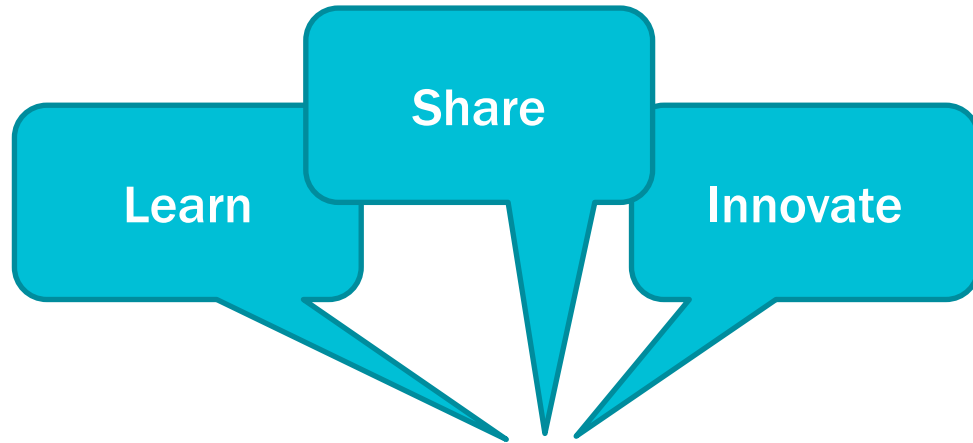


The Journey To Operational Intelligence

Presented by **Martin Otterson, Senior VP of Sales, Marketing and Industry**




This is **your**
opportunity!







What would life be like without electricity?

A man in a light blue shirt and jeans is walking across a vast, dry, and cracked landscape. The ground is parched and broken into large, irregular blocks of dry earth. In the background, there are rolling hills under a clear blue sky. A semi-transparent white box is overlaid on the middle of the image, containing the text.


What if you didn't have any water?



How would work change without the internet?

A vibrant, high-angle photograph of a terraced tea plantation. The tea bushes are meticulously manicured into neat, undulating rows that follow the contours of the hillside. In the center-right of the frame, a small, open-sided pavilion with a traditional thatched roof stands amidst the tea fields. The scene is bathed in bright, natural light, creating a rich green palette with some highlights on the tea leaves and the thatch.

**How complex would your business be
without data?**



Without **visibility** into your data what direction would you take?



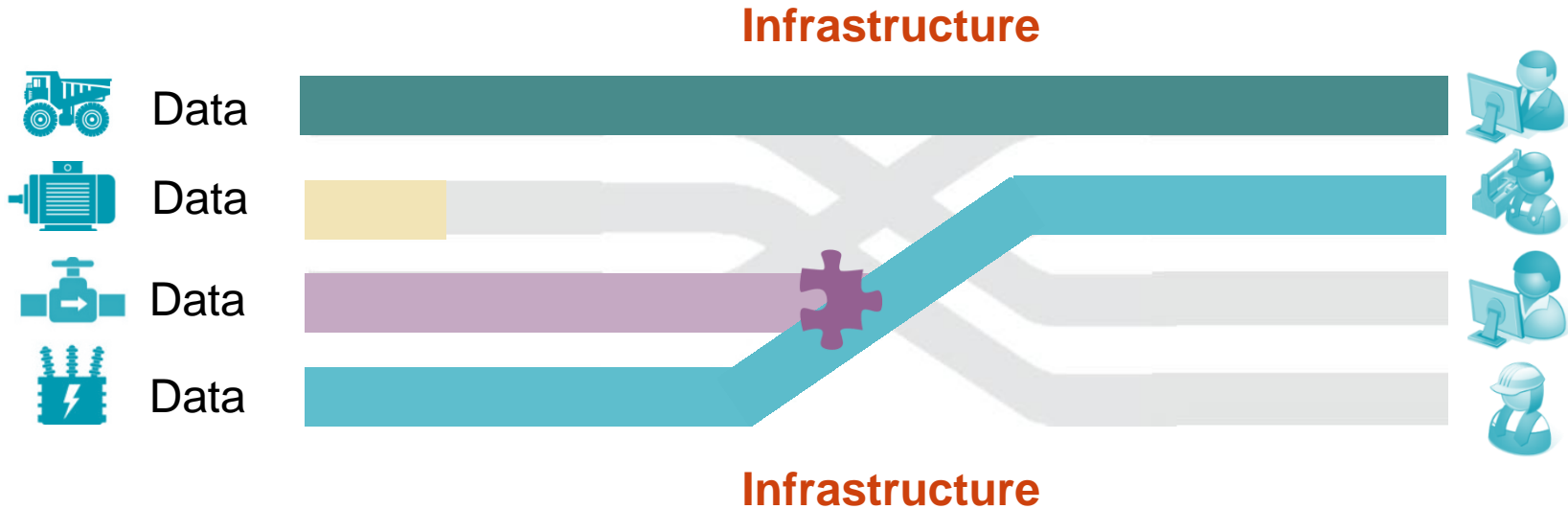
What if you couldn't **understand** your data?

Real-time Operations Data Created Everywhere

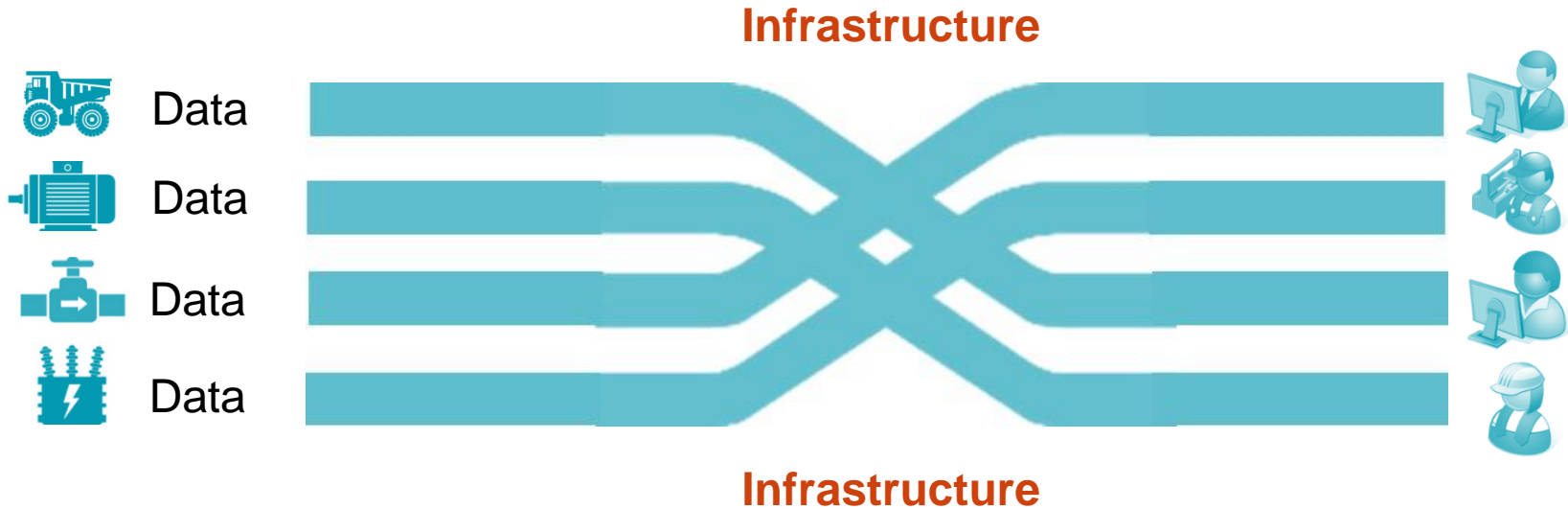
- Creating **islands** of systems
- Demanding we **connect** data, to systems, to people, to actions
- Availability and **accessibility** of this data is critical



