Digital Transformation Journey

Martin Otterson Sr. VP of Customer Success

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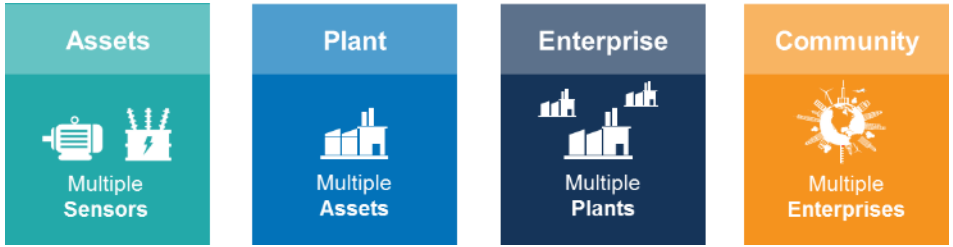
Our Mission

Empower people, industries and communities to **transform their world** using operational data.



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Data Is Your Most Important Resource

ArcelorMittal
supply chain modifications = 3MT ($40M) iron ore

Halifax Water
saving 38 million liters per day by detecting1,300 leaks

Kellogg's
$3.3M In Energy savings

Novartis
lights out manufacturing

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The Challenge: The Operational Data Deluge

Volume

DTE:
3 million customers
27 million + tags

Variety

E.ON:
310,000 tags,250 formats,
140+ locations

Velocity

SETPOINT Vibrations:
200,000 events /sec

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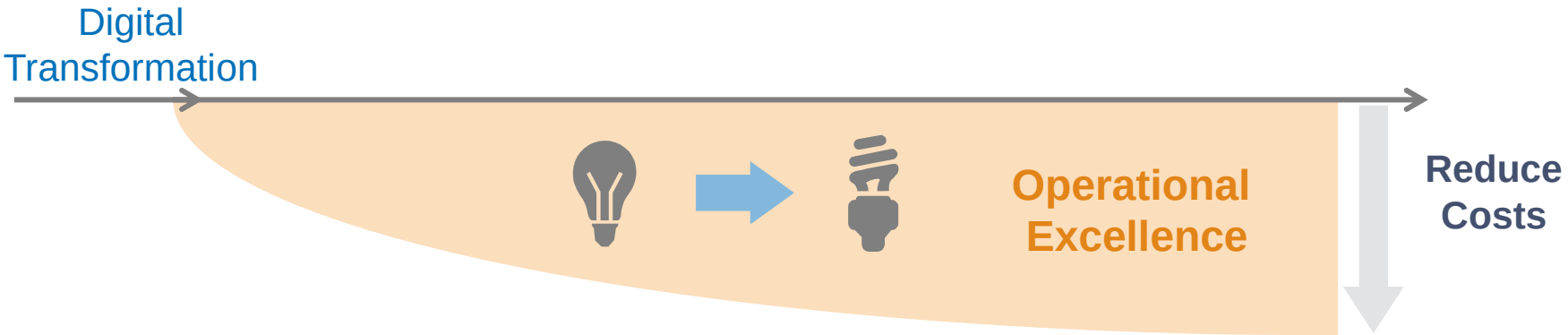
Digital Transformation: Our Opportunity



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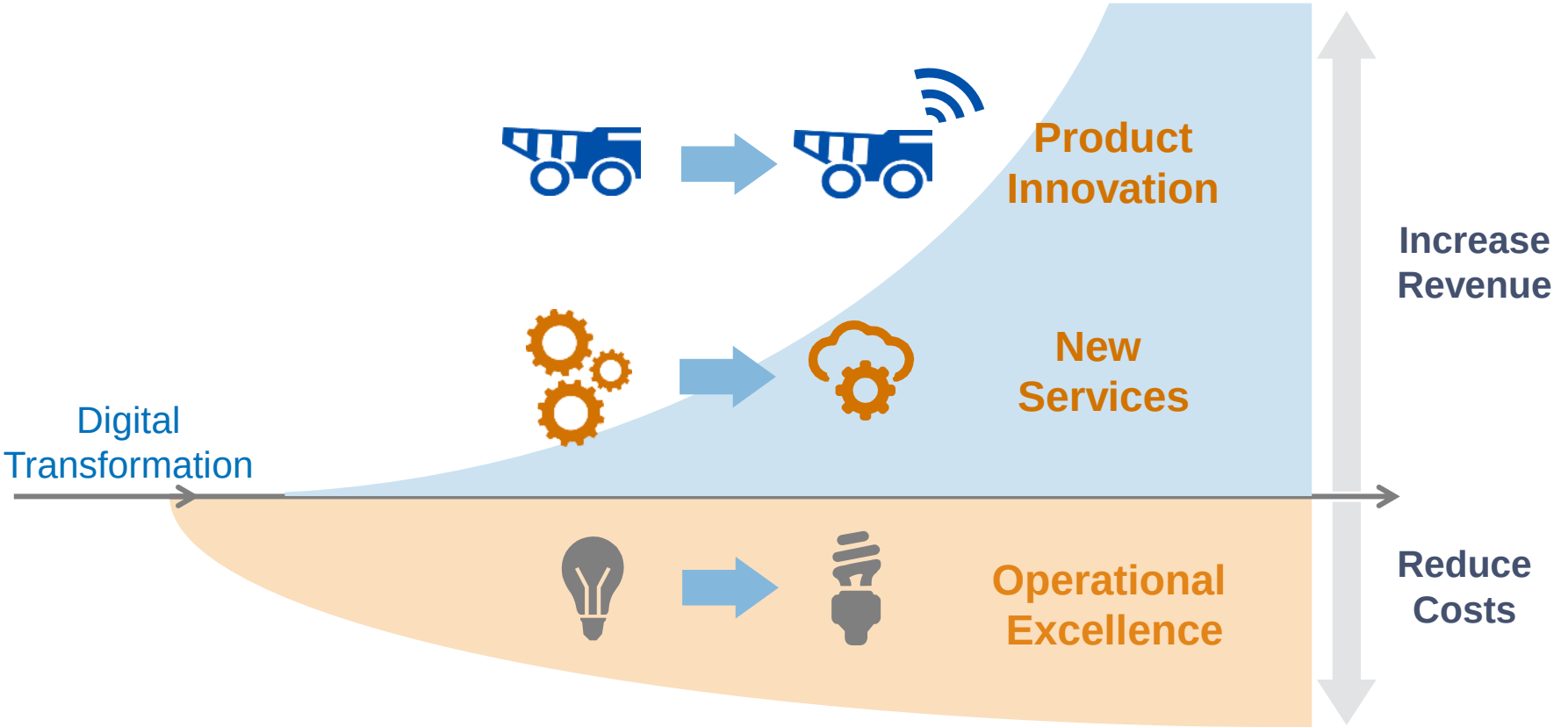
Digital Transformation: Our Opportunity



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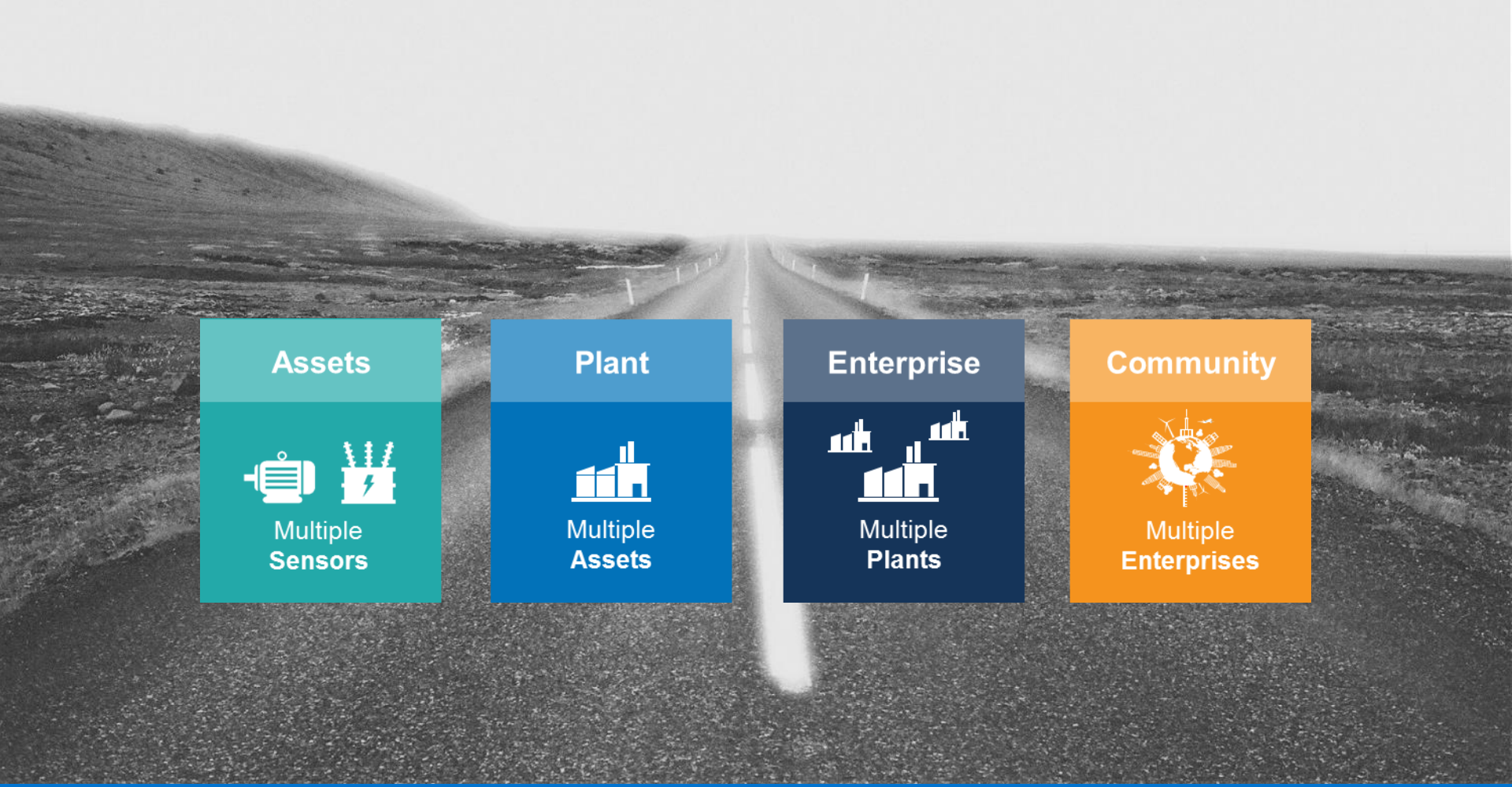

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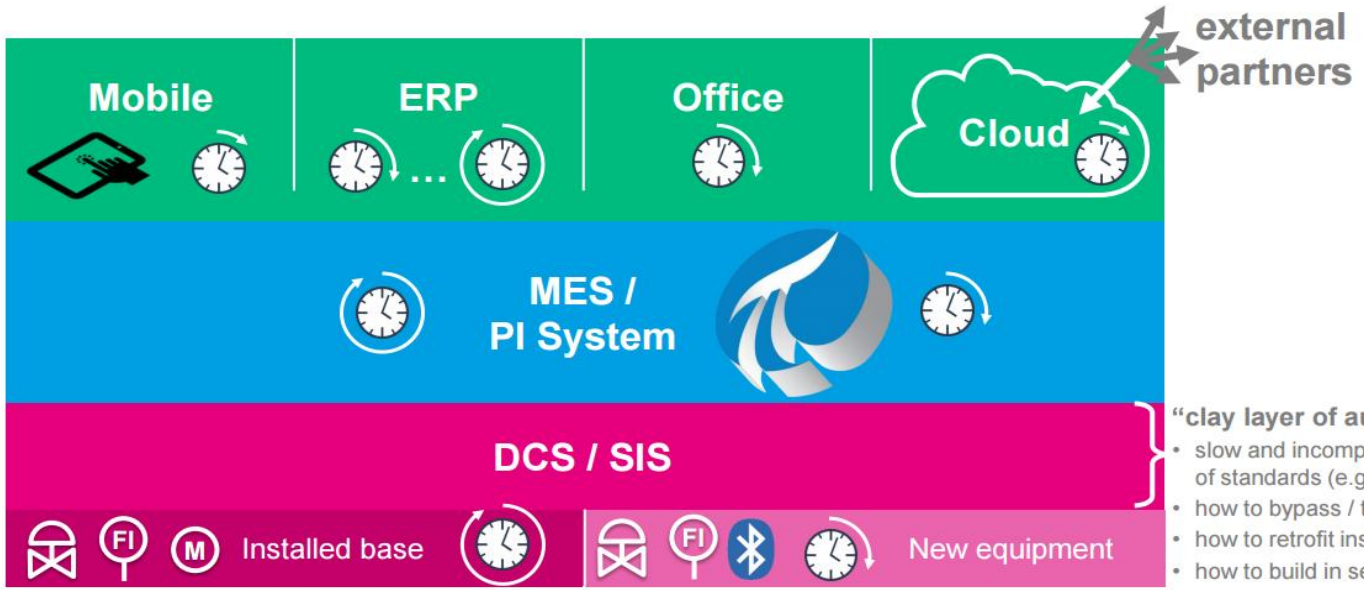
Aligning with the Customer Journey

Challenge #2: different innovation cycles

How can we leverage tech developments more quickly on a broad base?



"clay layer of automation"

- slow and incomplete adoption of standards (e.g. OPC UA)
- how to bypass / tunnel?
- how to retrofit installed base?
- how to build in security?

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STRATEGY: ELEMENTS FOR SUCCESS

CUSTOMER SUCCESS

ENABLE COMMUNITY

EXPAND THE CORE

Digital Transformation Journey: Agenda

Industry Insights

Assets	Plant	Enterprise	Community
Multiple **Sensors**	Multiple **Assets**	Multiple **Plants**	Multiple **Enterprises**

BARRICK · EMERSON · GREAT LAKES BREWING CO. · bhpbilliton · POWER FACTORS · AeroVironment · NATIONAL INSTRUMENTS · MIT · CISCO · Rockwell Automation · PEMEX · esri · Sempra Energy · adani · Berkeley UNIVERSITY OF CALIFORNIA · Kellogg's

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Level-setting: Market Opportunity

1.2B

500M

110M

1.7B

75M

13M

Source: McKinsey, "MGI Digital America" December 2015

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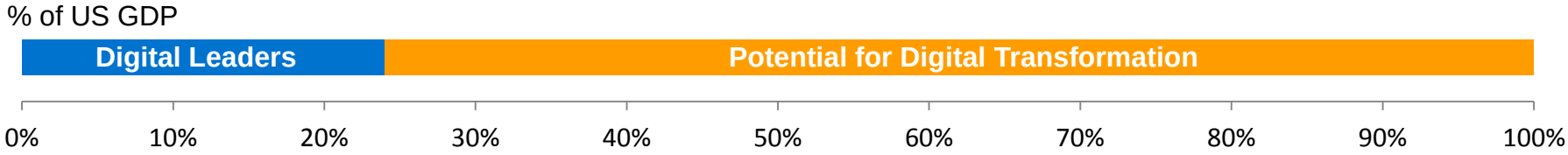
Digitization of Industry is Underway



Relatively high digitization

- Information technology
- Media
- Professional services
- Finance & insurance
- Utilities
- Transportation
- Advanced manufacturing

Relatively low digitization

- Agriculture
- Mining
- Basic goods manufacturing
- Chemicals
- Oil & gas
- Wholesale trade

Source: McKinsey, "MGI Digital America" December 2015

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Digitization of Industry – Why?

