
AVEVAWORLD
PARIS

Innovative lithium extraction with AVEVA PI System and AVEVA Production Management

16/10/2024

eramet

Agenda

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Our presenters

Bernard Lafrance

Senior Industrial IT engineer

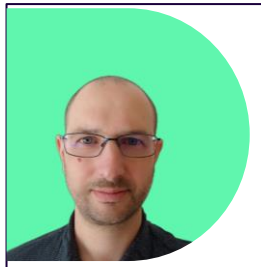
Bernard.Lafrance@bba.ca

Bernard has extensive experience in industrial computing. Over the years, he has built a robust expertise in MES (Manufacturing Execution Systems), data historians, quality systems, and system integration.

Areas of expertise :

- MES Platforms
- Historians and Databases
- System Integration
- Dashboards and Data Visualization
- Quality Systems (LIMS)

23+
years of experience



Pierre-Mael Fontaine

Plant Control System Product Line Manager

pierre-mael.fontaine@eramet.com

Pierre-Mael, in Eramet group for 13 years. Industrial IT developer, data engineer and manager. Deployed Historian, MES, APS and custom apps in different workshops.

Areas of expertise :

- Project management
- Industrial architecture
- Historians and Databases
- Data analysis

16+
years of experience

40+ years of innovation
190 partners
1,500+ employees
20 offices across Canada and abroad

Our multidisciplinary team continues to expand across Canada. By setting up shop near client operations, we can maintain lasting relationships with those clients by remaining mobile and available.

Serving the energy and natural ressources industry

Terrace
Vancouver
Trail
Calgary
Edmonton
Santiago, Chile
Utah, USA

Sudbury
Toronto
Rouyn-Noranda
Val-d'Or
Mont-Tremblant
Concord

Montréal
Mont-Saint-Hilaire
Québec
Boisbriand
Labrador City
Sept-Îles
Saguenay

Introduction

01

Eramet's strategic roadmap based on 2 pillars with strong CSR commitments

Growth in metals needed for global economic development

Continued global growth should sustain demand for :

MANGANESE
(carbon steels for consumer goods)

NICKEL
(stainless steels for consumer goods)

MINERAL SANDS
(pigments for paints, ceramics)

Growth in the metals needed for the energy transition

These markets are growing exponentially, driven by electrification (electric vehicles) and the decarbonization of the global economy.

LITHIUM
In 2024, Eramet will become Europe's leading producer of battery-grade lithium, with the start-up of production at the **Centenario-Ratones** site in Argentina.

BATTERY RECYCLING
Through the **ReLieVe** project, carried out in partnership with Suez, Eramet aims to become a major player in lithium-ion battery recycling in Europe.

Set an example by deploying a responsible approach

COMMITMENT TO PEOPLE

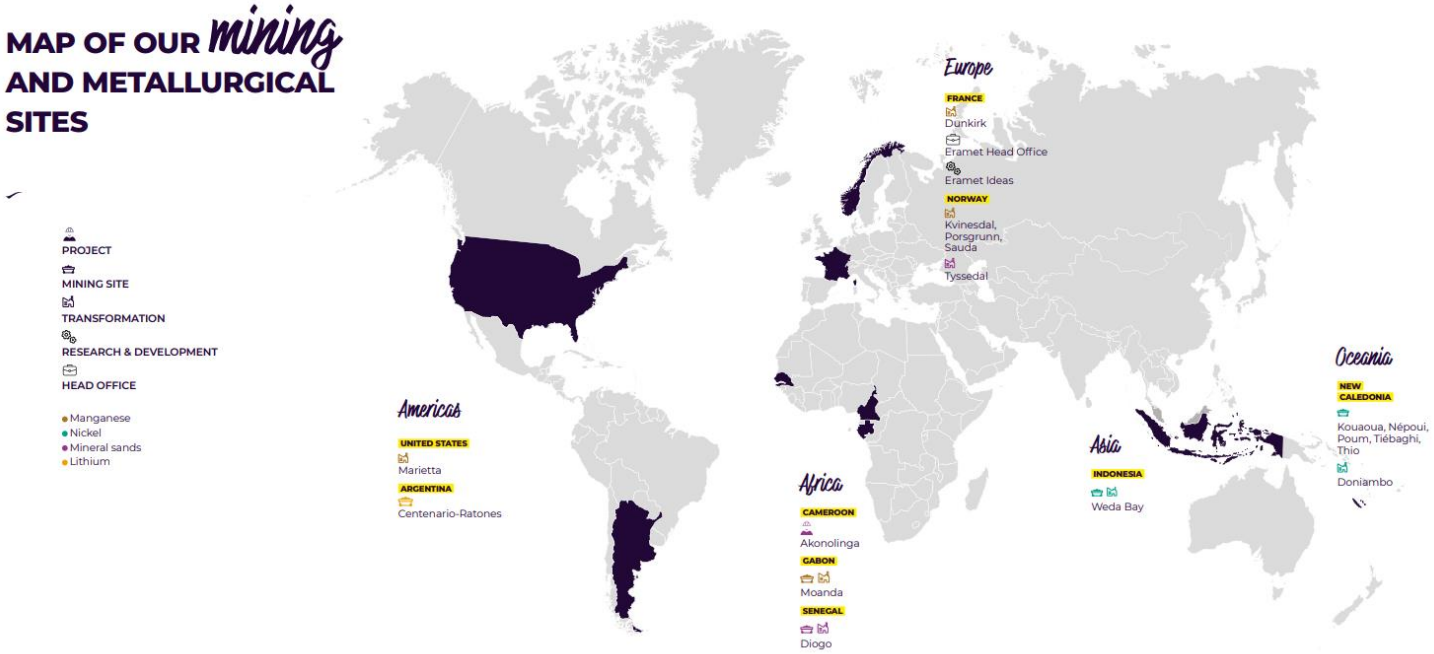
COMMITMENT TO RESPONSIBLE ECONOMY

COMMITMENT TO THE PLANET

Growth enablers: Exploration, Innovation and Digital transformation

Eramet - 2023 Figures

MAP OF OUR *mining* AND METALLURGICAL SITES



Initiative for Responsible Mining Assurance (IRMA)

3,8 Md€
BN **ADJUSTED** TURNOVER

52%
MN

41%
NI

7%
MINERAL SANDS

10 700
EMPLOYEES

1,2
REHABILITATION RATE OF CLEARED SURFACE AREA

1,1[1]
ACCIDENT FREQUENCY RATE FR2

-40%
REDUCTION IN TCO2/TON OUTGOING PRODUCT VS 2018

Eramet – Top-notch sustainability standards

PEOPLE

We look for people aligned with our values and accompany their personal and professional development.

LOCAL DEVELOPMENT

Local employment: 82% Salta & 95% Argentina*.

Development of our local value chain: 263 local suppliers (Salta).

100% Sustainable Projects with an ESG approach target to direct and indirect communities (Puesteros, SRPG, SAC and Salta Province).

ALLIANCES

We work with expert organizations to ensure the sustainability of projects.

HUMAN RIGHTS

Respectful & diverse work environment with our communities, both internal and external.

Committed to the development of a solid due diligence process.

PLANET

Participating in the challenges of the ecological and energy transition.

Strong water recycling rate limiting freshwater consumption.

Significantly lower incidence on hydric balance vs. conventional process.

Robust environmental programme:

- Efficient use of resources
- Participatory Environmental Monitoring
- Photovoltaic generation plant

IRMA Initiative for Responsible Mining Assurance

SUSTAINABLE DEVELOPMENT GOALS

HMS Hacia una Minería Sustentable

UN Global Compact United Nations Global Compact

Genesis of the project

Lithium is a key resource for the **energy transition**

New Lithium mine with disruptive process : better efficiency, lower water resources and less energy required ➔ **need to validate in real condition**

Pilot plant created in 2020

- BBA set up the information system
- Plant is run without SCADA, with AVEVA PI Vision

Curious? **https://centenario.virtual.eramet.com/en/**

Lithium
a world-class deposit in Argentina

Resources & activities

- Extraction of the lithium contained in the brines of the Centenario salar and conversion into battery-grade lithium carbonate, at an altitude of 4,000 m in the province of Salta
- Production to start in Argentina in **November 2024**
- Estimated reserves **> 40 years**, positioned in the **1st quartile of** the lithium industry's cost curve
- Compliance with the most stringent standards for **responsible mining** (IRMA standard), including all environmental, social and governance aspects

An innovative process developed by Eramet

- **10 years** of R&D, **5 years** of continuous management
- **90%** efficiency
- Processing time of **one week**, compared with 18 months for the conventional evaporation process
- **60%** of the water used in the process is recycled.

