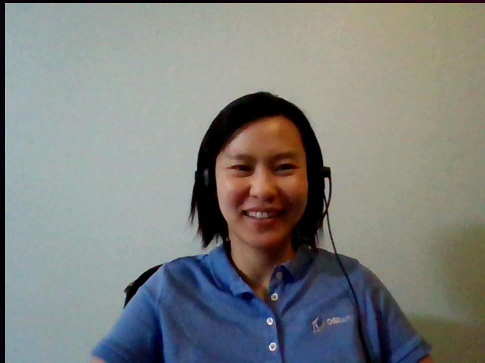
NOVEMBER 2021

PI System: Data Infrastructure for Performance Intelligence

Presented By: Nathawan Hanpadungdhama, Presales Engineer - APAC



Agenda

Company Introduction

Introduction to PI System as a Data Infrastructure

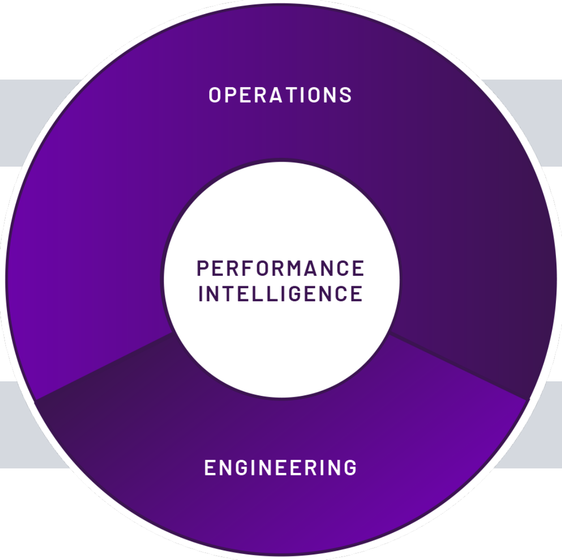
PI System & Sigmafine

Company Introduction

Bringing together two world-class software experts

Delivering end-to-end customer value with best of breed industrial software

AVEVA Connect cloud services platform and AVEVA FLEX subscription program



AVEVA

Comprehensive industrial software to optimize engineering and operations

OSIsoft

PI System is the industry standard for industrial information management

- Big Data
- Industrial IoT/Edge
- Cloud
- Artificial Intelligence
- Digital Twin
- Connected Worker

1 **Better data**
Accuracy, reliability, context, scope and scale

2 **Smarter solutions**
With better integration, while maintaining neutrality

3 **Proven results**
Efficiency, agility, reliability, sustaina

Performance Intelligence

OSIsoft.

High fidelity asset data enabling deep analysis and accurate reporting on asset performance

+

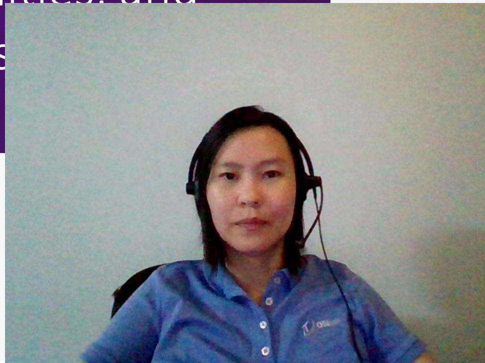
AVEVA

Actionable, real-time information about current and future performance based on AI and machine learning

=

PERFORMANCE INTELLIGENCE

The ability to rise to today's and tomorrow's challenges, seize opportunities, and achieve bus



