

# OSIsoft Technologies for the Industrial IoT and Industry 4.0

Chris Felts, Sr. Product Manager

Houston Regional Seminar, October 4, 2017



# Introduction

# Industry 4.0

Industry 1.0



1

End of 18<sup>th</sup> century

Use of water and steam power to run mechanical production facilities

Industry 2.0



2

Beginning of 20<sup>th</sup> century

Use of electrical power to enable work-sharing mass production

Industry 3.0



3

Early 1970s

Use of electronics and IT to automate production

Industry 4.0

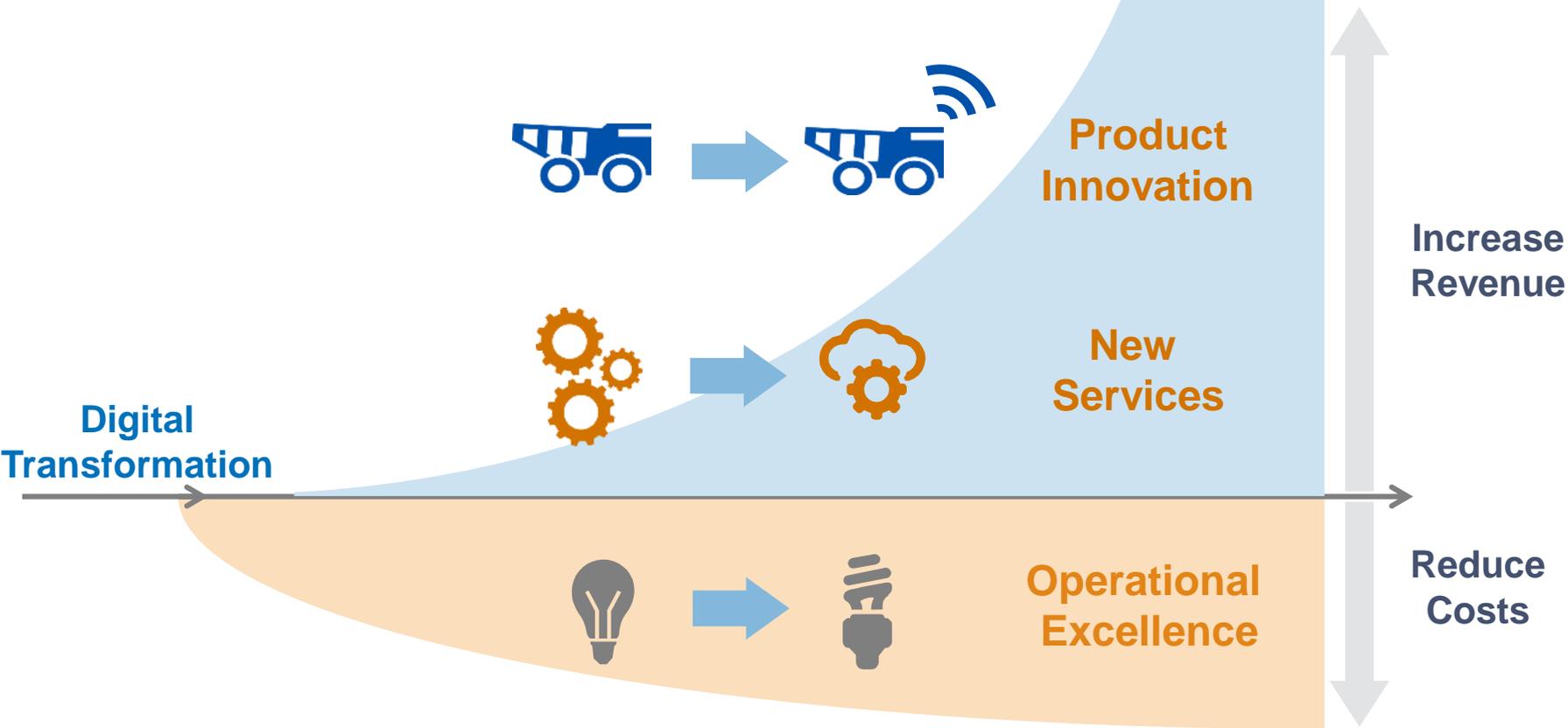


Today

Use of cyber-physical systems to monitor, analyze, and automate business

Source: [www.saphanatutorial.com](http://www.saphanatutorial.com)

# Industry 4.0 Drives Digital Transformation



# OSISOFT'S 8 ENABLERS 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 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

Boston Consulting Group (BCG)

<http://www.consultancy.uk/news/2099/bcg-industry-40-to-lift-manufacturing-to-new-levels>

# Smart Manufacturing Leadership Coalition

“**Smart Manufacturing (SM)** is integrating network-based data and information that comprises the real-time understanding, reasoning, planning and management of all aspects of a manufacturing and supply chain enterprise.”

...

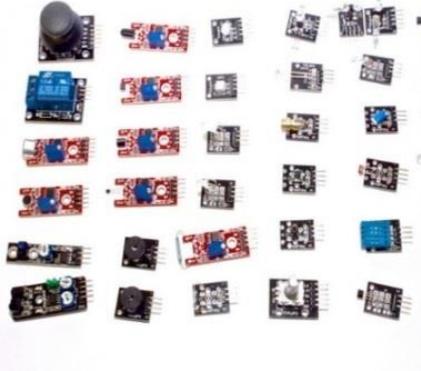
“The goal is to build a cloud-based, open-architecture platform that integrates existing and future plant level data, simulations and systems across manufacturing seams and orchestrate business real time action.”

