Data Transformation on AWS

Construction Industry

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Agenda

1. What is AWS?
2. Technology Trending for Construction Industry
3. Case sharing
4. Q&A

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AWS Recognized as a **Cloud Leader** for the **12th Consecutive Year**

Gartner 2022 Magic Quadrant for Cloud Infrastructure & Platform Services (CIPS)

Figure 1: Magic Quadrant for Cloud Infrastructure and Platform Services

Gartner, Magic Quadrant for Cloud Infrastructure & Platform Services, Raj Bala, Bob Gill, Dennis Smith, Kevin Ji, David Wright, Miguel Angel Borrega 27 June 2022. Gartner and Magic Quadrant are registered trademarks of Gartner, Inc. and/or its affiliates in the U.S. and internationally and is used herein with permission. All rights reserved. Gartner does not endorse any vendor, product or service depicted in its research publications, and does not advise technology users to select only those vendors with the highest ratings. Gartner research publications consist of the opinions of Gartner's research organization and should not be construed as statements of fact. Gartner disclaims all warranties, expressed or implied, with respect to this research, including any warranties of merchantability or fitness for a particular purpose.

Global Reach & High Availability

AWS Regions provide multiple, physically separated and isolated Availability Zones which are connected with low latency, high throughput, and highly redundant networking

The AWS Cloud spans 99 Availability Zones within 31 geographic regions around the world, with announced plans for 12 more Availability Zones and 4 more AWS Regions in Australia, Canada, Israel, New Zealand, and Thailand.

With AWS Local Zones, you can easily run highly-demanding applications that require single-digit millisecond latencies to your end-users.

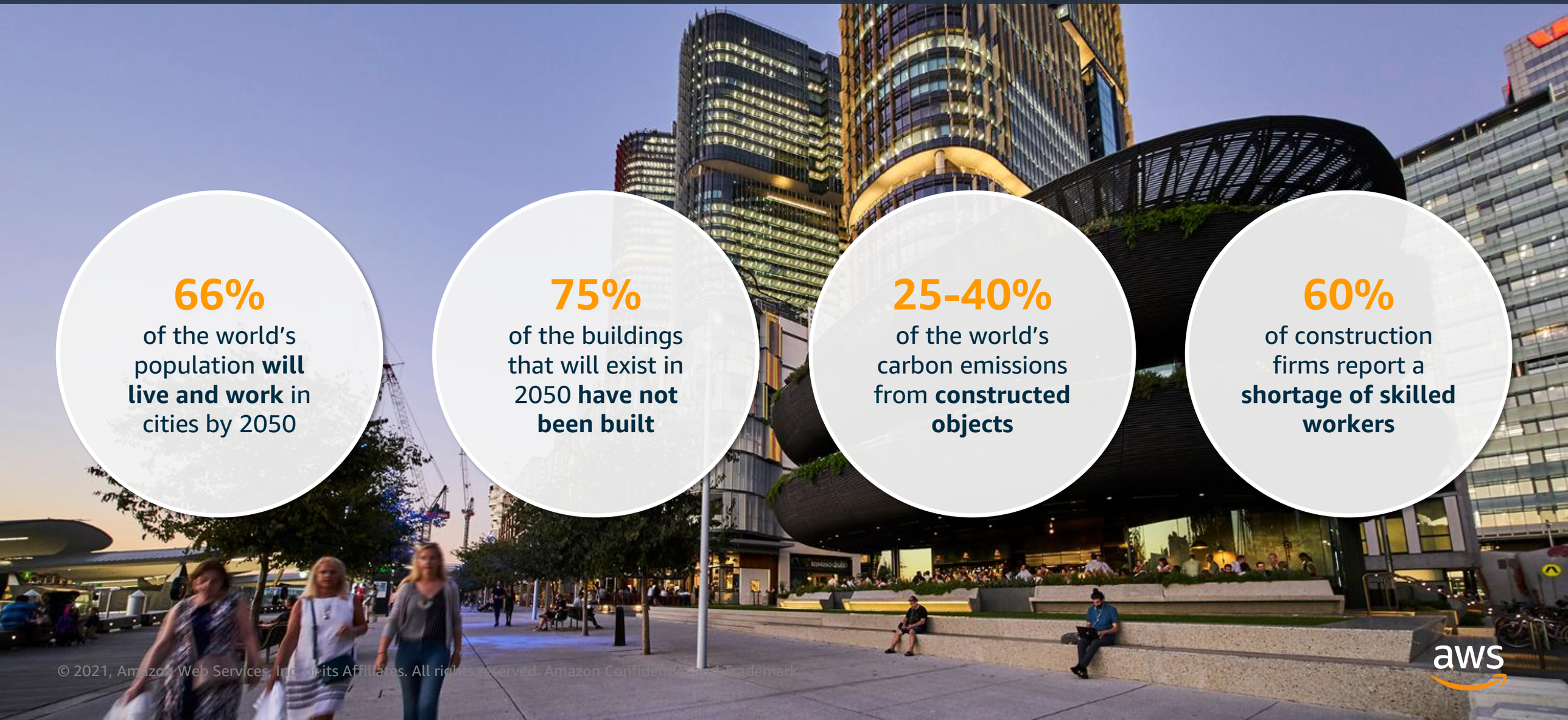
Amazon CloudFront uses a global network of 450+ Points of Presence (400+ Edge locations and 13 regional caches) in 90+ cities across 48 countries.

See interactive map

ECR customers innovating on AWS

Urbanization is the future…

Demand for sustainable construction with skilled workers is increasing



66%
of the world's population **will live and work** in cities by 2050

75%
of the buildings that will exist in 2050 **have not been built**

25-40%
of the world's carbon emissions from **constructed objects**

60%
of construction firms report a **shortage of skilled workers**

70% of projects are over budget & delivered late

63% of direct labor time is spent waiting for materials and equipment, traveling to the area, taking breaks, and planning how to do the work

Indicative Development Cost Stack

US$20T of construction activity globally

- **3%** Other
- **5%** Sales & Marketing
- **37%** Labor
  - **25%** Construct
  - **10%** Design
  - **2%** Mgmt.
- **30%** Materials & Equipment
- **25%** Land Cost

~70% of development costs are ripe for disruption

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Data is transforming the industry value chain

