Past, Present and Future Insights for a Journey to Operational Intelligence

Presented by Martin Otterson, OSIsoft

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Martin Otterson

Journey to Operational Intelligence

Joseph Sirosh

Connected Cow to Connected Datacenter, Advanced Analytics in the 21st Century

Nils Herzberg

IoT & Big Data for the Industrial Space

Norton Green

OSIsoft's Journey to Operational Intelligence

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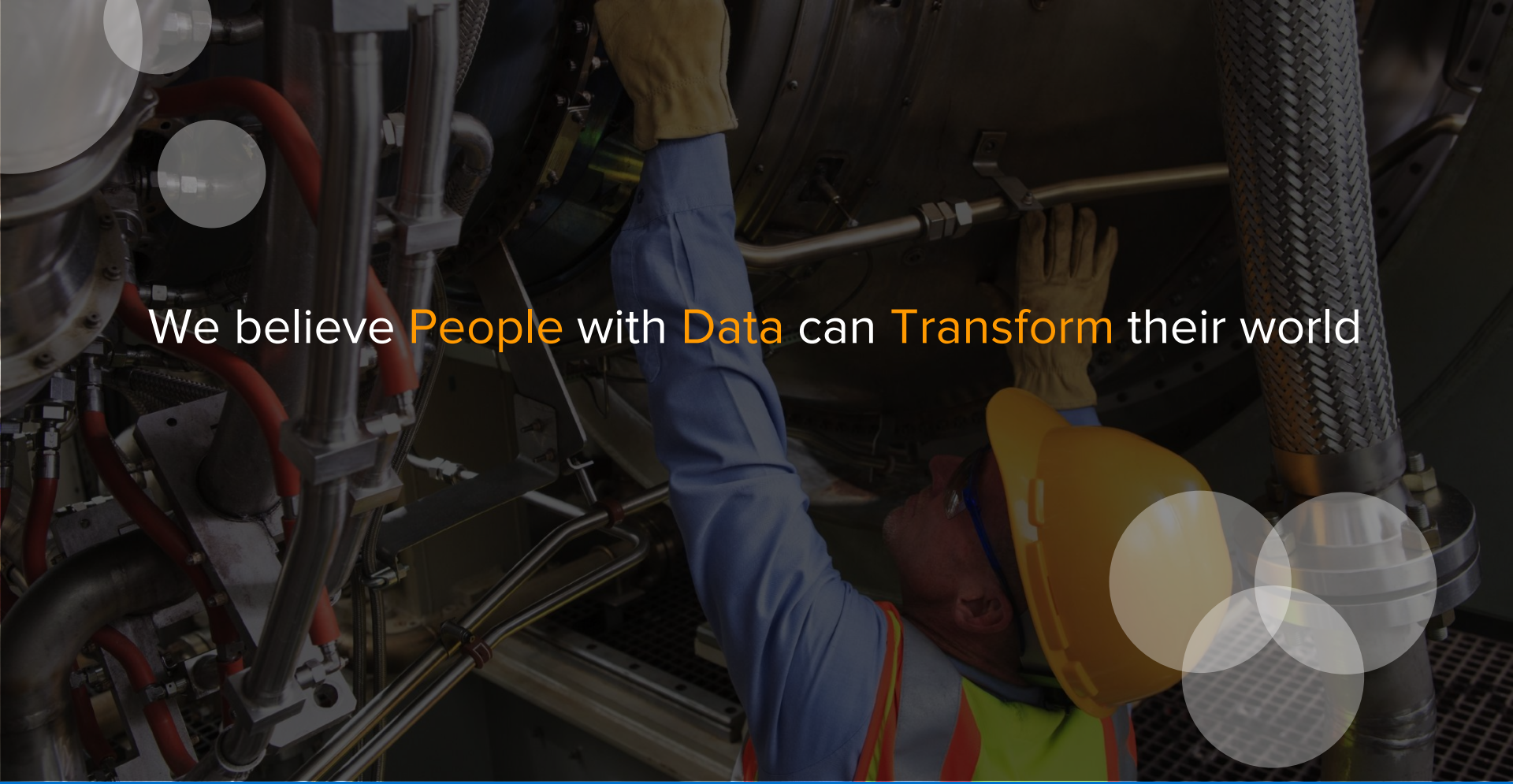

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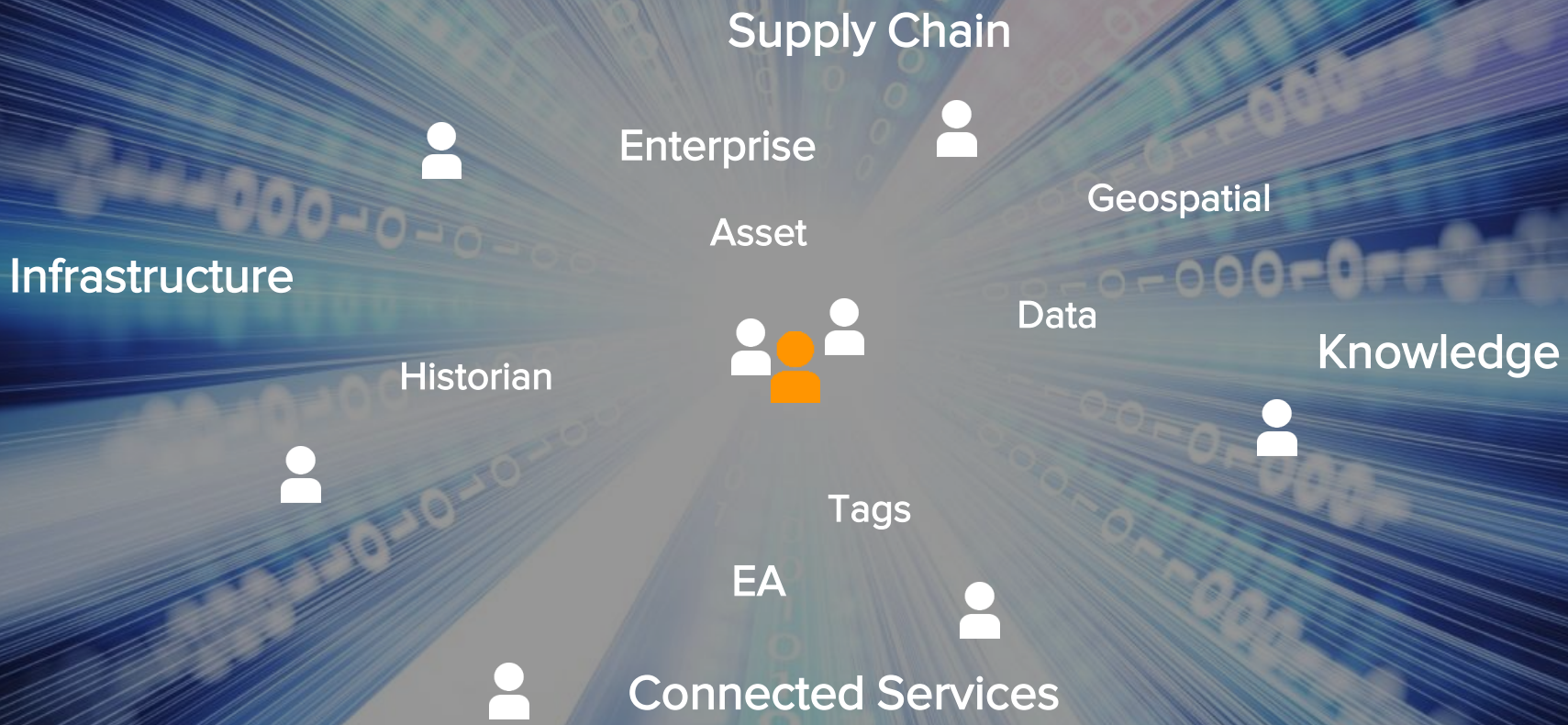
A Transformational Journey



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Game Plan for Your Journey

6. Buy-in

- Business impact workshop to assess areas of transformation

5. Socializing the business case

- Build internal awareness

4. Mapping your organization

- Identify key stakeholders, what they value, and a plan for success

3. Imagine the possible

- What else could you do?

2. Document your success

- Showcase what you have been able to achieve with the PI System

1. Aligning our vision

- Understanding your strategic focus
- How does OSIsoft align with your goals

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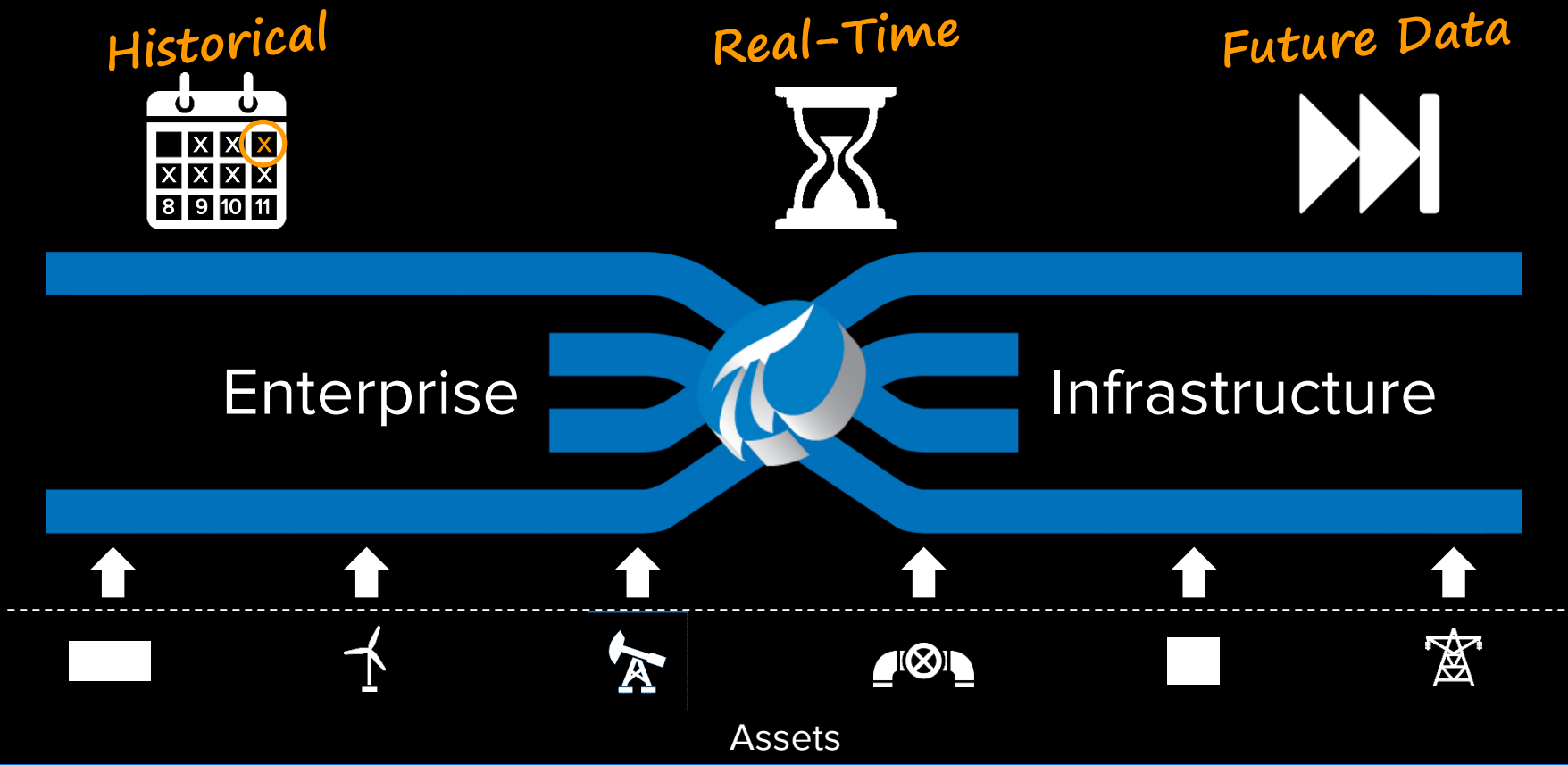
Infrastructure For Transformative Insights



