

22/4/2022

Across The Ocean

Working Together for a more Effective Plant Analytics Platform

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AVEVA



Who We Are

Digital Solutions

AVEVA Products

TOMONI Hub Analytics and Performance Center

Dashboard

Global Development

Early Warning Application

Next Steps

Takeaways And Questions

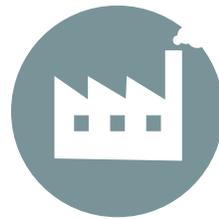
Who We Are

Mitsubishi Power is a power solutions brand of **Mitsubishi Heavy Industries (MHI)** – a global leader in engineering & manufacturing spanning energy, infrastructure, transportation, aerospace and defense.

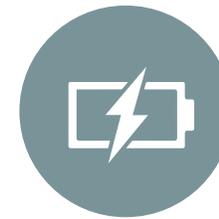
MHI GROUP OPERATES IN THREE INDUSTRY SEGMENTS



Aircraft,
Defense & Space



Industry &
Infrastructure



Power
Systems

Who We Are – Introducing Mitsubishi Power Americas

▶ COMPANY HIGHLIGHTS



2,300
EMPLOYEES

25+
OFFICES &
FACTORIES

1,500
SUPPLIERS

1.2M
SQUARE FEET OF
MANUFACTURING SPACE

21
YEARS OPERATING
IN THE AMERICAS

Who We Are – Introducing Mitsubishi Power Europe



▶ COMPANY HIGHLIGHTS

15
offices

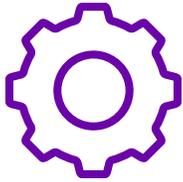
1,000
employees

300
projects⁶



⁶ An average number of projects per annum

Collaborative Development



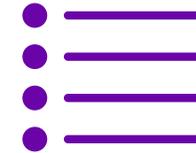
Challenge

- With limited resources creating custom applications for analytics, troubleshooting, and performance management, to support the digitalization initiatives within Mitsubishi Power.



Solution

Pool Resources Across the Globe to leverage existing data infrastructure, streamline development, share best practices, and create applications that best suite the needs of our respective markets.

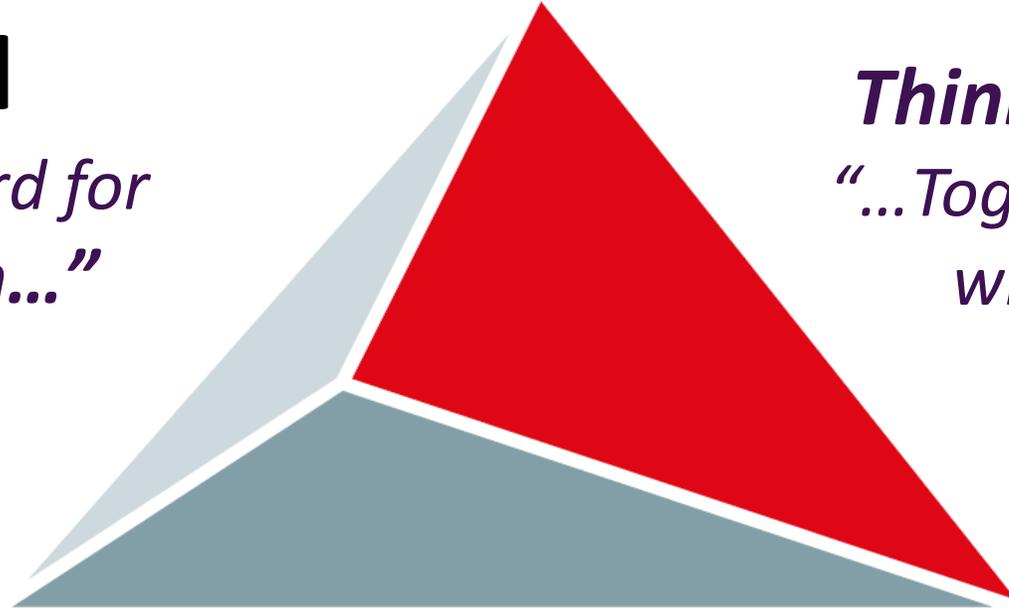


Benefits

- Knowledge sharing eliminates duplication of effort is evaluation
- Best Practices for use of Data Infrastructure avoids previous miscalculations or missteps in use
- Faster Delivery