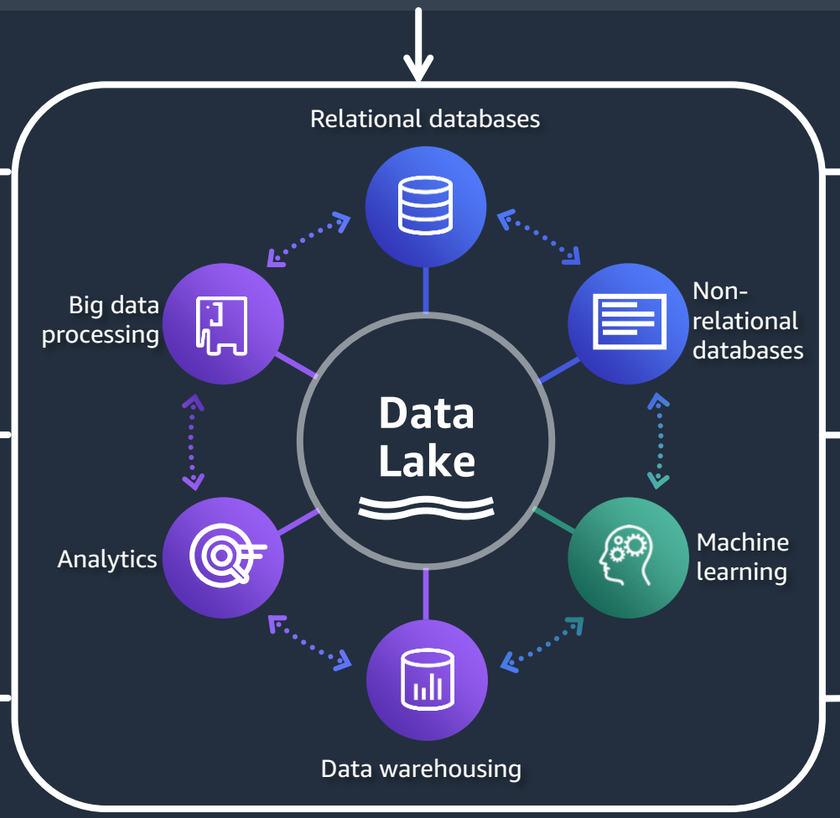
Investment & Planning	Design & Engineering	Sourcing & Procurement	Prefabrication & Manufacturing	Construction & Supply Chain	Operations & Maintenance

ERP, HCM, CRM, Estimating, BIM, CAD, Geospatial, Video, Images, Point Clouds, AR/VR, CMMS, PDF, Operational Databases, Sensors, and IoT Data

Sustainability
Using data to design, build, and operate infrastructure that reduces waste, emissions, and energy usage

Emerging Tech
Using data to build technology that disrupts industry operating models (PropTech and ConTech)

Health and Safety
Using data to keep people safe and secure when building and operating infrastructure



Supply Chain
Using data to better track and trace materials and labor from planning through delivery

Smart Infrastructure
Using data to better manage and operate the built environment with IoT and digital twins

Customer Experience
Using data to deliver modern apps that anticipate customer needs and create a better experience

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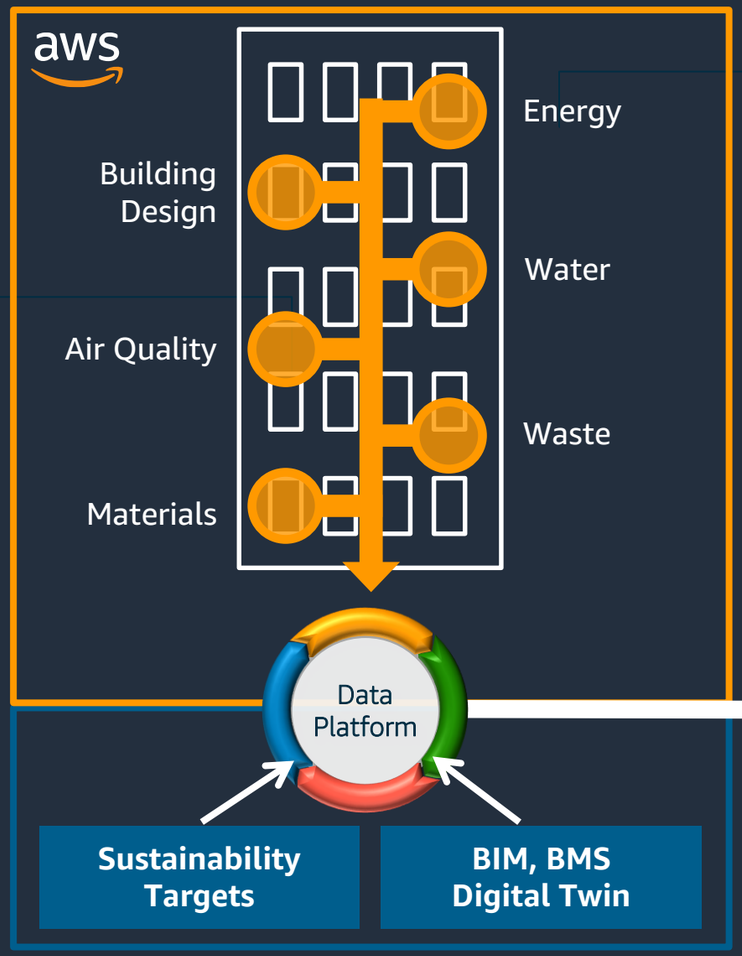
Sustainability

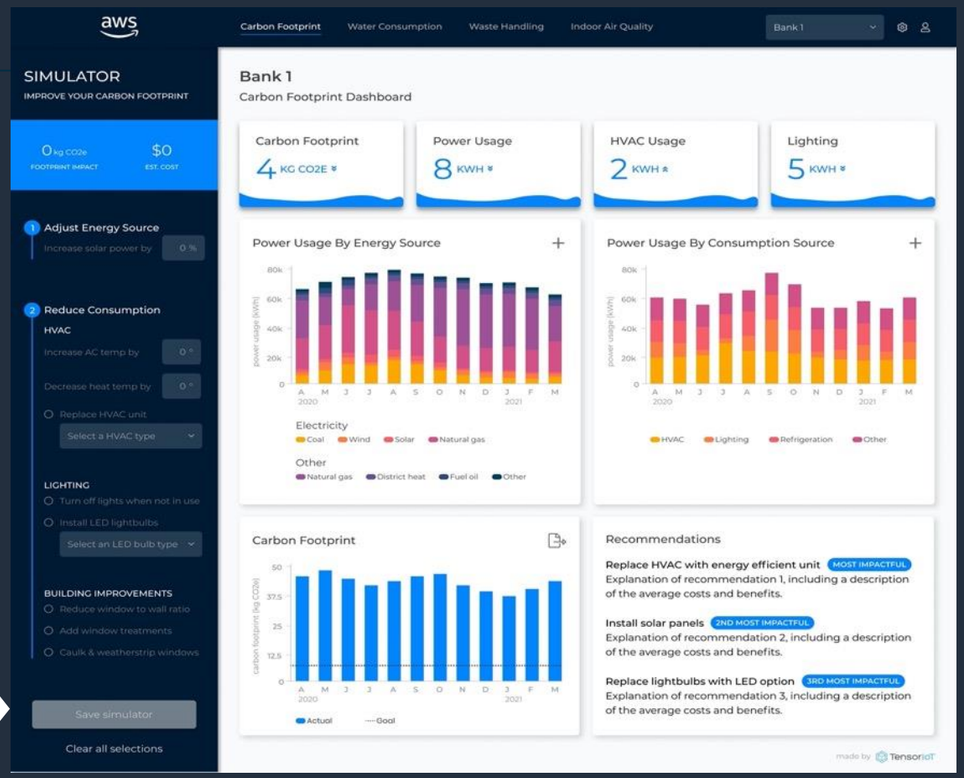
Integration with AWS IoT and sustainability solutions can help you achieve your carbon reduction goals

