Microsoft's Approach to IoT

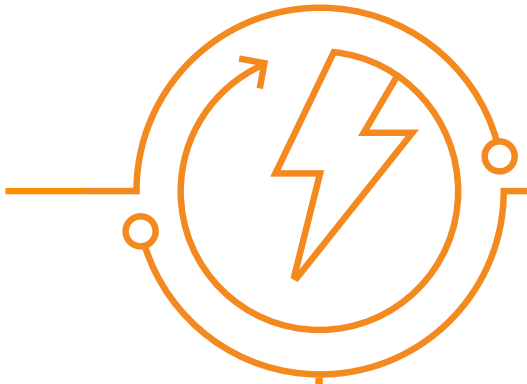
Digital Transformation and The Internet of Things

Mark Garcia
Cloud Solution Architect
U.S. Education
markga@microsoft.com

The Internet of Things isn’t a technology revolution…

…IoT is a business revolution, enabled by technology

IoT is Set to Explode



6.6 billion "things" will ship in 2020

Installed base of 20.8 billion units expected in 2020

IoT endpoints will grow at a 32% CAGR through 2020

Hardware spending on networked endpoints = $3 trillion in 2020

50% of Education CIOs expect IoT to have a major impact

Defining Internet of Things

Connect Things

30B
connected devices by 2020

Control Anything

$1.5M
average increase in operating income for digitally transformed enterprises

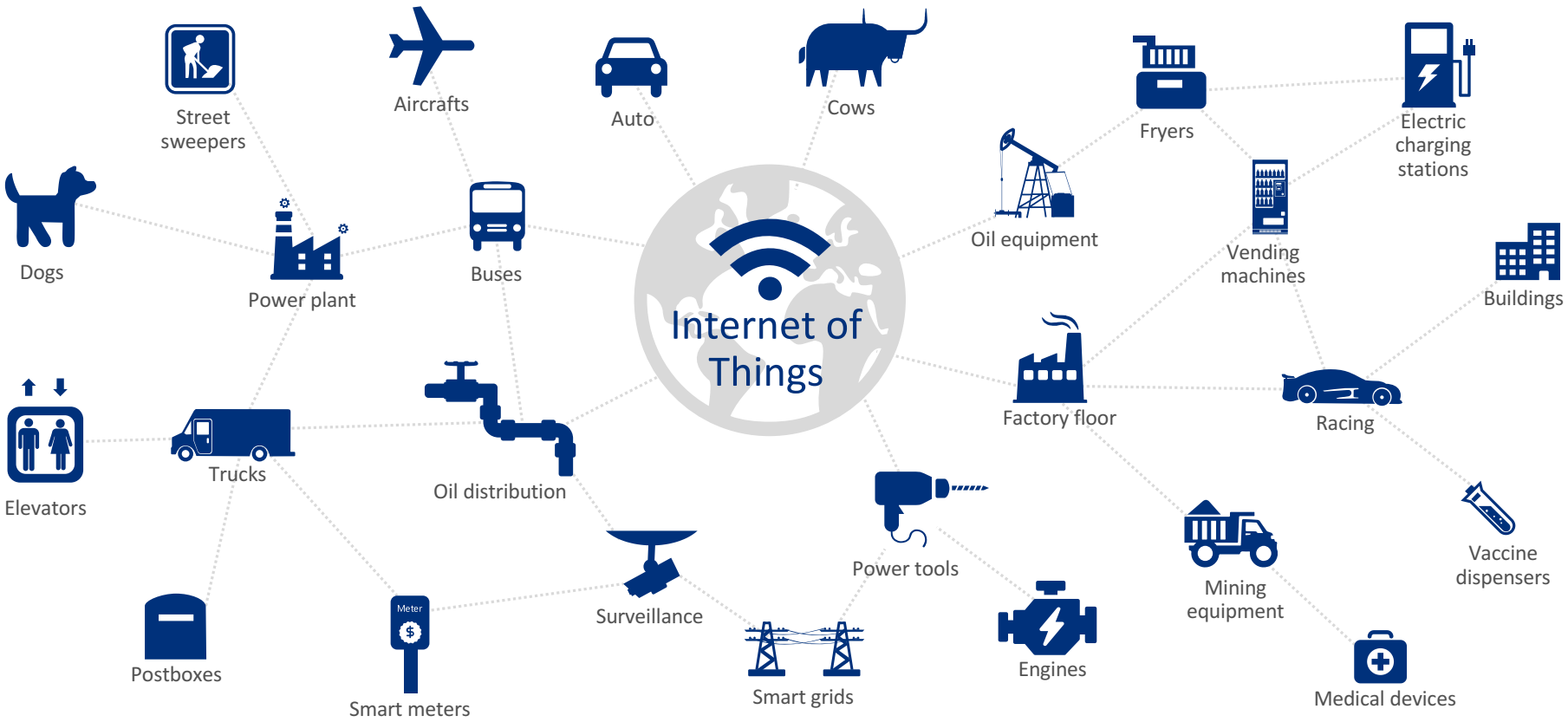
Gain Insights

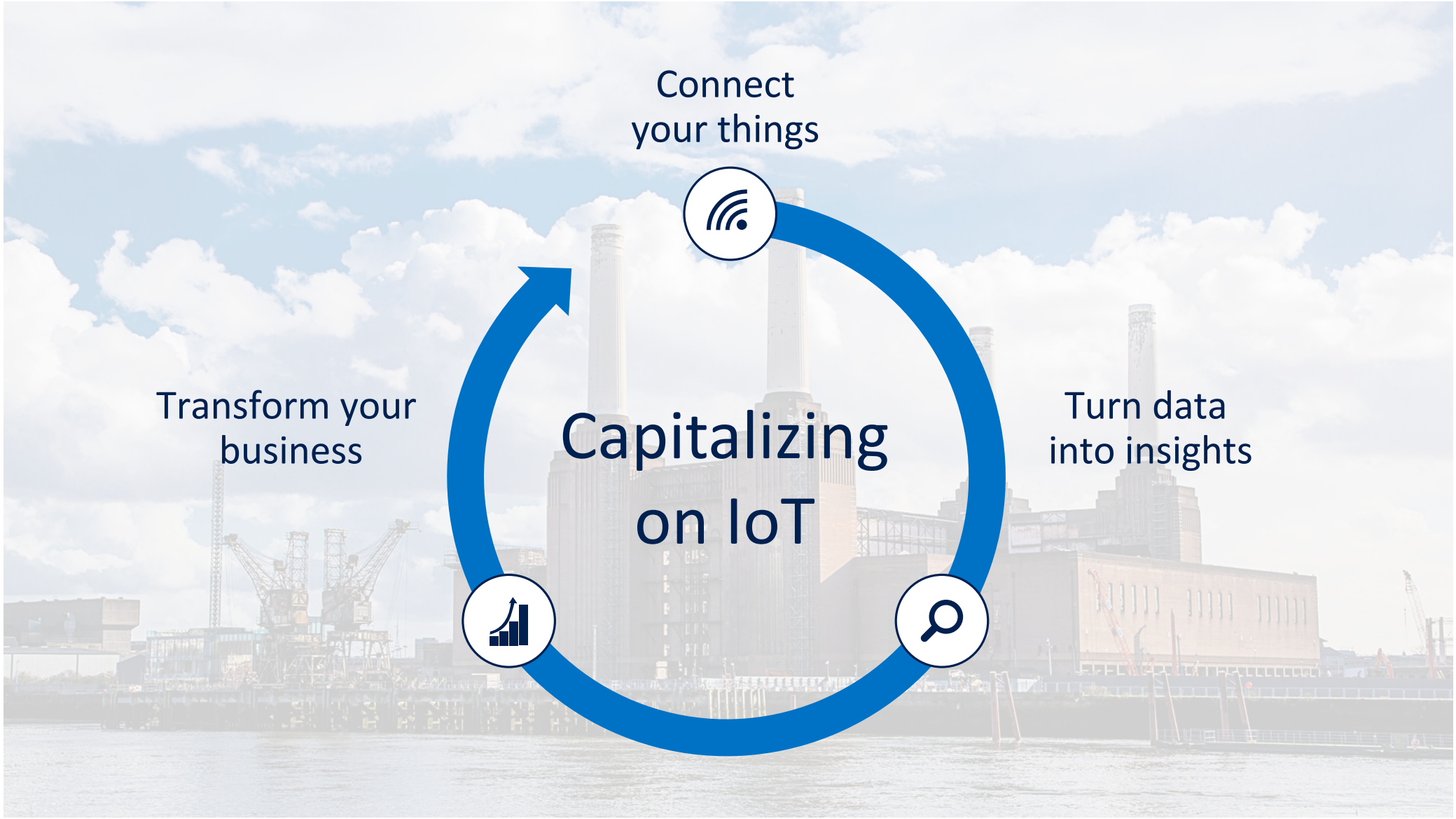
10%
of the data on earth will come from IoT by 2020