Source: SMLC Membership Information Brochure

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

# What's Driving the Industrial IoT?

↓ \$  
↑ Quantity



Sensors

↓ \$  
↑ Capability



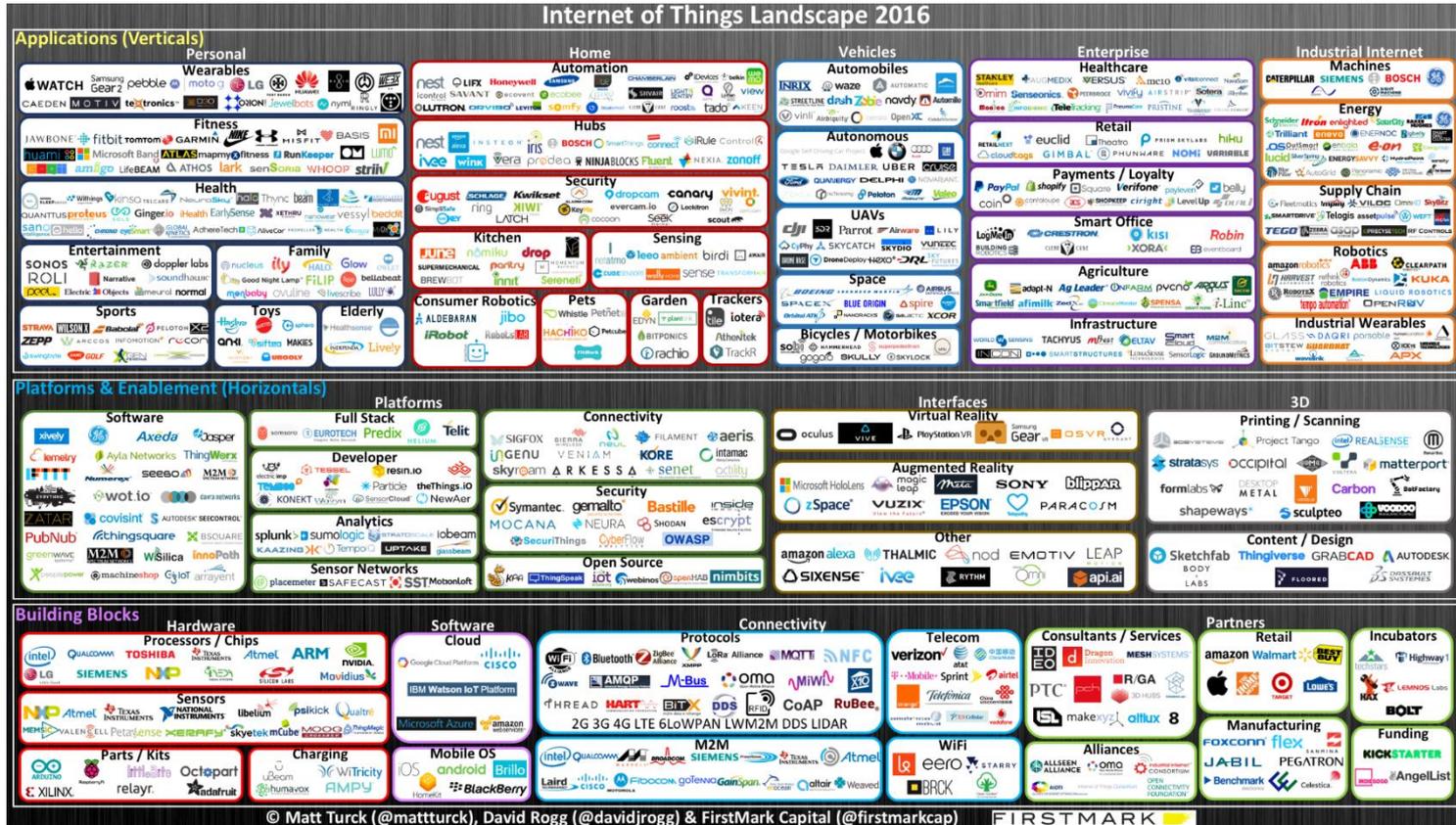
Hardware

↓ \$  
↑ Availability

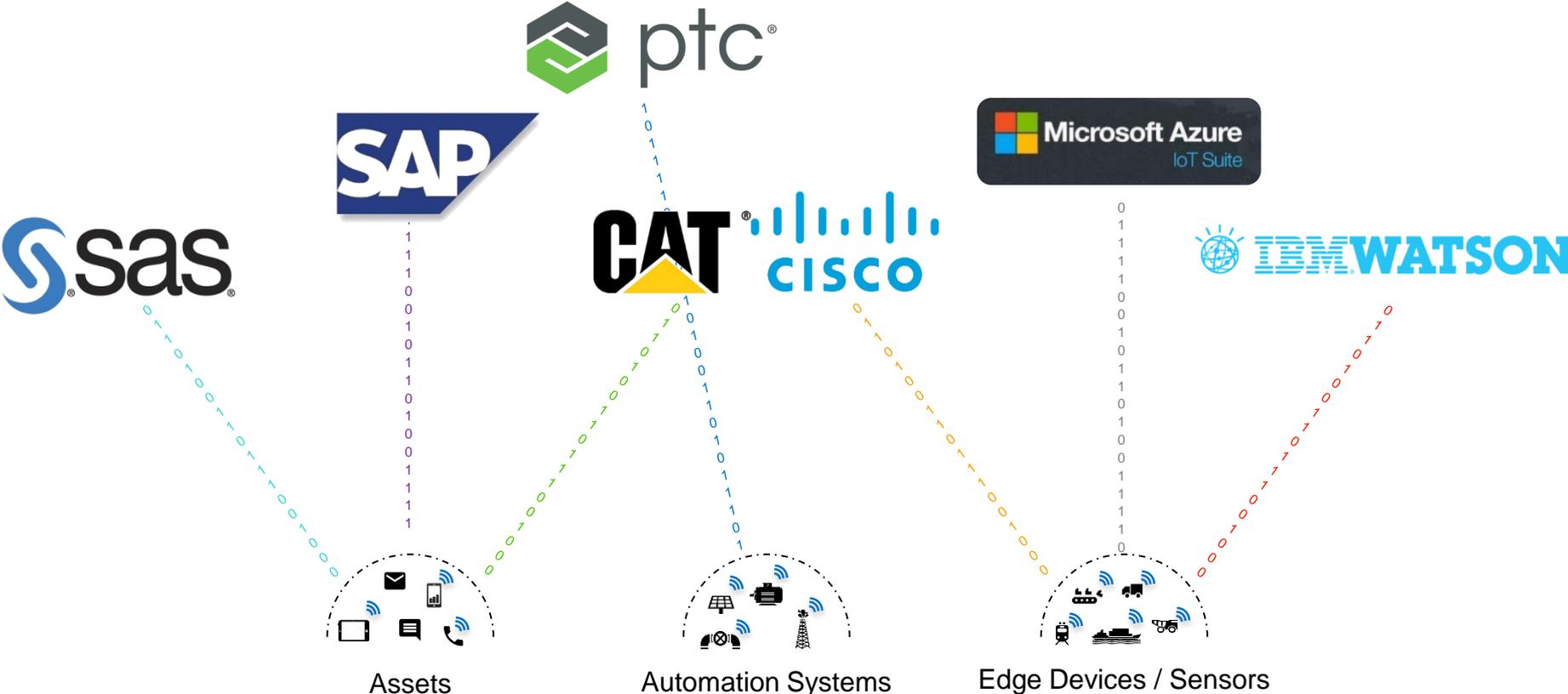


Connectivity

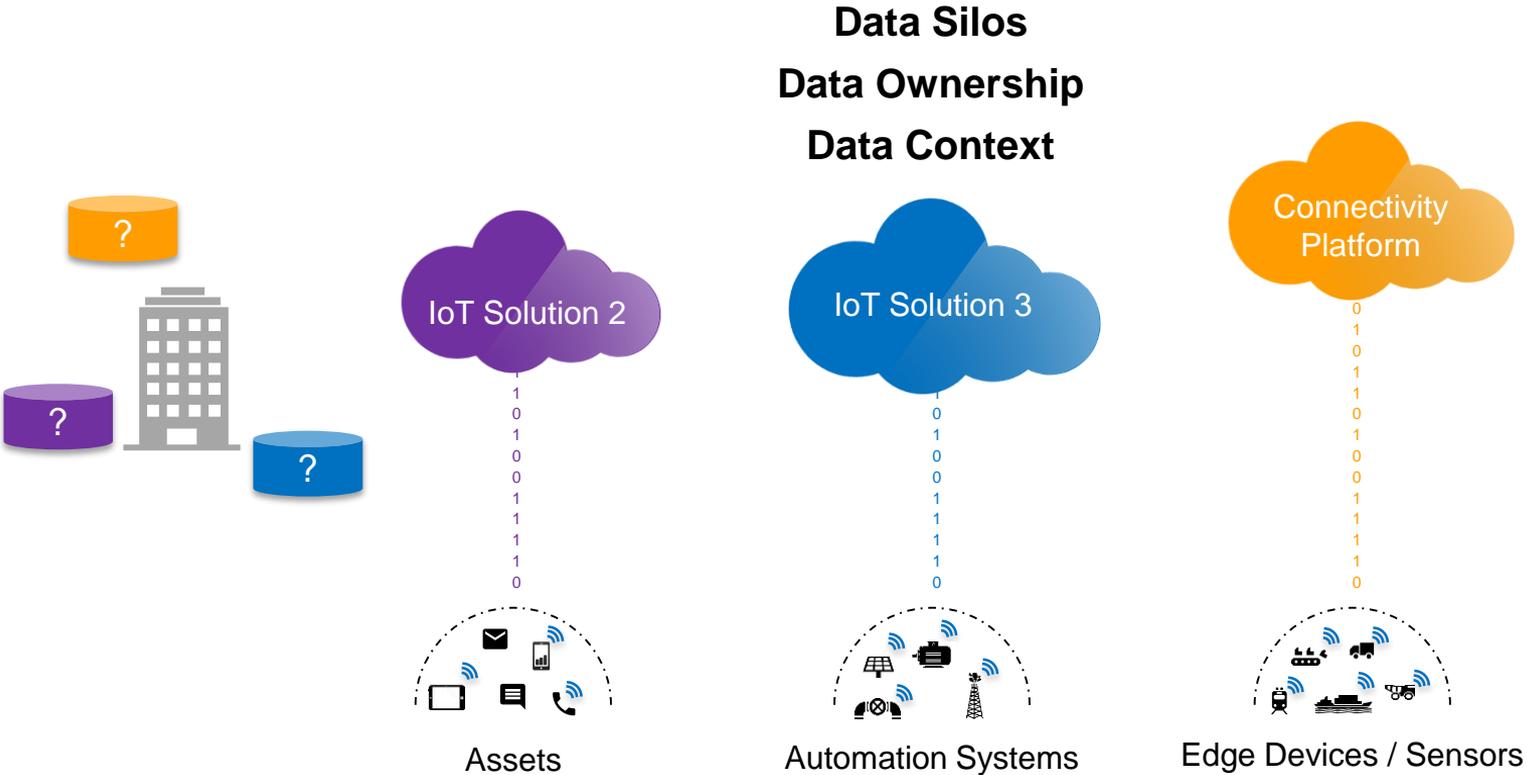
# Interest in IoT is Enormous



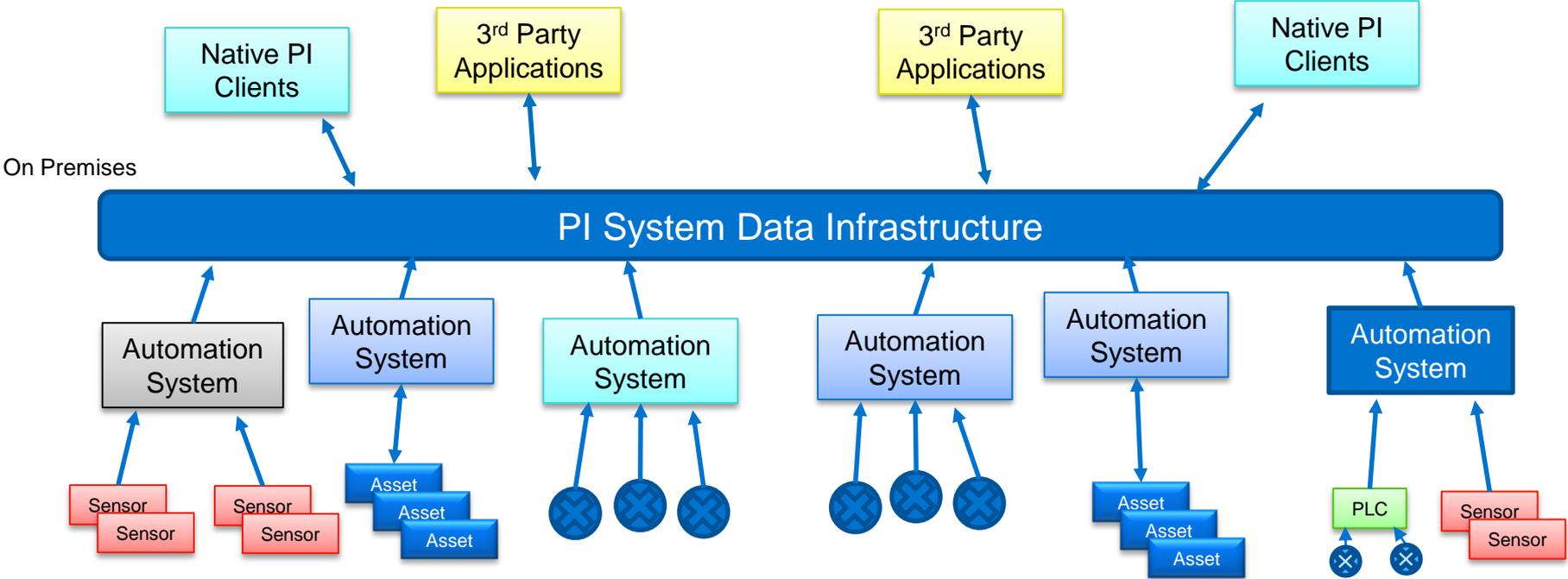
# IoT is Driving Innovation Across the Industrial World



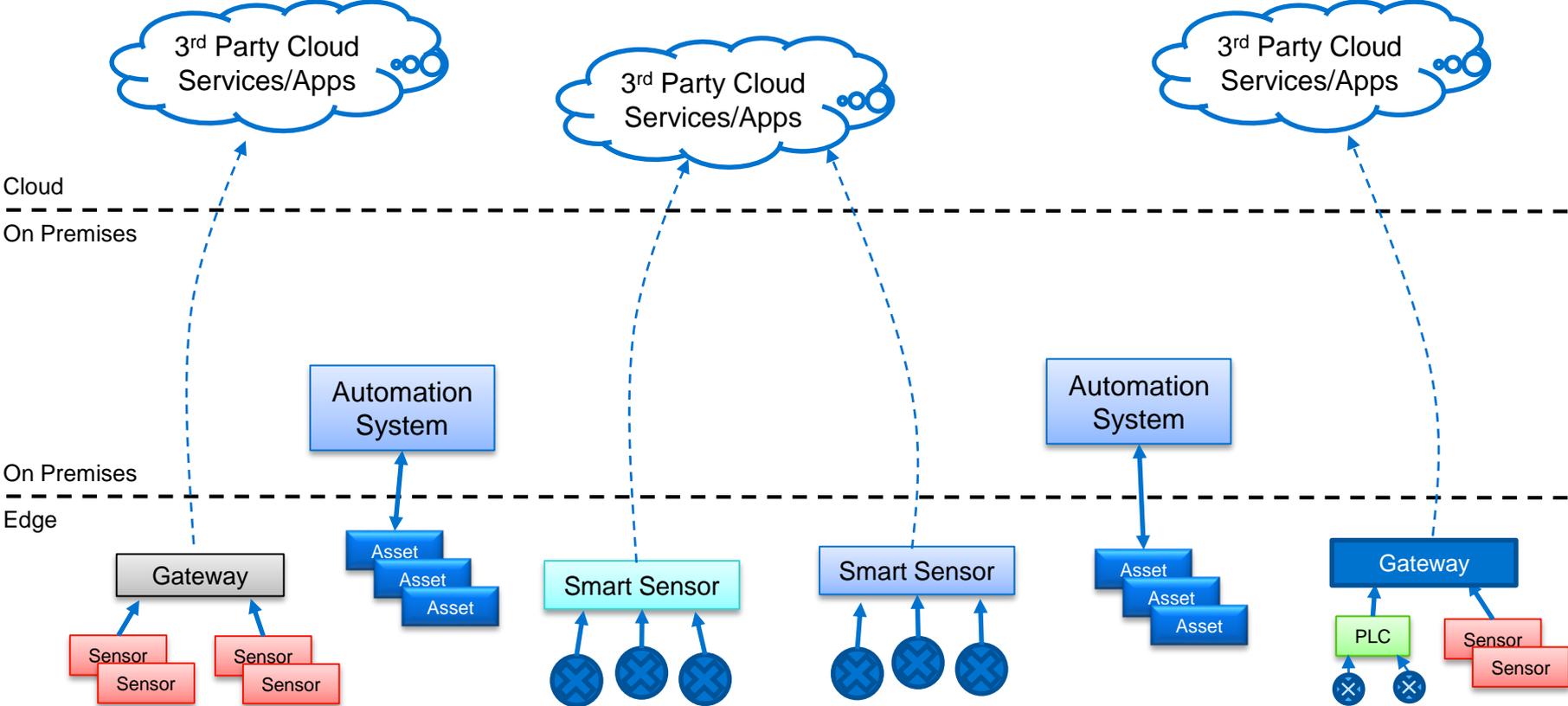
# There are Inherent Risks and Challenges



