Building IoT solutions with Azure

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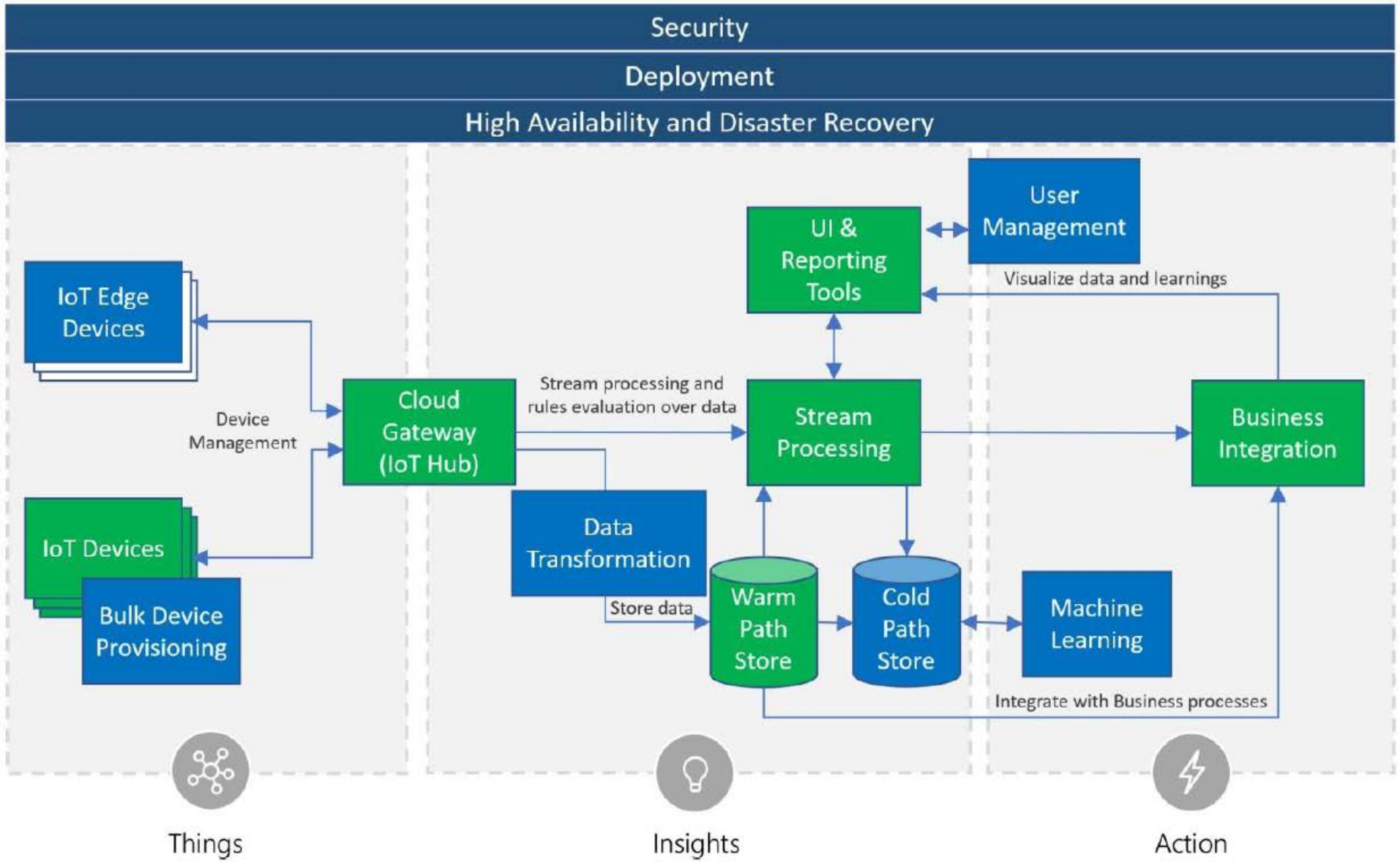
Agenda

