Panel:
Networking in Challenging Environments -- Hype or Reality?

Ravi Jain
Google
ravijain@google.com
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Examples of Wireless Networks for Challenging Environments (from the panel description)

- Mobile Ad Hoc Networks
- Mesh Networks
- Sensor Networks
- Underwater Acoustic Networks
- Delay / Disruption Tolerant Networks
- Vehicular Networks -- Aerial and Ground
But ... these are very different environments

- Mobile ad hoc networks
  - Typically terrestrial, on-ground
  - Mobile nodes
  - Reasonable computation and storage resources
  - Medium-range, medium bandwidth communications
- Sensor networks
  - Multiple geography types
  - Typically fixed nodes
  - Extreme limitations in computation, storage, energy
  - Typically short-range, low bandwidth communications
- Underwater acoustic networks
  - 2D or 3D underwater
  - Fixed or mobile nodes
  - Network communication energy may not be an issue
  - Long propagation delays, low bandwidth communication
- How to avoid the litany ... security, reliability,,mobility, ...
Common themes

• Communications networks are going to pervade every part of the physical environment: from the human body to outer space
• Two broad classes of wireless networks
  o Dominant: Mass-market, broad application networks
    ▪ Satellite, Cellular, WiFi
  o Specialized: Niche-application networks
    ▪ Bluetooth, IR, mobile ad hoc, sensor, ...
• Hypothesis: Specialized networks risk getting swallowed up by dominant unless they
  o Have at least one compelling special application & business case
  o Perform at least 10x better in at least one key metric
  o Can develop and deploy faster than the dominant network can catch up
The Specialization Burden hypothesis: The engineering time, cost and complexity of specialized networks is too high and risks their marginalization or obsolescence.

Challenge 1: Design reuse.
- How can the huge investment and insights in this design space be reused to reduce the burden?

Challenge 2: Agile R&D.
- How can the design-build-test-iterate cycle be made real and faster?

Challenge 3: Open interfaces.
- Can open interfaces at multiple layers for multiple key components spur distributed innovation and reduce the burden?

Is WiFi a poster child for this approach?