Networking the World

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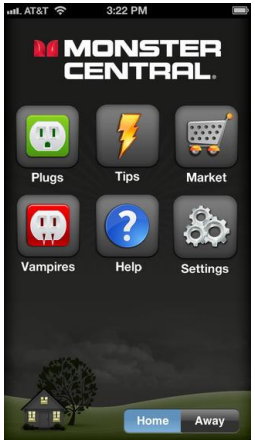
Networks have traditionally been used to connect people

We are starting to network people to physical world

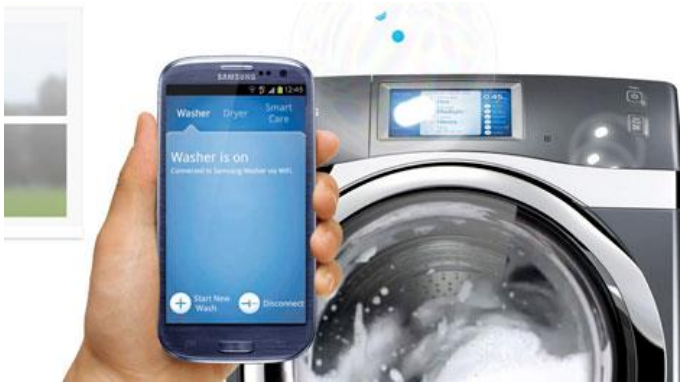
nest
COOLING
72

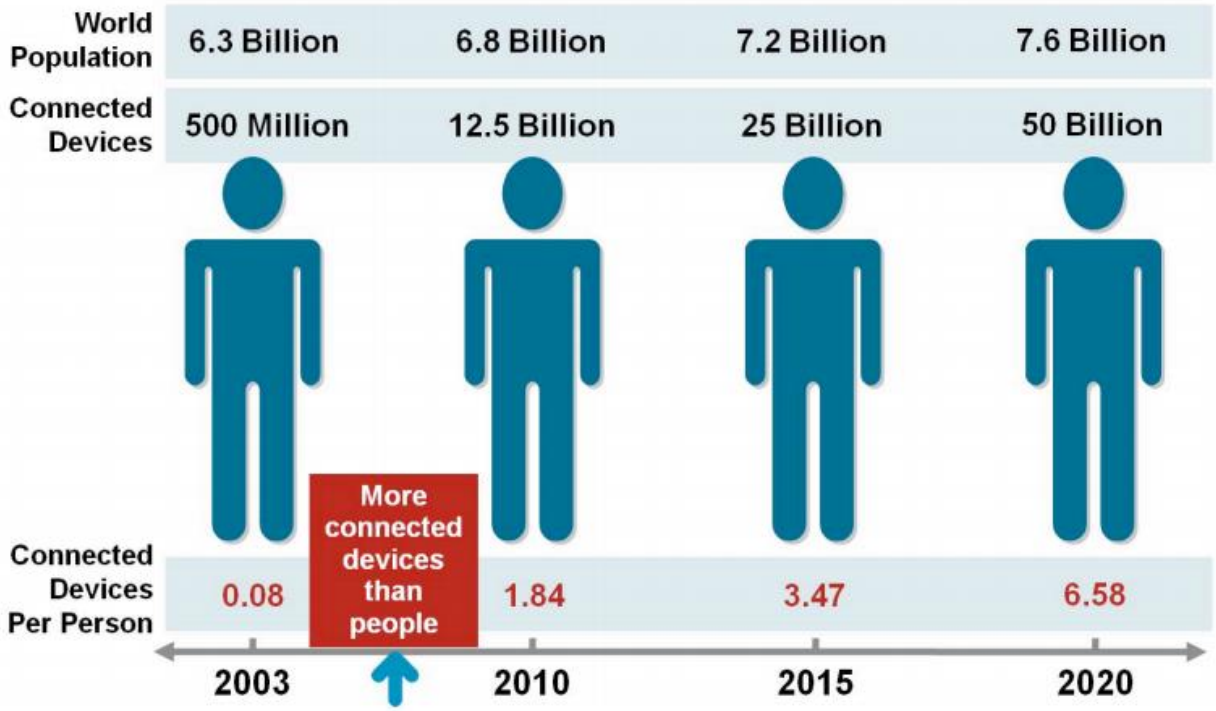
nest
IN 25 MIN
72
DOWNSTAIRS
UPSTAIRS

MONSTER CENTRAL
INTERNET
PROTECTION ON
RF LINK
PCT 300MC


AT&T
3:22 PM
MONSTER CENTRAL
Plugs
Tips
Market
Vampires
Help
Settings
Home
Away

Gone
Fishing!


