

PULP & PAPER

From tag-mapping to scalable integration: how vNode connects ~4,000 Dynamox sensors to AVEVA PI and Futurai

With vibration, speed, and temperature data from thousands of sensors used for predictive maintenance, vNode replaced a non-scalable custom development with a reusable solution across the client's 23 plants.

INTEGRATOR: **inovex** 



Project

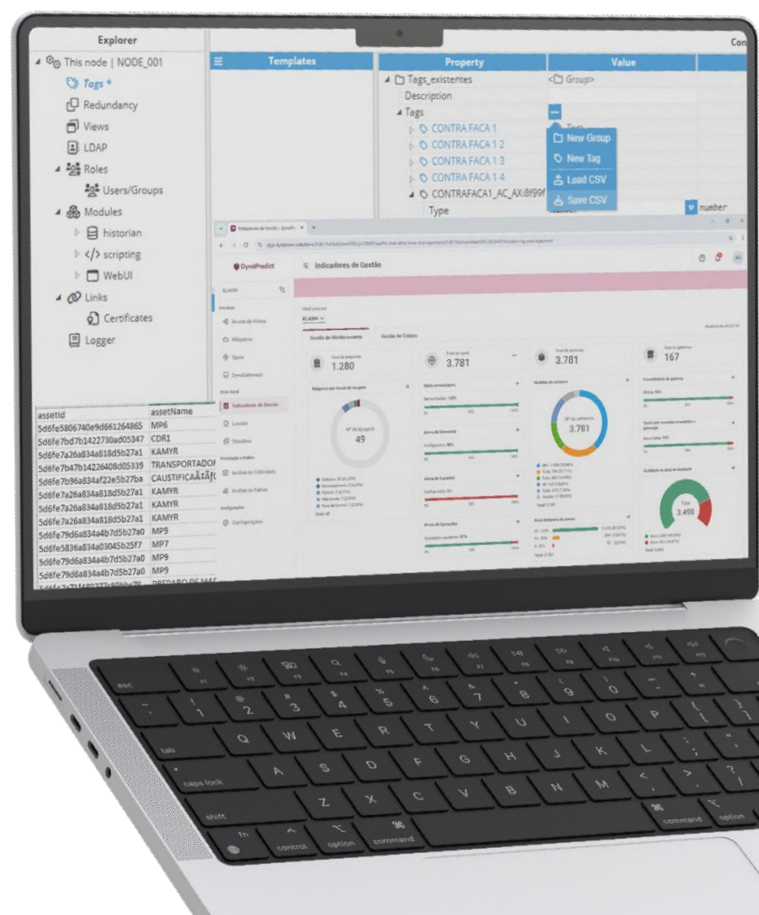
Brazil's largest pulp and paper company operates 23 industrial plants with thousands of sensors distributed across its facilities. Despite its scale, the company faced technological fragmentation that limited how much real value it could extract from field-generated data: it needed to standardize the communication protocols of its industrial IO devices and consolidate, in a single point, data that until then was only available in each vendor's proprietary cloud.

Solution

Inovex deployed vNode as an edge integration middleware layer between the customer's industrial sensors and its enterprise systems, connecting the Dynamox, AVEVA PI, and Futurai APIs through custom scripts, without requiring custom development for each new plant or integration.

Client & Partner

The customer is Brazil's largest pulp and paper company, with 23 industrial plants, and was already an Inovex customer prior to this project. Inovex, an integrator with a track record in industrial software since 2005 and in OT/IT connectivity since 2012, is the official vNode distributor in Brazil and the system integrator that carried out the deployment: the team already had in-depth knowledge of the APIs of the vendors involved (Dynamox, AVEVA PI, Futurai, and Siemens Senseye) and its status as official distributor enabled direct communication with the vNode product team throughout the project (more on Inovex under About Inovex, at the end of the document).



Objectives



Standardize the communication protocols of industrial IO devices across the 23 plants.



