



# Joining In-Home Sensing onto the Internet of Things

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[www.cir-strategy.com/events/heat](http://www.cir-strategy.com/events/heat)

- ▶ Intelligent in-building environmental control and monitoring needs a method for connecting sensors, devices and appliances that meets the offering's overall goals.
- ▶ Connectivity that works for large scale rollouts at appliance-level price points is challenging and requires more than mere off-the-shelf thinking.
- ▶ We call this concept “In-Home M2M”

# Internet of Things: It's Already Big



## ▶ Connecting up more than just the humans

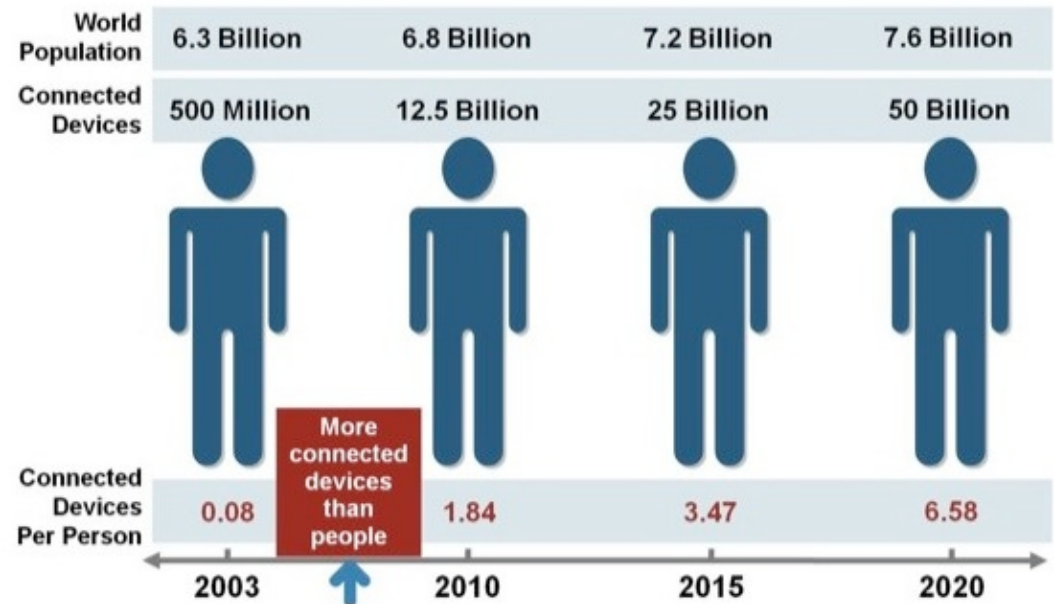
2010: Cisco/IBM: “1 trillion connected devices in 2013”

2011: Cisco/Ericsson: “50 billion connected devices in 2020”

2012: GSMA: “24 billion by 2020 – \$4.5 trillion market value”