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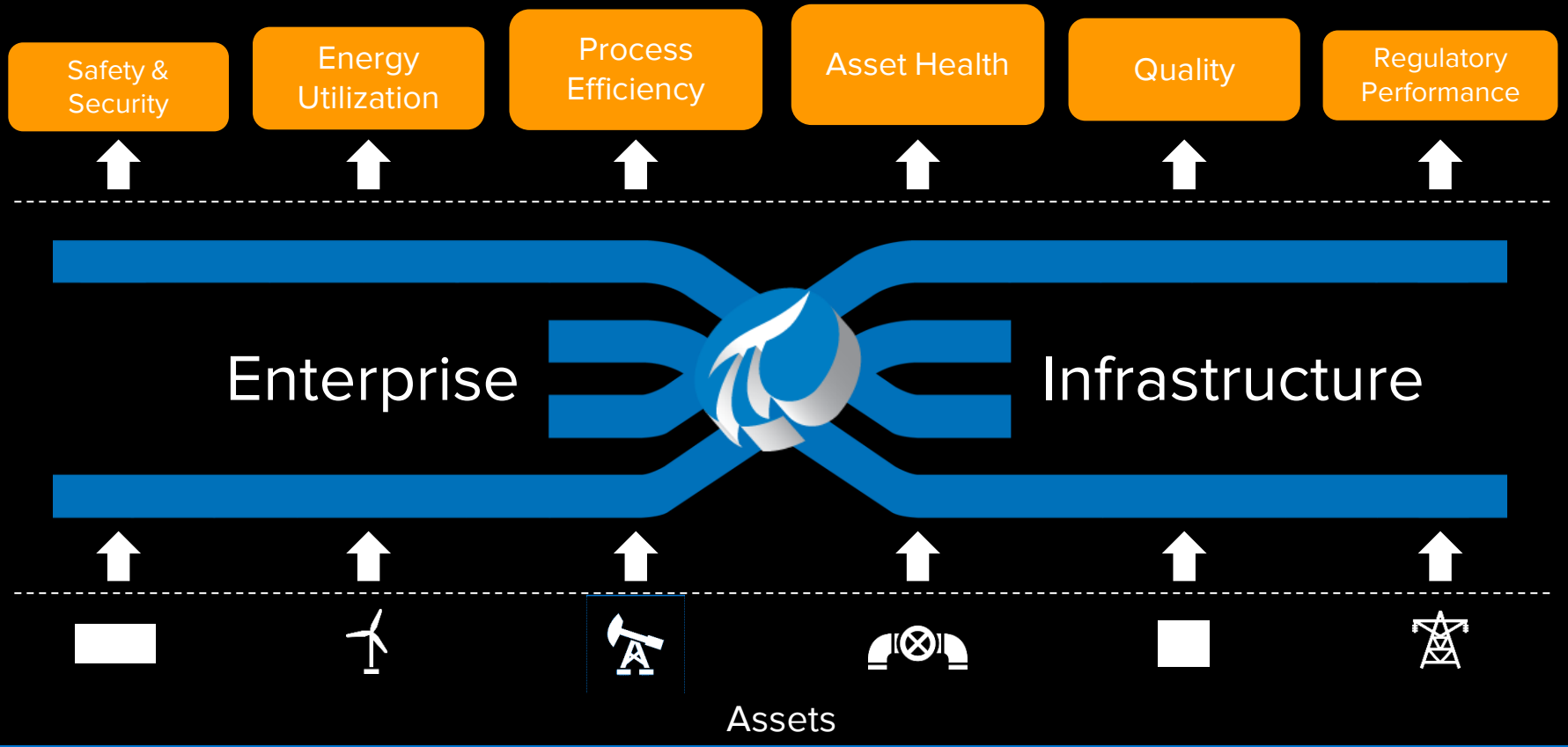
Insights For Enterprise Impacts



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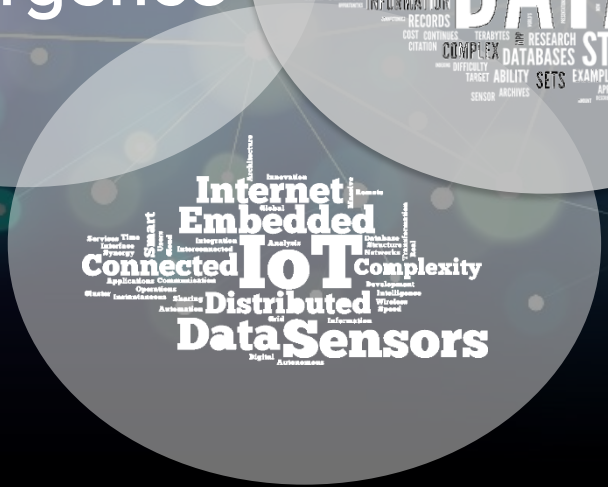
Sensor Data Trends and New Insight Opportunities

Enterprise Insights

IT / OT Convergence

Novel Insights



New Insights

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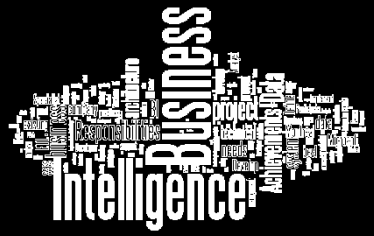
Infrastructure For Today and Tomorrow's Transformations



OT

IT

Scada

HMI

PLC

DCS

Assets

Assets

Assets

Sensors

Gateways

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Connected Cow to Connected Datacenter - Advanced Analytics for the 21st Century

Joseph Sirosh
Corporate Vice President

Microsoft

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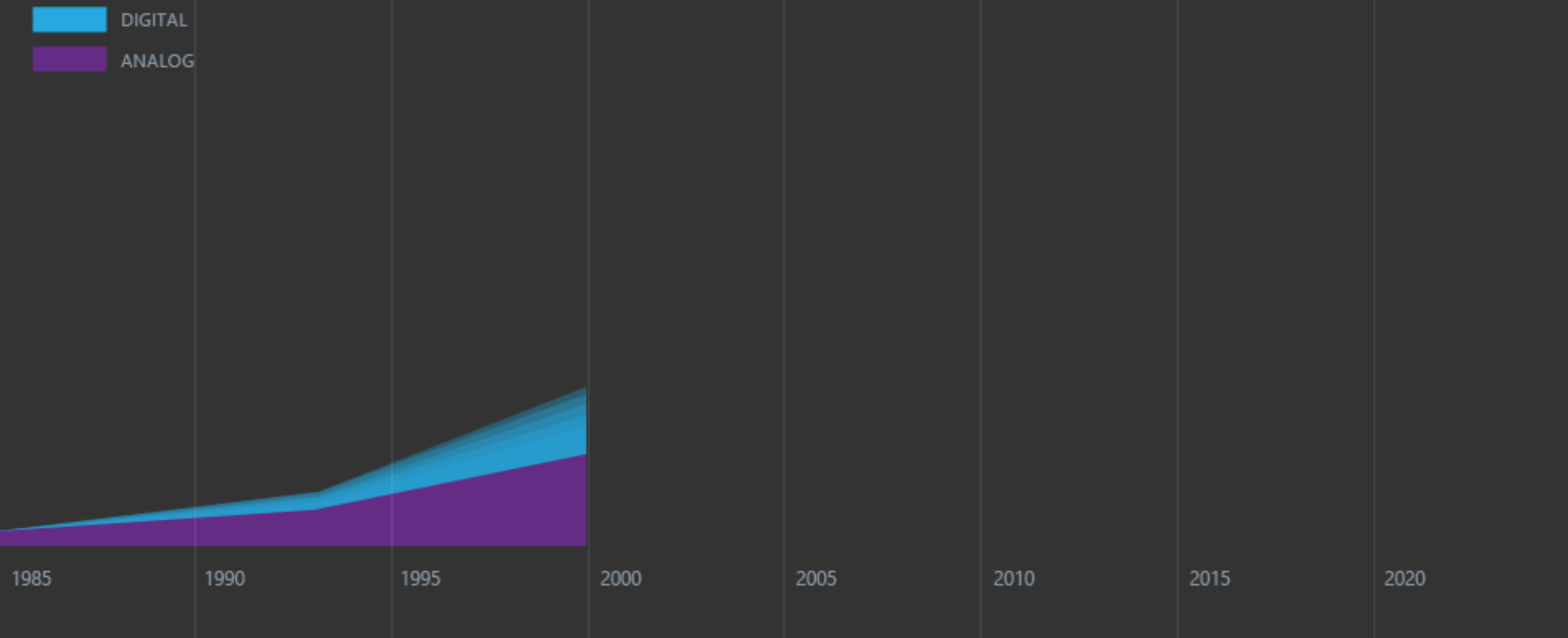
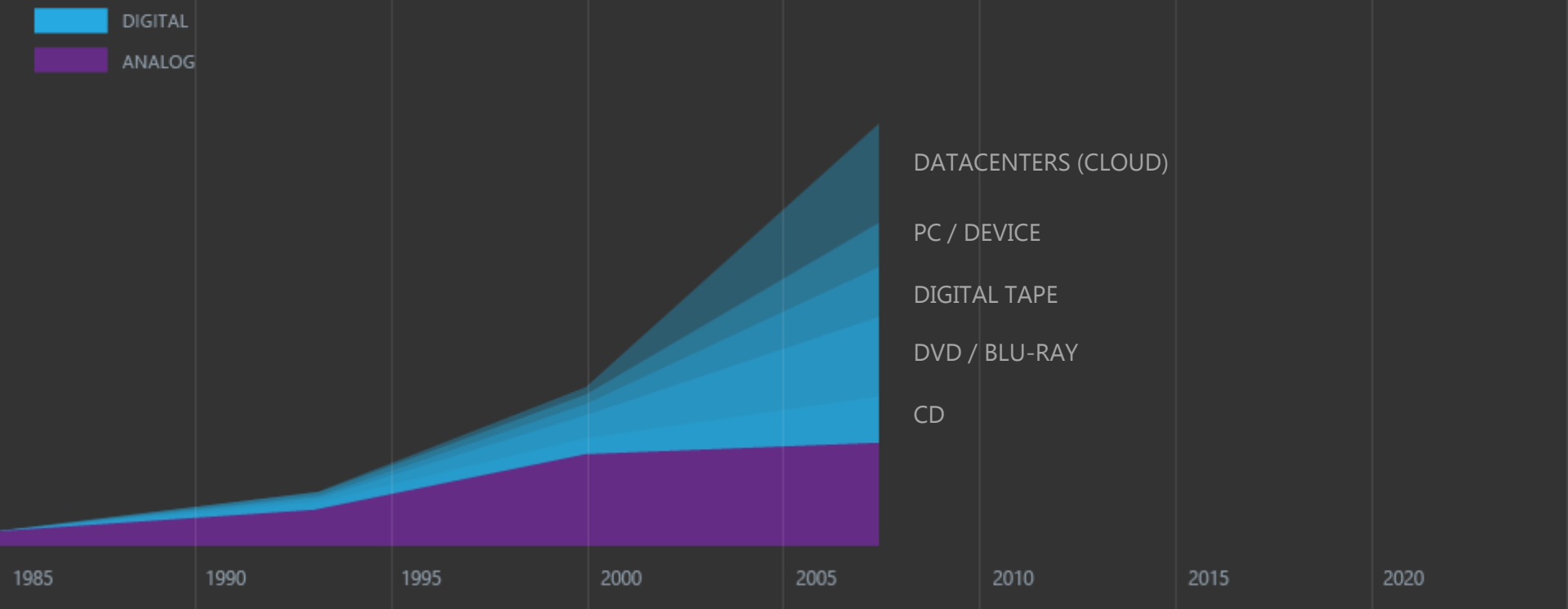
The world's data



The world's data



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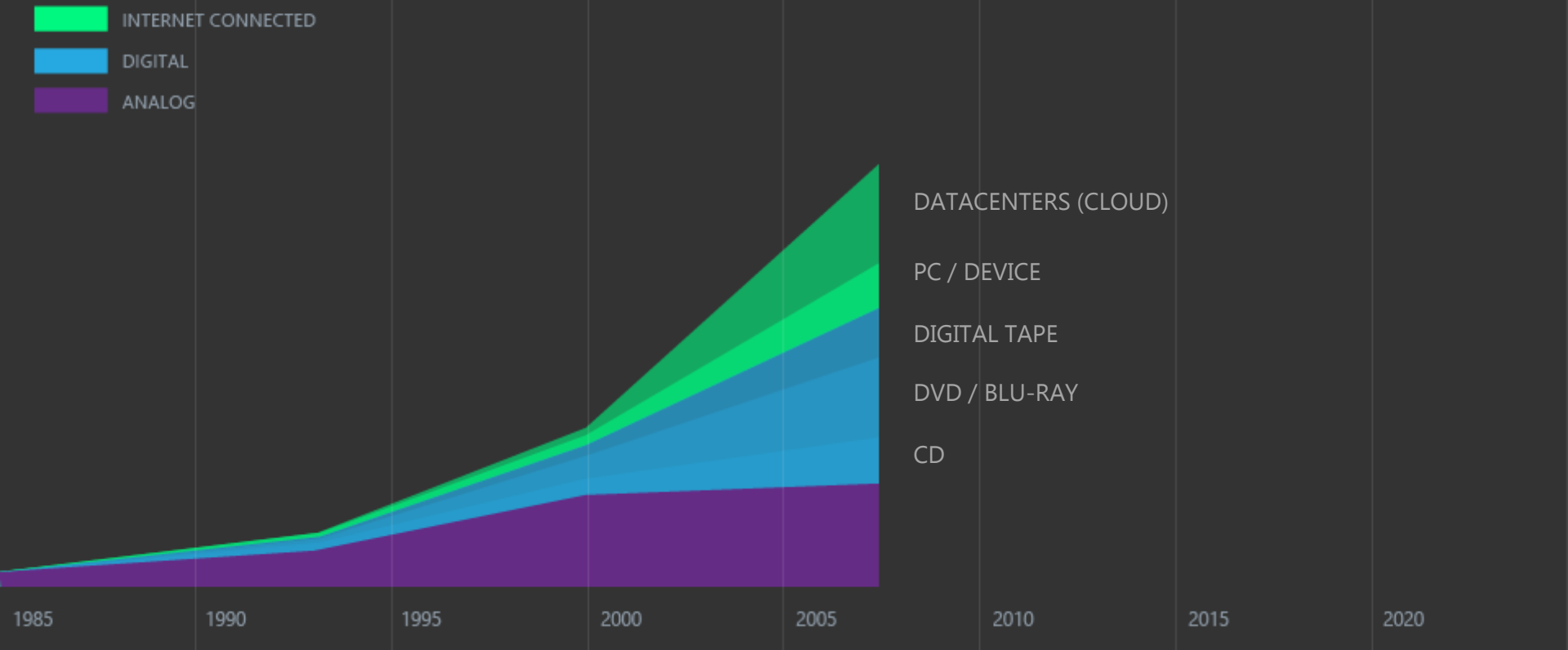

