# *Mobile Broadband and Wireless Measurement Infrastructure:*
## *Policy Challenges & Opportunities*

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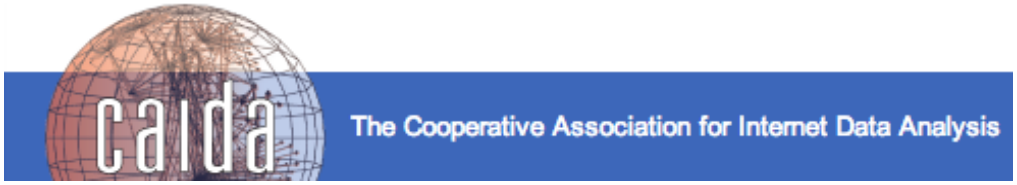
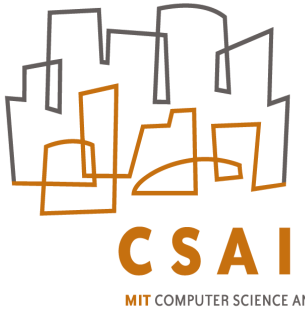



AIMS 2014: Workshop on Active Internet Measurements

March 26-27, 2014
San Diego




# Mobile & Broadband Measurement : Policy Issues

**Privacy : is *1984* finally here? (Bendert Zevenbergen)**

**Licensed v. Unlicensed Spectrum : WiFi etc. (David Reed)**

**Policy/Econ aware Measurement Infrastructure**

- Informed market decisions
- Regulation
- Innovation & management of networks

**If measurement matters, then strategic!**

- Design of metrics
- Participation (data, costs)
- Control (access/presentation/interpretation)

**Design for tussle!**

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# Broadband v. Spectrum Policy : separate!

- **e.g., National Broadband Plan ⇔ "500MHz for commercial BB"**

**Why conflate?**

- Mobile BB is future, key traffic/architecture/value driver….
- Mobile mostly) wireless… spectrum scarcity is potential roadblock
- Wireless best hope for facilities-based competition
- (Spectrum auctions = politically free $$$$)

**Why distinct?**

- Broadband: Last-mile, universal service, interconnection
- Spectrum: (scarce) resource management
  - All wireless: comms/sensing, PANs to WANs, Broadband to narrowband
  - "Interference management" = scarcity *or* coordination (sharing)

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# Mobile & Wireless Measurement : integrate more!

**Why distinct?**

- Radio v. Internet expertise silos
- Wireless is PHY, RAN, local v. Mobile is network, e2e, wide-area

**Why conflate?**

- Mobile (mostly wireless) broadband Internet is future
- Mobile/Wireless ⇔ similar measurement challenges
  - Heterogeneity, complexity, context (location) dependence ⇔ dynamic
  - Shared measurement infrastructure: distributed sensing

**Why hard?**

- Mobile measurement ⇔ performance (including security)
- Wireless measurement ⇔ "White spaces"

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# Measurement & Policy

**What are measurements for?**

- Real-time management (resources, services)
- Needs assessment (e.g., BB universal service, spectrum allocation)
- Enforcement (SLAs v. sharing)
- (Innovation…. R&D…. Test-beds)

**Who needs?**

- End-user: service selection/multihoming v. cognitive radio
- Network: QoS v. spectrum sharing
- Regulator: enforcement v. resource manager

**Design issues?**

- Privacy/security of data access
- Averaging (summary statistics, crowd-sourcing biases)
- Incentives to measure, share measurements, coordinate metrics
- Platform: multiple, not one

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# What we need: a dynamic ecosystem…

**Multidisciplinary: Internet and Radio *and* *Economics/Policy***

**Multiple platforms and solutions needed**

- **No single best perspective**
  - Active/passive, Core/edge, Ground-zero/crowd-source, etc.
  - Summary statistics throw away info (and weights are subjective)
  - Open/closed
- **Competition to protect from "capture" (*Karl Rove*-ization)**

**Evolvability ➔ tool sets, standards & innovation, feedback loops**

- Mobile measurement is work-in-process
- Patient is evolving so we do not know what questions will be
- Faster time clock for policy decision-making

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# Some resources….


NITRD

*Promoting Economic Efficiency in Spectrum Use: the economic and policy research agenda*

NITRD Wireless Spectrum R&D Senior Steering Group
Group Workshop IV Report

April 23-24, 2013

Massachusetts Institute of Technology
32 Vassar Street
Cambridge, MA 02138

CSAIL

http://www.nitrd.gov/nitrdgroups/images/2/2e/WSRD_Workshop_IV_Report.pdf

REPORT TO THE PRESIDENT

REALIZING THE FULL POTENTIAL OF GOVERNMENT-HELD SPECTRUM TO SPUR ECONOMIC GROWTH

Executive Office of the President

President's Council of Advisors on Science and Technology

JULY 2012

http://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast_spectrum_report_final_july_20_2012.pdf

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