- Reference IoT Architecture
- Azure IoT Hub
- Azure Stream Analytics
- Demo

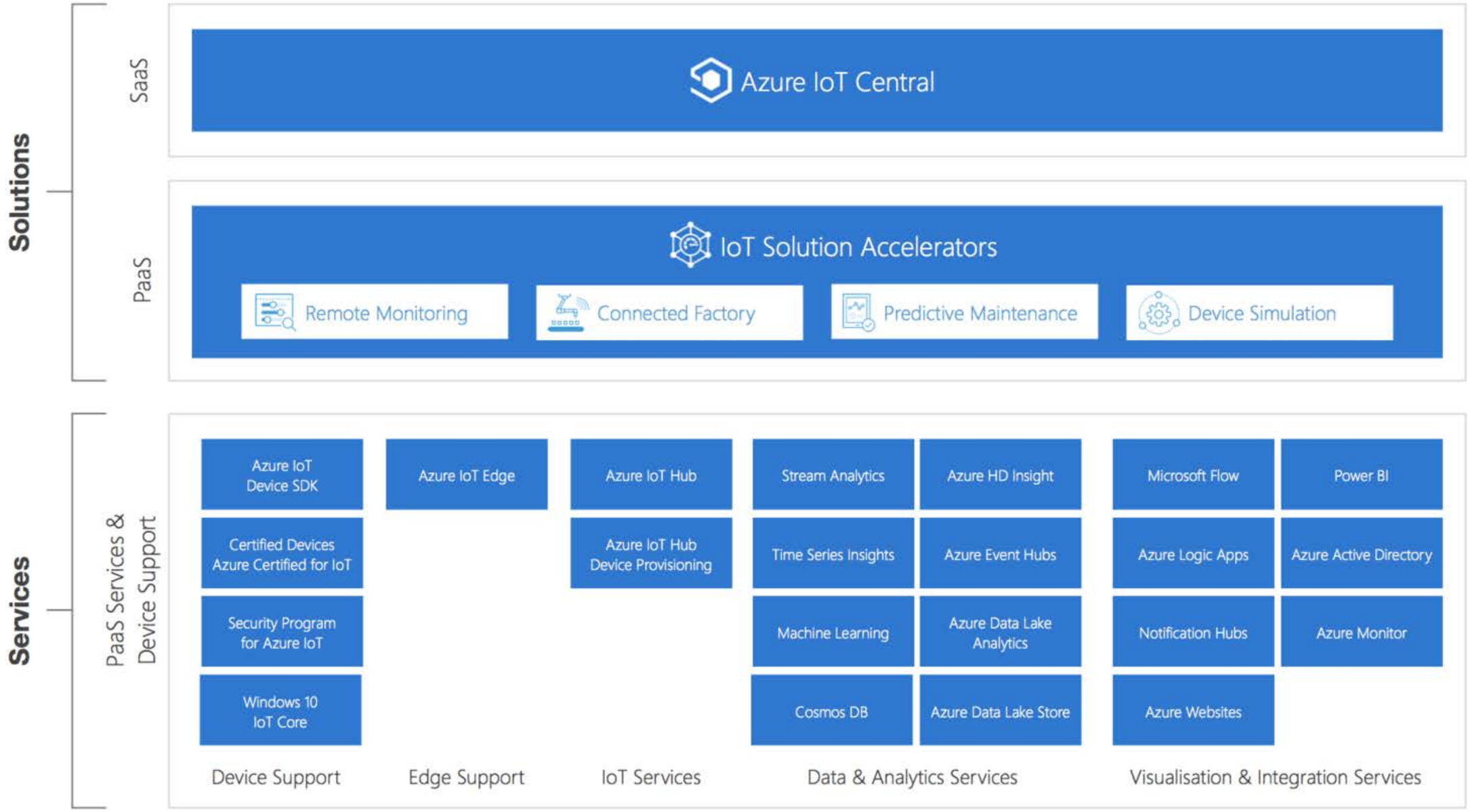
What is an IoT solution?

