Simulcast Mesh Networking via Multiple Physical Transports

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What is this talk about?

50 billion devices by 2020

Over 50 billion devices by 2020

Up to $6.2 trillion by 2025

$7.3 trillion by 2017

IoT
Internet of Things

Massive Opportunities

But problems too – like scaling

Gartner

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STAMFORD, Conn., September 8, 2014

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Gartner Says a Typical Family Home Could Contain More Than 500 Smart Devices by 2022

Smart Homes to Offer Numerous Innovative Digital Business Opportunities

Gartner Special Report Examines Trends in Digital Technologies

The falling cost of adding sensing and communications to consumer products will mean that a typical family home, in a mature affluent market, could contain several hundred smart objects by 2022, according to Gartner, Inc. Gartner said that the smart home will be an area of dramatic evolution over the next decade and will offer many innovative digital business opportunities to those organizations who can adapt their products and services to exploit it.

"We expect that a very wide range of domestic equipment will become 'smart' in the sense of gaining some level of sensing and intelligence combined with the ability to communicate, usually wirelessly," said Nick Jones, vice president and distinguished analyst at Gartner. "More sophisticated devices will include both sensing and remote control functions. Price will seldom be an inhibitor because the cost of the Internet of Things (IoT)

Network Practical Maximums

- Bluetooth – 9
- WiFi – Dozen ?
- Zwave / Zigbee - 35

…and more problems – range & reliability

Consumers are much more sensitive to IoT failures than other consumer electronic glitches

…. and still many more problems

Appearances

- It Looks Easy
- Misperceptions
- Misinformation
- FUD
- Everything will have IP address
- Megabytes of data needed
- Cool but useless
- We can make it better
- Can tie it all together
- Push Model
- Funding driving uptake
- Incorrect Conclusions

Products

- Setup is too complex
- Lack of a value proposition
- Too many Interconnect protocols
- Too many single point solutions
- Too narrow product offerings
- Too many setup paradigms
- Too many styles / designs
- Too many ecosystems
- Too few international solutions

Technologies

- Don’t scale
- Don’t reach (Range)
- Not Reliable
- Ignorance of what matters
- Open standards demand
- Lack of compatibility
- Single point of failure
- Network overheads
- Popcorn effect
- Healing
- Ad hoc setup

Simulcast Mesh Networking via Multiple Physical Means

Designed specifically for the IoT
Solves the problems

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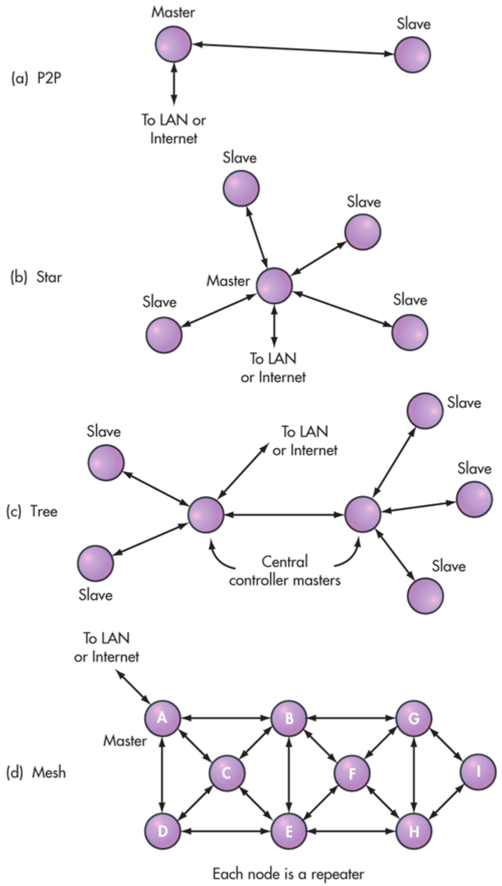
Simulcast Mesh Network?

Multiple Physical Means?

Distributed Intelligence?

