

EMPOWER YOUR ANALYTICS WITH OPERATIONAL DATA  
2019 OSISOFT MUMBAI SEMINAR

# OT/IT Integration

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OSIsoft, LLC.  
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*Regional Seminars  
Mumbai, INDIA*

# OT/IT Integration - Takeaways

- Automate/Change existing **business process**
  - **Small** amounts of data
  - Trigger a work order in SAP PM..., Initiate a workflow in IBM Maximo
    - What, Why, How... with use cases
  - **People, Process, Technology**
- Cloud based machine learning, Enterprise data lake ...
  - **Large** amounts of data
  - Microsoft Azure, Amazon AWS, Google Cloud, SAP HANA, R, Python ...
    - What, Why, How... with use cases

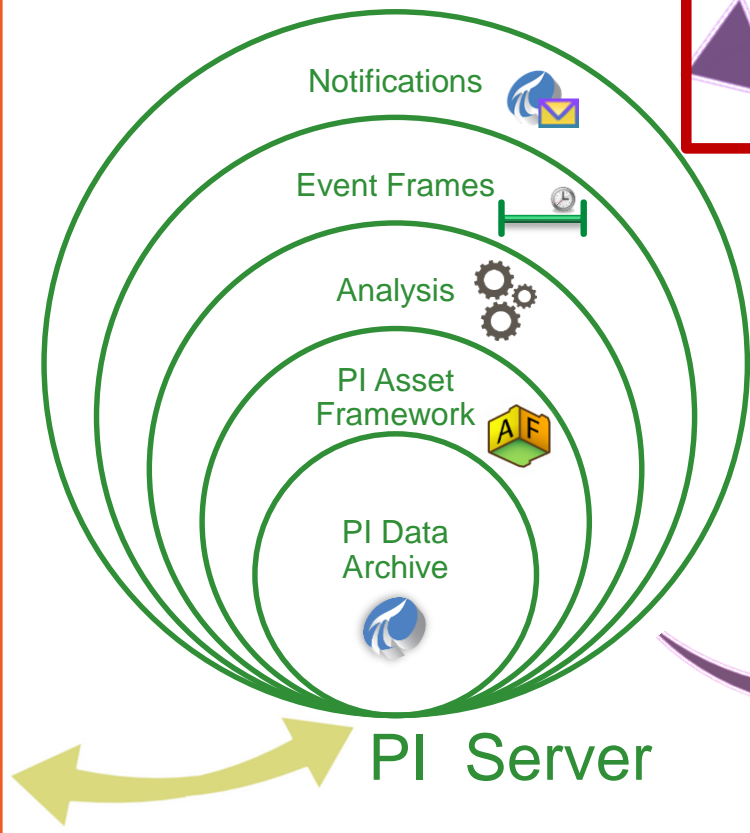
OT=Operations Technology  
IT=Information Technology

# OT/IT Integration - Takeaways

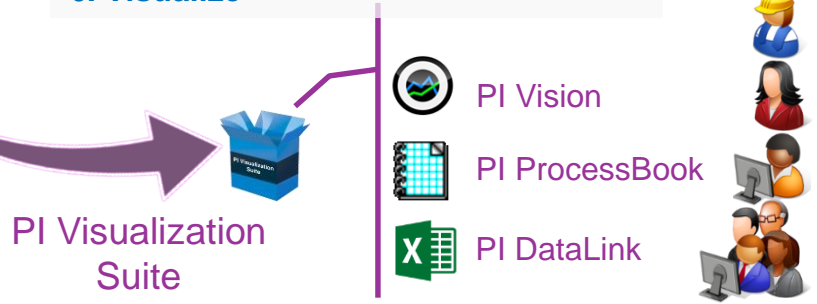
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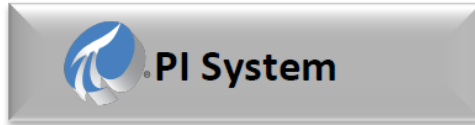
# The Modern PI System



1. Connect to relevant sources
2. Collect and archive data
3. Assign context (asset-based)
4. Add Analytics logic
5. Alert and notify
6. Visualize



Production Maintenance Inventory Quality

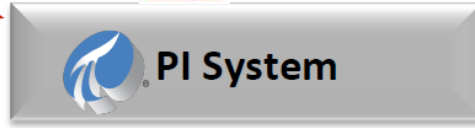


Production Maintenance Inventory Quality



PI OLEDB Enterprise

ORACLE



PI JDBC



INFOR



PI Notifications



PI Web Services API

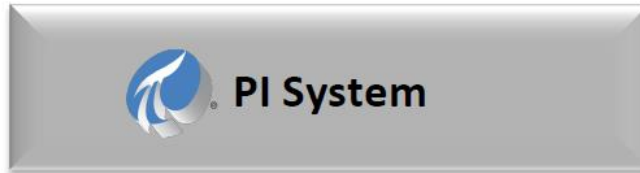
MINCOM

Ventyx

# PI Data Access family of products

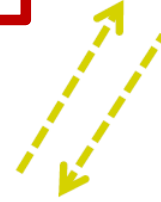


## PI System Access (PSA) license







# Business Integration – What?

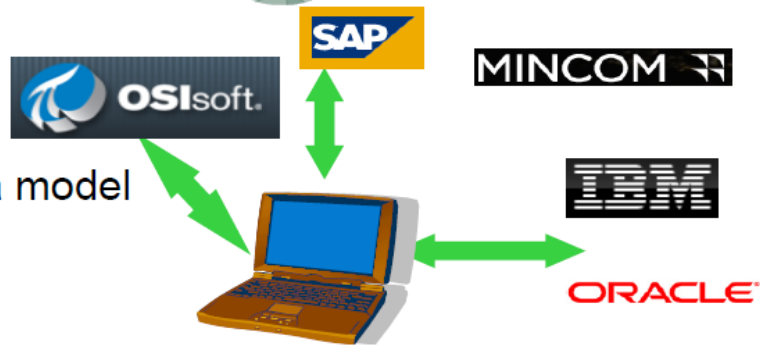
- Data/Event integration (transactions)
  - 1000s/day
  - small amounts of data (per transaction)
- Visual integration





# Business Integration – What (Data, Event, Visual)

- Data - motor run-hours (once a day) 
- Event - motor vibration (on alert) 
- Event - raw material consumed, goods produced 
- Data - lab data (pH, density...) for a batch 
- Visual integration
  - shared asset naming convention or data model
  - Loosely coupled URLs



