Lighthouse Project for
Data Analytics Platform
at F. Hoffmann – La Roche

Accelerator Forum *2024*

11:15

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NOVEMBER 2024

A Lighthouse Project

for a Data Analytics Platform at F. Hoffmann-La Roche

Jointly presented by ROCHE - CAPGEMINI - AVEVA

CEO,

Thomas Schinecker

> Roche focuses on innovation for people’s health around the world. With Pharmaceuticals and Diagnostics under one roof, we are uniquely positioned to improve care along the patient journey.

Roche at a glance

Who we are and what we do

127 years
founded in Basel in 1896

3 Nobel prizes and 44 Prix Galien, since 1974

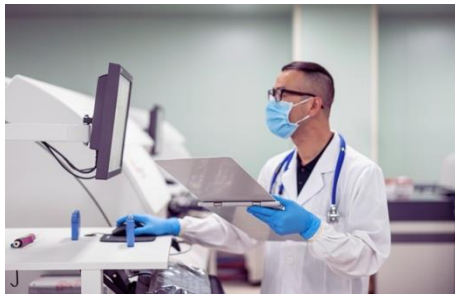
CHF 58.7 billion* in Roche Group sales in 2023

A leader in healthcare R&D
with CHF13.2 billion invested in 2023

>22 million people
treated with our medicines in 2023

Multiple Roche medicines & diagnostics
on the WHO List of Essential Medicines & Tests

103,000+ dedicated employees worldwide

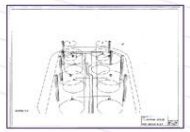
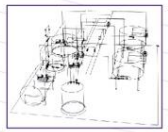
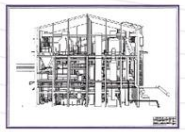


29 billion tests
conducted with our Diagnostics products in 2023

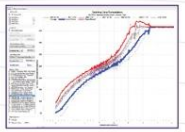
*Unless otherwise stated, all growth rates and comparisons to the previous year are at constant exchange rates (CER; average rates 2022) and all total figures quoted are reported in CHF.

