MHPS-TOMONI: Cloud Based Plant Data Monitoring and Analysis Platform

Presented by Hiroyasu Ishigaki

MHPS

Agenda

1. MHPS-TOMONI Digital Solutions
2. MHPS-TOMONI Cloud/Edge System
3. Cyber security on MHPS-TOMONI
4. User environment and PI development
5. Red carpet incubation program
6. Conclusion

Part 1
MHPS-TOMONI Digital Solutions

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1-1. Our Background

MHPS At a glance

Power plant equipment OEM / EPC contractor

The Prove of Engineering Excellence

1-2. MHPS-TOMONI : The Concept

TOMONI means “Together” in Japanese.

It represents MHPS’s bold move to revolutionize ICT solution for thermal power industries, together with our customers.

We aim at transforming businesses and leading digitalized industries with advanced technologies, decades of O&M knowhow and profound plant knowledge.

Through partnership, we ensure customer satisfaction with strategic development to expand mutual benefits in a sustainable way.

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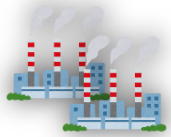
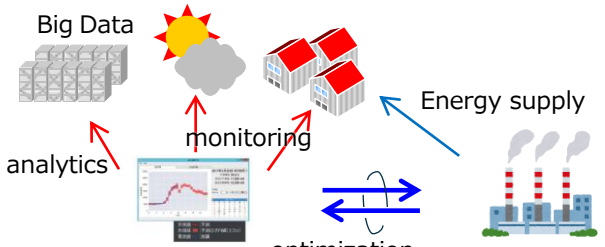
1-3. MHPS-TOMONI : Roadmap

Autonomous Operation



Optimize the overall fleet portfolio

E M S (Energy Management System)



Advanced O&M

Remote Operation

Advanced Remote Monitoring

Optimized Performance

Automated Boiler Combustion Tuning

Extended Outage Intervals

O&M Support

Shorter Outages

Global Service Center (Philippines)
Remote monitoring and O&M support

Higher Reliability

Predictive Analytics by diagnostics of motor current

Monitoring

1-4. MHPS Remote Monitoring Center

Our Remote Monitoring Centers are first step for MHPS ICT solutions

Takasago RMC (Japan) 1999-

Orlando RMC (USA) 2001-

Alabang RMC (Philippine) 2016-

1-5. Strong relationships for MHPS-TOMONI

We have selected best in class technologies

MHPS ICT uses common platform for greater flexibility and security

Collaboration with customers identify new ways to solve problems

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Part 2
MHPS-TOMONI Cloud/Edge System

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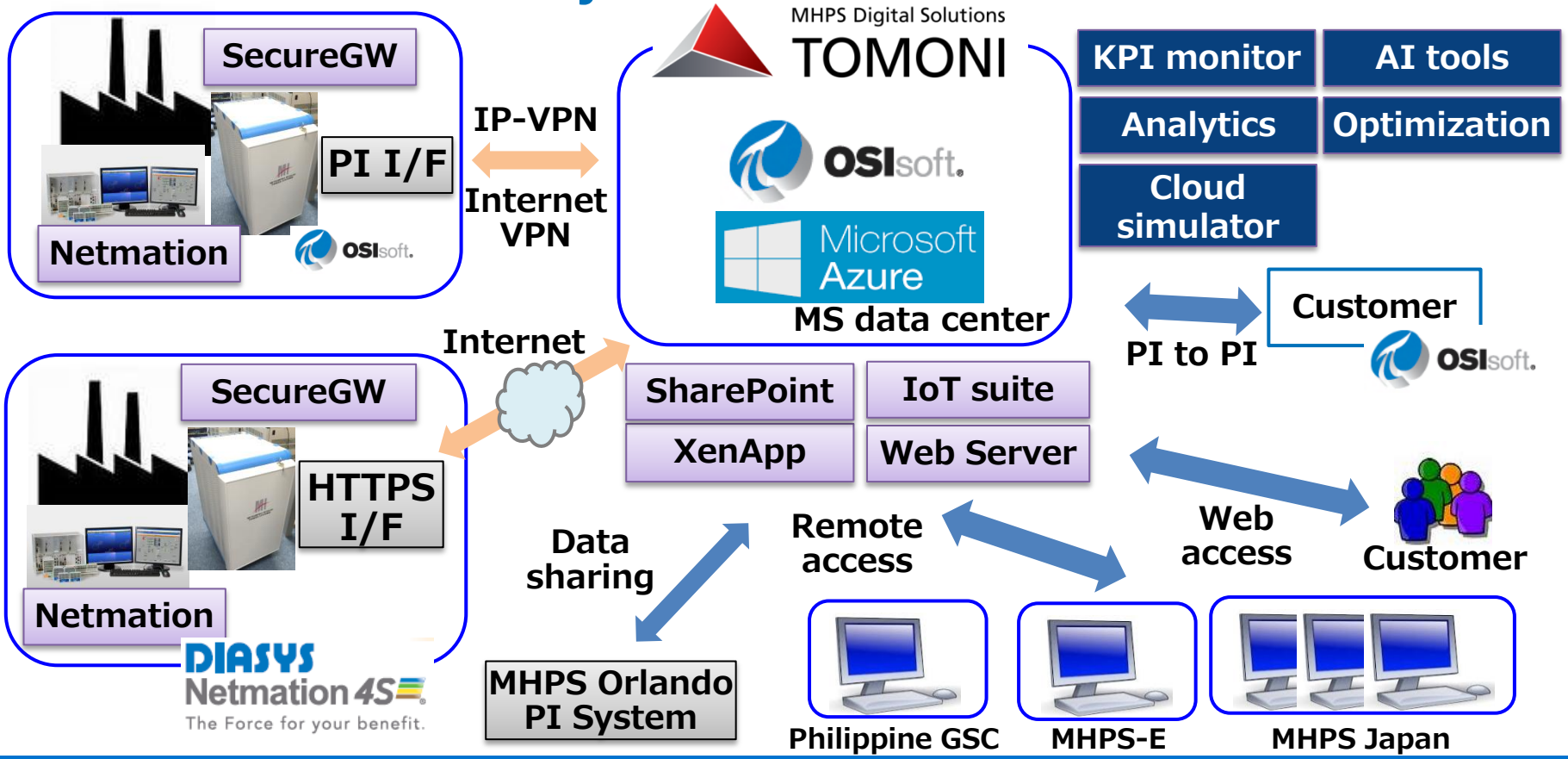
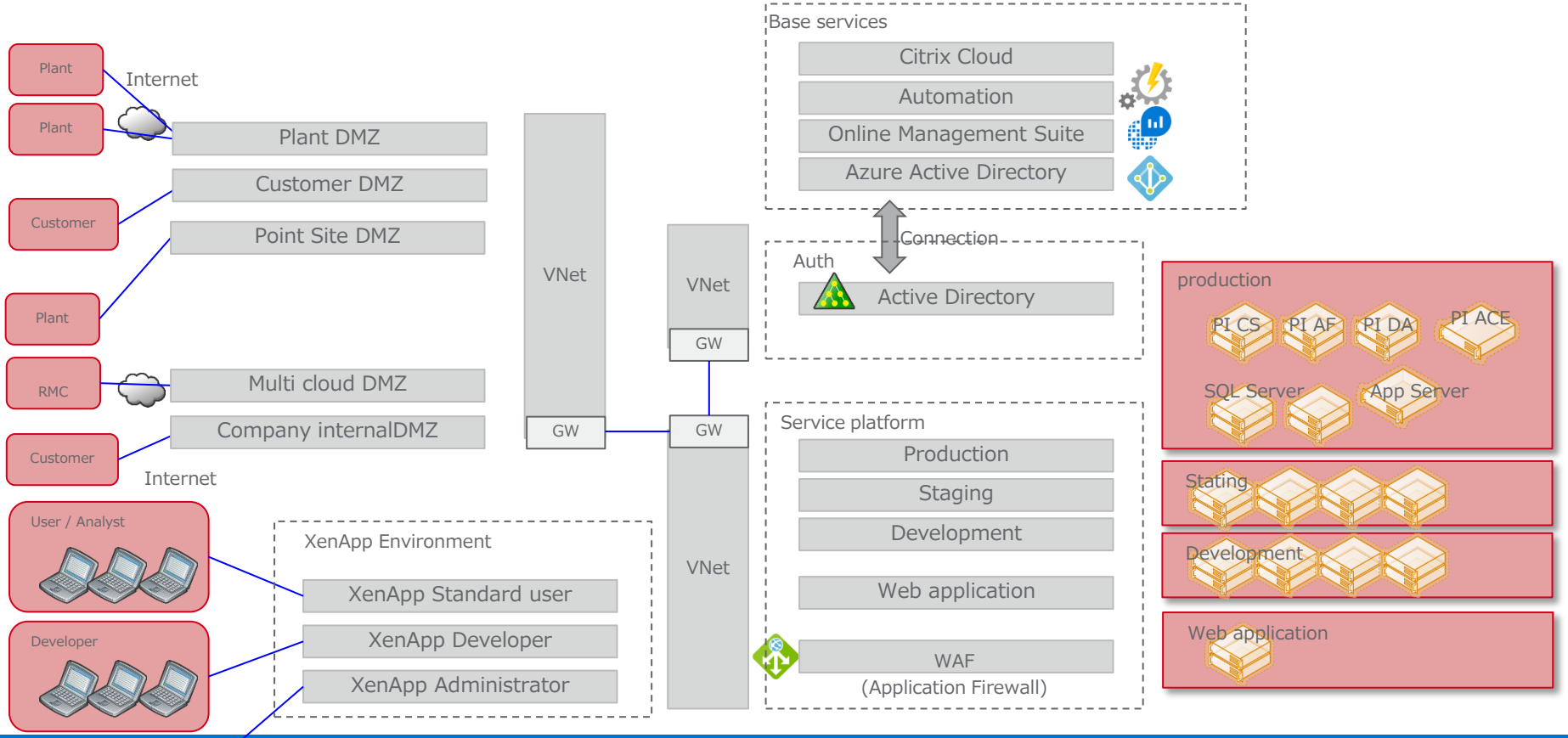
2-1. MHPS-TOMONI System overview

