Industrial Automation
Architecture Hub

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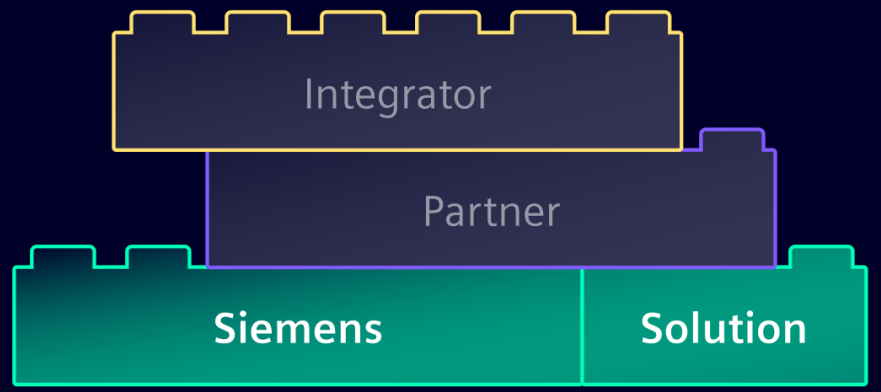
Discover how Siemens products and solutions can be used like building blocks to interoperate with technology partners and system integrators, working side-by-side with the tools you already use.

Together they solve real manufacturing problems across edge, SCADA, cloud and enterprise software, making it easier to integrate OT with IT, speed up deployment, and scale securely.



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Explore Open Architectures

Industrial Data to the AWS Cloud – OT to IT Integration with Industrial Edge and AWS

SCADA Openness

Industrial Artificial Intelligence Orchestration Layer

Snowflake OT Data Integration

AI/LLM integration to the shop floor

Unified Namespace with HighByte – Connecting the shop floor to the Unified Namespace of HighByte

Mendix Workstation

Unified Namespace with HiveMQ – Connecting the shop floor to the Unified Namespace HiveMQ

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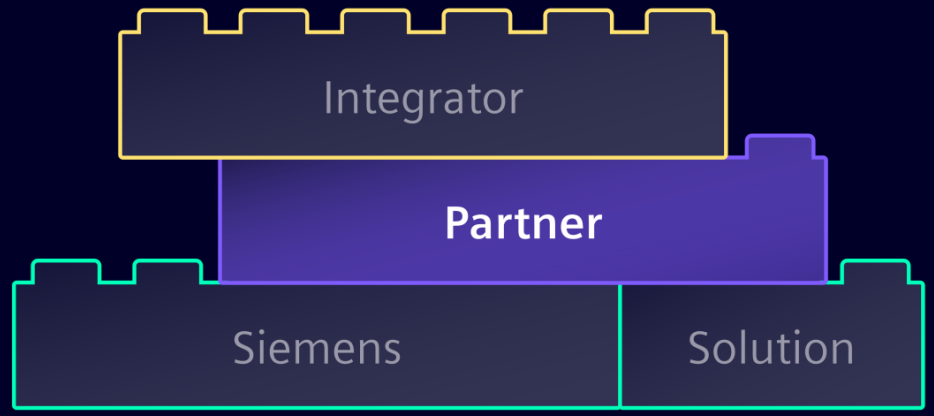
OT to IT Integration with Industrial Edge and AWS

Industrial Data to the AWS Cloud

A vendor-agnostic, edge-first architecture that captures shop floor data via Industrial Edge, models and preprocesses it with AWS IoT SiteWise Edge, and securely forwards harmonized time-series and asset-model data to AWS for digital twin, analytics, and machine learning workflows.



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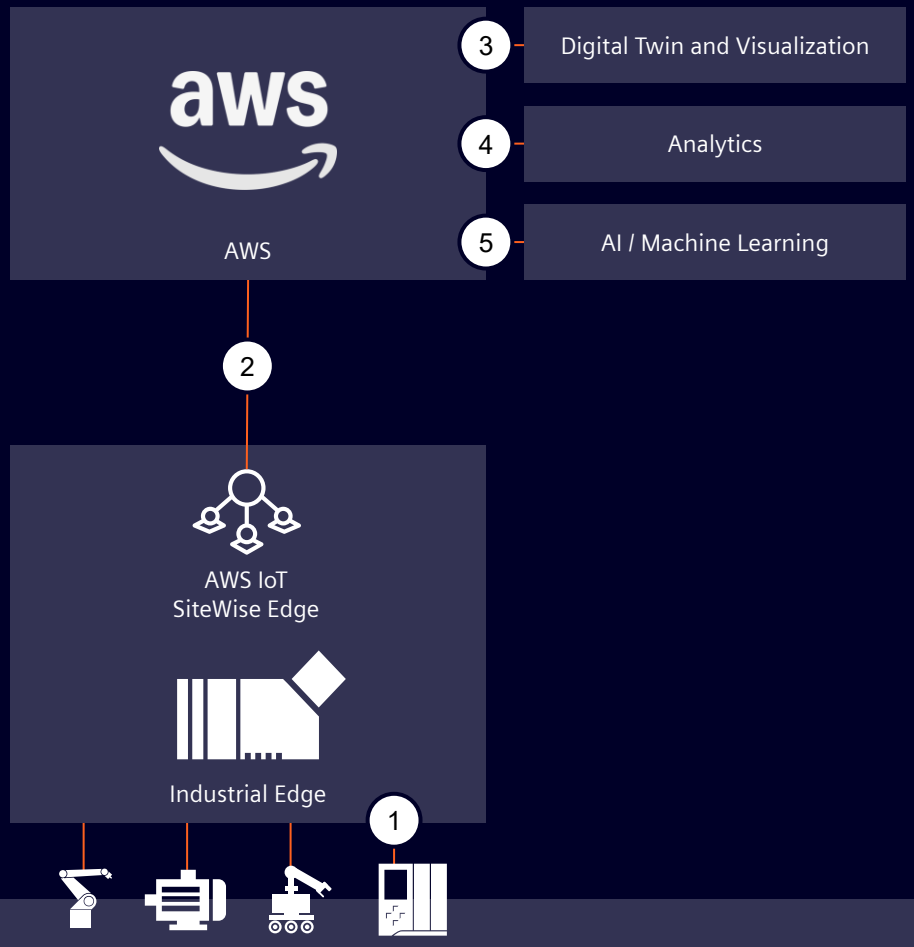
Siemens Industrial Edge to AWS

Level 1
Overview

Level 2
Detailed



1. Connect vendor agnostic shopfloor equipment to Industrial Edge via pre-configured connectors
2. AWS IoT SiteWise Edge on Industrial Edge devices collects and aggregates data and sends it to AWS IoT SiteWise.
3. Create visualizations and get insights into collected industrial data using e.g. Amazon Managed Grafana.
4. Query and analyze IoT data using Amazon QuickSight or Mendix apps.
5. Train AI models using Amazon SageMaker and deploy those models back to Industrial Edge.

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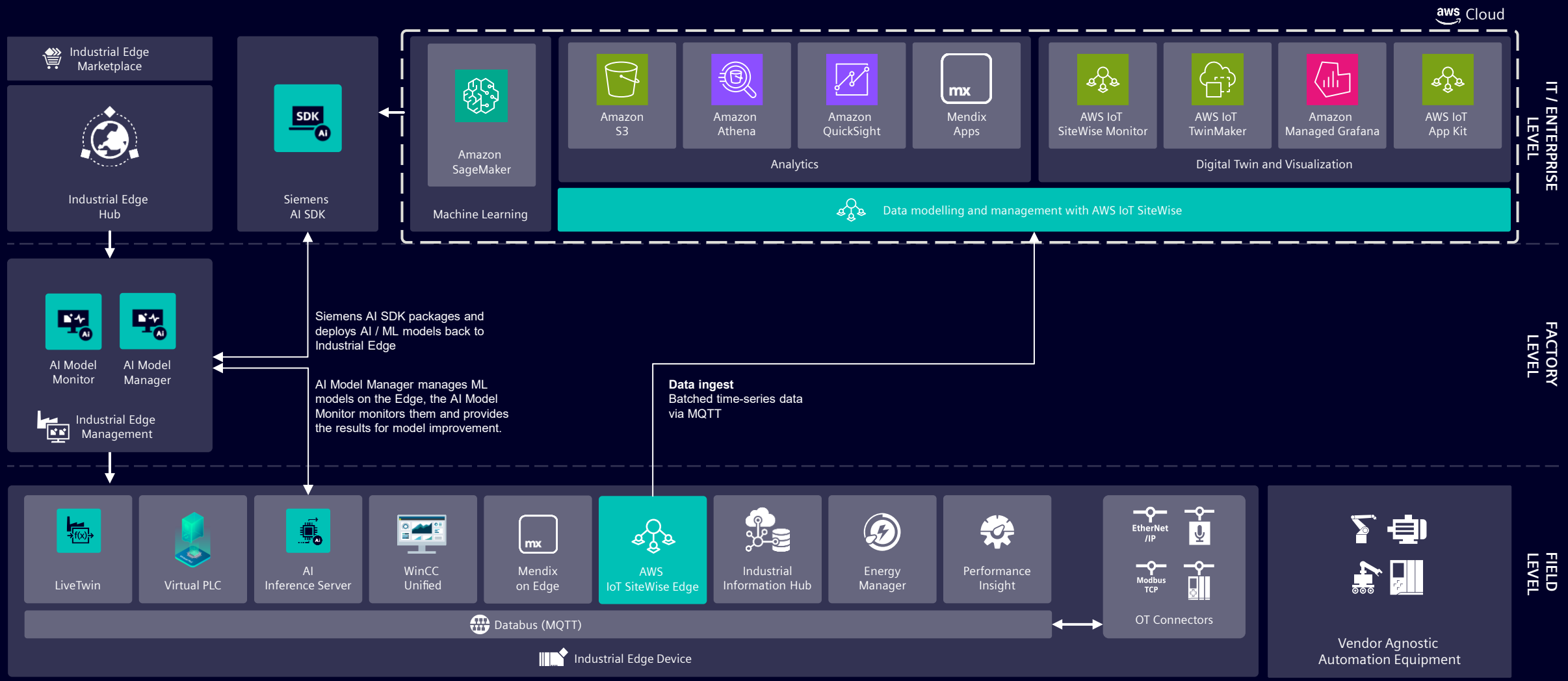
Overview

This solution combines Industrial Edge with AWS IoT SiteWise Edge and a set of AWS cloud services to deliver a scalable, secure, and vendor-independent path from field devices to enterprise decision making.

On-premise edge components collect, normalize and pre-process OT data; SiteWise Edge builds asset models and local operations views; the cloud hosts digital twins, visualization, analytics, and ML to drive continuous improvement and predictive capabilities.

Siemens Industrial Edge to AWS

Level 1 Overview
Level 2 Detailed



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Values and Benefits

Edge-first resilience

Local modelling and preprocessing keep operations running even with intermittent cloud connectivity and reduce bandwidth needs.

Consistent digital twin across edge and cloud

AWS IoT SiteWise Edge establishes the same asset models on-premises and in AWS, improving consistency of KPIs and analytics.

Faster insights & ML-ready data

Pre-processed, labelled time-series data in S3 + SiteWise enables rapid analytics and scalable ML workflows (SageMaker), accelerating predictive maintenance and OEE improvements.

Secure operations & governance

End-to-end encryption, IAM-based controls and centralized deployment reduce security risk and operational overhead.

Scalable cloud-native capabilities

Cloud services provide near-unlimited compute/storage for analytics, historical retention, enterprise reporting and multi-site rollouts.

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Components

Industrial Edge

- Host for vendor-agnostic OT connectors (OPC UA, Modbus, EtherNet/IP, etc.), local HMIs (WinCC Unified, LiveTwin) and apps.
- Provides centralized orchestration, app lifecycle management and device observability (Industrial Edge Management / Hub / Marketplace).
- Runs AI inference server and model monitor for local predictions and anomaly detection.

AWS IoT SiteWise Edge

- Industrial Edge app that ingests directly from machines/controllers and builds local asset models.
- Performs local preprocessing, KPI calculations and aggregation to reduce cloud bandwidth.
- Built-in buffering/cache holds time-series during connectivity outages and syncs when online.
- Enables local monitoring and alarm handling while keeping asset models consistent with the cloud.

AWS IoT SiteWise (Cloud)

- Cloud-hosted industrial data platform for asset modelling, long-term storage and fleet management.
- Receives harmonized data from Industrial Edge for cross-site analytics and reporting.
- Integrates with visualization and analytics tools (SiteWise Monitor, Managed Grafana, QuickSight) and ML (SageMaker).
- Enterprise security and governance via IAM, encryption, KMS and centralized observability.

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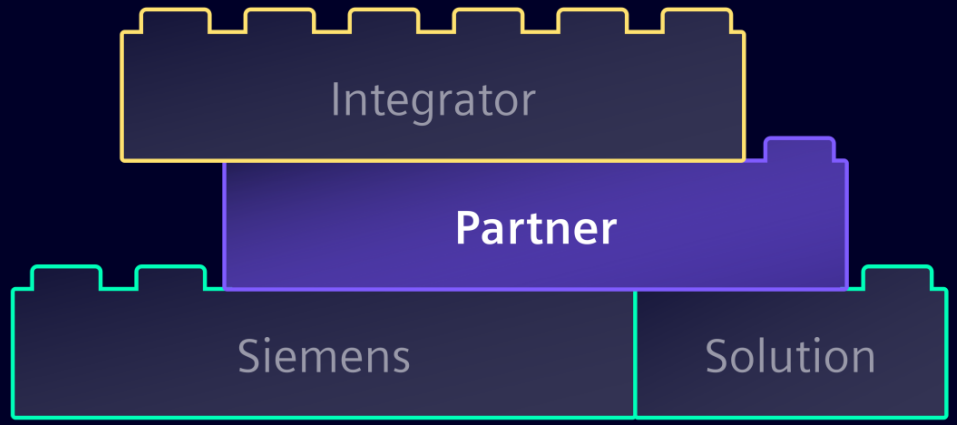
SCADA Openness

Seamlessly integrate heterogeneous data sources and systems from the shop floor and smaller-scale SCADA systems into a highly scalable and reliable architecture, one that supports overarching SCADA and enterprise-level applications.