24 Kt LCE*

ANNUAL PRODUCTION TARGET 2026

15 Mt LCE*

OF DRAINABLE RESOURCES ON SITE

THE BRINE PASSES THROUGH COLUMNS WHERE LITHIUM IS CAPTURED BY AN ALUMINUM-BASED LITHIUM SORBENT ACTING LIKE A "SPONGE" DEVELOPED BY ERAMET AND IFPEN.
IT IS COVERED BY 12 PATENTS.

Business challenges

02

Eramet – Business challenges (Level 3)

Remote location with complicated access
No existing telecommunication

Greenfield and new process :

- Resilient solution
- Operate efficiently
- Track all the activities
- Provide auditable reports for environment

Avoid paper, digital forms and reports

Network limitation in a tough area

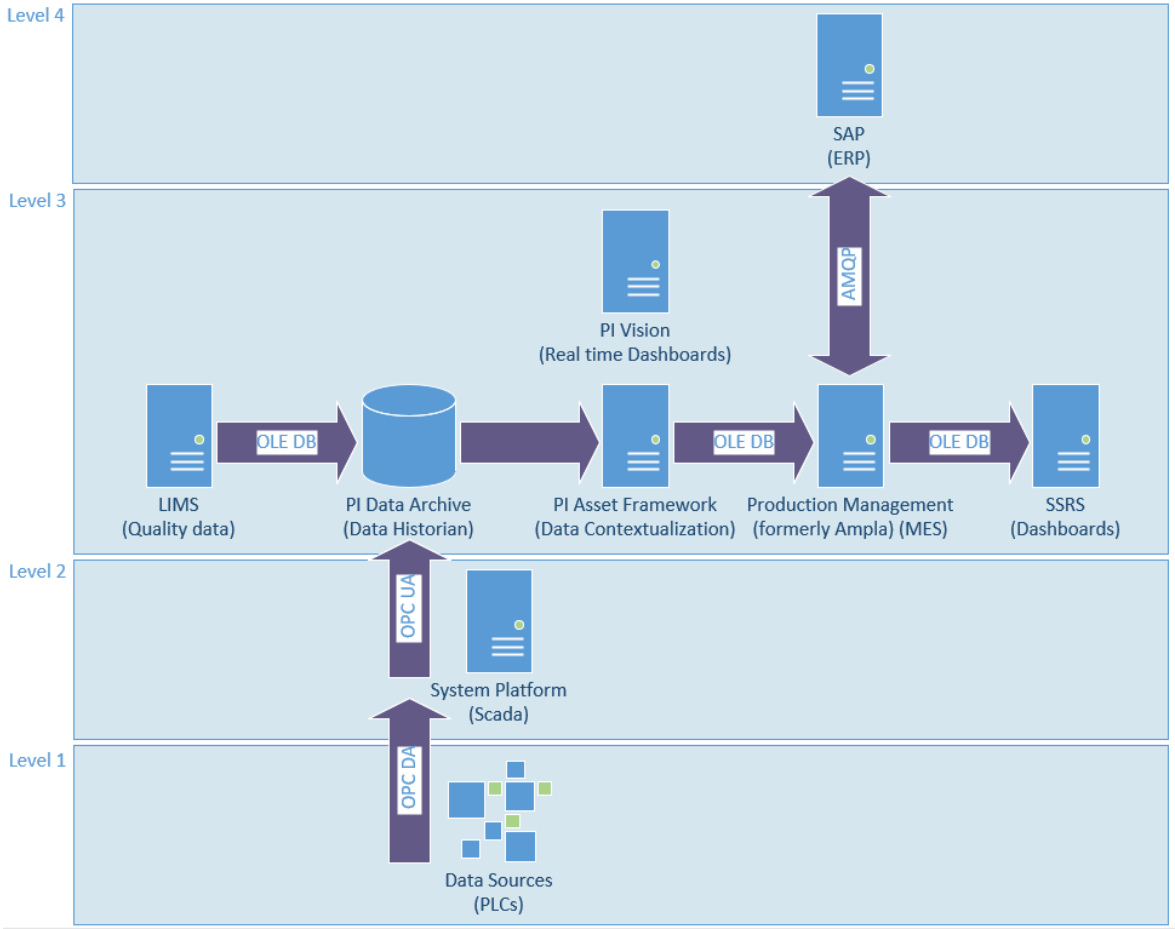
Cybersecurity **is mandatory**

Use latest technologies (OPC UA, HMTL5, etc)