Take Action

$10B
market for business process automation tools by 2020

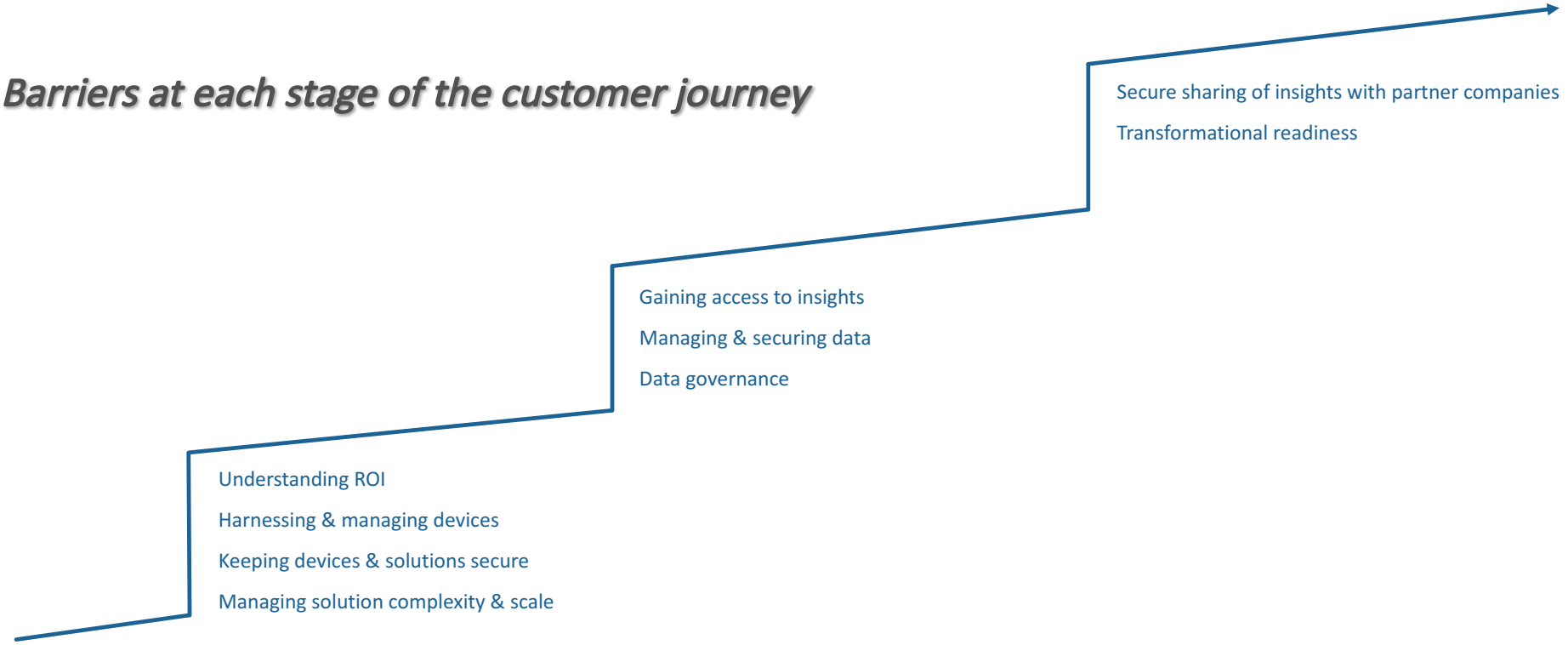
Innovation at work – real world IoT use cases




Connect
your things
Turn data
into insights
Transform your
business
Capitalizing
on IoT

IoT Customer Journey

Barriers at each stage of the customer journey



Phase->	Connect & Monitor	Analyze & Improve	Business Transformation & Insight Economy

Azure IoT Journey

We are lowering these barriers to pull customers along in their digital transformation journeys

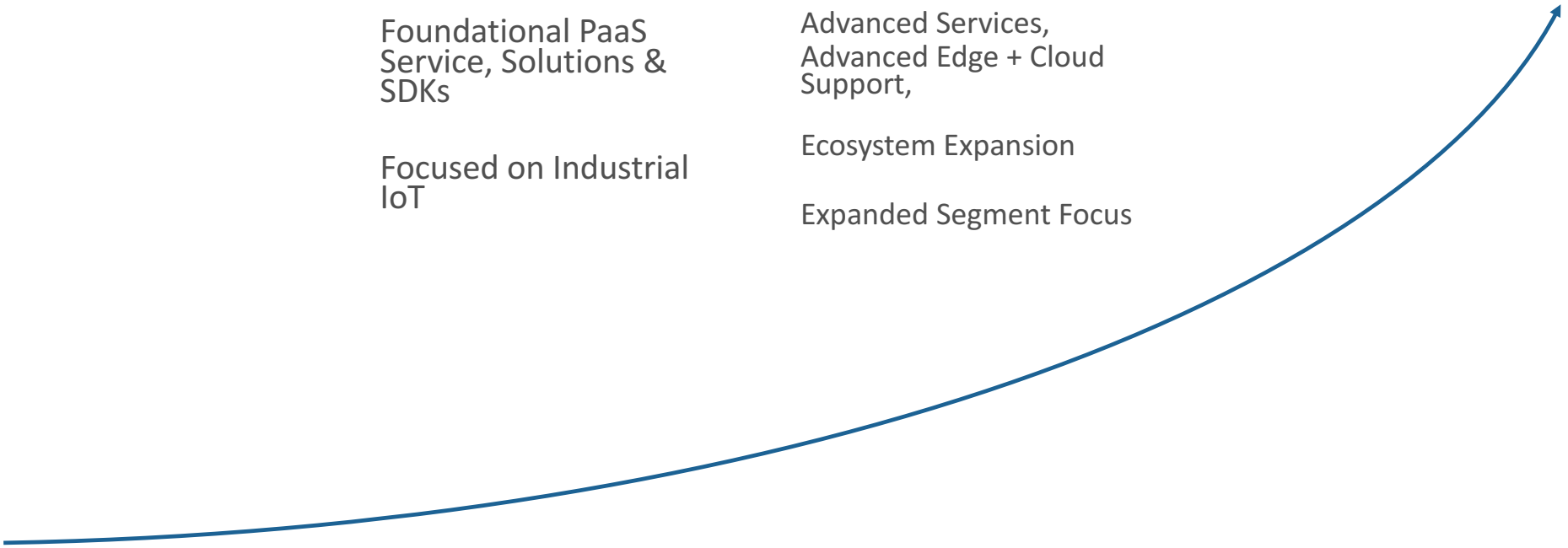
Foundational PaaS Service, Solutions & SDKs

Focused on Industrial IoT

Advanced Services, Advanced Edge + Cloud Support,

Ecosystem Expansion

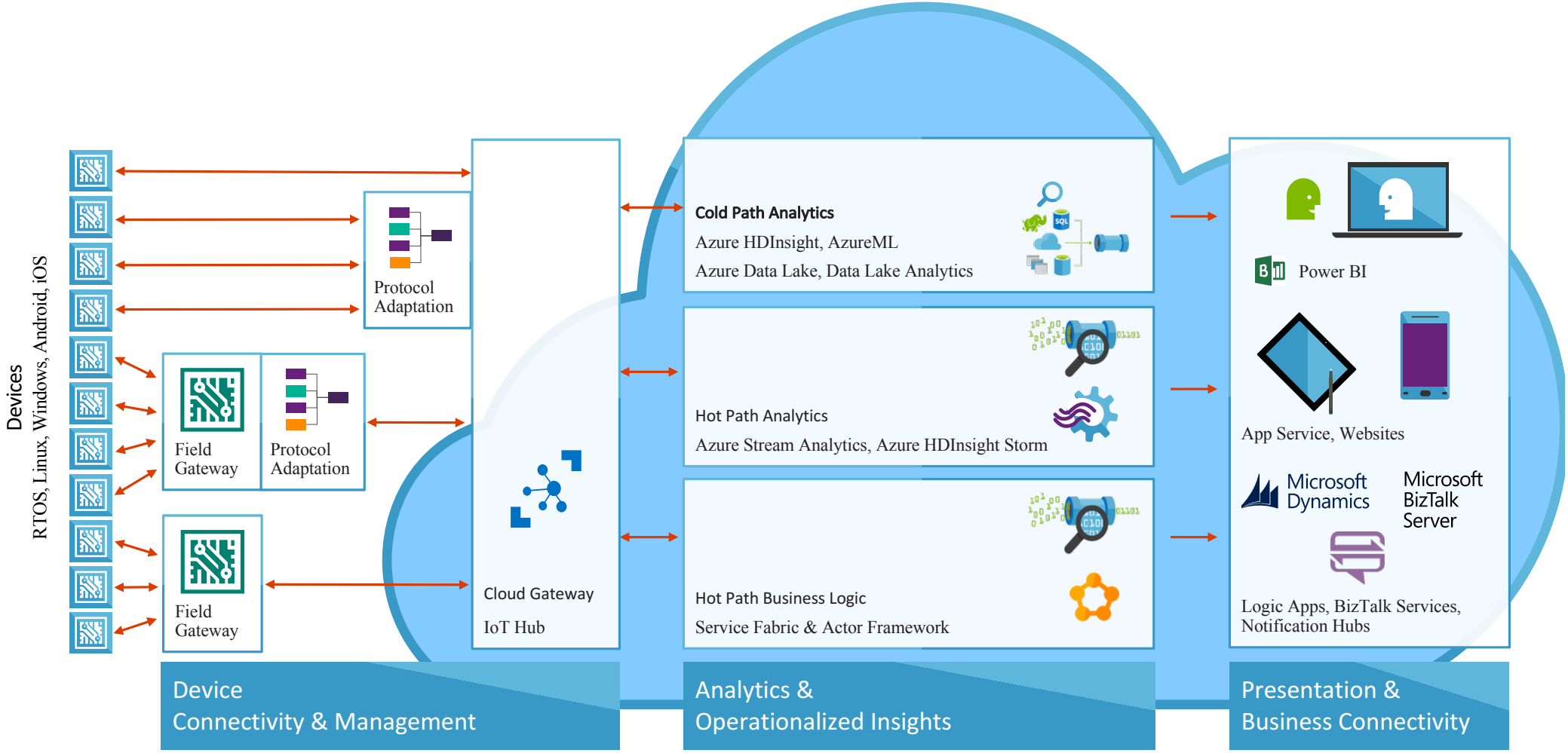
Expanded Segment Focus



Phase->	Connect & Monitor	Analyze & Improve	Business Transformation & Insight Economy

