OSIsoft Technologies for the Industrial IoT and Industry 4.0

Dan Lopez, Senior Systems Engineer

Wednesday 1 November 2017

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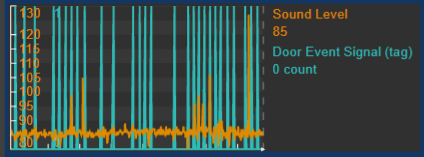
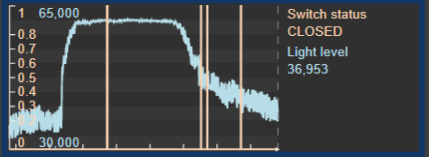
Dan Lopez House (via PI Cloud Conn… *(read-only)* Asset: Dog Door Sensor+ ▼ Ad Hoc Display

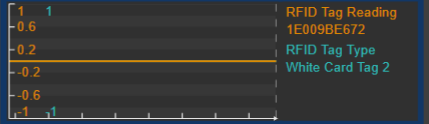
Petrie's Dog Door Photon



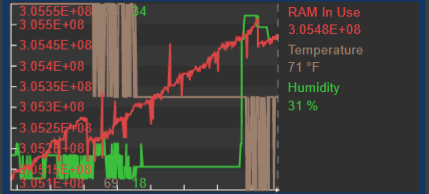
Refrigerator Imp Switch and Kitchen Light



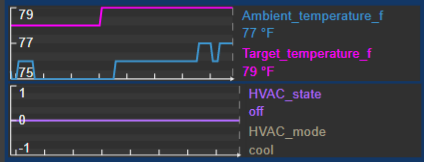
Workroom Parallax RFID Reader



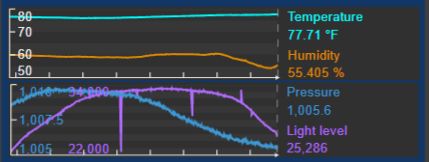
Workbench DragonBoard



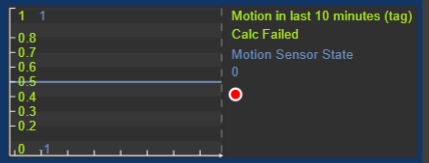
Hallway Nest Thermostat



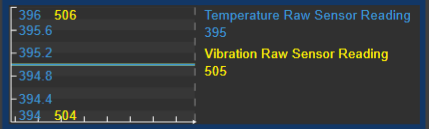
Workroom Imp Light and Environment



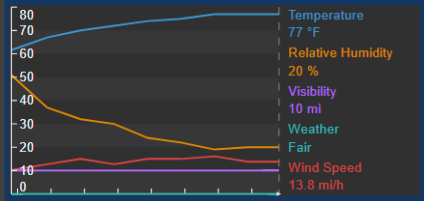
Daytime Raspberry Pi Dog Bed Motion Sensor



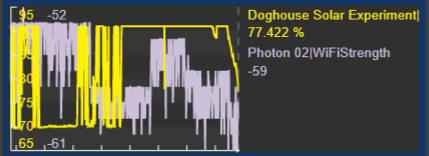
Workroom Phidget SBC OMF App



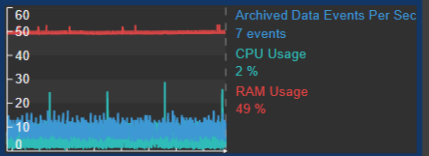
NOAA Weather From Austin Airport



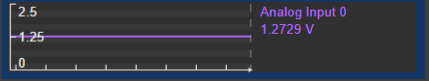
Backyard Photon Solar Output



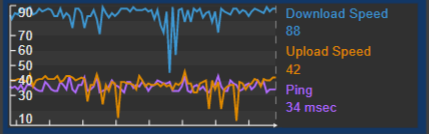
Home PI Server Performance Counters



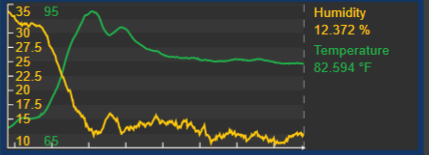
Kitchen Photon Experimental Web Server



Living Room BeagleBone Router Monitoring



Backyard Photon Weather Station



Front Yard Manually Logger Water Meter Reading

House Electricity Usage (delayed 1-2 days)

Workbench Raspberry Pi Seismograph Accelerometer

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Industry 4.0 and Industrial IoT

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The Development of Industry 4.0

Industry 1.0

1

End of 18th Century

Water and steam power run mechanical production facilities

Industry 2.0

2

Beginning of 20th Century

Electrical power enables work-sharing mass production

Industry 3.0

3

Early 1970s

Electrical and IT automates production

Industry 4.0

Today

Cyber-physical systems monitor, analyze, and automate business

Digital Transformation

Source: www.saphanatutorial.com

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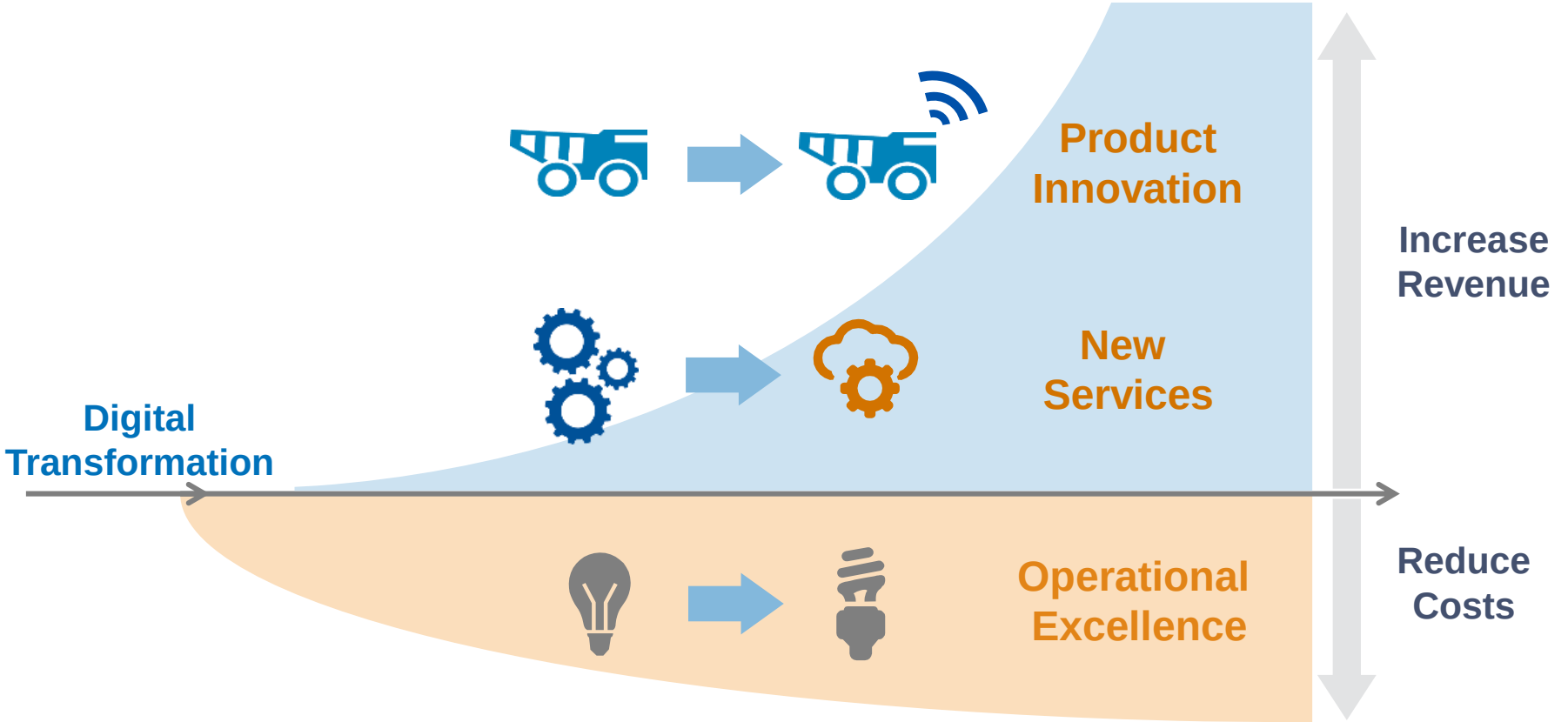
How Industry 4.0 Drives Digital Transformation



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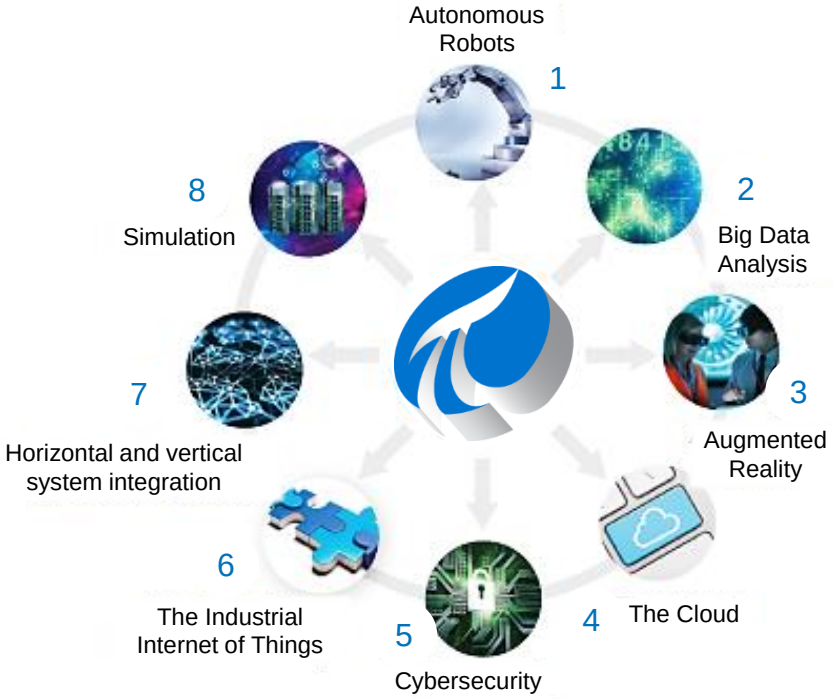
OSIsoft is Positioned as an Enabler of Industry 4.0



1. Real-time connectivity and monitoring
2. Analytics-ready historical data
3. Open access to real-time and historical data for augmented reality development
4. Cloud-based data exchange and web-based connectivity
5. Three decades of hardening against security threats
6. End-to-end connectivity from edge devices to analytics applications
7. 450+ options for real-time, historical, and transactional data connectivity
8. Seamless data transfer between on-line and off-line systems and asset analytics

Source: Boston Consulting Group (BCG)

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OSIsoft on Industrial IoT

"Connecting people with sensor based data in ways that were **physically** or **economically** unrealistic before"

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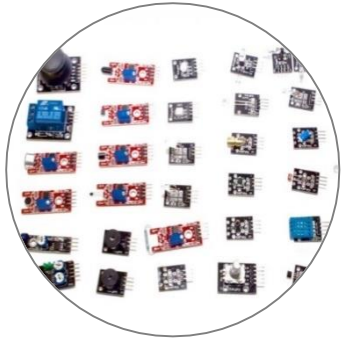
What's Driving the Interest in Industrial IoT?



Cheap and tiny sensors

Decreased compute and storage costs

New abilities to process and analyze data

Ubiquitous connectivity

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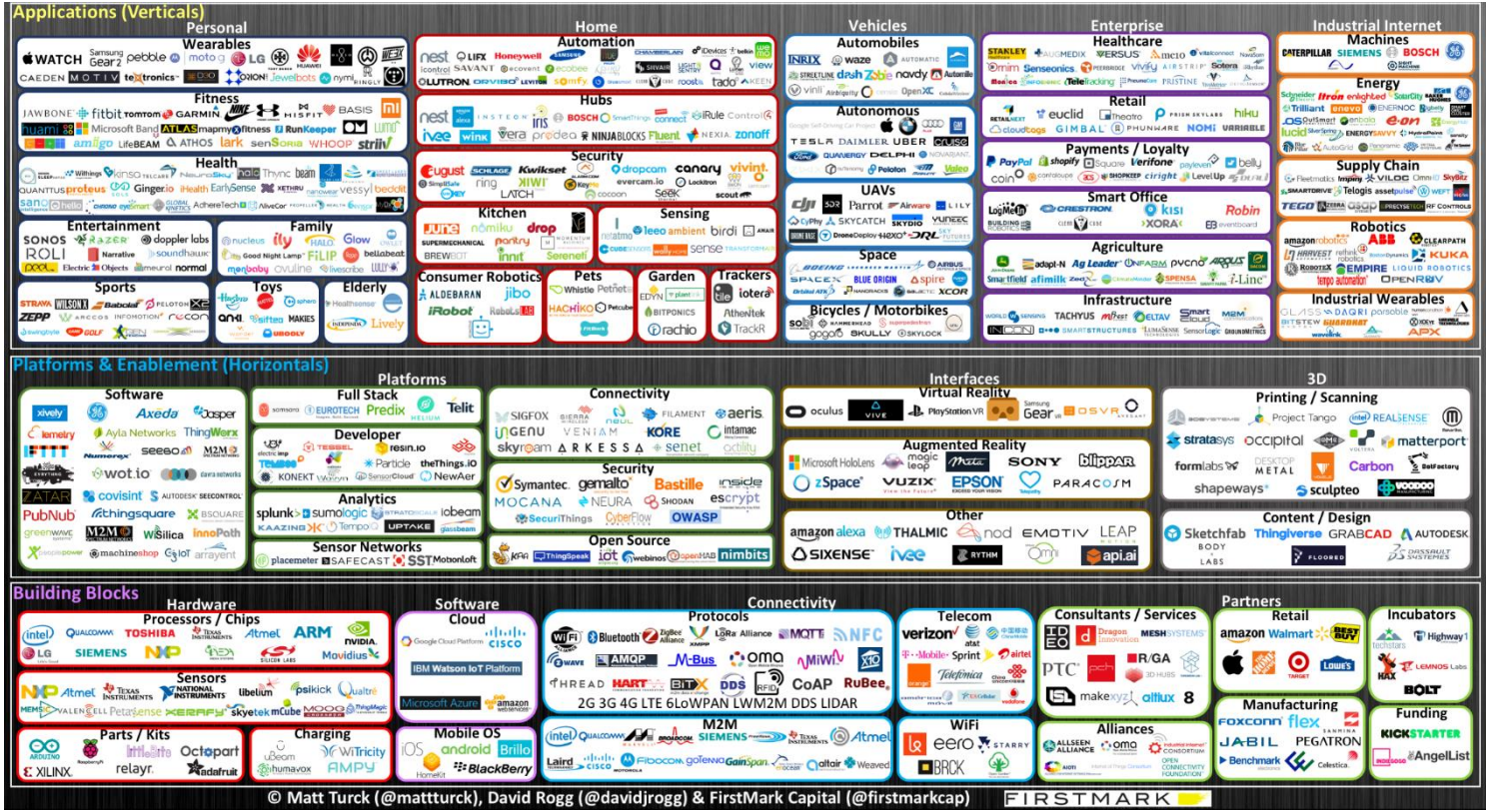
That Interest in IoT is Enormous!