Solution details

03

Solution Details
Solution architecture

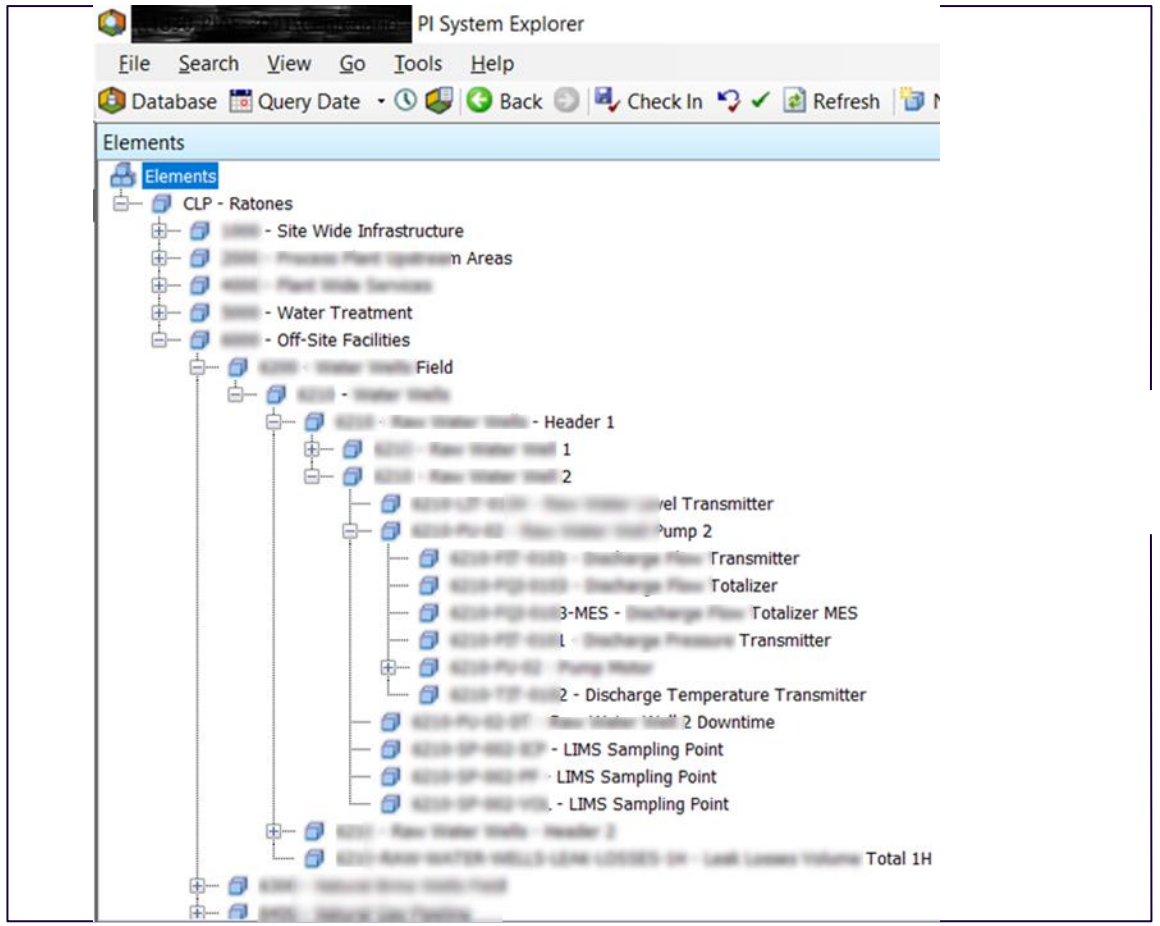


Solution Details

AVEVA PI Server’s asset framework configuration design

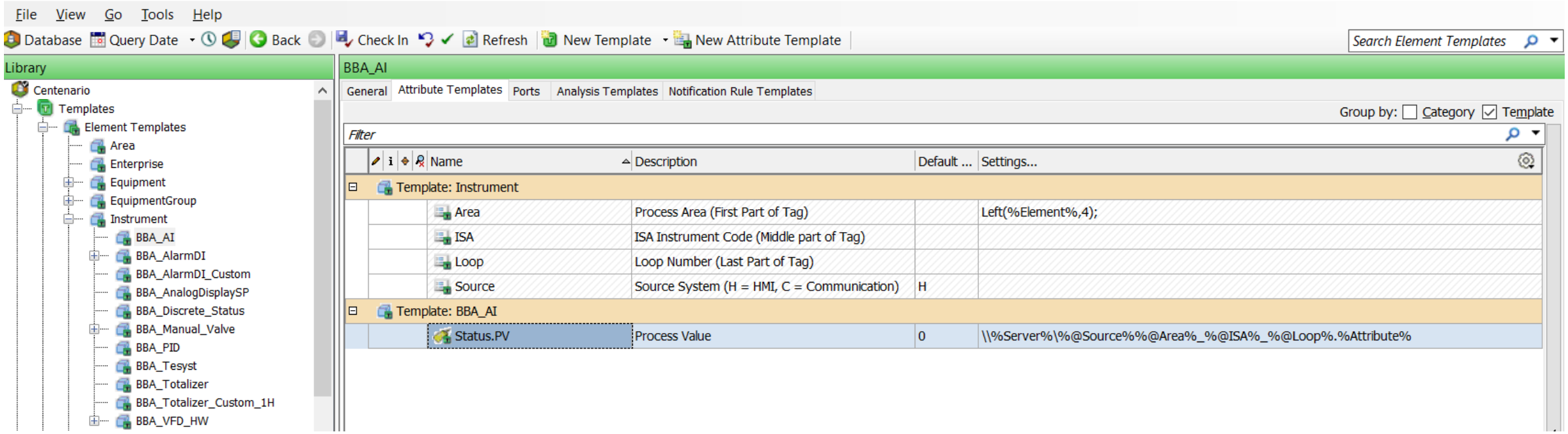
The PI AF hierarchy configuration is based on the SCADA configuration as well as the P&IDs

Scripts have been developed to **automatically generate** the initial version of the PI AF hierarchy from an export of the SCADA tags configuration



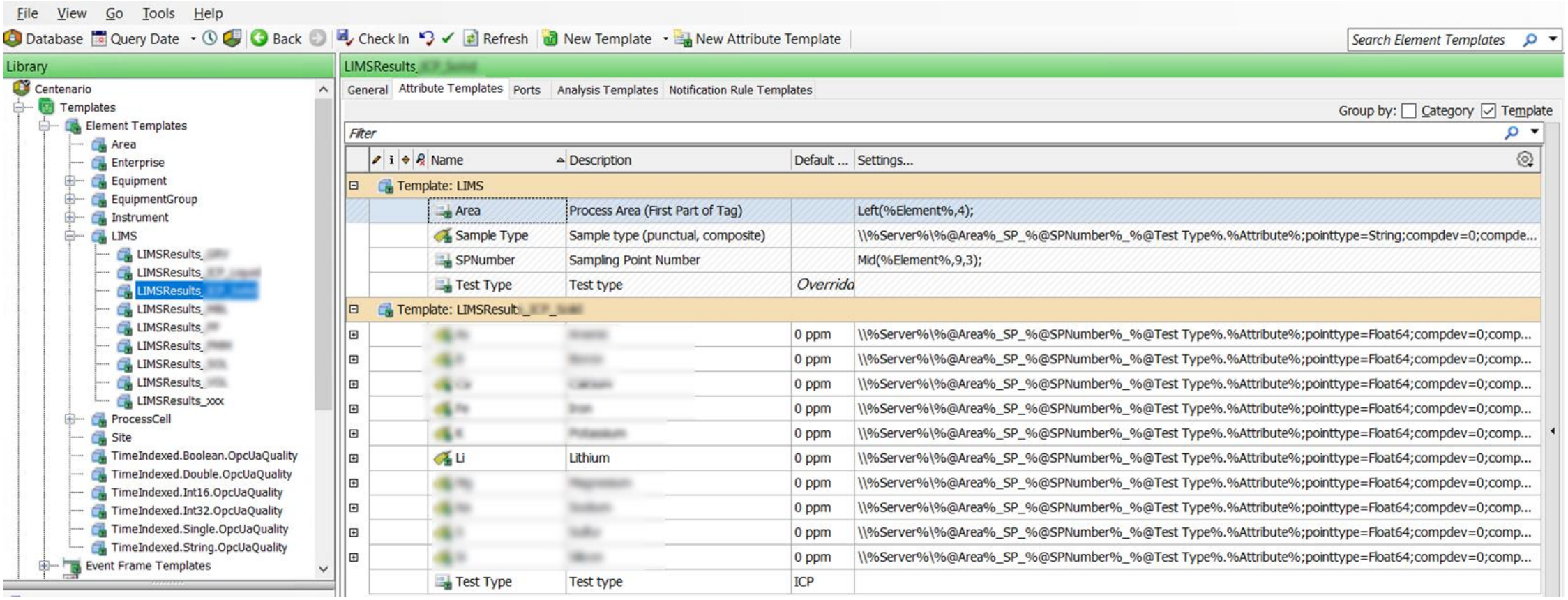
Solution Details
AVEVA PI Server’s asset framework configuration design

Configuration of AF Element Templates for process data is aligned with SCADA object templates



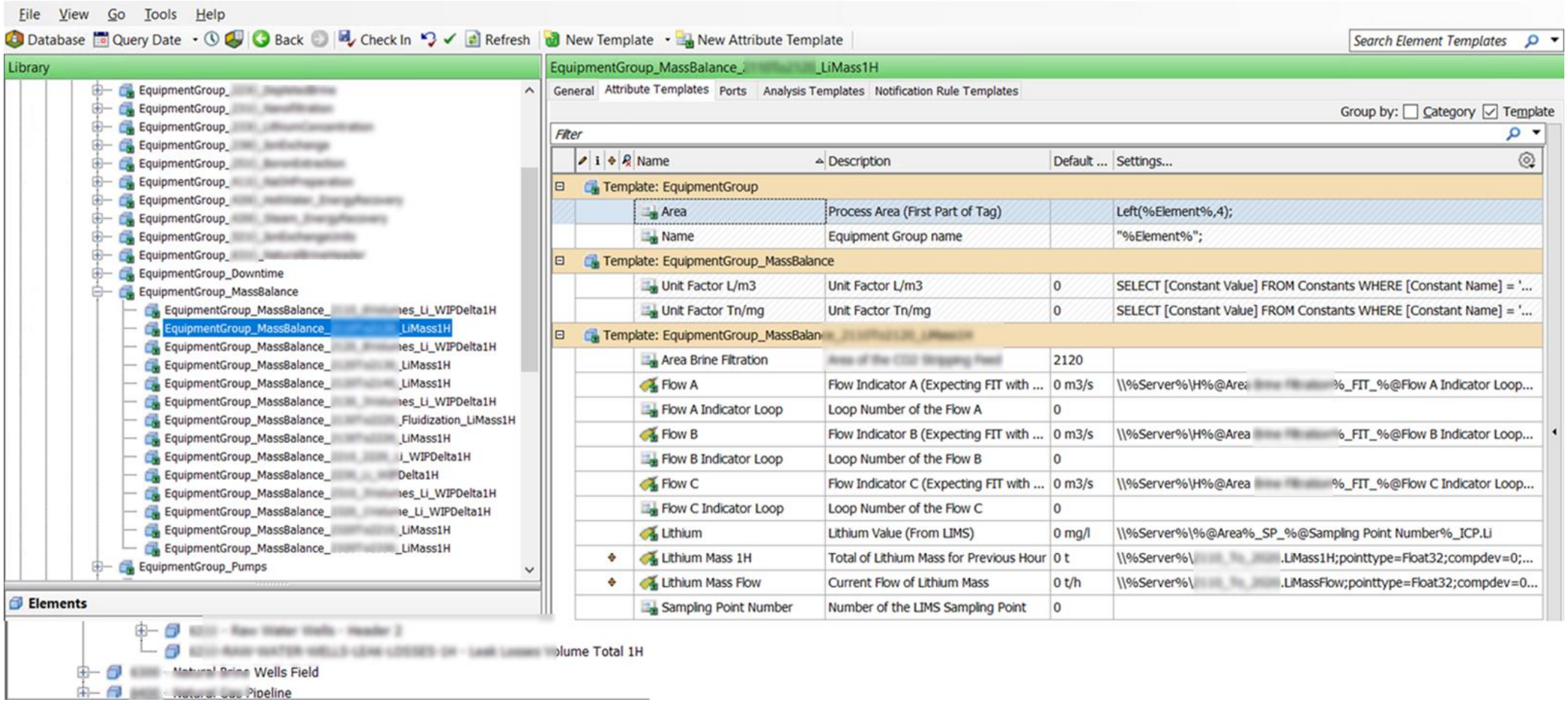
Solution Details
AVEVA PI Server’s asset framework configuration design