Revenue Growth	Profit	Shareholder Returns
5X	8X	2X
Their rivals	Their rivals	Their rivals

Source: McKinsey and Company-McKinsey Digital Quotient, Capital IQ

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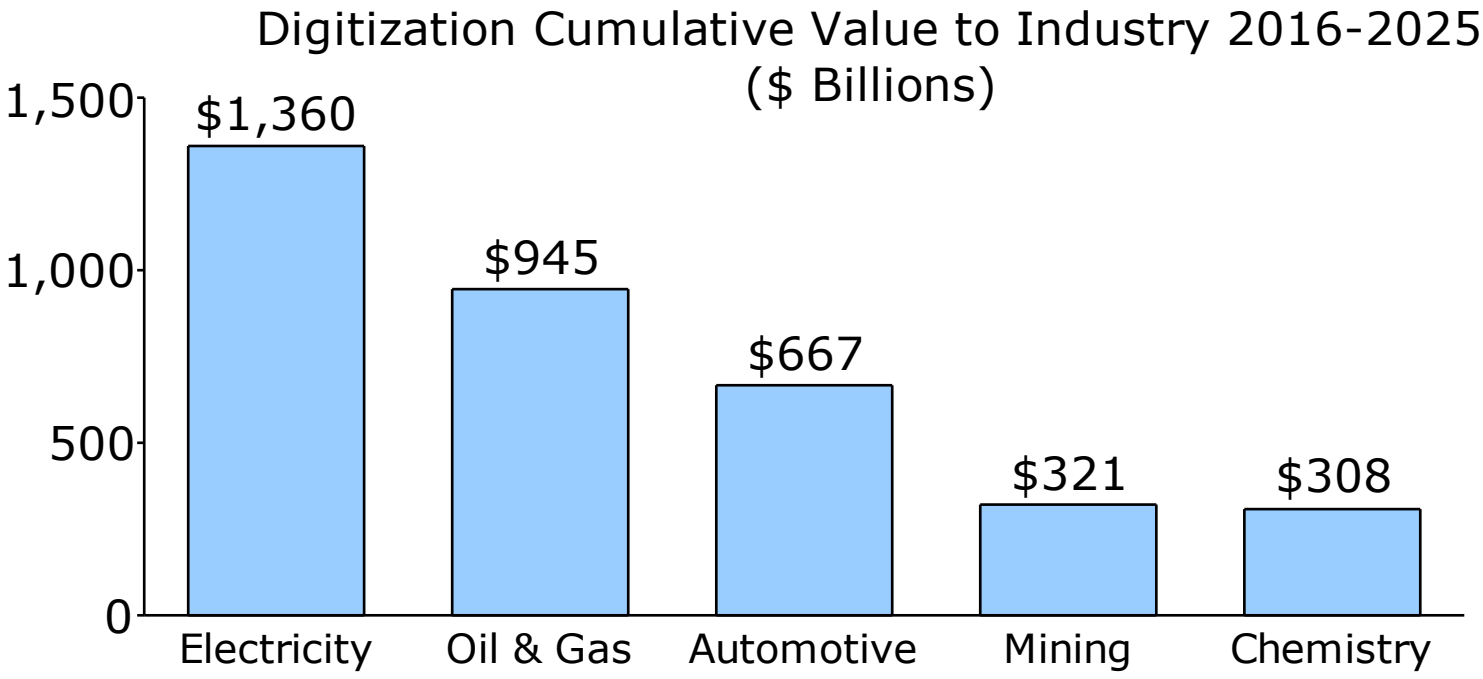
Digitization Value Estimates are Measured in Trillions



Source: World Economic Forum Digital Transformation Initiative – January 2017

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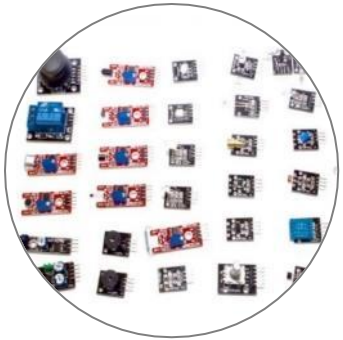
Market Opportunity

- Digitization Hype driven by 4 converging megatrends



Pervasive, cheap, and tiny sensing

Decreasing compute and storage costs

New abilities to process and analyze data

Ubiquitous connectivity

Convergence of key enablers indicate coming demand for pervasive sensing and vertical-specific analytics applications

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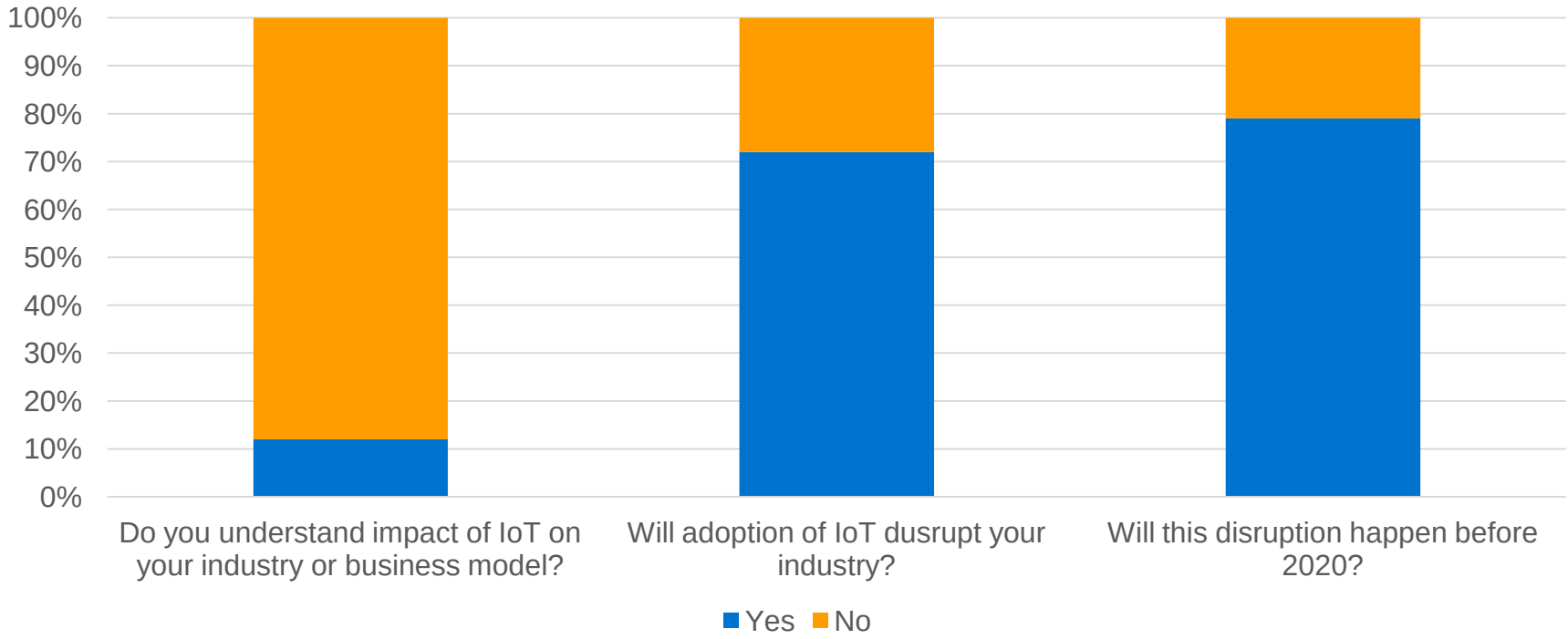
Big Data from Distributed Sensors is Believed to have the Potential to Upend Industry



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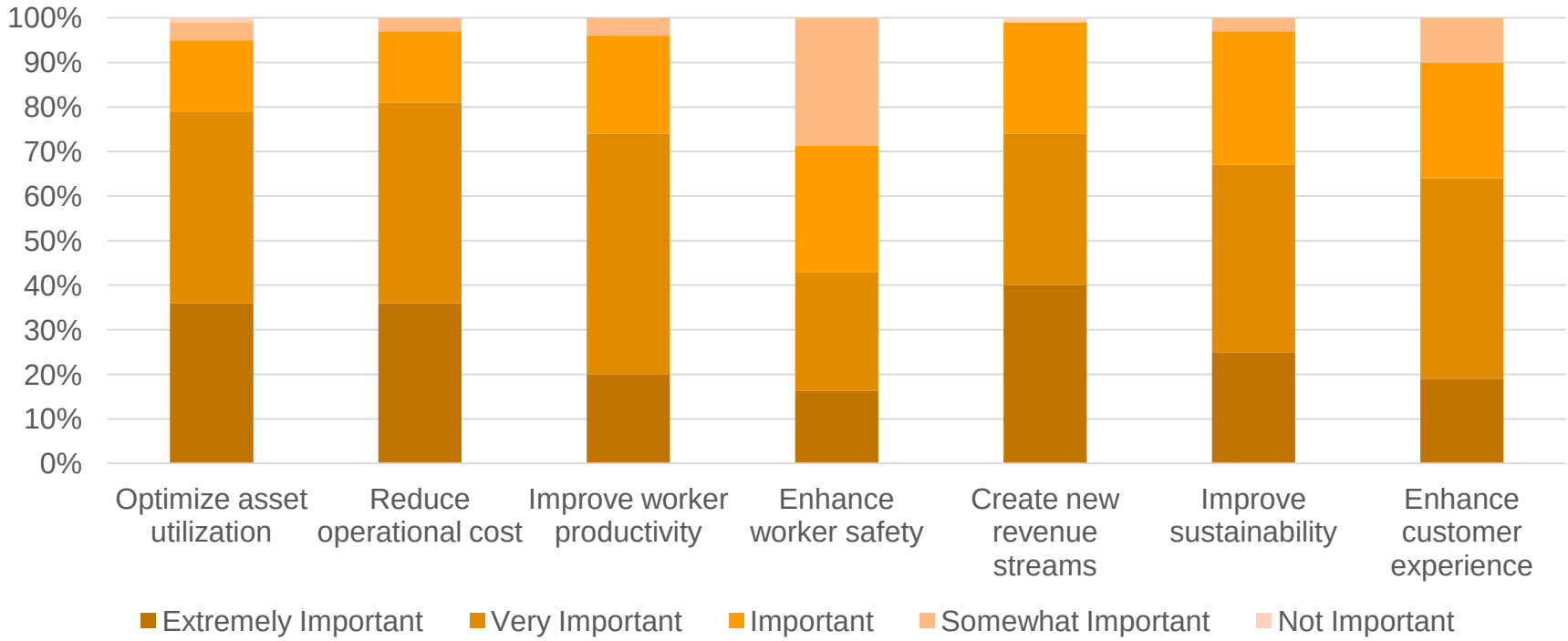
Time Series Data is Critical for Analytics Value



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What is your Big Data Strategy?

1. Context engine with Asset Framework and Event Frames
2. Independence with data consuming applications/platforms
3. Independence of data collection sources
4. Spans asset, plant, enterprise, community – work where you want
5. Customer first philosophy (we'll never be left behind)
6. 500 protocols – it just works
7. Engineering culture – made by and for the people doing the work
8. 30+ year track record
9. Scale – 1,500,000,000 data points
10. Time Series data is different and critical for IoT analytics

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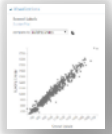
OSIsoft Infrastructure is Source of Truth for IoT Analytics

Real-time Monitoring



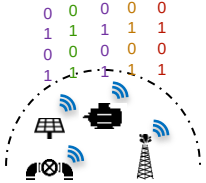
Analytics/
GIS/BIG Data

Vendor Applications

3rd Party Services

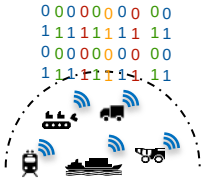
OSIsoft.