## ▶ What's connected ?

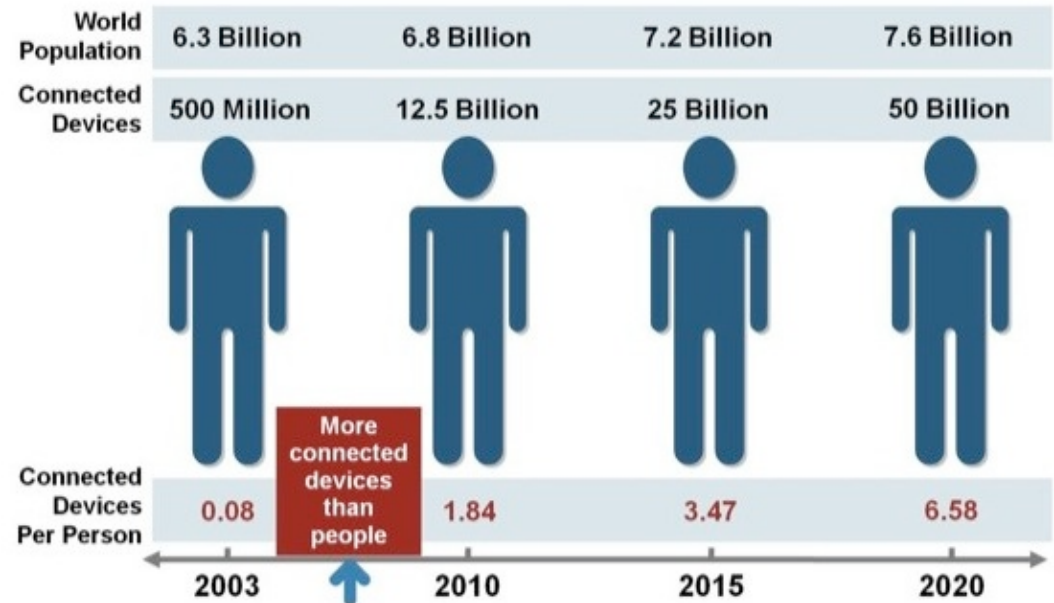
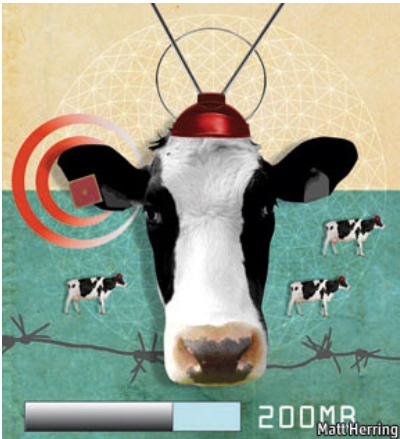
- ▶ Us
- ▶ Our devices
- ▶ Our machines
- ▶ Our world



