



# IoT and Azure


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# Agenda

- Case studies
- IoT Services
- Putting it all together
- ... lead into next session on data



"The more data we have, the more we can learn and put together algorithms to predict problems. It's about taking information to make systems even more efficient and productive."

**DOUG WEBER**

BUSINESS MANAGER,  
REMOTE APPLICATION MONITORING  
ROCKWELL AUTOMATION

**Rockwell**  
**Automation**



WATCH VIDEO



# The Internet of Things gives the world's cities a major lift

[THYSSENKRUPP ELEVATOR VIDEO](#)

## CHALLENGE

Leading global manufacturer ThyssenKrupp Elevator maintains more than elevators worldwide, including those at some of the **1.1 million** world's most iconic buildings. ThyssenKrupp wanted to better compete in their industry by offering dramatically **increased uptime**, taking preventative maintenance a step further to predictive and even **pre-emptive service**.

## SOLUTION

ThyssenKrupp teamed up with Microsoft and CGI to create a connected, **intelligent** asset monitoring **system** based on Microsoft Azure Intelligent Systems Service, Power BI for Office 365, and Microsoft Azure Machine Learning. The solution connects thousands of sensors and systems in its elevators to the **cloud** and draws this data into a **dashboard** available on PCs and **mobile** devices for a real-time view of key performance indicators.

## BENEFITS

- **Increases reliability** through predictive maintenance and rapid, remote diagnostic capabilities
- **Reduces costs** for ThyssenKrupp and their customers
- Rich, **real-time** data visualization
- Data continually feeds into dynamic predictive models



## Create the Internet of Your Things

[www.InternetofYourThings.com](http://www.InternetofYourThings.com)

"We wanted to go beyond the industry standard of preventative maintenance, to offer predictive and even preemptive maintenance."

Andreas Schierenbeck  
CEO

Platform Services

Security & Management

- Portal
- Active Directory
- Multi-Factor Authentication
- Automation
- Key Vault
- Store / Marketplace
- VM Image Gallery & VM Depot

Compute

- Cloud Services
- Service Fabric
- Batch
- Remote App

Web and Mobile

- Web Apps
- API Apps
- API Management
- Mobile Apps
- Logic Apps
- Notification Hubs

Developer Services

- Visual Studio
- Azure SDK
- Team Project
- Application Insights

Hybrid Operations

- Azure AD Connect Health
- AD Privileged Identity Management
- Backup
- Operational Insights
- Import/Export
- Site Recovery
- StorSimple

Integration

- Storage Queues
- Biztalk Services
- Hybrid Connections
- Service Bus

Analytics & IoT

- HDInsight
- Machine Learning
- Data Factory
- IoT and Event Hubs
- Stream Analytics
- Mobile Engagement

Data

- SQL Database
- SQL Data Warehouse
- Redis Cache
- Search
- DocumentDB
- Tables

Media & CDN

- Media Services
- Content Delivery Network (CDN)

Infrastructure Services

Compute

- Virtual Machines
- Containers

Storage

- BLOB Storage
- Azure Files
- Premium Storage

Networking

- Virtual Network
- Load Balancer
- DNS
- Express Route
- Traffic Manager
- VPN Gateway
- Application Gateway

Datacenter Infrastructure (24 Regions, 19 Online)



# Analytics and IoT

## Transform data into intelligent action



Connect & Control  
Azure IoT Hub





# Azure IoT Hub

## Designed for IoT

Connect up to 10 million devices

## Service assisted communications

Secure bi-directional communication

Command and control

## Cloud-scale messaging

Device-to-cloud and Cloud-to-device

Durable messages (at least once semantics)

## Cloud-facing telemetry ingestion

Delivery receipts, expired messages

Device communication errors

## Per-device authentication

Individual device identities and credentials

## Connection multiplexing

Single device-cloud connection for all communications (C2D, D2C)