Enterprise
Operations
Infrastructure



Automation/Control
Systems

New Sensor
Technology



Remote and Mobile
Assets

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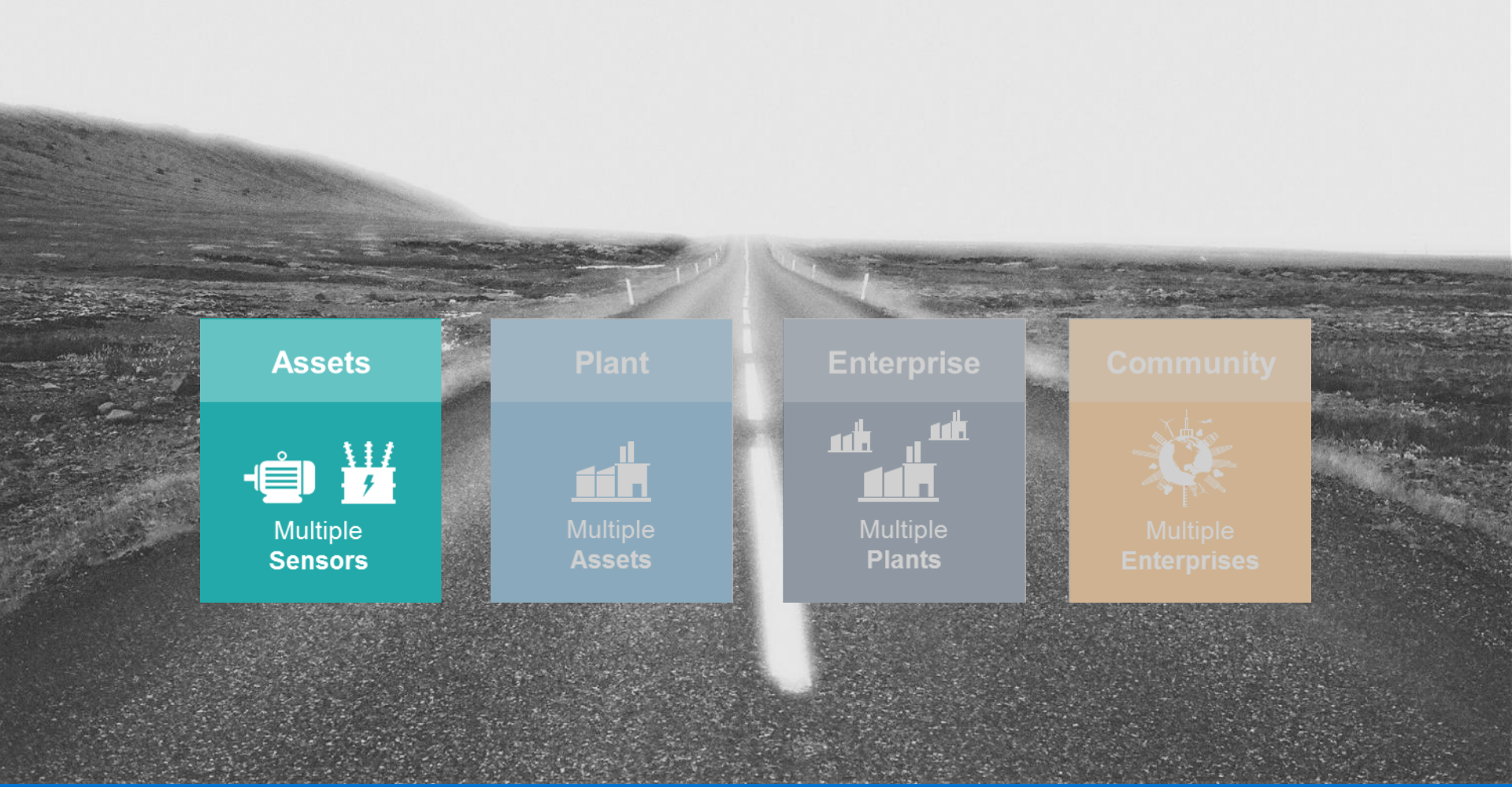

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NEW OSIsoft IoT Focus

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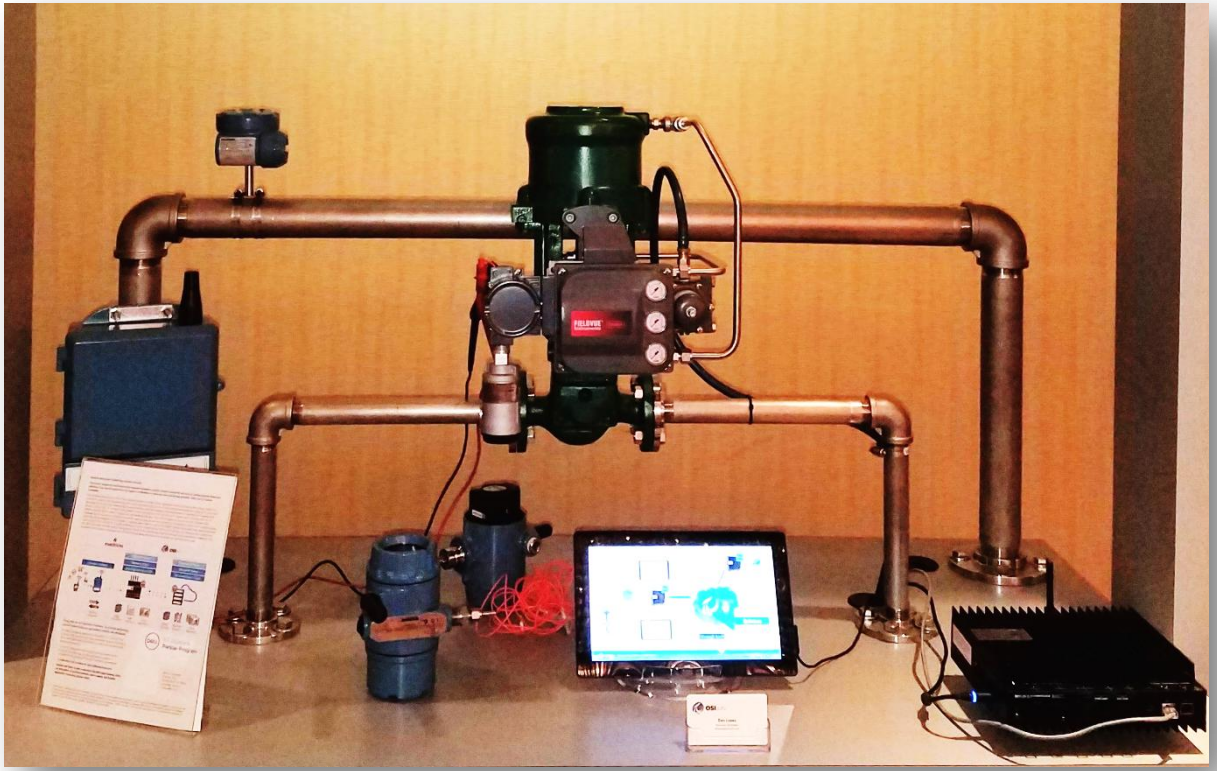
Outside: UC Expo



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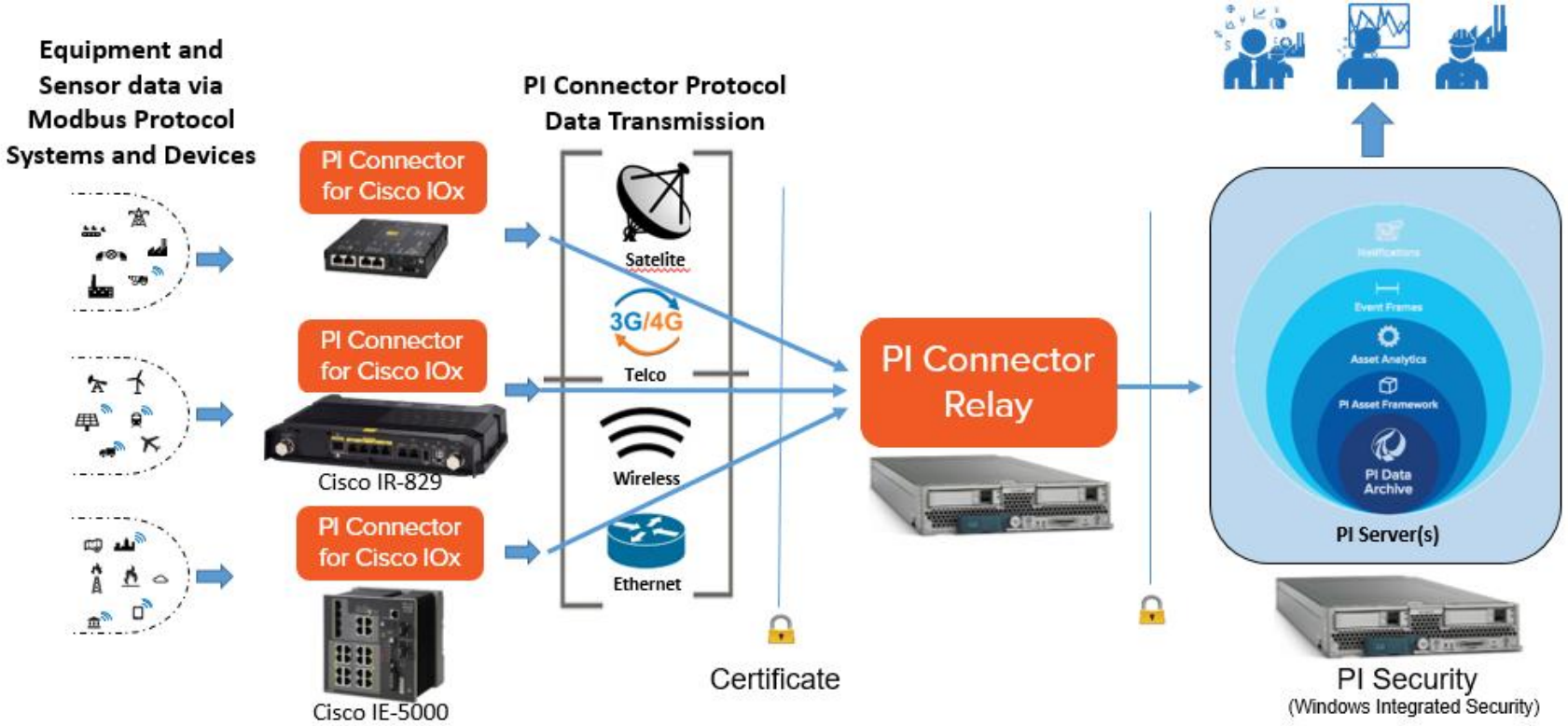
PI Connector for Modbus on Cisco IOx + Fog Director on IR-809 / IR-829



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Digital Barrick

BARRICK

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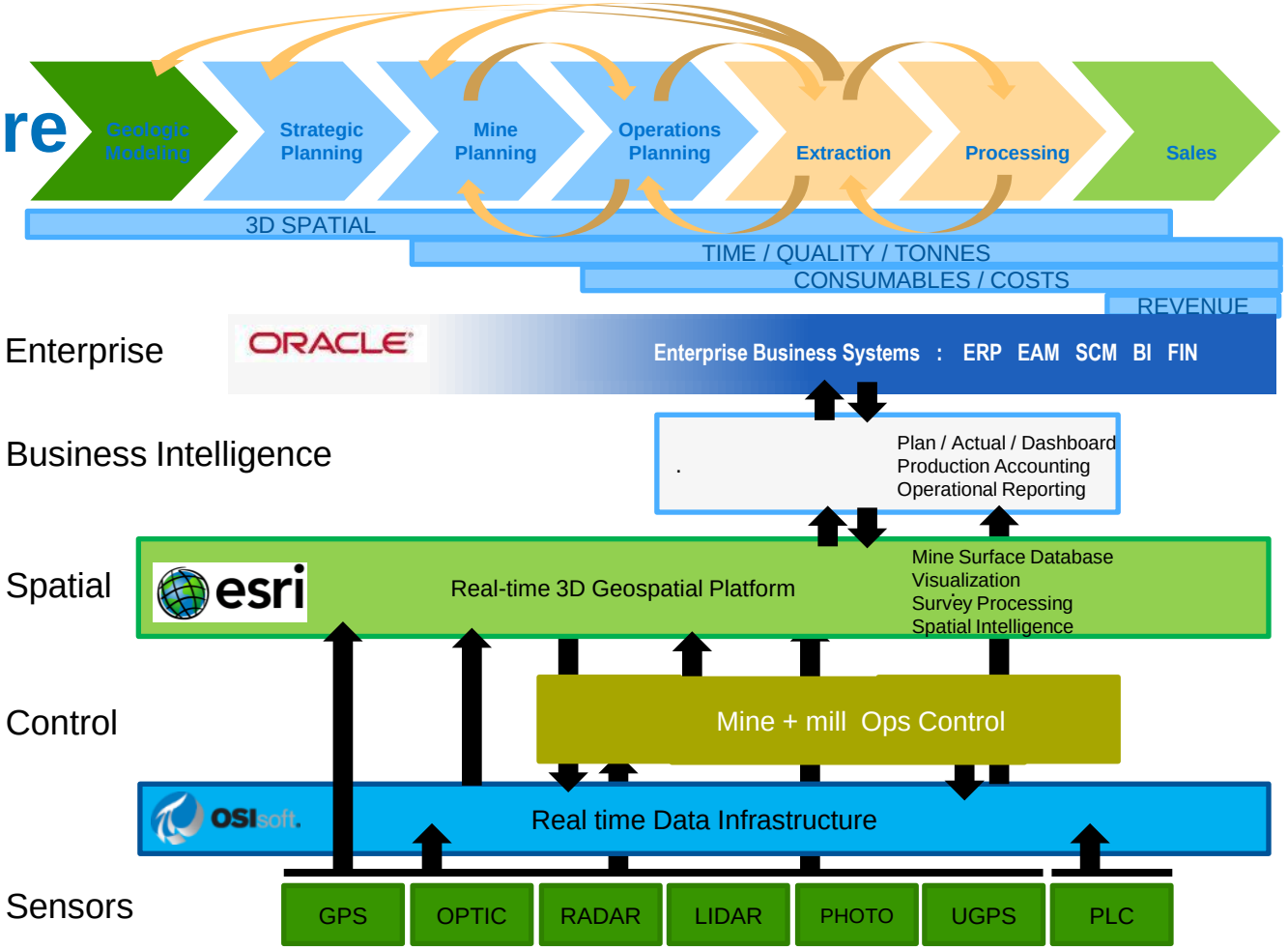
Architecture



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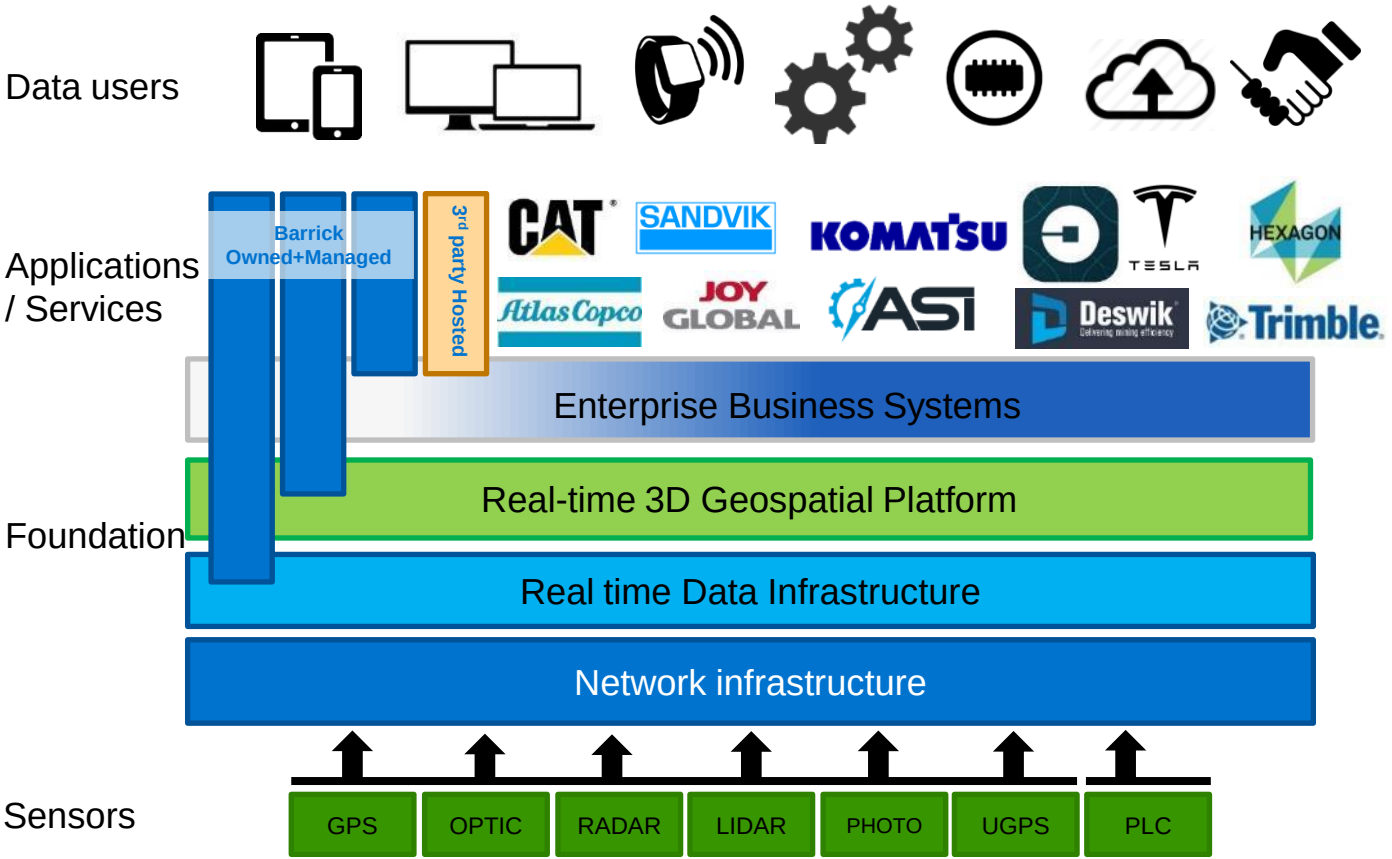
Foundation for Innovation