Today's Data Challenges

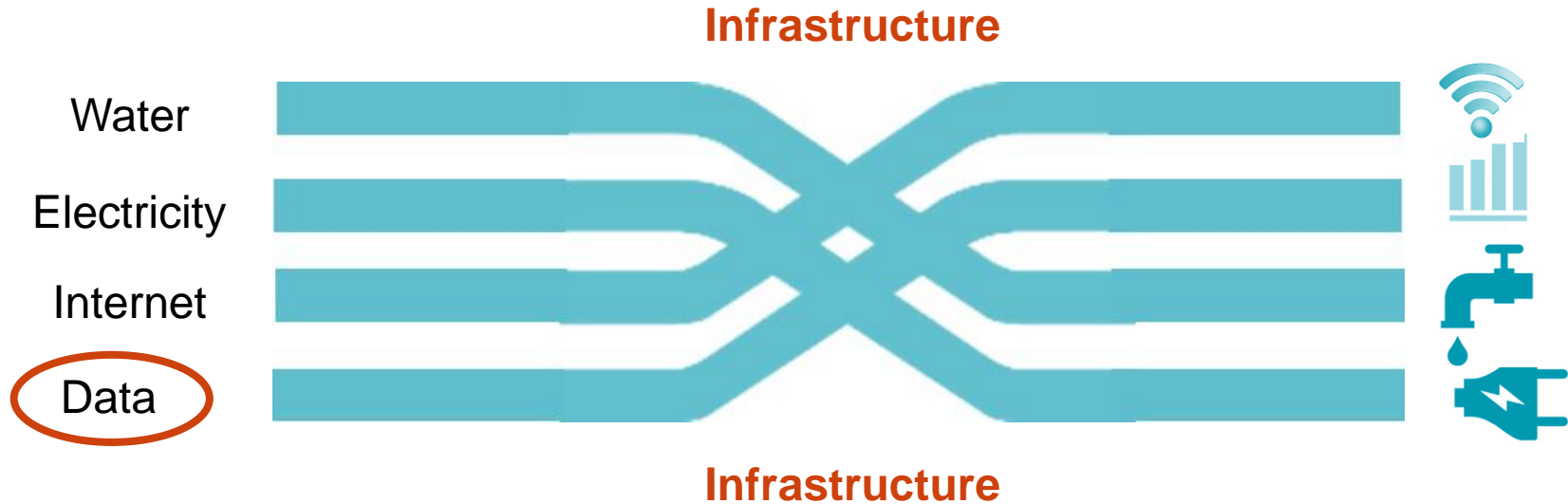


The Solution- Enterprise Infrastructure



Connect the **right data** to the **right people** in the **right context**
for the **right decisions** in **real-time**

Data is Critical to Your Infrastructure



Operational Intelligence



[Create account](#) [Log in](#)

[Article](#) [Talk](#)

[Read](#)

[Edit](#)

[View history](#)



Operational intelligence

From Wikipedia, the free encyclopedia

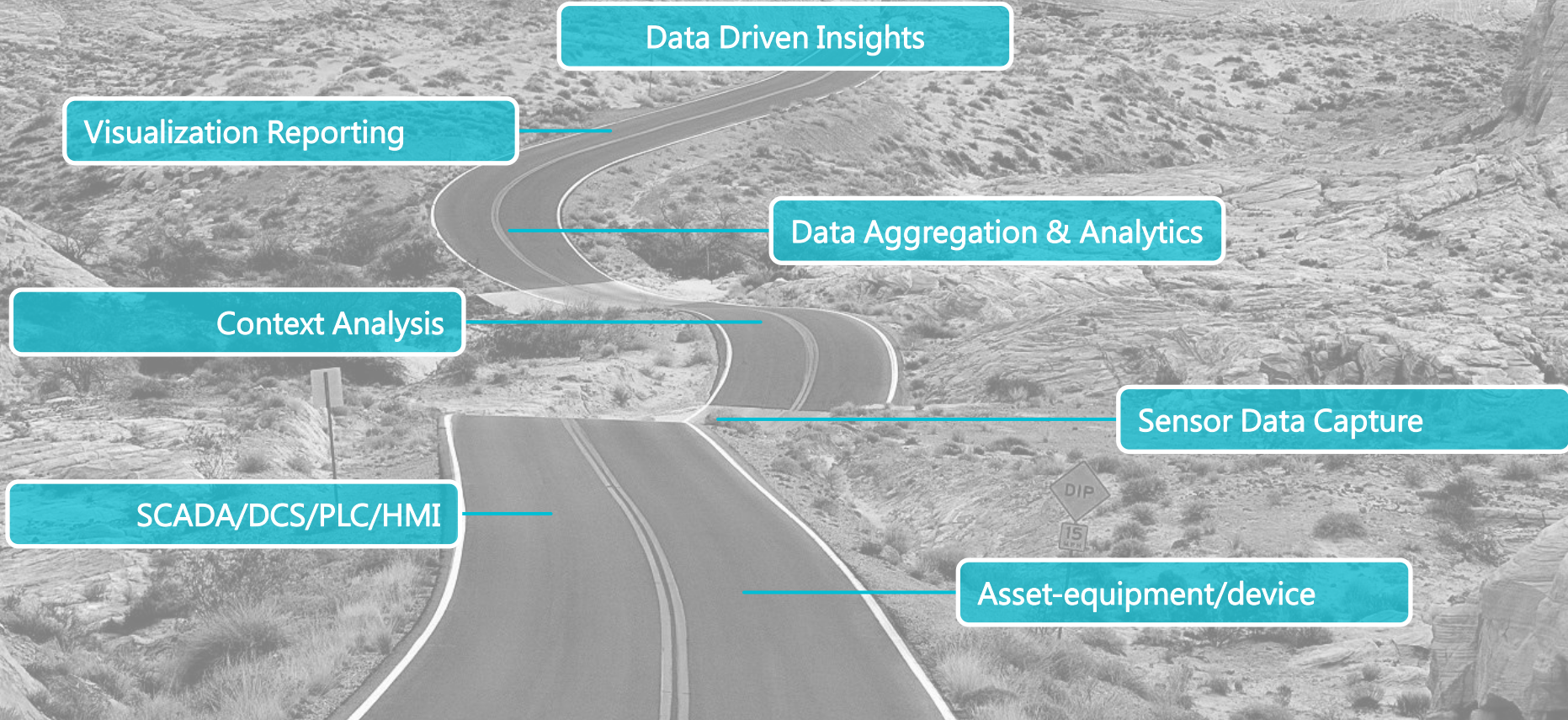
Operational intelligence (OI) is a category of real-time dynamic, business analytics that delivers visibility and insight into data, streaming events and business operations. Operational Intelligence solutions run queries against streaming data feeds and event data to deliver real-time analytic results as operational instructions.^[1] Operational Intelligence provides organizations the ability to make decisions and immediately act on these analytic insights, through manual or automated actions.

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Tools

Operational intelligence (OI) is a category of real-time dynamic, business analytics that delivers visibility and insight into data, streaming events and business operations. Operational Intelligence solutions run queries against streaming data feeds and event data to deliver real-time analytic results as operational instructions.^[1] Operational Intelligence provides organizations the ability to make decisions and immediately act on these analytic insights, through manual or automated actions.

Journey to Operational Intelligence





Shell Enterprise Agreement



OSIsoft Renews Enterprise Agreement with Shell for Operational Intelligence Infrastructure

Continued deployment of the OSIsoft PI System Infrastructure connects people, assets and operations for real-time intelligence and decisions

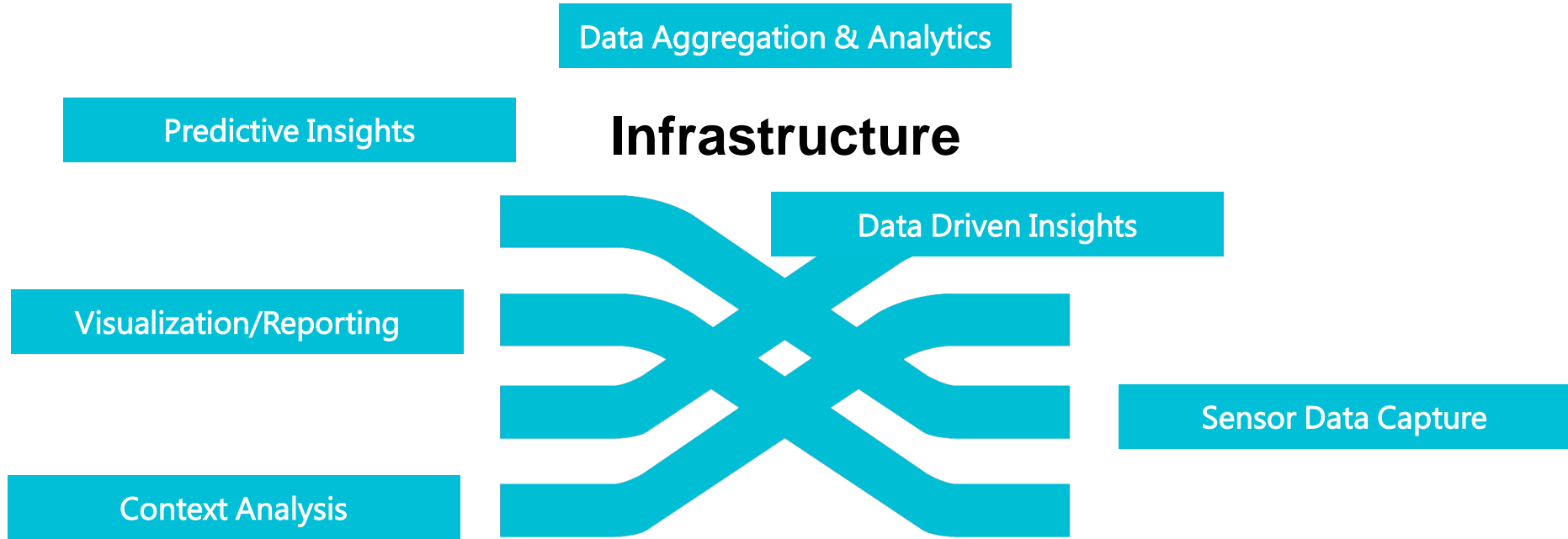
OSIsoft Renews Enterprise Agreement with Shell for Operational Intelligence Infrastructure