## Multi-protocol support

Natively supports AMQP, HTTP

Designed for extensibility to custom protocols

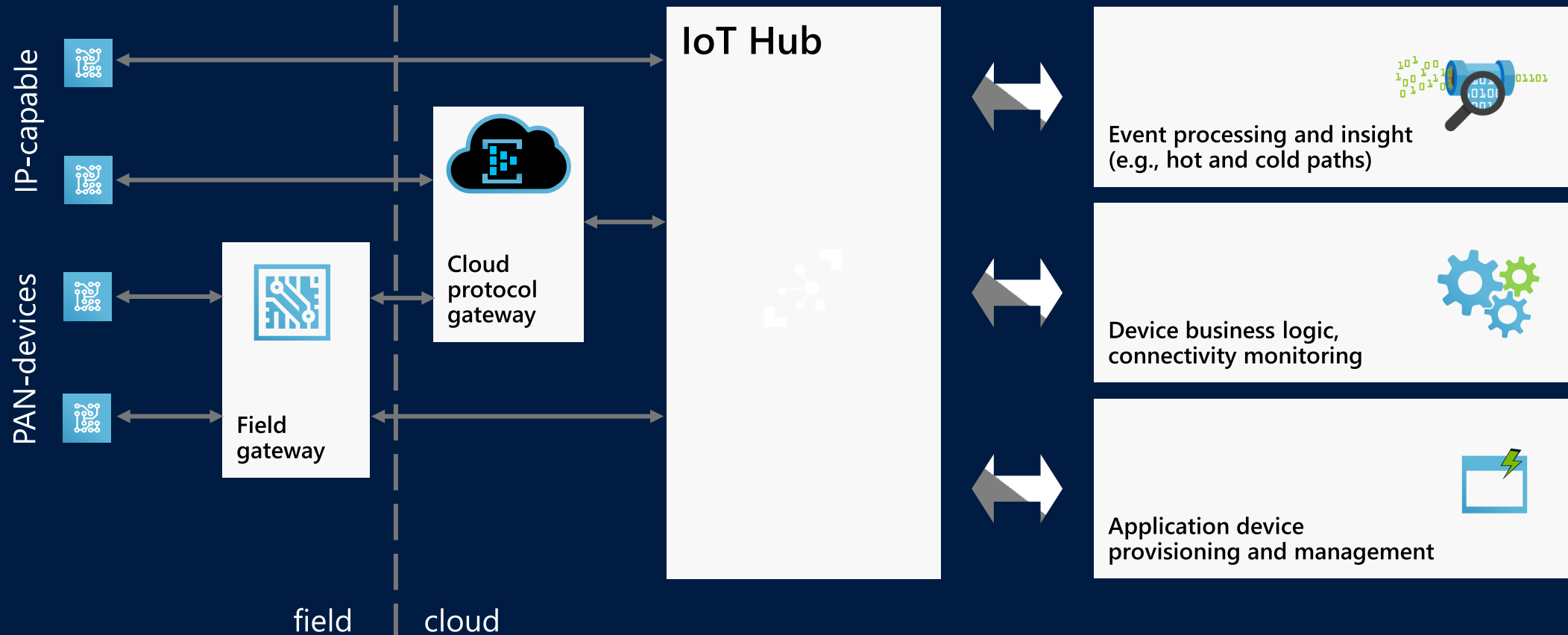
## Multi-platform

Device SDKs available for multiple platforms (e.g. RTOS, Linux, Windows)

