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The magazine for civil & structural engineers

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Bentley[®]
Advancing Infrastructure

 **Microsoft**

Why the Cloud?

March 16, 2021

Introduction



Scott Devoe
Senior Director, Geotechnical Information
Management
Bentley Systems, Inc.



Andy Hassett
Principal Solution Specialist
Microsoft

Poll Question



Poll Question:

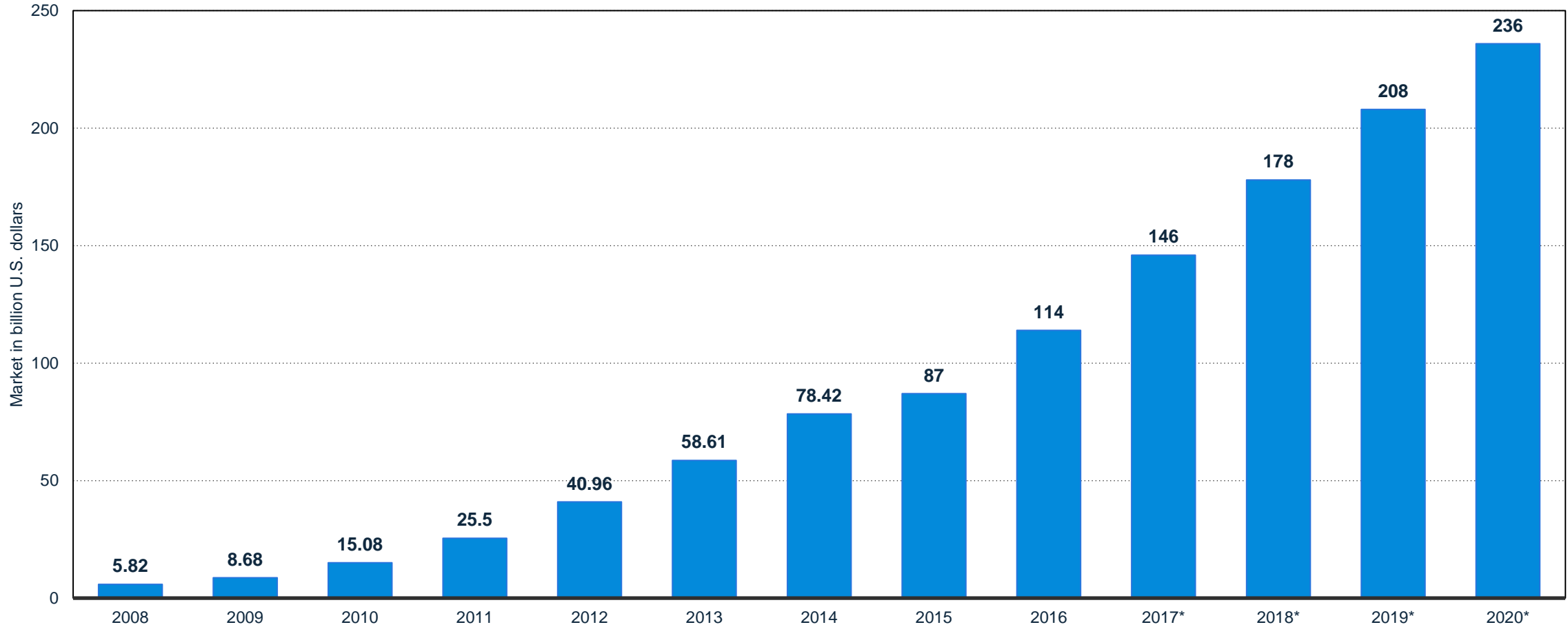
Have you ever:

- Downloaded an App game: Angry Birds, Minecraft, Wordscapes
- Watched: Netflix, Amazon Prime, YouTube, Disney+
- Used: icloud for photos, Apple pay, or a FitBit?
- Microsoft Excel App, PowerPoint App, or PowerBI App?
- All of the above
- None of the above

Cloud technology is transforming every industry.

Global cloud computing market

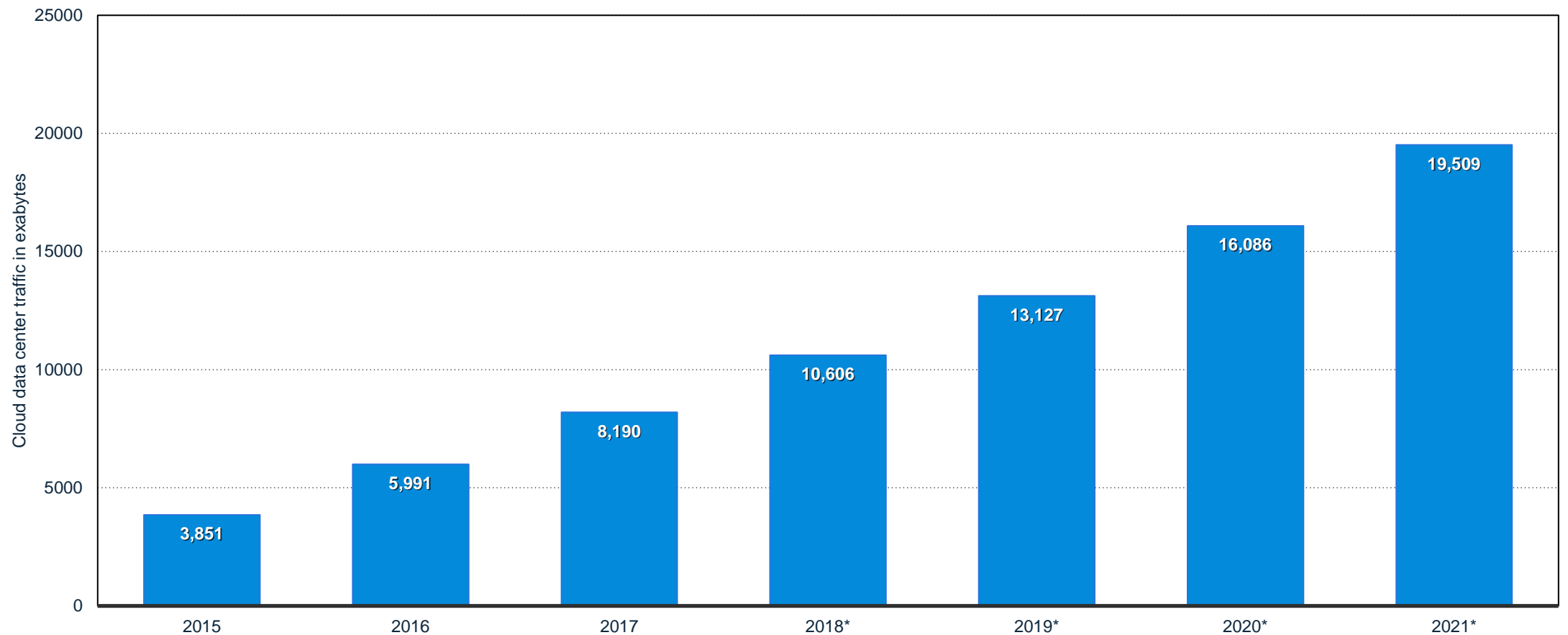
2008-2020



Statista: Worldwide; 2008 to 2016 (Source: Forrester Research; Forbes; Tata Communications)

