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Casting a wider net: New applications for wireless sensing

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Casting a wider net: New applications for wireless sensing

Presentation overview

- Background of Sensors and Devices group
- What *are* wireless sensor networks?
- Prototyping sensor network applications

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Sensors and devices at MSR Cambridge

- Applied research into embedded hardware
  - Sensors and actuators
  - Embedded, handheld, peripheral devices
- Unusual perspective and context
  - Technological expertise
  - Sensitivities to and insights into usage
- Develop technology and applications together
  - Consider the complete *system*
  - Particularly relevant to wireless sensor networking

What *are* wireless sensor networks?

- Properties that characterise WSN technology

What *are* wireless sensor networks?

- Properties that characterise WSN technology

Radio communications

Low power

Redundant

Ad-hoc topology

Peer to peer

Multi-hop

Autonomous

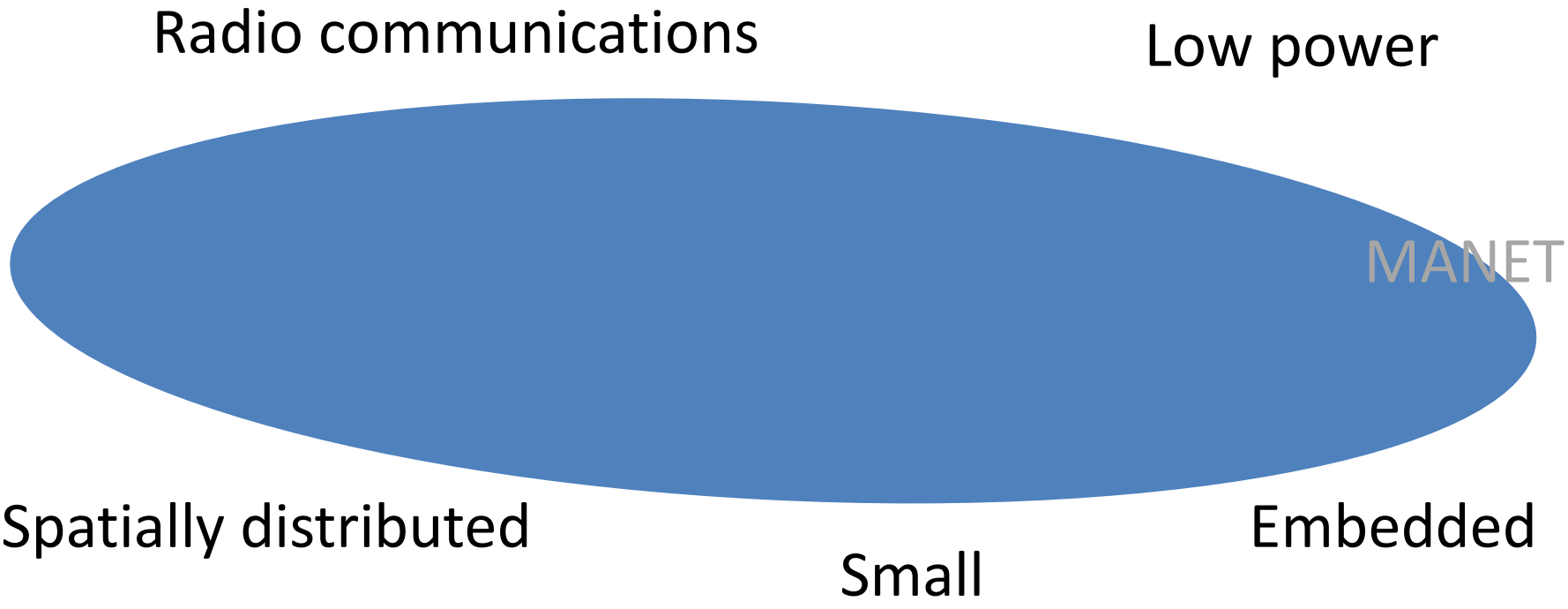
Spatially distributed

Embedded

Small

What *are* wireless sensor networks?