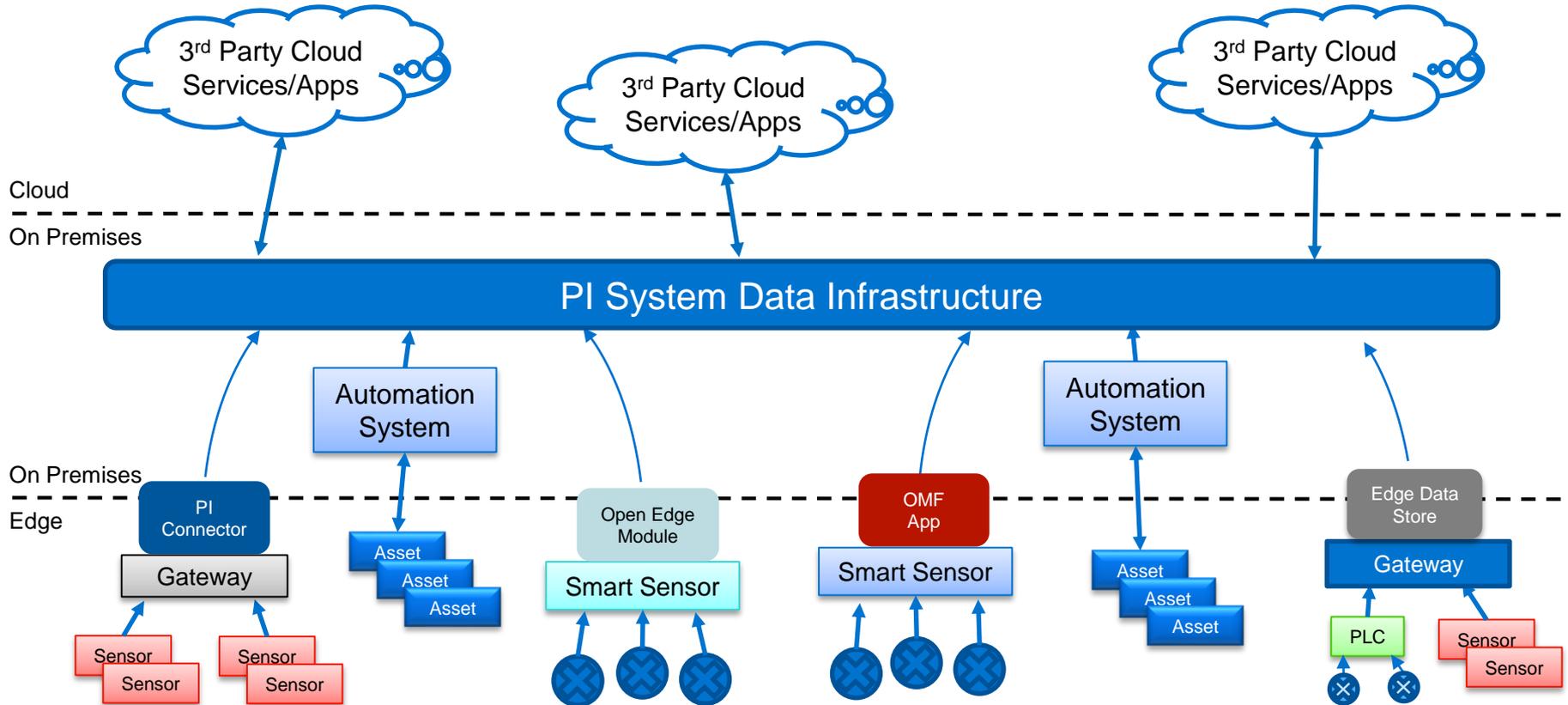
# Traditional PI System Architecture



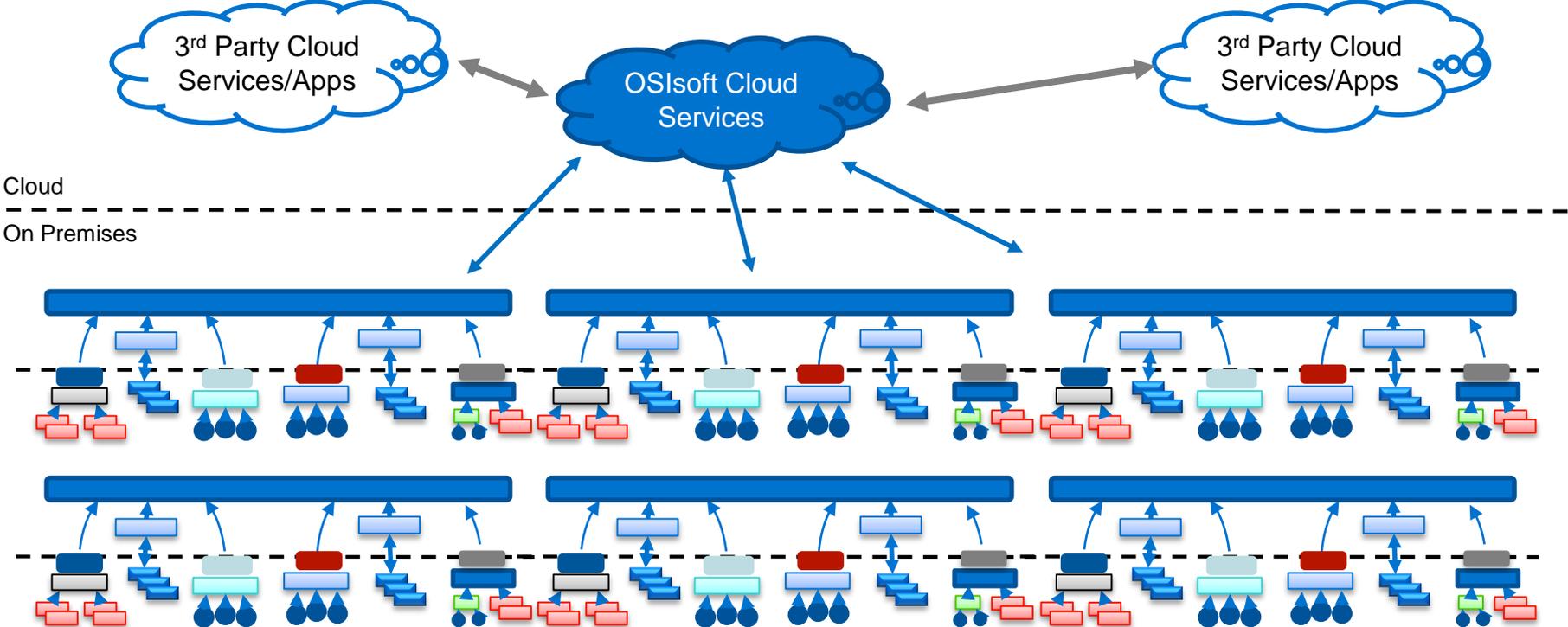
# Typical Industrial IoT Architecture



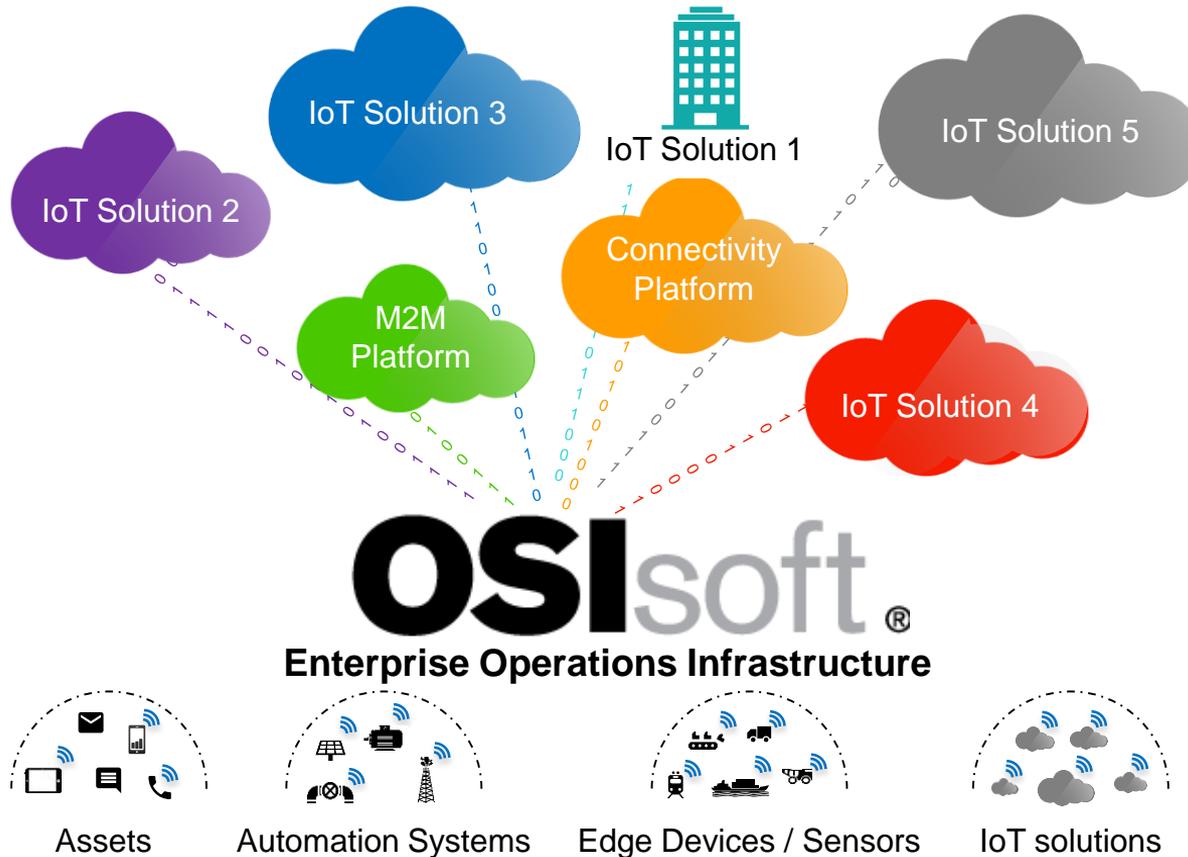
# OSIsoft Industrial IoT Architecture for the Enterprise



# OSIsoft Industrial IoT Architecture for the Community

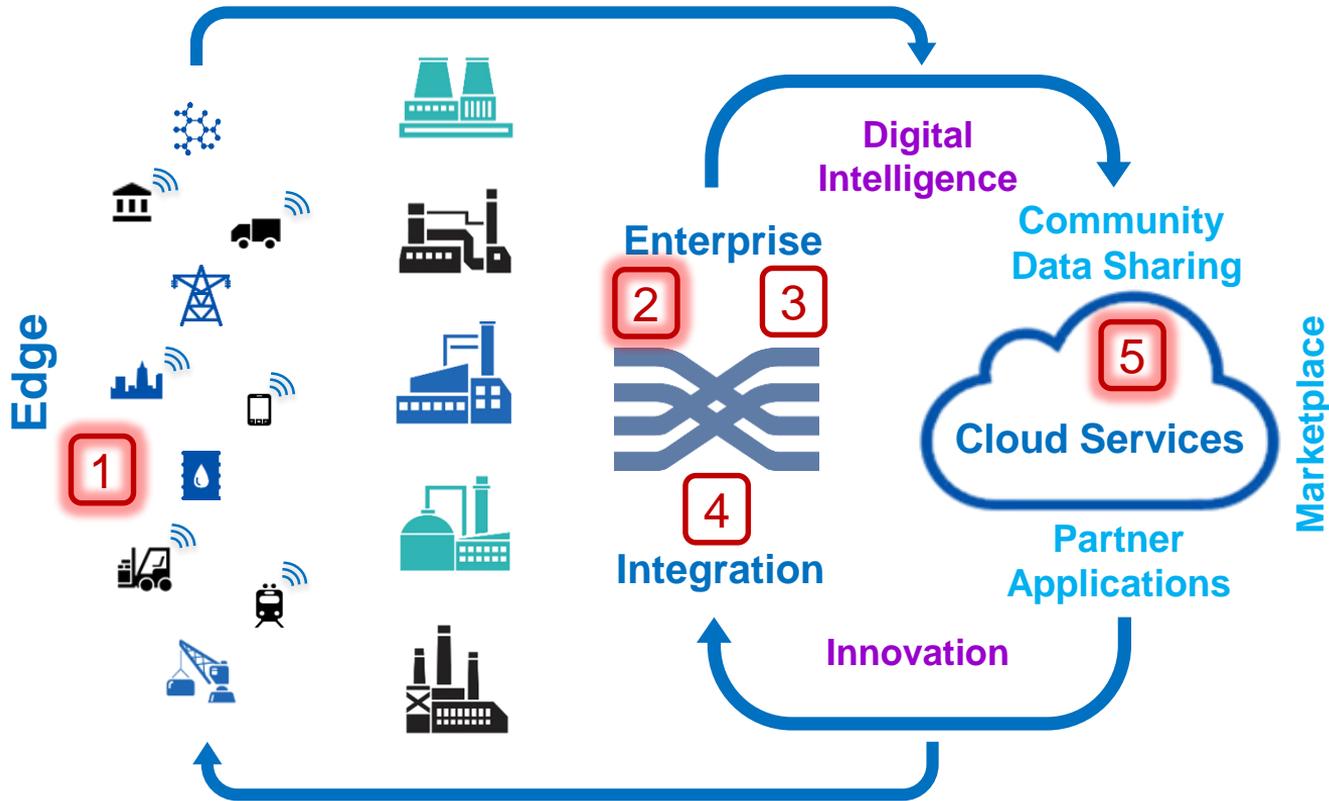


# Extending the Time Series Infrastructure from the Edge to the Enterprise



**OSIsoft**<sup>®</sup>  
Enterprise Operations Infrastructure

# OSIsoft Engineering Areas of Focus



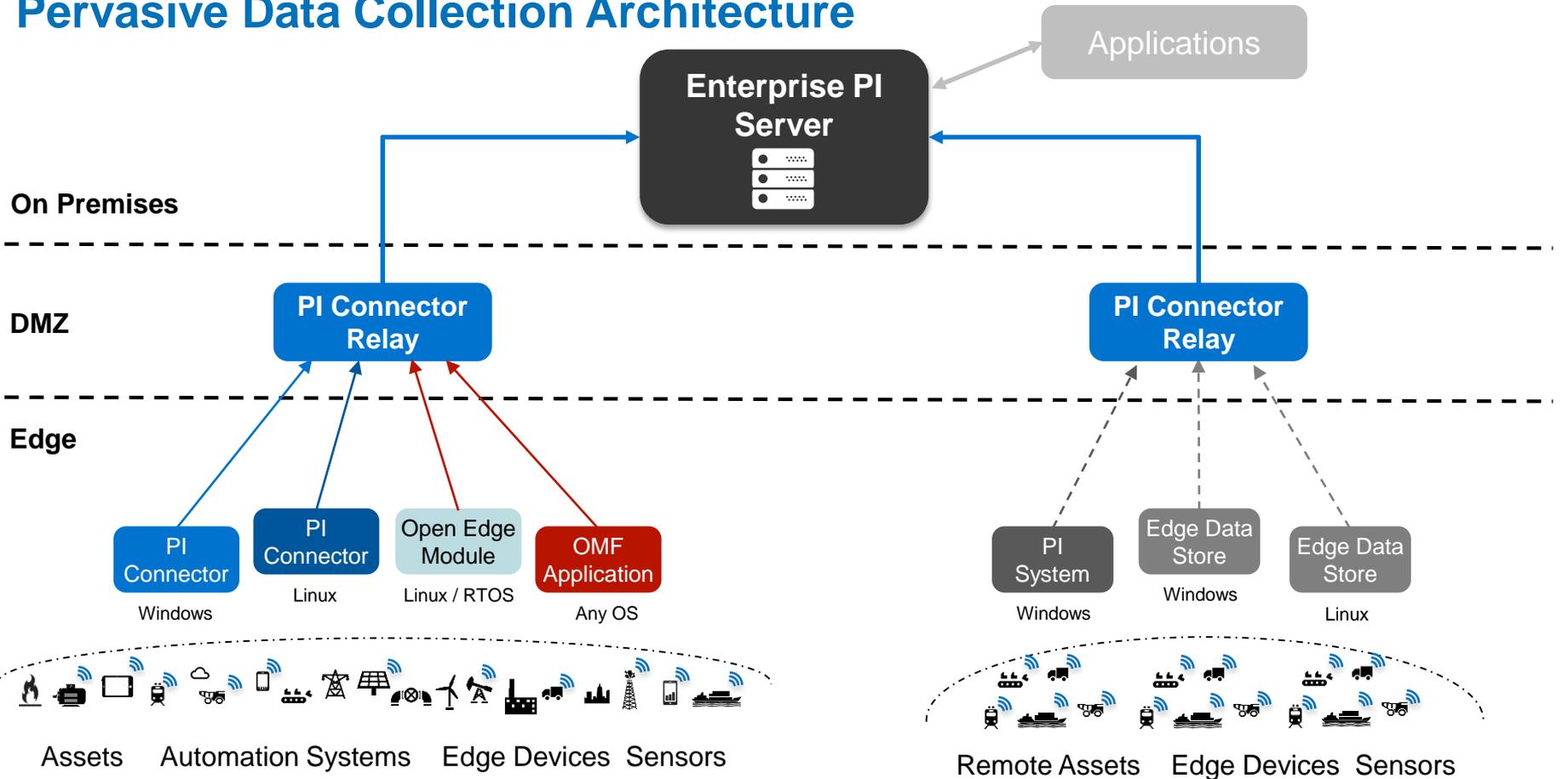
1. Accessing all Operations Data
2. Supporting the largest deployments
3. PI Vision
4. Supporting fleet-wide Questions & Queries
5. OSIsoft Cloud Services