Key Benefits

- Achieve sustainability goals in cost effective manner
- Implement/deploy platform within existing constraints
- Integrate with existing and new systems

THE CLIMATE PLEDGE Net zero carbon by 2040
Learn more





Sustainable Buildings on AWS
Leveraging data collection (IoT sensors, BMS, Databases), AI & Machine Learning to ensure buildings are operating at maximum efficiency to reduce carbon footprint and material consumption.

Worker Safety and Construction Tech

Integration with AWS services can improve worker safety and enable a connected construction site

Key Benefits

- Identify unsafe working conditions and trigger notifications
- Track worker location / presence, fatigue, falls, and other vitals
- Monitor equipment health and automate construction activities using robotics, sensor data, and BIM models

Computer Vision

Detecting safety issues using video

Panorama, Rekognition, SageMaker Ground Truth, SNS

Wearables

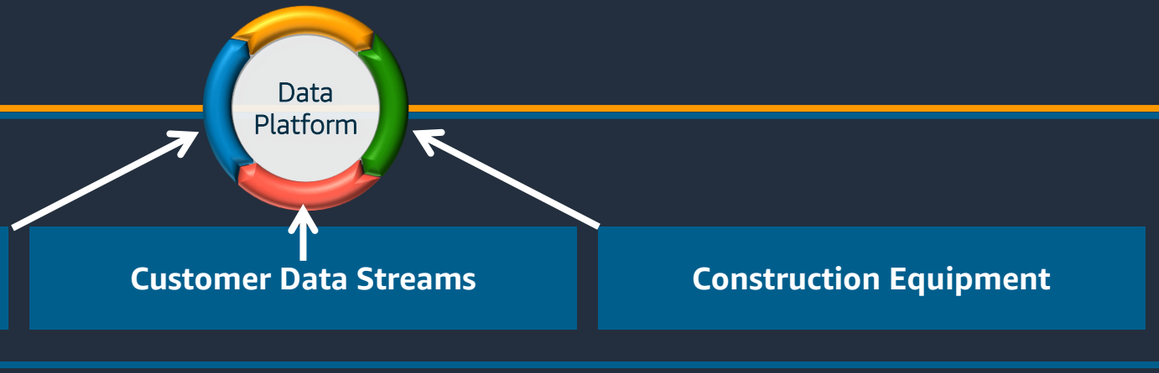
Tracking worker safety and location

Kinesis Data Streams, IoT Core, IoT Greengrass, IoT Events / Analytics

Construction Robotics

Automate manual construction activities

RoboMaker, Monitron, Lookout for Equipment, SageMaker



Supply Chain and Predictability

Integration with AWS services can optimize and provide a cockpit view of your project supply chain

Key Benefits

- Predict supply issues with sourcing risks
- Improve productivity with automation, real-time visibility, and early warning of issues
- Traceability (where, when, what, and how)
- Optimize sourcing activities
- Collaborate with freight transporters with shipment updates

AWS Supply Chain Solutions

Shipment tracking

Use cases
- Raw material supply tracking
- Customer delivery tracking
- Predictive ETA computation

Outcomes
- Improved on time in full
- Reduced freight expedites
- Reduced stock outs

Inventory tracking

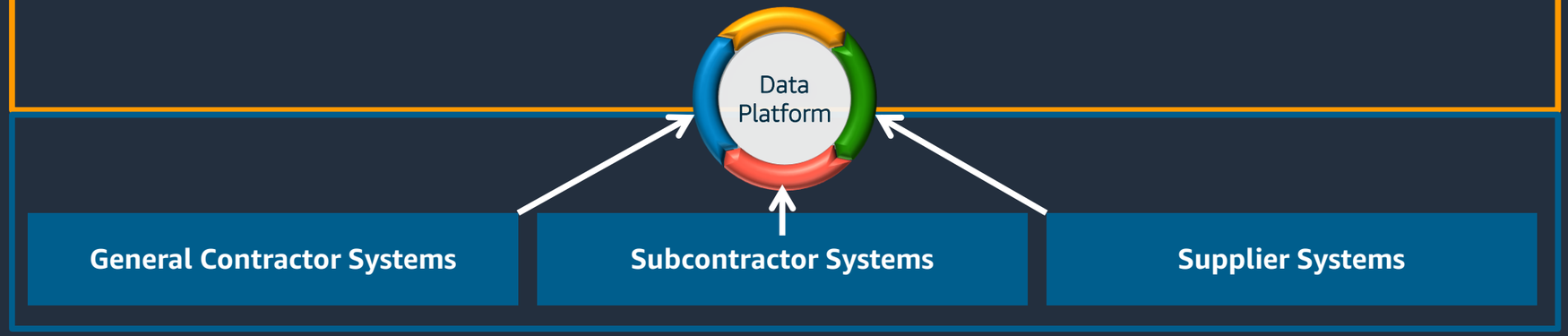
Use cases
- Origin provenance traceability
- Inventory condition monitoring
- Predictive inventory stock outs

Outcomes
- Improved inventory turns
- Reduced recalls
- Improved safety compliance

Asset tracking

Use cases
- Real time asset visibility
- Asset condition monitoring
- Predictive asset analytics

Outcomes
- Improved asset utilization
- Reduced capital expenses
- Improved fulfillment throughput