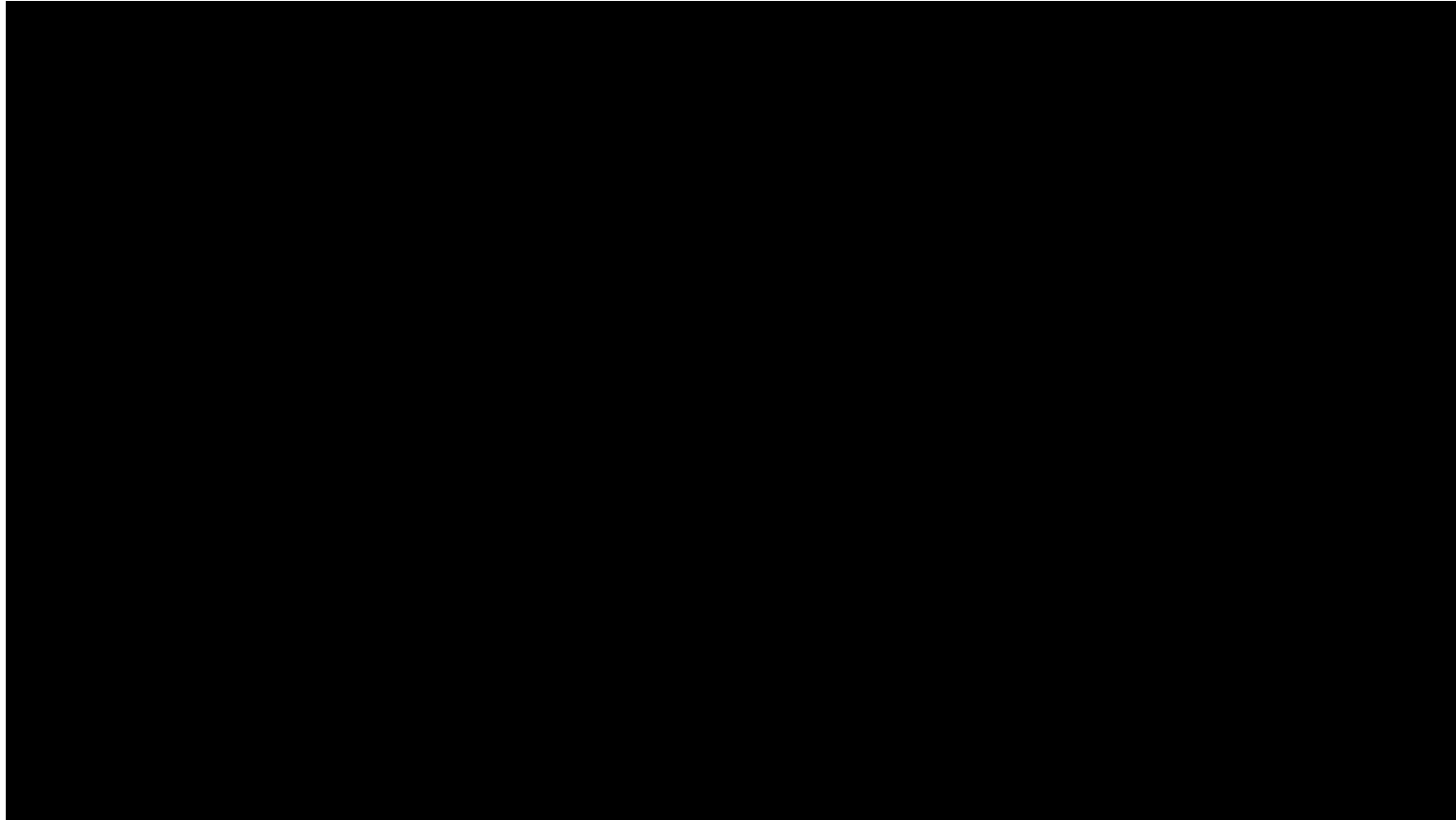
# Business Integration – Why

## Enable **business agility (time enough to act)**

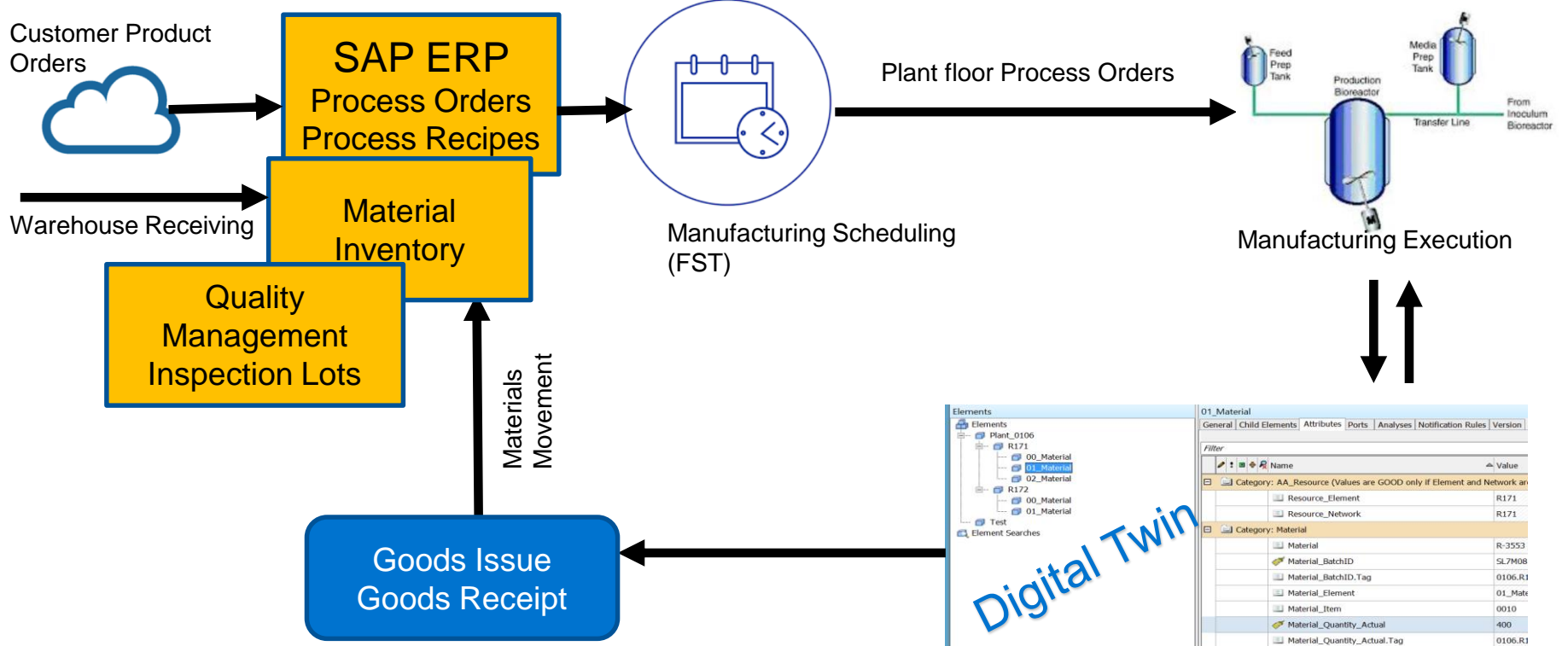
- Available-to-promise (ATP), better inventory, visibility into capacity
- Condition-based maintenance (CBM) for better asset reliability, reduce maintenance cost
- Quality – compare production runs, close out orders faster
- Visual – visibility into PI System data throughout the enterprise



# Maintenance & Reliability - Video



# Integration with Production Planning/Management System



Elements

- Plant\_0106
  - R171
    - 00\_Material
      - 01\_Material
    - 02\_Material
  - R172
    - 00\_Material
    - 01\_Material
  - Test

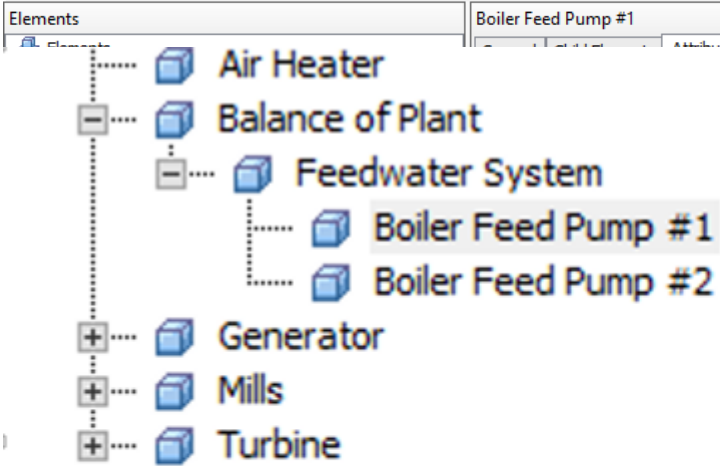
Element Searches

01\_Material

Filter	Name	Value
Category: AA_Resource (Values are GOOD only if Element and Network are)		
Resource_Element	R171	
Resource_Network	R171	
Category: Material		
Material	R-3553	
Material_BatchID	SL7M08	
Material_BatchID.Tag	0106.R1	
Material_Element	01_Mate	
Material_Item	0010	
Material_Quantity_Actual	400	
Material_Quantity_Actual.Tag	0106.R1	

# To Do List – Work Management

- Create a watch list – early warning system
  - Equipment usage – run hours, tons processed, start/stop cycles...
  - Equipment condition alerts – filter clogged, heat-exchanger fouled, motor vibration high...
- Notify the asset owner – with links to details
- Create a report – across asset and production events



<input checked="" type="checkbox"/>		Control Oil Pressure	33.965976...
<input checked="" type="checkbox"/>		Discharge Pressure	147.82136...
<input checked="" type="checkbox"/>		Enter Low Pressure Safet...	8.9459667...
<input checked="" type="checkbox"/>		EXT Steam Pressure	-2.501819...
<input checked="" type="checkbox"/>		Suction Pressure	194.44204...