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

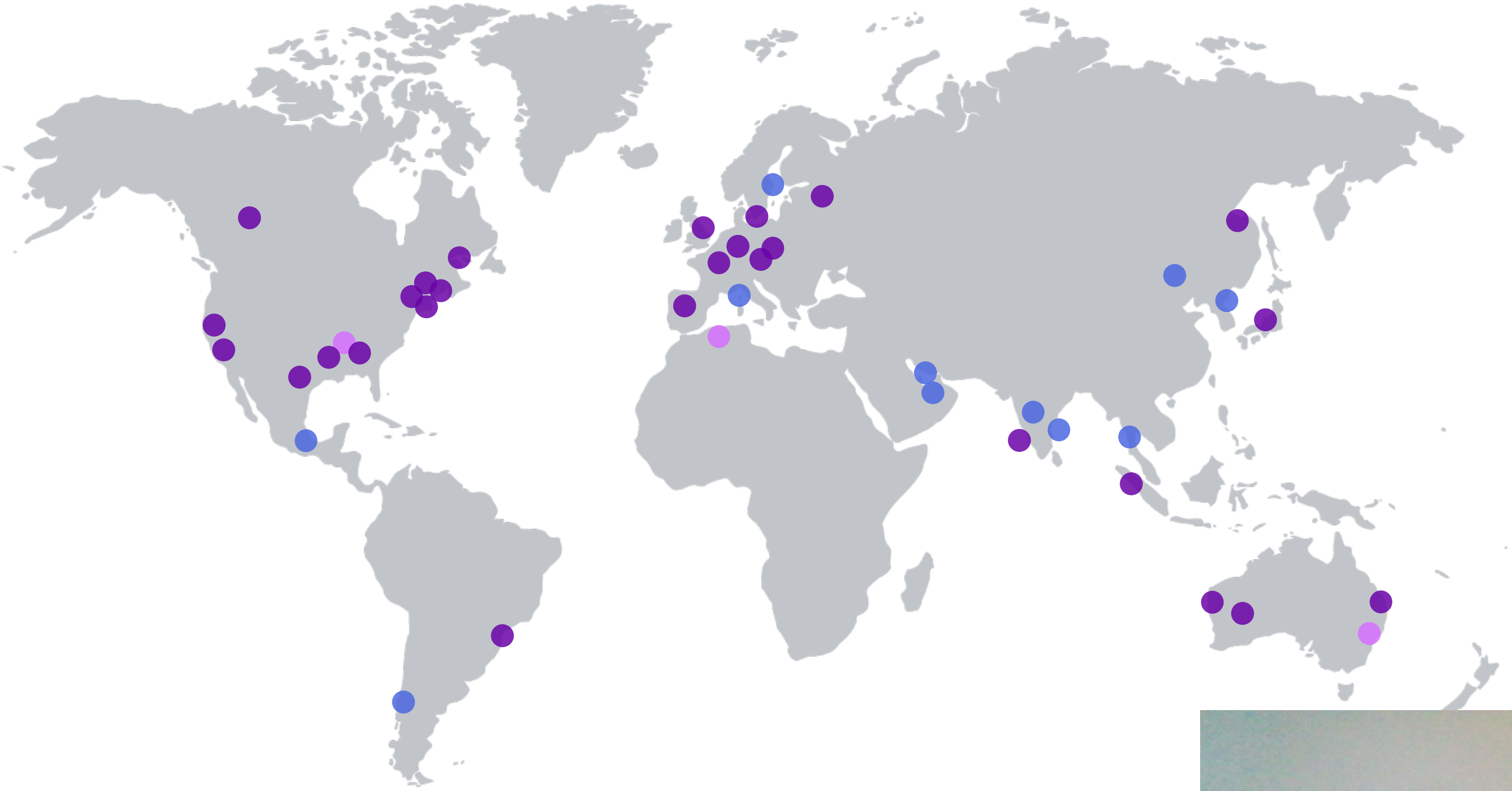
120+
Sales Partners

16%
of Revenue reinvested in R&D

250+
Tech Partners

85%
of deployments supported by R&D

20+
Alliance Partners

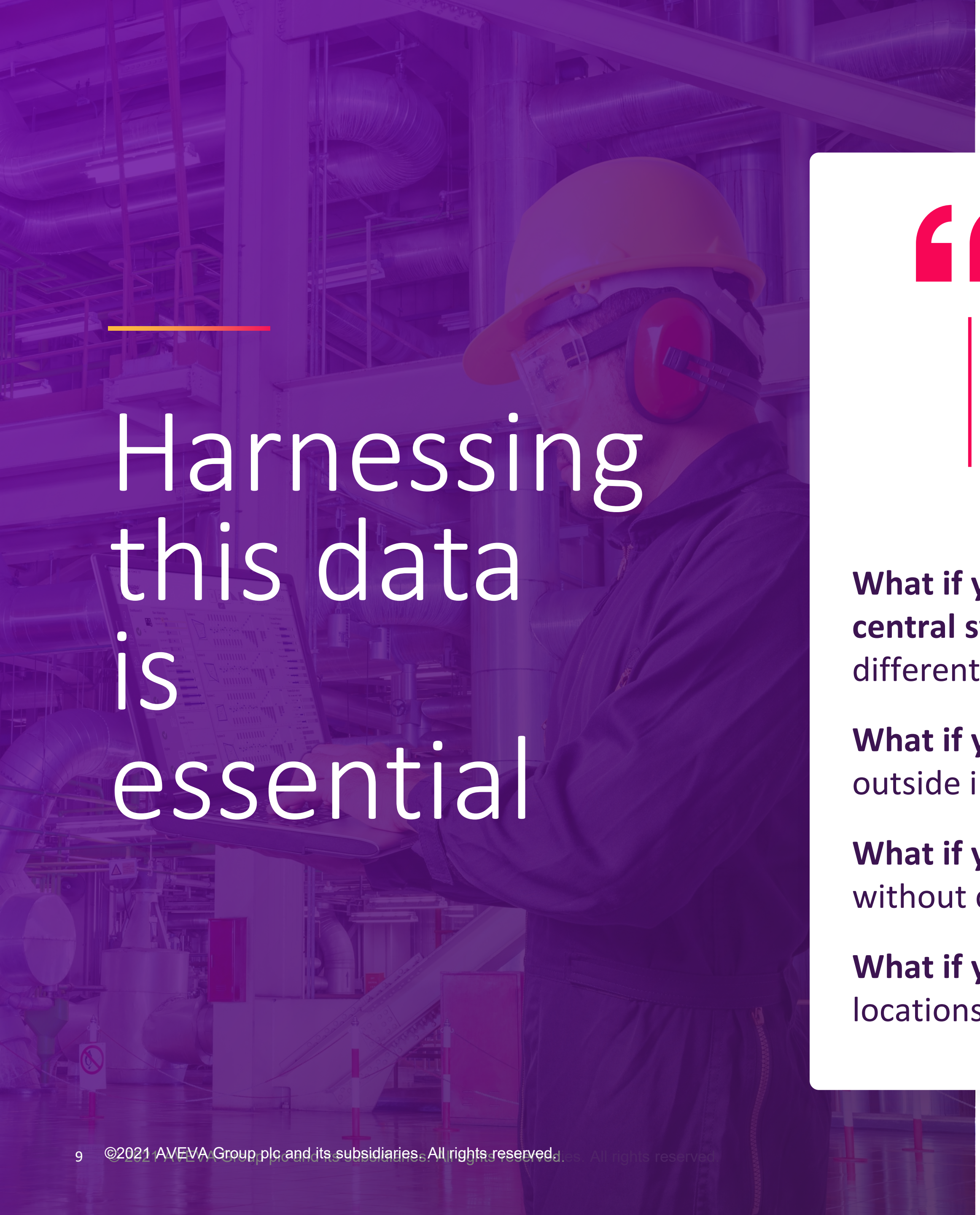


● Project Center ● R&D Center ● Combin and Pro

PI System as a Data Infrastructure

Real-time operations data is the lifeblood of your business

And now, we’re seeing an explosion of data volume, variety, and velocity



Harnessing this data is essential

> *For industrial organizations, having a comprehensive operations data management strategy is key to achieving the promise of Industry 4.0 and unlocking operations insights and efficiencies"*
>
> **IDC Technology Spotlight**

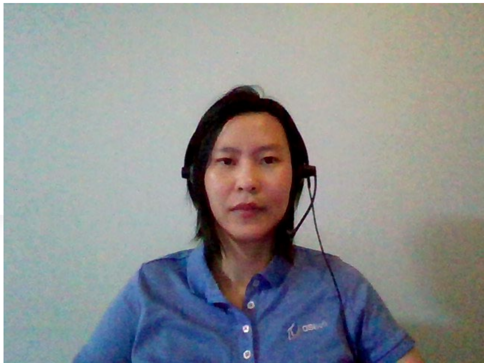
What if you could eliminate data silos, monitor remote assets and maintain a central system of record for operations data, accessible by engineers across different domains and by analysts at the enterprise level?

What if you could enhance that data with context so it is easily understood by users outside industrial operations?

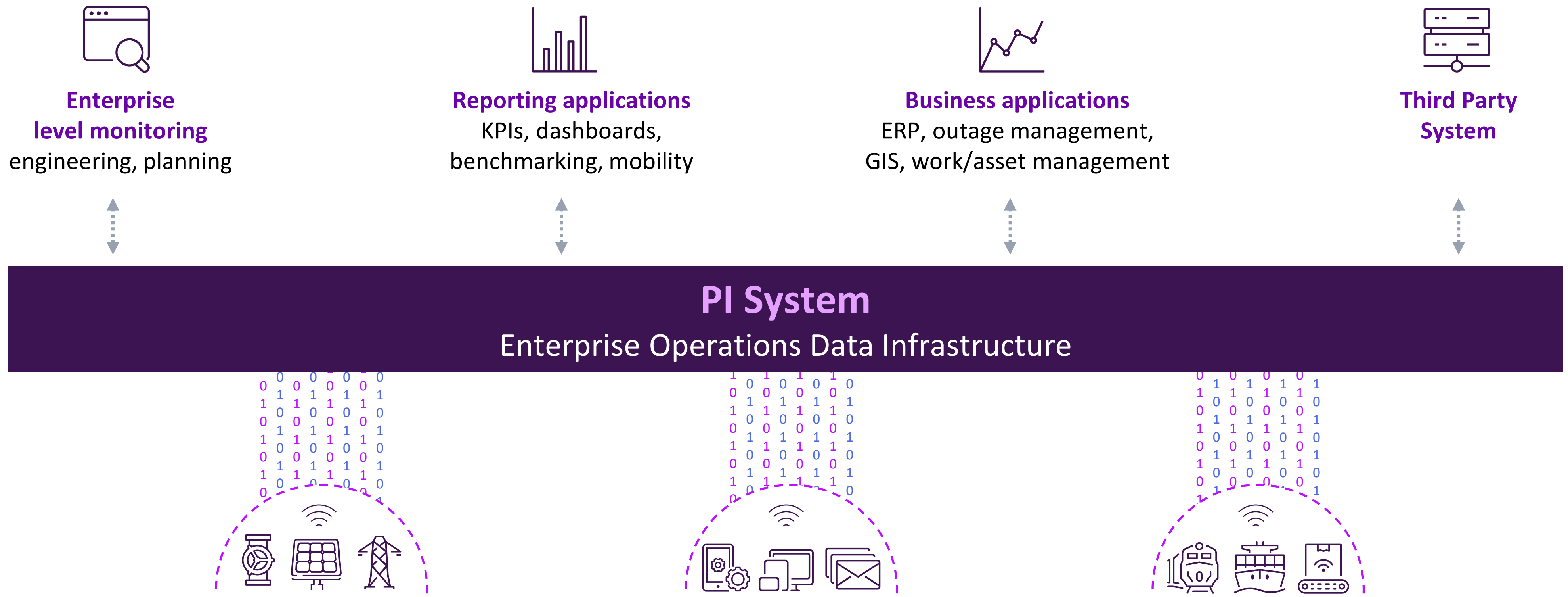
What if you had an easy way to select and visualize data in a self-service tool, all without coding?

What if you could share data and data views with trusted col

locations through a simple web browser?



An Infrastructure Approach



Enterprise level monitoring
engineering, planning

Reporting applications
KPIs, dashboards, benchmarking, mobility

Business applications
ERP, outage management, GIS, work/asset management

Third Party System

PI System
Enterprise Operations Data Infrastructure

Automation/Control Systems

New Sensor Technology

Remote and Mobile Assets

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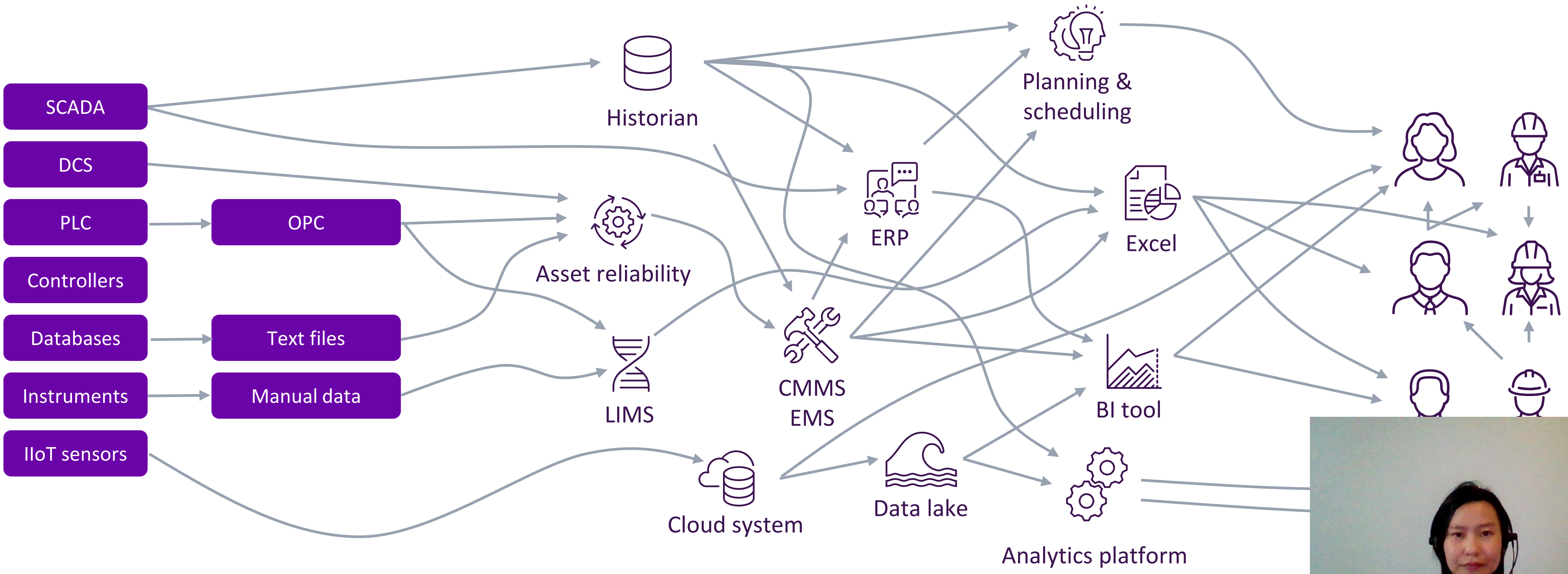
Managing operations data is complex