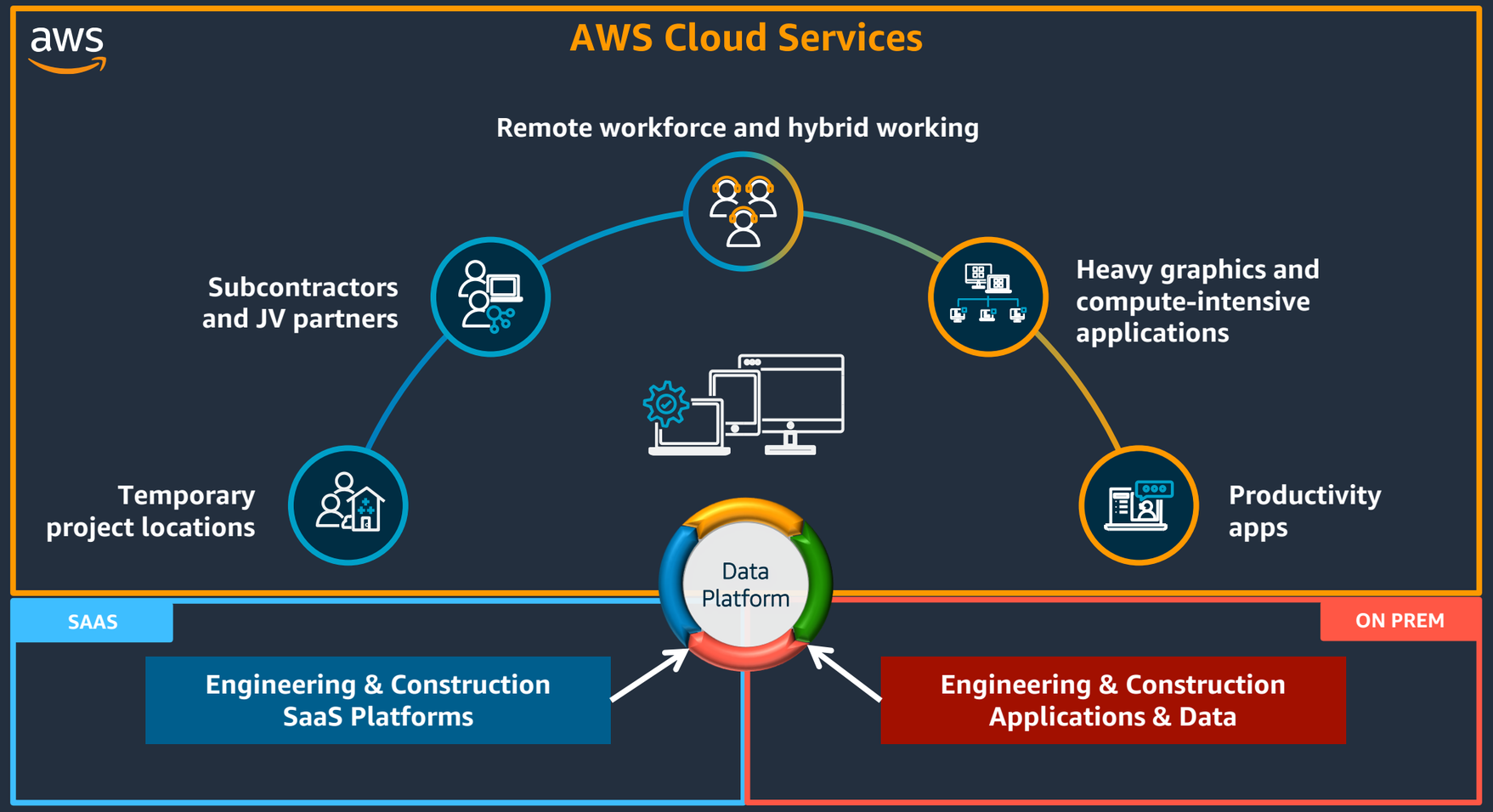


Productivity

Integration with AWS services can improve productivity and collaboration across the design, build, and operate lifecycle

Key Benefits

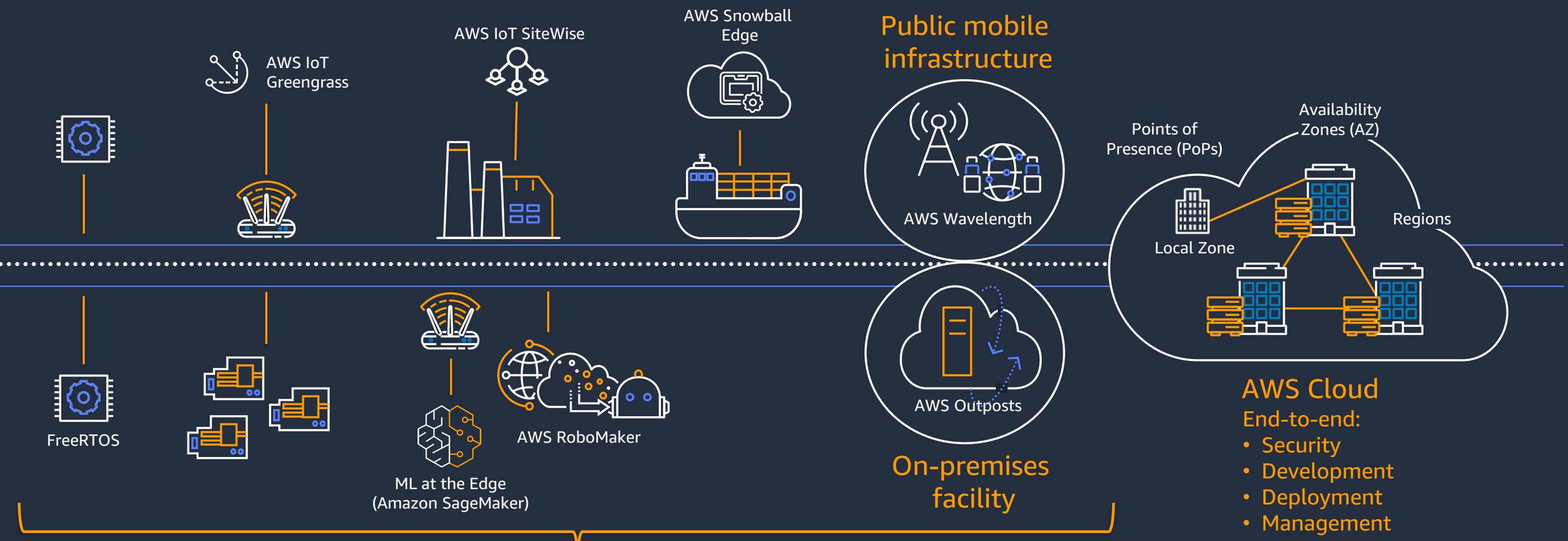
- Securely connect your applications and data to your project teams (wherever they are located)
- Bring together project data into a common data environment to improve collaboration
- Integrate data from your critical business systems to improve the delivery workflow



If you knew **the state of every thing** and could **reason on top of that data…**