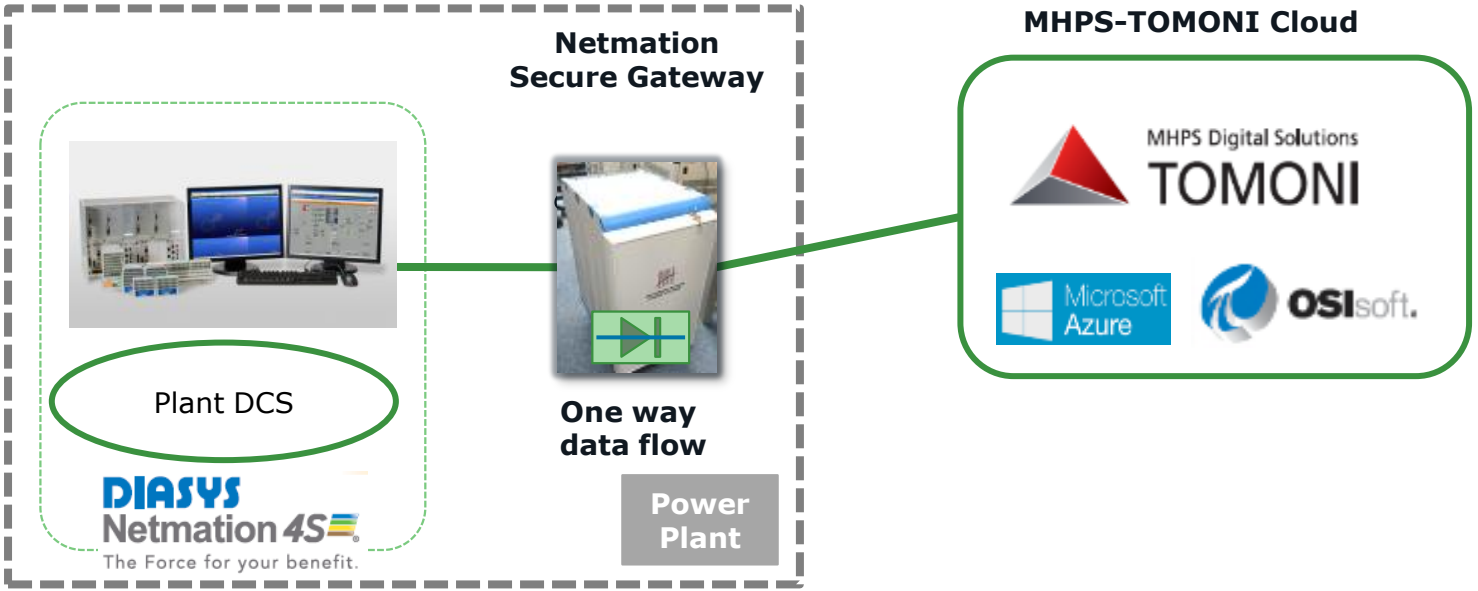


2-2. MHPS-TOMONI Cloud System in detail



2-3. Edge System – data collection

Based on data volume, we have several options to transmit data to Cloud.



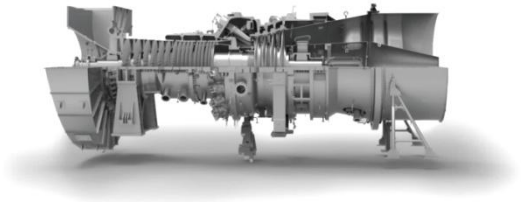
HTTPS on Internet : Low volume

PI OPC Interface on IP-VPN/Internet VPN : Middle volume

PI to PI Interface on IP-VPN : High volume

2-4. Edge System – plant performance enhancer

Not only collecting data, also enhancing plant performance



Plant DCS

DIASYS Netmation 4S
The Force for your benefit.

