AVEVAWORLD

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ISA Intercolombia

Improving Reliability in Electrical Signal Monitoring for ISA and its Companies using AVEVA PI System

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Agenda

- About ISA and its Companies
- Business Challenge Addressed
    - Challenge, Solutions, and Benefits
- Implementation Details
- Conclusion


isa
United States
Mexico
Colombia
Central America
Brazil
Perú
Chile
Argentina
7 countries
3 business units
Roads
Telecom
Energy
ISA is the largest energy transmission company in Latin America

We transmit Electrical Energy throughout Latin America
while taking care of what you see least

Energy

In operation

Circuit Km

49.398

72.849
Including participation of ISA in other Companies

Capacity MVA

110.998

143.730
Including participation of ISA in other Companies

In construction

Circuit Km

8.151

Capacity MVA

18.021

4.700
People

Indicators

99.77%
Availability

99.99%
Reliability

Information as of 30 June 2024, ISA 2024 Integrated Report

Business Challenge Addressed

POWER AND UTILITIES | COLOMBIA

ISA optimizes its reliability indicator for electrical signals, increasing from 94.74% to 97.09%

Challenge

- **Measurement Errors and Communication Latency:** The accuracy of supervision is affected by measurement errors and delays in data transmission, which can compromise the safe and efficient operation of the system.
- **Integration and Analysis of Large Volumes of Data:** The challenge lies in the precise integration of data from multiple sources and real-time analysis of large volumes of information to optimize maintenance and improve decision-making.

Solution

- Deployed AVEVA™ PI System™ at ISA and its affiliates for storing and analyzing supervisory data. Using PI AF, a dynamic model was developed that integrates SCADA data to establish reliability indicators in supervision

Results

- **12069 of ISA's signals' are monitored by this implementation**
- **Improves the reliability of monitoring and optimizes the management and maintenance of assets, achieving a more efficient and safe operation of the power system**
- **Early notification of potential problems, facilitating a quick response from the maintenance team and reducing operational impact**

ISA 2030 Strategy – Four Pillars

Strategy Mobilization Programs

Asset management, renewal, and maintenance: robotics, advanced O&M.

System security and reliability

Intensified digitalization: implementation of digital solutions supported by big data and Analytics…

CONNECTIONS THAT INSPIRE

COMMITMENTS TO OUR STAKEHOLDERS

All daily actions and decisions are determined by how ISA is related internally and to the world.

GREEN

We work to proactively minimize the environmental impact and promote initiatives for its protection.

INNOVATION

Taking advantage of opportunities derived from technological evolution and trends.

DEVELOPMENT

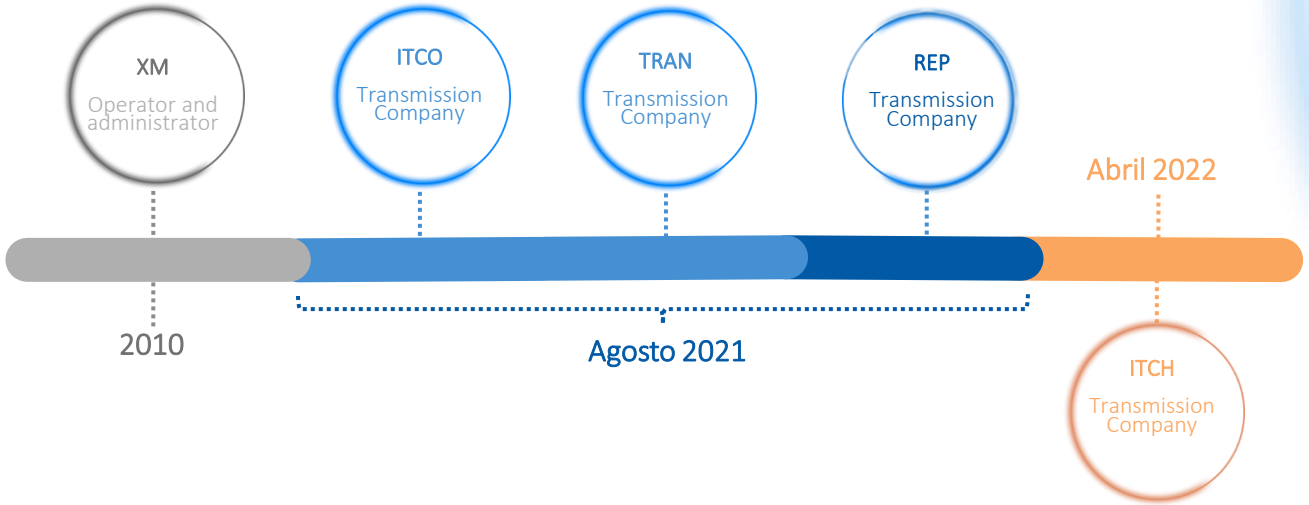
We build capacities to face business challenges and promote entrepreneurship ecosystem.