TOMONI

*is the Japanese word for
“Together with...”*

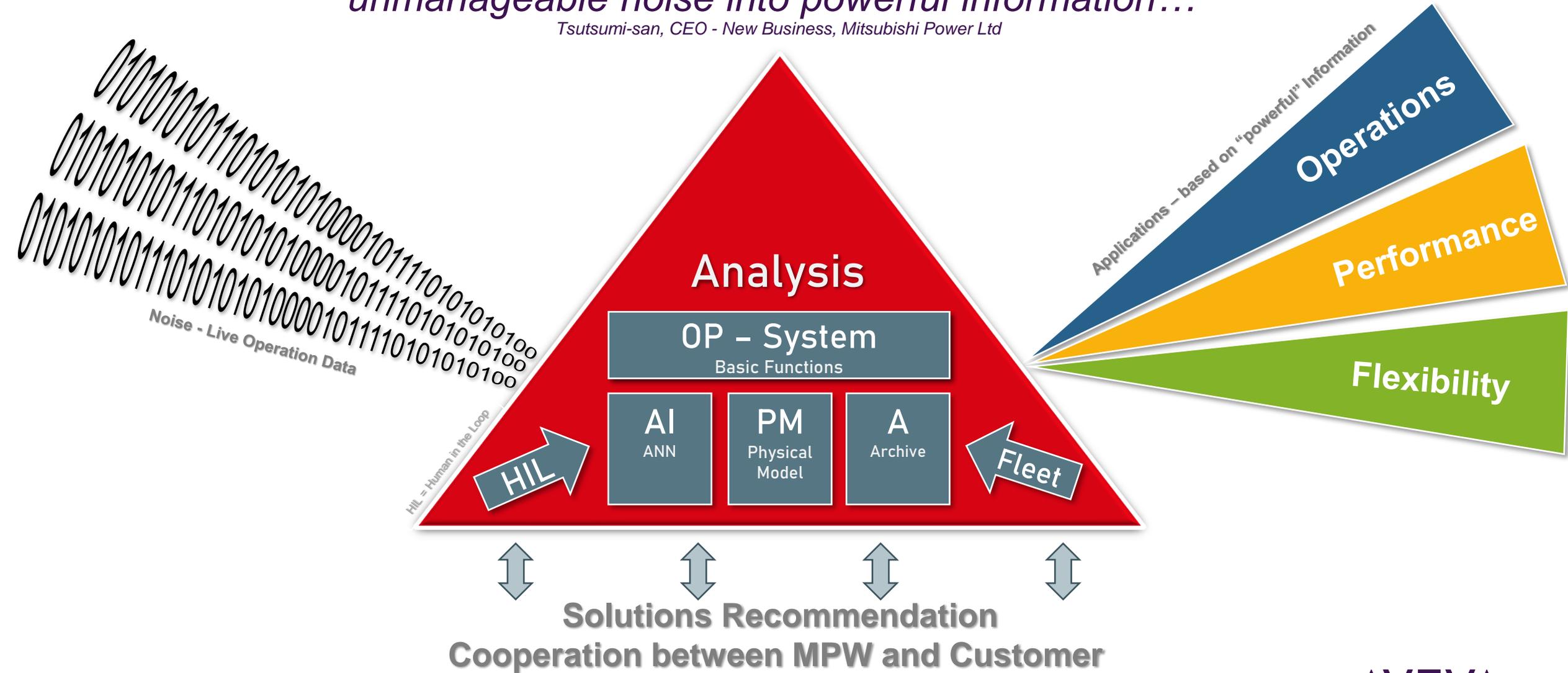


*Think Global – Act Local
“...Together – in our Network,
with our Customers!”*

TOMONI™

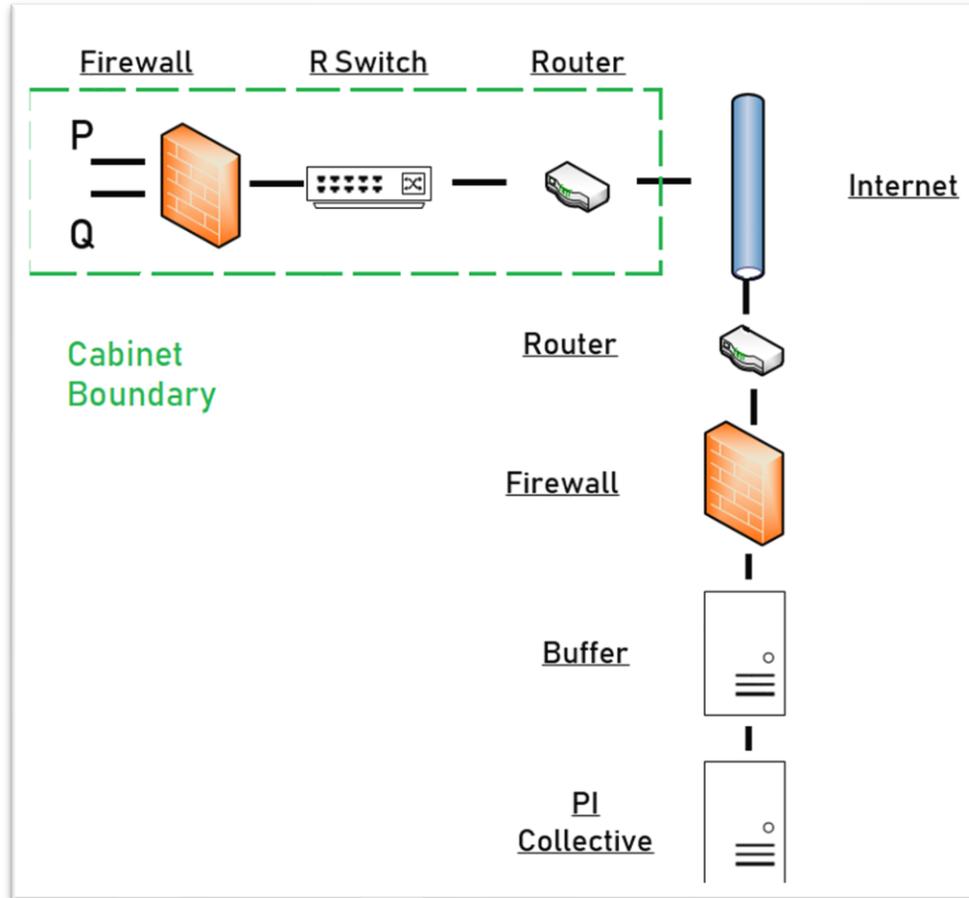
“ TOMONI takes the massive amount of data ... and transforms it from unmanageable noise into powerful information...”

Tsutsumi-san, CEO - New Business, Mitsubishi Power Ltd



Utilizing AVEVA PI System, AF, PI Web API to Enable Development

PI System



- The PI System is our foundation for data collection.
- We have several configurations but the basic concept is data is transferred to the site/remote PI Server, using either PI Interface for OPC or PI Interface for UFL.
- The data is then transferred to our PI Collective.
- This data is used by the Dashboard, Analytics tools, Our Simulator, and other custom tools.

Utilizing AVEVA PI System, AF, PI Web API to Enable Development

Asset Framework

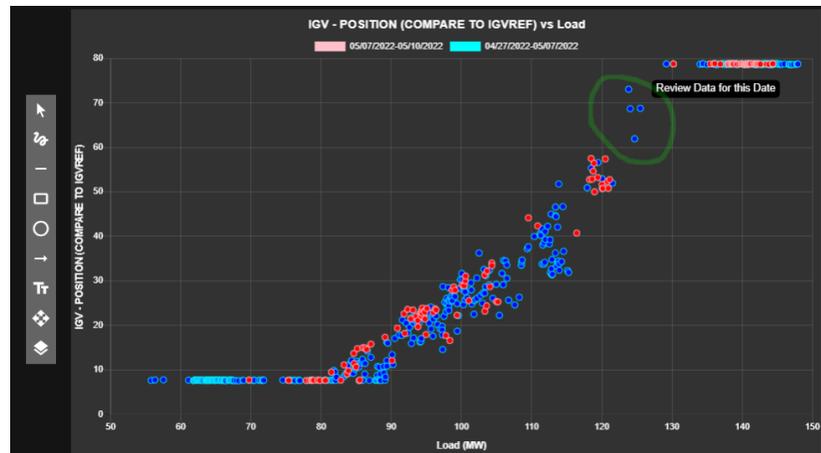
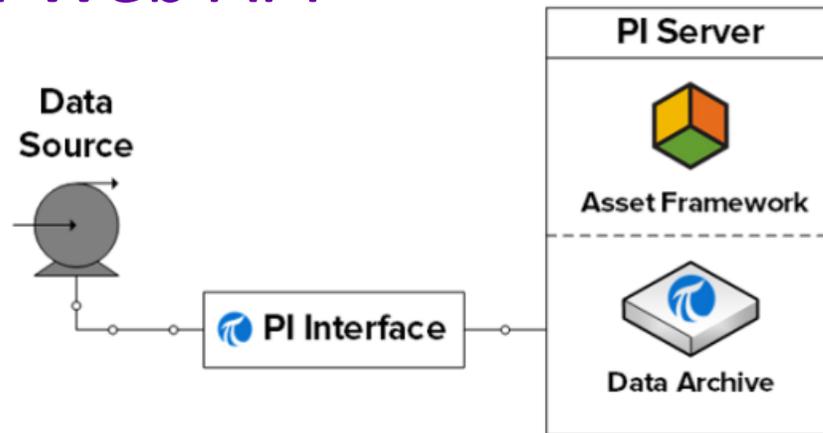
- Through a combination of Python code and Asset Framework Analysis we create Thermal Performance Calculations.
- Event Frames in Asset Framework are the foundation for the automated event notifications we have created.
- The Asset Framework structure and attributes are what we call upon as endpoints from the Dashboard. This allows us to development and application once and for similar configurations that application automatically works.

The screenshot displays the AVEVA PI System Asset Framework interface. On the left, a 'Library' pane shows a hierarchical tree of elements, including 'RMC.VOLT_EMISSIONS'. The main area shows the 'RMC.VOLT_EMISSIONS' element selected, with a 'Filter' section and a list of attributes. A 'GRDA3' window is open, showing a table of attributes and their values. Below this, an 'Evaluate' table shows the mapping of expressions to output attributes.

Name	Expression	Output Attribute
BreakerStatus	'Breaker Closed'	Map
FuelStatus	'ANY FUEL IN'	Map
BaseLoadSpeed	'TURBINE BASE SPEED'	Map
Speed	'Speed'	Map
UnitMaster	'UNIT MASTER'	Map
TurningGear	'Turngear Speed'	Map
FlameStatus	'FLAME ON'	Map
UnitType	'Unit Type'	Map
TripMaster	If UnitType = "W501FC" or UnitType = "START TRIP MASTER" Else 'TRIP MASTER'	Map
PrvBrk	PrevVal(BreakerStatus, "-2s")	Map
PrvMaster	PrevVal(UnitMaster, "-2s")	Map
PrvSpeed	PrevVal('Speed', "-1m")	Map
BPT	'BPT Average Temperature'	Map
PrvBPT	PrevVal('BPT Average Tempera	Map

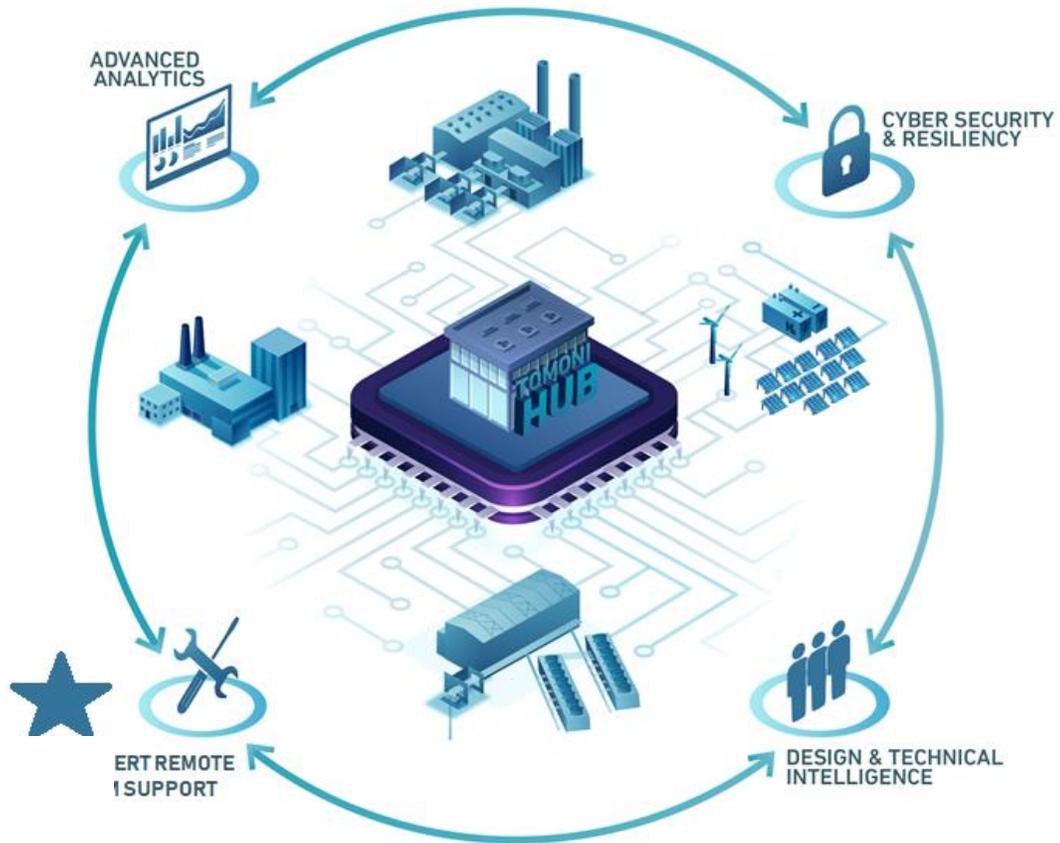
Utilizing AVEVA PI System, AF, PI Web API to Enable Development