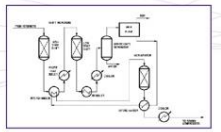
The **evolution** of AVEVA

1970 | 1980 | 1990 | 2000 | 2010





1967
SimSci founded with Plant Level Simulations

1973
Citect founded as Control Instrumentation

1983
Avantis formed with Enterprise Asset Management

1991
Telvent OASyS SCADA System

1996
Serck Controls ClearSCADA

1998
System Platform
FactorySuite
Spiral founded with Planning Software

2009
Virtual based Operator Training

Schneider Electric Software

1987
SimSci PRO/II
Wonderware founded with HMI SCADA (InTouch)

1995
InStep founded with Predictive Analytics
SAT Corp founded with Mobile Asset Management

1997
Skelta founded with Business Process Management
Indusoft founded with embedded HMI
Wonderware Historian

2003
Wonderware MES with SCADA

1969
Tribon formed with marine vessel design

1967
AVEVA founded as CADCentre

AVEVA

1987
Logimatic founded with Enterprise Resource Management (ERM)

2002
AVEVA Net

2001
AVEVA Global

2005
AVEVA Marine

1993
PI Datalink
PI System 2

1995
PI System 3

1994
Process Book

1980
OSIsoft founded with real-time data management

2000
PI SDK

OSIsoft

2005
PI Datasheet

2004
PI Asset Framework

We offer a powerful combination of technology and teamwork

10+
R&D Centers

6,500
Employees

22+
Project Centers

4,300
SI Partners

2,000+
R&D Capacity

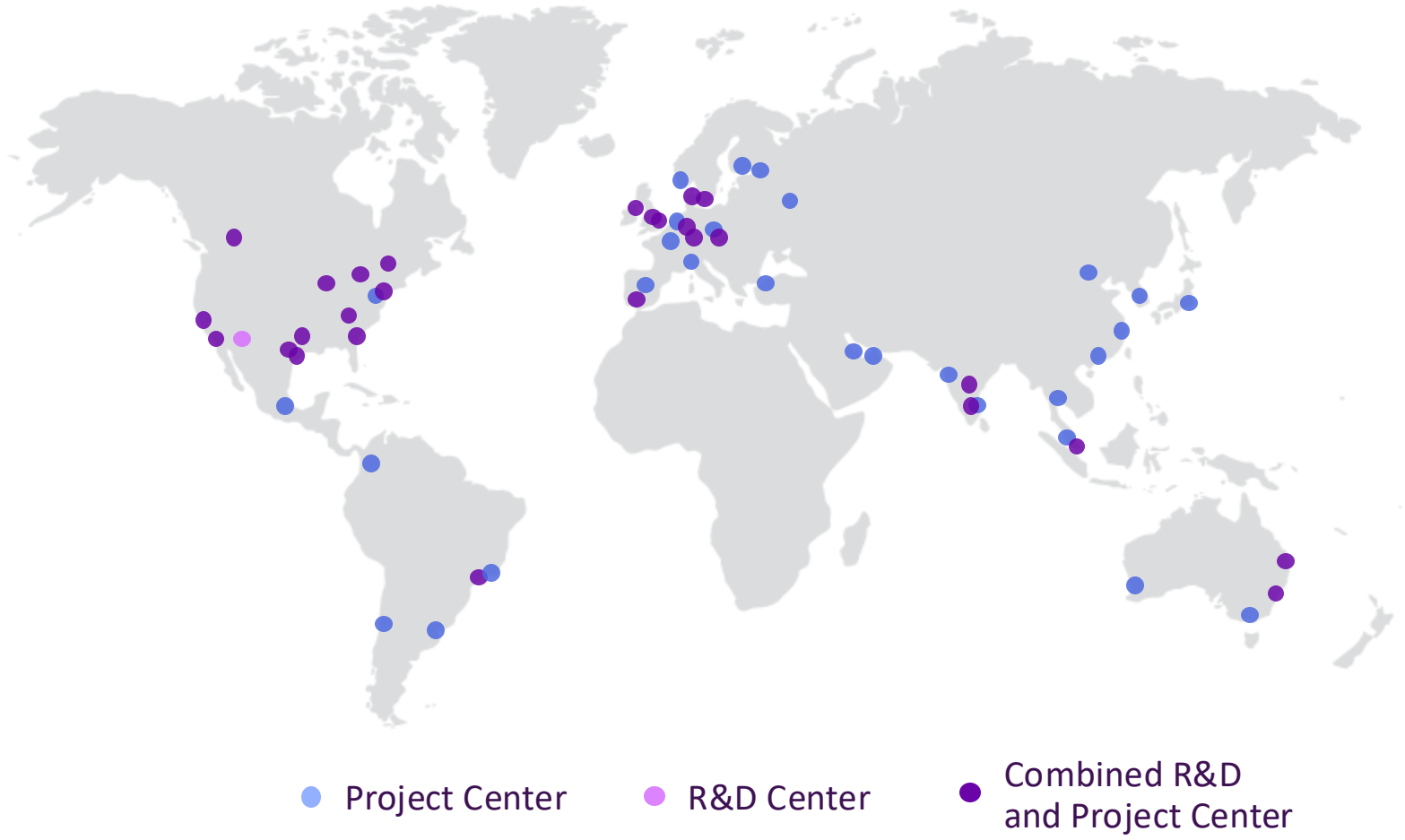
120+
Sales Partners

16%
of Revenue reinvested in R&D

250+
Tech Partners

85%
Projects include Next-Gen tech

20+
Alliance Partners



F. Hoffmann-La Roche requires a reliable cloud-based data platform

Pharma & Life Sciences | Switzerland - Global

Challenges

- **Availability** of relevant data for business analysts of ROCHE
- Terabytes in the PI System become petabytes in a commercial datalake
- **Complex** server **landscape** to aggregate data at global scale
- **High skill set** and expertise **required** to work with data
- Demonstration of project results in **less than 3 months** (target milestone: Hannover Messe)

Solution

- Leverage CONNECT Data Services (aka AVEVA Data Hub) as **industrial** data enablement infrastructure
- Leverage **AVEVA Advanced Analytics** for rapid implementation of **self-service data analytics**
- **Partnership approach:** Client – Vendor – Integrators

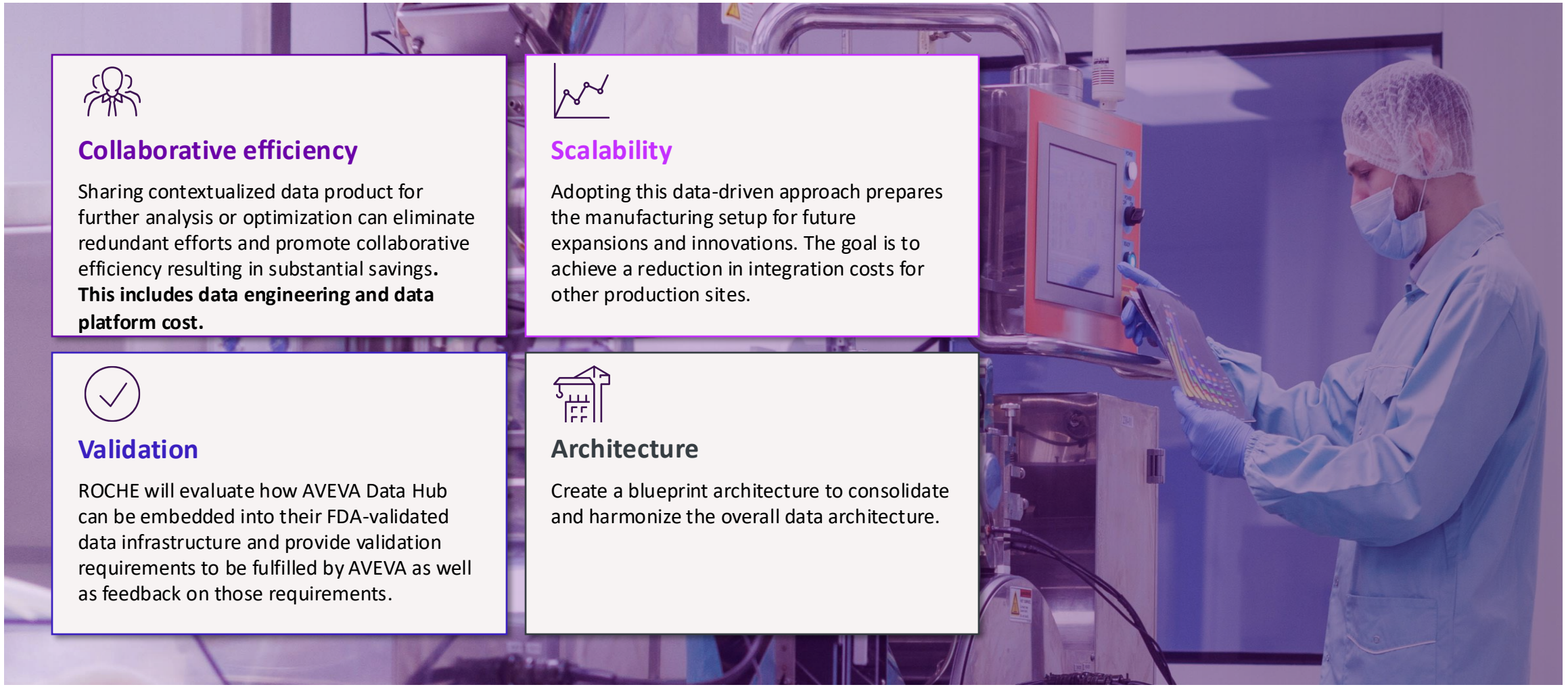
Results

- End-to-End data availability
- Major reduction of data consumption cost (petabytes become terabytes again ☺)
- Potential reduction by approx. up to 70 servers within the entire system landscape
- accelerated time-to-market for industrial data-products

> We didn't expect to have tangible results within such a short time frame. CONNECT data services supported by a strong partner (Capgemini) accelerates the time-to-value of a cloud-based data infrastructure significantly.
>
> Heiko Trefzger, ROCHE, Product Manager – Data & Insights

Learn more

Business success objectives



Collaborative efficiency

Sharing contextualized data product for further analysis or optimization can eliminate redundant efforts and promote collaborative efficiency resulting in substantial savings**. This includes data engineering and data platform cost.**

Scalability

Adopting this data-driven approach prepares the manufacturing setup for future expansions and innovations. The goal is to achieve a reduction in integration costs for other production sites.