"The Internet of things (IoT) is the extension of Internet connectivity into physical devices and everyday objects."

Reference IoT Architecture



Technology options



Azure IoT Hub

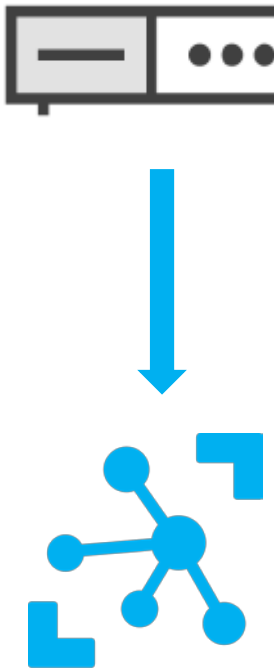
Bidirectional communication

Authentication Per Device

Automate Device Provisioning

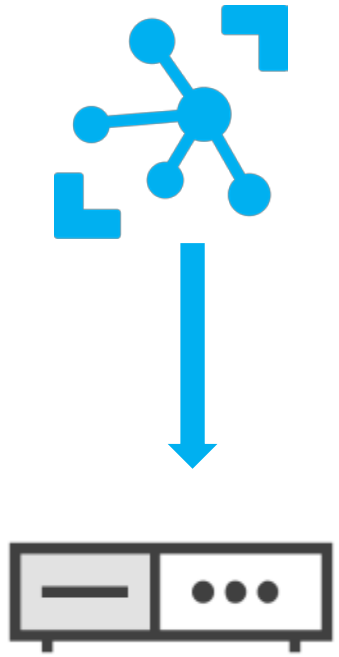
Azure IoT Hub Messaging

Device to Cloud (D2C)



D2C messages
Device twin’s
File uploads

Cloud to Device (C2D)