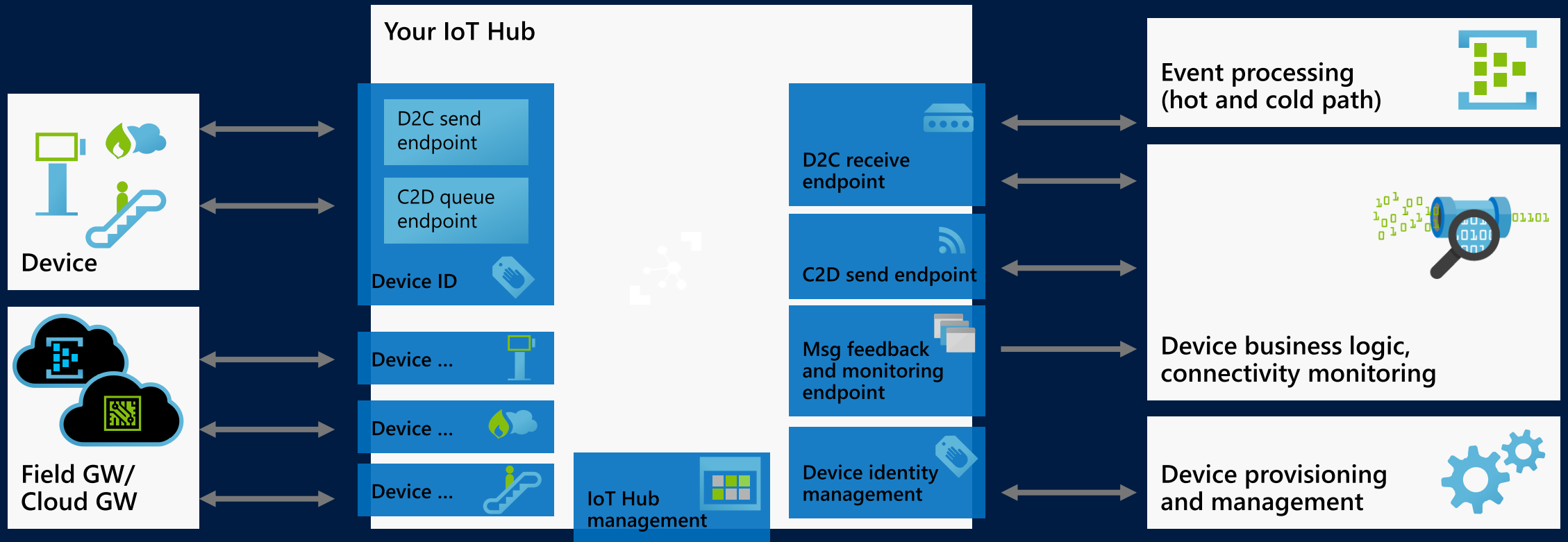
Multi-platform Service SDK.



# Connect your devices to Azure



# IoT Hub endpoints



Event Processing  
Azure Stream  
Analytics





# Real time event processing

## Uncover real time insights

Perform real time analytics across multiple streams

## Rapid Deployment

Use simple SQL syntax, auto distributed for scale

## Mission critical reliability

Fully managed, low latency, high throughput

## Create real time alerts

Flag alerts and alarms for attention

## High volume

Analyze millions of data points per second

## Highly scalable

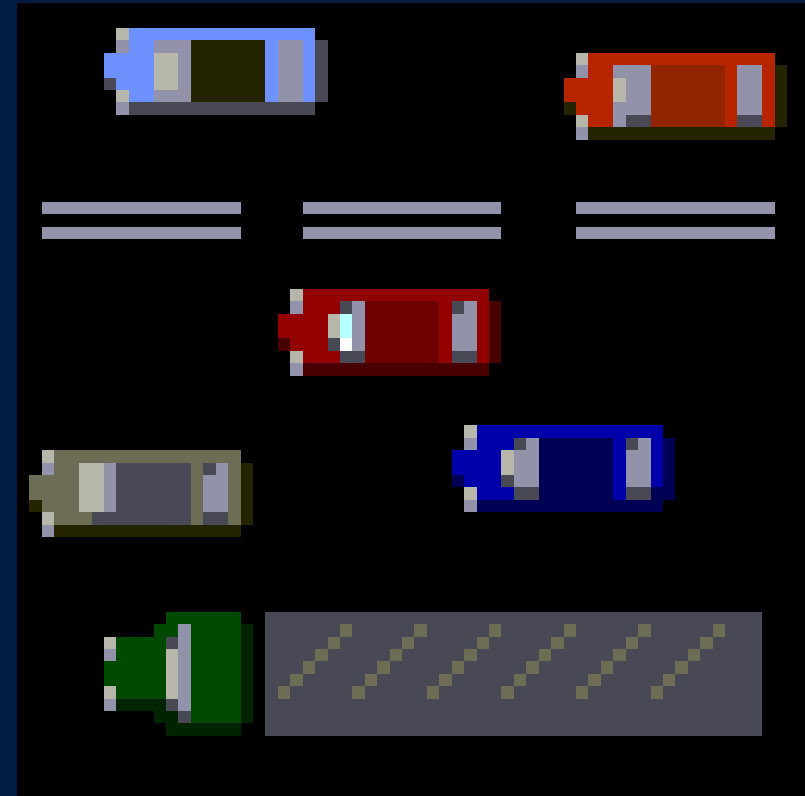
Enterprise grade, predictable solution.

