UTA Conference

Utility Standards, Transformation, and the Microsoft Cloud

Wednesday, October 12, 2022

Agenda

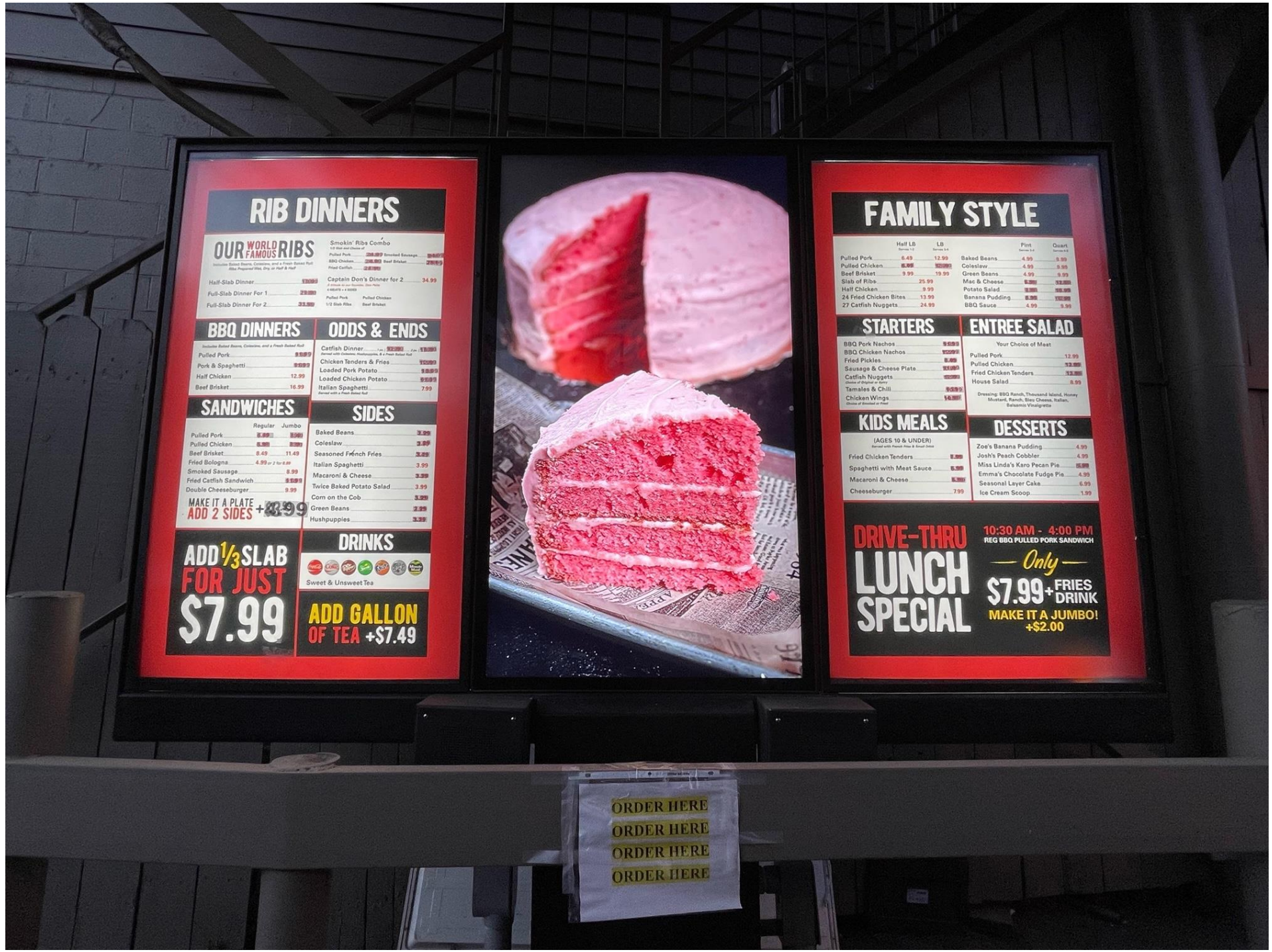
What are Cloud Capabilities / Options for utilities?

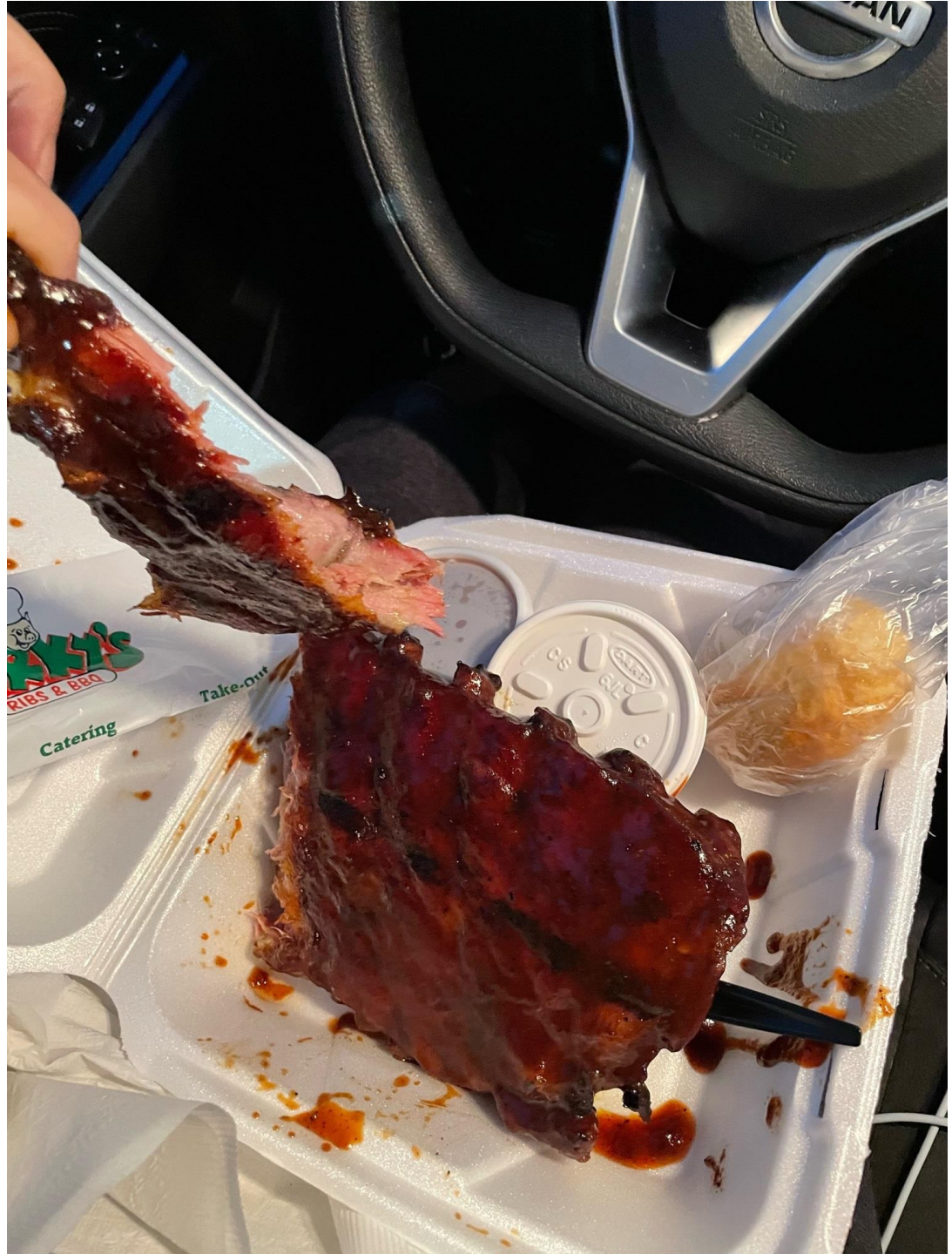
Use cases

But what about NERC CIP?

What can we do today to leverage the benefits?


CORKY'S
RIBS & BBQ
CORKY'S BAR-B-Q
LOWE'S
LOWE'S
LANDMARK
CONSTRUCTION
Spirit
Architecture
www.spiritarch.com
DRIVE-THRU IS OPEN
DINING ROOM IS CLOSED
PLEASE VISIT OUR OTHER LOCATIONS WHILE WE REMODEL


RIB DINNERS
OUR WORLD FAMOUS RIBS
Half-Slab Dinner
Full-Slab Dinner For 1
Full-Slab Dinner For 2 31.99
Smokin' Ribs Combo
Captain Don's Dinner for 2 34.99
BBQ DINNERS
Pulled Pork
Pork & Spaghetti
Half Chicken 12.99
Beef Brisket 16.99
ODDS & ENDS
Chicken Tenders & Fries
Loaded Pork Potato
Loaded Chicken Potato
Italian Spaghetti 7.99
SANDWICHES
Regular Jumbo
Pulled Pork
Pulled Chicken
Beef Brisket 8.49 11.49
Fried Bologna 4.99 or 2 for 8.99
Smoked Sausage 8.99
Fried Catfish Sandwich
Double Cheeseburger 9.99
MAKE IT A PLATE ADD 2 SIDES +4.99
SIDES
Baked Beans
Coleslaw
Seasoned French Fries
Italian Spaghetti 3.99
Macaroni & Cheese
Twice Baked Potato Salad 3.99
Corn on the Cob
Green Beans
Hushpuppies
ADD 1/3 SLAB FOR JUST $7.99
DRINKS
Sweet & Unsweet Tea
ADD GALLON OF TEA +$7.49
FAMILY STYLE
Half LB LB
Pulled Pork 6.49 12.99
Pulled Chicken
Beef Brisket 9.99 19.99
Slab of Ribs 25.99
Half Chicken 9.99
24 Fried Chicken Bites 13.99
27 Catfish Nuggets 24.99
Pint Quart
Baked Beans 4.99 9.99
Coleslaw 4.99 9.99
Green Beans 4.99 9.99
Mac & Cheese
Potato Salad
Banana Pudding
BBQ Sauce 4.99 9.99
STARTERS
BBQ Pork Nachos
BBQ Chicken Nachos
Fried Pickles
Sausage & Cheese Plate
Catfish Nuggets
Tamales & Chili
Chicken Wings
ENTREE SALAD
Your Choice of Meat
Pulled Pork 12.99
Pulled Chicken
Fried Chicken Tenders
House Salad 8.99
Dressing: BBQ Ranch, Thousand Island, Honey Mustard, Ranch, Bleu Cheese, Italian, Balsamic Vinaigrette
KIDS MEALS
(AGES 10 & UNDER)
Fried Chicken Tenders
Spaghetti with Meat Sauce
Macaroni & Cheese
Cheeseburger 7.99
DESSERTS
Zoe's Banana Pudding 4.99
Josh's Peach Cobbler 4.99
Miss Linda's Karo Pecan Pie
Emma's Chocolate Fudge Pie 4.99
Seasonal Layer Cake 6.99
Ice Cream Scoop 1.99
DRIVE-THRU LUNCH SPECIAL
10:30 AM - 4:00 PM
REG BBQ PULLED PORK SANDWICH
Only
$7.99 + FRIES DRINK
MAKE IT A JUMBO! +$2.00
ORDER HERE
ORDER HERE
ORDER HERE
ORDER HERE