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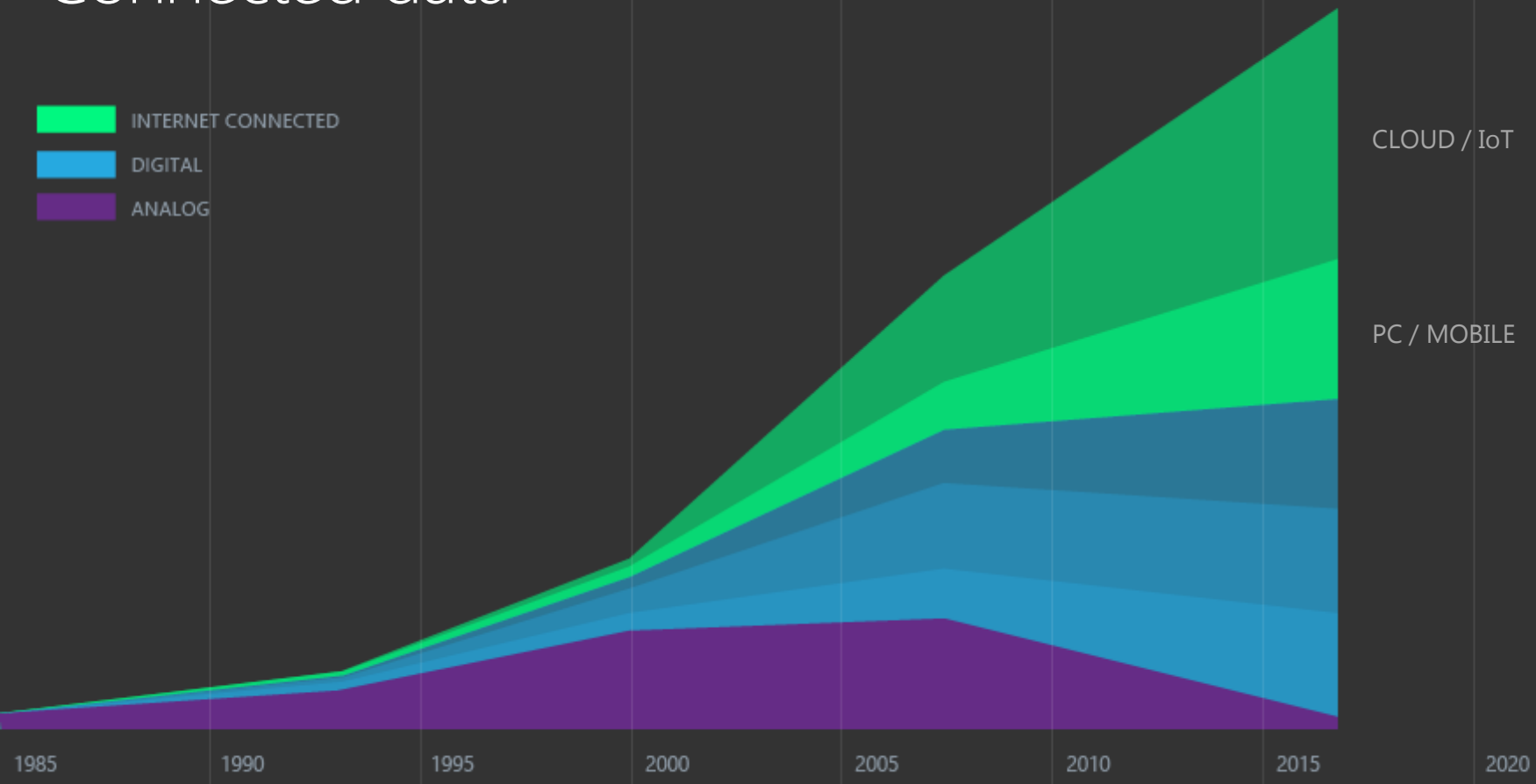

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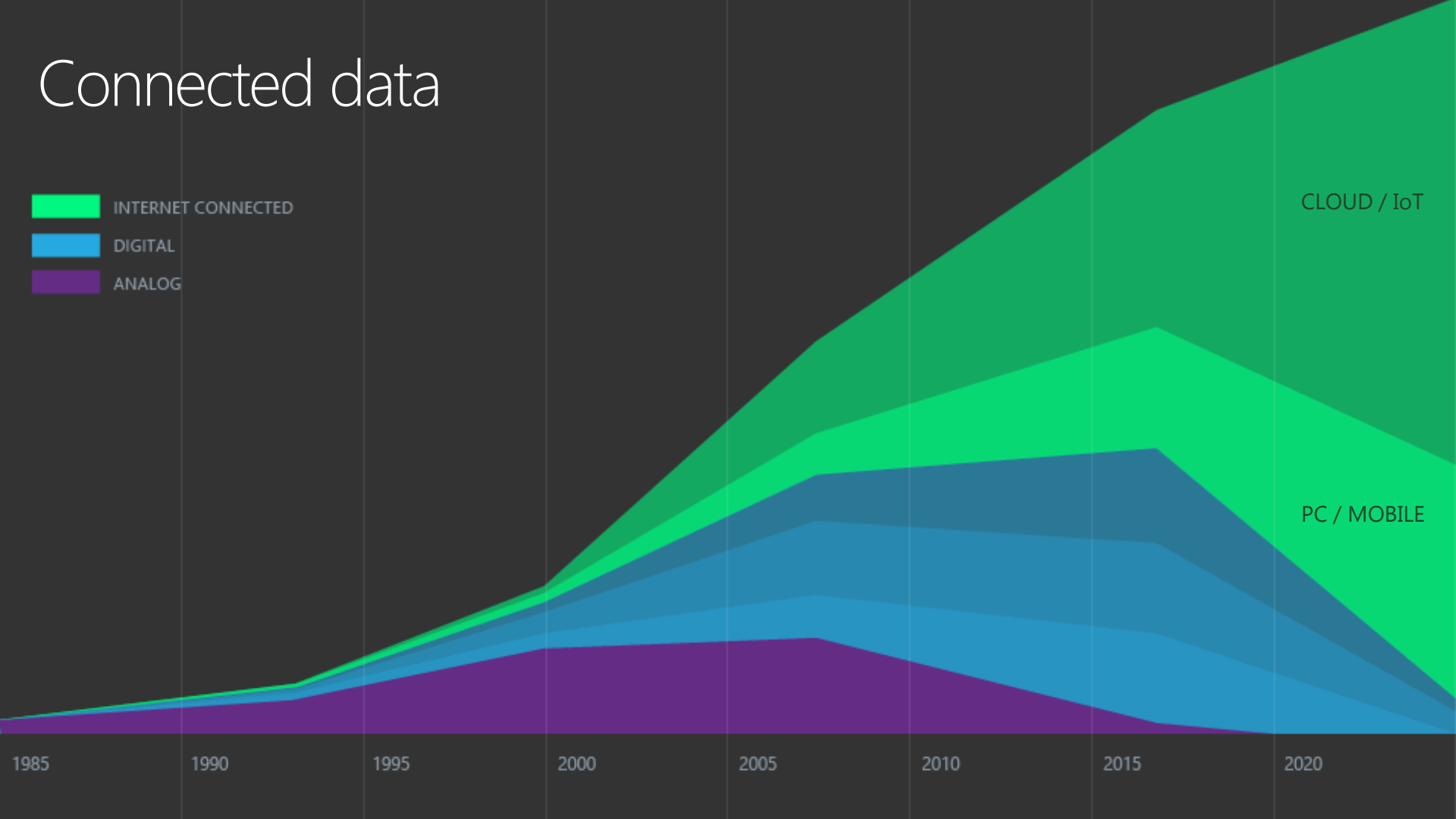


Connected Cow

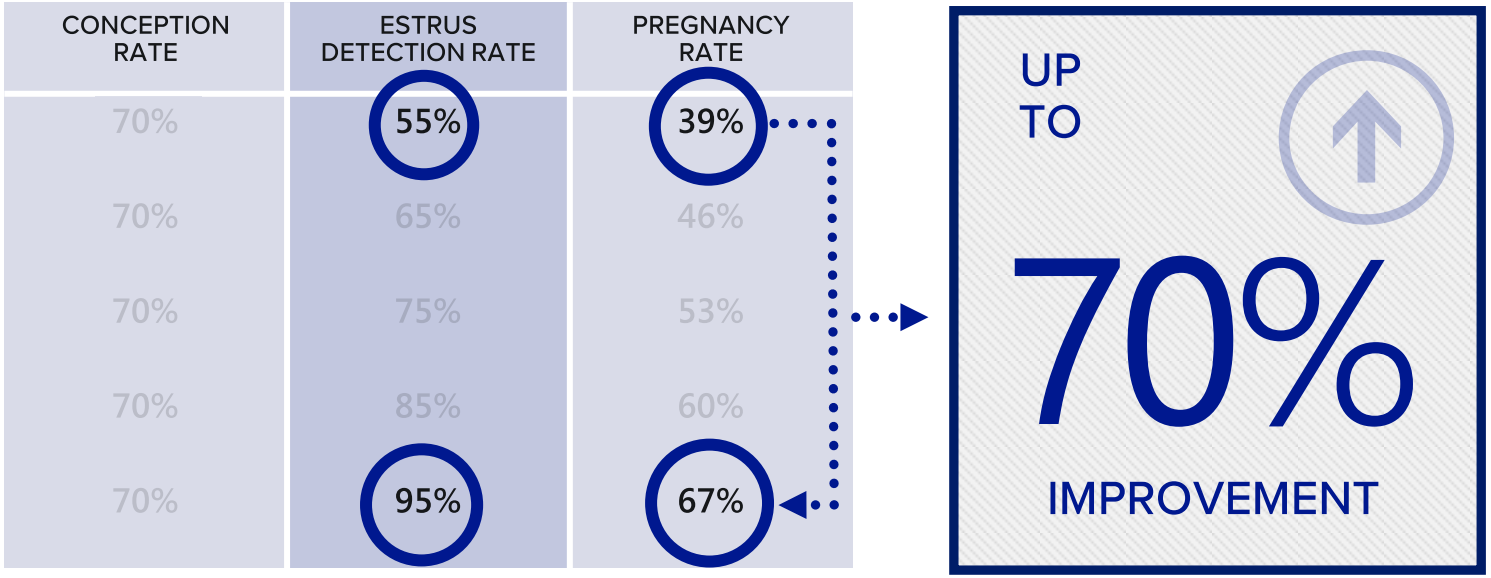
Do cows need to take 10,000 steps a day?

Every company is a data company…

What a dairy farmer can do..

- Detect health issues early and prevent loss
- Improve cattle production by accurate detection of estrus

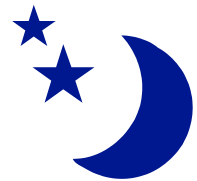
Effect of estrus detection rate on increasing pregnancy rate



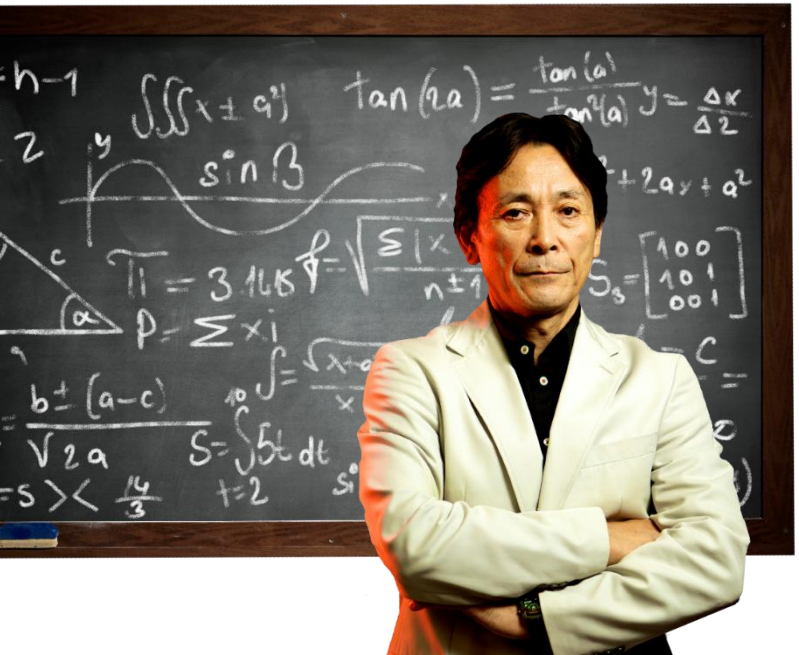
Source: “Detection of Standing Estrus in Cattle”
FS921B – George Perry, Beef Reproduction and Management Specialist Animal and Range Sciences Department

But this is hard…

- Estrus lasts only for 12-18 hours every 21 days
- Occurs mostly between 10pm and 8am