# Working with Streaming Data

## Data at Rest

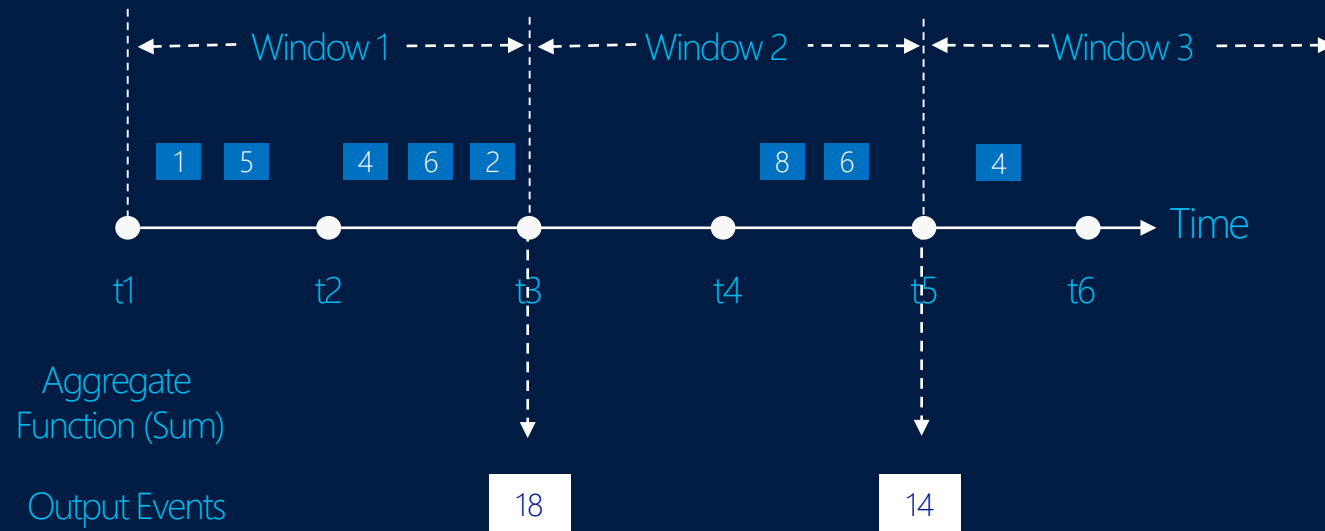


## Data in Motion



# Windowing Concepts

- Windows can be **tumbling**, **hopping**, or **sliding**
- Windows are fixed length
- Must be used in a **GROUP BY** clause



