CUSTOMER CASE STUDY

Automating PI Tag Mapping with Multi-Agent Systems

Resolving inconsistent industrial database tags with collaborative AI agents

Solution: PI Mapping Intelligence System **Industry:** Industrial Operations

Use Case Focus: Data Integration and Entity Resolution

GOALS

- Map PI points to physical equipment across multiple disparate databases.
- Resolve inconsistent tag names and operational context gaps.
- Establish a live knowledge graph to enhance system diagnostics.
- Automate the equipment-tag mapping process to eliminate manual workflows.

CHALLENGES

- Equipment appears under different aliases across disparate industrial databases.
- Mapping processes rely heavily on manual efforts and tribal knowledge.
- Fragmented systems lack semantic alignment, restricting analytics and automation.
- Operational systems experience data context gaps due to isolated silos.

SOLUTIONS

- Deploy collaborative agent-to-agent reasoning with self-reflection capabilities.
- Utilize natural language processing and domain ontologies to extract tag descriptions.
- Integrate symbolic reasoning to map and resolve physical equipment identities.
- Establish continuous feedback loops for live, automatic mapping updates.

RESULTS

- Unified equipment intelligence across SCADA, maintenance, and operational databases.
- Automated and evolving knowledge graphs of equipment-tag relationships.
- Scalable deployment capable of adapting to multi-system industrial environments.
- Improved diagnostic accuracy and operational visibility across the organization.

EXECUTIVE SUMMARY

This deployment delivered an advanced multi-agent system designed to map PI points to physical equipment across SCADA, maintenance, and operational databases. By resolving highly inconsistent tag names and context gaps, the technology establishes a live knowledge graph that significantly enhances operational diagnostics and visibility. The implementation successfully replaced slow, manual mapping workflows with automated agent-to-agent reasoning, introducing continuous feedback loops. As a result, industrial operators can scale equipment intelligence effortlessly across complex, multi-system environments.

The Challenge of Inconsistent Industrial Data

Industrial operations often struggle with highly fragmented data systems where critical equipment is represented by different tag aliases across SCADA, maintenance, and operational databases. Resolving these conflicting identities manually requires extensive tribal knowledge and slow, error-prone workflows. Without reliable semantic alignment, organizations face extremely low data interoperability, which severely limits the success of downstream analytics and automation initiatives. These operational context gaps make it difficult to conduct swift, reliable system diagnostics, leading to operational inefficiencies, increased downtime, and missed optimization opportunities across large-scale industrial facilities.

Implementing Agent-Based Cognitive Mapping

To address these data alignment challenges, the implementation introduced a sophisticated multi-agent system utilizing collaborative agent-to-agent reasoning and self-reflection capabilities. These intelligent agents work together to analyze and resolve ambiguous tag identities, leveraging natural language processing and domain ontologies to extract precise meaning from complex operational descriptions. By combining symbolic reasoning with continuous feedback loops, the system autonomously refines tag-to-equipment relationships over time. This advanced cognitive mapping process successfully replaces manual workflows with an automated, self-correcting system that updates in real time.

Driving Visibility with Live Knowledge Graphs

The deployment successfully unified equipment intelligence, establishing a single source of truth across formerly siloed industrial databases. By generating rich, evolving knowledge graphs of complex equipment-tag relationships, the solution provides operators with unprecedented operational visibility and automated diagnostics. The scalable architecture effortlessly adapts to large, multi-system environments containing thousands of disjointed tags. Ultimately, transitioning to automated mapping ensures continuous, reliable asset monitoring while creating a robust foundation for advanced operational analytics and future enterprise-wide automation strategies.

OPERATIONAL IMPACT PATHWAY