Configuration of AF Element Templates for quality data is aligned with LIMS configuration



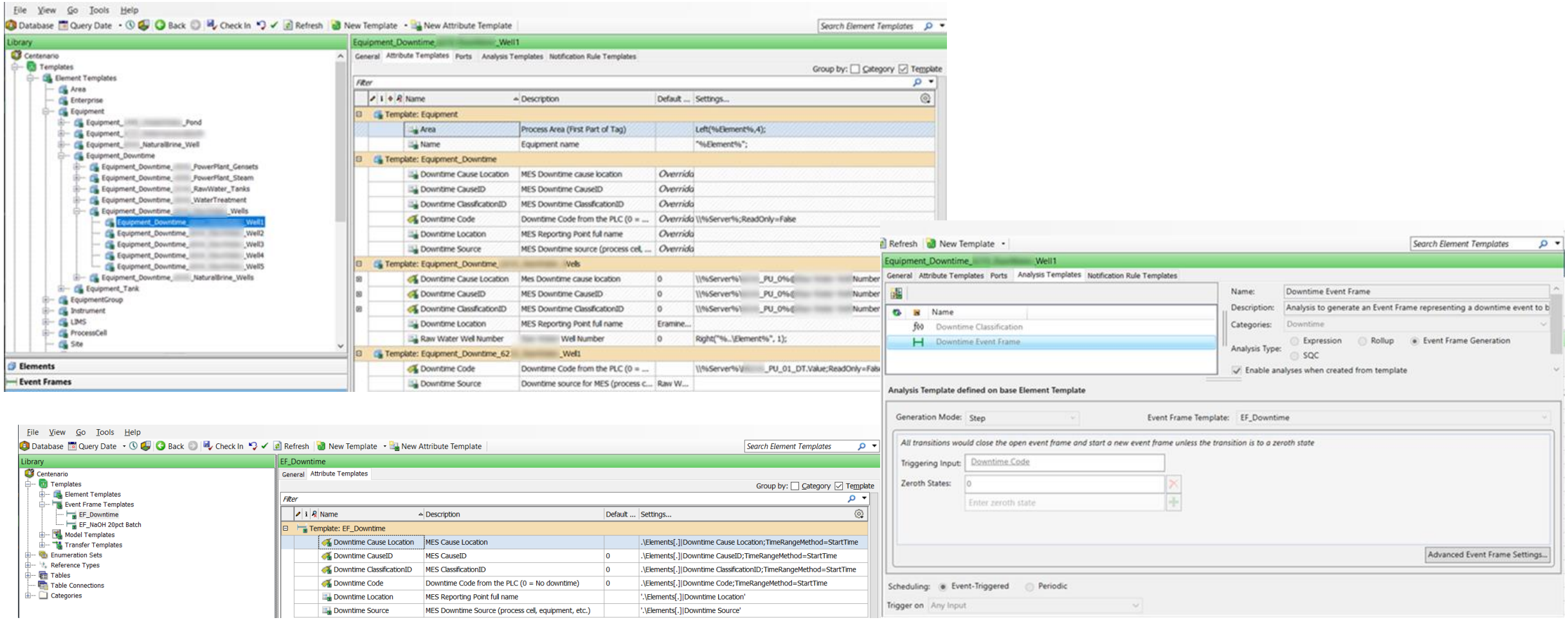
Solution Details
AVEVA PI Server's asset framework configuration design

AF Element Templates are also configured for more complex calculations, such as mass balance calculations



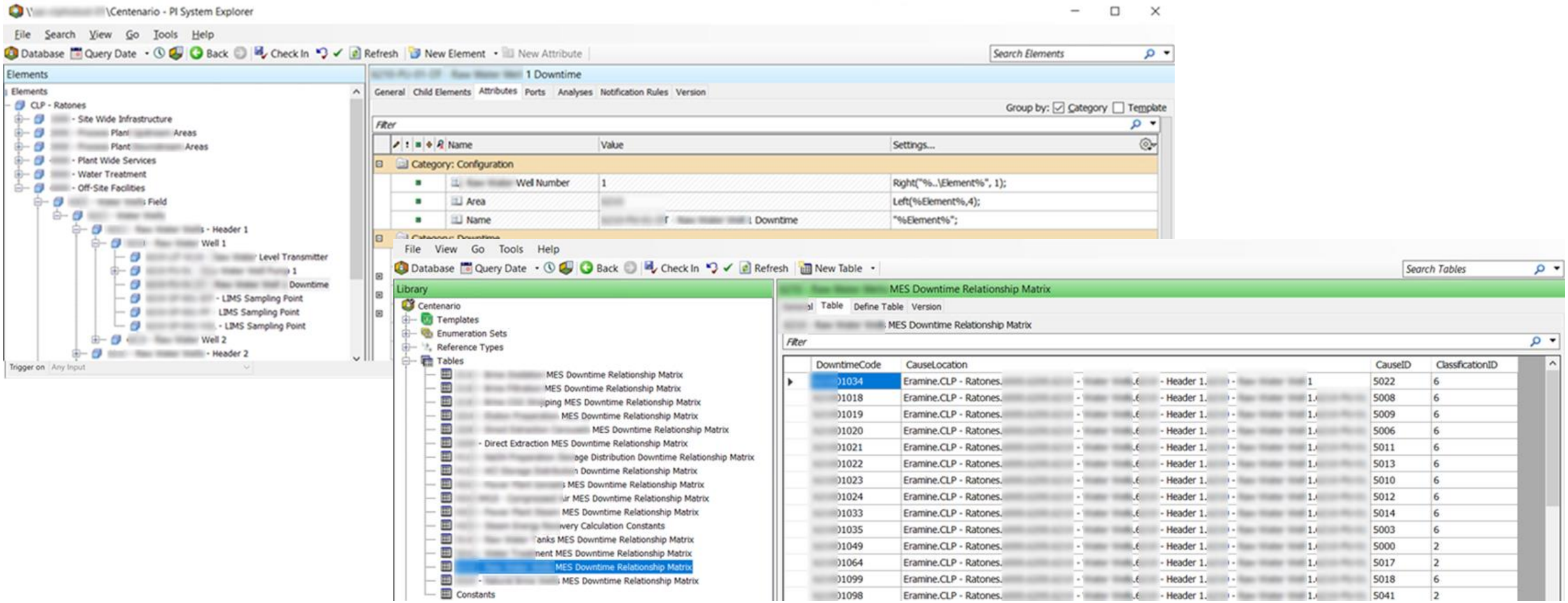
Solution Details
AVEVA PI Server’s asset framework configuration design

AF Element and Event Frame templates are configured in PI AF to capture downtime events