IoT is already delivering tangible results

Azure IoT Solutions Big Picture

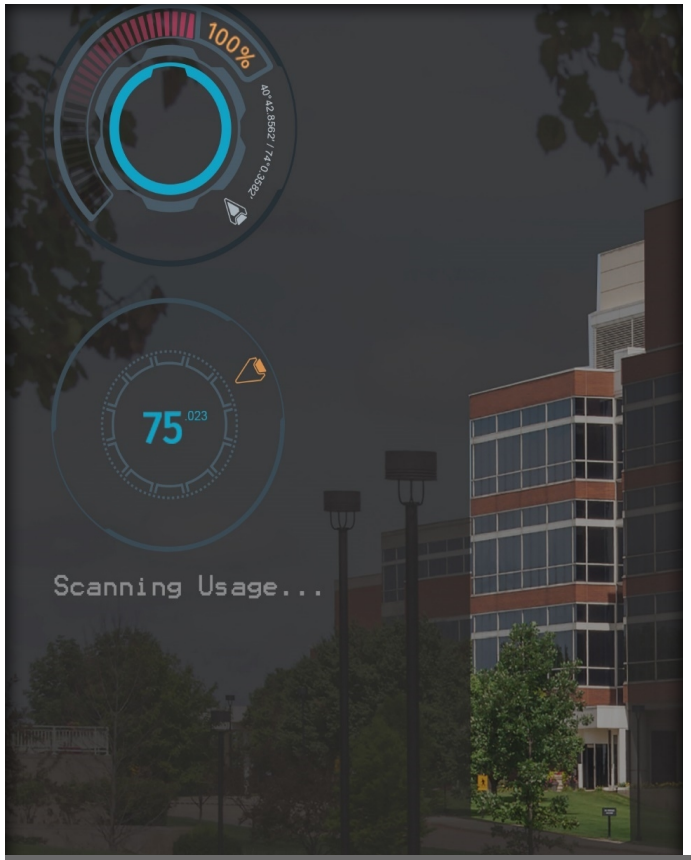


Azure IoT Suite

- Device Connectivity & Management
- Data Ingestion and Command & Control
- Stream Processing & Predictive Analytics
- Workflow Automation and Integration
- Dashboards and Visualization
- Preconfigured Solutions
  - Remote Monitoring
  - Predictive Maintenance

Azure IoT Demo


SAFETY & SECURITY
BUILDINGS & ENERGY EFFICIENCY
ACCESS, CONTROL & PAYMENTS
CONNECTED CAMPUS & SCHOOLS EXPERIENCES (CITYNEXT)
CONNECTED TRANSPORTATION
STUDENT EXPERIENCE
Microsoft



ENERGY USAGE FAULT DETECTION PREDICTIVE DATA

BUILDING ENERGY EFFICIENCY

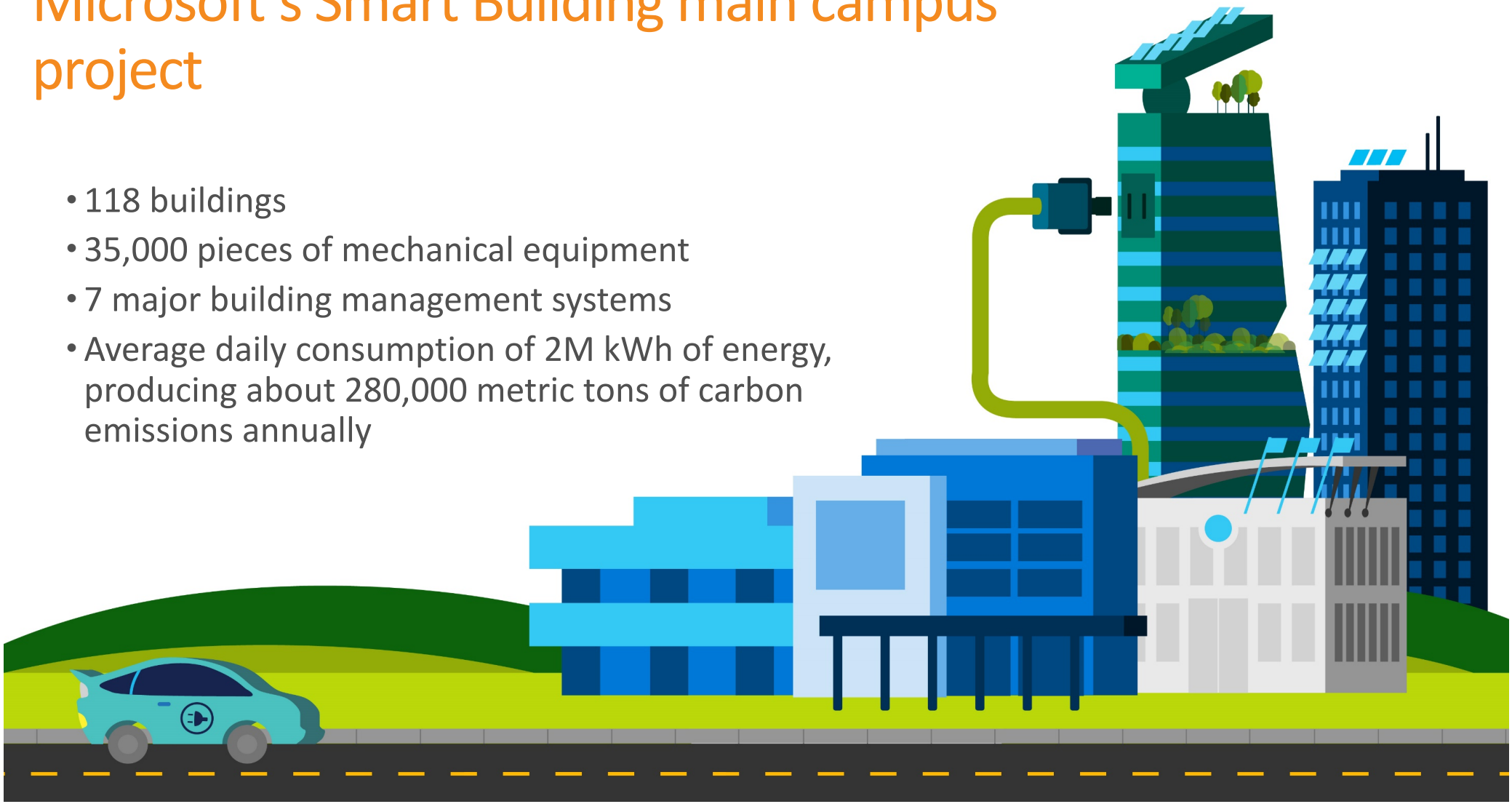
With smart buildings, schools and university campuses can save 10% or more through facilities management & energy efficiency.