RIBS & BBQ
Take-Out
Catering


Take-Out

NIST SP 800-145 definition of cloud computing

Service Models

- Infrastructure as a Service (IaaS)
- Platform as a Service (IaaS)
- Software as a Service (IaaS)

Deployment Models

- Private cloud
- Community cloud
- Public cloud
- Hybrid cloud

http://nvlpubs.nist.gov/nistpubs/Legacy/SP/nistspecialpublication800-145.pdf

Cloud services – shared responsibility

On-Premises	Infrastructure (as a Service)	Platform (as a Service)	Software (as a Service)
Applications	Applications	Applications	Applications
Data	Data	Data	Data
Runtime	Runtime	Runtime	Runtime
Middleware	Middleware	Middleware	Middleware
O/S	O/S	O/S	O/S
Virtualization	Virtualization	Virtualization	Virtualization
Servers	Servers	Servers	Servers
Storage	Storage	Storage	Storage
Networking	Networking	Networking	Networking

Microsoft Azure

Office 365

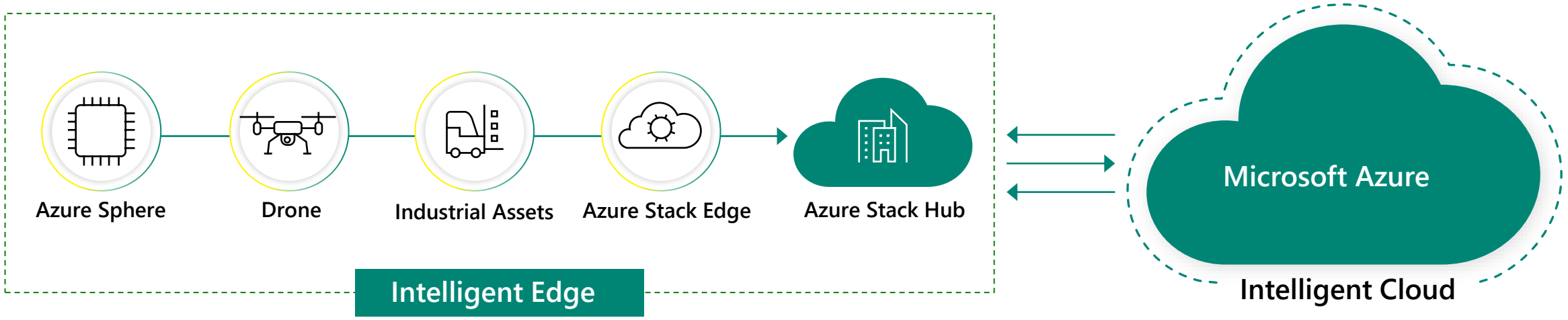
Each customer environment is isolated on top of Azure's Infrastructure

Shared Physical Environment

Managed by:
Customer
Vendor

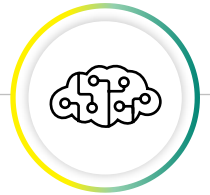
Certification dependencies

Microsoft Azure approach



Azure IoT Edge	Azure Services
	Azure Serverless
	Azure Security Center
	Azure Active Directory
	Azure Management
	Artificial Intelligence

Discover Azure AI



AI Apps & Agents

- Azure Bot Service
- Azure Cognitive Services

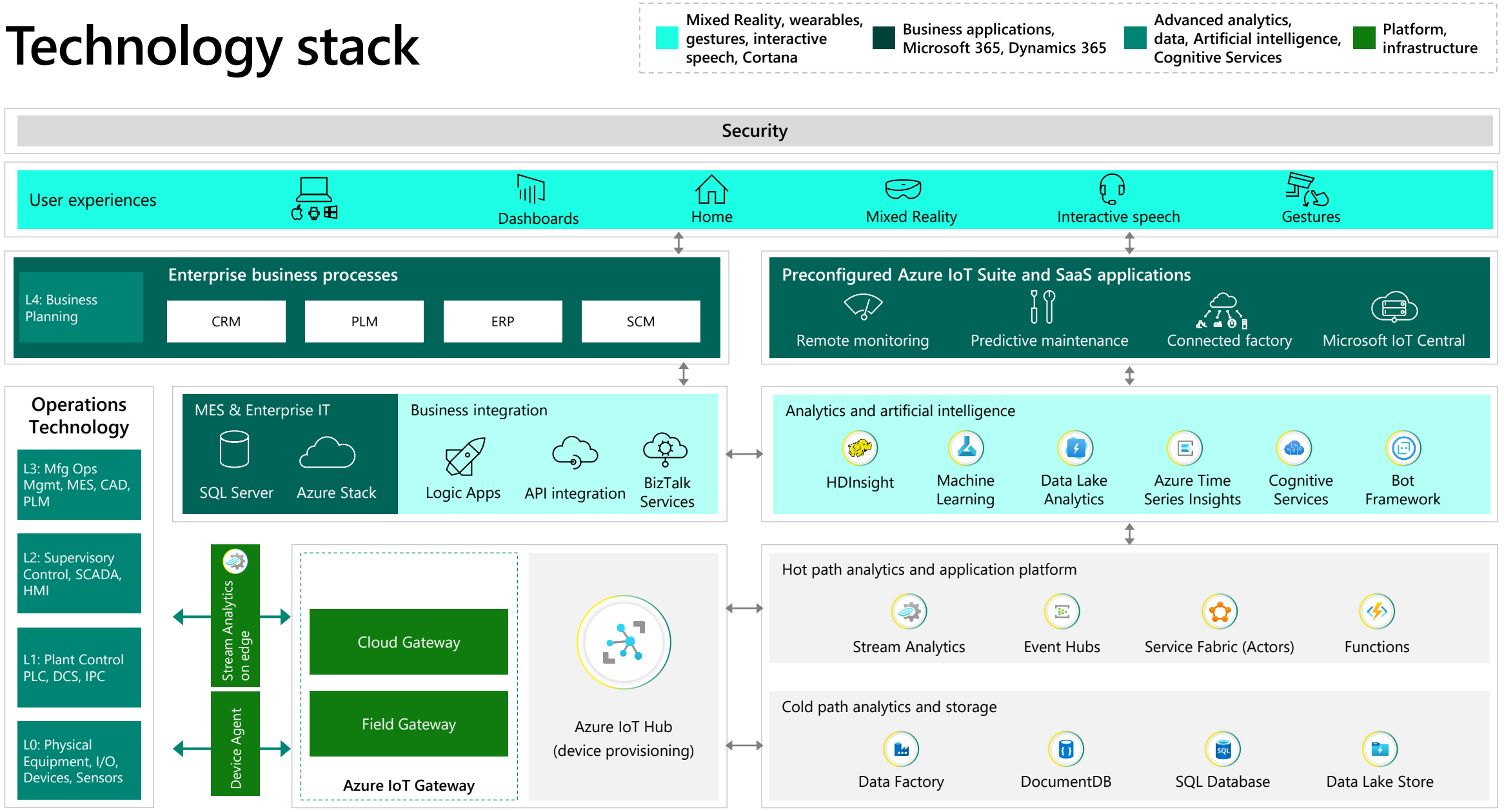
Machine Learning

- Azure Databricks
- Azure Machine Learning
- Azure AI infrastructure

Knowledge Mining

- Azure Cognitive Search

Technology stack



Why cloud for electric utility industry?

1. Compliance
2. Reliability
3. Cybersecurity
4. Innovation*

Utility Industry – Key IT Trends

The electric utilities industry has also been going through the implementation of business intelligence tools, Service oriented architecture solutions and environment friendly green technologies

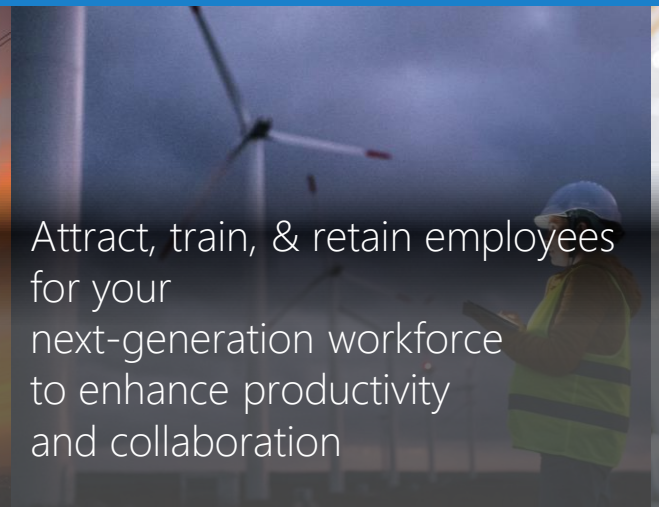
Trends	Description	Implications
Business Intelligence tools	• BI and analytics offer significant management advantages in the utilities industry (e.g., the ability to improve what can be measured) when strategic improvement programs are undertaken	• Integration of the BI tools with business applications, such as enterprise asset management, ERP, CRM, energy trading and risk management, and customer information systems
Service-oriented architectures and SaaS	• Technology advances in service-oriented architectures and SaaS, especially in the areas of meter-to-cash (on-demand presentment and payment) and niche solution areas (specifically, performance optimization and tracking for renewable energy assets)	• Significant business opportunities for IT to create additional value, which are already being explored by existing and new IT vendors • Renewed scope for Cloud computing and CRM solutions
Green technologies	• Rising management emphasis on investment in "green" technologies and strategies has increased as climate change initiatives have come to the forefront — given the utility industry's significant contribution to overall carbon dioxide emissions	• Inclusion of alternative energy sources promotes a wider use of communication and control technologies and supports evolution of an intelligent grid • Electronic bill presentment and payment • Mobile handheld devices for utilities

Power & Utilities Industry Priority Scenarios

Operate for the future

- Health & safety
- Intelligent supply chain
- Connected assets & operations
- Physics-based models

Transform your workforce



- Digital field worker
- Skills enhancement
- Knowledge management & collaboration
- Productivity & process improvement

Transition to clean

- Measure emissions & environmental performance
- Manage & reduce carbon
- Enhance renewables & decarbonize the grid
- Powering the intelligent grid

Reimagine energy

- Accelerate energy efficiency
- Scale electric vehicles
- Business innovation
- Enhance sustainable industries

Cloud Industry Trends for Utilities

- Demand Response
- EV Scheduling & Vehicle Information Services
- Crew Scheduling
- Street Light Outage Reporting
- Advanced Metering Infrastructure
- Renewables (Solar/Wind)

- Commercial & Industrial Metering
- Meter Data Management
- Geospatial Information System
- Enterprise Resource Planning
- Customer Information System
- Power Plant Monitoring/KPIs

Utility Cloud Applications

- Outage Management
- Meter Data Management
- Power Trading
- Shadow Settlement
- Forward Forecasting Price Curves
- Electricity Forecasting System

- Occupational Health & Safety
- Asset Management
- Network Planning
- Structured Gas Contracts
- Social Employee Volunteer Portal
- Customer/Stake Holder Web Sites