Continued deployment of the OSIsoft PI System Infrastructure connects people, assets and operations for real-time intelligence and decisions

Today, OSIsoft LLC, provider of the PI System and the leader in real-time data and events infrastructure

production, generation, process and discrete manufacturing, distribution and services to leverage streaming data to optimize and enrich their businesses. For over thirty years, OSIsoft customers have enhanced the PI System to deliver process, quality, energy, regulatory compliance, safety, security and asset health improvements across their operations. Founded in 1980, OSIsoft is a privately-held company, headquartered in San Leandro, California, U.S.A., with offices around the world. For more information visit www.osisoft.com

Journey to Operational Intelligence

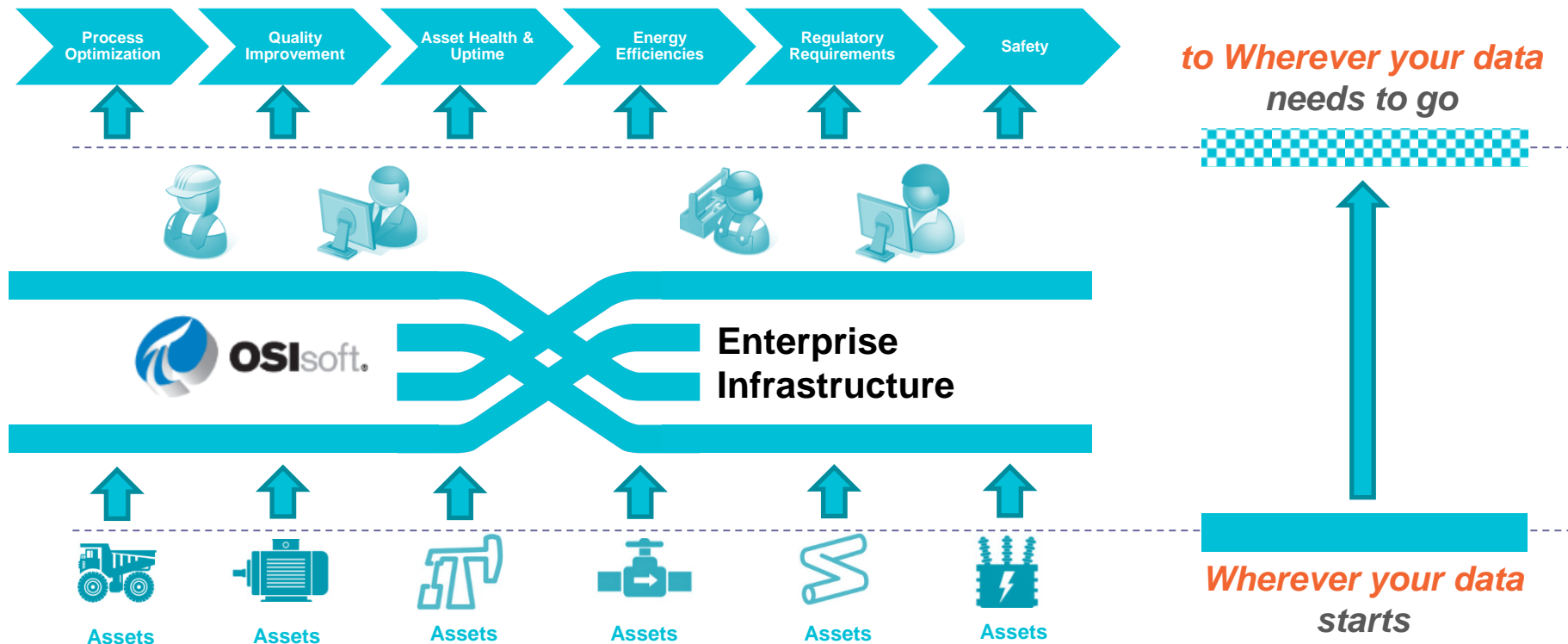


in-fra-struc-ture [in-fruh-struhk-cher]

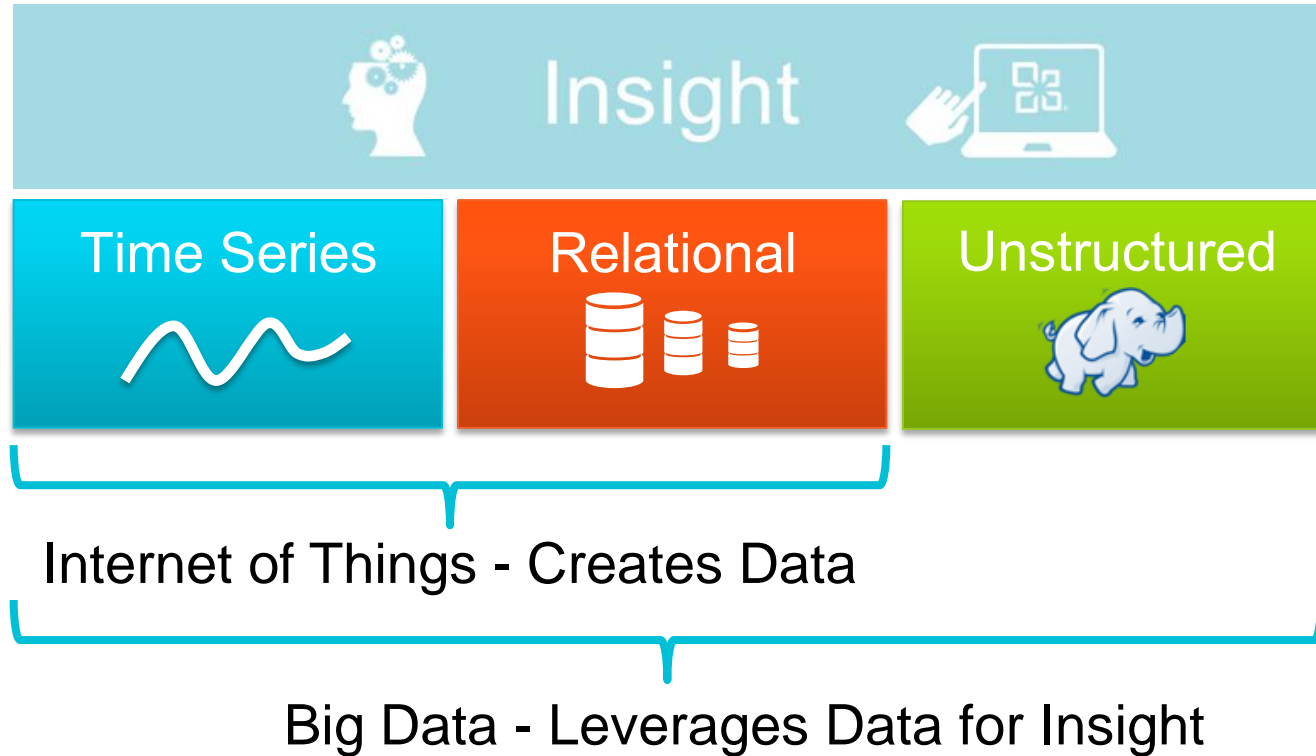
“It can be generally defined as the set of **interconnected structural** elements that provide **framework supporting** an entire structure of development¹”

