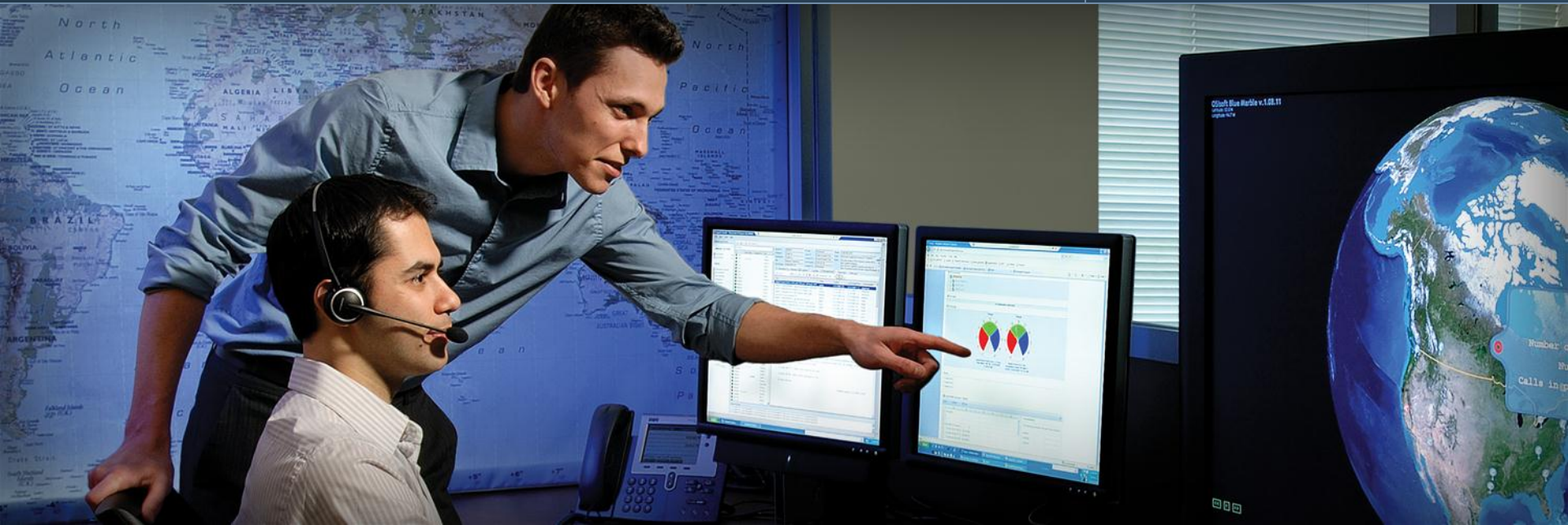




Regional Seminar Series Sofia, Bulgaria



The Value of the Real-time Infrastructure

Radisson Blu Grand Hotel
Sofia, Bulgaria

5 October 2010

Zsolt A. Oros
Sales Account Manager, CEE
OSIsoft Europe GmbH.

Empowering Business in Real-Time

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- Introduction
- What is the PI System and its Impact on your Business?
 - The reason for a Real-time Infrastructure
 - How does it fit into your existing infrastructure?
 - System Overview
 - Benefits & Value Creation Mechanism
- The Value of the PI System in Industries
 - Use Cases & Examples
- Summary

Great People - Significant Achievements

Perhaps the most famous bulgarian:

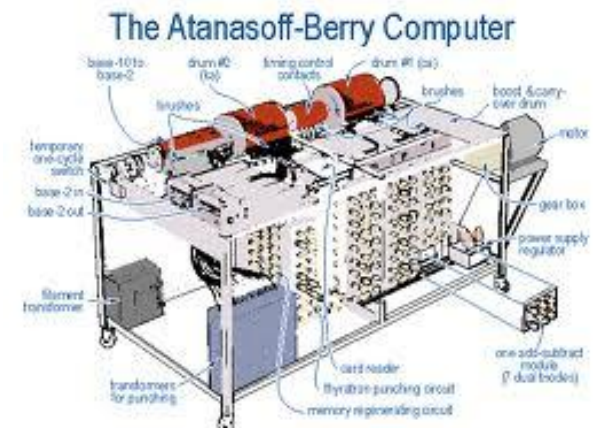


- The **Atanasoff-Berry Computer (ABC)** was the first fully electronic digital computing device.
 - » Conceived in 1937, tested in 1942
 - » Special purpose: not programmable, being designed only to solve systems of linear equations.
 - » The ABC has pioneered binary arithmetic and electronic switching elements
- **John Vincent Atanasoff's** and Clifford Berry's computer work was not widely known until it was rediscovered in the 1960s
 - » amidst conflicting claims about the first instance of an electronic computer. At that time, the ENIAC was considered to be the first computer in the modern sense, but
- In 1973 a U.S. District Court invalidated the ENIAC patent and concluded that the **ABC was the first "computer"**.



[John Vincent Atanasoff](#) (October 4th 1903 - June 15th 1995) was an American physicist of Bulgarian descent.

He was named inventor of the first automatic electronic digital computer, a special-purpose machine that has come to be called the Atanasoff-Berry Computer.



Great People - Significant Achievements

So who is the most famous one then?



HRISTO STOICHKOV

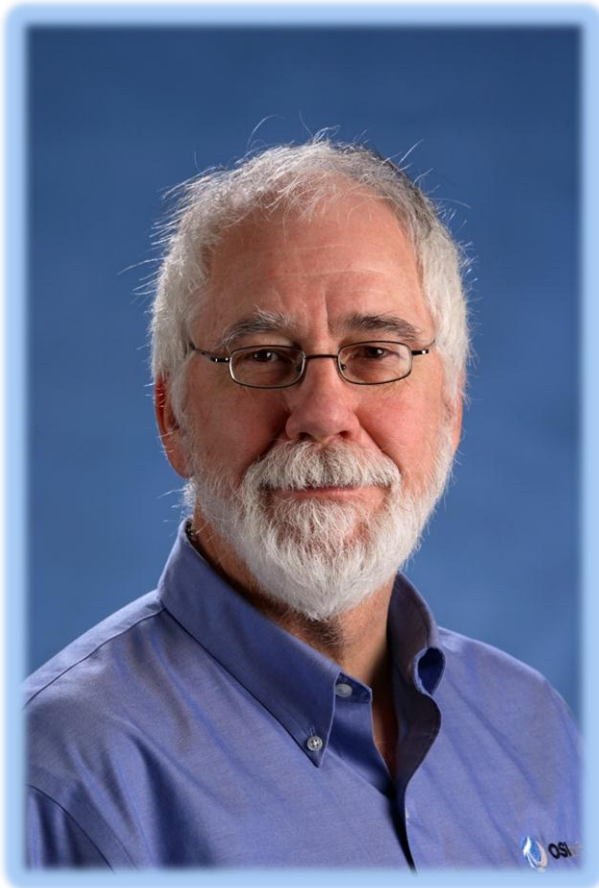


DIMITAR BERBATOV

Great People - Significant Achievements

California ISO: Governor's visit





“We are rewarded when we deliver superior value. This means delivering a platform on which our customers can continuously improve their business performance.”

Dr. J. Patrick Kennedy,
CEO & Founder

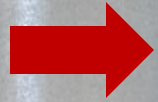
***OSIsoft LLC. celebrates the 30th
Anniversary of foundation of
the Company !!!***

What is the PI System?

Real-time Infrastructure for the Enterprise



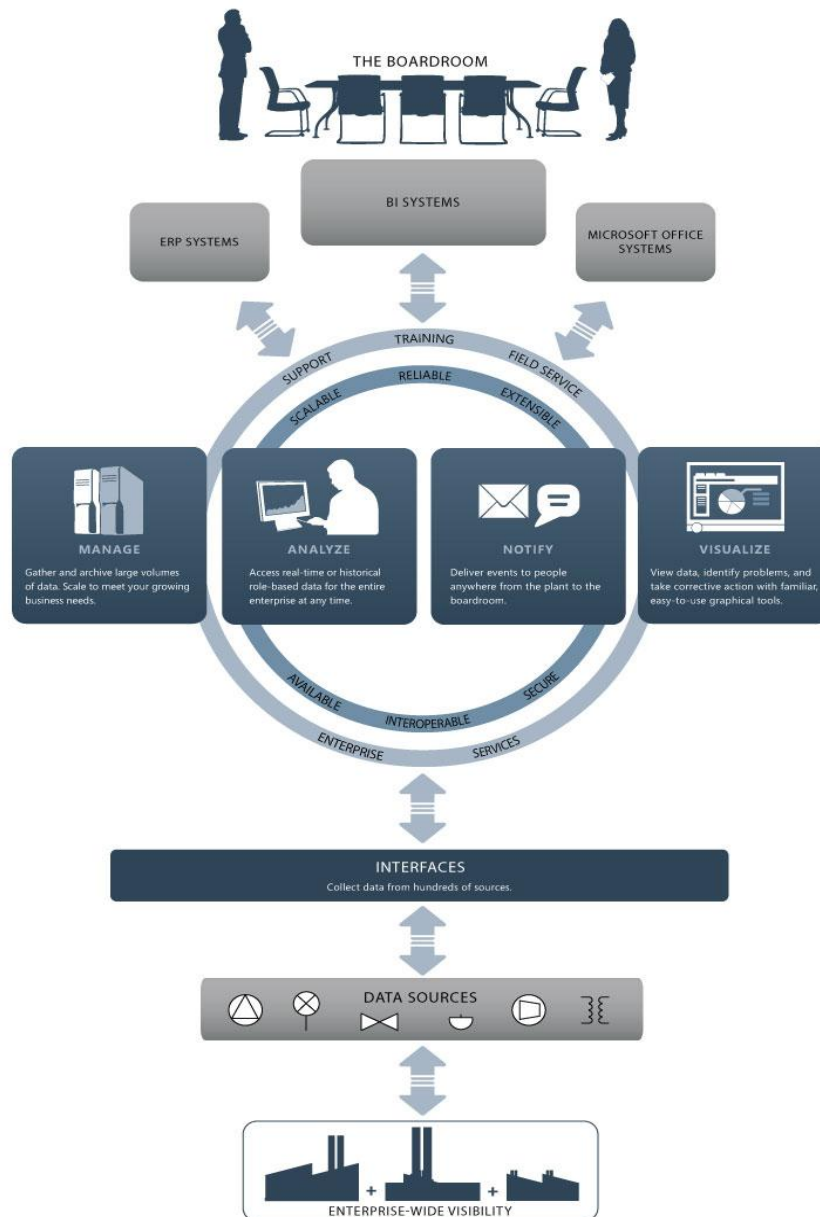
MONEY FLOW



INFORMATION FLOW



MATERIAL FLOW



Enterprise Infrastructure for management of real-time data and events

Continuous Monitoring

Performance - Availability – Security

Real-time Decision Making

Valuable business decisions based on actionable, Real-time Information

Real-time Communication

Between ISLANDs of data and information

Collaboration

Everybody works with the same Information – Rules – Tools

Adoption

To Changes in

- Business / Organization / Process
- Technology

From Local to Global

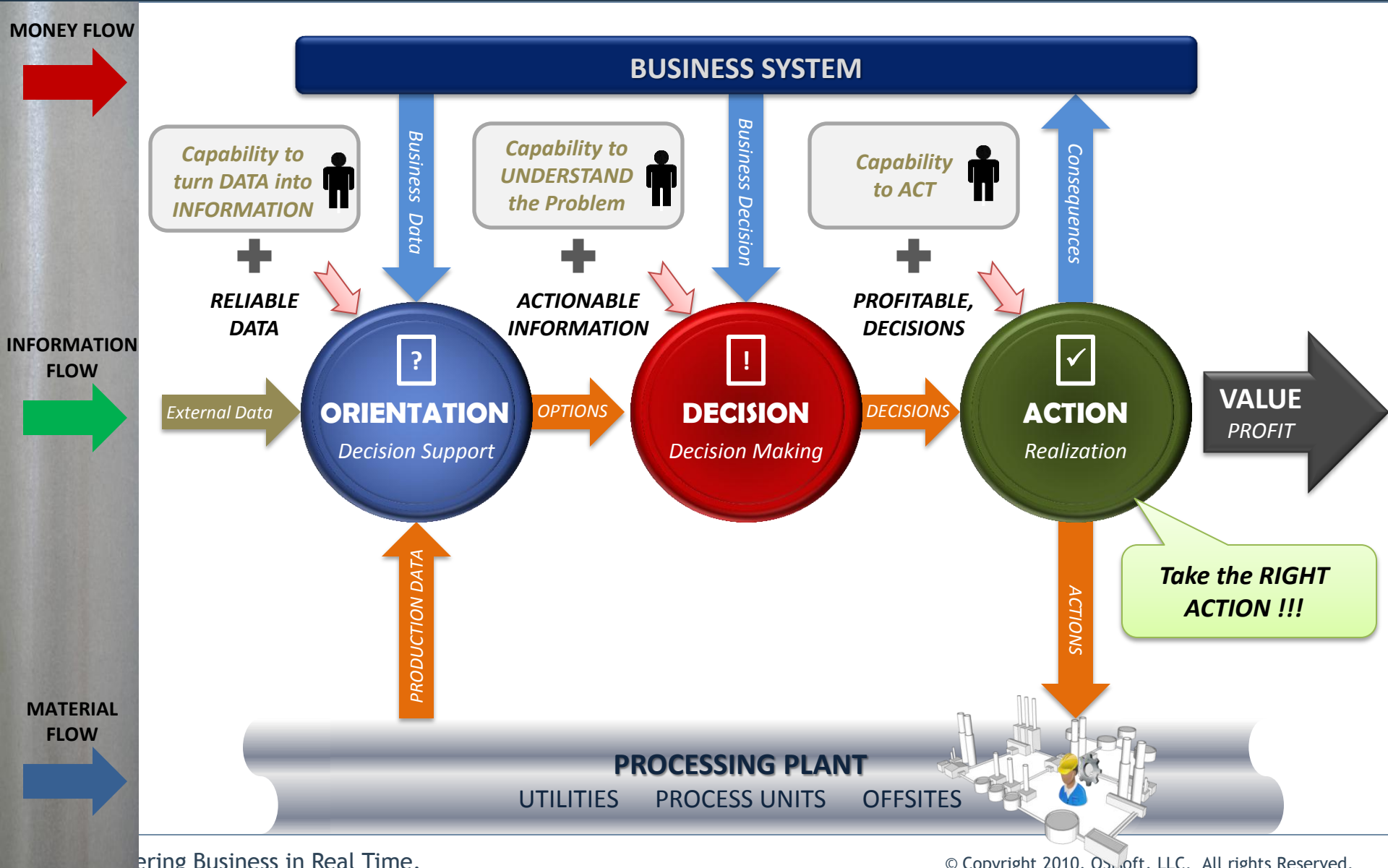
Backbone for Integration

Plant to Business (P2B) Integration

Continuous Improvement

Across the whole Enterprise

The reason for a Real-time Infrastructure Business Decision Cycle - Value Creation Process



Information is as good as the decision made with it !!!

Information must be **TIMELY, MEANINGFUL & ACTIONABLE**

There are two very important aspects to it:

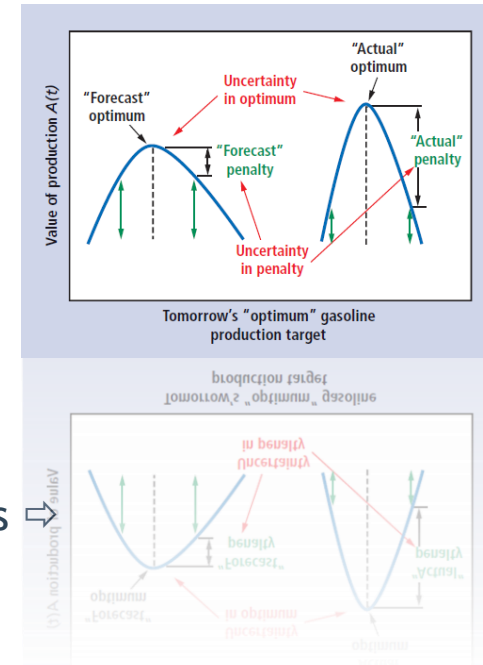


1. *Reduced Time to Decision*

- » Faster time to decision ⇨
- » Reduced Cycle Time ⇨
- » Faster time to market ⇨
- » **HIGHER REVENUE** of products

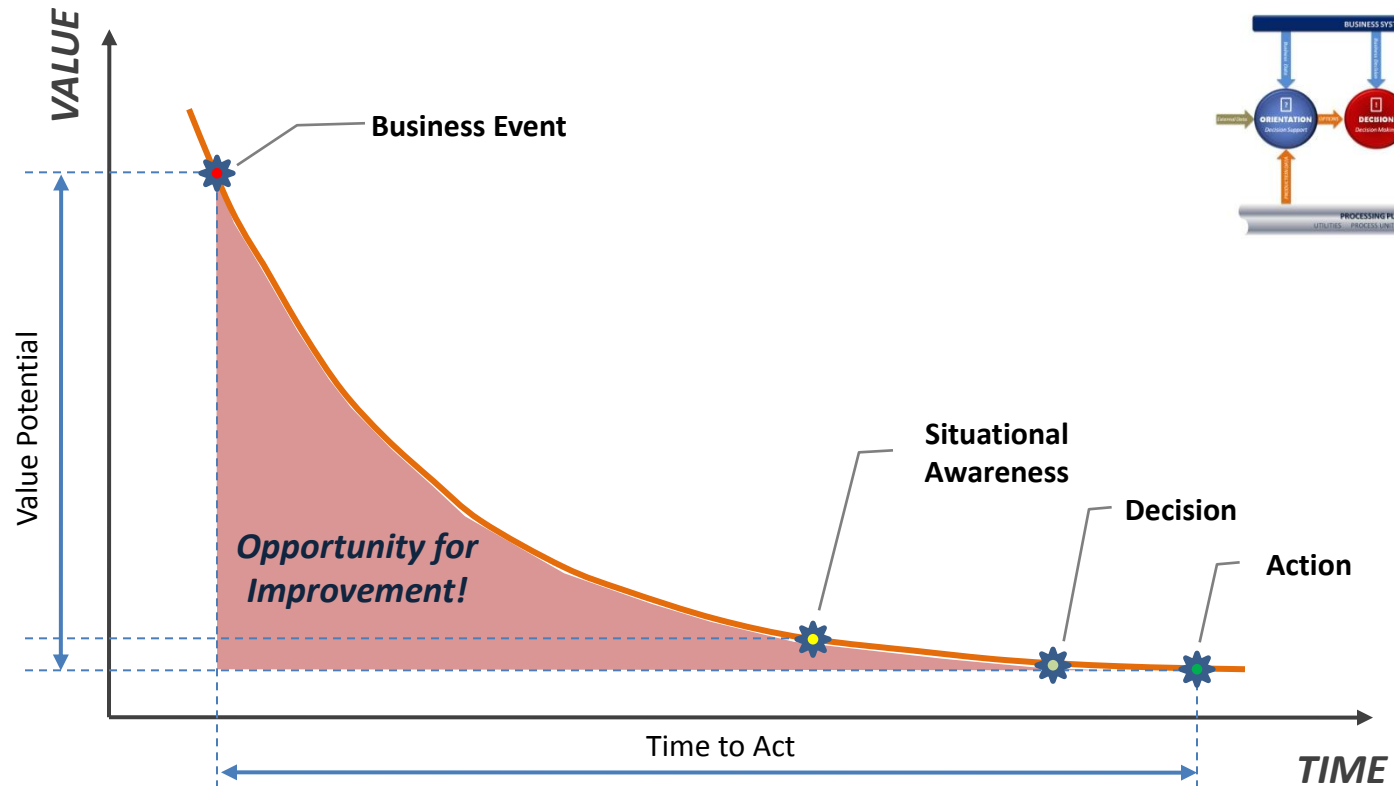
2. *Improved Decision Quality*

- » Reduced Decision Uncertainty ⇨
- » Better quality and more products ⇨
- » **LOWER COST** of production



The TIME Aspect

How to Improve?