C2D messages
Twin’s desired
Direct methods

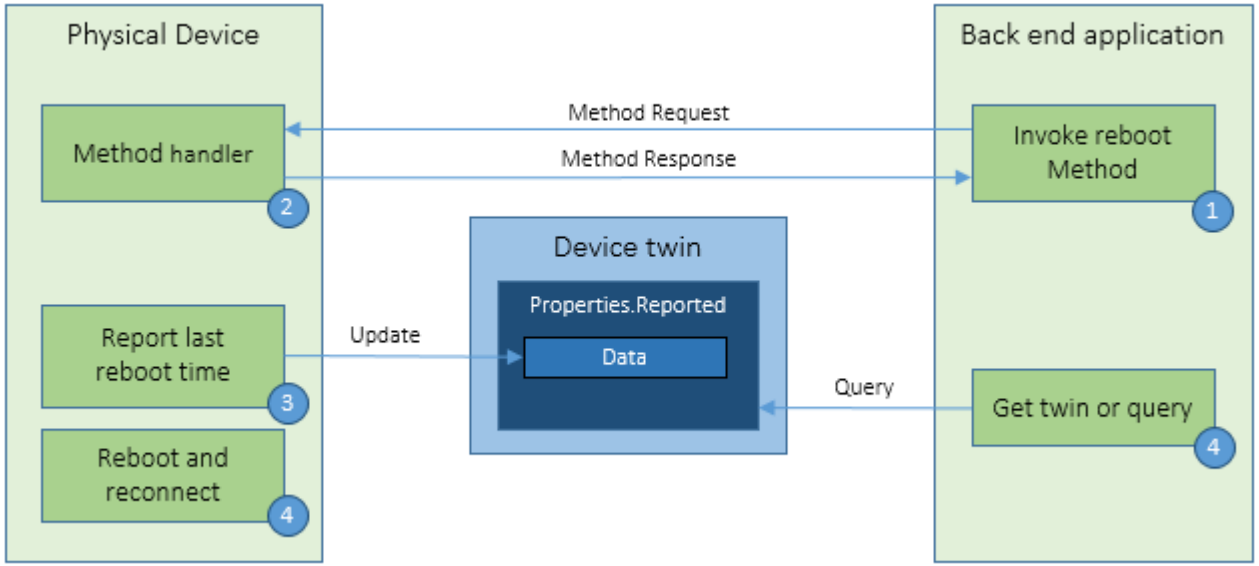
Communication Protocols

Protocol	When you should choose this protocol
MQTT MQTT over WebSocket	Use on all devices that do not require to connect multiple devices (each with its own per-device credentials) over the same TLS connection.
AMQP AMQP over WebSocket	Use on field and cloud gateways to take advantage of connection multiplexing across devices.
HTTPS	Use for devices that cannot support other protocols.

https://docs.microsoft.com/en-us/azure/iot-hub/iot-hub-devguide-protocols

Device management patterns

- Reboot
- Factory reset
- Configuration
- Firmware update
- Reporting progress and status



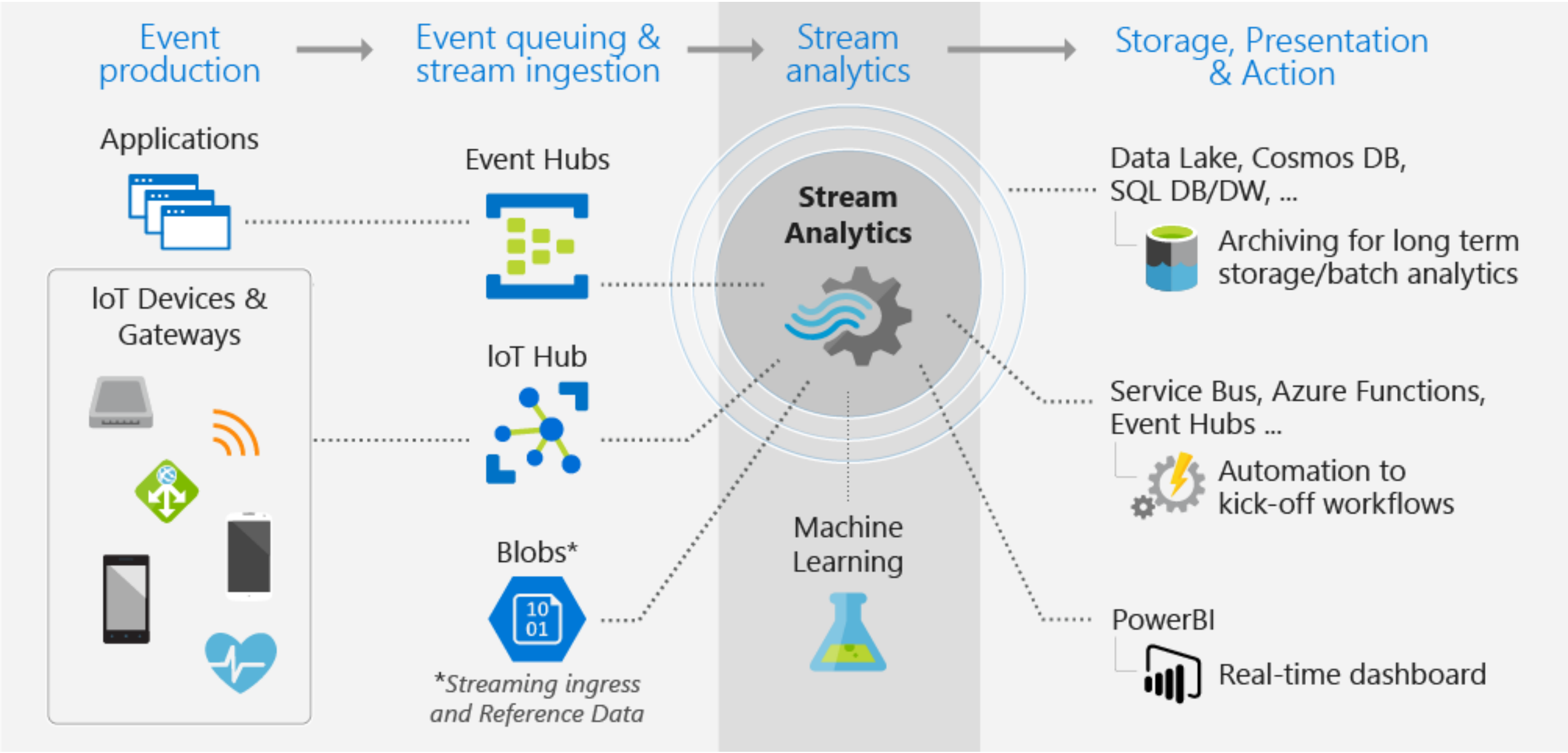
https://docs.microsoft.com/en-us/azure/iot-hub/iot-hub-device-management-overview

