Azure IoT / RPI / Windows 10 Core

Jens Vestergaard, Sr. BI Architect & Partner, CatMan Solution
CatMan Solution A/S

• Primarily targeting FMCG sector, span others as well
• Best In Class, easy, no real local competitors 😊
• BI as a Service – think subscription based external BI Department
• Cloud Solution backed by Azure, SQL Server, AAS and Power BI
• 50+ Customers, incl. Unilever, Kellogg, L’Oréal, British American Tobacco, Lindt, Mondelez, Pågen, Danone among others.’
• Validoo and Genero product master data
• 20 years in business, in 2020...
Show of Hands

- Windows 10 Core
- Azure / IoT
- PowerBI
- Raspberry Pi or similar
What is The Internet of Things (IoT)

- Municipality of Copenhagen (HOFOR)
- Large parts of areas in city w/out hot water
- 3 weeks delivery on critical valve
- 300,000 containers
- Temperature, Pressure, Humidity...
- Alerts
The ‘S’ in IoT is for Security
Light Bulbs - DDOS

• The scale of DDoS attacks has continued to rise over recent years, by 2016 exceeding a terabit per second. We are now past Q1 2019...

• 150,000 devices in a single attack
The “BRIGHTER” side of IoT
Raspberry Pi
RASPBERRY PI

* Tom's Hardware: https://www.tomshardware.com/news/raspberry-pi-4-everything-we-know-38539.html
GPIO

- can be configured to be input or output
- can be enabled/disabled
- Input values are readable (typically high or low)
- Output values are writable/readable
- Input values can often be used as IRQs (typically for wakeup events)
SENSORS

Heat
Light
Sound
Humidity
Shock
IR
Temperature
Touch
Tracking
Avoidance
Ultrasound
...

[Images of various sensors and electronic components]
Operating Systems
And that's not mentioning the Media Oss, such as OSMC, Kodi, OpenELEC or the Retro Gaming Suites, Android or the AmigaOS remake...

[Definitive list](https://raspberrypi.stackexchange.com/questions/534/definitive-list-of-operating-systems)
Everything you need all in one place

- **Flexibility**
  - Build apps for any platform

- **Productivity**
  - Designers, editors, debuggers, profilers, in one single tool

- **Ecosystem**
  - Access to thousands of extensions

- **Languages**
  - Code in C#, Visual Basic, F#, C++, HTML, Java/JSP, TypeScript, Python, and more

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**NuGet Package Project for Visual Studio 2017**
Provides a NuGet package project (*.nuproj).

**Connected Service for Azure IoT Hub**
Allows developers to connect to Azure IoT Hub easily and with step-by-step guidance.

**Windows IoT Core Project Templates for VS 2017**
This package contains project templates for Windows IoT Core Applications and Visual Studio 2017

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**Windows Core 10 / Visual Studio**
Windows Core 10 IoT
WINDOWS 10 IoT CORE
Windows Core 10 / Visual Studio

Visual Studio Dev Essentials

Everything you need to build and deploy your app on any platform – for FREE.
<table>
<thead>
<tr>
<th>Headed mode</th>
<th>Headed mode is defined by the presence of UI. In <em>headed</em> mode a single UI app will be launched at system boot and there can additionally be 0 or more “Background Apps” (StartupTasks).</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 only</td>
<td></td>
</tr>
<tr>
<td>Headless mode</td>
<td>Headless mode has no UI. Devices that don’t need UI functionality can be set to <em>headless</em> mode. The UI stack is disabled and UI apps will not launch. This reduces the amount of system resources used. If you attach a monitor to your device, the screen will be black.</td>
</tr>
<tr>
<td>0...*</td>
<td></td>
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</table>
Tools

**IoT Dashboard**
- Explore & Manage Devices
- Set up new Installations

**Windows IoT Remote Client**
- Connect to specific device

**Known Issues**
- F5 driver deployment from Visual Studio does not work on Windows 10 IoT Core. Drivers must be manually copied and registered on the device.
- The Windows IoT Remote client does not work for Raspberry Pi. Use a board with accelerated graphics such as Minnowboard Max or Dragonboard or attach a monitor for local display.
Demo - Tools
Azure IoT
AZURE IOT HUB