- Output event will have the timestamp of the end of the window

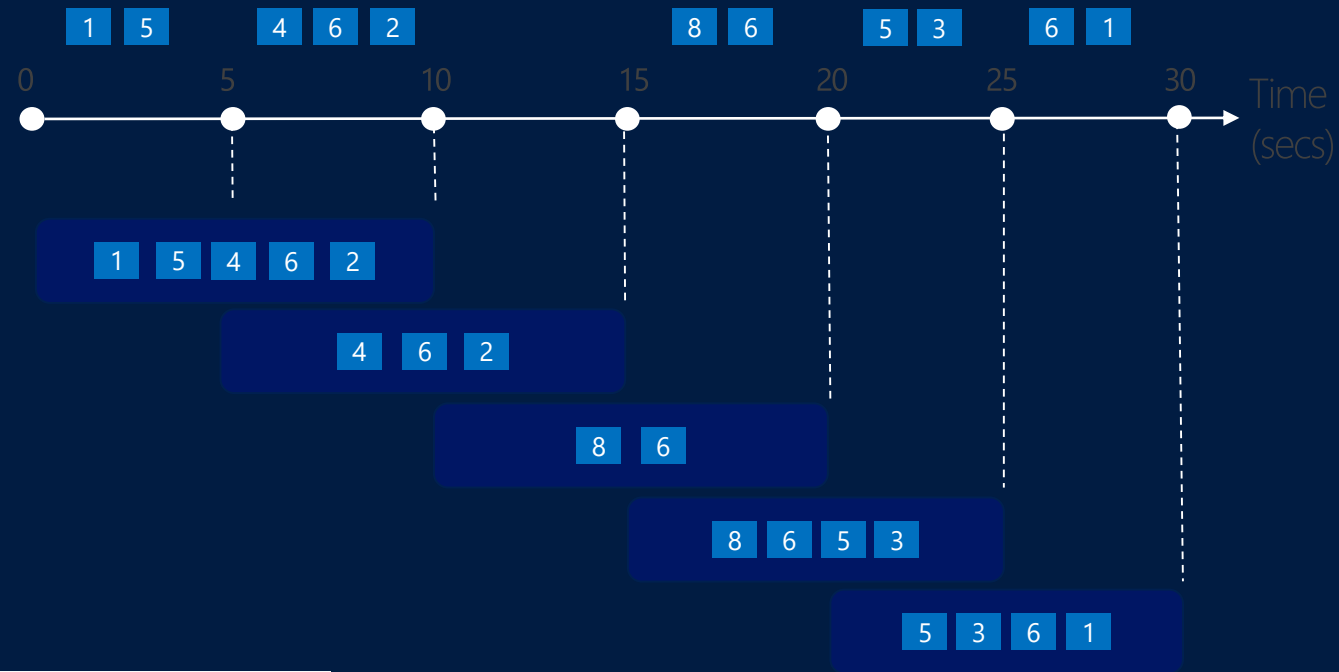


# Hopping Windows

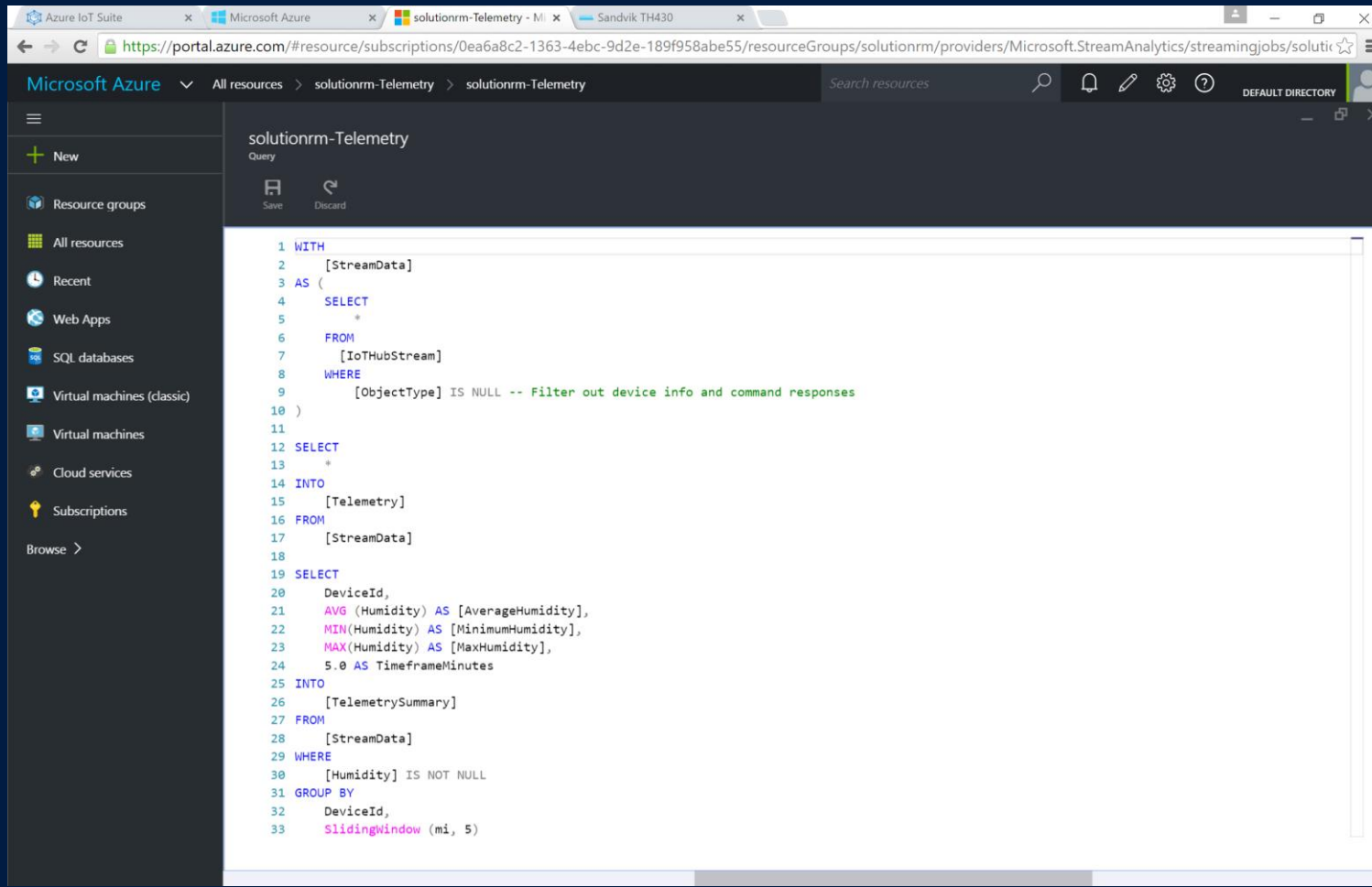
*"Every 5 seconds give me the count of tweets over the last 10 seconds"*

```
SELECT Topic, Count(*) AS TotalTweets
FROM TwitterStream
TIMESTAMP BY CreatedAt
GROUP BY Topic, HoppingWindow(second, 10, 5)
```