SCADA/DCS/PLC/HMI

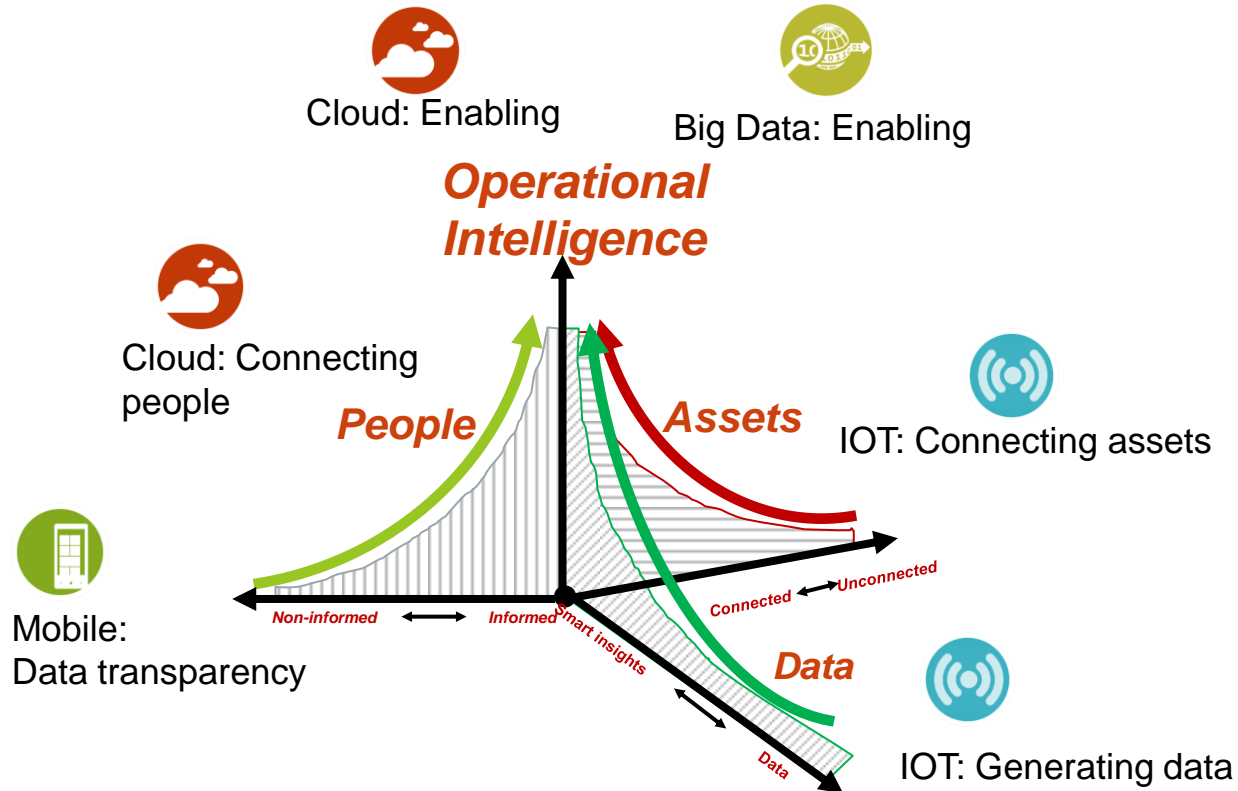
An Enterprise Infrastructure



Your PI Infrastructure is Essential for Big Data



Megatrends Driving Operational Intelligence



Partner Ecosystem for Infrastructure Excellence



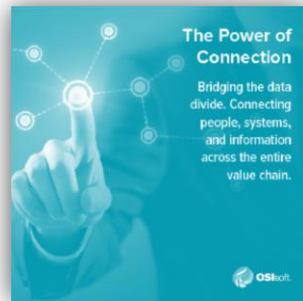
Infrastructure



**185+
Partners**

- Integrations
- Services
- Embedded

OSIsoft 2014 Investment In Your Infrastructure



Data Aggregation & Analytics

Sensor Data Capture

Asset-equipment/device

SCADA/DCS/PLC/HMI

Predictive Insights

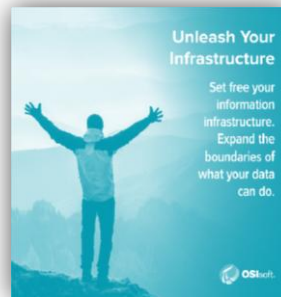
Data Driven Insights

Visualization/Reporting

Analysis



- **PI Connectors**
- **PI Cloud Connect**
- **PI Integrator for Esri**



- **PI Server 2014**
- **PI Asset Calculations**
- **PI Event Frames**

- **ProcessBook Displays in PI Coresight**
- **PI Coresight Mobile**

OSIsoft PI System 2015 Investigations



**Predictive Analytics /
Simulations**

**Integration with Big
Data Analytics**

**Integration with
Business Systems**

Process
Optimization

Quality
Improvement

Asset Health
& Uptime

Energy
Efficiencies

Regulatory
Requirements

Safety

Share

Learn

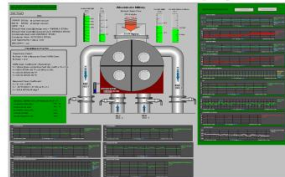
Innovate

This is **your**
work!
True
Business
Impact

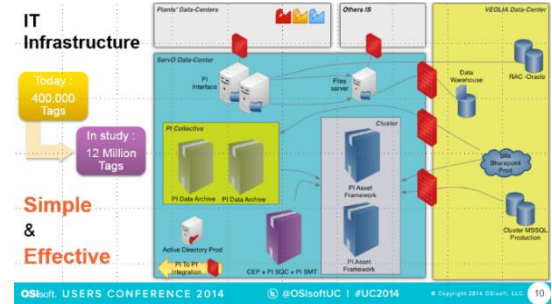
Performance Monitoring Center Hampton NH



Condenser Performance Display



Data Workflow



Results and Benefits

- Cooling Tower Performance Improvement - \$450K/Year
- River Water Temperature Management - \$300K/Summer
- Chemical Consumption Reduction - \$70K/Year/Plant

Continuous Improvement in Rate of Penetration (ROP)



Eagle Ford Drilling – Spud to Total Depth



PI System and Real Time Data Analysis

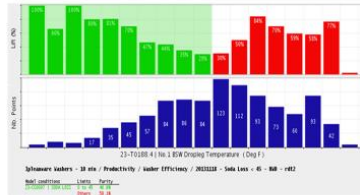
A new generation of tools, agnostic technology, for an automatic and efficient detection

- Leak Detection **on demand**
- Analyze every sensor in **Real Time**
- Put Data for **analysis** in SQC and Scilab
- compute proximities between the signals to determine the best location of leaks





Easy to find key variables



"Hyperlift" for Hardwood 1st Drop Leg Temperature

Hyperlift that shows the dramatic impact of 1st drop leg temp on soda loss

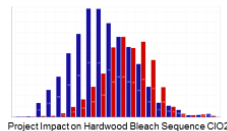
green = "good", red = "bad"

Braincube can automatically rank and sort all potential model inputs

Hypercube analysis can be used to rank models that contain more than one variable

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PROJECT SAVINGS



6% Cost Reduction

+

- ✓ ClO₂ & NaOH demand reduction
- ✓ Caustic makeup reduction
- ✓ Increased recovery boiler steam generation
- ✓ Lower BOD load to waste water treatment

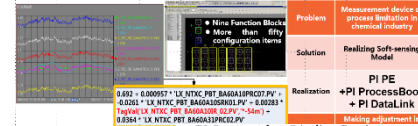
= Additional Savings

Improving brown washer efficiency has reduced organic carryover to the bleach plant

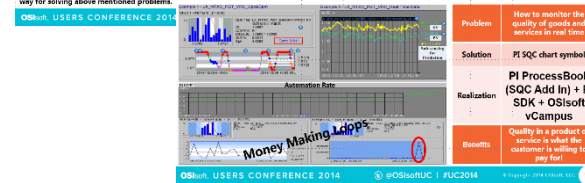
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PI System for Process Control Engineer



PI System for Quality Engineer



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5. BENEFITS FROM USING PI SYSTEM

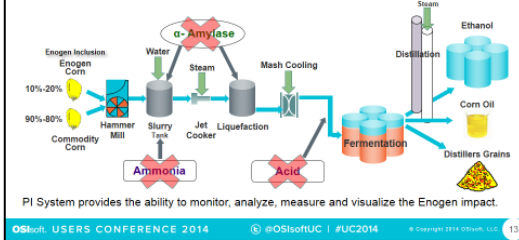


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syngenta

Enogen Impact – Dry Grind Ethanol



PG&E Gas Operation Center



Why do we need PI System?