Global cloud data center traffic

2015-2021



Exabyte = 1 Billion Gigabytes

Poll Question

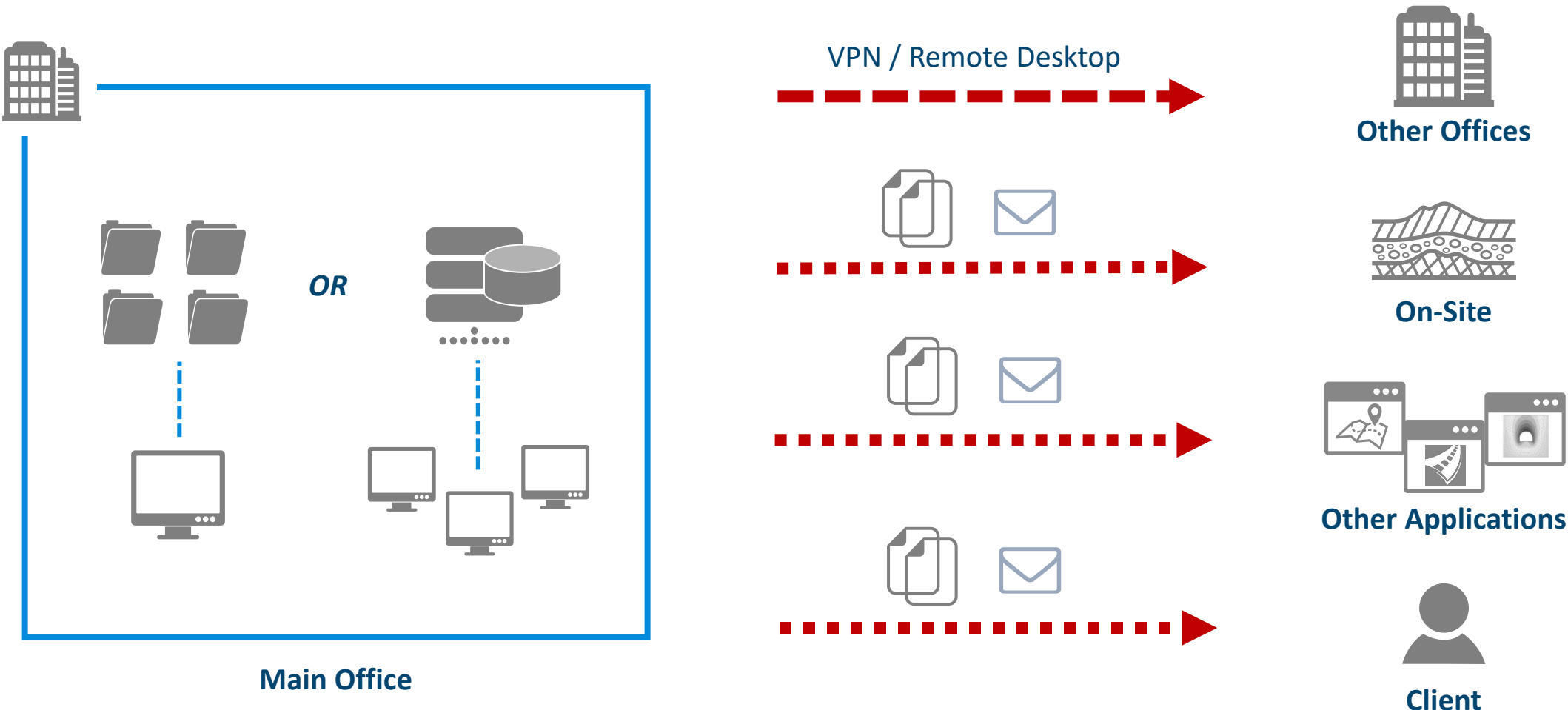


Poll Question

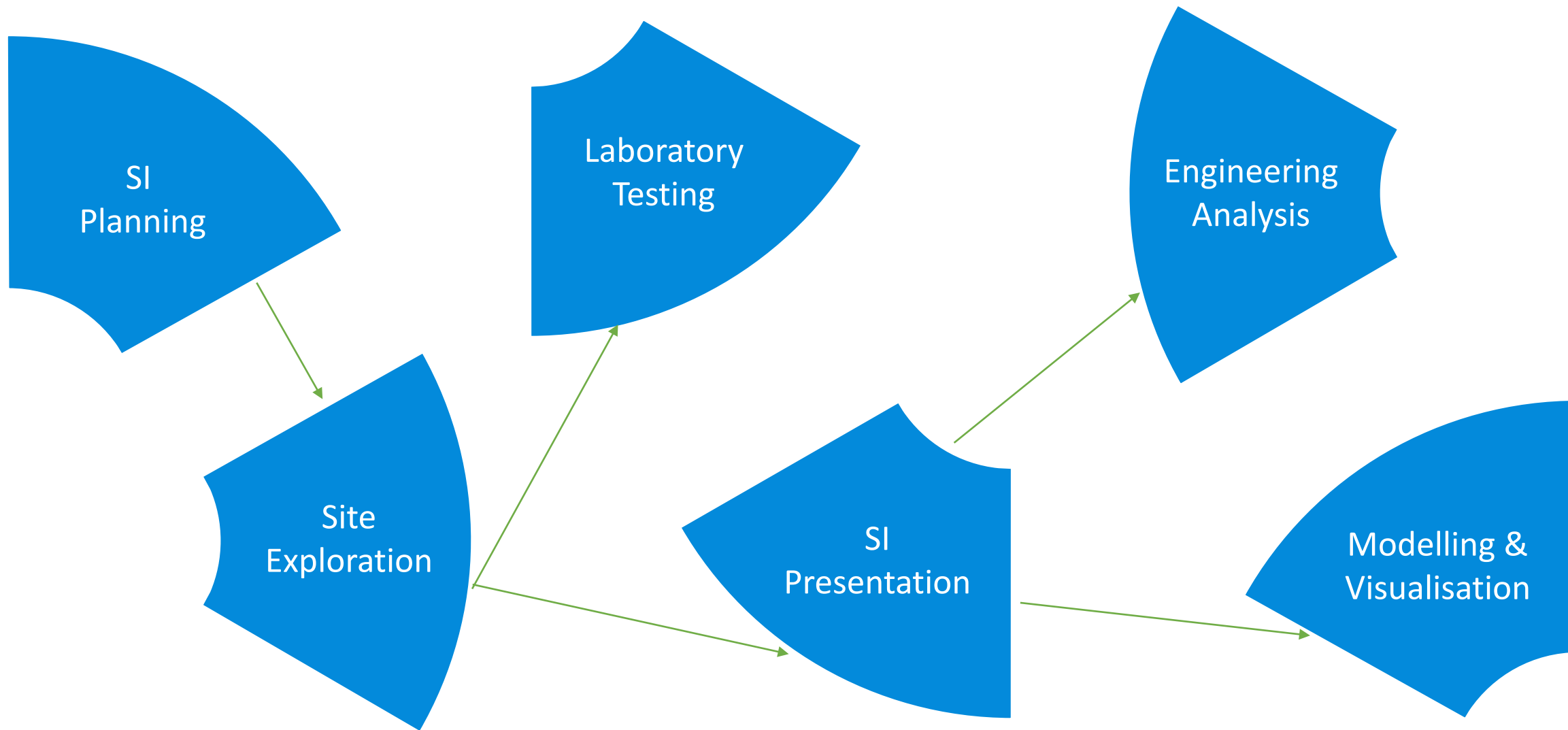
What are your biggest data challenges?

- Collecting it from the field
- Sharing it to make it productive across teams
- Trusting the data to be current
- Relying on access to the data to be secure
- Providing clarity for executive decision making