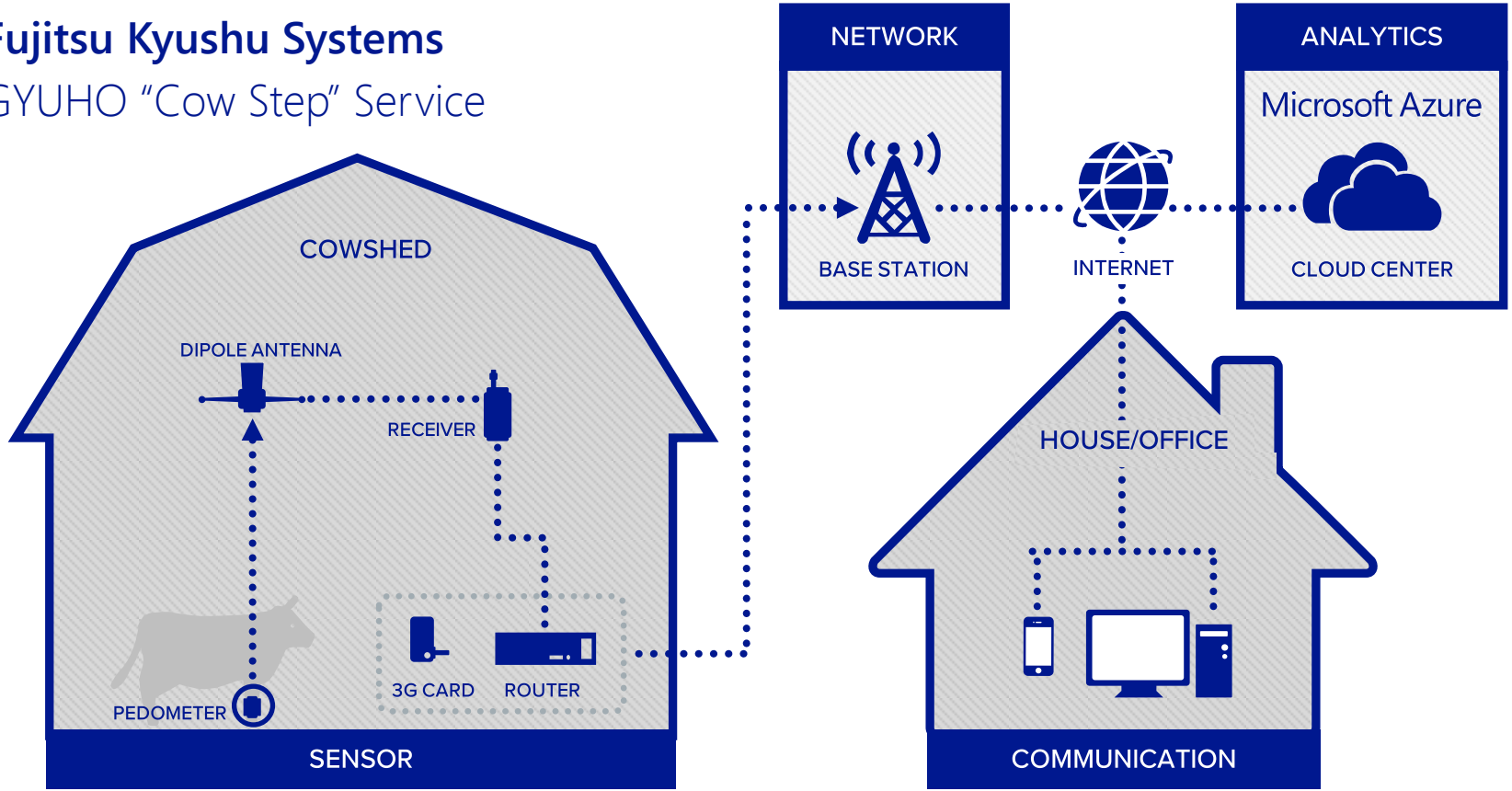


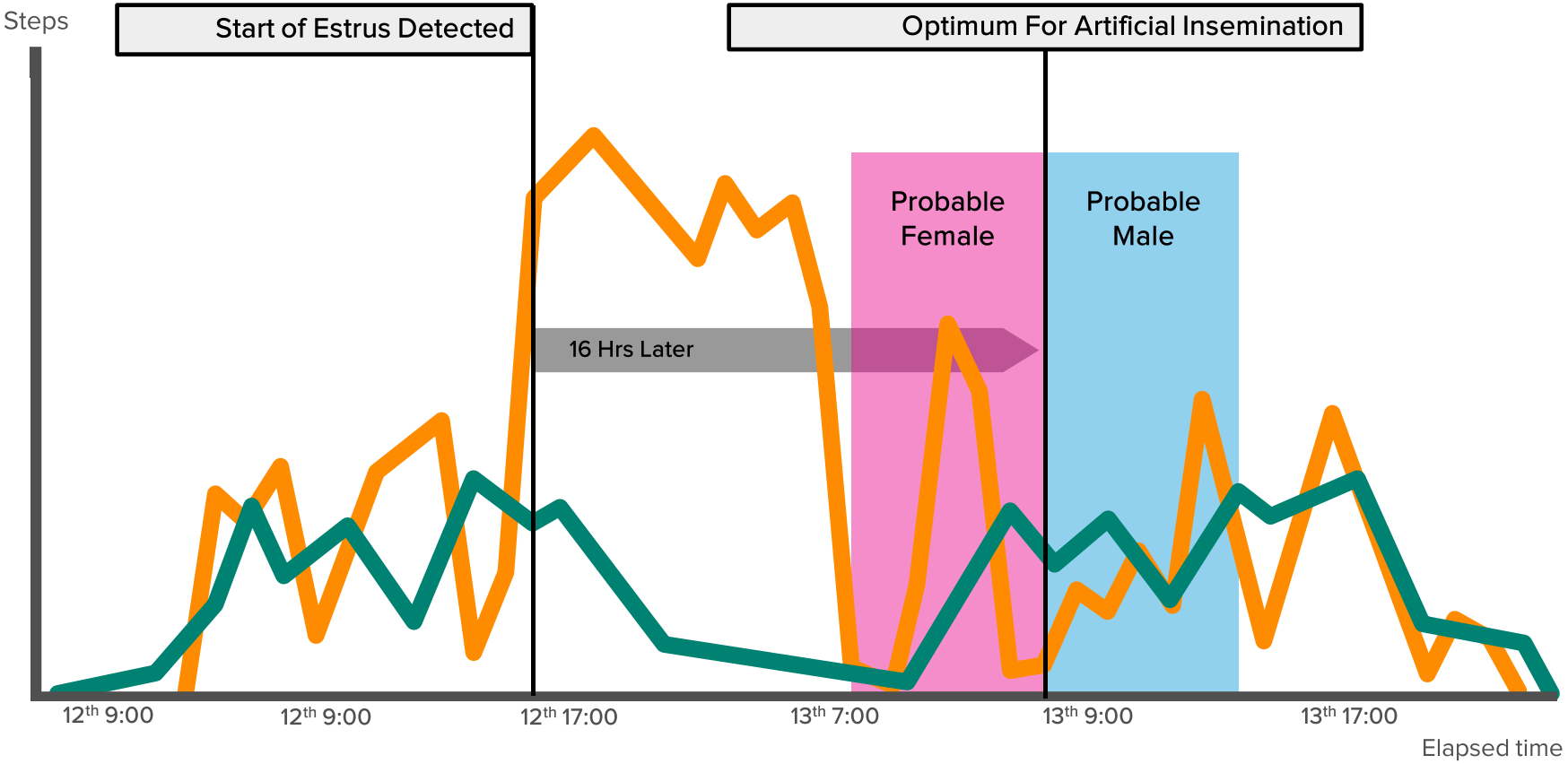
How can farmers tell when the time is right for hundreds of cows?


tan (2a) = tan (a) / tan²(a)
sin β
P = Σ xi
S = ∫ 5t dt
t=2

Fujitsu Kyushu Systems

GYUHO “Cow Step” Service





Source: http://www.fujitsu.com/global/about/resources/news/press-releases/2013/1015-01.html

"In God I trust, but all others bring data"

W. Edwards Deming

Economic effects before and after utilizing Fujitsu GYUHO system on 11 dairy farms

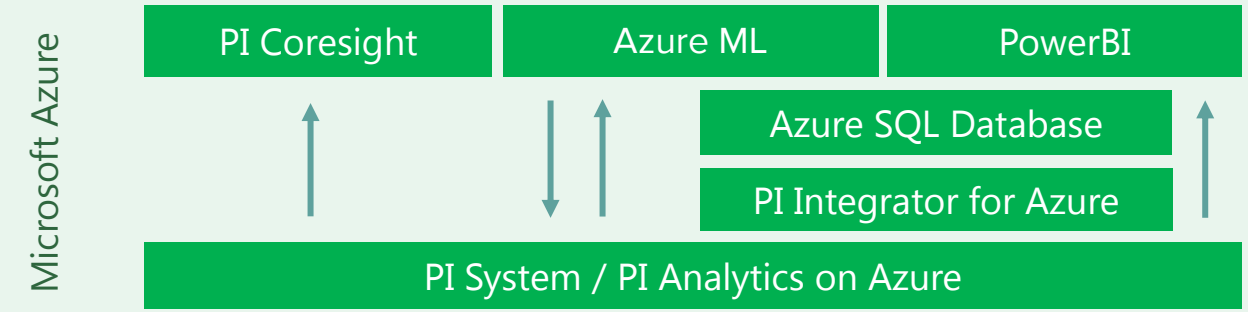
	STOCK FARMER NAME	BREEDING NUMBERS	BEFORE GYUHO INTRODUCTION 8 MONTHS		AFTER GYUHO INTRODUCTION 8 MONTHS		SHORTENED DAYS	ANNUAL PRODUCTION INCREASED HEADS	ANNUAL INCREASE IN %	INCOME INCREASE BY PRODUCTION INCREASE JPY350,000/ CATTLE (♂・♀AVERAGE)
			DAYS-OPEN	INTRAPARTUM INTERVAL	DAYS-OPEN	INTRAPARTUM INTERVAL				
1	A STOCK FARMER	180	78	363	63	348	15	8	4%	2,800,000
2	B STOCK FARMER	262	74	359	59	344	15	12	5%	4,200,000
3	C STOCK FARMER	110	96	377	66	351	26	8	7%	2,800,000
4	D STOCK FARMER	202	54	339	40	330	9	6	3%	2,100,000
5	E STOCK FARMER	498	78	363	51	336	27	40	8%	14,000,000
6	F STOCK FARMER	201	154	439	74	359	80	37	18%	12,950,000
7	G STOCK FARMER	537	115	400	62	347	53	75	14%	26,250,000
8	H STOCK FARMER	273	217	502	66	351	151	85	31%	29,750,000
9	I STOCK FARMER	173	137	422	67	352	70	29	17%	10,150,000
10	J STOCK FARMER	248	83	368	50	335	33	24	10%	8,400,000
11	K STOCK FARMER	151	102	387	69	354	33	13	9%	4,550,000
	AVERAGE	258	108	393	61	346	47	31	12%	10,722,727

Connected
Datacenter

Microsoft Critical Infrastructure Operations (MCIO)

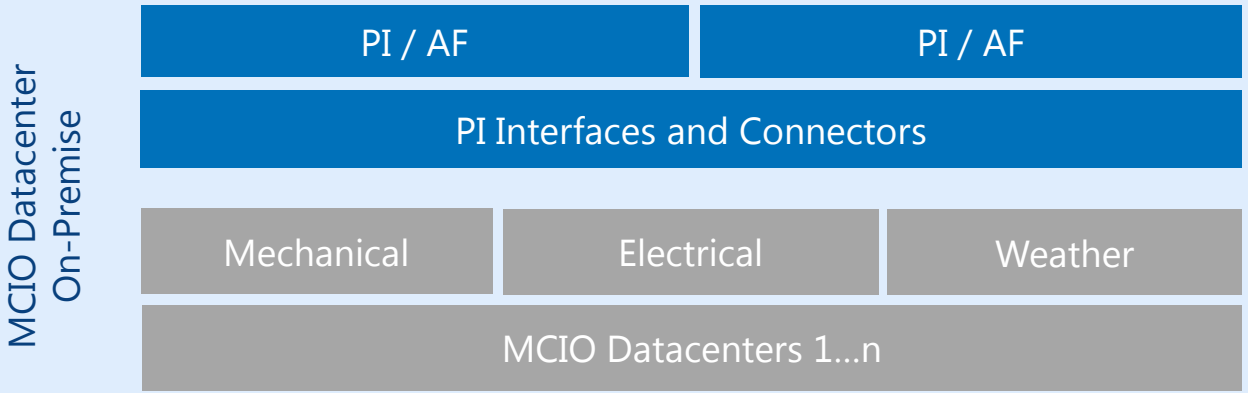
Azure Region	Location
Central US	Iowa
East US	Virginia
East US 2	Virginia
US Gov Iowa	Iowa
US Gov Virginia	Virginia
North Central US	Illinois
South Central US	Texas
West US	California
North Europe	Ireland
West Europe	Netherlands
East Asia	Hong Kong
Southeast Asia	Singapore
Japan East	Saitama Prefecture
Japan West	Osaka Prefecture
Brazil South	Sao Paulo State
Australia East	New South Wales
Australia Southeast	Victoria

OSIsoft PI and MCIO Datacenters



Operationalize Azure ML forecasting and predictive analytics for xUE (PUE, CUE, WUE) calculations with data from PI System

Create Event Frames, asset-based analytics and cloud-based Power BI Dashboard for performance analysis from aggregated PI System on Azure IaaS.



Collect real-time and historical data from Datacenter Mechanical, Electrical Systems and weather feeds within on premise PI Systems. Microsoft Datacenters are OSIsoft EA customers from 2007

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EXPERIMENT

Oil Price Forecasting with STL+ETS model

This experiment is a demonstration on how user apply STL decomposition and ETS model on time series data in AzureML.

Forecasting ETS STL

695 583 3 months ago

Yijing Chen

Trending experiments

VIEW ALL

EXPERIMENT

Sample 1: Download dataset from UCI: Adul...

This sample demonstrates how to download a dataset from a http location, add column names to th...

reader http reader input

EXPERIMENT

Tutorial: Building a classification model in ...

This experiment serves as a tutorial on building a classification model using Azure ML. We will be using...

Two-Class Decision Forest

tutorial classification

EXPERIMENT

Telco Customer Churn

Customer churn can take different forms, such as switching to a competitor's service, reducing th...

