IoT: Integration and Standardisation

Making your way through the "Fog"

IoT Scotland 2015

Dr David Holder **CEng FIET MIEEE**

david.holder@erion.co.uk http://www.erion.co.uk

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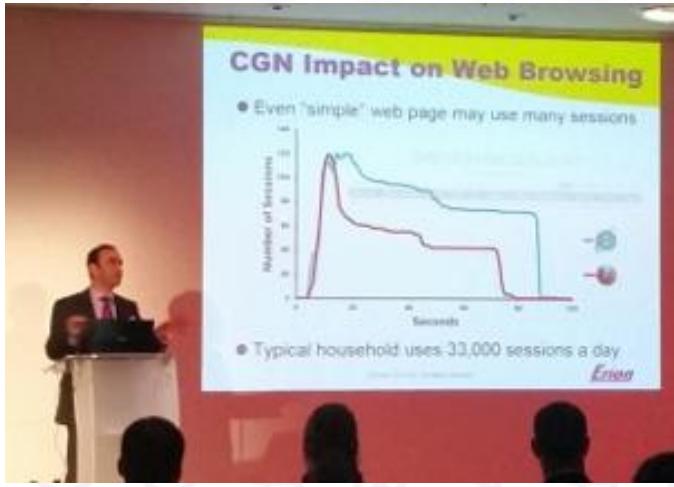
Profile: David Holder

- CEO and Chief Consultant Erion
- Author of numerous reports and whitepapers including recent CGN and IPv6 studies for Ofcom
- Chairman of IPv6 Task Force Scotland
- Regular speaker at global conferences on IPv6
- Extensive experience of IPv6 spanning over 17 years
- Builds sensor networks for fun!
  - PhD in electronic engineering
    - (Microwave Semiconductor Devices)
  - Fellow of IET (FIET)
  - Member of IEEE (MIEEE)
  - Chartered Engineer (CEng)



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Integration & Standardisation

- Why you should care

  The consequences of getting it wrong

- Standards

  Take your pick

- What will the future be?

  Predicting the future is difficult

- Backing the “right” standard/s

  How to make the “right” choice

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Why Standards are Important

- ✓ Compatibility
- ✓ Interoperability
- ✓ Functionality
- ✓ Flexibility
- ✓ Longevity
- ✓ Ease of use
- ✓ Maintainability
- ✓ Manageability
- ✓ Ease of application development

Impact on bottom line

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Bewildering Array of IoT Standards to Choose From

Examples of standards bodies and standards

How do you choose?

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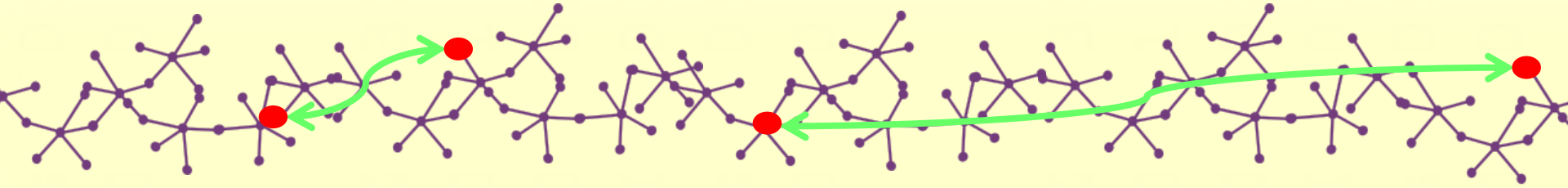
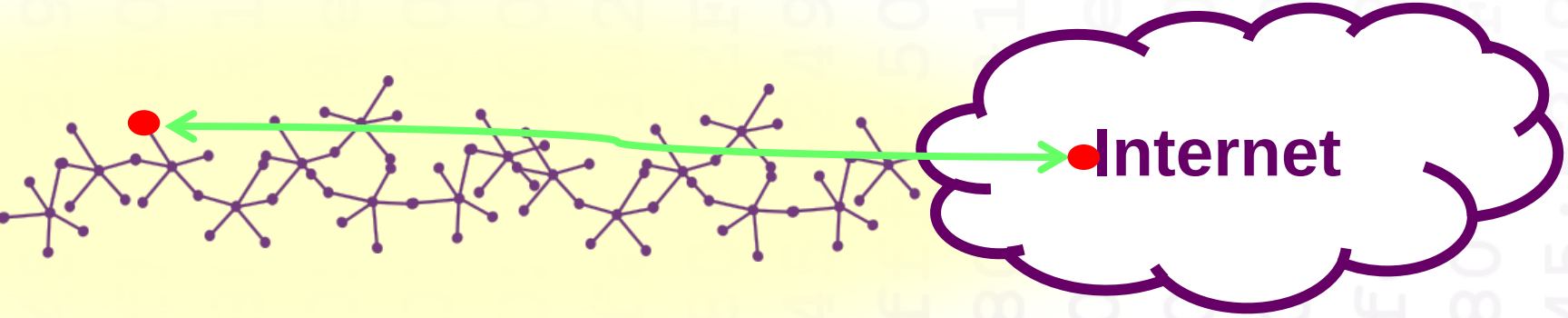
The Ideal

