Measuring Broadband America

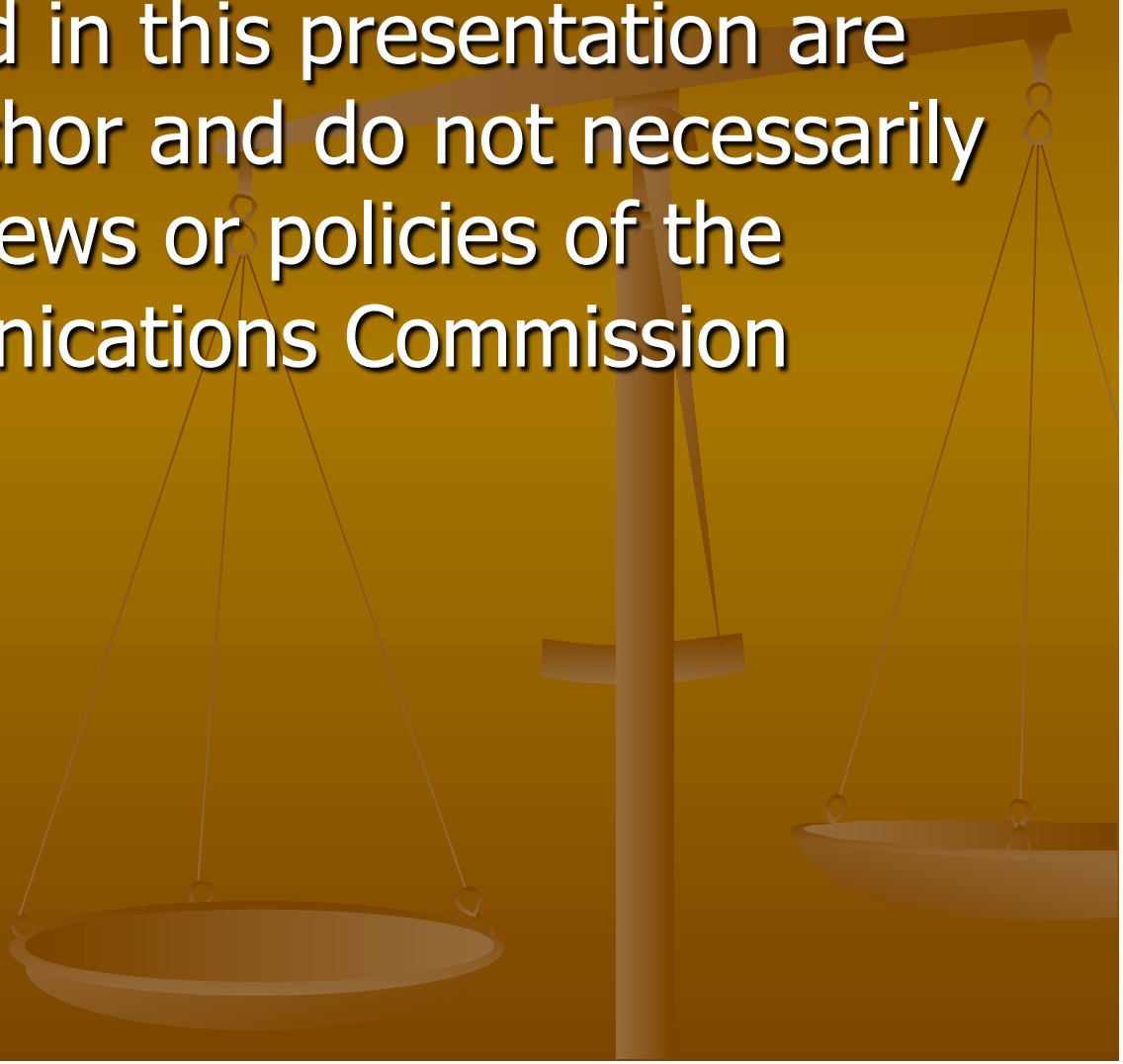
Walter Johnston, Chief ECC

Federal Communications Commission

NANOG – 10-6-14

Disclaimer

- Views expressed in this presentation are those of the author and do not necessarily represent the views or policies of the Federal Communications Commission