Two-Class Decision Forest

Customer Churn Decision Tree

EXPERIMENT

Predict Wine Quality - Classification

Prediction of wine quality using Multiclass Classification analysis

Multiclass Decision Forest, Multiclass Decision Jungle, Multiclass Neural ...

Multiclass Classification

EXPERIMENT

Predictive Maintenance Model

This is a predictive maintenance model that predicts yield failure in a semiconductor manufacturing ...

Two-Class Boosted Decision Tree, Two-Class Logistic Regression, Two...

Predictive maintenance model

EXPERIMENT

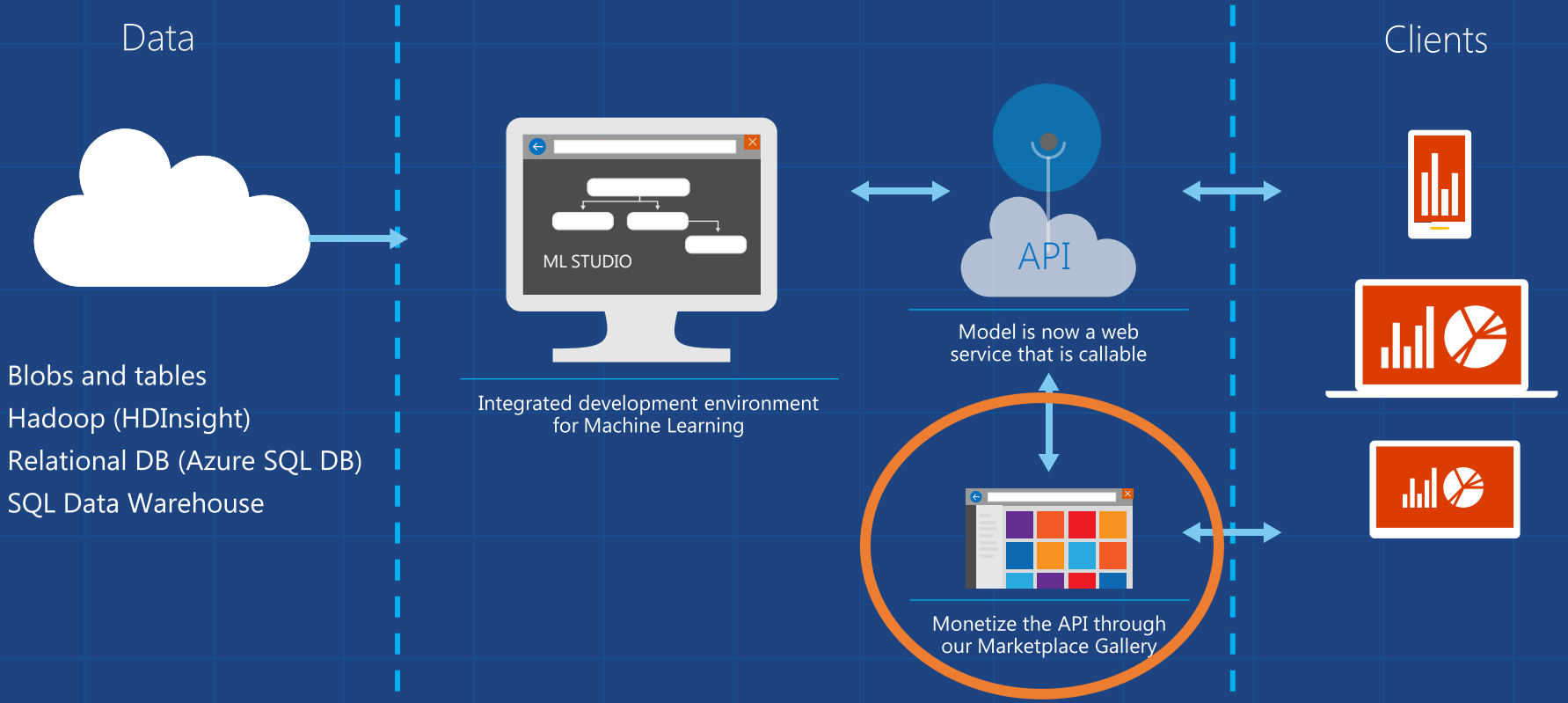
Recommender: Restaurant ratings

This experiment demonstrates the use of the Matchbox recommender modules to train a restaurant rec...

Recommender Restaurants

Azure Machine Learning

Data -> Predictive model -> Operational web API in minutes

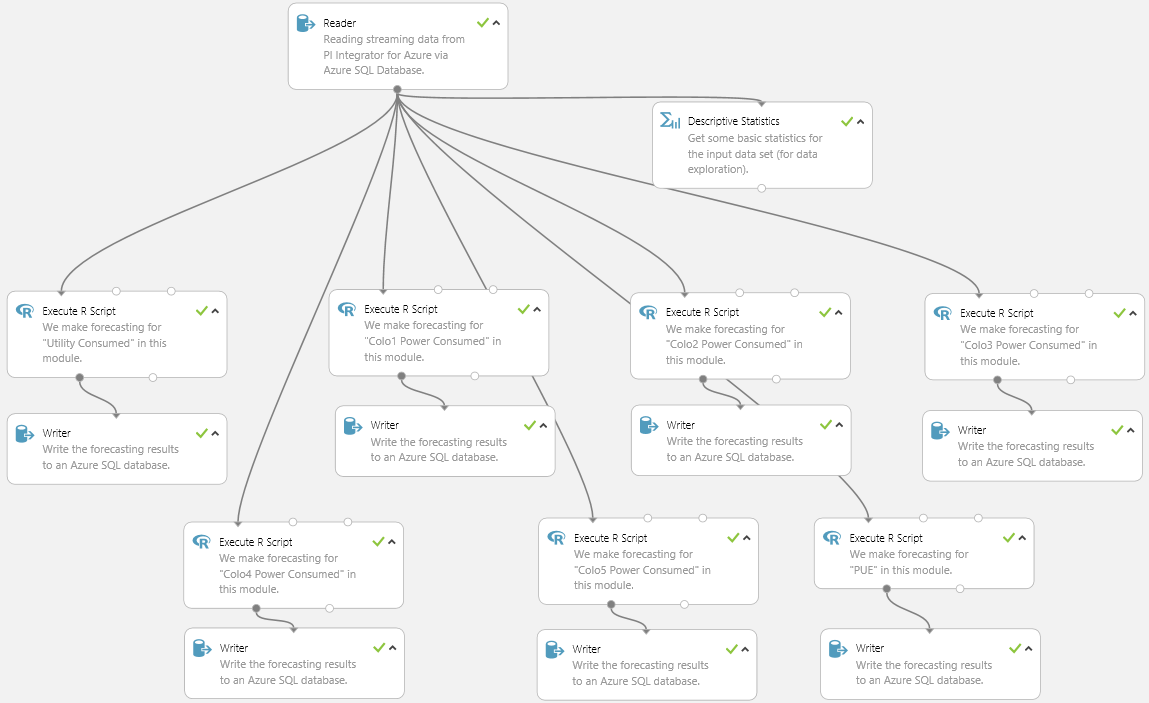


Microsoft Datacenter - Short Term Forecasting (PUE, Colo Power Usage, and Total Utility Usage)

Finished running

Search experiment items

- Saved Datasets
- Data Format Conversions
- Data Input and Output
- Data Transformation
- Feature Selection
- Machine Learning
- OpenCV Library Modules
- Python Language Modules
- R Language Modules
- Statistical Functions
- Text Analytics
- Web Service
- Deprecated



Properties

Experiment Properties

START TIME	4/24/2015...
END TIME	4/24/2015...
STATUS CODE	Finished
STATUS DETAILS	None

Disable upgrades

Prior Run

Summary

Enter a few sentences describing your experiment (up to 140 characters).

Description

Enter the detailed description for your experiment.

Quick Help

NEW | VIEW RUN HISTORY | SAVE | SAVE AS | DISCARD CHANGES | REFRESH | CANCEL | RUN | PREPARE WEB SERVICE | PUBLISH TO GALLERY | CREATE SCORING EXPERIMENT

Microsoft Datacenter - Short Term Forecasting - R Script

In draft

Draft saved at 2:12:33 PM

Search experiment items

- Saved Datasets
- Data Format Conversions
- Data Input and Output
- Data Transformation
- Feature Selection
- Machine Learning
- OpenCV Library Modules
- Python Language Modules
- R Language Modules
- Statistical Functions
- Text Analytics
- Web Service
- Deprecated

Properties

Execute R Script

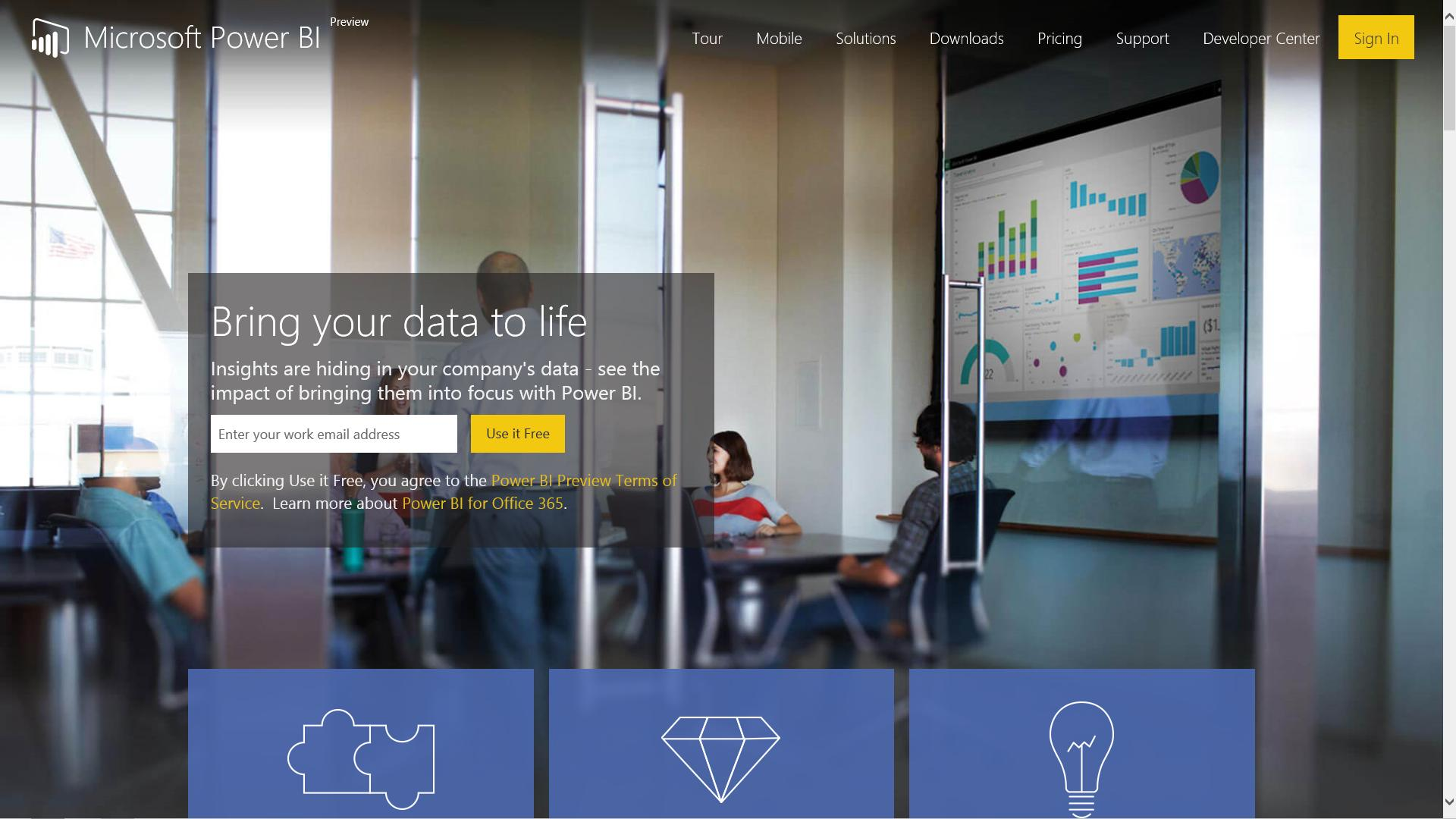
R Script

```
# In this module, we read the historical data and make the forecasting
# using the ARIMA method.

#==================================
# Part 1. Read and filter the input data as a data frame in R
D <- maml.mapInputPort(1)

colnames(D)[8] <- 'PUE'
D$GMTTimePoxit <- as.POSIXct(D$GMTTime, format='%Y-%m-%d %H:%M:%S', tz='UTC'
D = D[D$GMTTimePoxit<as.POSIXct('2015-03-01 0:00:00', format='%Y-%m-%d %H:%M


#============================
# Part 2. Parameter setting
# Please set the following parameters:
# 1. The index of the item to be forecasted. Please set F_col_idx to the corresponding value.
# 2. The number of future time points we are going to forecast. By default, we are making
#   hourly prediction in the next 3 days, so the parameter horizon is 24 * 3.
# 3. The length of forecasting time period by setting parameters forecasting_time_begin and
#   forecasting_time_end.
F_col_idx <- 2
horizon <- 24 * 3

# Here we set the forecasting time period from 2015-01-01 0:00:00 to 2015-02-25 23:00:00 UTC
forecasting_time_begin <- as.POSIXct('2015-01-01 01:00:00', tz='UTC')
forecasting_time_end <- as.POSIXct('2015-02-25 23:00:00', tz='UTC')
forecasting_time_list <- seq(from=forecasting_time_begin, to=forecasting_tim


#============================
# Part 3. Forecasting Part
library(forecast)
F_length <- length(forecasting_time_list)
for (i in 1:F_length) {
  # F_time is the forecastCreatedTime
  F_time <- forecasting_time_list[i]

  # Extract the most recent 7 days
  # for each signal, we are building a time series model and make the foreca
  time_range <- c(F_time-3600*(24*7-1), F_time)

```

Quick Help

Execute the given R script using R 3.1.0
(more help...)