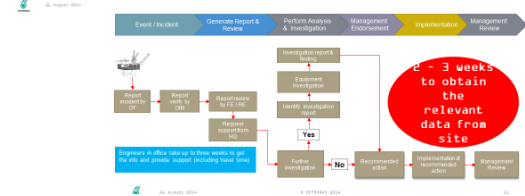
Diverse operational facilities

Inhomogeneous sources of operational data

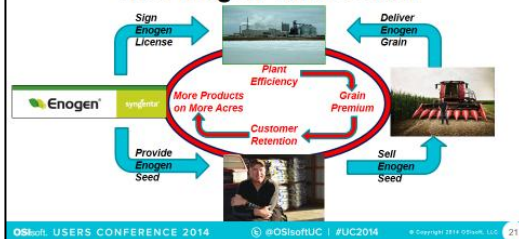
Real-time process data locked within isolated control systems

Technical performance & business intelligence reliant on offline data

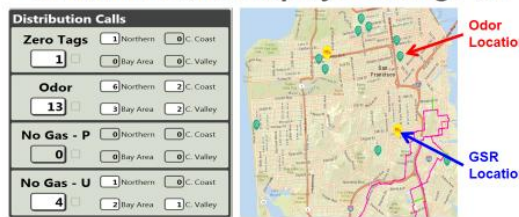
Previous information flow took weeks to obtain data



The Enogen Value Chain



Customer Calls Displayed using Esri



Troubleshooting made easy and accurate!

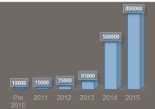


PI System deployment status

PI System: Number of Assets Deployed



Number of PI Tags Installed





Business Challenges

- Manual data collection despite the existing automation system.
- Data is being organized using Microsoft Excel.
- Engineers spend long time organizing data and they don't have enough time to analyze it.
- Data is transmitted via email.



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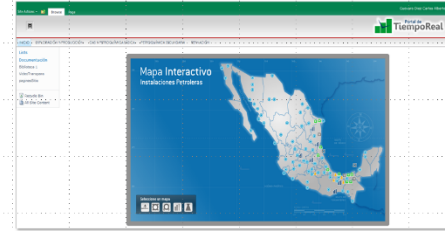
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Standardized Real Time Portal at PEMEX

All 4 PEMEX Companies' Metrics are in a single Portal



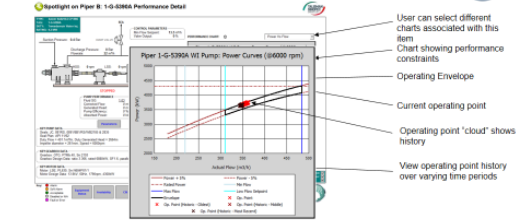
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Spotlight Display - Performance



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Solution

Implement PI System to manage, secure and display operational information through reports and KPIs of wells and CPF (Central Production Facilities)

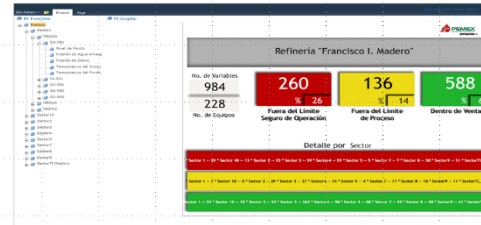


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A single detailed view for all equipment



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Examples of Value Delivered

- High Seal Gas filter DP Catch**
 - DP reached 3.5BarG, limit should be 1BarG
 - Spotlight alerted users, who followed up with operators to swap to standby filter and raised work order to replace fouled filter
 - If allowed to continue could have caused 14 days lost production @11,000bbls/day : 154,000bbls
- High Seal Oil Tank Temperature Catch**
 - Temp should be around 60°C, but had reached 110°C
 - Spotlight alerted onshore users, who followed up with offshore team and it was picked up that 2 seal oil pumps were running instead of 1
 - If high temperatures had continued seals could have failed and caused 10 days lost production @7,000bbls/day : 70,000bbls
- Surging Compressor Proactive Resolution**
 - Operators reported compressor surging
 - Spotlight's history functions allowed engineers to confirm problems had occurred and make control tuning suggestions
 - If allowed to continue would have caused production/mechanical problems

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Does the Process Fit in the Range?

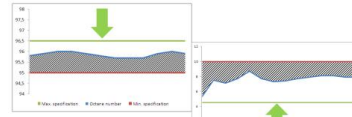


Process in Operation Example 3



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Reducing Quality Giveaway



Benefits of TQI

- Unnecessary give-away can be eliminated
- Information about product quality is quickly available any time
 - Laboratory analysis is slower and less often available.
- Ensures smaller variance than the ISO standards for laboratory measurements
 - Disturbances in measurements are eliminated by weighted averaging
 - Place of sampling is indifferent
- Provides data for further optimization

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View of control room video walls



Situational awareness in control room



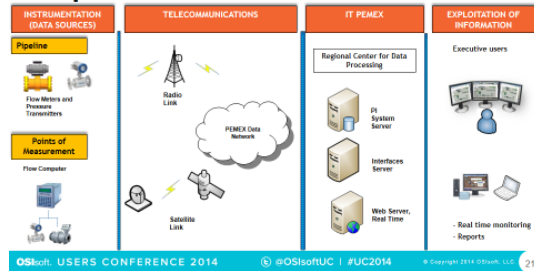
Process
Optimization

Quality
Improvement

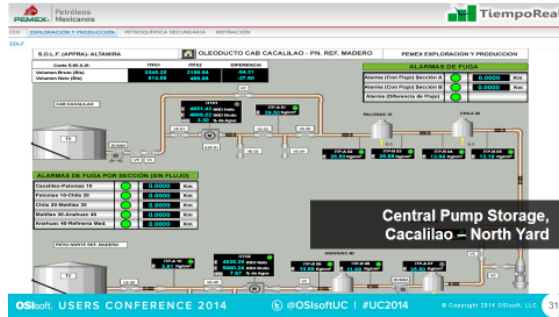
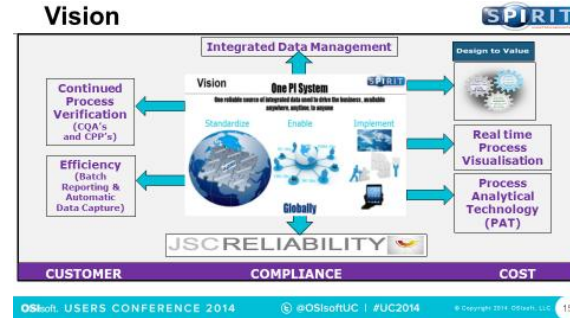
Asset Health
and Uptime



Implementation of the Solution



Vision



Vision



Process
Optimization

Quality
Improvement

Asset Health
and Uptime

Energy
Efficiencies



PI System in AA Copper



Business Challenge: The need of **real-time information management** for Operational Excellence, Safety & Sustainability

OSIsoft PI System:

- Single platform to **integrate all data** from the Operations Value Chain.
- Enabling infrastructure to develop **value applications** in real-time.

Real-time Operations Management

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PI System in AA Copper

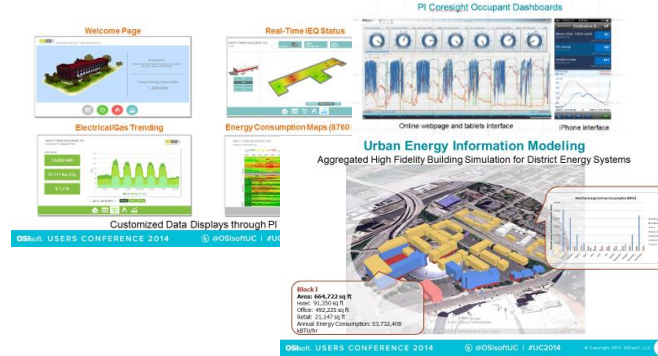
2013 results:
 > Operating profit: US\$ 1,739 millions (26%)
 > EBITDA: US\$ 2,402 millions, ROCE: 25%
 > Production Cu fine: 775 [kton]
 > Average number of Employees: 4,200

Economic Benefits (as Project estimation):