Category: RunHours

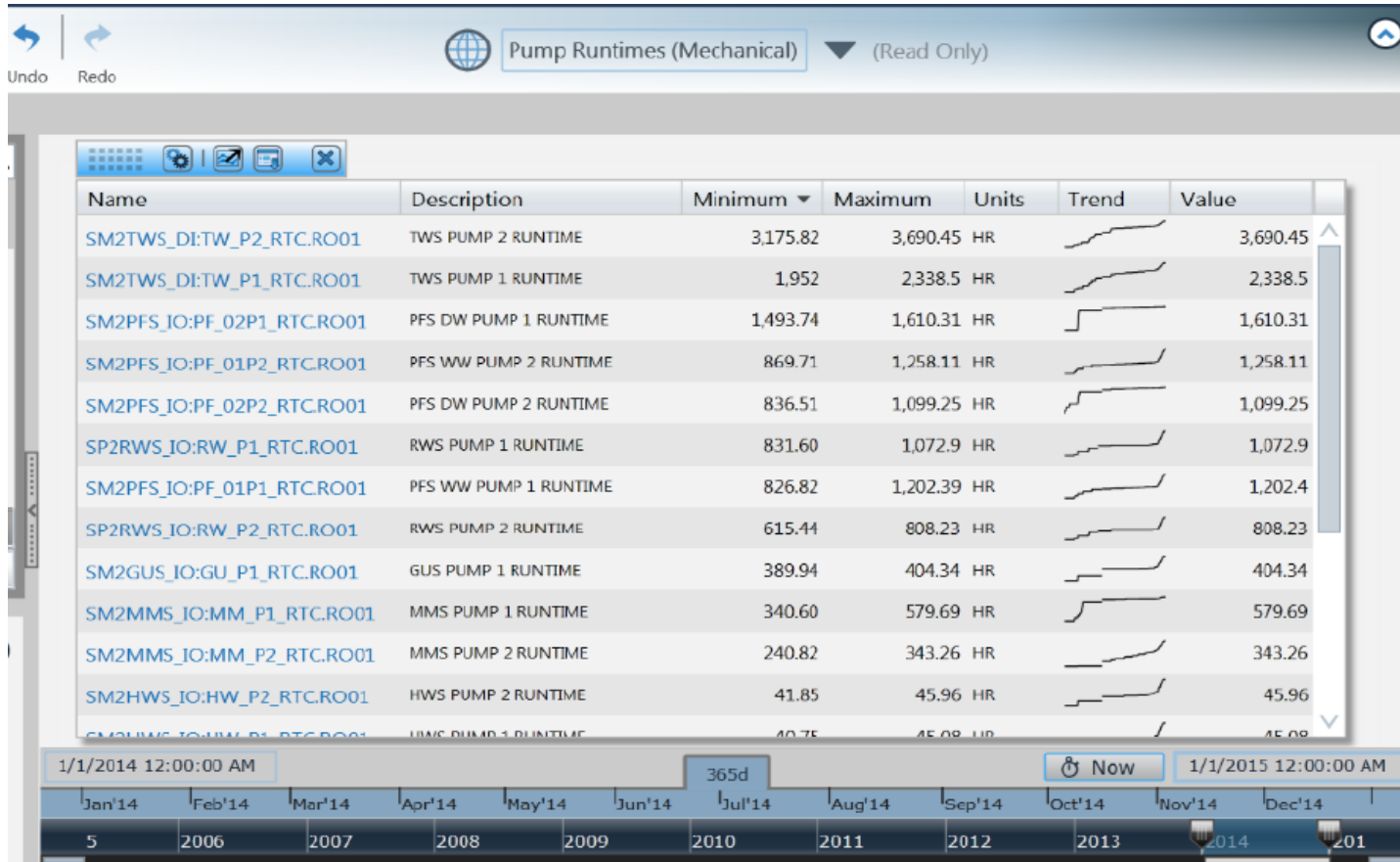
		RunHours_MonthTD	204 h
		RunHours_WeekTD	87 h

zz\_RunHours\_Report  
 Wind Power Generation Fleet  
 mission and Distribution  
 Archives

- Notifications
- Contacts
- Analyses

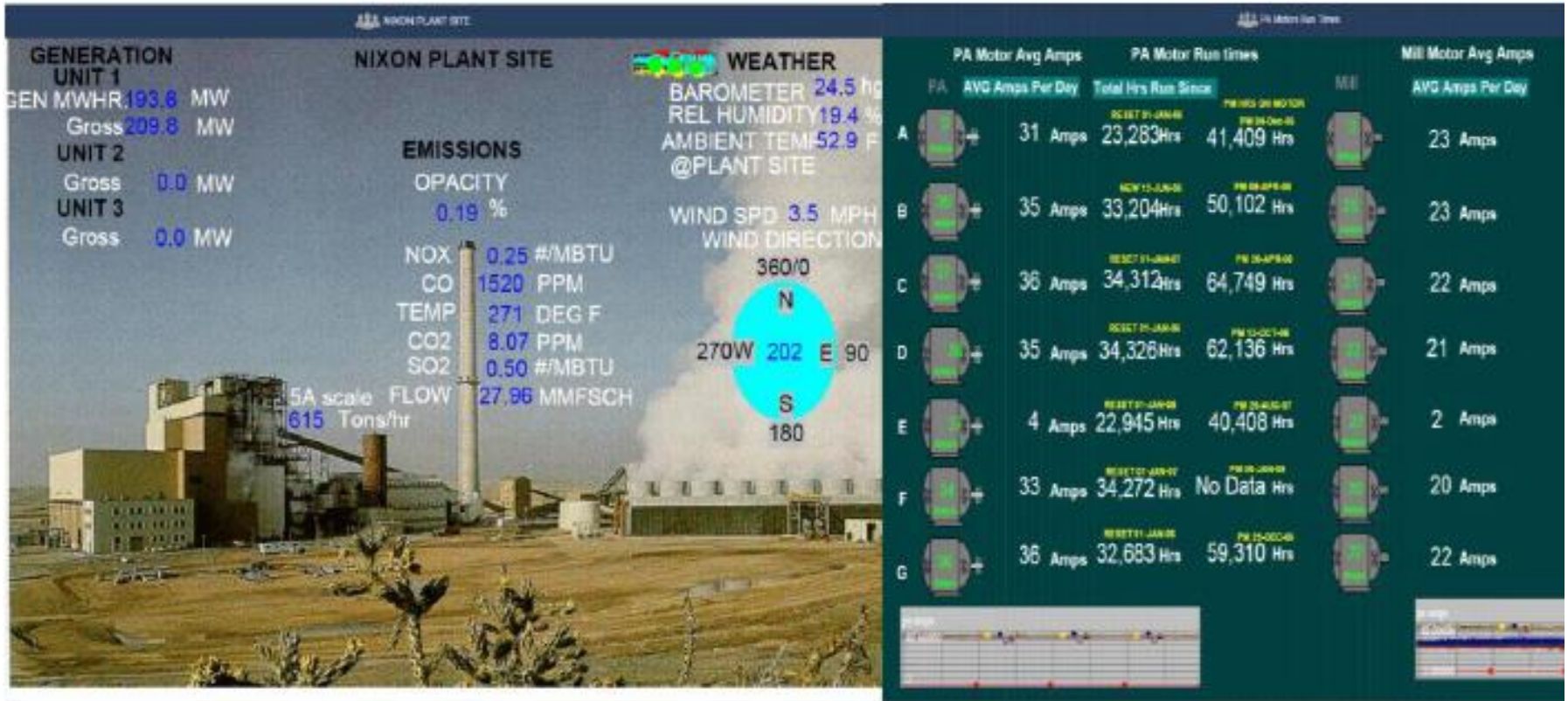
<input checked="" type="checkbox"/>		Inboard Bearing Vibration Y	0.162708...
<input checked="" type="checkbox"/>		Outboard Bearing Vibratio...	0.1727749...
<input checked="" type="checkbox"/>		Outboard Bearing Vibratio...	0.1693600...