NEW | VIEW RUN HISTORY | SAVE | SAVE AS | DISCARD CHANGES | REFRESH | CANCEL | RUN | PREPARE WEB SERVICE | PUBLISH TO GALLERY | CREATE SCORING EXPERIMENT


Microsoft Power BI
Preview
Tour
Mobile
Solutions
Downloads
Pricing
Support
Developer Center
Sign In
Bring your data to life
Insights are hiding in your company's data - see the impact of bringing them into focus with Power BI.
Enter your work email address
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By clicking Use it Free, you agree to the Power BI Preview Terms of Service. Learn more about Power BI for Office 365.

https://msit.powerbi.com/dashboards/4277b621-c2bc-48dd-a6b4-f6b68c80078d

Power BI

Microsoft Power BI Preview

Get Data

Filter content

Dashboards

- ADF Wireless Sample
- How Old Dashboard: ho...
- Microsoft datacenter cri...
- New Technology Adopti...
- Retail Analysis Sample

Reports

- New Technology Adopti...

Datasets

- New Technology Adopti...

Microsoft datacenter critical electrical system dash...

Share Dashboard

Ask a question about the data on this dashboard

DC1 operation
IN YEARS
4.00

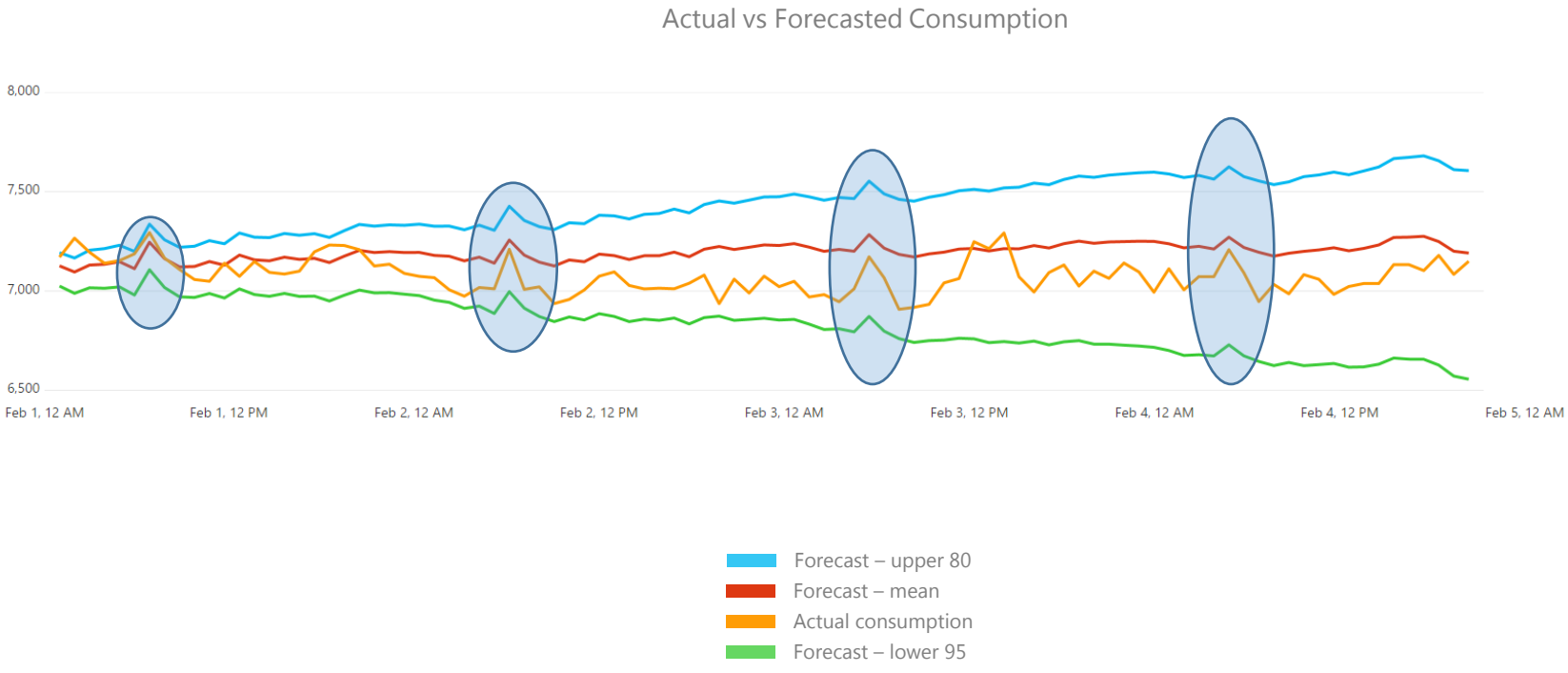
DC2 operation
IN YEARS
4.00

DC1 PUE
AVE. OVER LIFETIME
1.46
1
2

DC2 PUE
AVE. OVER LIFETIME
1.51
1
2

Actual vs Forecasted Consumption
Average of ForecastMean
Average of Actual
7,300
7,200
7,100
7,000
6,900
Feb 02
Feb 03
Feb 04

DC campus consumption
BY COLO
Colo5 Power Consumed
Colo5 Power Consumed
Colo3 Power Cons...
Colo4 Power Cons...
Colo2 Power Consumed
Colo1 Power Consumed
Colo3 Power Consumed
Colo1 Power Consumed
Colo4 Power Consumed
Colo2 Power Consumed


Actual vs Forecasted Consumption
8,000
7,500
7,000
6,500
Feb 1, 12 AM
Feb 1, 12 PM
Feb 2, 12 AM
Feb 2, 12 PM
Feb 3, 12 AM
Feb 3, 12 PM
Feb 4, 12 AM
Feb 4, 12 PM
Feb 5, 12 AM
Forecast – upper 80
Forecast – mean
Actual consumption
Forecast – lower 95

MOD xLIE Alert
Load Transferred In (Verify)
DC Name: DCxx1, low CLIE
Reason: Renewable load increase

MCIO xUE Alert
Load Transferred In (Verify)
DC Name: DCxx1, low CUE
Reason: Renewable load increase

PI Server 2015

Allows to store and analyze past / present / future/predicted data

Azure Machine Learning

Allows to operationalize R code as a web-service

Predicts possible spikes (highs and lows) for xUE (PUE, CUE, WUE) metrics
Makes just-in-time changes to the operation
Reduces Energy Usage, and improves xUE

THANK YOU

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IoT & Big Data for the Industrial Space

Presented by Nils Herzberg, SAP

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Thing to Action – OSIsoft & SAP Partnership for Customer Value

Nils Herzberg – Co-Lead for IoT Go to Market
April 2015

Public

There is no BI without PI

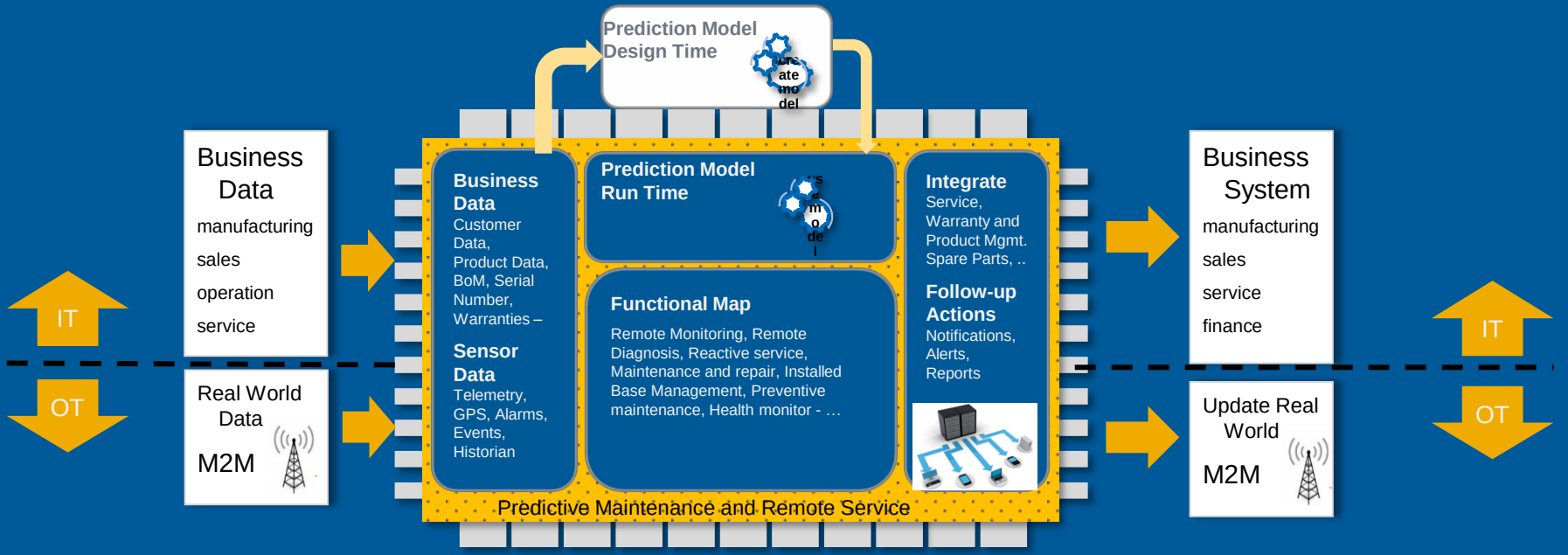
Josh Greenbaum

2006

There is no convergence of OT and IT without OSIsoft and SAP

Martin Otterson & Nils Herzberg

April 28th 2015



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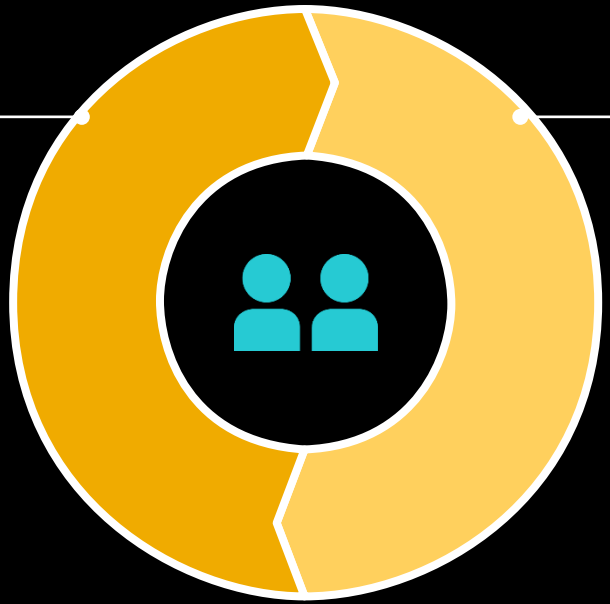
PI System