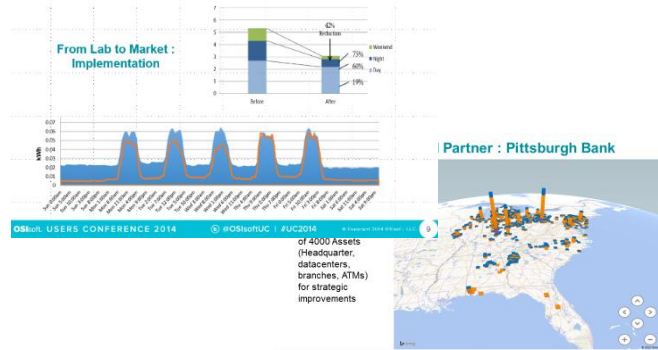
- Increase in the availability of processes and equipments: **0.2%**
- Increase in Energy Efficiency: **1%**
- Decrease of Maintenance Costs: **1%**



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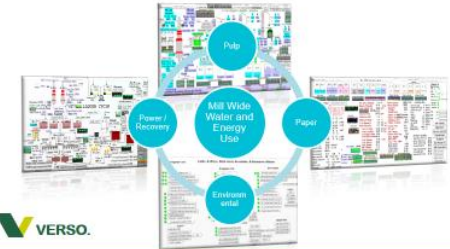
EA Journey – From Real Time to Future Time

- Every PC in the Mill has PI ProcessBook
- Every PC with Excel has PI DataLink
- Master PI Processbook
 - used Mill wide
 - over 1000 PB displays
- Majority of PB displays
 - developed by area process and operation experts



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EA Journey – From Real Time to Future Time



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Process
Optimization

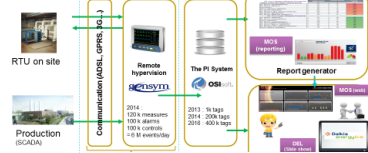
Quality
Improvement

Asset Health
and Uptime

Energy
Efficiencies



Architecture Overview



Building Energy Services (BES)

- Remote monitoring service
- Analyze building/operational data
- Take Action to improve energy performance
- Provide support with technicians
- Communicate value of energy savings with reports



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Reporting to our Customers



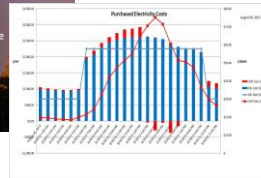
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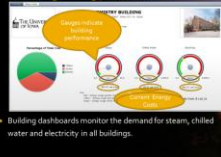


2020 "Net-Negative" Energy Goal

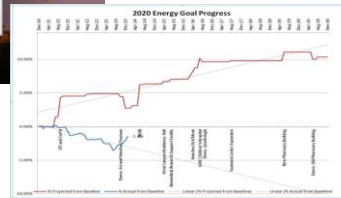
- Goal is to use no more energy in 2020 than in 2010 despite a billion dollars of new construction on campus.
- Use real-time and historical information to optimize energy supply and consumption at the University of Iowa



Building Energy Dashboard



- Building dashboards monitor the demand for steam, chilled water and electricity in all buildings.



"City as
a System"

- GOALS:**
- Connect buildings' operating systems
 - Lower individual and aggregate energy demand and usage
 - Establish permanent load reduction
 - Measure and report results

- SCOPE:**
- 6 downtown San Diego buildings (2 commercial, 2 residential, 2 hotels)
 - OSIsoft software
 - Data and savings results at end of 2014

- KUDOS:**
- Received White House recognition as big data solution

City-wide Energy Optimization



UC San Diego's
World-renowned
Microgrid

- Generates 92% of campus electricity
- \$8 Million+ in annual savings
- One of the world's most advanced microgrids

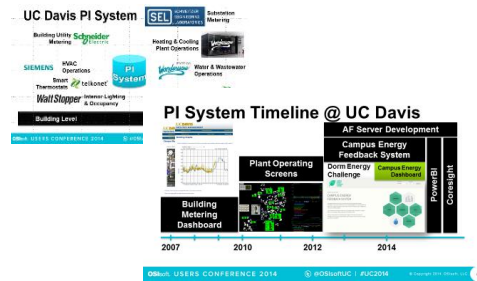
Process
Optimization

Quality
Improvement

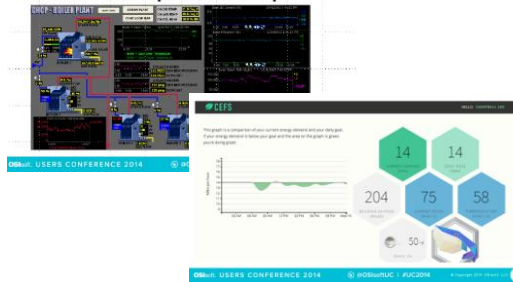
Asset Health
and Uptime

Energy
Efficiencies

UCDAVIS



ProcessBook Operations Graphics



[illegible]

MDAGM Rule 1201(2)(13000)	40 CFR 98.232 (a)
MDAGM Rule 1201 (9)(2)	40 CFR 98.232 (b)
MDAGM Rule 1201(2)(13100)	40 CFR 98.232 (c)
MDAGM Rule 204	40 CFR 98.237 (e)
MDAGM Rule 1203(2)(13100)	40 CFR 98.237 (e)
SVAPCD Rule 1000	40 CFR 98.3 (a)
SVAPCD Rule 4003	40 CFR 98.3 (b)
SVAPCD Rule 4503	40 CFR 98.3 (b)
VCAPCD Rule 74.9	40 CFR 98.3 (c)
VCAPCD Rule 33	40 CFR 98.3 (d)
VCAPCD Rule 10	40 CFR 98.3 (f)
40 CFR 92.22(a)(9)(9000)	40 CFR 98.3 (g)
40 CFR 70.1(a)(1)(b)	40 CFR 98.3 (g)(i)
40 CFR 70.6(a)(1)(9000)	40 CFR 98.4 (a)
40 CFR 60.605	40 CFR 98.4 (a)
40 CFR 60.610	40 CFR 98.8
40 CFR 60.655	40 CFR Subpart C



The screenshot shows the InSpring application interface. At the top, there is a navigation bar with the InSpring logo and tabs for 'Home', 'Workflow', 'Dashboard', and 'Tools'. The main content area is titled 'Approve and Print report' and includes a 'Print report' button and a 'Print report' link. Below this, there is a section for 'Approve and Print report' with a 'Print report' button and a 'Print report' link. The bottom section shows 'Print report' with a 'Print report' button and a 'Print report' link. Annotations include a blue box around 'Approve and Print report' and a blue box around 'Print report'.

Time	Temp	4HrAvg	Time	Temp	4HrAvg	Time	Temp	4HrAvg	Time	Temp	4HrAvg
0:00	840	800	0:15	835	805	0:30	830	803	0:45	820	799
1:00	795	797	1:15	815	800	1:30	820	805	1:45	799	800
2:00	800	801	2:15	780	785	2:30	775	780	2:45	780	775

It would take two employees approximately 1 ½ hours to review 6 months of records. 8 reads each hour X 24 hours X 183 days yields over 35,000 reads per unit. One location had 2 units another had 3 units.

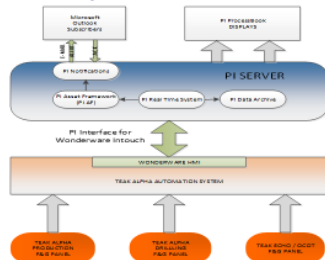
- System Reliability
- Flexible Data Handling
- Tunable Security Parameters
- Scalable

A robust validation strategy is critical for using exception based reporting.

The diagram illustrates a robust validation strategy for using exception-based reporting. It shows the flow from a **PI System** and a **PI Batch Model** through **Parametric Simulation** and **Test Cases** to generate **Report Templates** and **Report Parameters**. The **Report Parameters** are then used for **100 % Parameter Verification** and **Exception Timeframe Testing**, which includes **Report Testing Methodology** (Continuous Data, Long, Simplified Time, compared against Report Parameters).



PI System Fire & Gas Dashboard Architecture



- Data from the F&G panels are sent to the Wonderware HMI via the automation network
- PI Interface for WonderWare Touch transfers data to the PI Data Archive.
- PI Notifications (alert conditions from F&G panel) are forwarded to selected e-mail subscribers
- PI ProcessBook display dashboards allow end users to immediately determine the health of the overall system down to sensor level.