- Devices talk directly to each other (the “Fog”)
  - No complex translators, gateways or “Upperware”



- Devices communicate directly with the Internet



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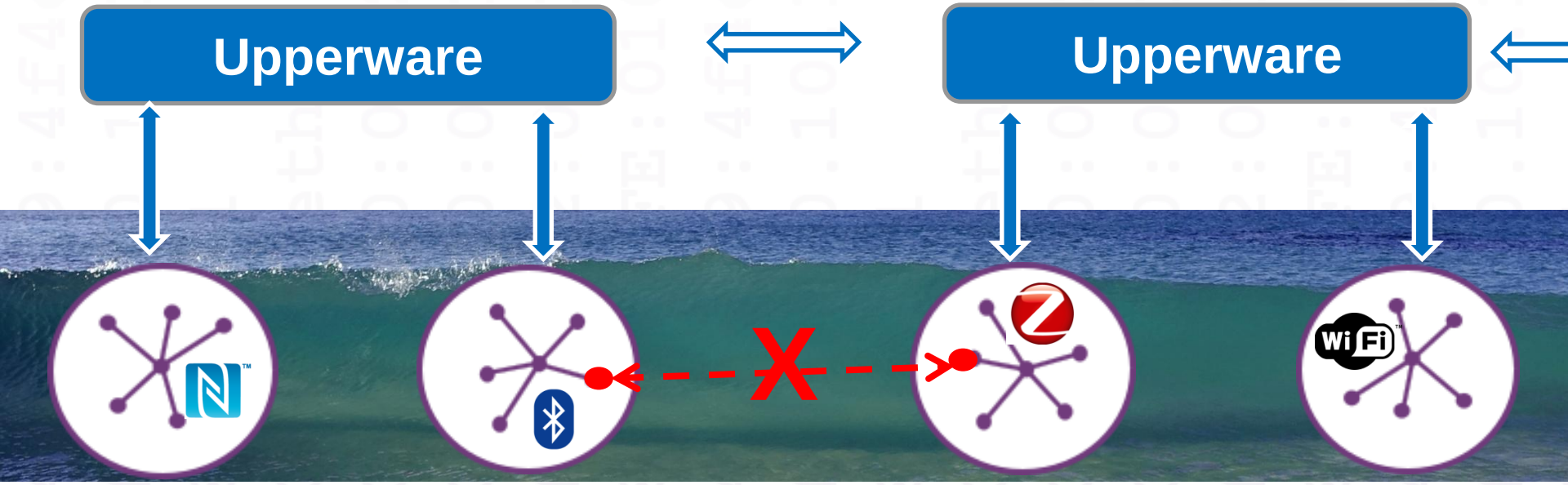
The Reality

- "Vertical Silos" – islands of standards
- "Upperware" necessary for interoperability
  - Devices cannot talk to each other or to the Internet

Incompatible datalinks, WiFi, IEEE 802.15.4, NFC, Bluetooth etc cannot communicate directly



