Universal Service, Mobile Broadband and Reverse Auctions
(or, Universal Service in a 5G world)
(or, or, what can we learn from MF-II challenge process)

Agenda: *Universal Service: What Needs to be Measured*

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CSAIL
MIT COMPUTER SCIENCE AND ARTIFICIAL INTELLIGENCE LABORATORY

IIiI | **Internet Policy Research Initiative**
Massachusetts Institute of Technology

Rosenworcel:
"FCC says 24million, while recent NYT article says 162million without adequate BB"

USF in U.S.: $9B/year, $4.5B CAF, $0.5B MF-II

Mobility Fund – Phase II (MF-II) : reverse auction for allocating USF funding
- Reverse auction: like an RFP with competitive bidding. Providers bid to meet service requirements.
- Mobile: probability to deliver X Mbps Y% at network loading Z% at edge of 1 km grid zone? (CAF: Fixed is to locations in area.)
- Step 1: Identify Eligible Areas?
    - (1) 477 Data: operator reported coverage by zones
   - (2) Challenge: submit measurements to ID white space

Proposal: Analyze MF-II Challenge Process and Data
- (1) Reverse auctions are economists' preferred mechanism. How to improve process?
- (2) Markets/Light-handed reg needs healthy measurement ecosystem which requires capability for third parties (incl. independent analysts) to access basic broadband performance/service data (speed, latency, provider, etc.) for arbitrary locations/time/providers that combines mobile & fixed

Universal Service in a 5G World

- **5G: converged broadband – mobile/fixed, tech-neutral regulation**
  - Lots of heterogeneity: tech, uses (bursty traffic), value, costs
  - Digital Divides *always… markets evolve, tech changes*
- **Universal service – ensure access to BB**
  - Available, Affordable, Accessible, (Adopted, Equitable, Choice)
  - Why not available? Not economically viable for private investors.
  - Solutions: Subsidize, Lower cost (other barriers), Raise demand
- **Challenges/research questions/measurement need?**
  - Identify target BB goal: speed, services (latency), affordability, usage
  - Identify eligible subsidy areas (coverage goal)
  - Measure actual performance (better targeting, impact assessment, enforcement)

Digital Divide Policy Problem

Where's inflection point?
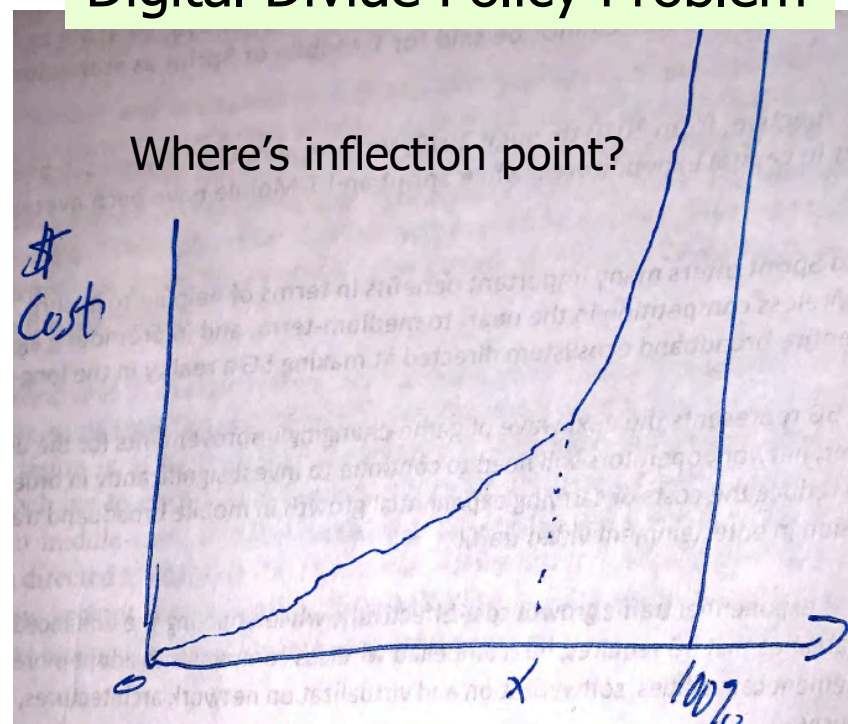
Universal Service in 5G world