• Establish bi-directional communication with millions of IoT devices
• Work with familiar platforms and protocols
• Standards based IoT device management at scale
• Related products
  • Machine Learning
  • Stream Analytics
  • App Services
IoT Hub Communication Patterns

1. Direct connection (HTTP, AMQP)
2. Cloud Protocol Adaptation (e.g. MQTT)
3. Field Protocol Adaptation (e.g. DDS)
4. Gateway-assisted (e.g. Bluetooth LE)
Free: Try out the Azure IoT Hub service for free.

- < 8,000 messages a day.
- The Free edition is suitable for gaining familiarity and testing.

S1: IoT Hub S1 edition is designed for small amounts of data.

- Each unit < 400,000 messages per day across all connected devices.

S2: IoT Hub S2 edition is designed for large amounts of data.

- Each unit < 6 million messages per day across all connected devices.

S3: IoT Hub S3 edition is designed for large amounts of data.

- Each unit < 300 million messages per day across all connected devices.
# AZURE IOT HUB - Pricing

<table>
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<tr>
<th>Edition Type</th>
<th>Price (per month)</th>
<th>Total number of Messages/day</th>
<th>Messages / Sec</th>
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<tbody>
<tr>
<td>Free</td>
<td>Free</td>
<td>8,000</td>
<td>1.0 per 10 sec</td>
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<tr>
<td>S1</td>
<td>$25</td>
<td>400,000</td>
<td>4.6 per sec</td>
</tr>
<tr>
<td>S2</td>
<td>£250</td>
<td>6,000,000</td>
<td>69.4 per sec</td>
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<tr>
<td>S3*</td>
<td>$2,500</td>
<td>300,000,000</td>
<td>3,472 per sec</td>
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* Germany Central & Northeast: S3 = €5,059.80 ~ +20%
Stream Analytics

- Perform real-time analytics for your Internet of Things solutions
- Stream millions of events per second
- Get mission-critical reliability and performance with predictable results
- Create real-time dashboards and alerts over data from devices and applications
- Correlate across multiple streams of data
- Use familiar SQL-based language for rapid development
SQL for Stream Analytics
Power BI
POWER BI
Power BI Service

• Power BI is a cloud-based suite of business analytics tools that enables anyone to connect to, visualize, and analyze data with greater speed, efficiency, and understanding. It connects users to a broad range of live data through easy-to-use dashboards, provides interactive reports, and delivers compelling visualizations that bring data to life.
Power BI Desktop

• **Transform and clean data**
  • Getting your data ready to analyze can be time-consuming. We’re on a mission to make it much simpler. Try the data shaping and modeling capabilities of Power BI Desktop and take back hours in your busy day.

• **Complete analytics life-cycle**
  • The Power BI Desktop is an elegant end-to-end solution for building analytics. The Desktop has all the capabilities to quickly connect, shape, visualize, and share data insights through Power BI.

• **Design once, view anywhere**
  • We know you need to get data into the hands of decision makers when and where they need it. Power BI makes publishing and sharing your beautiful interactive reports easy.
Power BI Desktop Update – April 2019

Reporting
• Filter pane improvements
• Conditional formatting for visual titles
• Conditional formatting for web URL actions for buttons, shapes, and images

Data preparation
• Data Profiling enhancements and general availability
• Fuzzy merge performance enhancements & general availability
• M Intellisense supported in formula bar and custom column dialog & is generally available

Analytics
• Drillthrough across reports
• Key Influencers visual now supports continuous analysis for numeric targets
• Python support is now generally available
• Partial synonym matching for terms in Q&A

Other
• Power BI Paginated Report Builder
Running on ARM and Intel architecture, Azure SQL Database Edge—now in private preview—brings the most secure Microsoft SQL engine to the edge. This productivity tool for edge computing combines new capabilities such as data streaming and time series with in-database machine learning and graph features. Develop your application once and deploy anywhere across the edge, your datacenter, and Azure.