A 10-second Hopping Window with a 5-second "Hop"



# Add or edit jobs using simple ASA interface



Rule based interface

Simple implementation and rule development using ASA UI.

Multi-channel

Analyze multiple channels of information simultaneously, in real time.

# Data Visualization Power BI





# Data visualization with PowerBI

## Highly accessible analytics

Cloud based dashboard and analytics tool,

## 360° view of business KPI's

Customize dashboards to address concerns and performance metrics.

## Cross platform support

View data via web platform, on any device

## Pre-built dashboards

Utilize standard dashboards for rapid deployment, based on popular solution demands.

## Real time capabilities

Ingest, analyze and display data as it happens

## Secure access

Secure, live communication with data source

## Query data







Intuitive, natural language query tool

## Integrated systems







Integrate with other business systems and enrich device data with intelligence from other business systems, eg: CRM, ERP

# Power BI Overview

## Data sources

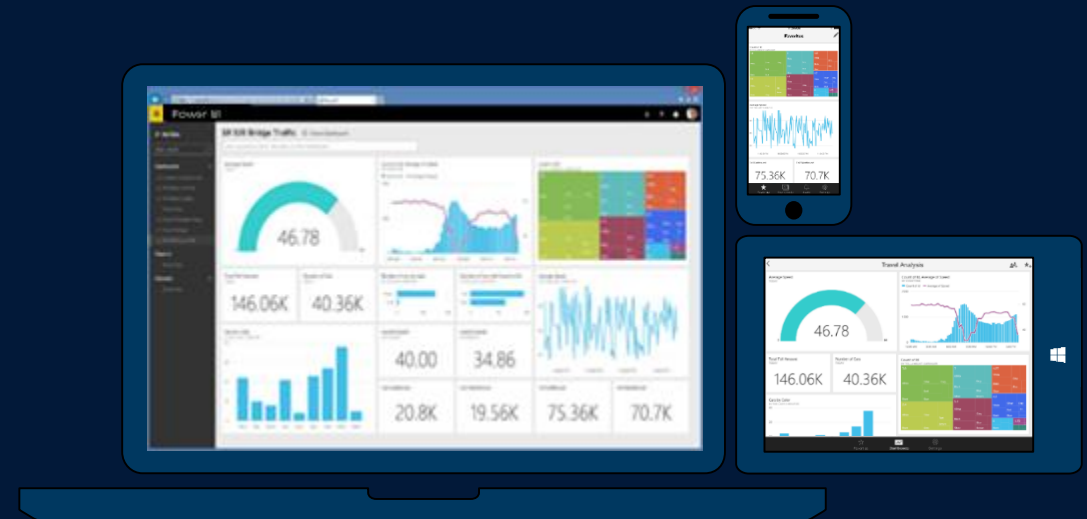
-  SaaS solutions  
*e.g. Marketo, Salesforce, GitHub, Google analytics*
-  On-premises data  
*e.g. Analysis Services*
-  Organizational content packs  
*Corporate data sources or external data services*
-  Azure services  
*Azure SQL, Stream Analytics...*
-  Excel files  
*Workbook data / data models*
-  Power BI Desktop files  
*Data from files, databases, Azure, and other sources*

## Power BI service

-  Content packs
-  Live dashboards
-  Visualizations
-  Reports
-  Datasets  
**01001**  
**10101**
-  Data refresh