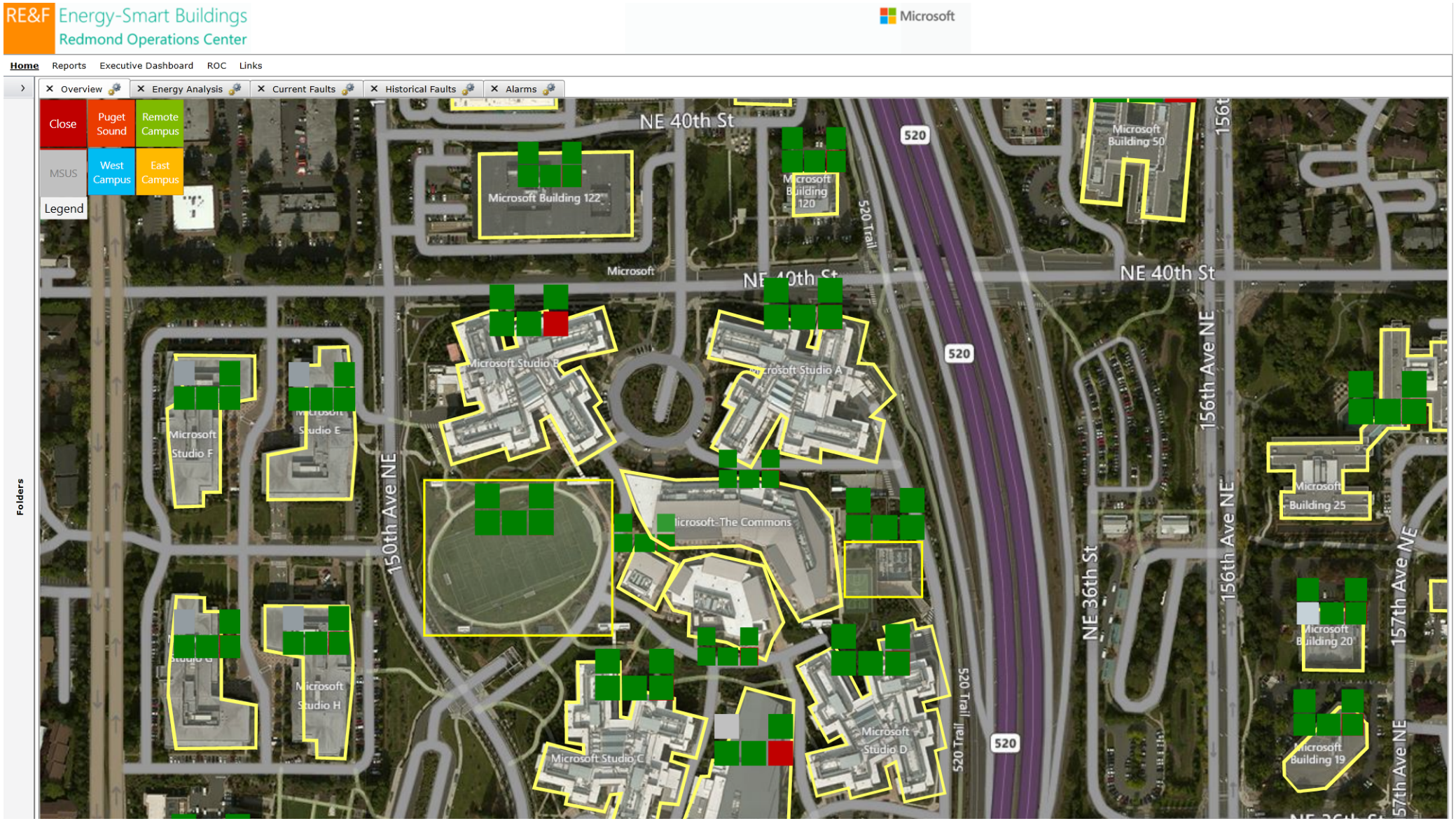
What does it mean to have Smart Buildings?

- Reduce energy consumption
- Fault detection
- Reduce minor disasters
- Save money
- Go green

Microsoft's Smart Building main campus project

- 118 buildings
- 35,000 pieces of mechanical equipment
- 7 major building management systems
- Average daily consumption of 2M kWh of energy, producing about 280,000 metric tons of carbon emissions annually




RE&F Energy-Smart Buildings
Redmond Operations Center
Microsoft
Home
Reports
Executive Dashboard
ROC
Links
Overview
Energy Analysis
Current Faults
Historical Faults
Alarms
Folders
Close
Puget Sound
Remote Campus
MSUS
West Campus
East Campus
Legend
NE 40th St
520
520 Trail
Microsoft Building 122
Microsoft Building 120
Microsoft Building 50
Microsoft
Microsoft Studio B
Microsoft Studio A
Microsoft Studio F
Microsoft Studio E
Microsoft Studio H
Microsoft Studio C
Microsoft Studio D
Microsoft-The Commons
150th Ave NE
156th Ave NE
157th Ave NE
NE 36th St
Microsoft Building 25
Microsoft Building 20
Microsoft Building 19

RE&F Energy-Smart Buildings
Redmond Operations Center

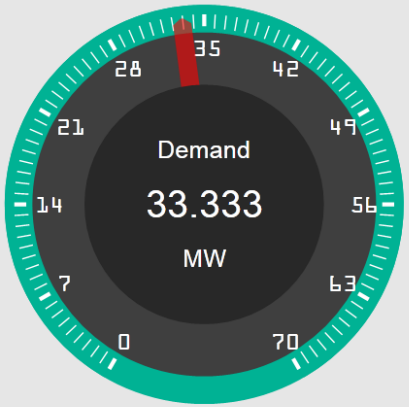
rain - 42 F

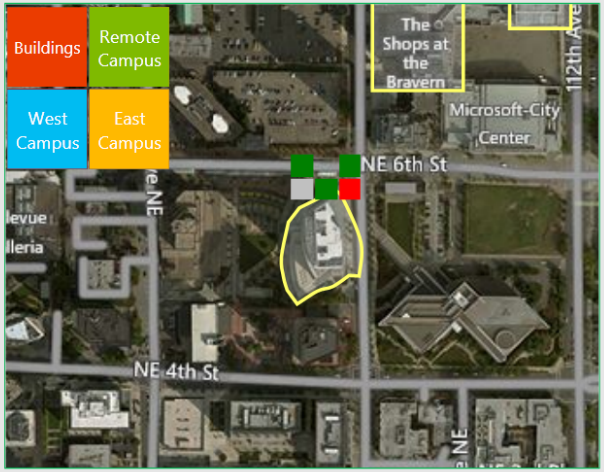
Microsoft

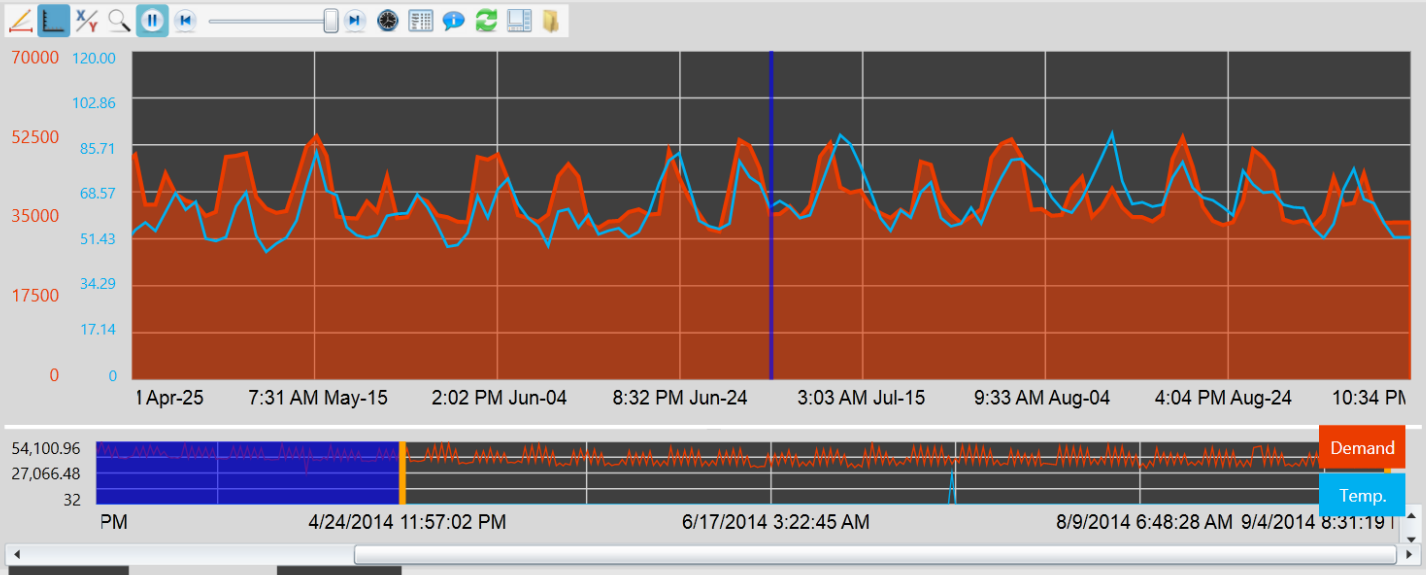
Top Performing Buildings by BPI

1	1	1.00	4	127	1.13	7	ADVANTA A	1.49
2	2	1.08	5	BRAVERN 1	1.26	8	10	1.55
3	STUDIO G	1.12	6	REDW E	1.31	9	87	1.59

Total Region | Demand | Demand/Person | Demand/Sq.Ft.

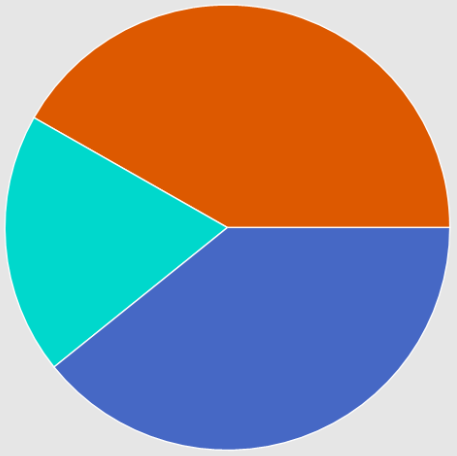






Day | Month | Year

Load Segmentation



Base 42 %

Plug 19 %

Lab 39 %

RE&F Energy
Redmon

Top Performing E

1 | 1

2 | 2

3 | STUDI

Total Region

70000 120.00
102.86
52500 85.71
68.57
35000 51.43
34.29
17500 17.14
0 0
1 Apr-

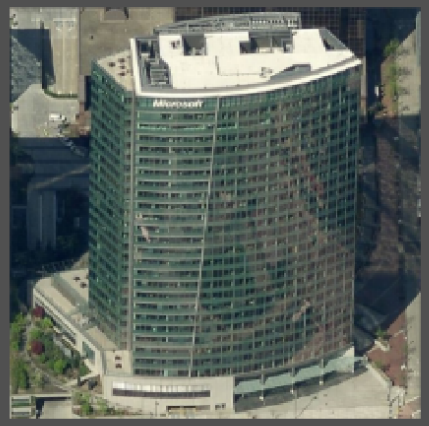
54,100.96
27,066.48
32
PM

Day | M

Microsoft

CITY CENTER Bellevue, WA

X



Developer Building
Building Type

Chillers In building, CHW AHU's, CHW Labs
System Type

561,583
Floor Space sq. ft.