Validation

ROCHE will evaluate how AVEVA Data Hub can be embedded into their FDA-validated data infrastructure and provide validation requirements to be fulfilled by AVEVA as well as feedback on those requirements.

Architecture

Create a blueprint architecture to consolidate and harmonize the overall data architecture.

Use cases during the Lighthouse project

Use Case 1 - Data Mesh – Collaboration enablement

1. **Centralizing** manufacturing data from different distributed PI Systems in a global cloud-hosted repository
2. **Sharing** data from Operations to various tools and applications for data analytics and reporting
    - Snowflake (Enterprise Data Hub)
    - Data analytics (Dataiku, Seeq, **AVEVA Advanced Analytics**)

Use Case 2 - Digital maintenance using AVEVA Advanced Analytics

- Centrifuge condition monitoring

Optional use cases

- Net-Production-Time KPIs
- Energy Monitoring

Success criteria

Rapid Data Integration from On-Premise to Cloud

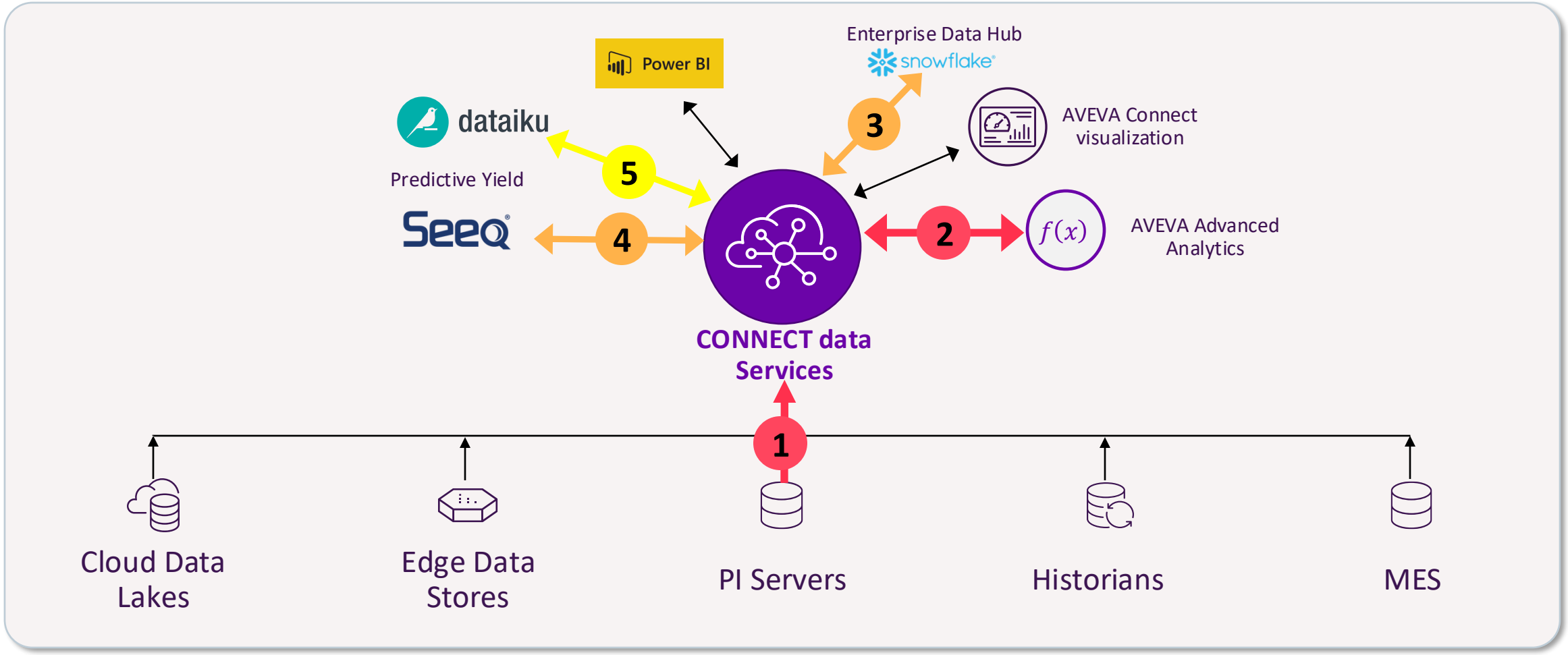
Establish Data Mesh – integrate with existing applications

Digital Maintenance – Experience Self-Service Data Analytics as an after-work experience