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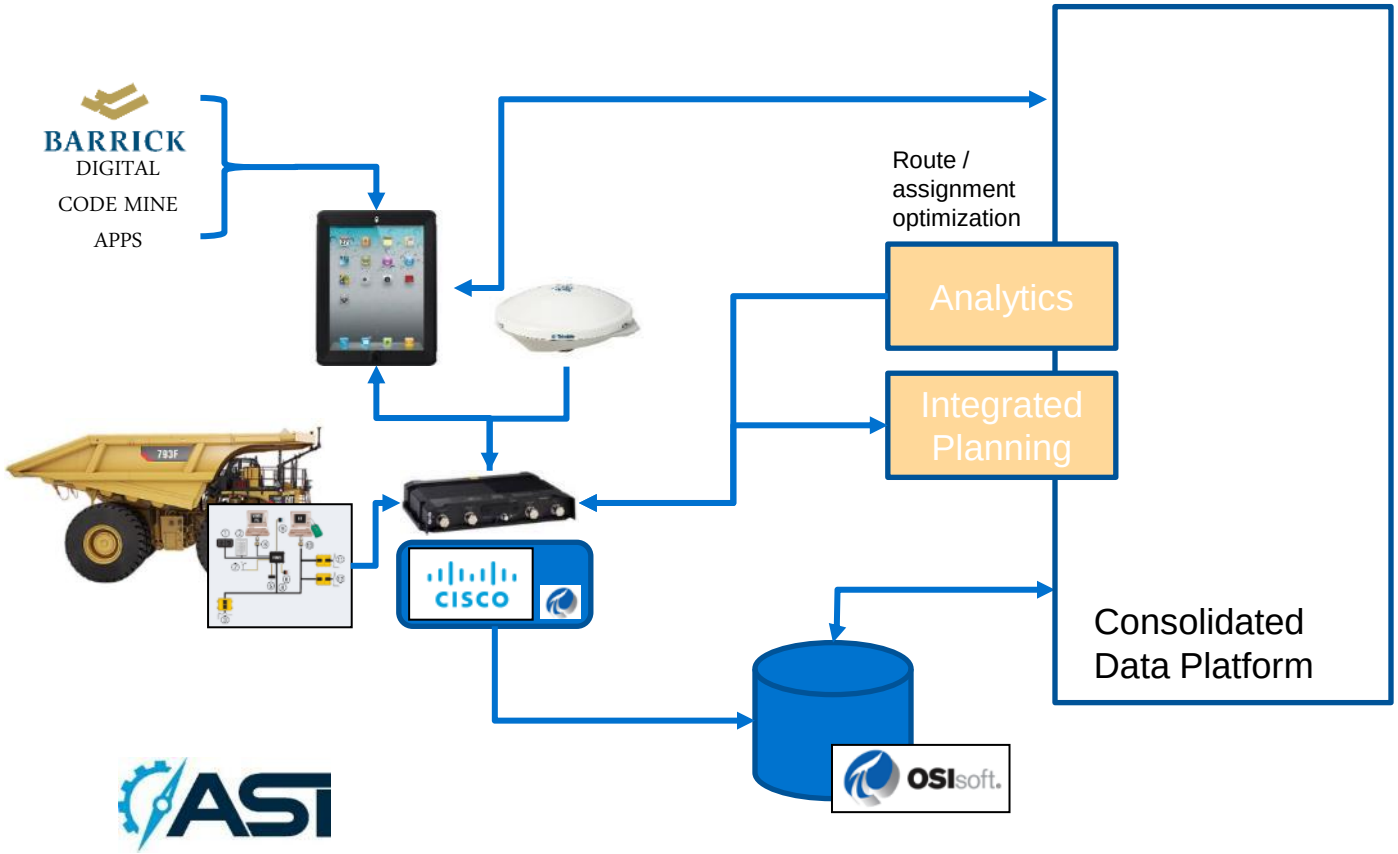
One Scenario



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Part of our Innovation Strategy

Absolute Integration

We will connect every asset and activity in our ecosystem in an intelligent and transparent system.

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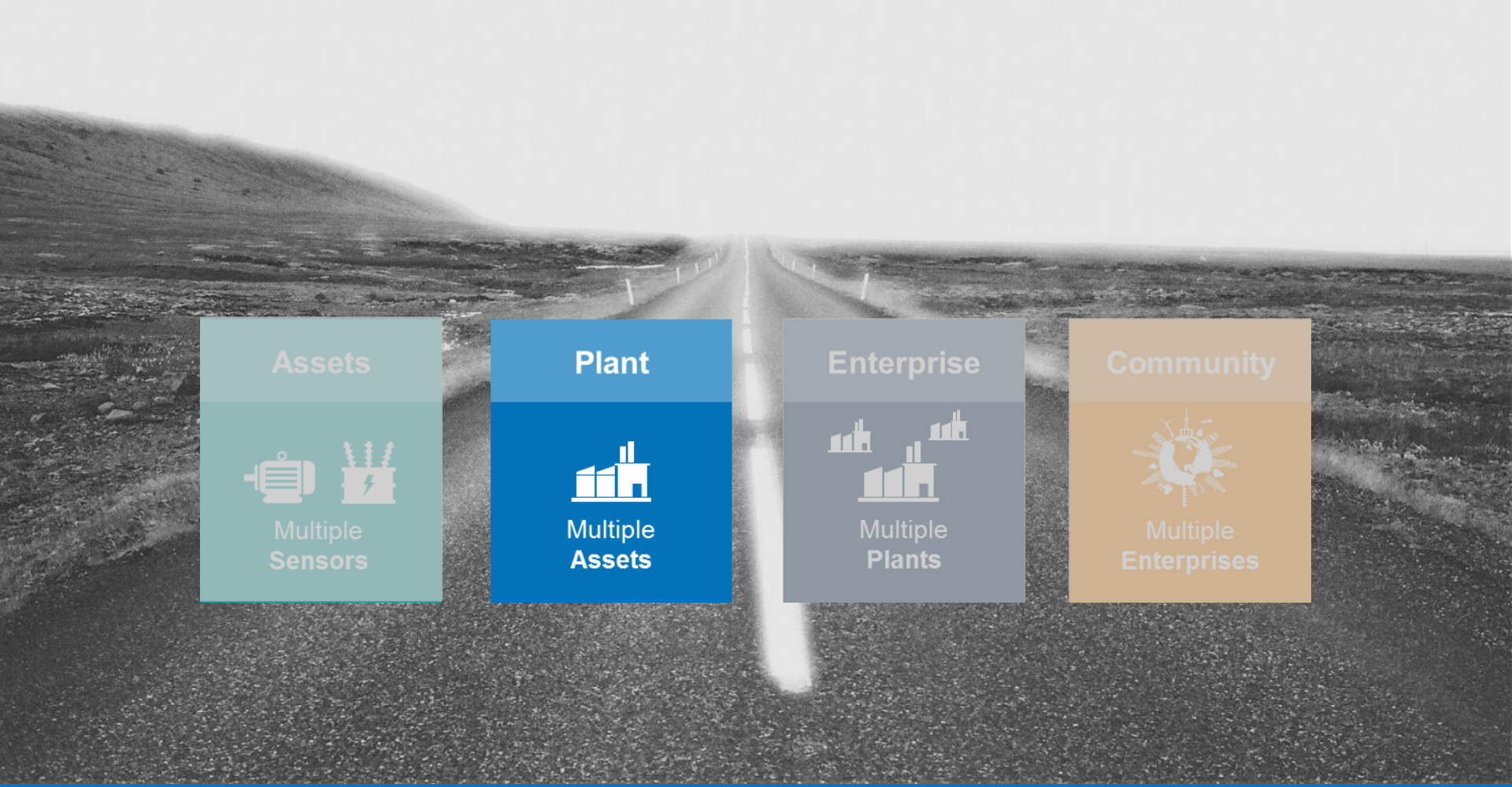

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Partnership

- Many common Customers
- Customers that demand a global reach
- Emerson's Pervasive Sensing is a fundamental data source
- Emerson provides Applications and Consulting expertise leveraging value from the OSI data

- Enterprise Data Infrastructure
- Real-time data access
- Initially a Technology Provider, now **Global Encompass™** Partner
- Enterprise selling – value of data driven decision making

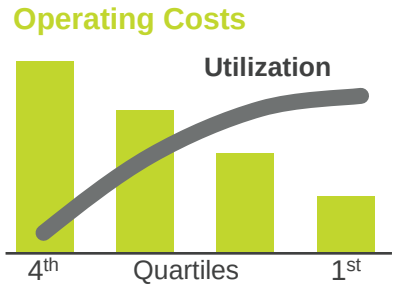
EMERSON

Industry Benchmarks Reveal Significant Business Improvement Opportunities from Average to Top Quartile Performers

Production

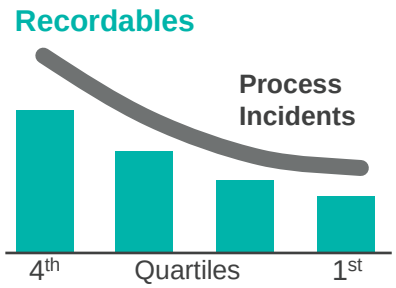
20% lower
operating costs

10% higher
Utilization Rate



Safety

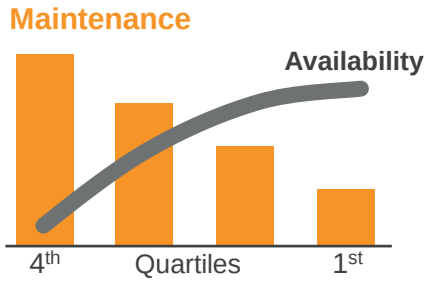
3X fewer recordables
and process incidents



Reliability

4% higher
availability

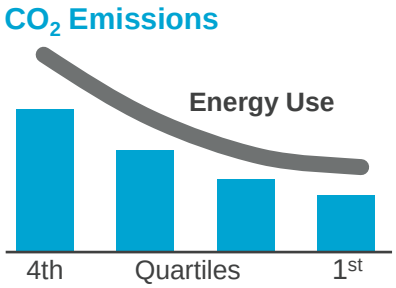
Half the maintenance costs



Emissions

30% lower
emissions

30% less
energy use



Sources: Refining and Petrochemical Benchmarks, API, Solomon, OSHA, IHS Markit and Company Reports

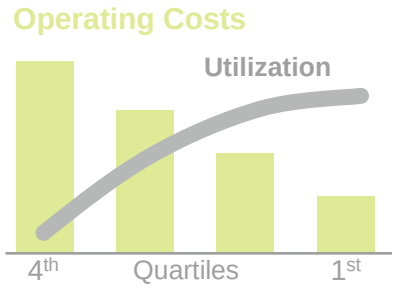
Emerson Confidential

Industry Benchmarks Reveal Significant Business Improvement Opportunities from Average to Top Quartile Performers

Production

20% lower
operating costs

10% higher
Utilization Rate



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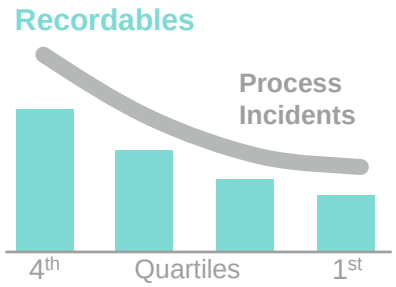


Approximately

ONE TRILLION DOLLARS

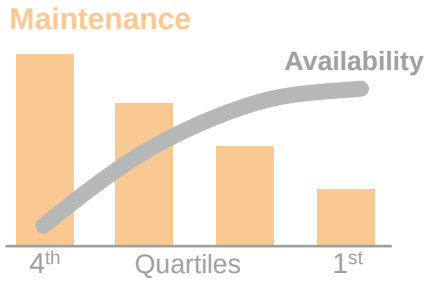
in company value is lost every year to

suboptimal operating performance

Reliability

4% higher
availability

Half the maintenance costs



Emissions

30% lower
emissions

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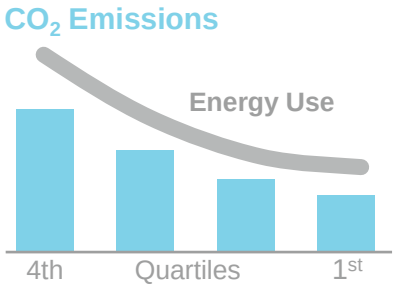
energy use



Sources: Refining and Petrochemical Benchmarks, API, Solomon, OSHA, IHS Markit and Company Reports

Emerson Confidential

The Emerson Plantweb Digital Ecosystem
Our Advisor Solutions leverage the OSI Data Infrastructure