1885
Persons Headcount

2144.35
Demand kW

2.20
BPI

Total Demand | Base Load | Plug Load | Lab Load

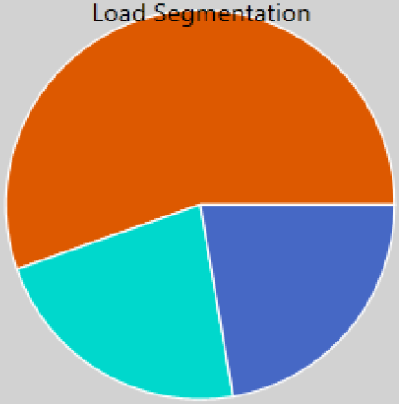
3,838.27 120.00
102.86
3,191.25 85.71
68.57
2,544.22 51.43
34.29
1,897.20 17.14
1,250.17 0

l Nov-13 6:50 PM Nov-13 8:32 AM Nov-15

3,439.06
1,733.48
27.90

12:00:00 AM 11/15/2014 12:00:00 AM 11/17/2014 12:00:00 AM 11/19/2014 12:00:00 AM

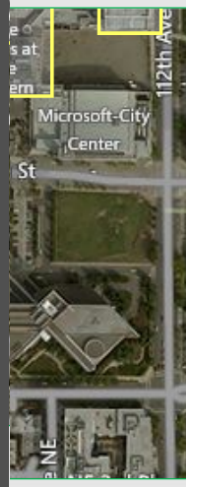
Load Segmentation



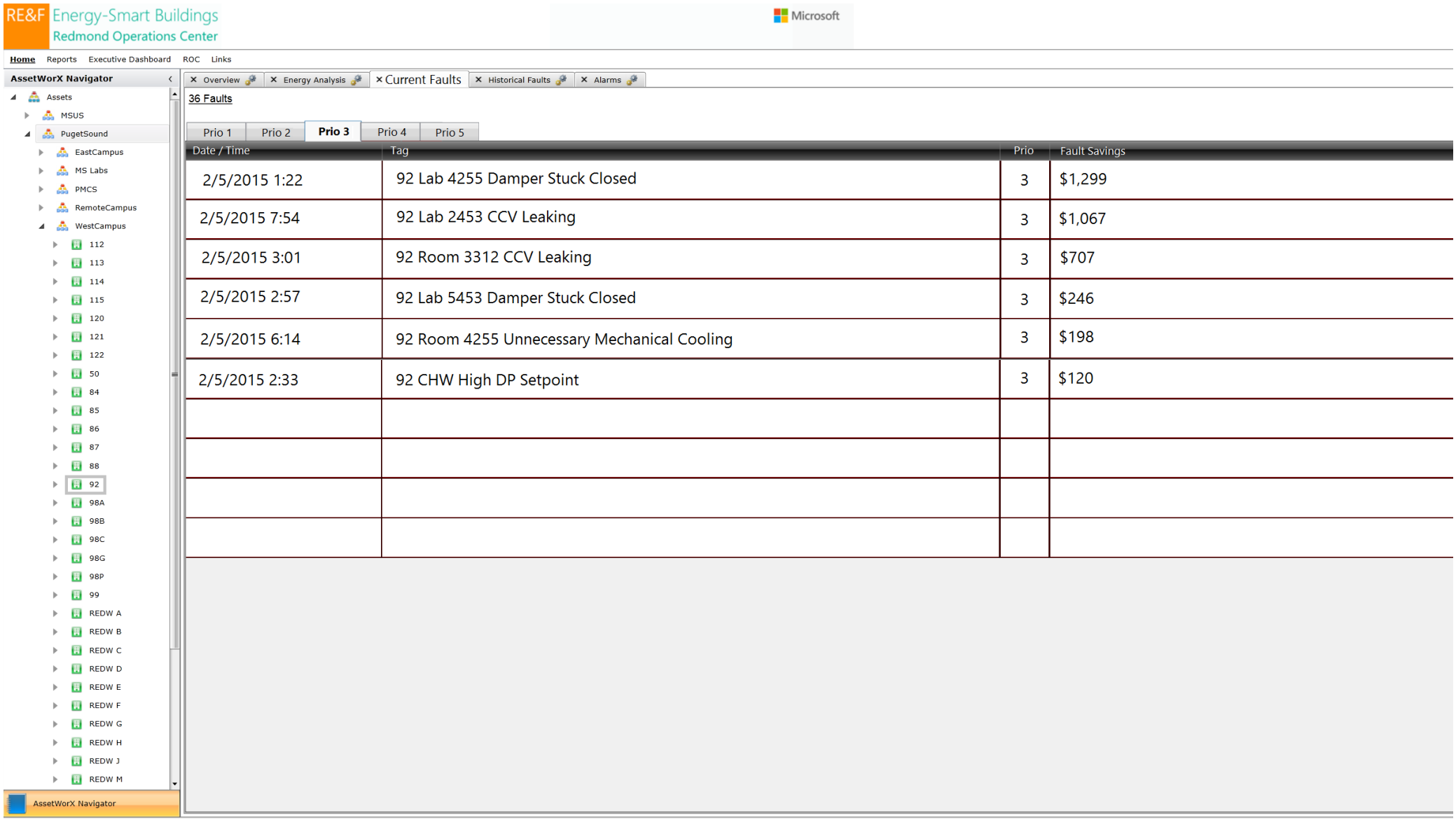
Descript	Ur	Last value
Base Load	%	55
Plug Load	%	22

Description	Last time	Last value	Cursor time	Cursor v.
Redmond Temp	6:00 PM Nov-15	41	12:00 PM Nov-13	46

per Day | per Month | per Year



Base 42 %
Plug 19 %
Lab 39 %


RE&F Energy-Smart Buildings
Redmond Operations Center
Microsoft
Home Reports Executive Dashboard ROC Links
AssetWorX Navigator
Assets
MSUS
PugetSound
EastCampus
MS Labs
PMCS
RemoteCampus
WestCampus
112
113
114
115
120
121
122
50
84
85
86
87
88
92
98A
98B
98C
98G
98P
99
REDW A
REDW B
REDW C
REDW D
REDW E
REDW F
REDW G
REDW H
REDW J
REDW M
AssetWorX Navigator
Overview
Energy Analysis
Current Faults
Historical Faults
Alarms
36 Faults
Prio 1
Prio 2
Prio 3
Prio 4
Prio 5
Date / Time
Tag
Prio
Fault Savings
2/5/2015 1:22
92 Lab 4255 Damper Stuck Closed
3
$1,299
2/5/2015 7:54
92 Lab 2453 CCV Leaking
3
$1,067
2/5/2015 3:01
92 Room 3312 CCV Leaking
3
$707
2/5/2015 2:57
92 Lab 5453 Damper Stuck Closed
3
$246
2/5/2015 6:14
92 Room 4255 Unnecessary Mechanical Cooling
3
$198
2/5/2015 2:33
92 CHW High DP Setpoint
3
$120

Enhanced

Building and Energy

management for a school

Arlington primary school's energy management was transformed by cloud-based insights with a solution from Microsoft partner ICONICS. They **reduced energy usage, increased equipment lifespan, and sped problem detection by 15%.** As soon as the fault detection system was turned on, it revealed the school's new chiller was running constantly, cycling every five minutes even at night to keep the school within a needlessly narrow, half-degree temperature range.