MHPS-TOMONI Edge Enabler

Power Plant

MHPS-TOMONI Cloud

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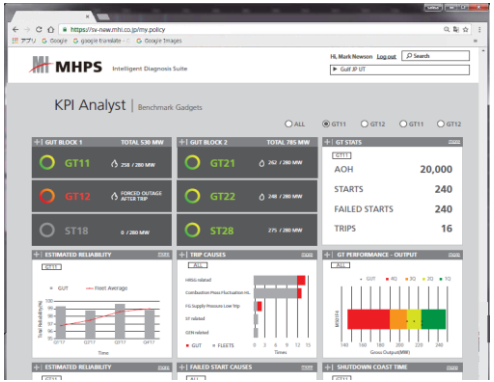

Heat rate recovery

CC efficiency

Part 3
Cyber security on MHPS-TOMONI

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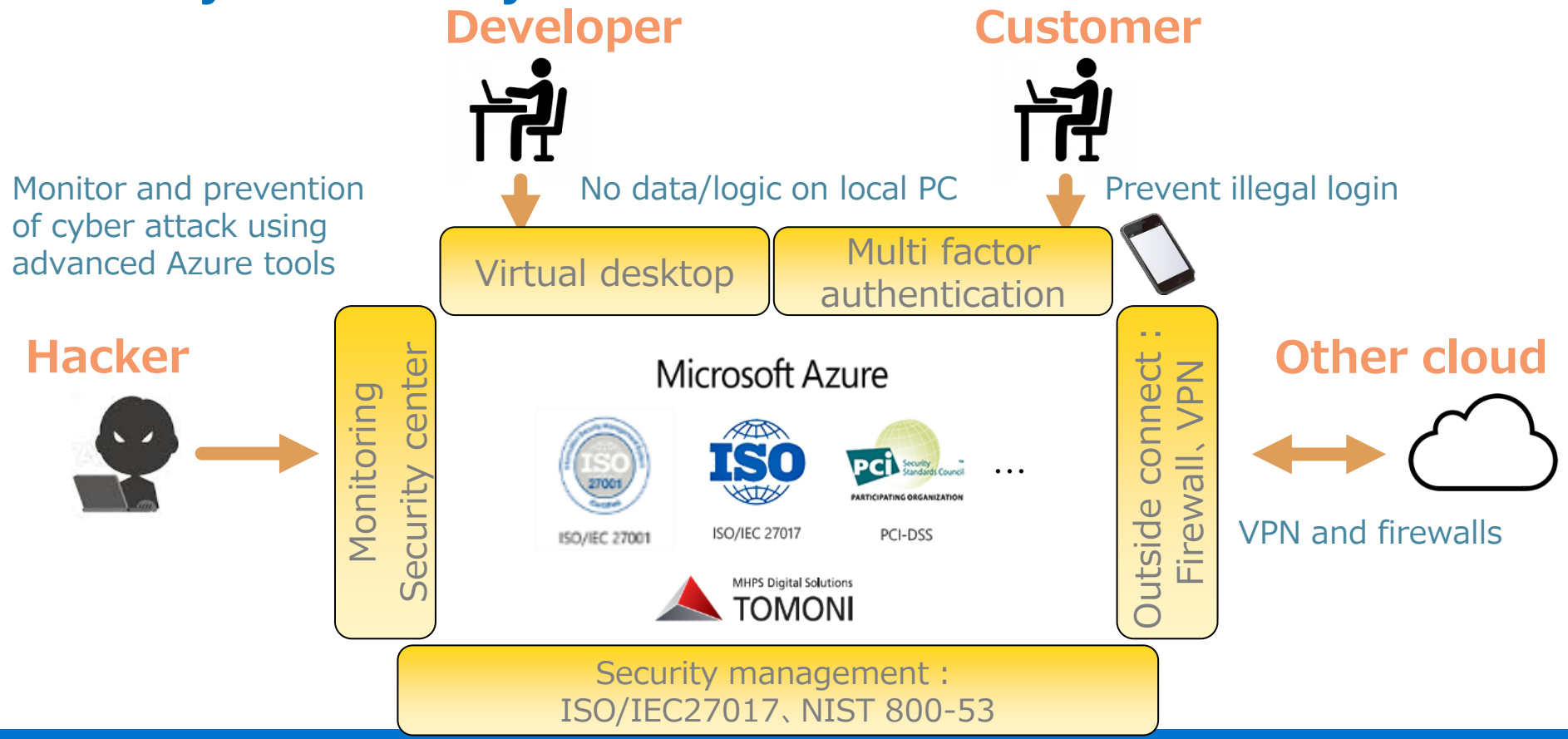
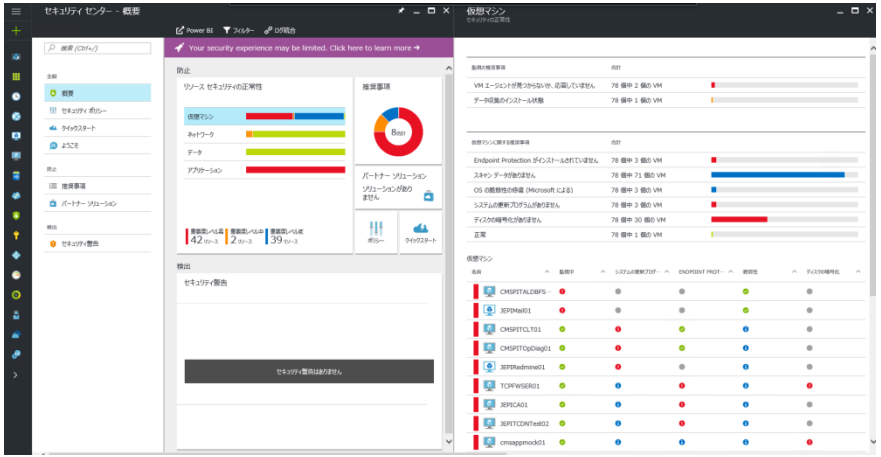
3-1. Cyber security on cloud



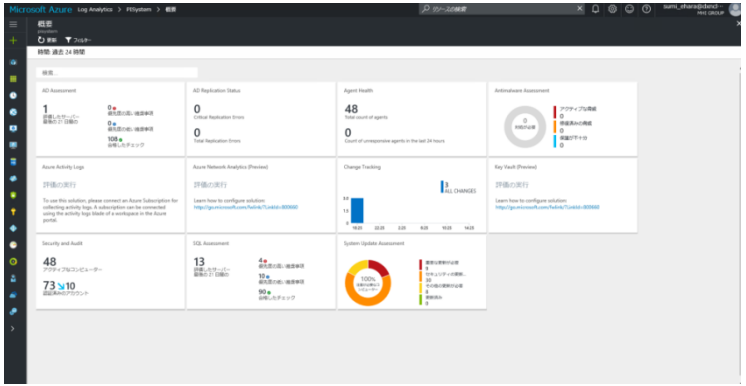
3-2. Various cyber security tools provided by Azure