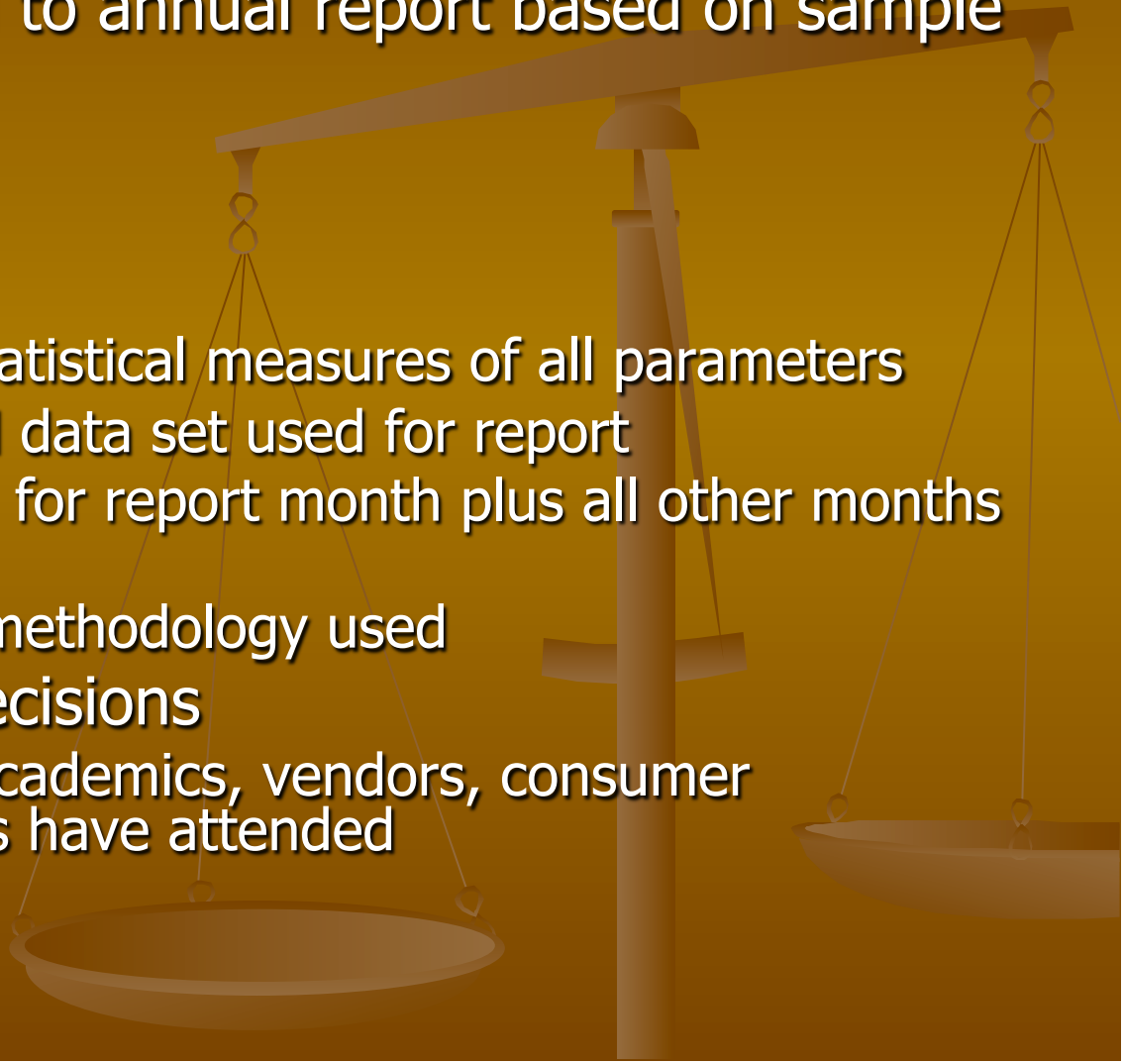


Measurement History

- 2010 FCC began program of measuring broadband service performance in consumer's homes
  - Hardware monitors within household
- 7,000 volunteers annually participate
- Measure up/down speed, latency, packet loss and other parameters
  - Last report introduced concept of consistency of service
- Collaborate with industry and others
  - Provisioned rates validated by service providers
- Over 80% of broadband consumers covered
  - Focus on most popular speeds
  - DSL, Cable, Fiber and Satellite technologies now in report from
- We reported on this program @ NANOG 2011
- See http://www.fcc.gov/measuring-broadband-america for program details

FCC MBA Reports

- Presently committed to annual report based on sample month (September)
  - 4 reports released
- Open data program
  - Annual text report
  - Spreadsheet with statistical measures of all parameters
  - Release of validated data set used for report
  - Release of raw data for report month plus all other months collected
  - Full explanation of methodology used
- Open meeting for decisions
  - Service providers, academics, vendors, consumer advocates and press have attended