# Internet of Things: It's Already Big

## ▶ What's connected ?

- ▶ Us
- ▶ Our devices
- ▶ Our machines
- ▶ Our world

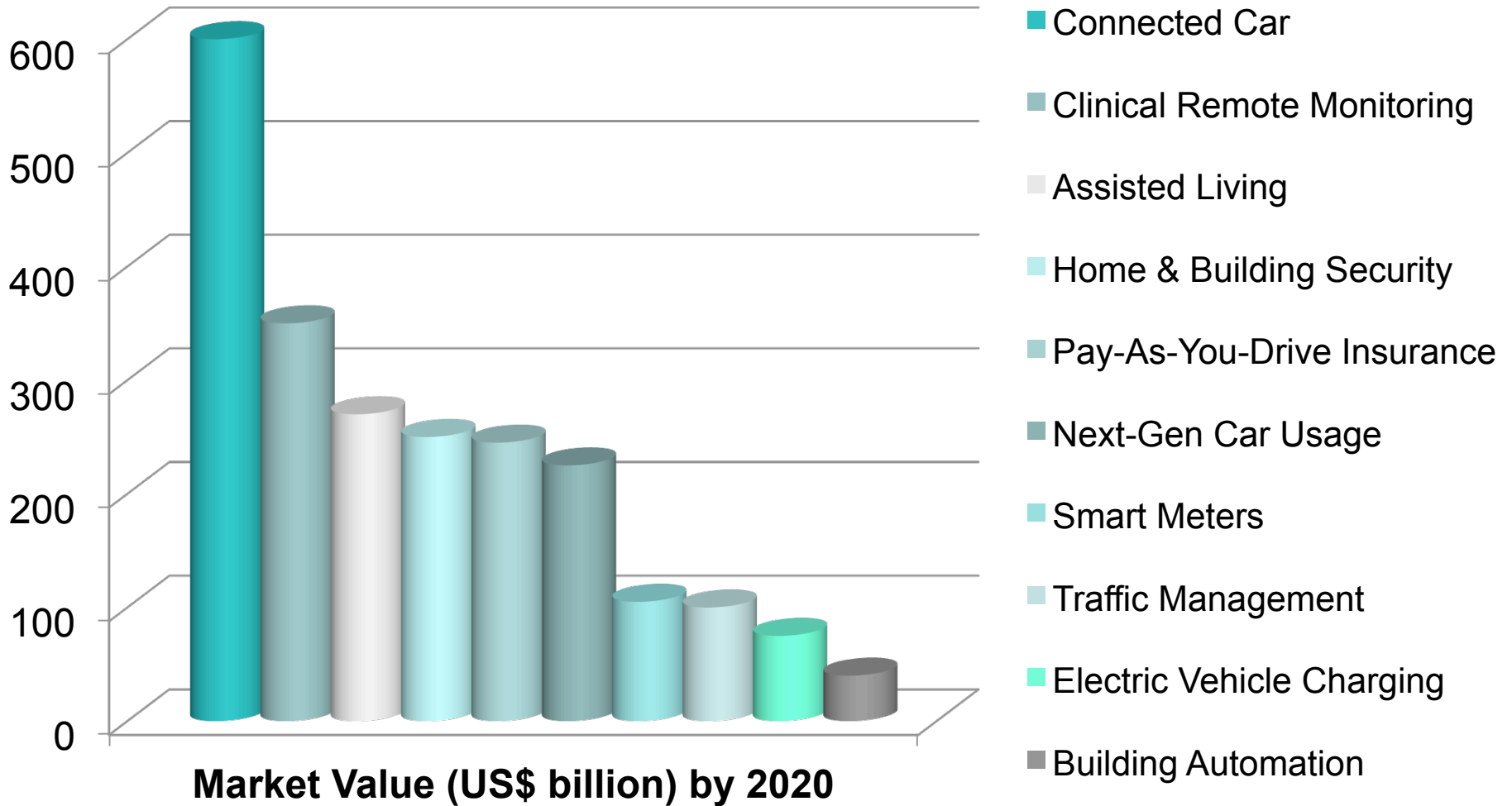


## ▶ And even our livestock

- ▶ “The average cow generates about 200 megabytes of information a year”