Device and Service SDKs

	Node.js	.NET	Java	Python	Android	C	iOS
Send telemetry	↗	↗	↗	↗	↗	↗	↗
Control a device	↗	↗	↗	↗	↗		

If a device cannot use the device SDKs,
it can still connect to the public device endpoints using the MQTT protocol on port 8883.

Azure Stream Analytics



Core concepts

Inputs

1

azbootcamphub

Outputs

1

powerbi

Query

Edit query

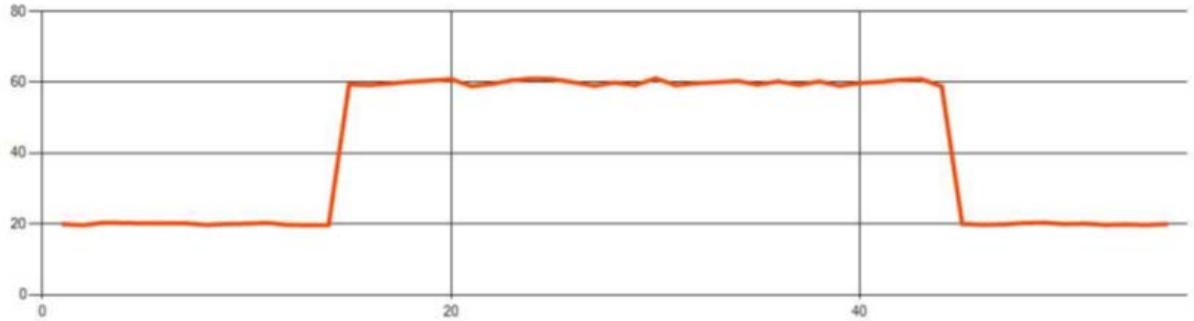
```
1   WITH AnomalyDetectionStep AS
2   (
3       SELECT
4           EVENTENQUEUEDUTCTIME AS time,
5           CAST(temperature AS float) AS temp,
6           CAST(humidity AS float) AS humidity,
7           AnomalyDetection_SpikeAndDip(CAST(temperature AS float), 95
8               OVER(LIMIT DURATION(second, 120)) AS TempScores,
9               AnomalyDetection_SpikeAndDip(CAST(humidity AS float), 9
10              OVER(LIMIT DURATION(second, 120)) AS HumidityScores
11      FROM [azbootcamphub]
12  )
13  SELECT
14      time,
```