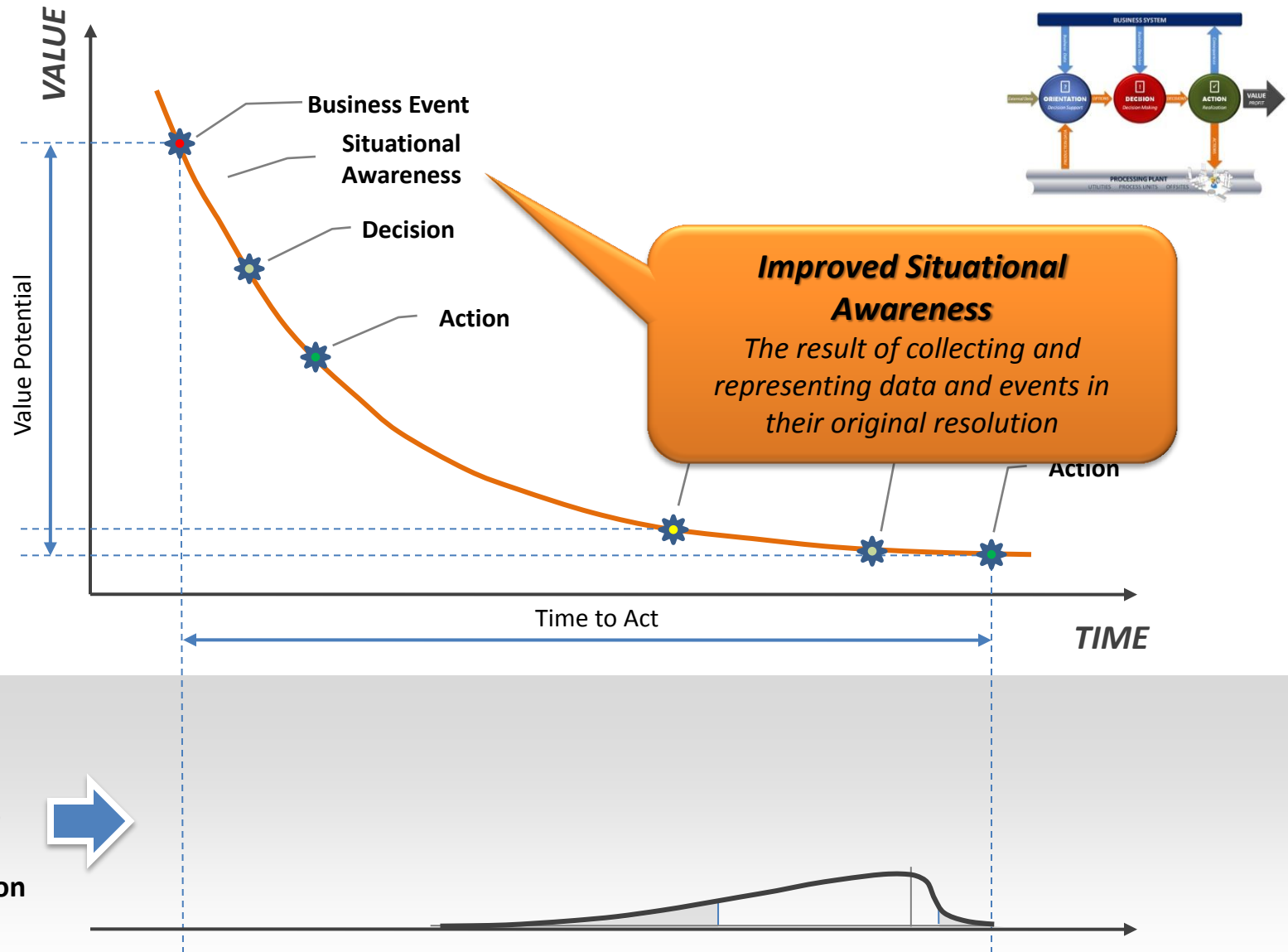


Ultimately, Value can be obtained from

- Reducing Time to Decision by Improving Situational Awareness
- Situational Awareness can be improved by having data available in real-time in their original resolution