Disconnected Data Environment

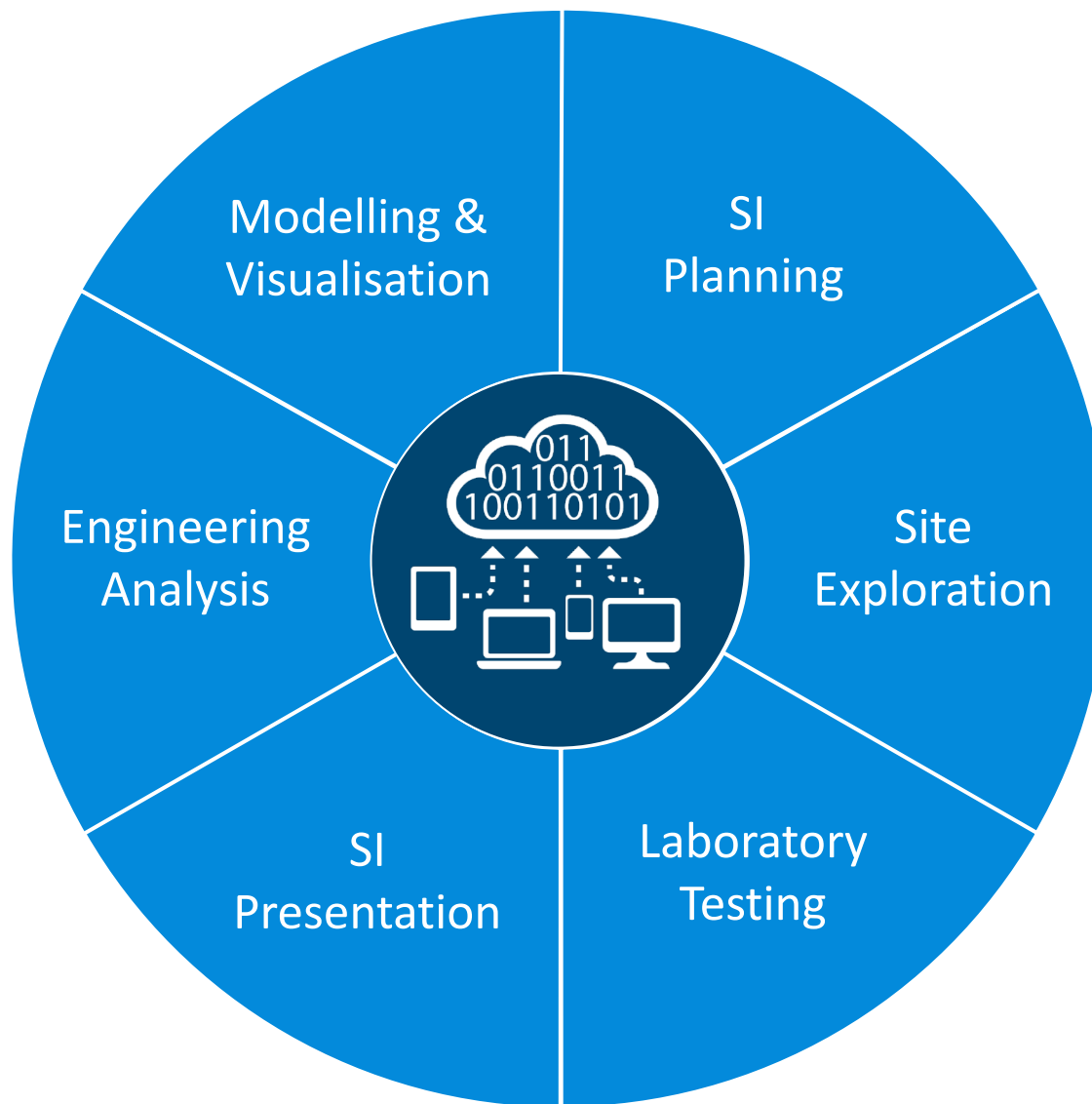


Geotechnical Data Example



Connected Data Environment

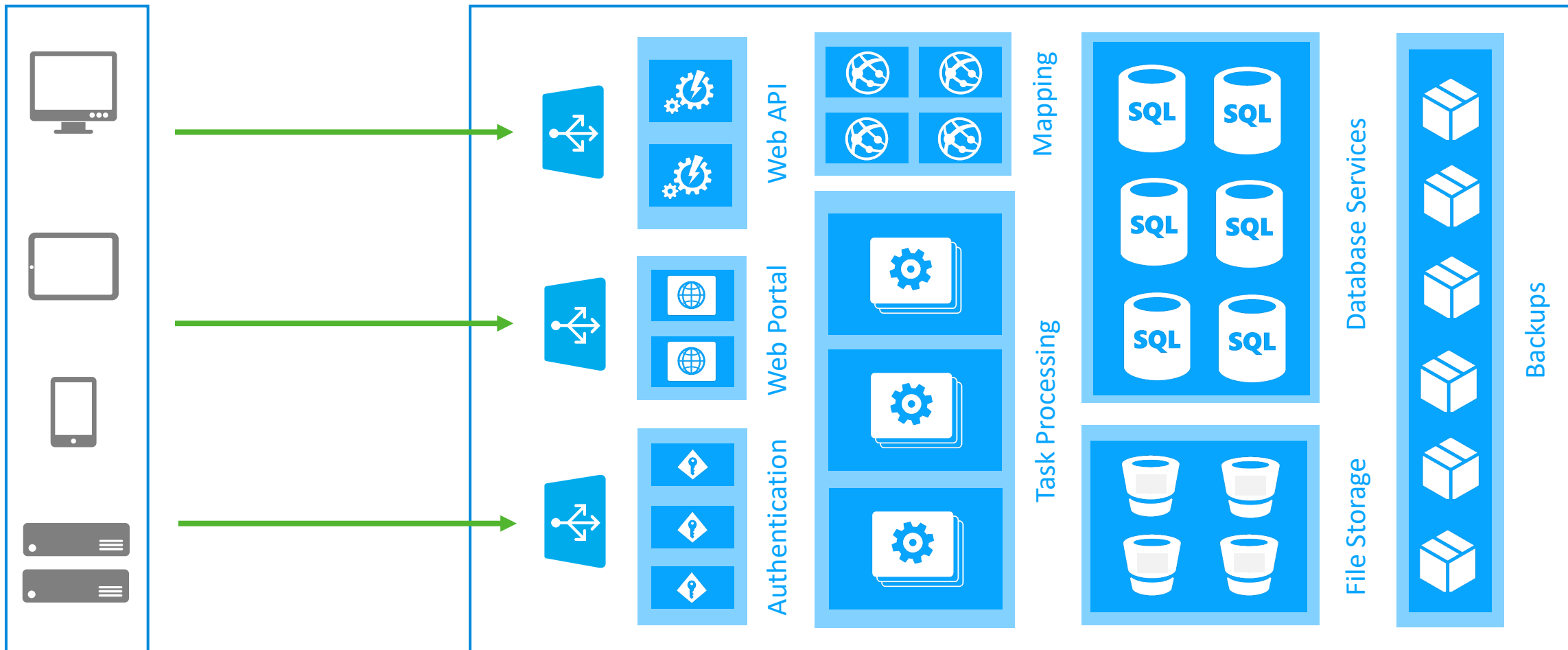
Iterative and Incremental



Responsive and Optimal

Video 2

Connected Cloud Platform

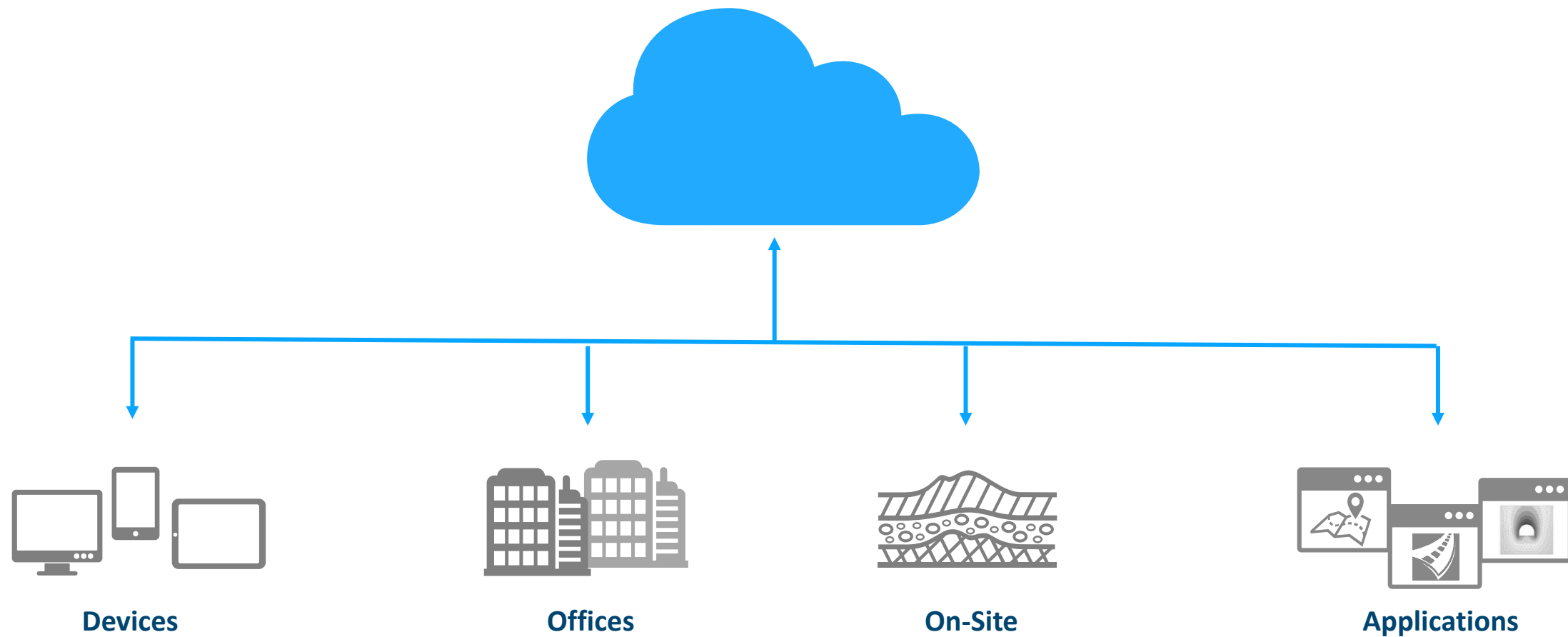


Its more than just data storage in the cloud...