FOUNDATIONAL SOLUTIONS

IIoT SOLUTIONS

PLANTWEB

Services & Consulting

Control & Safety Systems, Asset Management

Intelligent Field Devices

Applications

Plantweb Advisor

Rich Tools

PERFORMANCE | HEALTH | ENERGY

Plantweb Insight

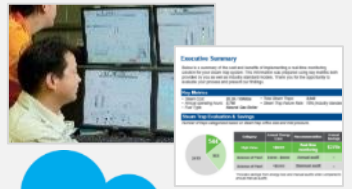
Standalone

PUMPS | HEAT EXCHANGER | VALVE HEALTH | STEAM TRAP

Always Aware

Services

Emerson Connected Services



Microsoft Azure

Technology Partnership

Connectivity

Secure First Mile™

Traditional Data Pathways

IIoT Application Gateways

Data

Pervasive Sensing™

Pressure Gauge

Gas Monitor

Radar Level

X-Well

Electrical Monitoring

Steam Traps

Vibration

Valve Position Monitor

Corrosion

Plantweb Advisor, Enterprise Suite for Equipment Analytics

1 Equipment Health
(Actual vs. Baseline)

EMERSON PLANTWEB advisor

Reliability

2 Equipment Efficiency
(Actual vs. Design)

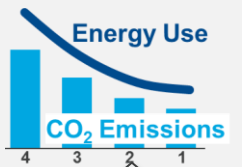
EMERSON PLANTWEB advisor

Production

3 Energy Intensity
(Actual vs. Target)

EMERSON PLANTWEB advisor

Emissions



EMERSON

-67%

Operator rounds

+20%

Throughput

$12M savings

in 1 Year

Stronger Together

Rockwell Automation

OSIsoft

- Leadership in Automation and Information Solutions
- Integrated Control and Information Platform **powered by OSIsoft**
- Global Solution Provider
- Scalable offering from products to solutions

- Enterprise Data Infrastructure
- Performance Management Software Products
- Initially a Technology Provider, now **Global Encompass™** Partner
- Enterprise selling – value of data driven decision making

Market leaders joining together to provide winning solutions

Transactional data: orders, supply network, product design …

ERP FINANCIALS HR LOGISTICS QUALITY CUSTOMERS …

IT

Microsoft

OSIsoft

CONVERGENCE

Rockwell Automation

CISCO

OT

Real-time data: **CONTROL**, **SAFETY, SECURITY** + alarms, events, states, energy, diagnostics, …

SENSORS, ACTUATORS CONTROLLERS MATERIAL & TRANSPORT MACHINES & EQUIPMENT LABELERS & PRINTERS …

ENTERPRISE

- Site to site benchmarking
- Operational analytics
- Integration to/from business systems
- Data visualization & discovery

SYSTEM

- Real-time optimization of machines, processes & plants
- Predictive maintenance
- Abnormal system awareness & action

DEVICE

- Information from smart assets
- Third party device integration
- Machine/fleet management for remote assets

OSIsoft.

DATA INFRASTRUCTURE AT EVERY LEVEL

- Built into Smart Assets
- Analytics from Device to Enterprise
- PI integration at every level
- PI Integrator for Business Analytics with Microsoft PowerBI for complete operational intelligence

SCALABLE ANALYTICS

Rockwell Automation

GREAT LAKES
BREWING CO
EST. 1988 CLEVELAND, OH
100+
DEVICES
23
Action Cards
IN MINUTES

APPLICATION LAYER
(AZURE CLOUD OR DATA CENTER)

ENDECA

hadoop

Microsoft

Power BI

Cortana Intelligence Suite

+ableau SOFTWARE

informatica

CORPORATE SOFTWARE SYSTEMS (DATA CENTER OR CLOUD)

ERP

ADP

DW

EHS

Cloud

PI Integrator for Business Analytics

PI Integrator for Microsoft Azure

PI Asset Framework

PI Data Archive

CENTRALIZED PI TOOL SUITE

PI Connector

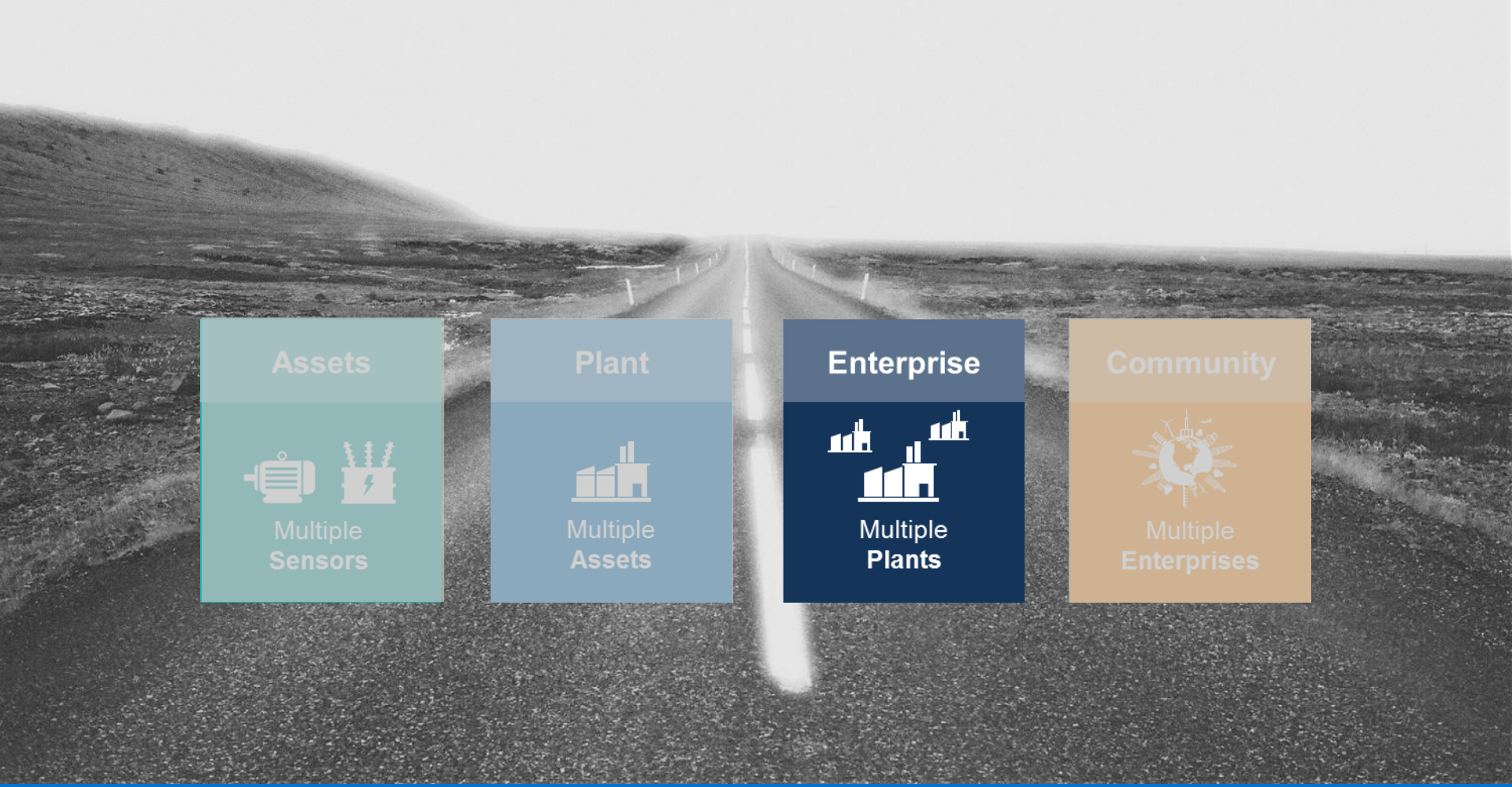
PI Connector

On Prem

Plant 1 - FactoryTalk Historian

FactoryTalk VantagePoint

Plant 2 - FactoryTalk Historian



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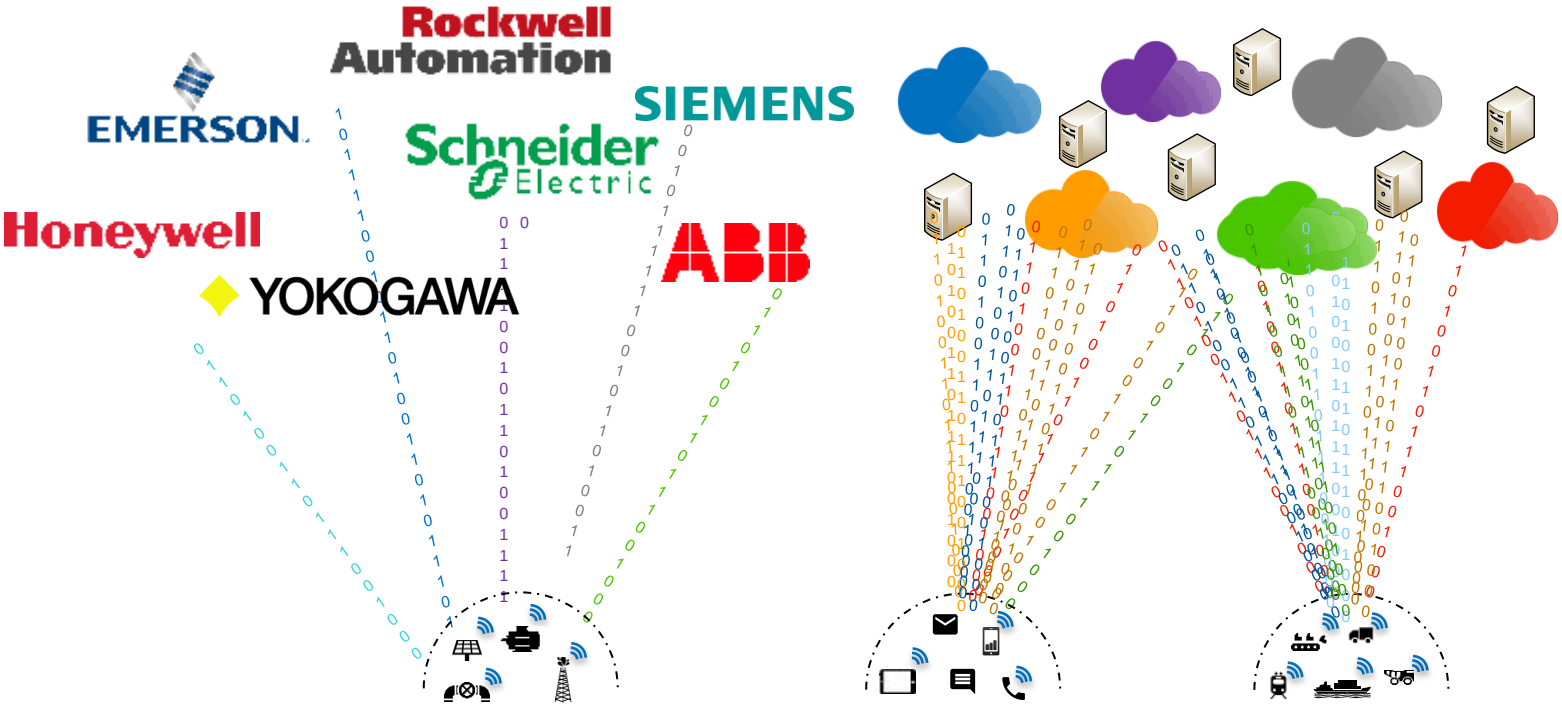
The Data Challenge



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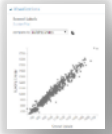
Strategic Approach to an IIoT Enabled Enterprise

Real-time Monitoring



Analytics/
GIS/

rd Party Services

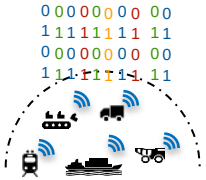
Application Ready
Real-time Decisions
IIoT for 35+ Years
Operational Intelligence

160+ Enterprise Agreements

rprise
Operations
Infrastructure

Auto n/Control Systems

New Sensor Technology



Remote and Mobile Assets

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Adani - Leading Business Conglomerate with interest in diversified sectors

Revenue: $12 B Assets: $19 B Employees: 10,400

Resources

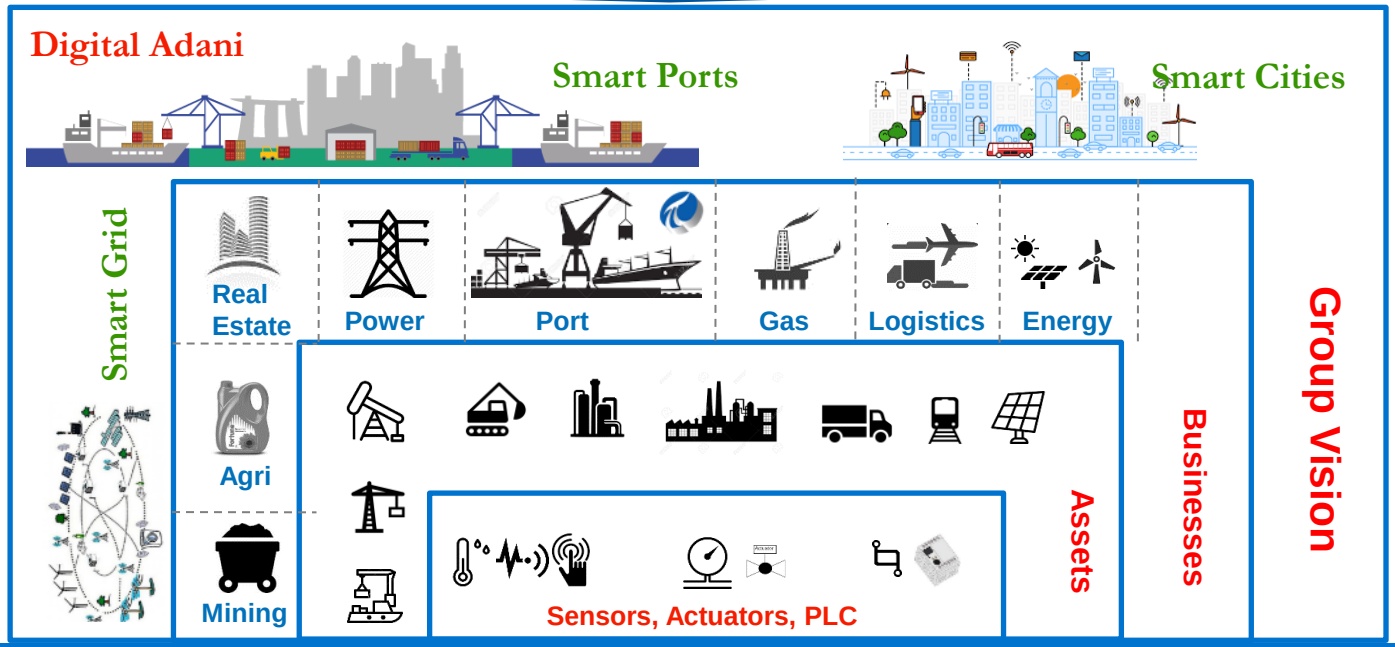
- Coal Mining
- Oil & Gas Exploration
- Coal Trading