Operations Timeseries Data Sources

Complexity

Data consumers

SCADA

DCS

PLC

Controllers

Databases

Instruments

IIoT sensors

OPC

Text files

Manual data

Historian

Asset reliability

LIMS

Cloud system

ERP

CMMS
EMS

Data lake

Planning &
scheduling

Excel

BI tool

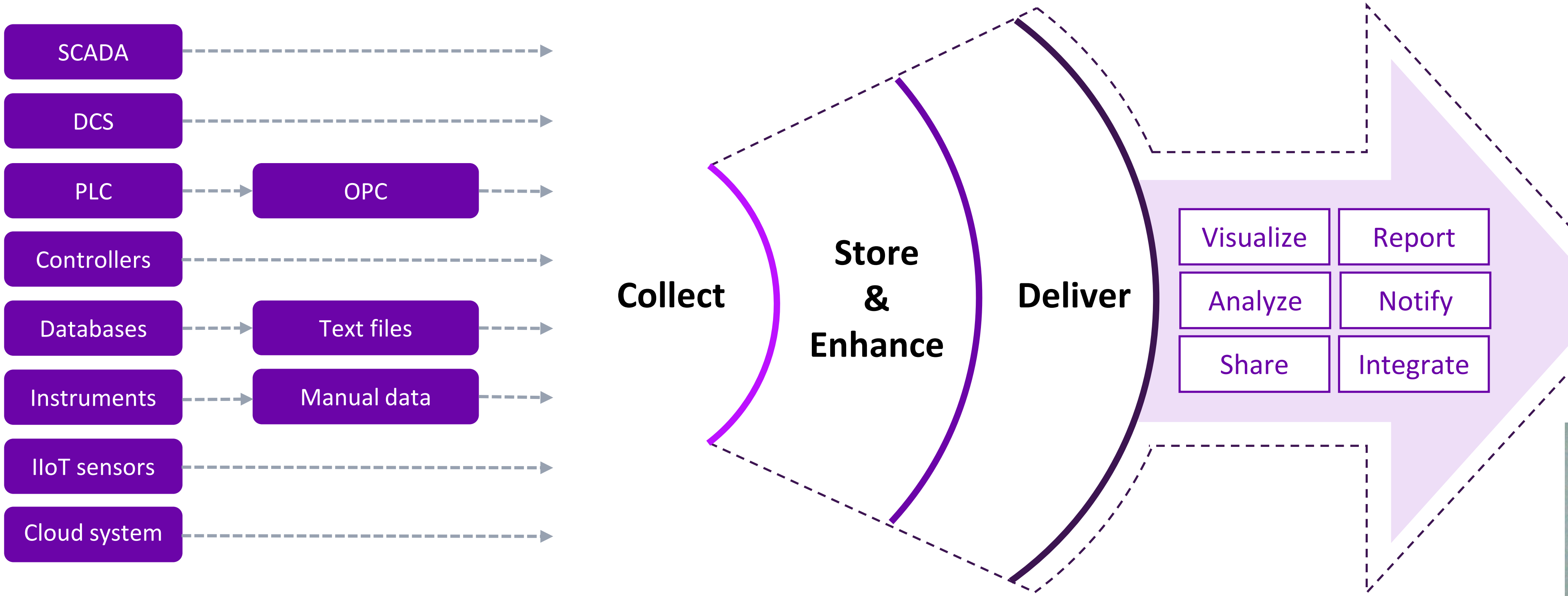
Analytics platform

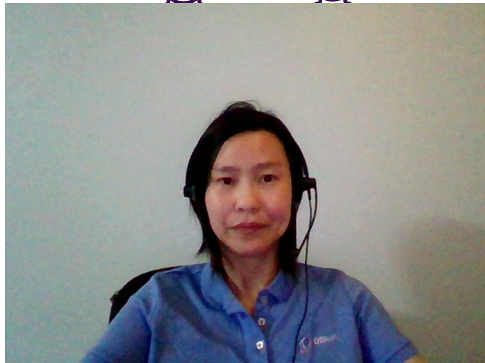
Connect people to data with an infrastructure approach

Operations Timeseries Data Sources

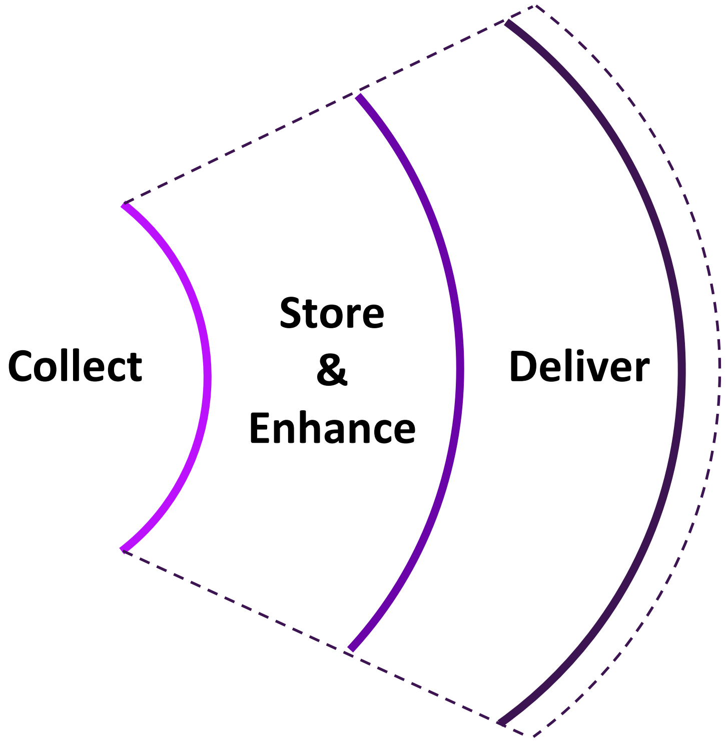
Standardization

Data Consumers

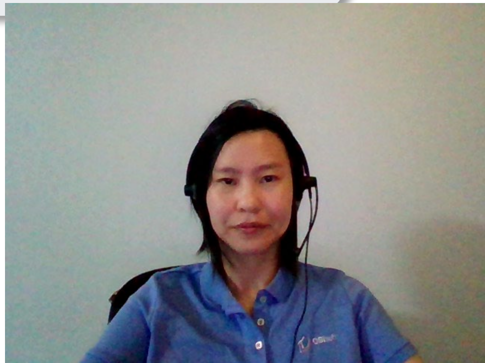

SCADA
DCS
PLC
OPC
Controllers
Databases
Text files
Instruments
Manual data
IIoT sensors
Cloud system
Collect
Store & Enhance
Deliver
Visualize
Report
Analyze
Notify
Share
Integrate



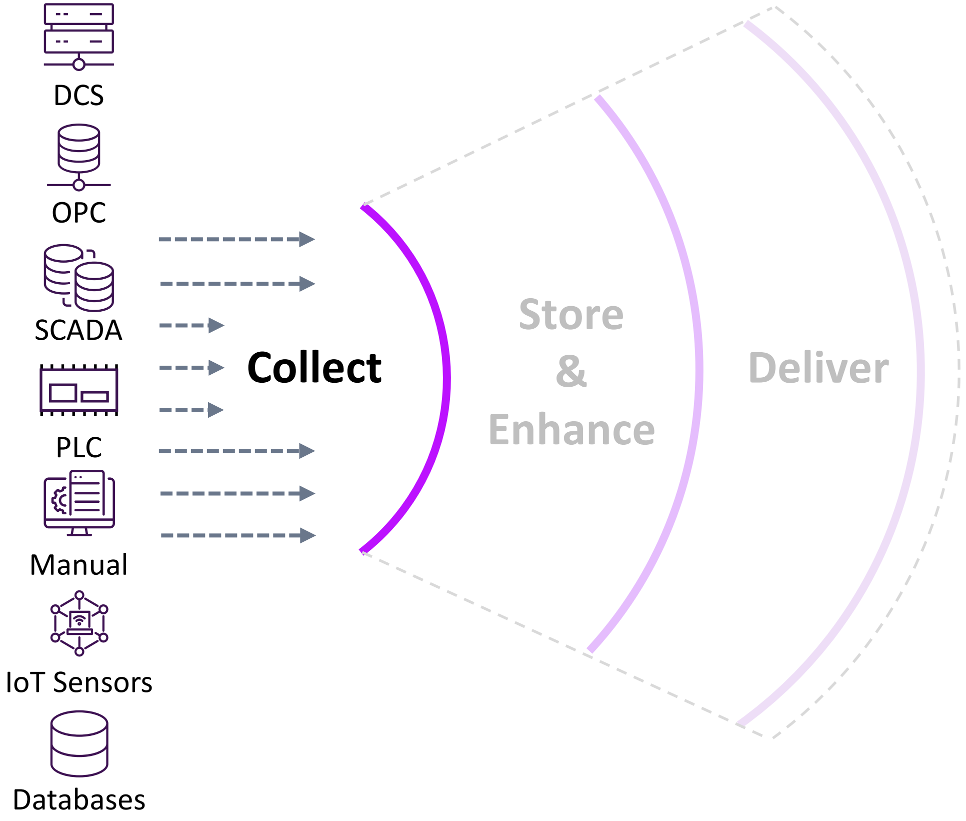
How PI System technology helps our users


Collect
Store
&
Enhance
Deliver

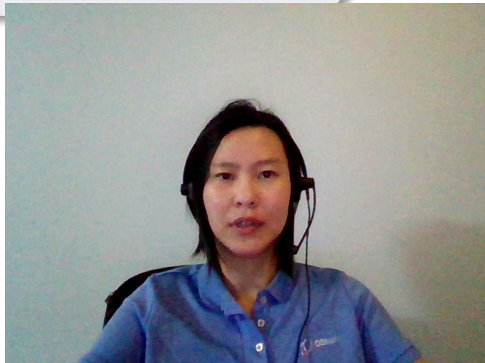
- It can **collect** the data that you need to make decisions
- It can **enhance** that raw data to turn it into actionable information
- And it can **deliver** it where and when you need it