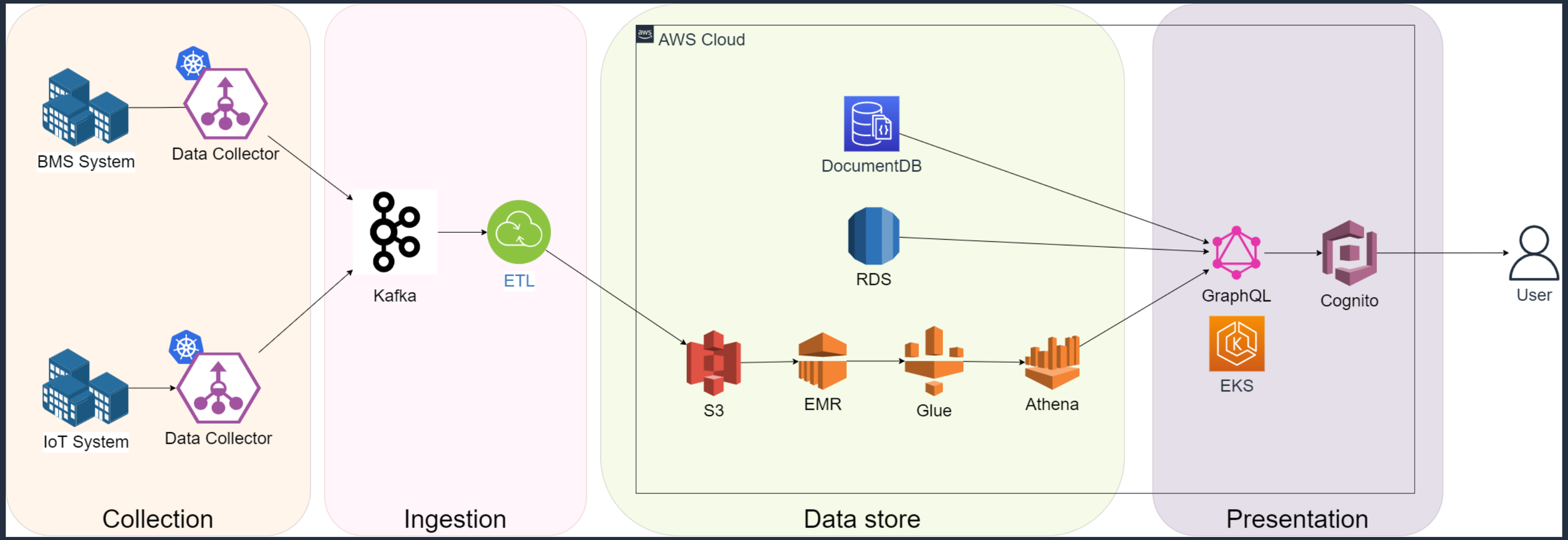
what **problems** would you solve?

AWS Edge-to-Cloud Continuum



- ✓ Reduce Latency
- ✓ Integrate with a broad set of cloud services and edge specific capabilities
- ✓ Reduce cost of development with single programming model

Enabled by AWS



On-premise

- Raw data streams from on premise site to cloud via Kafka streaming process
- ETL pipeline transform data to S3 data store

AWS

- Large amount of data (more than 100M numbers of data per day) processed in AWS Data pipeline (S3, EMR, Gule, Athena)
- Both structured and non-structured data stored in RDS and Document DB
- An auto scalable GraphQL engine is running on EKS
- User credential protected by Cognito

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Energy Upstream Innovation bpx on AWS

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Challenge: Duplicative infrastructure and applications

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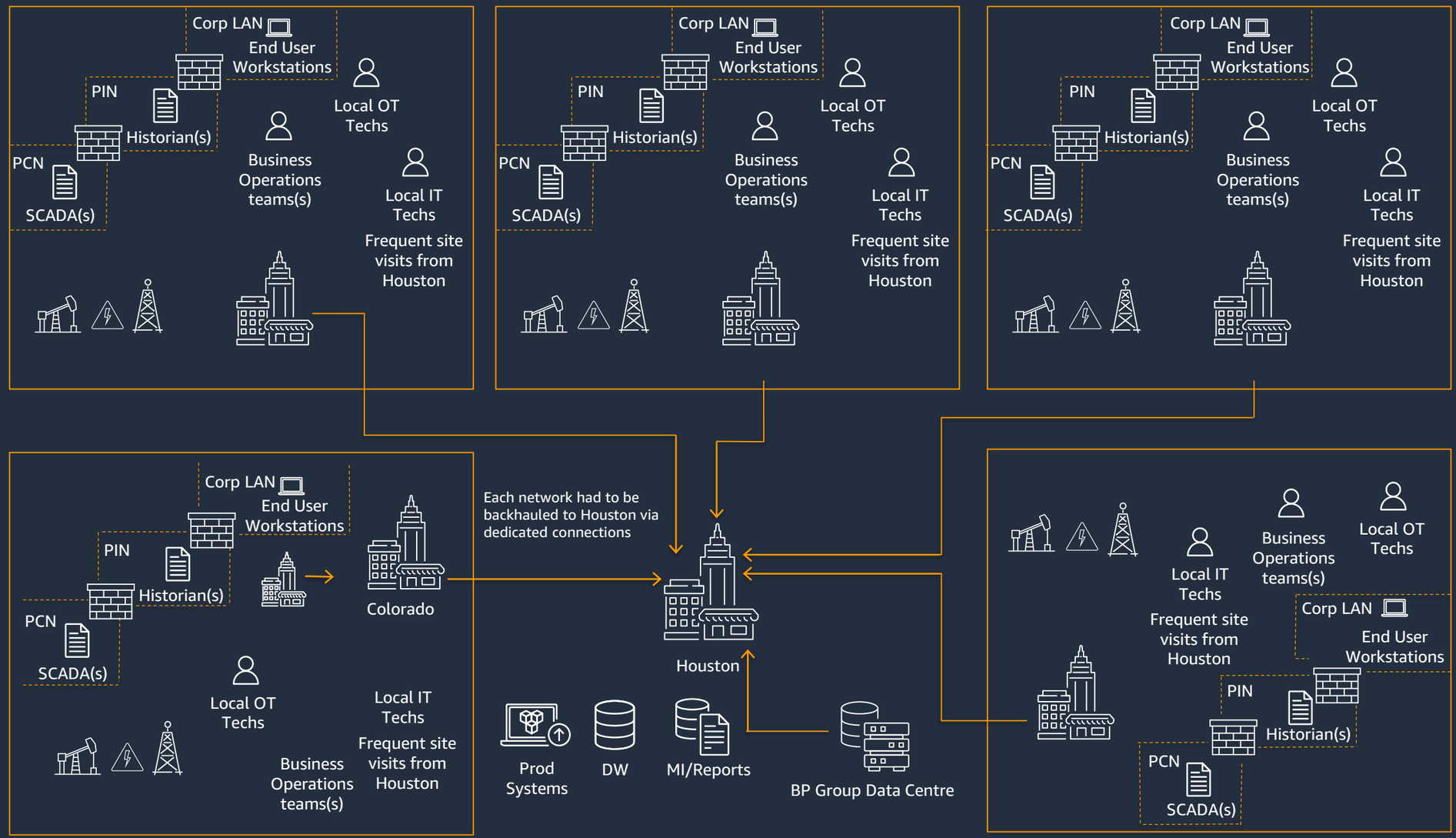