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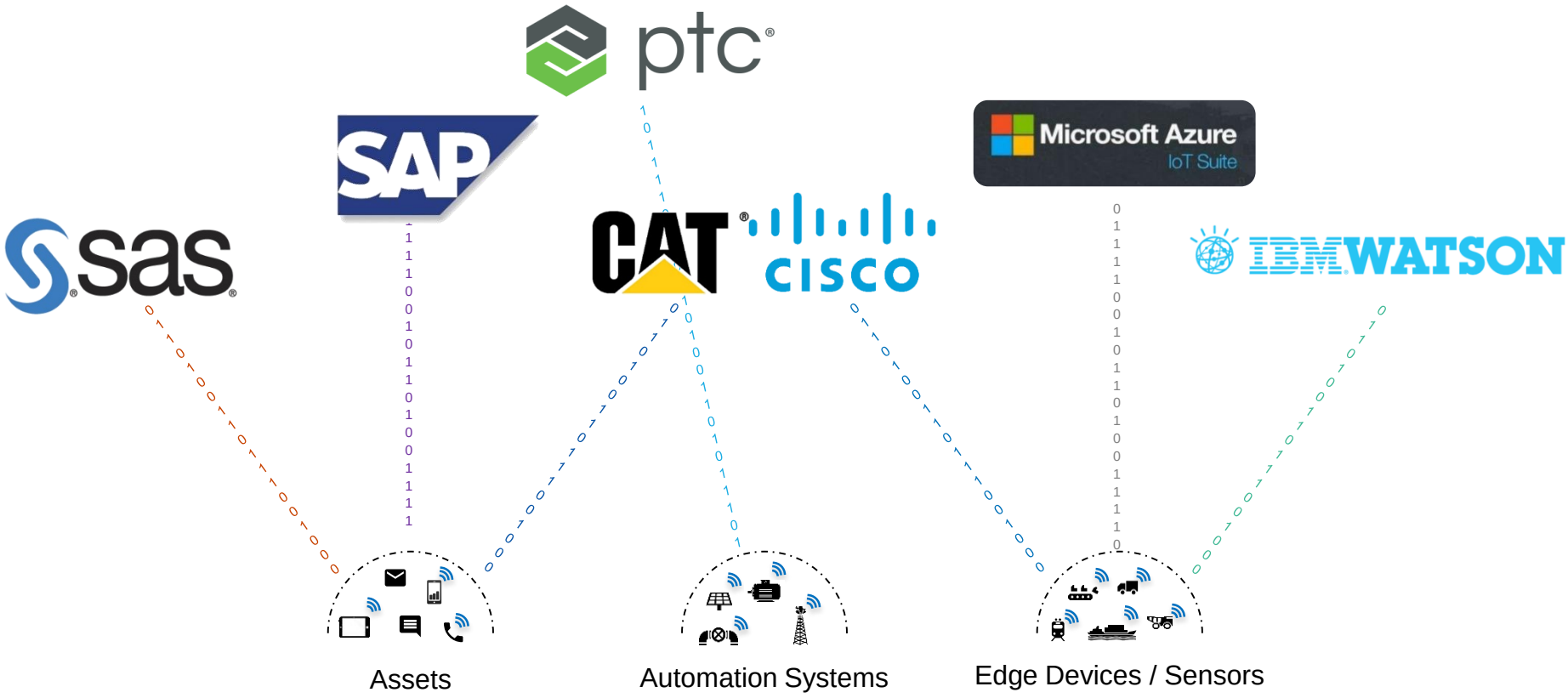
IoT is Driving Innovation Across the Commercial and Industrial World



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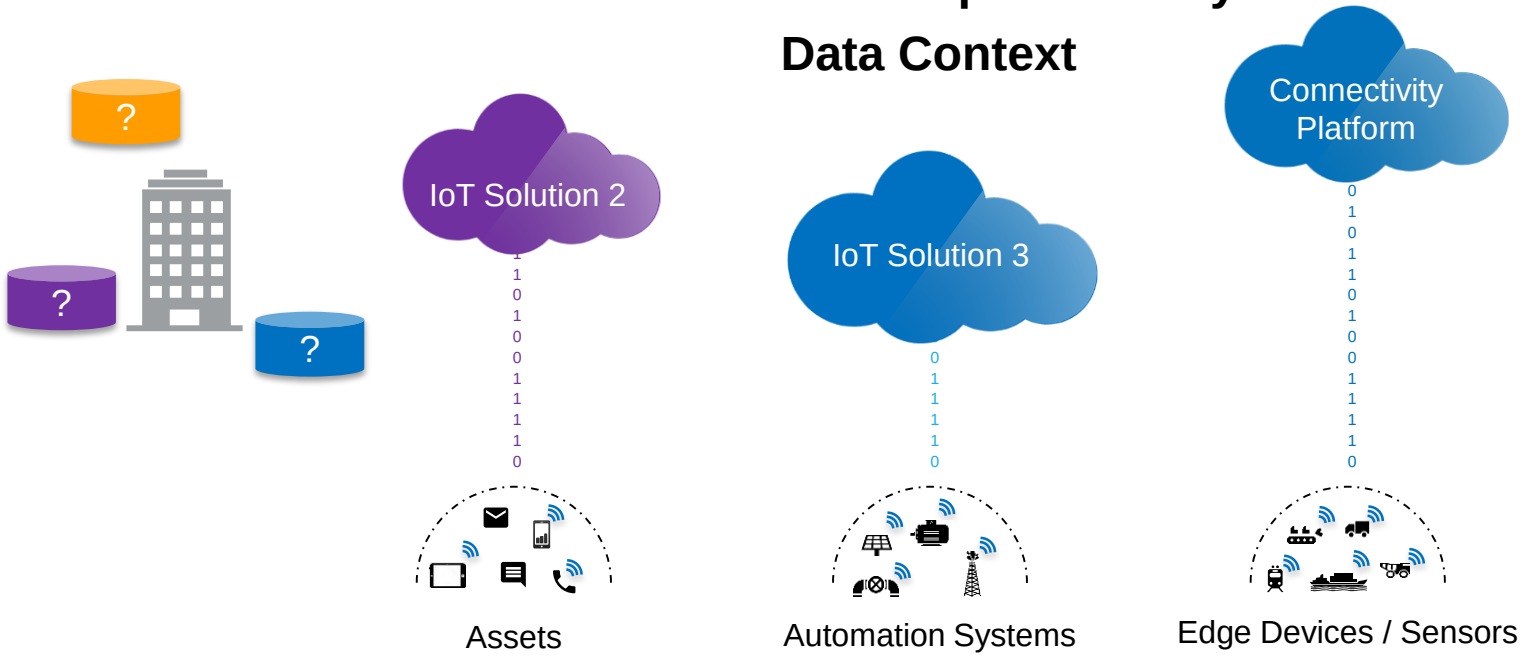
Rest Assured: We Are Aware of Inherent Risks of IoT

Data Silos

Data Ownership & Security

Data Context



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Where Does IoT Fit Into A PI System?

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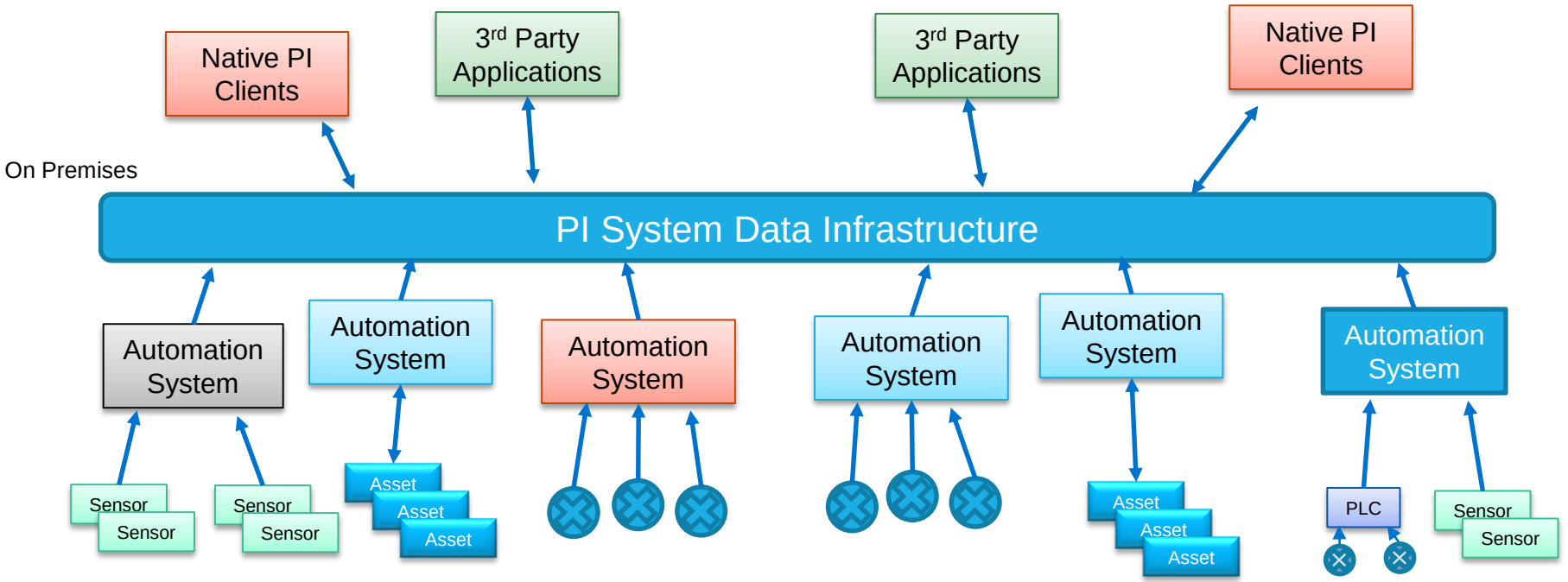
Recap: Traditional OSIsoft PI System Architecture



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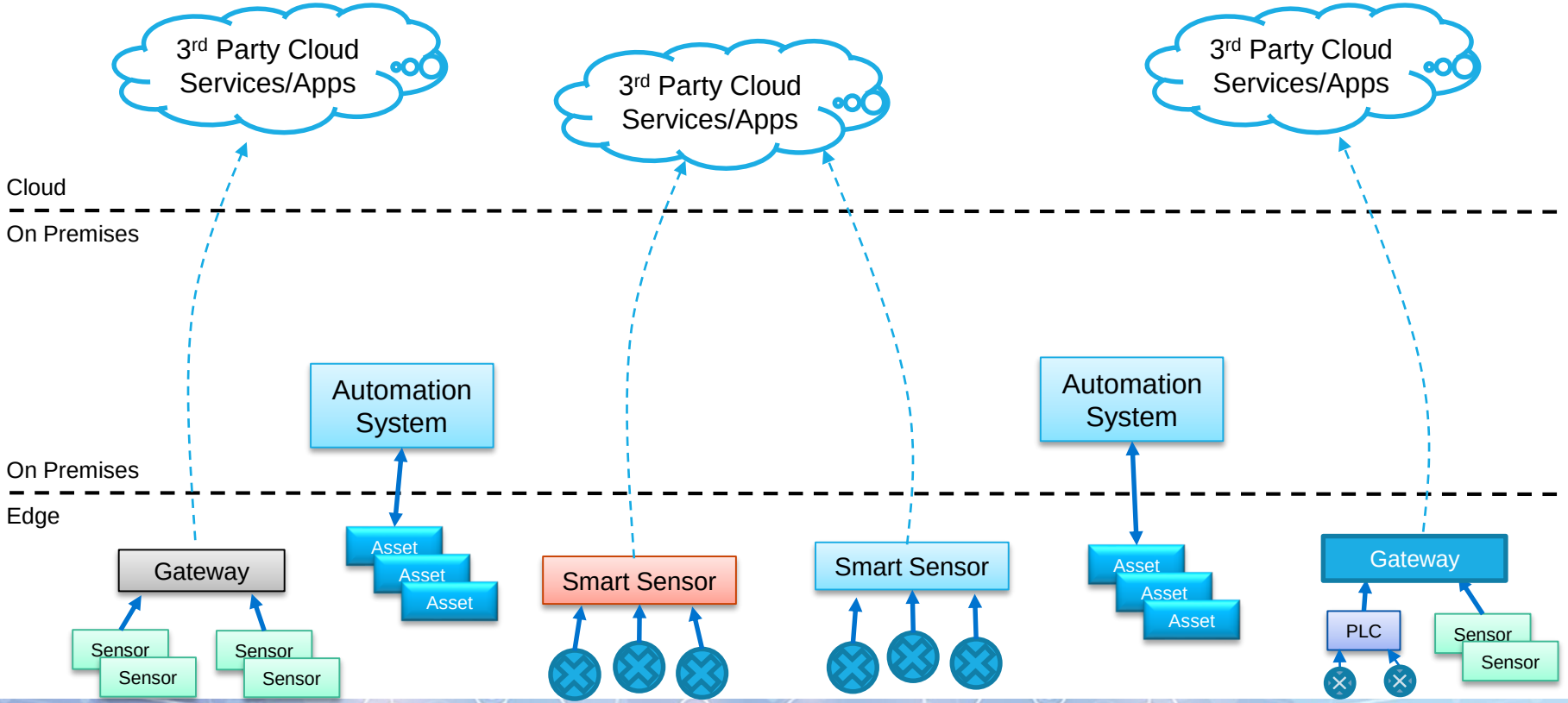
Attempt at an Industrial IoT Architecture…