Operations Management Suite（OMS）

Security Center

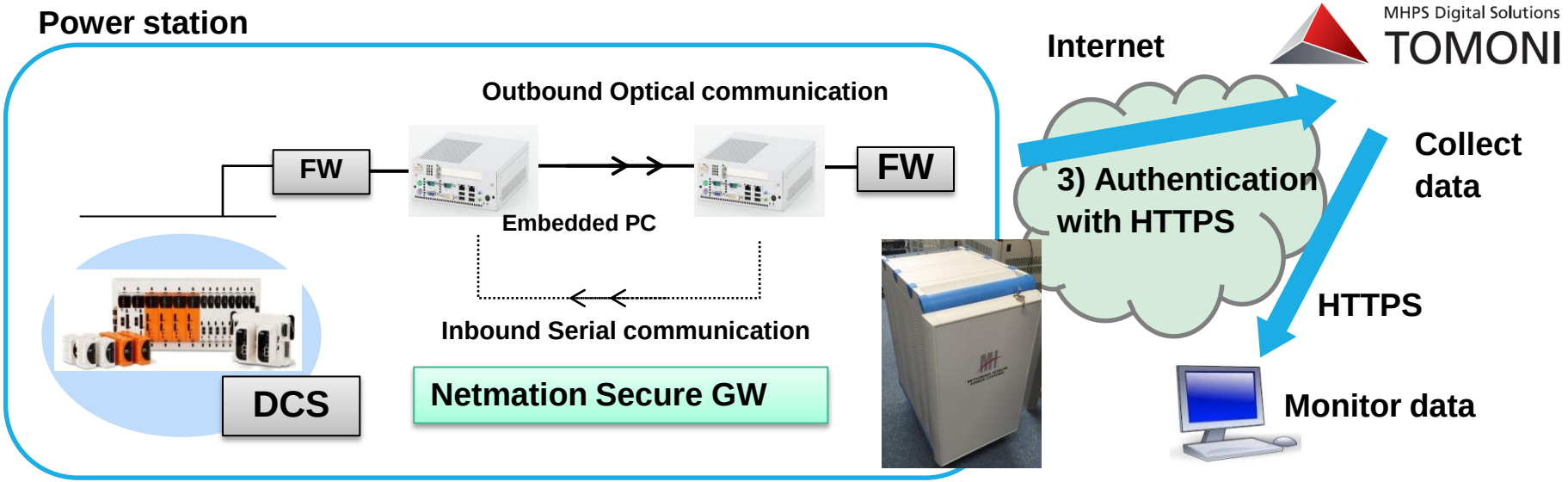


Log Analytics



To achieve high security level which we hardly obtain by ourselves on premise system with reasonable cost.

3-3. Cyber security on edge



Netmation Secure Gateway

- One way data diode equivalent secure communication with asymmetric data lines to realize flexible data access

- Secure SSL/TLS communication with server/client digital certification

Part 4
User environment and PI development

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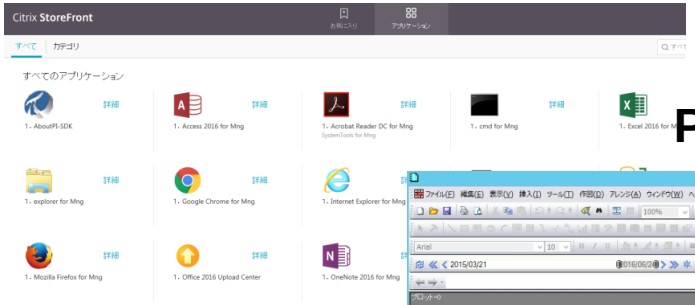
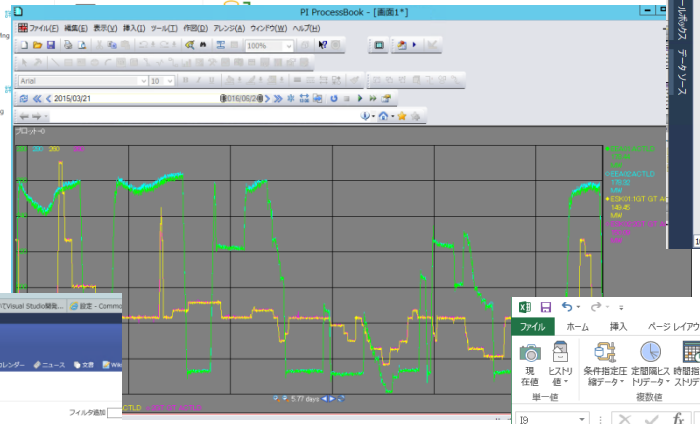
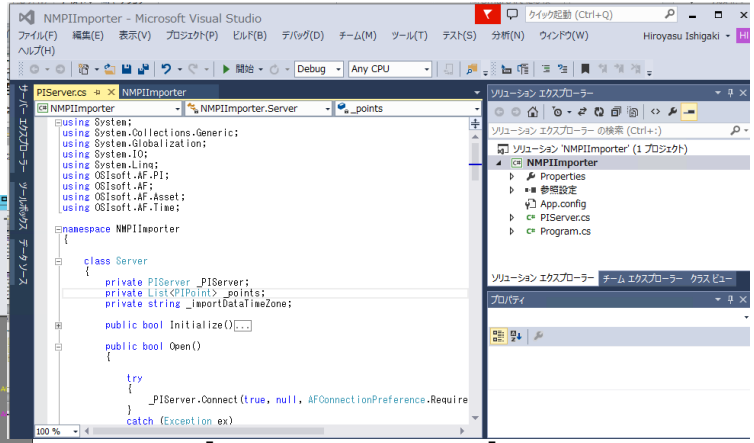
4-1. Remote application environment



PI ProcessBook

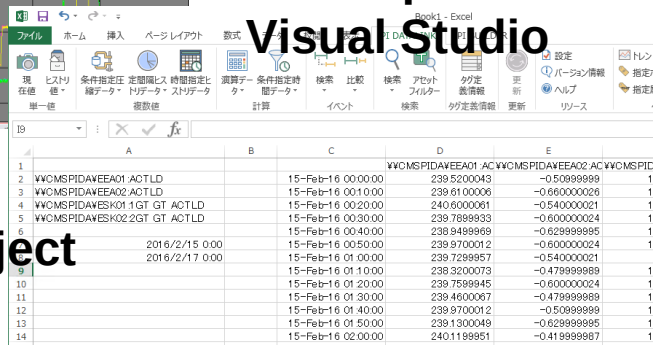


Virtual desktop Menu



Development environment Visual Studio

Ticket-driven Project management

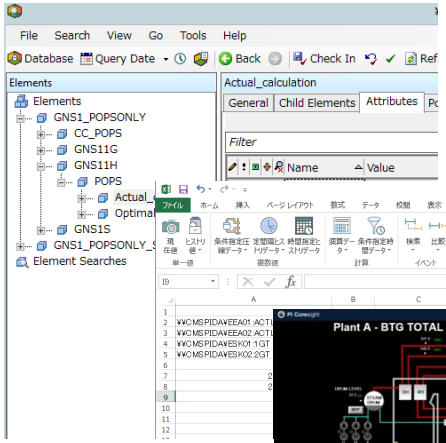


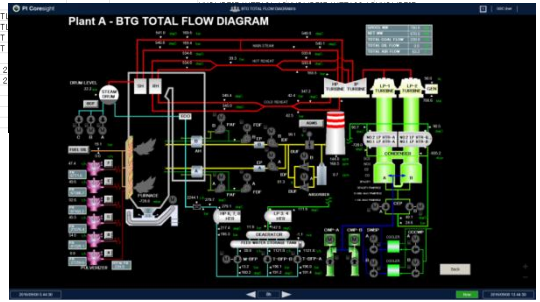
Excel Data-link

4-2. Important PI system components

Calculation / Visualization

- PI Asset Framework
  Handling multiple power plants with structure/templates
- PI ProcessBook / PI DataLink
  Data visualization, easy,
  rich functionality
- PI Vision
  Easy, Ad-hoc, mobility visualization
- PI AF Analytics
  Various data analysis including
  Heat rate, equipment efficiency