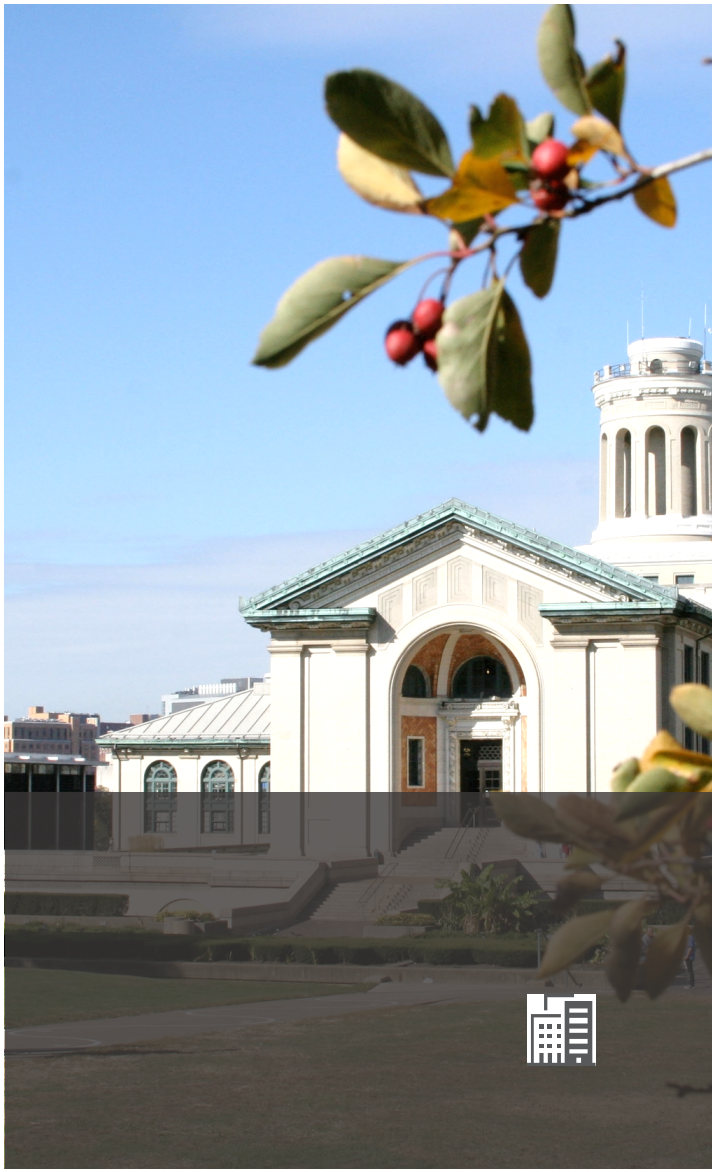
Learn more

Applying

MACHINE LEARNING

to save energy

Carnegie Mellon University wanted to reduce energy usage and cut carbon emissions. The university leveraged the PI system from Microsoft partner OSIsoft in combination with Azure HDInsight and Power BI for better fault detection, diagnosis, and more efficient operations. They were able to detect equipment failures sooner and **achieved a 30% reduction in energy costs**.

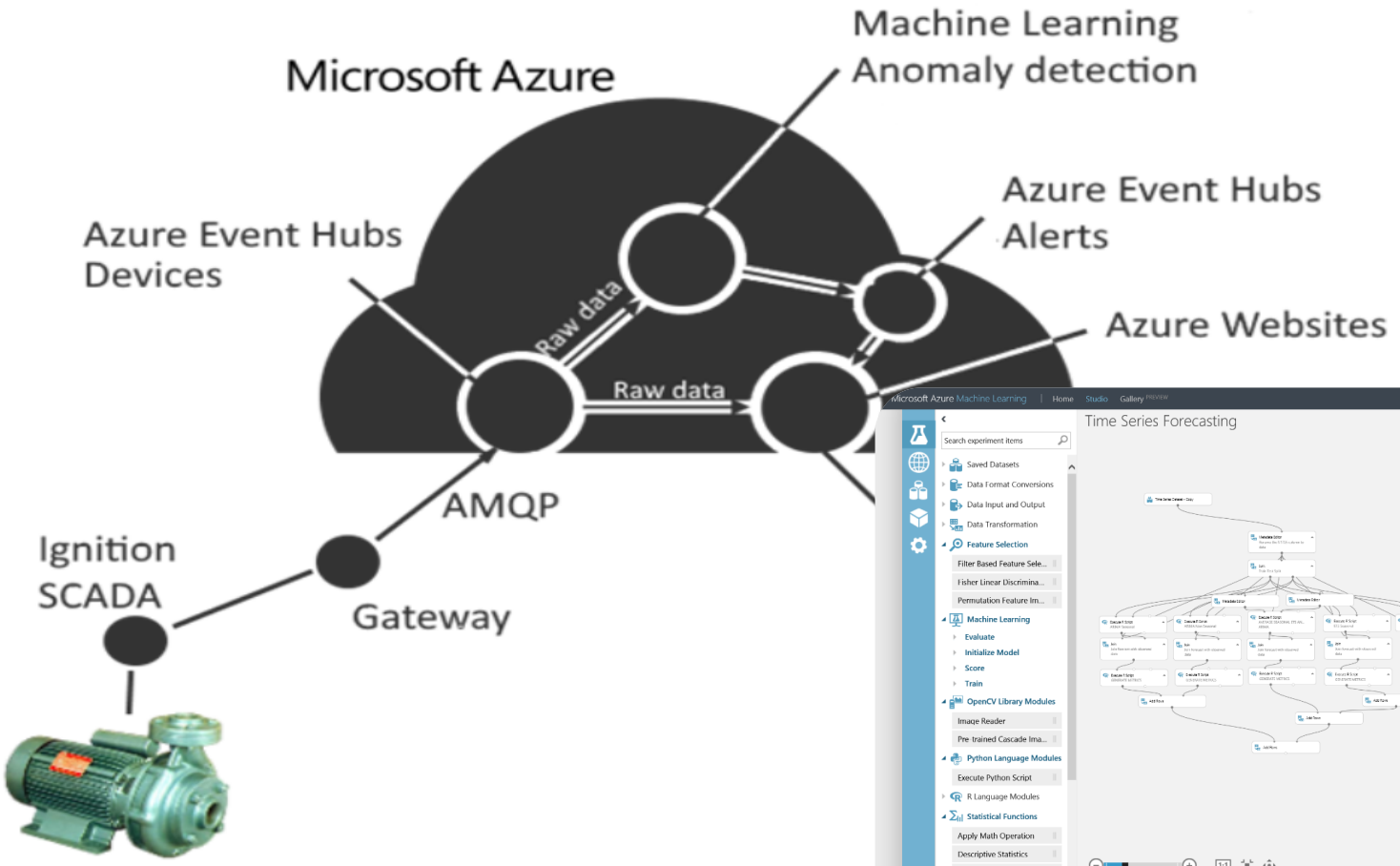


Learn more

@MSFTCityNext Microsoft.com/CityNext

SLAC National Accelerator Laboratory

Azure Machine Learning for IoT



Health

weka solutions

IoT-enabled Smart Fridge

Weka builds a life-saving smart fridge using Azure IoT Suite and Windows 10 IoT

Click to see more

The Leeds Teaching Hospitals NHS Trust

Transforming healthcare with faster access

By capturing and analyzing data recorded in medical charts, staff were able to improve treatments techniques by tracking return visits.

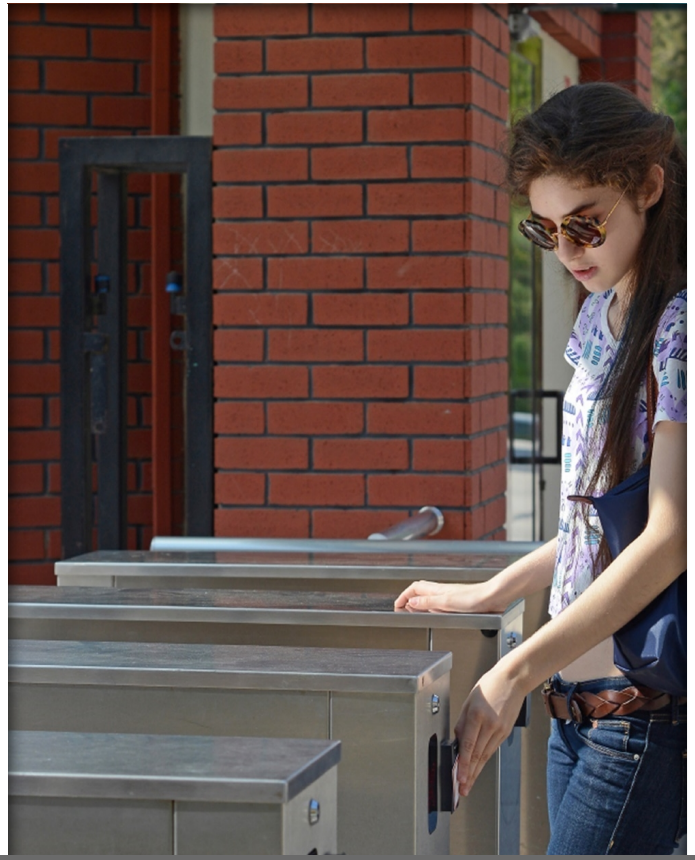
Click to see more

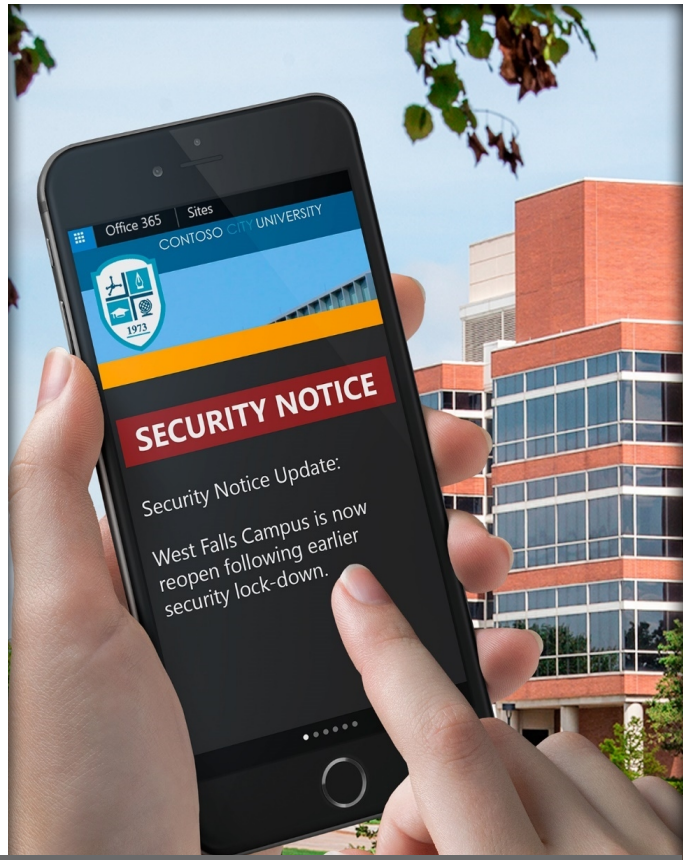
Great River Medical Center

Building a connected hospital

Reduce medication delivery times and inventory costs by connecting dispensary devices with electronic medical records.

