Avoid the silos and help build the true Internet of Things

Introduction

- **Aaron Vernon**, CTO at **Two Bulls**

- Been at Two Bulls from the beginning with two stretches away at startups - CTO of **Blokify** and VP Software Engineering at **LIFX**

- Member of the **AllSeen Alliance** Technical Steering Committee

- I am going to cover the following:
  - The complexities of the current IoT landscape
  - How this affects companies and users
  - The Internet of Silos example
  - How we can work together better

Transports

WiFi

- Uses the 802.11 standard
- Standard on all mobile devices and routers
- Has become ubiquitous for users
- Great range
- Great bandwidth
- High power consumption
- High cost
- Onboarding experience can be complicated
- Examples: Nest Cam, LIFX, Canary, Honeywell Lyric

Bluetooth Smart

- Standard on most mobile devices
- Becoming increasingly ubiquitous
- Low bandwidth
- Medium range
- Low power consumption
- Low cost
- Smart Mesh is being worked on
- Examples: Flic, Ilumi, Elgato Eve

ZigBee

- Uses the 802.15.4 standard
- Low bandwidth
- Low range
- Low power consumption
- Very low cost
- Forms a mesh network
- Typically requires a hub for the radio
- Known to have interop and interference problems
- Examples: Phillips Hue, large amount of sensors and actuators

Z-Wave

- Proprietary - chips developed by a single manufacturer
- Uses different frequencies in different countries
- Low bandwidth
- Medium range
- Low power consumption
- Very low cost
- Forms a mesh network
- Better interoperability and less interference than ZigBee
- Typically requires a hub for the radio
- Examples: large amount of sensors and actuators, particularly in the home security sector

Thread

- Uses the 802.15.4 and 6LoWPAN standards
- Can be bridged to the cloud relatively easily
- Low bandwidth
- Medium range
- Low power consumption
- Low cost
- Forms a mesh network
- ZigBee devices can be upgraded to Thread
- Will require a hub for the radio
- *Was Open Sourced earlier this year*
- Examples: Google OnHub, Nest, more products coming soon (certification launched last November)

EnOcean

- Ultra low bandwidth
- Energy harvesting - no power consumption
- Medium range
- Low cost
- Requires a special purpose antenna and a hub
- Examples: large amount of sensors and actuators

Protocols and Ecosystems

OCF

- ~~Yes there are two competing Linux Foundation Open Source IoT projects - AllJoyn and IoTivity~~ As of this week the insanity is over! 🎉
- Open Connectivity Foundation is now the **one** open specification for IoT interoperability and sponsors both the IoTivity and AllJoyn open source efforts - massive congratulations to everyone who was involved in making this happen!
- Current devices running on either AllJoyn or IoTivity solutions will be interoperable and backward-compatible
- A great step forward for IoT but I fear that it will now be another 6-12 months before solid open source progress can continue
- A lot of great thinking went into Common Device Models 16.04 and 16.10 that we hope finds a place in the new world
- Prominent members: Intel, Samsung, Microsoft, Qualcomm, Electrolux, Cisco, GE Digital, Technicolor

Weave

- ~~Yes really! Nest Weave is separate to Google Weave~~ *There has been a lot of positive movement on uniting Google's IoT efforts including most notably the Core Platform team from Nest moving to Google*
- Nest was coming at things from a low power and low latency over Thread perspective and was very focussed on the proximal network
  - It was operating within a walled 'Works with Nest' garden and was super light weight
- Google was coming at things from a Google Cloud and easy to use developer API perspective
  - Resource based REST model initially focussed on WiFi and BLE and was quite heavy weight
- The dust is still settling but we are very excited about Google's contribution and approach to IoT over the next 12 months

Apple HomeKit

- Apple's answer to IoT that was announced in 2014
- A huge amount of market demand but relatively few available devices
- The tallest walled garden in IoT - you need an MFi chip in your device in order to support HomeKit
- Siri support and Apple's customary User Experience could result in a very successful ecosystem but the path there has not been clear:
  - ~~HomeKit APIs only supported on iOS~~ *Now available in tvOS 10*
  - MFi process is very strenuous
  - ~~Where is the killer app from Apple?~~ *Home app was launched recently in iOS 10*
  - *Apple TV or iPad still required in Home for the full experience*

EnOcean, ZigBee, Z-Wave & Bluetooth Smart

- Enocean, Zigbee, Z-Wave & Bluetooth all have Alliance organizations that have defined device profiles
- Zigbee and Z-Wave device profiles are fragmented and not universally adopted
- Bluetooth Smart uses GATT profiles (Generic Attribute profiles) but the device support is not very broad