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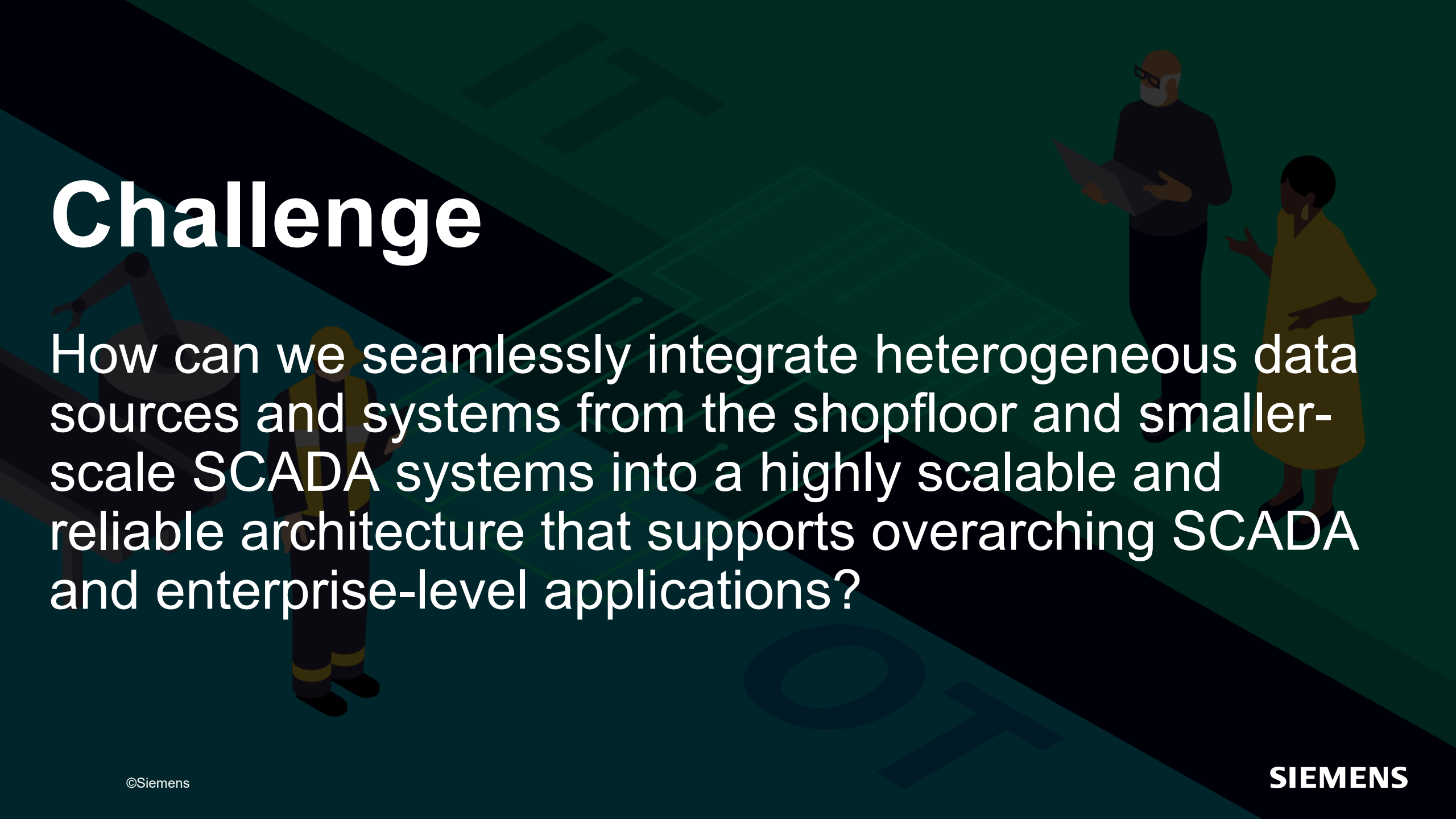
Challenge

How can we seamlessly integrate heterogeneous data sources and systems from the shopfloor and smaller-scale SCADA systems into a highly scalable and reliable architecture that supports overarching SCADA and enterprise-level applications?



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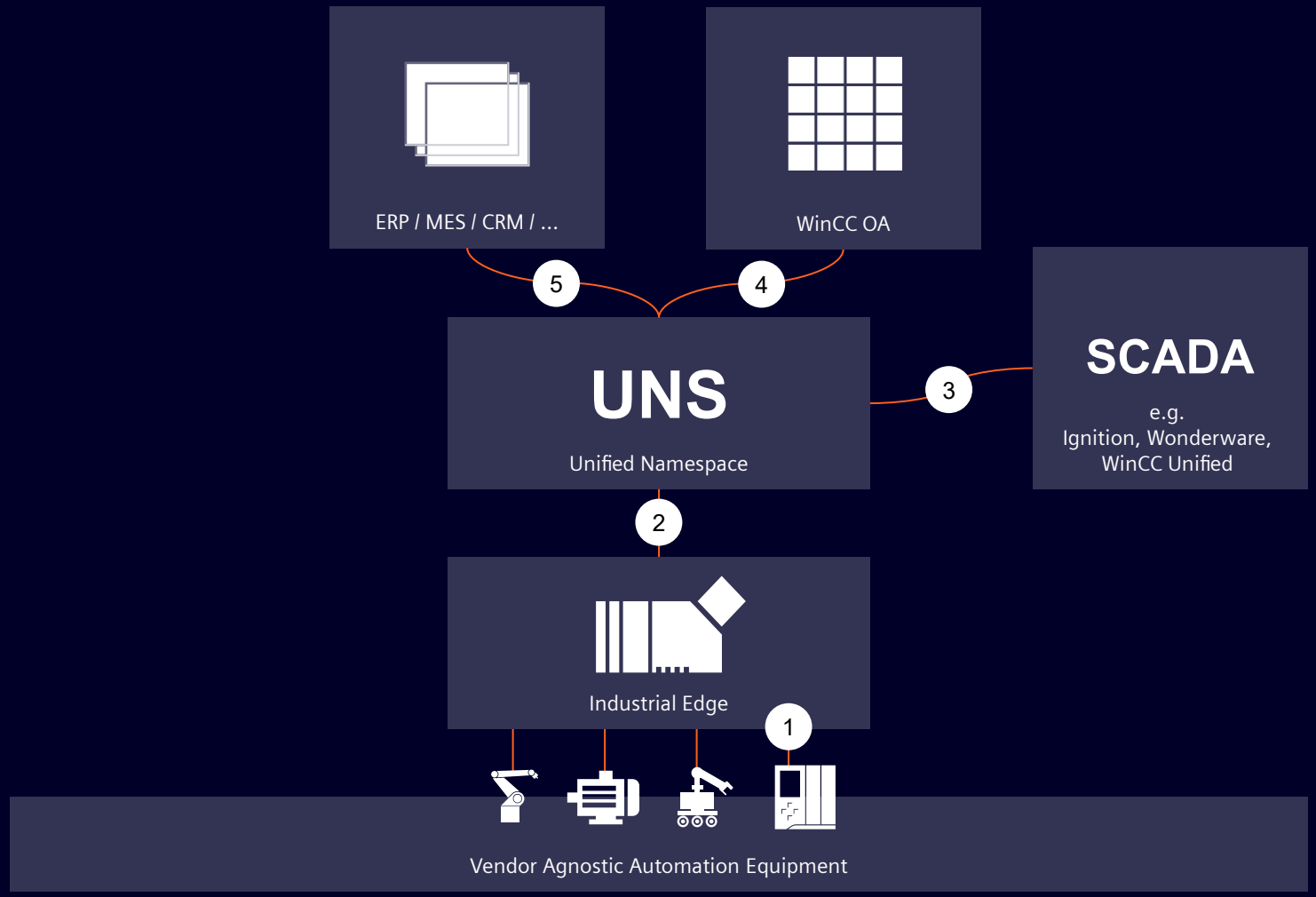
SCADA Openness
Industrial Edge, Unified Namespace, WinCC OA, SCADA



Level 1
Overview

Level 2
Detailed

1. Connect shopfloor equipment to Industrial Edge via pre-configured connectors
2. Use UNS to standardize and centralize data flow across the entire operation using an industrial grade MQTT broker
3. Integrate e.g. Ignition, WinCC Unified or Wonderware as visualization and control layer with seamless access to real-time data
4. Deploy WinCC OA as the overarching SCADA system with built-in scalability and redundancy
5. Connect enterprise systems (ERP, MES, CRM, etc.) to the UNS

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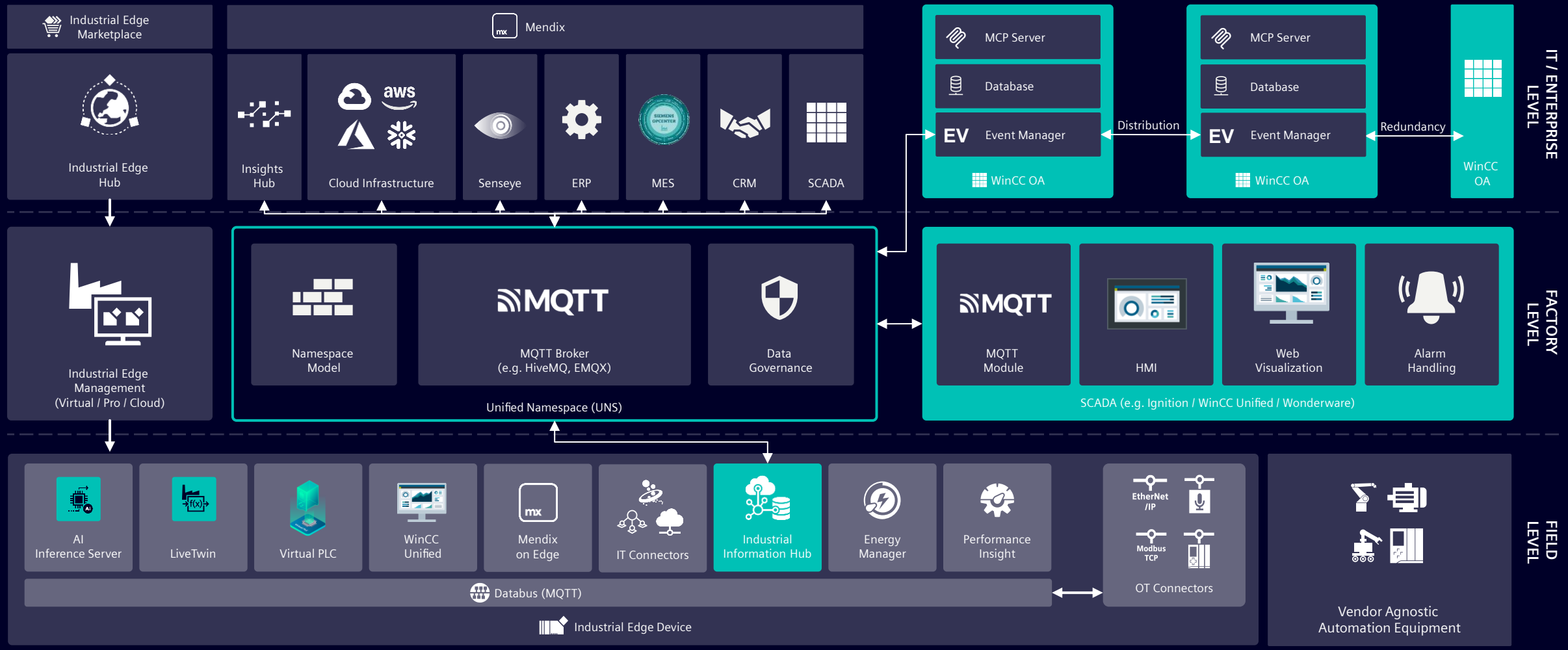
SCADA Openness
Industrial Edge, Unified Namespace, WinCC OA, SCADA

Level 1 Overview
Level 2 Detailed



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Values and Benefits

Seamless OT-IT integration

Simplifies connectivity between shop floor systems and enterprise applications

Highly scalable architecture

Supports future expansion without redesign

Data consistency & governance

UNS enforces naming conventions and standardized data models

Operational reliability

Redundant SCADA and MQTT infrastructure ensures continuous availability

Vendor-agnostic flexibility

Works across diverse automation equipment and protocols

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Components

Industrial Edge

- Centralized orchestration for edge Edge apps and connectors
- Secure data acquisition from heterogeneous devices
- Integration with MQTT UNS for standardized data flow

SCADA (Factory Level)

e.g. Ignition, WinCC Unified, Wonderware

- Flexible HMI and visualization tools for web and mobile
- Alarm management and dashboards for local and remote access
- Native MQTT support for seamless UNS integration
- Rapid customization and scripting for agile development

WinCC OA

- Enterprise-grade SCADA with advanced visualization and event management
- Built-in redundancy for high availability
- Scalable architecture for large, distributed systems

Unified Namespace (UNS)

- Harmonized data structure across OT and IT layers
- MQTT broker ensures real-time, vendor-agnostic communication
- Supports governance and naming conventions