PI Web API



- The PI Web API is a RESTful interface to the PI system. It gives client applications read and write access to their AF and PI data.
- We utilize this to call on the data in our collective.
- The Dashboard also has the ability to write values to the collective. User inputs from the UI of the Dashboard as well as backend calculations can and are written to PI.

TOMONI Hub



Maximize Customer Plant Optimization

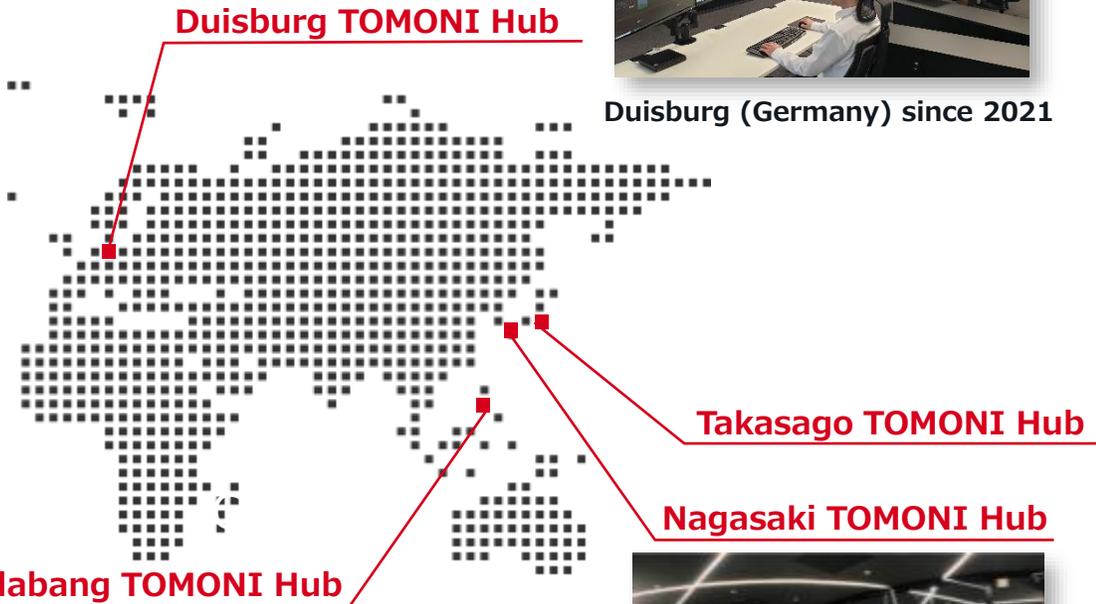
Through

System Experts and Data Analytics

To Achieve

World Class Reliability & Performance

World Wide – TOMONI Hub Network



Duisburg (Germany) since 2021

Alabang TOMONI Hub



Alabang (Philippines) since 2016

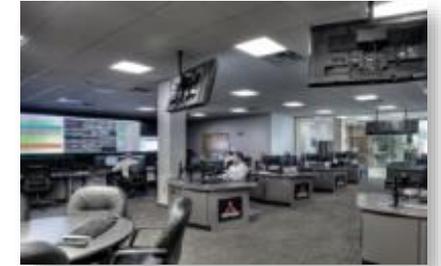


Nagasaki (Japan) since 2019

