Future Network Applications

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What drives new applications?

- Availability of technology: do bandwidth-intensive applications lead to increased access bandwidth or vice-versa?
- Necessity may be mother of invention, but cost is the driver for market penetration!
Very-high speed access

Market penetration story for ADSL (10 Mbps), ADSL+ (20 Mbps), DOCSIS 2.0?

Entertainment industry

- Videos, music on the web
- Enabling technology: high-speed access
- Barriers: piracy concerns
- Impact: Blockbuster video 2002 sales was $5.5 billion, 48 million user accounts
Everything is networked

- Smart office-space, smart household
- Everything from microwave ovens to light switches are networked (wireless)
- Ability to browse for anything from anywhere
- Medical applications
- Security applications

Far-out applications

- Virtual reality at home?
- Watch a football game and feel how it is to be the quarterback
- Remote surgery?
- ......
Research

- Wireless Networking
  - Capacity of wireless networks
  - From Sum capacity (total throughput) to Capacity region (individual throughput)
  - Algorithms for efficient resource utilization (routing, power control, MAC, etc.)
  - Hybrid networks

Research

- Wireline networking
  - High-speed TCP, router functionalities
  - Peer-to-peer networking
  - Pricing
    - Access costs ($40 for telephone, $40 for cable, $40 for DSL or cable modem, $40 for cell phone, etc.)
    - Pricing across ISPs
Pricing

- Peering, transit, access and termination charges
- Impact on routing and congestion
- Bandwidth brokers
- Truth telling and auction theory

Pricing Challenges

- Computability
- Distributed implementation
- Divisibility of goods
- Resources that are neither unrelated nor in direct competition
Conclusions

- Applications are hard-to-predict, but it is clear that applications will continue to become more bandwidth intensive and there will be pervasive connectivity.
- Supporting science:
  - Theory of distributed wireless networks
  - Network Economics