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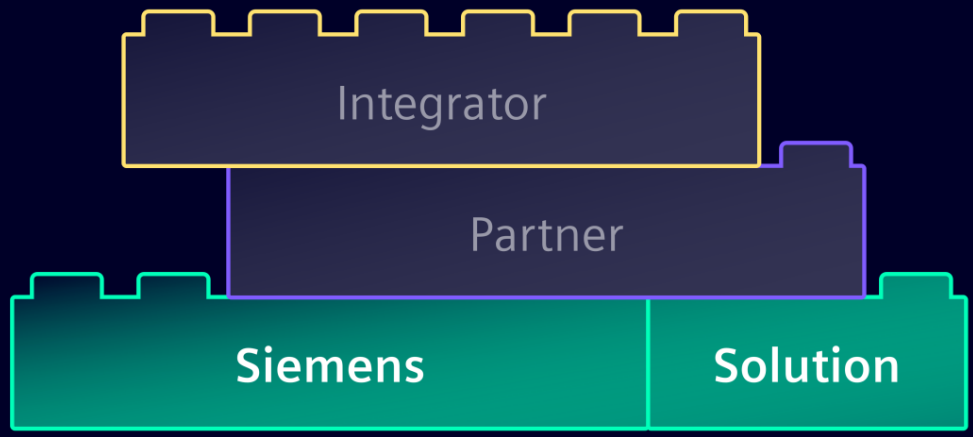
Industrial Artificial Intelligence Orchestration Layer (IAIOL)

Make AI safe, deterministic, and auditable. Coordinate AI models, humans, and automation systems using hierarchical state machines, blue and green rollouts, and full traceability



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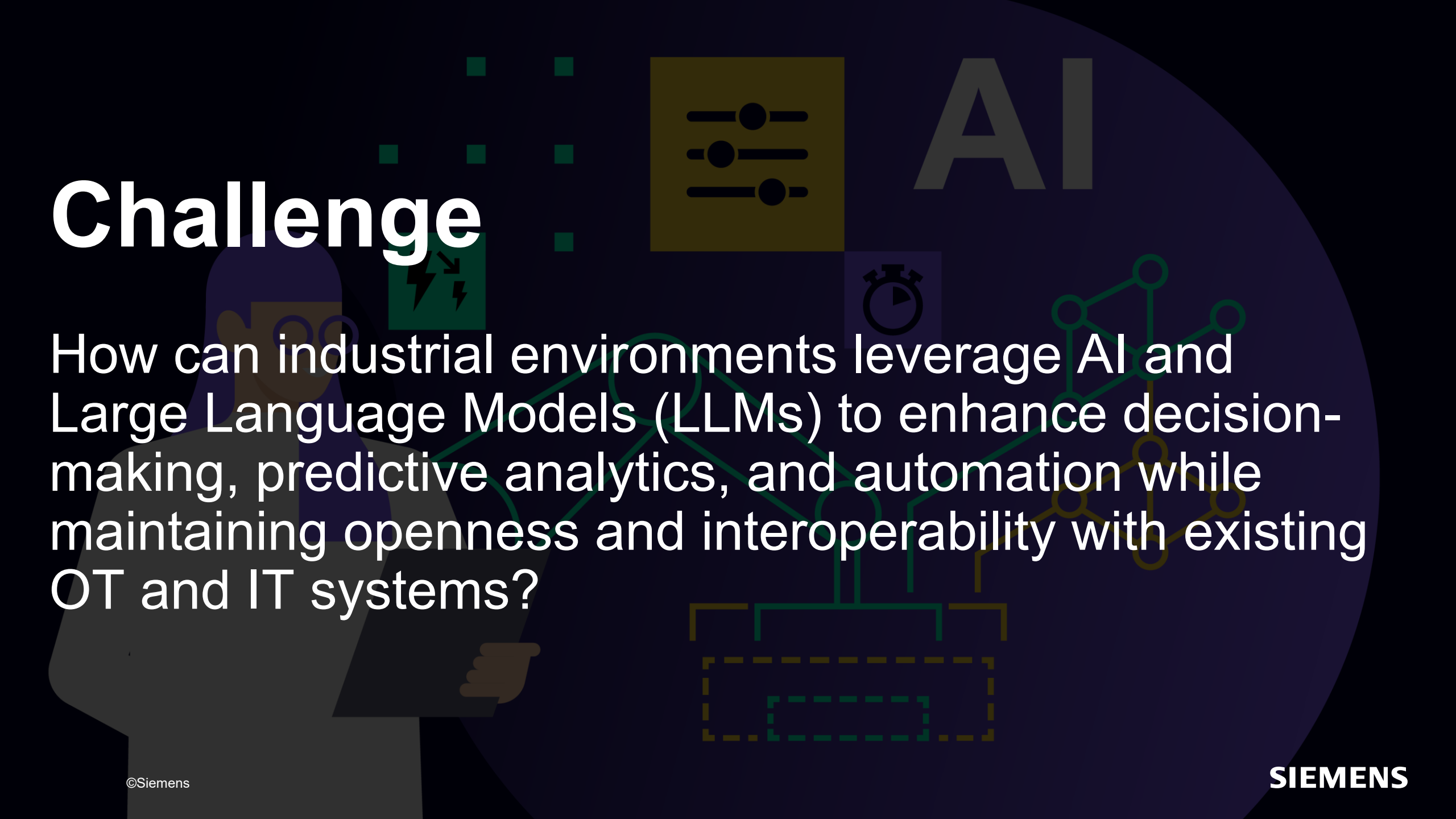

Challenge

How can industrial environments leverage AI and Large Language Models (LLMs) to enhance decision-making, predictive analytics, and automation while maintaining openness and interoperability with existing OT and IT systems?

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Overview

The Industrial AI Orchestration Layer is the safeguard between artificial intelligence and real-world machinery. It ensures that AI-driven insights can enhance operations always without compromising safety, reliability, or operator authority. Acting as a policy, safety, and control gateway, the orchestration layer validates every AI suggestion against machine state, interlocks, permissions, and plant rules before anything reaches a PLC.

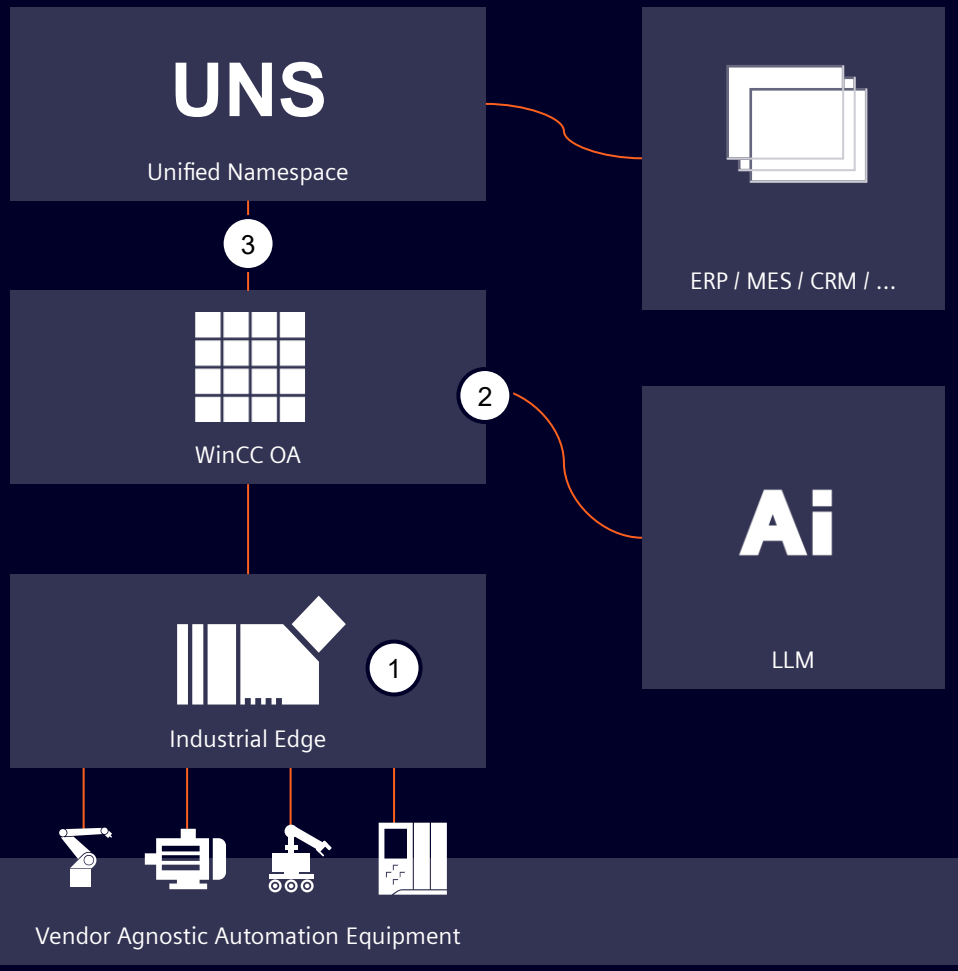
It prevents unsafe commands, resolves conflicts between multiple AI systems, provides full transparency to operators, and ensures all model updates are tested through virtual commissioning before deployment.

This layer enables manufacturers to adopt AI confidently—unlocking higher efficiency and smarter automation while maintaining the strict standards of industrial control environments.

IAIOL
Industrial Artificial Intelligence Orchestration Layer

Level 1
Overview

Level 2
Detailed



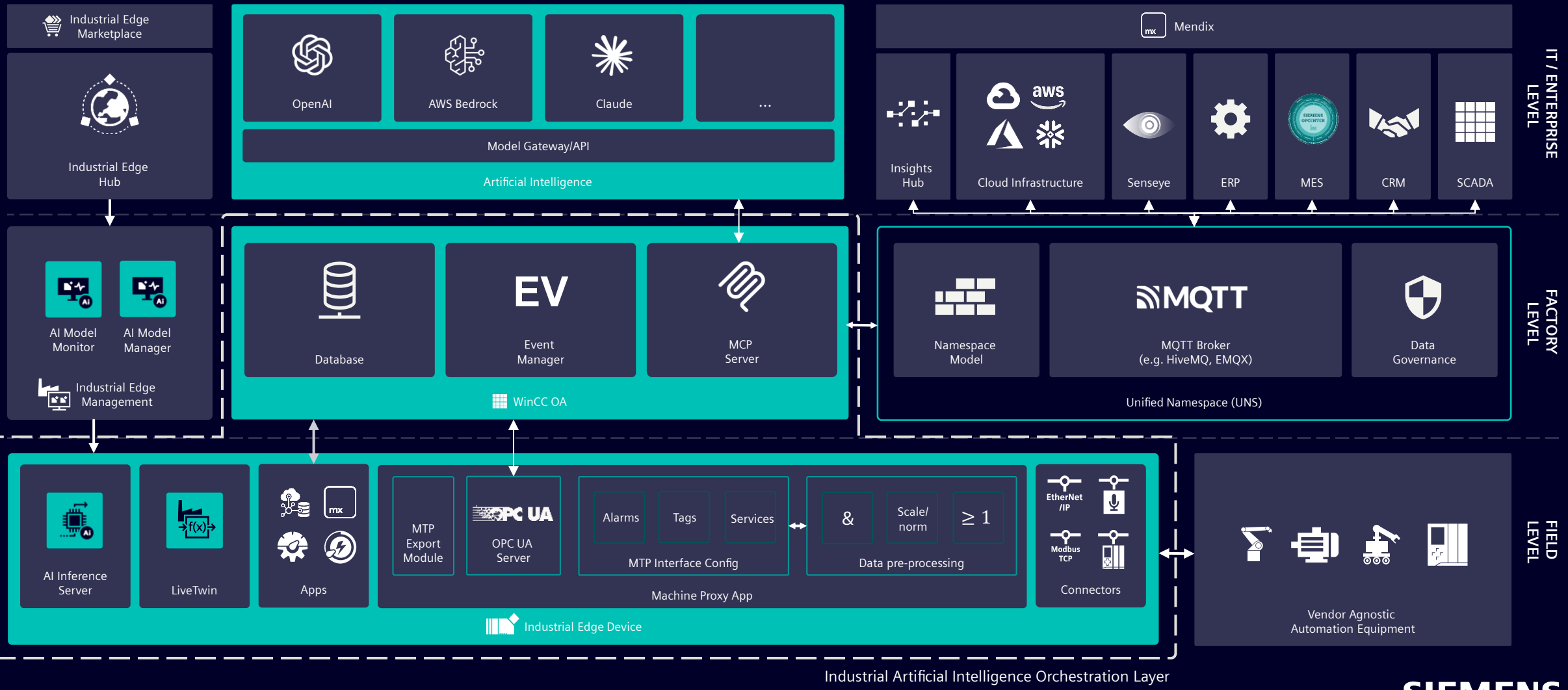
1. Run AI models on the Industrial Edge device next to the PLC for low, predictable latency. Decisions remain locally during wide-area network or datacenter outages, and data resynchronizes when the link returns.

2. The Machine Proxy on Industrial Edge maps existing equipment and protocols to a consistent MTP structure of tags, states and events. WinCC OA and AI services consume this same model, so onboarding a new asset becomes a mapping task rather than a bespoke integration.

3. Industrial Edge harmonizes timestamps, units of measure and data quality, and enriches signals with machine mode and state before they leave the cell. It filters, aggregates and compresses locally, then publishes clean, contextualized data to WinCC OA and to the plant-wide Unified Namespace (UNS).

IAIOL
Industrial Artificial Intelligence Orchestration Layer

Level 1 Overview
Level 2 Detailed



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Values and Benefits

AI-driven insights

Unlock advanced analytics and predictive decision-making through LLM integration.

Openness & flexibility

Supports multiple LLM providers and enterprise applications without vendor lock-in.