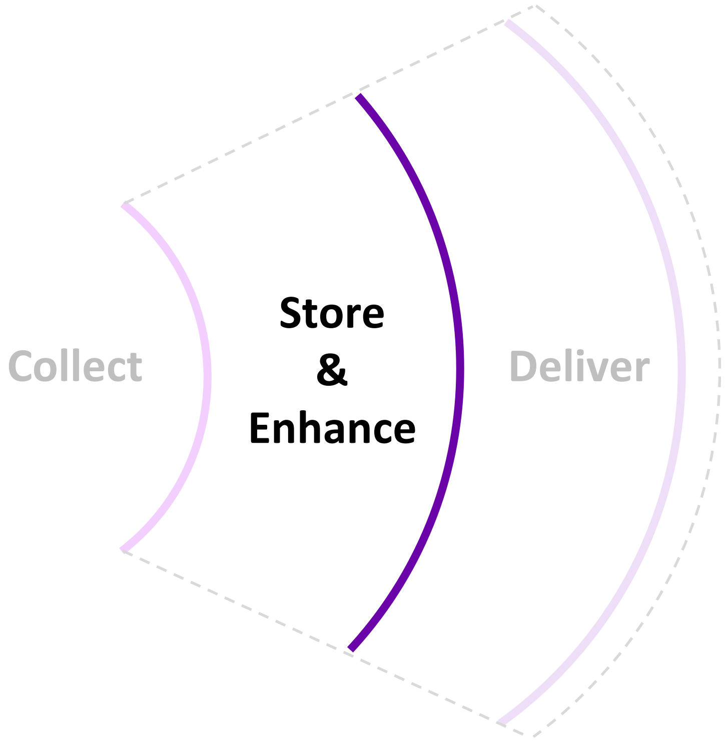
Gather Operations Data From Past, Present, and Future Data Sources


DCS
OPC
SCADA
PLC
Manual
IoT Sensors
Databases
Collect
Store & Enhance
Deliver

- Connect to any asset regardless of vendor
- Supports 225+ industrial protocols
- Developed and maintained by us
- Configured. No programming required



Turn Raw Operations Data Into Decision-Ready Information

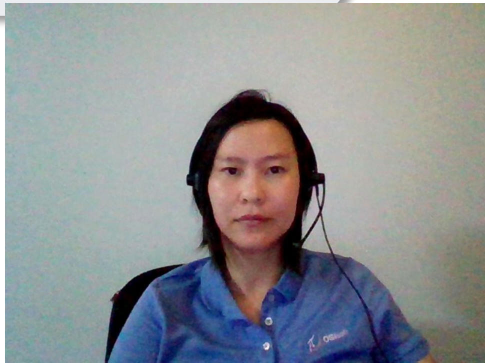


Collect

Store & Enhance

Deliver

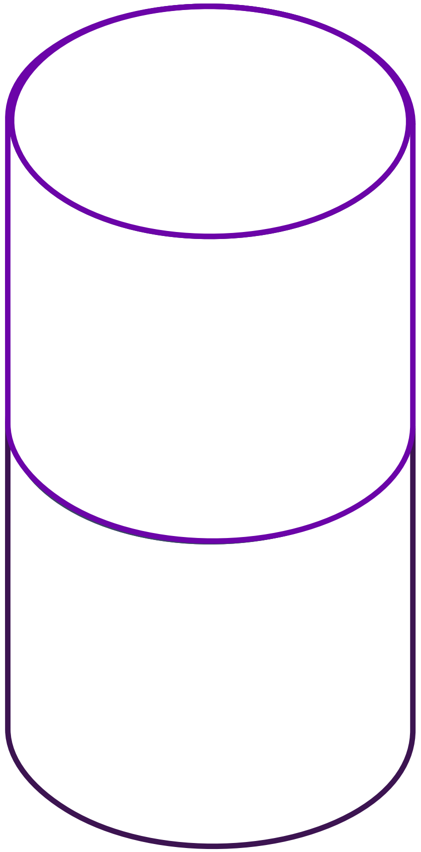
- Store high-frequency and large volumes of data
- Provide context to your data
- Run real-time analytics on your raw data
- Bookmark & notify of key events and batches in your data



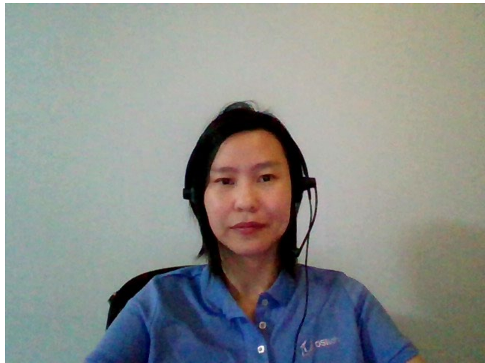
PI Server

PI Server is the real-time data storage, normalization, analytics, and notification engine at the **heart of on-prem deployments.**

- Single source of truth for all users
- Layered capabilities enhance operations data



PI Server



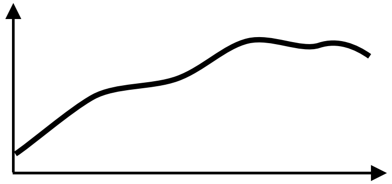
Data Archive

Optimized storage & access to massive volumes of operational data

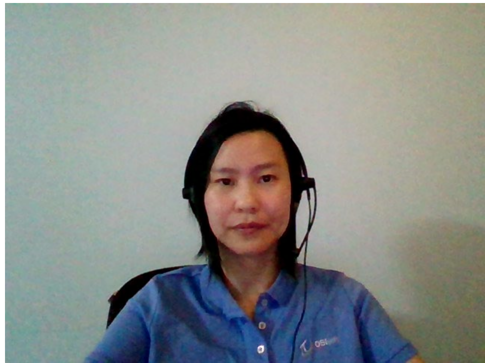
- Store millions of data streams and thousands of values per second over multiple decades
- Maintain the original fidelity of your data
- Keep your data online for immediate, real-time retrieval
- Store future data from predictive models and other sources

Data
Archive

PI Server



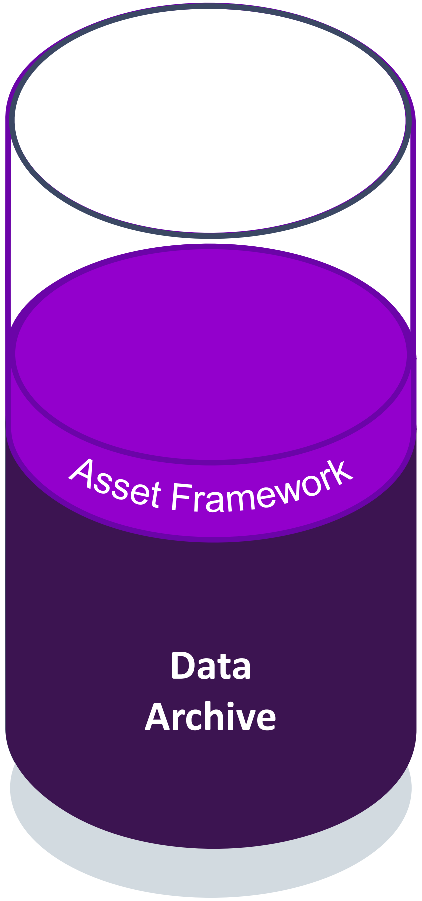
MP01.HOU.PV



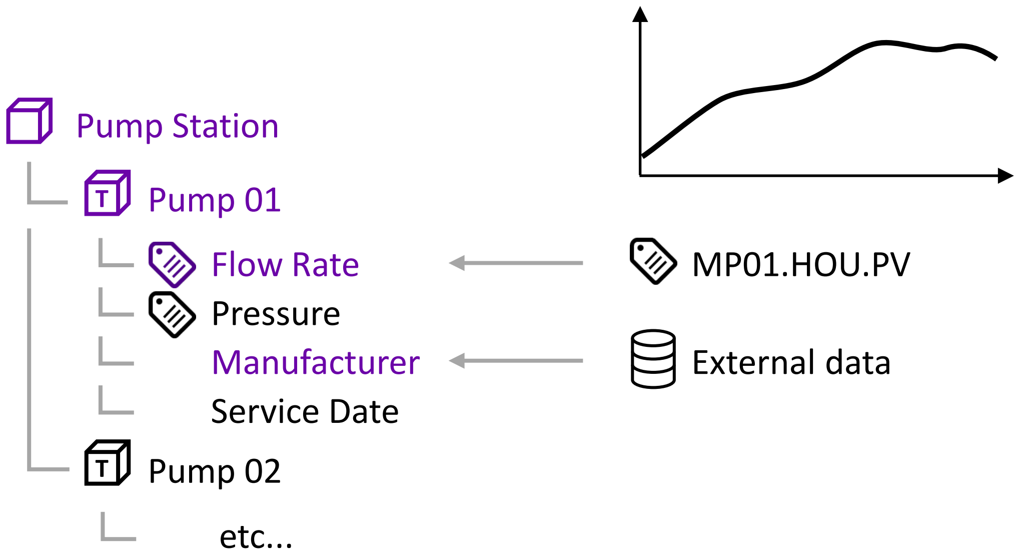
Asset Framework

Organize and contextualize your operational data in a way that makes sense to users across your enterprise — not just SCADA experts

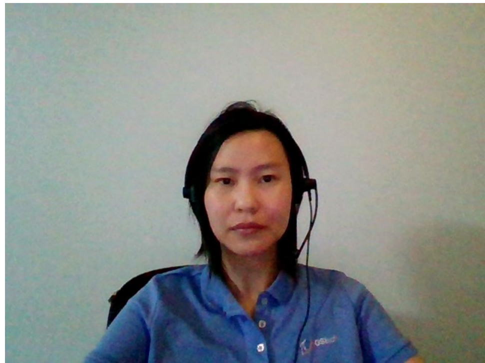
- Label data with human-friendly names
- Group related data into Assets
- Add metadata and context manually or from external systems
- Standardize groupings, labels, and units with Templates



PI Server



- Pump Station
  - Pump 01
    - Flow Rate ← MP01.HOU.PV
    - Pressure
    - Manufacturer ← External data
    - Service Date
  - Pump 02
    - etc...