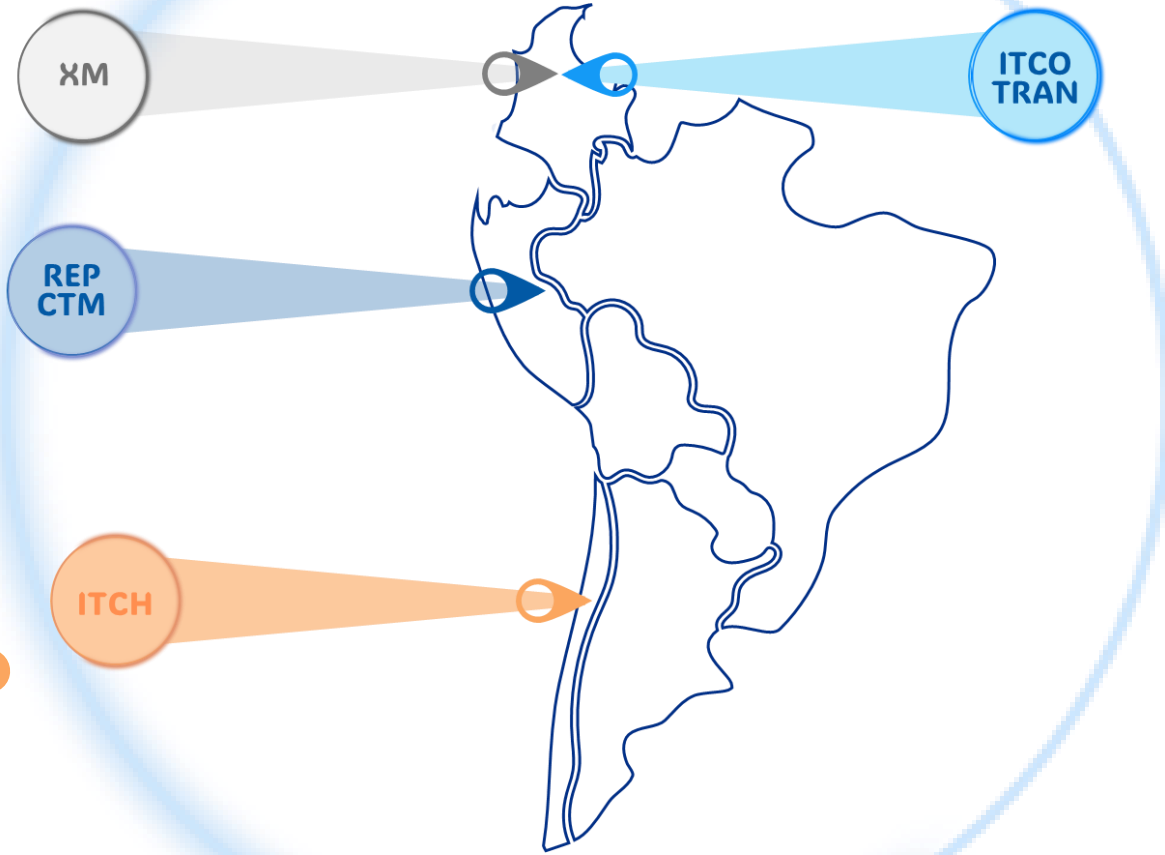
ARTICULATION

Seal of strategic alliances to meet common objectives.