Secure & scalable

Industrial Edge ensures secure connectivity and scalable architecture for future AI adoption.

Enhanced human-machine interaction

Natural language interfaces simplify complex operations and troubleshooting.

End-to-end integration

From shop floor to cloud AI services, ensuring data consistency and governance.

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Components

Industrial Edge

- Run applications and AI close to machines with low latency
- Manage and update edge devices securely at scale
- Bridge shop floor equipment with higher-level IT and cloud systems

Industrial AI

- Turn raw production data into actionable AI insights
- Deploy and manage AI models across lines and sites
- Keep model outputs coordinated, explainable, and traceable

Machine Proxy App

- Standardize machine signals into a common data format
- Securely expose equipment data to higher-level systems
- Pre-process data close to machines for faster AI decisions

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Components

UNS

Unified Namespace (UNS)

- Create one shared data language for all systems.
- Provide context and history for AI and analytics.
- Control who publishes and consumes industrial data

WinCC OA

- Monitor plant state that AI decisions must follow
- Use alarms and events as safety guardrails
- Give operators clear visibility into AI-assisted actions

Insights Hub

- Store and analyze data from multiple plants over time
- Track AI performance and key process KPIs
- Feed insights back into models and orchestration rule

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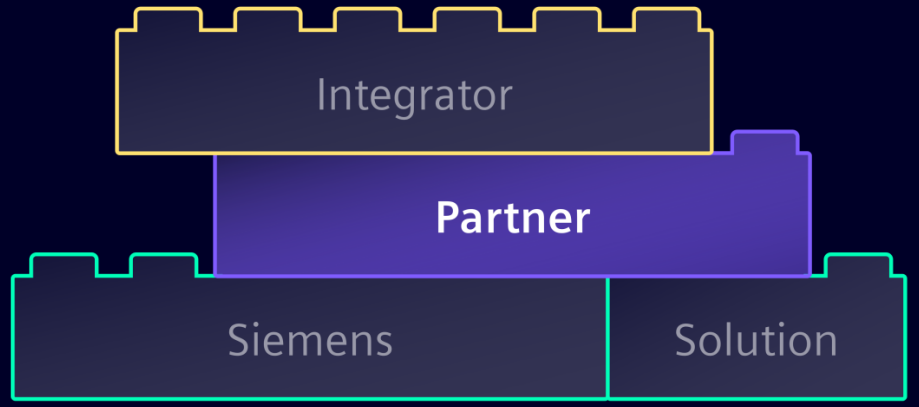
Contextualized OT Data Pipeline into Snowflake

How can we reliably collect vendor-agnostic OT data from the shopfloor, enrich it with asset and production context at the edge, and deliver a governed, queryable copy into Snowflake for analytics, ML and enterprise consumption?



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Challenge

How can factories reliably acquire, preprocess, and contextualize machine and sensor data at the edge and make it available in a globally scalable AI-ready data cloud?

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Overview

A hybrid edge-to-cloud architecture where Industrial Edge captures, normalizes and contextualizes OT telemetry and events, then delivers them to Snowflake using both file-based and streaming ingestion patterns.

Snowflake serves as the enterprise data cloud for landing, curated and analytical layers, enabling near-real-time analytics, model scoring, operational apps and integrations with MES/ERP/SCADA systems. The design prioritizes data consistency, security, resilience and vendor-agnostic interoperability.

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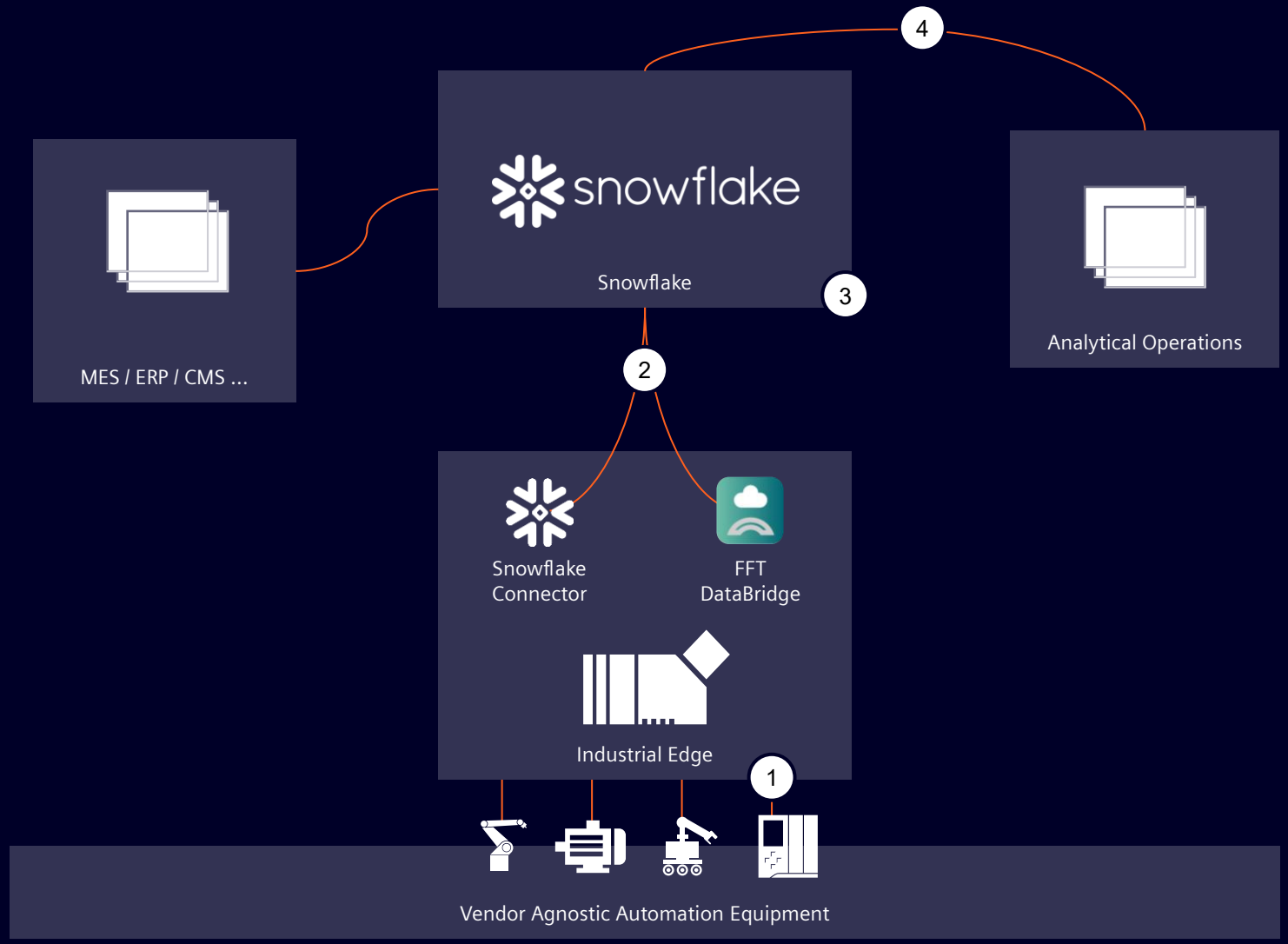
Siemens Industrial Edge to Snowflake



Level 1 Overview

Level 2 Detailed

1. Connect vendor agnostic shopfloor equipment to Industrial Edge via pre-configured connectors
2. Create a secure and reliable connection between Siemens Industrial Edge Devices and Snowflake databases using the Snowflake Connector or the FFT DataBridge.
3. Store and manage harmonized industrial data in Snowflake for scalable analytics.
4. Perform analytical operations on harmonized data layer, like OEE, Monitoring, Predictive Maintenance, Conversational Assistants and more.

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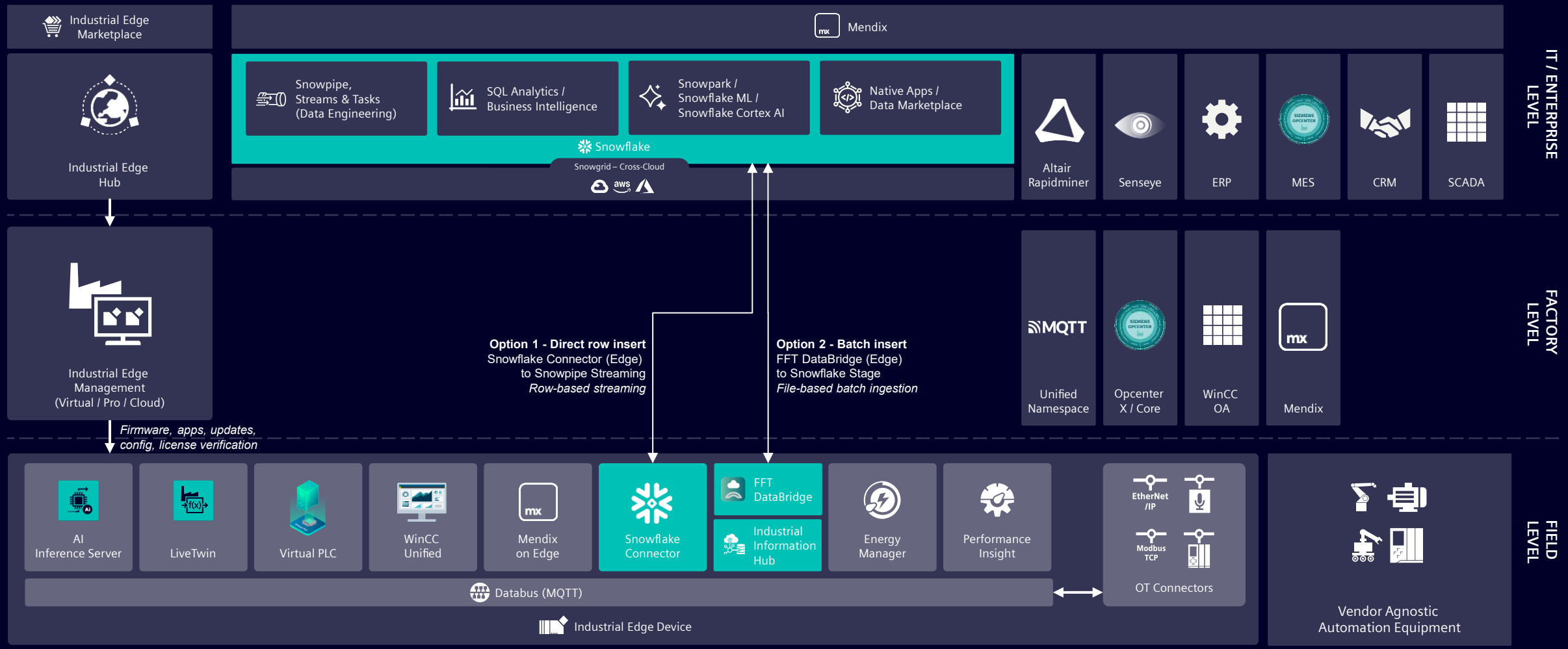
Siemens Industrial Edge to Snowflake

Level 1 Overview
Level 2 Detailed



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Description

Edge collection and contextualization (Industrial Edge)

- Industrial Edge runs on-prem devices close to the shopfloor and connects to vendor-agnostic automation equipment via OT connectors (OPC UA, Modbus, EtherNet/IP, etc.). It acquires raw telemetry, alarms and events.

- At the edge, data is pre-processed: filtering, compression, timestamp normalization, enrichment with asset metadata (asset hierarchies, work order / batch context), and local aggregation to reduce cloud bandwidth.

- An internal databus (MQTT / Unified Namespace) or Industrial Information Hub propagates harmonized topic streams for downstream components and local consumers.

Edge collection and contextualization (Industrial Edge)

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Description

Protocol and format bridging

- FFT DataBridge (Edge App) transforms and prepares data for file-based ingestion. It buffers to handle connection loss, batches data intelligently, authenticates securely with Snowflake key-pair auth and writes to cloud stages for Snowpipe processing.

- Snowflake Connector (Edge App) subscribes to the databus for continuous streams, performs schema validation and health checks, buffers short outages in memory, and uses Snowpipe Streaming to insert rows directly into Snowflake with low latency..

Edge collection and contextualization (Industrial Edge)

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Description

Snowflake data platform

- JSON-based ingestion via Stage + Pipe (FFT DataBridge): raw payloads land in a staging area; Snowpipe / Tasks create curated tables and historical archives.
- Direct row-based ingestion (Snowpipe Streaming via Snowflake Connector): continuous, low-latency availability of operational rows for dashboards and monitoring.
- Transformation pipelines (SQL, Snowpark, Streams & Tasks) produce curated, time-aligned and context-enriched datasets for BI and ML.
- Snowflake provides governance (access control, masking, lineage), scaling and cross-cloud capabilities for enterprise consumption.
- Snowflake runs natively and consistently across the major cloud providers (AWS, Microsoft Azure and Google Cloud Platform), offering true cross-cloud deployment, replication and data mobility.

Edge collection and contextualization (Industrial Edge)

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Values and Benefits

Single, governed source of truth

Snowflake stores raw and curated OT data, enabling consistent analytics and reporting.

Reduced cloud cost and bandwidth

Edge-side aggregation and filtering lower data volume while preserving fidelity where needed.

Faster ML and analytics

Snowpark and Streams & Tasks accelerate feature engineering, model training and deployment.

Operational resilience

Edge buffering (ring memory, file buffers) and retry logic maintain continuity during network outages.

Security and governance

End-to-end encryption, key-pair authentication, role-based access and Snowflake controls protect sensitive operational data.

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Components

Industrial Edge

- Hosts OT connectors, apps (FFT DataBridge, Snowflake Connector), local databus and buffer storage.
- Responsibilities: secure acquisition, enrichment (asset/production context), filtering, aggregation, buffering and orchestration.
- Managed centrally via Industrial Edge Management for deployment, lifecycle and monitoring.

