



Disrupting the Disruption: The revenge of end to end

David D. Clark

M.I.T. ITC

January 2003

The Internet changed everything?

- The old-line telephone companies are in pain right now.
 - Not just the Internet's fault...
 - The Internet is not the end-point of the revolution.
 - Give IT 50 years to see where it ends up.
 - A cycle of innovation is repeating itself.
 - Now the ISPs are the “old-line”.
-

Is the Internet done?

- Ubiquitous mobile computing
 - But who provides the infrastructure?
 - Location-aware computing.
 - But who owns the knowledge of my location?
 - Embedded processing—computerizing everything.
 - But who will hook all these devices together?
 - Networked digitized consumer devices
 - But who will set the standards?
 - The networked automobile
 - But (again) who provides the infrastructure
 - Who provides the standards?
-

What shapes the present?

- Economic downturn
 - Especially IT, and especially Internet
 - Backlash from incumbent industry sectors
 - Telephone, music, radio, micro-payments...
 - Telcos are the surviving ISPs.
 - They own facilities and deep pockets
 - They may still think like telcos.
-

Central thesis

- ISPs, to make money, would like to control the market and the services.
 - Telcos especially think this way.
 - Remember the end to end arguments.
 - ISPs are now in the middle.
 - Innovation is happening at the edge.
-

Losing their grip

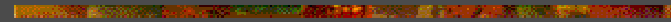
- ISPs don't "own" the network.
 - Car, residence, enterprise, body,
 - Wireless owners did not corner the spectrum.
 - Long haul fiber is cheap.
 - The double whammy of bankruptcy.
 - ISPs don't control standards for devices.
 - Municipalities are doing broadband.
-

The battle for the future

- Edge vs. center
 - Wireless infra: WiFi vs. 3G?
 - My location: edge node or telco?
 - Sensor network: sensor operator?
 - Consumer standards: device manf?
 - There is a natural vigor to edge solutions.
-

The next big thing



- Collaborative edge activities.
 - Napster and peer-to-peer sharing.
 - SETI@home and collaborative computing (e.g. code-breaking).
 - Grid networking.
 - Collaborative filtering (content preferences, spam detection)
 - Overlay networks.
 - Multi-hop ad hoc radio.
 - Mutual backup across the network.
 - Residential co-op and municipal networks.
- 

False comfort for the center

- These things will not scale.
 - They don't need to, and they do.
 - Self-interest will kill them.
 - A dose of economics will cure them.
 - When costs are low, self-sacrifice is nothing.
 - They will not be trustworthy.
 - We are learning how to model trust.
 - They will not be robust.
 - Small \neq crummy. Who do you trust?
-

Can the center thrive?

- Why should the center invest in improvements?
 - Increased revenues? Not likely.
 - Competitive pressures? Limited.
 - Example question:
 - Will residential broadband get faster?
 - How little middle is necessary?
 - A question for developing countries?
 - A question for times of emergency.
 - A disruptive question.
-

Bottom line

- Focus on the positive--edge power.
 - Collaboration is win-win, creates new value.
 - We know more about building these systems.
 - Engineer economic systems
 - We did this without knowing it with Internet.
 - Usage, edge-driven infrastructure
 - Be realistic about policy.
 - Remember the role of research.
 - Open research can make a market.
-

An MIT agenda

- Tell the story. Alert the players. Emphasize the key points.
 - Demonstrate the story. Excite people by building collaborative applications.
 - Dispel the myths and negative advertising.
 - Analyze the outcome. Is there a roadmap to this future?
 - Remove the technical barriers. We can pick the future we like and invent it.
 - Remove the policy barriers. Recognize the pressure of the incumbents to block it.
-