Click to see more



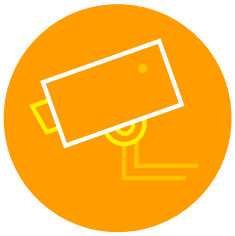


SMART CAMERAS

ACCESS CONTROL

EMERGENCIES

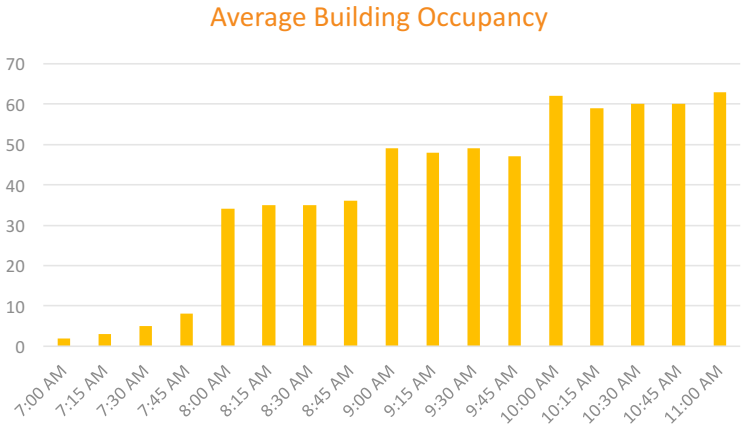
SAFETY AND SECURITY



Apply realtime analytics

Mix local intelligence with centralized data storage and analysis

- Reduce video storage
- Deduce usage patterns



Reducing

RESPONSE TIMES

at the University of Puerto Rico

The University of Puerto Rico at Humacao was experiencing a spike in crime on campus. To ensure student safety, Microsoft partner INVID developed an emergency response app that allows students to **report incidents, pinpoints their location, and dispatches the nearest security officer**, reducing response times significantly.

Learn more

@MSFTCityNext Microsoft.com/CityNext

Mitigating

SAFETY

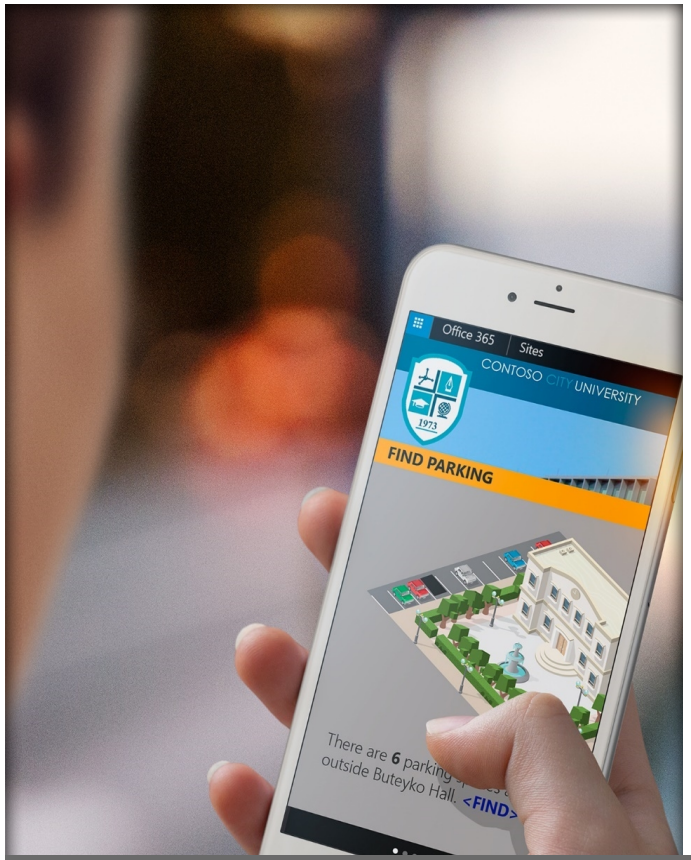
Threats in New York

The New York Police Department (NYPD) had to be up-to-date with the latest crime prevention and counterterrorism technology capabilities.

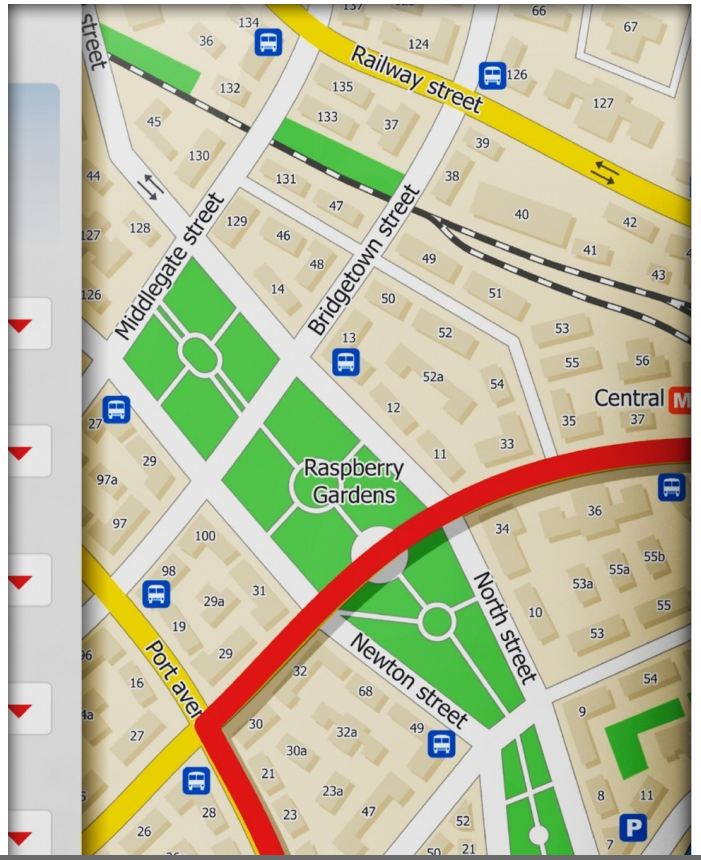
They worked with Microsoft to develop the Domain Awareness System. This system **aggregates and analyzes public safety data in real time**, providing investigators and analysts with a comprehensive view of potential threats and criminal activity.

The Domain Awareness System has helped the NYPD improve its response time and even prevent crimes.

Learn more



TICKET / PARKING



INTELLIGENT

WI-FI ENABLED

CONNECTED TRANSPORTATION

Smart Parking

- Find a space
- Automatic ticketing and collection
- Provide wi-fi on buses
- Plan your commute
- Analyze and optimize usage over time

Overcoming PARKING Challenges in Serbia

The public parking utility in Subotica, Serbia, often faced complications in organizing the parking of about 35,000 registered vehicles in the central municipal area.

To streamline the process, it implemented the SMS4 Parking System from Microsoft CityNext Partner PSC, based in Belgrade. Using Microsoft technology, the mobile solution uses **text messaging for charging and controlling parking services**.

Now, drivers are charged for the exact time they use their parking spaces, rather than by the hour. This increases efficiency and helps citizens find open parking spaces.

Learn more

PSC Pakom Solution Centar

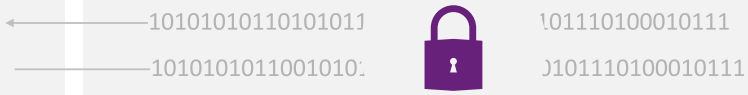
@MSFTCityNext Microsoft.com/CityNext

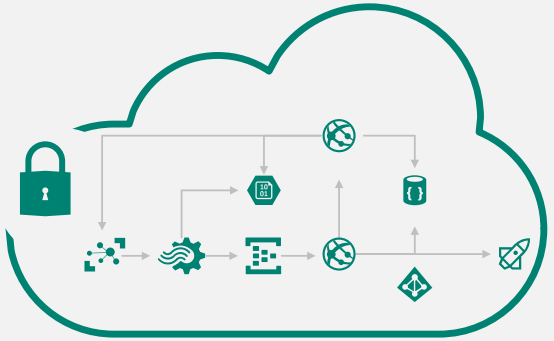
Gain defense in depth with Azure IoT Suite security

Securely connect millions of devices . . .