FFT DataBridge (Edge App)

- Buffers data using ring memory and file persistence to survive extended outages.
- Handles retries, connection loss, batching and schema packaging for file-based ingestion.
- Authenticates securely using Snowflake key-pair authentication.
- Uses JSON-based ingestion via Snowflake Stage + Pipe to land files in Snowflake for downstream processing.

Snowflake Connector (Edge App)

- Subscribes to the Industrial Edge databus for continuous data streams.
- Buffers data in memory for short outages and implements retries.
- Performs schema validation and health checks via JDBC.
- Streams data rows directly into Snowflake using Snowpipe Streaming for low-latency row-based ingestion.

Snowflake Data Cloud

- Landing/Raw zone: preserves original JSON payloads and metadata for auditability.
- Curated/Analytical zone: structured, time-aligned and context-enriched tables used for reporting, ML and operational apps.
- Ingestion patterns:
- *JSON-based ingestion via Stage + Pipe (FFT DataBridge) for file/batch/micro-batch workflows.*
- *Direct row-based ingestion with Snowpipe Streaming (Snowflake Connector) for continuous, low-latency access.*
- Services used: Snowpipe, Snowpipe Streaming, Streams & Tasks, Snowpark, SQL Analytics and Data Governance features.

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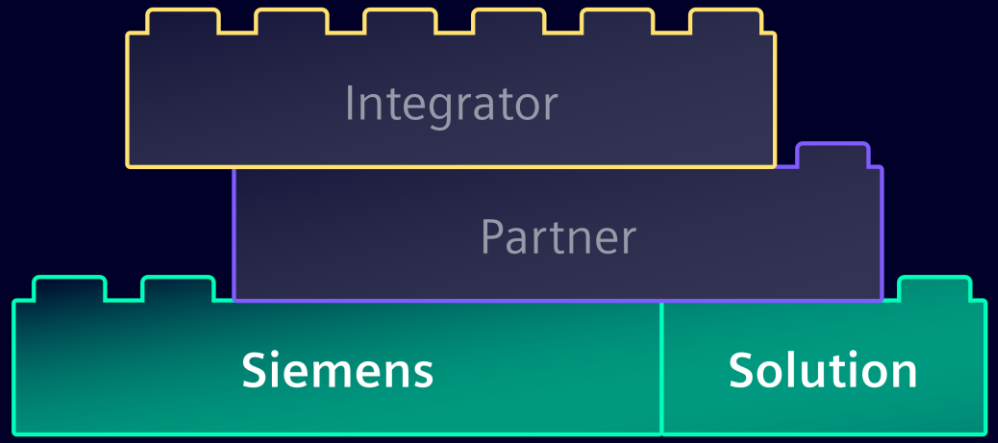
AI/LLM integration to the shop floor

Successful industrial environments leverage AI and Large Language Models (LLMs) to enhance decision-making, predictive analytics, and automation while maintaining openness and interoperability with existing OT and IT systems.



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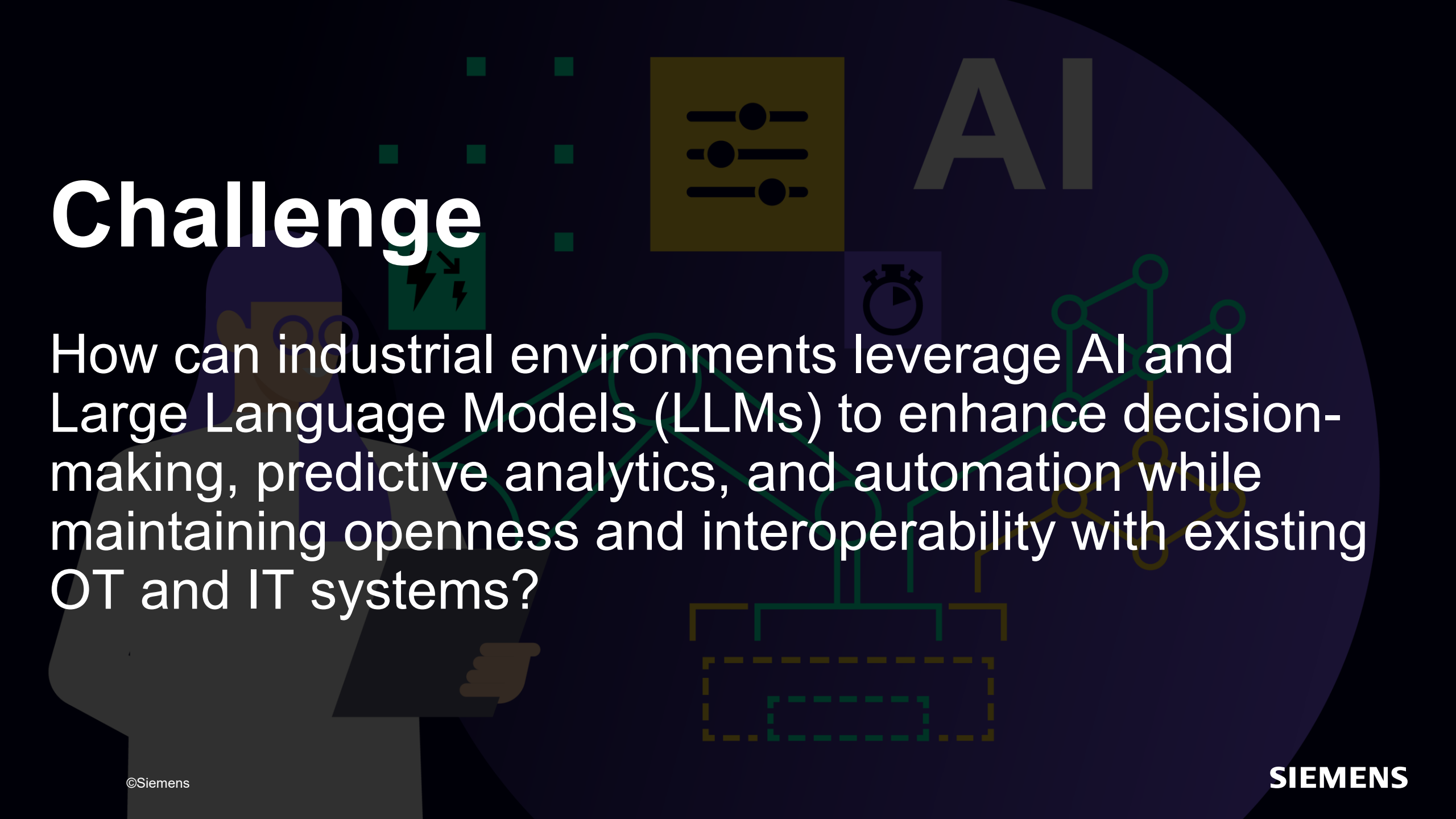

Challenge

How can industrial environments leverage AI and Large Language Models (LLMs) to enhance decision-making, predictive analytics, and automation while maintaining openness and interoperability with existing OT and IT systems?

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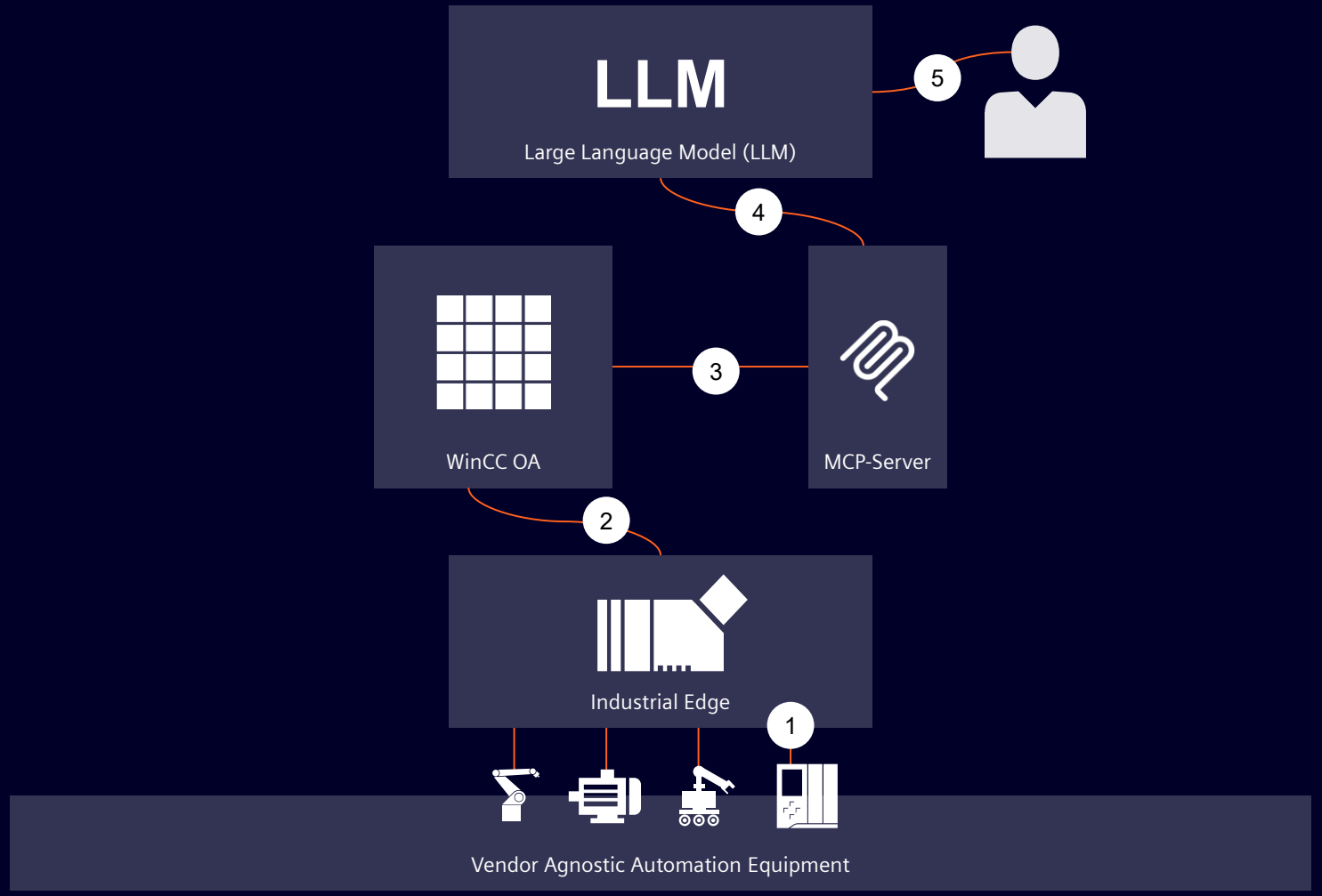
AI / LLM integration to the shop floor
Openness towards LLM providers



Level 1
Overview

Level 2
Detailed

1. Connect shopfloor equipment to Industrial Edge via pre-configured connectors
2. Integrate Industrial Edge with WinCC OA for data aggregation and visualization
3. WinCC OA seamlessly interacts with the WinCC OA MCP Server
4. The MCP server connects LLMs to WinCC OA, enabling intelligent automation and monitoring for industrial environments.
5. "Show me all temperature values in the plant"
   "Which pumps are currently running?"
   "Set the setpoint for pump P-101 to 50%"
   "Create a production report for today"

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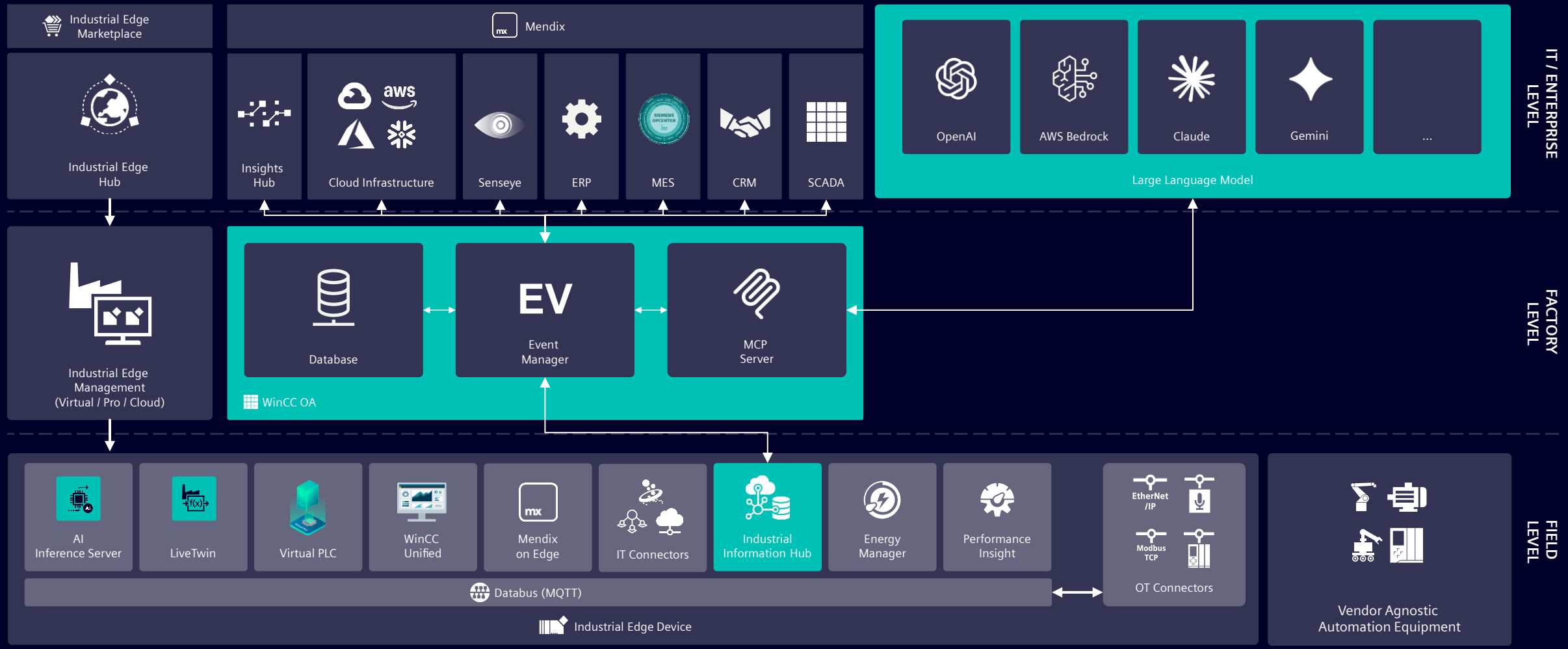
AI / LLM integration to the shop floor
Openness towards LLM providers

Level 1 Overview
Level 2 Detailed



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Values and Benefits

AI-driven insights

Unlock advanced analytics and decision support through LLM integration.