Smart Asset Management

Monitor assets, predict maintenance needs, digital twin

Asset health monitoring and predictive maintenance

IoT based asset monitoring

Digital Twin simulations

Predictive maintenance

Analyze sensor data for service issues, using predictive maintenance models

Asset lifecycle management

Top-line Impact

Reduced Costs, Improved Profits & Enhanced Efficiencies

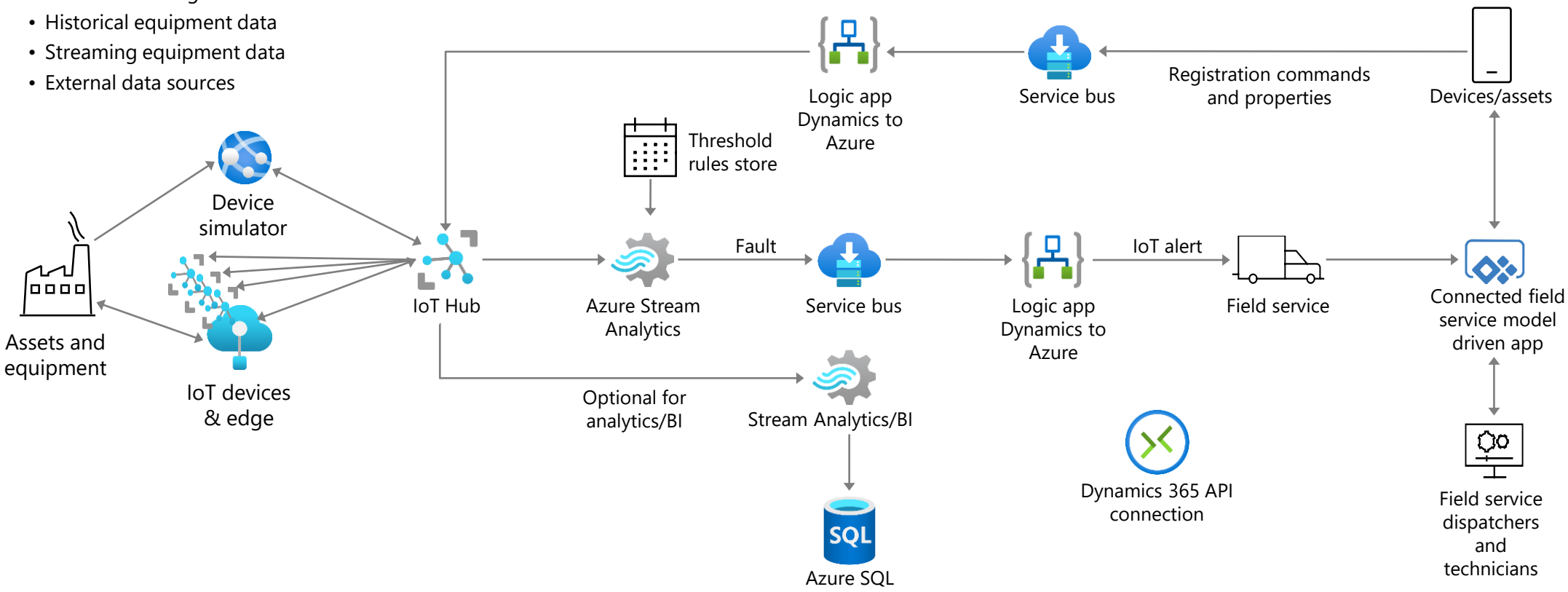
Benefits	Start	Stop	Continue
• Reduce asset downtime • Reduce maintenance costs • Improve productivity • Improve equipment longevity • Enable enterprise wide asset intelligence • Reduced risk of failure/accident	• Collect data & derive insights on a real time basis both from external & internal environment • Integrate models which support a broad range of decision making • Enable agile operations with Data & Insights • Predict maintenance needs and proactively fix it.	• Delay in decision making due to lack of data at the right time • Failures and unplanned maintenance and downtime • Taking reactive approach to the maintenance needs	• Focusing on operational efficiency • To take actions based on the insights from real time data

Transform the workforce technology

Example use case: Engaged and connected field service

Types of data sources

- Asset monitoring
- Historical equipment data
- Streaming equipment data
- External data sources



End user

Insights

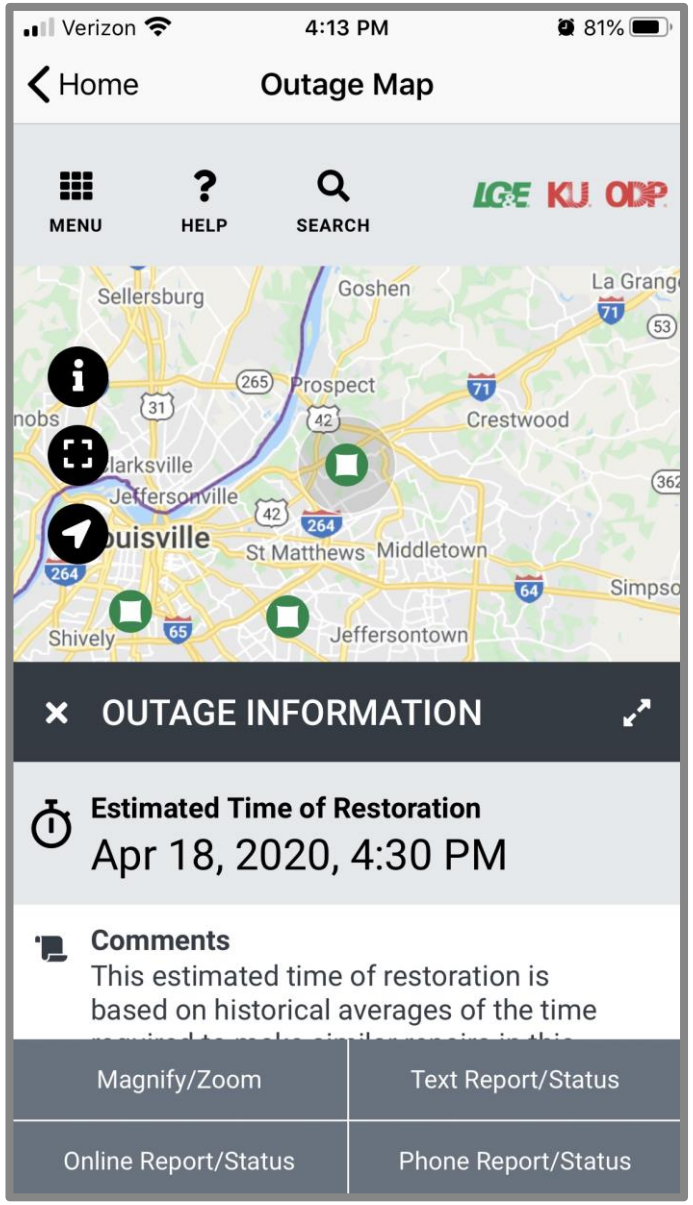
Global operations

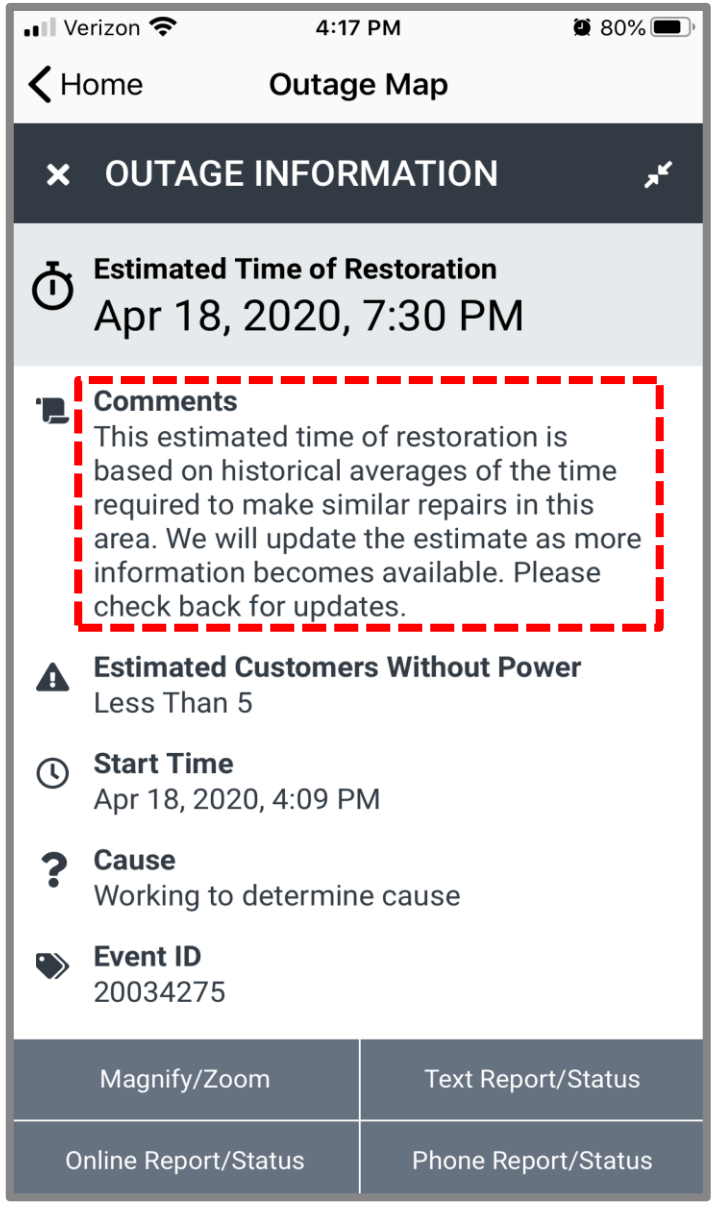
Real time alerts

Operations and maintenance

Use case and reference architecture are provided as an example. Real-world conditions will vary. Additional architectures to be provided separately at a later date.