**Edge**

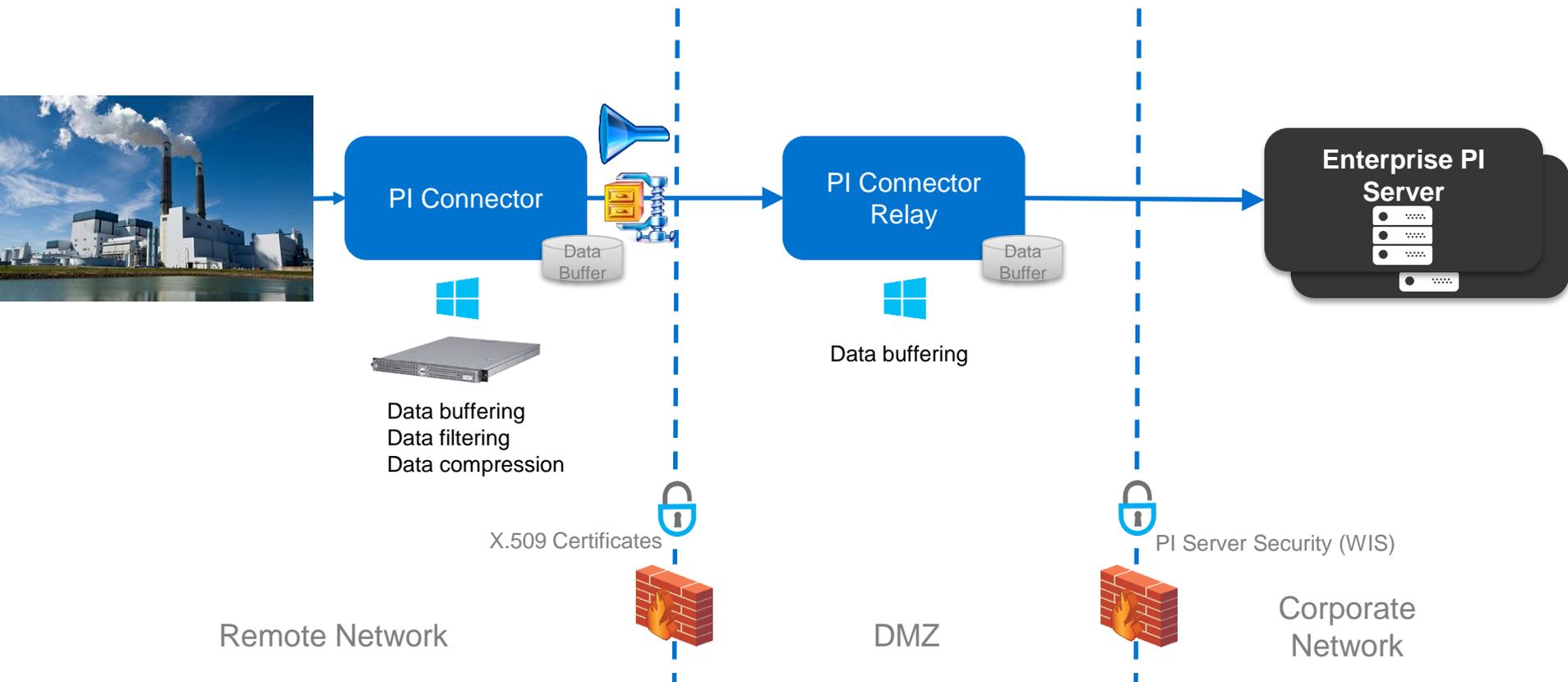
## OSIsoft Pervasive Data Collection

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

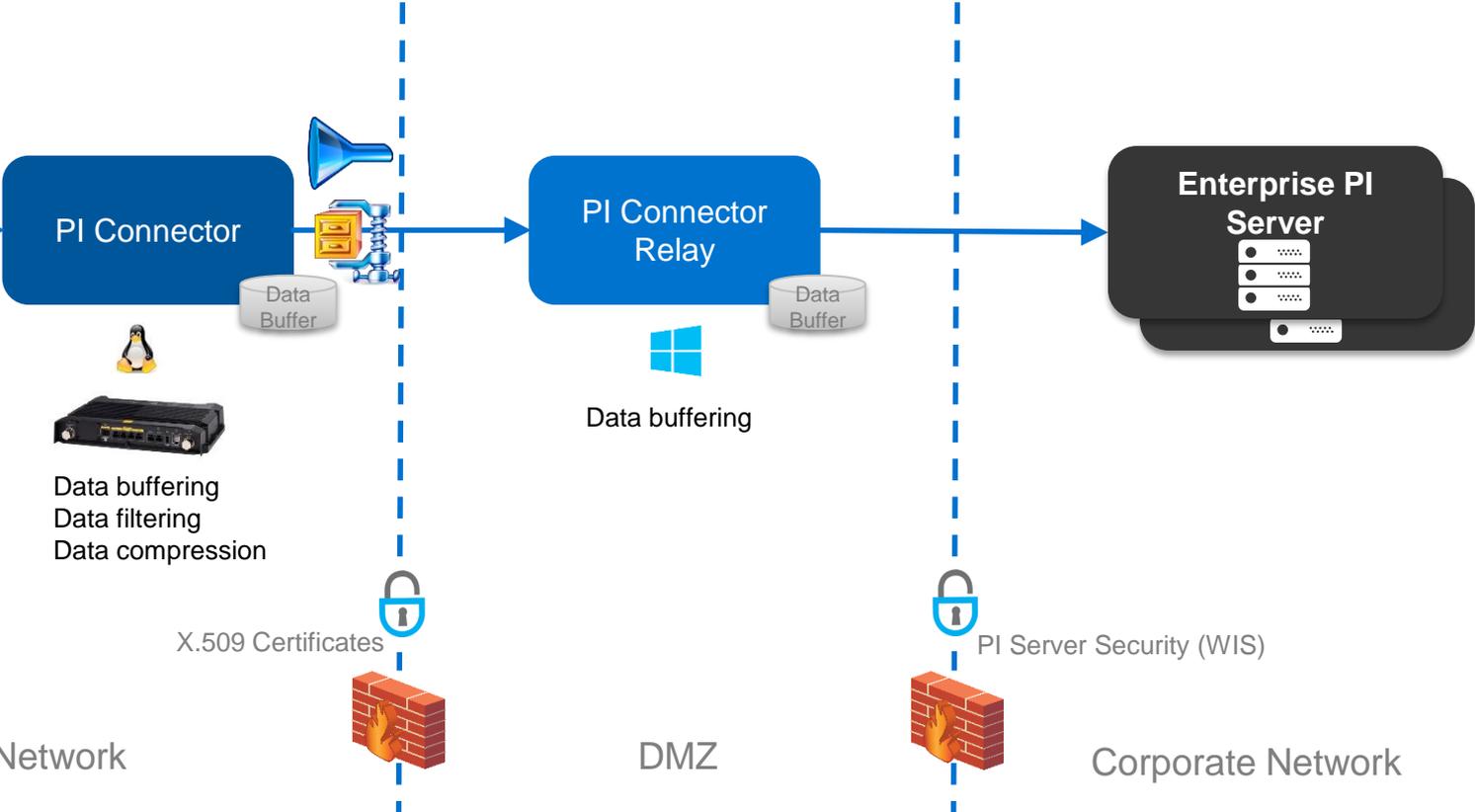
# Pervasive Data Collection Architecture



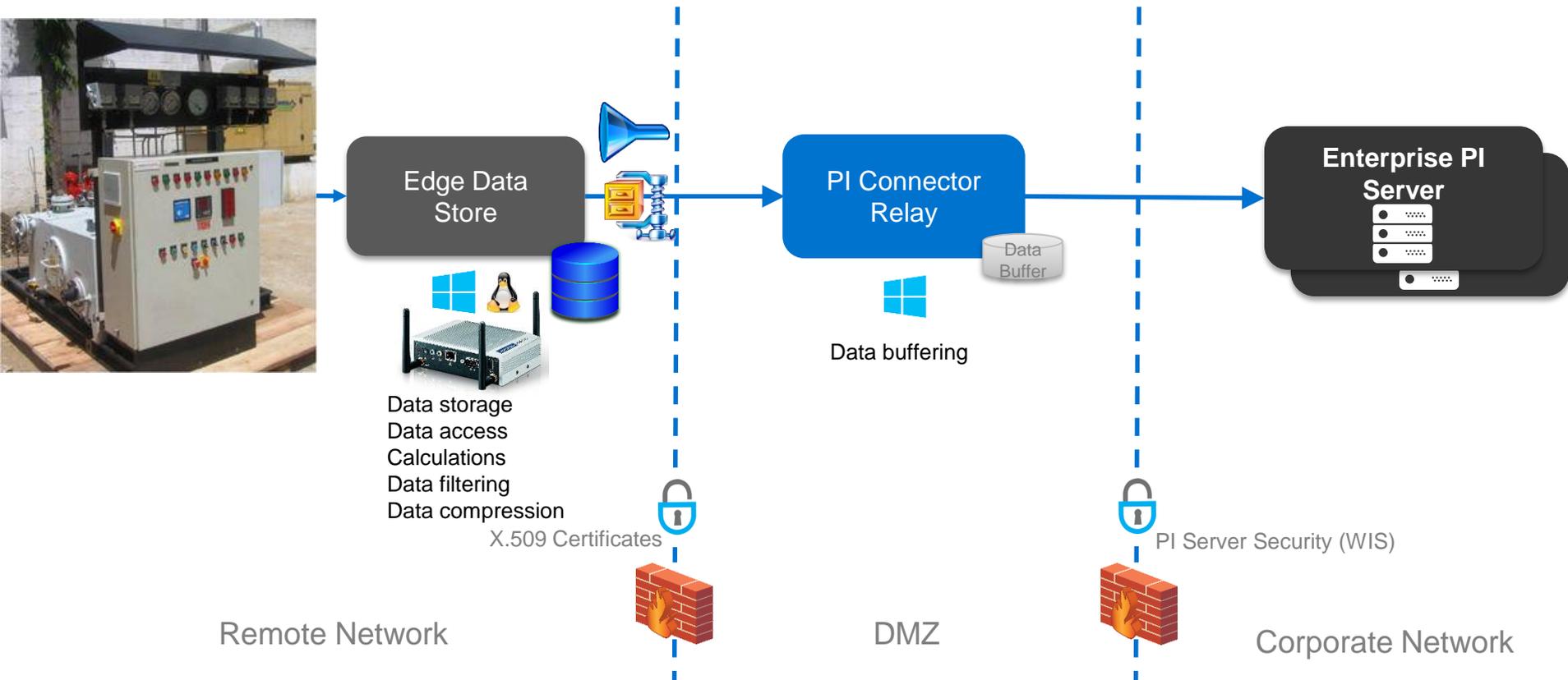
# PI Connector Relay Architecture Enhances Security and Network Flexibility for IIoT Data Patterns



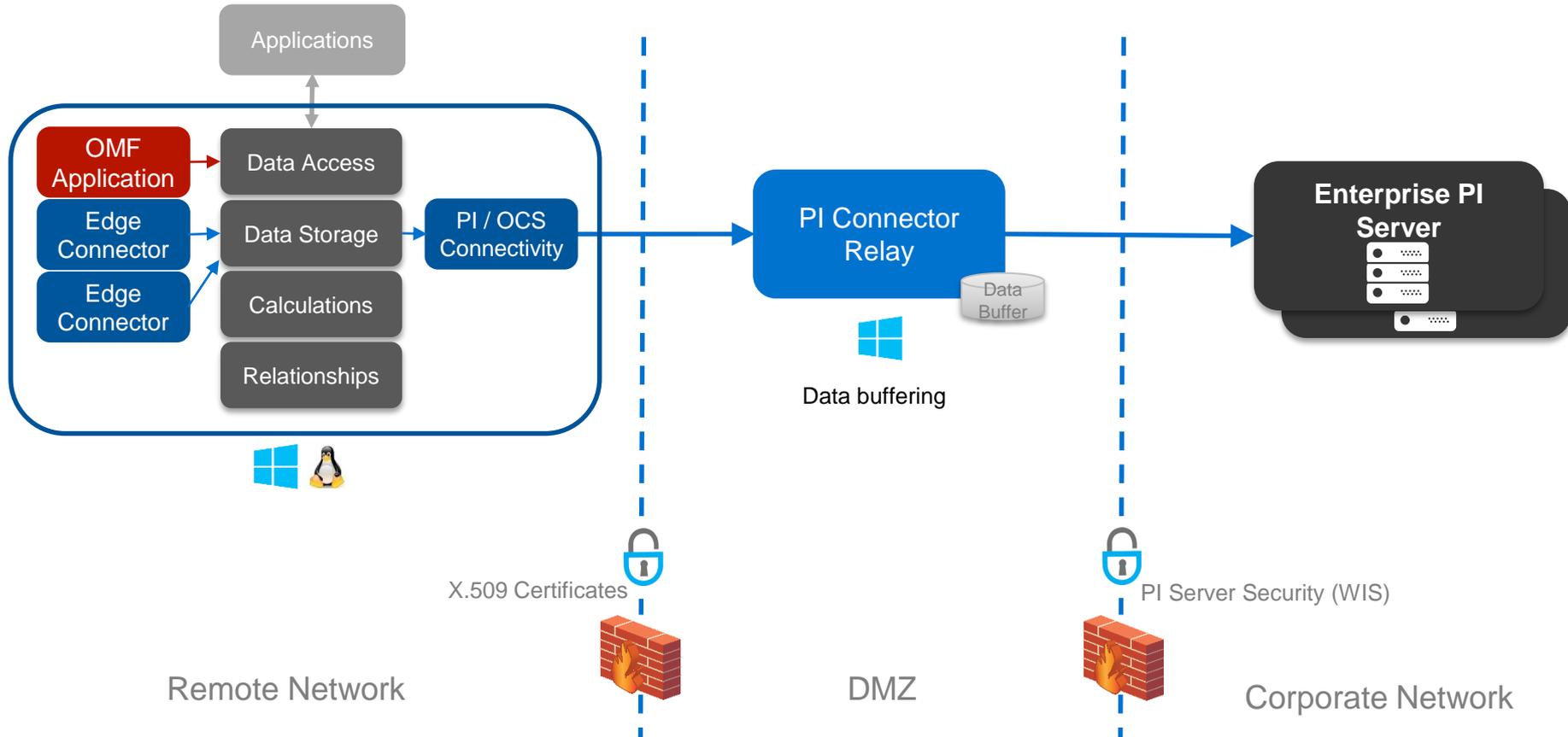
# PI Connectors for Linux Add Connectivity for Remote and Mobile Assets



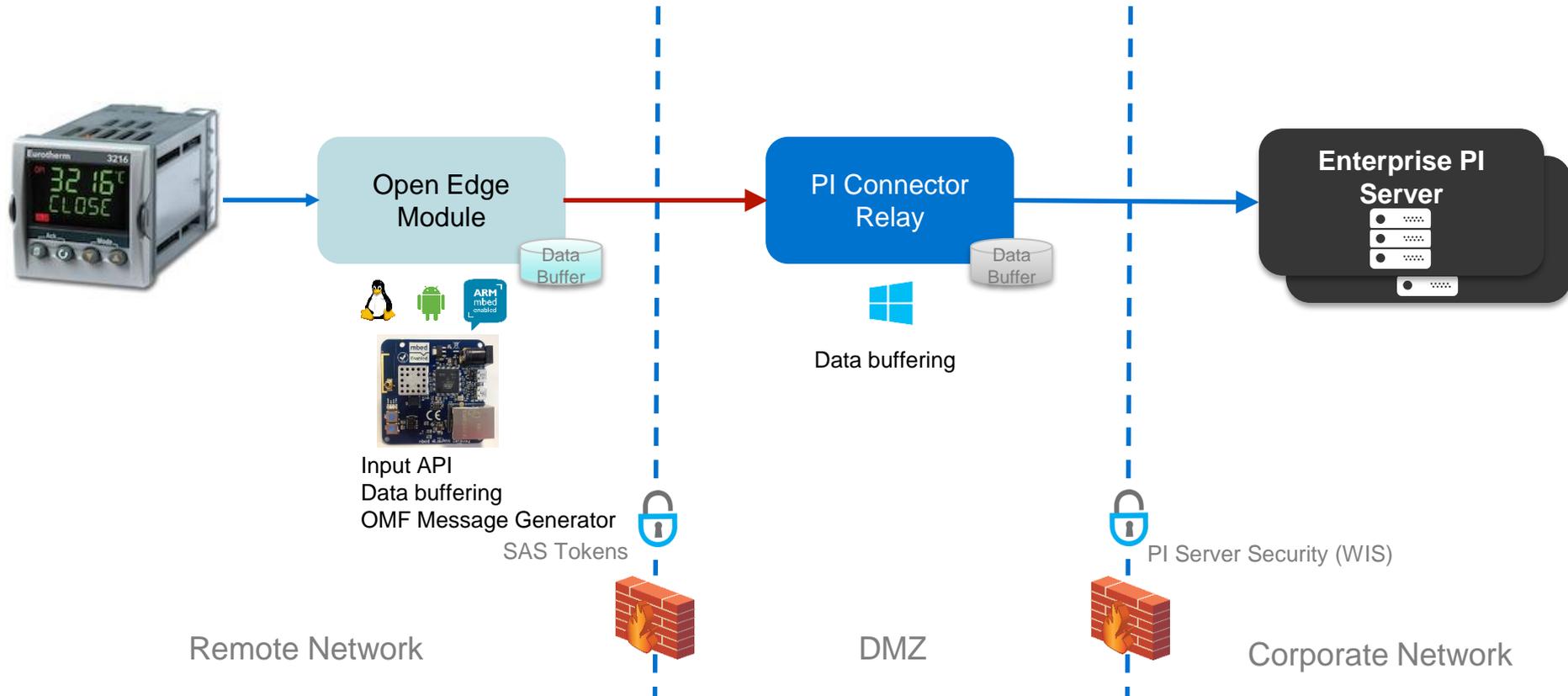
# Built for Purpose Storage, Access and Calculations for Edge Devices