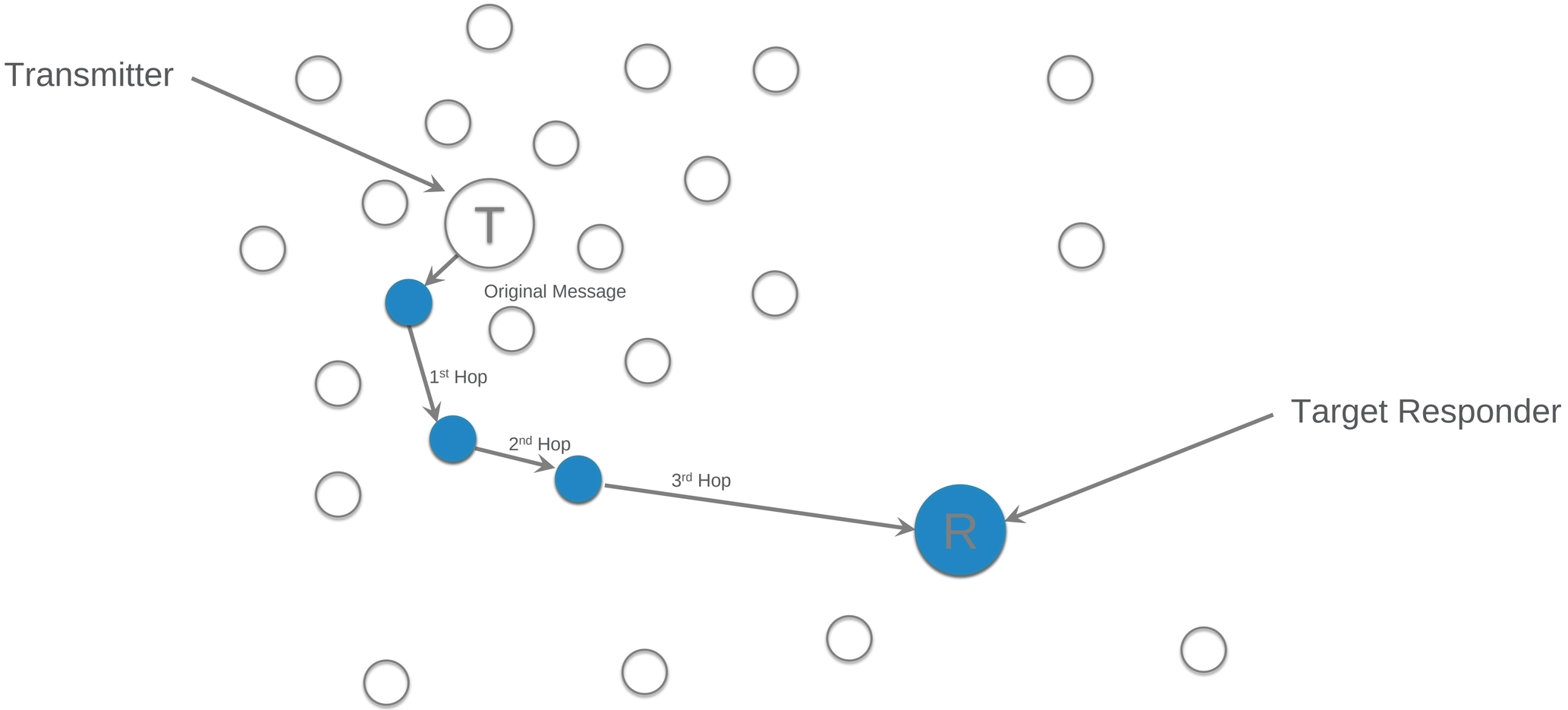
Wireless Network Signal Propagation Examples

- Point to Point - Wifi (Wireless Local Area Network)
  - very high data rate – e.g. Video, Practical node count in 10’s depending on usage
- Star – Bluetooth (Personal Area Network)
  - high data rate – e.g. Audio, ~8 nodes per network
- Mesh, Routed – 802.15.4 (various)
  - Relatively low data rate (utility meters), Practical node count in 10’s
- Mesh, Simulcast – Insteon (Wireless Device Area Network)
  - Relatively low data rate, very high node count