Keeping customers informed





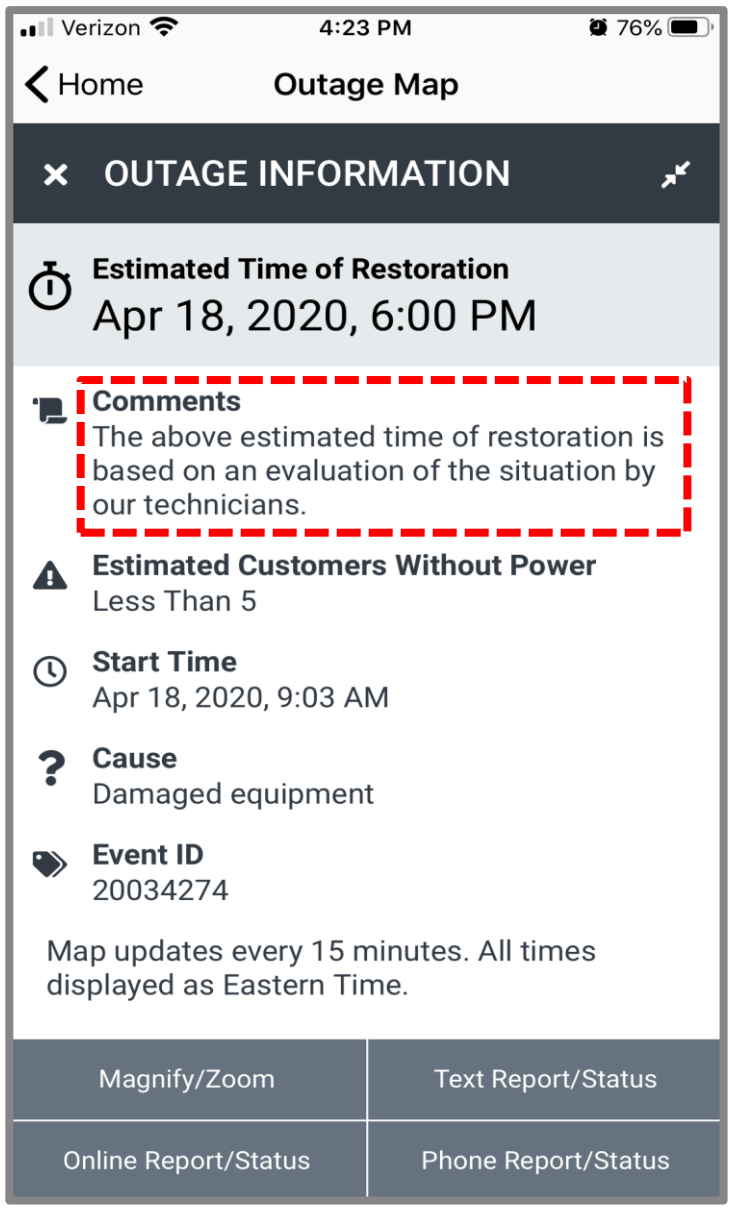
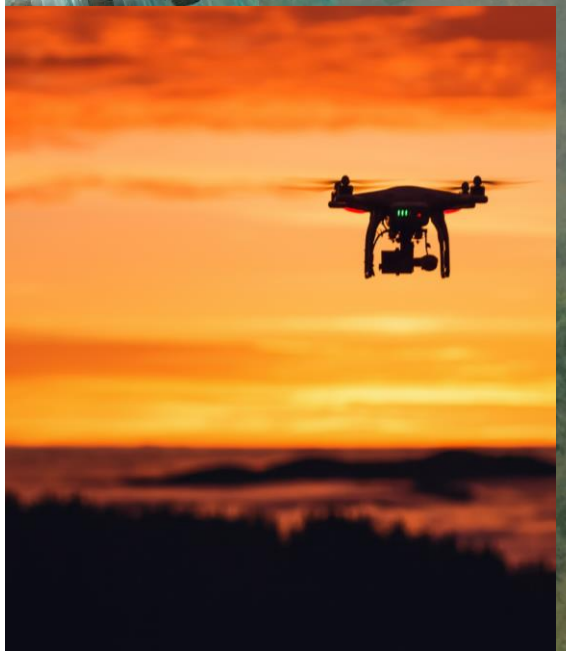


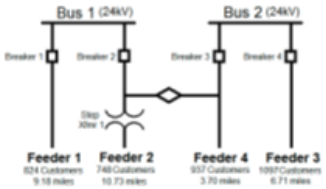
Image Recognition



Machine Learning to Uniquely Identify Various Power System Faults to Predict and Prevent Failure

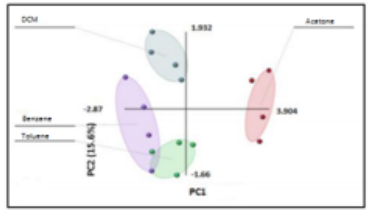
Collect data from line sensors

Sensor Data Processing



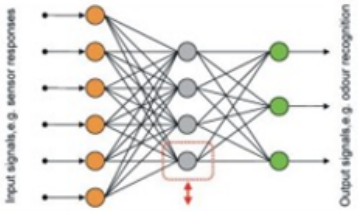
- Compensates for sensor drift
- Compress the transient response of the sensor reading
- Reduce sample to sample variation

Data Curation and Integration



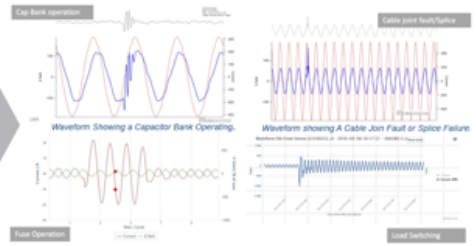
- Reduce the dimensionality of the measurement space
- Extract information relevant for pattern recognition
- Perform with linear or nonlinear transformation

Fault Pattern Recognition



- Classification algorithms are used
- Trained to identify the patterns representative of each fault type
- Identify the fault type by comparing to the trained models and calculation its concentration

Unique digital signature for various line faults



Customer:
Axpo

Industry:
Energy

Size:
Large (1,000 – 9,999 employees)

Country:
Switzerland

Products and services:
Azure
Azure Cognitive Search
Azure IoT Edge
Azure IoT Hub
Azure Maps
Power BI

[Read full story here]

Microsoft

"We can speed up processes tremendously with Cognitive Search, Azure Maps, and Power BI embedded in Insights. That means better quality power at lower costs because we don't have to spend half of our time trying to locate the asset information."

—Johannes Manser: Head of BI and Analytics, Axpo Grid

Situation:

Axpo, the largest renewable energy producer in Switzerland, needed to provide grid managers with quick access to all condition information regarding the assets in its 2,400-kilometer, high-voltage power grid.

Solution:

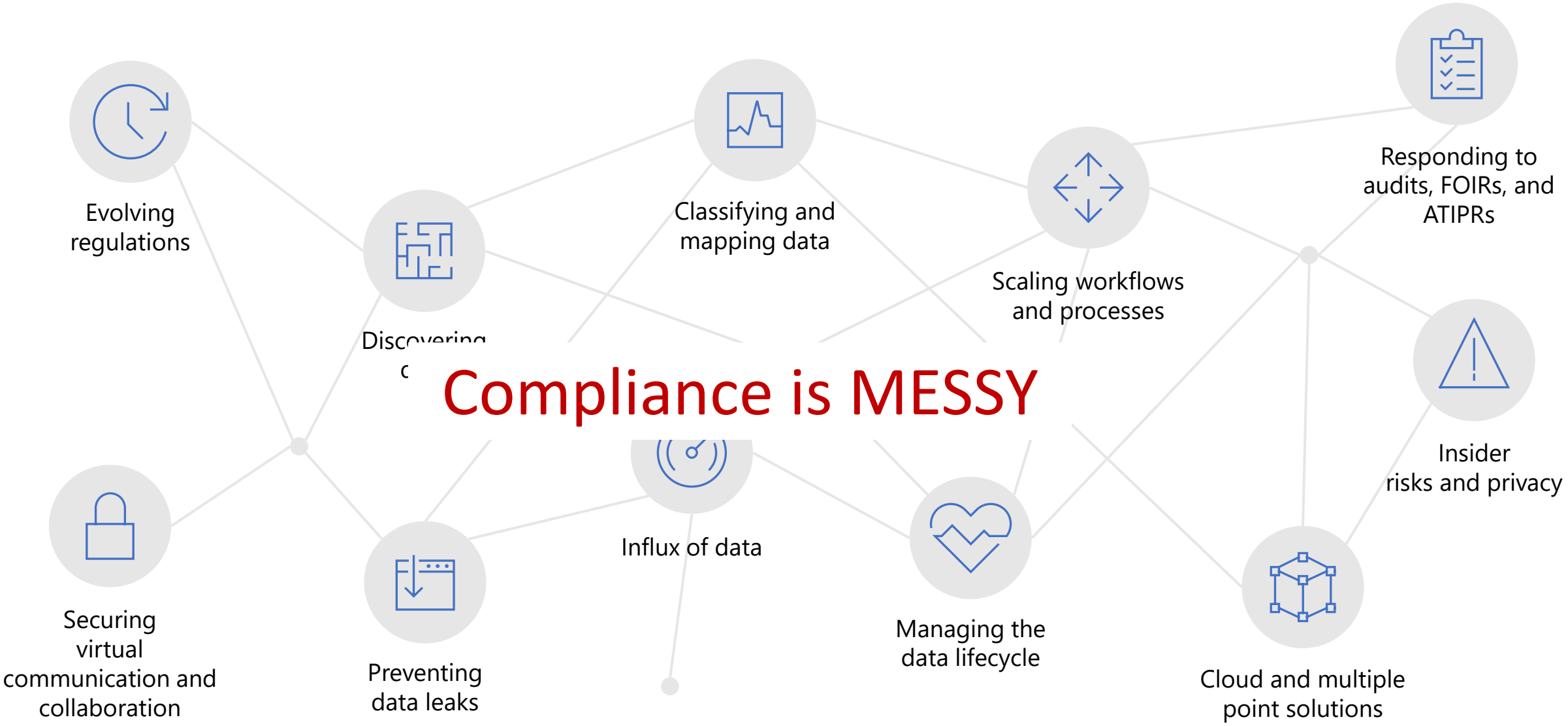
Axpo built a web-based interface that uses Microsoft Azure Cognitive Search, Azure Maps, and Power BI to provide grid engineers and maintenance teams a single point of access to comprehensive, up-to-date grid data within a geographical view.

Impact:

This solution cuts search time up to 99 percent, makes it easier to identify problem areas in near real time, and paves the way to automate several grid-asset management tasks, thus significantly reducing time for many operational activities.

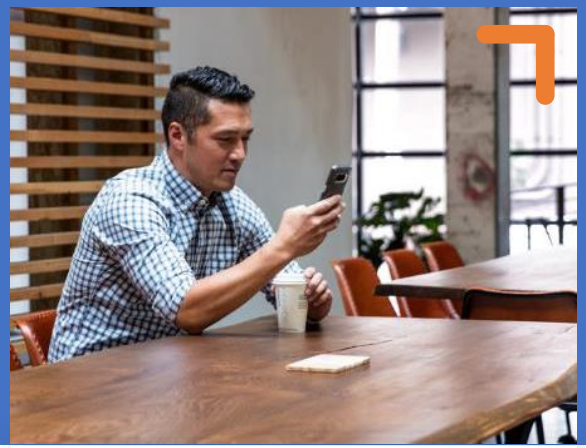

https://videos.microsoft.com/customer-stories/watch/HtUTCiZAb8CZ2ef7bWY56m
CC
HD

Critical Infrastructure trends and concerns:



Microsoft Privacy and Compliance

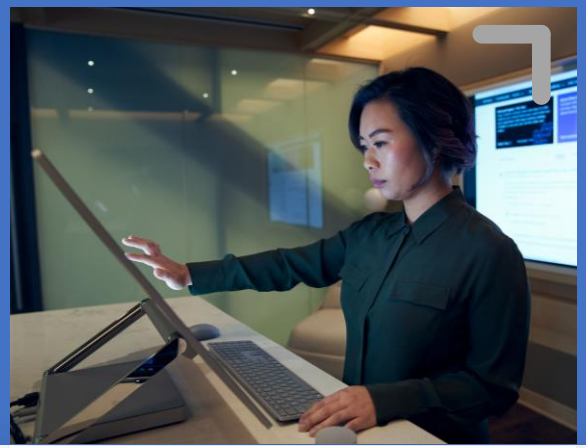
Intelligent risk, compliance, and privacy solutions