Logistics

- Multi Modal Logistics
- Ports
- Special Economic Zones

Energy

- Gas Distribution
- Power
- Bunkering
- Edible Oil



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Intelligent Operations for DVMS (Dynamic Vessel Monitoring System)

Safety Assets

VTMS

Weather

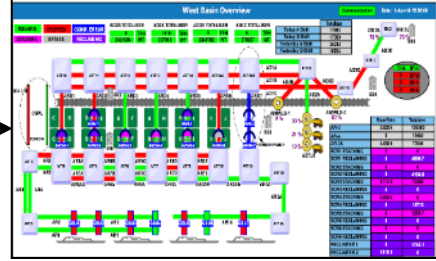
Advance Queuing
Vehicle Route Planning
Supply Chain Optimization

Forecasting of Vessel & Material

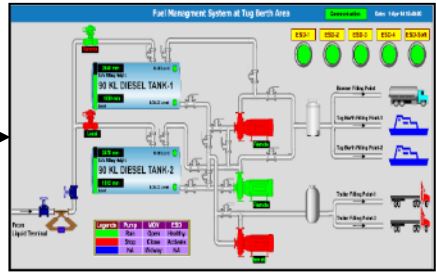
ecubix DVMS

- Berth planning
- Discharge Sequence & Sub sequence Planning
- Allocate Assets
- Monitor Plan Vs Actual
- Replan

esri



West Basin



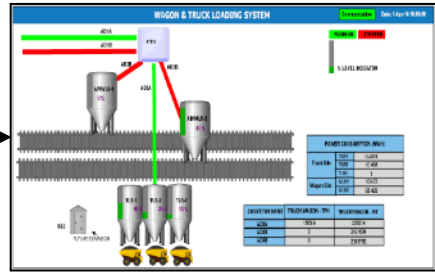
FMS

Share planning with stakeholders

Tugs boats – Anchorage to Berth

ecubix HMI

Capture delay and stoppage reasons



WB WLS / TLS

Planned

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FILE TOOLS VIEW APDPPL Cranes

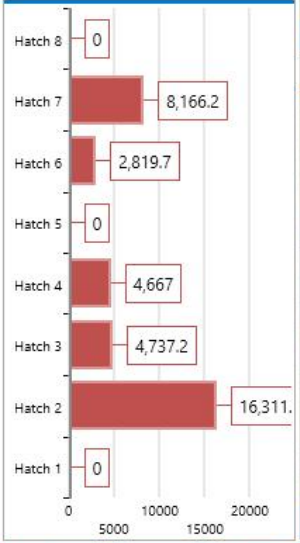
Gottwald Crane

1,355 MT

Liebherr Total Disc.

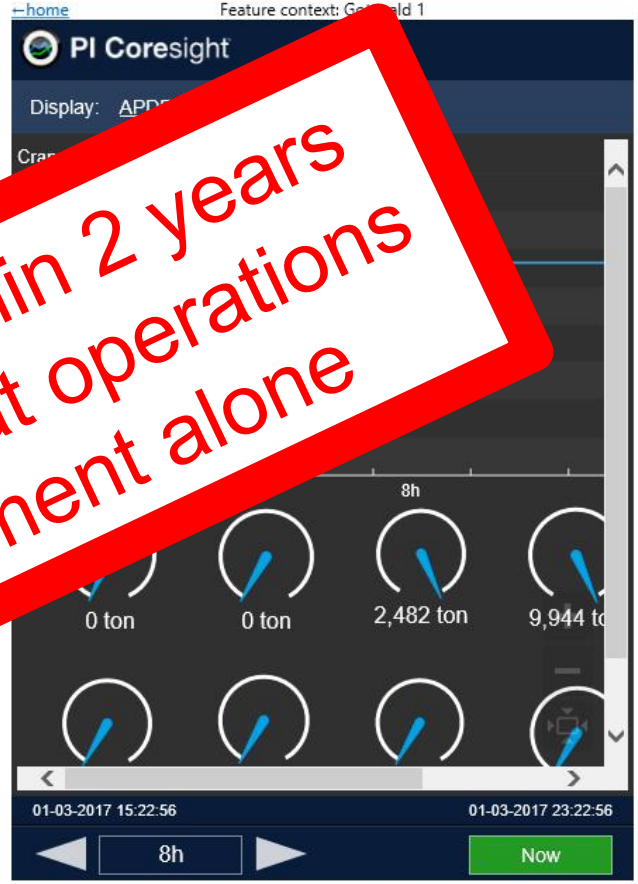
36,701MT

Liebherr Crane



APDPPL MAP

Gottwald OPR Cycle



Payback within 2 years from Tug boat operations improvement alone

Hatch Pie Chart [...

Hatch wise Discharge View

Hatch Pie Chart [...

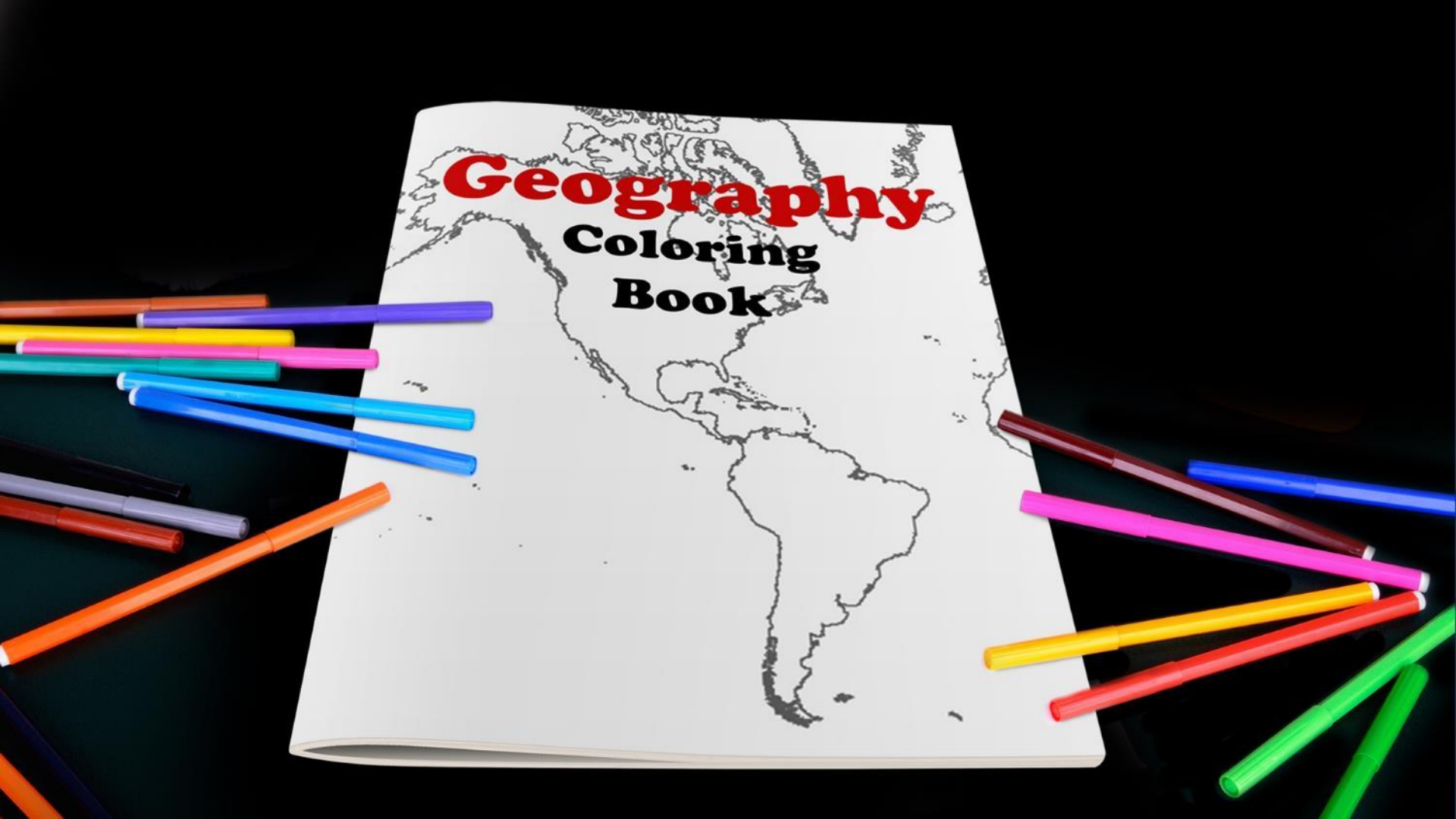
Stacker [Reclaimi...

7,320 MT

Stacker [Stacking]