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Benefits of PI System for Fire & Gas Monitoring

- Real time monitoring of F&G system health: minimizing system downtime and maximizing availability, quality control of preventive maintenance
- Historical archiving of F&G system events: timeline of event reconstruction, identifying faults and root causes
- Better management of control for bypassing
- E-mail notification of system health issues: bypass, sensor trouble, communication failures, panel fault
- Superior process safety: assurance of safety barrier integrity
- High potential for improved safety and production with negligible capital investment

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Controlling Safety via PI System Tools



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19

Interlock program benefits

Switched off interlocks more than 1 day	2013 (H2)	2014 (H1)
Pcs	964	881
Days	29,052.4	10,857.97
Total switched off interlocks	2013 (H2)	2014 (H1)
Pcs	2294	2224
Days	31,710.3	21,436.9
Interlock relevant events (pcs)	2013 (H1+H2)	2014 (H1)
	111	22
Unit shutdowns due to interlocks (pcs)	2013 (H1+H2)	2014 (H1)
	11	0



*2013/11 pcs. shutdowns = 84 lost operation hours
Calculated loss based on EDC is 1,000,000€

EDC: Equivalent Distillation Capacity – Solomon study

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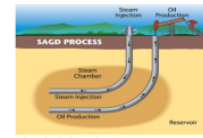
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Steam-Assisted Gravity Drainage (SAGD)



- Approximately 80% of Canada's Oil Sands too deep to mine
- Two key SAGD facilities – Firebag & MacKay River
- Parallel pairs of horizontal wells are drilled:
 - one for steam injection
 - one for oil recovery
- Safety and Operational challenges:
 - Large numbers of assets and instrumentations
 - Complex logic and criteria
 - Process Changes



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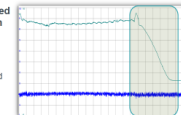
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Low Flow alerts on ESPs (electric submersible pump)

- A Low Flow event was detected in one of the pumps based on wellhead temperature fall off
- Lost production
- Potentially fail of an ESP, around \$0.5 million at risk
- 130+ wells at Firebag



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Data Flow for the Bypass & Equipment Trips Monitoring

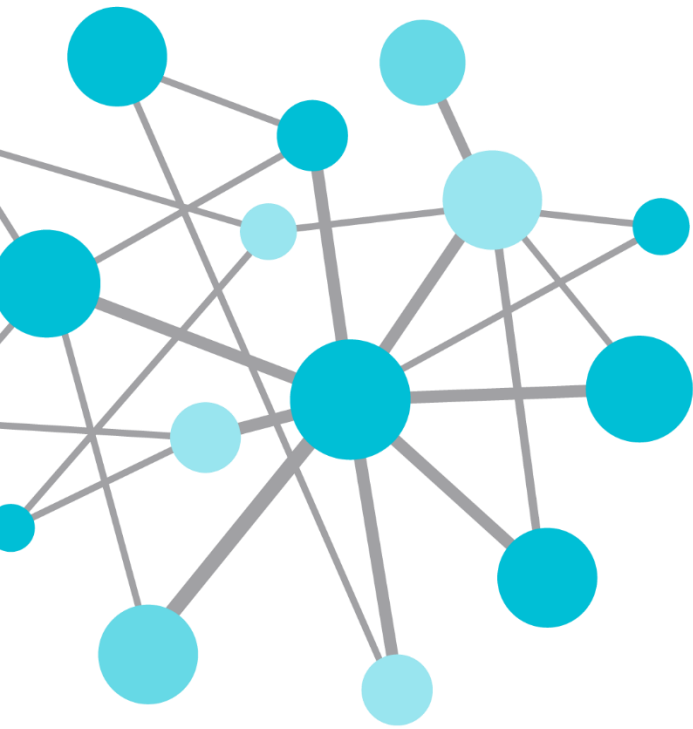


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OSIsoft's Journey to Operational Intelligence

“Eating our own PI”

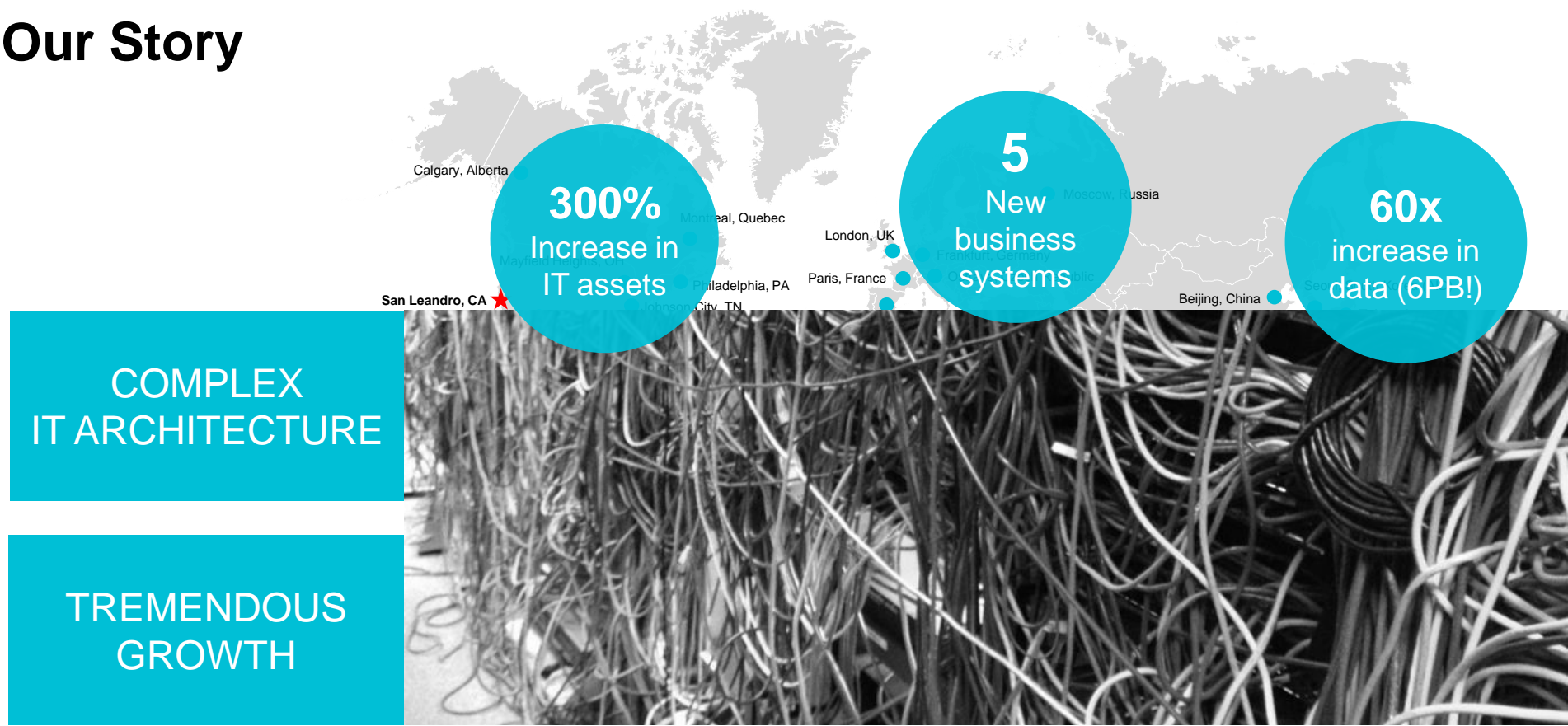
Presented by **Norton Green**, IT Director, OSIsoft LLC

Our Story



TREMENDOUS
GROWTH

Our Story



COMPLEX
IT ARCHITECTURE

TREMENDOUS
GROWTH

Our Story

NO VISIBILITY

COMPLEX
IT ARCHITECTURE

TREMENDOUS
GROWTH





Stage 1: Monitor and alert

Stage 2: Extend data collection and utilize data to understand why

Stage 3: Service level monitoring, prediction

Mission: Improve employee productivity

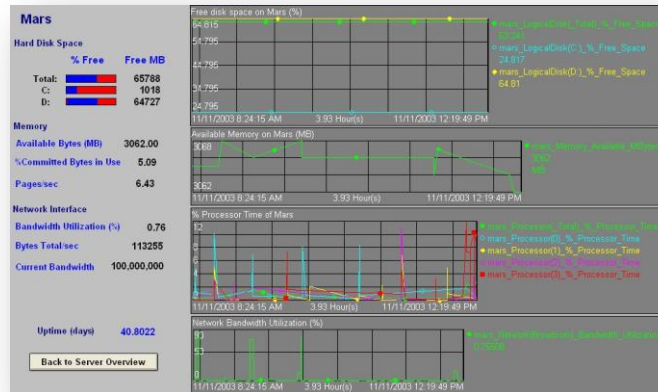
Our Journey

Stage 1: Monitor and alert

Component level
monitoring

Unused Uptime
Reports

“Tip of the Iceberg”