Involved Companies

PI System Implementation

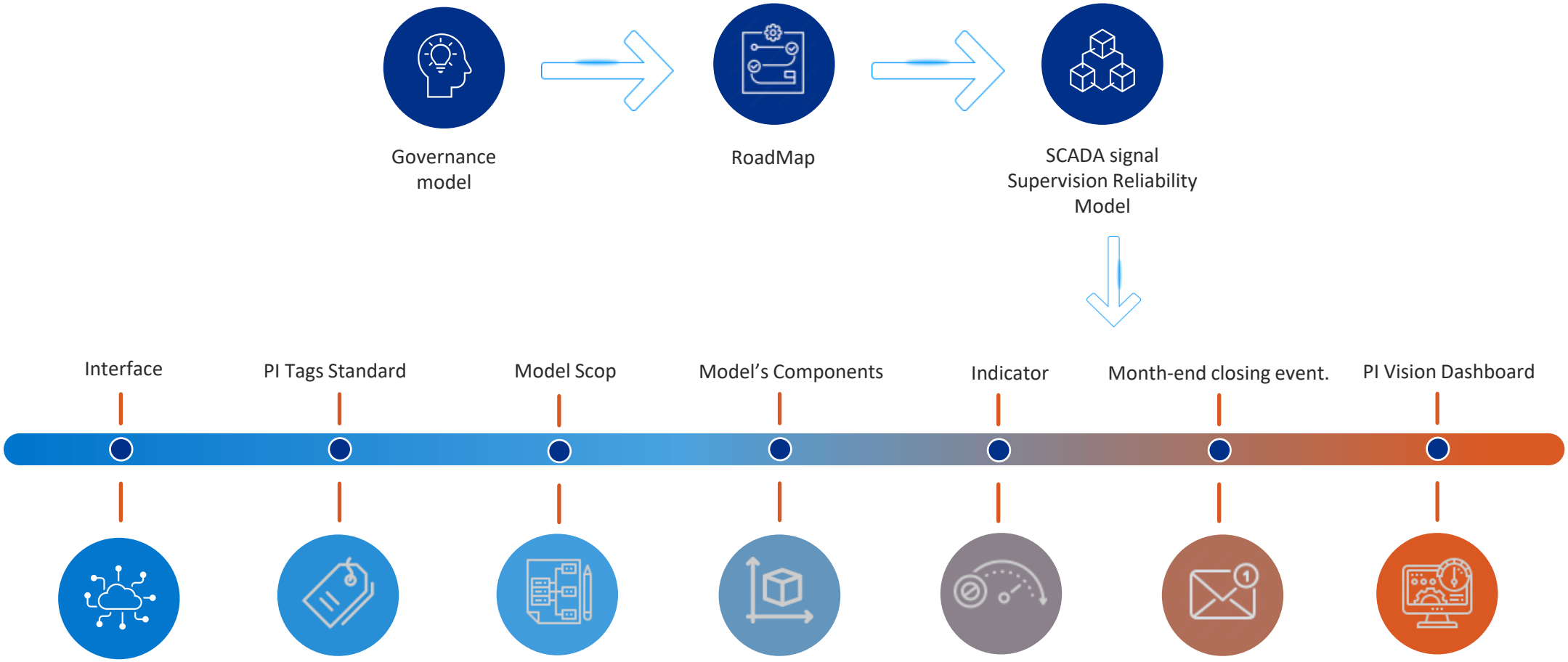




IMPLEMENTATION TECHNICAL DETAILS

Signal Supervision Reliability Model

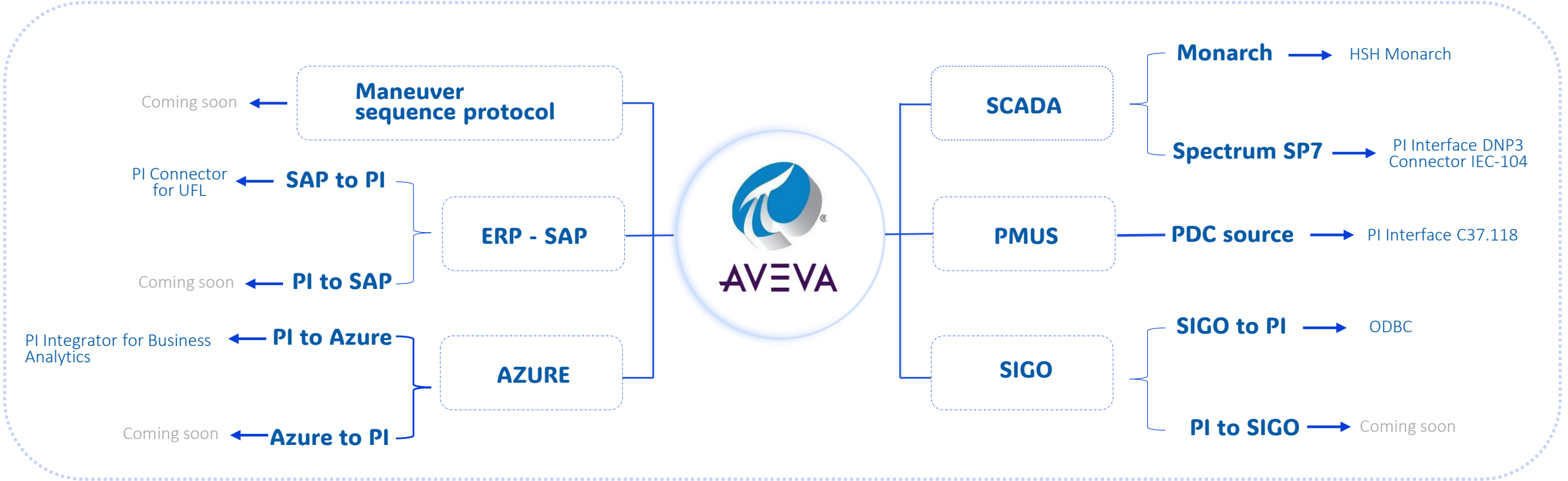
Planning Implementation



Interfaces and Connectors

Energy

Interfaces and Connectors



ERP - SAP: SAP Enterprise resource planning.
AZURE: Microsoft Cloud platform
SCADA: Supervisory Control And Data Acquisition
PMU: Phasor Measurement Unit
SIGO: Operational Information System. Inhouse Software.
Maneuver sequence protocol: web application that allowe maneuver management. Inhouse Software.