Information protection & governance

Safeguard sensitive data across clouds, apps, and endpoints

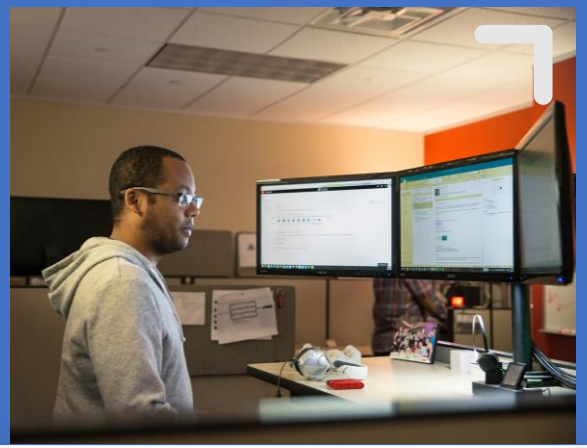
Data Loss Prevention
Information Protection and Encryption
Information Governance
Records Management
Azure Purview
App Governance



Risk management

Identify and remediate critical risks within your organization

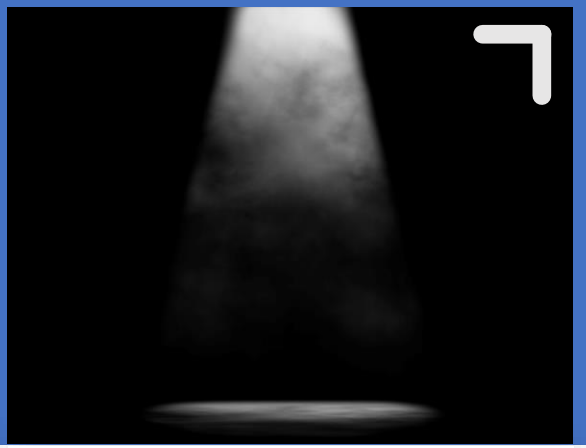
Insider Risk Management
Communication Compliance
Advanced Audit
Advanced eDiscovery
Information Barriers
Privileged Access Management
Customer Lockbox



Compliance management

Assess compliance and respond to regulatory audit and requirements

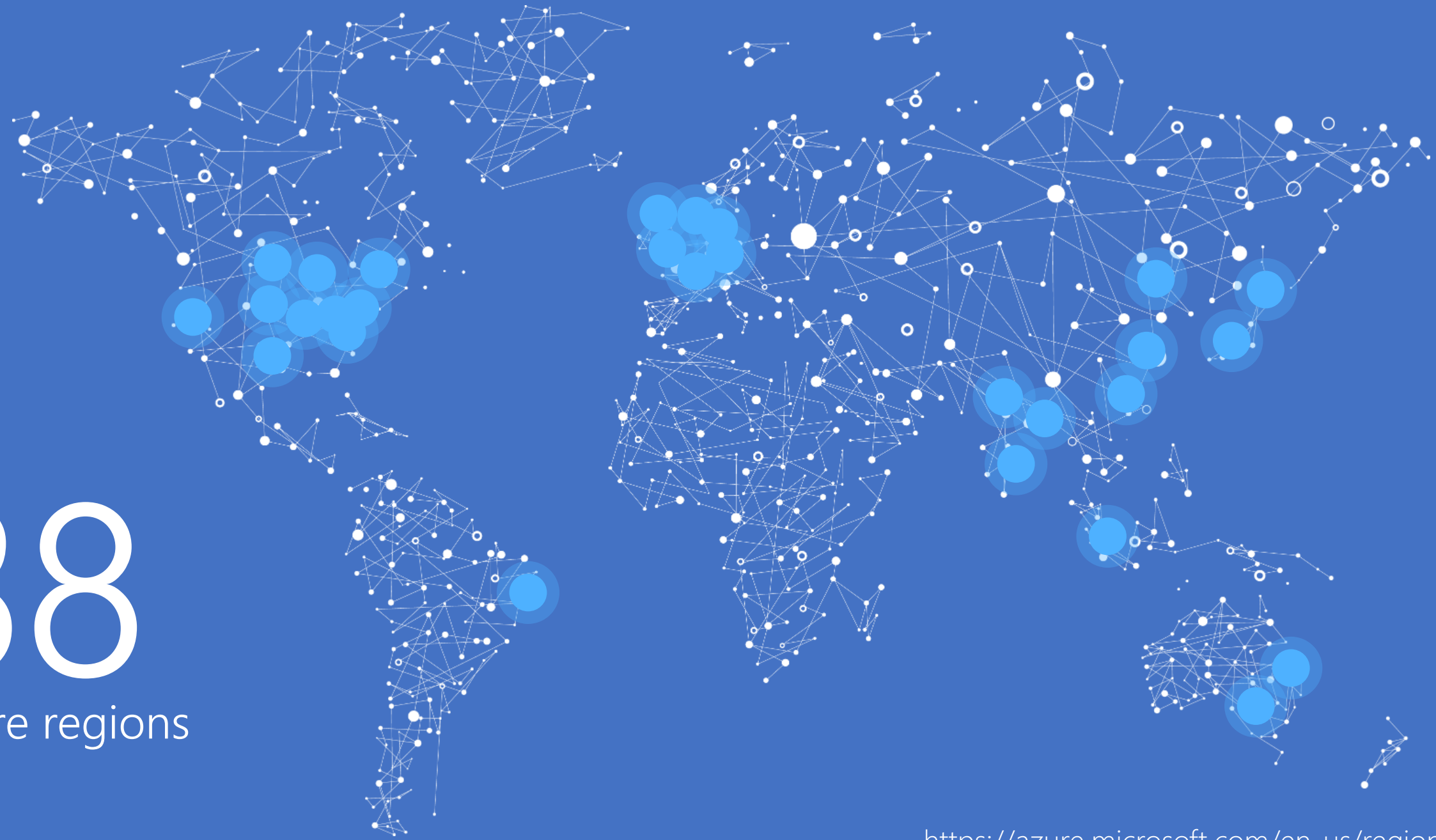
Compliance Manager
Service Trust Portal



Privacy management

Safeguard personal data and build a privacy resilient workplace

Data Minimization
Data Overexposure
Data Transfers
Subject rights requests



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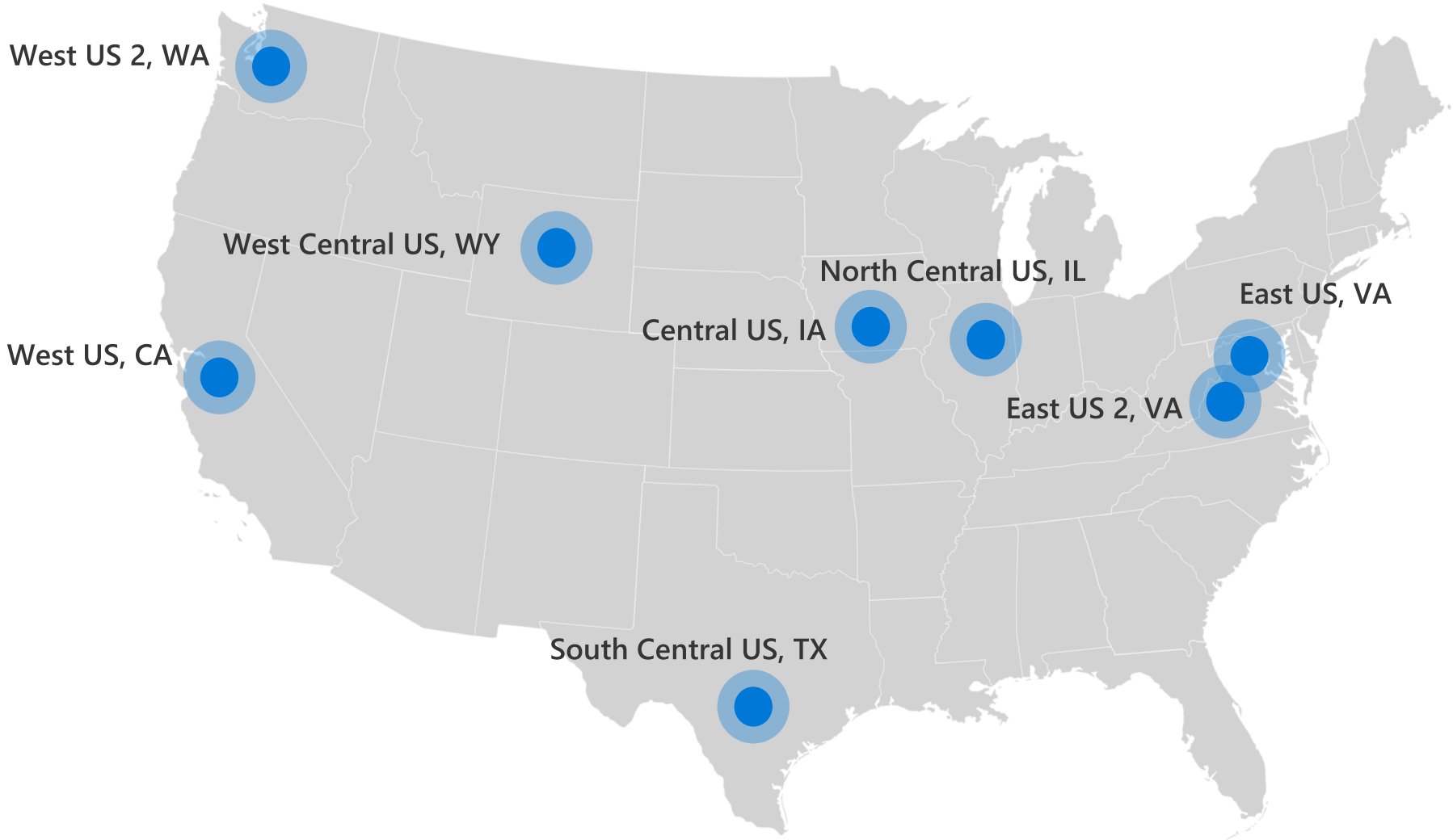
Azure regions