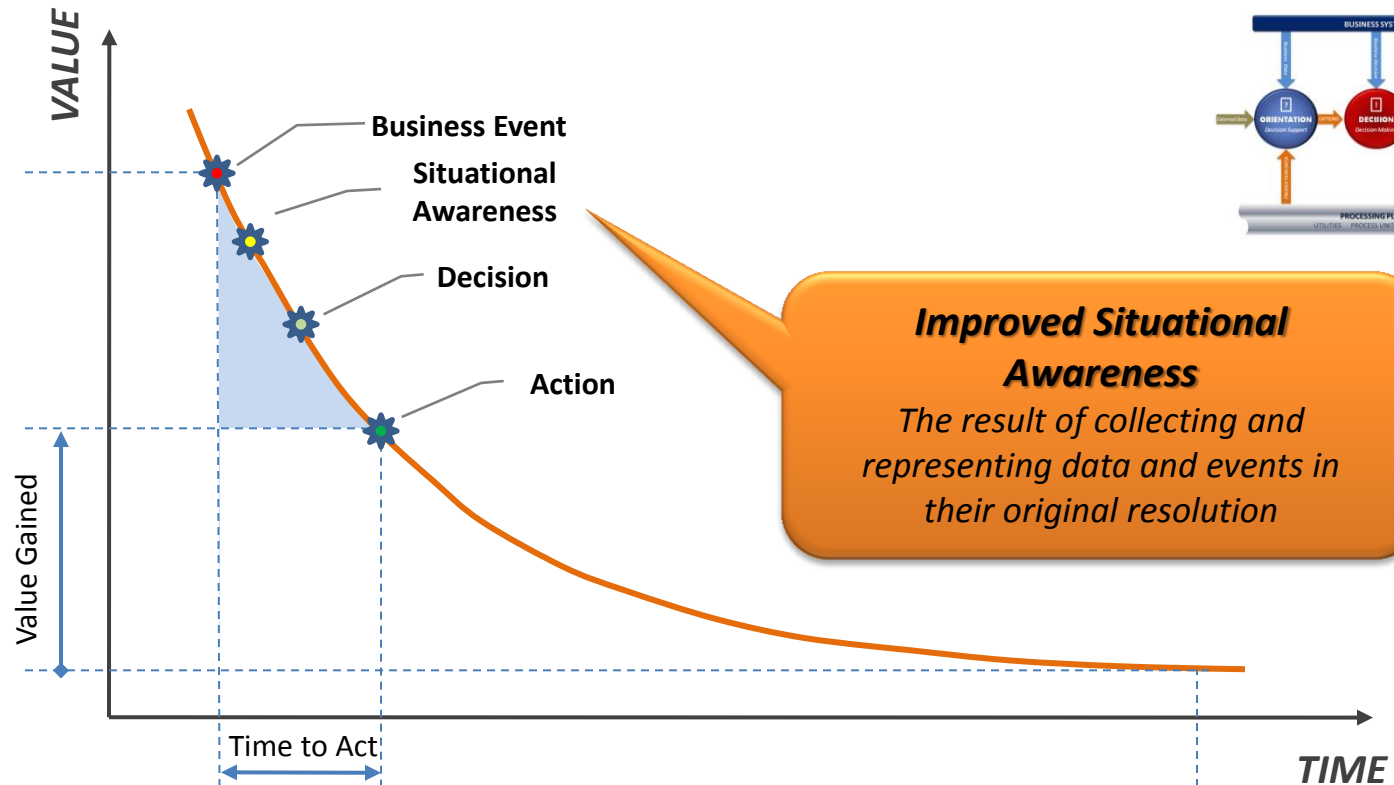
The TIME Aspect

Improving Situational Awareness



The TIME Aspect

Improving Situational Awareness

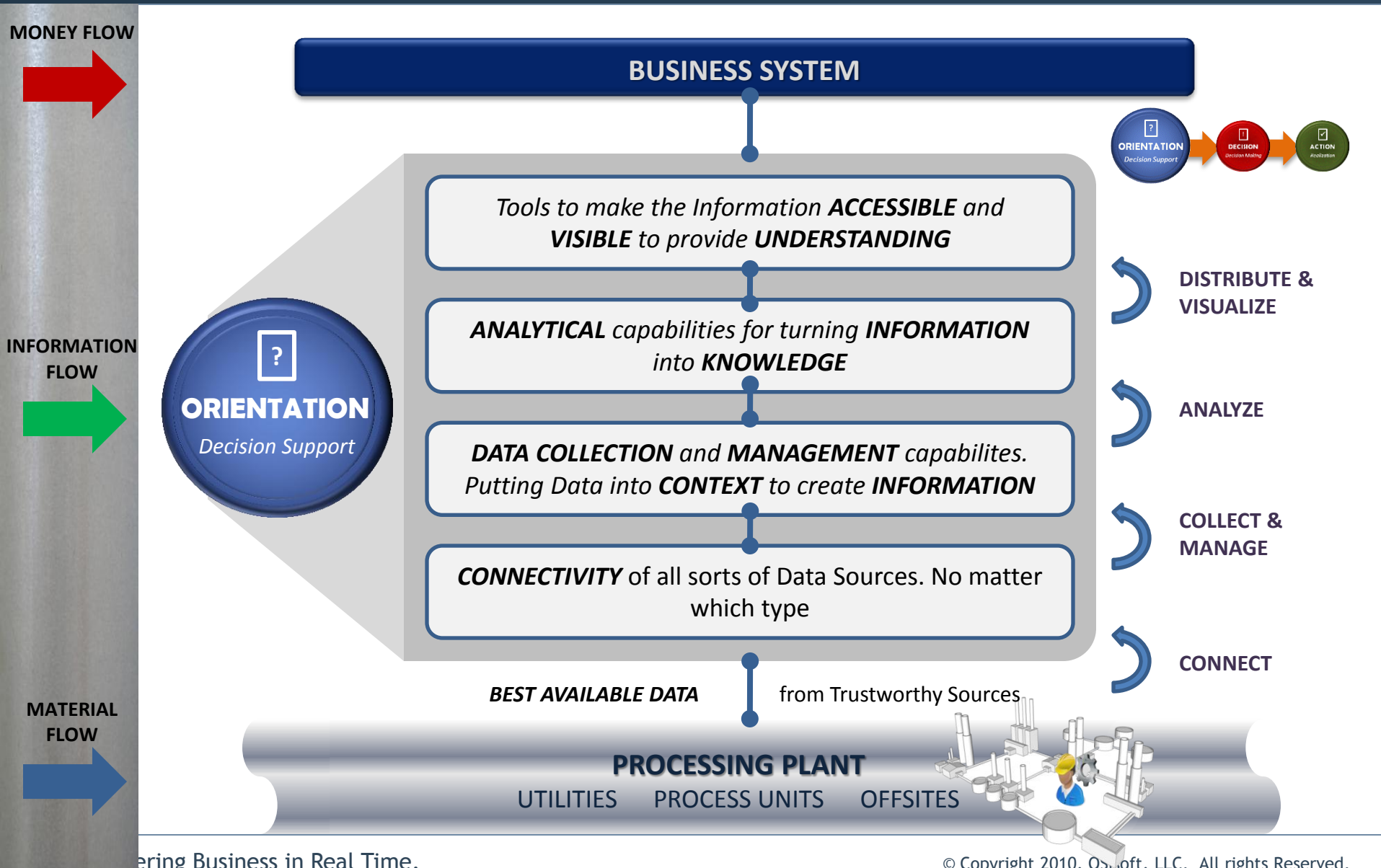


Distribution of time between a Business Event and the Corresponding Action



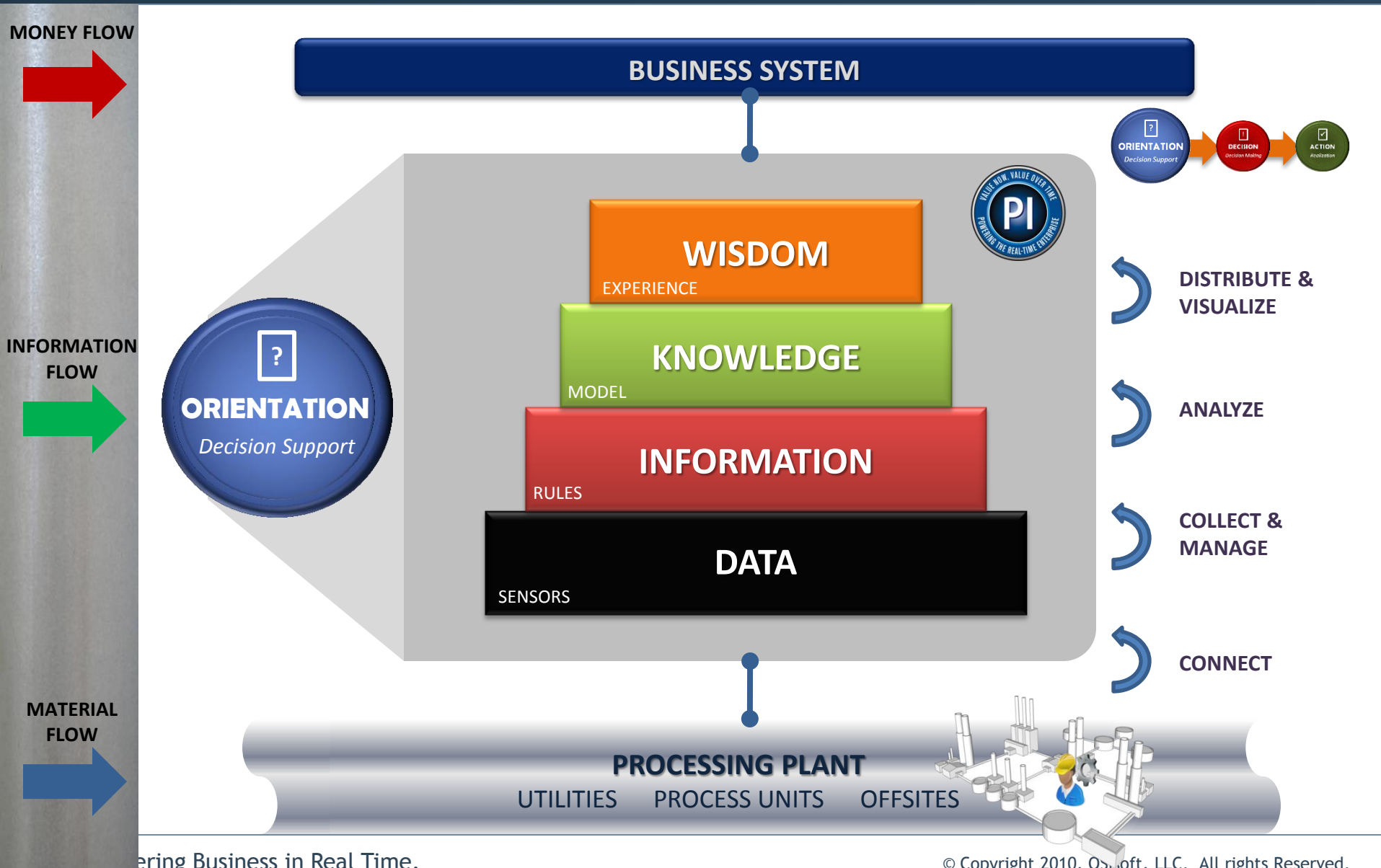
The QUALITY Aspect

Reducing Uncertainty by Turning DATA into KNOWLEDGE



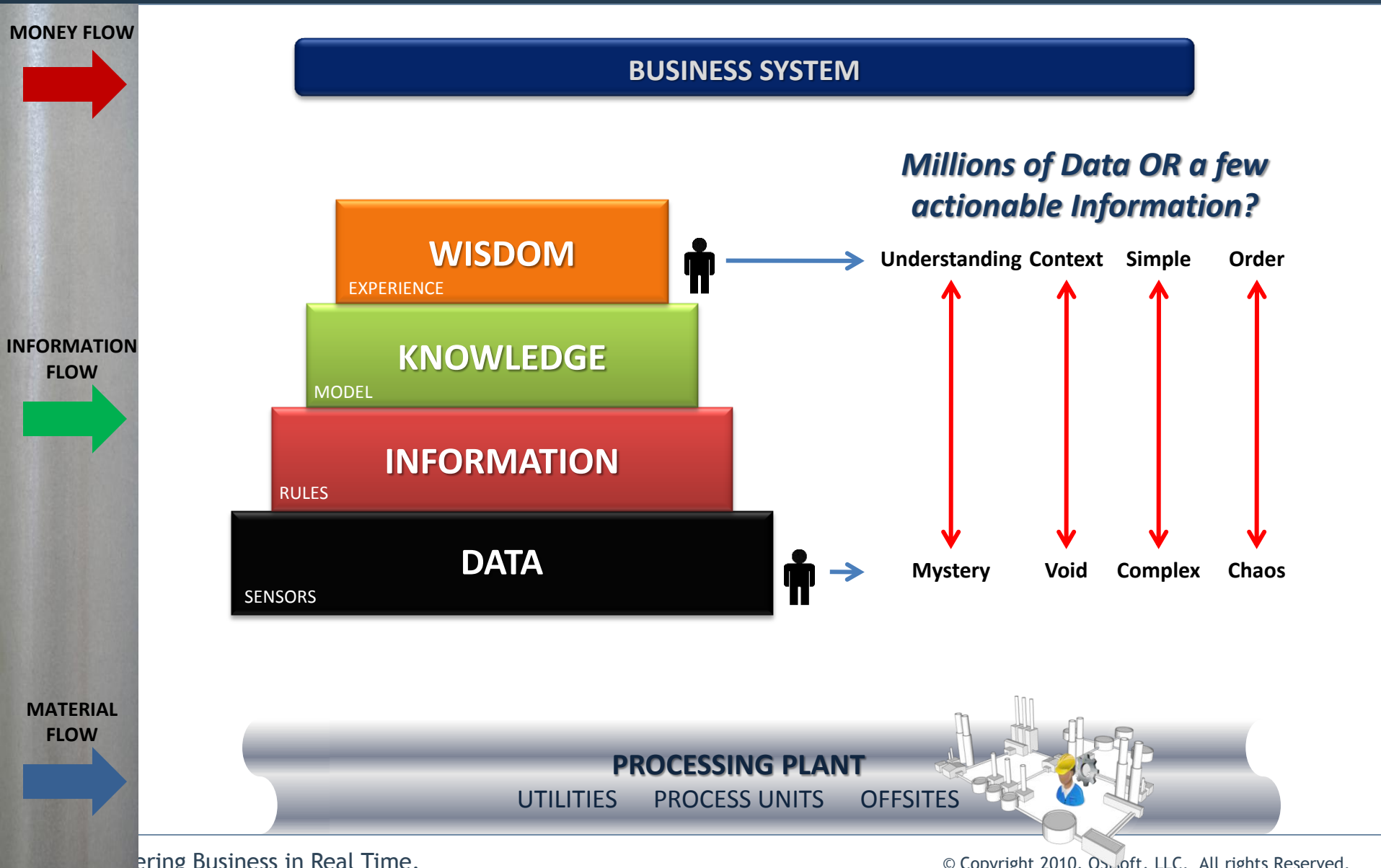
The QUALITY Aspect

Reducing Uncertainty by Turning DATA into KNOWLEDGE

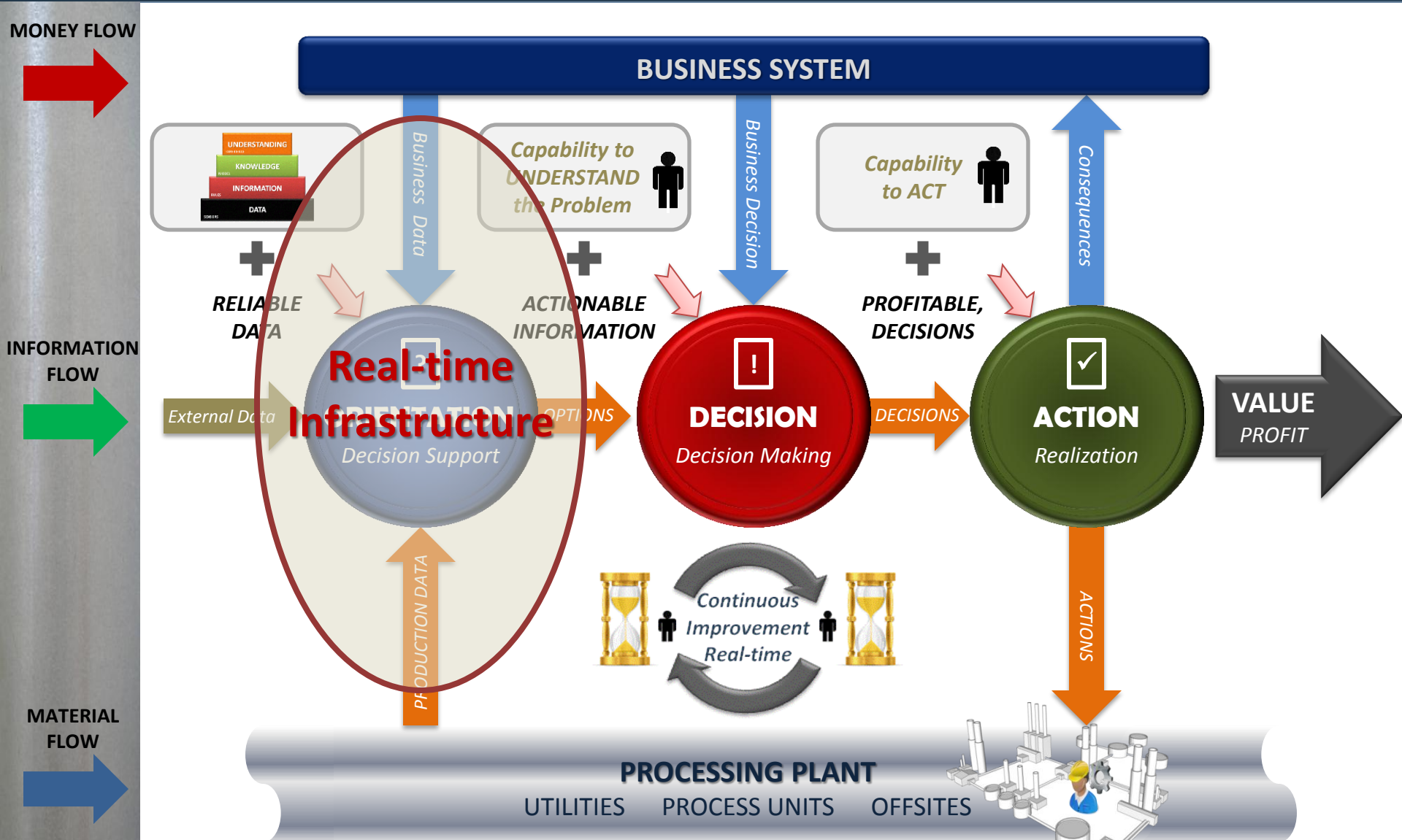


Why it is Important?

What is the basis of your decision?



The place for Real-time Infrastructure: Foundation for Real-time Decision Support



How does it fit into your existing Infrastructure?

Typical Situation - Hundreds of Islands



MONEY FLOW



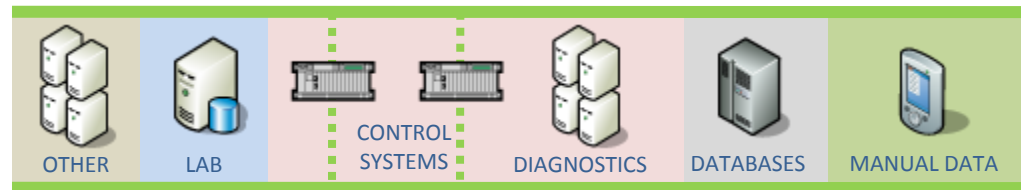
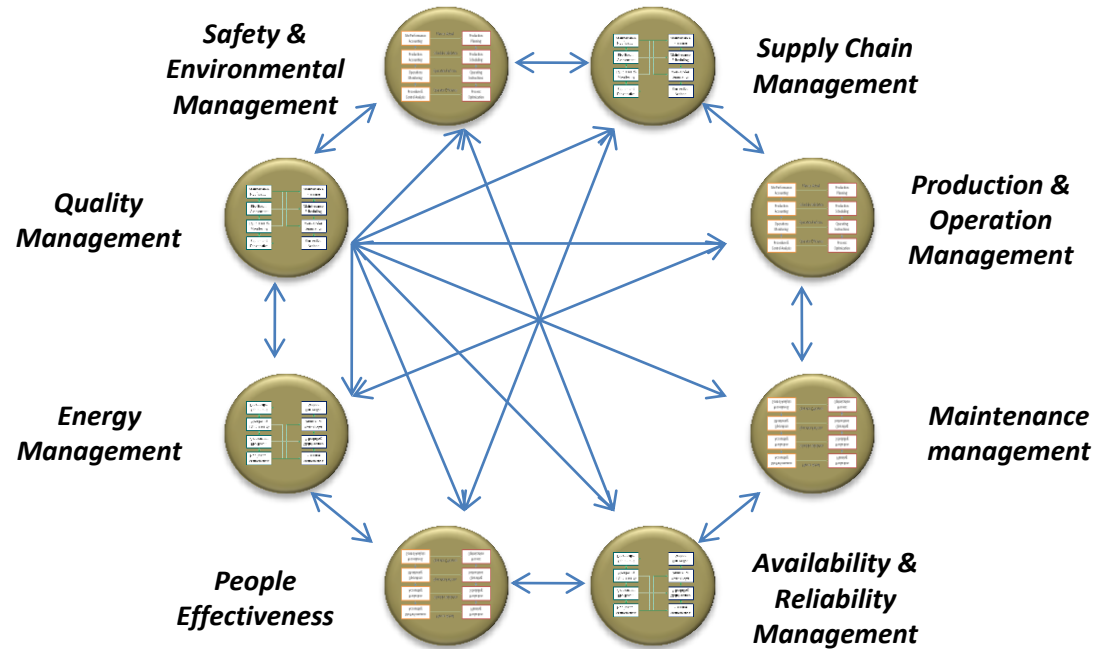
INFORMATION FLOW



MATERIAL FLOW



BUSINESS SYSTEM



ISA95

Level 4: Issues:

- **Islands**
 - Number of Business Processes
 - Various Systems – Solutions & Applications

Level 3: Issues:

- **Boundaries**
 - Various Analytical & Visualisation Tools
 - Organizational
 - Communication
- **Time**

Level 2: Issues:

- **Monitoring**
- **Decision Making**

Level 1: Issues:

- **How to Collaborate?**
- **Sensing & Control**
- **How to improve?**

Level 0: Issues:

- **Process**

How does it fit into your existing Infrastructure?

Integration of Islands



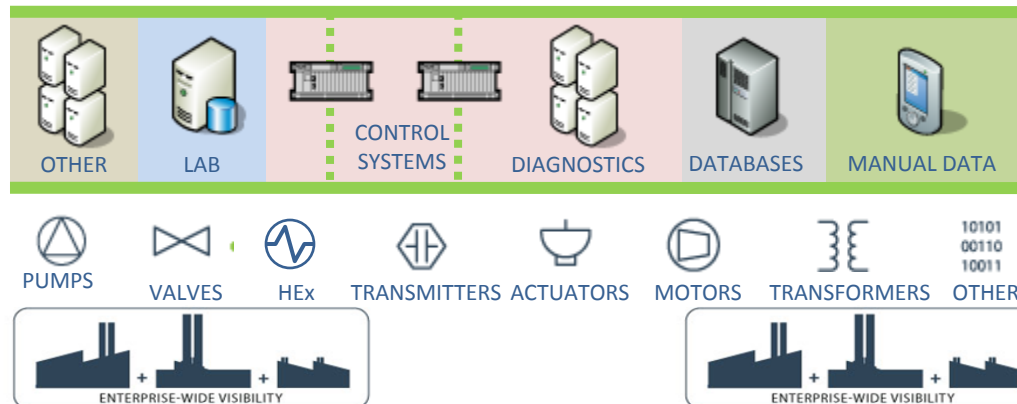
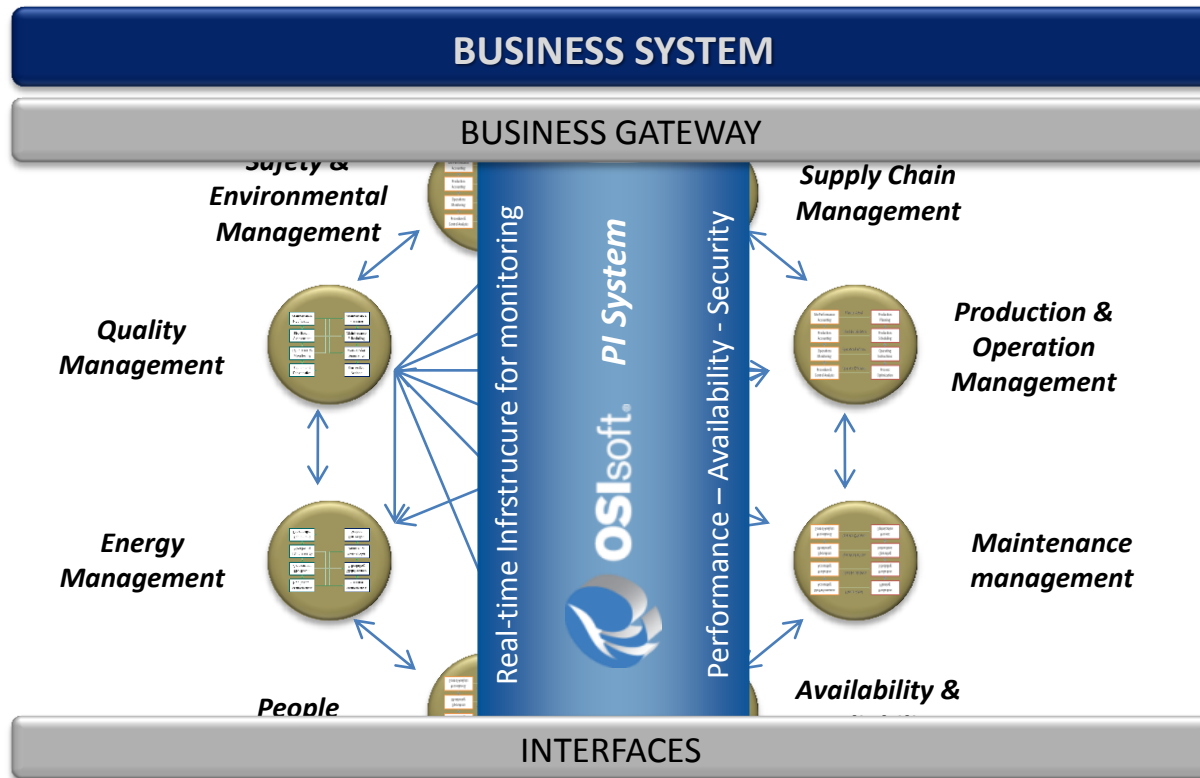
MONEY FLOW



INFORMATION FLOW



MATERIAL FLOW



How does it fit into your existing Infrastructure?