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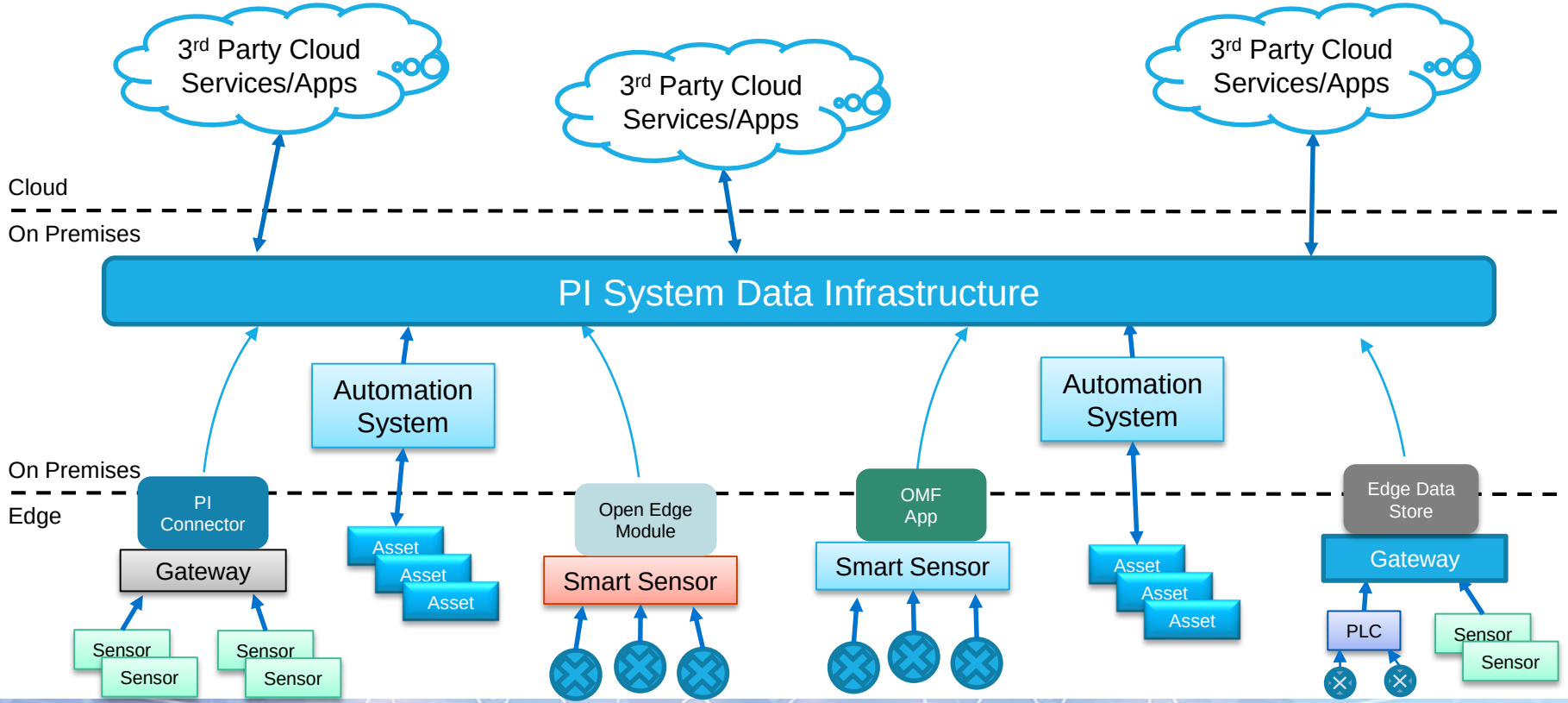
OSIsoft's Industrial IoT Architecture for the Enterprise



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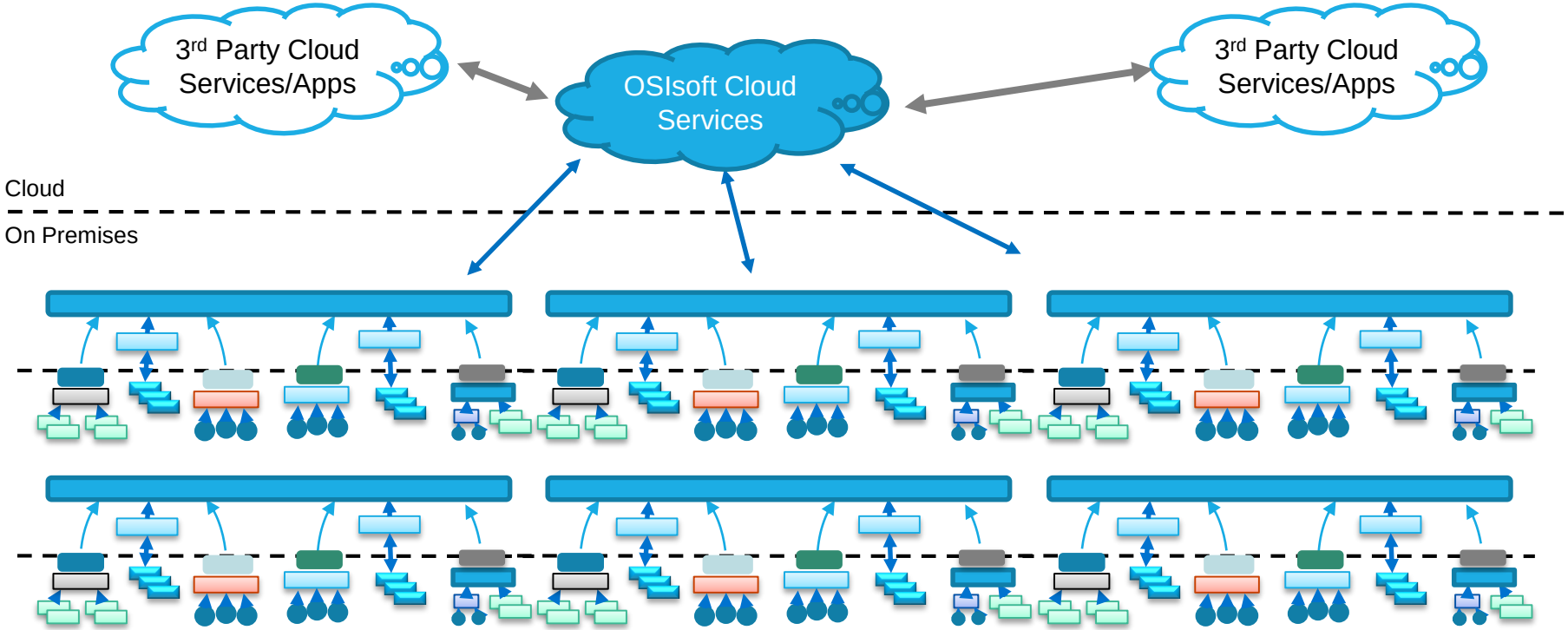
OSIsoft's Industrial IoT Architecture for the Community



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OSIsoft and the Edge

Pervasive Data Collection

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OSIsoft's Pervasive Data Collection Goal

Ensuring that no matter where your operational data resides, there are OSIsoft technologies available to **collect and store that data**

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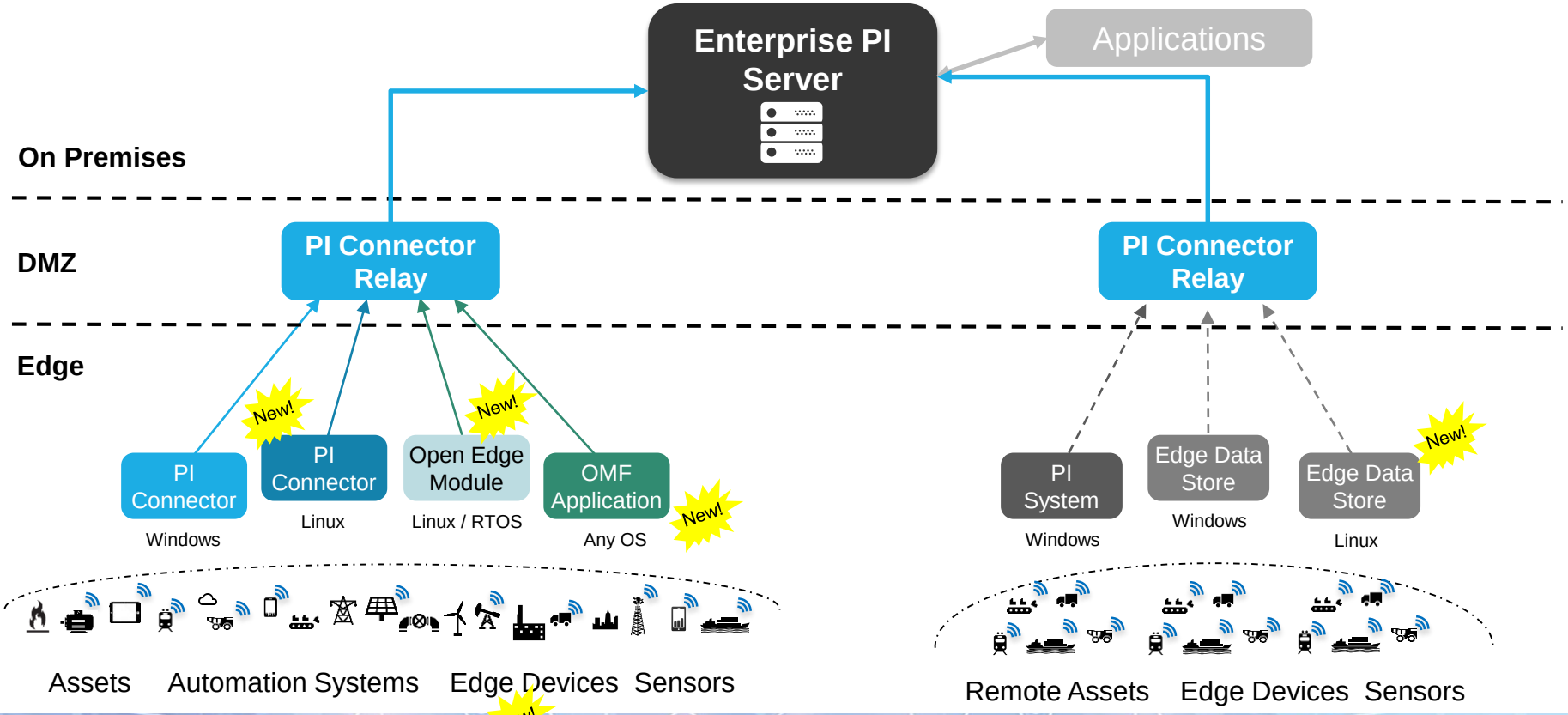
Pervasive Data Collection Architecture: What's New?



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PI Connector Relay Architecture
Enhances Security and Network Flexibility for IIoT Data Patterns

PI Connector

Data Buffer

Data buffering
Data filtering
Data compression

New!

PI Connector Relay

Data Buffer

Data buffering

Enterprise PI Server

X.509 Certificates

PI Server Security (WIS)

Remote Network

DMZ

Corporate Network

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PI Connectors for Linux
Add Connectivity for Remote and Mobile Assets

New!

PI Connector on Linux

Data Buffer

Data buffering
Data filtering
Data compression

PI Connector Relay

Data Buffer

Data buffering

Enterprise PI Server

X.509 Certificates

PI Server Security (WIS)

Remote Network

DMZ

Corporate Network

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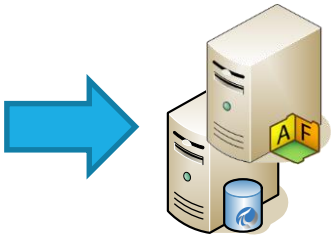
What Can This Look Like?

Example application:
Collecting power data at the edge

Critically important power data from a Modbus device is available at the edge



That data needs to eventually end up in an OSIsoft PI System, but the edge isn't suitable for running a PC

1. Power data is available at the edge, but there aren't any PCs at the edge!
2. The only hardware available at the edge is a Cisco 829 industrial router
3. **Our goal:** run a PI Connector for Modbus at the edge to collect critical power data

Solution: an embedded PI Connector can run directly on the Cisco edge device!

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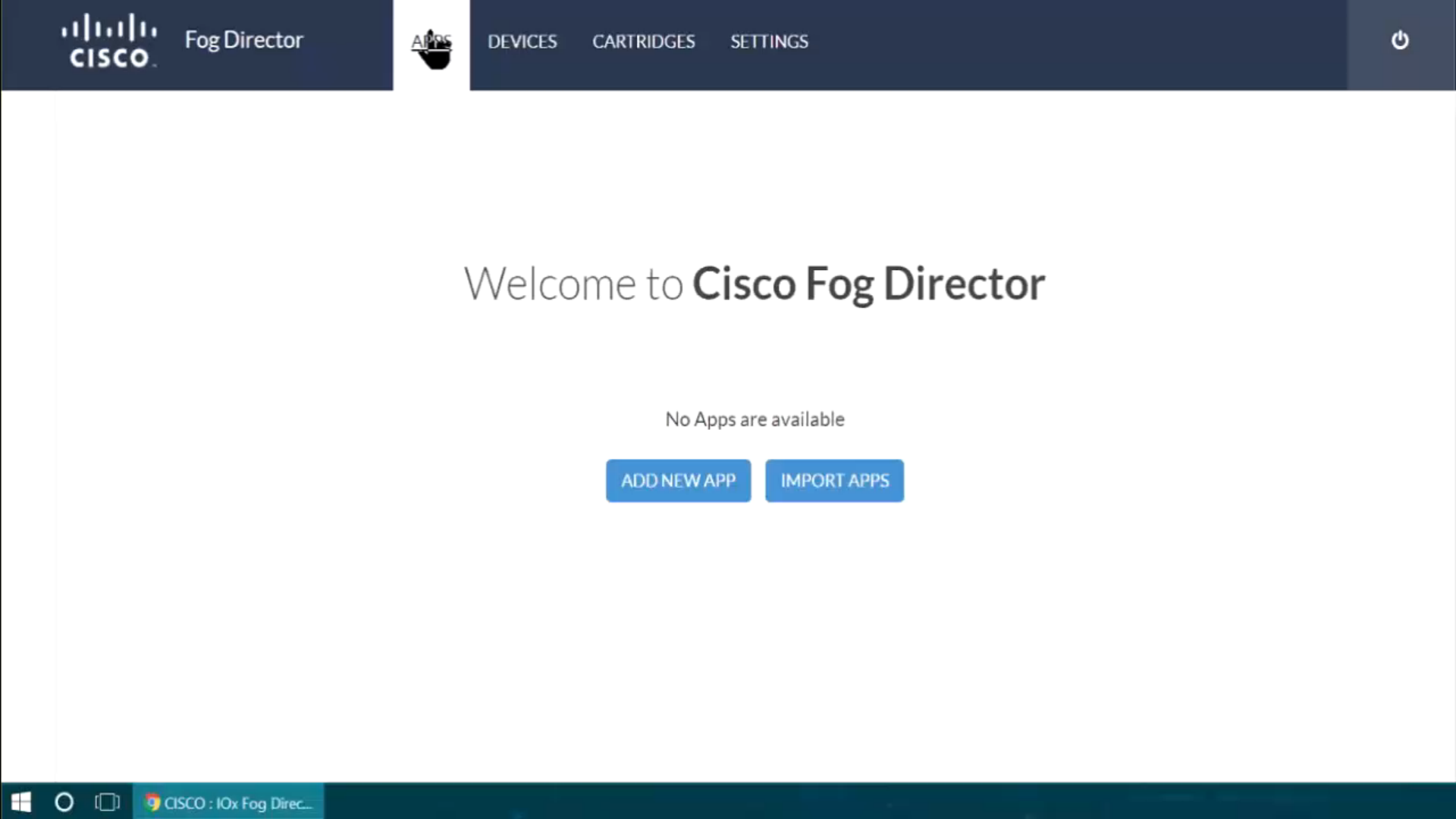
Fog Director
APPS
DEVICES
CARTRIDGES
SETTINGS
Welcome to Cisco Fog Director
No Apps are available
ADD NEW APP
IMPORT APPS
CISCO : IOx Fog Direc...