- **(Q1) Goal: technology neutral reverse auction design (i.e., does not differentiate between fixed and mobile proposals)**
  - Avoid distorting investment (arch, fixed/mobile), duplicative investment, tech-neutral regulation
- **(Q2) Data: USF needs**
  - Identify territories eligible for subsidies (reverse auction) & challenge measurements (to target funds, measure effectiveness)
  - QoS impacts (how much speed matters? Balancing mobile v. fixed service differences in performance, demand/supply)
- **(Q3) Approach: look at MF-II process (and relation to CAF)**
  - Evaluate challenge process, Implications of MF-II for investment
  - Does MF-II crowd-out/promote broadband investment in aggregate?
- **(Q4) Management: public data on performance measurement**
  - Need integrated way to measure performance for BB (by location, time, tech, (use))
  - What should be our Broadband USF goal: When (how) are Mobile and Fixed substitutes or complements?

Some further questions

- **Can we ever consolidate fixed and mobile measurements?**
  - Fixed: by location, but no national dbase of locations geocoded and requires more detailed infrastructure and subscriber location data that raises security, cost, and strategic confidentiality issues.
  - Mobile: probabilistic by location, speed. Where are users in cell? What are they doing?
  - *Are these really so different problems?*

- **What level of precision needed?**
  - Do we really need to serve 100%? At what cost to address last 1%?
  - What level of divergence between min and average is acceptable?
  - *How many 9's accuracy is reasonable? Where is inflection point?*

- **How to aggregate data from different sources?**
  - States/locals have more granular data, but not interoperable.
  - Voluntary data usually only provided with NDAs so hard to share.
  - Data layers: availability, usage, socio-economic demographics, pricing, costs
  - *No economic impact assessment unless layering/aggregation feasible*

- **Accuracy, sustainability challenges?**
  - Measurement error? Misrepresentations?
  - Algebra of Measurement: how to composite measurements from different sources?
  - Incentives to measure, report truthfully, and share?