PI System Tags

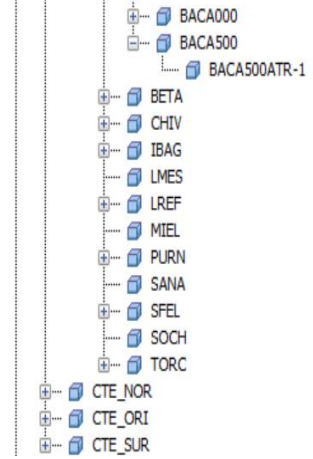
Standardization and Approval

PI TAG is the key

- Data structure approved for ISA and its companies
- Allows communication between SIGO – SAP and PI System
- Facilitates data sharing

Taxonomy and hierarchy

COMPANY	SOURCE	SUBSTATION ID	VOLTAGE LEVEL	EQUIPMENT	VARIABLE
ITCO	SCADA	CERR500		ATRAF01_5A1-4	I1.Estimated
ITCO	SCADA	CERR500		ATRAF01_5A1-4	I1.Q
ITCO	SCADA	CERR500		ATRAF01_5A1-4	I1.Value



Model Scope

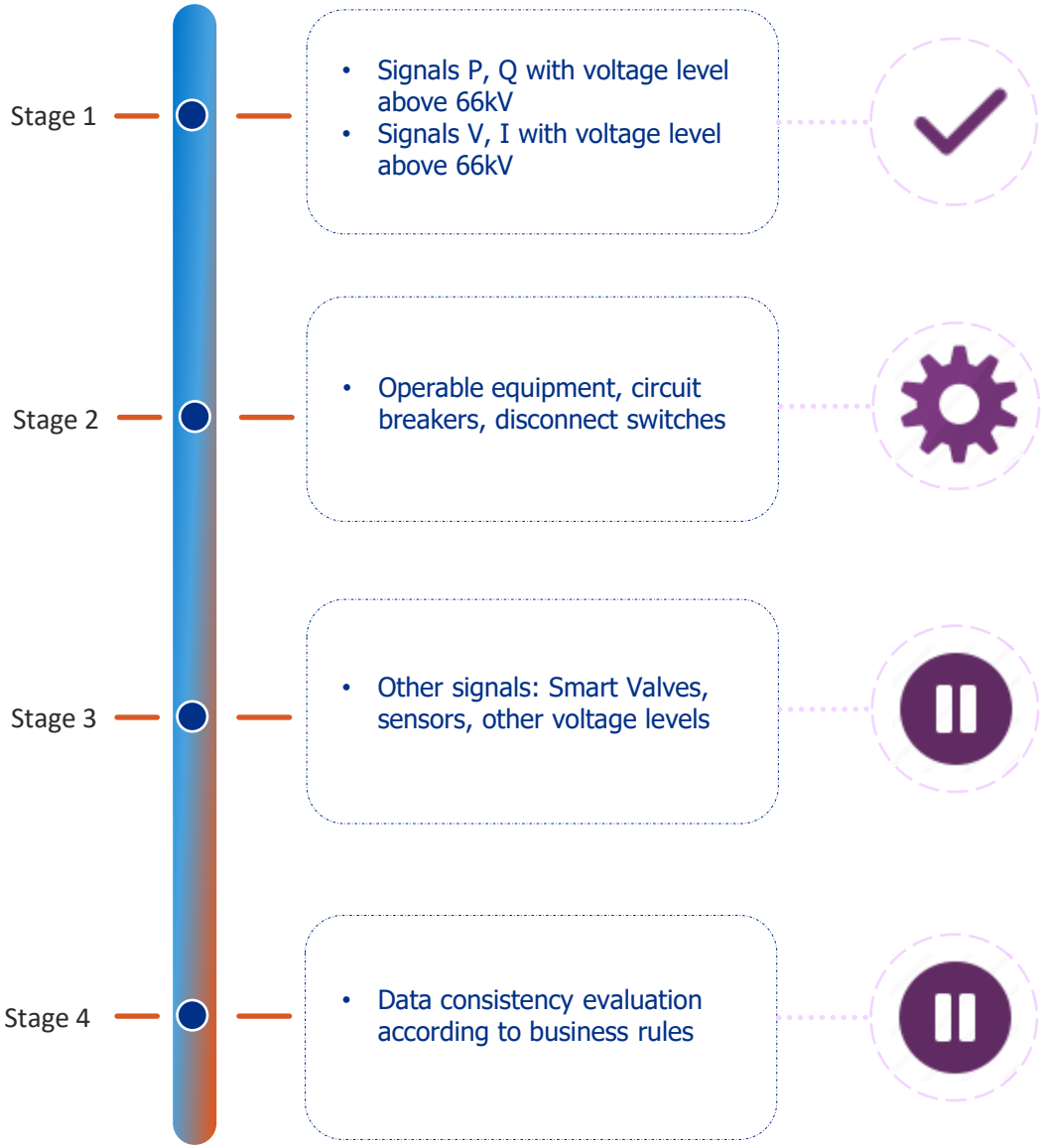
%
Reliability of the signal

