Vale implements a global operations data infrastructure to drive transformation
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What we will see TODAY

1. Introduction to Vale
2. The REdiscover PIMS project
3. Technical Implementation
4. Use cases
1. Introduction to Vale
We are Vale

• We exist to improve life and transform the future Together.
• A **global** mining company.
• A company with **strategic** assets.
• One of the world’s largest producers of iron ore, pellets and nickel.

Mining is the **basis of a chain** that contributes to the **development** of society. It is present in products that are essential to **people’s well-being**.

<table>
<thead>
<tr>
<th>Take children to school</th>
<th>Bring energy to your home</th>
<th>Exercise your body and mind</th>
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<tbody>
<tr>
<td>Help develop medical devices</td>
<td>Relieve the summer heat</td>
<td>Keep us connected and entertained</td>
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Our presence in operations

+20 Open-cast mines
+15 Underground mines
13 Pelletizing plants
2 Railroads
6 Ports of operation

- Iron
- Nickel
- Manganese
- Copper
- Coal
Plant information management systems at Vale (PIMS)

First AVEVA PI System: 1998

82 OPERATIONAL UNITS

2016

PIMS at all sites, not all PI System based

29 instances
PIMS transformation plan

1998
First AVEVA PI System

2016
PIMS at all sites, not all PI System based

7 instances

Carajás Ferrosos
Carajás MB
Canadá
Itabira
Malásia
Omã
Vitória

82 OPERATIONAL UNITS
Data democratization at Vale delivers efficiency gains and reductions in costs and time

**Challenge**

- Implement a robust and secure data infrastructure providing high-quality, real-time data for users across 80 global operating units.
- Use standardization of data solutions across the global enterprise to ensure data quality and accelerate data-driven decision making.

**Solution**

- Centralization and standardization of Vale’s global Plant Information Management Systems (PIMS) based on AVEVA™ PI System™ and its off-the-shelf native interfaces to collect data at the source.

**Results**

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2. The REdiscover PIMS project (Plant information management system)
Our Mission
To be Vale’s master source of temporal data
REdiscover Program Structure

- CUSTOMIZATIONS
- CLIENT TOOLS
- HARBOR
- INFRASTRUCTURE
- INTERNATIONAL

- IRON ORE BENEFICIATION
- PELLETIZING
- POLICIES & STANDARDS
- RAILWAY
REdiscover Program Structure

- ARCHITECTURE
- AUTOMATION
- BUSINESS SOLUTIONS
- END USERS
- HOSTING
- NETWORK
- OPERATIONS / BUSINESS
- SAFETY

Departments involved
REdiscover Program Structure

- Hybrid Project (Agile and Waterfall)
- Devops
- +100 People
- Change of roadmap (location of operation)
- Execution time (3 years): expiration date of previous PIMS
- Architecture, infrastructure, and security changes happening in the enterprise
- Change in delivery strategy
- Treating the unknown

- Lack of availability of change agents
- User engagement
- Budget
Journey of AVEVA PI System at Vale

1998

2020

2023

IT’S OFFICIAL!!!
We are 100% PI System!
Our numbers!

- Temporal data stored: +25 TB
- Sites: +80
- Users: 10,432
- Users Screens: 2,608
- Reports: 90+
- Users Trained Last Year: 550
- Tags Collected: 830,000
- Tags Calculated: 89,864
- Native Integration: +39
- Customized Integrations: +56
- Application Servers: 43
- Collection Server Instances: 97 / 173
3. Technical Implementation
REdiscover PIMS

VALE’s PI SYSTEM

Greater Robustness
Greater Scalability
More Information
Innovation
Better Governance
More Security
Greater Robustness
Greater robustness with high availability

- Windows Failover Cluster
- Network Load Balance
- PI Collective
- SQL AlwaysOn
- PI Interfaces
- Backup

<table>
<thead>
<tr>
<th>AVEVA PI System</th>
<th>1 Pair</th>
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<tbody>
<tr>
<td>AVEVA PI Server data archive</td>
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<tr>
<td>AVEVA PI Server asset framework</td>
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<tr>
<td>AVEVA PI Vision</td>
<td></td>
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<td>PI Web API</td>
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<td>AVEVA PI Server analytics, notifications</td>
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<td>SQL Server</td>
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<td>PI-to-PI</td>
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PI System Vitória
HIGH AVAILABILITY INFRASTRUCTURE
Greater Scalability