# Edge Data Store Components



# Edge Device Connectivity for the Open Source Community



# OMF Extends Remote Asset Connectivity Through Partner Enablement



OMF Application



Custom features

PI Connector Relay



Data buffering



Enterprise PI Server



Remote Network

SAS Tokens



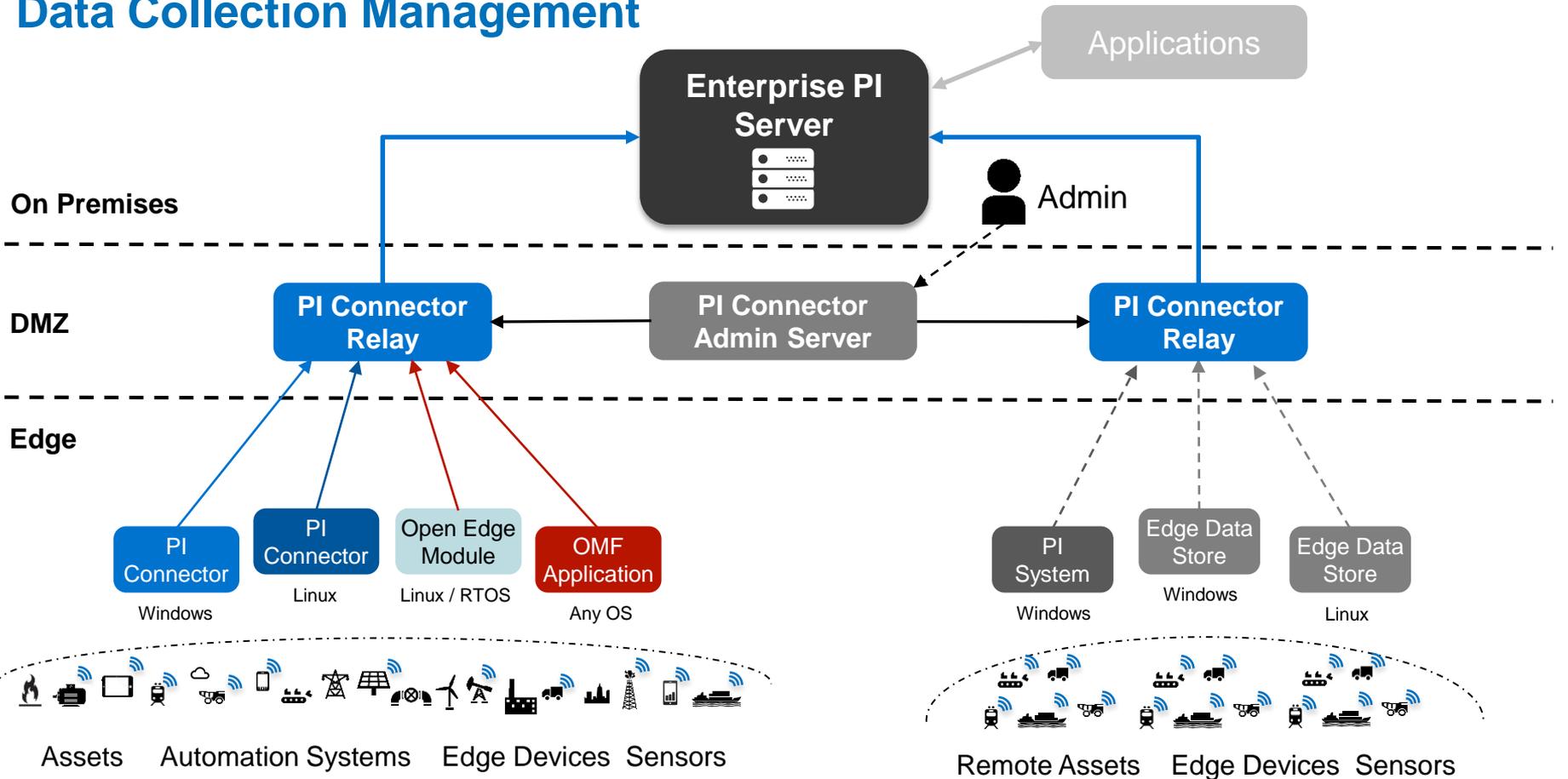
DMZ

PI Server Security (WIS)

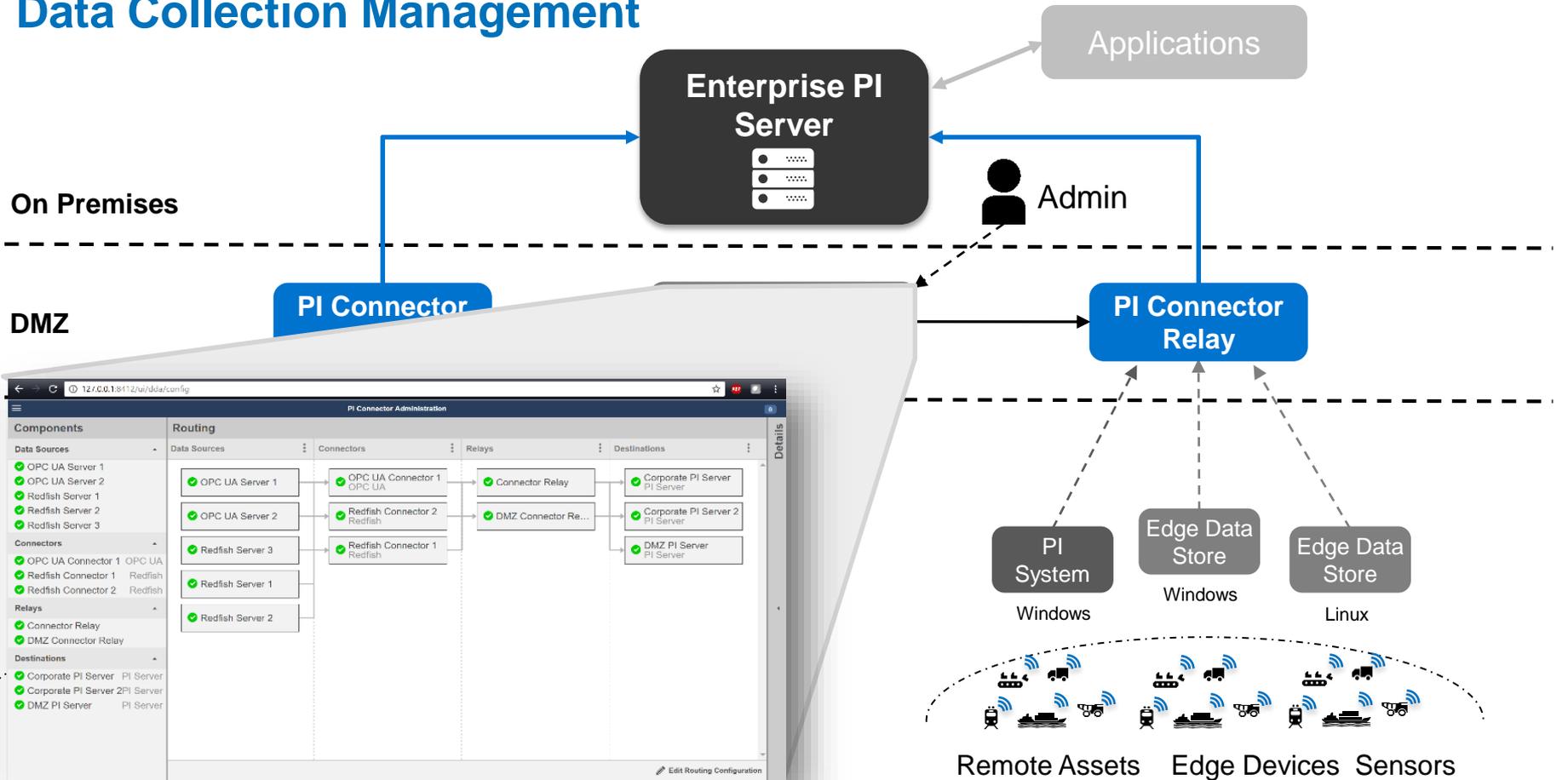


Corporate Network

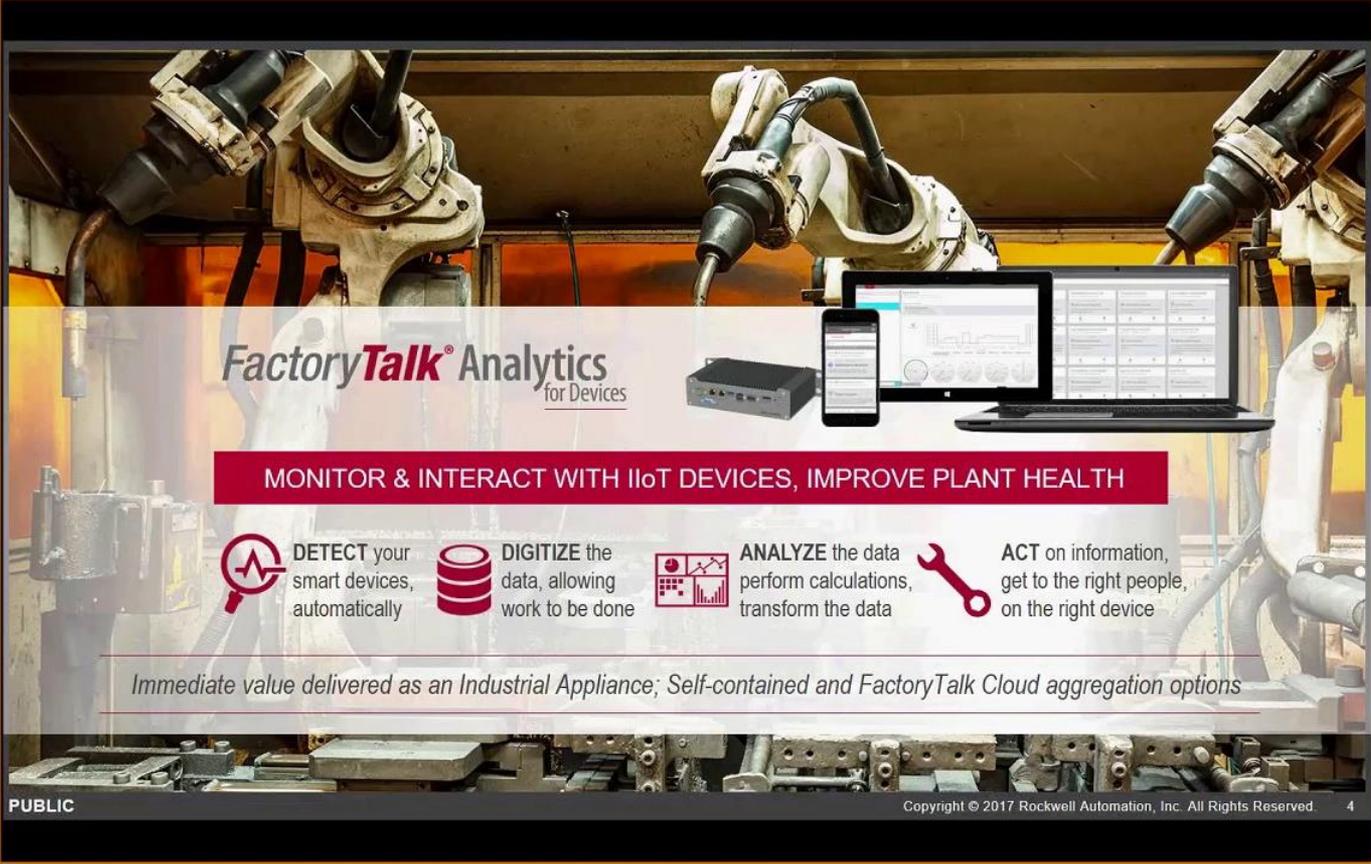
# Data Collection Management



# Data Collection Management



# Edge Analytics Appliance Using Embedded OSIsoft Technology



**FactoryTalk<sup>®</sup> Analytics**  
for Devices

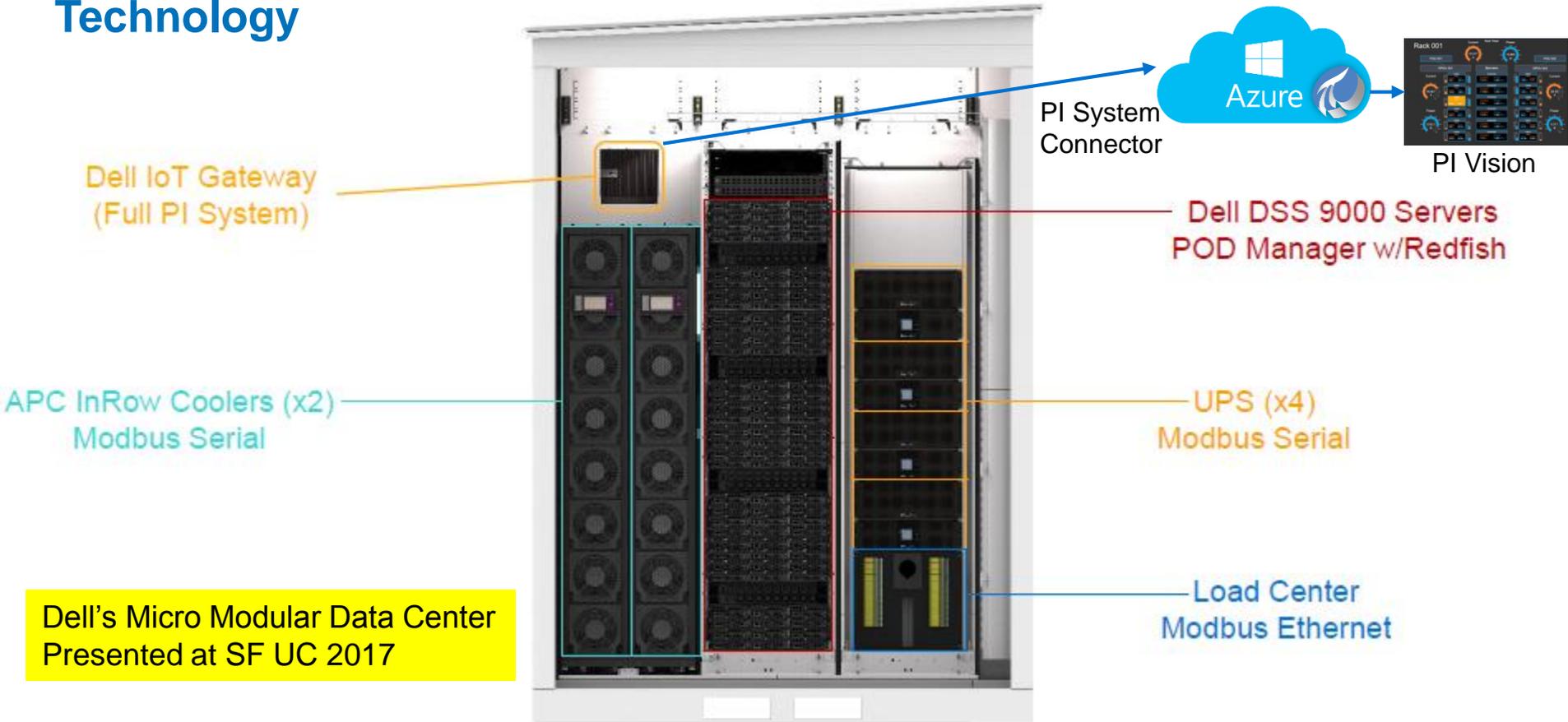
**MONITOR & INTERACT WITH IIoT DEVICES, IMPROVE PLANT HEALTH**

-  **DETECT** your smart devices, automatically
-  **DIGITIZE** the data, allowing work to be done
-  **ANALYZE** the data perform calculations, transform the data
-  **ACT** on information, get to the right people, on the right device