Complex and fragmented technology infrastructure

- Multiple States
- Multiple BUs
- 27 SCADA & RTU Management contracts

High IT/OT TCO

Disparate and localized data sets

No real-time asset visibility across the organization

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Solution: Centralized, cloud-hosted OT & IT

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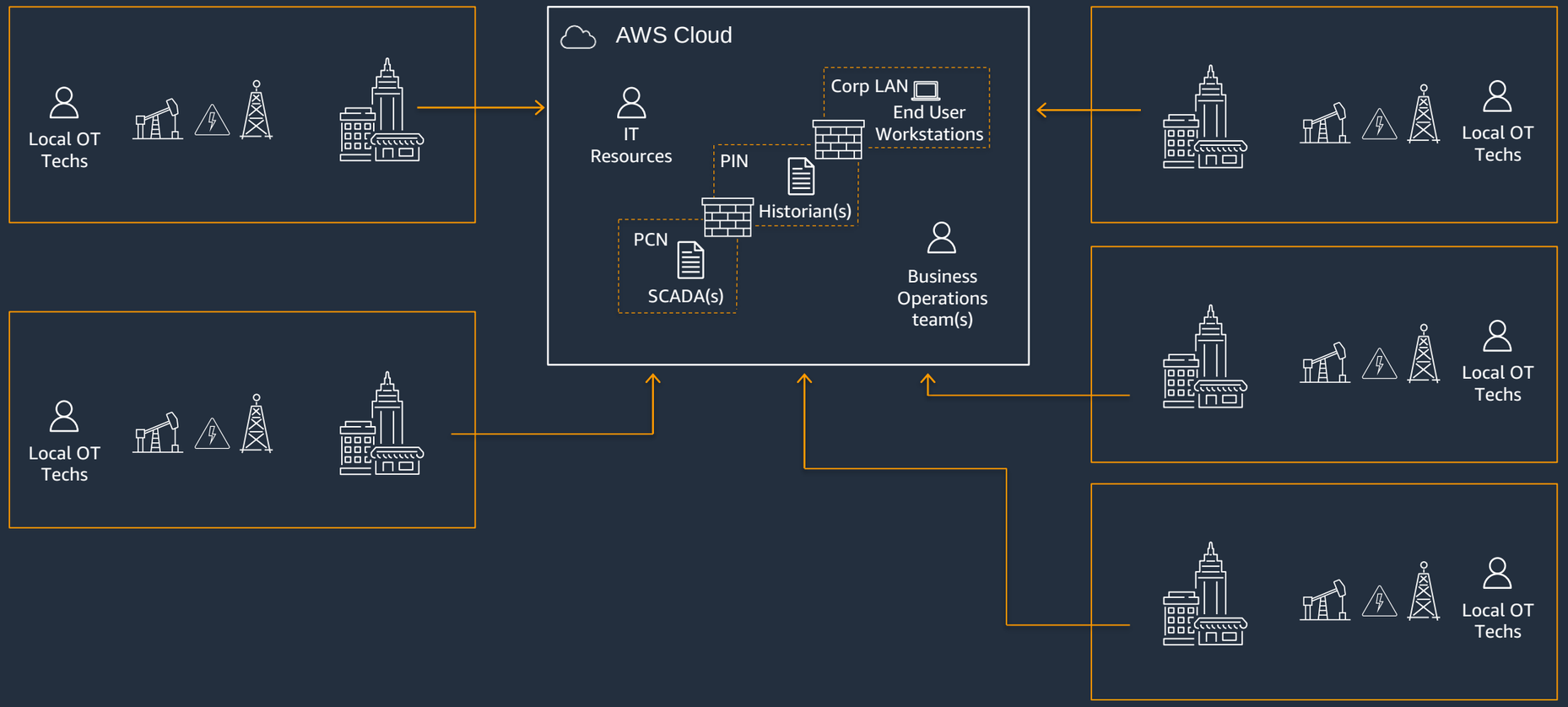

Results:

- Single Upstream SCADA
- Single Upstream Historian
- 3 Management Contracts
- On-premises data center nearly eliminated