Data foundation for all Business Processes



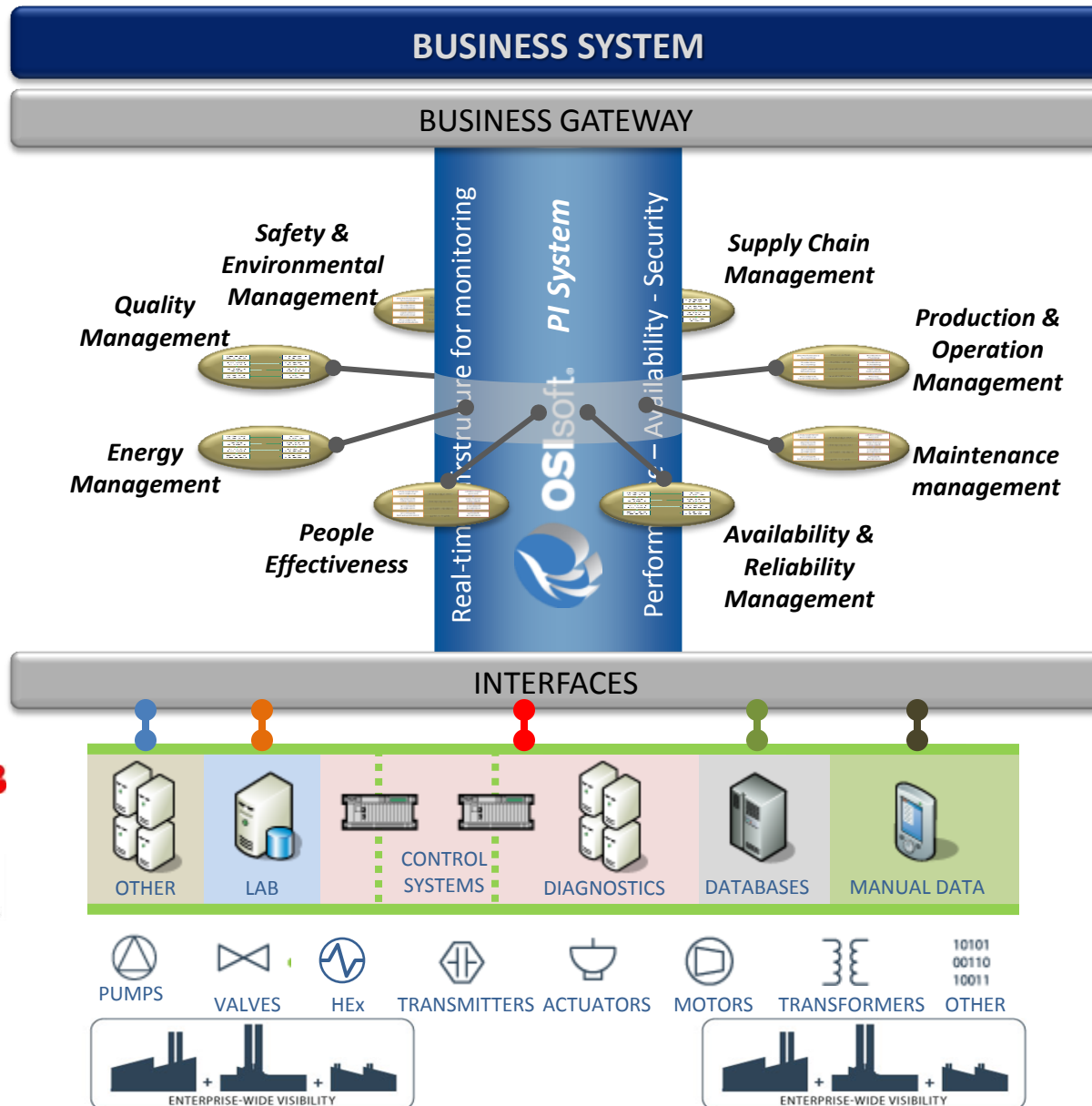
MONEY FLOW



INFORMATION FLOW

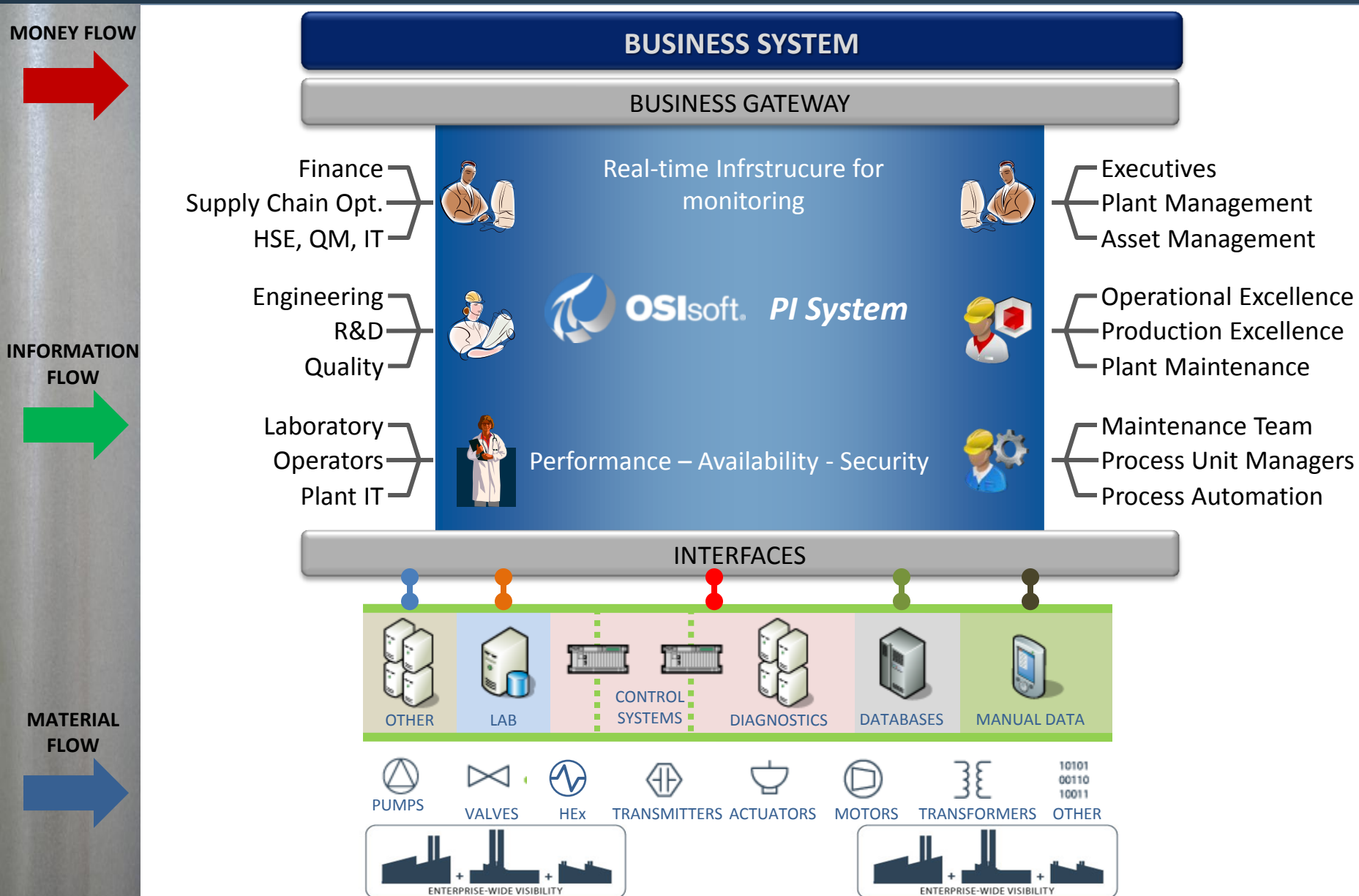


MATERIAL FLOW



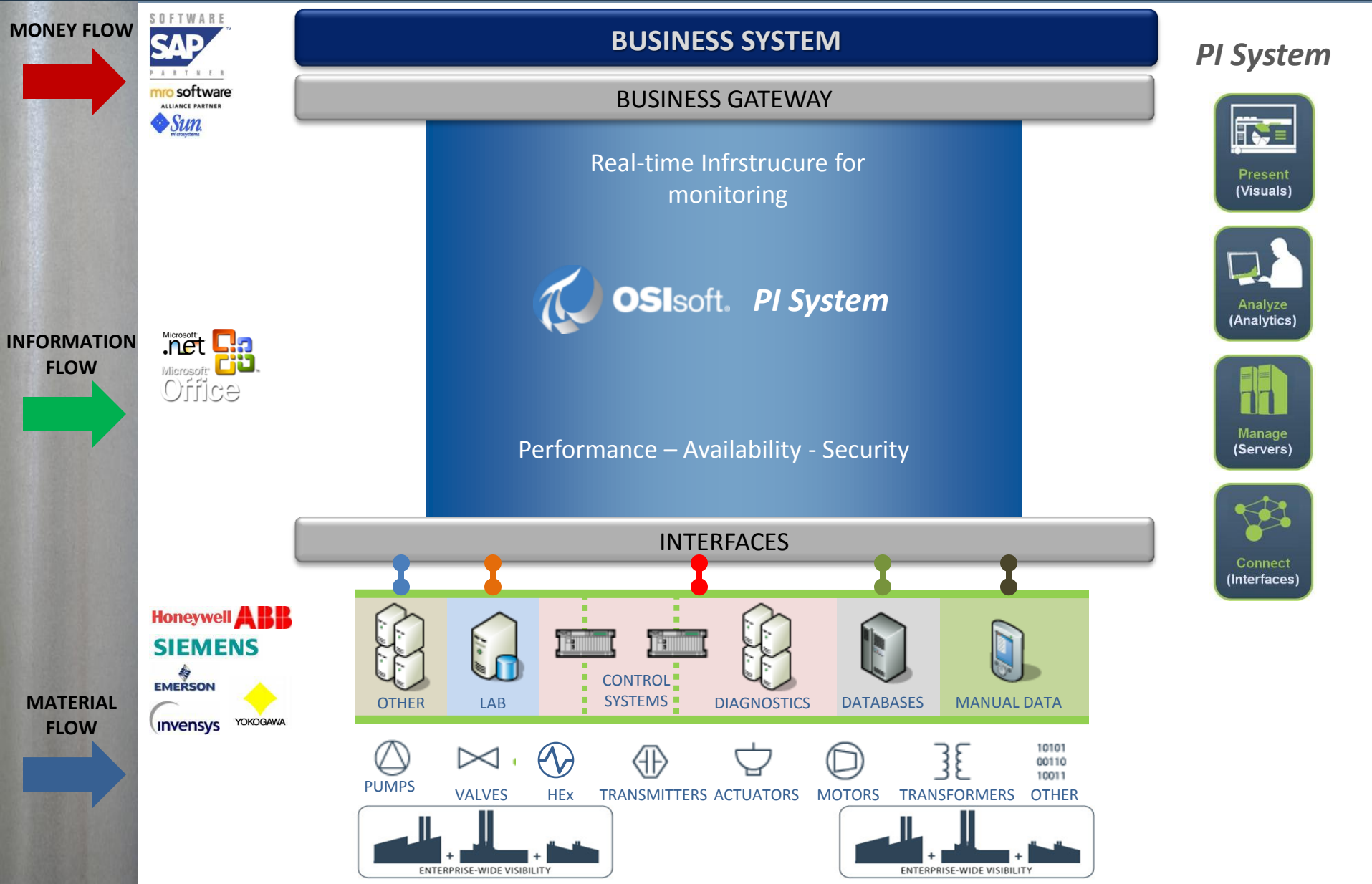
Collaboration

Everyone works with the same Information - Rules - Tools

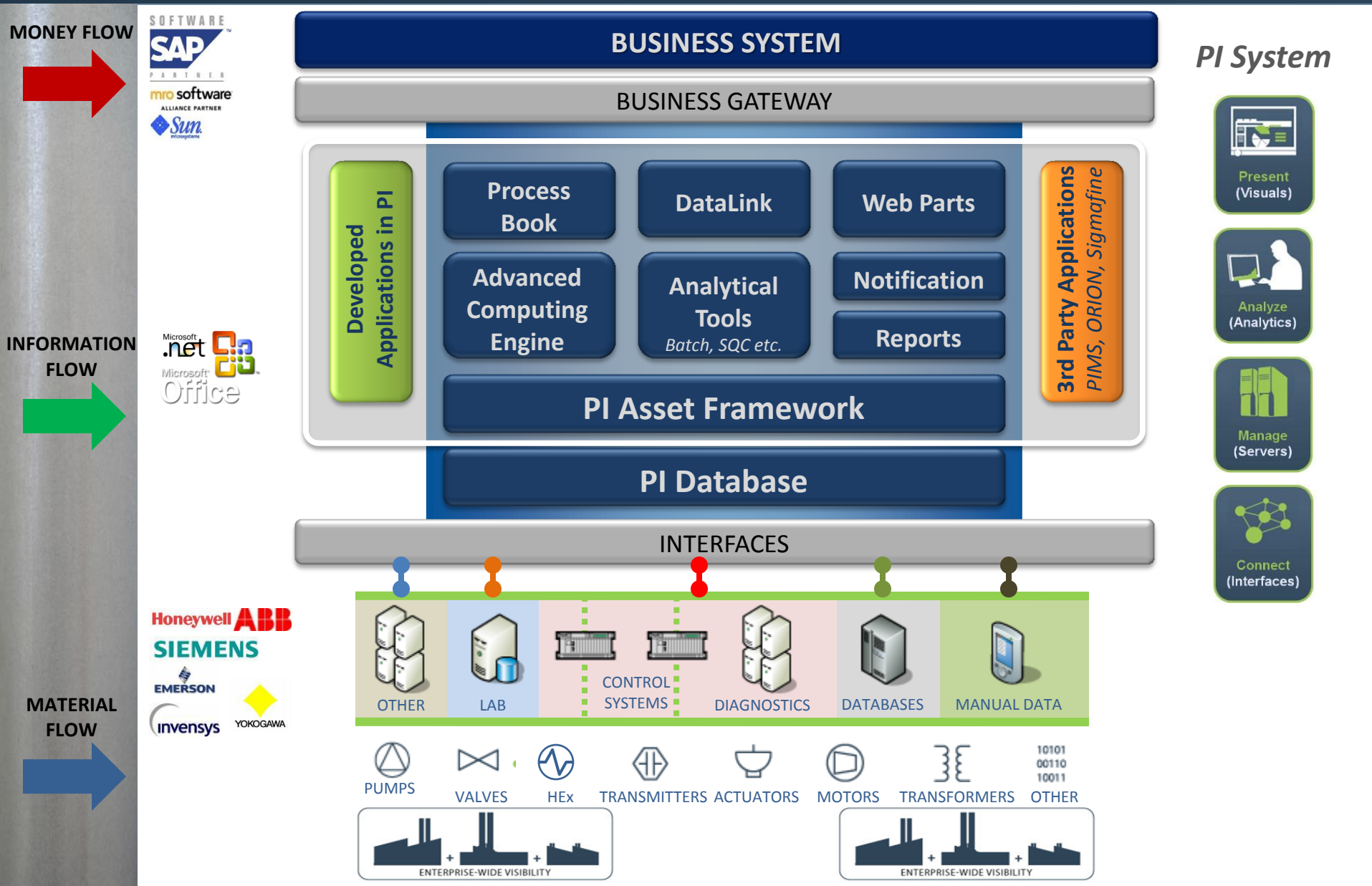


How it is Structured?

Fundamental Layers of the PI System



How it is Structured?





Connect

Collect data from hundreds of sources.

Interfaces



Manage

Gather and archive large volumes of data. Scale to meet your growing business needs.

Servers



Analyze

Access real-time or historical role-based data for the entire enterprise at any time.

Analytics



Present

View data, identify problems, and take corrective action with familiar, easy-to-use graphical tools.

Visuals

The OSIsoft PI System is the highly scalable and secure real-time and event infrastructure that connects people with the right operational and manufacturing information at the right time to analyze, collaborate, and act.

Connect to over 400 data systems and sources

Measures and aggregates a broad range of data types



Connect

Collect data from
hundreds of sources

Real-time

Relational

Transactional

Custom

Web Services

AMI

IT

[MY SUPPORT](#) | [PRODUCTS](#) | [DOWNLOAD CENTER](#) | [KNOWLEDGE CENTER](#) | [CONTACT US](#)

PI Interfaces

PRODUCTS

- [PI Servers](#)
- [Client Products](#)
- [Layered Products](#)
- [OPC](#)
- [Interfaces](#)
- [COM Connectors](#)
- [System Management](#)
- [RLINK](#)
- [ECHO](#)
- [PI Protocol Converter](#)
- [OSIsoft MDUS](#)
- [Prerequisite Kits](#)

RELATED PRODUCTS

- [COM Connectors](#)

PI Interfaces Search

Search

List All

• Standard • Maintenance • 3rd Party • Non-Standard

Name	Platform	Current Version	Shipping Version	Part#	APS Status
Siemens RXS4 Meter	NTI	1.0.0.1	1.0.0.1	PI-IN-SI-RXS4-NT	
Siemens S5 PLC				See Comments	
Siemens S7 PLC				See Comments	
Siemens S7-200 PLC's				See Comments	
Siemens SIMATIC Batch Interface	NTI	1.0.1.0		PI-IN-SI-SBAT-NTI	
Siemens Simatic Net (TI-505, S5)	NTI	1.4.2.1	1.4.2.1	PI-IN-SI-SIMAT-NTI	
Siemens Simatic Net S7	NTI	1.0.0	1.0.0	PI-IN-SI-S7-NTI	
Siemens SINAUT				See Comments	



Manage

Gather and archive large volumes of data. Scale to meet your business needs.

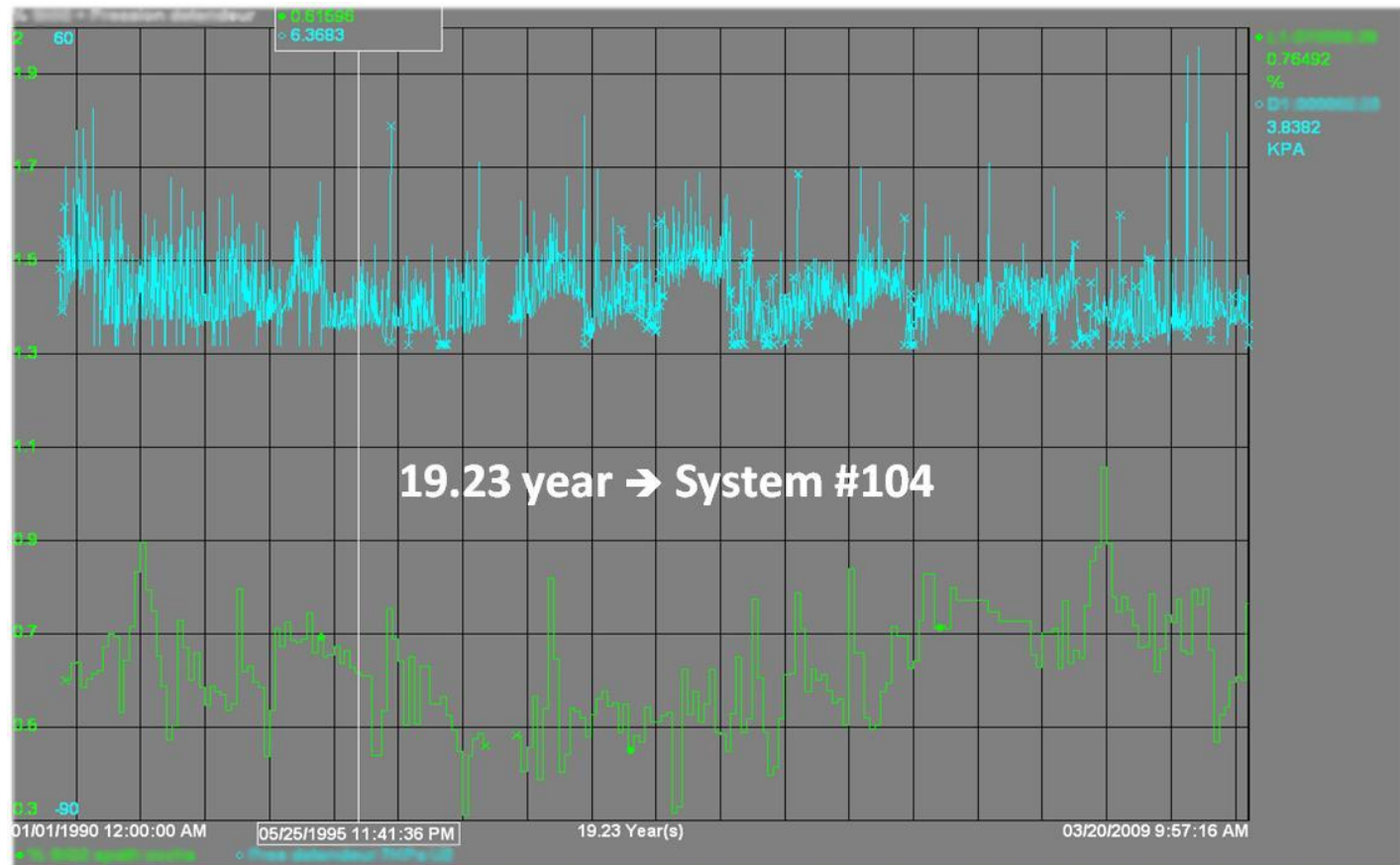
PI Server

System Management

System Access

PI Asset Framework

Reliably gather, archive and serve large volumes of data
Designed for time series and non time series data





Gather and archive large volumes of data. Scale to meet your business needs.

PI Server

System Management

System Access

PI Asset Framework

Contextualize, structurize and enrich data

Represents the entire Asset Structure of the Plant

Shaping your data by:

1. Defining types of assets

Schema how to attribute Elements



2. Association to a “real” asset

Created from Template



3. Describing the “real” asset

having Units Of Measurements (UOM)

can come via data references from everywhere



4. Physical/logical asset structure

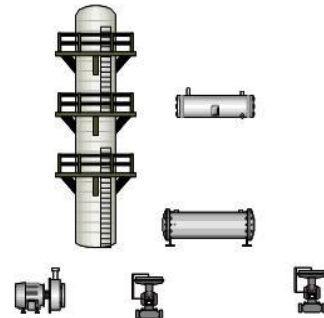


5. Assets connectivity

Model : Collections of connected elements

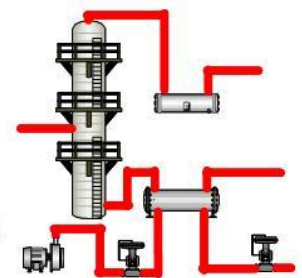
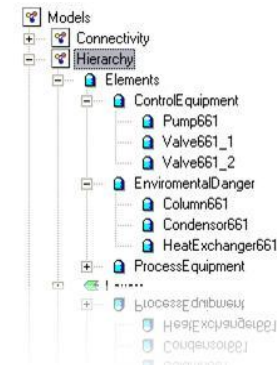


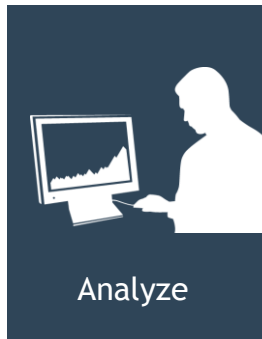
- Condensor
- Heatexchanger
- Column
- Valve
- Pipe
- Pump
- Column661
- Condensor661
- P661_1
- P661_2
- HeatExchanger661
- Valve661_1
- Valve661_2



OpeningGrade
InspectionResult
LastInspection
SerialNumber
XYZ

PIPoint: \\MOBILEVBC\Valve661_1.OpeningGrade
Table Lookup: SELECT InspectionResult FROM ...
Table Lookup: SELECT LastInspection FROM ...
Table Lookup: SELECT SerialNumber FROM ...
Formula: A=OpeningGrade/[A*0.98]





Access real-time or historical role-based data for the entire enterprise at any time.