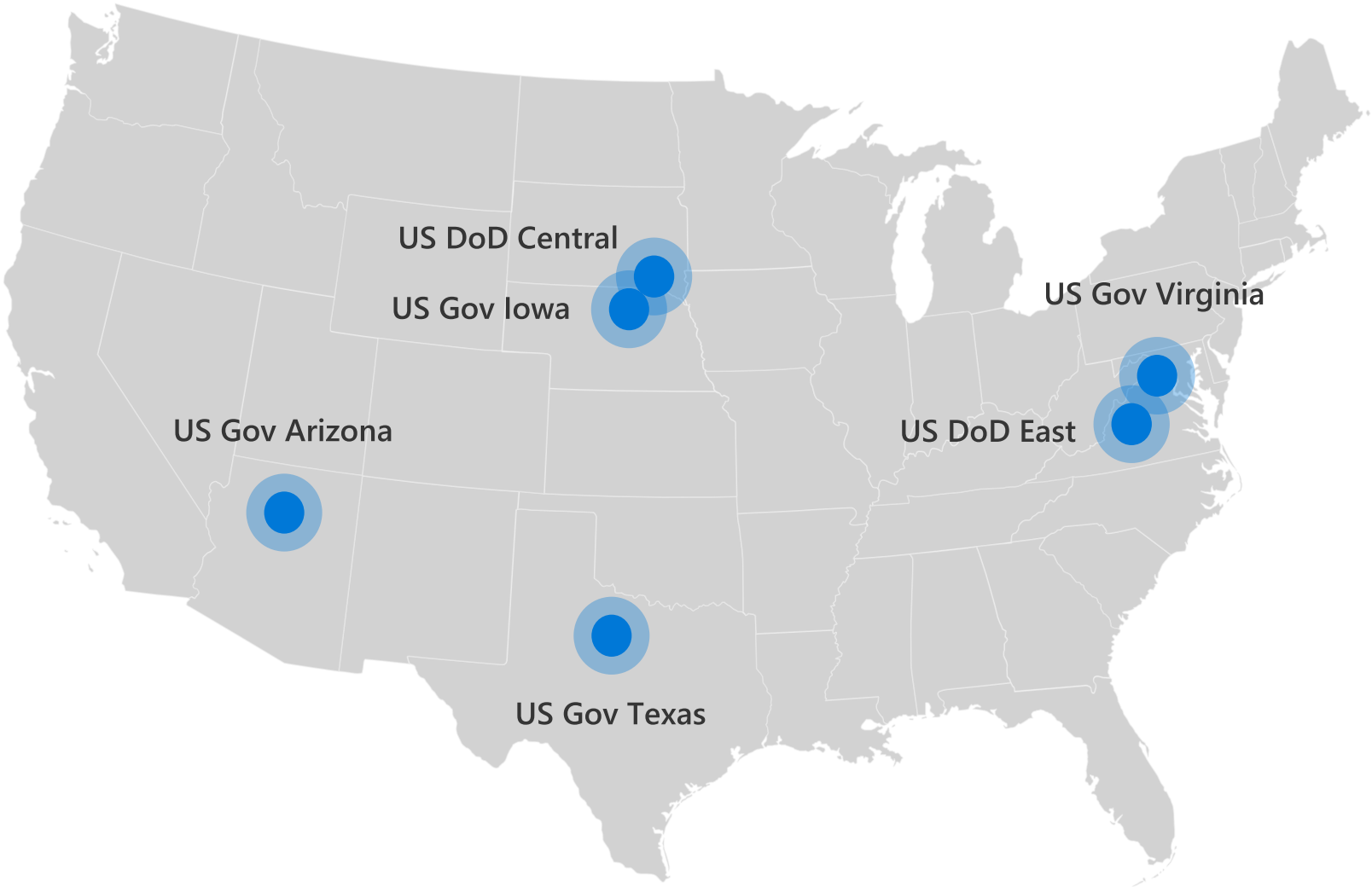
https://azure.microsoft.com/en-us/regions/

Azure Public cloud US locations



https://azure.microsoft.com/en-us/regions/

Azure Government locations



https://azure.microsoft.com/en-us/regions/

Azure is a market leader in compliance coverage

Global

ISO 27001

ISO 27018

ISO 27017

ISO 22301

SOC 1
Type 2

SOC 2
Type 2

SOC 3

CSA STAR
Self-Assessment

CSA STAR
Certification

CSA STAR
Attestation

US Gov

Moderate
JAB P-ATO

High
JAB P-ATO

DoD DISA
SRG Level 2

DoD DISA
SRG Level 4

DoD DISA
SRG Level 5

SP 800-171

FIPS 140-2

Section
508 VPAT

ITAR

CJIS

IRS 1075

Industry

PCI DSS
Level 1

CDSA

MPAA

FACT
UK

Shared
Assessments

FISC
Japan

HIPAA /
HITECH Act

HITRUST

GxP
21 CFR Part 11

MARS-E

IG Toolkit
UK

FERPA

GLBA

FFIEC

Regional

Argentina
PDPA

EU
Model Clauses

UK
G-Cloud

China
DJCP

China
GB 18030

China
TRUCS

Singapore
MTCS

Australia
IRAP/CCSL

New
Zealand
GCIO

Japan My
Number Act

ENISA
IAF

Japan CS
Mark Gold

Spain
ENS

Spain
DPA

India
MeitY

Canada
Privacy
Laws

Privacy
Shield

Germany IT
Grundschutz
workbook

NERC CIPs and FedRAMP control set

FedRAMP
Federal Risk Authorization Management Program

NERC CIPs

Reliability Standards

Standard Number	Title
(CIP) Critical Infrastructure Protection (82)	
Subject to Enforcement (11)	
CIP-002-5.1	Cyber Security — BES Cyber System Categorization
CIP-003-6	Cyber Security - Security Management Controls
CIP-004-6	Cyber Security - Personnel & Training
CIP-005-5	Cyber Security - Electronic Security Perimeter(s)
CIP-006-6	Cyber Security - Physical Security of BES Cyber Systems
CIP-007-6	Cyber Security - System Security Management
CIP-008-5	Cyber Security - Incident Reporting and Response Planning
CIP-009-6	Cyber Security - Recovery Plans for BES Cyber Systems
CIP-010-2	Cyber Security - Configuration Change Management and Vulnerability Assessments
CIP-011-2	Cyber Security - Information Protection
CIP-014-2	Physical Security

FedRAMP control set

ID	Family	Low	Moderate
AC	Access Control	11	18 (25)
AT	Awareness and Training	4	4 (1)
AU	Audit and Accountability	10	11 (8)
CA	Certification, Accreditation, and Security Assessment	7 (1)	8 (7)
CM	Configuration Management	8	11 (15)
CP	Contingency Planning	6	9 (15)
IA	Identification and Authentication	7 (8)	8 (19)
IR	Incident Response	7	9 (9)
MA	Maintenance	4	6 (5)
MP	Media Protection	4	7 (3)
PE	Physical and Environmental Protection	10	16 (4)
PL	Planning	3	4 (2)
PS	Personnel Security	8	8 (1)
RA	Risk Assessment	4	4 (6)
SA	System and Services Acquisition	6 (1)	9 (13)
SC	System and Communications Protection	10	20 (12)
SI	System and Information Integrity	6	12 (16)
	Totals (Controls and Enhancements):	125	325

Compliance considerations for NERC CIPs

Microsoft Azure

- Independent compliance certifications
- Guidance documentation
- Audit support

+

NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

- Data and workload classification
- Security and CIPs compliance guidance

→

Customer

- Risk assessment
- Cloud deployment
- NERC audit

Workloads that may not be subject to 15-minute rule

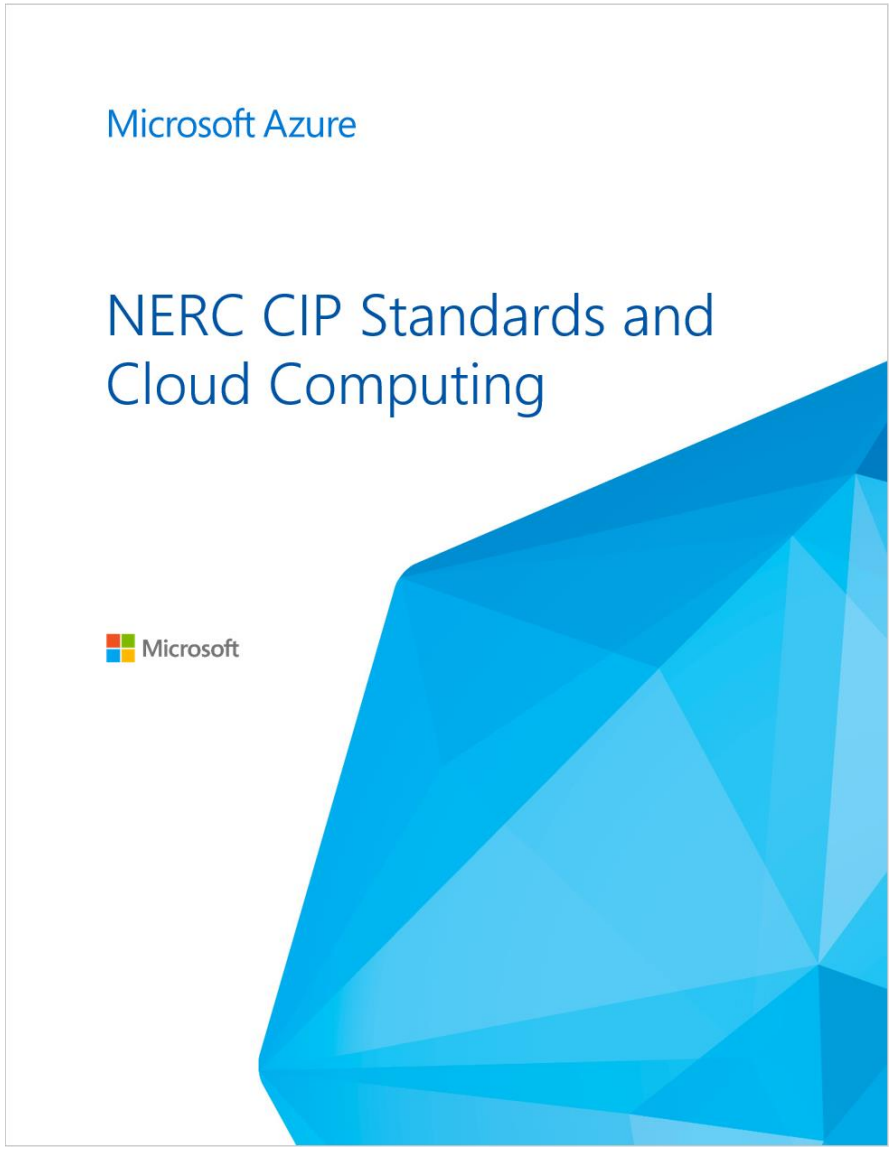
- Transmission substation equipment status
- Transmission network planning
- Transmission demand forecasting
- Contingency analysis
- Utility asset management and predictive maintenance
- Geospatial asset location information
- Common Information Model (CIM) modeling and existing CIM network model
- Streaming of operational phasor data to the cloud for storage and analytics
- Many more

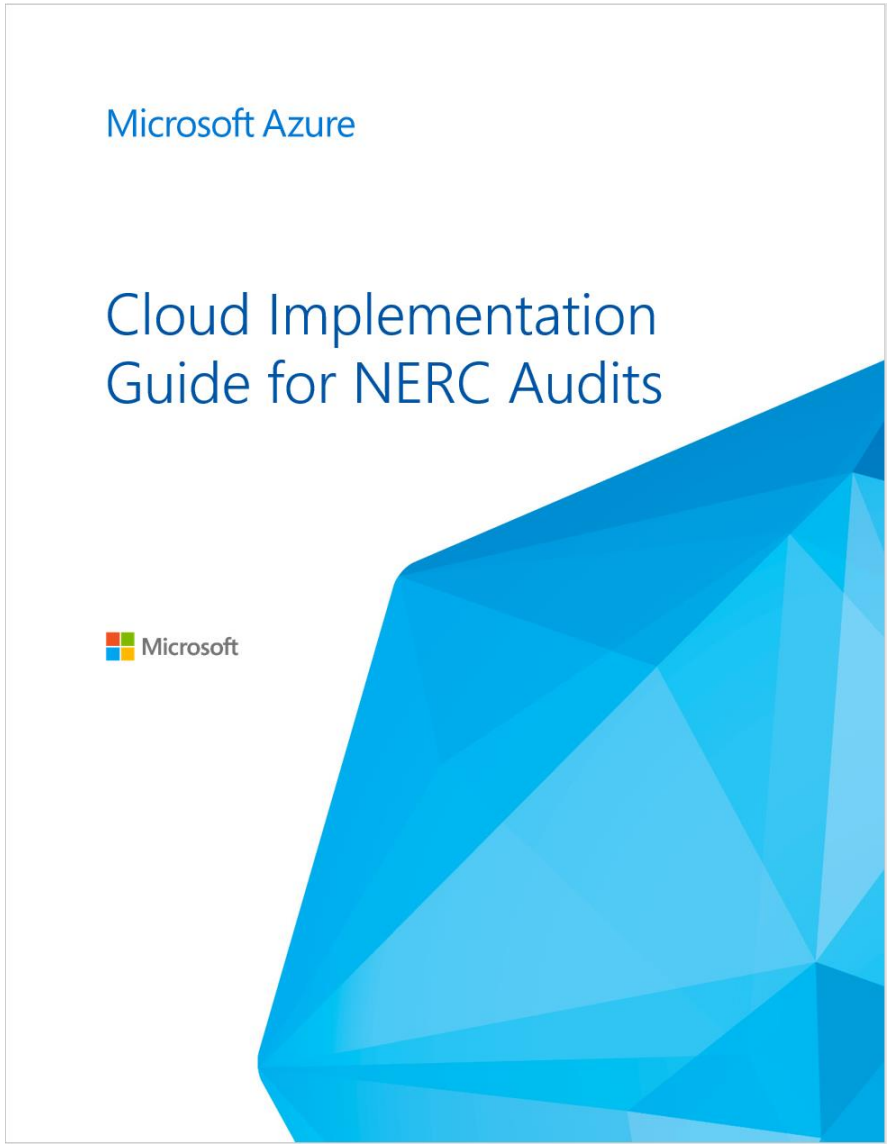
- However, depending on particular utility implementation, some of these workloads may be part of the BES Cyber Assets
- Requires careful assessment that takes into consideration individual utility needs