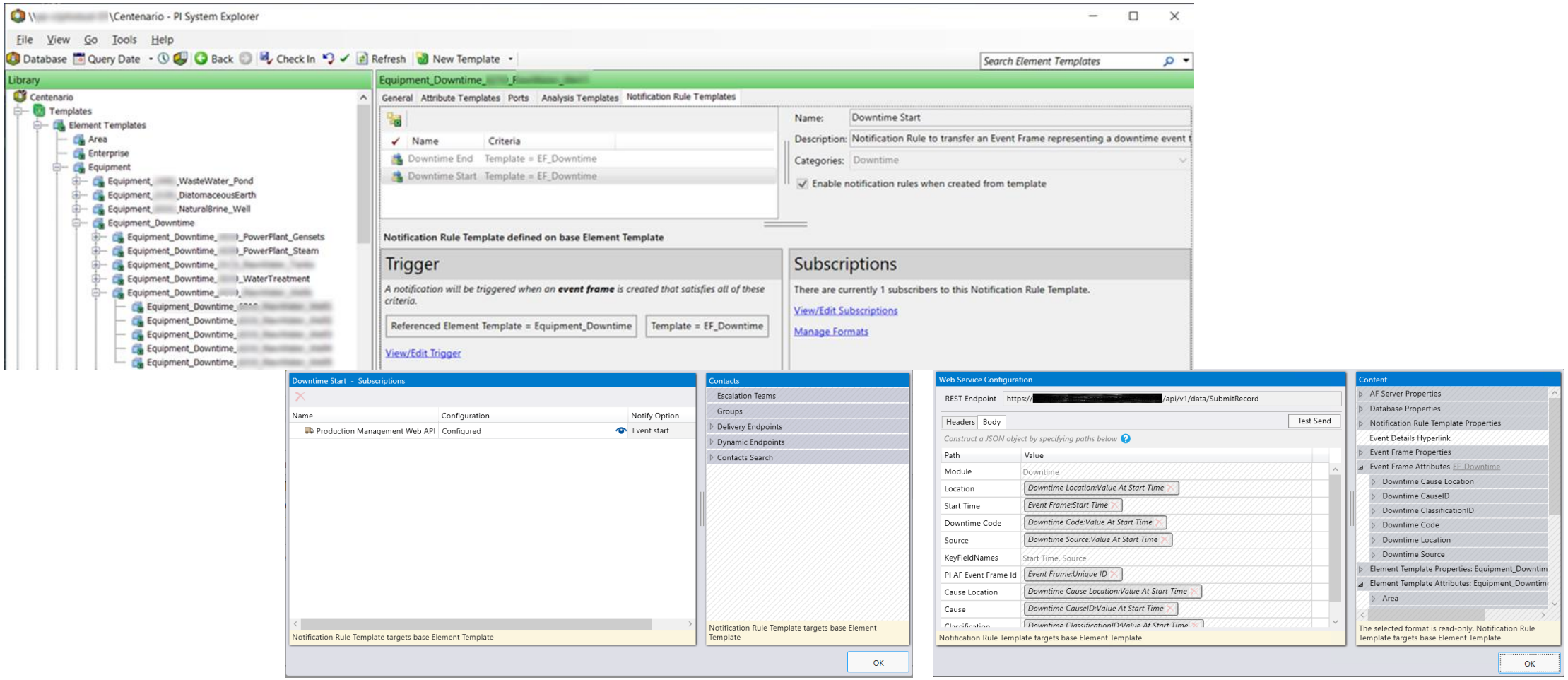
Solution Details
AVEVA PI Server’s asset framework configuration design

Downtime events are automatically classified in PI AF using reason codes received from the PLC and mapping tables configured in PI AF



Solution Details
AVEVA PI Server’s asset framework configuration design

Downtime events captured in PI AF are transferred to the MES using PI Notifications and the MES Web API



Solution Details
MES software evaluation and selection process

MES requirements were defined in collaboration with Eramet

Multiple MES solutions were evaluated against these requirements.

AVEVA Production Management (APM) was selected because:

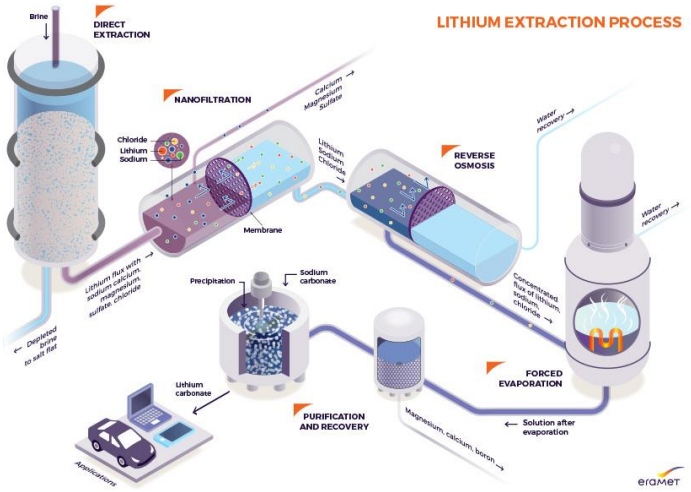
- APM is a **low-code solution** designed to monitor and optimize continuous processes that are deployed at over 400 sites
- APM is an **integrated solution** with multiple built-in connectors to easily connect to various data sources and external systems
- APM is a **modular solution** which is easily scalable
- APM is **easy and fast to configure**
- APM is **easy to maintain**

Solution Details
Using APM to track a non-conventional mining process

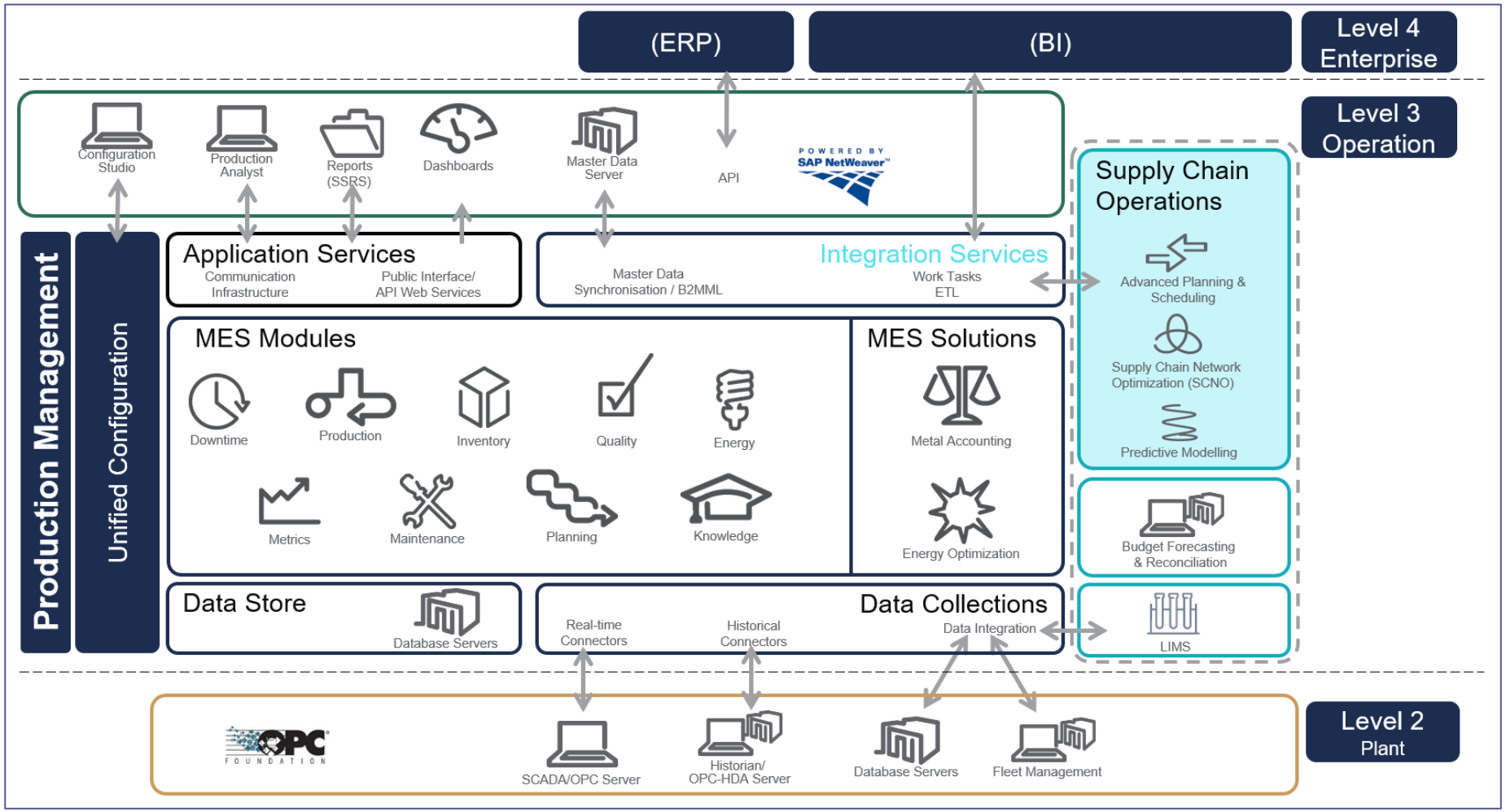
Although APM has been designed to track conventional mining processes...