Cloud Advantages

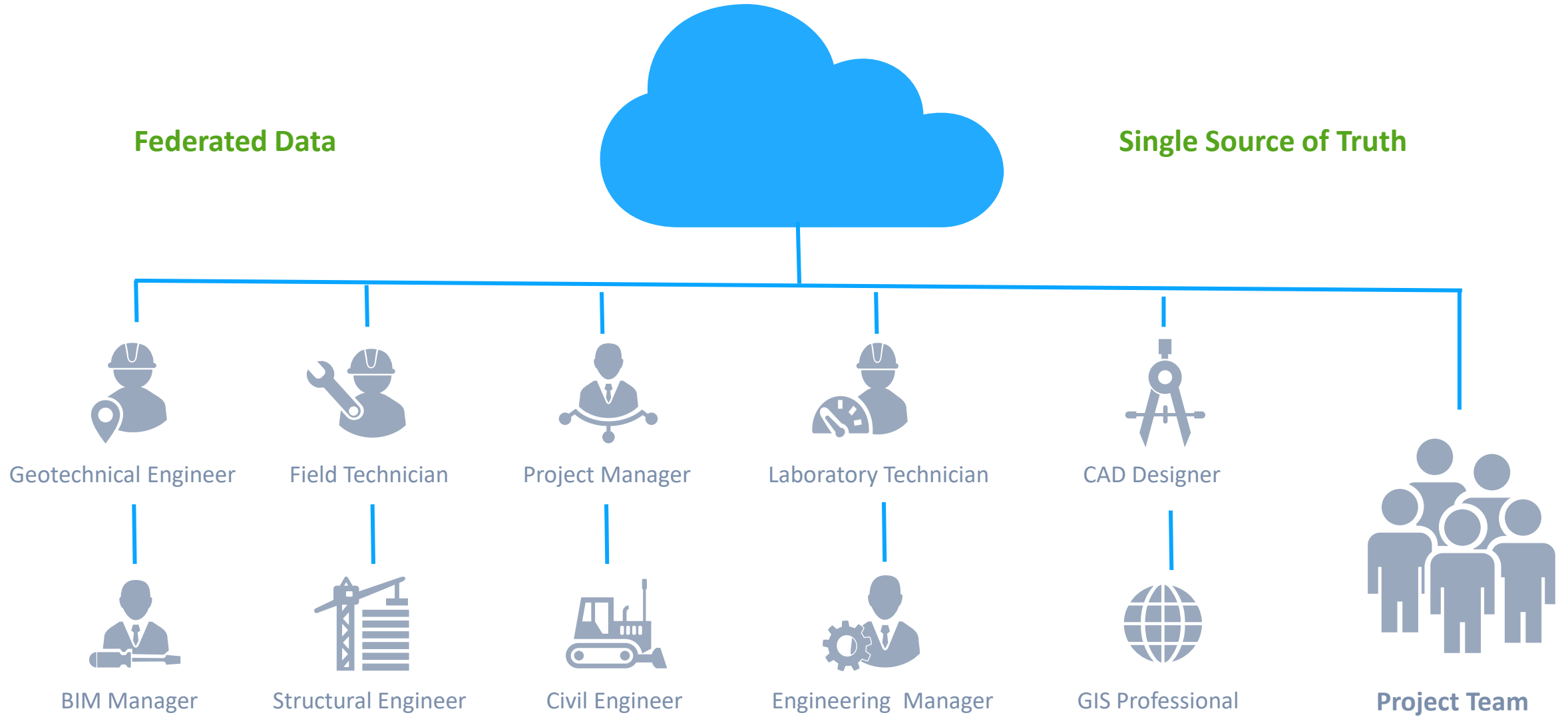


Increase Accessibility

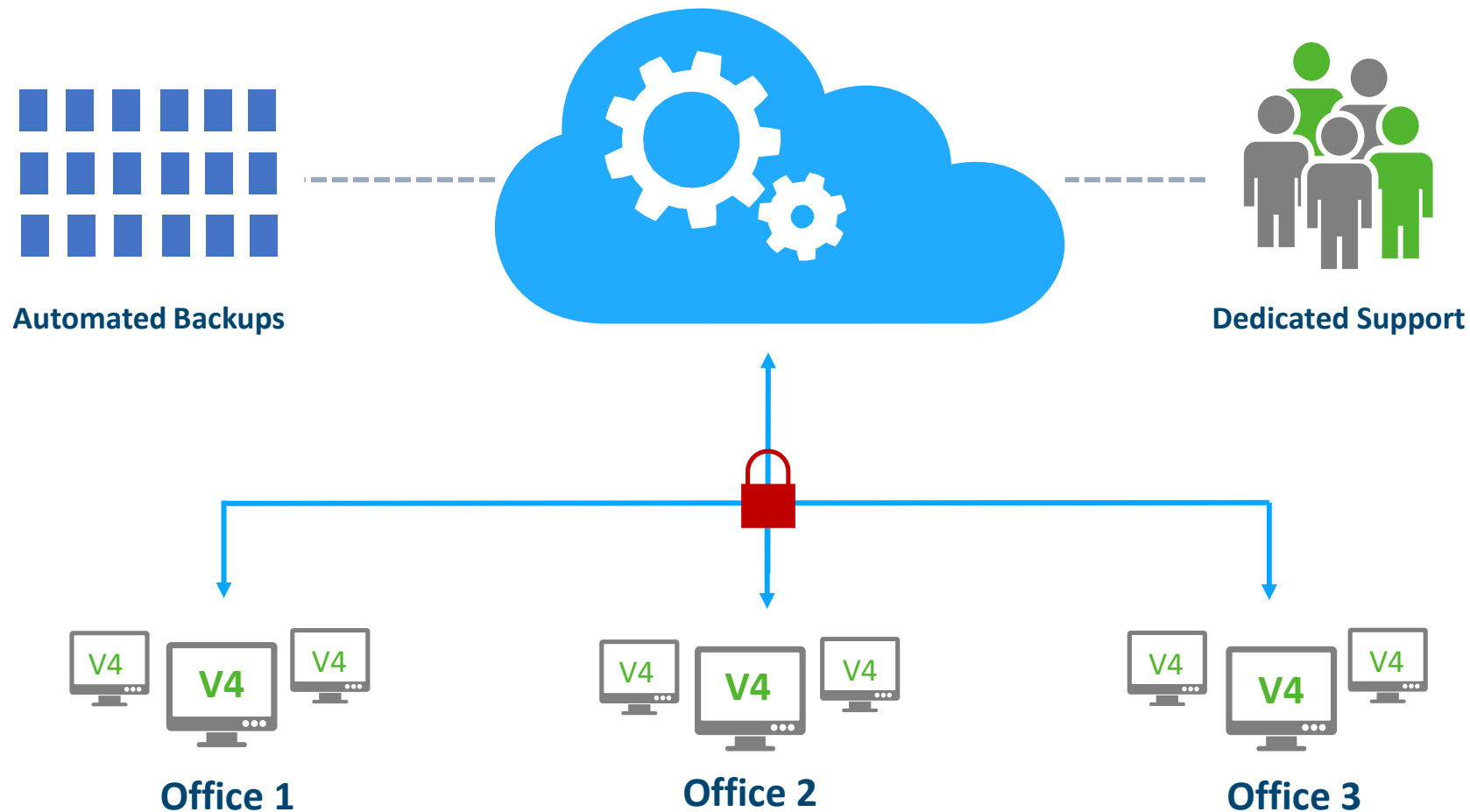


Access data from any location, on any device, in any application...