4-3. Important PI system components

Data interface

- PI AF SDK / PI OLEDB IF / PI Web API

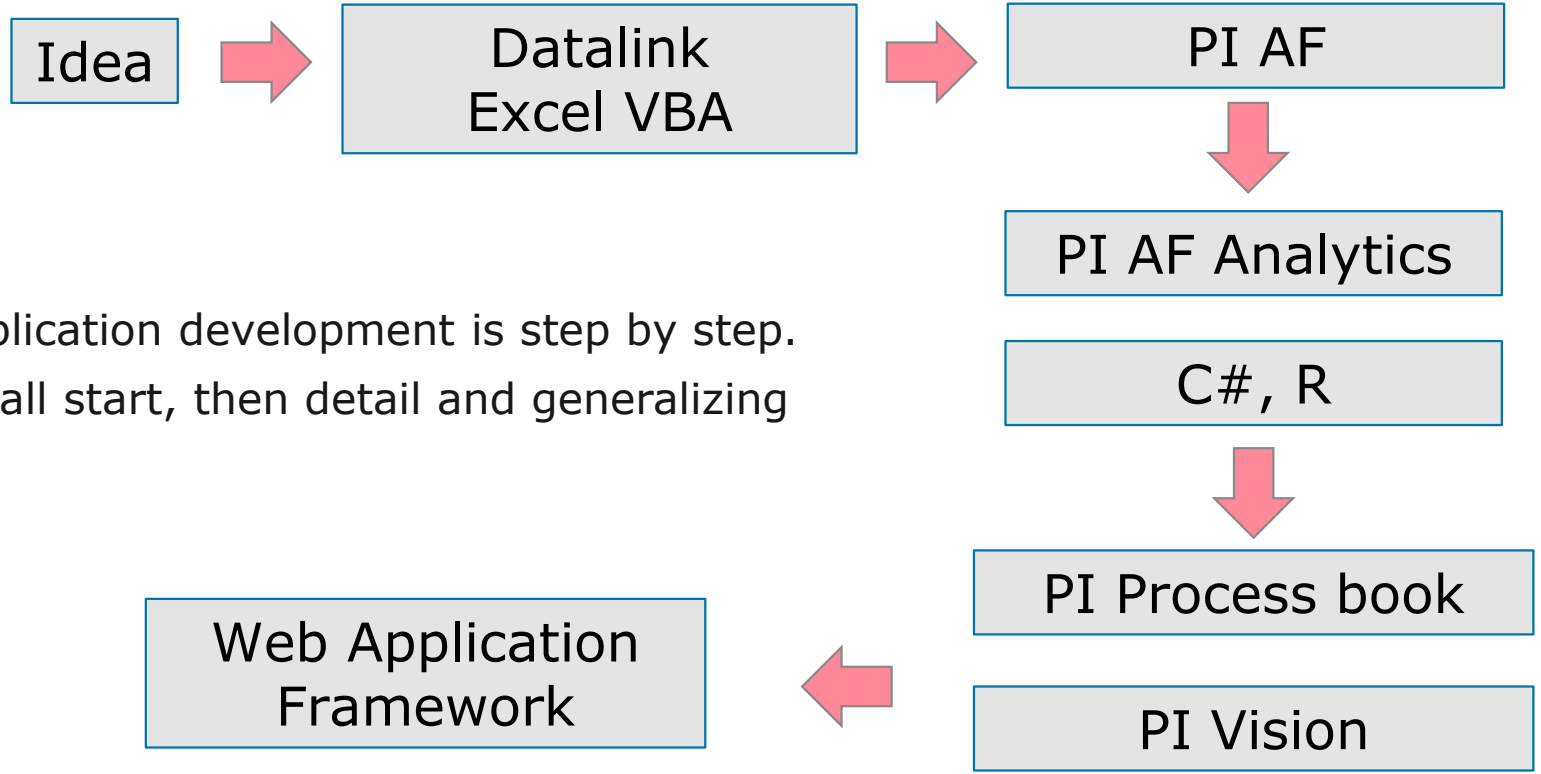
Data interface for various development environment / languages