# San Francisco Public Utility Commission – Pump run hours



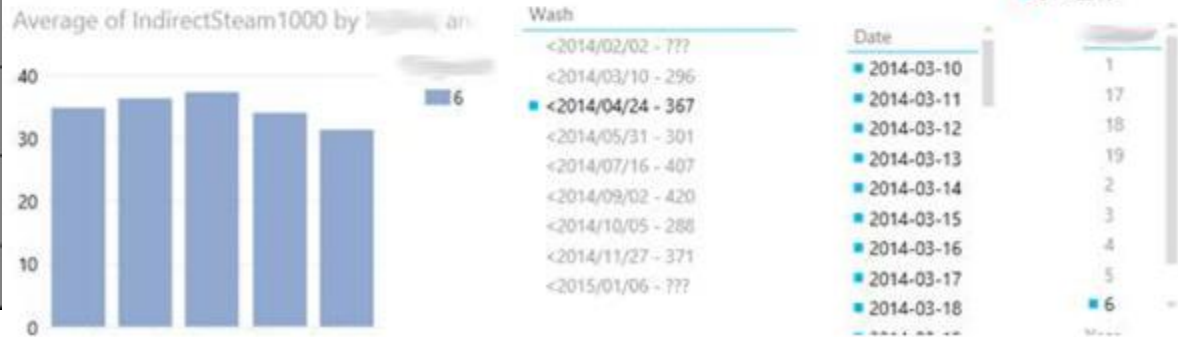


# Colorado Spring Utilities – Motor run hours

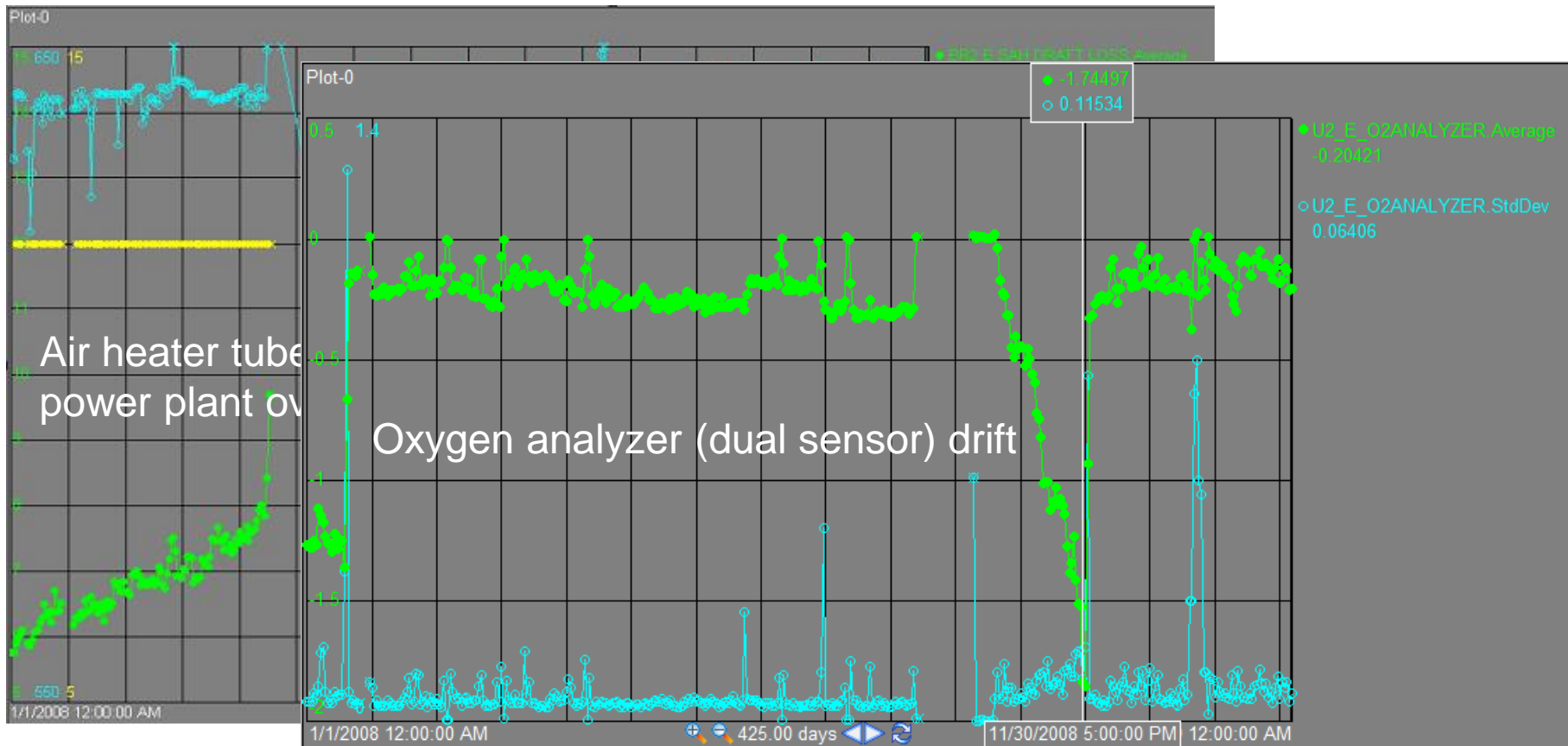




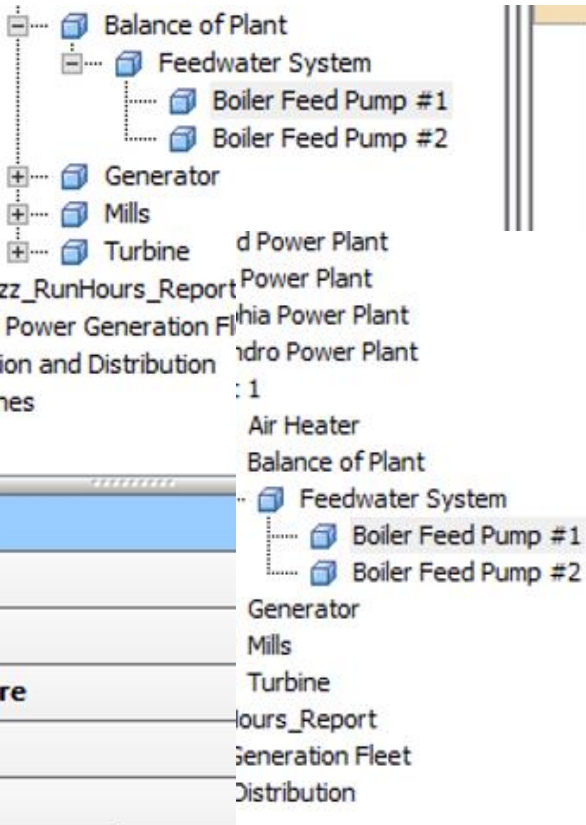
# Filter clogging, Heat exchanger fouling...