Takasago TOMONI Hub



Takasago (Japan) since 1999



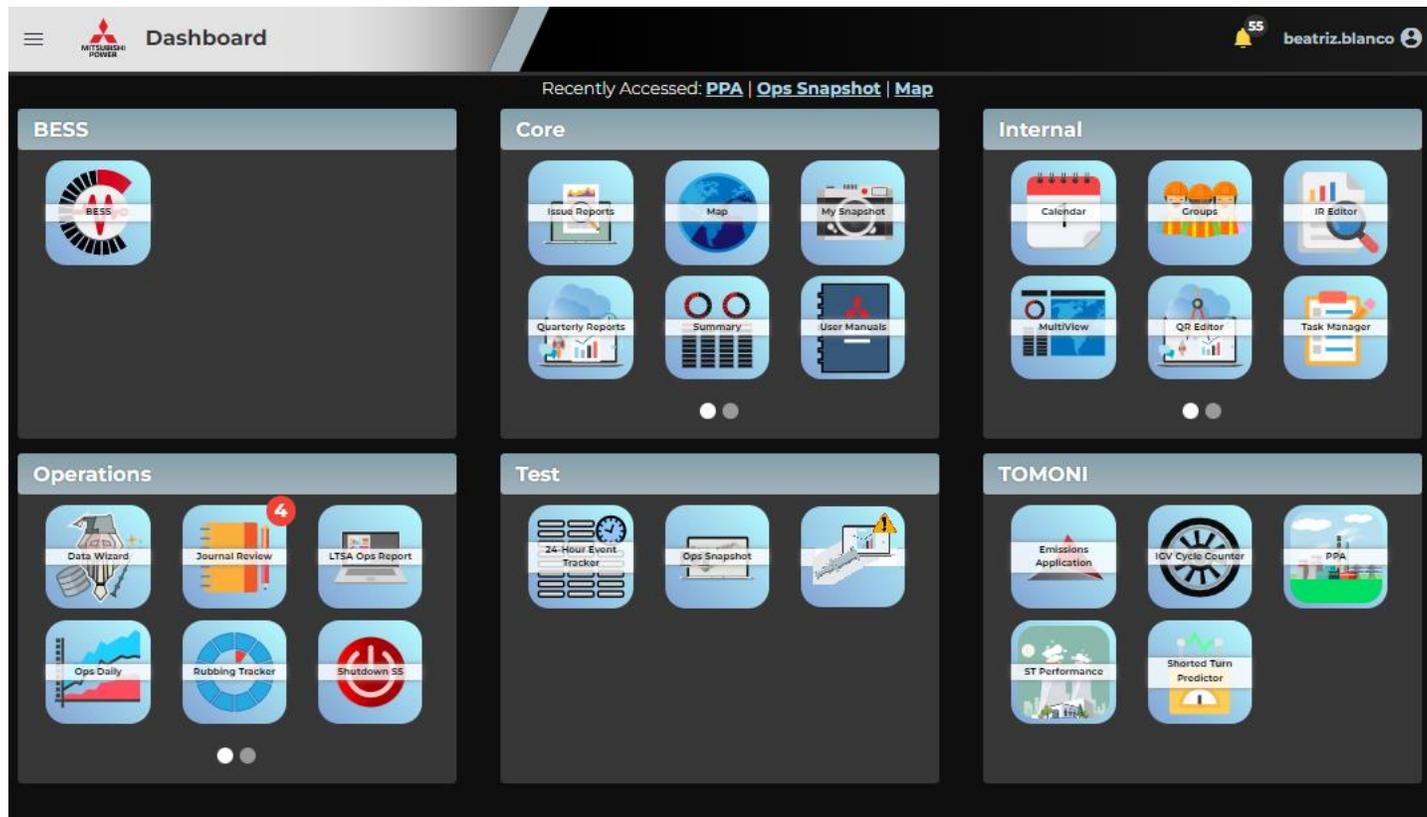
Orlando (USA) since 2001

Orlando TOMONI Hub

Steadily increasing number of reference plants worldwide

Dashboard Development to Create Custom Applications

Dashboard – Internal View



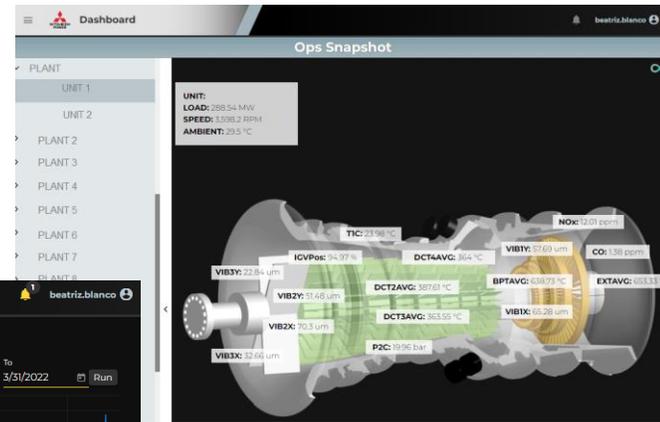
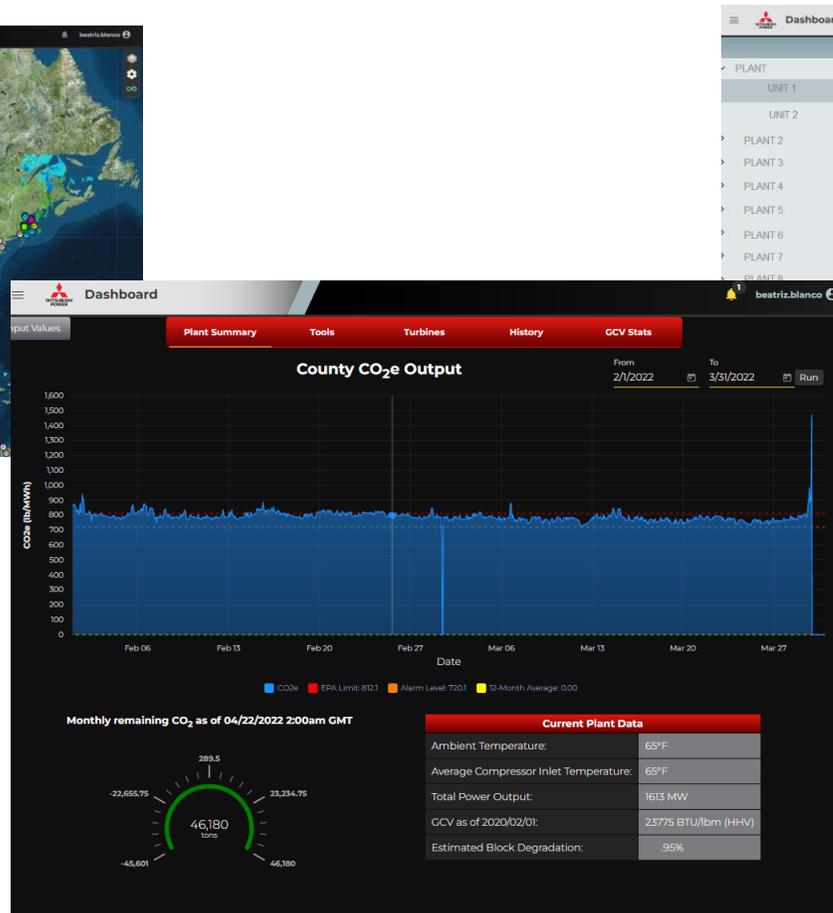
Front End:
-Angular

Back End:
-Python
-Docker
-Apache
-MySQL
-MongoDB
-ExpressJS
-RabbitMQ

Key Applications:
-Map
-Ops Snapshot
-Ops Daily
-Emissions App
-Event Tracker
-Plant Performance

Dashboard Development to Create Custom Applications

Dashboard – Applications



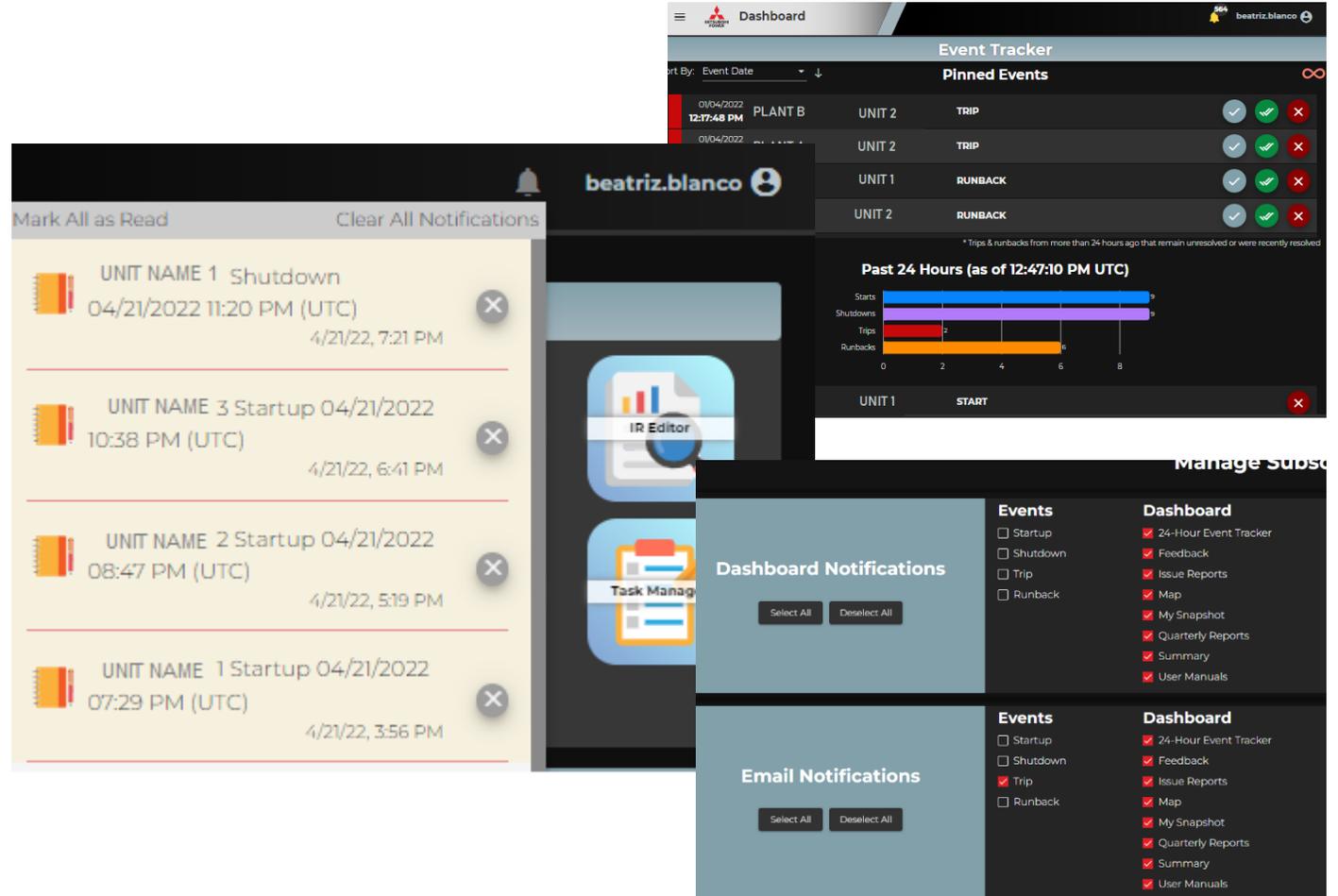
Key Applications:

- Map
- Ops Snapshot
- Ops Daily
- Emissions App
- Event Tracker
- Plant Performance