Consolidate sensor data into a single point, previously available only in each vendor's proprietary cloud.



Replace the custom-built data tagging system (limited to extracting data only from AVEVA PI) with a flexible layer able to connect to multiple sources.



Build a scalable solution that would not require additional custom development for each new plant or integration.



Provide an edge and integration layer able to communicate in a unified way with all external systems.



Challenges



No standardization in the communication protocols of industrial IO devices across the different plants.



Sensor and equipment data was only available in each vendor's proprietary cloud environments, with no way to consolidate it.



A custom-built Tag Manager system that could extract data only from AVEVA PI and send it to the company's AWS Data Lake, and nothing beyond that.



A non-scalable solution: every new plant or integration required a new round of costly custom development.



No edge layer capable of communicating across all external systems in a consistent, governed way.

With nearly 4,000 Dynamox sensors generating approximately seven variables each, the total volume was approximately 28,000 data points. Acceleration, velocity, and temperature data are critical to equipment reliability monitoring and predictive maintenance, with alerts reaching as far as messaging apps. Managing all of this with a non-scalable custom solution had become unsustainable, especially as the company pursued advanced process control initiatives under its FINAP innovation program.

Solution

Inovex deployed vNode as an edge integration middleware layer between the customer's industrial IO sensors and its enterprise systems. The implementation was structured in several stages.

The pilot phase evaluated integrations with AWS S3, PostgreSQL, Sensei, SKF, and OPC UA, validating the approach before moving into full production.

The main production integration connects the approximately 4,000 Dynamox vibration and condition-monitoring sensors through its cloud API. Using scripts built in vNode, sensor meta-data is retrieved to generate a mapping file (CSV), historical data is fetched while respecting the Dynamox API's rate limits, metric IDs are mapped to local tag aliases inside vNode, and



"vNode gave us a real integration layer that we could actually build on, not just another one-off connection. When the customer's IT team made it their official standard, that told us everything."

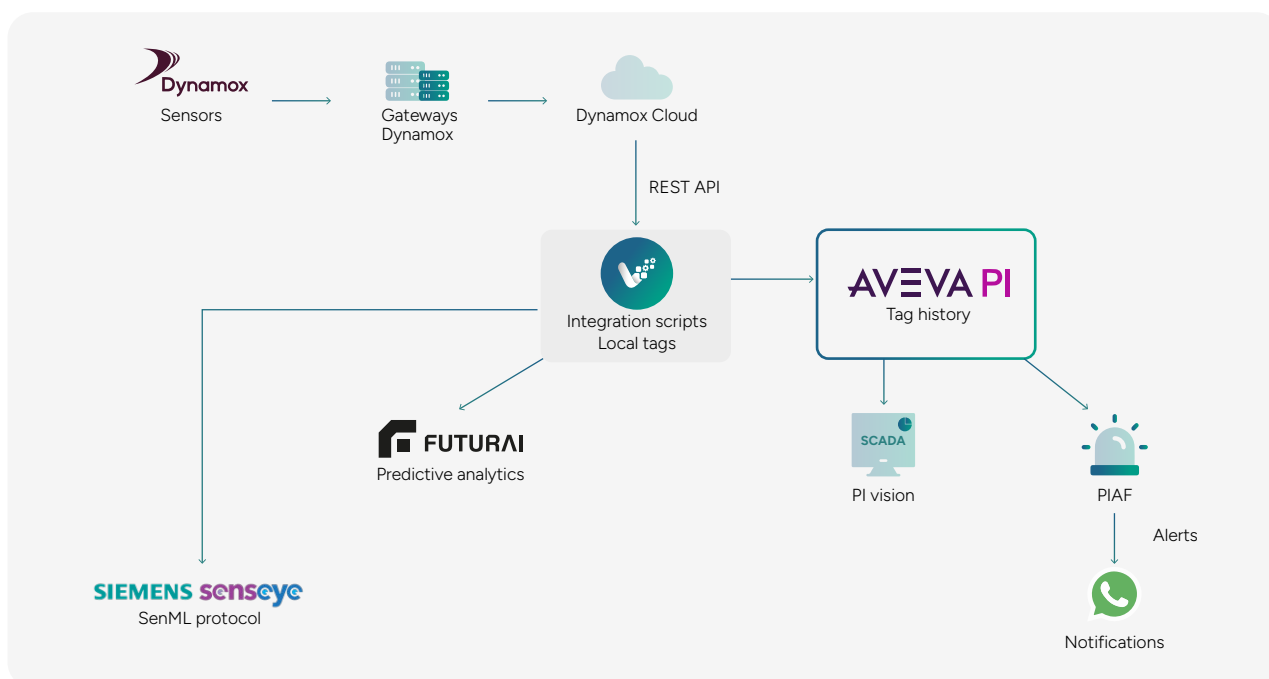
-Adriano Costa, Engineer, technical lead and founder at Inovex