*Immediate value delivered as an Industrial Appliance; Self-contained and FactoryTalk Cloud aggregation options*

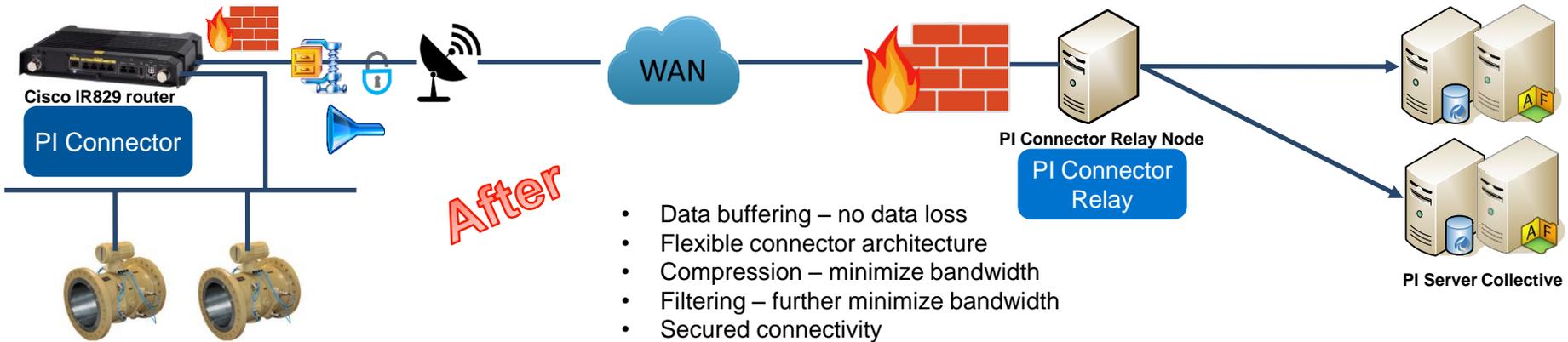
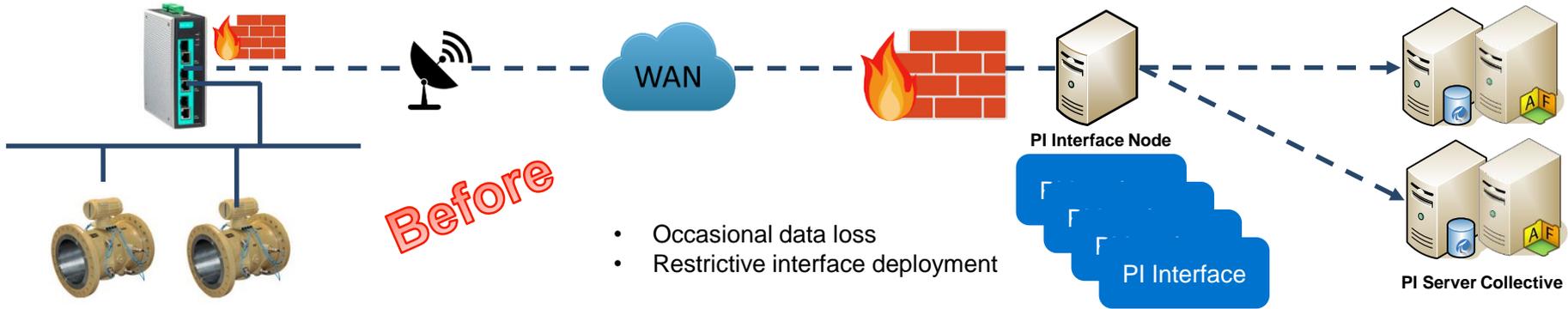
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# Micro Modular Data Center Monitoring Using Embedded OS/soft Technology



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

# Remote Asset Monitoring Using Embedded OSisoft Technology



# Enterprise

# Evolution of the PI System

## Expand



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

## Extend



Associate **quality** information with measured values

## Ease



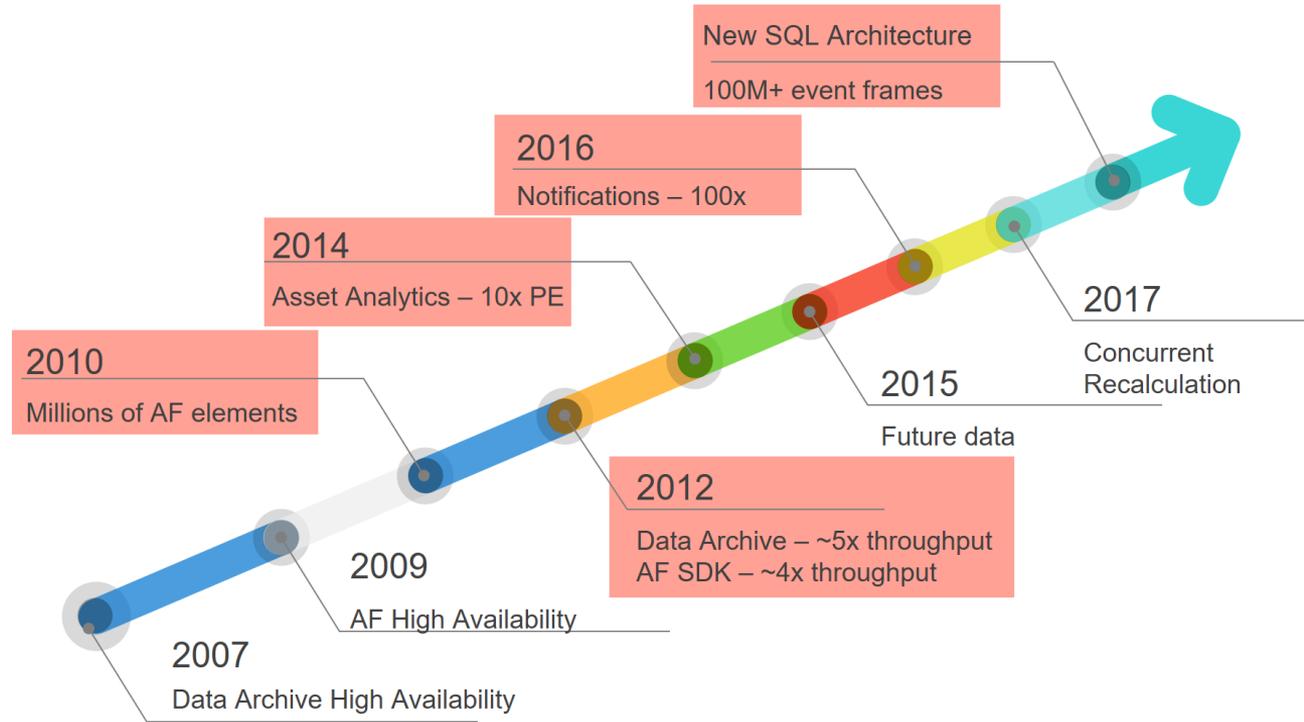
PI system tools designed to work across the enterprise

# Performance and Scalability

Expand



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



# Data Quality

## Extend



Associate **quality** information with measured values

### Data Collection



Collect quality information from source systems

### Storage



Natively associate quality information with data

### Asset Analytics



Calculations take into account quality of inputs

### Developer Technologies



Ingress and egress of data with quality via programmatic means

### Visualization



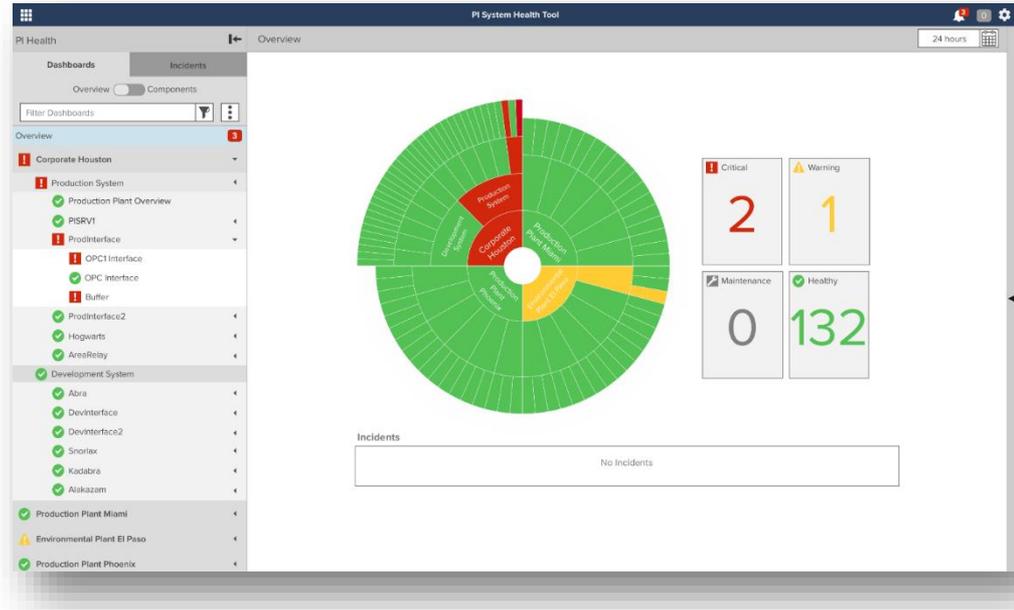
Display data with quality information

# Management and Administration

Ease



PI system tools  
designed to work  
across the enterprise

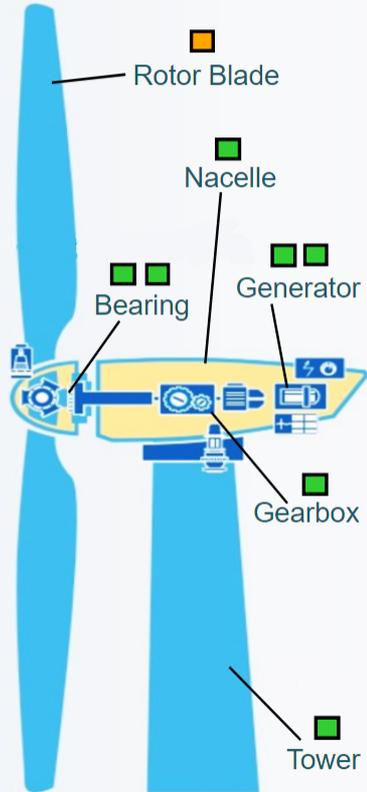


# Application Integration

Windtopia Sub-Turbine Asset: GE09

 Windtopia

PI Vision



GE09

Manufacturer  
GEOperating Status  
Load OperationActual Power  
930.53 kW

## Temperatures

Nacelle		-10.491 °C
Gen 1		9.7192 °C
Gen 2		10.563 °C
Bearing A		25 °C
Bearing B		0.74656 °C
Gearbox		62.555 °C
Tower		-17.778 °C

## Blade Angle

Blade1 Set Value	0.13381 °
Blade1 Actual Value	-0.4704 °
Blade2 Set Value	0.076093 °
Blade2 Actual Value	-0.4704 °
Blade3 Set Value	0.16462 °
Blade3 Actual Value	-0.4704 °

## Wind Speed



## Rotor Speed



## Grid Data

	Phase Amps	Phase Volts
L1	905.25 A	326.81 V
L2	894.7 A	323.83 V
L3	886.55 A	326.81 V

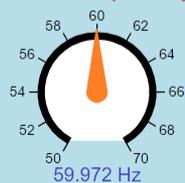
## Nacelle

Nacelle Position	20 °
Nacelle Revolution	1.5167 °

## Torque

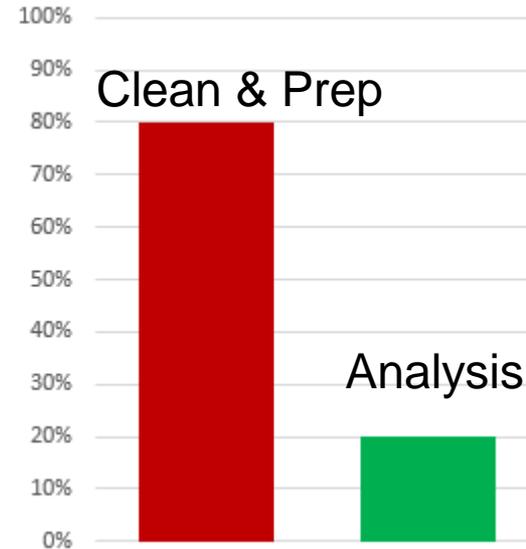
Torque Set Value	62.537 Nm
Torque Actual Value	64.104 Nm