Dashboard Development to Create Custom Applications

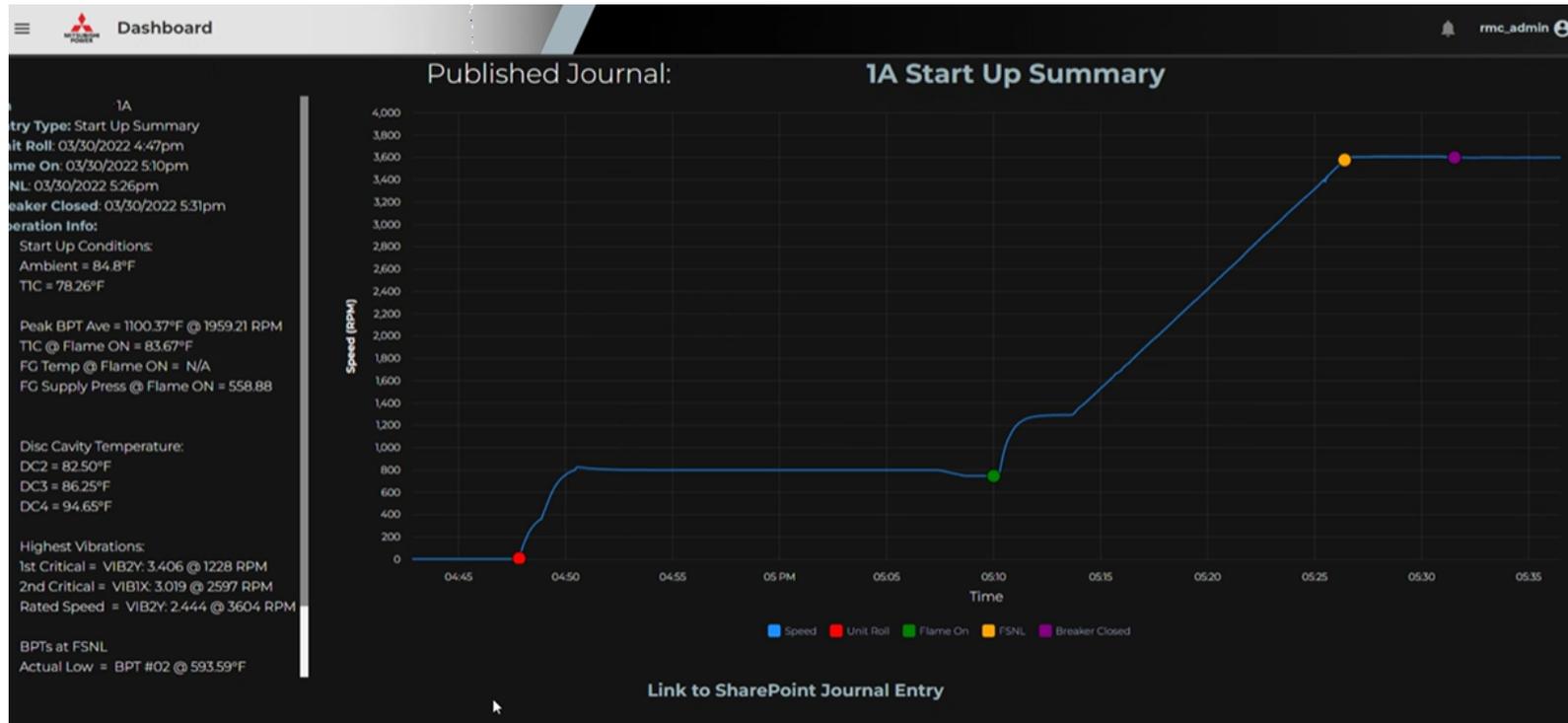
Dashboard – Key Features

- Event Notifications based on Asset Framework Event Frames
 - Starts
 - Stops
 - Trips
 - Runbacks
- Retrieves PI Data Archive Data using PI Web API
- In App Notifications that take you to view Event Frame captured data
- Email Notifications
- Discussions



Dashboard Development to Create Custom Applications

Dashboard – Event Frame to SharePoint Entry



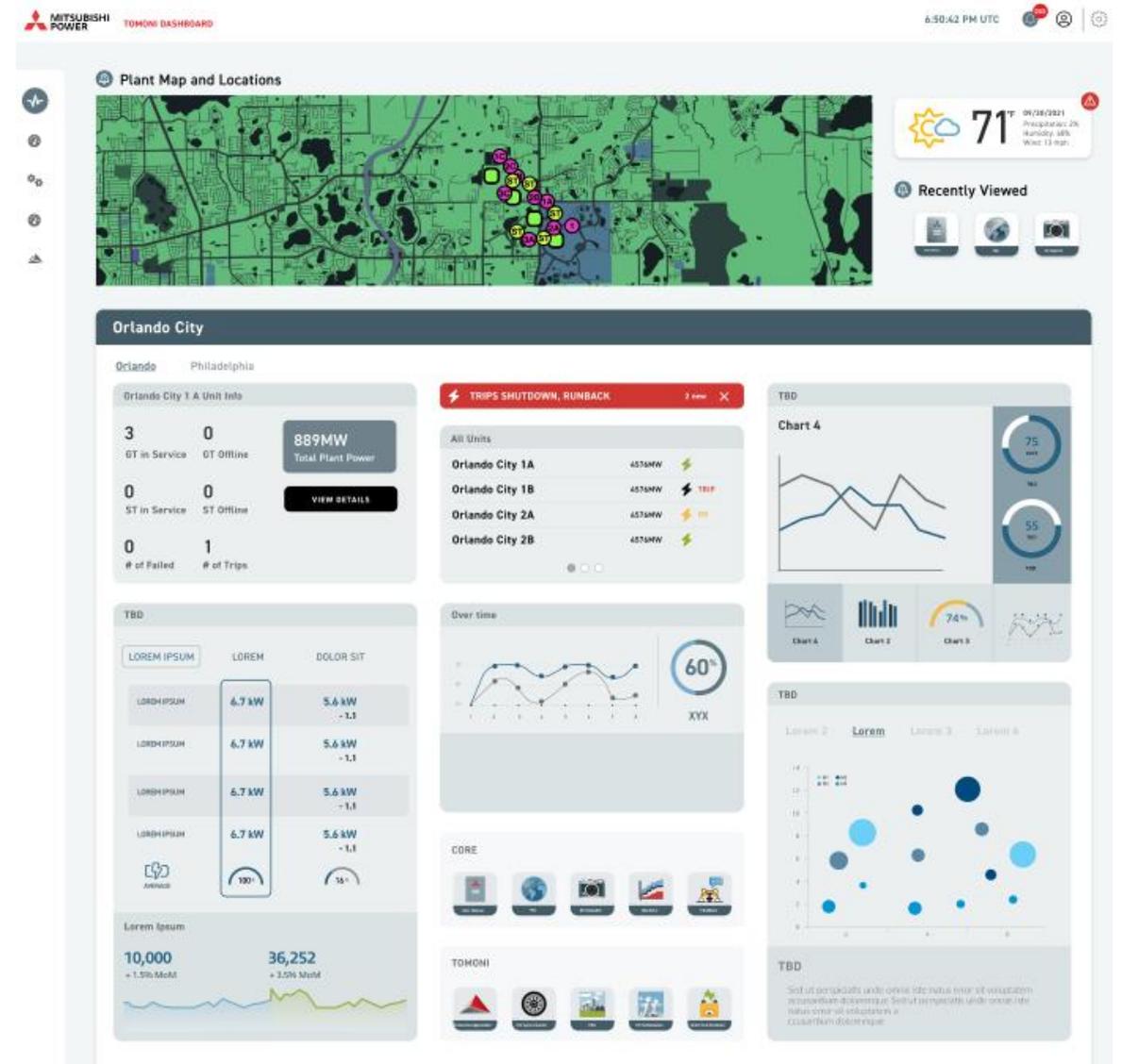
- Event Frames referencing Asset Framework capture key event data.
- That data is populated in an application in the dashboard, and the TOMONI Hub Engineer with the click of a button can automatically publishing that information to SharePoint.
- Office365 connector