C#, Java, R

- PI Interface

Interface with various equipment and data sources
PI to PI, PI OPC, PI UFL

4-4. Development flow for plant application

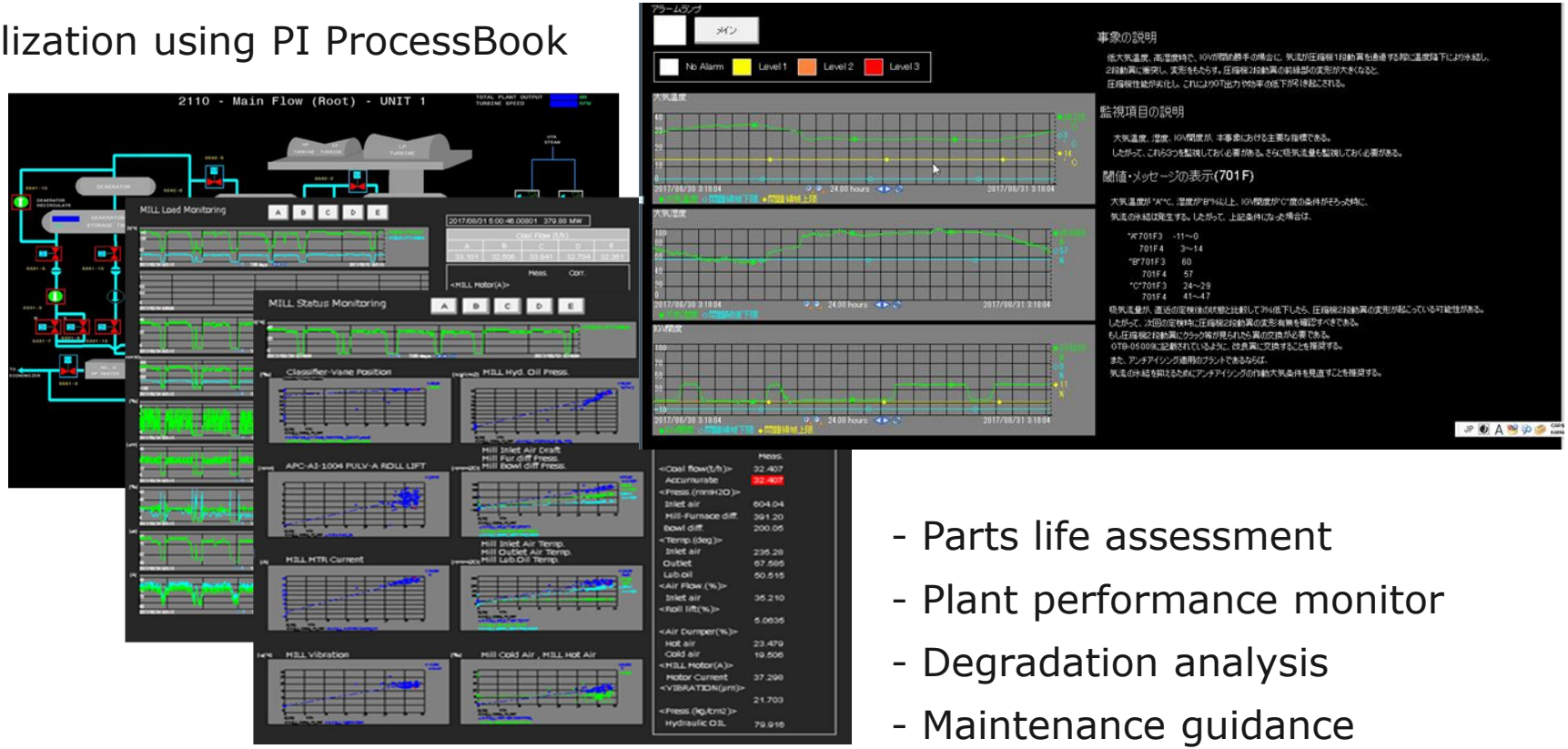


Application development is step by step.

Small start, then detail and generalizing

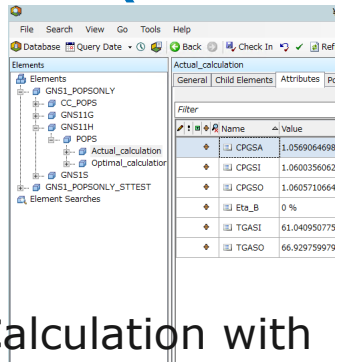
4-5. Application examples

Visualization using PI ProcessBook

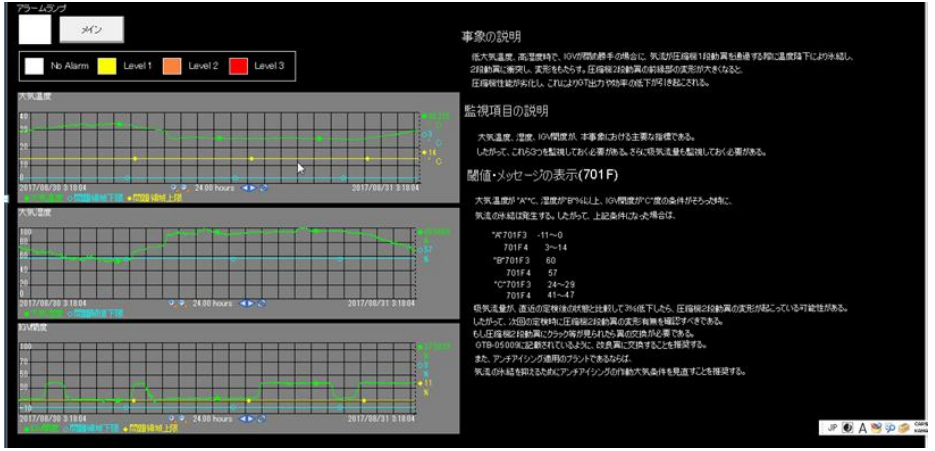


- Parts life assessment
- Plant performance monitor
- Degradation analysis
- Maintenance guidance

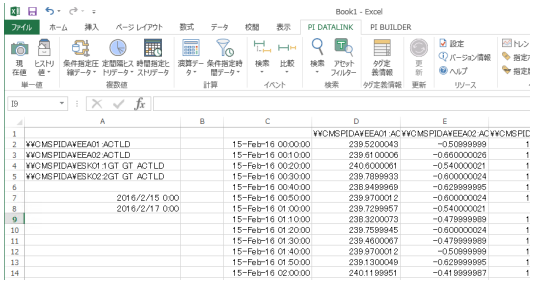
4-5. Application example (Performance monitor)