Correct operation of the signal time

Total measurement time

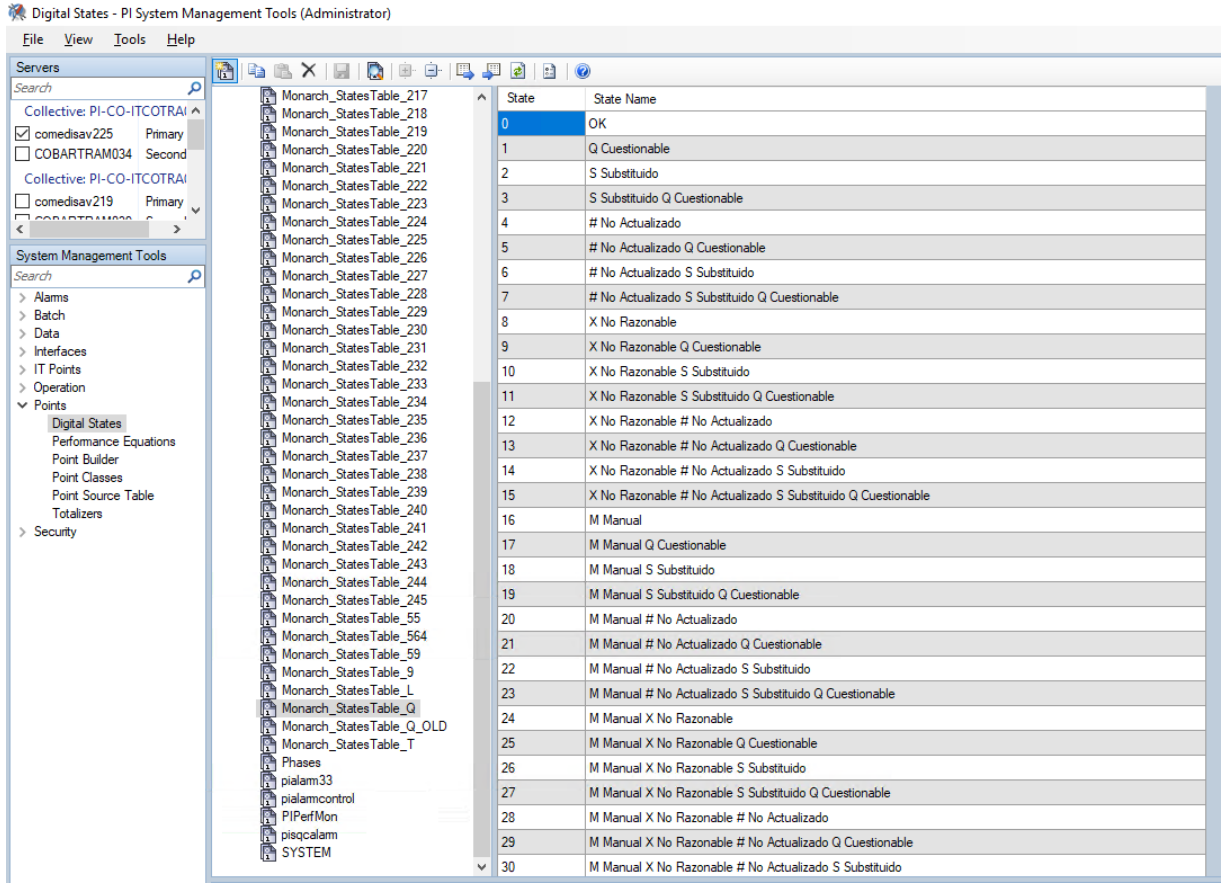
Considerations

1. The model will be applied to elements that are owned by the companies or are their responsibility under a specific contract.
2. The model will be applied to the following elements that may be part of an electrical substation components: transformer, line, compensation, and generation.
3. The result of the reliability value calculation for each variable in each component will be stored in a PITAG.



