IoT Data Platform

A highly scalable platform to ingest, store and process events that can be generated from Connect IoT or other systems.

Overview

Manufacturing processes generate a wealth of data. As more and more processes are automated, equipment becomes more sophisticated and sensors become widely used, the volume of data generated in a typical factory will grow significantly. Also, even though there is data that is valuable today, there is data for which there is no known usage currently, but that may be very useful in the future. A key requirement in any manufacturing environment is the capability to store massive amounts of data a long period of time. A second key requirement is to be able to process and analyze the data, either online (stream processing) or offline (batch processing). These types of analysis can be applied to gain actionable results quickly, for example, to automatically trigger a maintenance request.

The IoT Data Platform application is a highly scalable platform based on Apache Kafka™ and Apache Spark™ to ingest, store and process events. The system is based on a meta data registry, that specifies the different system events, as well as their routes to different event consumers. The system provides a consumer out of the box to write event data into CSV/ JSON and SQL Server. The flexible and extensible architecture allows new consumers to be seamlessly added to the platform.

Data consumers can work in real-time (stream processing) or in batch mode to:

1. Send an event to the ingestion layer
2. Transform data and send it to a data sink
3. Trigger an action to an output application (for example, to disable a recipe)

Data for processing in the IoT Data Platform can be provided by the Connect IoT module or from any other application, using the ingestion layer APIs. Data from the IoT Data Platform, in combination with the contextual data available from MES, can be used to create all sorts of models, analysis and algorithms for real-time process control, yield improvement and root-cause analysis. Any data captured by the IoT Data Platform, including streaming data, can be visualized in a general application Dashboard or in an Asset specific Dashboard.

Each Data Platform installation comes with its own Canonical Data Model (CDM). For multi-site companies, the Enterprise Data Platform (DP) provides a scalable and unified foundation for managing, integrating, and analyzing MES data across sites.

Key Features

- Register events with a strongly typed event schema
- Ingest and store a massive number of events and files
- Replay an event sequence from any point in time
- Configure multiple consumers for the same event, providing real time-stream processing analytics as well as batch capabilities
- Out of the box event writer for CSV/JSON files and to SQL Server
- Out of the box native integration with Connect IoT
- Visualize streaming data in real-time using a dashboard widget
- Data manager component that supports the creation and management of Data Sets
- Capability to store and visualize telemetry data
- Capability to create and deploy Machine Learning models
- Capability to trigger actions based on events
- CDM, a collection of manufacturing domain Data Sets that can be shared across multiple applications
- Capability to push data into Unified Namespace (UNS)
- Enterprise Data Platform to consolidate data from multiple sites and perform multi-site reporting
- A generative AI Analytics Assistant that allows users to query the Data Warehouse using natural language processing (NLP)

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Benefits

- Increased operational efficiency
- Faster speed of learning
- Reduction of problem resolution time
- Improved traceability

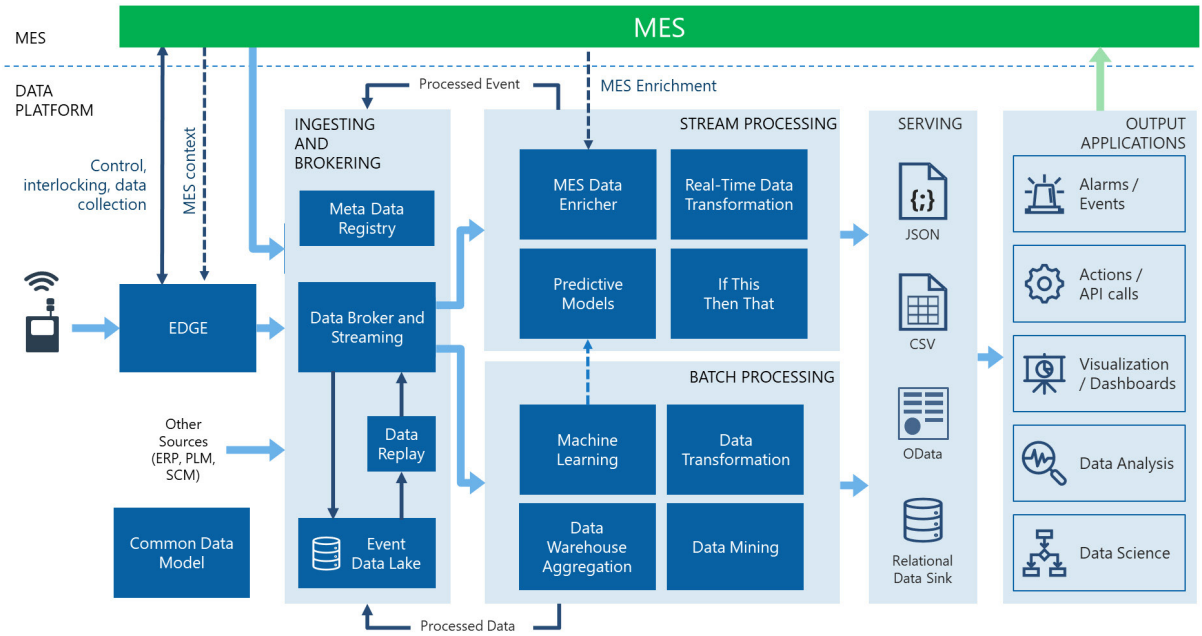


Figure 1 IoT Data Platform architecture

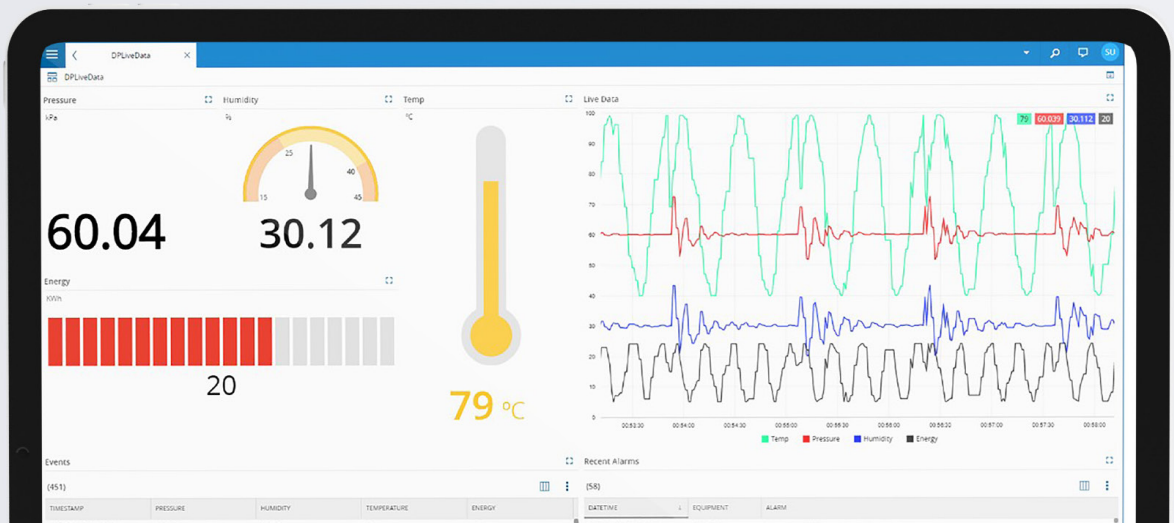


Figure 2 IoT Data Platform streaming data using a dashboard

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