Over a secure internet connection . . .

To Microsoft Azure – built with security from the ground up





Device Security

Device Provisioning and Authorization

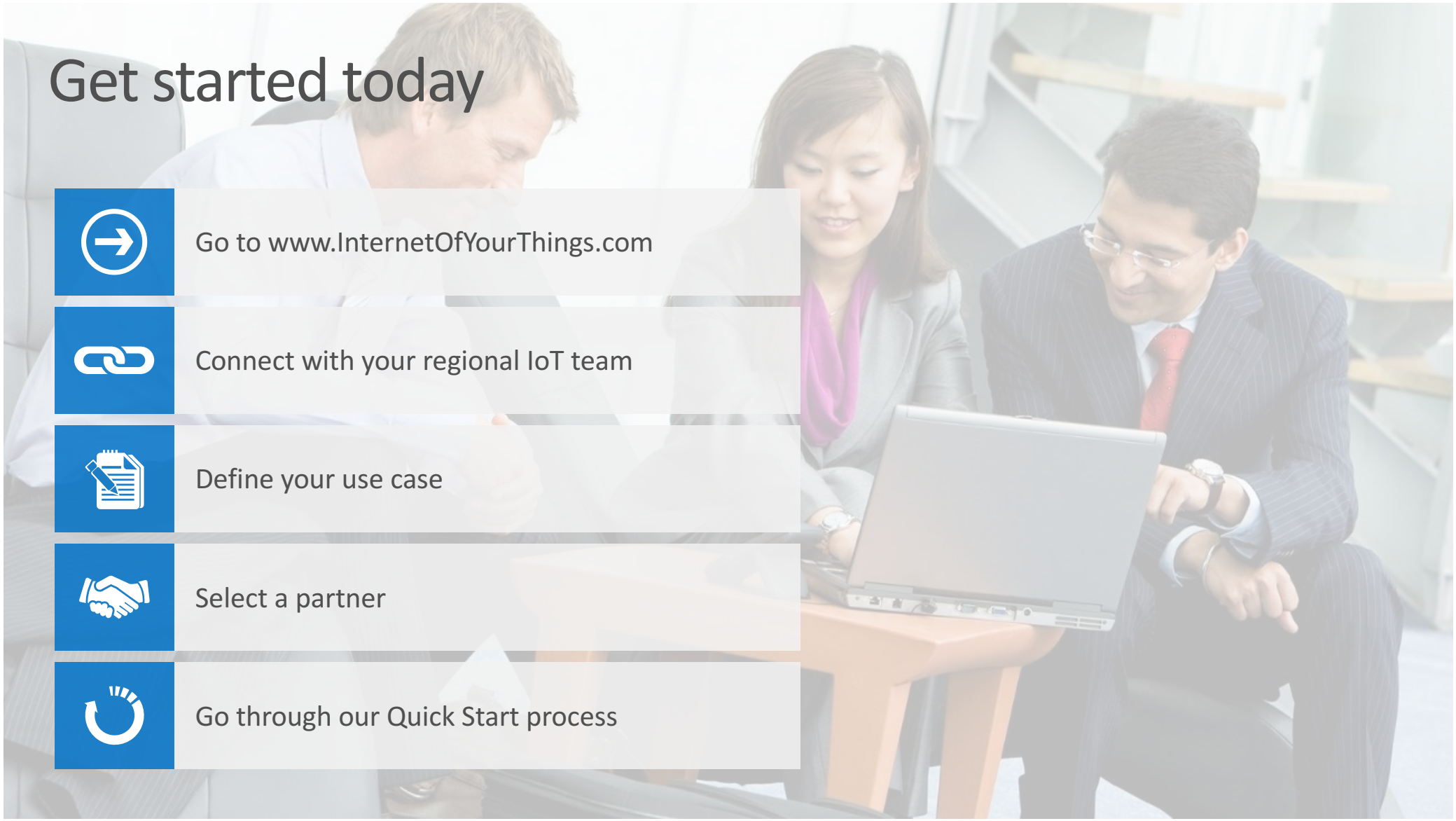
Connection Security

X.509/TLS-Based Handshake and Encryption

Cloud Security

Azure Security Center
Azure Active Directory
Key Vault
Policy-Based Access Control

Get started today



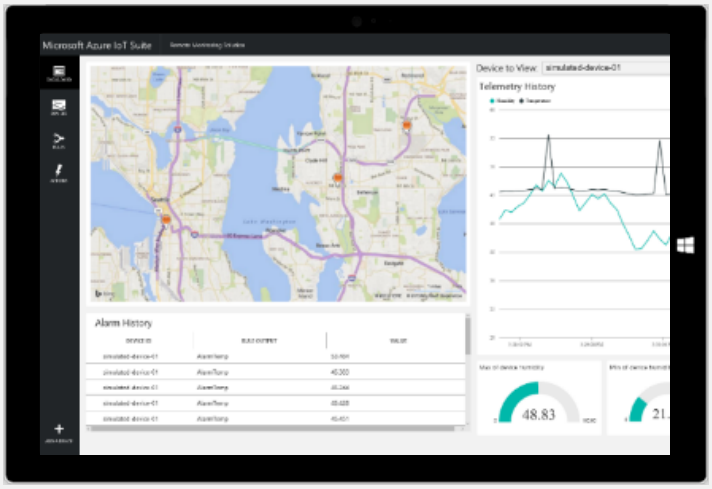
- Go to www.InternetOfYourThings.com
- Connect with your regional IoT team
- Define your use case
- Select a partner
- Go through our Quick Start process

Thank you

Appendix

Accelerate time to value

Start quickly for common IoT scenarios

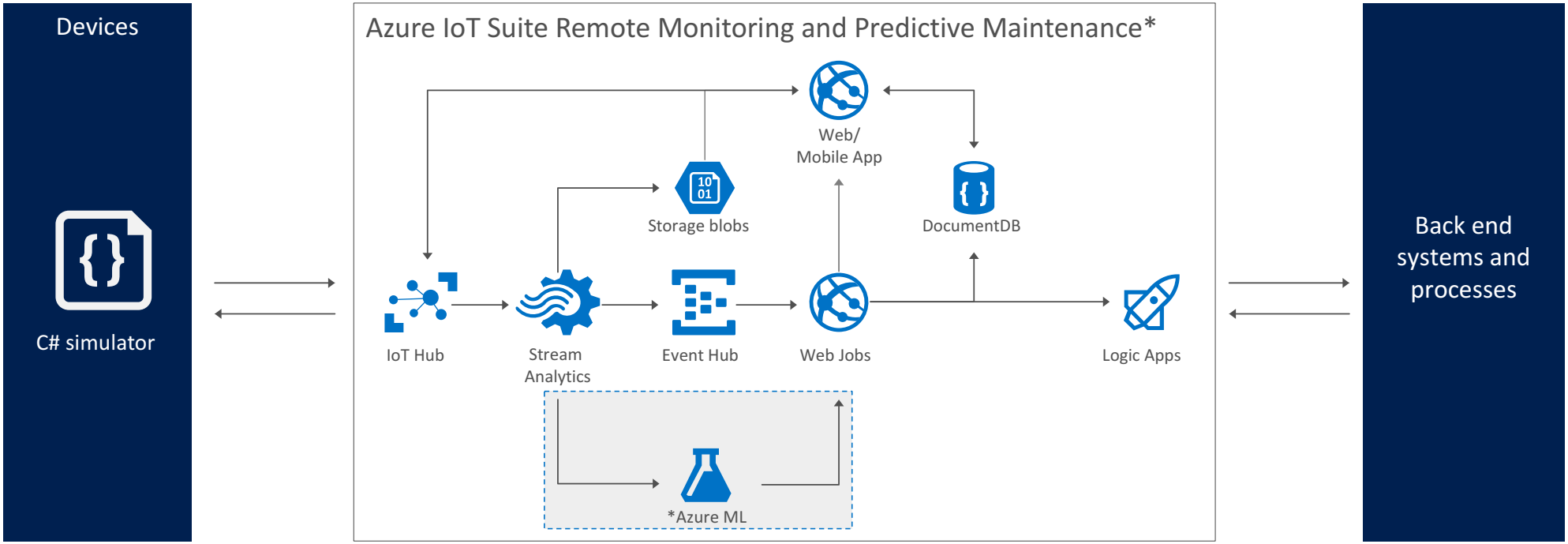


- Get started in minutes
- Modify existing rules and alerts
- Add your devices and begin tailor to your needs

Finish with your Internet of Things application

- Fine-tuned to specific assets and processes
- Highly visual for your real-time operational data
- Integrate with back-end systems

What you get with a preconfigured solution



*Machine Learning is available with Predictive Maintenance

Obtain flexibility with an open approach

Work with any device

Devices

Operating Systems

Languages

- C
- .NET
- Node.js
- Python
- Java

Protocols

- MQTT
- AMQP
- HTTP
- LwM2M

Work with business processes

Business solutions and processes

And other business systems

Using…

- Device SDK
- Gateway SDK
- Windows 10 IoT Core
- Azure IoT Hub
- Device Management
- OPC/UA

Using…

- Power BI
- Azure App Service
- Azure Mobile Apps
- Azure API Management
- Azure Logic Apps