PCN and PIN on AWS to Segregate Security Enclaves

Consolidated dataset in historian

Positioned for data analytics and AI/ML

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Initial Architecture

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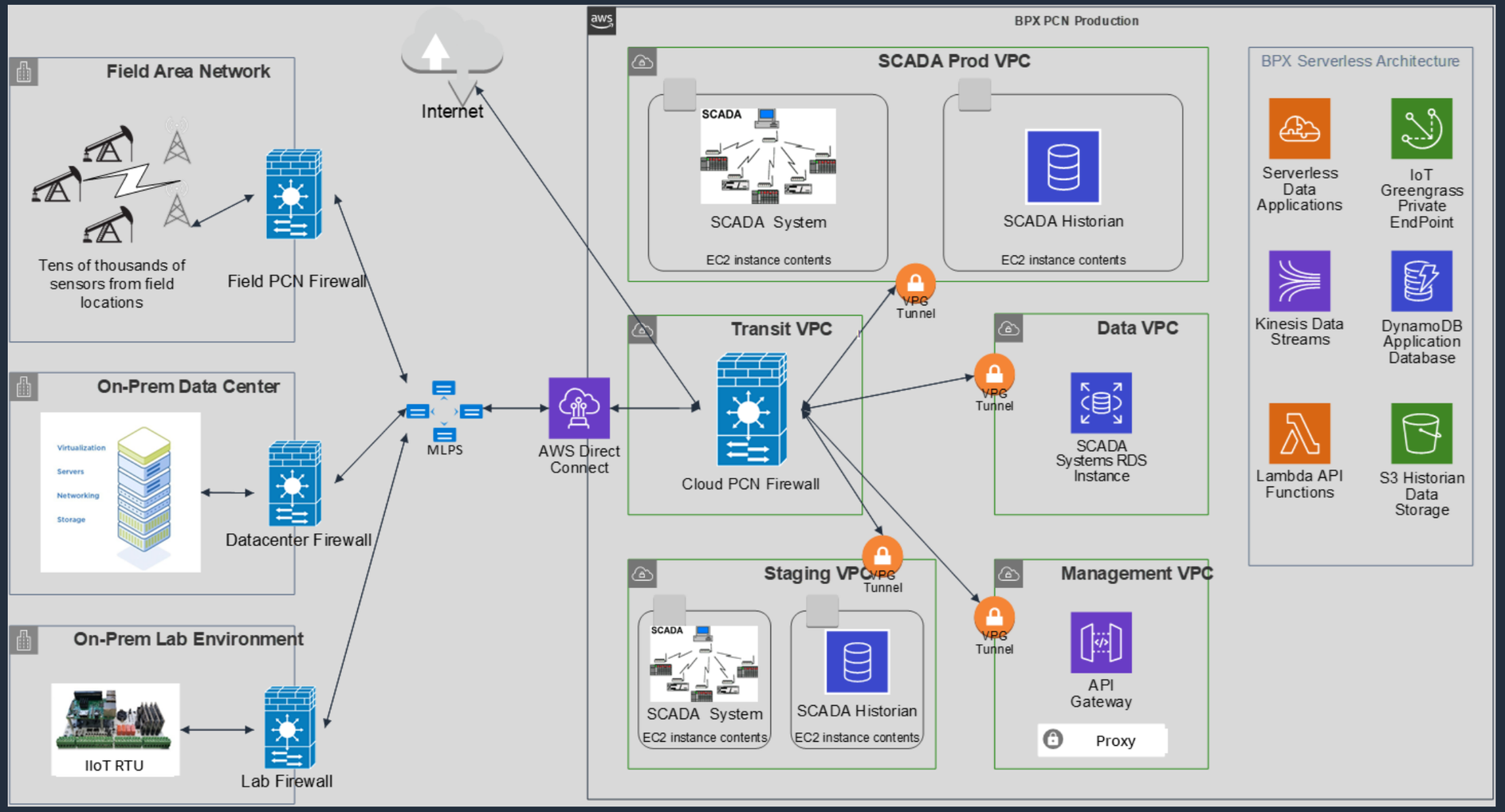

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Scaled Architecture

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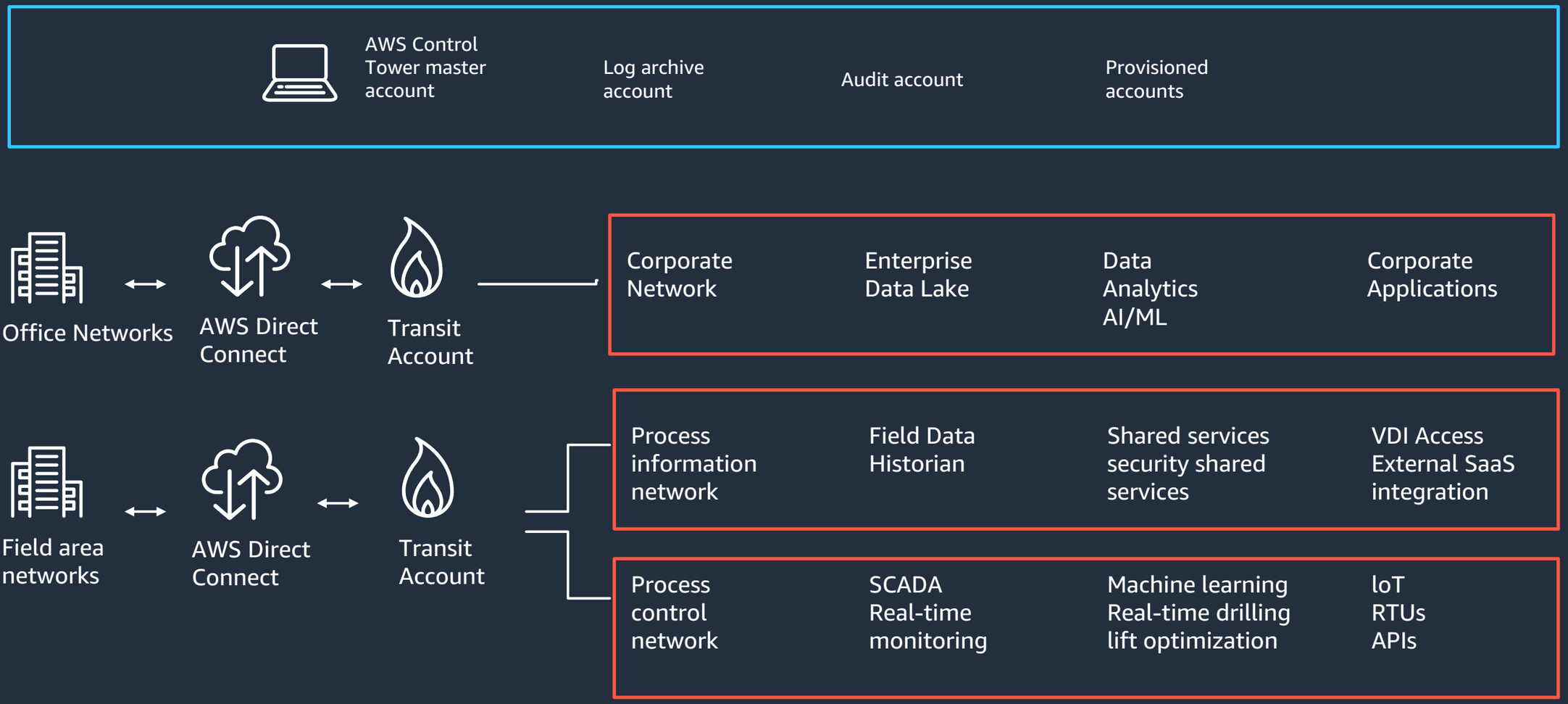

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bpx realized benefits utilizing AWS Cloud based OT

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Real-time asset visibility across the organization **across thousands of wells on a single platform**

Improved capability for **real-time analysis and optimization**

Reduced equipment downtime, better maintenance practices, **reduced opex**

Creating a **unified real-time and historical data repository for standardization, centralization, and simplification**

Capture and transfer of data straight from sensor to cloud, **improved cyber security**

45% reduction in IT/OT TCO

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Enabling Edge Automation and Sensing/Control on AWS

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With AWS, bpx energy has a more powerful edge strategy

At bpx energy the edge isn't a field office or a factory floor. Our edge is a 4-hour drive from the closest airport, 2-hours from the nearest gas station and 30 minutes from the last set of powerlines

- At bpx, devices are running critical processes on solar power & private networks
- Vendor lock-in is a major issue with both high capital & operational costs