Advanced Computing Agent

Performance Equations

PI Notifications

PI Reports™

Batch

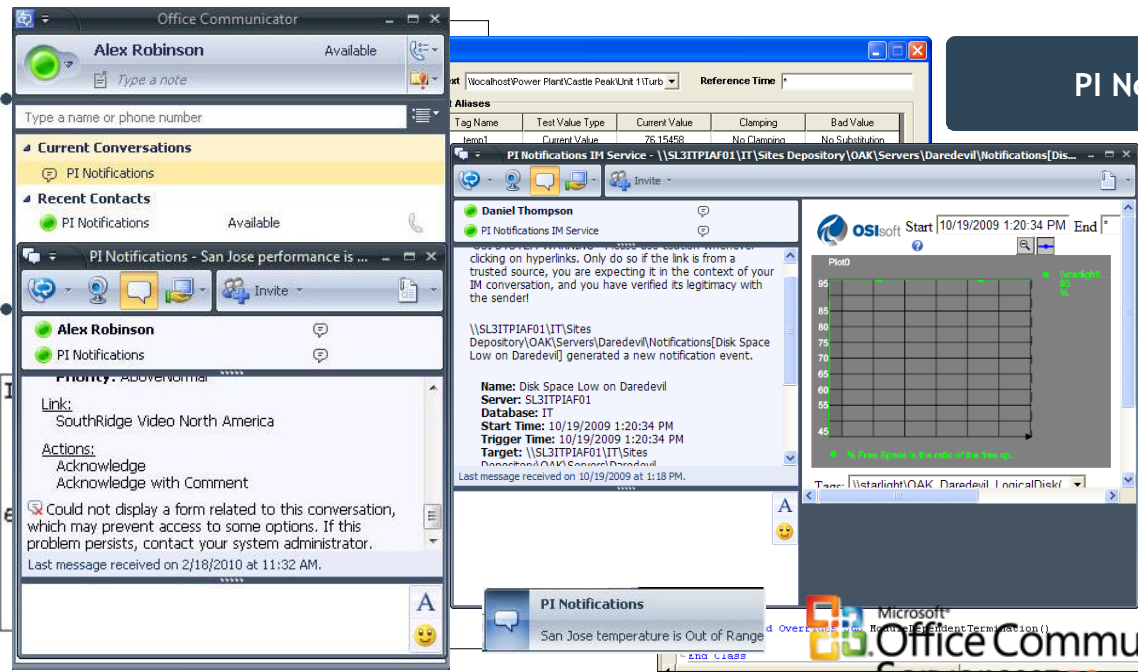
Statistical Quality Control (SQC)

Convert real-time data into actionable information

Measure and improve business performance

- Equations, calculations, aggregations, filters, business rules
- CEP (Complex Event Processing) & Post processing
- Reports, Notifications and Alerts
- Monitor business & operational performance in real time

PI Notifications



The screenshot displays the Office Communications Server 2007 R2 interface. On the left, a contact list shows 'Alex Robinson' as 'Available'. The main window shows a conversation with Alex Robinson. The conversation history includes a message from 'PI Notifications' stating 'San Jose performance is ...'. Below this, a detailed notification is shown from 'PI Notifications IM Service' regarding a 'Disk Space Low on Daredevil' event. The notification includes details such as the server (SL3ITPIAF01), database (IT), start time (10/19/2009 1:20:34 PM), and target (\\SL3ITPIAF01\\IT\\Sites). A small graph is visible in the background of the notification window.

y shift

ent-max'
nt-min') then

ent-max'
nt-min') then

Office Communications
Server 2007 R2

VISUALIZE - Visualization Capabilities



Gain a comprehensive view of operational information
Empower informed decisions and drive business success



Present

View data, identify problems, and take corrective action with familiar, easy-to-use graphical tools.

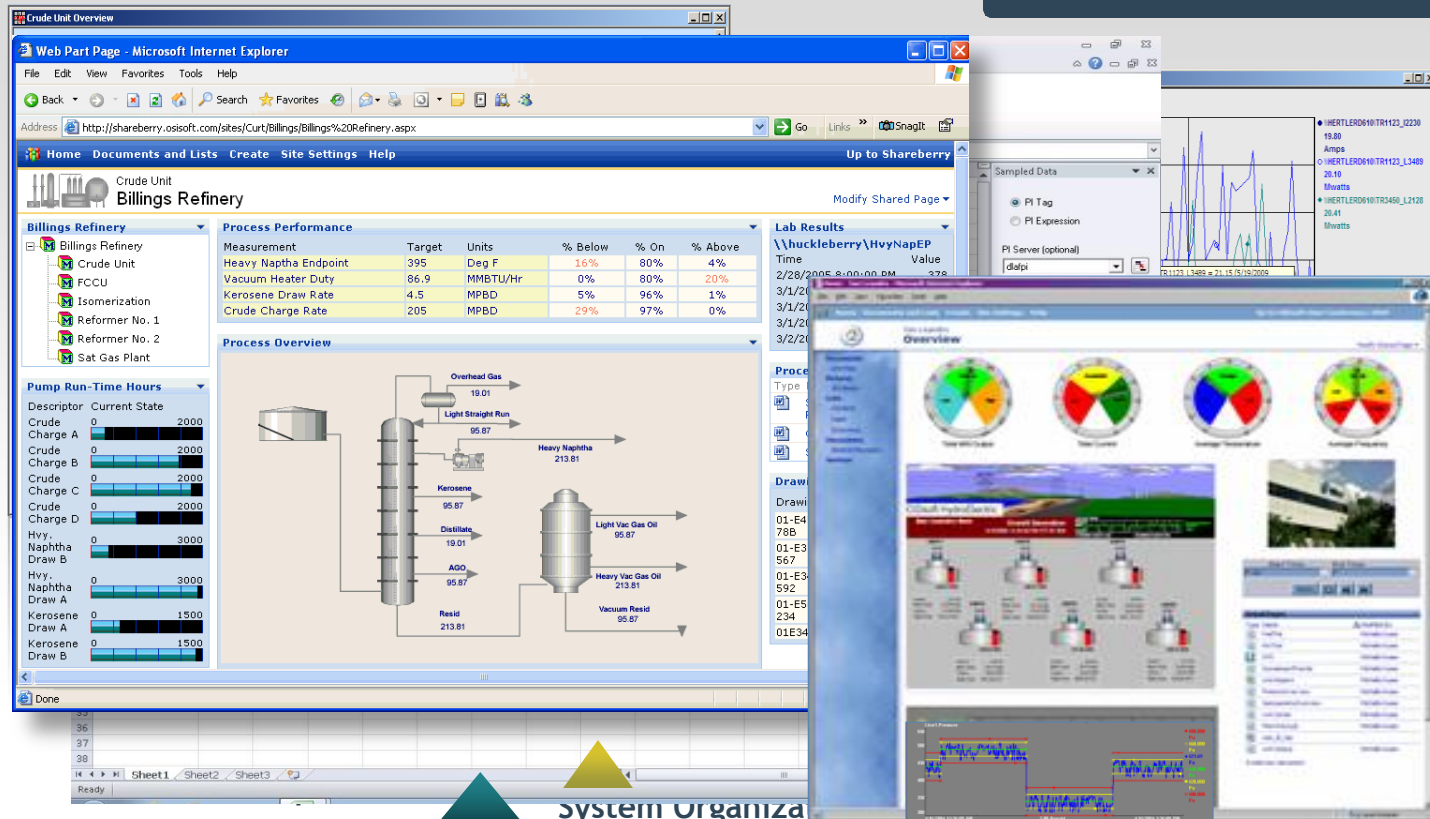
ProcessBook®

PI DataLink™

DataLink for Excel Services

PI BatchView

PI WebParts™

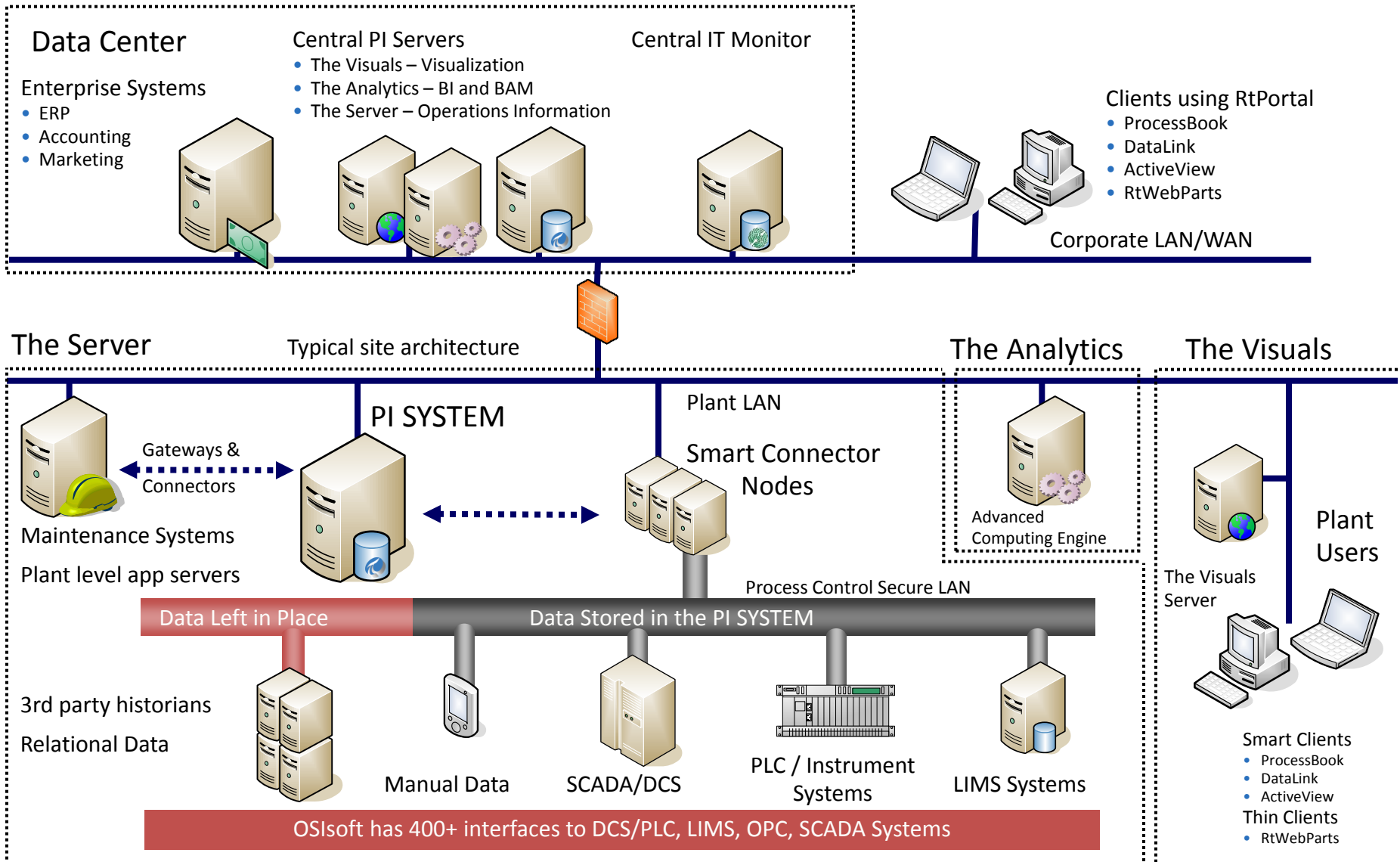


PI WebParts™

Provide access to real-time and historical process information for analysis and reporting

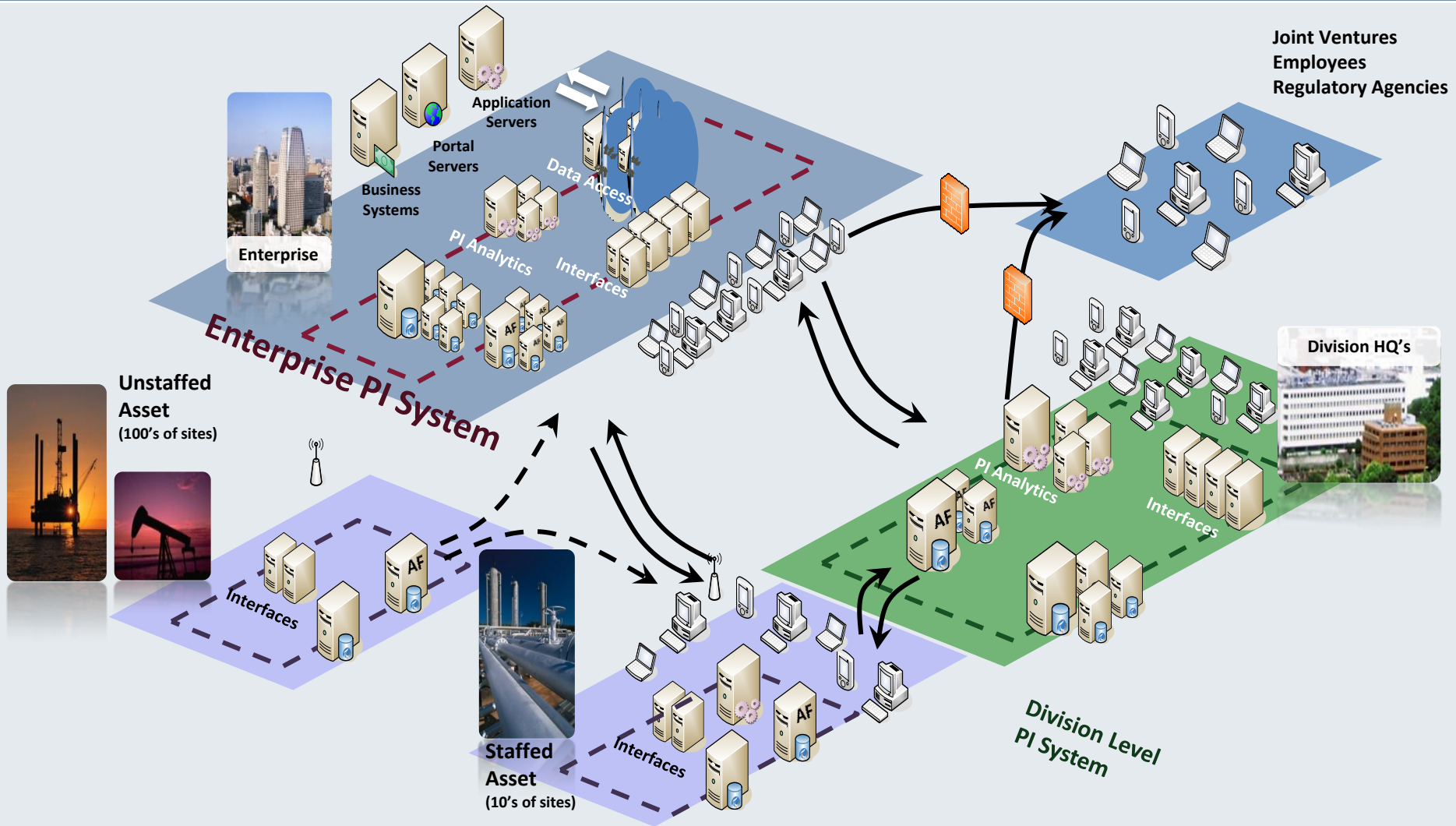
Typical System Architecture at Local Level

Infrastructure for a Plant or Site



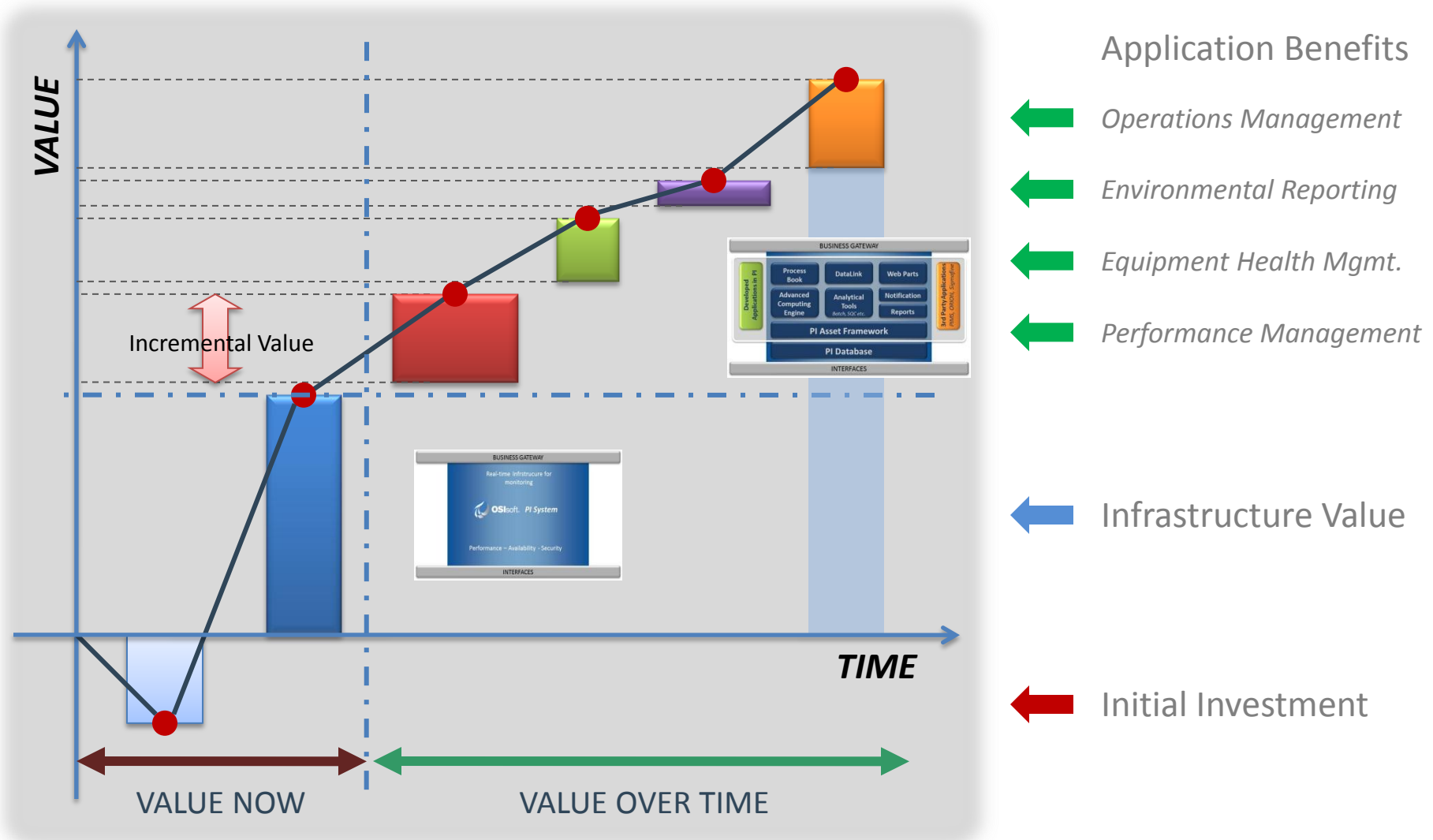
Moving from Local to Global

Real-time Infrastructure for the Enterprise



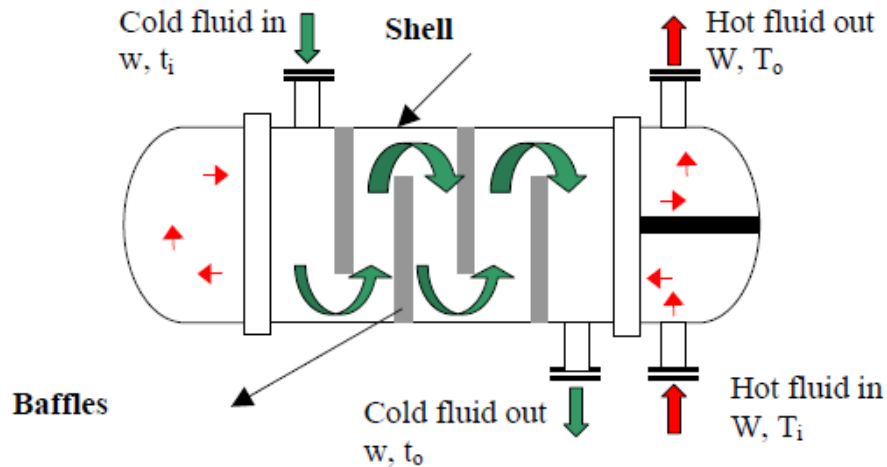
Value Creation Mechanism of the PI System

Value Now, Value Overtime



Example: Heat Exchanger Performance Monitoring

CALCULATION ALGORITHM



Calculation Steps:

1. Heat Duty, $Q = q_s + q_l$
 $q_s = W \times C_{ph} \times (T_i - T_o) / 1000 / 3600$
 $q_s = w \times C_{pc} \times (t_o - t_i) / 1000 / 3600$
2. Hot Fluid Pressure Drop, $\Delta P_h = P_i - P_o$
3. Cold fluid pressure drop, $\Delta P_c = p_i - p_o$
4. Temperature range hot fluid, $\Delta T = T_i - T_o$
5. Temperature range cold fluid, $\Delta t = t_o - t_i$
6. Capacity ratio, $R = W \times C_{Ph} / w \times C_{pc}$ (or) $(T_i - T_o) / (t_o - t_i)$
7. Effectiveness, $S = (t_o - t_i) / (T_i - t_i)$
8. LMTD

LMTD Counter current Flow = $((T_i - t_o) - (T_o - t_i)) / \ln ((T_i - t_o) / (T_o - t_i))$

LMTD Co current Flow = $((T_i - t_i) - (T_o - t_o)) / \ln ((T_i - t_i) / (T_o - t_o))$

Correction factor for LMTD to account for Cross flow

$$F = \frac{(R + 1)^{1/2} \times \ln ((1 - SR) / (1 - S))}{(1 - R) \times \ln \left\{ \frac{2 - S(R + 1 - (R + 1)^{1/2})}{2 - S(R + 1 + (R + 1)^{1/2})} \right\}}$$

9. Corrected LMTD = $F \times \text{LMTD}$

Heat Exchanger Key Performance Indicator:

Overall heat transfer coefficient

$$U = \frac{Q}{A \times \text{Corrected LMTD}}$$

RULE: IF the heat transfer coefficient is decreasing,
 THEN the **Heat Exchanger FOULING !!!**
 Cleaning is required!