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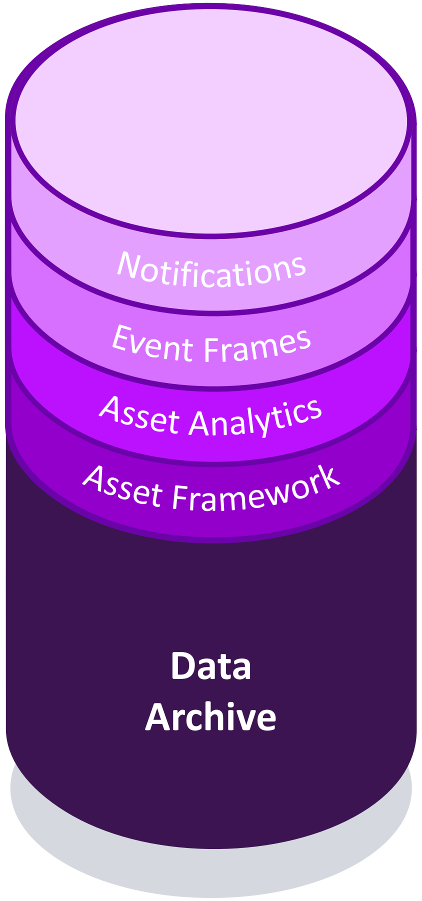
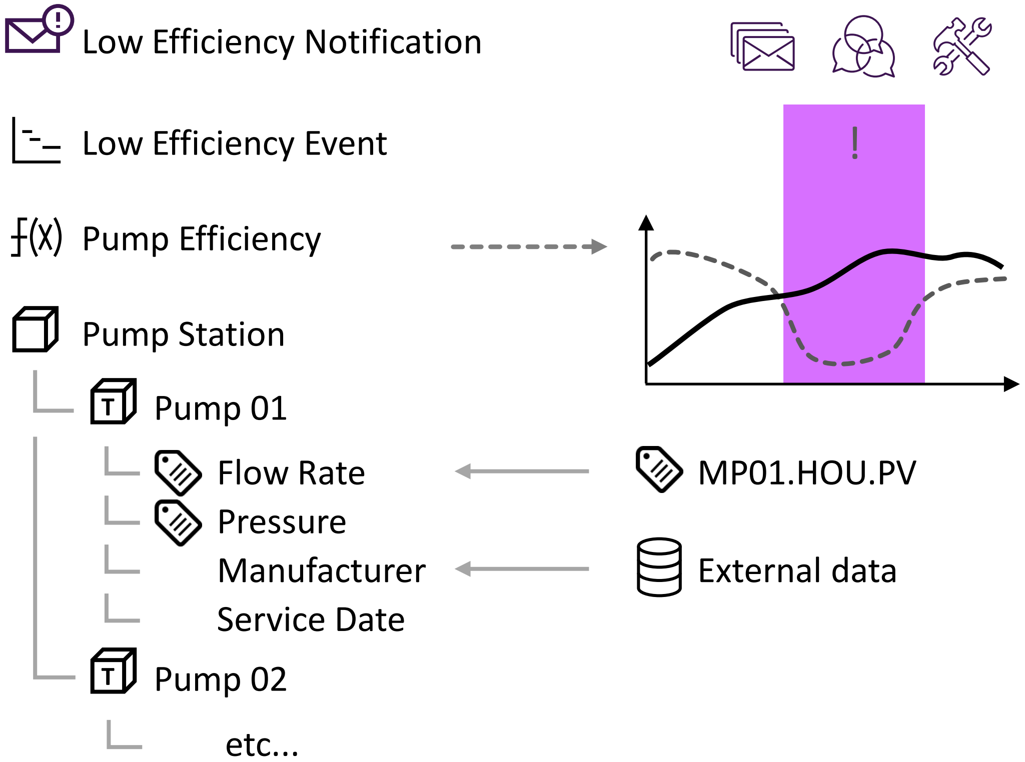
- Layered capabilities enhance operations data


Notifications
Event Frames
Asset Analytics
Asset Framework
Data Archive

PI Server

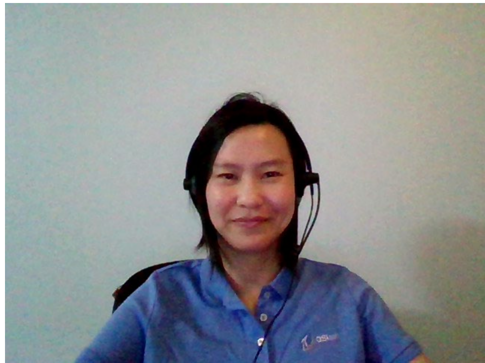


Low Efficiency Notification

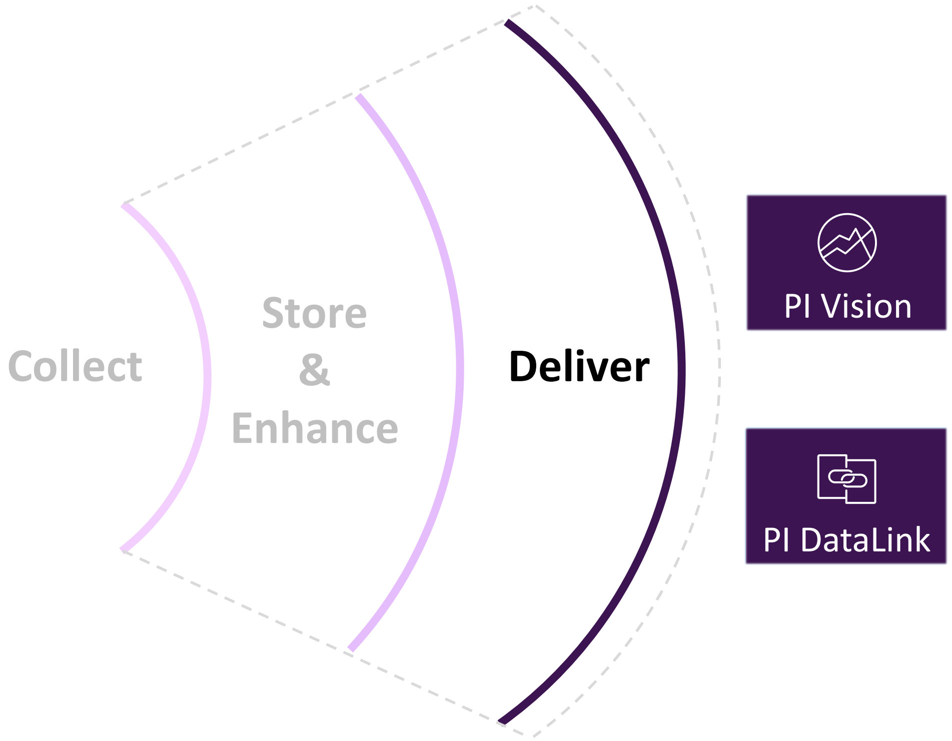
Low Efficiency Event

Pump Efficiency

Pump Station
  - Pump 01
    - Flow Rate ← MP01.HOU.PV
    - Pressure
    - Manufacturer ← External data
    - Service Date
  - Pump 02
    - etc...