# Air heater tubes plugging, Oxygen analyzer drift...



# Motor vibration alert calculations



<input checked="" type="checkbox"/>	Bearing Vibration High Limit	2 mils
<input checked="" type="checkbox"/>	Control Oil Pressure Low Limit	32 psi
<input checked="" type="checkbox"/>	Discharge Flow Low Limit	1700 k lb/hr

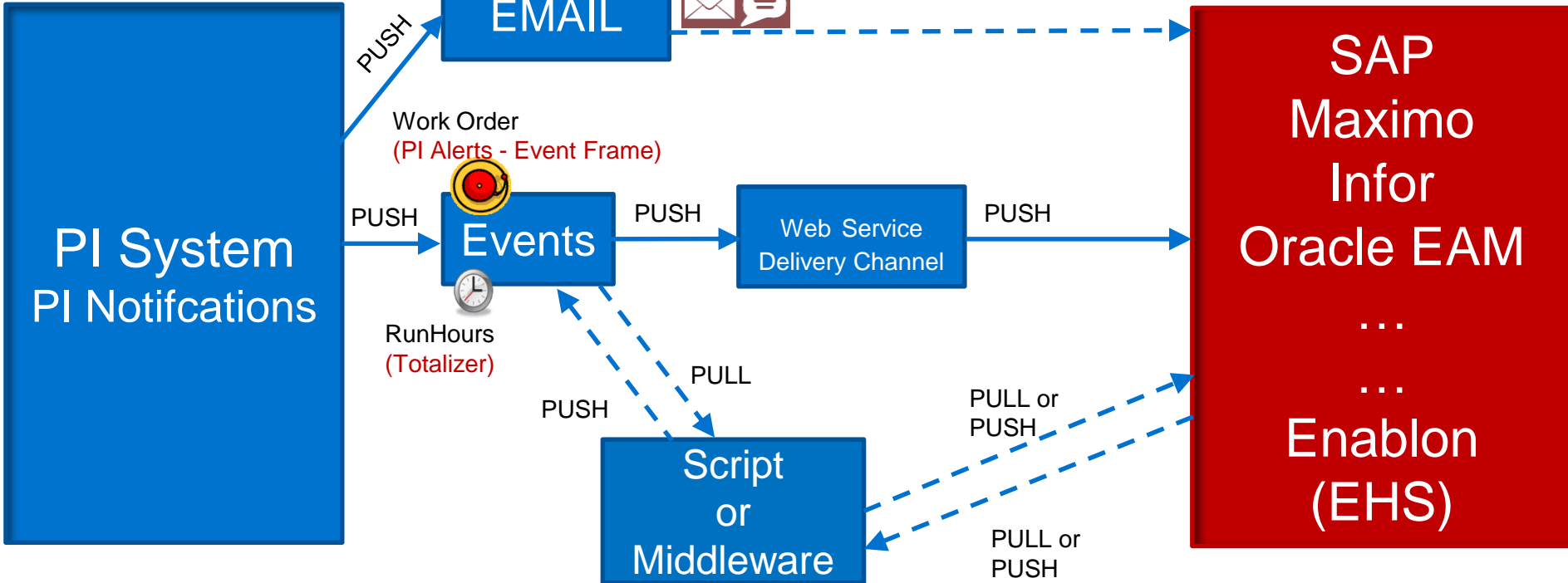
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Boiler Feed Pump High Bearing Temperature	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Boiler Feed Pump Low Discharge Flow Anomaly	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Boiler Feed Pump Low Pump Speed	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Boiler Feed Pump Suction Pressure Anomaly	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Boiler Feed Pump Vibration Anomaly	<input checked="" type="checkbox"/>

Event Frame Template: Boiler Feed Pump Vibration Anomaly

Name	Expression
OutboardYFault	'Outboard Bearing Vibration Y' > Limit
StartTrigger	if InboardXFault or InboardYFault or OutboardXFault

Evaluated at 3/29/2015 7:10:46 PM

# PI System to External Systems



Application Middleware=BizTalk, TIBCO, WebSphere...

\\myAF\myAFDB\_vc13 - PI System Explorer (Administrator)

File View Go Tools Help

Database Query Date Back Check In Refresh New Template New Attribute Template Search Element Temp

Library

- myAFDB\_vc13
  - Categories
    - Analysis Categories
    - Attribute Categories
    - Element Categories
    - Reference Type Categories
    - Table Categories
  - Templates
    - Element Templates
      - MaximoMeterTemplate
    - Event Frame Templates
    - Model Templates
    - Notification Templates
    - Transfer Templates
  - Enumeration Sets
  - Reference Types
  - Tables

Elements

Event Frames

Library

Unit of Measure

MyPI

Notifications

Contacts

MaximoMeterTemplate

General Attribute Templates Ports

Group by:  Category

Filter

Name	Description	Default Value
Category: <None>		
IsEnabled	Required, 0=False, 1=True If True, send the reading to Maximo	0
LastUpload_Error	Last Upload Error	
LastUpload_Reading	Last Uploaded Reading and Timestamp	
Category: MaximoMeter		
ASSETNUM	Required; specify either ASSETNUM or LOCATION, if both are specified LOCATION will override	
INSPECTOR	Required	OSIsoft PI
ISDELTA	Required for CONTINUOUS meters, 0=False, 1=True	0
LOCATION	Required; specify either ASSETNUM or LOCATION, if both are specified LOCATION will override	
METERNAME	Required, meter names are case sensitive	
NEWREADING	Required, points to a PI Tag	
SITEID	Required	

\\myAF\myAFDB\_vc13 - PI System Explorer (Administrator)

File Edit View Go Tools Help

Database Query Date Back Check In Refresh New E

Elements

- Elements
  - BR430\_RUNHOURS

BR430\_RUNHOURS

General Child Elements Attributes Ports Versi

Filter

Name

Category: <None>

- IsEnabled
- LastUpload\_Error
- LastUpload\_Reading

Category: MaximoMeter

- ASSETNUM
- INSPECTOR
- ISDELTA
- LOCATION
- METERNAME
- NEWREADING
- SITEID

Elements

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BR430\_RUNHOURS

General Child Elements Attributes Ports Version

Filter

Name Value

Category: <None>

IsEnabled	1
LastUpload_Error	
LastUpload_Reading	99.66188 / 2013-10-26 14:46:42

Category: MaximoMeter

ASSETNUM	
INSPECTOR	OSIsoft PI
ISDELTA	1
LOCATION	BR430
METERNAME	RUNHOURS
NEWREADING	99.66188
SITEID	BEDFORD





# Report across asset events

Select a DAY

2015\_01\_13

Search Start 1/10/2015

10-Jan-

Search End \*

24-Mar-

## GENERAL INFORMATION

DAY NAME	2015_01_13
Site	San Leandro Power Plant
Unit	Unit 1
Start Time	13-Jan-15 00:00:00
End Time	14-Jan-15 00:00:00
Duration	1 0:00:00
Duration (min)	1440.0
Day of Week	TUESDAY
Day Type	WEEKDAY
Element Path	\\DFPIAF\Power Generation\Generation\OSIsoft Power\San Leandro Power Plant\Unit 1