Additional Resources

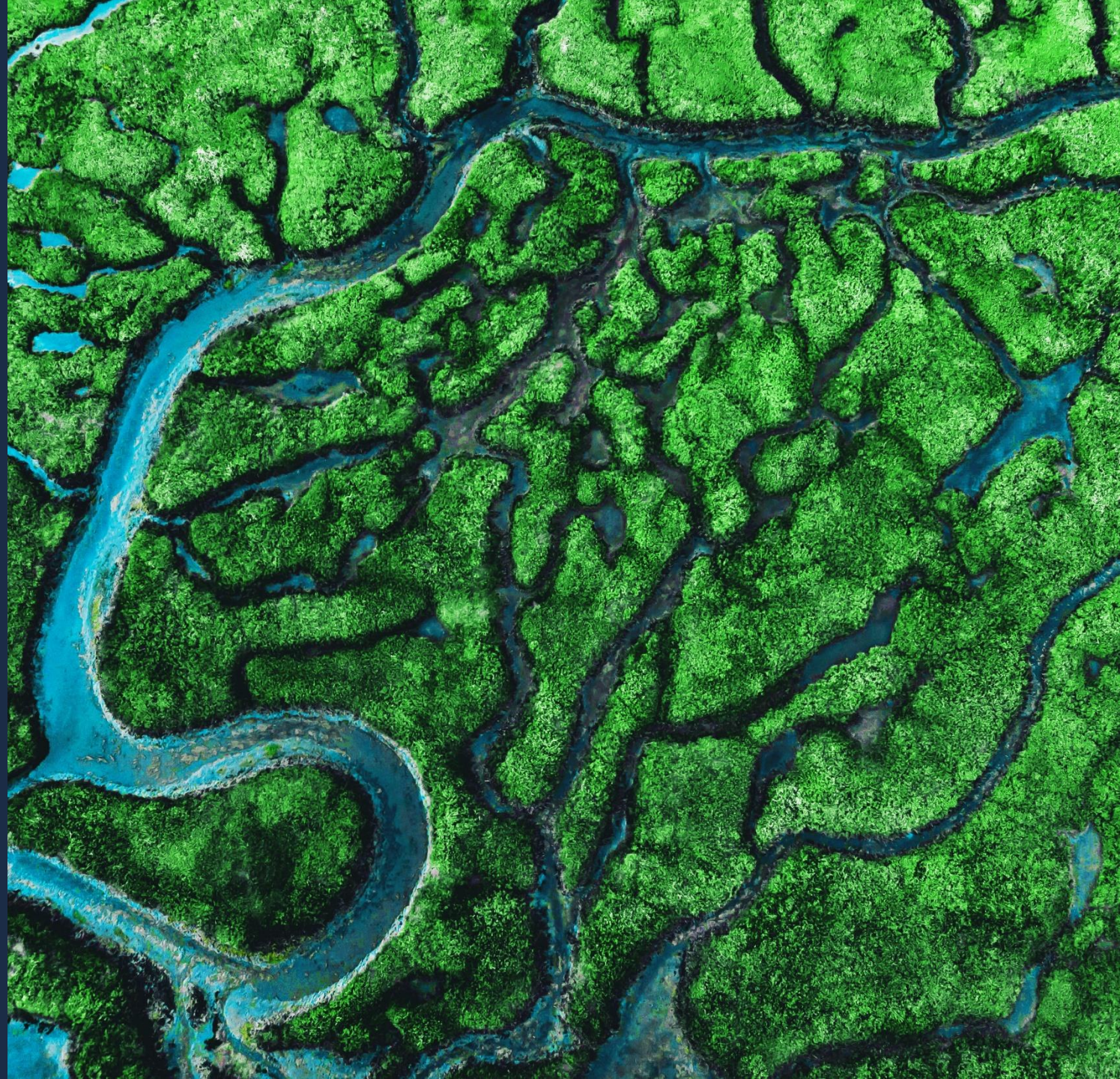
- Compliance offerings for Microsoft 365, Azure, and other Microsoft services. | Microsoft Docs
- Get started with Microsoft Compliance Manager - Microsoft 365 Compliance | Microsoft Docs
- Governance, risk, and compliance - Azure Architecture Center | Microsoft Docs
- Microsoft Information Protection in Microsoft 365 - Microsoft 365 Compliance | Microsoft Docs
- Introduction to Azure Purview - Azure Purview | Microsoft Docs
- Microsoft Information Governance in Microsoft 365 - Microsoft 365 Compliance | Microsoft Docs
- Service Trust Portal (microsoft.com)
- Compliance in the trusted cloud | Microsoft Azure
- Privacy – Microsoft privacy
- Law Enforcement Request Report | Microsoft CSR
- Corporate Social Responsibility Report | Microsoft CSR
- Regulatory Compliance in initiative definitions - Azure Policy | Microsoft Docs
- Data retention and storage in Azure Application Insights - Azure Monitor | Microsoft Docs
- Learn about privacy management - Microsoft Privacy | Microsoft Docs

Microsoft White Papers for NERC CIP Compliance





Microsoft's Sustainability Story



Decades of action

Our history 2009-2019

2009
First carbon emission reduction goal

2012
100% carbon neutral
Internal carbon fee instituted

2016
Zero-waste campus certification

2017
AI for Earth launch
LEED Gold certification for new datacenters

2018
Supplier carbon engagement in China launched
Net zero potable water
Silicon Valley campus groundbreaking

2019
Carbon fee raised to $15
Water replenishment goal set

Our commitments 2020-2050

2025
Operate with 100% renewable energy

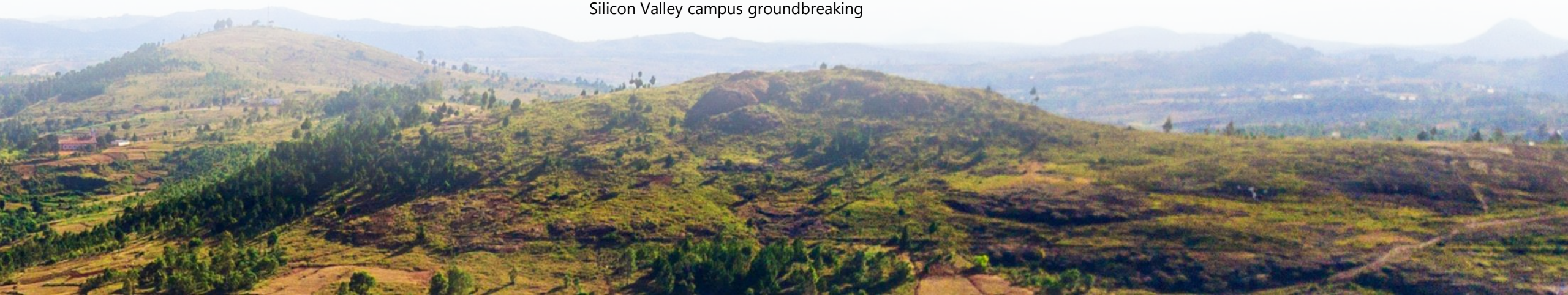
2025
Protect more land than Microsoft uses