Edge Data Store:
Built for Purpose Storage, Access and Calculations for Edge Devices

New!

Edge Data Store

PI Connector Relay

Data Buffer

Data buffering

Enterprise PI Server

Data storage
Data access
Calculations
Data filtering
Data compression

X.509 Certificates

PI Server Security (WIS)

Remote Network

DMZ

Corporate Network

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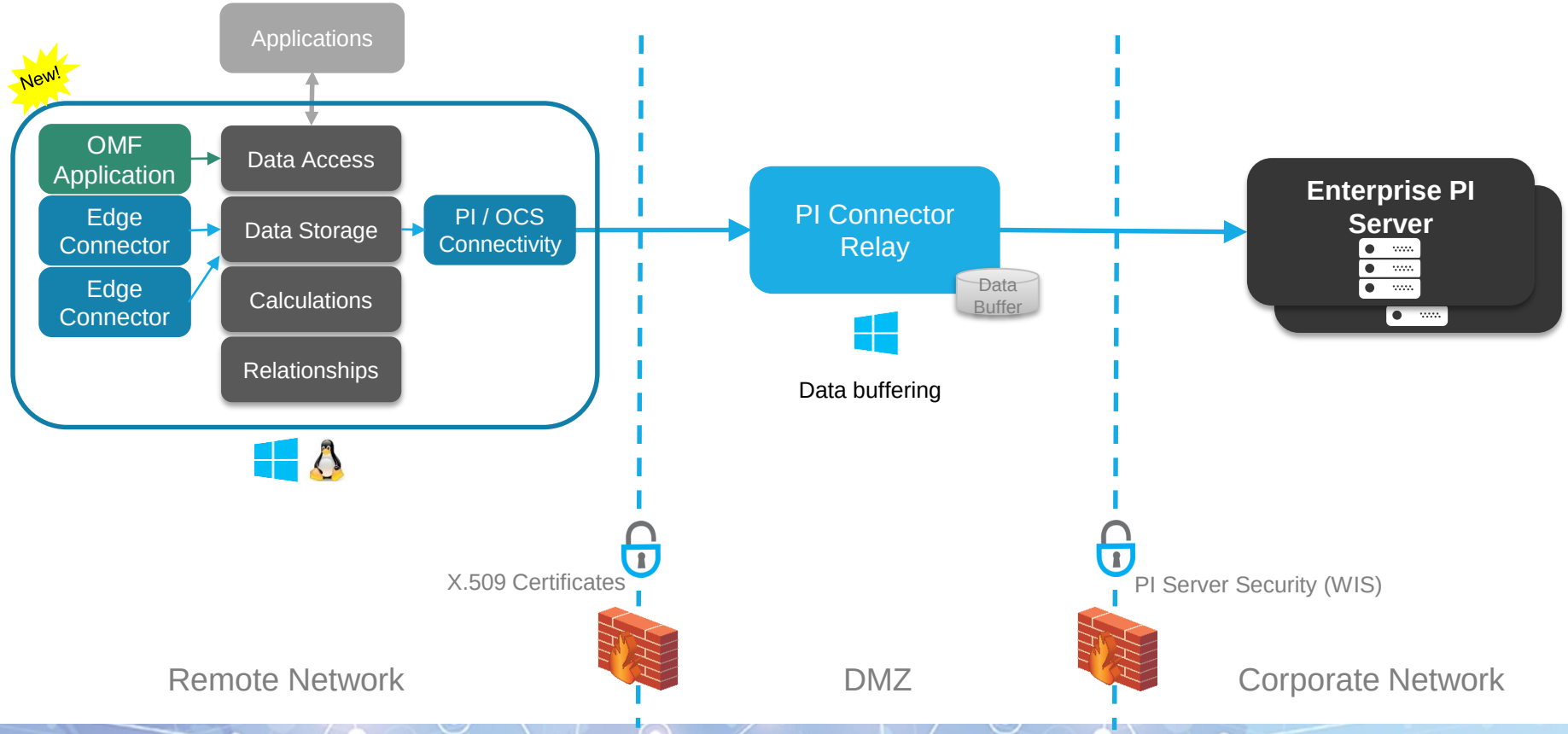
Edge Data Store Components



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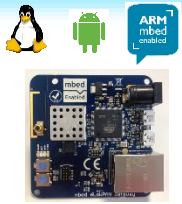
Open Edge Module:
Edge Device Connectivity for the Open Source Developer Community

New!

Open Edge Module

Data Buffer



Input API
Data buffering
OMF Message Generator

SAS Tokens

PI Connector Relay

Data Buffer

Data buffering

Enterprise PI Server

PI Server Security (WIS)

Remote Network

DMZ

Corporate Network

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The OSIsoft Message Format: Application Development Flexibility and Partner Enablement

New!

OMF Application

PI Connector Relay

Data Buffer

Data buffering

Enterprise PI Server

Custom features

SAS Tokens

PI Server Security (WIS)

Remote Network

DMZ

Corporate Network

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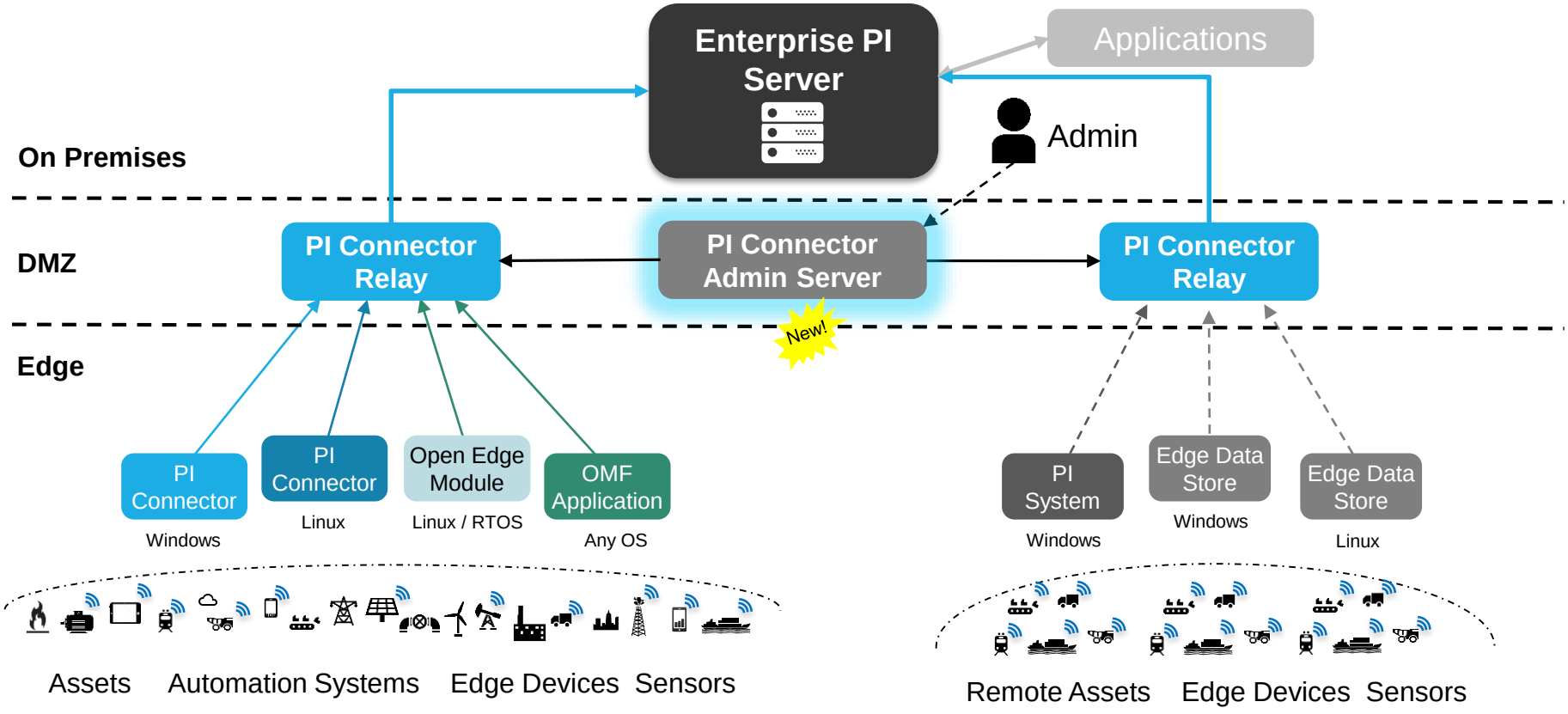
Pervasive Data Collection Management



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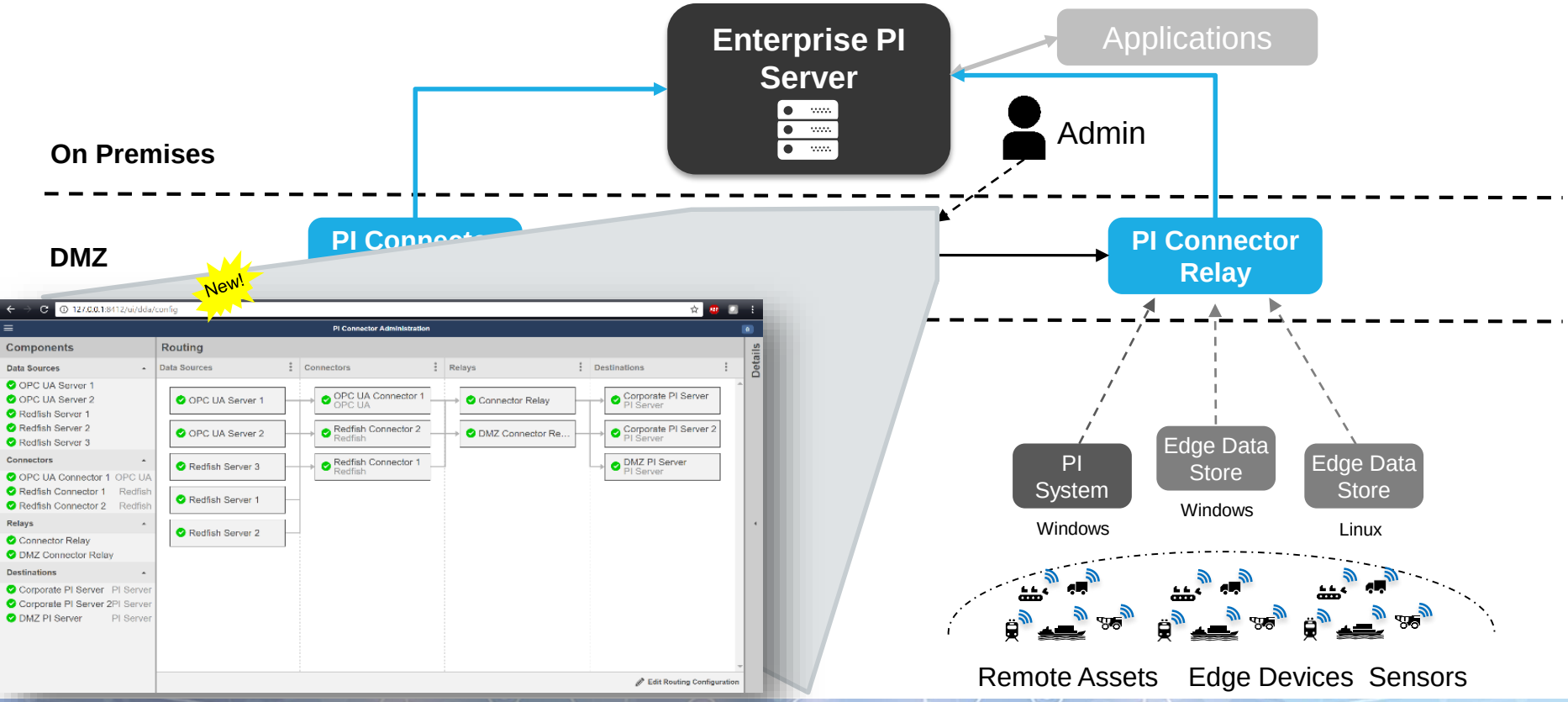
Pervasive Data Collection Management



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Examples of Success at the Edge