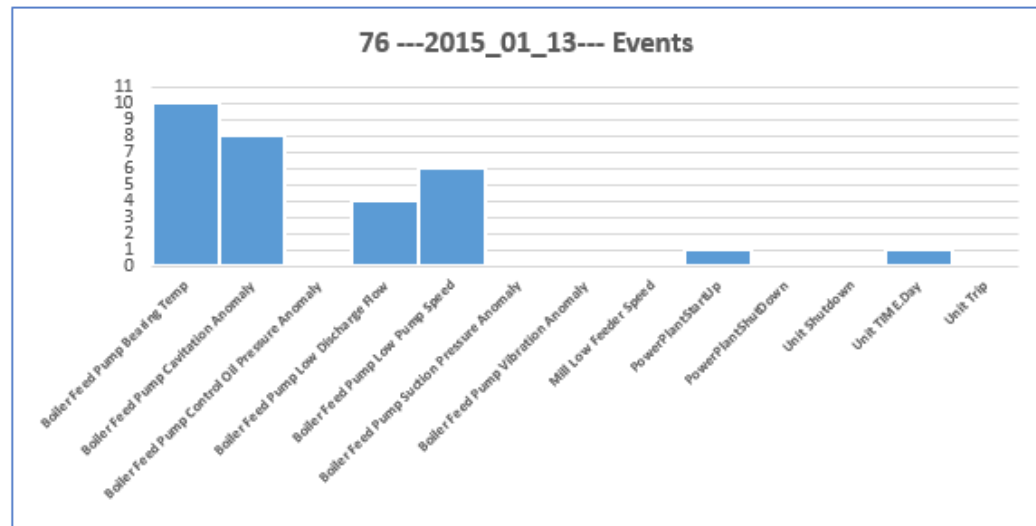
## AMBIENT TEMPERATURE

Ambient Temperature.Min	36.23
Ambient Temperature.Avg	38.02
Ambient Temperature.Max	40.44

## TURBINE OVERVIEW

HP Overall Efficiency.Avg	0.00
IP Overall Efficiency.Avg	0.00

(76) Events during DAY ---2015\_01\_13--- on <<Unit 1>>





# Equipment display & SAP WorkOrder info in PI Vision

- BOILERS
  - 52-B-101A
  - 52-B-101B
  - 52-B-101C
  - 52-B-101D
  - 52-B-101E
- COMPRESSORS
  - 15-K-101
  - 15-K-102A
  - 15-K-102B
  - 15-K-103
  - 16-K-101 WGC
  - 19-K-101 HPC
  - 58-K-101A
  - 58-K-101B
  - 58-K-101C
- DCS
- FURNACES
  - 11-F-101
  - 12-F-101
  - 13-F-101
  - 14-F-101
  - 14-F-102
  - 21-F-101
  - 21-F-102

Boiler Detail
Asset: 52-B-101B
Ad Hoc Display

## Boiler Details

### 52-B-101B

<b>Manufacturer</b> ISHIKAWAJIMA HARIMA HEAVY IND	<b>O2 Excess</b> 2.6655	<b>Efficiency</b> 92.369 %
<b>Installation Date</b> 01.05.1994	<b>FO Press</b> 13.722	<b>Steam Flow</b> 51.584
<b>Description</b> STEAM BOILER 52-B-101B	<b>ATM Steam Press</b> 9.653	<b>Steam Temp</b> 378.98
<b>Type</b> IHI-SC-261S	<b>Serial Number</b> RM-20793-01	<b>T Stack</b> 161.1
<b>Size</b> 8700HX6600WX12200D	<b>Last Maintenance</b> 1/10/2016 12:00:00 AM	<b>Next Maintenance</b> 1/10/2018 12:00:00 AM
	<b>Overdue</b> -35.062	

THIR	Waktu	Detail	Detail	Detail
1	11 May 2010	a. Burner ble rusak b. Refractory rusak	Perbaikan burner ble perbaikan refractory internal	
2	14 February 2011	a. Burner ble rusak b. Refractory rusak c. Insulation rusak	Perbaikan burner ble perbaikan refractory internal next overhaul 2015	
3	11 October 2012	a. Plate at register rusak b. Burner ble rusak dan crack c. Refractory rusak dan crack	Perbaikan burner ble perbaikan refractory internal next overhaul 2015	a. Tube arah isolasi ns
4	19 April 2013	a. Refractory rusak b. Intermittent blowdown valve flash pada mengopert bagging	perbaikan refractory internal next overhaul 2015	
5	10 September 2014	a. EDU economizer rusak	perbaikan refractory internal	
6	16 February 2015	a. Refractory rusak b. Burner bow terdapat gerangan at	perbaikan refractory internal next overhaul 2015	
7	10 January 2016	a. Refractory rusak b. Insulation bagian bawah furnace rusak	next overhaul 2015	
8	-	-	-	-
9	-	-	-	-
10	-	-	-	-

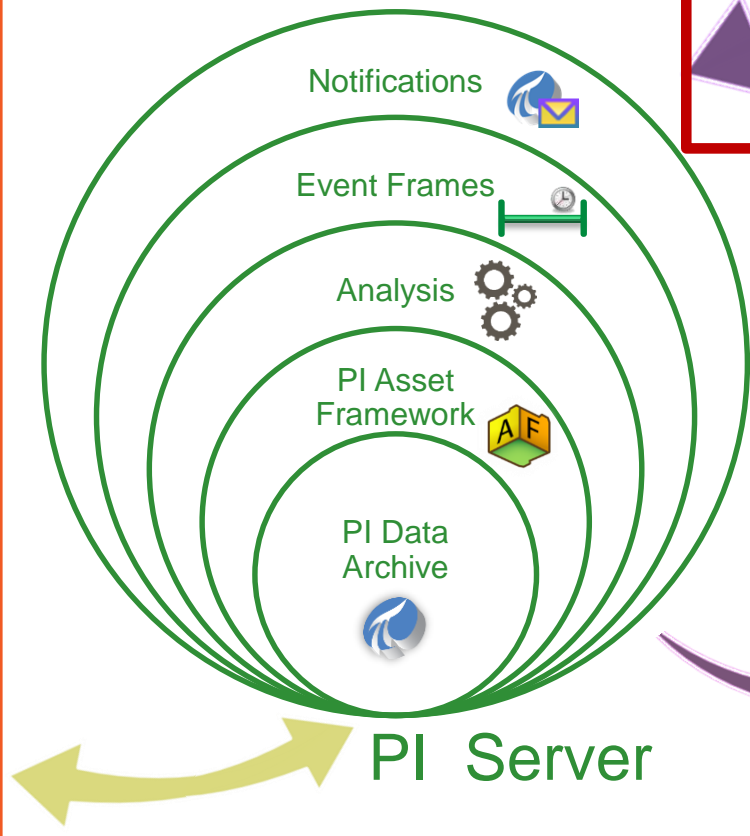
12/5/2017 2:31:22 PM
8h
Now
12/5/2017 10:31:22 PM