## Line Frequency



# Big Data Projects Are Attractive... But There Are Challenges

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

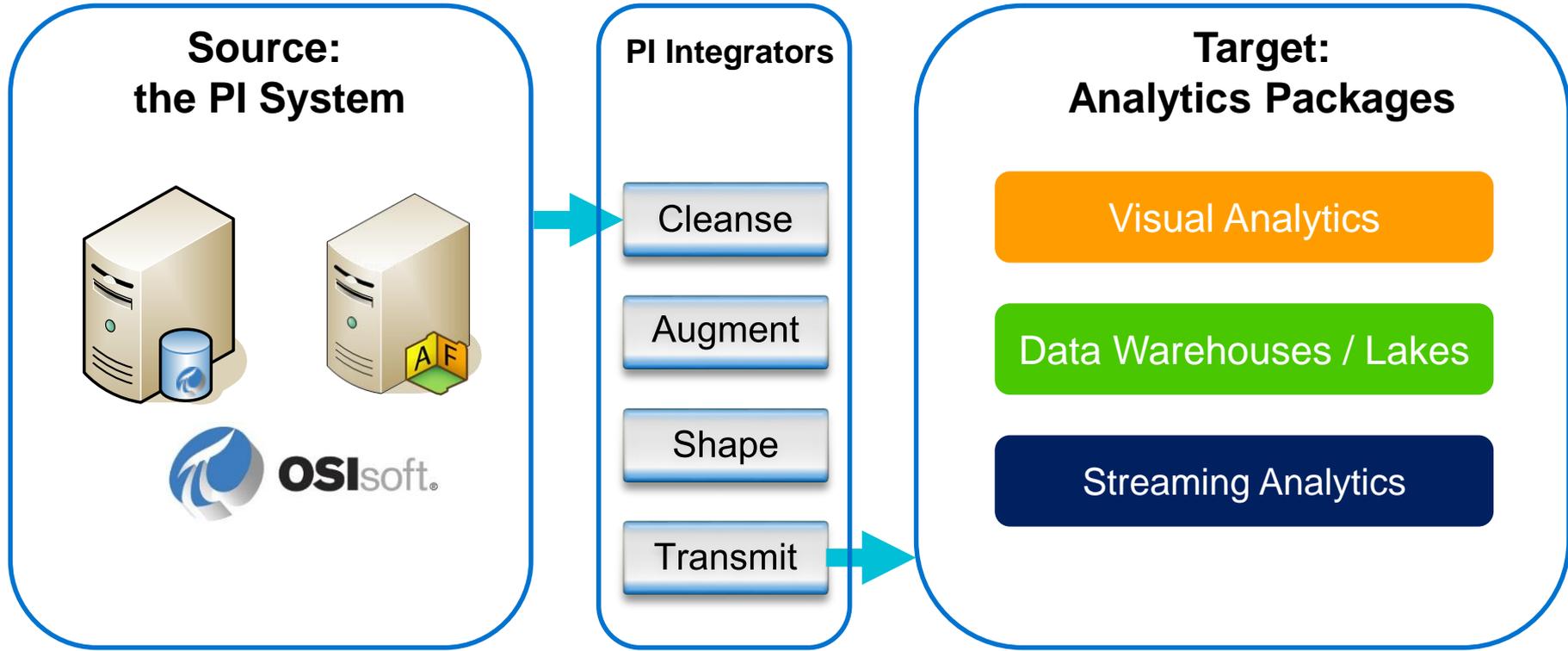


Data cleansing and preparation tasks can take 50-80% of the development time and funds.

Source: [Harvard Business Review](#)

# Data Delivery to Analytics Applications

PI Integrators



# PI Integrators for Advanced Analytics

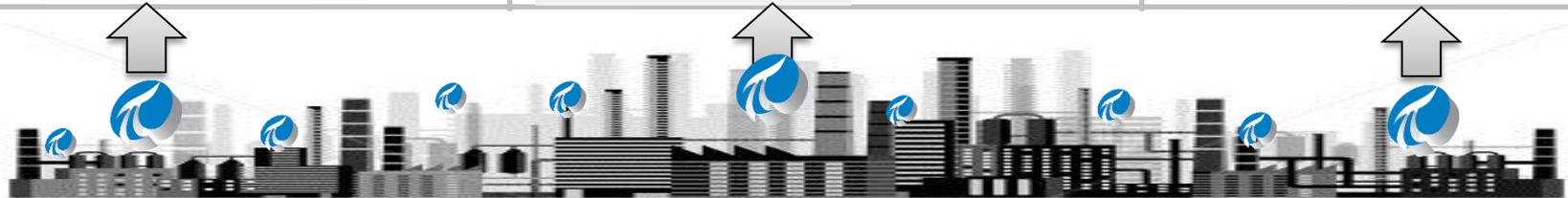
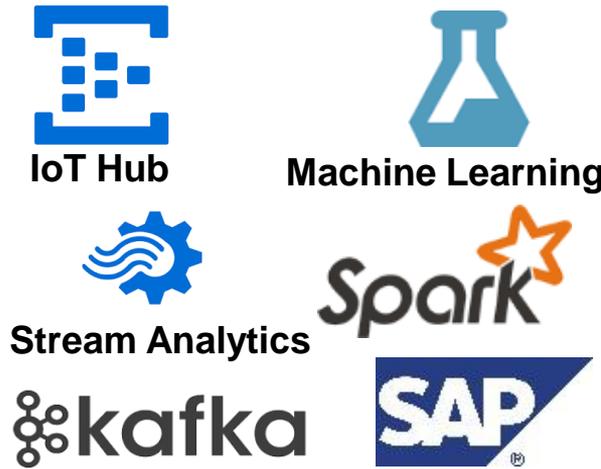
## Visual Analytics



## Data Warehouse / Data Lake



## Streaming Analytics – 2017



PI System Access

**Data** **Tools** **Comments**

Filter tools...

Overview » pv/temp\_in/output/pv » Related Signals

**Related Signals**

Primary Signal: pv/temp\_in/output/pv (Area A, ah)

- Name: Boundaries
- Select the relation type: Boundary
- Upper Signal: Temp In - Upper Limit
- Lower Signal: Temp In - Lower Limit

**Delete** **Cancel** **Save**



**Details**

	Name	Assets
°F	pv/temp_in/output/pv	Area A, ah789
°F	pv/temp_out/output/pv	Area A, ah789

OSIsoft Partner's Analytics Application

# Cloud

# The Four Components of our Cloud Strategy

**Offer Hosting  
Services for the  
PI System**

**Deliver native,  
complementary  
Cloud Services**

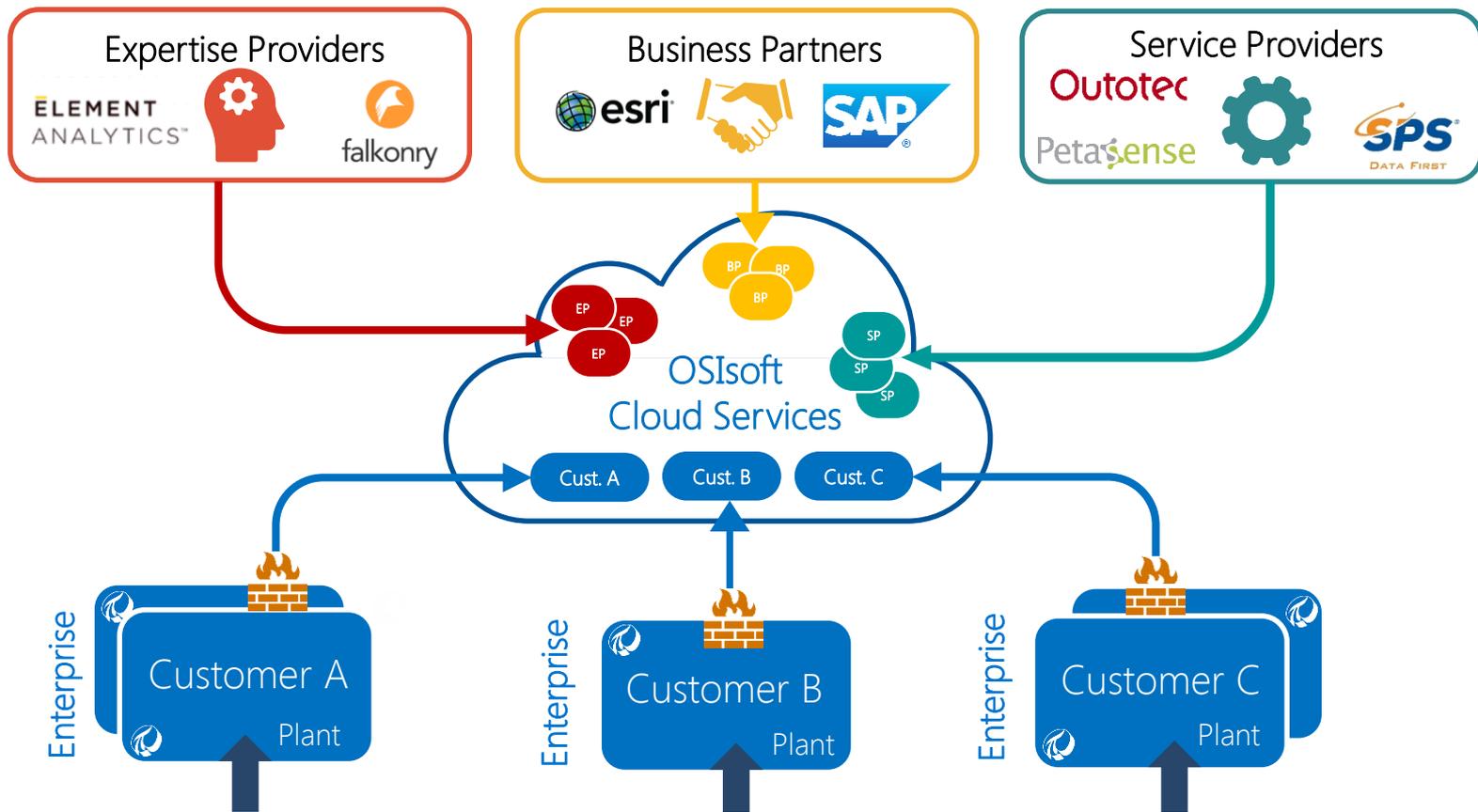
**Integrate with  
other  
Cloud Platforms**

**Make the PI  
System more  
serviceable**

# OSIsoft Cloud Services



- Secure, Distributed, Multi-tenant platform
- Maintained & Managed by OSIsoft
  - Developed on Microsoft Azure
- Complementary to PI Systems on premises
  - Easily share your PI data
  - Leverage new technologies (Big Data, ML...)



Process Equipment



Control Hardware



IT Hardware



Other Operational Data

- Facilities
- Logistics

# An Infrastructure Approach



Sign-up  
Provisioning



Security  
Authentication



Logging  
Telemetry



Scale out

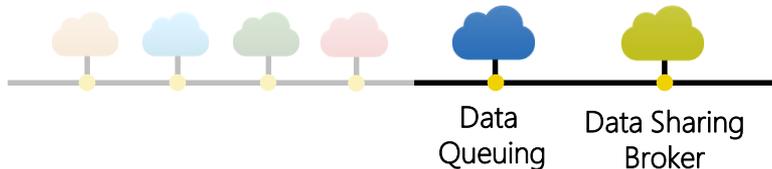
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Cloud Services Infrastructure