Example: Heat Exchanger Performance Monitoring

INFORMATION FLOW



CONNECT

Data Sources

COLLECT & ARCHIVE

Heat Exchanger Data

CALCULATE

Performance

VISUALIZE & NOTIFY

The Right People

CORRECTIVE

ACTION

Real-time data:

Parameters	Units
Hot fluid flow, W	kg/h
Cold fluid flow, w	kg/h
Hot fluid Temp, T	°C
Cold fluid Temp, t	°C
Hot fluid Pressure, P	bar g
Cold fluid Pressure, p	bar g

Offline data:

Parameters	Units
Hot fluid density, ρ_h	kg/m ³
Cold fluid density, ρ_c	kg/m ³
Hot fluid Viscosity, μ_h	MpaS*
Cold fluid Viscosity, μ_c	MPaS
Hot fluid Thermal Conductivity, k_h	kW/(m. K)
Cold fluid Thermal Conductivity, k_c	kW/(m. K)
Hot fluid specific heat Capacity, C_{ph}	kJ/(kg. K)
Cold fluid specific heat Capacity, C_{pc}	kJ/(kg. K)

**CALCULATION
ALGORITHM**

*Heat Transfer
Coefficient;
($U = Q / A \times LMTD$)*

RULE

*IF „U“ IS BELOW A
CERTAIN LIMIT,
THEN HEAT
EXCHANGER
FOULING*

Maintenance
task
prioritization

Heat Exchanger
Cleaning

Changing
Operating Mode

Re-planning /
re-scheduling

Control System

DCS
PLC
SCADA



Lab System

LIMS



Databases

HANDBOOK
ASSAY DB
SIMULATION
PROPERTIES DB



• Connect all relevant
data sources

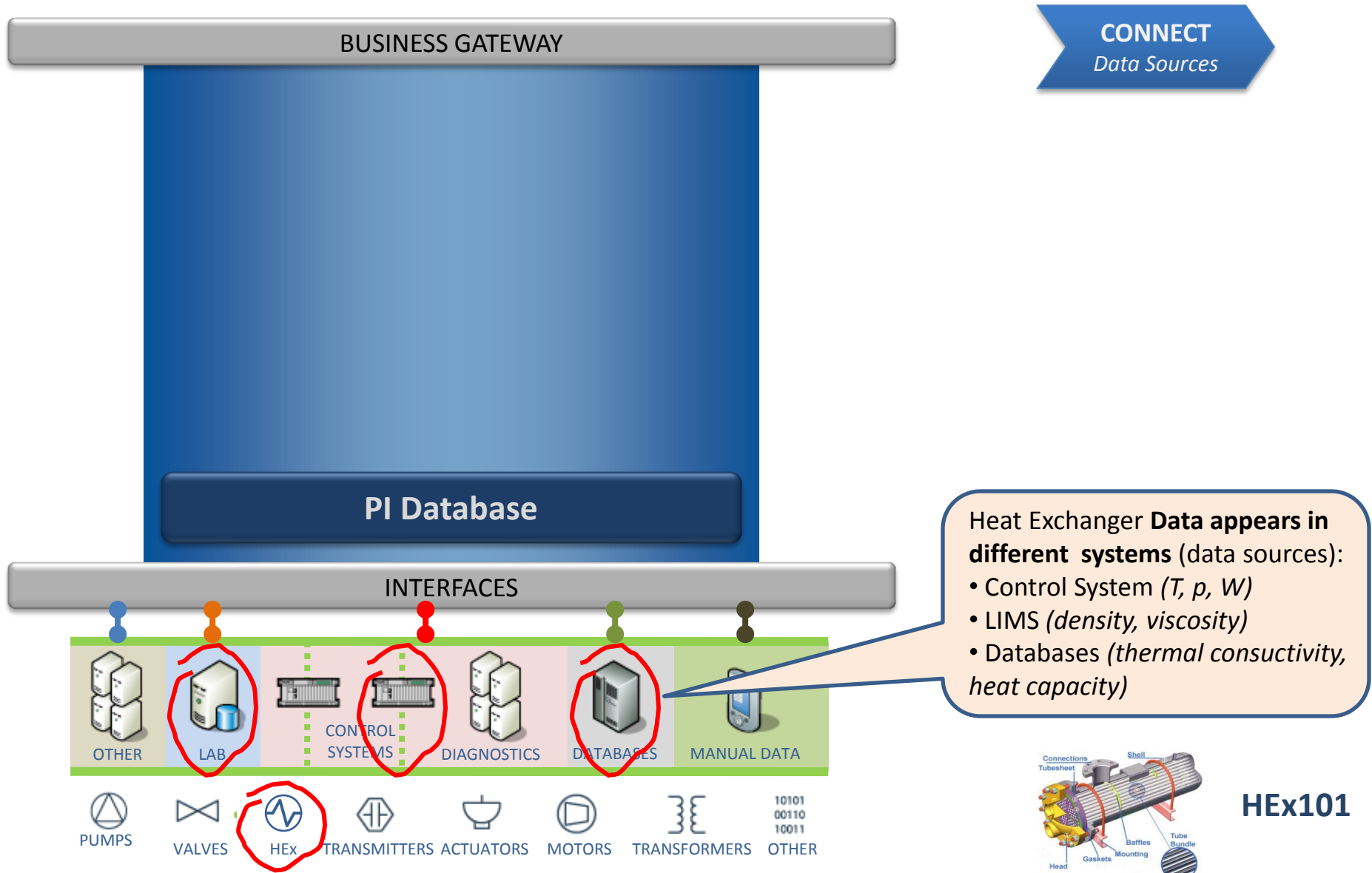
• Collect & Archive Data
• Put the Data into Context
• Asset Centric Information

• Rigorous Calculation
Capabilities
• Archive results

• Trending capabilities
• Visualisation capabilities
• Implementing rules
• Notify O&M Personnel

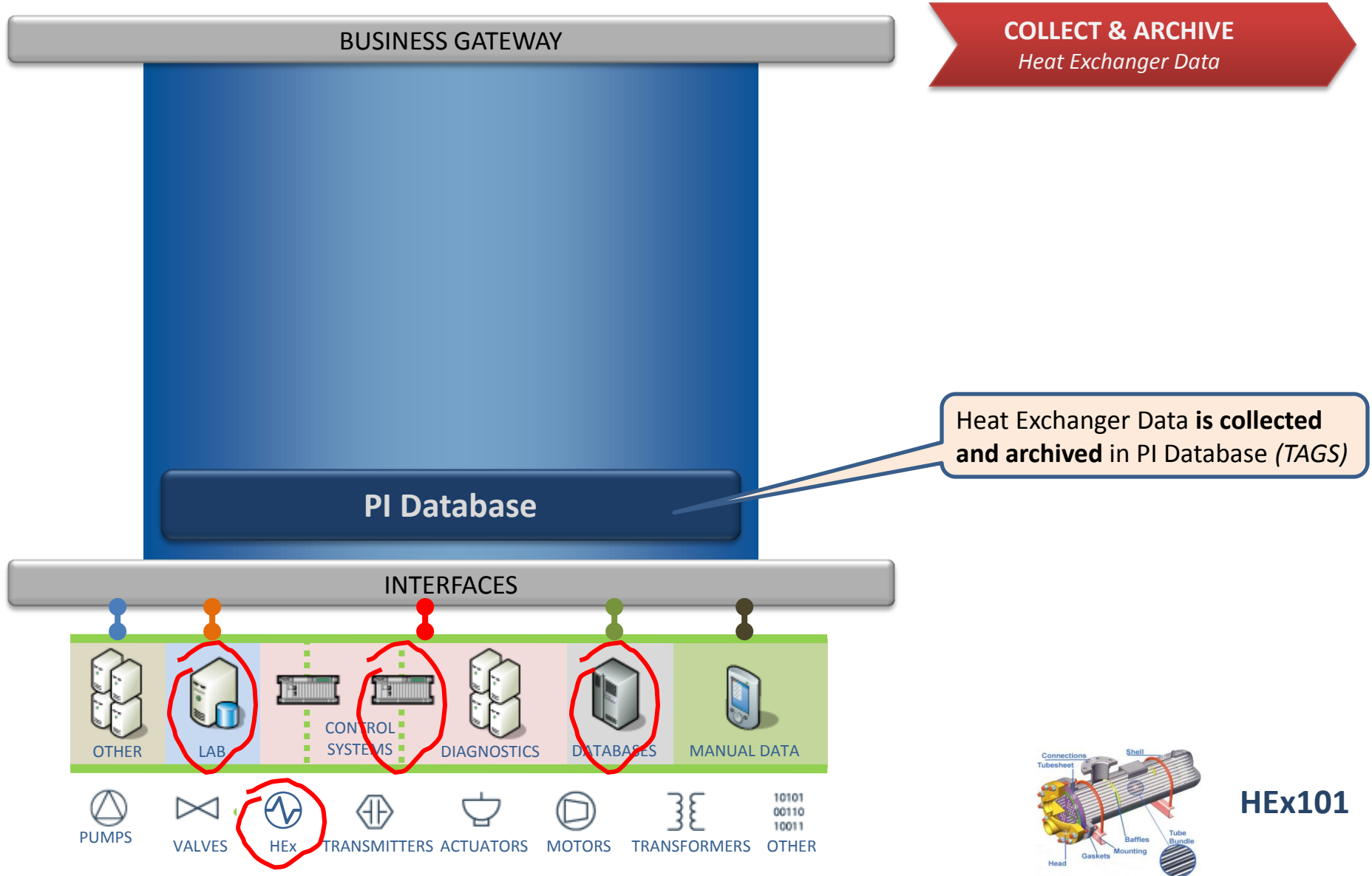
Example: Heat Exchanger Performance Monitoring

STEP 1: CONNECT RELEVANT DATA SOURCES



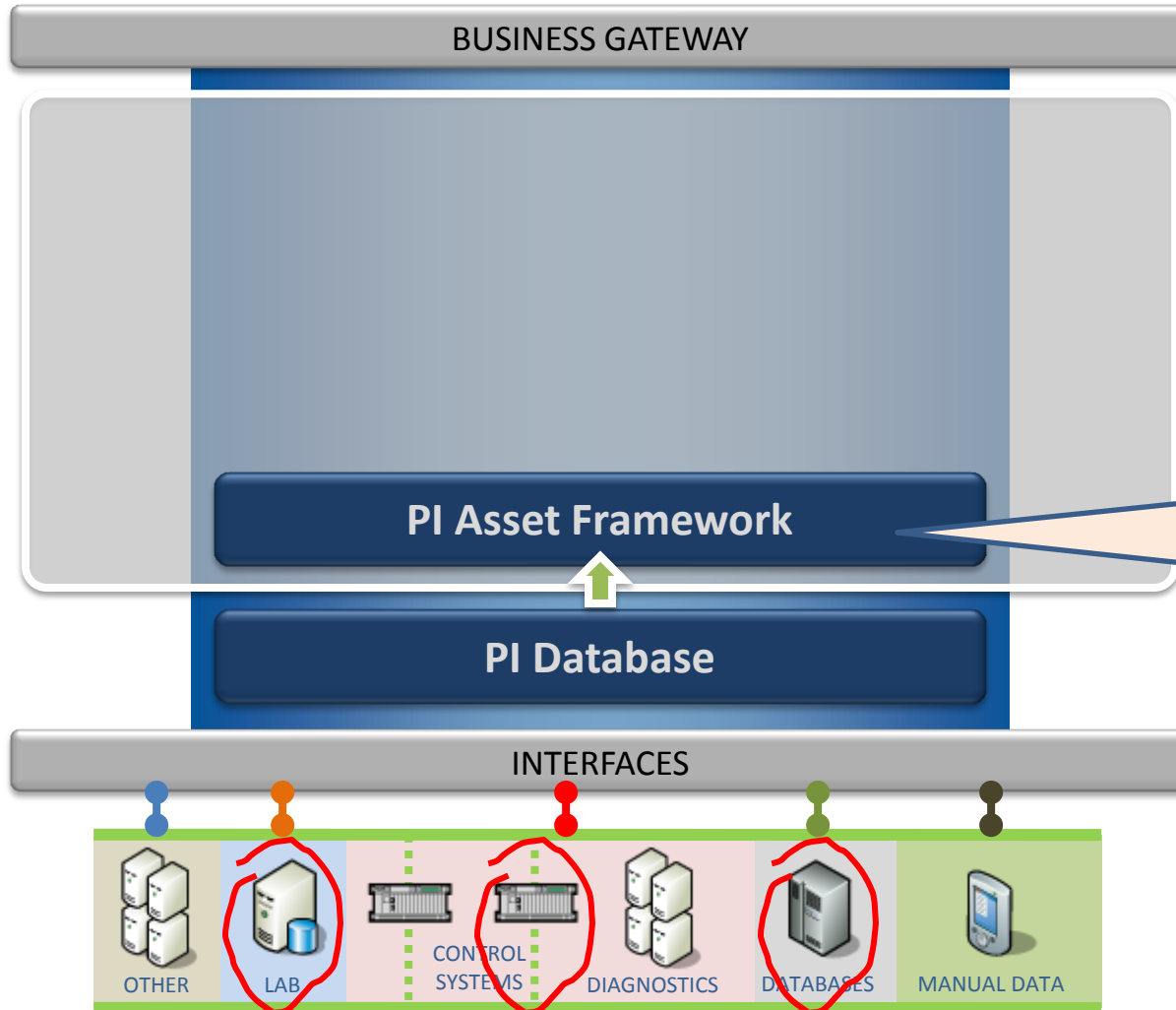
Example: Heat Exchanger Performance Monitoring

STEP 2: COLLECT AND ARCHIVE EQUIPMENT DATA (Tag-based)



Example: Heat Exchanger Performance Monitoring

STEP 3: ASSIGN CONTEXT (Asset-based)

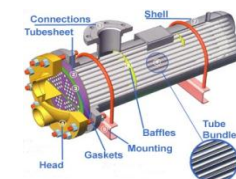
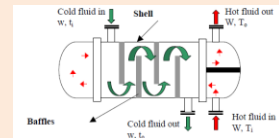


COLLECT & ARCHIVE
Heat Exchanger Data

Data is assigned to an individual equipment (heat exchanger 101):