Azure SQL Db Edge

Demo - Full
QUESTIONS
FOUND IN GOOGLE AUTOCOMPLETE

WHY DO WHALES JUMP
WHY ARE WITCHES GREEN
WHY ARE THERE MIRRORS ABOVE BOTTLES
WHY DO I SAY UH
WHY IS SEA SALT BETTER
WHY ARE THERE TREES IN THE MIDDLE OF FIELDS
WHY IS THERE NOT A POKEMON MONO
WHY IS THERE LAUGHING IN TV SHOWS
WHY ARE THERE DOORS ON THE PREMIUM
WHY ARE THERE SO MANY SCHEMATICS RUNNING
WHY ARE THERE ANY COUNTRIES IN AFRICA
WHY ARE THERE 94 SOUNDS IN MINECRAFT
WHY IS THERE AN ARROW ON APHRA'S HEART
WHY ARE THERE TEXT MESSAGES BLUE
WHY ARE THERE MUSTACHES ON CLOTHES
WHY ARE THERE MUSTACHES ON CARS
WHY ARE THERE MUSTACHES EVERYWHERE
WHY ARE THERE 2 BIRDS IN OHIO
WHY IS THERE SO MUCH RAIN IN OHIO
WHY IS OHIO WEATHER SO WEIRD
WHY ARE THERE MALE AND FEMALE BIKES
WHY ARE THERE SQUIRRELS IN OHIO
WHY ARE THERE LADIES

WHY ARE DINOSAURS EXTINCT
WHY DO OYSTERS HAVE PEARLS
WHY ARE DUCKS CALLED DUCKS
WHY DO THEY CALL IT THE CLOP
WHY ARE KYLE AND ORTIN FRIENDS
WHY IS THERE AN ARROW ON APHRA'S HEART
WHY ARE THERE TEXT MESSAGES BLUE
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WHY ARE THERE LADIES

WHY DO TESTICLES MOVE
WHY ARE THERE PSYCHOS
WHY ARE HATS SO EXPENSIVE
WHY DO THINGS HAVE DIFFERENT FINGERPRINTS
WHY DO YOUR BOOTS HURT
WHY ARE AMERICANS AFRAID OF DRAGONS
WHY IS HTTPS CROSSED OUT IN RED
WHY IS THERE A LINE THROUGH HTTPS
WHY IS THERE A RED LINE THROUGH HTTPS
WHY IS HTTPS IMPORTANT
WHY AREN'T MY ARMS GROWING
WHY DO I FEEL DIZZY
WHY ARE THERE SO MANY CROWS IN ROCHESTER, NY
WHY IS THERE SUCH A FEAR OF POPCORN
WHY ARE THERE 7 WAYS TO DIE
WHY IS THERE ICE IN SPACE
WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE ECONOMISTS RICH
WHY DO AMERICANS CALL IT SOCCER
WHY ARE MY EARS RINGING
WHY ARE THERE SO MANY AVENGERS
WHY ARE THE AVENGERS FIGHTING THE X-MEN
WHY IS WOLVERINE NOT IN THE AVENGERS
WHY IS THERE AN OWL IN MY BACKYARD
WHY IS THERE AN OWL INSIDE MY WINDOW
WHY IS THERE AN OWL ON THE DOLLAR BILL
WHY DO OWLS ATTACK PEOPLE
WHY ARE AK-47S SO EXPENSIVE
WHY ARE THERE HELICOPTERS CIRCLING MY HOUSE
WHY ARE THERE GODS
WHY ARE THERE TWO SPOOKS
WHY IS JESUS WHITE
WHY IS THERE A LONELY IN MY EYE
WHY DO I TIPS FEEL GOOD
WHY DO GOOD PEOPLE DIE
WHY ARE DOGS AFRAID OF FIREWORKS
WHY AREN'T THERE GUNS IN ENGLAND
WHY AREN'T THERE ANY FOREIGN MILITARY BASES IN AMERICA
WHY AREN'T MY QUAIL LAYING EGGS
WHY AREN'T MY QUAIL EGGS HATCHING
WHY AREN'T THERE ANY FOREIGN MILITARY BASES IN AMERICA
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USEFUL LINKS

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