Openness & flexibility

Open towards LLM providers and enterprise applications without vendor lock-in.

Secure & scalable

Industrial Edge ensures secure connectivity and scalable architecture for future AI adoption.

Enhanced human-machine interaction

Natural language interfaces simplify complex operations and troubleshooting.

End-to-end integration

From shop floor to cloud AI services, ensuring data consistency and governance.

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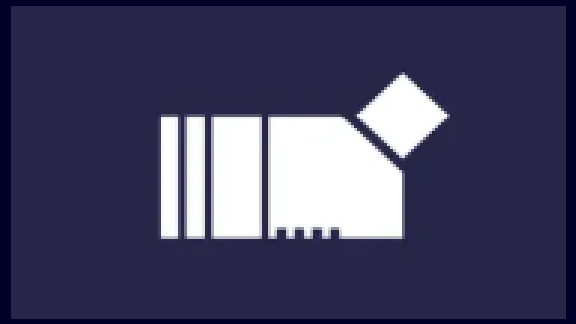
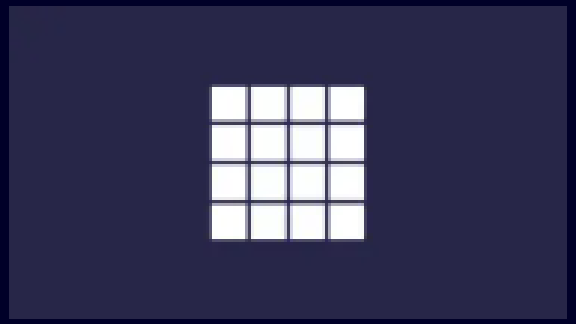
Components



Industrial Edge

- Secure data acquisition and pre-processing
- Vendor-agnostic connectivity (e.g. MQTT, OPC UA, REST API)
- Scalable edge computing for AI readiness



WinCC OA

- Centralized event management and SCADA
- Database integration for structured data
- MCP Server for seamless cloud and enterprise connectivity

Large Language Model (LLM)

- Natural language interaction with shop floor data
- Insight generation and predictive analytics
- Controlled execution of operational commands

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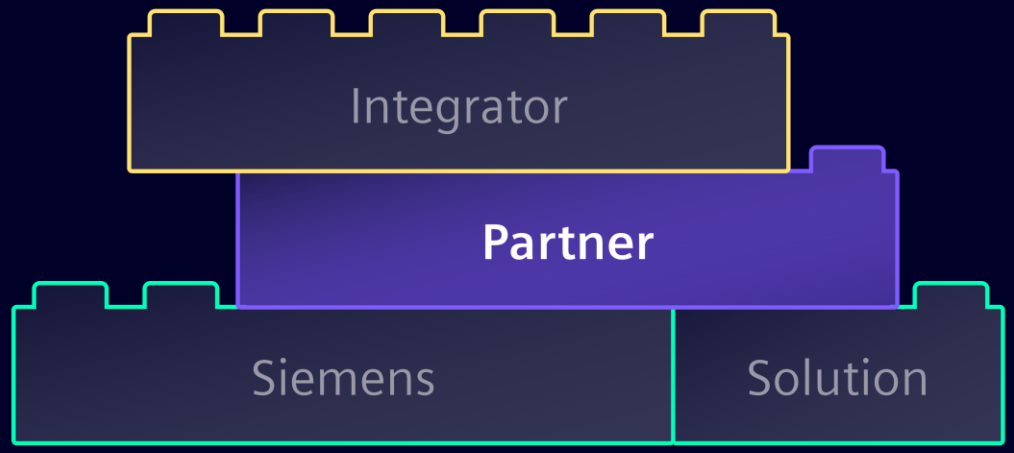
Connecting the shop floor to the Unified Namespace of HighByte

Learn how industrial sites can create a single, trusted operational data layer (UNS) that provides consistent, contextualized, and governed data to all OT and IT consumers.



SIEMENS

Challenge

How can industrial sites create a single, trusted operational data layer (UNS) that provides consistent, contextualized, and governed data to all OT and IT consumers?

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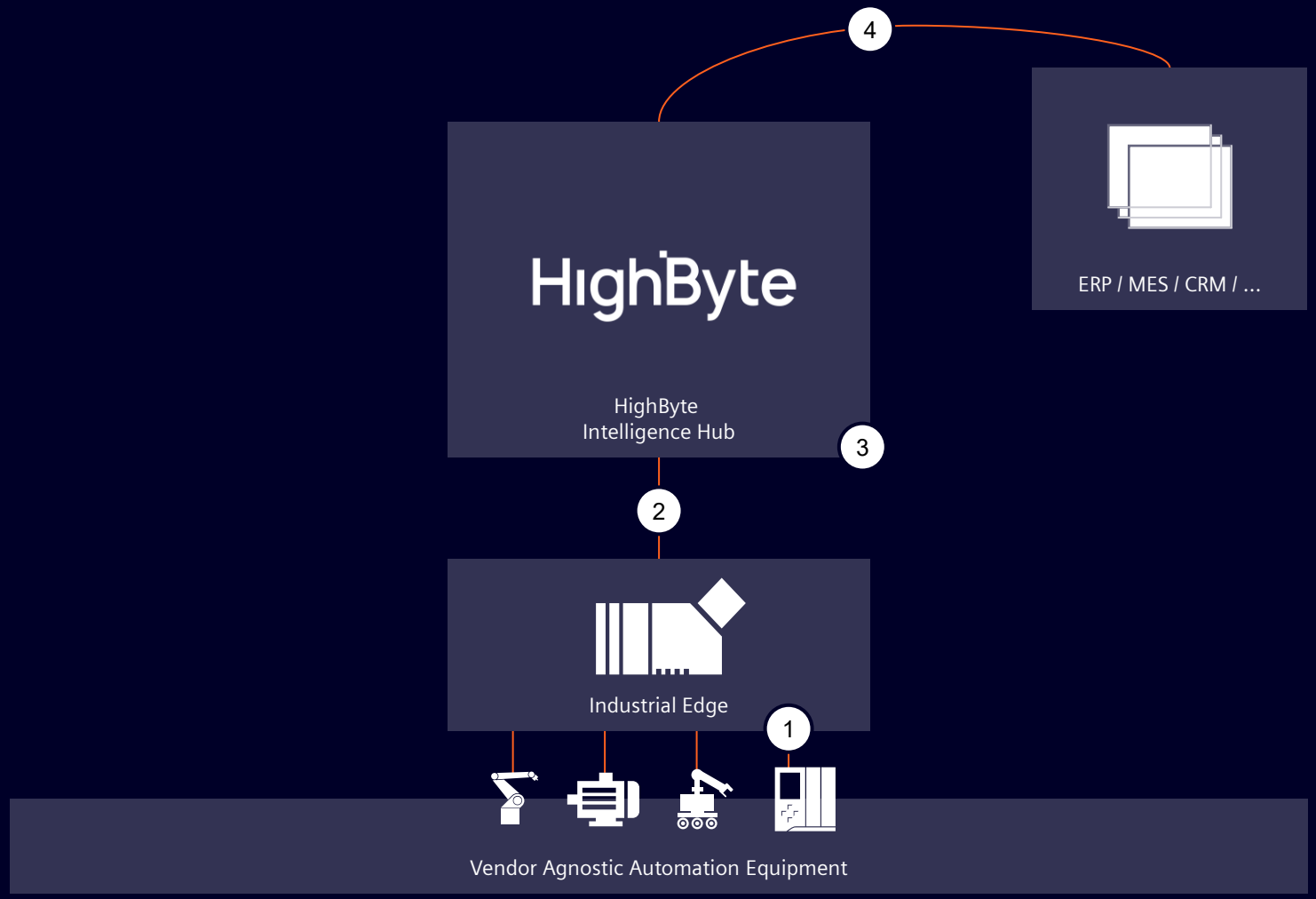
Unified Namespace
Industrial Edge with HighByte



Level 1
Overview

Level 2
Detailed

1. Connect shopfloor equipment to Industrial Edge via pre-configured connectors
2. Transfer pre-processed data from Industrial Edge to HighByte via standard data protocols (e.g. MQTT, OPC UA…)
3. Use HighByte Intelligence Hub as the UNS to standardize, contextualize, and centralize data flows via schema-validated streams
4. HighByte publishes schema-validated streams to consumers via supervised, auditable exports over standard protocols (MQTT/Kafka/REST).

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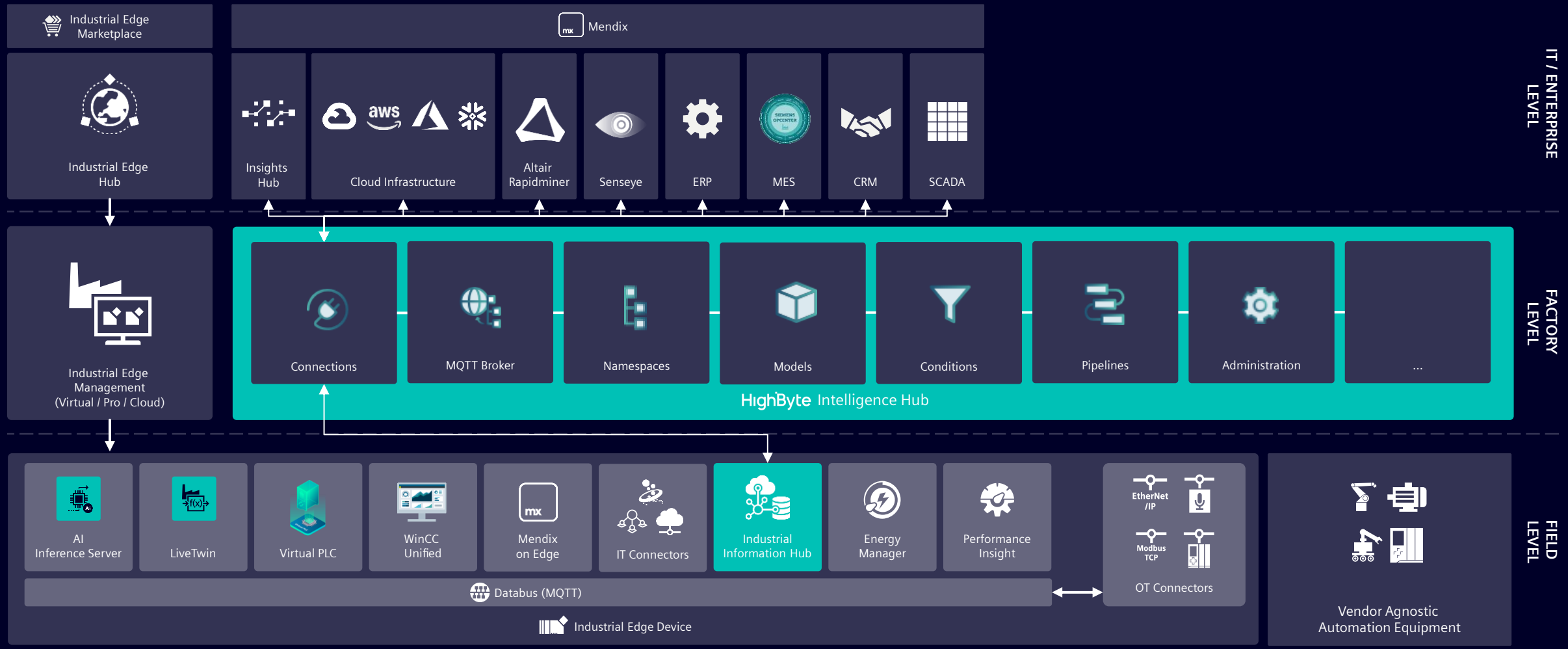
Unified Namespace
Industrial Edge with HighByte

Level 1 Overview
Level 2 Detailed



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Siemens Industrial Edge

- Collects data from automation and field devices using OPC UA, MQTT, REST, Modbus, etc
- .Performs local preprocessing: filtering, aggregation, normalization, time alignment, and lightweight edge logic where required.
- Acts as an OT gateway with secure connectivity (TLS, certificate-based auth) into the enterprise/UNS boundary.