Mine planning | Mine operations | ROM processing | Ore processing | Mine stockpile | Rail logistics | Port stockpile | Port logistics | Customer

… APM has all the features required to track process downtime, consumables, semi-finished and finished products, inventory, quality and to calculate KPIs.



Solution Details
APM Architecture



Solution Details
APM configuration design

In APM, Reporting Points are configuration items that are used to capture data

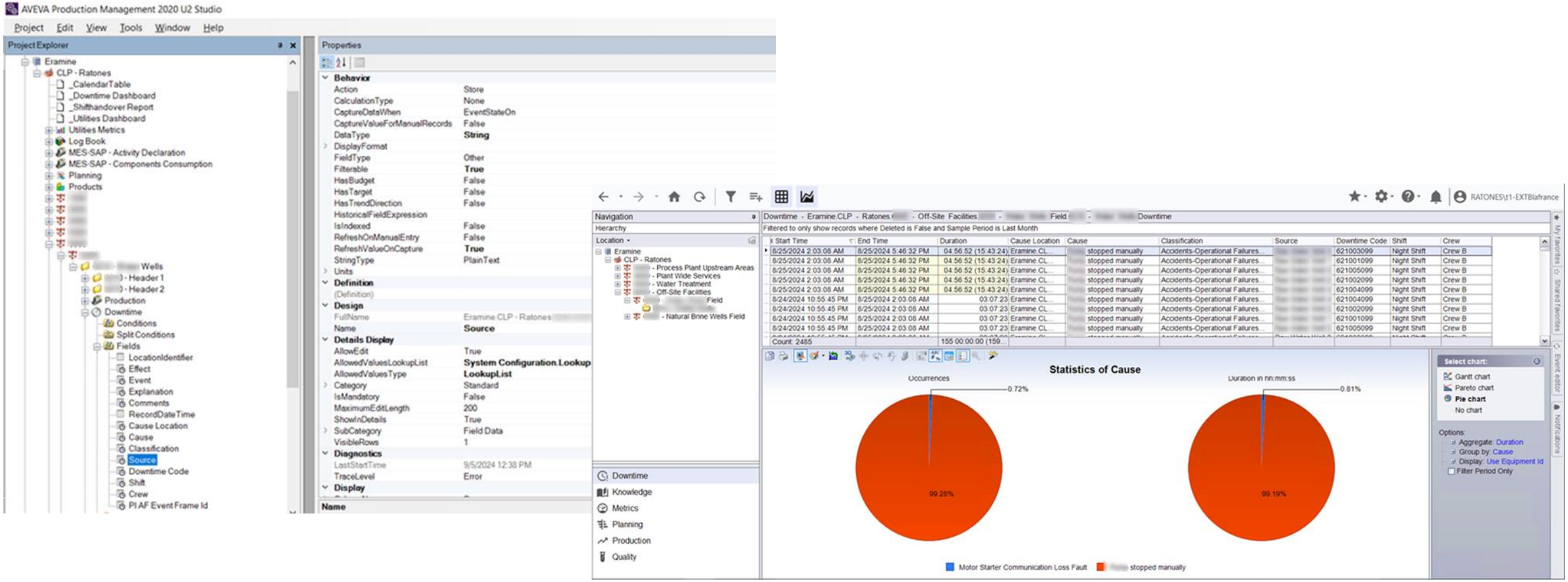
APM licensing model is based mainly on the number of Reporting Points used in the configuration of the solution.

In order to minimize licensing costs, APM configuration was designed to minimize the number of Reporting Points used in the solution:

- We used a **single Reporting Point** to capture data for multiple equipments (downtime, consumption and production data) and sample points (quality data)
- We used **OLE DB integrations in combination with PI SQL Client** to capture production and quality data from PI AF instead of using the standard OPC HDA connector to capture data from PI Data Archive, because it offered more flexibility
- **Downtime data** was captured in PI AF Event Frames and then transferred to APM using PI Notifications and APM Web API

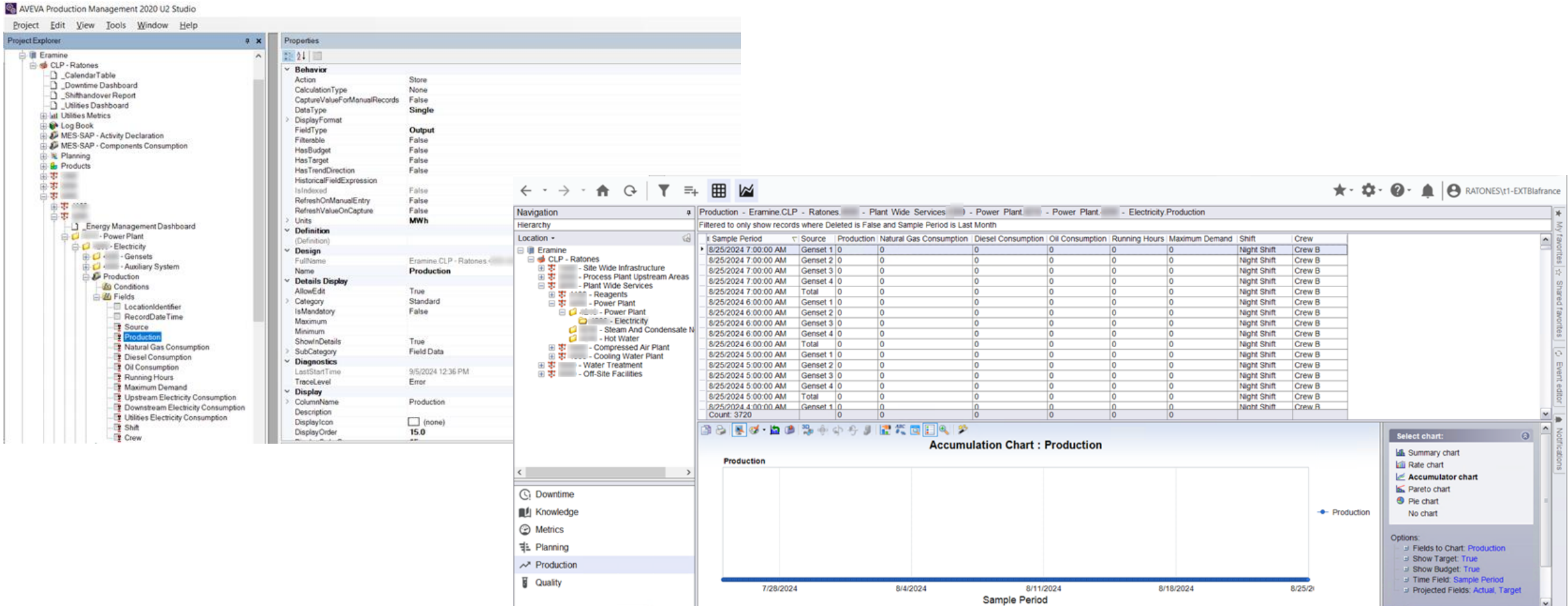
Solution Details
APM configuration design

Downtime Reporting Points are configured to capture Downtime data retrieved from PI AF