# \$2.7 Trillion Value from Just 10 Apps **Xsilon**

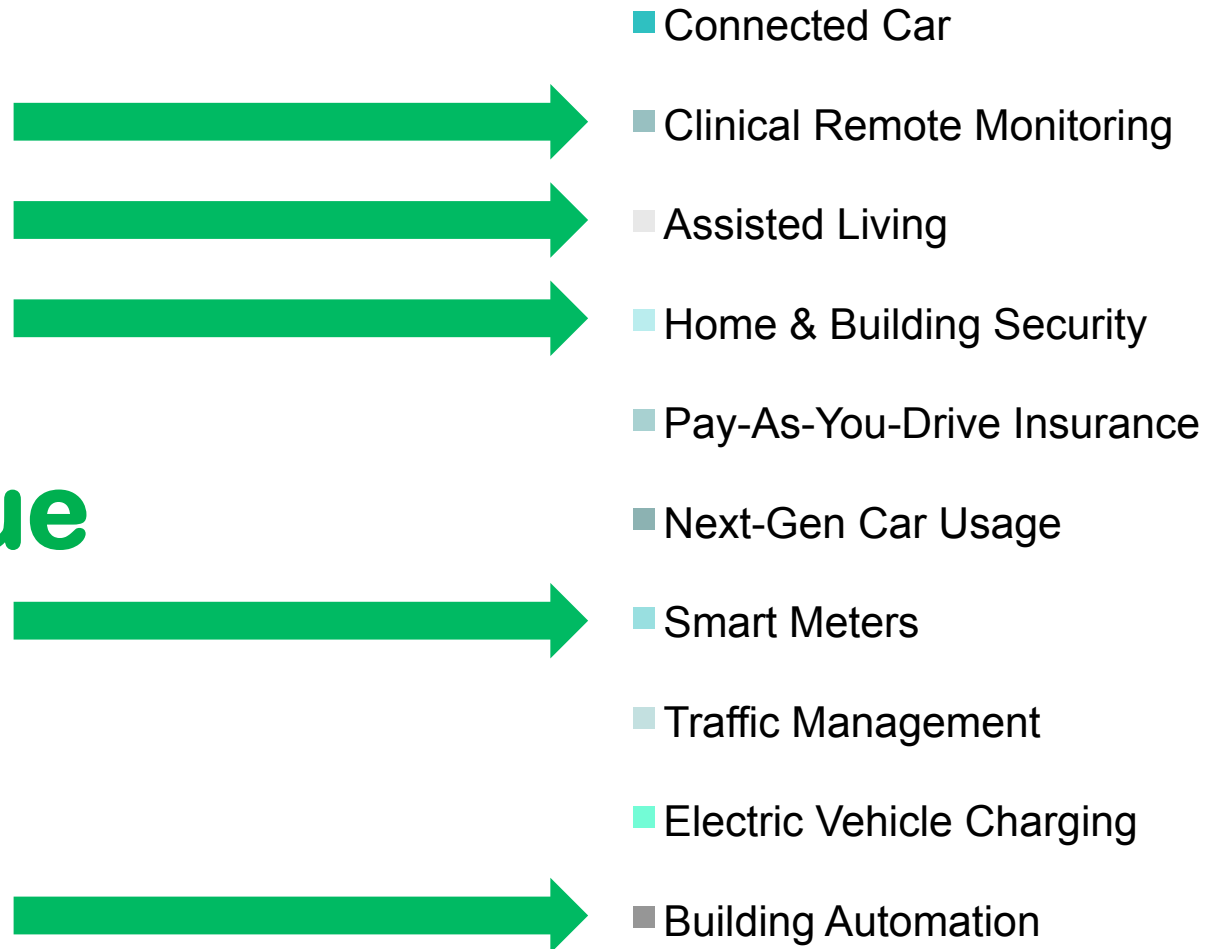
Source: GSMA 2012



\$2.7 Trillion Value from Just 10 Apps

Xsilon

**In-Building  
Market Value  
= \$1.0 tn**



## Internet of Things in the Home

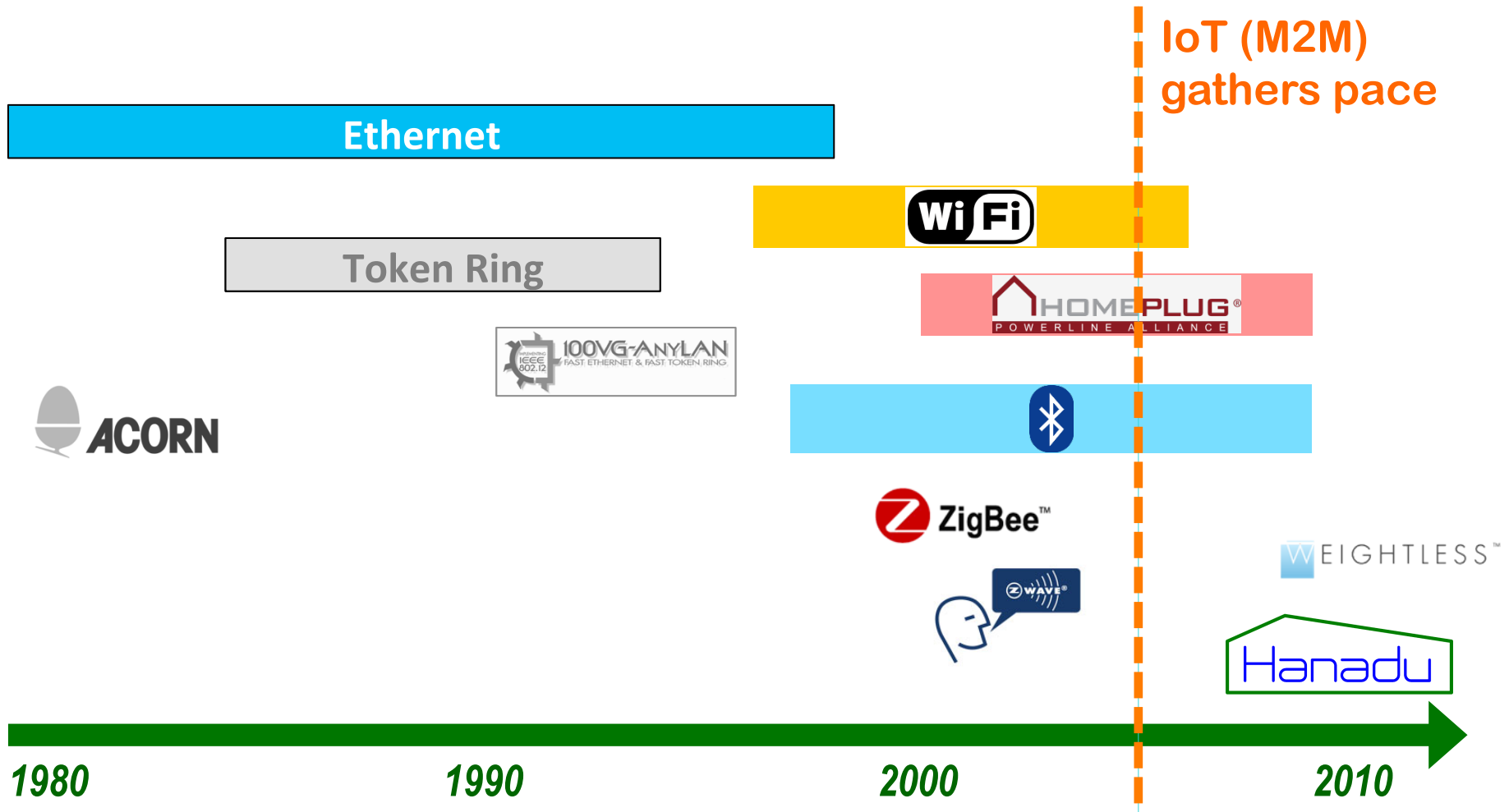
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- ▶ Connecting devices is a “Machine-to-Machine” task
  - ▶ M2M in the Home needs (near) perfect coverage
- ▶ Useful M2M services at home:
  - ▶ Smart metering
  - ▶ Environmental control
  - ▶ Home energy management
  - ▶ Smart appliances
  - ▶ Assisted living
  - ▶ E-Health
  - ▶ Microgeneration monitoring

### *Connectivity Essentials:*

- ▶ Mass Market installable
- ▶ No more wires
- ▶ Low cost
- ▶ Works everywhere, always
- ▶ Scalable
- ▶ Low power usage

# Warning! Comms Engineers at Work

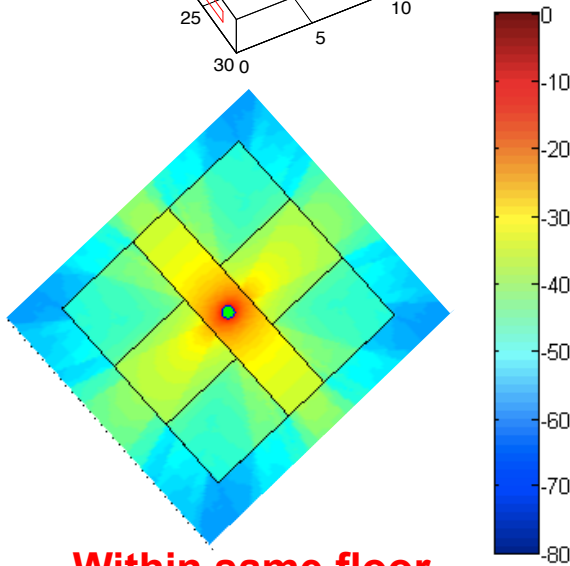
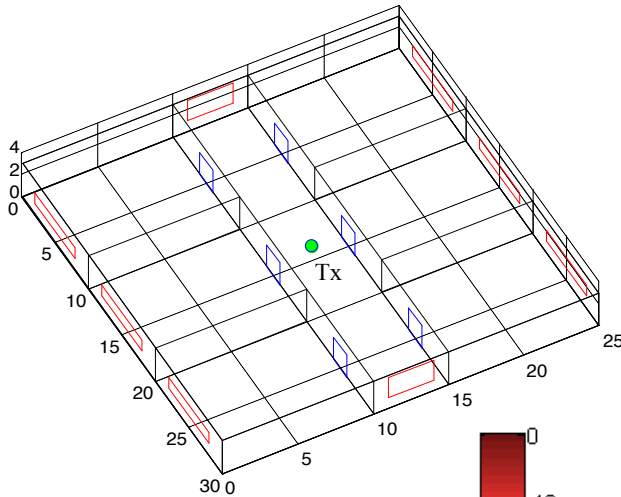