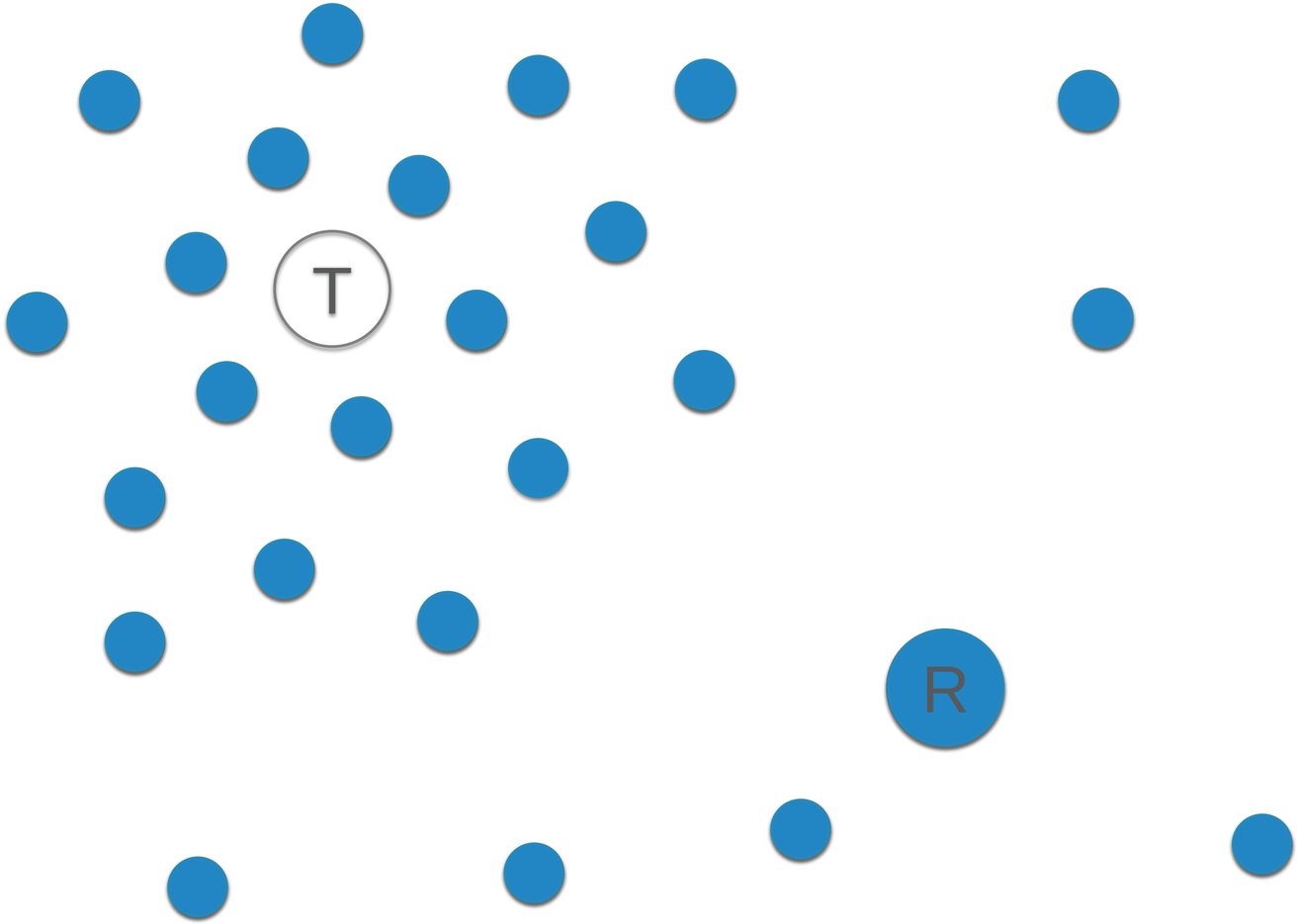


Electronic Design, Lou Frenzel, Nov 29,2012

Mesh, Routed


Transmitter
T
Original Message
1st Hop
2nd Hop
3rd Hop
Target Responder
R

Mesh, Simulcast



= Massive Scalability

Insteon – Original Message

Simulcast – even the biggest homes

With routed networks, different types of products require different commands clogging the network and causing delays – it just doesn't scale

Simulcast has no theoretical maximum network size and we've never heard of a practical one