Turn Raw Operations Data Into Decision-Ready Information



Collect

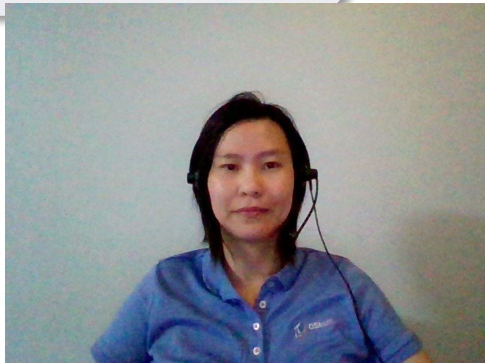
Store
&
Enhance

Deliver

PI Vision

PI DataLink

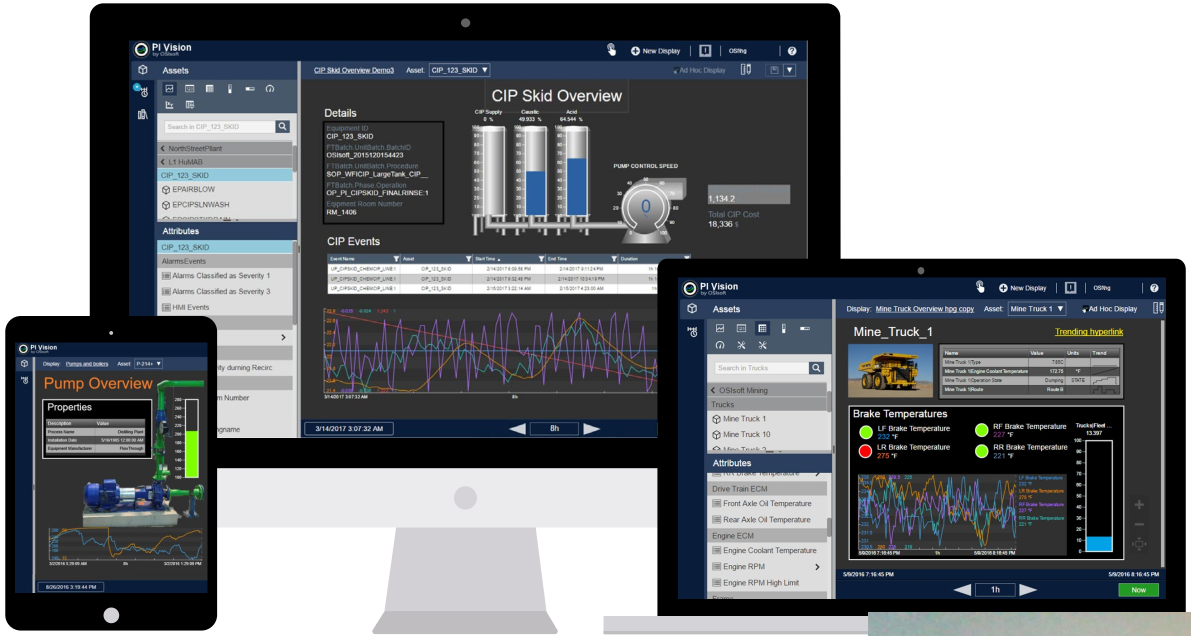
- View KPI’s in excel or on any device with a web-browser
- Truly real-time, displays that update in seconds, not minutes
- Build dashboards or reports without requiring help from IT



PI Vision

The fastest, easiest way to visualize PI Server data

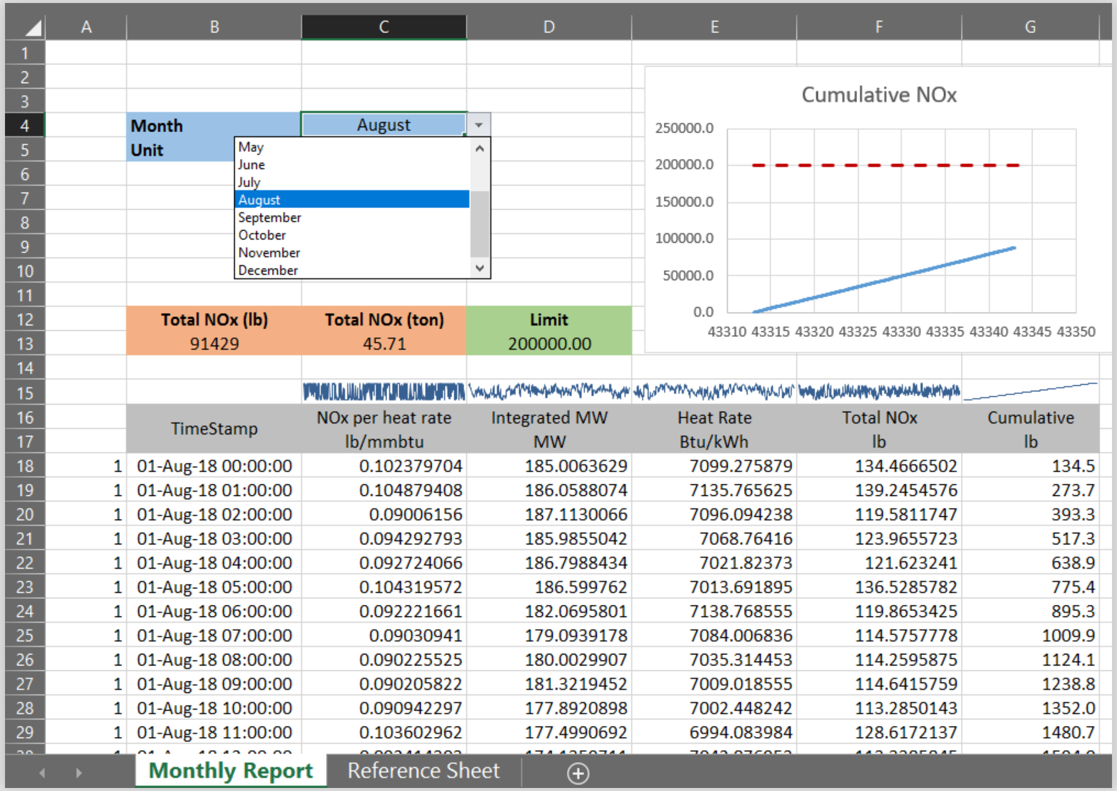
- An **easy to use, self-service, scalable** solution
- Access data from any web browser, including **mobile device** browsers
- **Organize and share** displays across your organization


PI Vision
CIP Skid Overview
Details
CIP Events
Pump Overview
Properties
Mine_Truck_1
Brake Temperatures
Assets
Attributes

PI DataLink

Delivering data to Microsoft Excel

- Create **live, interactive, spreadsheet reports** that easily compare and analyze assets
- Summarize **years of historical data** and view alongside **real-time data**
- Allows **summary calculations** and **filtering** of the data
- Access to Excel functionalities

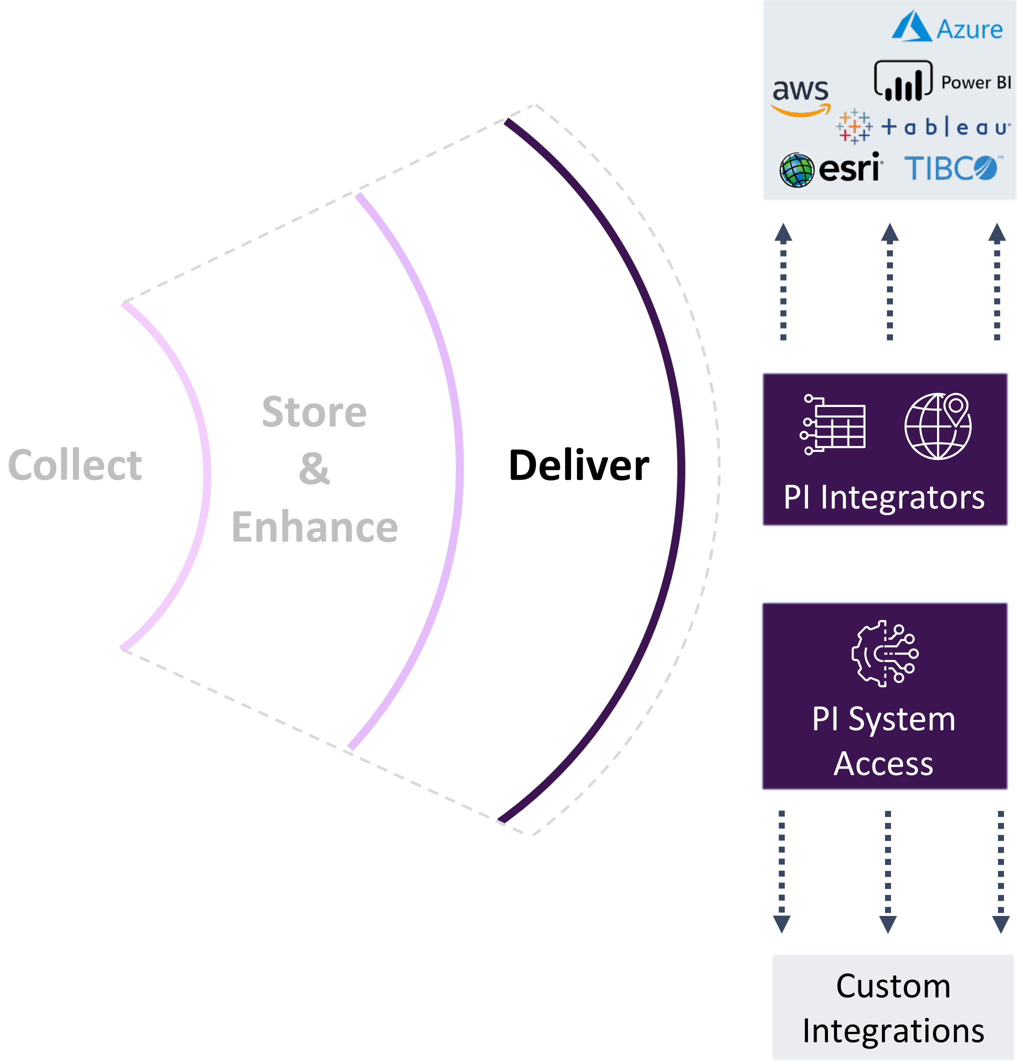

A
B
C
D
E
F
G
May
June
July
August
September
October
November
December
Cumulative NOx
250000.0
200000.0
150000.0
100000.0
50000.0
0.0
43310
43315
43320
43325
43330
43335
43340
43345
43350
Monthly Report
Reference Sheet

