business-driven use cases and related outcomes

2. Turning data into insights to foster various efficiency gains throughout the production lifecycle management value chain

3. Enablement of mature DataOps processes to foster efficient collaboration with improved ways of working with data
Understanding Production Anomalies with an AI Co-Pilot

PROBLEM
Data is kept in silos across plants and manufacturing facilities which limits innovation and analytical capabilities.

CHALLENGE
Variety of IT/OT data sources with a need for different integration scenarios for the generation of data insights at scale.

SOLUTION
Data Gateway
- Cloud connectivity to enable access to production data sets

Data Core
- Unified data model for IT & OT driven data product creation and utilization

Advanced Analytics
- Standardized solutions on a single platform insights generation

USE CASE DESCRIPTION
For the digitalization of industrial processes, the access to data from various departments contributing to the entire product lifecycle is crucial to realize the digital thread and to raise potentials for cost reduction and operational efficiency. An integrated data platform supporting the convergence of IT/OT data builds the foundation for further insights generation. Our use case provides an overview for monitoring manufacturing machines and enables the automated detection of production anomalies. Generative AI capabilities act as a copilot for a guided research of historic incident data to resolve the issue in operations.

TECHNOLOGY HIGHLIGHTS

AWS cloud hyperscaler specific capabilities
- AWS IoT Core to enable factory connectivity
- AWS S3 for raw data set storage
(Portable approach based on Azure or GCP possible)

Snowflake data platform capabilities
- Snowflake Snowpipe Streaming to gain near real-time data availability within a unified IT/OT data model
- Snowflake Data Cloud as single data platform for all manufacturing data products
- Snowflake Streamlit for easy to use and scalable standard data applications
- Snowflake Cortex to enable GenAI driven forecasting, anomaly detection & LLM service integration

IMPACT
(Near) real-time data availability of integrated IT/OT data
Scalable platform for a variety of data & analytics use cases
Standardized visualizations for fast data insights
AI assisted data analysis including GenAI enablement
Start generating sustained value today

Smart Manufacturing transformations are about more than adding new technology. Organizations must integrate solutions into their daily operations while driving user adoption, ensuring change management, and gaining workforce buy-in.

Deloitte’s value-add supporting your journey

- Manufacturing professionals and industry experts
- Proven methodology and innovative thinking
- People-first, user-centric mindset
- Scalable AI+Data solutions that fit with your existing technology, powered by our **Smart Factory Data Platform**

Our **Smart Factory Data Platform** offering provides:

- Analytics foundation to realize production operations efficiency and cost saving potentials based on any major cloud hyperscaler AWS, Azure or GCP
- Real-time and historical data-driven actionable insights to produce measurable results
- Extendable hyperscale agnostic platform for user-focused data visualizations & applications
- IT/OT data integration solutions to drive advanced analytics creating intelligent insights
- Integration with industry-leading technologies and subject matter expertise

Our **Smart Factory Data Platform** accelerates the deployment of smart manufacturing solutions, leveraging your existing technology landscape and growing with you as your organization transforms

We offer a growing library of ready-to-deploy use cases

- OEE
- Production Monitoring
- Loss Reasons
- Equipment Fault Code
- Line Balance Monitoring
Please approach your Deloitte contacts for more insights

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