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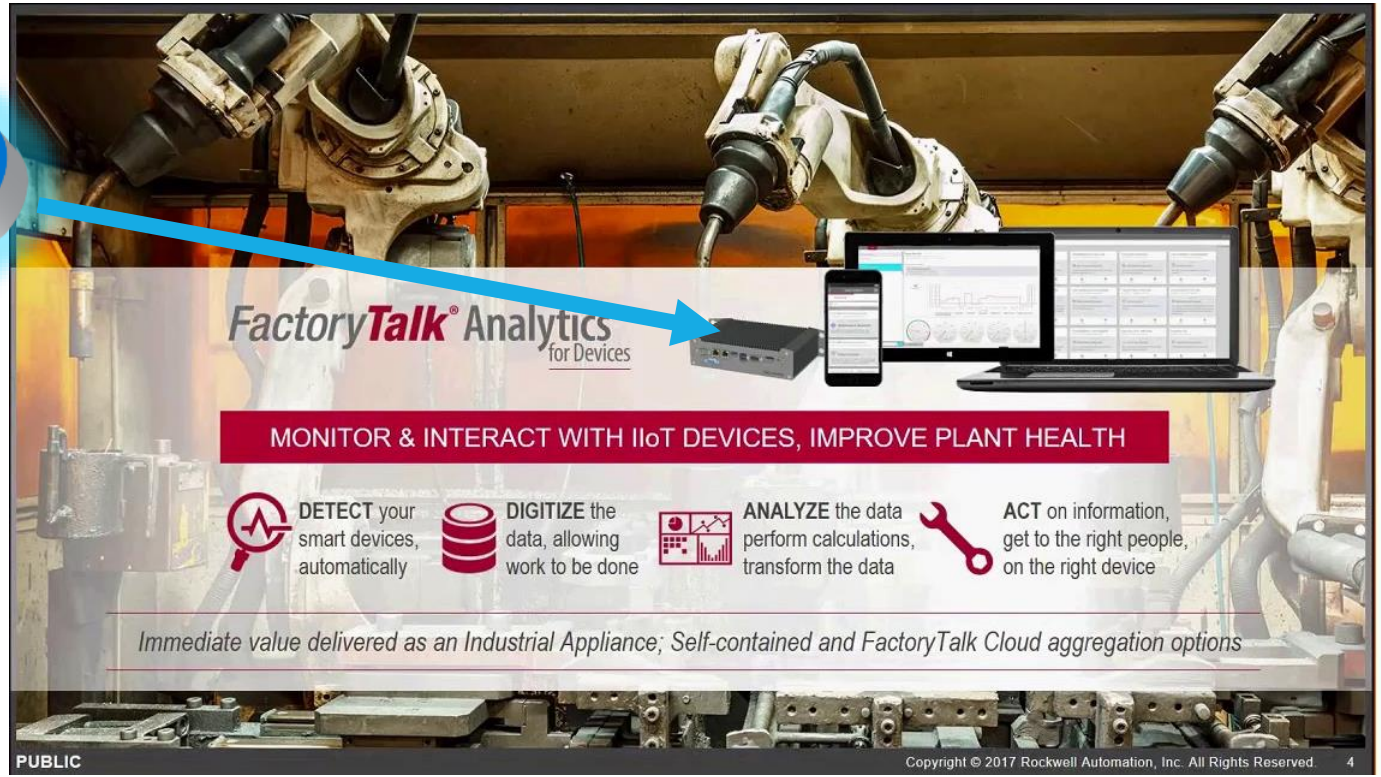
Edge Analytics Appliance Using Embedded OSIsoft Technology



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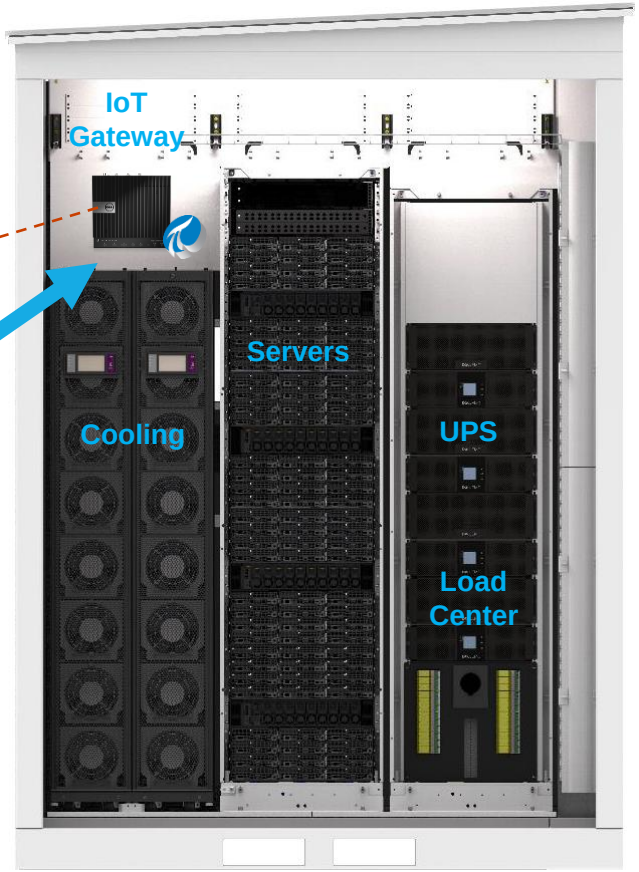
Micro Modular Data Center Monitoring Using Embedded OSIsoft Technology

PI System & PI Connector for Redfish

PI Vision

Azure

PI System Connector



Dell's Micro Modular Data Center Presented at the 2017 SF UC

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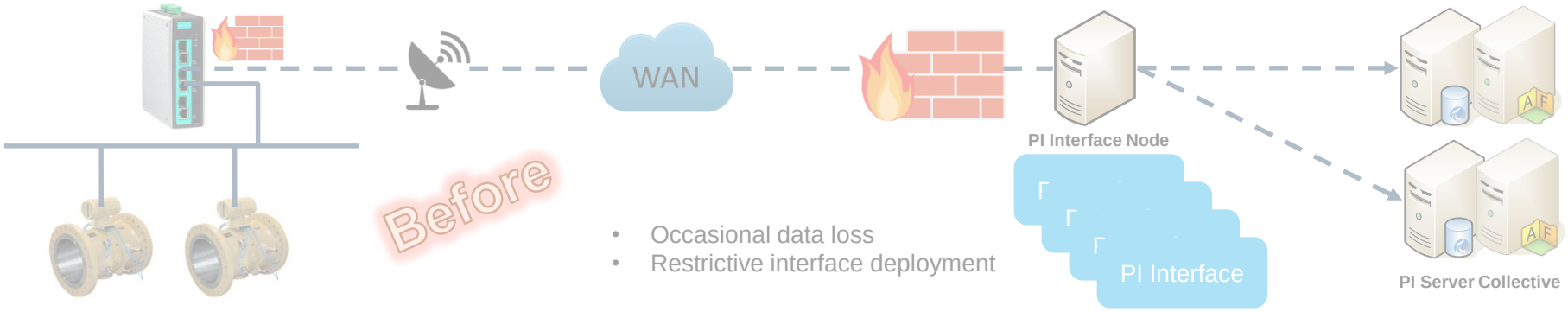
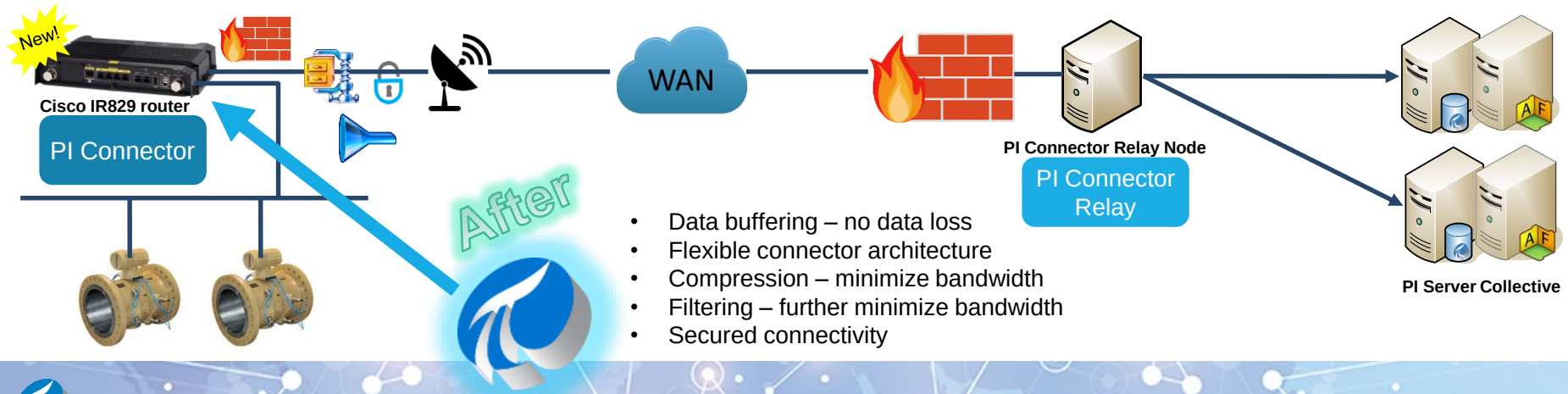
Remote Pipeline Monitoring Using Embedded PI Connectors



- Occasional data loss
- Restrictive interface deployment



- Data buffering – no data loss
- Flexible connector architecture
- Compression – minimize bandwidth
- Filtering – further minimize bandwidth
- Secured connectivity

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The Enterprise-Ready PI System

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Evolution of the PI System

Expand

Increase the **volume** & **velocity** of operations data

Extend

Associate **quality** information with measured values

Ease

PI system tools designed to work across the enterprise

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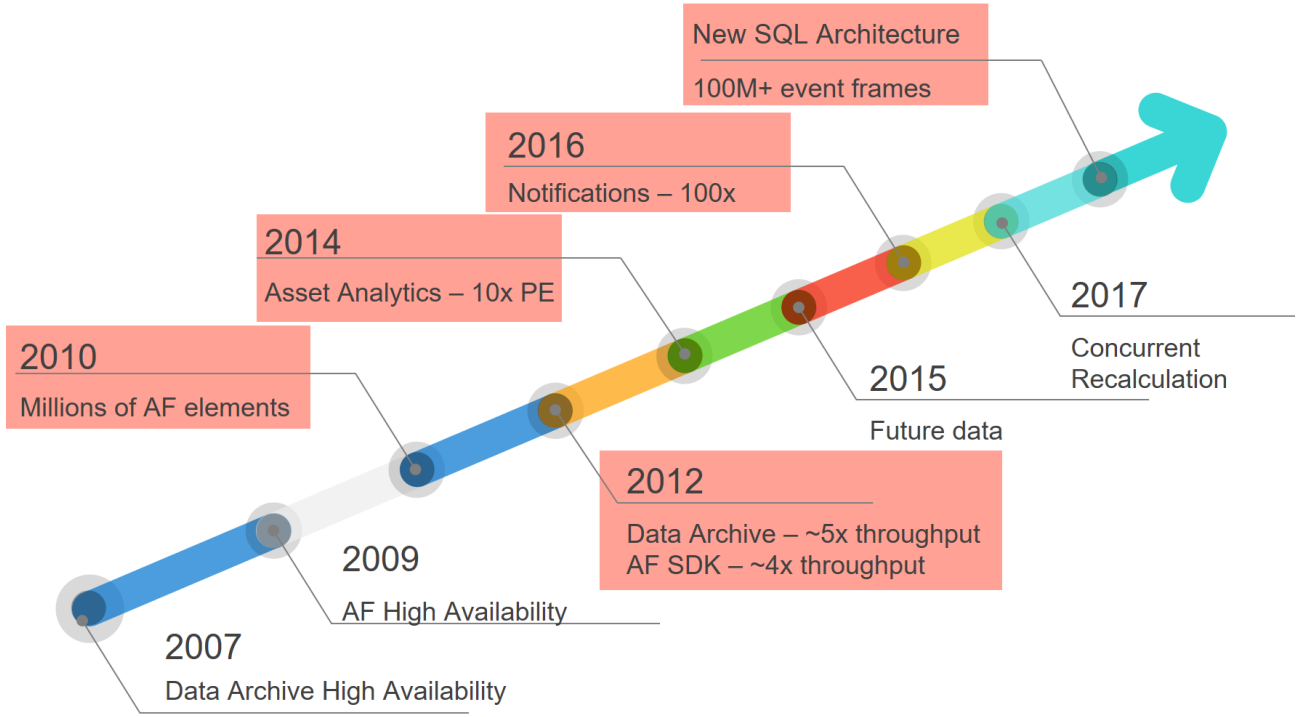
PI System Performance and Scalability

Expand

Increase the **volume** & **velocity** of operations data



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PI System Data Quality Features

Extend

Associate **quality** information with measured values

Data Collection

Collect quality information from source systems

Storage

Natively associate quality information with data

Asset Analytics

Write calculations that take into account quality of inputs

Developer Technologies

Ingress and egress data and quality information via programmatic means

Visualization

Display data with quality information

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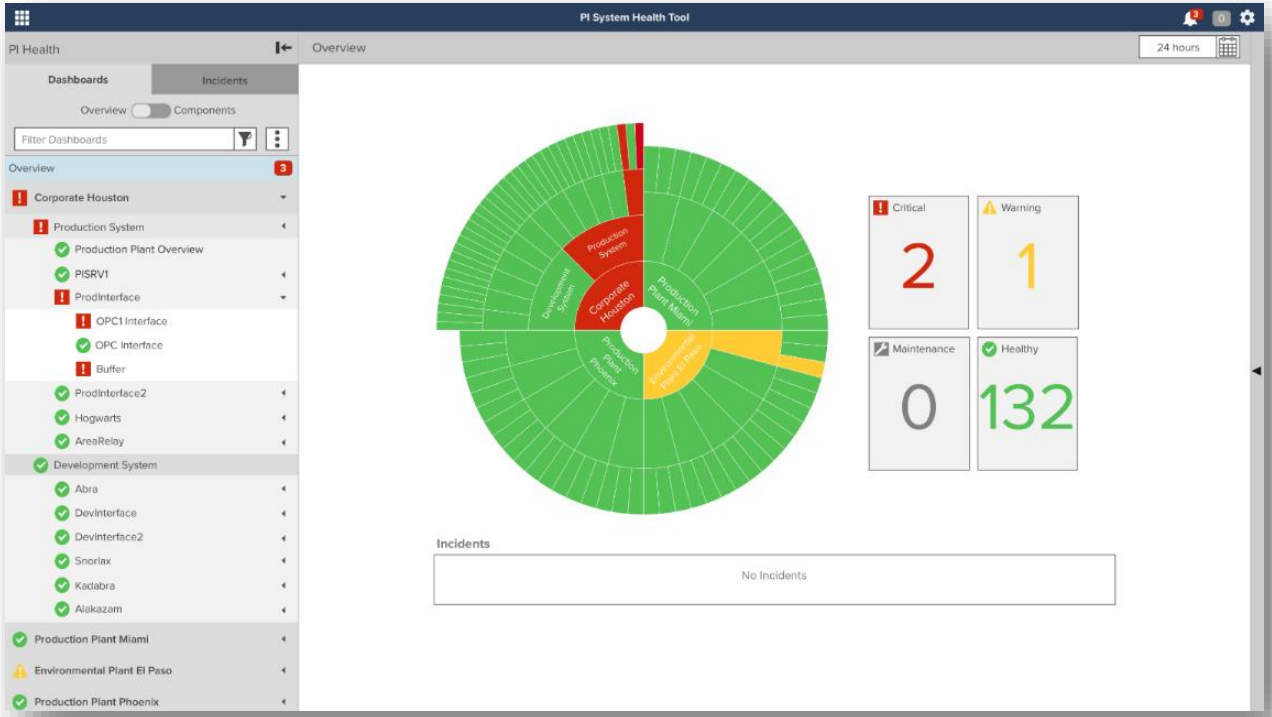
PI System Management and Administration

Ease

PI system tools designed to work across the enterprise



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Application Integrations

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One Vision:

A unified visualization infrastructure to support your diverse needs across the enterprise in a seamless, powerful, extensible environment

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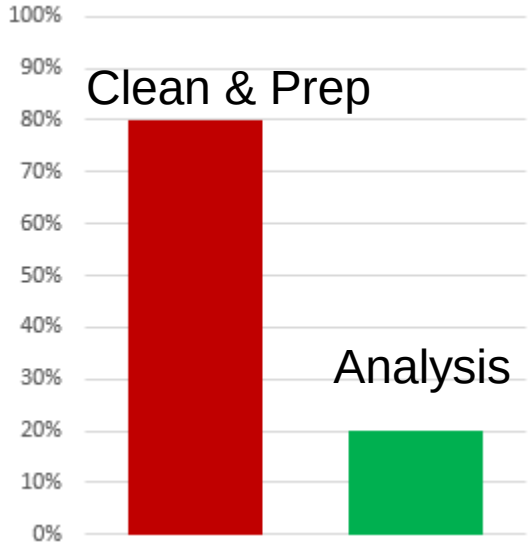
Big Data Projects Are Attractive… But There Are Challenges

64% of large enterprises plan to implement a big data project.
85% will be unsuccessful.