REdiscover PIMS

VALE’s PI SYSTEM
Greater scalability leveraging native integrations

- Native Solutions
  - 82 Native Solutions
  - 24 ROLLOUTS

- Native Integration Using PI Web API
  - 10 ROLLOUTS

- Solutions and integrations with various systems:
  - Laboratory Systems
  - Security Systems
  - Power Systems
  - Environmental Systems
REdiscover PIMS

VALE’s PI SYSTEM

More Security

Greater Robustness

Greater Scalability

Better Governance

More Information

Innovation
More security with layered architecture

• Standardized control access with domain groups related in one-to-one identities in AVEVA PI System and WIS model.

• Use of PI Mapping instead of PI Trust

• Addressed vulnerabilities and risk controls;

• Technological upgrade of 40 collection servers – using regional HCIs with high Availability and redundancy;

• Placement of PI Servers infrastructure in Central/Regional IDMZs bringing adherence to the target architecture
Better Governance

REdiscover PIMS

VALE’s PI SYSTEM
Better governance through central control

Centralized environment, centralized Governance.

01 Centrillized enviroment with system monitoring of critical assets and operations
02 Centrillized Business Rules Applied via AVEVA PI Server Asset Framework
03 Automatic notifications via AVEVA PI Server
04 Specific tools monitor AVEVA PI System
05 AVEVA PI Server analysis templates
06 Windows Integrated Security.

Iron Ore
Base Metals
Malaysia
Oman

Vitória
QA
More Information
Democratization of information with new formats and means of information delivery – enabling large programs at Vale.

Process tags were sanitized, standardized and created.

Historical data was migrated for 5 YEARS.

PI Vision Screens: +2.4K

Excel Reports: +90

Analysis: +82K

Calculated Tags: +89K

AND MUCH MORE TO COME

16 Plants |
| +100 PI Servers |

Monitored using PI System

Automatic opening of incidents by PIMS Support time and other engineering queues.

MORE INFORMATION
INNOVATION

The VPI (Vale PIMS Integrator), which is a high-performance cloud solution based on new technologies that provides a link between the PI System and other external systems and is responsible for hosting several custom solutions or integrations, and, in this way, providing business data to the desired destination.

CUSTOM INTEGRATIONS BASED VPI

➢ MES Systems
➢ Hourmeters
➢ ERP Systems
➢ EventHub
➢ Car loading

17 CUSTOM INTEGRATIONS BASED VPI

25 ROLLOUTS
4. Use cases
Use Case 1: Monitoring critical process variables in Carajás

**CHALLENGE**
- Managing multiple screens
- Difficulty accessing information.
- Difficulty identifying variables outside control limits.

**SOLUTION**
- Create single screen in AVEVA PI Vision showing all key process variables.

**RESULTS**
- Easy access to information.
- Consolidation of information.
- Faster identification of deviations.
Use Case 2: Monitoring Serra Sul’s process variables and performance

**CHALLENGE**
- Monitor the evolution of production by circuit in real time (volume, rates, etc.).

**SOLUTION**
- Create dashboard in AVEVA PI Vision with trend graphs for each production unit in real time.

**RESULTS**
- Easy access to information.
- Faster decision making in the event of an operational deviation.
Monitor the evolution of production by circuit in real time (volume, rates, etc.).

Challenge: Create dashboard in AVEVA PI Vision with trend graphs for each production unit in real time.

Solution: Easy access to information. Faster decision making in the event of an operational deviation.

Results: Use Case 2: Monitoring Serra Sul's process variables and performance.
Data democratization at Vale delivers efficiency gains and reductions in costs and time

**Challenge**

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**Solution**

- Centralization and standardization of Vale’s global Plant Information Management Systems (PIMS) based on AVEVA™ PI System™ and its off-the-shelf native interfaces to collect data at the source.

**Results**

- Democratization of data access across the enterprise.
- Increased availability and quality of operations data.
- Better governance, scalability, security and support for innovation.
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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