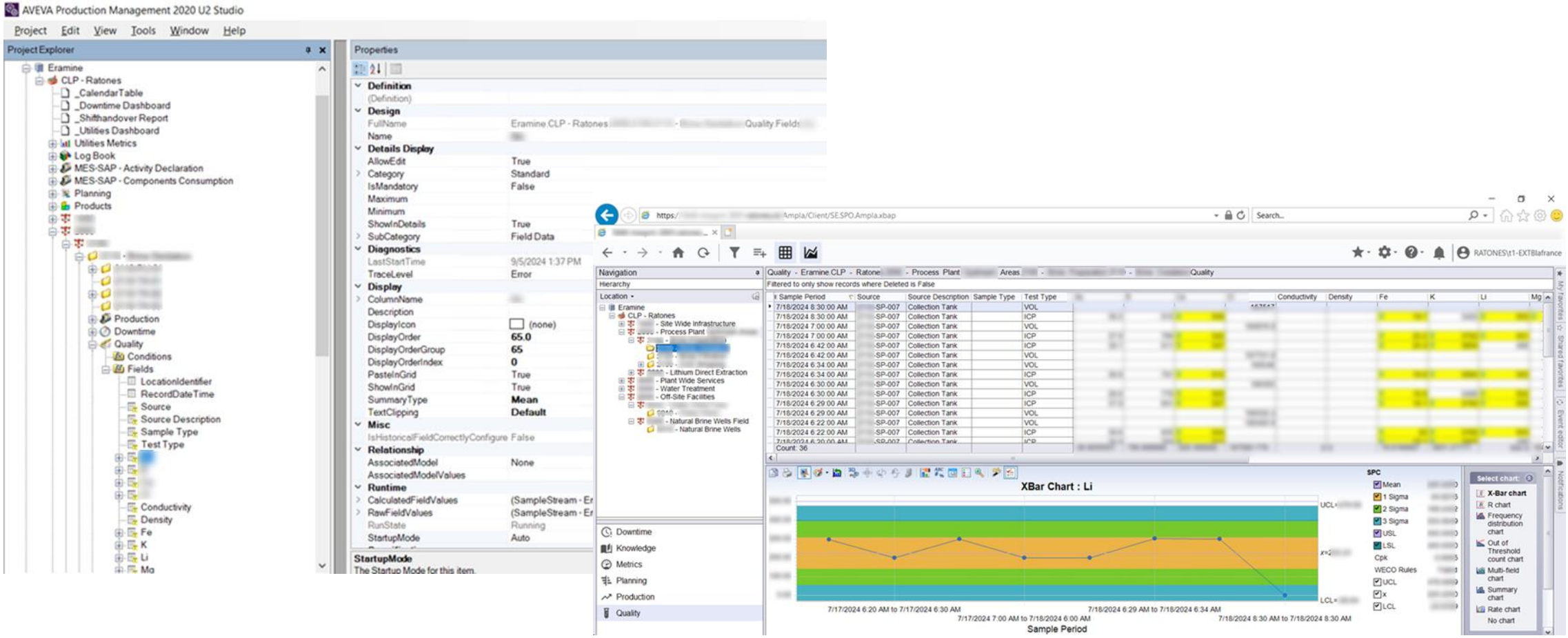
Solution Details
APM configuration design

Production Reporting Points are configured to capture production and consumption data retrieved from PI AF



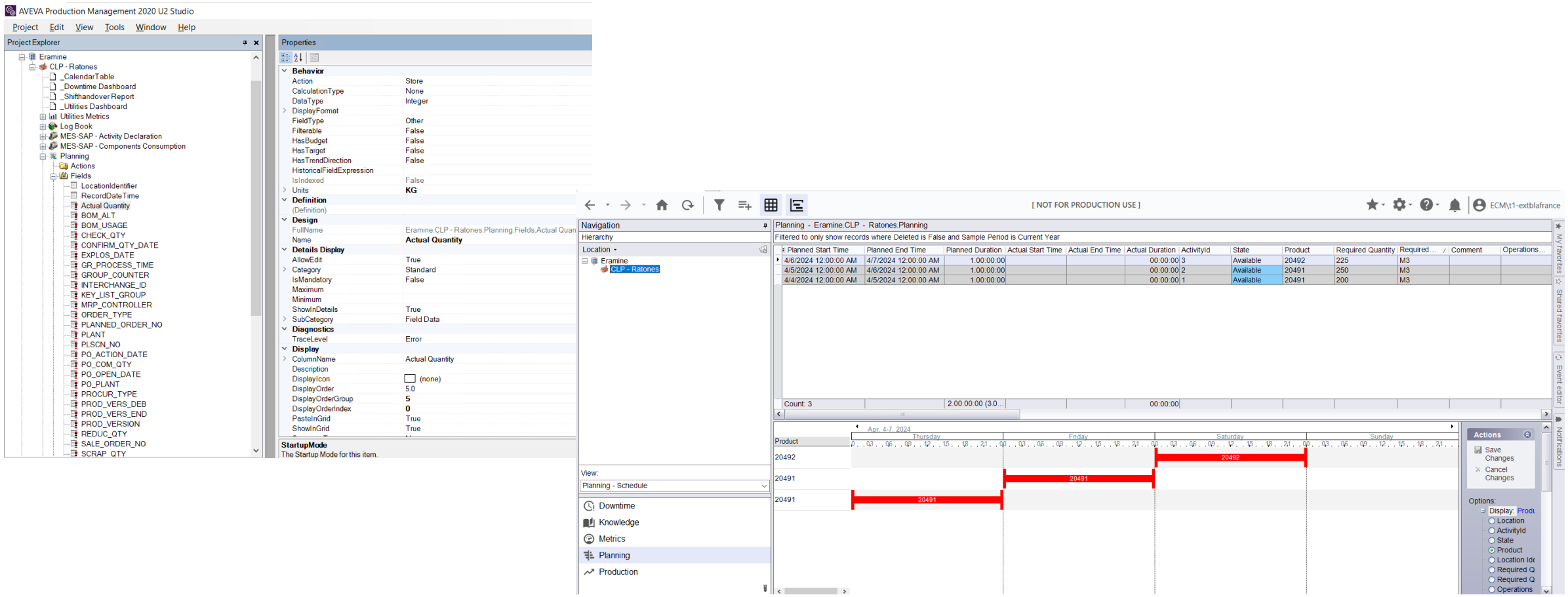
Solution Details
APM configuration design

Quality Reporting Points are configured to capture quality data retrieved from the LIMS



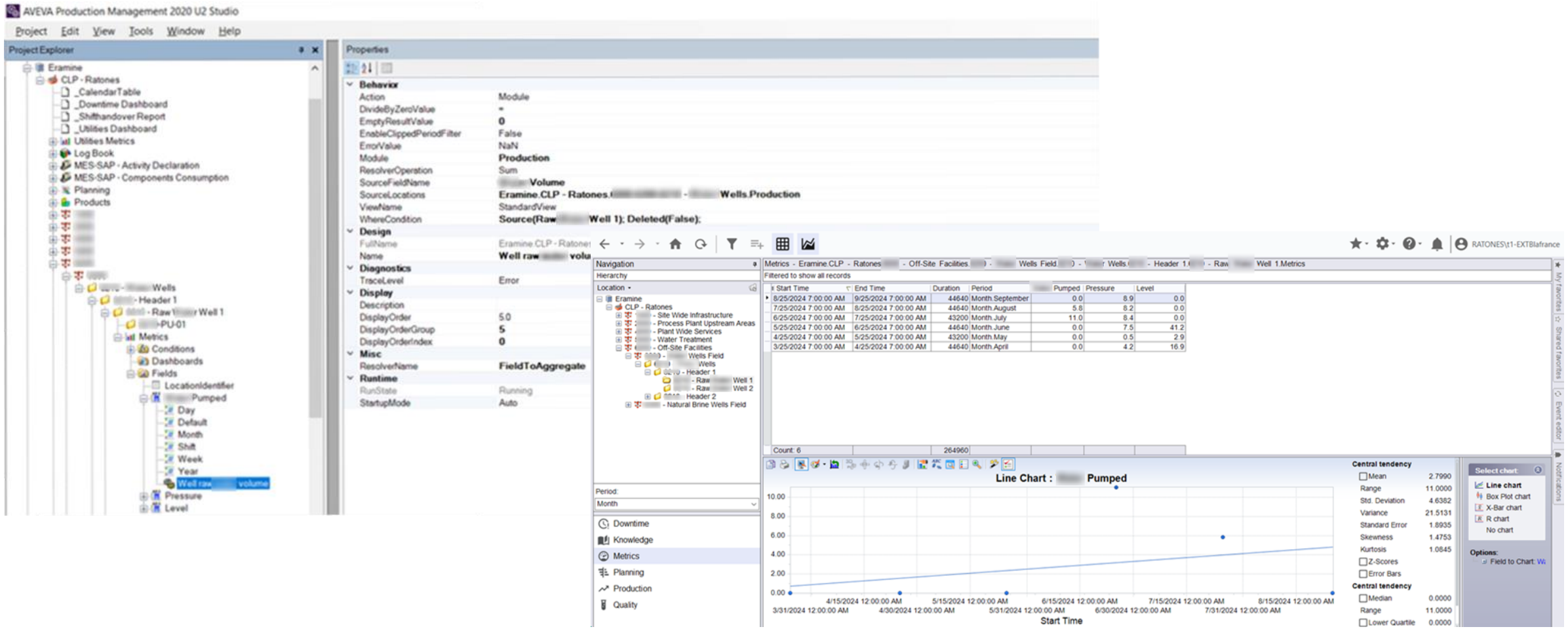
Solution Details
APM configuration design

