Azure IoT Data Services Solution Overview

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Events
Microsoft Azure Training Days – Containers and Path to the Cloud

1-day hands-on technical workshop will provide insights on the how Azure allows for several hosting options - Azure Container Instances, Web App for Containers, Azure Kubernetes Service, and Service Fabric.

Detroit – Oct. 30
To Register – aka.ms/PathToCloudDetroit
What is IoT?
Azure IoT Review
Bike Rental Scenario
Demo
Real-Life Scenarios
Wrap Up and Resources
New monetization avenues due to IoT-related services

Companies that increased revenue as a result of IoT implementation

Average increase in operating income (avg. 8%) among the most digitally transformed enterprises

Connected “things” by 2025 generating 180ZB of data

Engage customers

Optimize operations

Empower employees

Transform products

Data + intelligence

80B

$130B

80%

$100M
Intelligent Cloud

Intelligent Edge
Azure IoT reference architecture

https://docs.microsoft.com/en-us/azure/architecture/reference-architectures/iot/
Azure IoT Hub

- Establish bi-directional communication with billions of IoT devices
- Enhance security with per device authentication
- Manage & Provision devices at scale w/ IoT Hub Device Provisioning Service
- IoT Hub scales to billions of events per second, simultaneously
- Multi-language and open source SDKs
Azure IoT Hub simple architecture

- Things
- Provisioning
- Cloud Gateway
- Insights
- Actions

Azure IoT Hub
Azure IoT Hub Device Provisioning Service
Azure Event Hub

- Highly scalable, stream millions of events per second from any source
- Collects, Transforms and Stores events from remote devices
- The "front door" for an event pipeline
- Integrates with real-time analytics
- Low latency at massive scale
- Fan In Model, Low Cost, and Strict Ordering
✓ Use Event Hubs to process and analyze massive amounts of data produced by connected devices.
✓ Use IoT Hubs if you require two-way communications.
## Hub Comparison

<table>
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<tr>
<th>IoT Capability</th>
<th>IoT Hub standard tier</th>
<th>IoT Hub basic tier</th>
<th>Event Hubs</th>
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<tbody>
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<td>Device-to-cloud messaging</td>
<td>✓</td>
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<td>Protocols: HTTPS, AMQP, AMQP over webSockets</td>
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<td>Protocols: MQTT, MQTT over webSockets</td>
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<td>Per-device identity</td>
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<td>File upload from devices</td>
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<td>Device Provisioning Service</td>
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<td>Cloud-to-device messaging</td>
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<td>Device twin and device management</td>
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<td>Device streams (preview)</td>
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<tr>
<td>IoT Edge</td>
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Azure Functions

Serverless
- Event-driven scale
- Reduced Dev Ops

Accelerate development
- nodeJS
- C#
- python
- Develop your way
- Local development

Bind into services
- Azure Service Bus
- Azure Event Hub
- Azure Storage
- Dropbox
- Sendgrid
- AzureDocDb
- OneDrive
- Box
- Twilio
Scenarios for Serverless

Anything that needs to respond to events

Real-time stream processing
- Millions of devices feed into Stream Analytics
- Transform to structured data
- Store data in SQL DB

Timer-based processing
- Every 15 minutes
- Find and clean invalid data
- Clean table

Backends (Mobile/IoT/Web)
- Photo taken and WebHook called
- Stores in blob storage
- Produces scaled images

Real-time bot messaging
- Message sent to Chatbot
- Cortana Analytics answers questions
- Chatbot sends response
Cosmos DB

Cloud-born
Built from the ground up
Global distribution
Elastic scale out of storage & throughput
Guaranteed low latency at the 99th percentile
Five well-defined consistency models
Comprehensive SLAs
Azure Maps

Seamless handling of any data output or volume

Data made available immediately, and indexed automatically

Real-time, resilient change feeds logged forever and always accessible

Native integration with Azure Functions

- **Maps**
  Render maps and satellite imagery across many geographies

- **Map Control**
  Integrate rich mapping visualizations into applications

- **Routing**
  Calculate routes from N to N points for optimal calculations

- **Search and Geocoding**
  Convert places and addresses to coordinates; or, convert coordinates to addresses or cross streets

- **Traffic**
  Show real time traffic information

- **Time Zones**
  Obtain time zone and current time information
Blue Bike Scenario
Everything’s Better On a Bike

Welcome to BLUEbikes, your public bike share system in Boston, Brookline, Cambridge and Somerville.

How it works:

1. **Unlock** - Pick up a bike at any station around Boston, Brookline, Cambridge and Somerville.

2. **Ride** - Take a quick one-way trip or a leisurely ride around town. Commute to work or school, run errands and explore the city.

3. **Return** - Return your bike to any station. Slide the bike firmly into an empty dock and wait for the green light to make sure it's locked.
Stateless Architecture

Allows for fast, real-time analysis of records

Can be expanded to be stateful
Demo

Send data to Azure
Real-Life Scenarios
Problem
Hospital acquired infections (HAIs) are a major epidemic in our Health Care Industry today. One in twenty patients in a hospital acquire an HAI during a hospital visit. Nearly 75,000 people die from an HAI every year, it costs the US healthcare system $35B a year, and an estimated $1,100 per admission.