Month August
Unit

Total NOx (lb)	Total NOx (ton)	Limit
91429	45.71	200000.00

	TimeStamp	NOx per heat rate lb/mmbtu	Integrated MW MW	Heat Rate Btu/kWh	Total NOx lb	Cumulative lb
1	01-Aug-18 00:00:00	0.102379704	185.0063629	7099.275879	134.4666502	134.5
1	01-Aug-18 01:00:00	0.104879408	186.0588074	7135.765625	139.2454576	273.7
1	01-Aug-18 02:00:00	0.09006156	187.1130066	7096.094238	119.5811747	393.3
1	01-Aug-18 03:00:00	0.094292793	185.9855042	7068.76416	123.9655723	517.3
1	01-Aug-18 04:00:00	0.092724066	186.7988434	7021.82373	121.623241	638.9
1	01-Aug-18 05:00:00	0.104319572	186.599762	7013.691895	136.5285782	775.4
1	01-Aug-18 06:00:00	0.092221661	182.0695801	7138.768555	119.8653425	895.3
1	01-Aug-18 07:00:00	0.09030941	179.0939178	7084.006836	114.5757778	1009.9
1	01-Aug-18 08:00:00	0.090225525	180.0029907	7035.314453	114.2595875	1124.1
1	01-Aug-18 09:00:00	0.090205822	181.3219452	7009.018555	114.6415759	1238.8
1	01-Aug-18 10:00:00	0.090942297	177.8920898	7002.448242	113.2850143	1352.0
1	01-Aug-18 11:00:00	0.103602962	177.4990692	6994.083984	128.6172137	1480.7

Extending Further


Azure
aws
Power BI
tableau
esri
TIBCO

Collect

Store
&
Enhance

Deliver

PI Integrators

PI System
Access

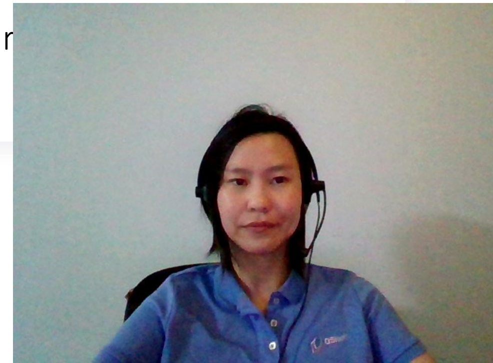
Custom
Integrations

- Bring trustworthy operations data to additional tools
- Move data between business and geographic boundaries
- Programmatic access to build anything on PI System

The operations data infrastructure approach

A truly comprehensive Operations Data Management solution

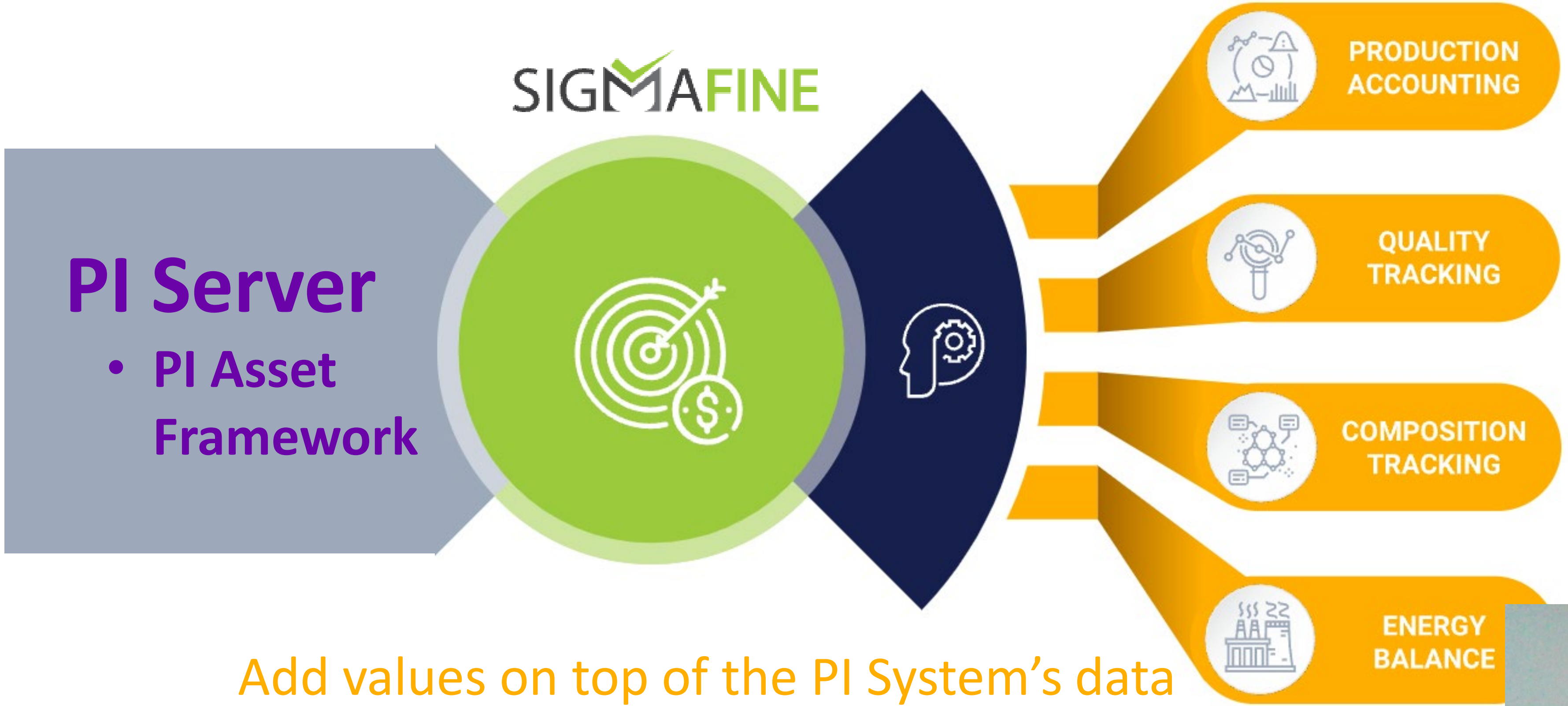
From This...	...To This
Data silos and stranded remote assets	Collect and integrate high volumes of data from any source, including process data, remote assets and IIoT devices
Inability to access data without IT support	Easy, self-service data visualization and extraction
Difficulty understanding context of raw data streams	Flexible, reusable data structures which present data in context for users inside and outside operations
Cost and delays associated with data wrangling	Data platform offering data normalization, layered analytics, event tracking, and alert notifications
Expensive systems and networks for secure data sharing	Purpose-built cloud services to provide secur data without VPNs



PI System + Sigmafine

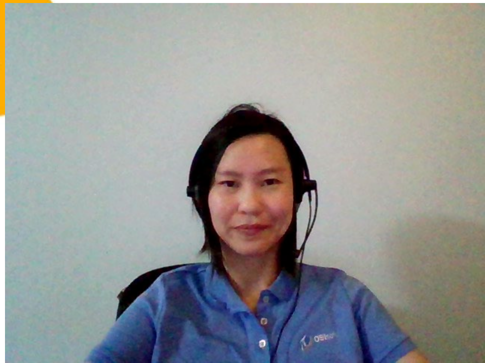
PI System + Sigmafine

In relationship since 1999

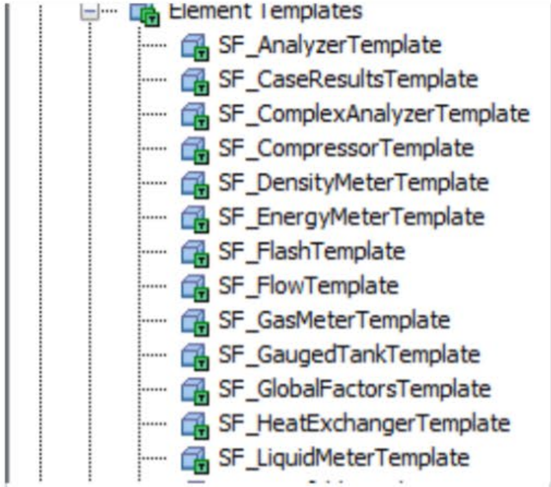

SIGMAFINE
PRODUCTION ACCOUNTING
QUALITY TRACKING
COMPOSITION TRACKING
ENERGY BALANCE

PI Server
- **PI Asset Framework**

Add values on top of the PI System's data



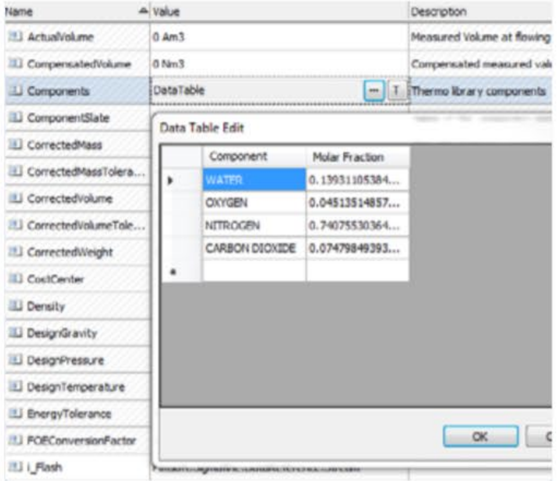
Sigmafine provides modeling capabilities plugged in the PI Asset Framework



- Element Templates
  - SF_AnalyzerTemplate
  - SF_CaseResultsTemplate
  - SF_ComplexAnalyzerTemplate
  - SF_CompressorTemplate
  - SF_DensityMeterTemplate
  - SF_EnergyMeterTemplate
  - SF_FlashTemplate
  - SF_FlowTemplate
  - SF_GasMeterTemplate
  - SF_GaugedTankTemplate
  - SF_GlobalFactorsTemplate
  - SF_HeatExchangerTemplate
  - SF_LiquidMeterTemplate