Samsung SmartThings

- A startup born out of a Kickstarter campaign that was acquired by Samsung in 2014
- It includes a hub, cloud platform and client apps
- Focuses on the use cases it makes available to consumers
- Has a robust device ecosystem including ZigBee, Z-Wave and WiFi devices
- Quite a successful open ecosystem but Samsung owns the user relationship which is going to be problematic for a lot of companies
- Not really competitive to the entities I have covered here but worth mentioning because it has a considerable mindshare

When a company wants to get involved in IoT

For the purpose of this section I am going to reference transports, protocols, ecosystems, etc, as **STUFF**

Challenges for Companies

- A company wants to make an IoT product or service
- The company spends a large amount of time building and maintaining support for the **stuff**
- There is a limited amount of **stuff** that can physically fit in an embedded device
- Users are confused about what **stuff** they actually need/want
- The end result is the company struggles as they spend most of their time working on the **stuff** rather than the actual differential value they want to deliver to users

When a user wants to get involved in IoT

Challenges for Users

- A user is enticed to buy a starter kit from an ecosystem
- The learning curve is steep but they eventually get everything onboarded and working
- A new device comes out that they really want but it does not work with their ecosystem at launch
- Regardless they buy the device and have to learn a new way of onboarding and controlling a device
- To get the full benefit of the new device they buy more devices from an ecosystem it is part of

Repeat this process a few times and now the user has several competing ecosystems, multiple device silos and a bunch of apps that all function in a unique way...

...and we wonder why consumer IoT has not taken off yet!

The Internet of Silos

Imagine for a moment that HTTP never came to be and the internet was like IoT is right now…

It would take 15mins to load your first website,
3hrs if you have certain types of routers…

Every time you click a link you would have to install a new browser to consume the content...

Sometimes you may even need to purchase and plug in a new dongle just to follow the link…

When you want to read the news you forget which of your 10 browsers (that all have different UI/UX) you need to use…

There would be the W3C and the W3A - both would contain roughly the same companies and claim to be open and the only path forward…

…yet everyone would keep telling you how fucking awesome the Internet is!

Working Together

True IoT Example

I was going to fill this slide with a **utopian vision** of what true **IoT** would look like but the truth is **we all already know** what this looks like and how it would work; **we just need to build it**.

We need to do better

- Hopefully it was evident from this presentation that we need to do better!
- If we want to be the **multi billion dollar sector** the world is expecting then we need to reach mainstream consumers
- Idealistic, but if we grow the space together there will be enough revenue to go around - **stop trying to be the platform** and start contributing to a real ecosystem

Remember the Users

- IoT needs to be about the users and use cases
- Focus on trying to deliver the **notable use cases** that we all want and a side effect will be that the IoT environment will be improved
- Most mainstream users don't even know what IoT is and what devices they have are considered **'IoT devices'**
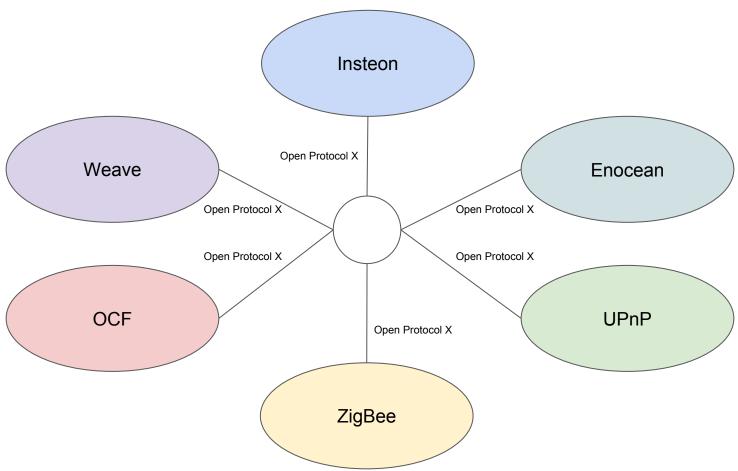- Focus on usability and **solve real problems**