Calculation with Asset Analytics



Visualization with PI Processbook / PI Vision



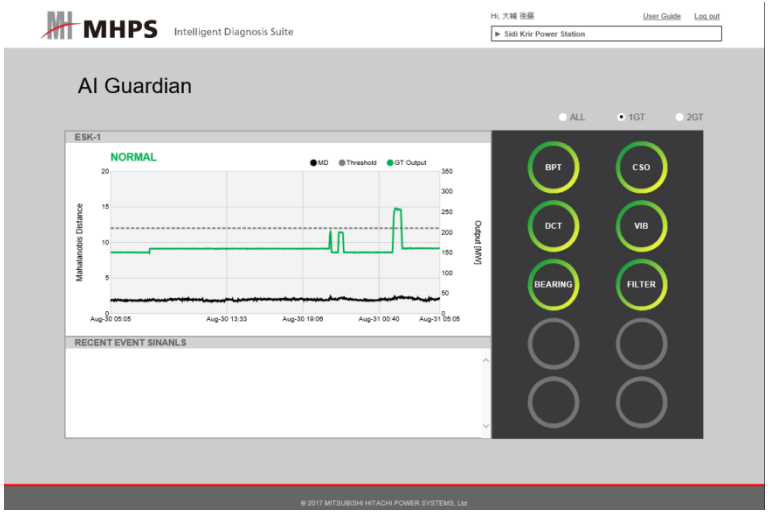
Calculation with Excel/Datalink

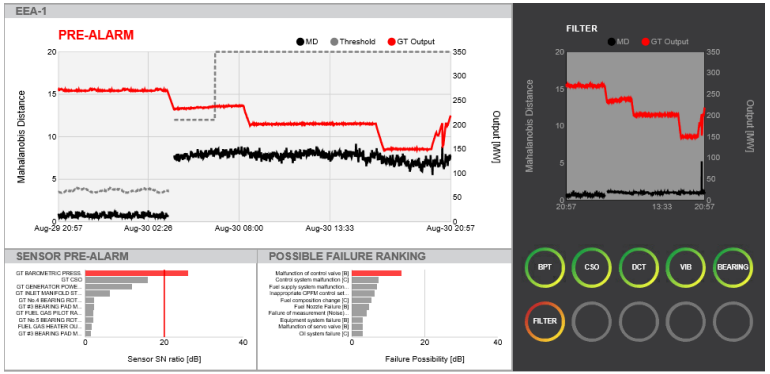
Store as Excel visualized report

4-6. Application examples

Visualization as Web Application

KPI monitoring

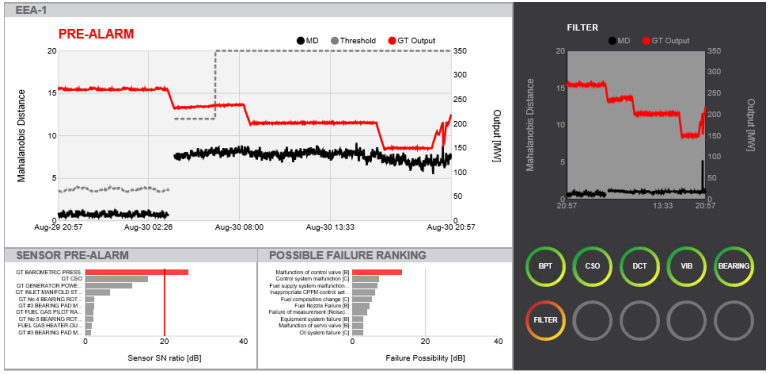




Predictive analytics
with root cause analysis

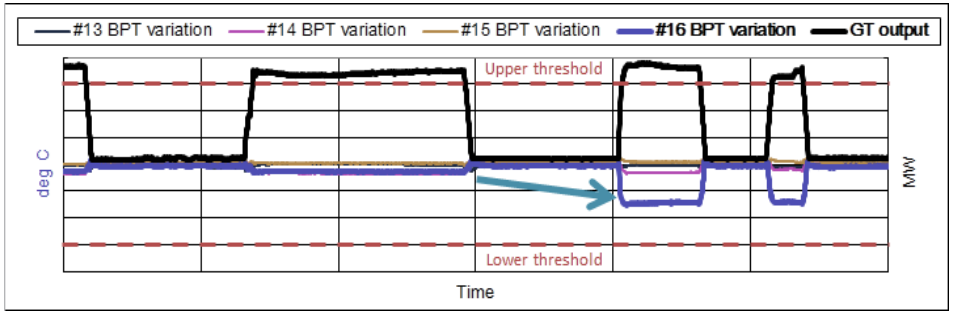
4-6. Application example (Abnormality detection)

Early abnormality detection technology identifies sensors indicating abnormal values.

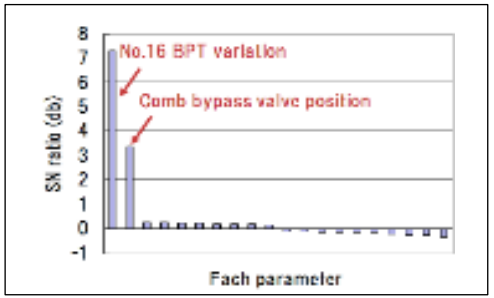


Root cause pattern matching

Example : BPT Abnormality detection



BPT fluctuation is within the threshold but MT method can detected abnormality



Abnormal signal detection

Part 5
Red Carpet Incubation Program

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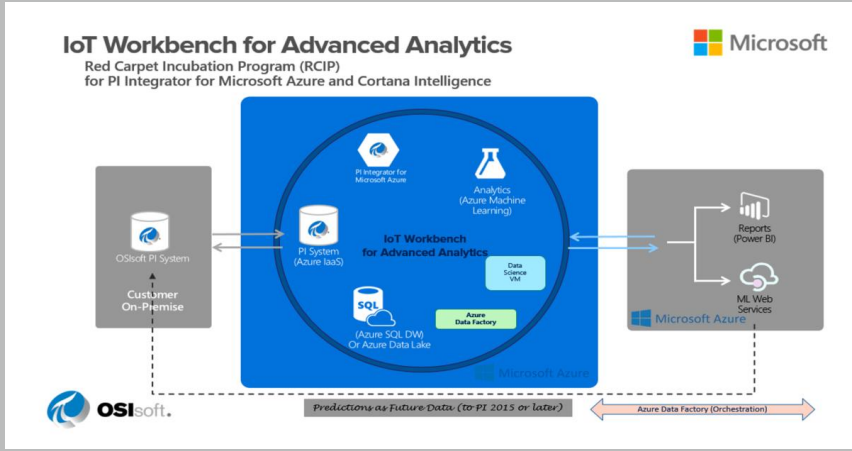
Red Carpet Incubation Program (RCIP)

*A key element of RCIP is the **PI Integrator for Microsoft Azure** that automatically cleans, prepares and transmits PI System data, context and insights to the Microsoft Cloud Platform, which facilitates a rapid operationalization of IoT analytics.*

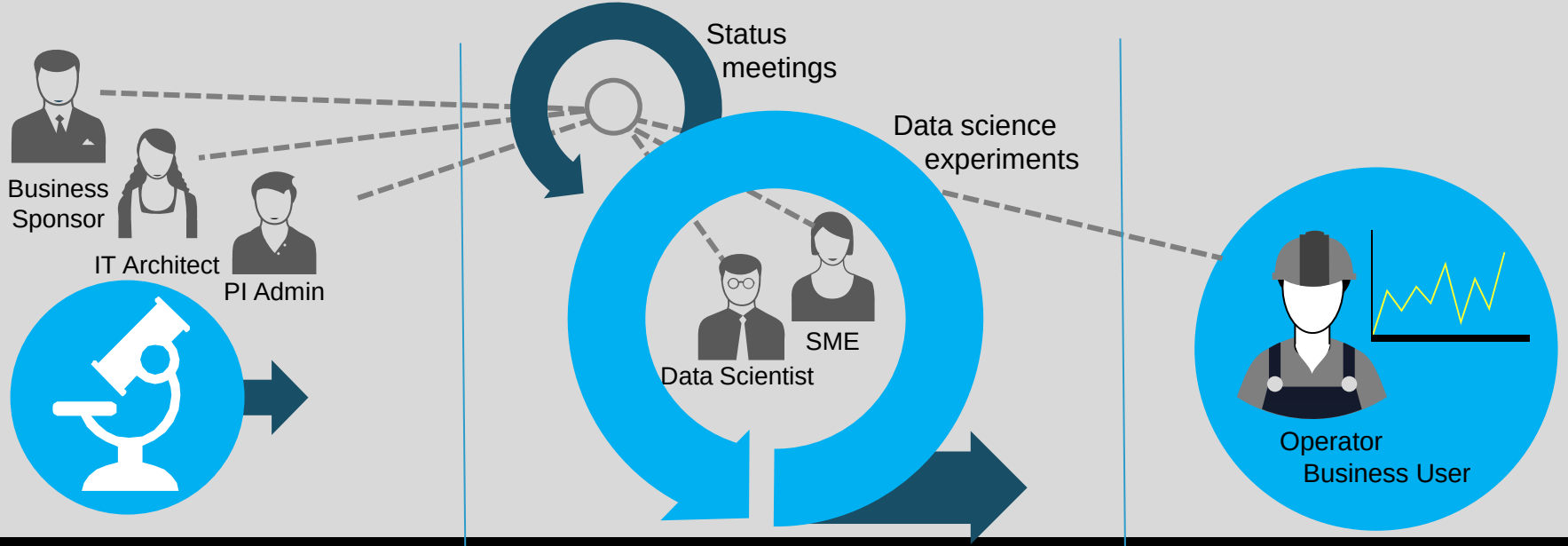


Red Carpet Incubation Program

The Red Carpet Incubation Program (RCIP), a comprehensive collaboration between OSIsoft and Microsoft, is designed to reduce the burden of data preparation by adding contextualization and insights from OSIsoft's PI System to support Industry 4.0 initiatives related to using Azure-based Internet of Things (IoT) and AI solutions.

https://partner.microsoft.com/en-us/case-studies/osisoft

OSIsoft | Microsoft Red Carpet Incubation Program (RCIP)



Discovery

Define use case & value proposition
Setup system access
Identify relevant data
Setup IoT Analytics Workbench
Install PI Integrator for Microsoft
Azure
Install Cortana Intelligence