7,320 MT

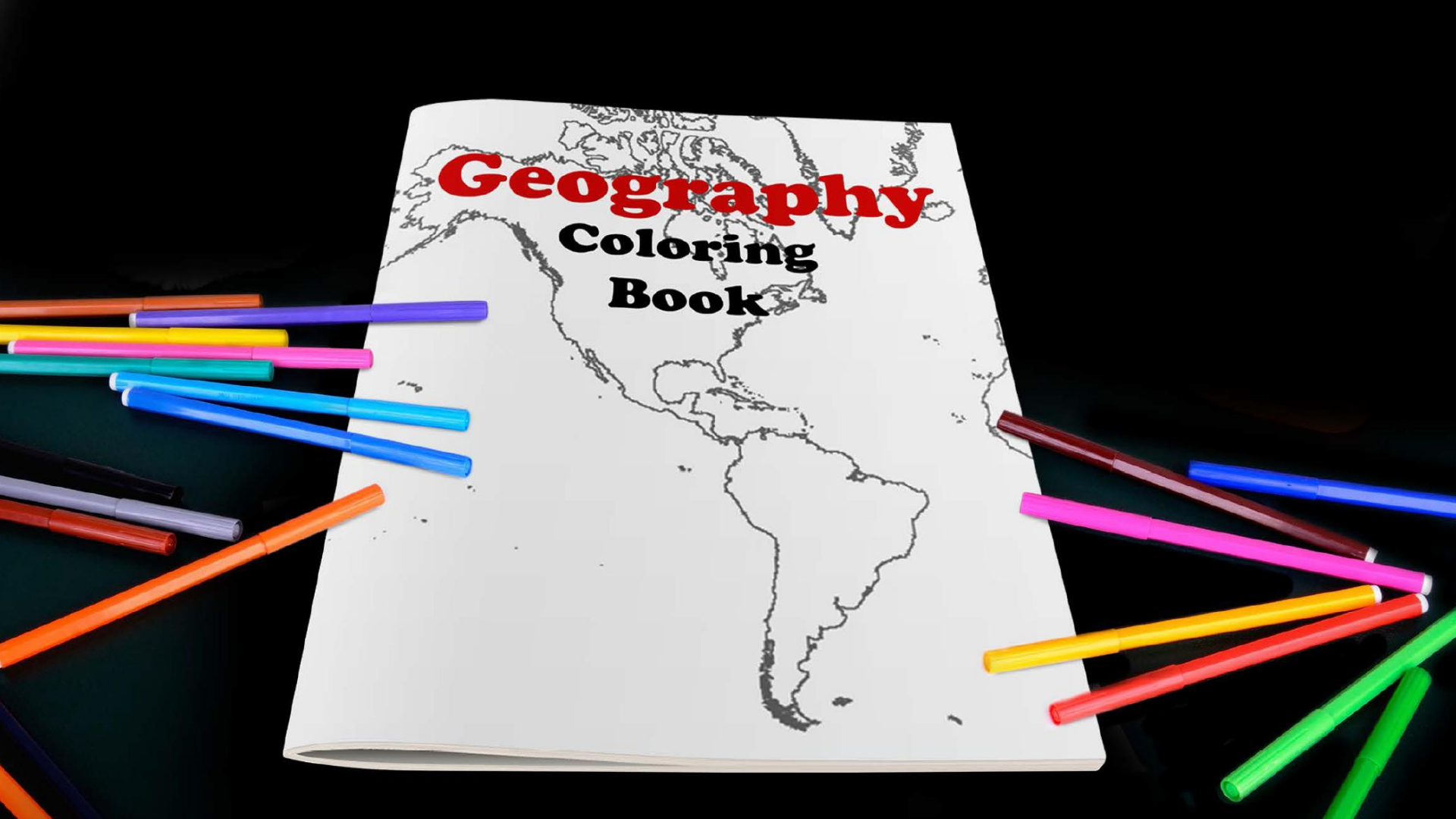
ENG 23:22 01-03-2017

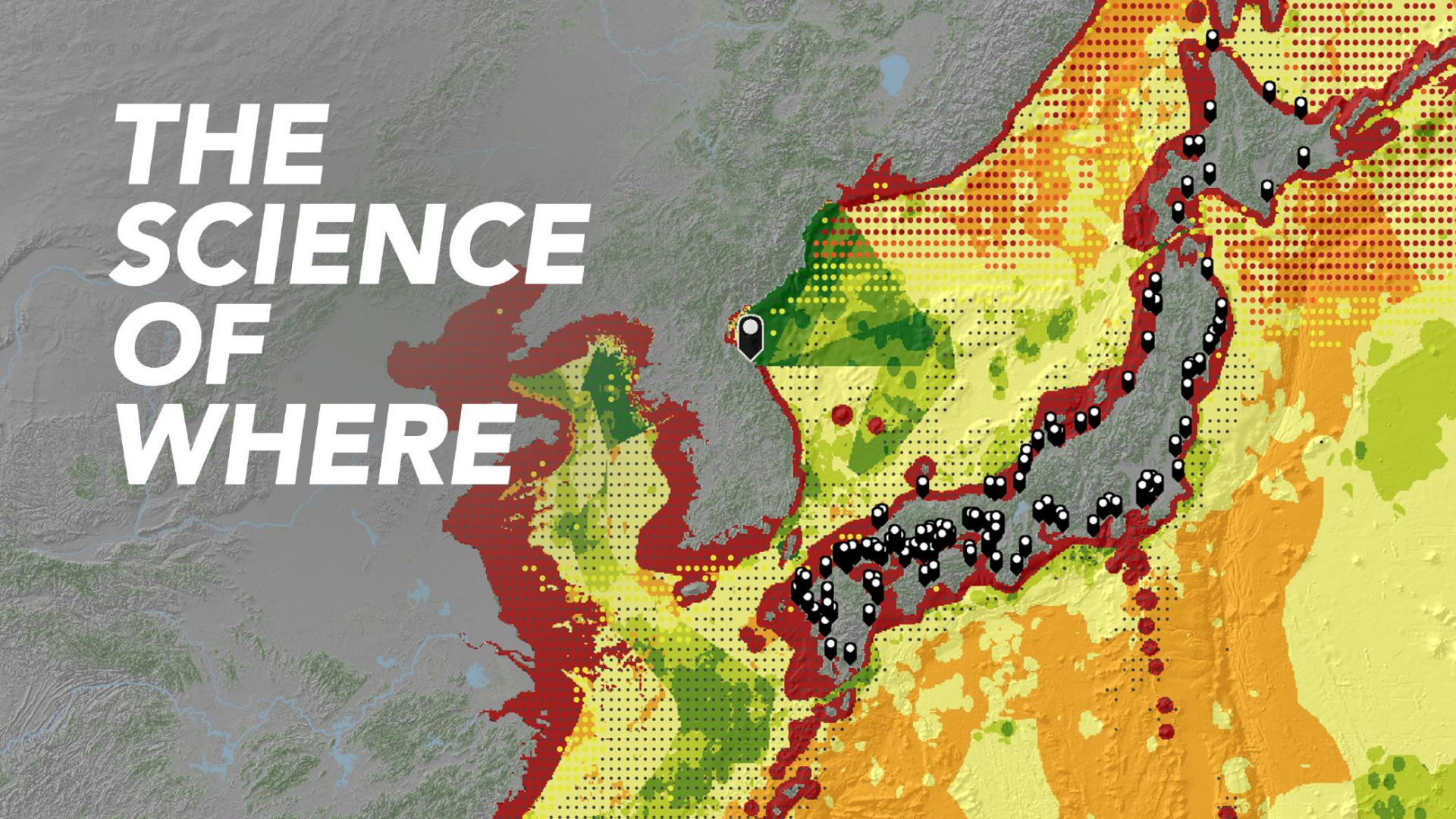

Geography
Coloring
Book

The Science of Where

A New Dimension for Your PI System

Christopher Cappelli | Geographer


Geography
Coloring
Book


THE
SCIENCE
OF
WHERE

GIS Provides the Framework and Process

For Enabling a Smarter World

Informing

Data Integration and Management

Visualization and Mapping

Analysis and Modeling

Understanding

Planning and Design

Decision-Making

Action

Collaborating

Transforming How We Think and Act . . .
. . . Creating a More Sustainable Future

Leverage GIS and The Science of Where

A new dimension for your PI System

Location Analytics

Provides the capability to unlock data's full potential

understanding

WHERE

measuring

SIZE, SHAPE, AND DISTRIBUTION

determining

HOW PLACES ARE RELATED

finding

THE BEST LOCATIONS AND PATHS

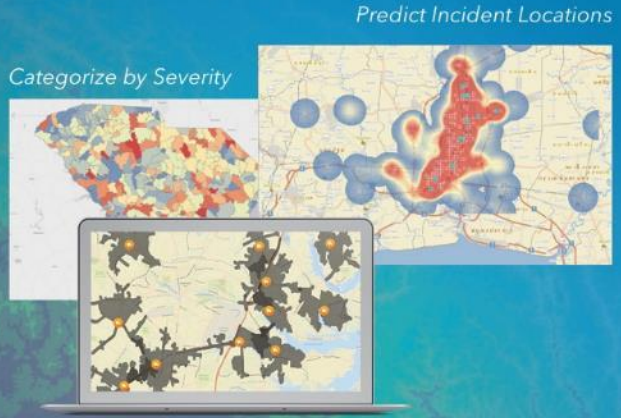
detecting & quantifying

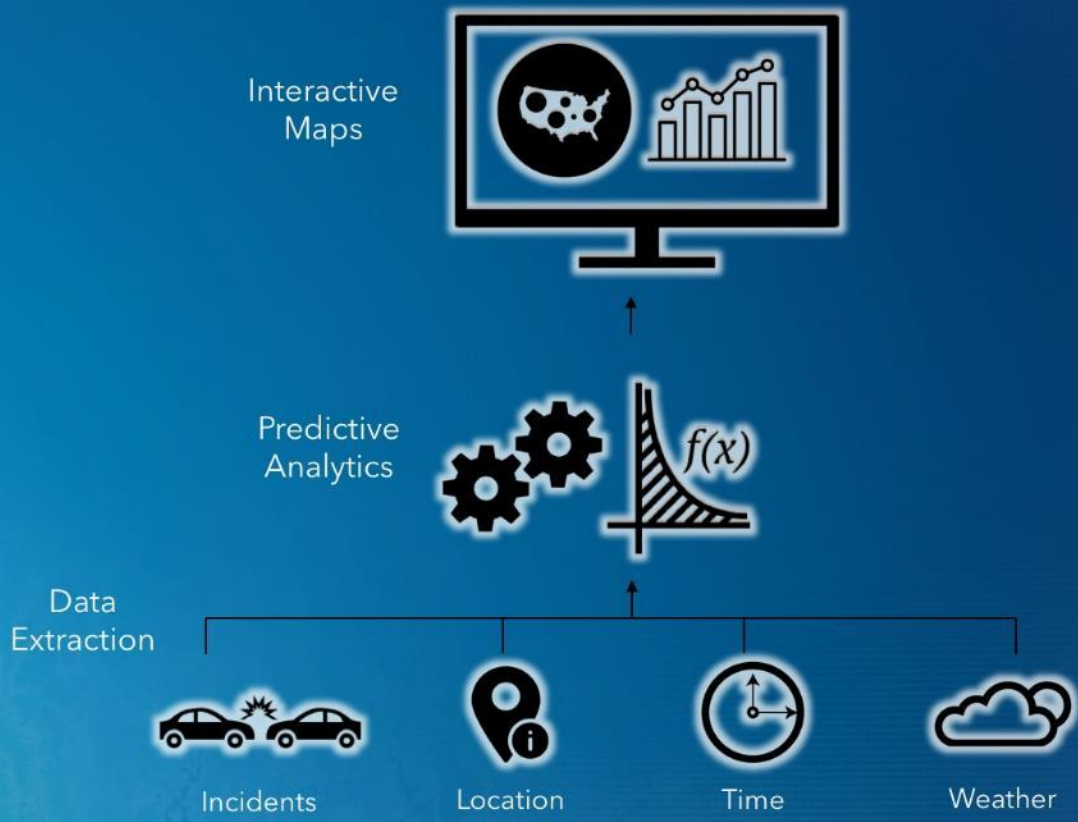
PATTERNS

making

PREDICTIONS

Predictive Incident Analytics





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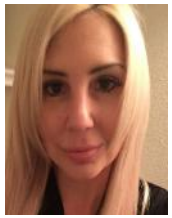

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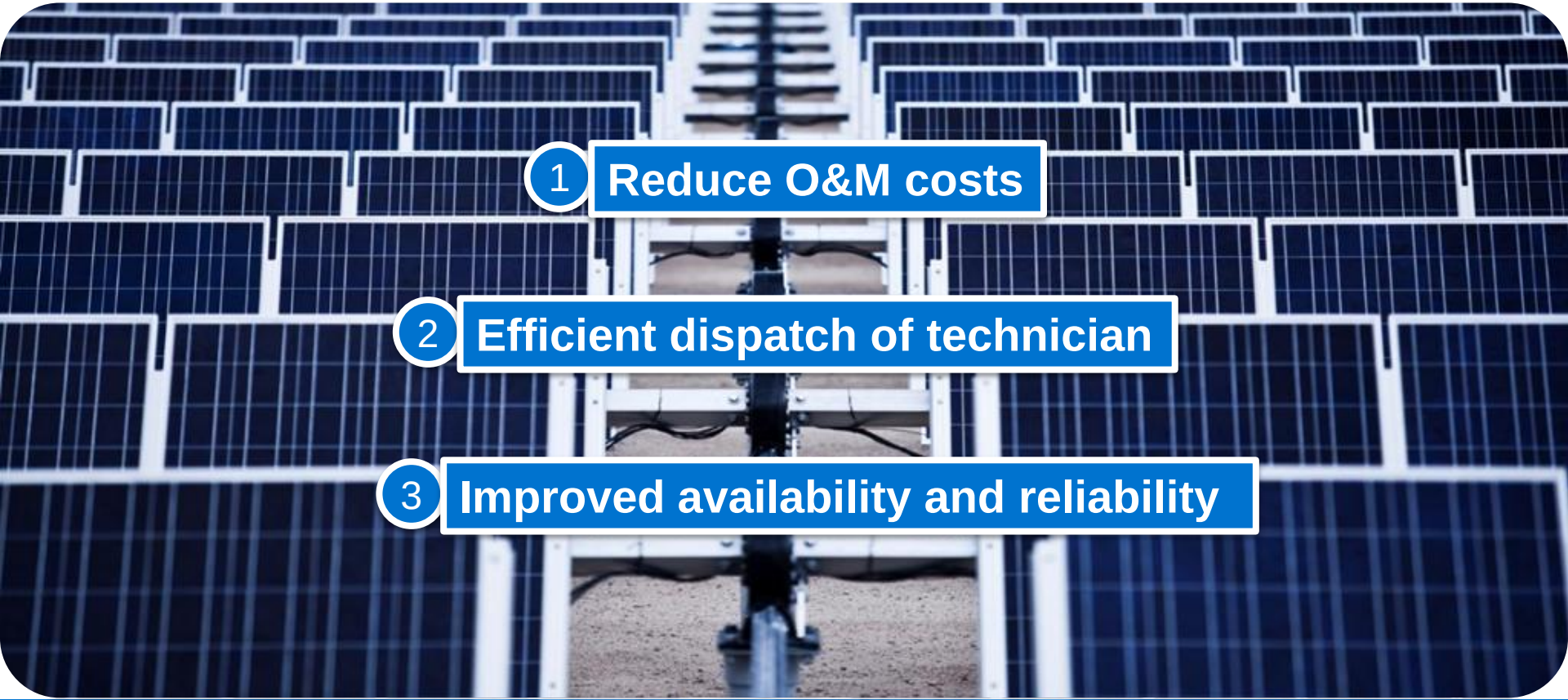
Transformational- Managing Large Solar Farms



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Physical and Economic Feasibility

OSIsoft.

esri

AeroVironment™ | PROCEED WITH CERTAINTY

Geospatial, Sensor Driven Analytics

- Asset Location
- Visual inspection
- Sensor data
- Events
- Automation
- Scale

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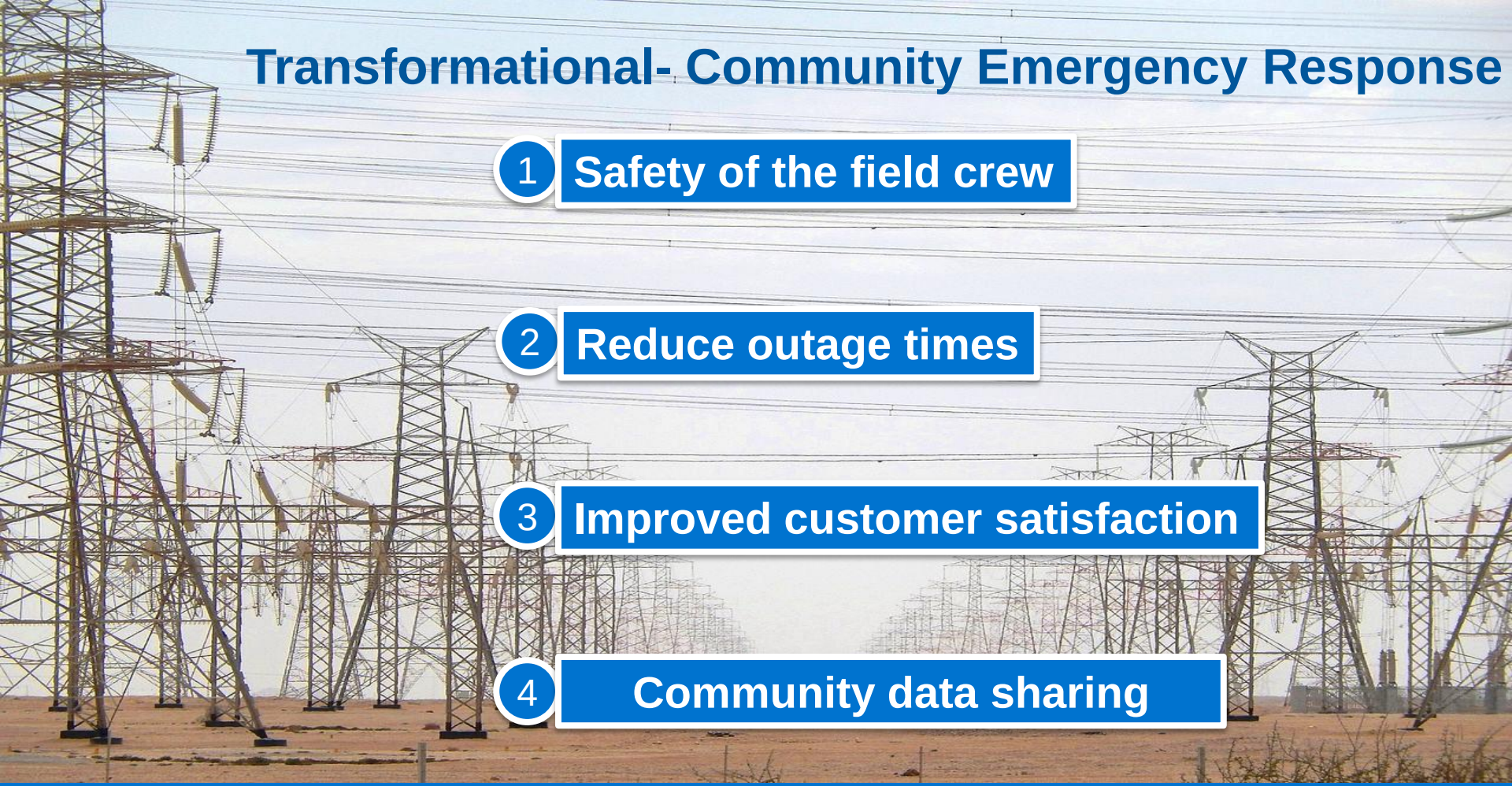
Transformational- Community Emergency Response



