

Mobility & the challenge for Regulatory Policy

William Lehr
MIT



The Cooperative Association for Internet Data Analysis

The 4th Workshop on Internet Economics (WIE 2012): Definitions and Data

December 12-13, 2013
San Diego



MIT COMPUTER SCIENCE AND ARTIFICIAL INTELLIGENCE LABORATORY

MIT Communications Futures Program

*"Defining the roadmap for communications
and its impact on adjacent industries."*

Mobility

From networking/technical perspective...

- Everything : nodes, of course, but also networks, **resources**, context.
- **Dynamic**: all time/geo scales, but increased granularity new.
- Wireless: Cellular & WiFi. **Small cells**.

From customer/user perspective...

- Mobile BB: new devices, services, places to be online → THE FUTURE!!
- Everywhere/always connected. Automation. Personalized.
- Choice?
 - What/when/where to use ⇔ audience/market fragmentation
 - Options ⇔ Last-mile or *other* bottlenecks? (spectrum, devices, apps, ...)
 - Configuration complexity ⇔ informed choice? “usable” choice?
- **End-user control** ⇔ wireless enables new vector for competition

Mobility's Regulatory Challenges

Market definition: Universal Service, Competition, Industrial Policy

- what is service? Definitions/Metrics/Universal Service (WIE2012)
- where is the bottleneck? (coord/rationing problem?) **Spectrum**
 - (coordination/rationing problem?)

Pricing : (economics is always about pricing...)

- Investment & Innovation: shared cost recovery? **Usage pricing**
- Interoperability & Connectivity: **Interconnection/Roaming**

Mobility of essential resource: **Spectrum**

Spectrum ⇔ **shared** ⇔ **unbundled from uses/apps/networks**

- Continuum of regimes : Exclusive licensed ⇔ Unlicensed
- Unbundled for uses, apps, networks for dynamic reallocation
- "*Spectrum Access System*" ⇔ distributed dbase (Internet)

Small cells

- Spatial reuse: infrastructure ⇔ spectrum substitution, low power
- What spectrum (rights)? Licensed or unlicensed?
- Backhaul?
 - Wired: special access, fixed BB
 - Wireless: higher power unlicensed?
- Who controls/invests in the small cell?
 - "Off-loading" value capture: complement or substitute for cellular?
 - Multi-homing? "Revenge-of-the-edge" offsets Terminating monopoly problem, but may complicate provisioning (unbundle "contracts"?)

Unlicensed necessary for end-user deployed option to be feasible

Mobility: Access → Usage pricing

Mobility increases shared/common costs.

- w/fixed, driveway goes with house; w/mobile, user may use any tower
- More “common pool” resources (spectrum, site access, standards)
- Maybe less so if RAN is user-provisioned

Higher shared costs → bigger cost recovery problem

- Price discrimination necessary to recover costs. (Incremental cost pricing for all goods will not recover)
- Mobility increases consumer choice, decreases ability to price discriminate (cross-price elasticity increases)

Verizon Wireless : “share everything plan” \$90+/month

- \$X (\$40 smartph, \$10 tablet,...) + \$Y (data plan, GB) per month
- Unlimited SMS/voice, data at \$/GB basket (\$50 for 1, \$60 for 2, ...)
- *Is this sustainable without market power??? Is this “fair”?*

Mobility: Interconnection → Roaming

Wholesale : intercarrier compensation

- Mobile SLAs?
- “Peering” or “Transit” or ...

Retail: (please, not back to retail price regulation....)

- Cost-recovery ⇔ efficient price discrimination
- Seamless mobility ⇔ demand growth complementary services

Waterbed effects, Free-riding, Lemon’s Problems....

- Waterbed: lower roaming, higher access/home usage pricing
- Free-riding: no user wants to pay more than incremental cost
- Lemon’s: selling verifiable QoS in mobile even more difficult (metrics)

Summing Up

Future of Broadband Internet is Mobile

Mobility is about dynamic, distributed, resource allocation

Key challenge for Comm Policy is sustaining Competition (that supports policy goals... not just economic efficiency)

Mobility ⇔ Competition Challenges

- **Spectrum Open Access → the wireless bottleneck resource**
- **End-user deployed networking → small cells, equipment v. operator**
- **Interconnection → shared costs/common costs**