# OT/IT Integration - Takeaways

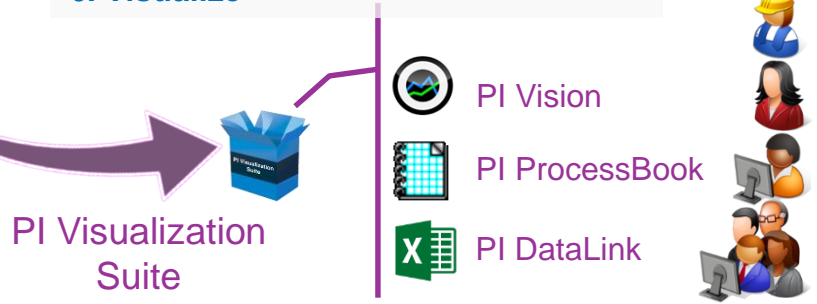
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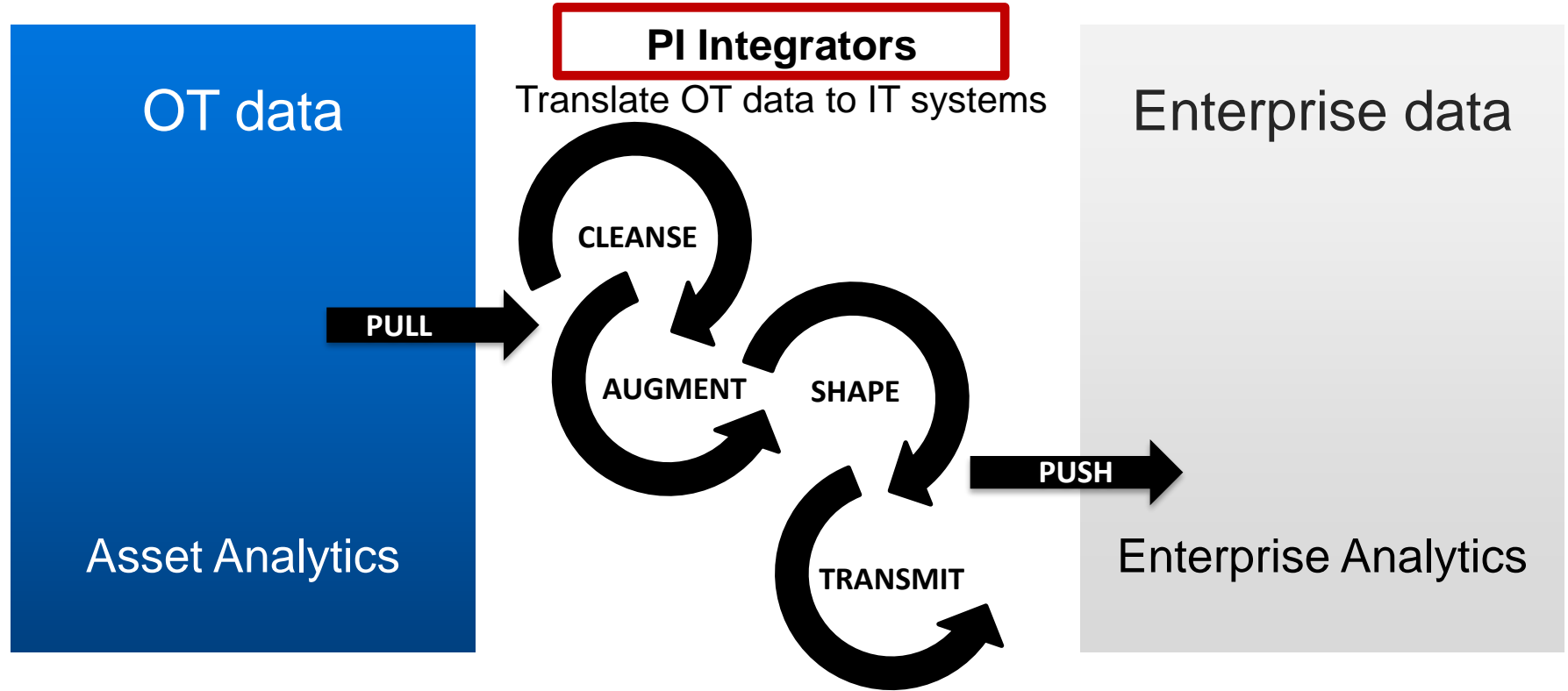
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# Integrate OT & IT Data with Data Management



OSIsoft has a multi-cloud strategy for *repeatable patterns* with major cloud vendors



Azure



Google  
Cloud Platform

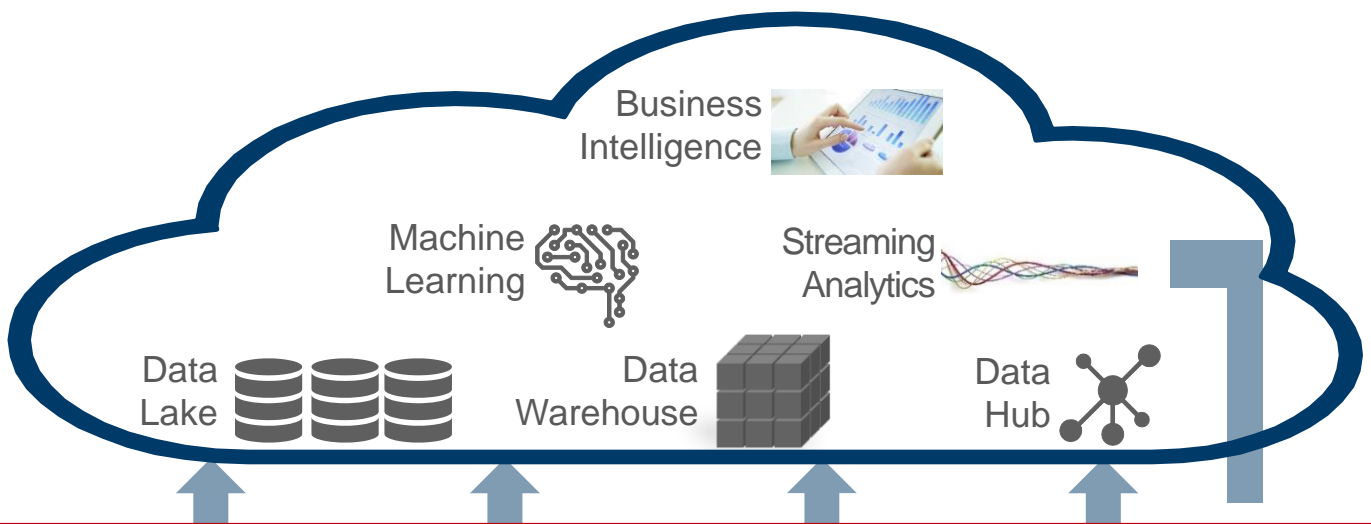
# Repeatable Patterns for Extending into Cloud