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HighByte Intelligence Hub as the UNS (semantic & integration layer)

- Implements the Unified Namespace by mapping raw tags/points into canonical asset models, standardized tag names, units, and hierarchies.
- Performs data shaping and enrichment (asset metadata, location, process context, shift/production context).
- Publishes well-structured, schema-validated streams and enforces data contracts for downstream consumers (MQTT topics, Kafka, REST, exports).
- Manages schema versioning, transformations, retention rules and buffering for consumers with different latency need

Integration & operationalization

- Use a publish/subscribe pattern: Industrial Edge -> HighByte -> consumers (SCADA, MES, analytics, dashboards).
- Enforce RBAC, logging, and audit trails in HighByte; secure OT/IT boundary via Industrial Edge controls (DMZ patterns)
- Provide adapters for historical systems (historians, databases) and real-time clients (HMIs, OEE dashboards) to subscribe to UNS streams.

Values and Benefits

Single source of truth

HighByte's UNS delivers consistent, canonical asset and tag models so every system reads the same semantic data.

Faster integrations

New consumers subscribe to standardized streams instead of re-mapping each device/source

Secure, OT-friendly architecture

Industrial Edge provides trusted OT boundary, ensuring secure collection and controlled exposure to the UNS.

Scalable & vendor-agnostic

Works across automation vendors and supports cloud/on-prem deployment models without vendor lock-in.

Governance & auditability

Versioned schemas, RBAC, and logging in HighByte make compliance and traceability straightforward.

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Components

Industrial Edge

- Provides secure, local data acquisition and pre-processing
- Acts as the OT gateway to bridge shop floor systems with enterprise IT
- Enables edge logic for real-time decisions and reduces upstream data load

HighByte Intelligence Hub

- Implements the UNS as a semantic and integration layer
- Normalizes and contextualizes data for all consumers
- Offers governance features like schema versioning, RBAC, and audit trails

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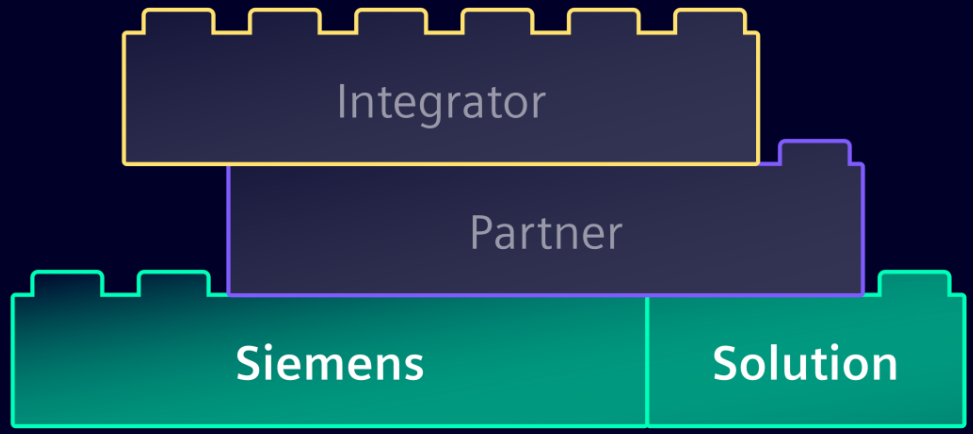
Mendix Workstation

Accelerate industrial automation by bridging shop floor operations, devices, and enterprise systems with low-code flexibility.



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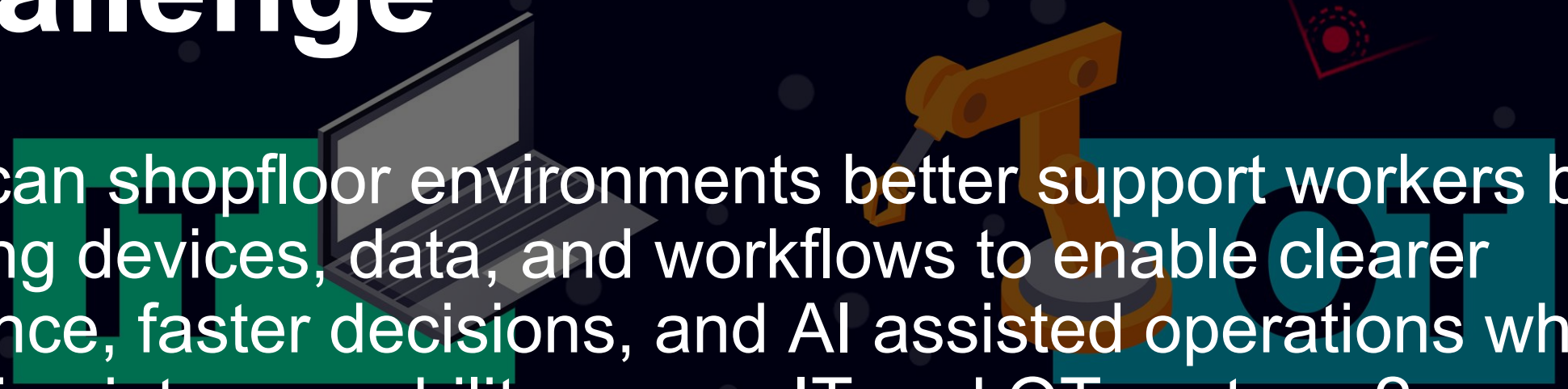
Challenge



How can shopfloor environments better support workers by unifying devices, data, and workflows to enable clearer guidance, faster decisions, and AI assisted operations while ensuring interoperability across IT and OT systems?

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Overview

Mendix Workstation empowers manufacturers to rapidly digitalize and optimize shop floor operations.

By enabling seamless integration between operators, machines, peripheral devices, and core automation systems, it supports the creation of tailored, scalable applications that enhance efficiency, quality, and adaptability across the industrial value chain.

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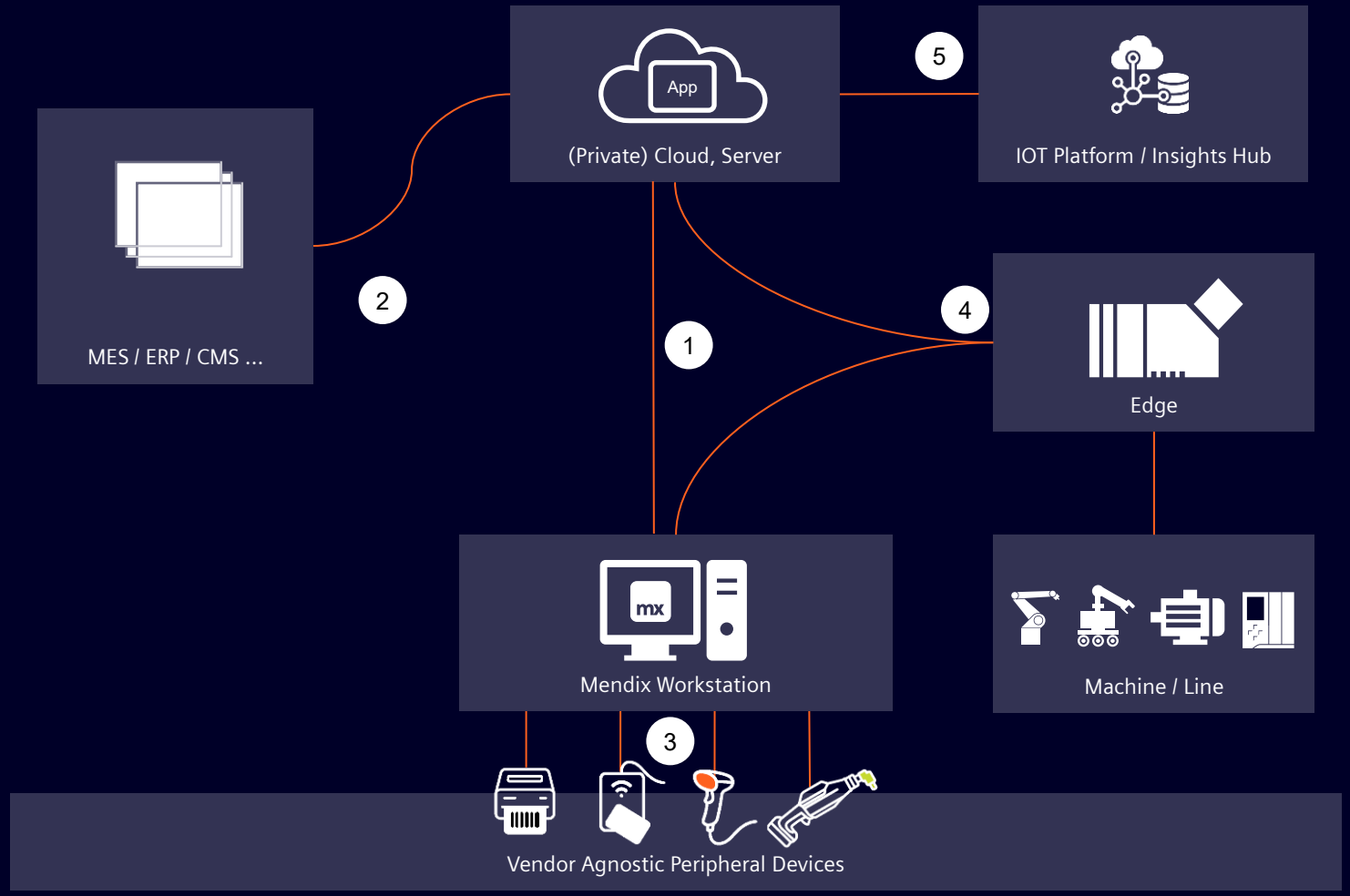
Mendix Workstation

Level 1
Overview

Level 2
Detailed

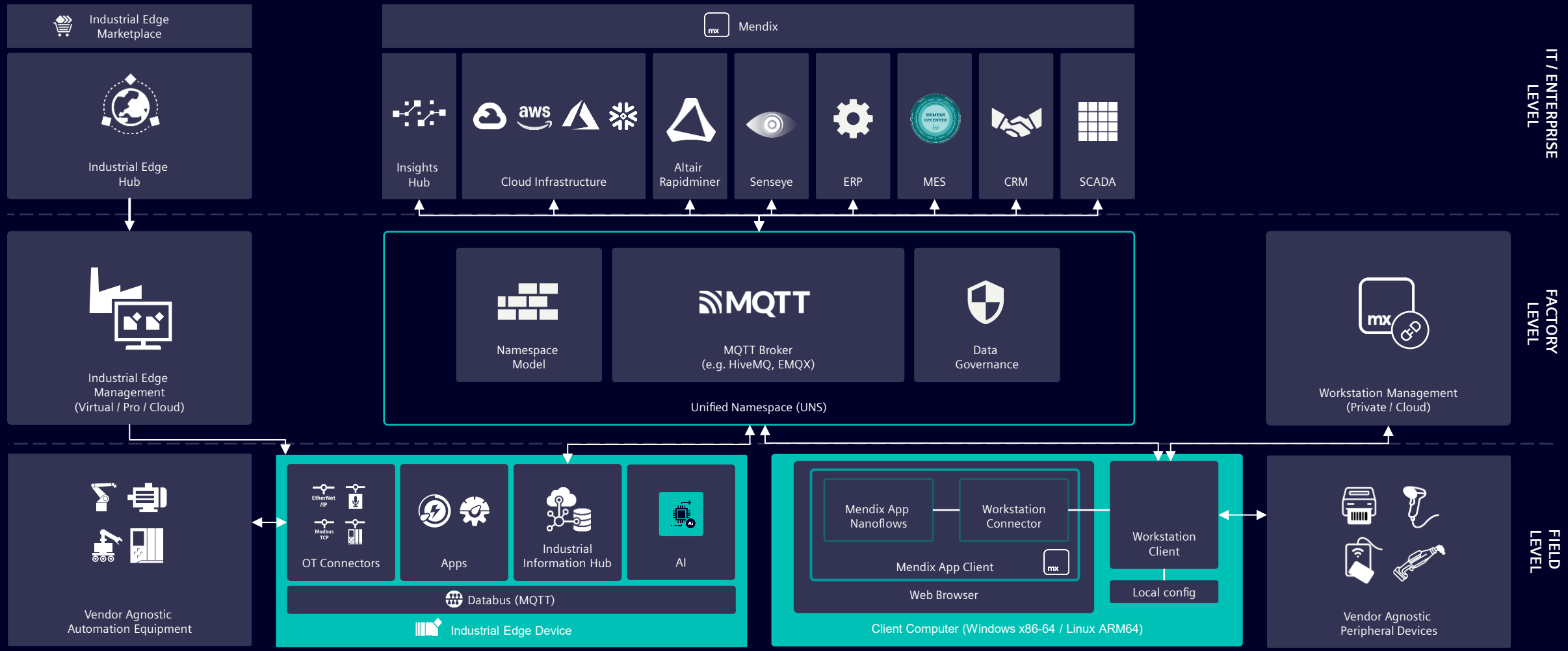


1. Choose between cloud, private cloud, on-premises servers, or edge environments to best fit your operational and security requirements.
2. Integrate with core business systems (such as ERP, MES, or PLM) directly from the server for seamless data exchange and workflow automation.
3. Enable direct, real-time communication with shop floor devices (e.g., barcode scanners, printers, smartcard readers) from the workstation client.
4. Facilitate bi-directional data flow and control between machines and applications, supporting both centralized and distributed architectures.
5. Integrate with Industrial IoT platforms to aggregate, analyze, and act on data from across your production environment.

Mendix Workstation

Level 1
Overview

Level 2
Detailed



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Description

Mendix Workstation acts as the unified interaction layer on the shop floor, connecting operators, stations, and peripheral devices through a consistent and configurable interface

It integrates with automation equipment and enterprise systems using open standards such as OPC UA, MQTT, REST, and GraphQL to ensure vendor-agnostic connectivity

Mendix Workstation enables near real-time data exchange with MES, PLM, quality, and IIoT platforms, supporting workflows that span operator guidance, inspections, material handling, and troubleshooting

Through this open architecture, Mendix Workstation orchestrates device input, contextual data, and backend logic into a single operator environment, ensuring consistent user experience and reliable execution across stations, lines, and plants

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Values & Benefits

Operator centricity

A unified interface for workers that simplifies tasks, reduces errors, and ensures consistent guidance across all stations.