Enhanced Collaboration

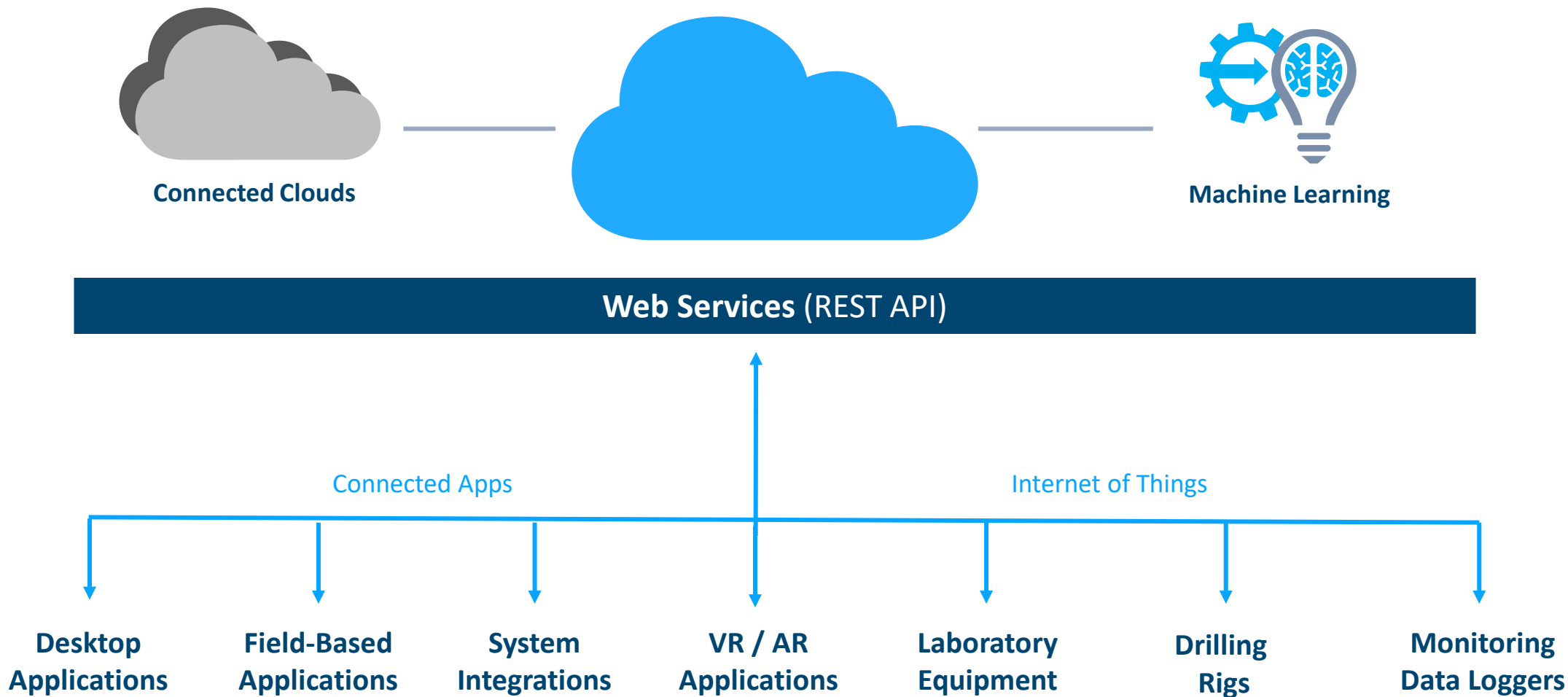


Managed Service



Always on the latest software...

Extensible Platform





Integrate Data with API

Connect OpenGround with your other enterprise systems through state-of-the-art REST API:

- Web GIS
- iTwins
- AutoCAD
- Microsoft Excel
- Power BI



OpenGround Cloud Usage

4.5k+

Users

1M+

Boreholes

34M+

Feet

Early adopters are already benefiting from cloud...

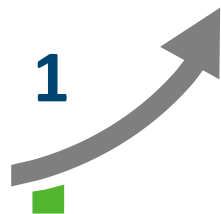


Improved Collaboration

“OpenGround Cloud improved the workflow for all members of the team. The various add-ins are faster within the cloud version of the database, which is useful when dealing with large datasets.”

Cedric Allenou
Ground Engineering Lead
Lower Thames Crossing

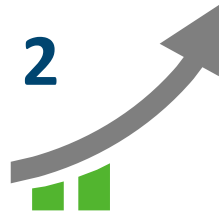
Digital Maturity:



**Data
Awareness**

*“Current methods of
working are OK...”*

Aware



**Isolated
Transformation**

*“The client has
requested...”*

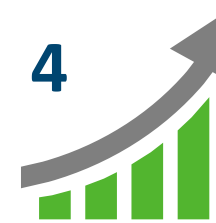
Reactive



**Organisational
Transformation**

*“We need to
stay competitive...”*

Coordinated



**Digital
Innovators**

*“There is an opportunity
to increase value...”*

Integrated

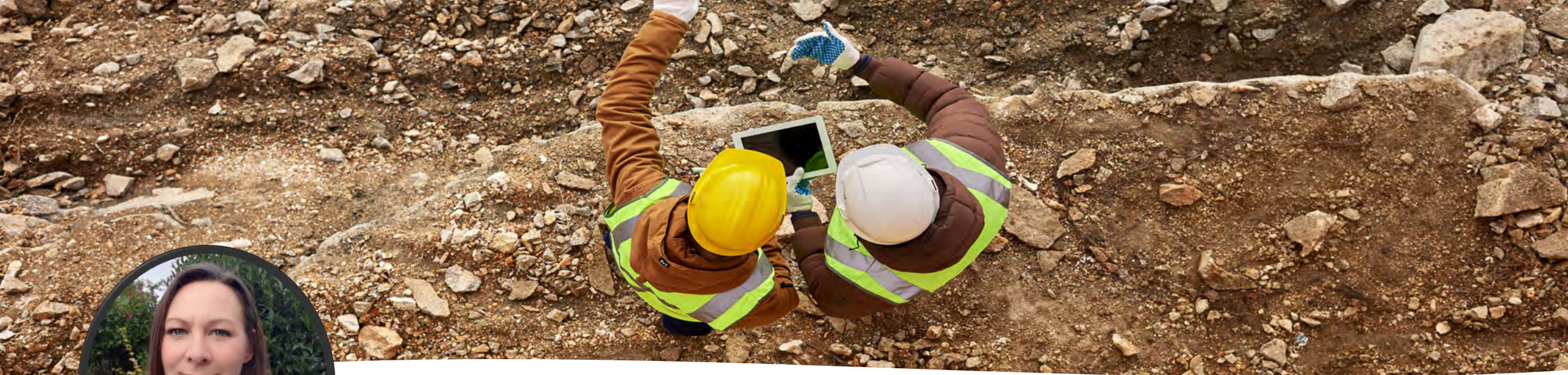
Poll Question

Poll Question

Where are you on your data journey?

1. Aware
2. Reactive
3. Coordinated
4. Integrated

Video 3



Mobile Data Collection

“It’s very exciting. Our engineers don’t know how lucky they are as they don’t have to write in notebooks and type it up later.

The clients are also very impressed as we can deliver their draft logs within 30 mins”

Emma Leivers
Engineering Technical Manager
Geotechnical Engineering

Geotechnical Subsurface Digital Twin Workflows

Applications span the entire asset lifecycle. Users at all stages can make better-informed decisions for better outcomes.





“At Bentley we believe that infrastructure digital twins can empower engineers, constructors and owner-operators to design, build and operate infrastructure assets that are more cost-effective, more resilient and more sustainable.

With Azure as the foundation of our cloud services, our offerings are more broadly scaled and differentiated by the further integrations of Microsoft technologies. We are excited to extend our partnership to bring new digital twin advances to infrastructure engineering organizations and their constituents.”