Model's Components

Context



State	State Name
0	OK
1	Q Cuestionable
2	S Substituido
3	S Substituido Q Cuestionable
4	# No Actualizado
5	# No Actualizado Q Cuestionable
6	# No Actualizado S Substituido
7	# No Actualizado S Substituido Q Cuestionable
8	X No Razonable
9	X No Razonable Q Cuestionable
10	X No Razonable S Substituido
11	X No Razonable S Substituido Q Cuestionable
12	X No Razonable # No Actualizado
13	X No Razonable # No Actualizado Q Cuestionable
14	X No Razonable # No Actualizado S Substituido
15	X No Razonable # No Actualizado S Substituido Q Cuestionable
16	M Manual
17	M Manual Q Cuestionable
18	M Manual S Substituido
19	M Manual S Substituido Q Cuestionable
20	M Manual # No Actualizado
21	M Manual # No Actualizado Q Cuestionable
22	M Manual # No Actualizado S Substituido
23	M Manual # No Actualizado S Substituido Q Cuestionable
24	M Manual X No Razonable
25	M Manual X No Razonable Q Cuestionable
26	M Manual X No Razonable S Substituido
27	M Manual X No Razonable S Substituido Q Cuestionable
28	M Manual X No Razonable # No Actualizado
29	M Manual X No Razonable # No Actualizado Q Cuestionable
30	M Manual X No Razonable # No Actualizado S Substituido

Figure 1: Status codes for signal quality

- **Bit 1** — Q Questionable: Translation of the signal protocol (101, 104, ICCP) to SCADA when the signal is invalid.
- **Bit 2** — S Substituted: Data coming from two different sources, where one source replaces the data sent by another source
- **Bit 3** — # Not Updated: If the RTU does not send the data or communication is lost, then SCADA retains the same value. It may come from the field or be set by SCADA.
- **Bit 4** — X Not Reasonable.
- **Bit 5** — M Manual: Data input by an operator or data removed by an operator
- **Bit 6** — DRIFT
- **Bit 7** — E Error Estimation.
- **Bit 8** — F Frozen: If the SCADA signal has the "Frozen Signal" analysis turned on.

The conversion of the 8-bit byte from binary to decimal corresponds to the status numbers in the table. Each active bit is added to the final state of the signal. Therefore, multiple states can occur within the same status code.

Model’s Components

Reliability of supervision

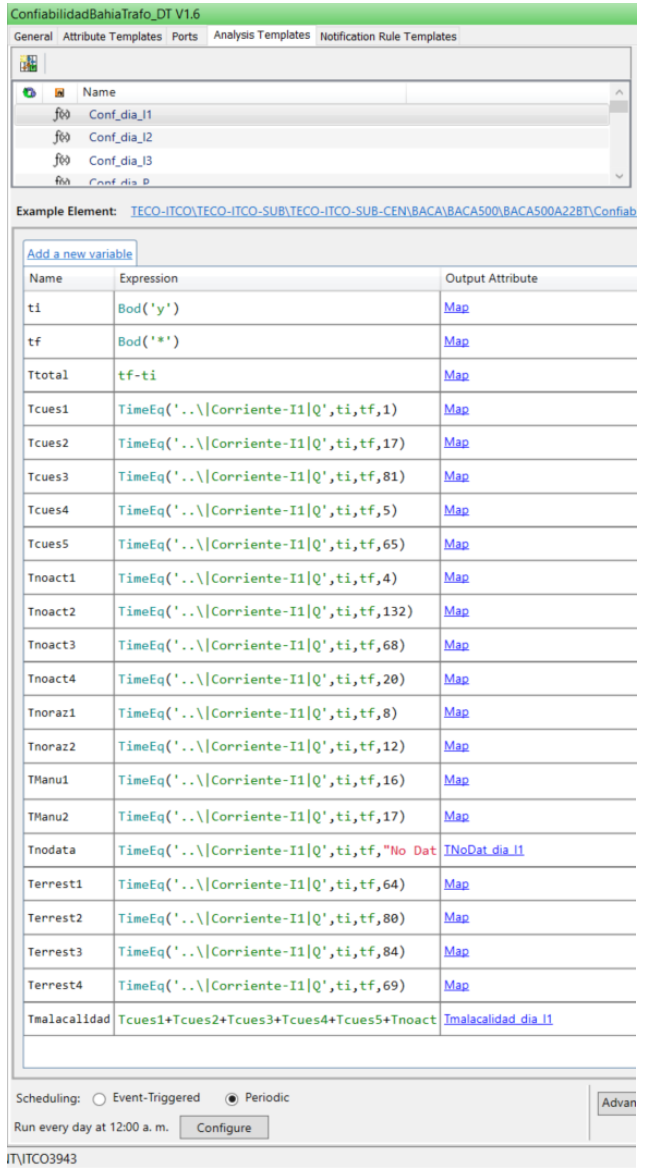
Reliability of supervision

Any status code that has any of the following bits is considered low quality:

