

# 2020: Long-Term Perspectives in Mobile and Wireless (and Beyond)

## Networking

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# Background

- performance requirements of access networks are increasing: access is bottleneck (cost)
- low cost, energy efficient wireless link technology (short, medium, and long range)
- expansion of un-licensed frequency spectrum
  - popularity of IEEE 802.11b/g (WiFi)
- user “willingness to pay” is very limited

# Trends and Visions

- The per unit cost of *long* distance information transport is rapidly approaching zero
  - voice
  - data
  - economies of scale with traffic aggregation
- ***Prediction:*** The cost of short-distance information transport (***access networks***) will approach zero
  - ad-hoc wireless networks
  - user owned infrastructure
  - low cost mobile data access will follow

# The Case for Wireless Ad-Hoc Networks

- Theoretical capacity calculations suggest ***Multi-Hop*** architectures for spectral efficiency
- *Proposition: Users will cooperate if there is a tangible benefit (cost)*
  - existence proofs:
    - the Internet
    - peer-to-peer file-sharing systems

# Challenges and Opportunities

- Automated or assisted network management
  - Lack of user sophistication
  - Already a difficult problem for ISPs
  - Reliability and robustness to failures
- Regulatory issues
  - Incumbents have vested interest in status quo
  - Unlicensed spectrum: range
- Security and Privacy
  - More opportunities for un-lawful intrusions
  - Accountability
  - Digital Rights Management

# Summary

- Access networks are still a bottleneck today
- Wireless ad-hoc networks show great promise in reducing cost of access
- User-owned infrastructure leveraging low cost wireless interfaces will drive access networks costs to zero
  - *open* access will create opportunities for new services and applications
- Enabler for low cost mobile broadband access