Processing & analyzing of data in the **same time period and rate…**

as the dynamic fluctuations **in data and events actually occur.**



SAP HANA & S4HANA

Analyzing and processing of **already stored data…**

within **seconds to minutes** of processing time

Thing to Insight → Insight to Action

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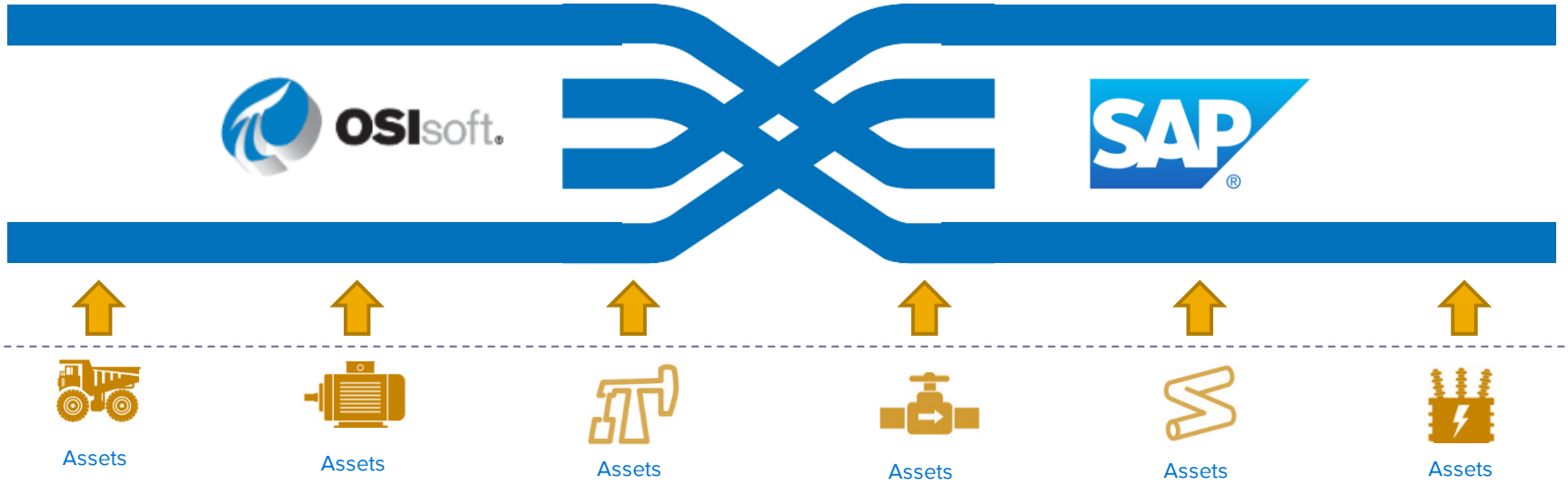
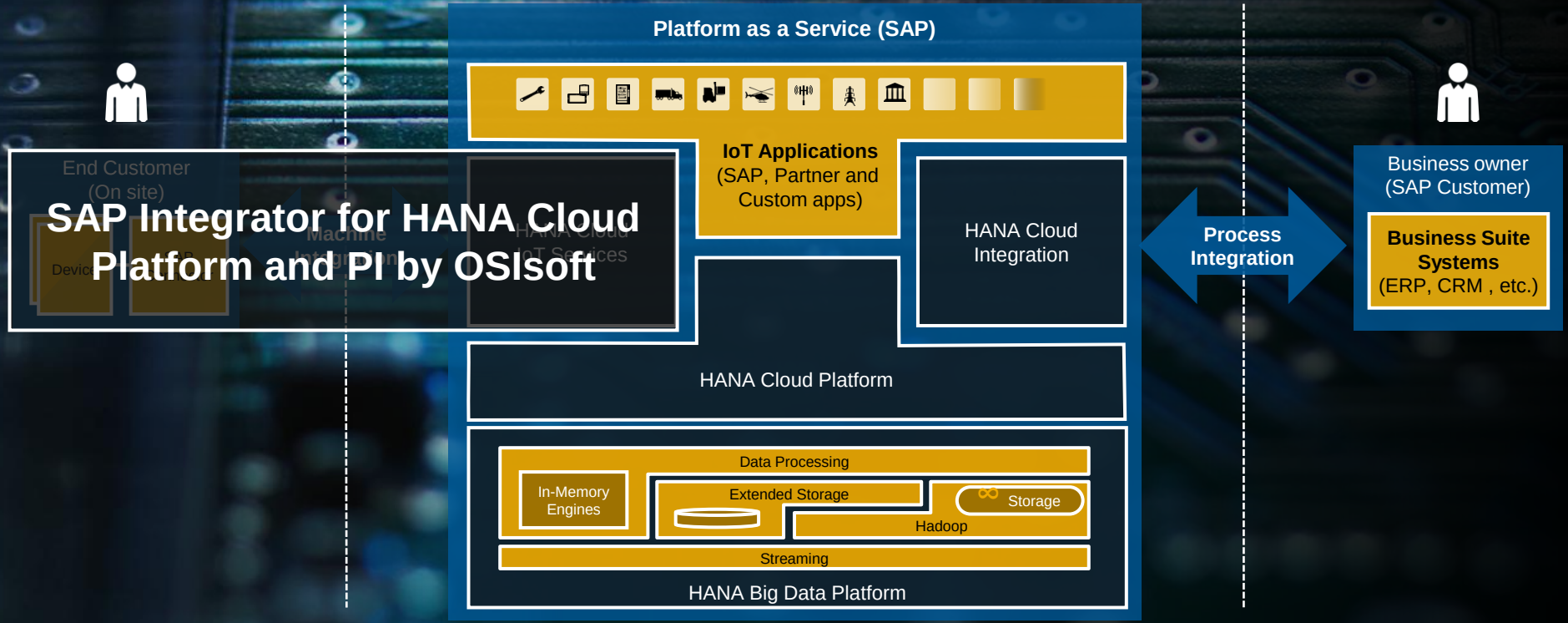
SAP Integrator for HANA and the PI System by OSIsoft

SAP Integrator for HANA Cloud Platform and the PI System by OSIsoft



SAP HANA Cloud Platform – a central element as your In-Memory ‘Platform as a Service’



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Making your life simpler in UTILITIES

Real-time grid analytics	Outage prevention and management	Asset health management and predictive maintenance	Leakage and fraud management
Consumption and load analytics	Demand response management	Commercial load planning and virtual power plants	Management of wind farms

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Source: Selected scenarios discussed as potential candidates with the SAP EAC for Utilities

Making your life simpler in OIL & GAS

Drilling Optimization	Geospatial Integration	Asset health management and predictive maintenance	Leakage Detection
Fuel Management	Feedstock supply optimization	Transmission Line-Pack Management	Regulatory Compliance

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Source: Selected scenarios discussed as potential candidates with the SAP EAC for Oil & Gas

Get onto the inside track on IT/OT convergence

- **Talk to OSIsoft during this UC**
- **Talk to SAP during this UC**
- **Register for the upcoming Webinar Series**
- **Be a beta-customer!**

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Thank YOU!

Thing to Action – OSIsoft & SAP Partnership for Customer Value

Nils Herzberg – Co-Lead for IoT Go to Market
April 2015

Public

OSIsoft's Journey to Operational Intelligence

Presented by Norton Green, OSIsoft

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Our Story

TREMENDOUS GROWTH

© Copyright 2015 OSIsoft, LLC

Our Story

300% Increase in IT assets

5 New business systems

60x increase in data (6PB!)

COMPLEX IT ARCHITECTURE

TREMENDOUS GROWTH

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Our Story

NO VISIBILITY

COMPLEX
IT ARCHITECTURE

TREMENDOUS
GROWTH

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FILE TOOLS VIEW

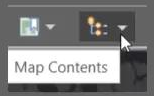
OSIsoft Offices and Azure Assets Full Operation View

Welcome!

Dashboard Description

Feel free to use the map toolbar to add or remove different live map layers to the dashboard map, and swipe left on this side panel to see additional live widgets based on live data from the PI System!

Below is the map legend, which expands with new information as new layers are added to the map. Use the "Map Contents" button:

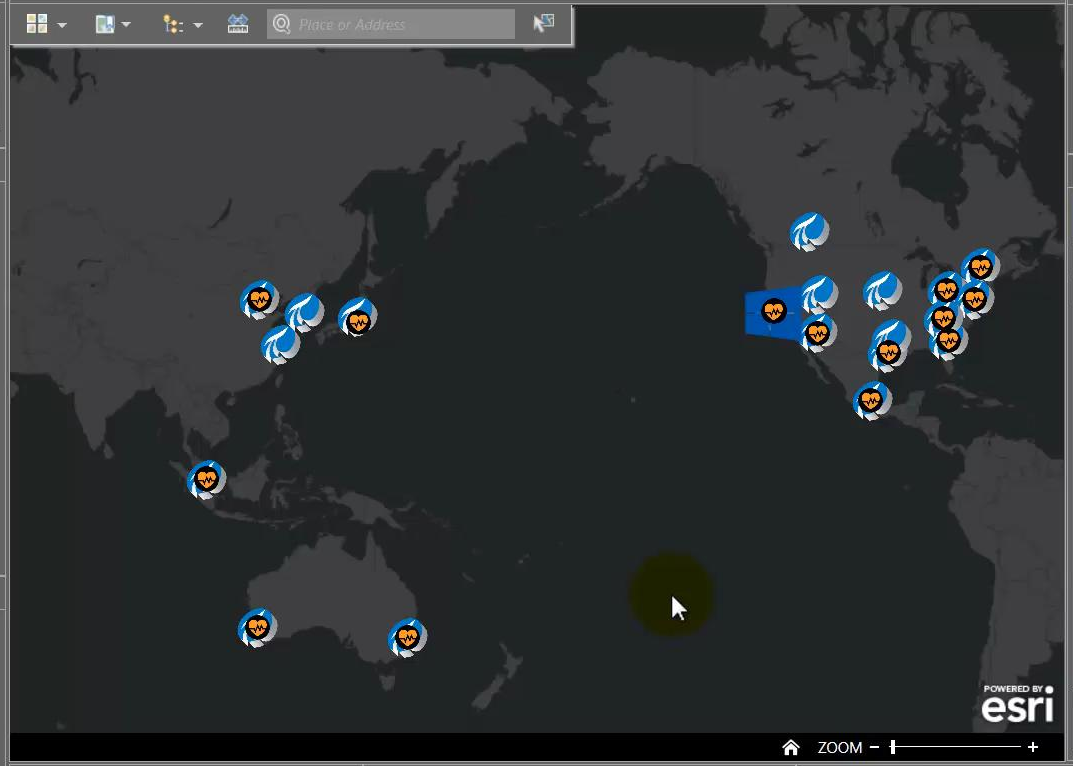


to add a new layer to the map.

Map Legend

- OSIsoft Live Office Data - All
- OSIsoft Live Azure Data
- OSIsoft World Wide Office Locations

OSIsoft Offices and Azure Assets



PI Coresight Description

Below is a PI ProcessBook display, hosted in PI Coresight 2014, showing the live CPU load at each office. You can click the "Pop-out" arrow button in the top right corner of the widget to expand it, and you can use the time control toolbar at the bottom of the display to change the display time range. You can also click on a map feature in order to see a pop-up that contains a link to open a new PI Coresight display in a seperate browser window!

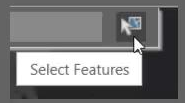
PI Coresight Widget

Average Ping Time

of all offices (in ms)

Gauge Description

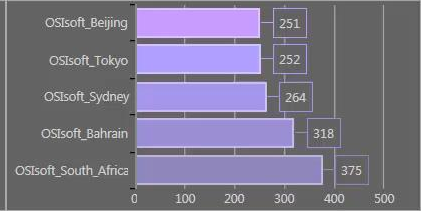
To the left is the average of all ping times across all offices, and to the right is the average of only the selected offices. You can select a single office by clicking on it; to select a group of offices, use the selection tool on the map toolbar:



Average Ping Time

No Data

Top 5 Office Ping Times



FILE TOOLS VIEW

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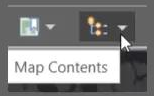
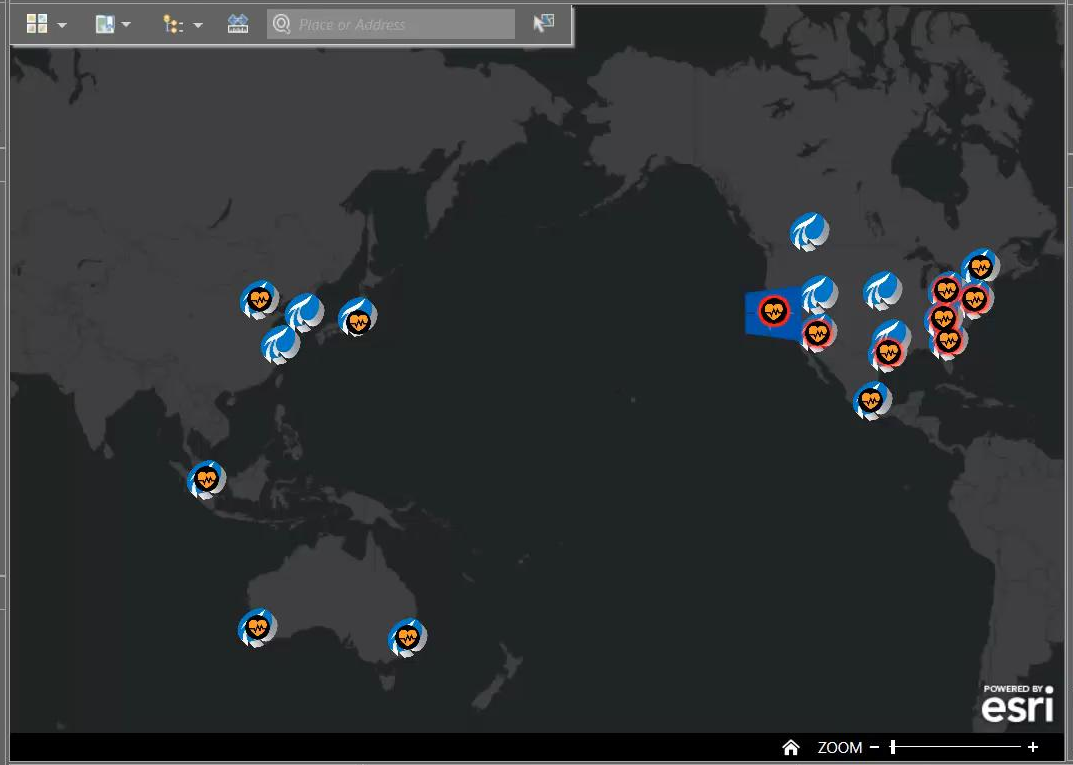


to add a new layer to the map.

Map Legend

- OSIsoft Live Office Data - All
- OSIsoft Live Azure Data
- OSIsoft World Wide Office Locations

OSIsoft Offices and Azure Assets



PI Coresight Description

Below is a PI ProcessBook display, hosted in PI Coresight 2014, showing the live CPU load at each office. You can click the "Pop-out" arrow button in the top right corner of the widget to expand it, and you can use the time control toolbar at the bottom of the display to change the display time range. You can also click on a map feature in order to see a pop-up that contains a link to open a new PI Coresight display in a seperate browser window!

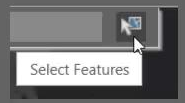
PI Coresight Widget

Average Ping Time

of all offices (in ms)

Gauge Description

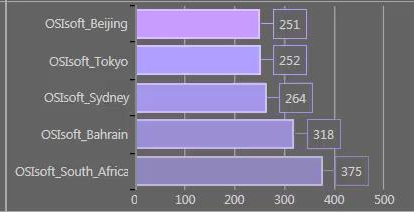
To the left is the average of all ping times across all offices, and to the right is the average of only the selected offices. You can select a single office by clicking on it; to select a group of offices, use the selection tool on the map toolbar:



Average Ping Time

of SELECTED offices (in ms)

Top 5 Office Ping Times



FILE TOOLS VIEW

OSIsoft Offices and Azure Assets Full Operation View

Welcome!