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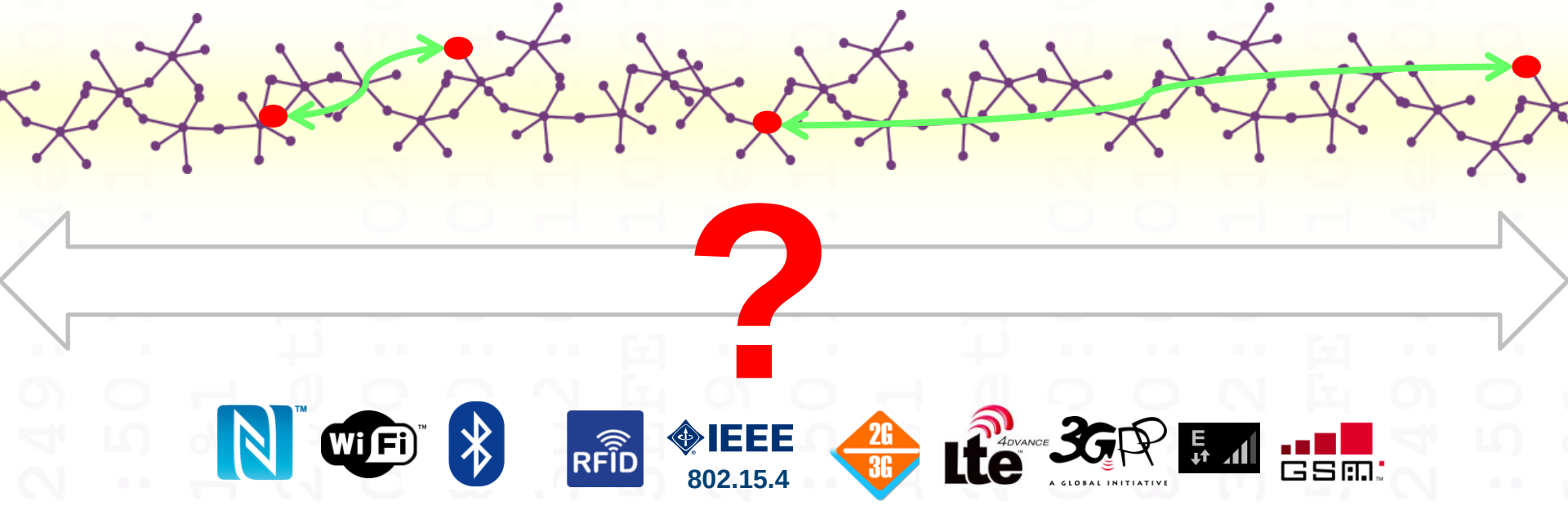
The Solution

- One standard beings all together



Why IPv4 is NOT the Solution

- The current Internet Protocol IPv4 is not suitable
  - IPv4 addresses are exhausted* – none left for IoT

    (* IPv4 never have had enough, as it only supports 4 billion addresses)
  - Address conservation using NAT/CGN* break connectivity to other IoT devices and the Internet

    (* Network Address Translation / Carrier Grade NAT)

50 Billion

Devices by 2020

  - Backwards support for IPv4 is often provided usually through some form of translator or gateway

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IPv6 a Solution for IoT

340,282,366,920,938,463,463,374,607,431,768,211,456

- Practically unlimited number of addresses
- No Network Address Translation (NAT or CGN)
  - Better performance
  - End-to-end Internet connectivity is possible
  - Network layer security is possible
- 6LowPAN is IPv6 designed for IoT
- Works across many technologies