1. Safety of the field crew
2. Reduce outage times
3. Improved customer satisfaction
4. Community data sharing

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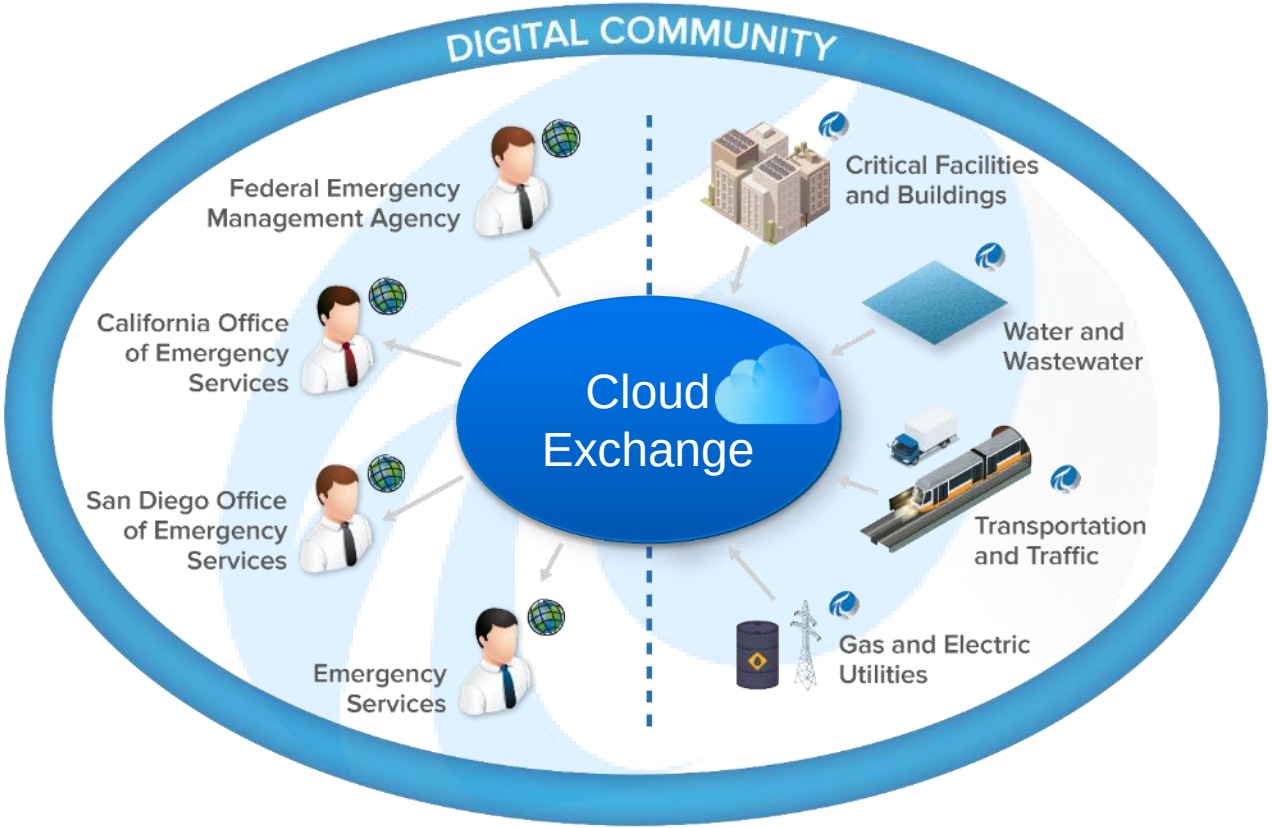
Community – Digital Transformation Collaboration



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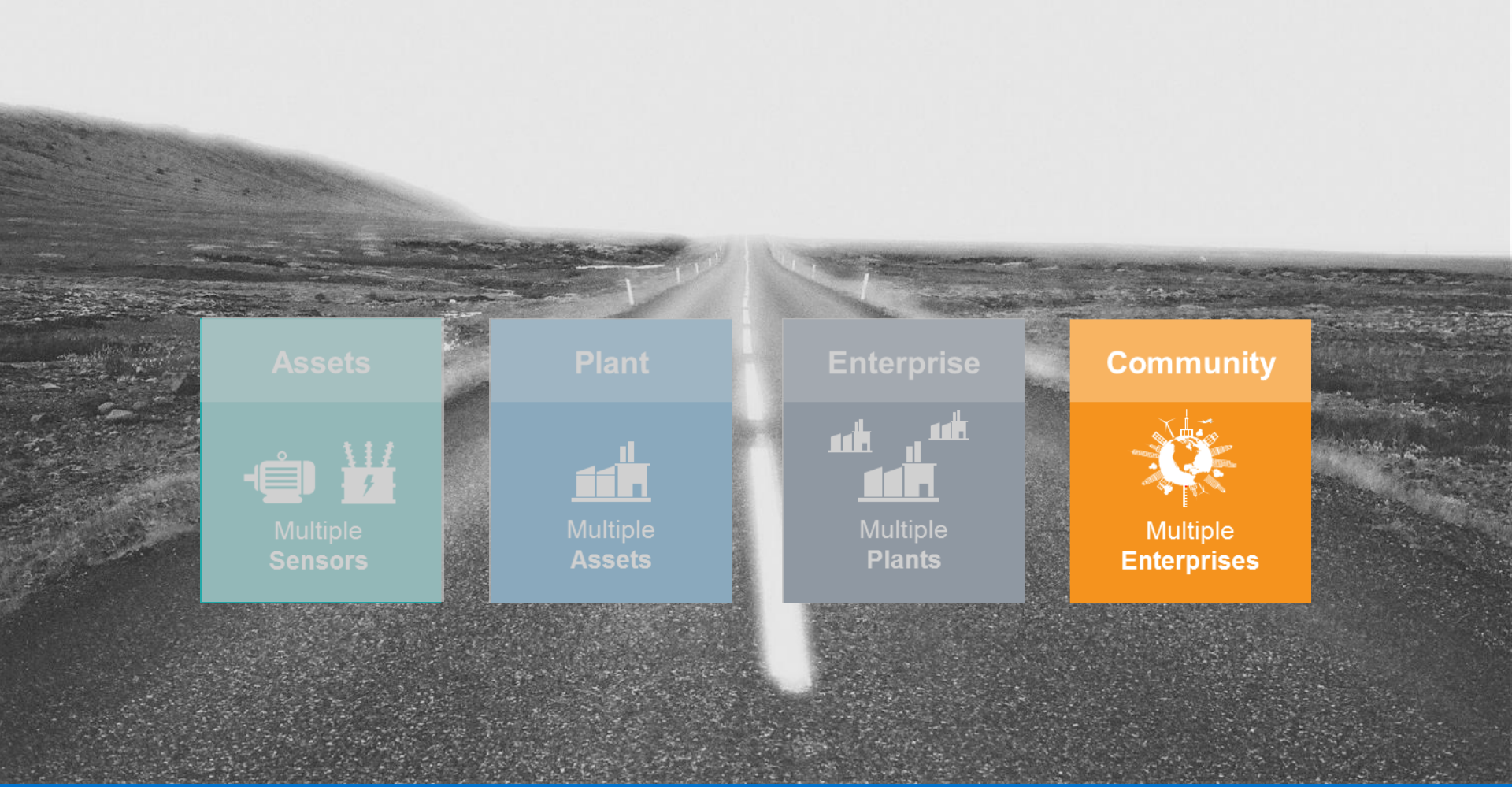

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Connecting the Value Chain

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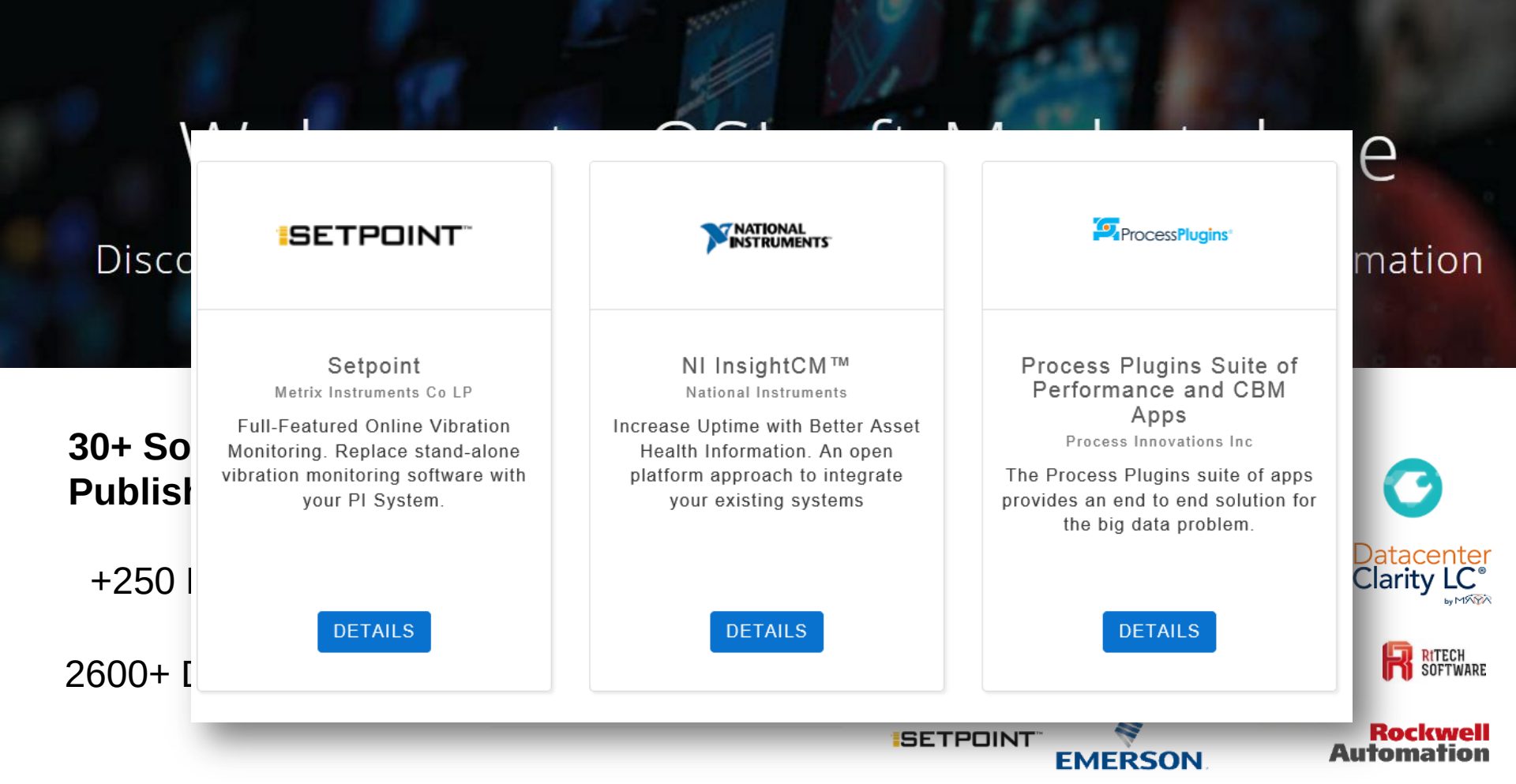

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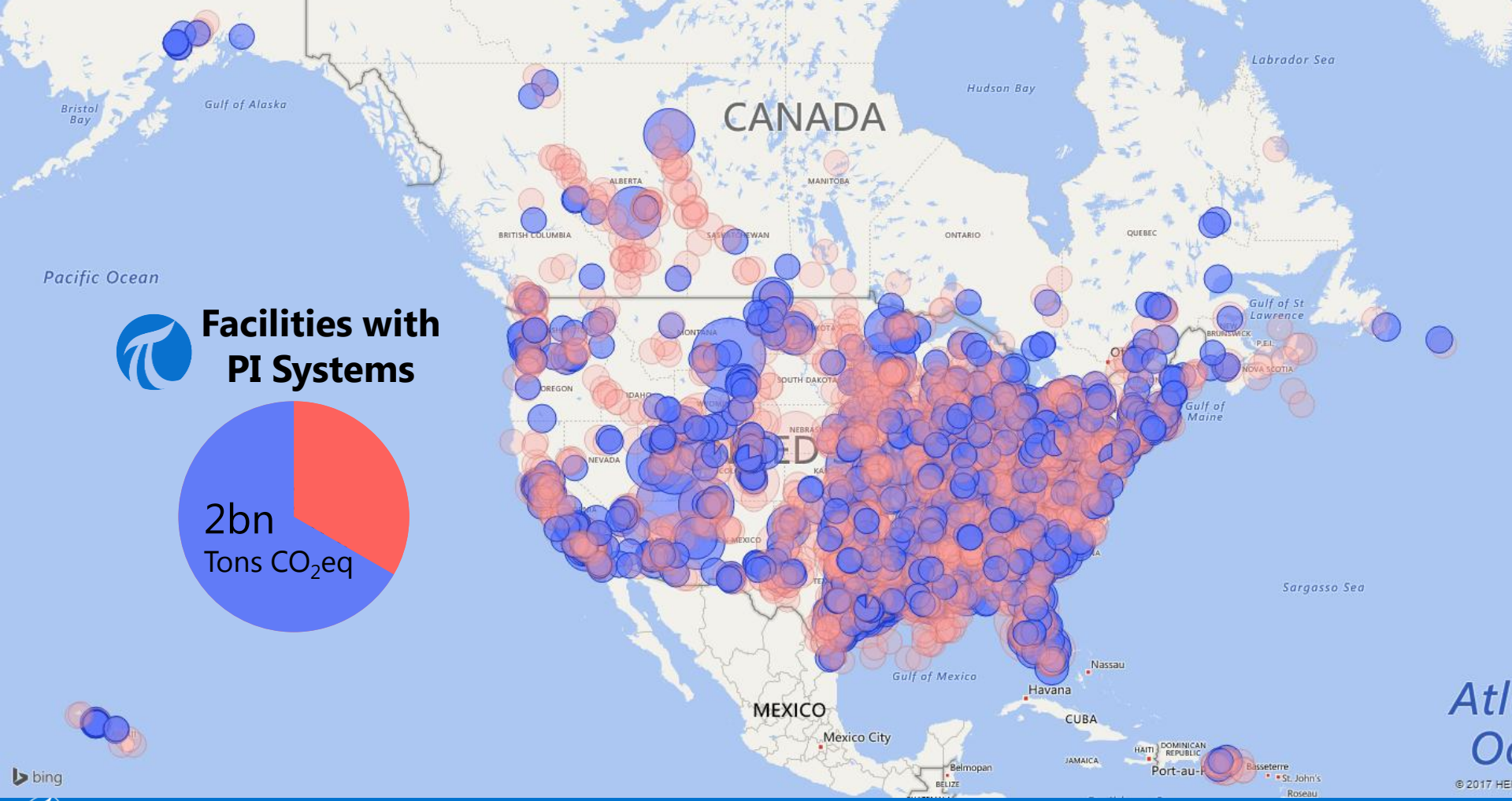
A Challenge!!

We believe
People with Data
can Transition
to a Sustainable
World



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Summary: Digital Transformation Journey

Industry Insights

Assets	Plant	Enterprise	Community
Multiple **Sensors**	Multiple **Assets**	Multiple **Plants**	Multiple **Enterprises**

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We believe **People** with **Data**
can **Transition** to a **Sustainable World**