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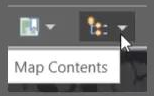
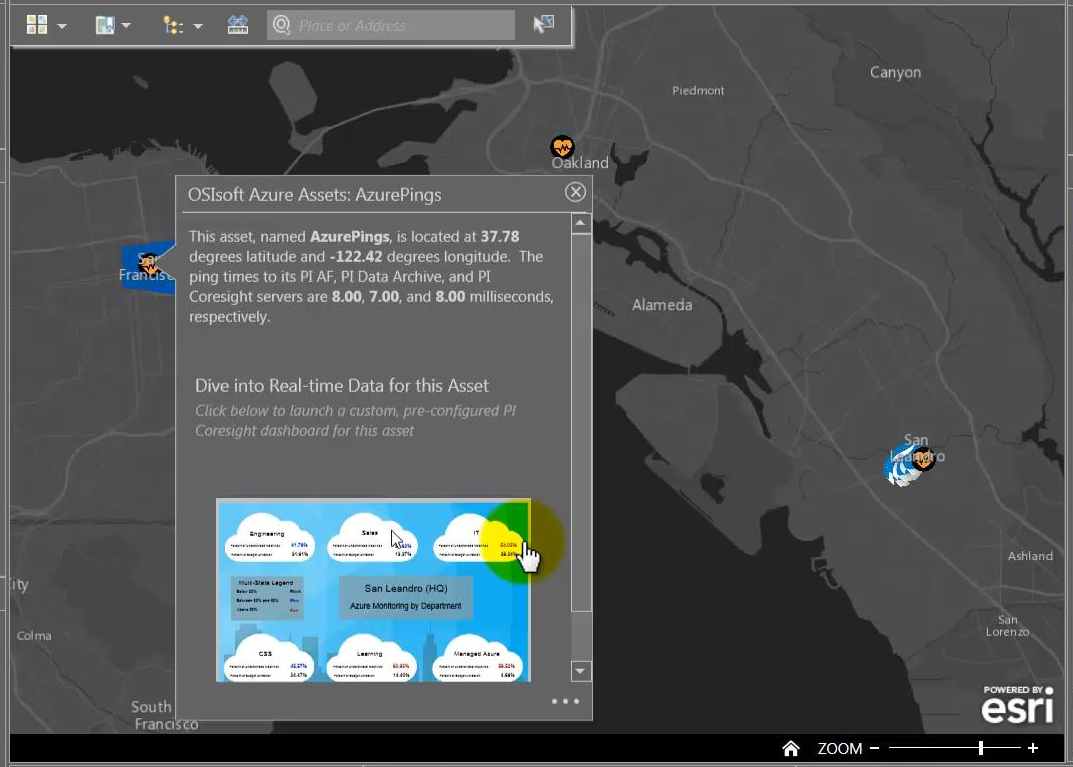


to add a new layer to the map.

Map Legend

- OSIsoft Live Office Data - All
- OSIsoft Live Azure Data
- OSIsoft World Wide Office Locations

OSIsoft Offices and Azure Assets



OSIsoft Azure Assets: AzurePings

This asset, named **AzurePings**, is located at **37.78** degrees latitude and **-122.42** degrees longitude. The ping times to its PI AF, PI Data Archive, and PI Coresight servers are **8.00**, **7.00**, and **8.00** milliseconds, respectively.

Dive into Real-time Data for this Asset

Click below to launch a custom, pre-configured PI Coresight dashboard for this asset

PI Coresight Description

Below is a PI ProcessBook display, hosted in PI Coresight 2014, showing the live CPU load at each office. You can click the "Pop-out" arrow button in the top right corner of the widget to expand it, and you can use the time control toolbar at the bottom of the display to change the display time range. You can also click on a map feature in order to see a pop-up that contains a link to open a new PI Coresight display in a seperate browser window!

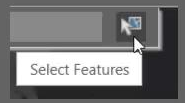
PI Coresight Widget

Average Ping Time

of all offices (in ms)

Gauge Description

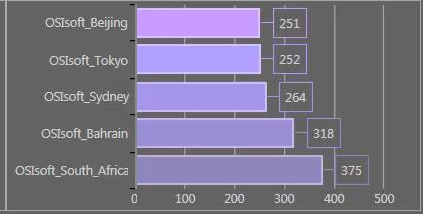
To the left is the average of all ping times across all offices, and to the right is the average of only the selected offices. You can select a single office by clicking on it; to select a group of offices, use the selection tool on the map toolbar:

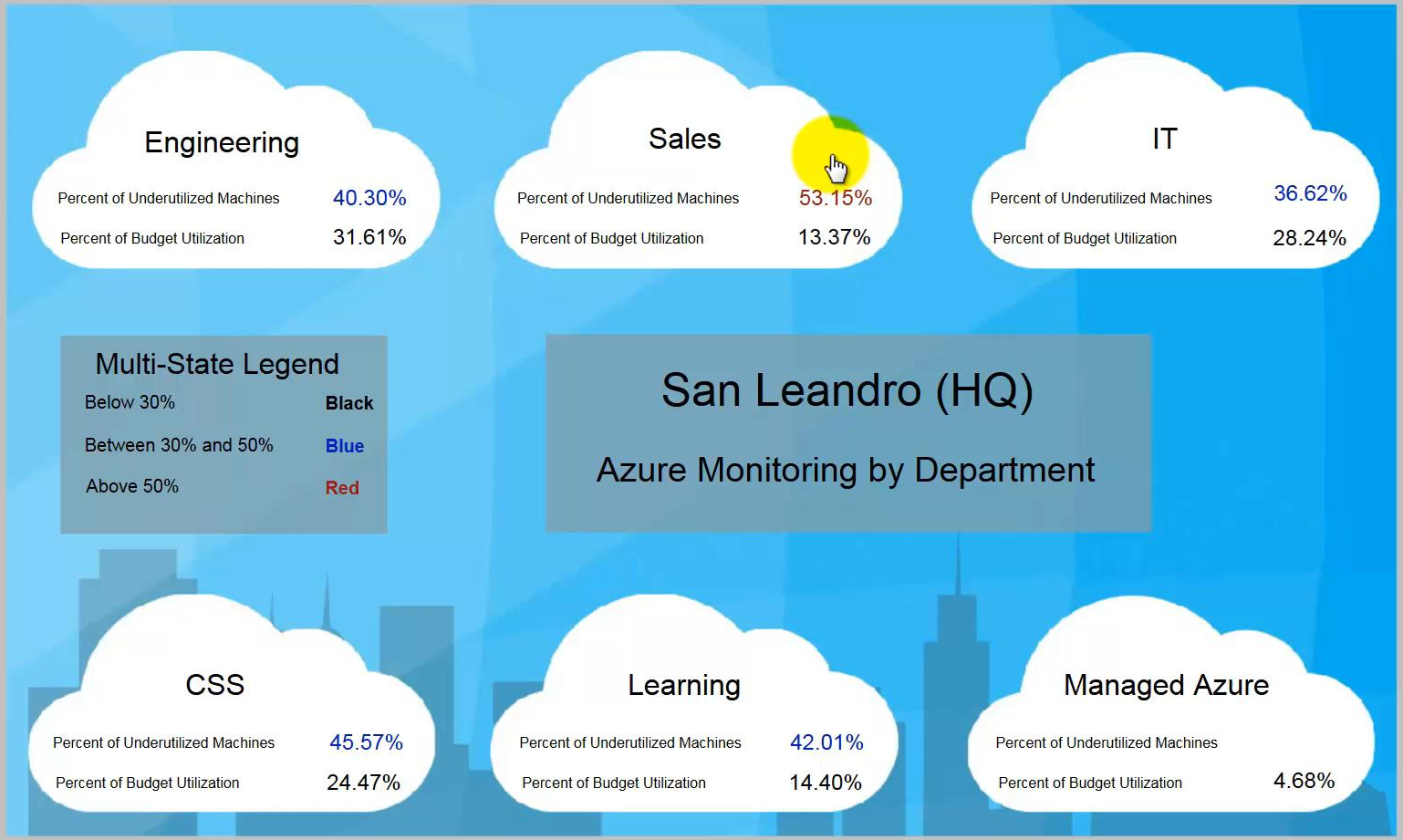


Average Ping Time

No Data

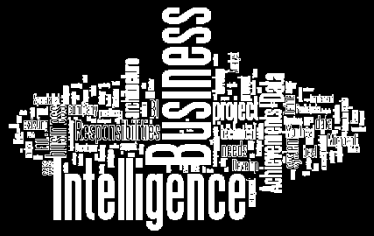
Top 5 Office Ping Times




Engineering
Percent of Underutilized Machines 40.30%
Percent of Budget Utilization 31.61%
Sales
Percent of Underutilized Machines 53.15%
Percent of Budget Utilization 13.37%
IT
Percent of Underutilized Machines 36.62%
Percent of Budget Utilization 28.24%
Multi-State Legend
Below 30% Black
Between 30% and 50% Blue
Above 50% Red
San Leandro (HQ)
Azure Monitoring by Department
CSS
Percent of Underutilized Machines 45.57%
Percent of Budget Utilization 24.47%
Learning
Percent of Underutilized Machines 42.01%
Percent of Budget Utilization 14.40%
Managed Azure
Percent of Underutilized Machines
Percent of Budget Utilization 4.68%

Sales Department
Azure Subscriptions
Japan Seminars
PISGDemo
Ford POC
DC1
DC2
PI1
See more Subscriptions
Number of Subscriptions 12
Number of Machines 111
Number of Underutilized Machines 59
Back to Department Home

Infrastructure For Today and Tomorrow's Transformations



OT

IT

Scada

HMI

PLC

DCS

Assets

Assets

Assets

Sensors

Gateways

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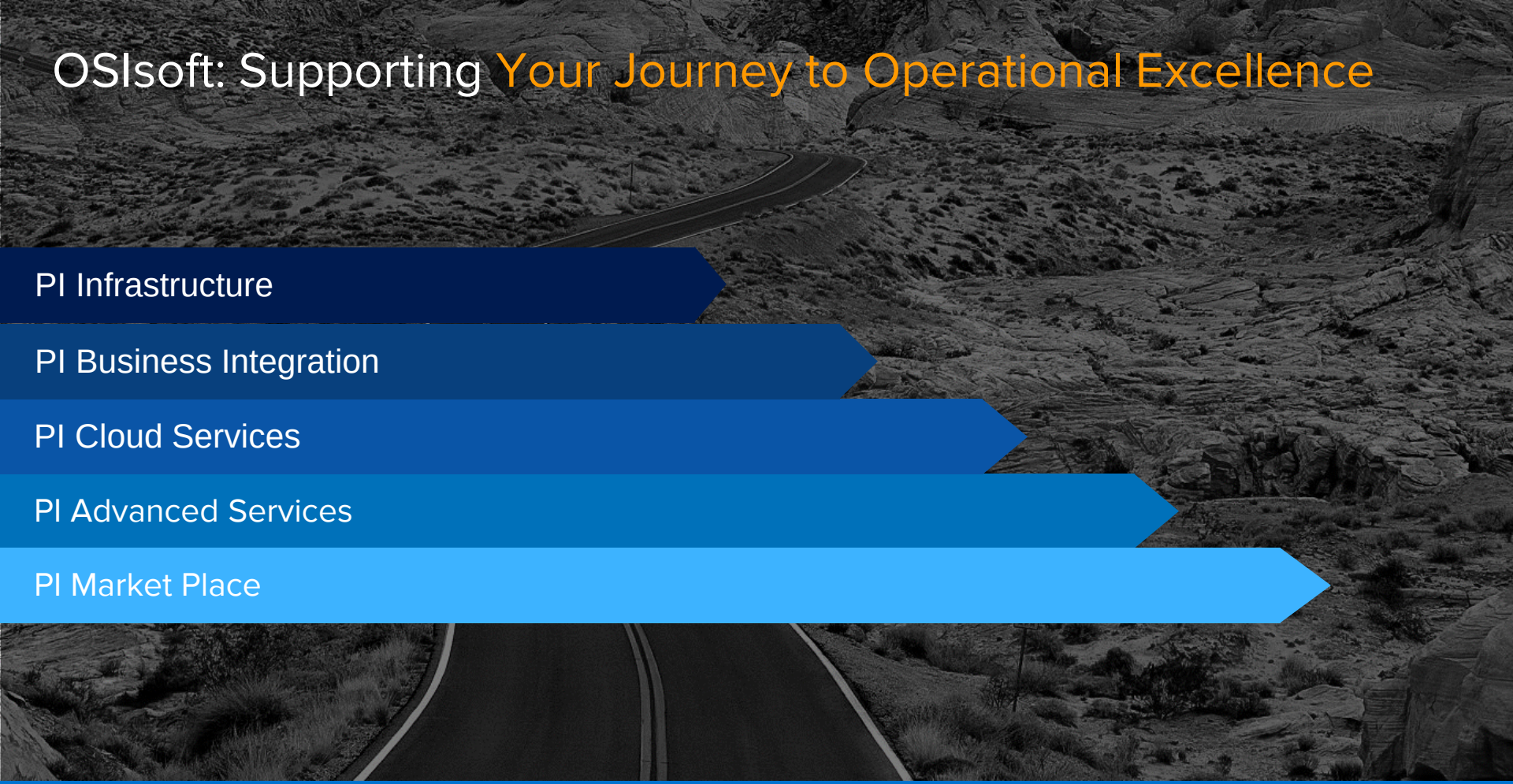
OSIsoft: Supporting Your Journey to Operational Excellence



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