Improve availability of manufacturing data and its ease-of-use

Achieve rapid deployment and scale-up to production

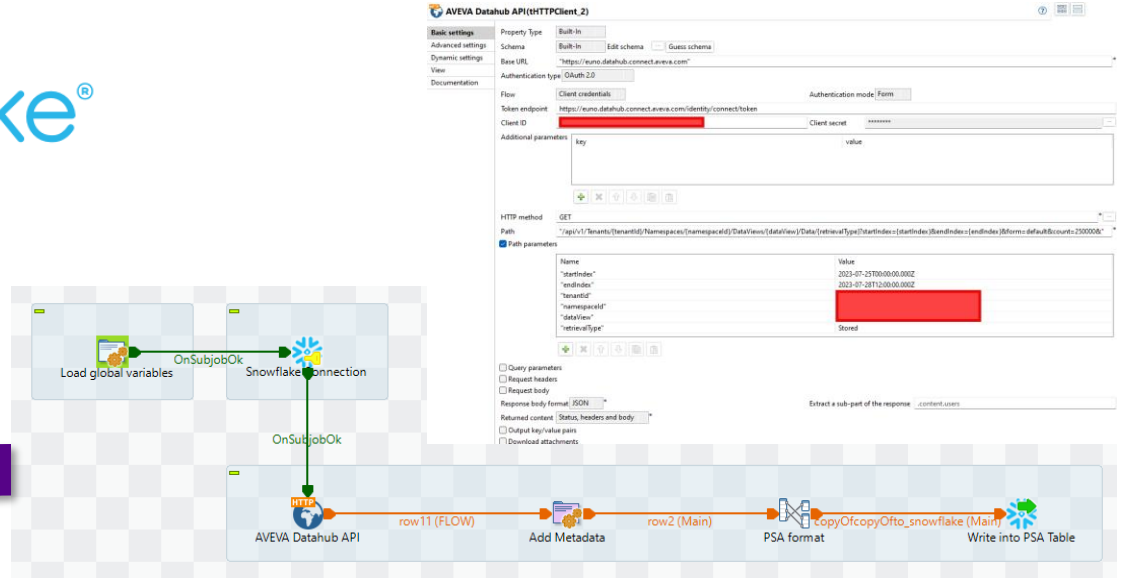
Use case 1 – Data mesh

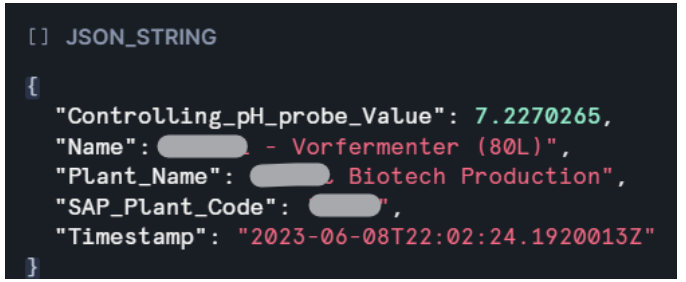


Integration with snowflake®

- Snowflake being used as central IT Data Warehouse at ROCHE
- Data Analytics tools using Snowflake as common data source
- Combination of OT and IT data

- ROCHE‘s original approach:
  - PI SQL Client ⇒ Talend Data Pipeline ⇒ Snowflake
- Lighthouse approach:
  - PI ⇒ CONNECT data views ⇒ Talend Data Pipeline ⇒ Snowflake
- Future:
  - PI ⇒ CONNECT ⇒ Snowflake virtual table – no more data replication