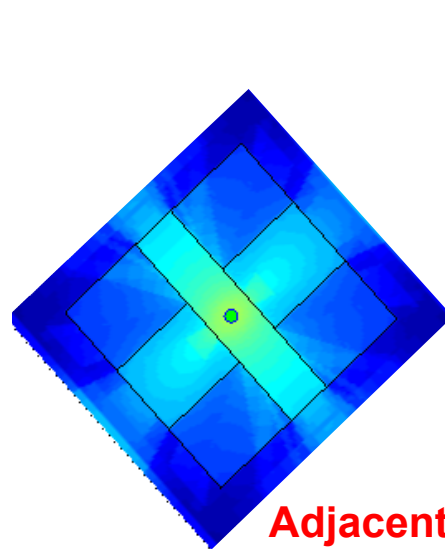
# Radio in the Home: WiFi Coverage ?



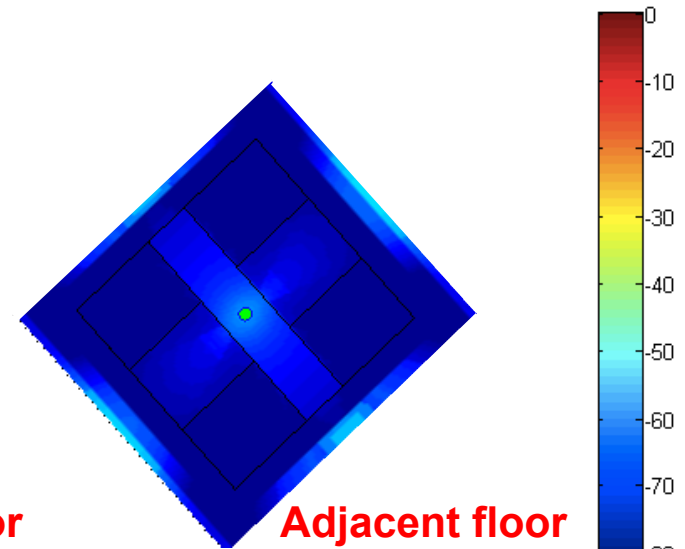
- ▶ Modelling of 2.4GHz radio (eg WiFi) coverage inside a building with walls and floors
- ▶ Propagation modelling only – ignores spectrum congestion effects



**Within same floor**



**Adjacent floor  
(aerated concrete)**



**Adjacent floor  
(concrete)**

## Connectivity in the Home

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- ▶ Key characteristics of In-Home M2M:
  - ▶ Walls and floors are hostile to radio
  - ▶ WiFi airwaves congested with neighbours' networks
  - ▶ Mixture of battery-powered and mains-powered devices
  - ▶ Broadband network likely already deployed
  - ▶ No IT manager available
  - ▶ Householder does not want multiple networks
  - ▶ *Ad hoc* connectivity and repositioning of appliances
  - ▶ High sensitivity to cost
  - ▶ High sensitivity to privacy and ownership
- ▶ Any compromise around a “convenient” technology risks a product’s mass market relevance