Exploration

Generate hypothesis with SME
Create data model & view
Run experiments in Azure ML
Analyze results
Update hypothesis & iterate

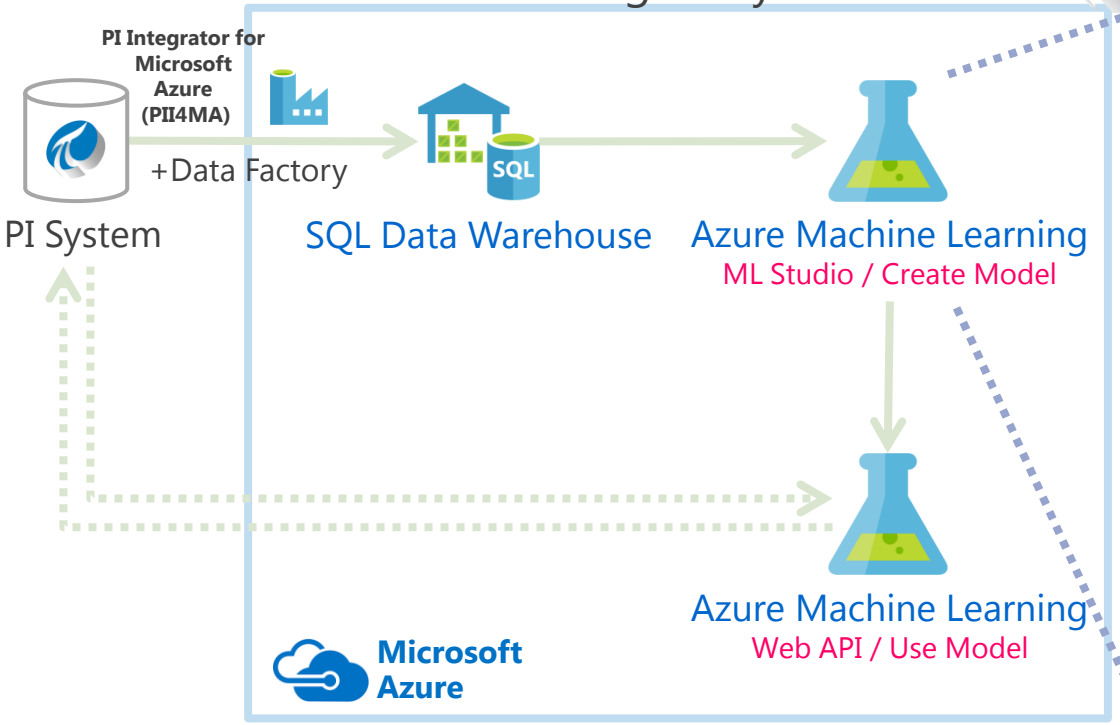
Operationalization

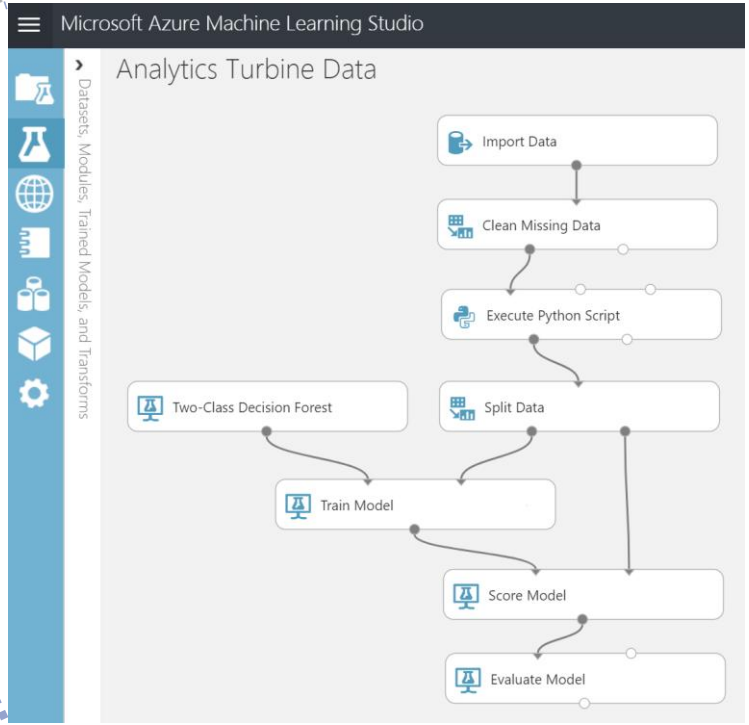
Store predictions in PI Syste
See predictions in PI Vision
Slice and dice data in Power BI
Present results to stakeholders
Train and handover

Red Carpet Incubation Program - Result

Microsoft Azure Machine Learning

Cloud based machine learning analytics service





Part 6
Conclusion

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6-1. Conclusion

- MHPS-TOMONI : Power Plant Digital Services
- Combining Azure cloud and PI System
- High level security
- Quick development
- Data analysis and visualization
- Advanced tool such as Azure Machine Learning

Digital Transformation with data and cloud

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6-2. Future tasks

- Cyber Security on Azure PaaS / SaaS (currently using IaaS)
- Asset Analytics capability (more complex calculation, better editor)
- PI Web API performance
- Calculating and storing statistical data

- PI system / Azure integration support for customer

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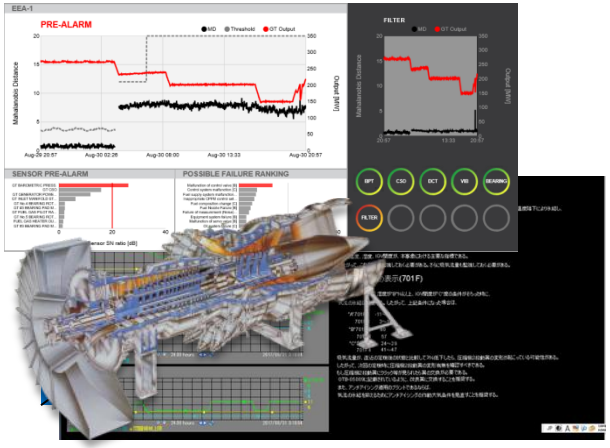
MHPS-TOMONI: Cloud Based Plant Data Monitoring and Analysis Platform

COMPANY and GOAL

MHPS is a power plant equipment OEM/EPC and wanted to provide best services for customers to improve power plant operation and maintenance

MHPS



CHALLENGE

How to create application/service platform which is secure and accessible from anywhere.

- World wide engineers/sales/customers
- Huge plant data
- Various requirements
- Cyber security

SOLUTION

Implement application/service platform using PI system on Azure cloud

- Asset Analytics
- PI Processbook / PI Vision
- PI AF SDK / PI Web API
- Azure tools / MS Datacenter
- Azure ML suite

RESULTS

Rapid, efficient and secure platform to provide best services for our customers

- Scalable
- Flexible
- Secure
- Accesible

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Mitsubishi Hitachi Power Systems, LTD.

Questions

Please wait for the **microphone** before asking your questions

State your **name & company**

Please remember to…

Complete the Online Survey for this session

감사합니다

Danke

谢谢

Merci

Gracias

Thank You

ありがとう

Спасибо

Obrigado