Built-in ML based anomaly detection

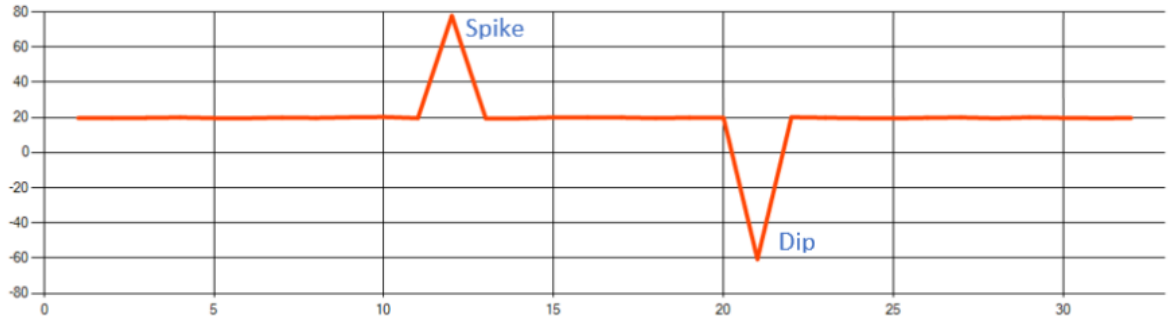
Un-supervised learning models

2 broad categories of anomalies detected
- Temporary Anomalies: Spikes and Dips
- Persistent Anomalies: Slow +/- trends, Bi-level changes

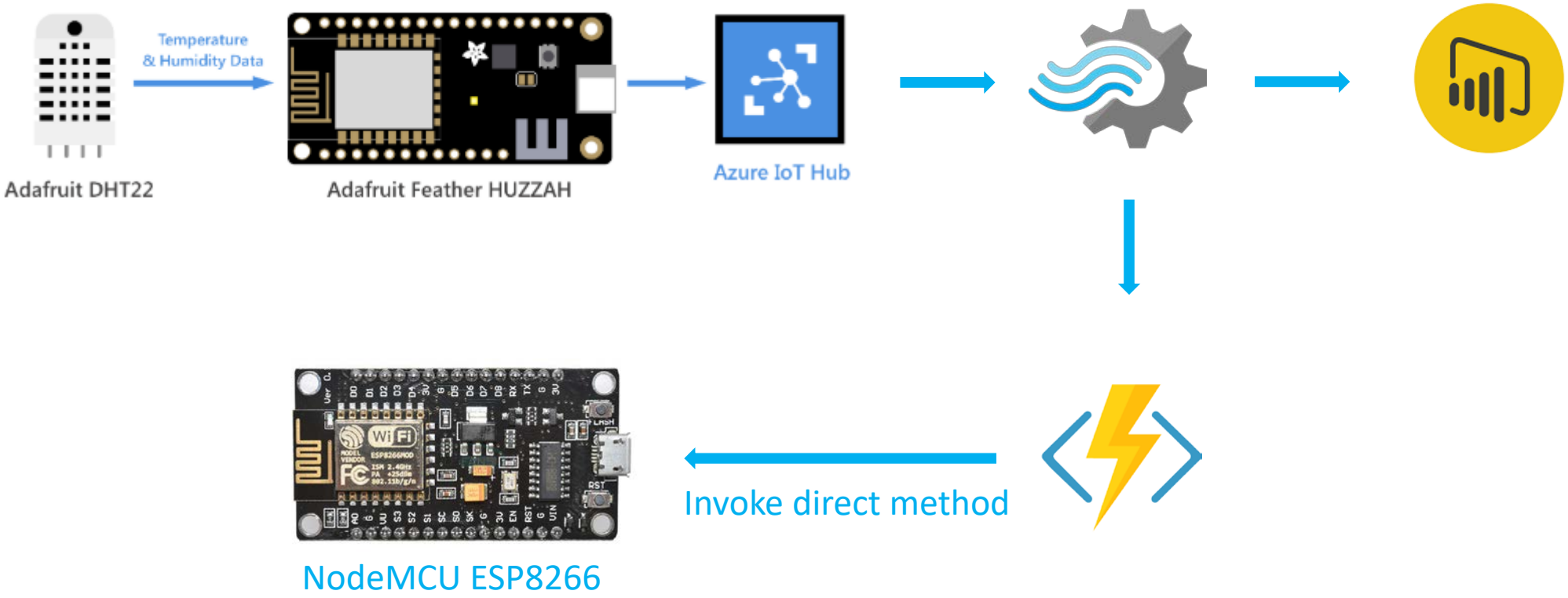
Change point: AnomalyDetection_ChangePoint



Spike and Dip: AnomalyDetection_SpikeAndDip



Demo – Spike and Dip anomaly detection




thank
you