Greg Bentley, CEO, Bentley Systems

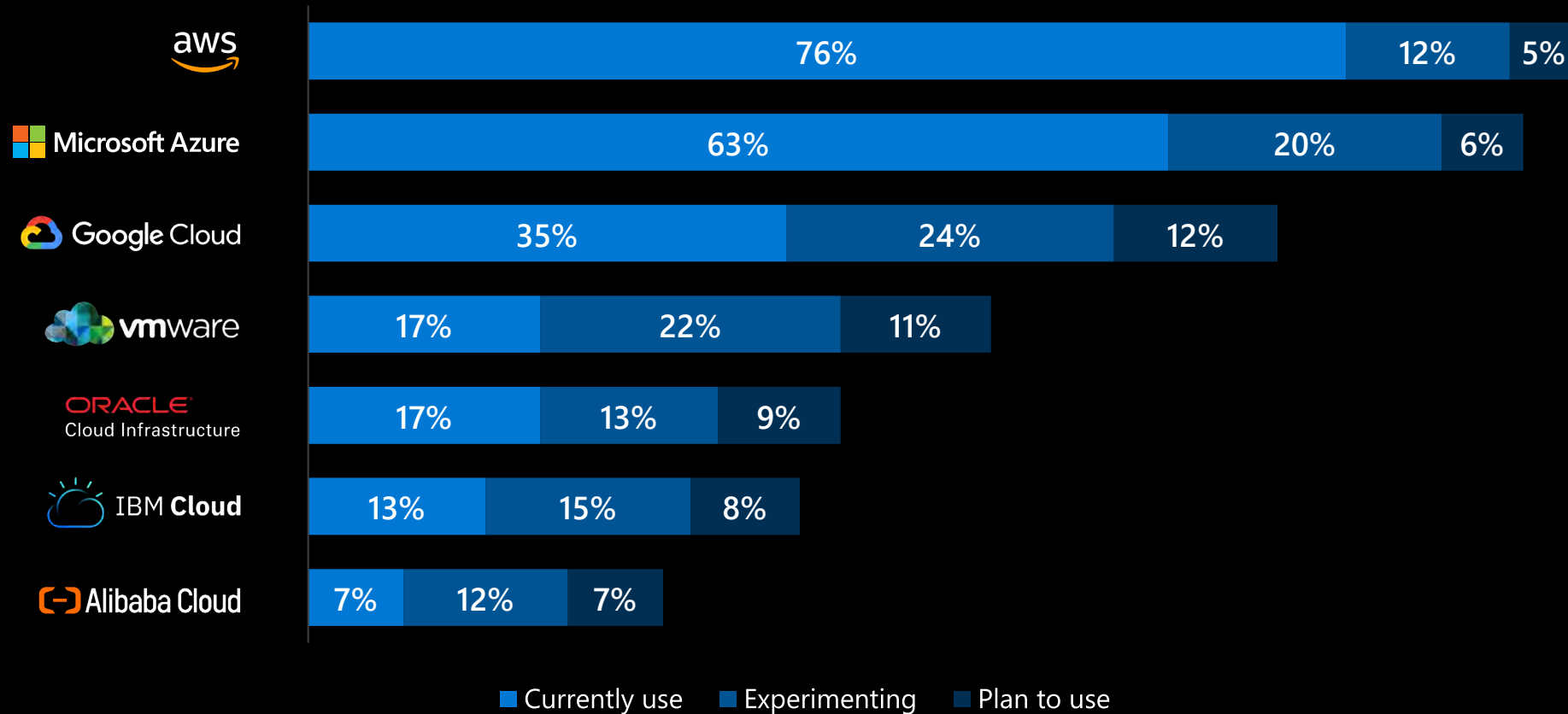
“There’s been no greater time to bring what we do together in the context of smart city, smart lighting, smart construction.

Wherever computing gets embedded in the physical world, the required digital twinning capability, the openness of the data ecosystem around it, empowers our joint users to create the insights they need to take mission critical decisions ensuring business continuity and transformation.”

Satya Nadella, CEO, Microsoft

Public cloud adoption

% of all respondents



Global



66 Azure regions

Largest geographical footprint of any cloud provider with more than **66** Azure regions

Secure



Microsoft Cyber Defense Operations Center

>3,500 full-time security professionals

6.5 trillion global signals daily

\$1 billion annual cybersecurity investment

Compliant

91 Compliance offerings

GLOBAL

- ISO 27001:2013
- ISO 27017:2015
- ISO 27018:2014
- ISO 22301:2012
- ISO 9001:2015
- ISO 20000-1:2011
- SOC 1 Type 2
- SOC 2 Type 2
- SOC 3
- CIS Benchmark
- CSA STAR Certification
- CSA STAR Attestation
- CSA STAR Self-Assessment
- WCAG 2.0 (ISO 40500:2012)

U.S. GOVT

- FedRAMP High
- FedRAMP Moderate
- EAR
- ITAR
- DoD DISA SRG Level 5
- DoD DISA SRG Level 4
- DoD DISA SRG Level 2
- DFARS
- DoE 10 CFR Part 810
- NIST SP 800-171
- NIST CSF
- Section 508 VPATs
- FIPS 140-2
- CJIS
- IRS 1075
- CNSSI 1253

INDUSTRY

- PCI DSS Level 1
- GLBA (US)
- FFIEC (US)
- Shared Assessments (US)
- SEC 17a-4 (US)
- CFTC 1.31 (US)
- FINRA 4511 (US)
- SOX (US)
- 23 NYCRR 500 (US)
- OSFI (Canada)
- FCA + PRA (UK)
- APRA (Australia)
- FINMA (Switzerland)
- FSA (Denmark)
- RBI + IRDAI (India)
- MAS + ABS (Singapore)
- NBB + FSMA (Belgium)
- AFM + DNB (Netherlands)
- AMF + ACPR (France)
- KNF (Poland)
- European Banking Authority (EBA)
- FISC (Japan)
- HIPAA BAA (US)
- HITRUST Certification
- GxP (FDA 21 CFR Part 11)
- MARS-E (US)
- NHS IG Toolkit (UK)
- NEN 7510:2011 (Netherlands)
- FERPA (US)
- CDSA
- MPAA (US)
- FACT (UK)
- DPP (UK)

REGIONAL

- Argentina PDPA
- Australia IRAP Unclassified
- Australia IRAP PROTECTED
- Canada Privacy Laws
- China GB 18030:2005
- China DJCP (MLPS) Level 3
- China TRUCS / CCCPPF
- EU EN 301 549
- EU ENISA IAF
- EU Model Clauses
- EU – US Privacy Shield
- GDPR
- Germany C5
- Germany IT-Grundschutz workbook
- India MeitY
- Japan CS Mark Gold
- Japan My Number Act
- Netherlands BIR 2012
- New Zealand Gov CIO Framework
- Singapore MTCS Level 3
- Spain ENS High
- Spain DPA
- UK Cyber Essentials Plus
- UK G-Cloud
- UK PASF