Mobile Fund II support to advance LTE service in underserved areas
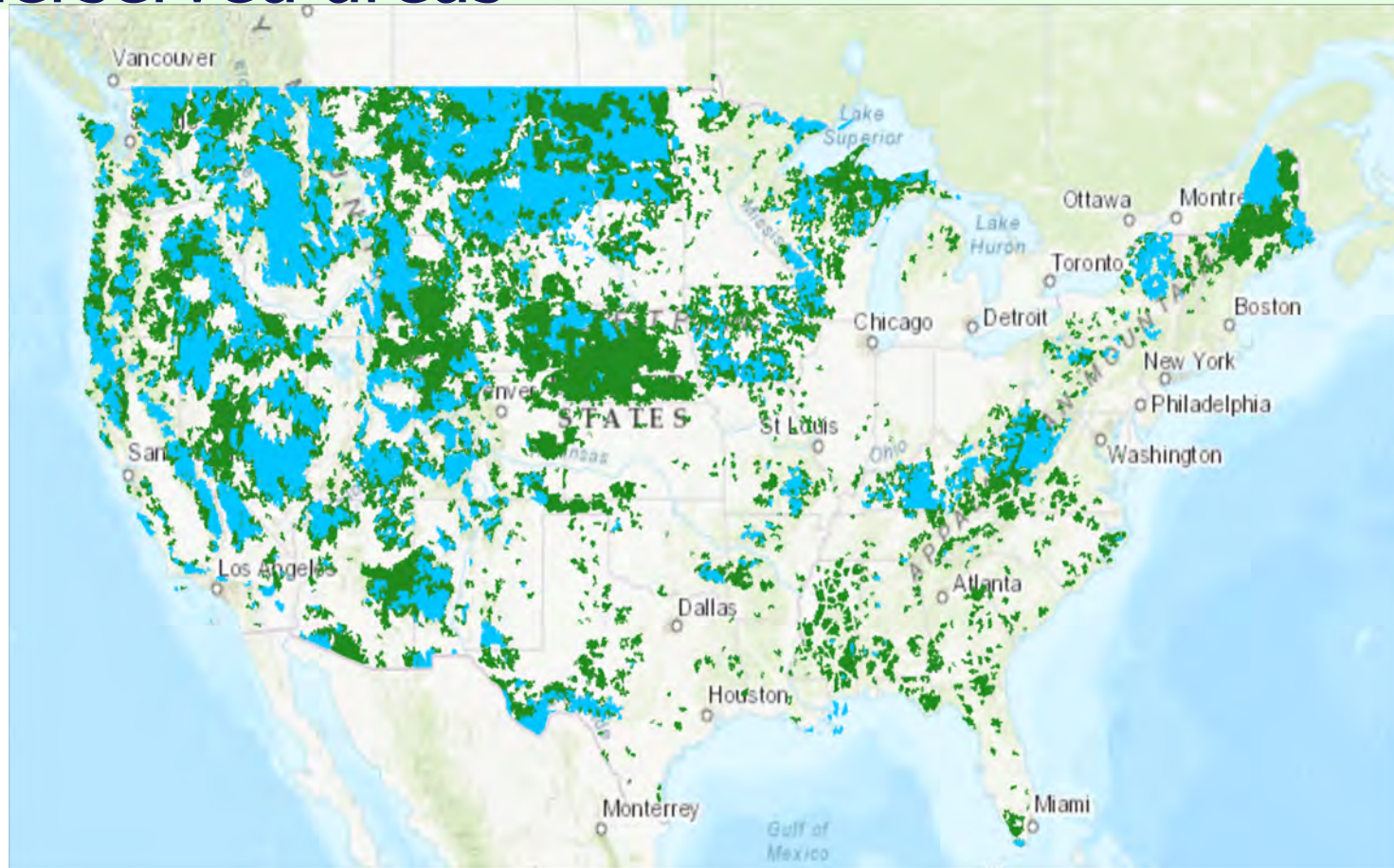
Green: "1 unsubsidized provider" - challengable; Blue: no challenge, eligible for funding

Challenge Process Timeline:

- **Jan. 4, 2018**: providers submitted one-time collection of 4G LTE coverage data
- **Feb. 27, 2018**: initial map of eligible areas released publicly
- **Mar. 29, 2018 – Aug. 27, 2018**: window to file challenges ("challenge window")
- **Sep. 2018**: opportunity for challenged parties to view challenge data
- **Oct. 2018 – Nov. 2018**: window to file responses ("response window")

Table 1.10
Universal Service Disbursements 2001-2016
(in Millions of Dollars)

Year	High-Cost Support	Low-Income Support	Rural Health Care	Schools and Libraries	Total
2001	$2,602	$584	$8	$1,464	$4,659
2002	2,978	673	16	1,683	5,350
2003	3,273	713	3	1,644	5,633
2004	3,488	759	1	1,076	5,324
2005	3,824	809	26	1,862	6,520
2006	4,096	820	41	1,669	6,626
2007	4,287	823	37	1,808	6,955
2008	4,478	819	49	1,760	7,106
2009	4,292	1,025	72	1,878	7,268
2010	4,268	1,316	110	2,282	7,976
2011	4,031	1,751	141	2,233	8,156
2012	4,147	2,189	155	2,218	8,710
2013	4,165	1,798	159	2,204	8,326
2014	3,733	1,660	193	2,269	7,855
2015	4,499	1,514	279	2,080	8,372
2016	4,490	1,537	298	2,387	8,712