✓ Lack of proper hand washing in a healthcare setting.
✓ Hand hygiene compliance rates in the US – less than 50%.
✓ HAIs are paid by Hospitals not Insurance Company’s.

Resolution
✓ Create solutions to track & monitor hand hygiene.
✓ Monitor hand hygiene in real-time with secure IoT dispensers.
✓ Measure compliance through Microsoft Azure IoT services.
✓ Azure IoT collects Big Data via Activity Counters + Dispensers Sensors.
✓ Deployed 25,000 hands-free dispensers across 100 healthcare facilities.
✓ Increase hygiene compliance – save lives.

Roadmap
✓ Employee level compliance through badged based proximity sensors.
✓ Improved security – Azure Sphere | Improved intelligence – Azure IoT Edge.

Better Insights!
Increased Patient Safety!

Application Info
- Azure DevOps + Visual Studio
- Azure IoT + Event Hubs
- Stream Analytics
- 2M events/day
- Azure SQL DB
- Azure App Service - Analytics Portal
- Application Insights + PowerBI
Heavy Equipment Company

Large corporation is one of the top manufactures of construction, mining, forestry, and military equipment.

Equipment Parts
- Builds large loaders replacement parts.
- Majority of revenue from parts.
- Uses IoT data for preventative maintenance before parts wear out.
- Proactively informs customers to secure parts.

Equipment Insights
- Articulated Face Engagement Detection
  - Loaders strain on many hinge points
  - Can damage machine frame – caused by operator
  - Real-time processing using Azure Stream Analytics
  - Real-time feedback displayed to operator – use to take 18 hrs.
- Detected by examining real-time data from sensors
  - Direction, bucket position, frame articulation, forward velocity, load.
  - Goal: Provide in-cab alert to operator immediately
- Improvement of 24+ hours to alert equipment owners

IoT In the Real-World

Mining Wheel Loaders
$10M+ each
8 ft tires and weighs 500k lbs

IoT In the Real-World

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Factory on Wheels
- Azure IoT Edge device under seat
  Sensor Data >> Mine DB >> Azure IoT Hub.
- Azure IoT Event Hub collects events.
- Programmable logic controllers.
- 300-400 sensors.
- 1,500 pieces of data per second.
- 3-4 Ethernet networks.
- Wi-Fi network.
Engaged in hydrocarbon exploration and pipeline transport

**Oil and Gas Industry**

**Drilling Wells**
- Drilling >>> Completions >>> Consuming.
- Provide real-time information from IoT devices
- Completions provides the largest cost savings opportunity
- Velocity, volume, and pressure from drill heads.
- Petroleum engineers monitor drilling equipment.

**Corporate & Water Trucks**
- Daily GPS data collection for corporate and contracted water trucks
- Determine truck locations relative to existing pad sites.
  - Is truck in route or on pad? Available for other jobs?
  - Are there enough trucks to complete jobs?
- Using Azure Databrick for analysis and reporting.

**Roadmap**
- 2,000 Production Wells >>> 1 msg/sec = 240M msgs/day

**IoT In the Real-World**

**Application Info**
- Azure IoT Hub + Azure Event Hub
- Azure Stream Analytics
- Databricks
- 1 device message/sec
- Azure BLOB Storage
- Azure DevOps Pipelines
- Dashboards using PowerBI
Looking to **USE** an IoT Solution?

Use managed and industry-specific solutions to get started quickly and easily. [Try IoT solutions](#)

Ready to **BUILD** IoT Applications?

Find everything you need to develop advanced IoT apps using familiar languages and tools. [Build IoT apps](#)

1. Go to Azure.com/IoT
2. **Skill up at IoT School**
3. **Select a partner**
4. **Contact Us**
Azure Trial Account
(12 months free services + $200 credit)
https://azure.microsoft.com/en-us/free/
What is a Raspberry Pi + SenseHAT?

- More powerful processor
- Choice of RAM: 1GB, 2GB, 4GB
- USB-C Power supply
- MICRO HDMI PORTS: Supporting 2 x 4K displays
- USB 2
- USB 3
- GIGABIT ETHERNET
Azure IoT PiDay Workshop

Workshop to build out a real-life IoT scenario by capturing IoT data and ingesting it into the Azure Cloud as a Data Services Solution.

Hands on Labs with IoT Device

https://github.com/Azure/IoT-Pi-Day
Thank You!

https://ptdrv.linkedin.com/vcg0vvc
Additional Resources
Resources

• Step-by-step guidance with your first IoT deployment

• IOT Suite For Developers Video:
  https://www.youtube.com/watch?v=5ES-1g_mGxY

• IOT customer videos

• IOT Accelerators
  https://docs.microsoft.com/en-us/azure/iot-accelerators/

  - Analyze Boston link
    https://data.boston.gov/dataset/hubway-system-data

  - Blue Bikes System Data
    https://www.bluebikes.com/system-data