Reliable infrastructure for your innovation

On-demand
global scale

66 regions

Global network More than 160 edge sites and 20,000 peering connections

150 VM size options

Best for Microsoft workloads

Best hybrid cloud experience for Windows Server

Run SQL in Azure VMs most cost-effectively

Comprehensive protection for hybrid environments

Linux, Open Source, and Red Hat

~50% of Azure VMs run Linux

1.4x growth of Linux

 Co-located support with Red Hat

Purpose-built infrastructure



vmware®

ORACLE®

 NetApp®

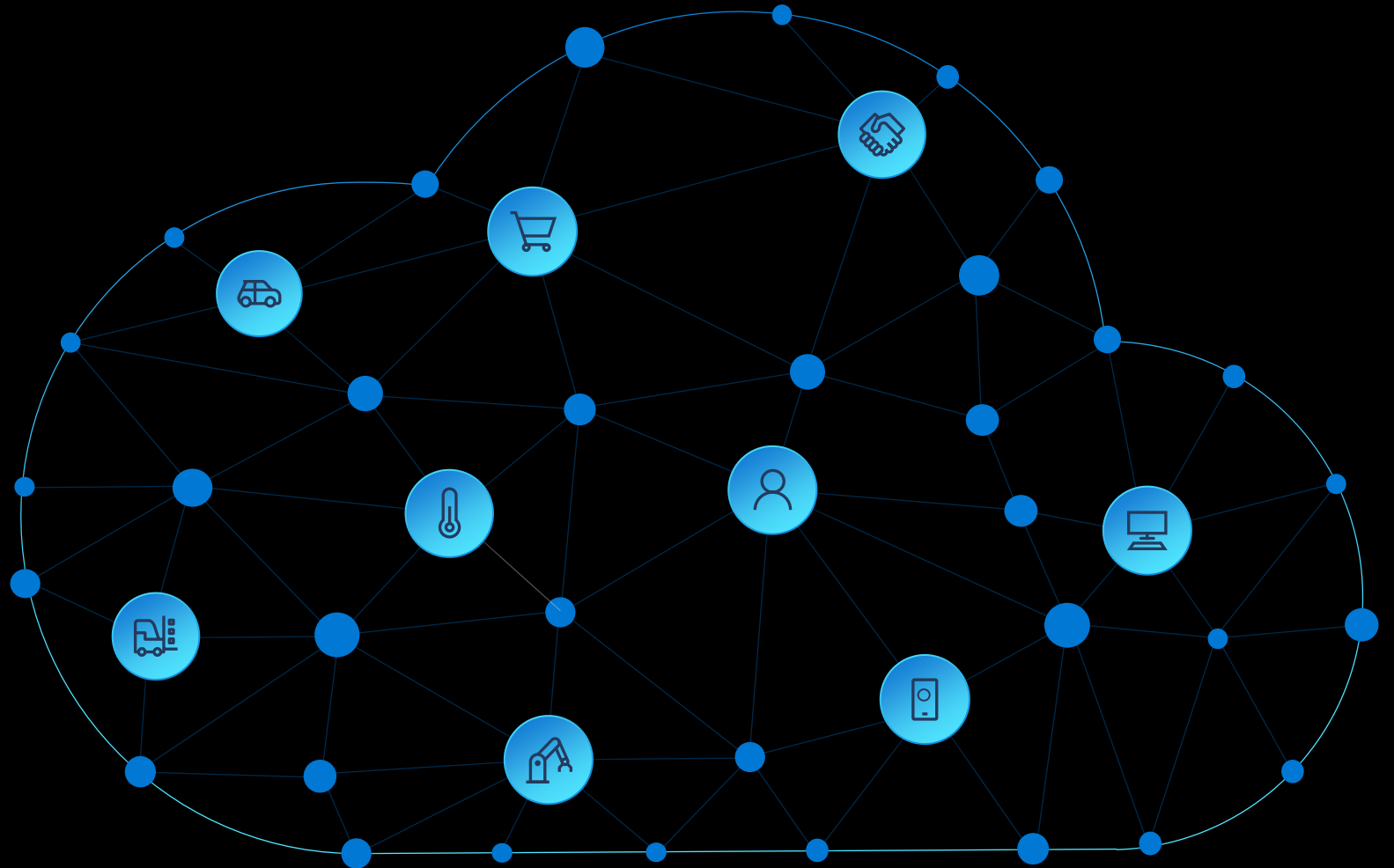
CRAY

Intelligent security built-in





\$1B+ annual investment

3500+ security experts

Trillions of signals
analyzed for intelligence



The broadest compliance coverage in the industry

 Global	<input checked="" type="checkbox"/> ISO 27001:2013 <input checked="" type="checkbox"/> ISO 27017:2015 <input checked="" type="checkbox"/> ISO 27018:2014	<input checked="" type="checkbox"/> ISO 22301:2012 <input checked="" type="checkbox"/> ISO 9001:2015 <input checked="" type="checkbox"/> ISO 20000-1:2011	<input checked="" type="checkbox"/> SOC 1 Type 2 <input checked="" type="checkbox"/> SOC 2 Type 2 <input checked="" type="checkbox"/> SOC 3 <input checked="" type="checkbox"/> CIS Benchmark	<input checked="" type="checkbox"/> CSA STAR Certification <input checked="" type="checkbox"/> CSA STAR Attestation <input checked="" type="checkbox"/> CSA STAR Self-Assessment <input checked="" type="checkbox"/> WCAG 2.0 (ISO 40500:2012)
 US Government	<input checked="" type="checkbox"/> FedRAMP High <input checked="" type="checkbox"/> FedRAMP Moderate <input checked="" type="checkbox"/> EAR <input checked="" type="checkbox"/> ITAR	<input checked="" type="checkbox"/> DoD DISA SRG Level 5 <input checked="" type="checkbox"/> DoD DISA SRG Level 4 <input checked="" type="checkbox"/> DoD DISA SRG Level 2 <input checked="" type="checkbox"/> DFARS	<input checked="" type="checkbox"/> DoE 10 CFR Part 810 <input checked="" type="checkbox"/> NIST SP 800-171 <input checked="" type="checkbox"/> NIST CSF <input checked="" type="checkbox"/> Section 508 VPATs	<input checked="" type="checkbox"/> FIPS 140-2 <input checked="" type="checkbox"/> CJIS <input checked="" type="checkbox"/> IRS 1075 <input checked="" type="checkbox"/> CNSSI 1253
 Industry	<input checked="" type="checkbox"/> PCI DSS Level 1 <input checked="" type="checkbox"/> GLBA (US) <input checked="" type="checkbox"/> FFIEC (US) <input checked="" type="checkbox"/> Shared Assessments (US) <input checked="" type="checkbox"/> SEC 17a-4 (US) <input checked="" type="checkbox"/> CFTC 1.31 (US) <input checked="" type="checkbox"/> FINRA 4511 (US) <input checked="" type="checkbox"/> SOX (US) <input checked="" type="checkbox"/> 23 NYCRR 500 (US)	<input checked="" type="checkbox"/> OSFI (Canada) <input checked="" type="checkbox"/> FCA + PRA (UK) <input checked="" type="checkbox"/> APRA (Australia) <input checked="" type="checkbox"/> FINMA (Switzerland) <input checked="" type="checkbox"/> FSA (Denmark) <input checked="" type="checkbox"/> RBI + IRDAI (India) <input checked="" type="checkbox"/> MAS + ABS (Singapore) <input checked="" type="checkbox"/> NBB + FSMA (Belgium) <input checked="" type="checkbox"/> AFM + DNB (Netherlands)	<input checked="" type="checkbox"/> AMF + ACPR (France) <input checked="" type="checkbox"/> KNF (Poland) <input checked="" type="checkbox"/> European Banking Authority (EBA) <input checked="" type="checkbox"/> FISC (Japan) <input checked="" type="checkbox"/> HIPAA BAA (US) <input checked="" type="checkbox"/> HITRUST Certification <input checked="" type="checkbox"/> GxP (FDA 21 CFR Part 11) <input checked="" type="checkbox"/> MARS-E (US)	<input checked="" type="checkbox"/> NHS IG Toolkit (UK) <input checked="" type="checkbox"/> NEN 7510:2011 (Netherlands) <input checked="" type="checkbox"/> FERPA (US) <input checked="" type="checkbox"/> CDSA <input checked="" type="checkbox"/> MPAA (US) <input checked="" type="checkbox"/> FACT (UK) <input checked="" type="checkbox"/> DPP (UK) <input checked="" type="checkbox"/> HDS (France)
 Regional	<input checked="" type="checkbox"/> Argentina PDPA <input checked="" type="checkbox"/> Australia IRAP Unclassified <input checked="" type="checkbox"/> Australia IRAP PROTECTED <input checked="" type="checkbox"/> Canada Privacy Laws <input checked="" type="checkbox"/> China GB 18030:2005 <input checked="" type="checkbox"/> China DJCP (MLPS) Level 3	<input checked="" type="checkbox"/> China TRUCS / CCCPPF <input checked="" type="checkbox"/> EU EN 301 549 <input checked="" type="checkbox"/> EU ENISA IAF <input checked="" type="checkbox"/> EU Model Clauses <input checked="" type="checkbox"/> EU – US Privacy Shield <input checked="" type="checkbox"/> GDPR <input checked="" type="checkbox"/> Germany C5 <input checked="" type="checkbox"/> Germany TISAX	<input checked="" type="checkbox"/> Germany IT-Grundschutz workbook <input checked="" type="checkbox"/> India MeitY <input checked="" type="checkbox"/> Japan CS Mark Gold <input checked="" type="checkbox"/> Japan My Number Act <input checked="" type="checkbox"/> Korea ISMS <input checked="" type="checkbox"/> Netherlands BIR 2012 <input checked="" type="checkbox"/> New Zealand Gov CIO Framework	<input checked="" type="checkbox"/> Singapore MTCS Level 3 <input checked="" type="checkbox"/> Spain ENS High <input checked="" type="checkbox"/> Spain DPA <input checked="" type="checkbox"/> UK Cyber Essentials Plus <input checked="" type="checkbox"/> UK G-Cloud <input checked="" type="checkbox"/> UK PASF

Poll Question



Which Area is of most interest to you?