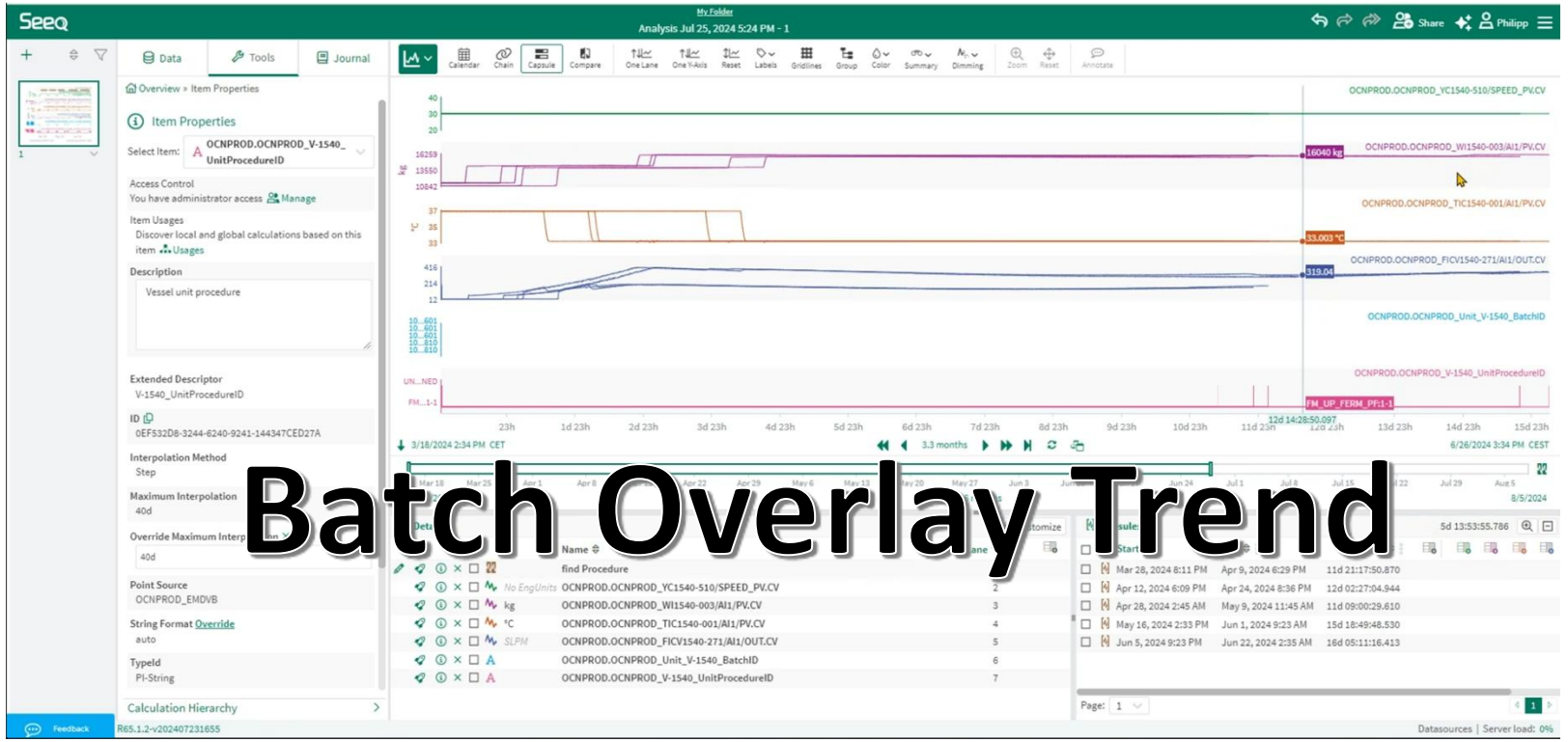




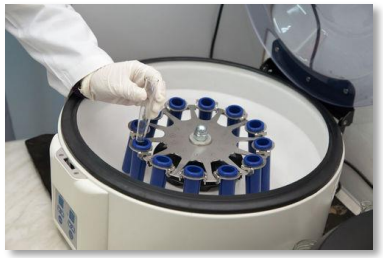
Integration with Seeq

Bioreactor V-1540 Production Analysis

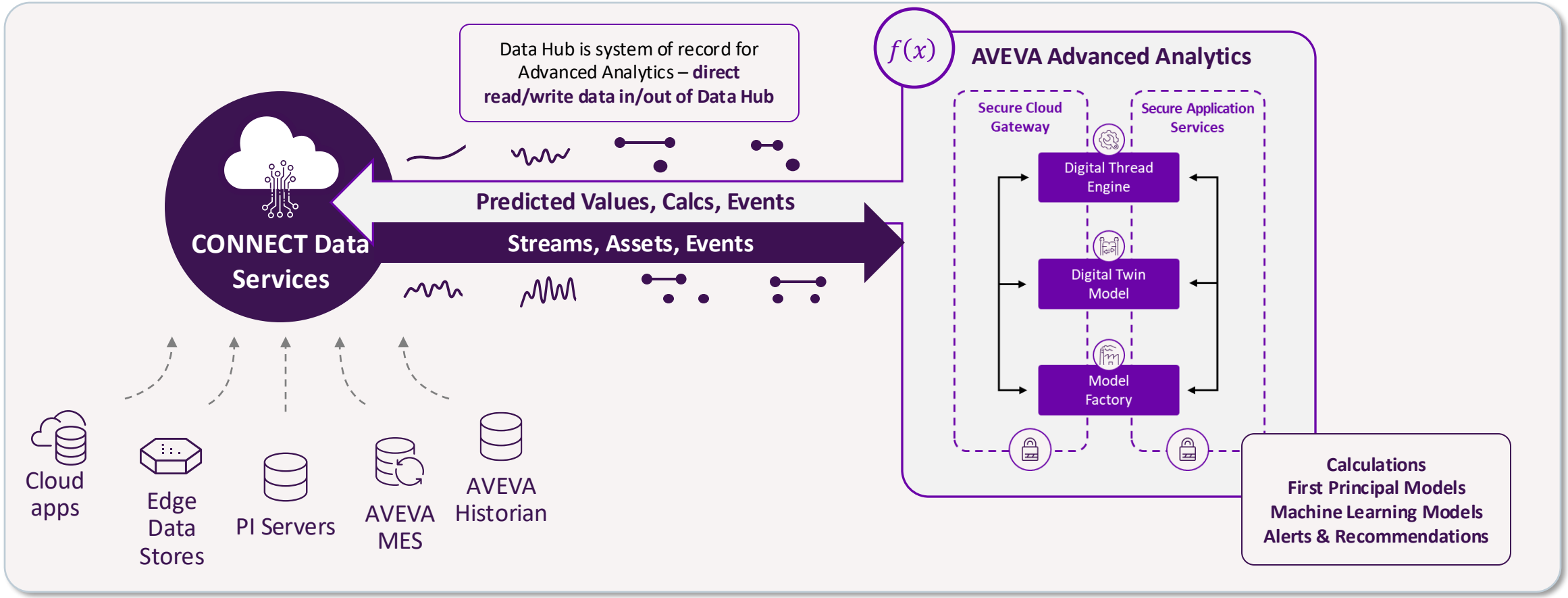
- Seeq is used at ROCHE to analyze data from PI System
- Upgrade to Seeq SaaS provides native CONNECT integration
- Visualization and data Analytics through cloud-native connection



Use case 2 - Digital maintenance



From calendar-based maintenance to predictive as an afterwork experience



Use case 2a – Condition-based centrifuge maintenance

Physical equipment:

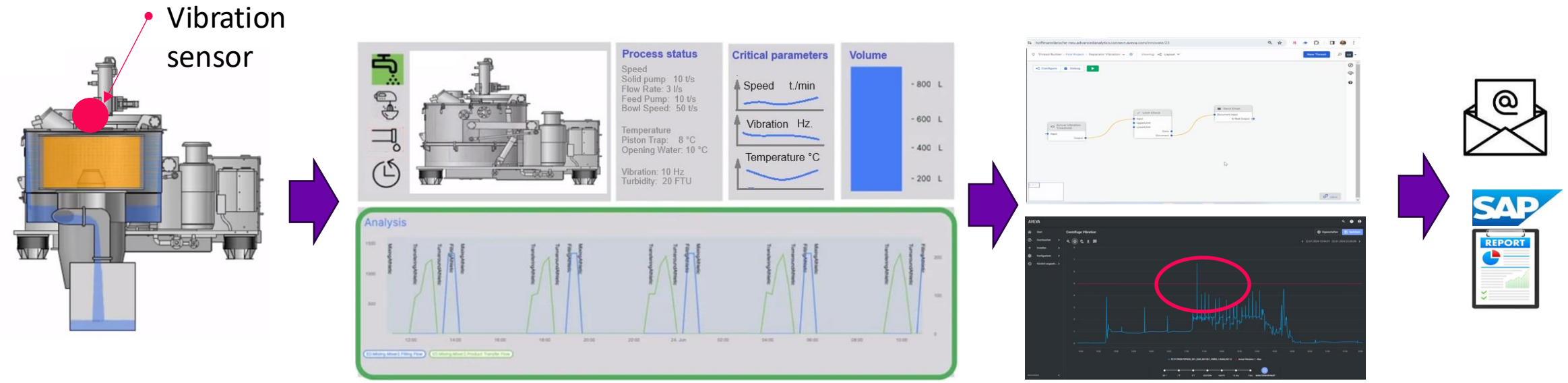
- Centrifuge CN-1610 after harvest in BioPharma Process

Problem statement:

- **Condition-based** maintenance shall replace calendar based punctual inspections
- Increase **efficiency to detect and alert** deteriorations before a breakdown that generates damage, delay and high cost

Advanced Analytics:

- Rapid development of model
- Monitor threshold on vibrations to trigger actions



Use Case 2b – Centrifuge process monitoring

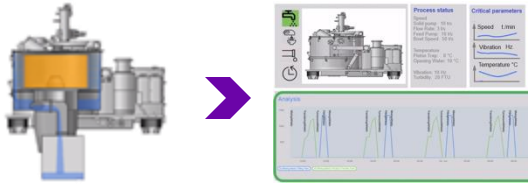
Anomaly detection in centrifuge data

Anomaly detection with AVEVA Advanced Analytics

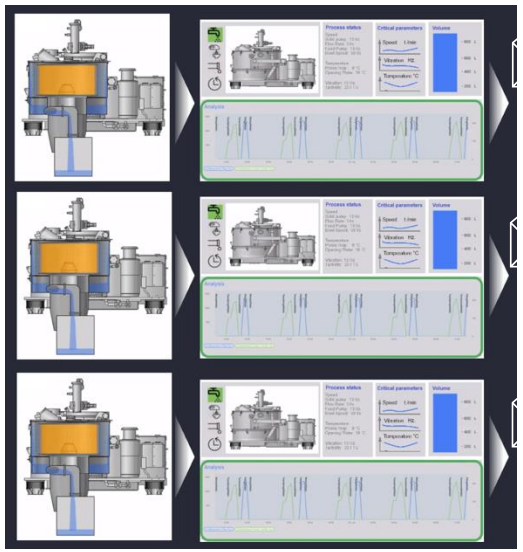
- Twin for digital representation of asset
- Anomaly detection model out of the box
- Multi variable observation
- Self-learning with history
- Notification