Templates

Ready made template for equipment, tanks, meters,…



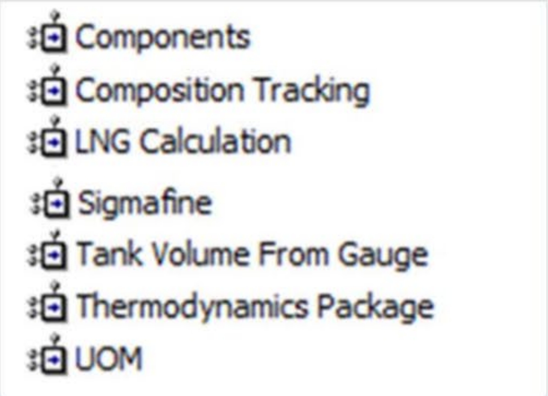
Name	Value	Description
ActualVolume	0 Am3	Measured Volume at flowing
CompensatedVolume	0 Nm3	Compensated measured val
Components	DataTable	Thermo library components
ComponentSlate		
CorrectedMass		
CorrectedMassTolera...		
CorrectedVolume		
CorrectedVolumeTole...		
CorrectedWeight		
CostCenter		
Density		
DesignGravity		
DesignPressure		
DesignTemperature		
EnergyTolerance		
FOEConversionFactor		
i_Flash		

Data Table Edit

Component	Molar Fraction
WATER	0.13931105384...
OXYGEN	0.04513514857...
NITROGEN	0.74075530364...
CARBON DIOXIDE	0.07479849393...

Elements

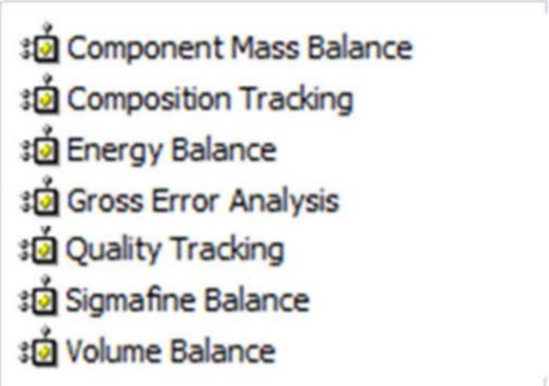
Assets are joined together in a model



- Components
- Composition Tracking
- LNG Calculation
- Sigmafine
- Tank Volume From Gauge
- Thermodynamics Package
- UOM

Data references

Data preparation such as meter and inventory compensation, thermodynamic calculations, etc.



- Component Mass Balance
- Composition Tracking
- Energy Balance
- Gross Error Analysis
- Quality Tracking
- Sigmafine Balance
- Volume Balance

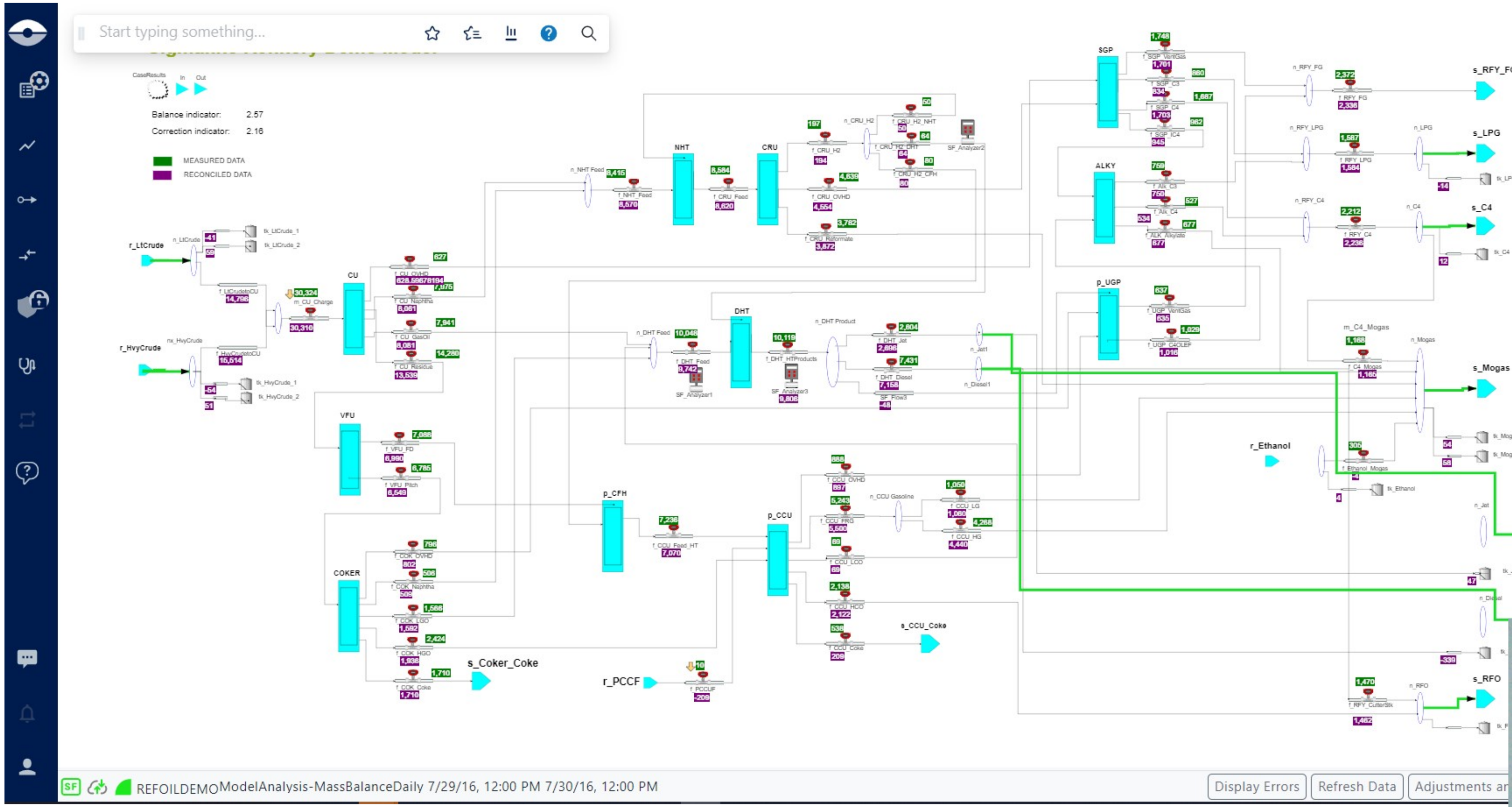
Analyses

PI AF capabilities are
extende
data rec
tracking

Reference: PI World 2020

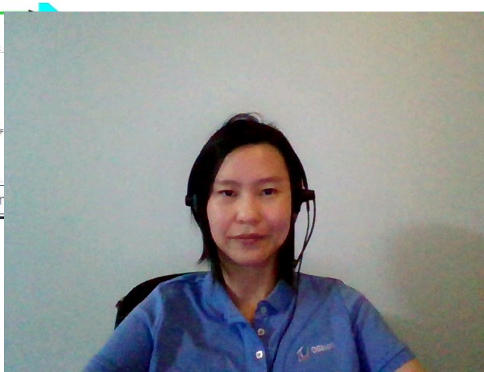
SigmafineHub

WebApp to view displays, run cases, and analyze results


Start typing something...
CaseResults
In
Out
MEASURED DATA
RECONCILED DATA
r_LtCrude
r_HvyCrude
CU
VFU
COKER
NHT
CRU
DHT
p_CFH
p_CCU
SGP
ALKY
p_UGP
r_Ethanol
r_PCCF
s_Coker_Coke
s_CCU_Coke
s_RFY_FG
s_LPG
s_C4
s_Mogas
s_Jet
s_Diesel
s_RFO
Display Errors
Refresh Data
Adjustments ar

Balance indicator: 2.57
Correction indicator: 2.16

REFOILDEMOModelAnalysis-MassBalanceDaily 7/29/16, 12:00 PM 7/30/16, 12:00 PM



A few examples of our customers

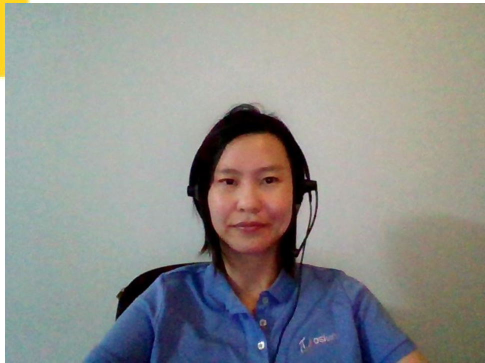
PERTAMINA

賽科 SECCO

NIS
GAZPROM NEFT
БУДУЋНОСТ
НА ДЕЛУ

Chevron

eni



Summary

PI System as a Data Infrastructure

An infrastructure unifies disparate data sources and information silos to build a single, comprehensive source of reliable data.

Real-time data is key to increasing operating efficiency and reliability, as well as integrating more closely with supply chain partners.

PI System provides a **secure hub for contextualized operations data** that can be extended via the cloud to give data access to any authorized person, application or tool in any location.

We are here to support your journey to Performance Intelligence.

PERFORMANCE INTELLIGENCE

The PI System Advantages

- Highly reliable system of record
- Easy self-service access and visualization
- Aggregate data in distributed environments
- Analytics and event tracking
- Attach context & meaning to data
- Fast integration with analytic tools & apps
- Secure data across all domains

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THANK YOU

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