Washer
Dryer
Smart Care
Washer is on
Start New Wash
Disconnect



Source: Cisco IBSG, April 2011

Wireless network of devices

Scale

Energy

Scale

How to achieve these properties despite the scale?

Reliability

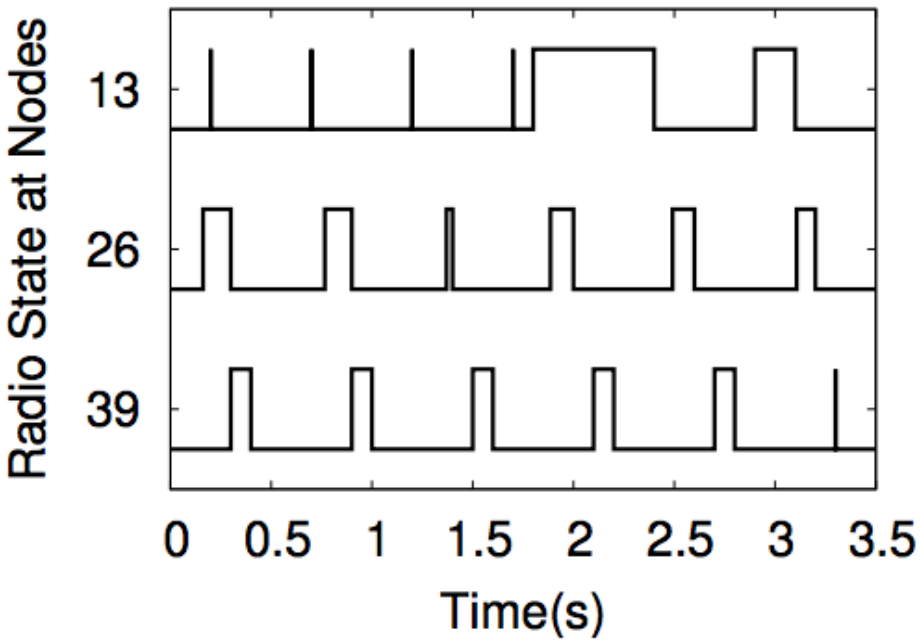
Efficiency

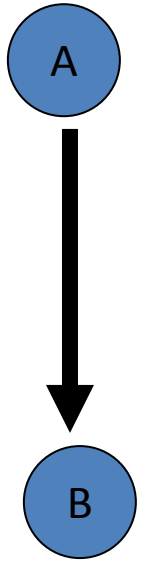