- Asset-centric representation of data

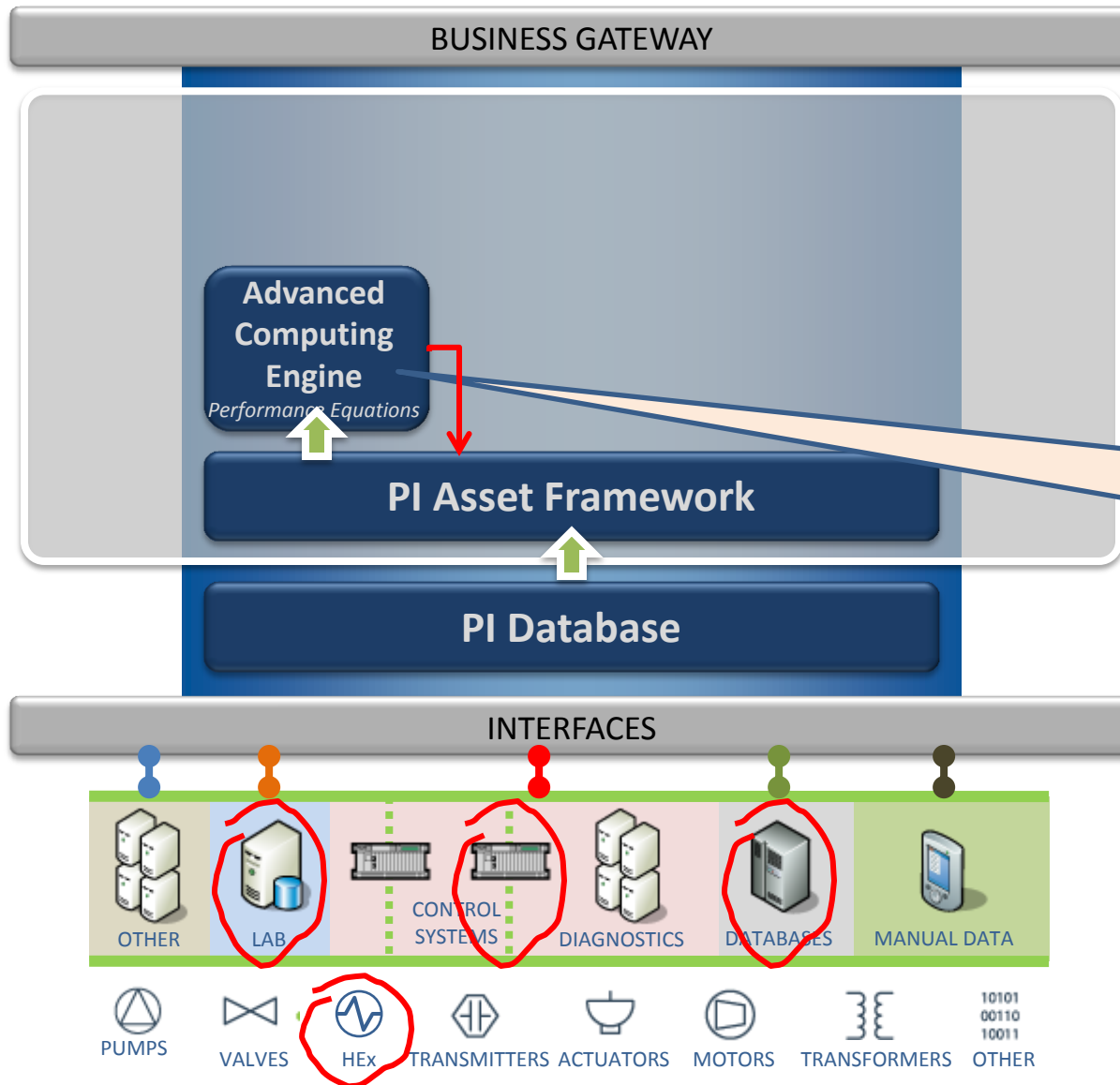
HEX101



HEX101

Example: Heat Exchanger Performance Monitoring

STEP 4: CALCULATE PERFORMANCE MEASURES

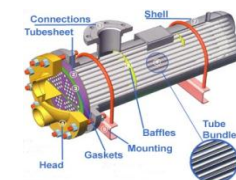


CALCULATE
Performance

Heat Exchanger **Performance is Calculated** in real-time:

$$U_{101} = Q_{101} / A_{101} \times LMTD_{101}$$

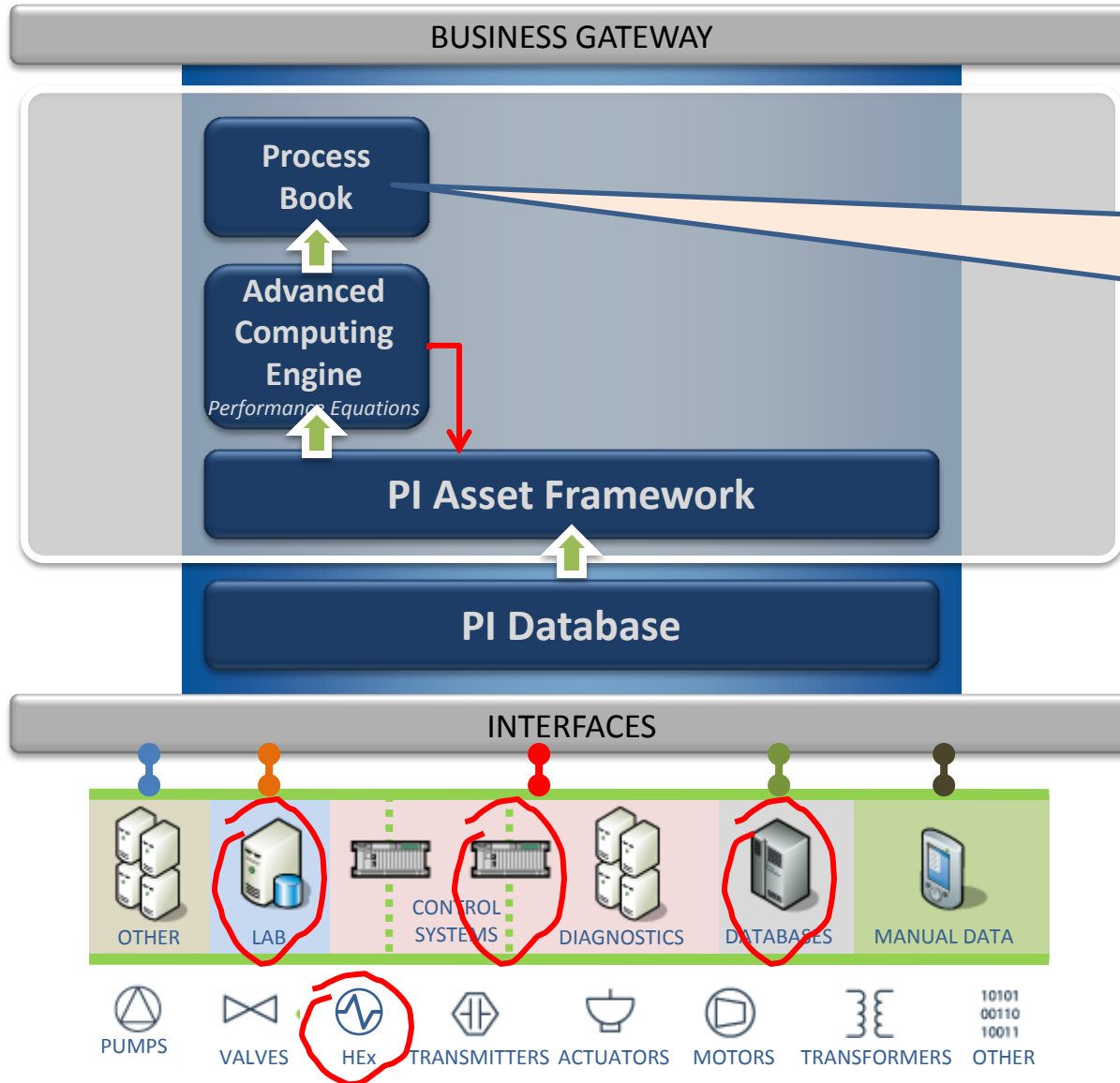
- **Archive** the result (U)



HEX101

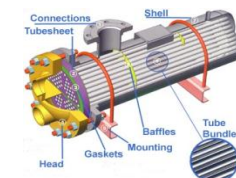
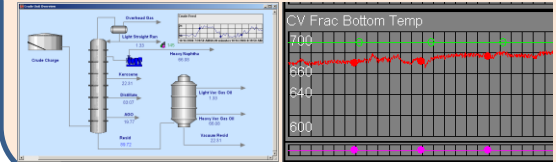
Example: Heat Exchanger Performance Monitoring

STEP 5: VISUALIZE EQUIPMENT PERFORMANCE REAL-TIME



VISUALIZE & NOTIFY
The Right People

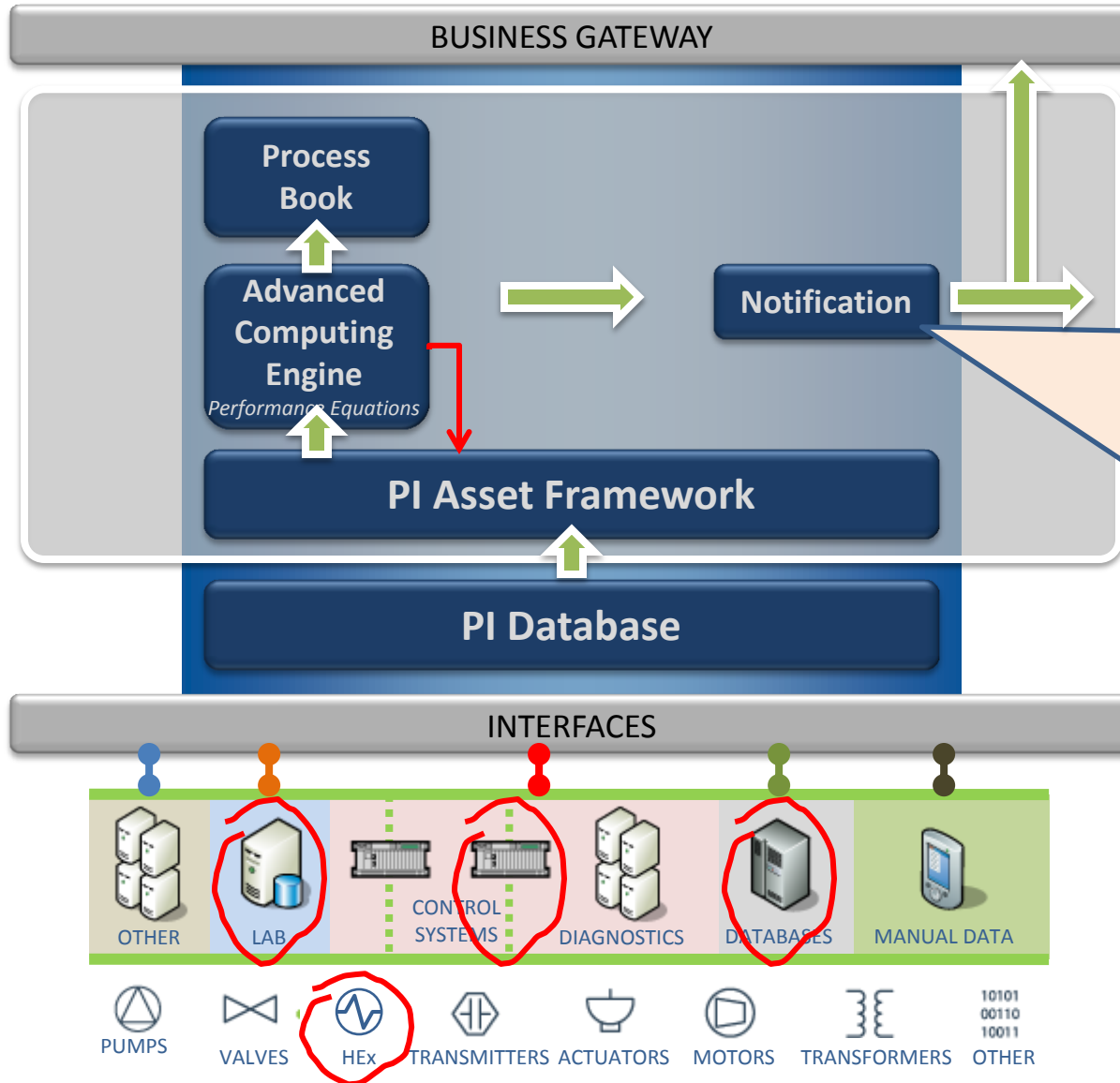
Trend and Visualize heat exchanger data:



HEX101

Example: Heat Exchanger Performance Monitoring

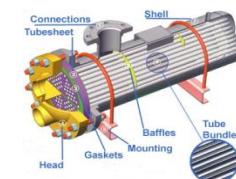
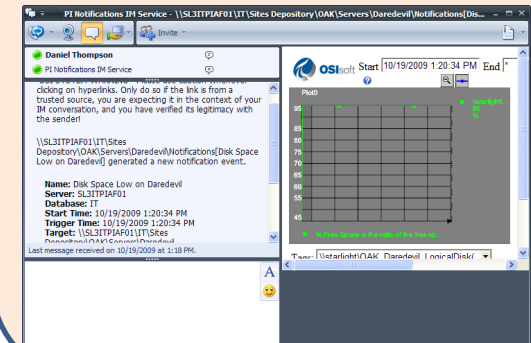
STEP 6: NOTIFY THE RIGHT PEOPLE AT THE RIGHT TIME



VISUALIZE & NOTIFY
The Right People

Notification is sent to shift operators and maintenance personnel, that:
HEAT EXCHANGER 101 IS FOULING

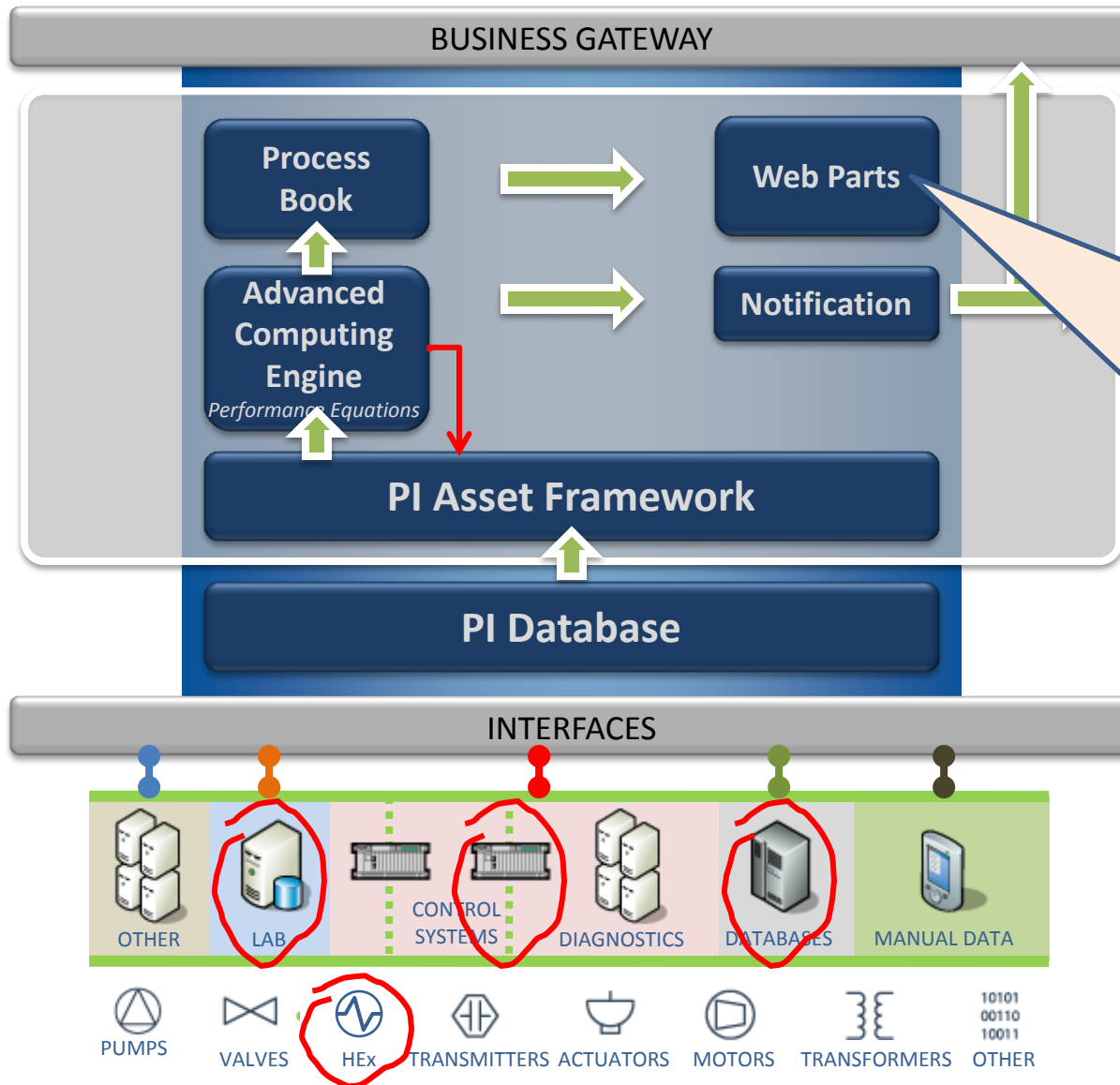
Maintenance Notification is sent to CMMS (SAP PM)



HEX101

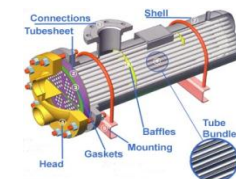
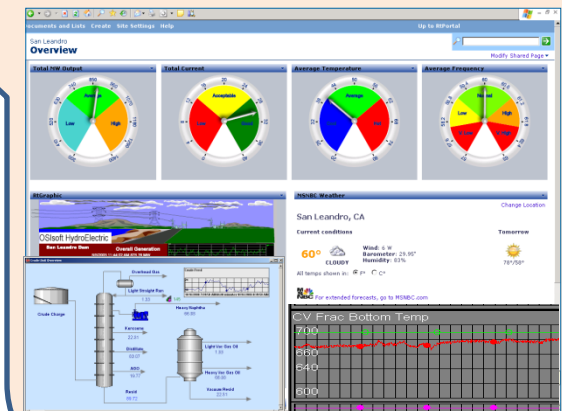
Example: Heat Exchanger Performance Monitoring

STEP 7: VISUALIZE OVERALL PERFORMANCE REAL-TIME



VISUALIZE & NOTIFY
The Right People

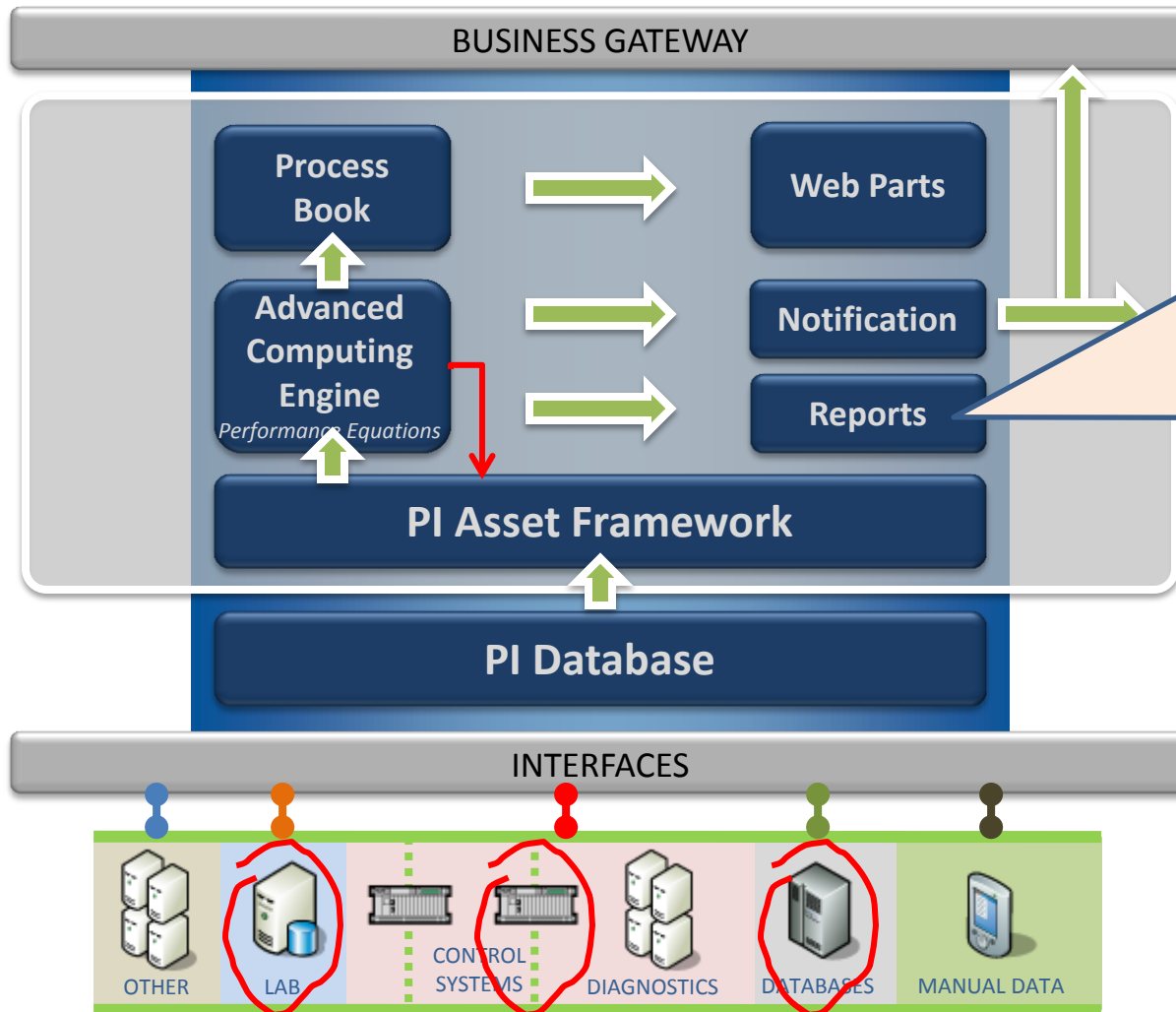
Visualize equipment, unit, plant, area KPIs on **Corporate Dashboard**