 Natural language query

 Sharing & collaboration



# Data visualization with PowerBI

Rich visuals

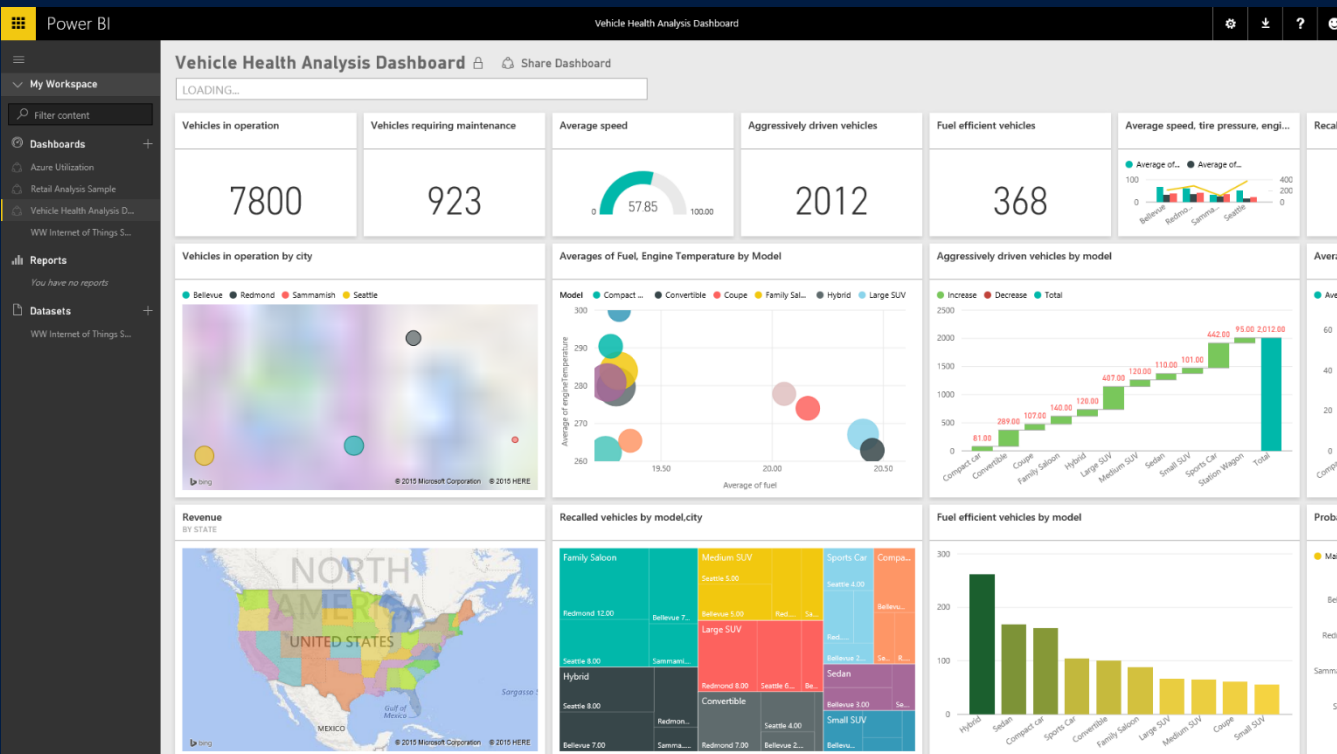
Standard and custom graphing options

Custom dashboards

Build heat maps and visually track data

External data

Integrate external data feeds to add value to device data, or pull in external information such as weather or market information.





# Azure IoT Suite

## Solution types



### Predictive maintenance

Anticipate maintenance needs and avoid unscheduled downtime by connecting and monitoring your devices for predictive maintenance.



### Remote monitoring

Connect and monitor your devices to analyze untapped data and improve business outcomes by automating processes.