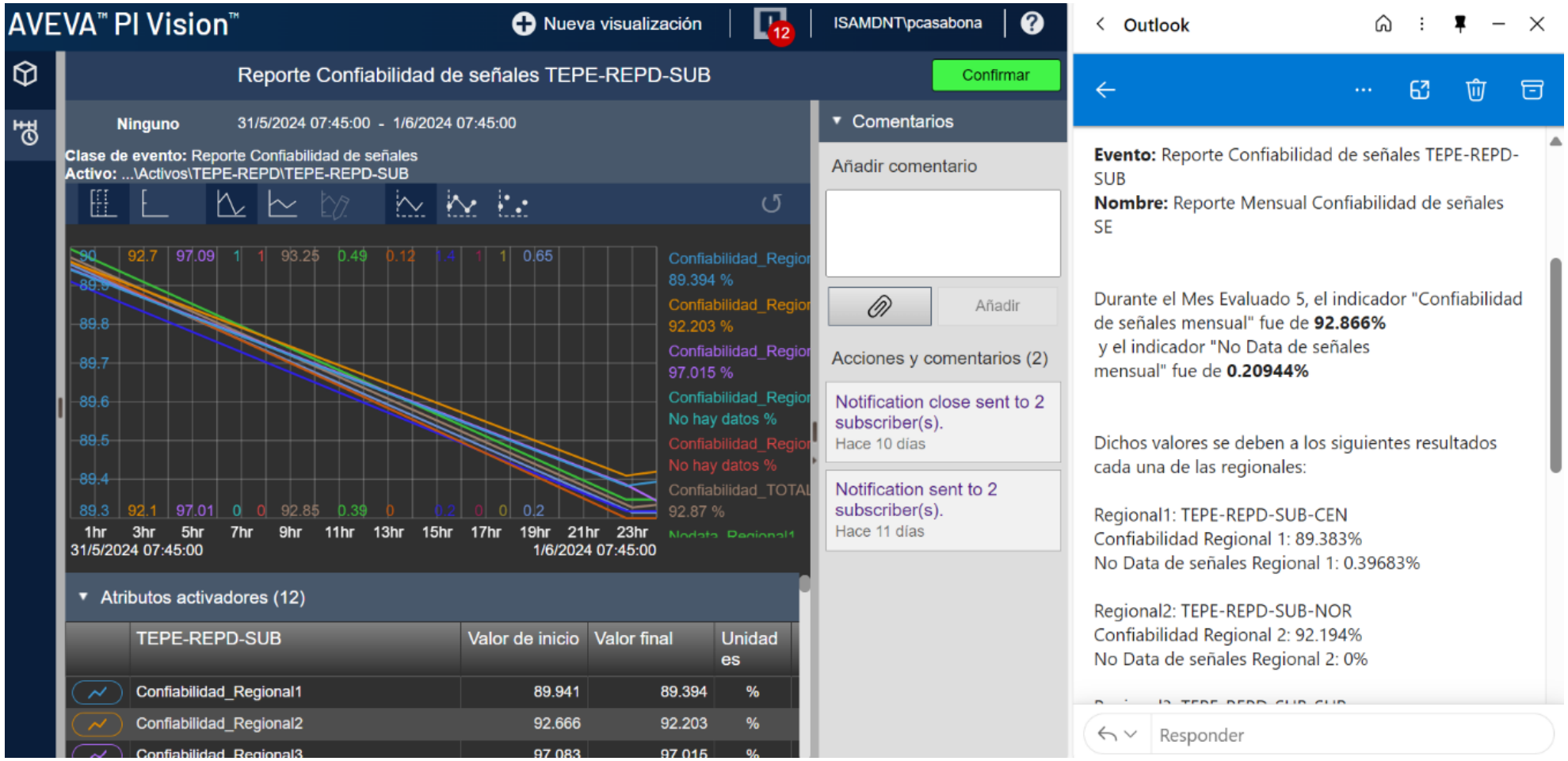
Bit 1: Q Questionable
Bit 3: # Not Updated
Bit 4: X Not Reasonable
Bit 5: M Manual

The status codes identified as recurrent were the following:.

State	State Name
0	OK
1	Q Questionable
4	Not Updated
5	Not Updated Q Questionable
8	X Not Reasonable
12	X Not Reasonable # Not Updated
16	M Manual
17	M Manual Q Questionable
20	M Manual # Not Updated
64	E Error Estimation
65	E Error Estimation Q Questionable
68	E Error Estimation # Not Updated
69	E Error Estimacion # Not Updated Q Questionable
80	E Error Estimation M Manual
81	E Error Estimation M Manual Q Questionable
84	E Error Estimation M Manual Not Updated
132	F Frozen # Not Updated
	No Data