HEX101

Example: Heat Exchanger Performance Monitoring

STEP 8: REPORT ANOMALIES IN THE RIGHT FORMAT



VISUALIZE & NOTIFY
The Right People

Send report

Production Summary Report

Report Summary

Report Name	Production Exception Report	Report Generation Date	03-Mar-04 10:30:07 PM
Report Version	1	Release Date	14-Sep-03 02:03:55 PM
Report Author	etahmeh_haghighi	Creation Date	1-Sep-03 10:28:28 AM
Batch ID	00000000000000000000	Duration	26-Feb-04 10:51:55 AM
Start Time	24-Feb-04 02:51:27 PM	End Time	

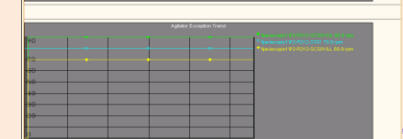
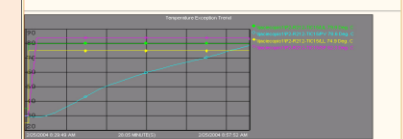
Start Time	End Time	Duration
24-Feb-04 02:51:27 PM	25-Feb-04 01:44:50 PM	22 hrs 23 mins 23 secs

PI R212

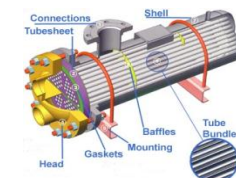
Start Time	End Time	Duration
25-Feb-04 08:29:49 AM	25-Feb-04 08:57:52 AM	28 mins 3 secs

Exception Detail Table

Type	DeviceName	Variable Name	Variable Value	Variable Limit	Min/Max	Duration
Below Low Limit	Reactor_Repression	Repression	20.58	25.00	15.56	24 mins 47 secs
Above High Limit	Reactor_Ag_2pnd	Ag_2pnd	10.04	9.00	79.04	20 mins 2 secs

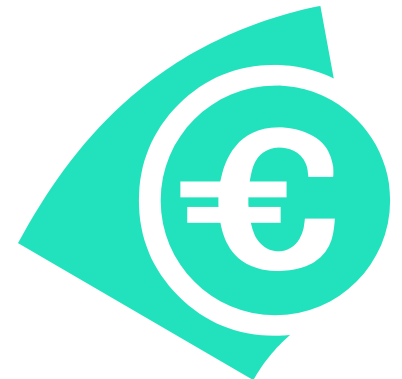


Comments: 100%
PI Show Comments



HEX101

- Typical Benefit Areas of a Real-time Infrastructure:
 - **Increased production/decreased downtime**
 - » The PI System infrastructure can reduce downtime as a result of improved situational awareness and decision making.
 - **Reduced Energy**
 - » The use of PI System infrastructure would result a reduction in energy usage by improved analytics and visualization of operational data
 - **Reduced loss and downgrade**
 - » Reduced loss and downgrade from improved information and decision support systems across the value chain
 - **Reduced Capital costs**
 - » PI System can provide improved operational information resulting in improved understanding and associated reduction in cap ex costs
 - **Reduced Maintenance costs**
 - » Reduced maintenance costs due to improved equipment/asset awareness, predictive analytic/notification, and ability to perform incident investigation.
 - **Reduced Chemical/additive costs**





PI System in the Industries

Use Cases & Examples

BP Exploration & Production

Real-time Data - Usage in Different Contexts



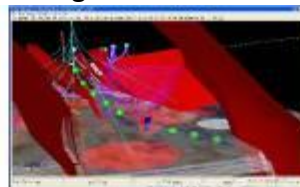
Rotating Equipment



Real-time Drilling



Drilling Visualization



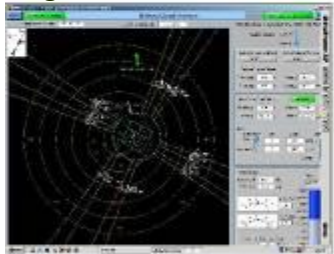
One Touch



Topsides Monitoring



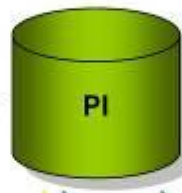
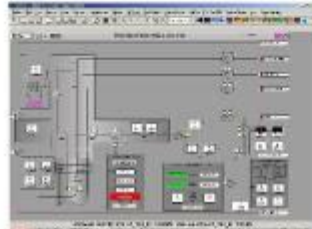
Integrated Marine Monitoring



Riser/Mooring Data

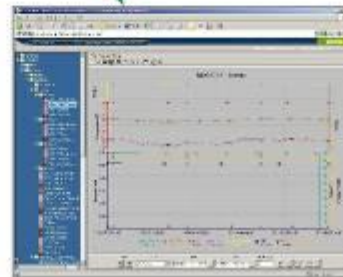


Subsea/Well Surveillance



Fiber Optic Network

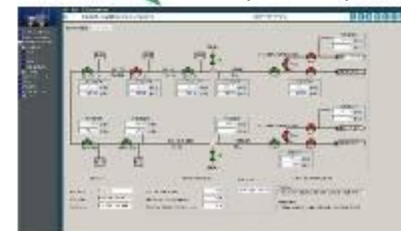
Process Net



ISIS



AWS (Subsea)



Conoco-Phillips E&P - North Sea

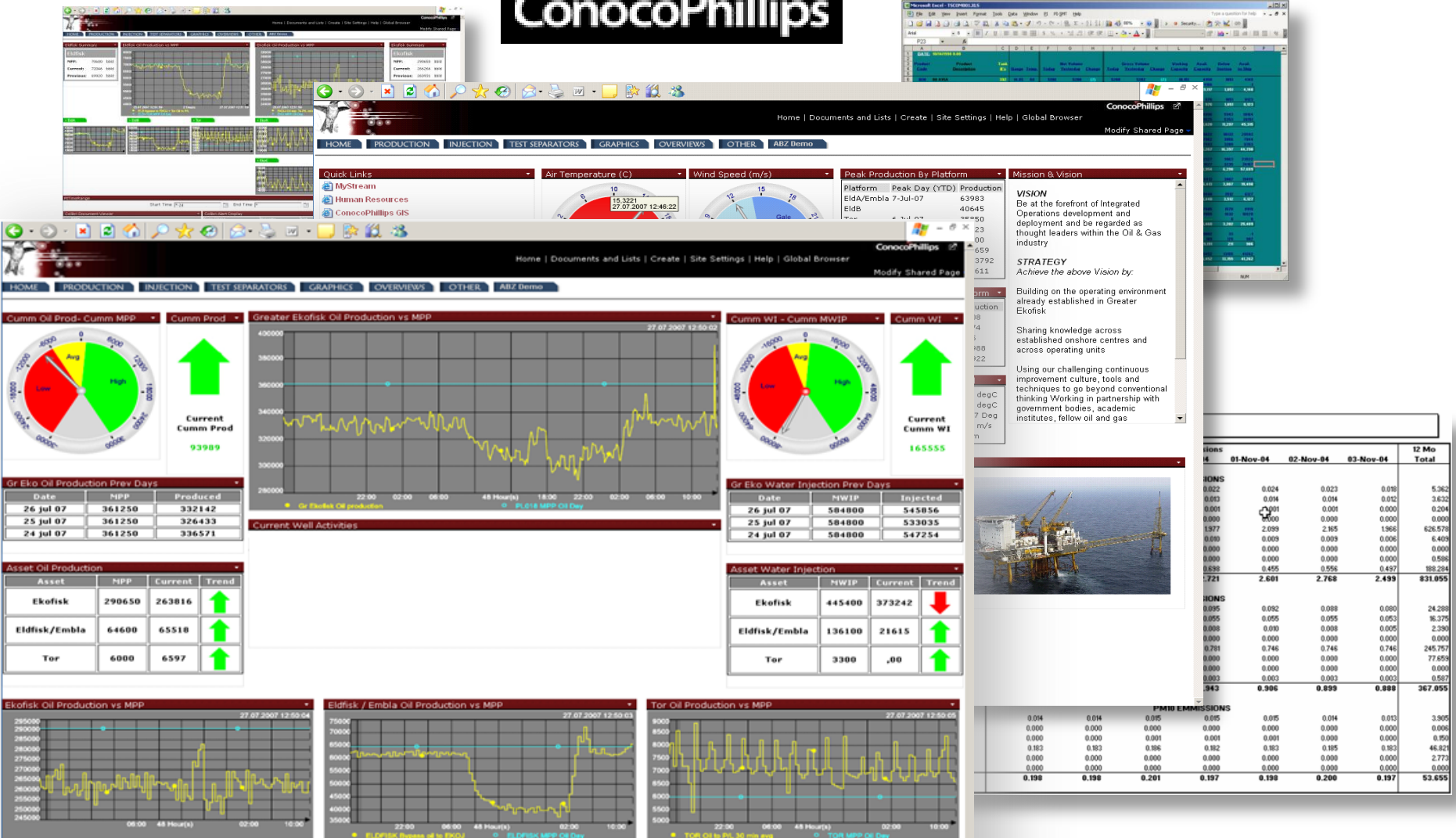
Analysis Tools to Support Asset and Cross-Asset Collaboration



Production Analysis

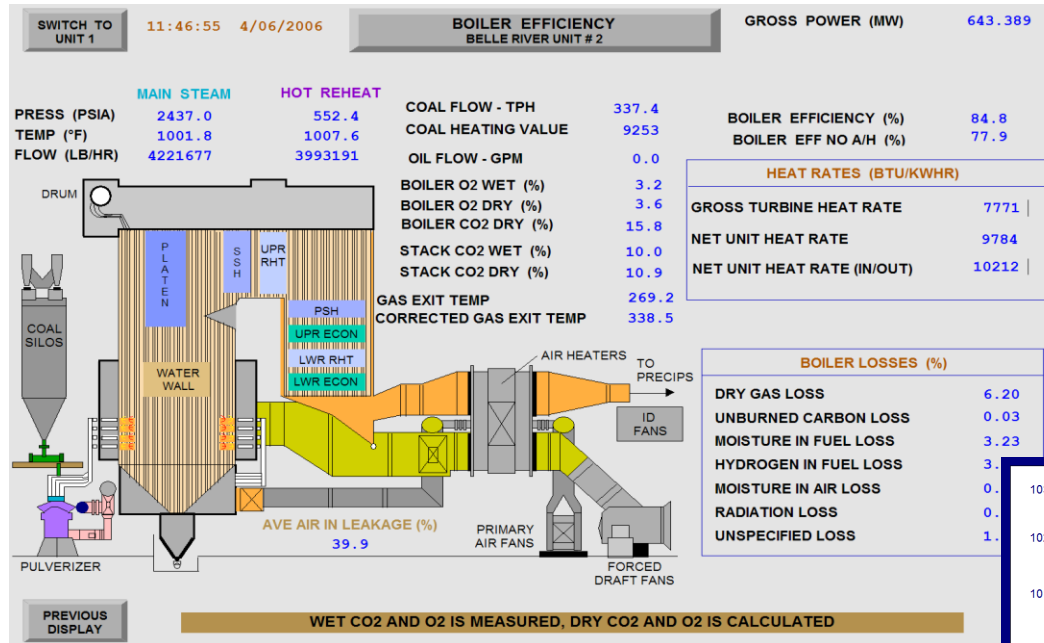


Equipment Monitoring



Detroit Energy - Generation

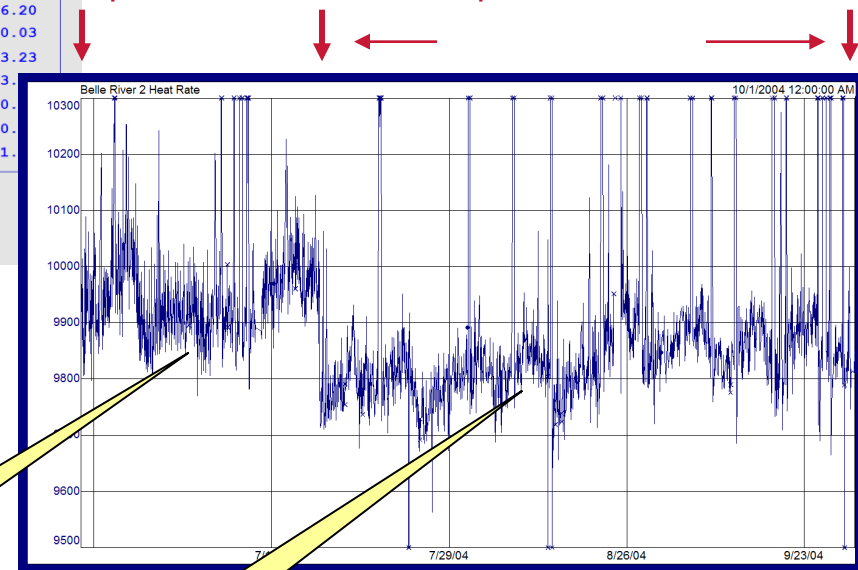
Optimization of thermal performance while reducing emission



NOx Reduction with Improved Heatrate

Before Implementation

After Implementation

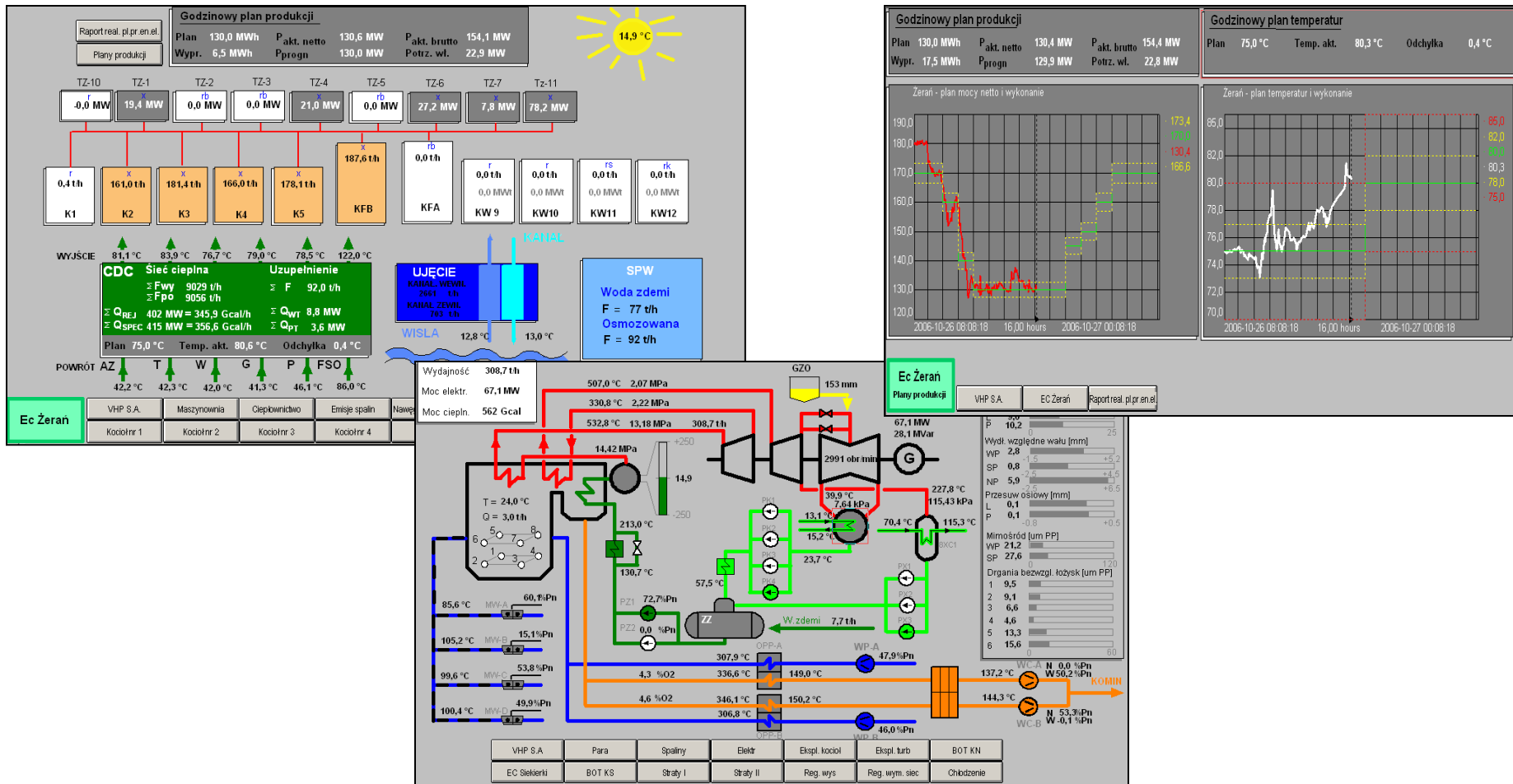


Primary focus is NOx reduction only

Focus on operating near NOx budget curve

Improving Thermal Performance

PI ProcessBook enabling graphical visualization of technological process



PEMEX, Gasatacama

Monitoring & Diagnostics Center



- We are focusing on ONE product, the PI System since ~ 30 years
- Our system is widely accepted globally and we have a very good reputation in the marketplace in all major industries
- The PI System
 - Creates an integration platform to all islands
 - Connects your plant floor data into the business process
 - Spans your supply
 - Enables collaboration and continuous improvement
 - Provides you with the capability of making profitable decisions real-time based on actionable information
- We understand the needs of all the major processing and manufacturing industries, so we are trusted by many prestigious companies
- We provide 24/7 Technical Support



Thank you

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777 Davis St., Suite 250 San Leandro, CA 94577