- Properties that characterise WSN technology



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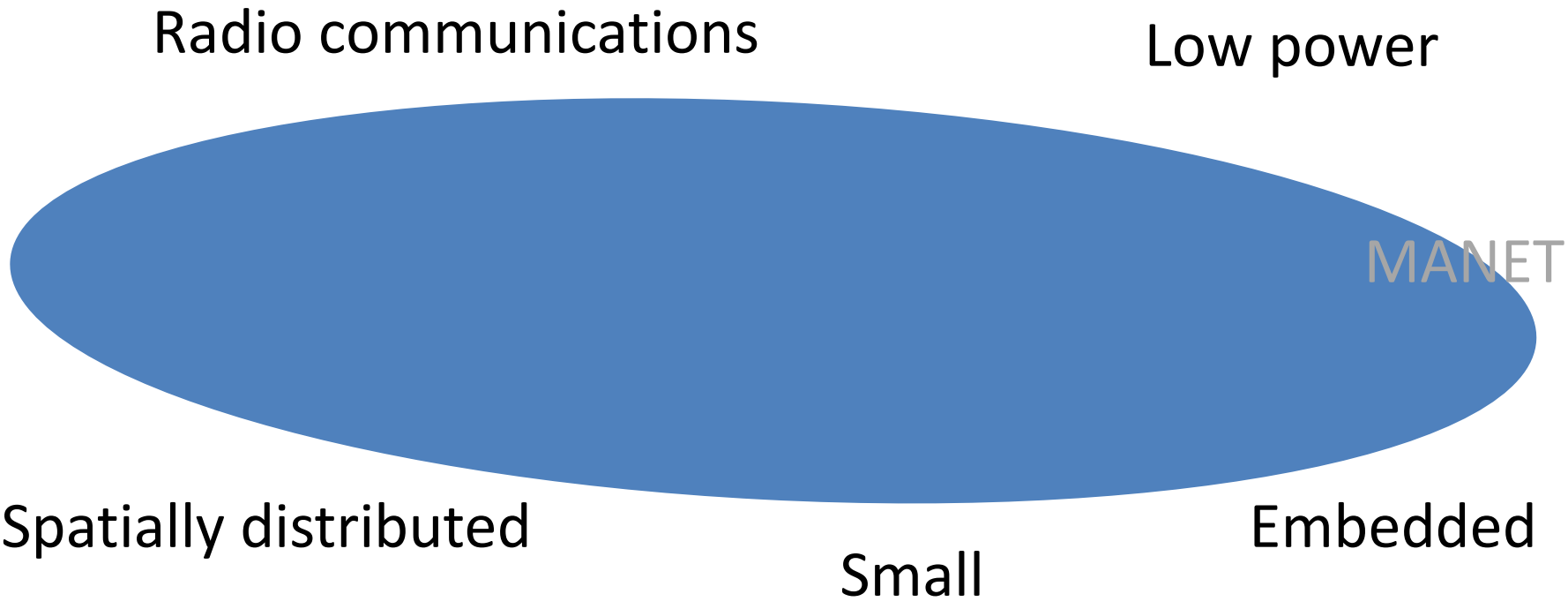
Quick demo

What *are* wireless sensor networks?

- Properties that characterise WSN technology



What *are* wireless sensor networks?

- There are lots of applications beyond environmental monitoring…

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Prototyping sensor networking applications

- Exploring applications through deployment is valuable…

  … but building prototypes is hard

- Especially true for wireless sensor networks
  - Small
  - Low-power
  - Multiple instances

Prototyping sensor networking applications

- Hardware platforms
  - Motes (x n), scatterweb, Smart-its, Particles, BTnodes, Sun SPOT, Fleck, …
- Software
  - TinyOS, AwareCon, embOS, Salvo, Contiki, Tiny PLUS, uC/OS-II…
- Each provides different pros and cons
  - *Largely* target mobile ad-hoc (MANET) WSNs

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a wider range of

Prototyping sensor networking applications

- A new wireless actuator and sensor platform
  - Maintain flexibility, size, power consumption, robustness
  - Proof-of-concept and beyond, multiple instances
- Modular approach to hardware
  - Modules small, but different sizes
  - Flexibility of physical arrangement – tile, stack etc.
  - SPI-based bus (10MHz), few wires
  - In line with modular nature of peripherals

a wider range of

Prototyping sensor networking applications

- Large range of modules
  - Base, processor module – ARM7, USB, power mgmt
  - Wireless – BT, GSM/GPRS, WiFi*, Zigbee*
  - Sensors – tilt, touch, light, temp, e-compass*, GPS*, etc
  - I/O – displays, LEDs, buttons, touch, vibrate, sounder
- New possibilities for development
  - Simplified monitoring of I/O communications
  - Firmware development on PC
  - Communicate with real hardware via USB proxy
  - Transition to embedded tools late in development

* future possibility…

Summary

- Reflect on what we mean by ‘wireless sensor networking’
- Think about applications and technology hand-in-hand
- Make it easier to prototype ideas

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