Capacity

Energy

Some devices have limited energy storage or generation capability

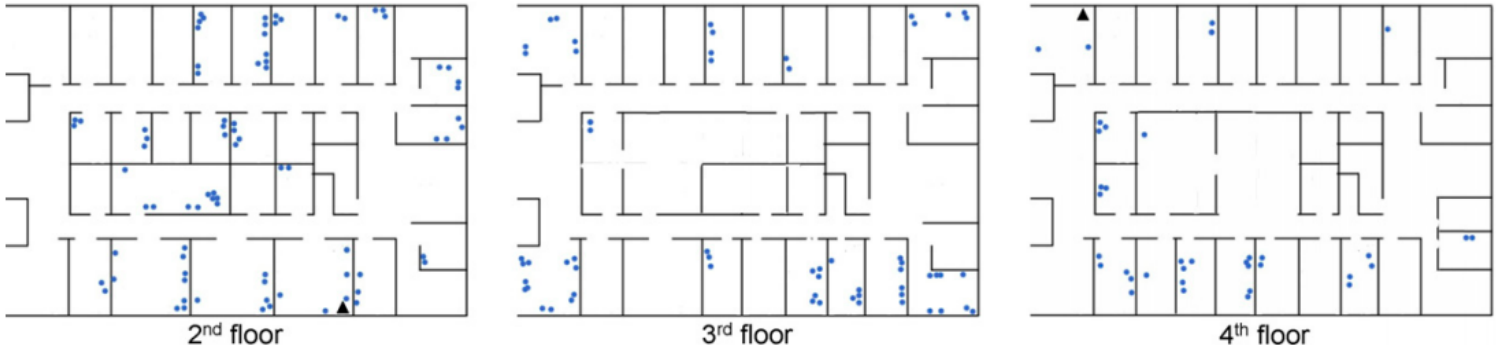
Some specific examples from my research



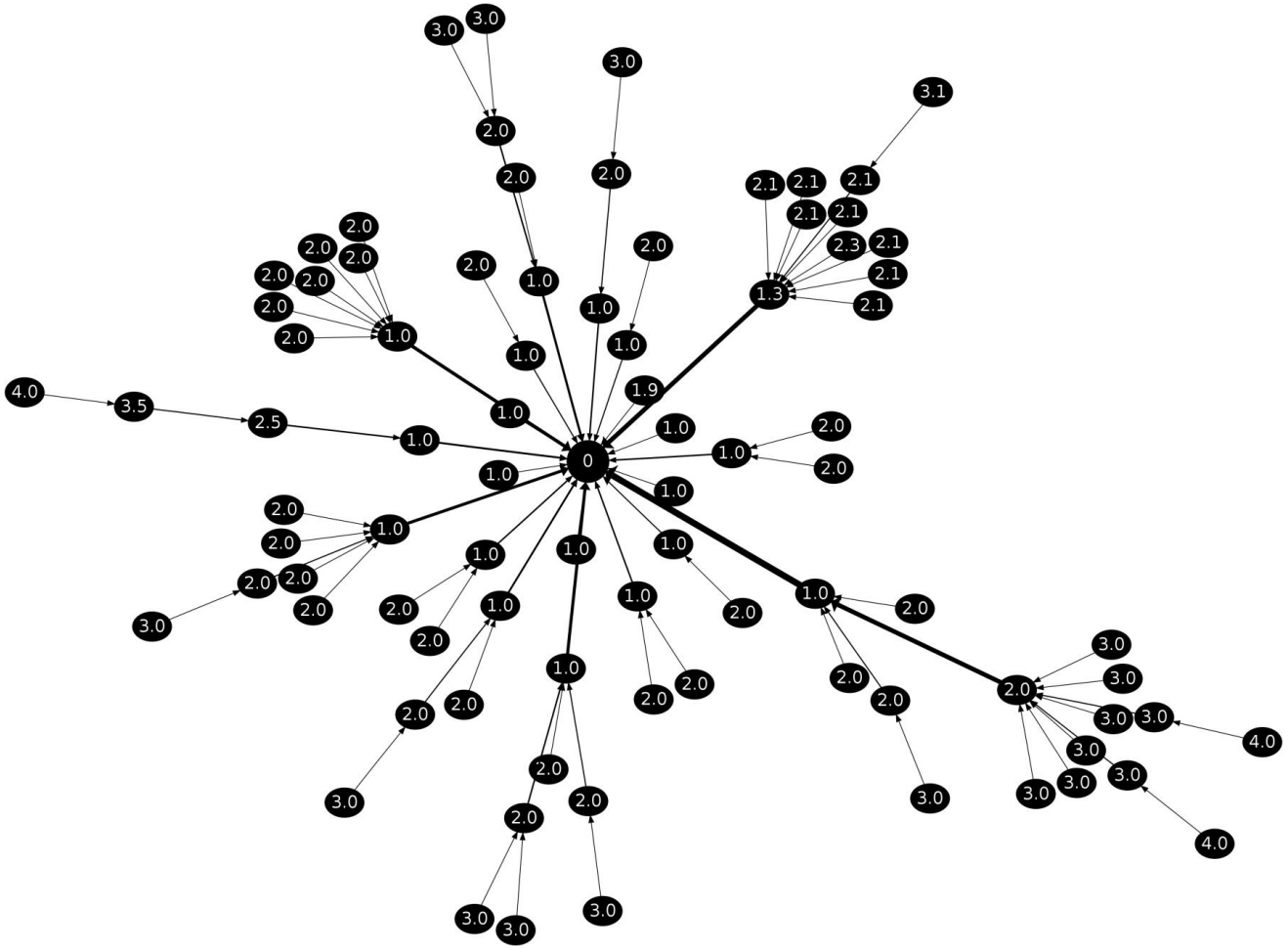


How does the transmitter know the receiver radio is on?