# An Infrastructure Approach...

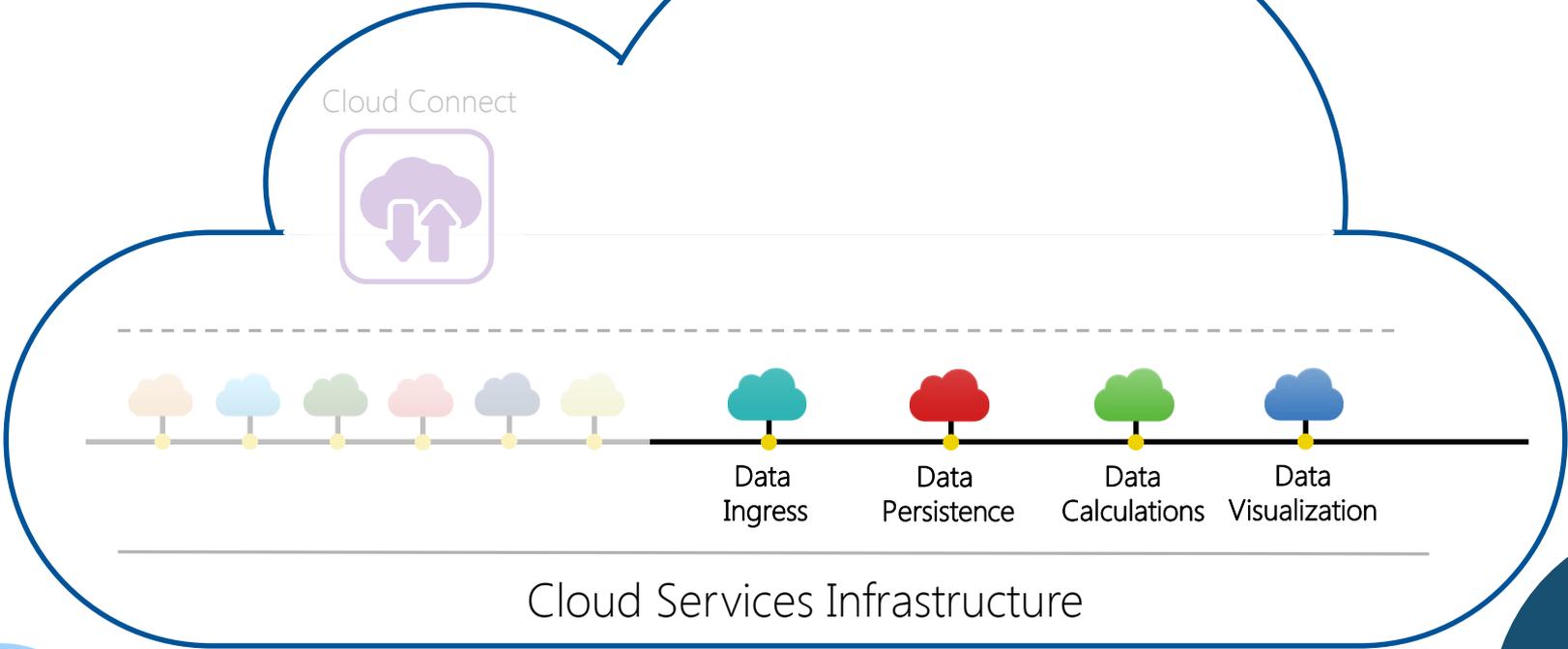
First Commercial Offering

Cloud Connect



Cloud Services Infrastructure

# Extending the Platform



# Adding New Offerings

More Commercial Offerings

Cloud Connect



Data Sharing

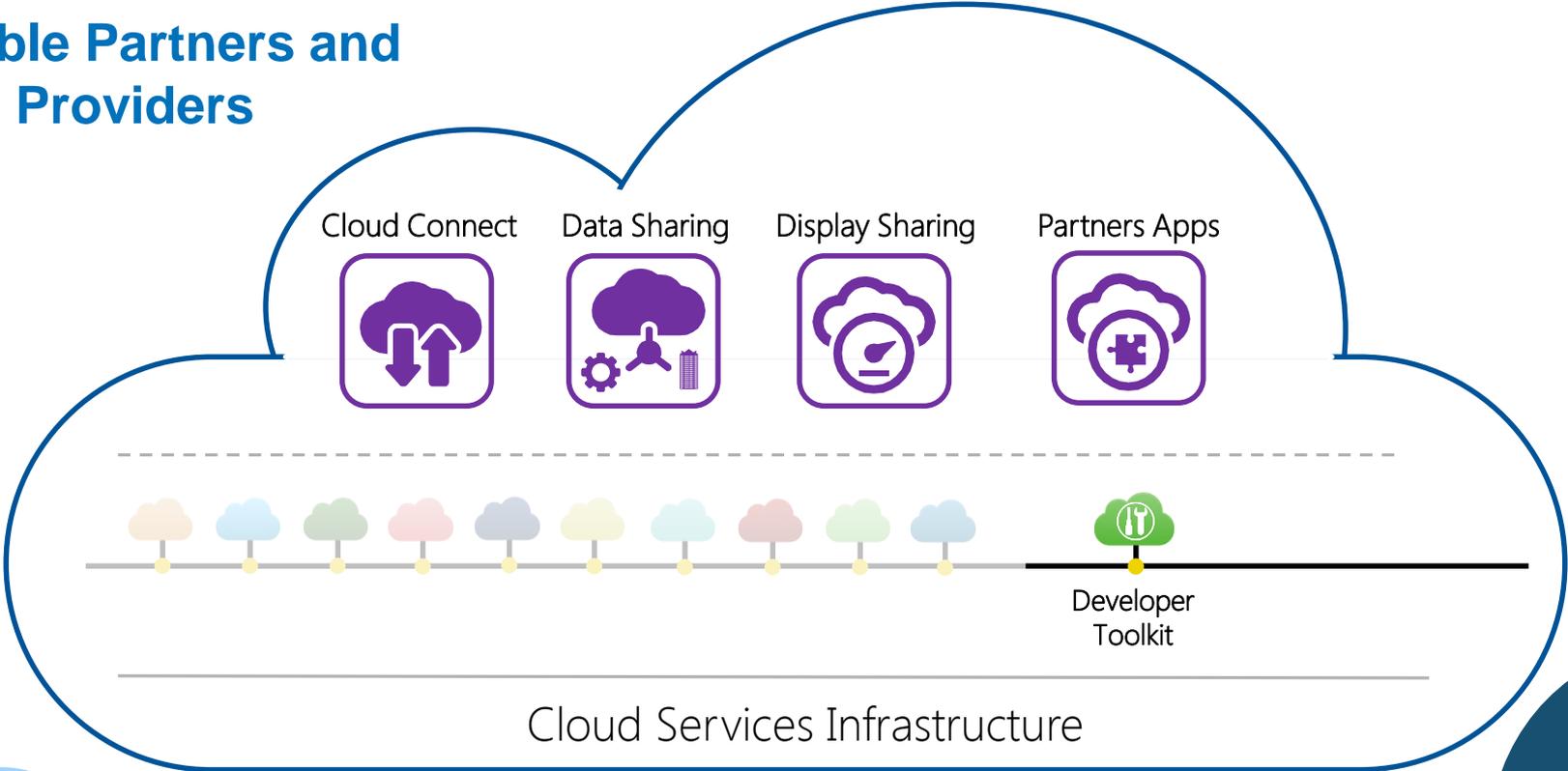


Display Sharing

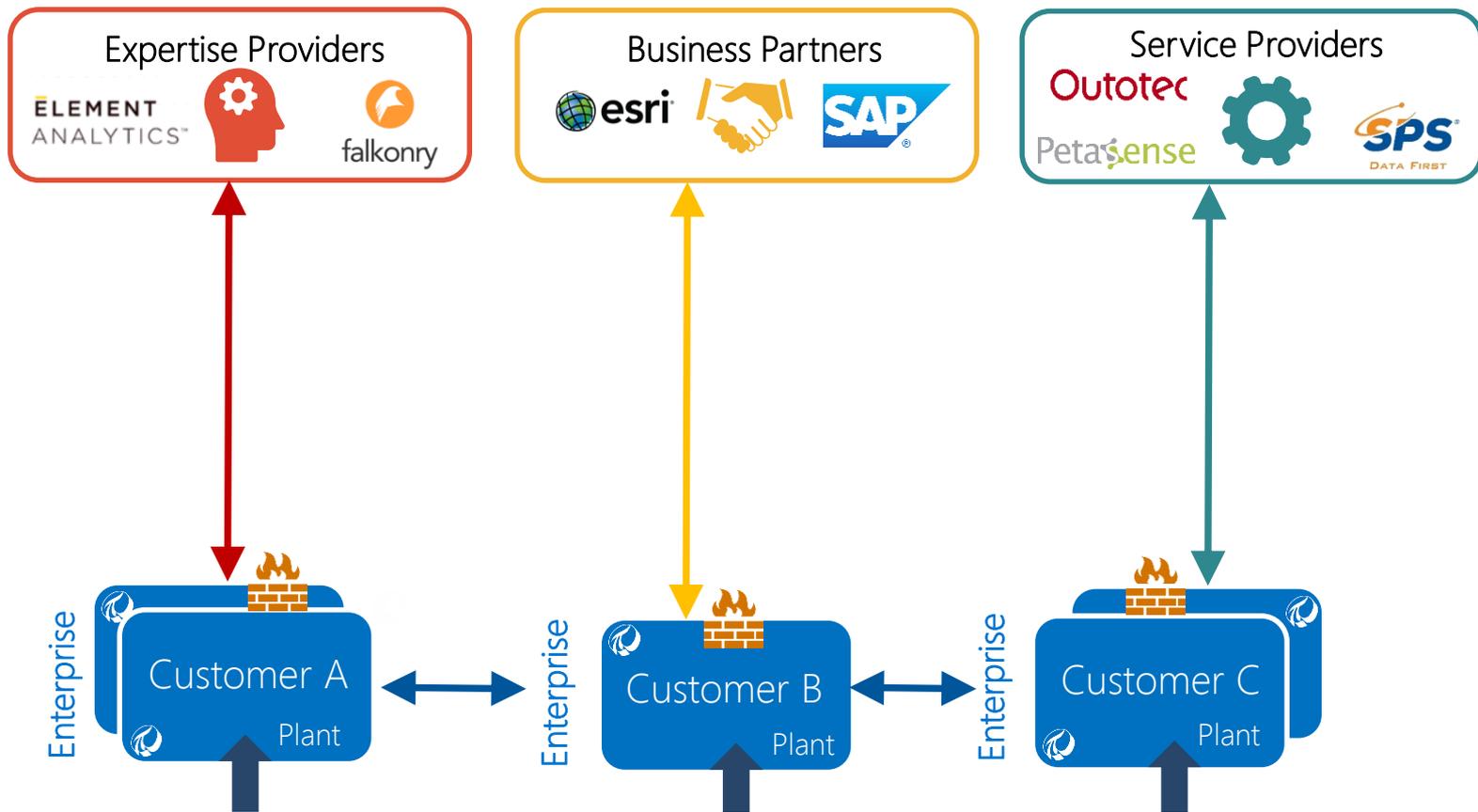


Cloud Services Infrastructure

# Enable Partners and App Providers



# Summary



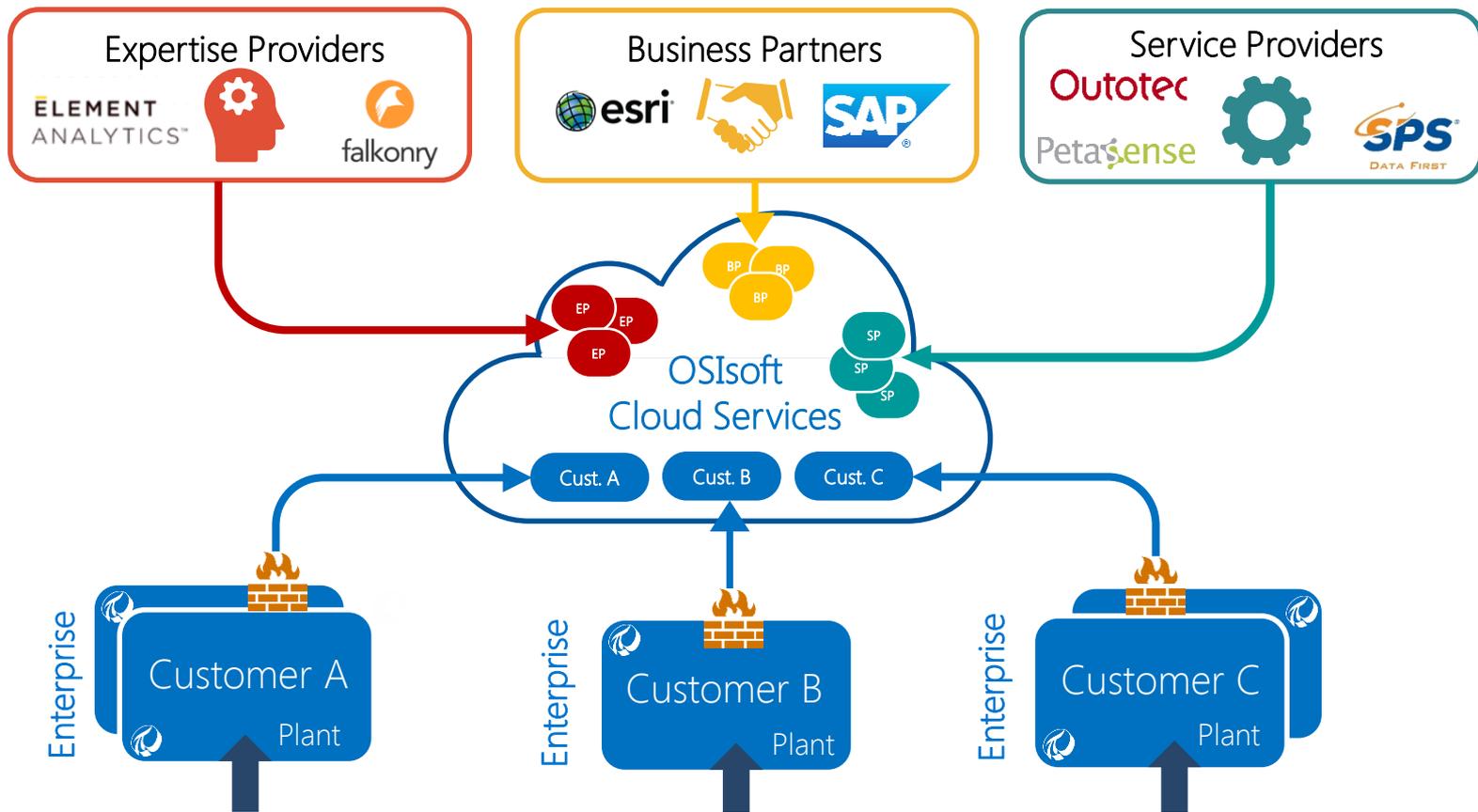
Process Equipment

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IT Hardware

Other Operational Data

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Process Equipment



Control Hardware

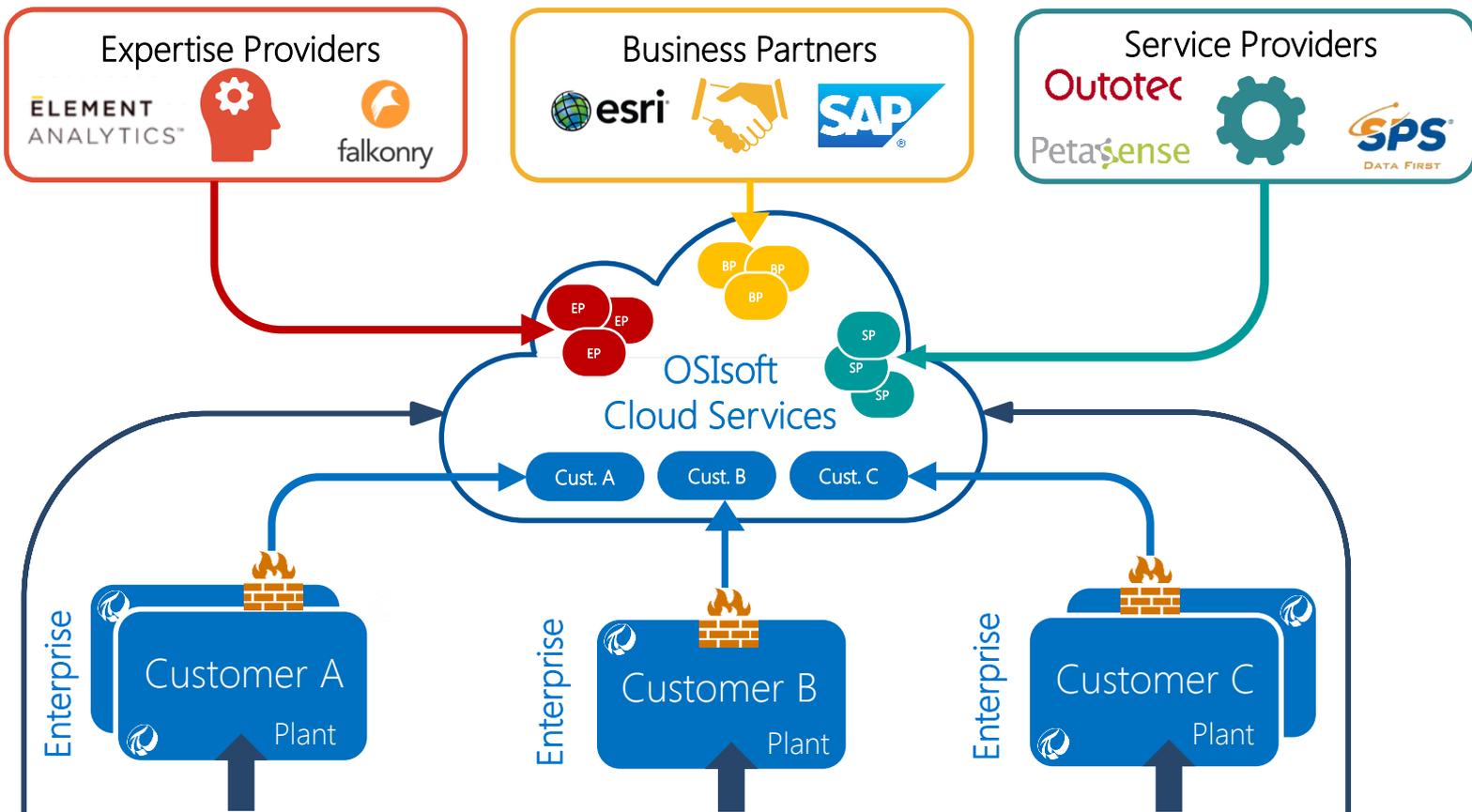


IT Hardware



Other Operational Data

- Facilities
- Logistics



Process Equipment



Control Hardware



IT Hardware



Other Operational Data

- Facilities
- Logistics

## Questions

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



Please state your **name & company**

## Please don't forget to...

complete the Post  
Event Survey

감사합니다

谢谢

Danke

Merci

Gracias

**Thank You**

ありがとう

Спасибо

Obrigado