Dinnertime Scene – Using Routed Networks

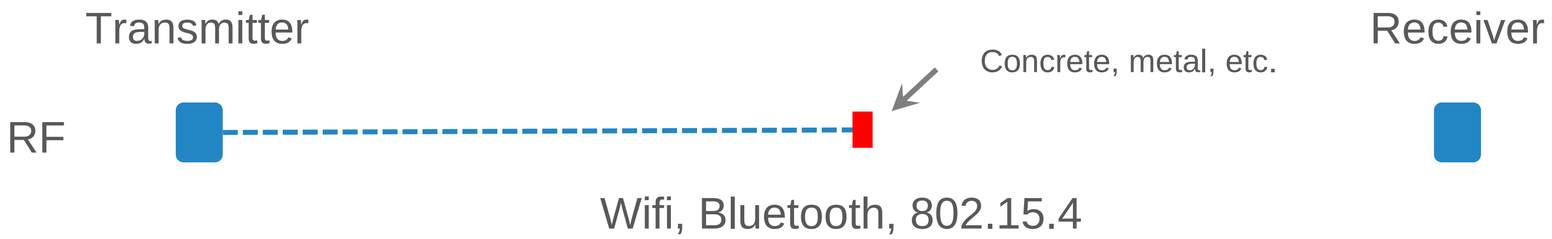
with Simulcast

Homes will have hundreds of devices, commercial buildings even more
Insteon is used in buildings over ½ millions square feet and even throughout large campuses

Multiple Physical Means

- Typical today = 2.4GHz Radio Frequency, various methods
  - All share the same physical space
  - Limited to the constraints of RF propagation
    - Most significant impediments are physical structures (walls, appliances, people)
- Using more than one physical method to propagate a signal significanly improves reliability

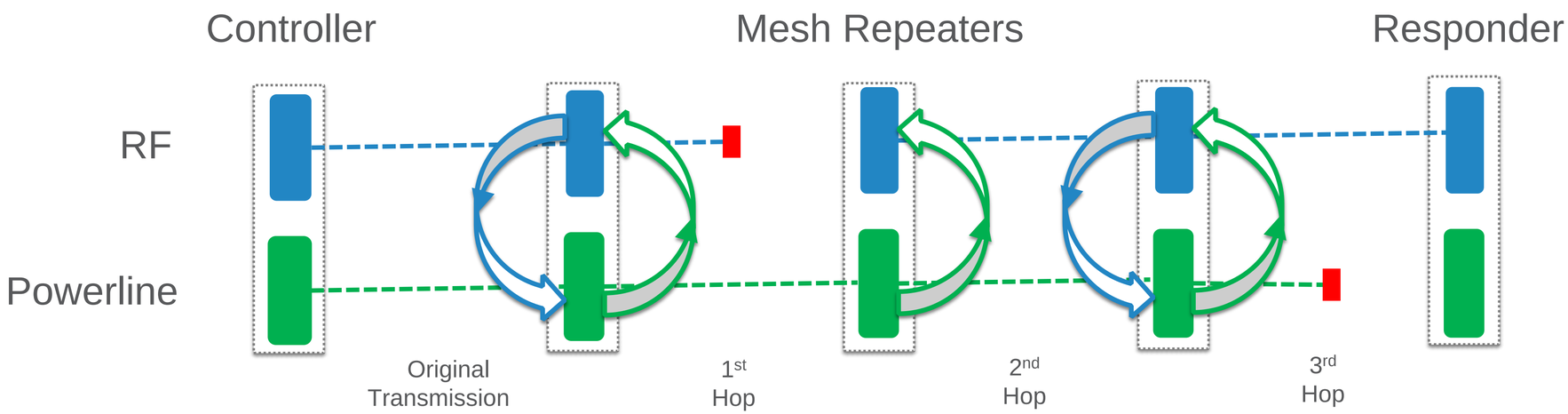
Dual mesh



With both RF and powerline a much greater range is achieved

Dual mesh – 100 x more reliable

Insteon gets through, even if both physical paths are blocked



Since RF and Powerline obstructions are rarely at the same place and time
When used together error rates are only 1% of a single band network

Summary

- Simulcast
  - all devices help propagate signals providing massive scale
- Multiple Physical Means
  - mitigates issues specific to any one single method
- Distributed Intelligence
  - Instant reaction on a massive scale without function compatibility issues

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