Working Together

With an Open Source Protocol

One open source solution

- The ideal way forward is a simple open source protocol and cross platform framework that can exist outside of all the walled gardens and bridges between them
- This would provide a lowest common denominator for IoT
- ~~Currently there are two competing open source LF projects AllJoyn and IoTivity~~ **We are now actually a lot closer to this!**
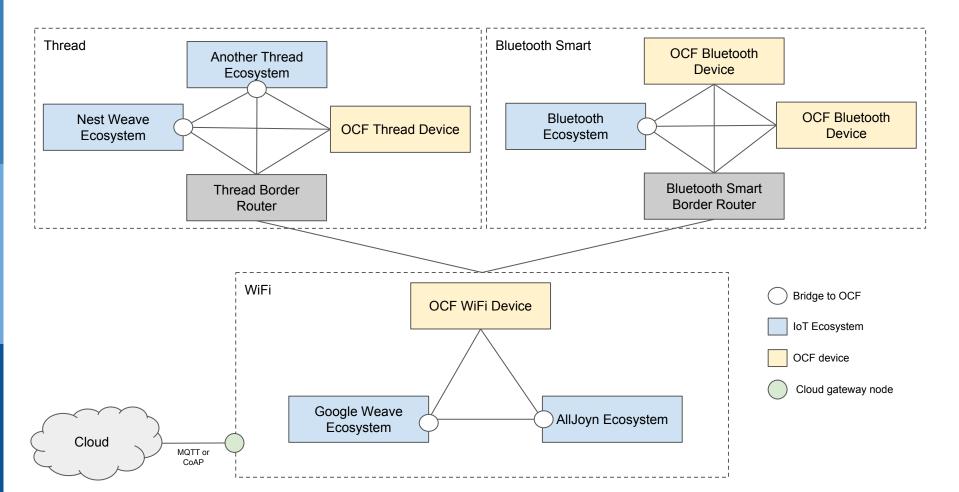- We must pool our minds, resources and efforts

An open solution

Keep it simple stupid

- At its most basic level the open source solution needs to contain schemas for devices and the ability to transfer these schemas across a network using different transports
- In my opinion, it should focus on transferring with IPv6 over WiFi, Thread and Bluetooth Smart to get a good spread of ubiquitous and forward thinking technologies
- Thread and Bluetooth Smart are able to achieve IPv6 using 6loWPan
- Given the focus on IP, Cloud can be layered on top using either MQTT or CoAP and a gateway node
- **Anything on top of this is nice to have**
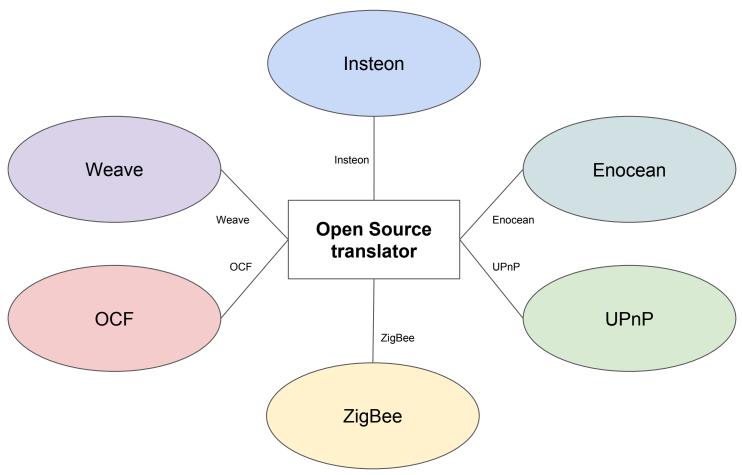
Now that's an ecosystem

Working Together

With an Open Source Translator

An open translator

- If we cannot have a single open source protocol then the fallback should be a single open source translator
- We feel that regardless of how the space evolves, an open source translator is going to be an important aspect of IoT and we are working with some others to get a project like this off the ground - so stay tuned
- Essentially it would be a cross platform solution for plugging in different protocol translators e.g. from OCF to Weave for a Light bulb
- It is **not yet another protocol**
- Security is going to be extremely tricky to get right but we think there is a path forward
- Early prototyping has shown that if we loosely couple the translator plugins then they could be easily developed on different platforms and in different languages

An open translator

Working Together

Final thoughts

Get involved

- Come to conferences and share your knowledge
- Get involved in open source projects
- Even if you don't commit code, it is still great to just be involved and share the perspectives of your company
- In my experience, companies do not speak up enough - at the end of the day you are the consumers of these projects
- You should try to just focus on developing the core value of your product and service and leverage existing technology for everything else - this is how the web 2.0 and mobile technology waves were successful

We have the power

- As engineers and product managers we actually hold more power than we think
- We are the ones who build the future, so encourage your companies to think about the success/failure of the larger IoT landscape
- I strongly believe that we are all know what is needed and we just need to be vigilant about achieving it

Thank you!

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