Data cleansing and preparation tasks can take 50-80% of the development time and funds.

Source: Harvard Business Review

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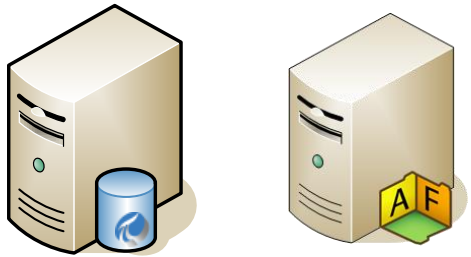
Data Delivery to Analytics Applications via PI Integrators

Source:
the PI System



OSIsoft.

PI Integrators

- Cleanse
- Augment
- Shape
- Transmit

Destination:
Analytics Packages

- Visual Analytics
- Data Warehouses / Lakes
- Streaming Analytics

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PI Integrators for Advanced Analytics

Visual Analytics

Excel

Spotfire® TIBCO Software

SAP BusinessObjects

COGNOS

esri

ORACLE BUSINESS INTELLIGENCE

+ableau SOFTWARE

Power BI

SAP Lumira

QlikView

Data Warehouse / Data Lake

SQL

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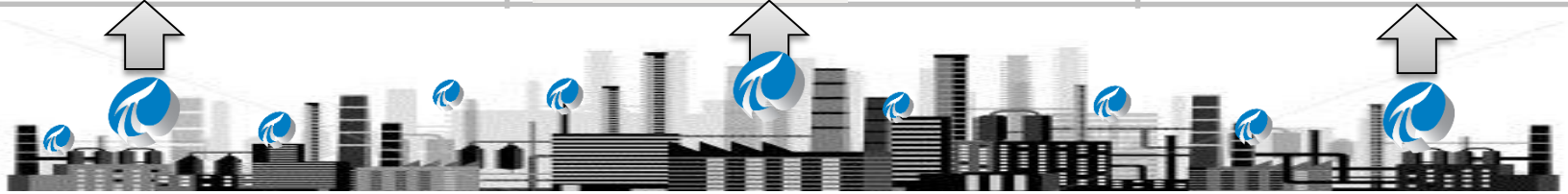
Spark

kafka

SAP®



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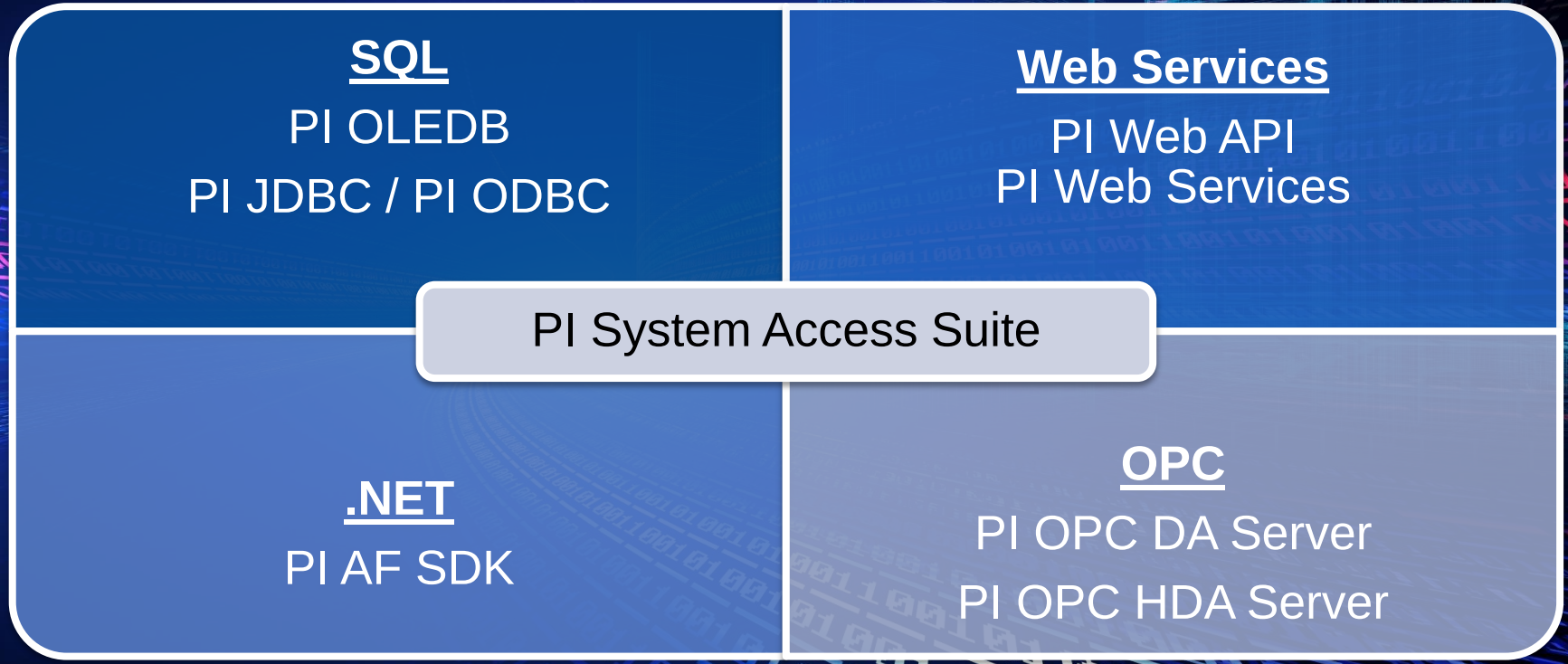
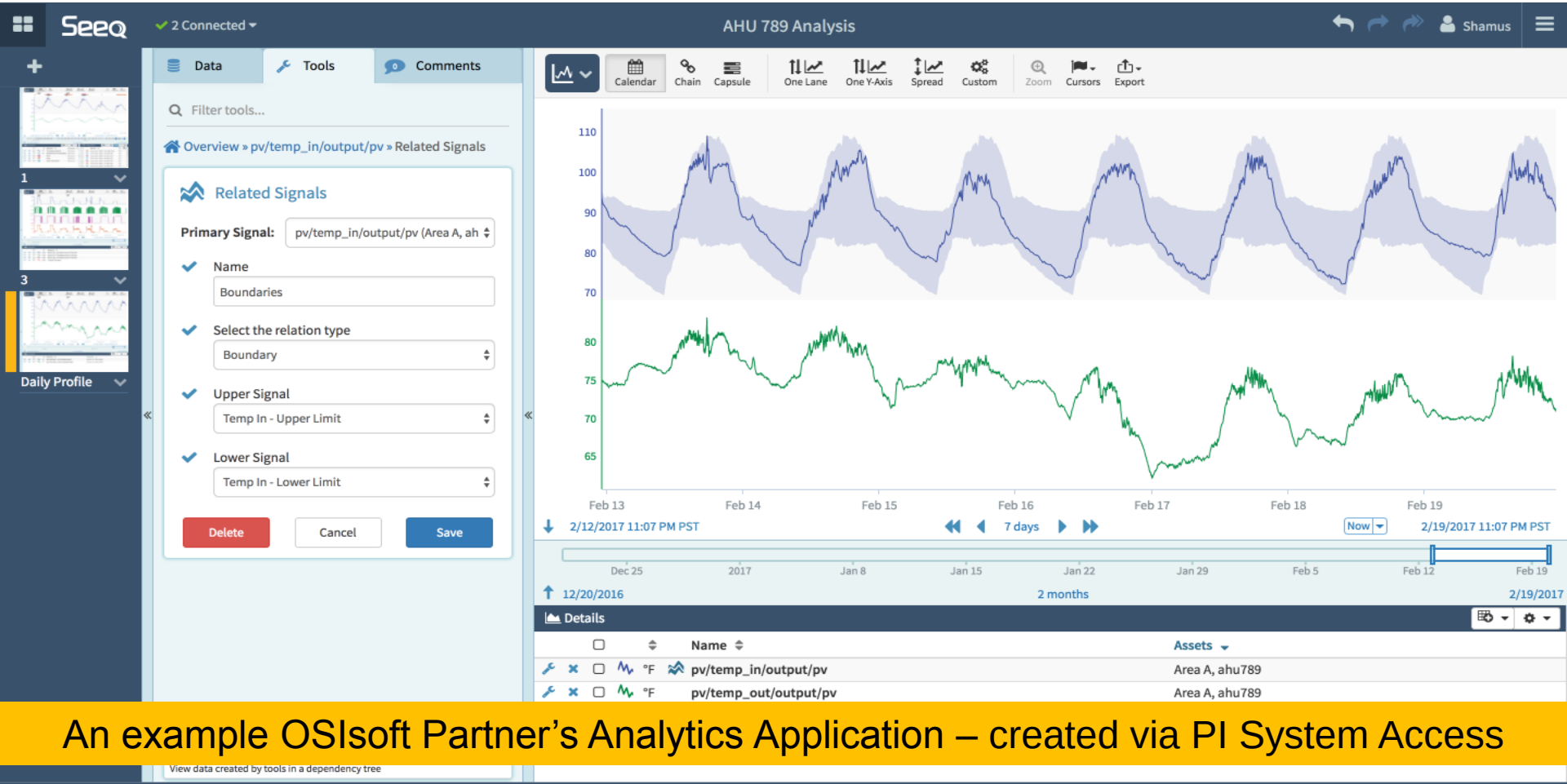
PI System Access Allows Everything Else!





An example OSIsoft Partner's Analytics Application – created via PI System Access

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OSIsoft and the Cloud

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The Four Components of OSIsoft's Cloud Strategy

Offer hosting services for the PI System

Deliver native, complementary cloud services

Integrate with other cloud platforms

Make the PI System more serviceable

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OSIsoft Cloud Services Overview

OSIsoft Cloud Services

- A secure, distributed, multi-tenant platform
- Maintained & Managed by OSIsoft
- Developed on Microsoft Azure
- Complementary to on-premises PI Systems

Microsoft Azure

- ➢ Easily share your PI data
- ➢ Leverage new technologies (Big Data, ML…)