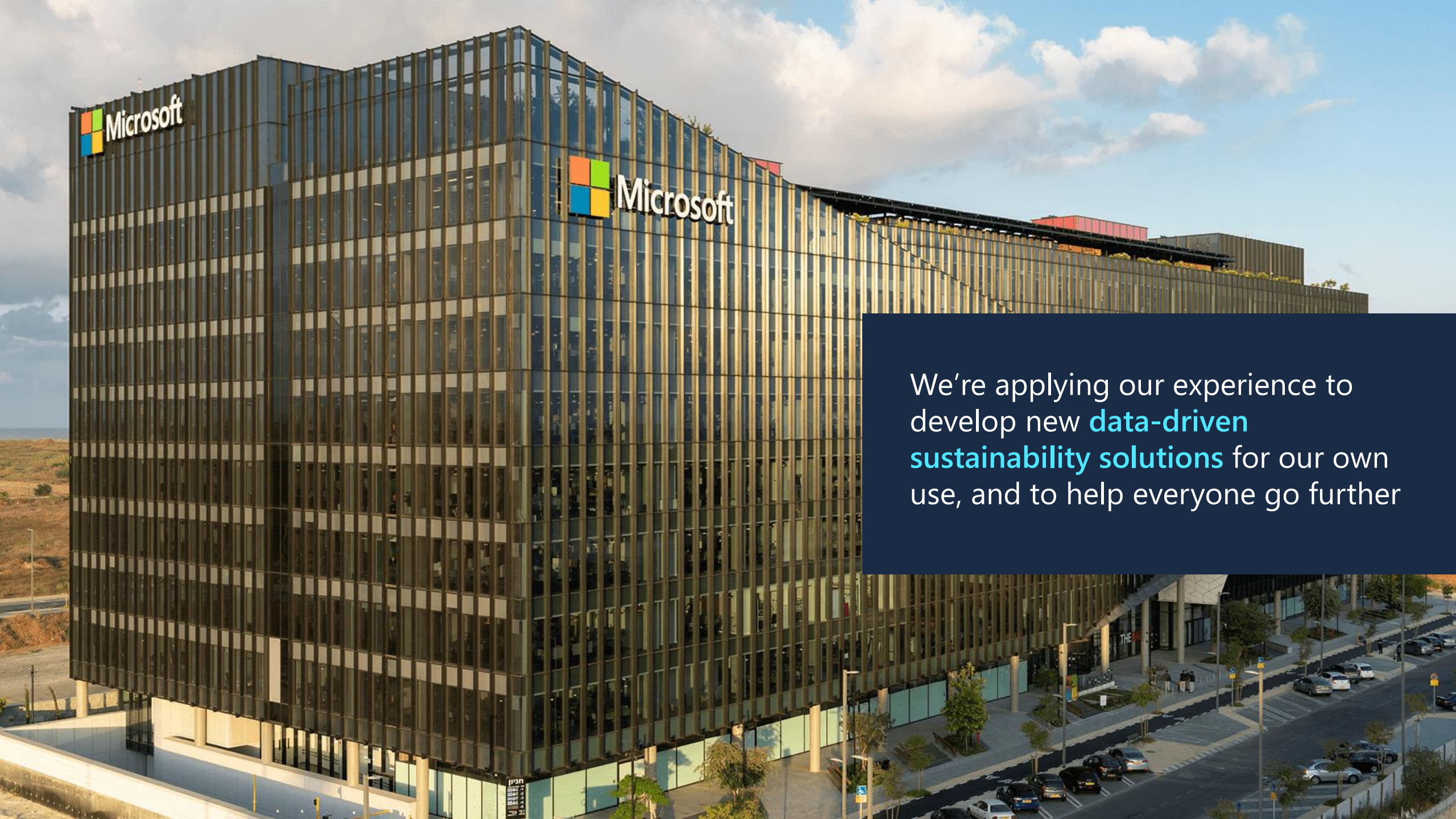
2030
Become carbon negative

2030
Become zero waste

2030
Become water positive

2050
Remove all historic emissions

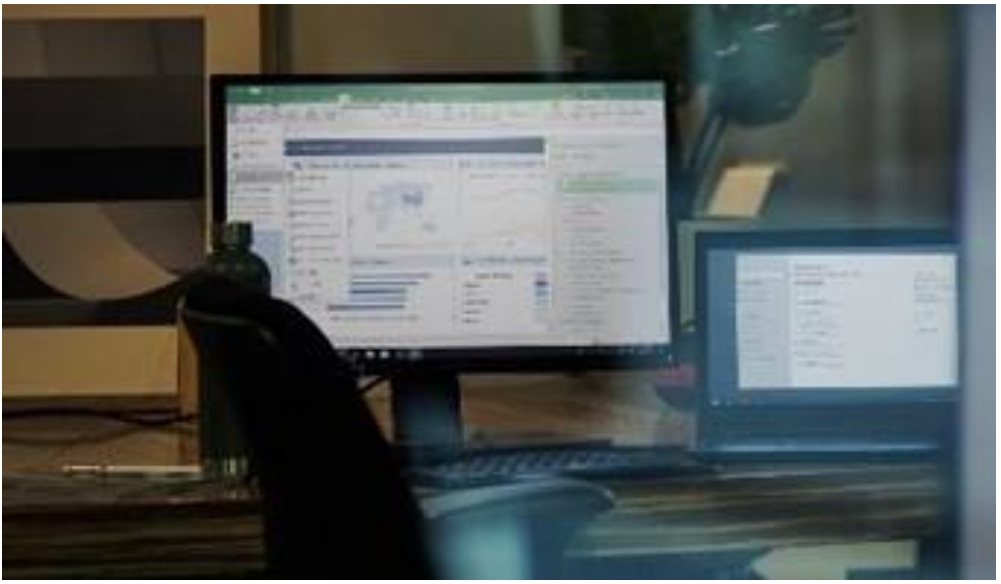




We’re applying our experience to develop new **data-driven sustainability solutions** for our own use, and to help everyone go further

Customer One: Microsoft

Operationalizing our sustainability reporting on Microsoft Cloud for Sustainability



One of the first lessons we learned more than a decade ago was that driving effective strategies to achieve sustainability targets would demand better data management. We implemented a data system to track carbon across our business, and we have made consistent improvements. Now, our goal is to have Microsoft fiscal year 2022 sustainability reporting fully operational on Microsoft Cloud for Sustainability. We're taking a modular approach to migrating reports—developing methodology that customers will be able to replicate.

Microsoft

Incremental reporting migration
Incremental migration of reporting scopes allows for validation against previous reporting cycles—and delivers an increasingly consolidated view of our footprint

Modular Common Data Models
Modular CDMs enable organizations to incrementally mature their sustainability reporting on Microsoft Cloud for Sustainability

Reliable data foundation
We use Enterprise Data Lake to collect, cleanse, and connect spend and activity data across scopes; customers can also BYOL (bring your own data lake)

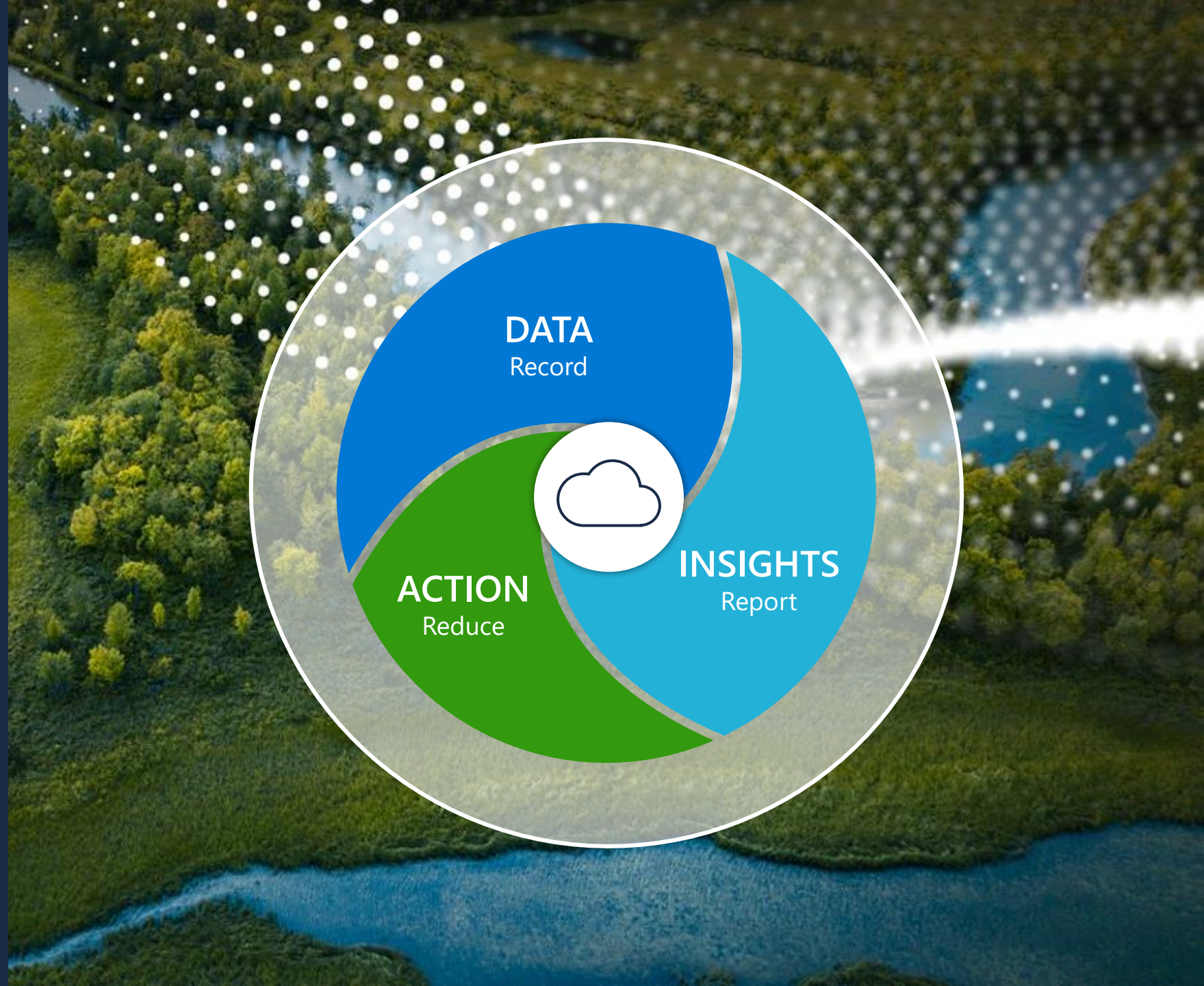
Microsoft Cloud for Sustainability

Delivering intelligence to help you accelerate every stage of your organization's sustainability journey

Comprehensive

Integrated

Automated



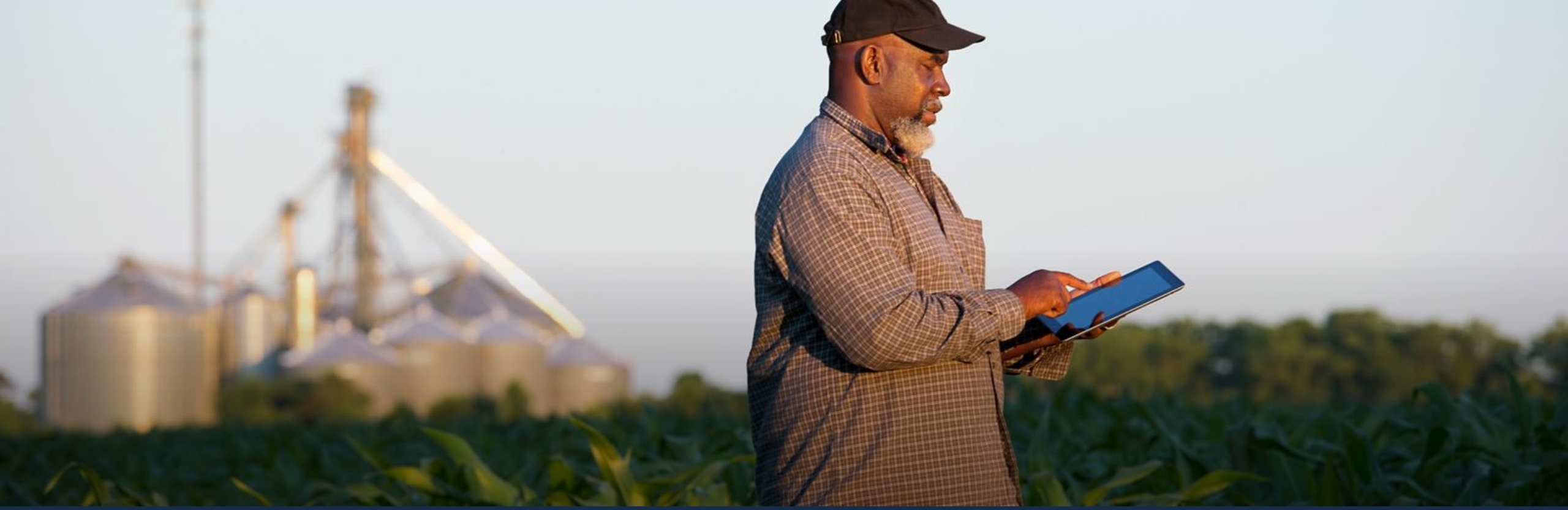
Record data

Automate data collection

Break down data silos with Common Data Model (CDM)

Calculate emissions across scopes

Generate more accurate results



Report insights

Visualize your impact in near real time

Track your performance against goals

Gain actionable insights to maximize progress

Share results with stakeholders and agencies

Reduce your footprint

Set and track sustainability targets

Develop a roadmap based on data

Use analytics to improve reduction activities

Reimagine fundamentals and drive lasting change

Microsoft

Thank you!