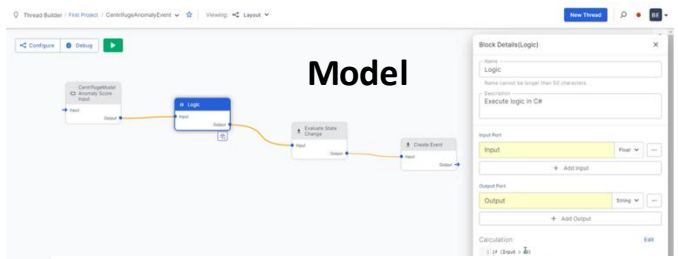
Benefits AVEVA

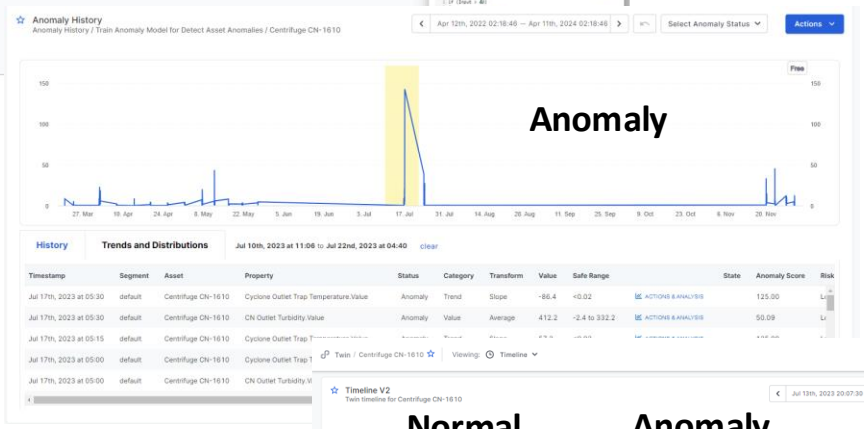
- Access to all tags from Connect Data Services
- No-code model out-of-the-box
- Days not weeks to solution

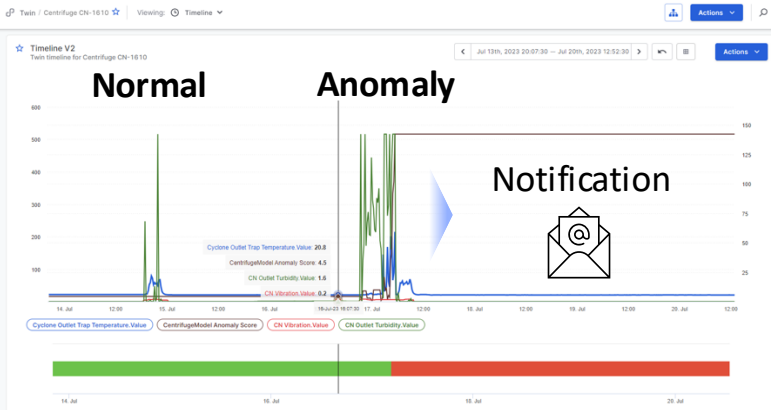


Physical Digital









Equipment:

- Centrifuge CN-1610 after harvest in BioPharma Process

Scaling to fleet:

Create model once, train, tune, **replicate easily**

Use Case 3 - Net Production Time of a Bioreactor

Using the Thread Engine to create production events in CONNECT

Net Production Time with AVEVA Advanced Analytics

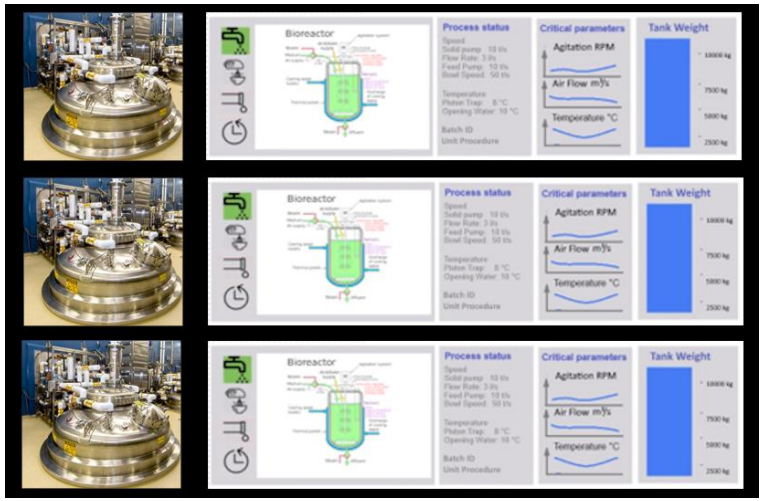
- Twin for digital representation of asset
- Easy configuration of threads (Node-Red Style)
- Multi variable observation
- Backfilling of Production Events
- Notification on Event
- Using the NPT as potential input to a Predictive Uptime Model

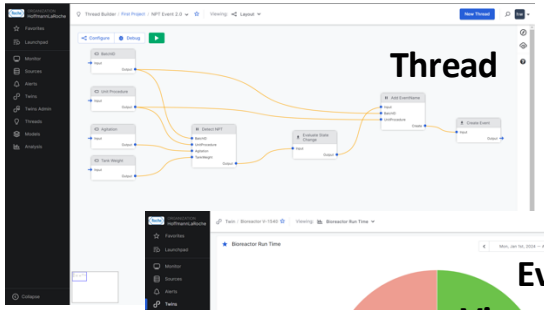
Benefits AVEVA

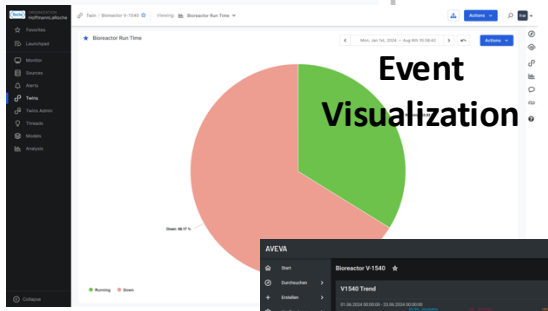
- Access to all tags from CONNECT data services
- Use Event Data Store
- Visualization of NPT Score using CONNECT visualization Services
- No-code model out-of-the-box