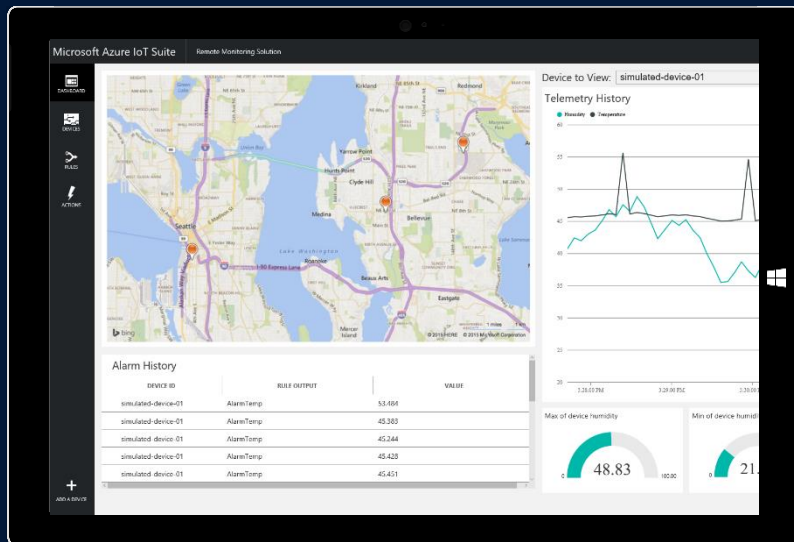
<http://www.microsoftazureiotsuite.com/demos/predictivemaintenance>

<http://www.microsoftazureiotsuite.com/demos/remotemonitoring>

<https://www.AzureIoTsuite.com/>

# Tailor Azure IoT Suite to your needs using preconfigured solutions

Start quickly with preconfigured solutions



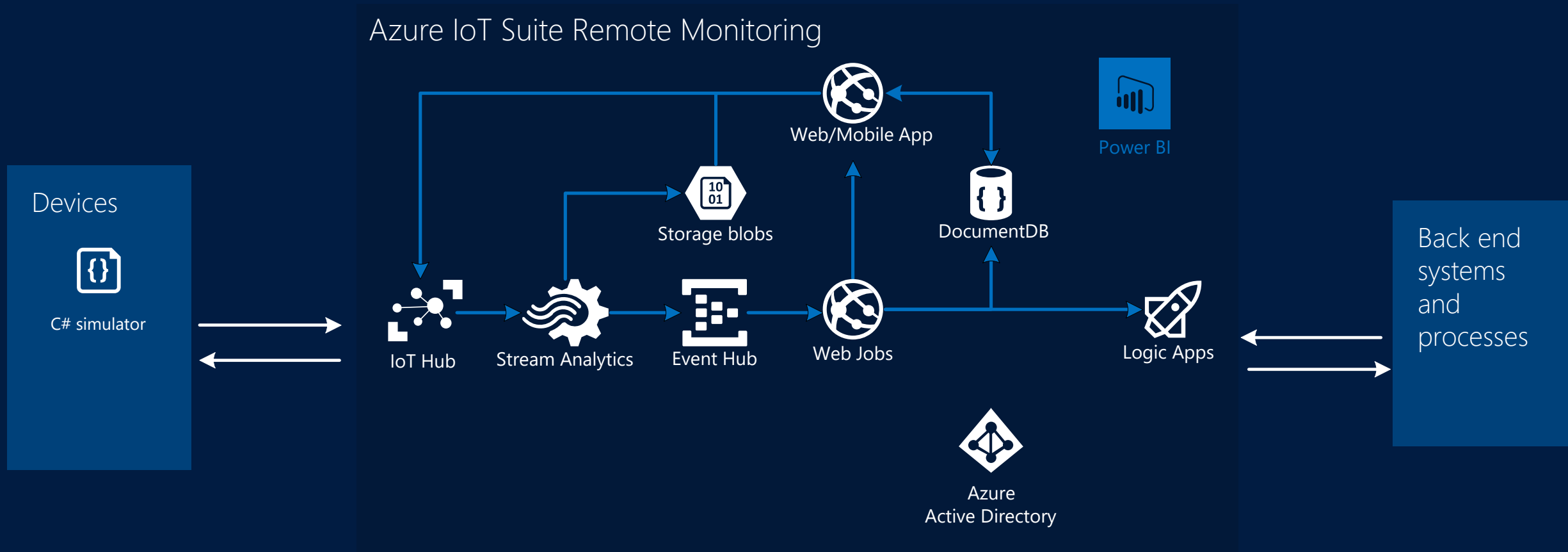
- Get started in minutes
- Modify existing rules and alerts
- Add your devices and begin tailor to your needs

Finish with your Internet of Things application



- Fine-tuned to specific assets and processes
- Highly visual for your real-time operational data
- Integrate with back-end systems

# What you get with remote monitoring preconfigured solution



# Demo – Band on the Run

<https://github.com/bandontherun>



## Band on the Run