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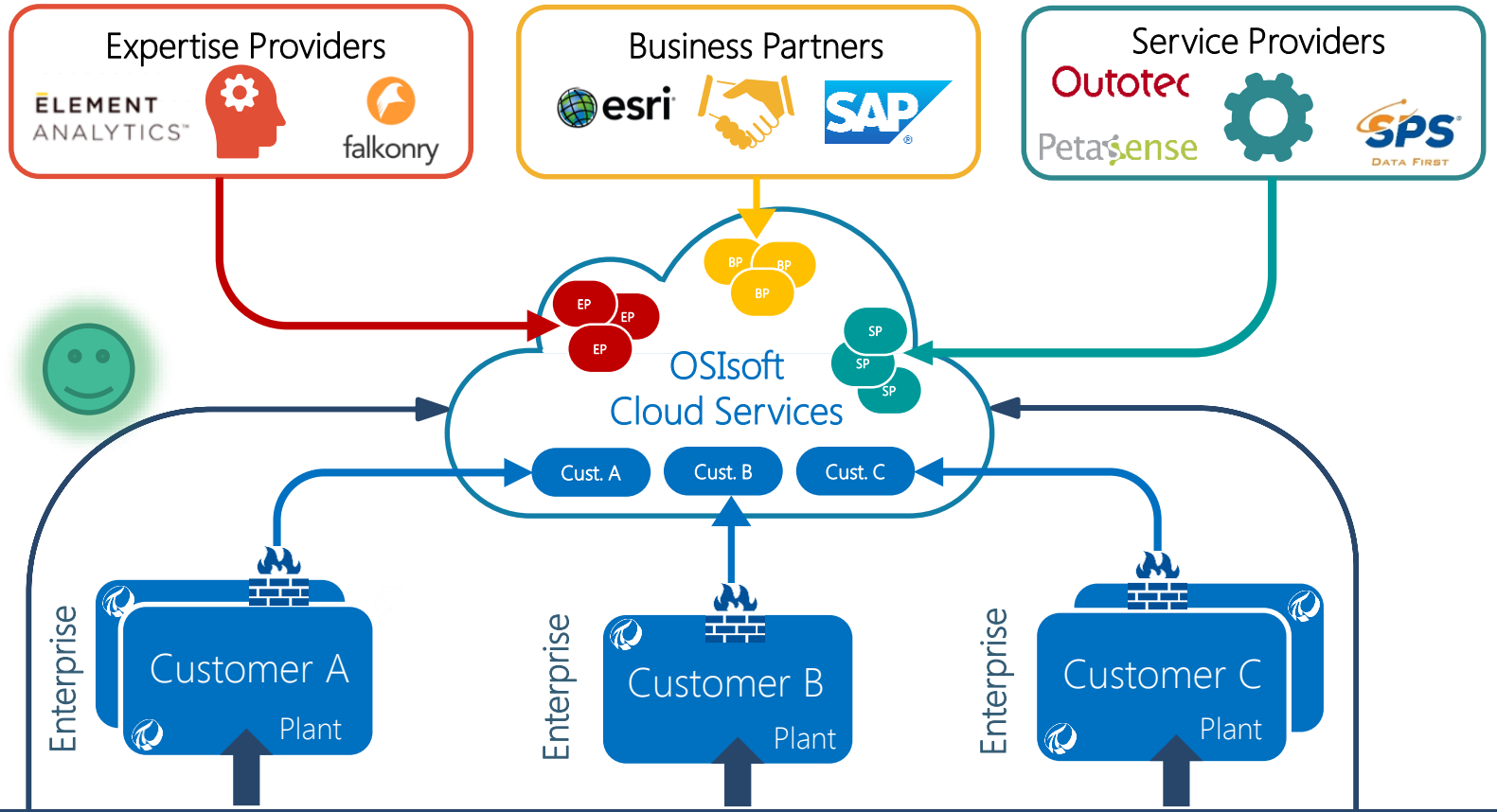
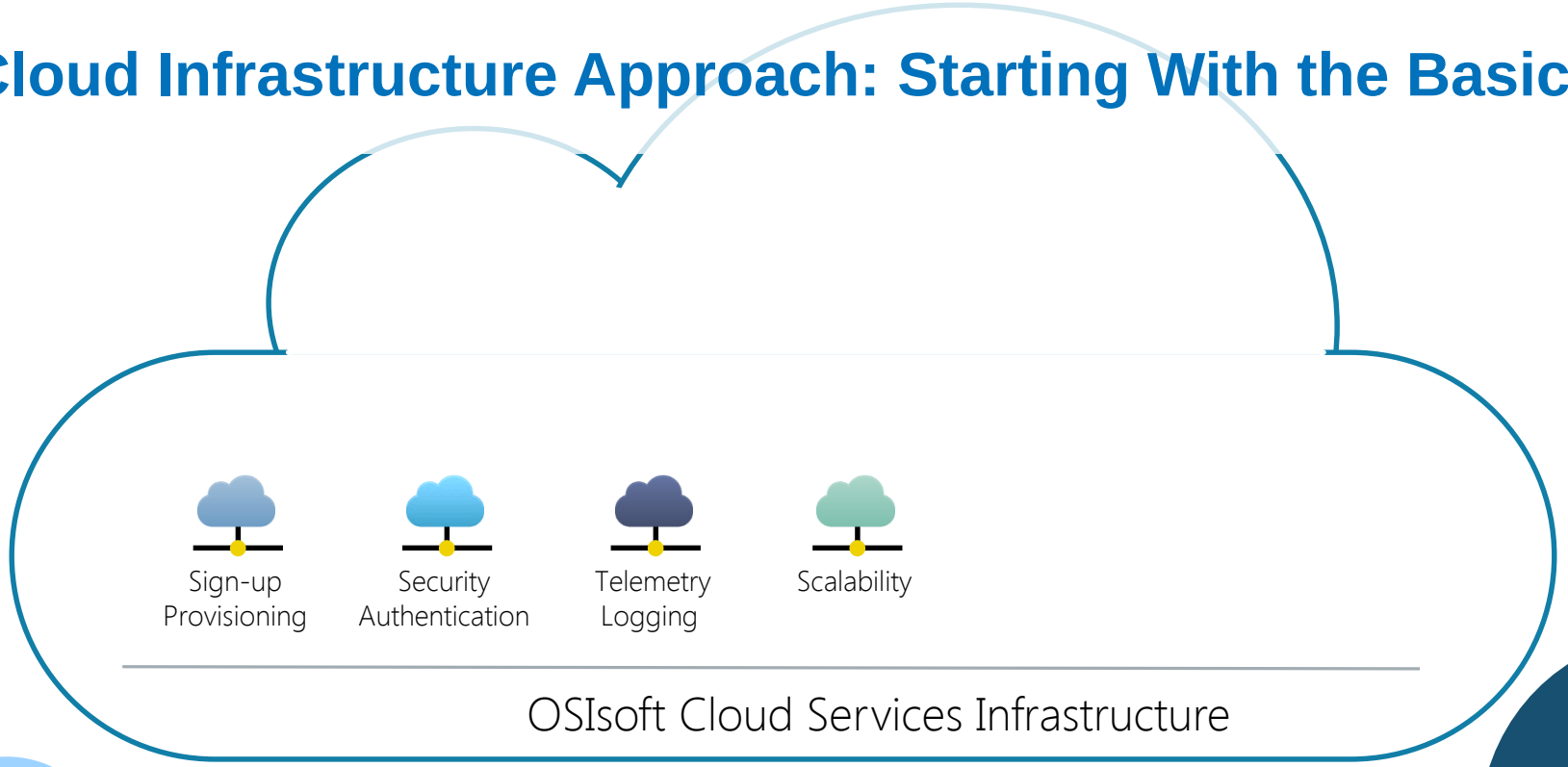
Our Goal: Connectivity!



- Process Equipment
- Control Hardware
- IT Hardware
- Other Operational Data
  - Facilities
  - Logistics

A Cloud Infrastructure Approach: Starting With the Basics



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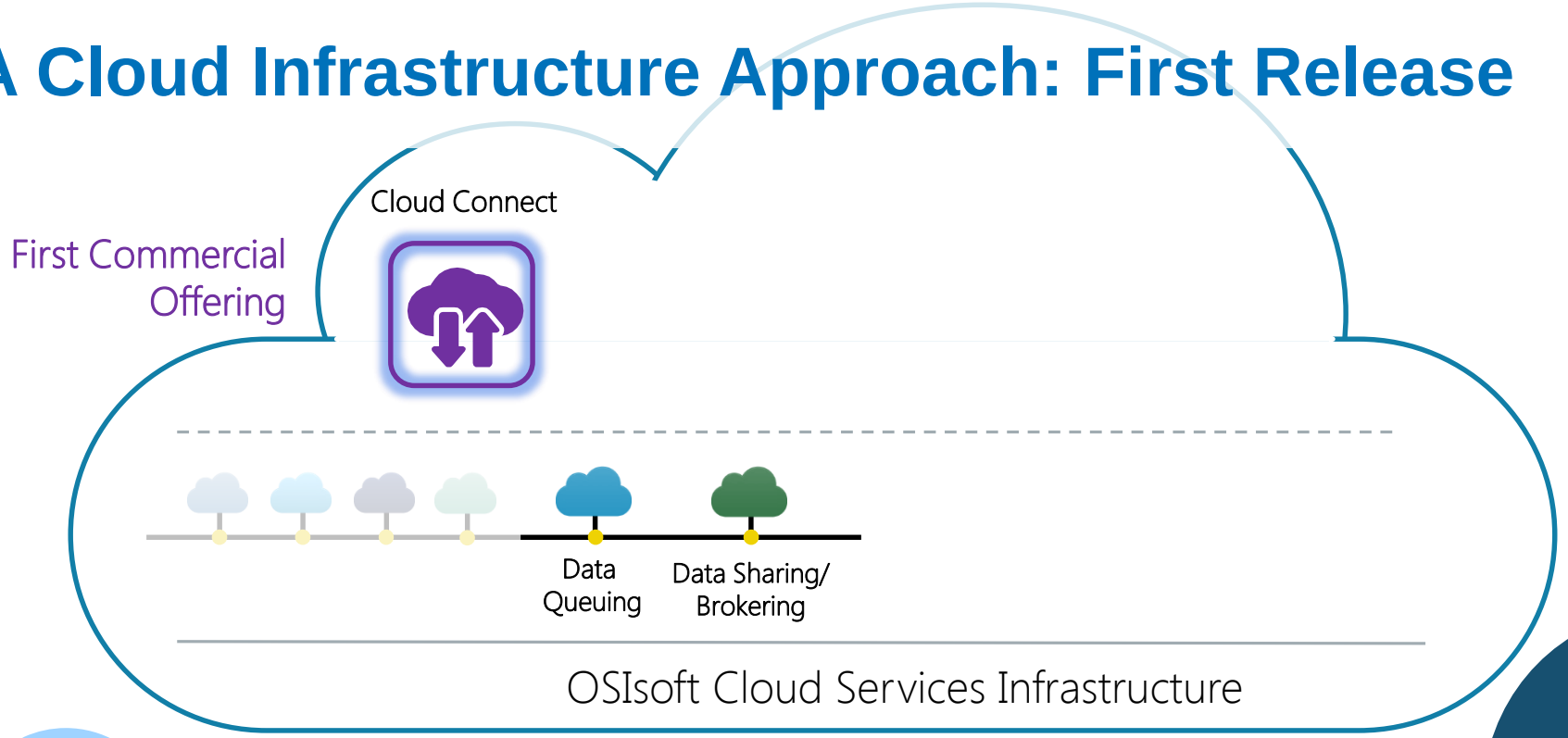
A Cloud Infrastructure Approach: First Release



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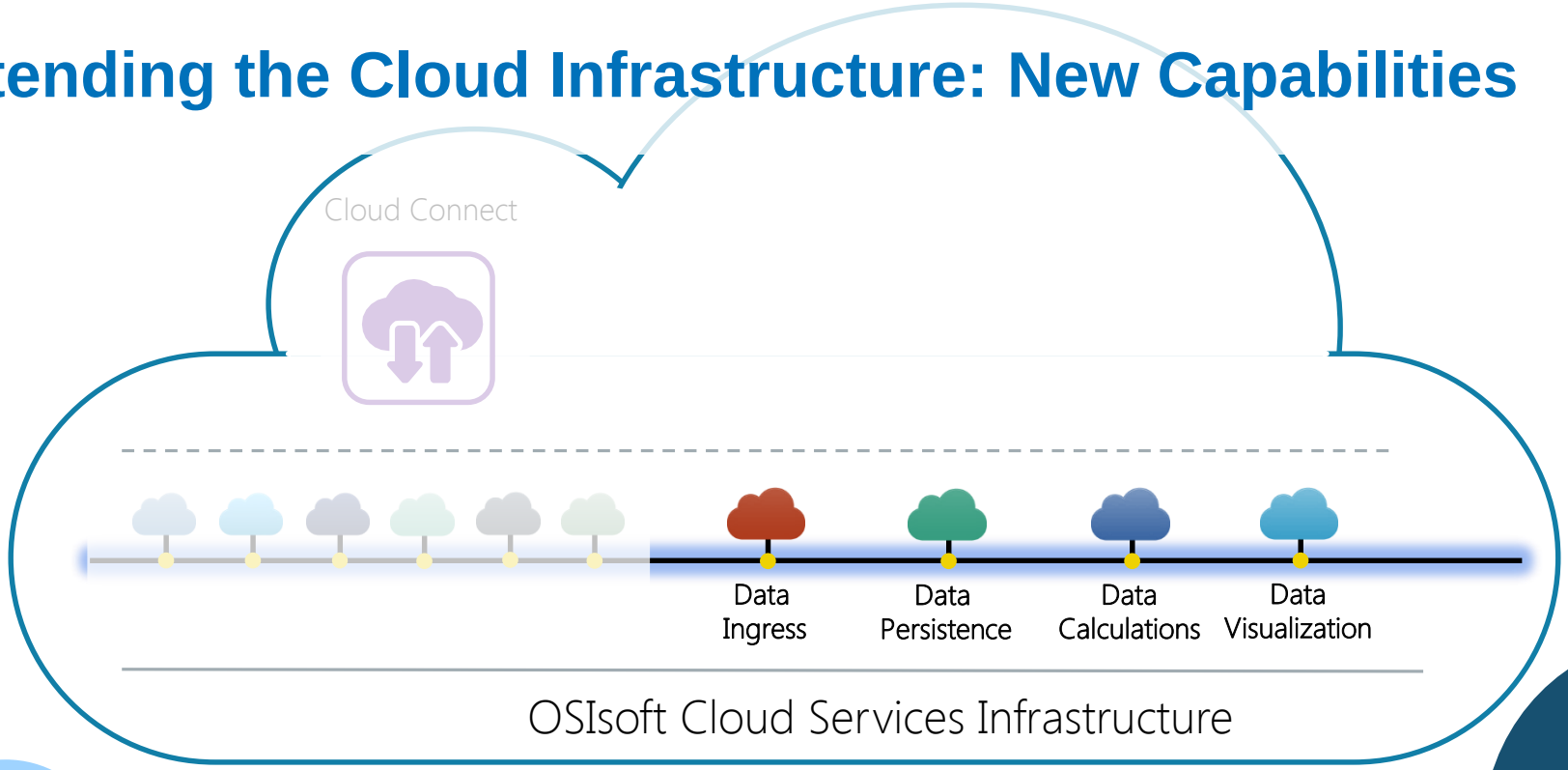
Extending the Cloud Infrastructure: New Capabilities