Month to Date				Month to Date			
File Servers		Ping	File Transfer Test	DHCP Query Response		Ping MTD	Test Operation
Raid50ern	99.872	99.684		San Leandro DHCP (.10)	100.000	99.889	
FTP.OS/Soft.com	100.000	100.000		Seattle DHCP (.15)	100.000	99.644	
				Houston DHCP (.20)	100.000	99.778	
Web Servers		Ping	Page Open Test	Johnson City DHCP (.25)	100.000	99.778	
www.osisoft.com	100.000	100.000		Cleveland DHCP (.30)	100.000	99.769	
Devnet	99.999	100.000		Montreal DHCP (.35)	100.000	99.777	
OSISCantra	99.371	100.000		Yardley DHCP (.40)	100.000	99.763	
TechSupport	99.847	100.000		Savannah DHCP (.45)	100.000	99.715	
Extranet	3.000	100.000		Perth DHCP (.50)	100.000	99.233	
OSILivePortal	99.988	100.000		Auckland DHCP (.60)	100.000	99.770	
Webmail	99.994	100.000		Germany DHCP (.75)	100.000	99.724	
OSI GoogleSearch	100.000	100.000		Phoenix DHCP (.70)	100.000	99.769	
Month to Date				Month to Date			
Clientele Servers		Ping	SQL or File Test	DNS Query Response		Ping MTD	Test Operation
Mars	100.000	99.799		Public DNS - Gd	100.000	100.000	
Jupiter	100.000			Public DNS - Cit	100.000	100.000	
Apollo	100.000			San Leandro DNS 1 - Mar	100.000	100.000	
Network - PIP Circuits				San Leandro DNS 2 - Top	100.000	100.000	
San Leandro	100.000			San Leandro DNS 3 - Etc	99.981	100.000	
San Jose	99.922			Seattle DNS - Chief	100.000	99.883	
Seattle	100.000			Phoenix DNS	100.000	99.931	
Phoenix	100.000			Houston DNS	100.000	99.931	
Houston	100.000			Yardley DNS	100.000	99.918	
Yardley	100.000			Johnson City DNS	100.000	99.918	
Johnson City	99.765			Cleveland DNS	100.000	99.906	
				Savannah DNS	100.000	99.873	

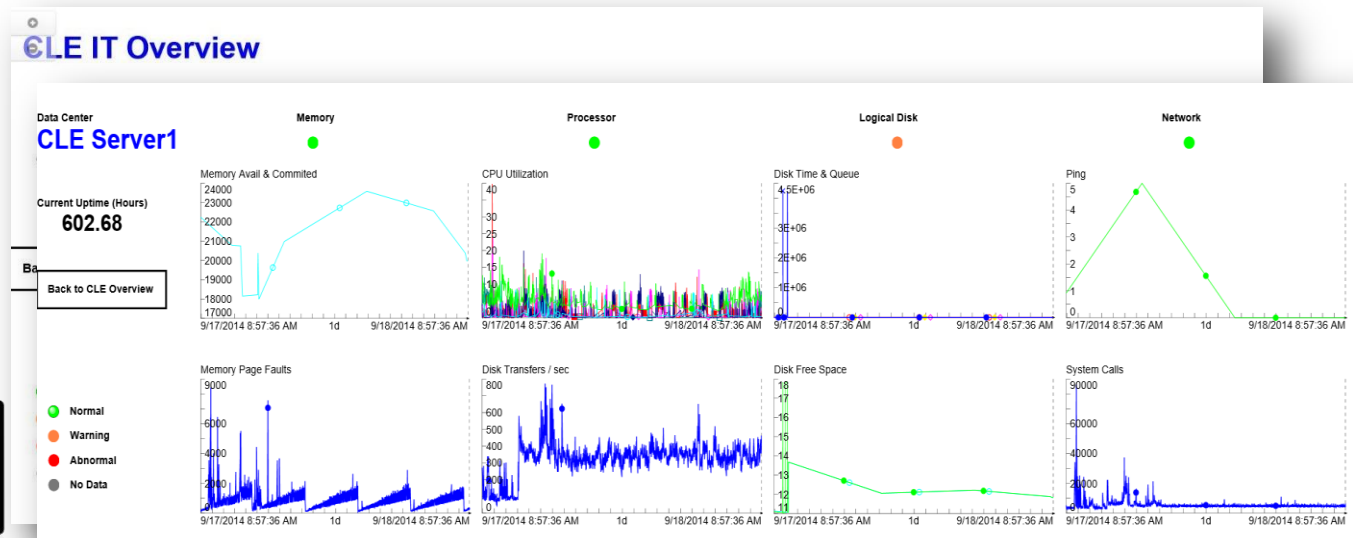
Our Journey

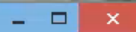
Stage 1: Monitor and alert

Stage 2: Extend data collection and utilize data to understand why

Increased accessibility

Increased ease of use
added context





File Edit View Go Tools Help

Database Query Date Back Check In Refresh New Element

Search Elements



Elements

- Elements
 - IPMI Data
 - Sites Depository
 - AAA-Generic Site
 - DBN
 - FRA
 - GRU
 - HOU
 - LON
 - OAK
 - PAR
 - PHL
 - PRG
 - SAV
 - SYD
 - TRI
 - YUL
 - YYC
 - Support Tier
 - zOut Of Service Device, Unmanaged, and NonAl
 - zPI Interfaces
 - zRiverbed
 - zSite Depository (Device type)
 - Element Searches

HOU

General Child Elements Attributes Ports Analyses Version

Name: HOU

Description: Houston

Template: Site Template



Type: None

Categories:

Default Attribute: <None>

[Extended Properties](#)Find: [Parents](#) [Models](#) [Layers](#) [Connections](#) [Children](#) [Event Frames](#)

Elements

Event Frames

Library

Unit of Measure



Our Journey

Stage 1: Monitor and alert

Stage 2: Extend data collection and utilize data to understand why

Increased accessibility

Increased ease of use
added context

Extend throughout
Enterprise



Our Journey

Stage 1: Monitor and alert

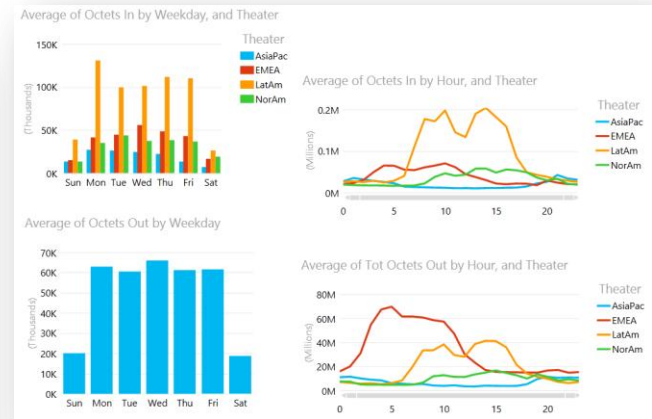
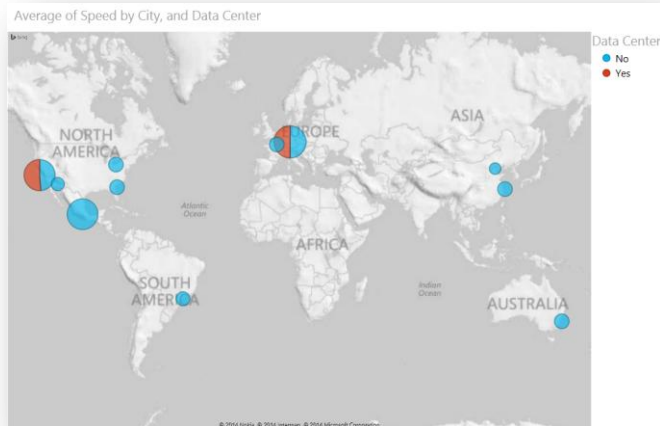
Stage 2: Extend data collection and utilize data to understand why

Stage 3: Service level monitoring, prediction

Break down technology
siloes

Service level
monitoring

Predictive Maintenance





Stage 1: Monitor and alert

Stage 2: Extend data collection and utilize data to understand why

Stage 3: Service level monitoring, prediction

Operational Excellence

PI System can be deployed anywhere and everywhere!

ありがとう

спасибо

gracias

Thank You

obrigado

danke

감사합니다

谢谢

merci



Summary: Operational Intelligence

- **It's a Journey**
- **Accelerated by the right infrastructure**
- **Megatrends taking us to new places**

“Intelligence without data is the slowest path to success. Data without intelligence is the noise before failure”



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