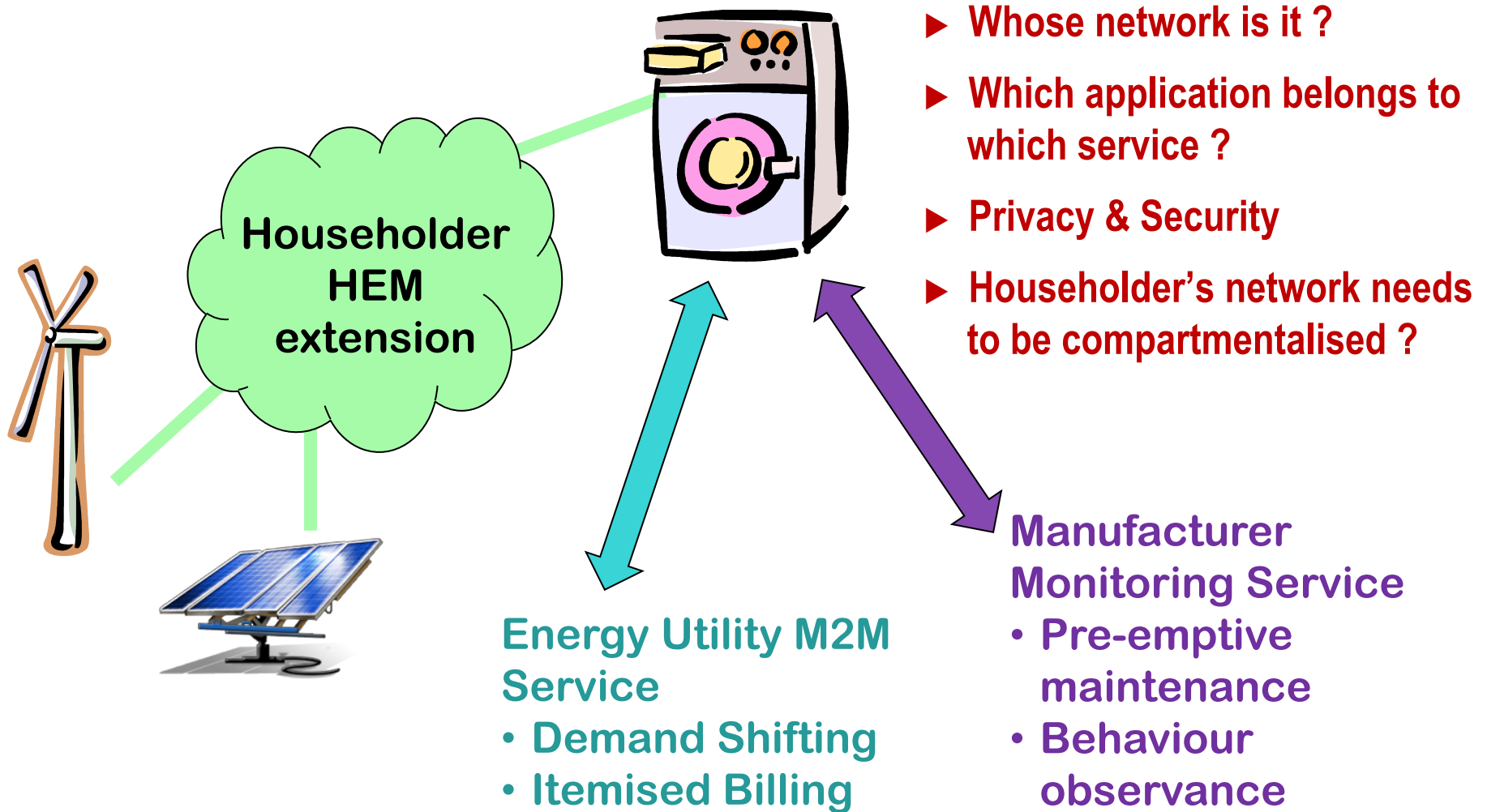
# No Single Solution for In-Home M2M



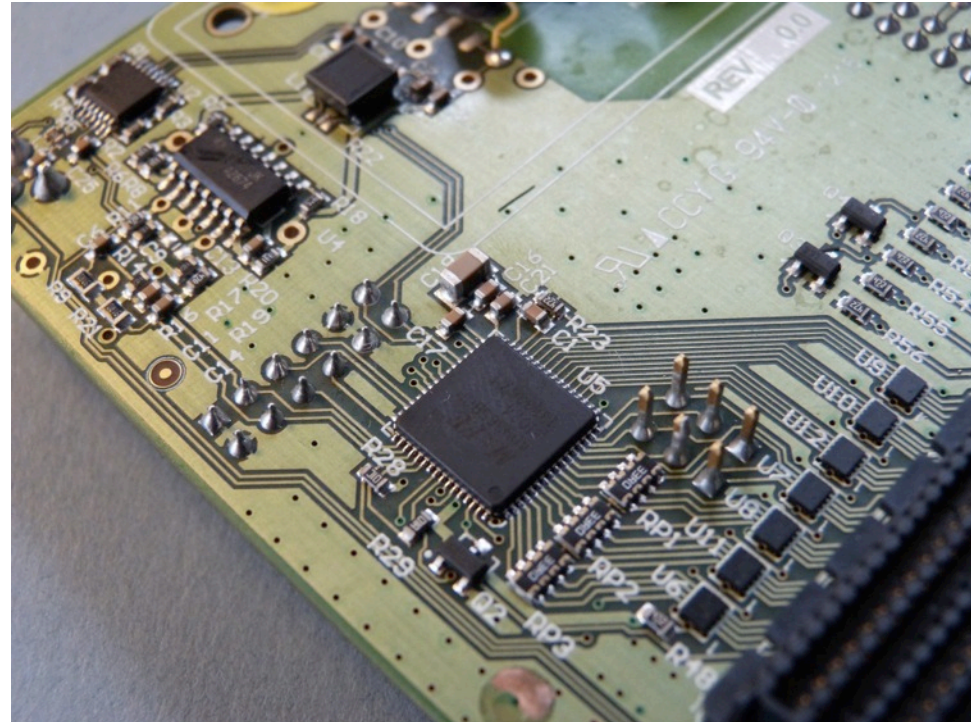
	WiFi	ZigBee	Bluetooth	HomePlug Green PHY	Hanadu
Battery friendly	N	Y	Y	N	N
Whole-house w/o meshing	N	N	N	N	Y
Whole-house w/ meshing	N	Y	N	N	Y
Power usage < 1W	Y	Y	Y	N	Y
High node counts	Y	Y	N	Y	Y
Full "IoT IPv6" (6LP, ZB profiles)	N	Y	N	N	Y
Secure	Sometimes	Y	Y	Y	Y

**Proprietary radio solutions exist at 433MHz and 868MHz – they are rarely scalable**

# In-Home M2M: An “Internet of Silos” ? **Xsilon**



- ▶ In development since 2009 – greenfield approach
- ▶ Powerline complement to ZigBee
- ▶ Proprietary open specification (like ZigBee, Bluetooth, etc.)
- ▶ Designed for In-Home M2M
- ▶ Ultra-small form factor
- ▶ Sub-500mW power
- ▶ Standards compliant
- ▶ Whole home coverage
- ▶ Full co-existence with other technologies



- ▶ Connectivity for Intelligent Control Systems sits within the context of what else is going into the home
  - ▶ Point solutions
  - ▶ Platform solutions
- ▶ Platform solutions aim to support multiple In-Home M2M and other applications
- ▶ Re-purposing an old connectivity solution risks being a compromise too far
  - ▶ Mass market solutions have to work for everyone
- ▶ No single technology will work for everything
  - ▶ Hybrid approaches essential eg ZigBee/Weightless/Hanadu

Thank You

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