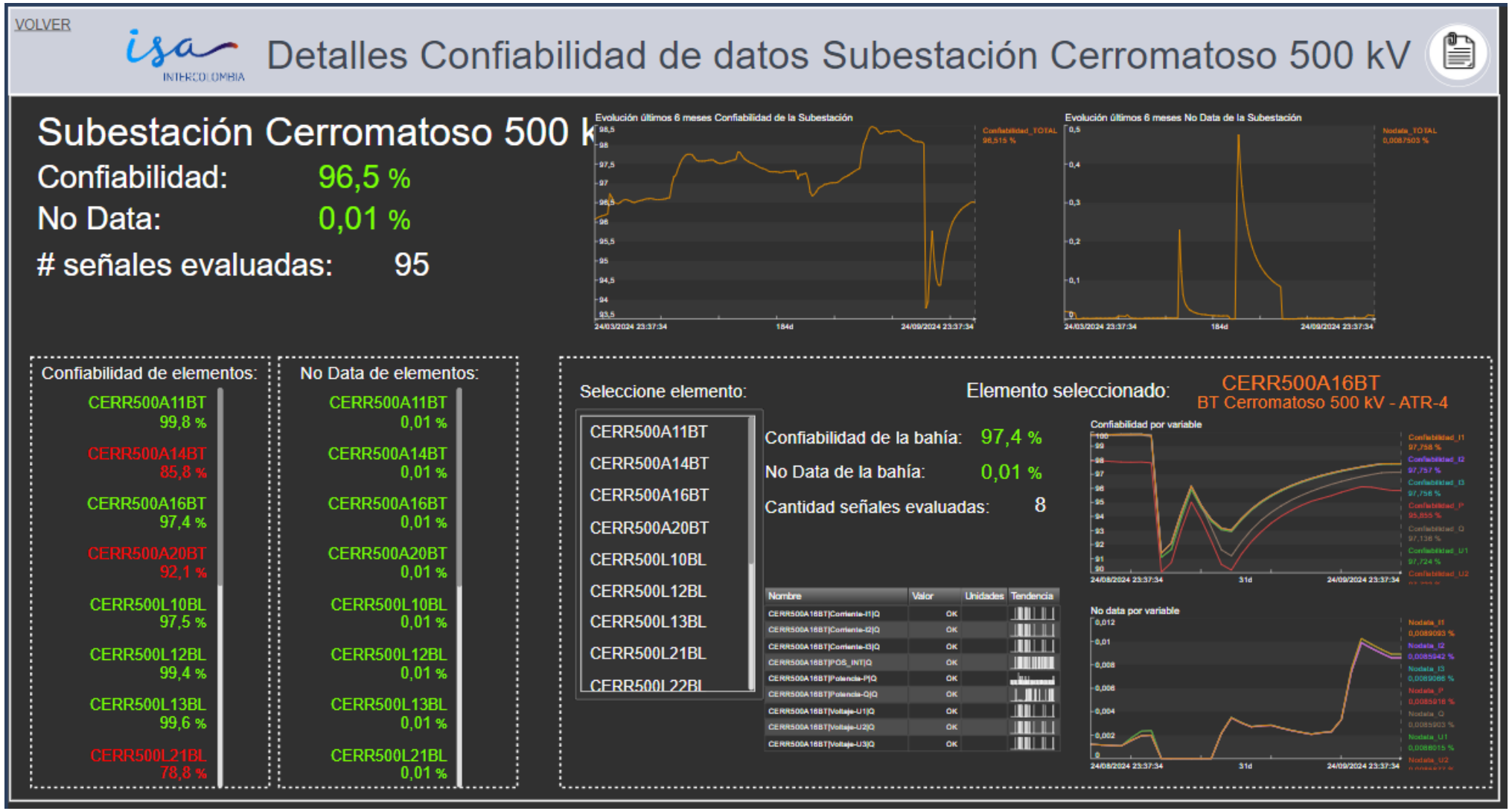


Indicator Notifications



PI Vision Dashboard – Data Reliability Indicator

PI Vision Dashboard –Data Reliability Detail (Substation)



Conclusion

- 12069 of ISA's signals are monitored by this implementation
- Improves the reliability of monitoring and optimizes the management and maintenance of assets, achieving a more efficient and safe operation of the power system
- Early notification of potential problems, facilitating a quick response from the maintenance team and reducing operational impact
- The model provides results on the reliability of supervision, covering not only each substation but also each zone or region, as well as an overall value for each company in the group. This makes it easy to identify the elements or substations where the quality of supervision is inadequate, thus optimizing the implementation of corrective actions and contributing to operational safety.
- The goal of developing the following steps is to enhance the analytical model, enabling a comprehensive evaluation of the reliability in the supervision of all electrical signals from ISA and its companies.

Questions?

Please wait for the microphone.

State your name and company.

Please remember to…

Navigate to this session in the mobile app to complete the survey.

Thank you!

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Over 20,000 enterprises in over 100 countries rely on AVEVA to help them deliver life's essentials: safe and reliable energy, food, medicines, infrastructure and more. By connecting people with trusted information and AI-enriched insights, AVEVA enables teams to engineer efficiently and optimize operations, driving growth and sustainability.

Named as one of the world's most innovative companies, AVEVA supports customers with open solutions and the expertise of more than 6,400 employees, 5,000 partners and 5,700 certified developers. The company is headquartered in Cambridge, UK.

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