**Data  
Science**

**Virtualized  
PI System**

**Architecting  
for IoT**

# Data Science



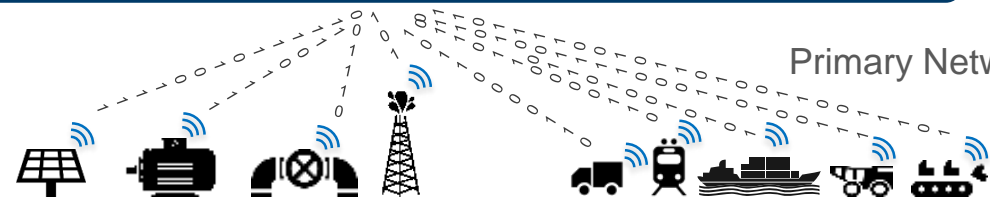
## On-Prem



Streaming & ML Insights

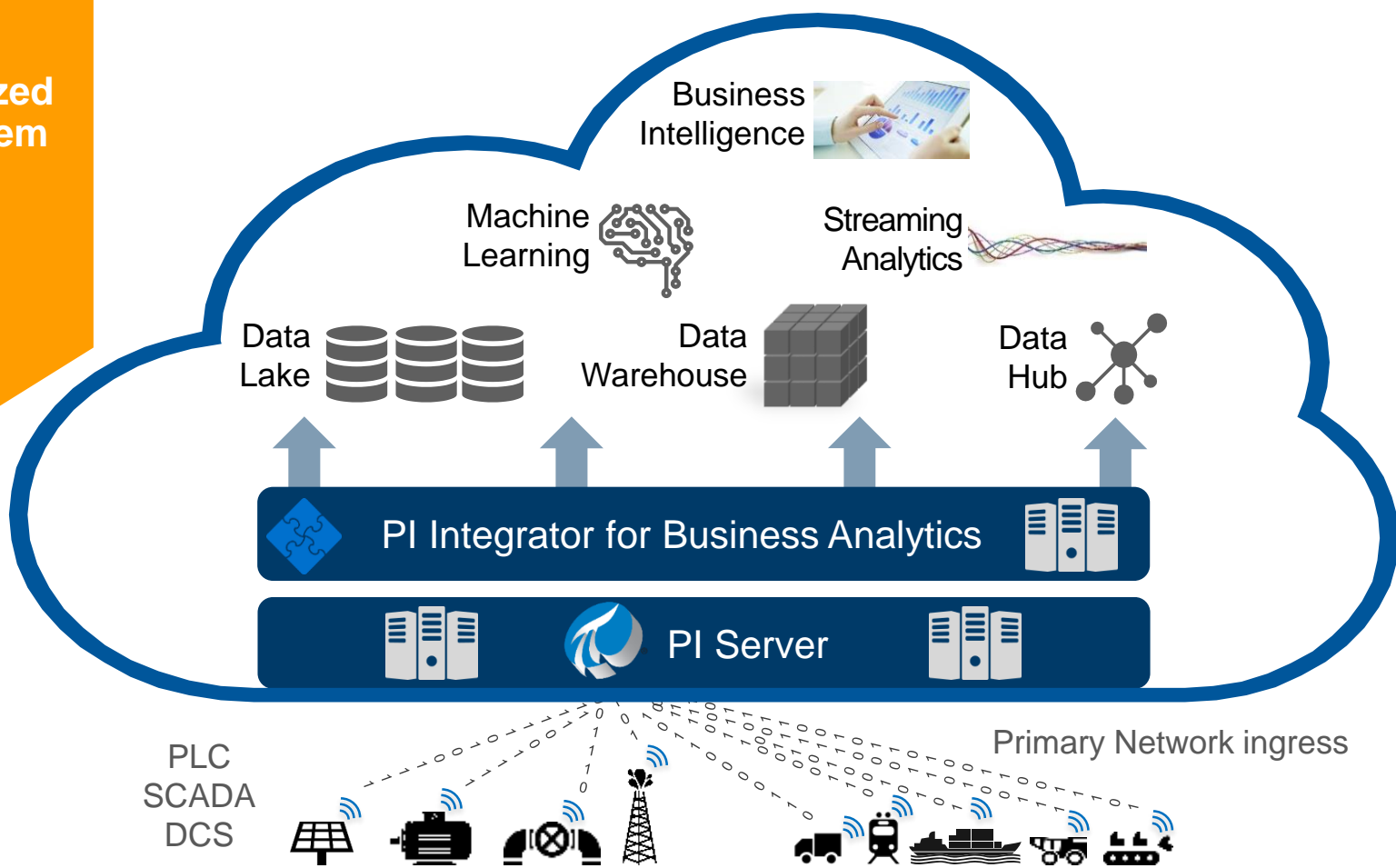


PLC  
SCADA  
DCS



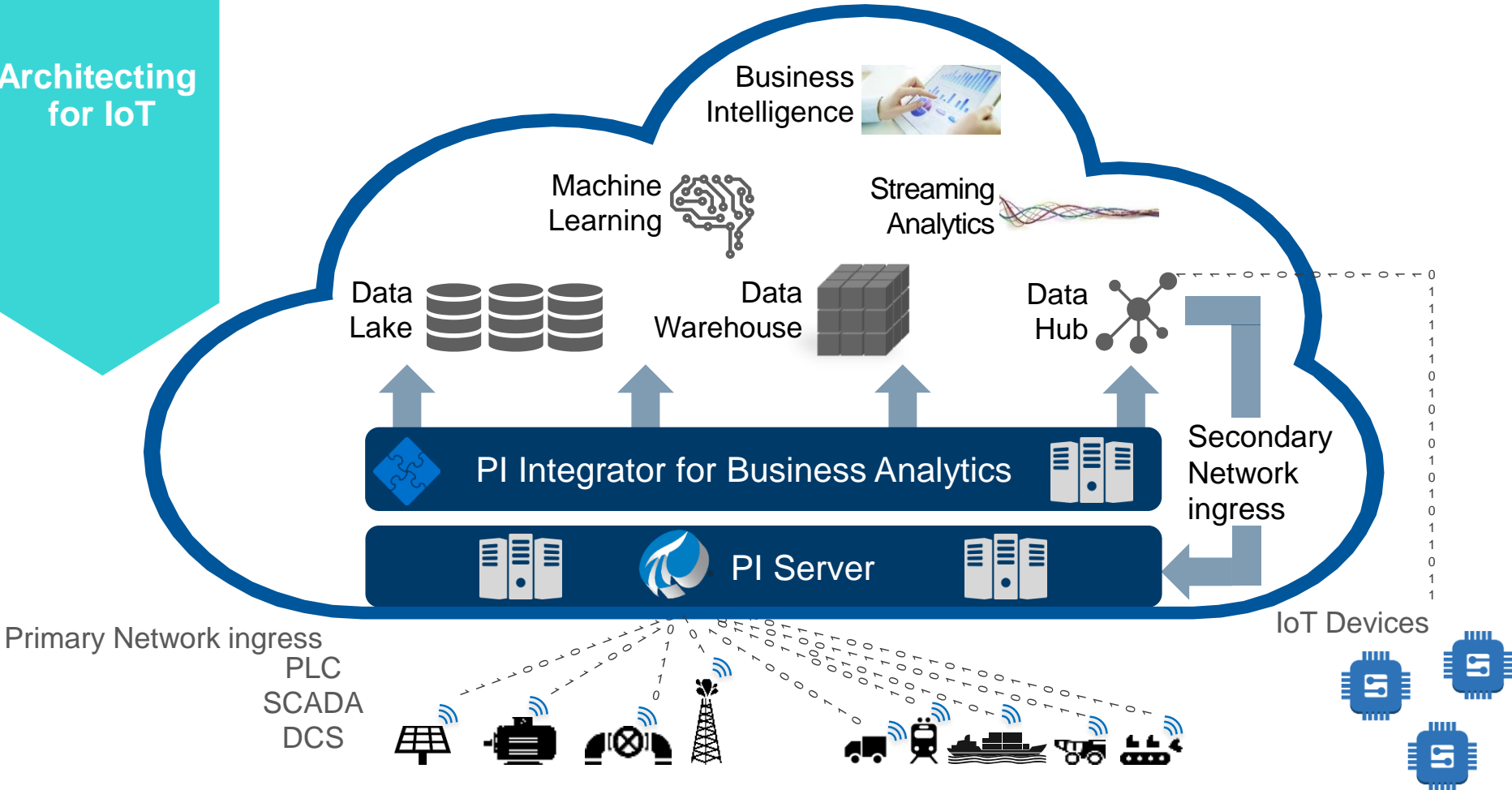
Primary Network ingress

# Virtualized PI System





# Architecting for IoT



# Customer Success Stories with Microsoft Azure ML (Machine Learning)

## Deschutes Brewery

Deschutes used machine learning to improve their brewery processes

- Saving up to 72 hours per batch
- Deferring an \$8 million upgrade

## Lonza Specialty Ingredients

Expanded production capacity limits

- Used machine learning to identify major drivers for reaction times
- 6 weeks – total time to value

- ✓ **Process optimization**
- ✓ **Improved maintenance**
- ✓ **Energy management**
- ✓ **Predictive operations**
- ✓ **And more...**

<https://www.osisoft.com/presentations/beer-the-smart-way/>

<https://www.osisoft.com/presentations/rcip--data-analytics-and-manufacturing-process-optimization/>

# Customer Success Stories in AWS

## TransCanada

Gas demand forecasting

## Georgia Pacific

Self-service analytics and  
data lakes

## TEPCO

Running PI System  
workloads in AWS

# The OSIsoft PI System & SAP

## SAP Hana IoT Integrator by OSIsoft

Operations data combined  
with ERP for advanced  
analytics and data science

## SAP Analytics Cloud

- Digital Boardroom
- SAP Data Hub
- Mobile Experience

# Customer Success Story

## Marathon Oil

### System of Record for Operational Data

The PI System collects 700,000 data points with 1400 updates per second

### OT Data, Enterprise Analytics

Over 100,000 PI System data points are fed every five minutes into SAP Hana

### Simplified Processes

- Automated data prep
- Agile application development
- Optimized E&P processes

<https://www.osisoft.com/presentations/the-pi-system-and-sap-hana--operating-at-the-speed-of-business/>

# Other Cloud Integrations

**Development in Progress - Preview**  
**Google Cloud Platform**

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# Thank You

## Next Steps:

- >Your OT/IT integration use cases
- >PI Workshop
- ><https://learning.osisoft.com/>
- ><https://pisquare.osisoft.com/> (Community & Developer)