Openness & flexibility

Supports broad integration with machines, sensors, tools, and enterprise systems without locking customers into vendors.

Secure & scalable

Built on industrial standards to ensure secure connectivity, controlled access, and scalable rollout across global shop floors.

Enhanced human-machine interaction

Improves worker interaction with devices, tools, and systems for clearer and faster execution.

End-to-end integration

Creates a coherent workflow from the workstation to MES, PLM, IIoT, and cloud platforms, ensuring reliable data and smooth process execution.

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Components

Mendix Workstation

- Act as the unified interaction layer for operators, stations, and peripheral devices
- Centrally manage and monitor workstation devices and configurations with Mendix Workstation Management
- Enable near real-time workflows and consistent user experience across stations, lines, and plants

Industrial Edge

- Provide secure, scalable connectivity between shop floor devices and enterprise/cloud systems
- Host and manage edge applications for data pre-processing and local decision-making
- Ensure low-latency, reliable data exchange for industrial automation

Unified Namespace (UNS)

- Create one shared data language and context for all systems
- Enable vendor-agnostic integration using open standards (OPC UA, MQTT, REST, etc.)
- Control and manage data publishing and consumption for seamless interoperability

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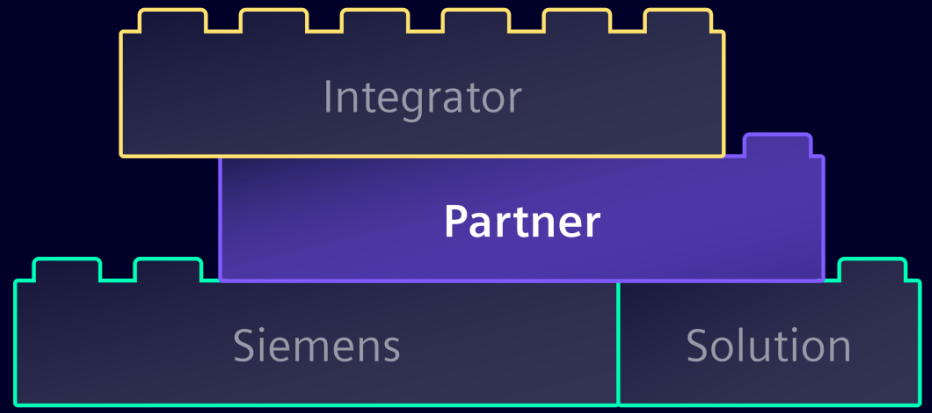
Connecting the shop floor to the Unified Namespace of Hive MQ

How can industrial sites create a single, trusted operational data layer (UNS) with HiveMQ that provides consistent, contextualized, and governed data to all OT and IT consumers?



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Overview

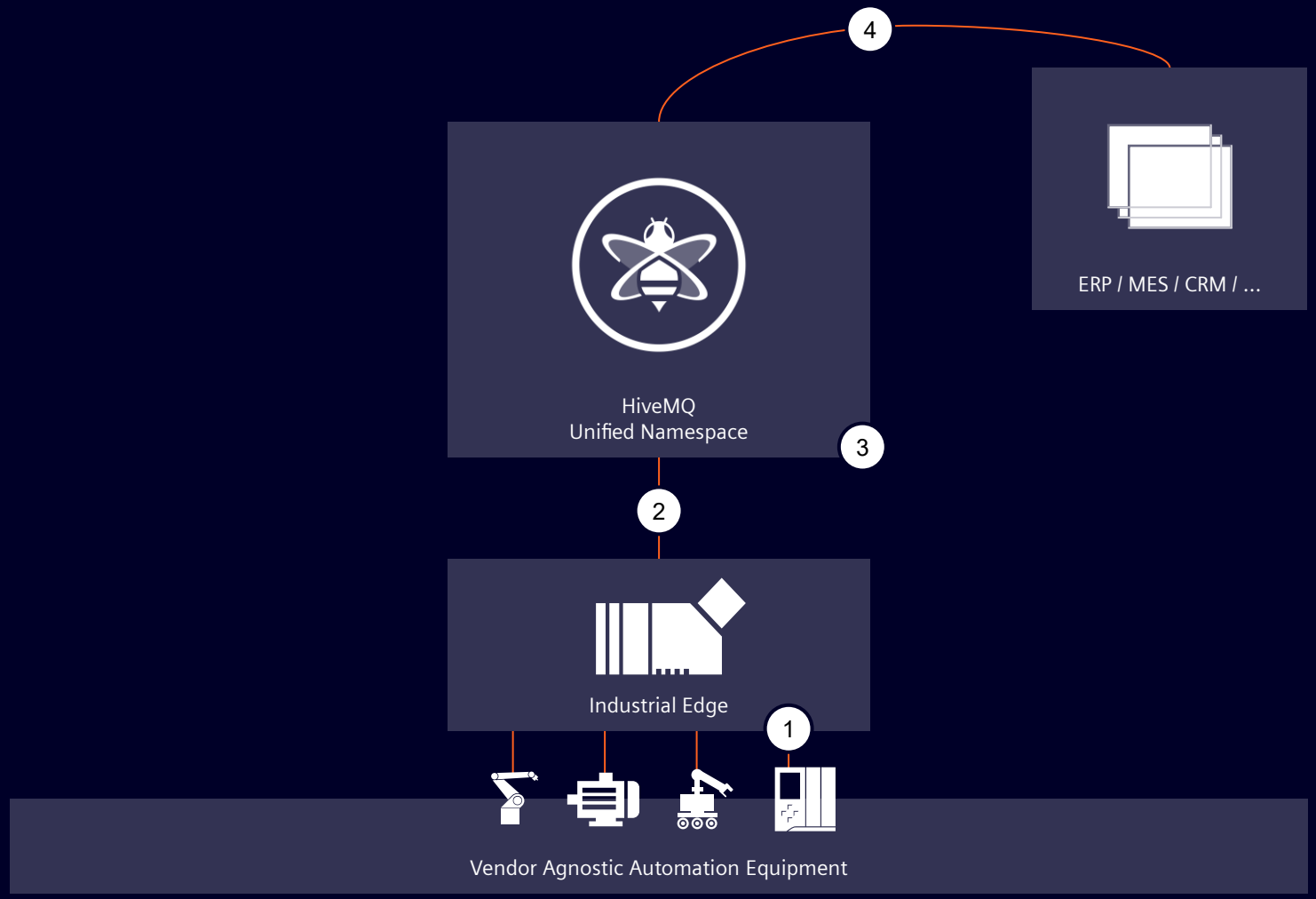
A modular, secure UNS built on HiveMQ (local factory brokers + central UNS) and Industrial Edge delivers a harmonized MQTT dataflow across OT and IT.

Edge devices normalize and publish field data into local HiveMQ brokers following UNS naming and governance. Local brokers cluster and bridge to a central HiveMQ for enterprise-wide distribution, providing low-latency access for SCADA, MES, ERP, analytics and web/HMI apps while ensuring security, scalability and operational resilience.

Unified Namespace
Industrial Edge with HiveMQ

Level 1
Overview

Level 2
Detailed



1. Connect shopfloor equipment to Industrial Edge via pre-configured connectors
2. Transfer pre-processed data from Industrial Edge to the Unified Namespace of HiveMQ.
3. Use HiveMQ as the UNS to standardize, contextualize, and centralize data flows via schema-validated streams
4. HiveMQ UNS publishes schema-validated streams to consumers via supervised, auditable exports over standard protocols (MQTT/Kafka/REST).

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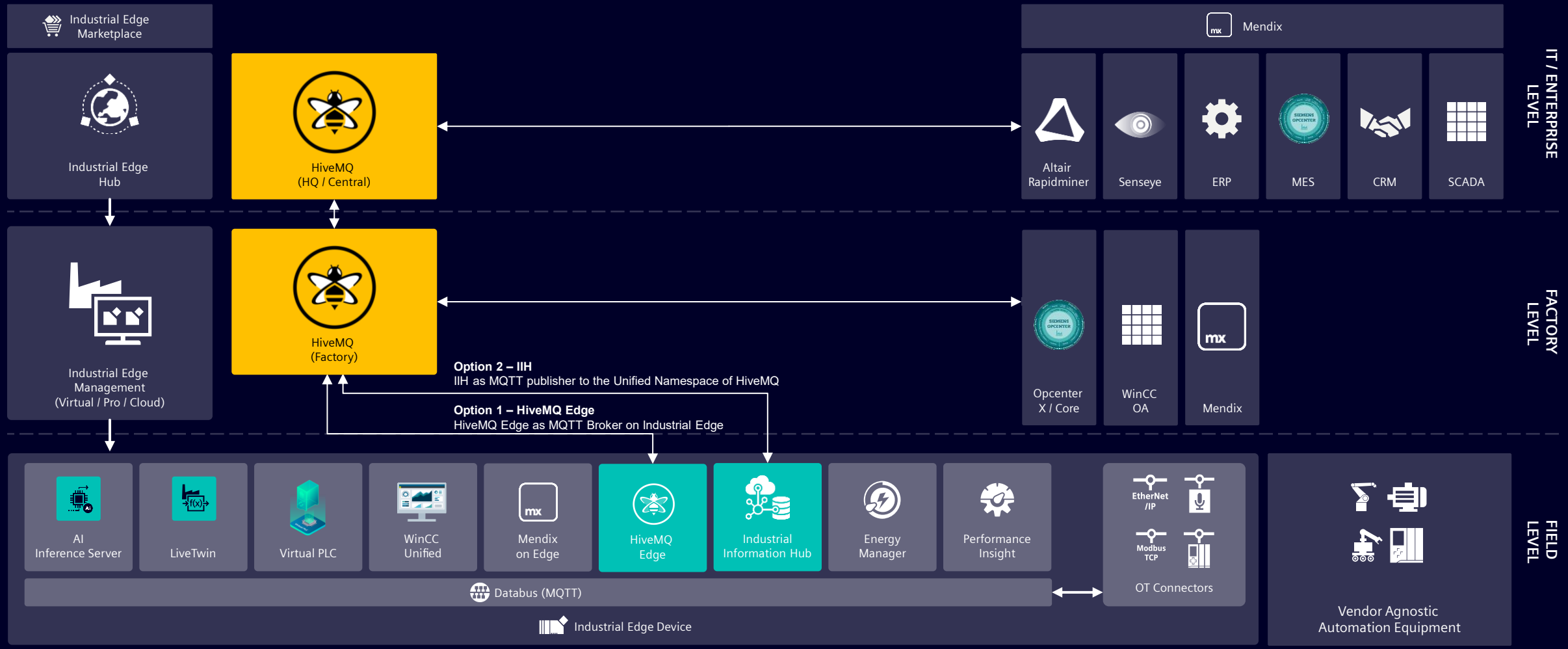
Unified Namespace
Industrial Edge with HiveMQ

Level 1
Overview

Level 2
Detailed



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Field and Edge layer

- Vendor-agnostic automation equipment (PLCs, drives, sensors) connects to Industrial Edge devices via OT connectors (EtherNet/IP, Modbus, OPC UA, etc.).

- Industrial Edge runs data acquisition, filtering, context enrichment, edge apps (e.g., Virtual PLC, LiveTwin, AI inference) and publishes standardized telemetry/events to the local MQTT databus.Performs data shaping and enrichment (asset metadata, location, process context, shift/production context).

Local UNS (HiveMQ Edge / Factory)

- Each site runs a HiveMQ instance implementing the Unified Namespace: consistent topic structure, metadata conventions and access control policies.
- HiveMQ Edge supports local persistence, extensions for transformation/validation, and role-based access control to enforce governance at the source.
- Local brokers serve real-time needs for local HMI/SCADA (WinCC OA, WinCC Unified, Ignition) and local analytics while minimizing dependency on connectivity to HQ.

Central UNS / Cloud (HiveMQ HQ / Central)

- Industrial Edge Management and HiveMQ management components enable deployment, monitoring, lifecycle management and scaling of edge apps and brokers..
- Clustering, replication and secure bridges ensure high availability and local autonomy during network outages.
- Extensions and plugins (transformation, schema validation, auditing, encryption) enable data governance, security and observability across the UNS.

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Values & Benefits

Single source of truth

A governed UNS provides consistent, contextualized operational data consumers can trust.

OT-IT Convergence

Simplifies and standardizes data flow between shop floor systems and enterprise applications.

Low Latency & Local Autonomy

Local HiveMQ instances ensure real-time responsiveness and continue operating during WAN interruptions.

Scalable Enterprise Distribution

Bridged HiveMQ clusters provide efficient, scalable distribution across factories, HQ and cloud.

Reduced Integration Cost & Time-to-value

Reusable UNS topics and broker extensions reduce custom point-to-point integrations.

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Components

Industrial Edge

- Centralized orchestration for edge apps, connectors and local processing.
- Secure data acquisition, filtering and contextual enrichment from heterogeneous devices.
- Publishes data to the local HiveMQ broker.

HiveMQ (Factory / Edge)

- Implements the local Unified Namespace: topic hierarchy, retention, and access control enforcement.
- Provides local MQTT persistence, extensions (validation, transformation) and optimized local subscriptions for HMI/SCADA and analytics.
- Enables secure bridging to central HiveMQ.

HiveMQ (HQ / Central)

- Enterprise UNS aggregation point with clustering, policy enforcement and enterprise integration.
- Provides curated data streams to ERP, MES, CRM, cloud analytics and corporate dashboards.
- Supports multi-site synchronization and disaster recovery strategies.

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