Building a Better Mousetrap:
Deploying and Managing IoT Solutions for ITPros

Anthony Bartolo
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Microsoft
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

80B
Connected “things” by 2025 generating 180ZB of data

$130B
New monetization avenues due to IoT-related services

80%
Companies that increased revenue as a result of IoT implementation

$100M
Average increase in operating income (avg. 8%) among the most digitally transformed enterprises
Developing an IoT solution can be challenging

**Complexity**
IoT requires numerous skill sets.

**Time**
Many IoT solutions require months to set up.

**Cost**
Heavy up-front investments as well as maintenance can be cost-prohibitive.

**Security**
IoT poses unique security, privacy, and compliance challenges.
A Simple View of an IoT Solution

Things

Insights

Actions
A more realistic view...

Things
- Cloud-to-device commands
- Internationalization
- Device recovery
- Updating devices
- Device lifecycle
- Drivers
- Device updates
- On device analytics
- HW certification
- Device commercialization
- Securing data

Insights
- Solution scale
- Transport protocols
- Disaster recovery
-制造业 scale
- Manufacturing scale

Actions
- Fault tolerance
- Deployment
- Operations monitoring
- Business process integration
- Cost management
- Provisioning devices
- High availability
- Warm path analytics
- Hot path analytics
- Data ownership
- Industry and government compliance
- Data visualization

... and why IoT needs Ops support
What could go wrong?

LET ME PLAY YOU

THE SONG OF MY PEOPLE
The Essential Relationship
MouseTrapp

Getting that mouse, out of your house, eh!

Anthony Bartolo | Jef King | Julien Stroheker | Susan Ibach | Barry Gervin
MouseTrapp
Opportunity

• Rats and mice spread over 35 diseases
• Traps are monitored by regular visitations requiring time & mileage
• Traps can be empty resulting in wasted resources
• Business owners can become frustrated if traps are not cleaned out regularly
• Business’ potential customers may stay away if vermin reported

• Industry Statistics & Market Size
  • Revenue $12B | Annual Growth 3.1%
• PaaS Services used for easy **Scale-out**, **Reliable** "Always On" SLA, and **low cost of maintenance**.

• Services **loosely coupled** together so the architecture is flexible to future enhancements & maintenance.
Solution Components

- PowerShell: Drive deployment
- Cordova: cross platform
- GitHub: dev in the open
- VSTS: Build, Package, Release
- Dacpac: database schema
- Raspberry Pi: Windows 10 IoT, UWP, Mousetrap
- Azure: IoT Hub, SQL Azure, Machine Learning, Stream Analytics, Blob/Table storage, Web Jobs
- Reporting: PowerBi
- C#: Web Job
  (Data Generation – Testing Component)
Demo

IoT Hub Setup
Solution Technical Overview

Map shows intensity based on building location. Buildings address manually entered into PowerBI Dataset for POC.

Floorplan Rooms colored by intensity based on Time to Catch or Clear.

Two Reports to focus on Time To Catch and Time To Clear.

Multi-Row Cards show aggregate information and is filtered when building is selected on map.

MouseTrapp
What is provisioning?
High level provisioning

1. Asks for hub
2. Creates ID
3. Returns ID
4. Returns hub
5. Connects
Quick orientation

Provisioning happens here

Devices

IoT Hub

Stream Analytics

Event Hub

Storage blobs

DocumentDB

Web/ Mobile App

Power BI

Web Jobs

Logic Apps

* Azure ML

Back end systems and processes
Demo

IoT Hub Provisioning Setup
Device Provisioning Service

Automate device provisioning at scale and eliminate security threats from manual handling
End to End Security with Azure IoT

Securely connect millions of devices...

...over a secure internet connection...

...to Microsoft Azure – built with security from the ground up

Device Security
X.509 Certificate Based Identity and Attestation
Device Provisioning, Authorization & Management
Support for Diverse Hardware Secure Modules

Connection Security
X.509/TLS-Based Handshake and Encryption

Cloud Security
Azure Security Center | Azure Active Directory
Key Vault | Policy-Based Access Control
IoT Hub Security Controls

Three Device Attestation and Authentication Methods with Policy Based Access Controls

Device

Connection Security
X.509/TLS-Based Handshake and Encryption

IoT Hub

Device Registry
9 BILLION new MCU devices built and deployed every year.
No manufacturer wants to make insecure devices

From: Hackers
To: Consumer
Subject: Your Fridge

We control your fridge.
Send us $5 in bitcoin or else...

Terrorists Ignite Thousands of House Fires with Hacked Stoves
Are your devices secure?

1. Can your device respond to vulnerabilities by automatically updating to your latest software?
2. Does your device report back failures and irregularities?
3. Does your device use certificates instead of passwords for authentication?
4. Can your device protect itself even when attackers defeat one or more layers of defense?
5. Does your device security get smarter over time?
Hackers attack casino
Highly-secured connected devices require 7 properties:

- Hardware Root of Trust
- Defense in Depth
- Small Trusted Computing Base
- Dynamic Compartments
- Certificate-Based Authentication
- Failure Reporting
- Renewable Security
Azure Sphere is an end-to-end solution for securing MCU powered devices
Azure Sphere certified MCUs, from silicon partners, with built-in Microsoft security technology provide connectivity and a dependable hardware root of trust.
The Azure Sphere OS
secured by Microsoft for the devices 10-year lifetime to create a trustworthy platform for new IoT experiences
The Azure Sphere Security Service guards every Azure Sphere device; it brokers trust for device-to-device and device-to-cloud communication, detects emerging threats, and renews device security.
Azure Sphere is open

Open to any MCU manufacturer
We are licensing our Pluton security subsystem royalty **free for use** in any chip*

Open to any cloud
Azure Sphere devices are free to connect to Azure or any other cloud, proprietary or public for application data

Open to any innovation
MCU manufacturers are free to innovate with our GPL'd OSS Linux kernel code base

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* Azure Sphere branding requires an Azure Sphere chip with Azure Sphere OS and Azure Sphere Security Service
Commercial IoT device hierarchy of needs

- Edge intelligence
- Cloud offload
- Rich device functionality
- Security update control, lifecycle management, device management
- Long-life hardware, long-term OS support, security updates
Thomas Rayner
@MrThomasRayner

Replying to @WirelessLife @MichaelBender and 2 others

Speaking with Anthony a year or so ago about the ops/devs line and he said that we're all just becoming "technologists" that blur that line until it's completely faded. Really changed my perspective on what I do and how I identify myself within this industry.
Next Steps

• Microsoft Learn: IoT for ITPROs
  • https://aka.ms/MSLearnIoT

• Hands-on-Labs
  • https://aka.ms/ITiotschool
    • Intro to IoT Hub
    • Device management with Azure IoT Hub
    • Device provisioning with Azure IoT Hub

• Getting Started with Azure Sphere
  • https://aka.ms/AzureSphereIOT

• Internet of Things Show
  • https://aka.ms/ITiotshow

• Mousetrap Solution: https://aka.ms/mousetrap
Thank you!

Questions?