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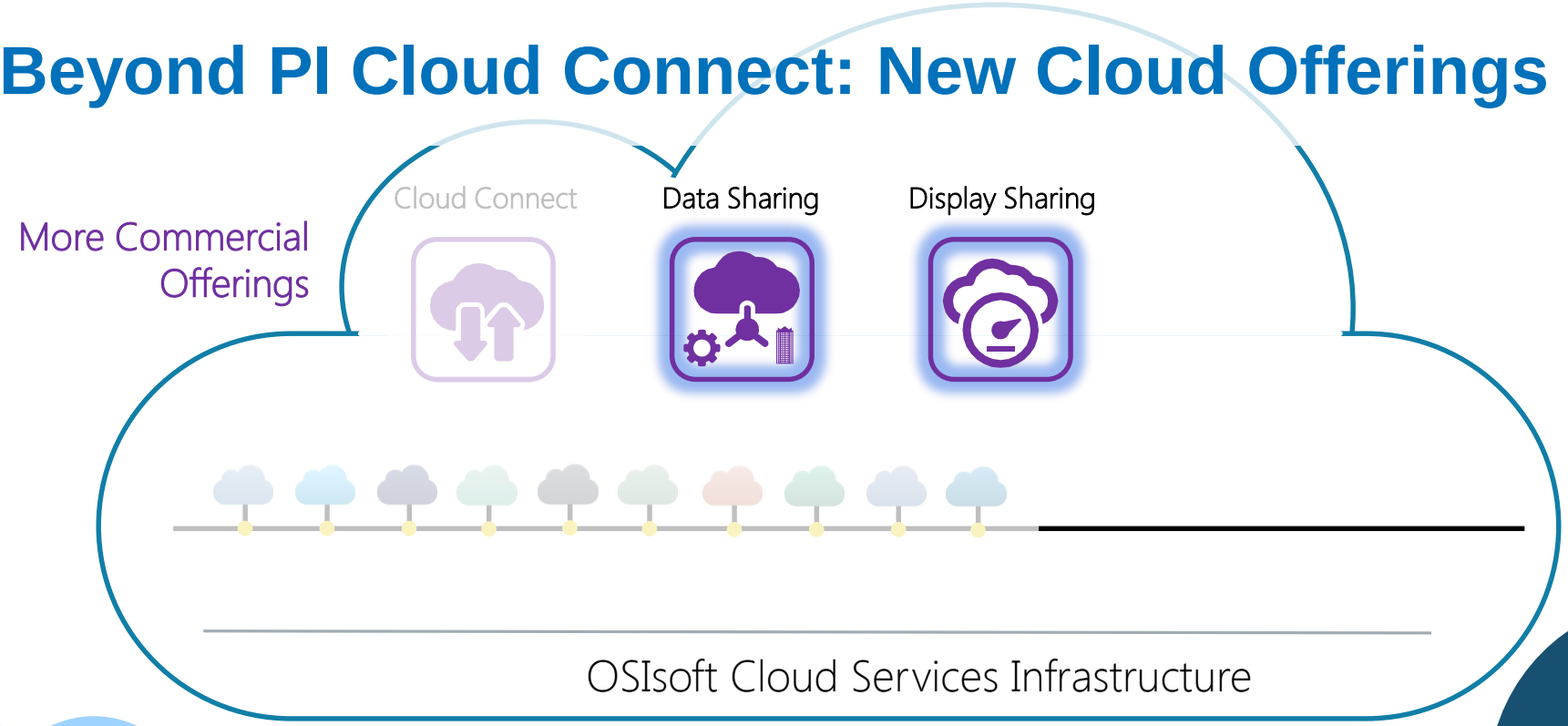
Beyond PI Cloud Connect: New Cloud Offerings



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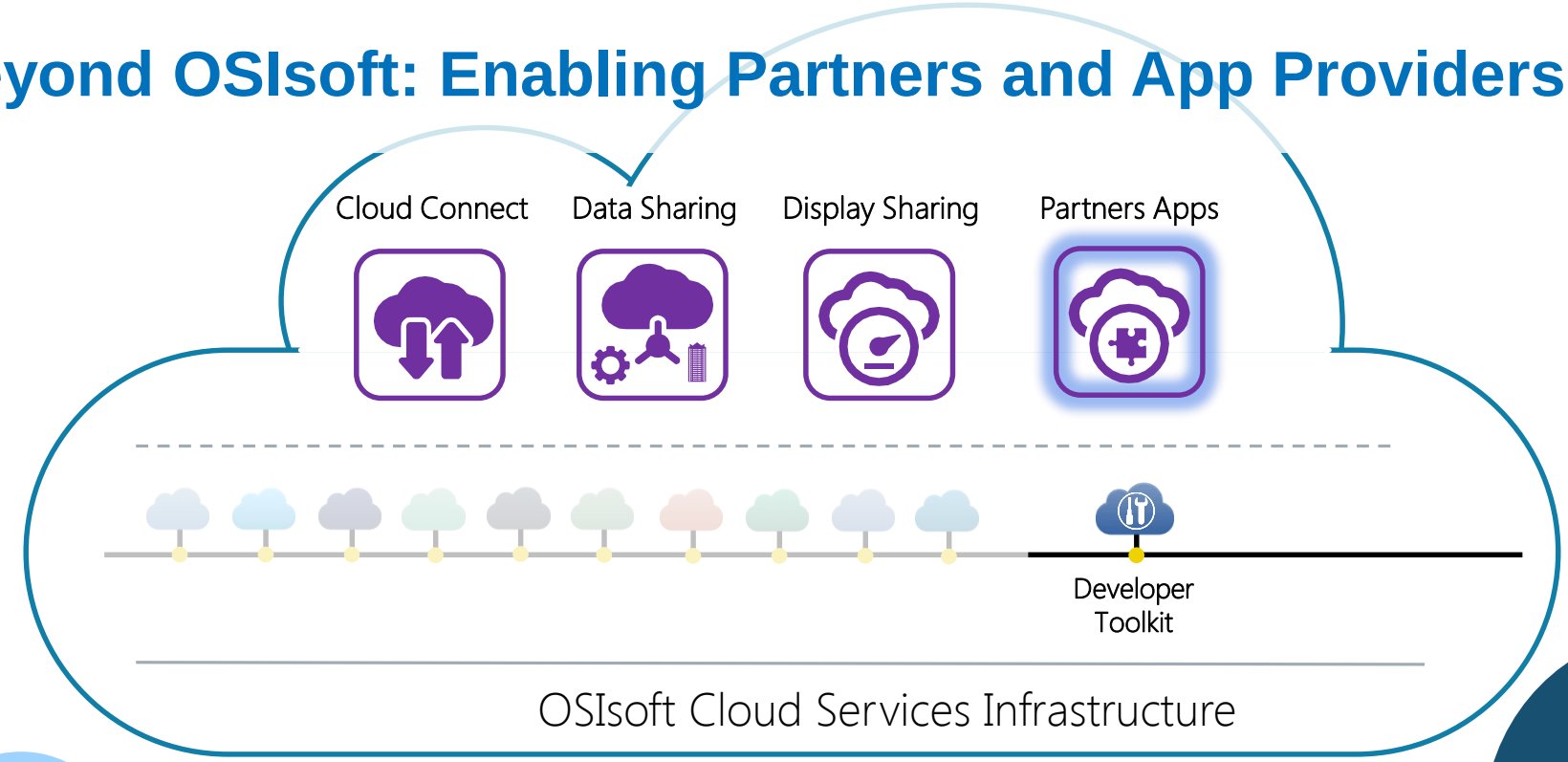
Beyond OSIsoft: Enabling Partners and App Providers



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Cloud Strategy Summary

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Our Goal: Connectivity!

Expertise Providers

ELEMENT ANALYTICS

falkonry

Business Partners

esri

SAP

Service Providers

Outotec

Petasense

SPS Data First

Enterprise

Customer A

Plant

Enterprise

Customer B

Plant

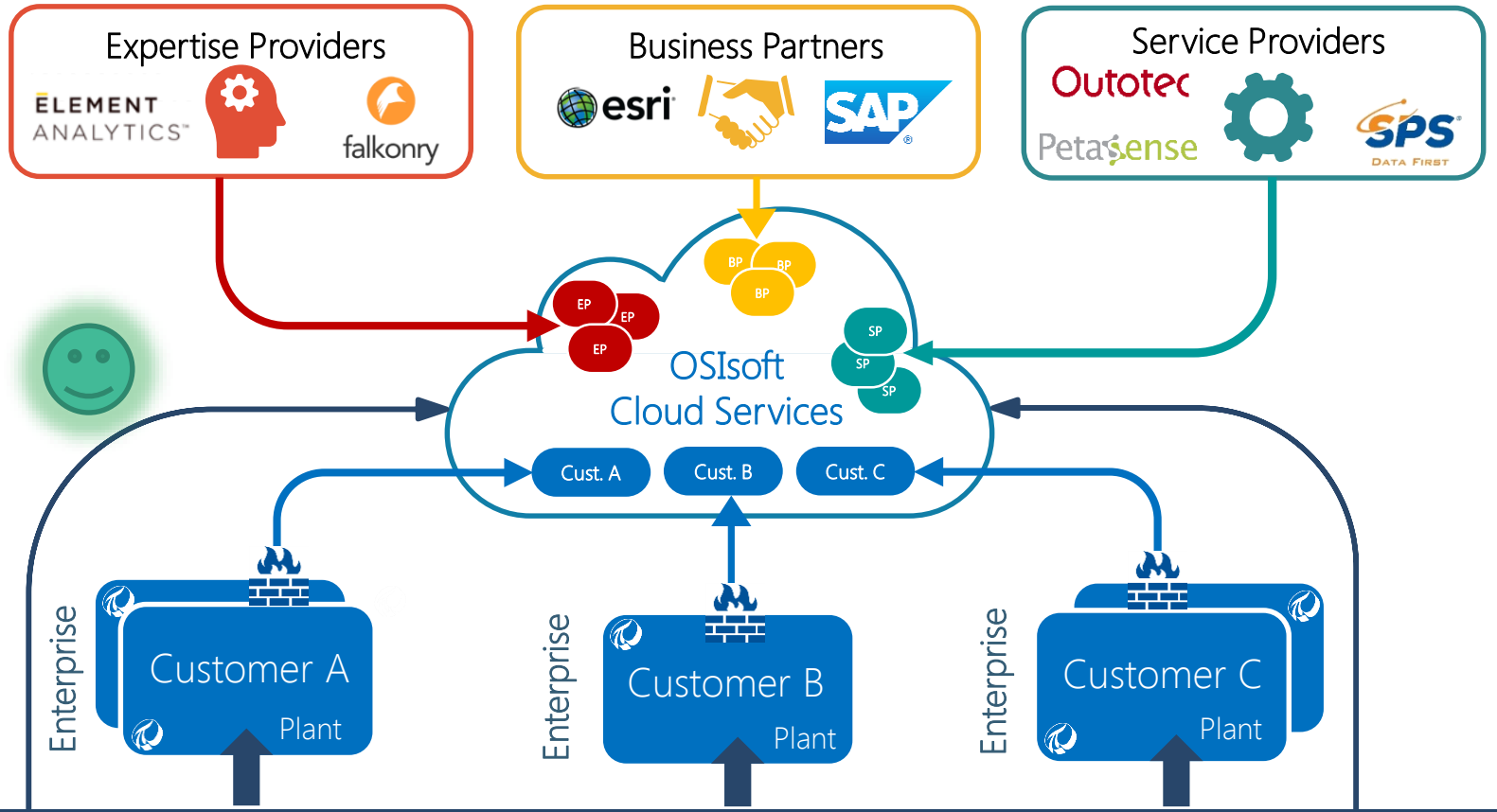
Enterprise

Customer C

Plant

- Process Equipment
- Control Hardware
- IT Hardware
- Other Operational Data
  - Facilities
  - Logistics

Our Goal: Connectivity!



- Process Equipment
- Control Hardware
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What Next?

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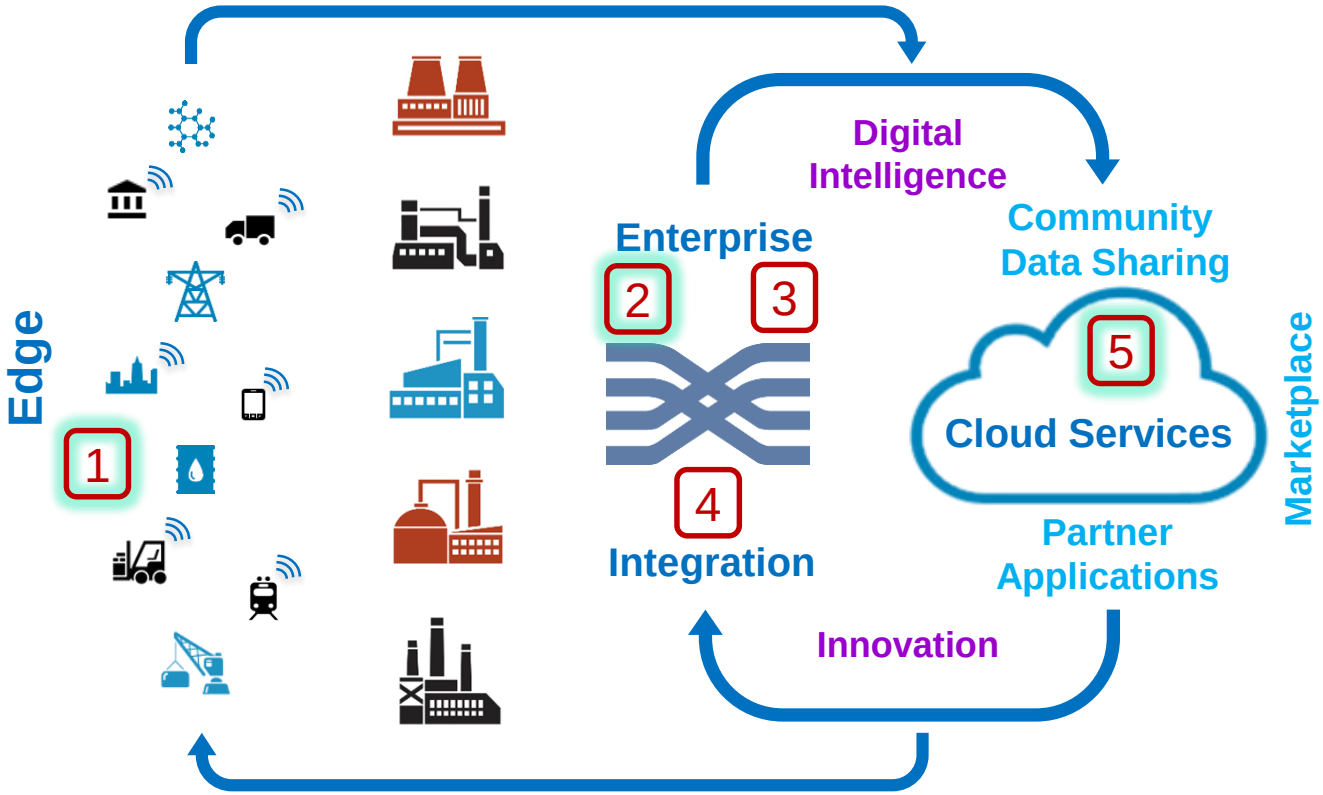
These Are But A Few of Our Developers' Areas of Focus!



1. Accessibility of all operations data
2. Supporting the largest deployments
3. PI Vision
4. Supporting fleet-wide big data questions & queries
5. OSIsoft Cloud Services

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Do you have an idea for how we should develop and improve our products?

OSIsoft wants to hear from you!

https://feedback.osisoft.com/

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What To Do With Your Questions Now?

Visit our engineers at the product pods!

Continue your discussions with your peers during lunch and the networking reception!

Ask questions to your presenter!

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Questions

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

State your **name & company**

Please remember to…

Complete the Post-Event Survey

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감사합니다

谢谢

Danke

Merci

Gracias

Thank You

ありがとう

Спасибо

Obrigado

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