Physical

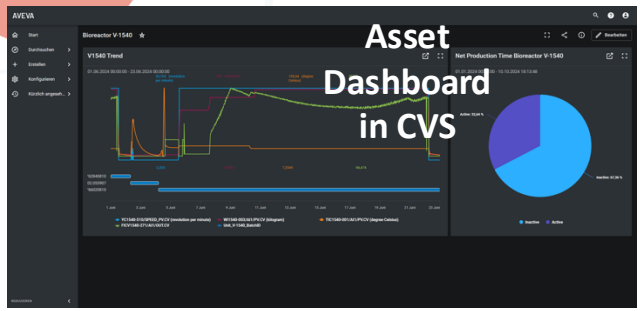
Digital







Notification



Equipment:

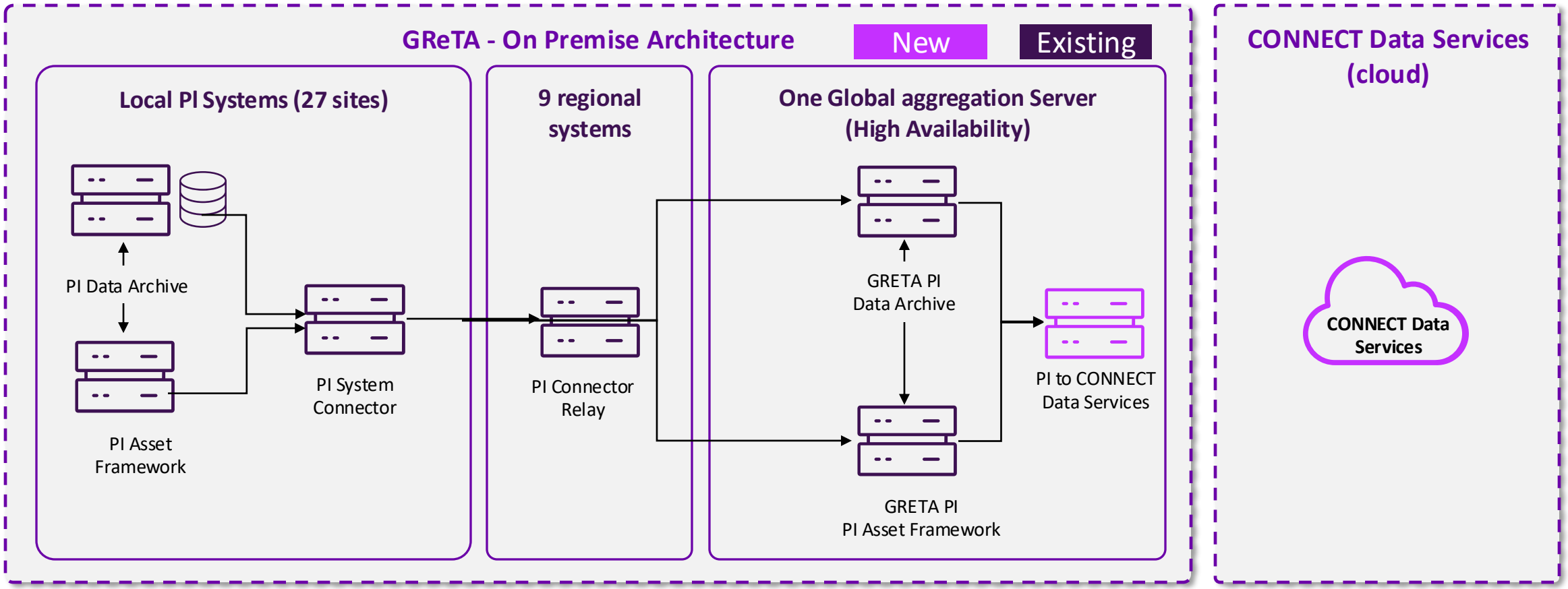
- Bioreactor V-1540 BioPharma Process

Scaling to fleet:

Create Thread once**,** train, tune, **replicate easily**

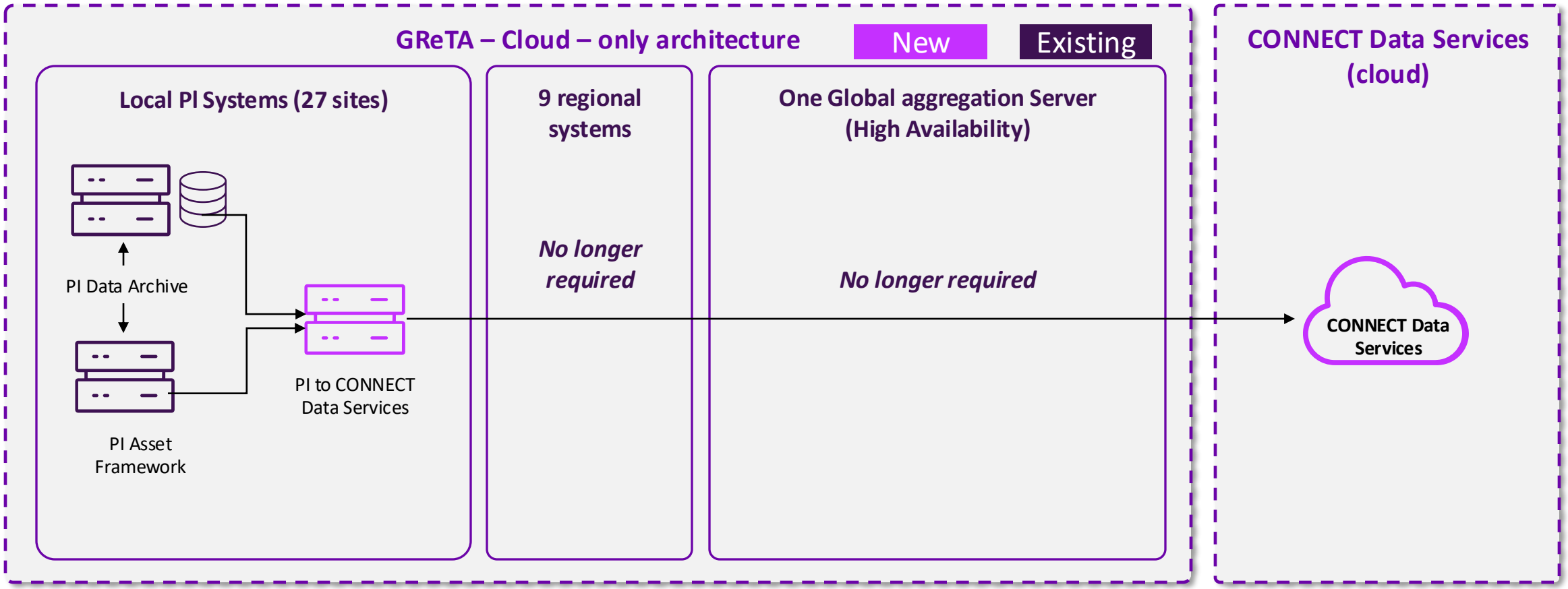
Solution to-be architecture (through central GReTA PI System)