Future Development

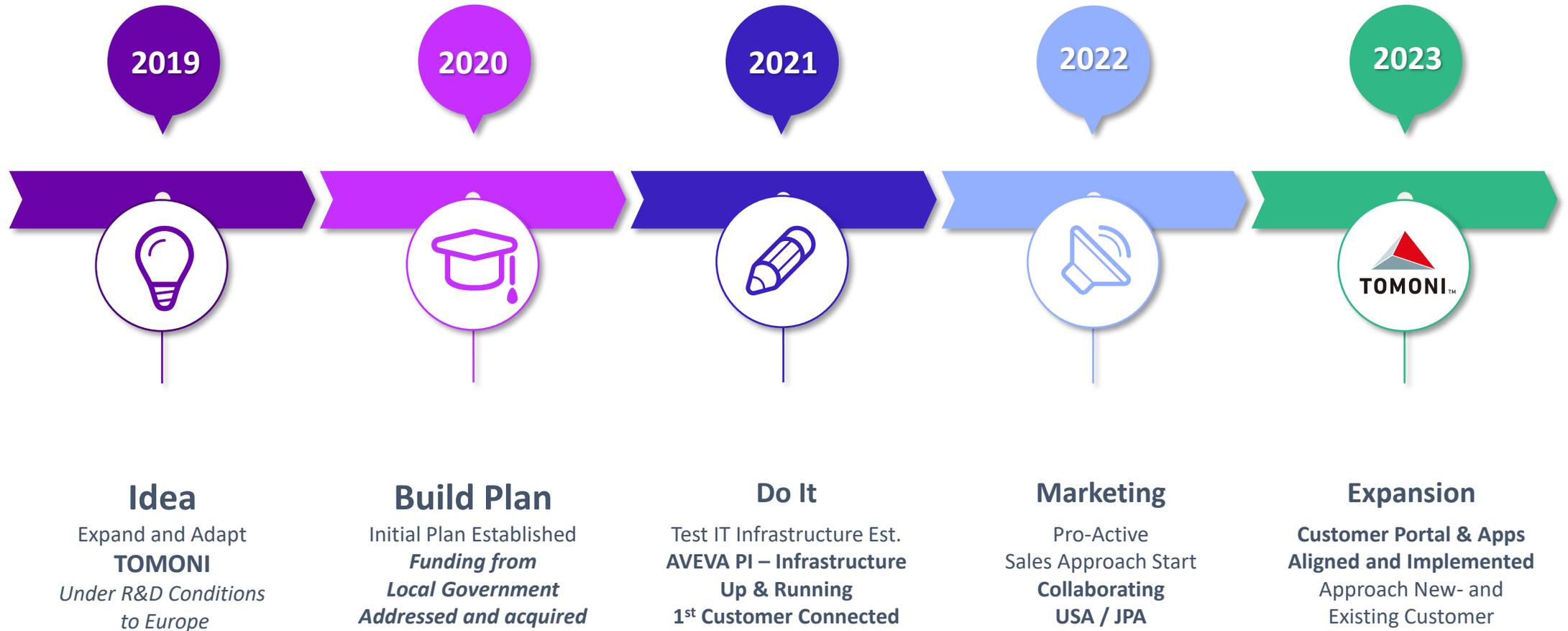
Dashboard – Plant Base Operational View – Continued Collaboration

Key Future Applications:

- Thermal Performance > Real Time Thermal Performance Monitoring > Notifications
- Total Plant Performance > Real Time Power Block Thermal Performance > Notifications
- Plant Health > Plant Indicators > Reliability
- Journal Automation > Event Capture > Insights



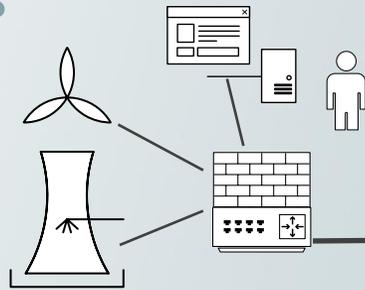
Development Roadmap EU



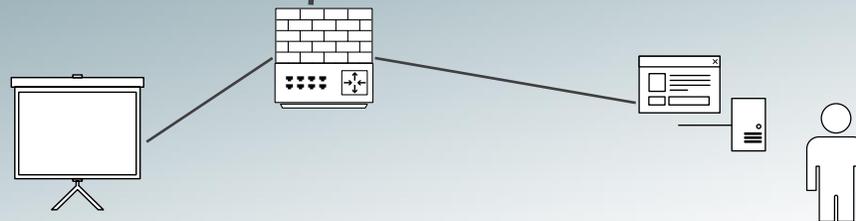
Mitsubishi Power Europe GmbH and its predecessors have installed more than **1,500** boilers world wide...
The basis for a huge market potential for Intelligent Optimization Solutions in “Steam Power”

EU Development

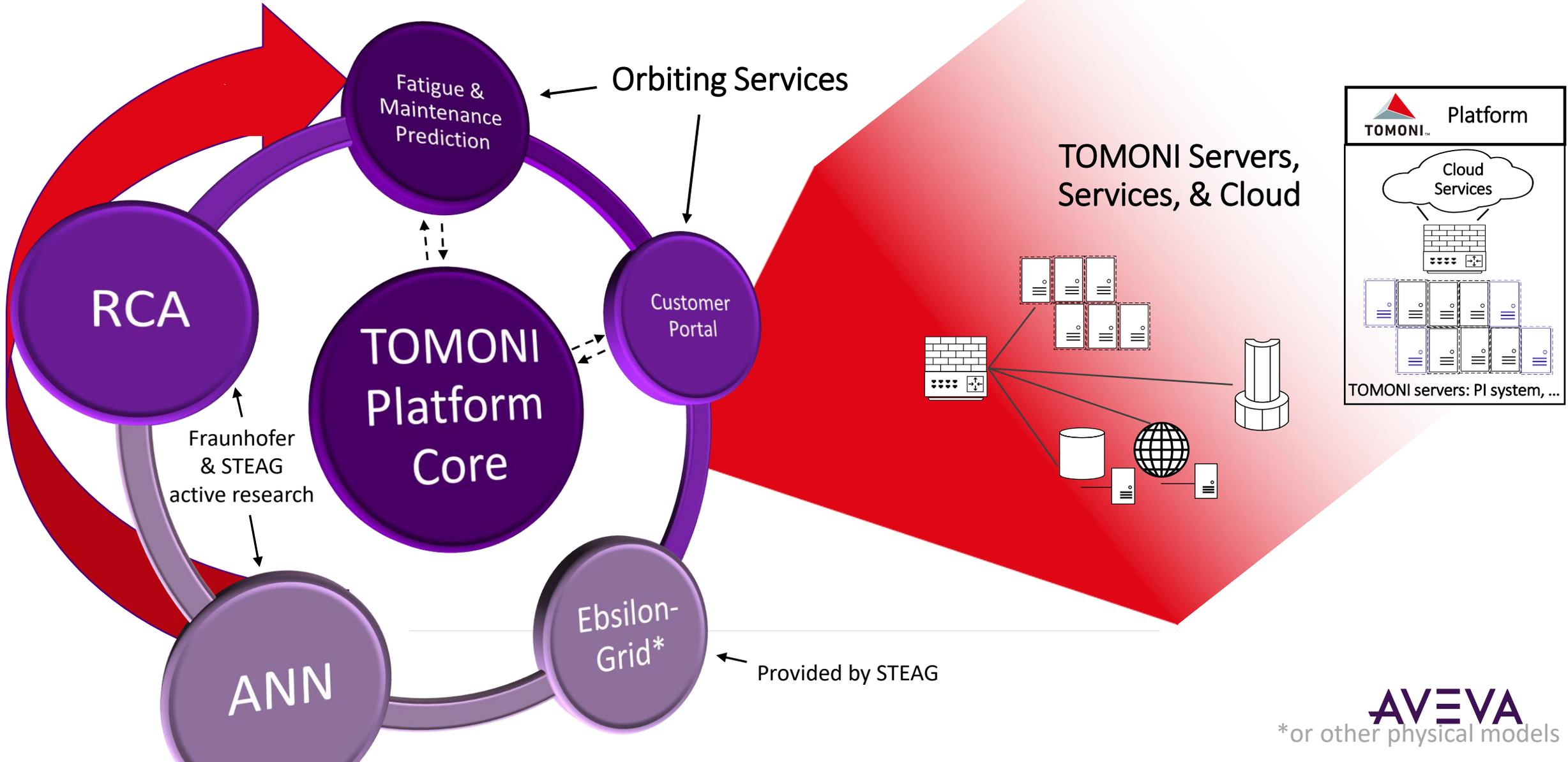
Connections to Sites and Users



TOMONI Servers, Services, & Cloud



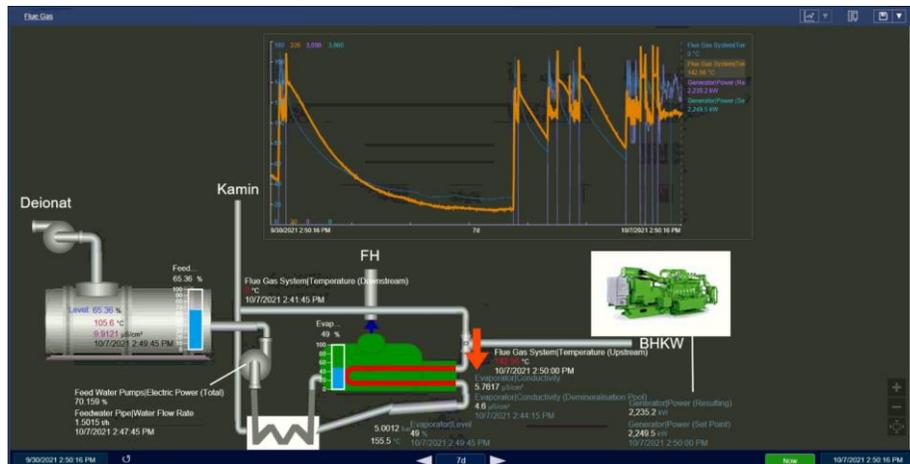
EU Development



EU Development

Plant Mirror – Signal Mapping, Modeling & Dashboards

- Total Plant Monitoring (TPM) Approach
- Variety of Plants: CCGT, BESS, Waste to Energy, SOFC, Electrolyzers, Heatpumps, Industrial Power Plant Solutions, ...
- Signal Mapping -> Tags, Elements, Templates
- Analysis Models, Dashboards, Trends

A screenshot of a plant monitoring software interface. It shows a tree view of elements on the left, including '10 Superheater' and '10 Exhaust Gas System'. The main area displays a table of data for the '10 Superheater' element, with columns for 'Category', 'Name', and 'Value'.