values are written to AVEVA PI every 10 minutes via its PI Web API. Data is visualized in PI Vision and monitored through alerts configured via PIAF.

A second integration extracts interpolated data from AVEVA PI and sends it every 30 minutes to the Futurai predictive analytics platform through its cloud API, whose response is written back to AVEVA PI for use in advanced process control initiatives.

A similar outbound flow was also implemented for Siemens Senseye using the SenML protocol during the project; that integration has since been discontinued.

All integrations rely on vNode's ability to run custom scripts adapted to each vendor's specific structure, format, rate limits, and authentication, avoiding custom development for each new connection.



Components: Dynamox vibration/condition monitoring sensors (~4,000 units); Dynamox field gateways; Dynamox Cloud (REST API); vNode, scripting engine and tag store (local tags); AVEVA PI (OSIsoft PI), historian; PI Web API; PI Vision (visualization); PIAF, PI Asset Framework (alarms); Futurai Cloud API (predictive analytics); Siemens Senseye API (SenML protocol, discontinued); AWS S3 (pilot); PostgreSQL (pilot); OPC UA client/server (pilot, for SKF); Sensei (pilot; role/protocol not specified in the source material); and WhatsApp (alert notifications).

vNode provided what the previous solution could not: a flexible, scalable edge platform able to communicate with heterogeneous systems through their respective APIs without custom development for each case. Inovex's position as the official vNode distributor in Brazil enabled direct communication with the product team to resolve the customer's technical requirements during deployment.

vNode Modules used

{REST:API}

REST API Client: consuming the Dynamox and Futurai cloud APIs; outbound integration to Siemens Senseye.



Scripting Engine (custom scripts): adapting to each vendor's structure, format, rate limits, and authentication; CSV-based data mapping.



Tag Store (local tags): staging and mapping data between reads and writes.



OPC UA Client / OPC UA Server: piloted, not deployed in production.



Featured functionalities

- Multi-protocol, multi-vendor integration without per-project custom development.
- Licensing-based scalability: the integration application built for one plant is reused at other facilities at only the cost of additional licenses.
- Bidirectional data flow (read from a source API, write to a destination API).

Results & benefits

The results achieved in 2025 are concrete and measurable:

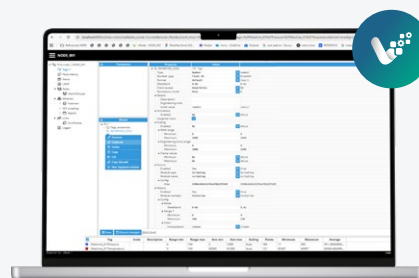


Three integrations delivered: Dynamox and Futurai running continuously in production, plus a third integration with Siemens Senseye that ran during the project before being discontinued.