Replacing potentially up to 70 associated Servers for a centralized Data Infrastructure



Solution to-be architecture

Cloud-only (Future consideration)



The CONNECT effect in practice

What have we achieved as partners in three months ?

Streamlined and accelerated the data-to-value for manufacturing

BEFORE	AFTER
PETABYTES	**TERABYTES (major $ reduction)**
❑ Various data silos/pipelines	✓ Single source of truth/end to end
❑ Heavy IT infrastructure	✓ Direct-to-cloud / SaaS approach
❑ Unstructured data lake	✓ Industrial contextualized data hub
❑ Data scientist only analytics	✓ Accelerated scalable analytics

AVEVA CONNECT DATA SERVICES ENABLES ALL:

Low code **out-of-the box analytics** with **AVEVA Advanced Analytics**

Future **Dataiku connectivity for Predictive Yield** and other Machine Learning use cases

Connectivity to **Enterprise Data Lake Snowflake** and many more data consumers

"We didn't expect to have tangible results within such a short time frame. CONNECT data services supported by a strong partner (Capgemini) accelerates the time-to-value of a cloud-based data infrastructure significantly."

Heiko Trefzger, ROCHE, Product Manager – Data & Insights

Lessons learned

1

Data Engineering is fundamental at the very beginning**:**
Data selection, data quality, data governance, data contextualization

2

Think big, start small: Lighthouse Project architecture as blueprint for ROCHE Industry 4.0 Roadmap

3

Regular cadence calls to ensure collaboration efficiency

4

Life science as the key expertise of all project stakeholders

5

Involve the **product consumers** from business side internally at ROCHE

6

Crossfunctional stakeholders from manufacturing, IT, data science

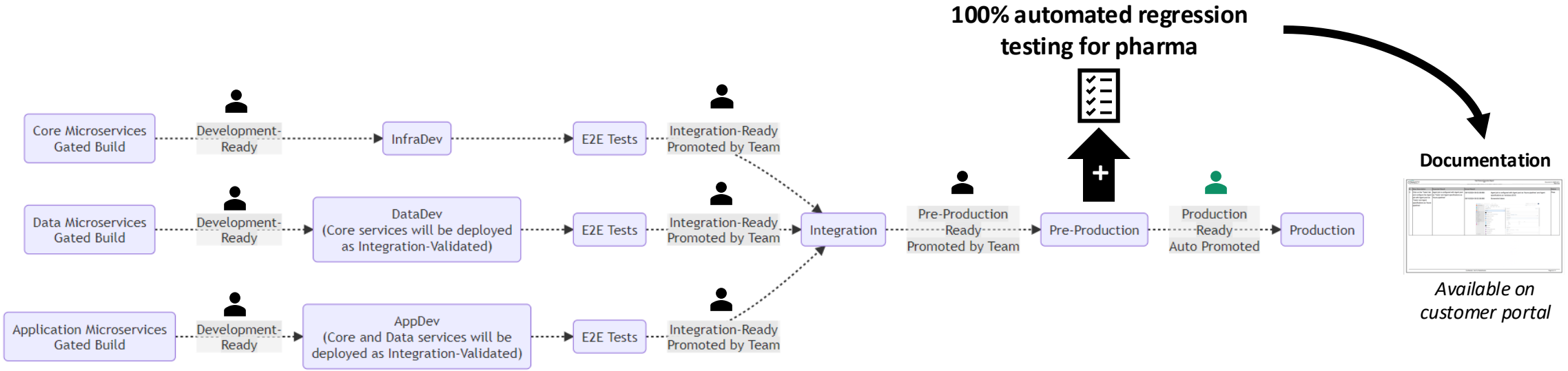
7

Experience of **Build vs. Buy**

But what about GxP and validation use cases on CONNECT?

A new validation approach towards a compliant SaaS Cloud Data Platform

CONNECT environments with increasing maturity & stability



CONNECT

CI/CD/CV Pipeline

Development

The version of the microservice is ready to be deployed to a development environment for integration testing with other microservices.

Integration

The main environment where microservices are integrated together and functionality is tested before being approved to be promoted to being deployed to Pre-Production.

Pre-Production

The environment that is the same as the Production environment where microservices are validated before the final push to the Production environment.

Production

The customer facing environment used by customers of our released microservices.

AVEVA

Acknowledgements

ROCHE

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Sumanth Artham - Data Analytics Specialist

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Philippe Loup – Senior OT and Data Engineer

Octavesoft

Phillipp Sutter - PI System SMEs

Actemium

Pascal Nass - PI System SMEs

AVEVA

Hans-Otto Weinhold - Principal Solutions Architect

Reinhold Ehrle - Industrial Software Solution Sales Expert

Fabio Dani - Software Developer Engineer

David Hoven - Business Value Consultant

Erik Prins – Customer Success Manager

Brandon Ekberg - Data Analytics Expert

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