Powernet Deployment

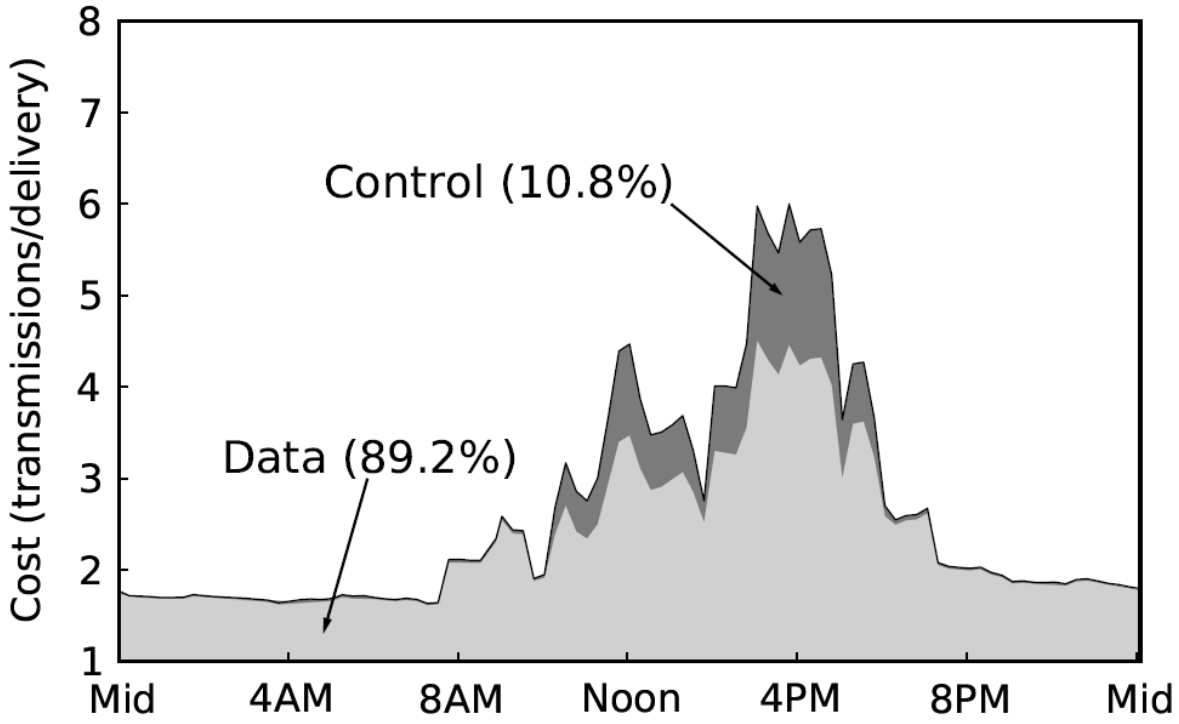


How do we collect data from all these sensors?



Multi-hop the data if the radio has limited range

Performance over time



Need high performance despite changes in the environment

How do we do systems research?

Come up with new ways to build these networks

Study existing networks and make them better

Write lots of low-level and high-level code.

Across the *network stack*

Run the code on a variety of devices
(depending on your research)

Use simulators as appropriate
(but don’t stop there)

Embedded platforms and sometimes phones, servers, …

Sometimes deploy them

Testbeds (twonet)

Offices (powernet)

Cities (bridges)

Collect and analyze data

Re-design

Re-deploy

Learn and Advance

Platforms

Stacks

Protocols

Applications

Visit

http://www.researchdiaries.org

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