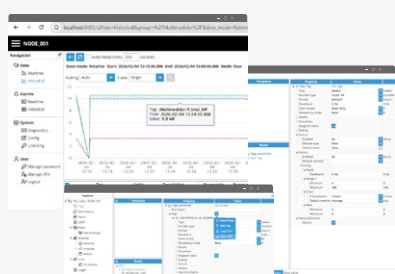
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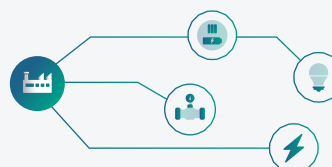
Approximately 12,000 data tags integrated through the Dynamox integration alone.



Formal adoption: the customer's IT department formally designated vNode as the standard edge integration platform for all integrations across all 23 plants.



Reusable solution: once the integration application is built for one plant, it can be deployed to other facilities at only the cost of additional licenses, eliminating custom development for each project.



Around 4,000 sensors connected across the customer's plants.

This last point represents a shift in the customer's cost model: from a scheme of ever-increasing costs for each new integration, to one of controlled, predictable expansion.

About Inovex

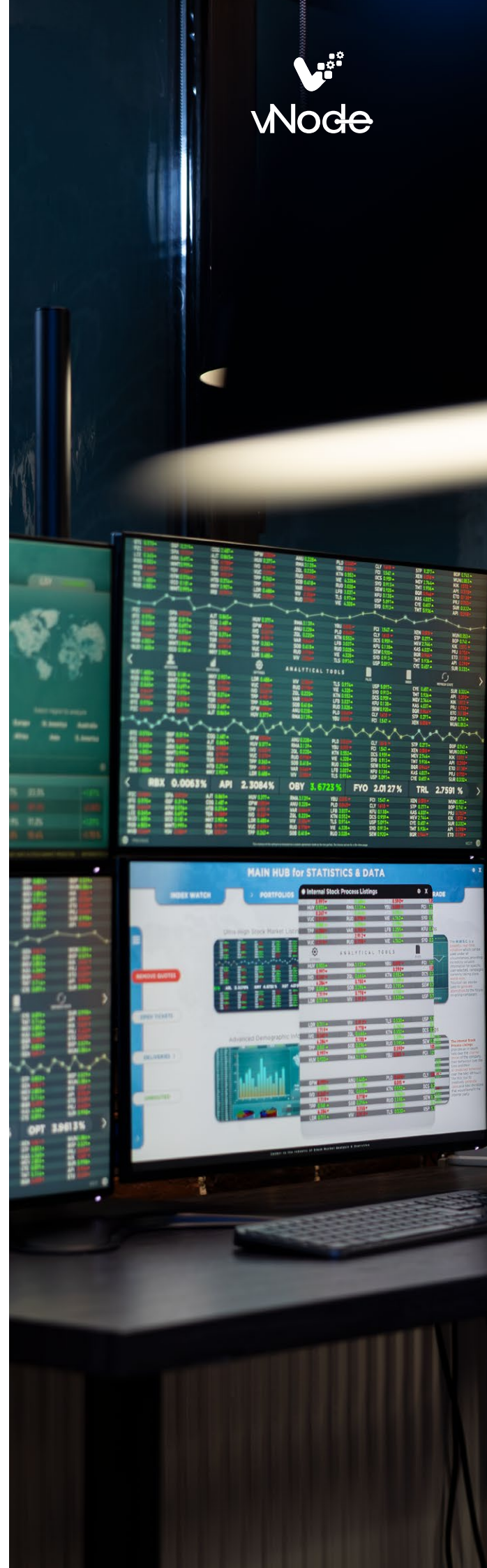


Inovex integrates industrial automation and information technology, with solutions that connect SCADA, MES, PIMS, and IIoT for sectors such as Oil & Gas, Energy, Pulp & Paper, Mining, and Steel. The company has a track record in industrial software since 2005 and in OT/IT integration since 2012, and is the official vNode distributor in Brazil. Before this project, the team had already built its own solutions for data mapping, rate-limit handling, and historical data retrieval.

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