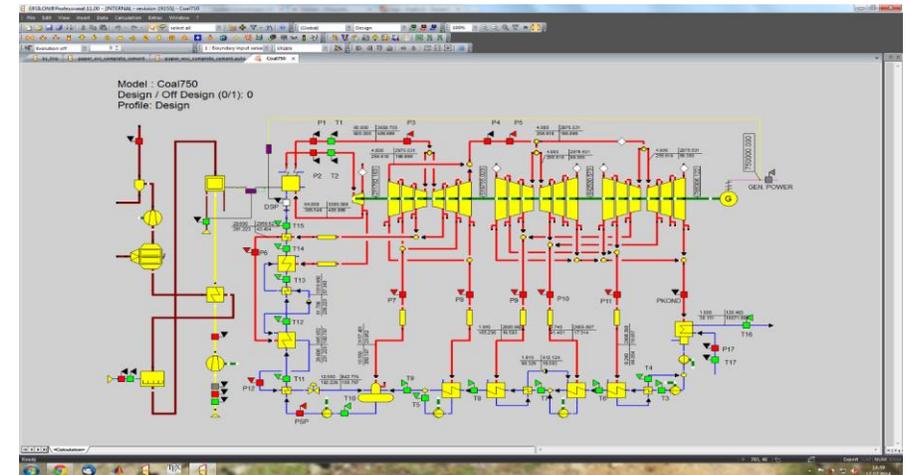
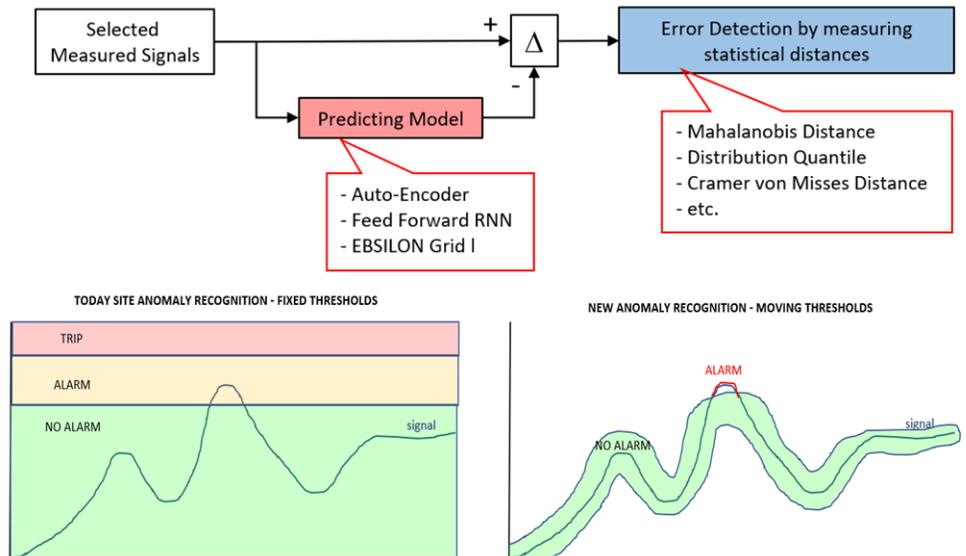
Category	Name	Value
CT Shell	CT 26.1	17.871 °C
Category: Shell Head		
CT 26.3	18.384 °C	
CT 26.2	17.871 °C	
CT 26.1	17.871 °C	
CT 9.3	18.407 °C	
CT 9.2	18.407 °C	
CT 8.1	17.871 °C	
CT 8.3	17.871 °C	
CT 8.2	18.384 °C	
CT 8.1	18.384 °C	
CT 7.3	17.285 °C	
CT 7.2	17.285 °C	
CT 7.1	17.285 °C	
CT 6.3	17.285 °C	
CT 6.2	17.285 °C	
CT 6.1	17.285 °C	
CT 5.3	17.285 °C	
CT 5.2	17.285 °C	
CT 5.1	17.285 °C	
CT 4.3	17.285 °C	
CT 4.2	18.407 °C	
CT 4.1	18.407 °C	
CT 3.3	17.871 °C	
CT 3.2	17.871 °C	
CT 3.1	17.871 °C	

EU Development

Early Warning – Anomaly Detection (AD) and Root Cause Analysis (RCA)

- Web Applications and Services built on a Service Oriented Architecture (SOA)
- “Plug-In” mechanism to support different models for AD and RCA
- Model development based on historical data as well as on simulated data
- Using physical models and artificial neural networks (ANN)
- Solutions developed via the government-funded R&D project “Digitales Service Center” (NRW funded project EFO 0010 A)

This is done under the NRW funded project EFO 0010 A under progress.nrw – innovation.



EU Development

Early Warning – Prototype Application

The screenshot displays the 'Early Warning' application interface. At the top, a navigation bar includes 'PROFILE', 'APPLICATIONS', and 'HELP', along with a 'dark theme' toggle. The breadcrumb path is 'Applications // Early Warning'. The main title is 'Early Warning'. On the left, an 'Explore Data' sidebar contains search and filter options. The central area features a table of tag data and a detailed 'Plant Information' panel on the right. The table lists tag names, counts, and statuses. The plant information panel provides details about the site connection, location, and current alerts.

Navigation Bar: PROFILE APPLICATIONS HELP dark theme

Breadcrumb: Applications // Early Warning

Early Warning

Explore Data

Search for tags by
Select interesting tags

filter results

Tagname				
<input type="checkbox"/> 11MBA1L				
<input checked="" type="checkbox"/> 11MBA102CT001 XQ51	114	deg C	25.11.2021 10:30:45	
<input type="checkbox"/> 11MBA102CT001 XQ52	112	deg C	25.11.2021 10:30:45	
<input checked="" type="checkbox"/> 11MBA102CT001 XQ53	111	deg C	25.11.2021 10:30:45	
<input checked="" type="checkbox"/> 11MBA102CT003 XQ50	101	deg C	25.11.2021 10:31:45	
<input type="checkbox"/> 11MBA102CT003 XQ51	99	deg C	25.11.2021 10:31:45	
<input type="checkbox"/> 11MBA102CT003 XQ52	103	deg C	25.11.2021 10:31:45	
<input type="checkbox"/> 11MBA102VDGT1 XG01	true	bool	25.11.2021 10:31:45	
<input type="checkbox"/> 11MBA102VDGT2 XG01	true	bool	25.11.2021 10:31:45	
<input type="checkbox"/> 11MBA104CT003 XQ50	101	deg C	25.11.2021 10:31:45	

Rows per page: 10 1-10

CONTINUE NEW SEARCH

Plant Information:

- active site connection (show in calendar)
- located at Wuppertal in Germany (show map)
- connected since 17th July 2021 (17.07.2021) (show in calendar)
- 7635 connected signals (4023 digital, 3612 analog) (show tags)
- 92 connected alarms (61 critical, 31 warning) (show tags)
- 2 current alerts** (1 critical, 1 warning) (show alerts)

Early Warning Information:

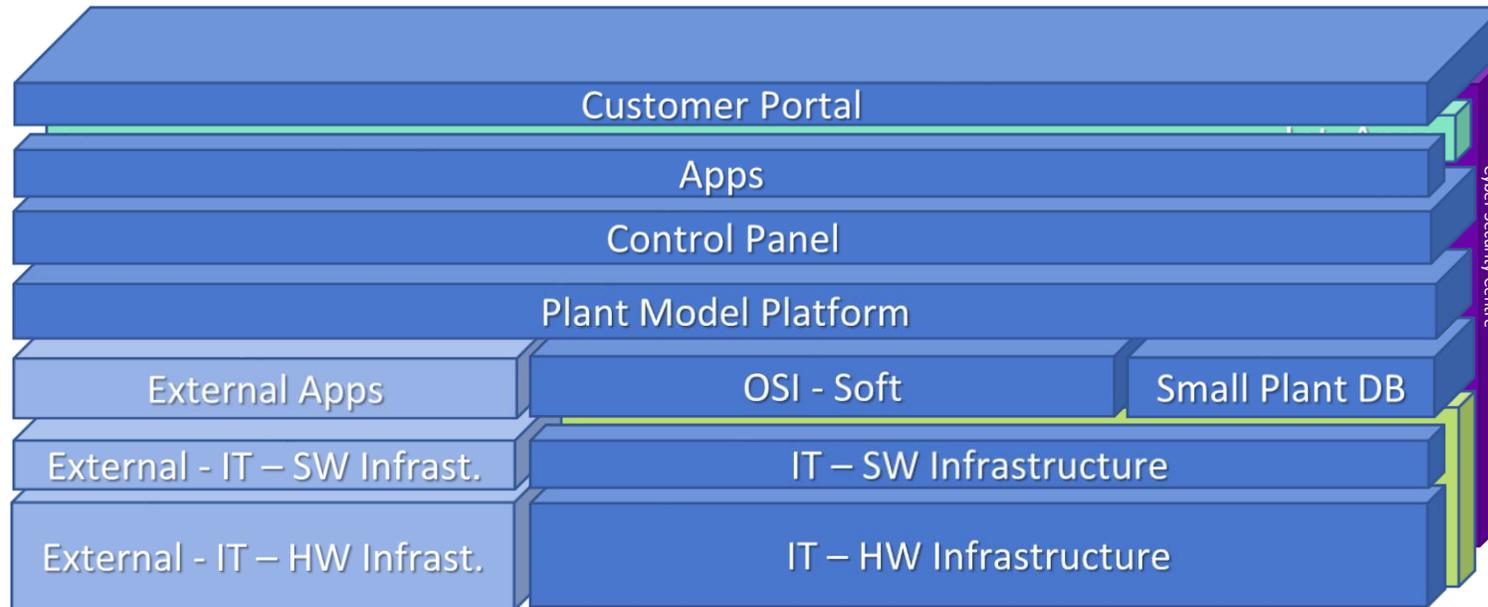
- 2/4 models enabled (1/3.H, 1/1.S, 0/0.A) (manage models)
- 290 signals under surveillance (120 enabled) (show evaluation)
- no models scheduled for execution (open scheduler)
- 1044 anomalies detected (455 H / 589 S / 0 A) (show reports)
- 1/86 open reports**, latest 2nd Feb 2022 (02.02.2022) (show reports)
- 39% false positives (63% H / 22% S / 0% A) (show evaluation)

Explore Data

- Manage Models
- Perform Check
- Browse Reports

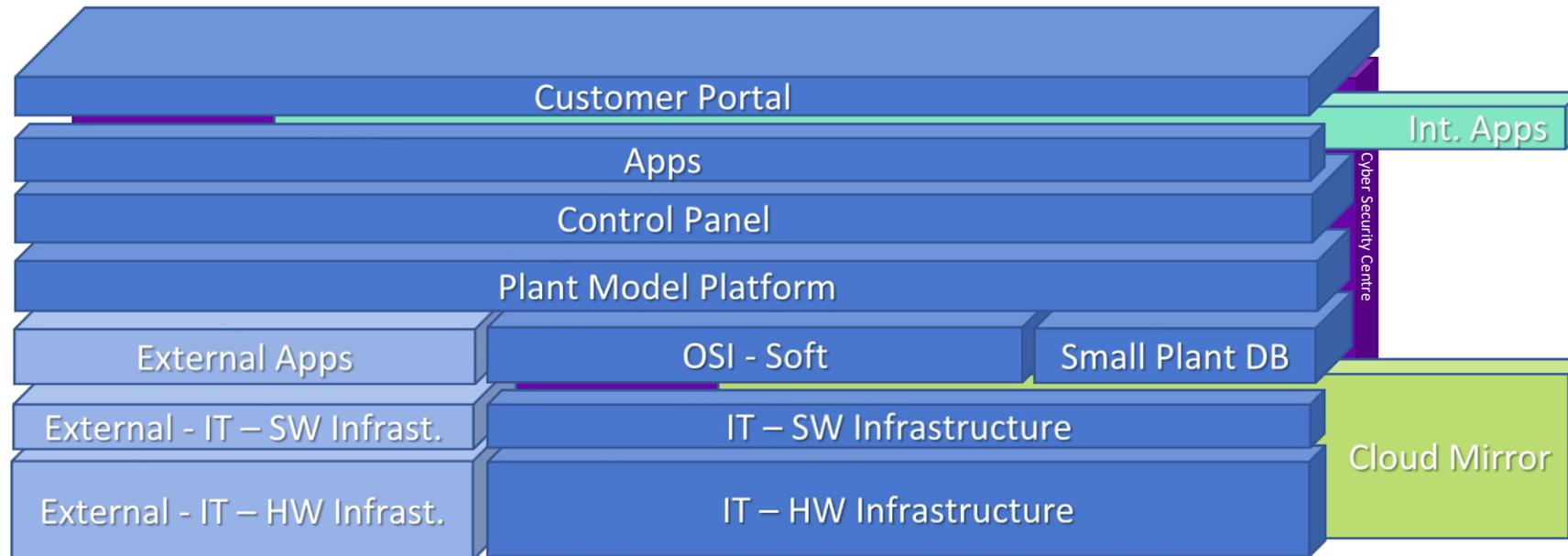
EU Development

Advanced Analysis Platform Development and Web Portal Integration



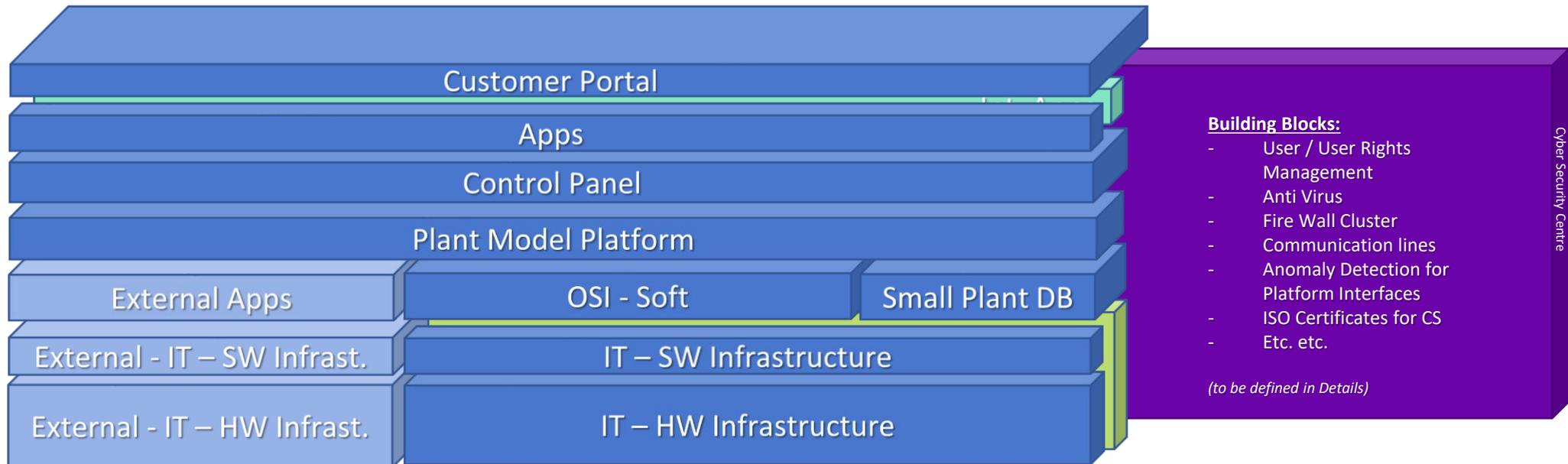
EU Development

Advanced Analysis Platform Development and Web Portal Integration



EU Development

Advanced Analysis Platform Development and Web Portal Integration





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- T_Rueschhoff-Nadermann@eumhi.com

Questions?

Please wait for the microphone

- State your name and company



Please remember to...

Complete the survey!

- Navigate to this session in the mobile agenda for the survey