- Internet standards have a long shelf life
  - Internet is over 30 years old

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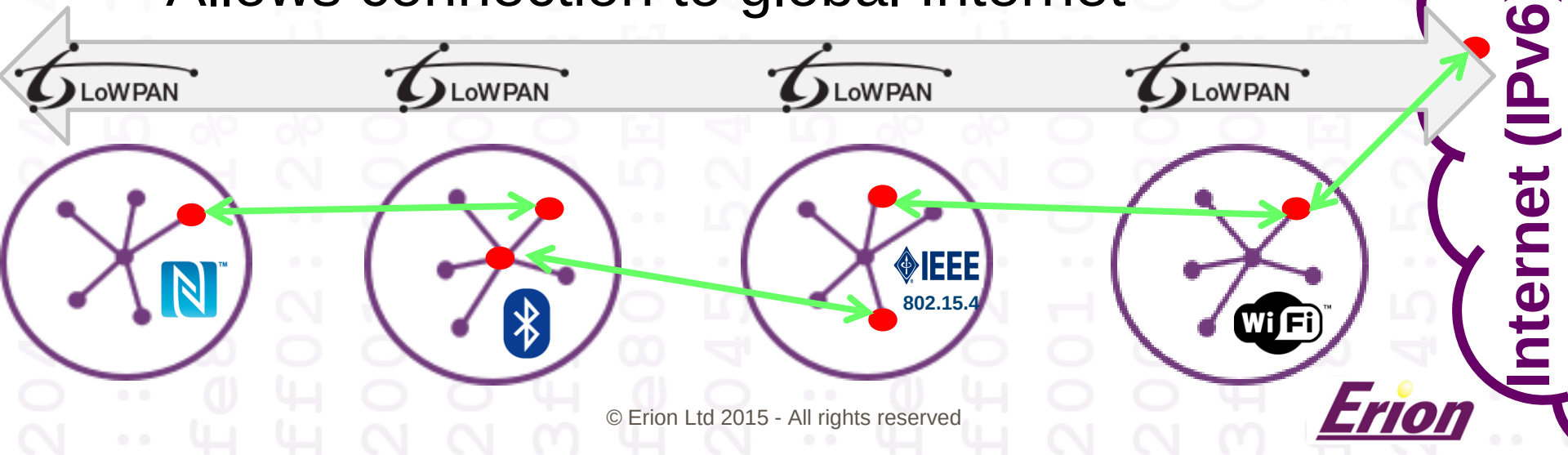
Why is 6LowPAN Good?

- ✓ Uses standard Internet Protocols
- ✓ Interoperates across many radio types
- ✓ Designed for Low-power, Lossy IoT networks
- ✓ Familiar APIs for software developers
- ✓ Allows direct connection between devices
- ✓ Allows connection to global Internet

IETF

IEEE 802.15.4 etc...



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IPv6 Status Today

- **No more IPv4 addresses**
- Today **70%** of a dual-stack user's traffic is IPv6
- Over **50%** of top web sites are IPv6 enabled
- IPv6 connections are faster – no NAT/CGN
- UK ISPs are rolling out IPv6
- Number of IPv6-capable users doubles annually
  - At this rate everyone will be using IPv6 by 2020

Please sir can I have some more?

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The Future of IoT Standards

- Many contenders
- Historically Zigbee was the biggest player
- 6LowPAN is taking off rapidly
- A number of big players are 6LowPAN based
  - Zigbee-IP brings together Zigbee and 6LowPAN
  - Thread is 6LowPAN (Wide industry support)
- Longevity of installed devices and significant investments by players may make the move to a common set of standard/s a long process


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Preparing for IoT

- Be aware of the huge range of options
- Understand the consequences
- Choose your standards carefully
- Include 6LowPAN in your options
- Prepare for IoT by deploying IPv6

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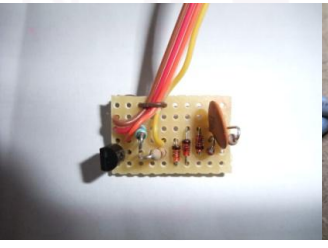
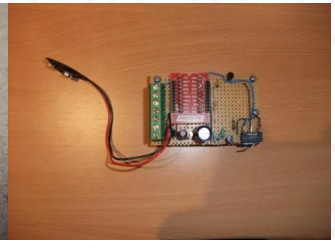
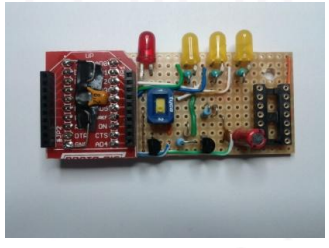
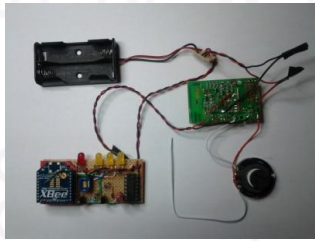
Personal Example

- Bespoke IoT network house & grounds
- Avoided commercial options due to vertical tie-in
- Chose Zigbee initially due to immaturity of 6LowPAN products at time of deployment
- Downside learning new standards and APIs
- Currently migrating to 6LowPAN
- Gates, door bells, temperature, security, weather, garden etc...





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Thank you for listening
Further Information

- 6LowPAN and IoT
  http://www.erion.co.uk/Training/6lowpanandtheinternetofthings.html
- IPv6 Training http://www.ipv6training.com
- IPv6 Consultancy http://www.ipv6consultancy.com

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