A Planning Reporting Point is configured to capture planning data received from the ERP



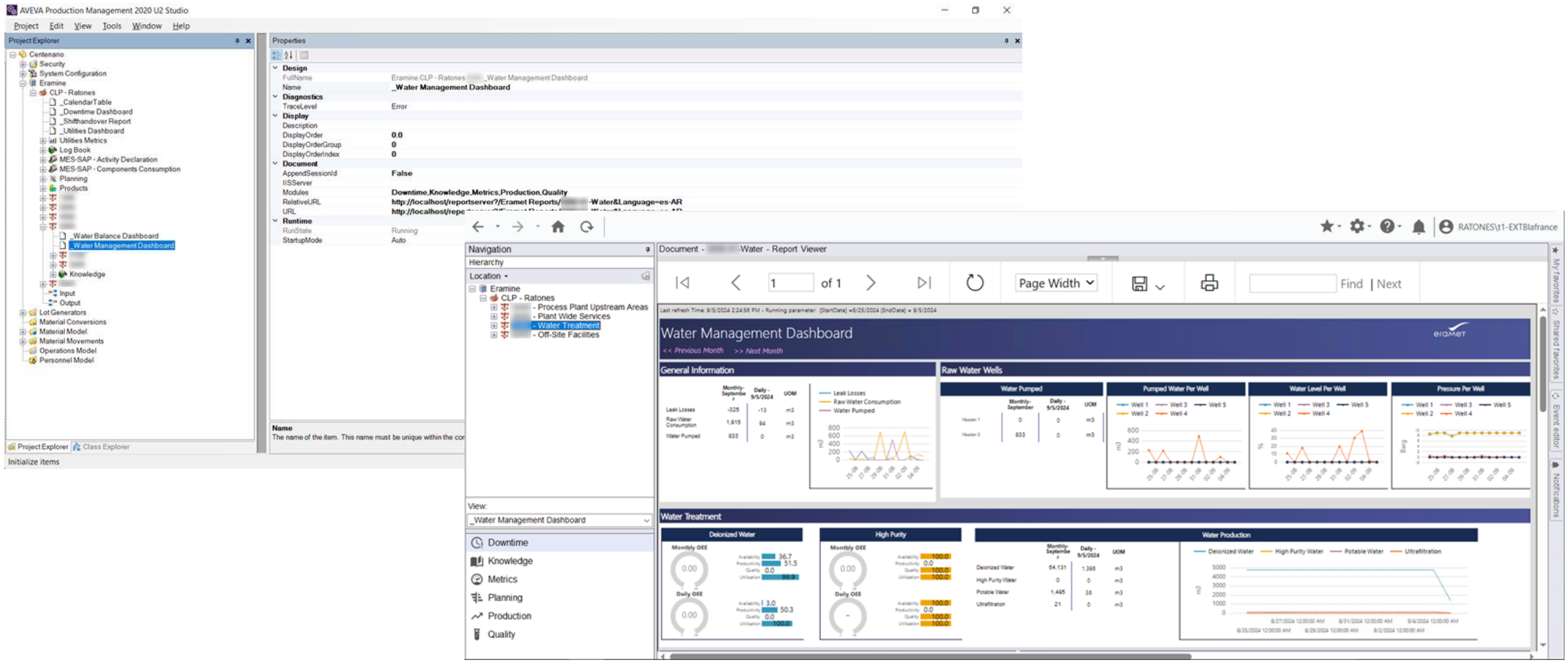
Solution Details
APM configuration design

Metrics Reporting Points are configured to calculate KPIs based on data captured by the other APM modules (downtime, production, quality)



Solution Details
APM configuration design

Dashboards are configured using SSRS and embedded in the APM's client

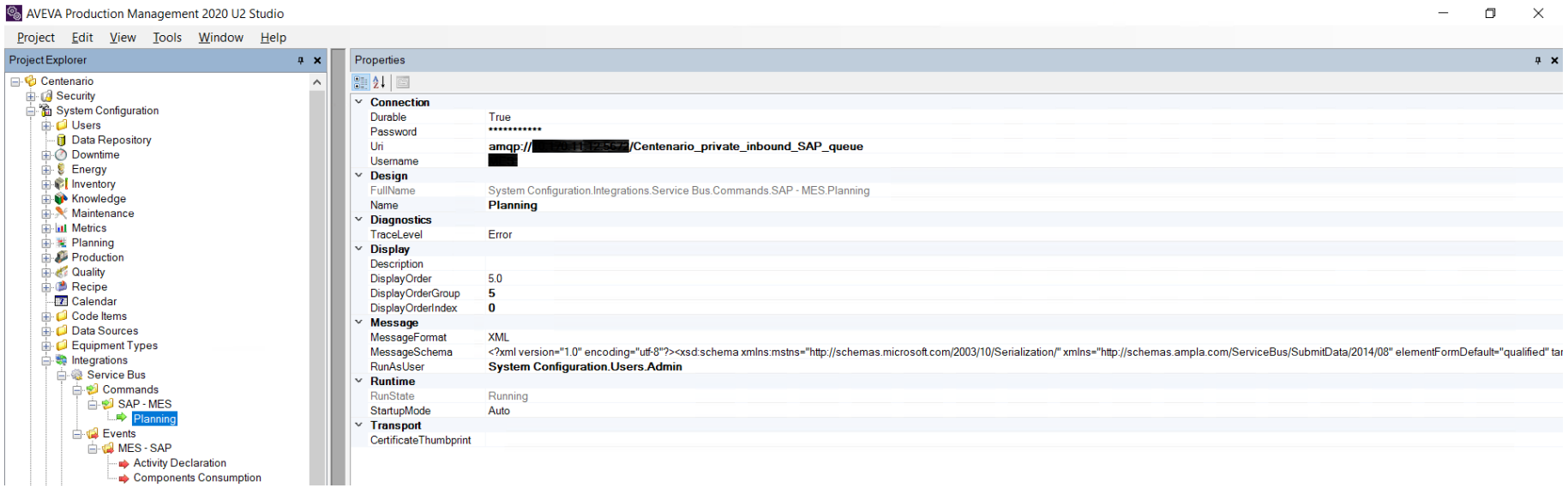


Solution Details
APM configuration design

APM Service Bus uses the Advanced Message Queuing Protocol (AMQP) to exchange messages with message brokers such as RabbitMQ and ActiveMQ

APM Service Bus is used to exchange data between APM and the ERP

- Planning data is transferred from the ERP to APM
- Production and consumption data is transferred from APM to the ERP



Issues and lessons learned

04

Issues and lessons learned

Working in 3 non-identical environments was a challenge (number of VMs, components, security configuration)

- It would have been easier if each environment was configured the same way

Managing the partial migration of the configuration between the different environments was a challenge (configuration was performed in phases)

- DevOps was used to track configuration changes to be migrated from one environment to the other

Change management was problematic as the configuration was done in parallel with the engineering

- Scripts were developed to identify changes between different versions of the configuration

Working with stakeholders localized in 3 different countries was a challenge

- We scheduled regular coordination meetings and a local resource was hired in Argentina to facilitate coordination with local stakeholders

Multiples issues with data collection from System Platform's OPC UA Server using AVEVA Adapter for OPC UA

- We will test the performance and reliability of AVEVA Historian 2023 replication to PI System

APM web client runs on Internet Explorer 11

- APM 2023 features a new web client which can be accessed using modern web browsers and mobile devices, but it doesn't support all the functionalities of the old web client yet

Results and benefits

05

MINING, METALS AND MATERIALS | ARGENTINA

Eramet starts a new disruptive plant fully digitalized

Challenge

- Very remote location in a harsh environment
- From Training center to industrial scale
- Start and control the production of a continuous process in a coherent information system

Solution

- **Implement redundant** AVEVA PI System with AVEVA Production Management as MES as **the control tower of the plant**

Results

- **Templates** makes deployment faster
- **High availability solution** able to switch seamlessly if a server room is down
- **Evolutive solution** to adjust quickly during the stabilization phase

Committed to **sustainable metals**