When choosing the Cloud what's most important to you?

- Global Access
- Security
- Compliance Coverage
- All of the Above
- None of the Above

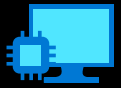


Embracing the Cloud

“We're trying to do more with less all the time, and we have to do more than just keep the lights on. By innovating on Microsoft cloud services, we can be more efficient, provide better resources both internally and externally, and make decisions better, faster, and more accurately.”

Chris McMasters,
Chief Information Officer
City of Corona

What is Azure?



Edge Devices

Azure Stack Hub

Azure Stack Edge

Azure Sphere

Azure Kinect

HoloLens



Serverless

Communication Services

Web

Mobile

Mixed Reality

Containers

Events + Integration

Databases

Analytics

AI + Machine Learning

Internet of Things

Media



Tools

Visual Studio

GitHub

Power Apps

Power BI



Infrastructure

Compute

Networking

Storage

Security

Identity

Customer
need

Improved
availability

Premium Storage

Infrastructure
(applications and data)

Single VM



SLA 99.9%
Isolated VM failure

Customer
need

Improved
availability

Build and run highly-available
applications with near-zero RPO/RTO

Premium Storage

Availability Sets

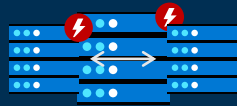
Infrastructure
(applications and data)

Single VM



SLA 99.9%
Isolated VM failure

Datacenter



SLA 99.95%
Hardware failure

Customer need

Improved availability

Build and run highly-available applications with near-zero RPO/RTO

Premium Storage

Availability Sets

Availability Zones

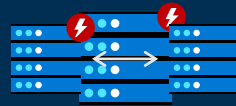
Infrastructure (applications and data)

Single VM



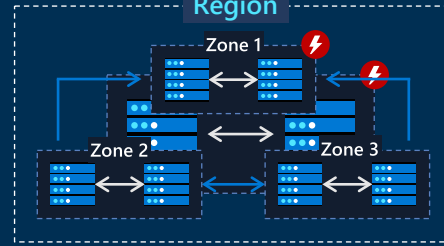
SLA 99.9%
Isolated VM failure

Datacenter



SLA 99.95%
Hardware failure

Region



SLA 99.9%
Entire datacenter failure

Customer need

Improved availability

Build and run highly-available applications with near-zero RPO/RTO

Implement disaster recovery plans with data residency and minimal RPO/RTO

Premium Storage

Availability Sets

Availability Zones

Azure Site Recovery / Region Pairs

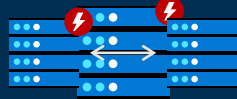
Infrastructure (applications and data)

Single VM



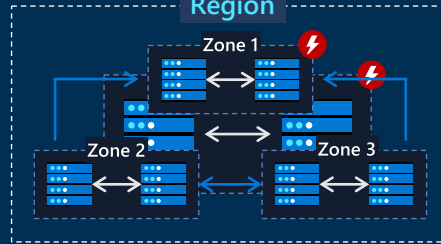
SLA 99.9%
Isolated VM failure

Datacenter



SLA 99.95%
Hardware failure

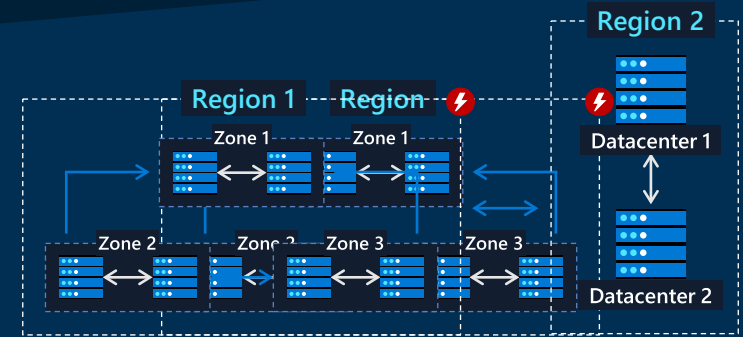
Region



SLA 99.9%
Entire datacenter failure

Region 1

Region 2



Industry-leading RPO/RTO
Entire region failure

Customer need

Improved availability

Build and run highly-available applications with near-zero RPO/RTO

Implement disaster recovery plans with data residency and minimal RPO/RTO

Premium Storage

Availability Sets

Availability Zones

Azure Site Recovery / Region Pairs

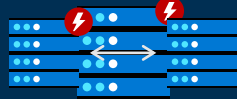
Infrastructure (applications and data)

Single VM



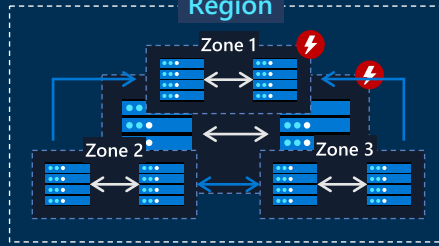
SLA 99.9%
Isolated VM failure

Datacenter



SLA 99.95%
Hardware failure

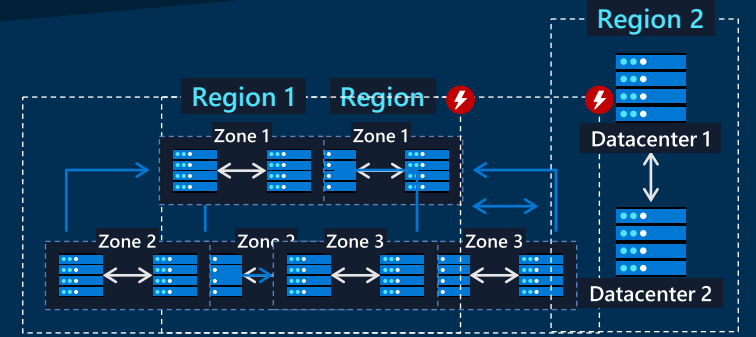
Region



SLA 99.9%
Entire datacenter failure

Region 1

Region 2



Industry-leading RPO/RTO
Entire region failure

Data (stateful)



Accidental data loss

Data corruption

Ransomware

Rogue administrator

Backup

Go back to restore a healthy version of the data



Efficient Asset Management

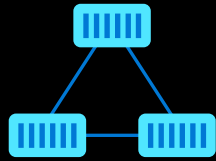
“Before Azure, if a business needed a server for a project, we’d have told them to come back in a week. Now, I can give them what they want in an hour—often, in five minutes.

“Our next step is implementing the same technology in other parts of the Vassallo Group. I would say ***we are only 50 percent of the way through a complete digital transformation.*** But we have the perfect basis for getting to 100,” Aquilina adds.

Carlo Aquilina: CIO
Vassallo Group

Efficient application development

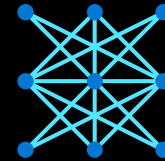
Characteristics of modern applications



Containers



Managed
Databases

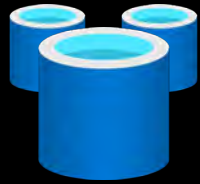


Artificial
Intelligence



Serverless

Data + Analytics



Relational

SQL Database
PostgreSQL
MySQL

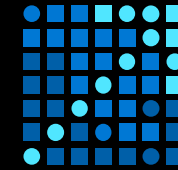


Non-relational

Cosmos DB
Mongo DB



Data Warehouse



Big Data

Why the Cloud?

Democratize your data with control
for improved collaboration and data resilience

“As urban populations continue to grow, the world is expected to add more than two trillion square feet of new building space [and other infrastructure] by 2060. That’s the equivalent of adding another New York City every month for the next 40 years”

Bill Gates



Questions and Answers with:



Scott Devoe

Senior Director, Geotechnical Information Management
Bentley Systems, Inc.



Andy Hassett

Principal Solution Specialist
Microsoft



Todd Danielson

Editorial Director
Informed Infrastructure

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