- These vendors have deprioritized innovation in lieu of maintaining the status quo
- High cost & low innovation prevent bpx from adapting to new requirements & opportunities

- With AWS, bpx has been able to use hardware & sensors from outside our industry to meet these new requirements & opportunities at a fraction of the cost
- This has enabled an entire platform of present and future solutions that are more dynamic, secure, extensible and cost-effective

Architecture designed for the future

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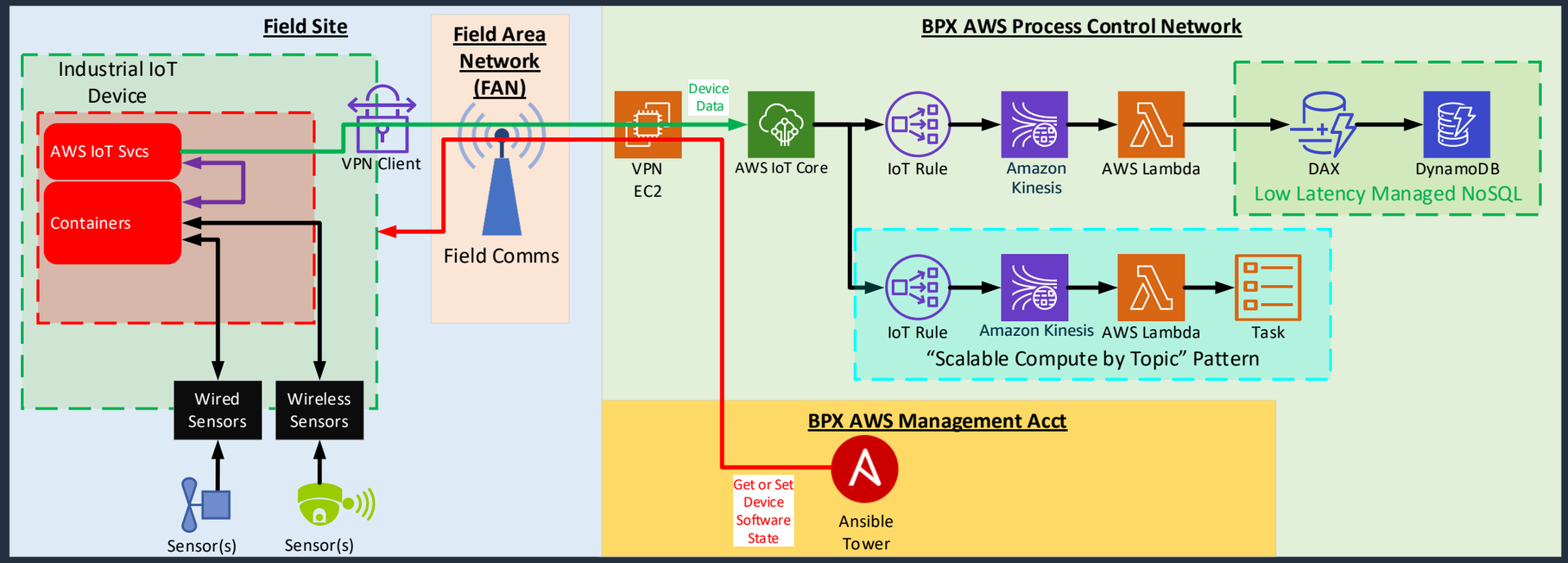
AWS collaboration gives bpx energy the confidence to deploy today knowing that we will be ready to support whatever comes tomorrow

- Our architecture allows us to combine OT & IT in a single environment
- We can use a container strategy over MQTT while historicizing in the cloud and statefully managing our edge hardware
- This type of architecture allows us to deploy low-cost hardware today and still be ready to enable new solutions in the future



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bpx realized benefits utilizing AWS for Edge Automation

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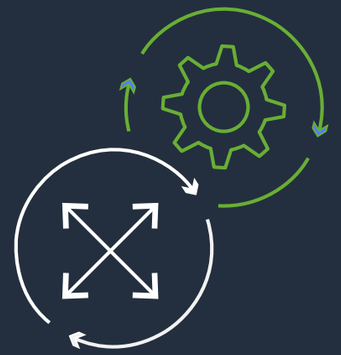
Private end-points for
enhanced security



Operations Efficiency
through automated
business & OTA updates

Secure Connectivity
through AWS service
AWS IoT Core

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Agility and Scalability from AWS

Concert achieves near real-time reporting and analytics with a custom data hub

Challenges

- A need to achieve near real-time integration among multiple data sources to simplify reporting, analytics & data and quality management
- Longer-term need to scale resources to match the projected ongoing growth of data volumes related to smart buildings, IoT, devices and sensors, digital twins and more

Solution

- POC demonstrated AWS' technical functionality, performance and scalability needed
- The custom data hub is built using Amazon S3, Amazon RDS, Amazon Redshift, and AWS Lambda

Benefits

- Custom cloud platform is about 90% more cost effective than Azure
- Updates 6 times faster for near real-time processing
- Connects disparate data sources for improved financial reporting
- Open platform is ready for future technology changes

> "Concert's success shows that on AWS, even small IT teams can create custom data platforms to connect disparate data sources, deliver custom reporting, and integrate real-time data services."

Mark Cosyn
VP Information Systems and Technology

Case Study: https://aws.amazon.com/solutions/case-studies/concert-properties-case-study/

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We have a record of building a sustainable future with our partners

Siemens builds their Digital Lifecycle Platform for Smart Buildings on AWS

Challenges	Solution	Benefits
• Digitalize building technology business from sales/planning to operations • Establish machine readable single source of information for all structural and asset data in commercial buildings • Scale to 500,000 buildings and billions of devices of different vendors	• Establish digital twins of buildings on MindSphere, Siemens IoT operating system • Develop value-add services e.g. optimization of energy/space usage • Adopt DevOps culture and practices in development teams	• Reduced innovation and deployment cycles • 50% reduction in energy cost • 20% maintenance cost reduction • 20% higher occupancy rate • 15% increased customer satisfaction

SIEMENS

Company:	Siemens Schweiz AG
Industry:	Building Technology
Country:	Switzerland
Employees:	28000+
Website:	https://www.buildingtechnologies.siemens.com/bt/global/en

"With the support of AWS Professional Services we were able to ensure our digital platform fulfills our very high demands on security and scalability. AWS Professional Services were key in speeding up our project and significantly increasing the expertise of our teams."

Markus Winterholer
Chief Product Owner, Digital Lifecycle Platform

Headquartered in Zug, Switzerland, the Building Technologies Division is a leading provider of automation technologies and services for commercial, industrial and public buildings and infrastructures across their entire lifecycle.

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Thank you!