Impact

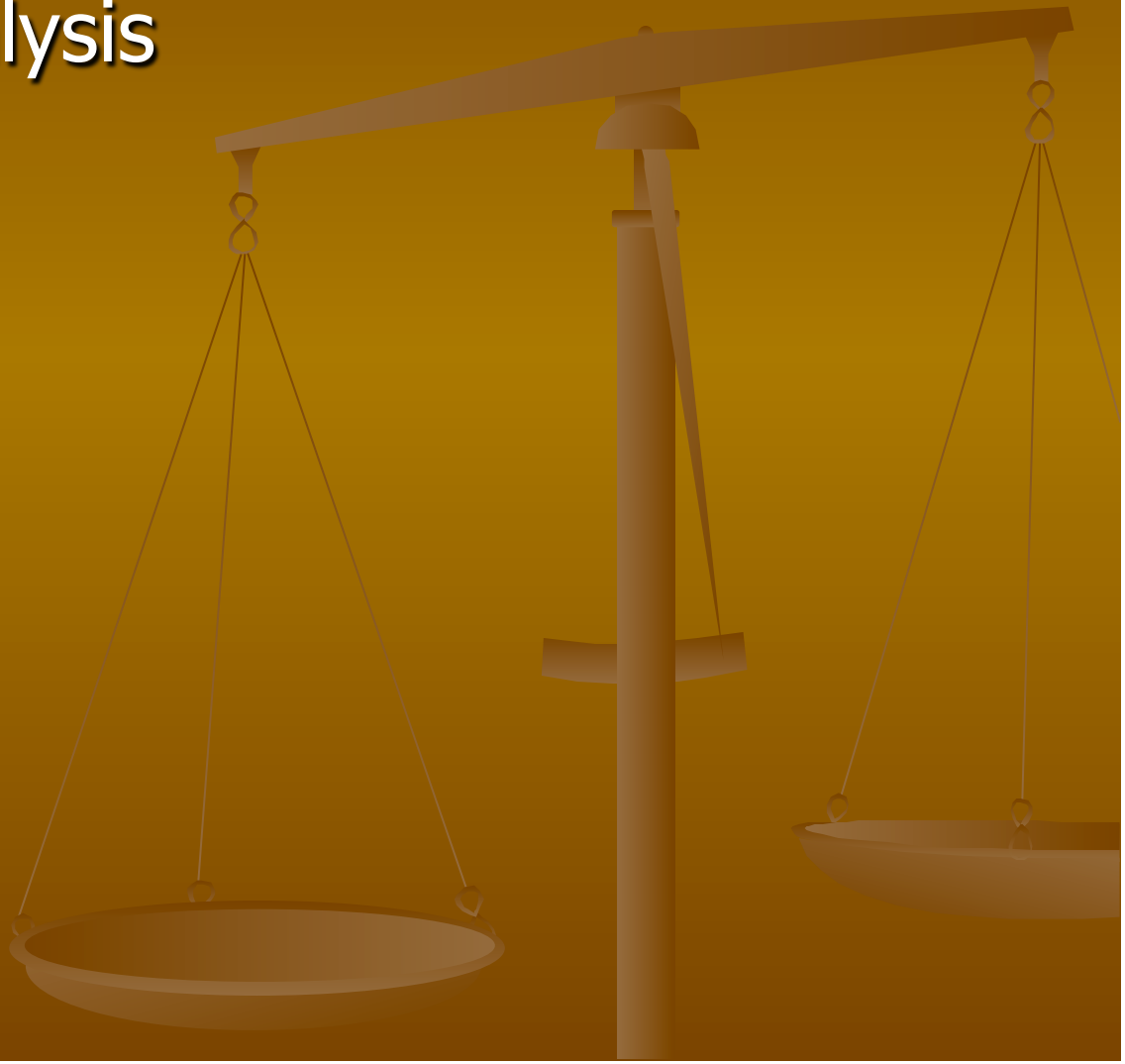
- Noticeable improvement in service since inception
  - Actual vs. Promised speed improvement
  - Narrowing between best and worst
- News sources highlight best/worst performers upon report release
- Some ISPs incorporate results in advertising
- FCC believes transparency spurs improvements
  - Moving out of an era in which all service providers claim best network
- Data utilized in a number of papers presented at conference
- Helped inform FCC on issues affecting broadband deployment

Report Forms Baseline for Broadband Evolution

- Speeds increasing 30% annually
- Legacy consumer equipment concerns as speeds increase
  - 25 Mbps is first threshold for consumer modems
  - Routers affected at very high speeds (100 Mbps)
- Higher speeds generate higher data consumption
- DSL speeds have not increased significantly in speed in popular usage over last 3 years
- Starting to see increase in upload speeds
  - FIOS offering symmetric rates
  - High speed coax services bring increased upload speeds

Evolution of the MBA Program

- New Traffic Analysis
- Partnering
- mobile MBA



New Traffic Analysis

- Program planning began over 4 years ago
  - Consumer usage then: bittorrent, browsing, email
  - Consumer usage now: video streaming dominant peak periods
- Video streaming dependent on enduring QOS
  - Service performance needs to meet minimums for duration of viewing experience
  - Average speed not a good QOS indicator
- Working with Netflix and others to develop video streaming test to be deployed across our platform
  - Developed proof of concept on YouTube with work adapted from research at Alto University, Finland

FCC Test Infrastructure & Report Usage

- FCC and its collaborators has deployed a network consisting of several dozen backbone test servers and consumer household probes
- Consumer probes ("WhiteBoxes")
  - Over 13,000 deployed
  - ~ 7,000 remain valid for testing
  - Additional 2,000+ active
    - Most no longer in reported tiers
    - Some are Phantom boxes: New locations, new countries, EBay effect
- Our program requires at most 3 months of platform utilization
  - Opportunity for additional work

Partnering

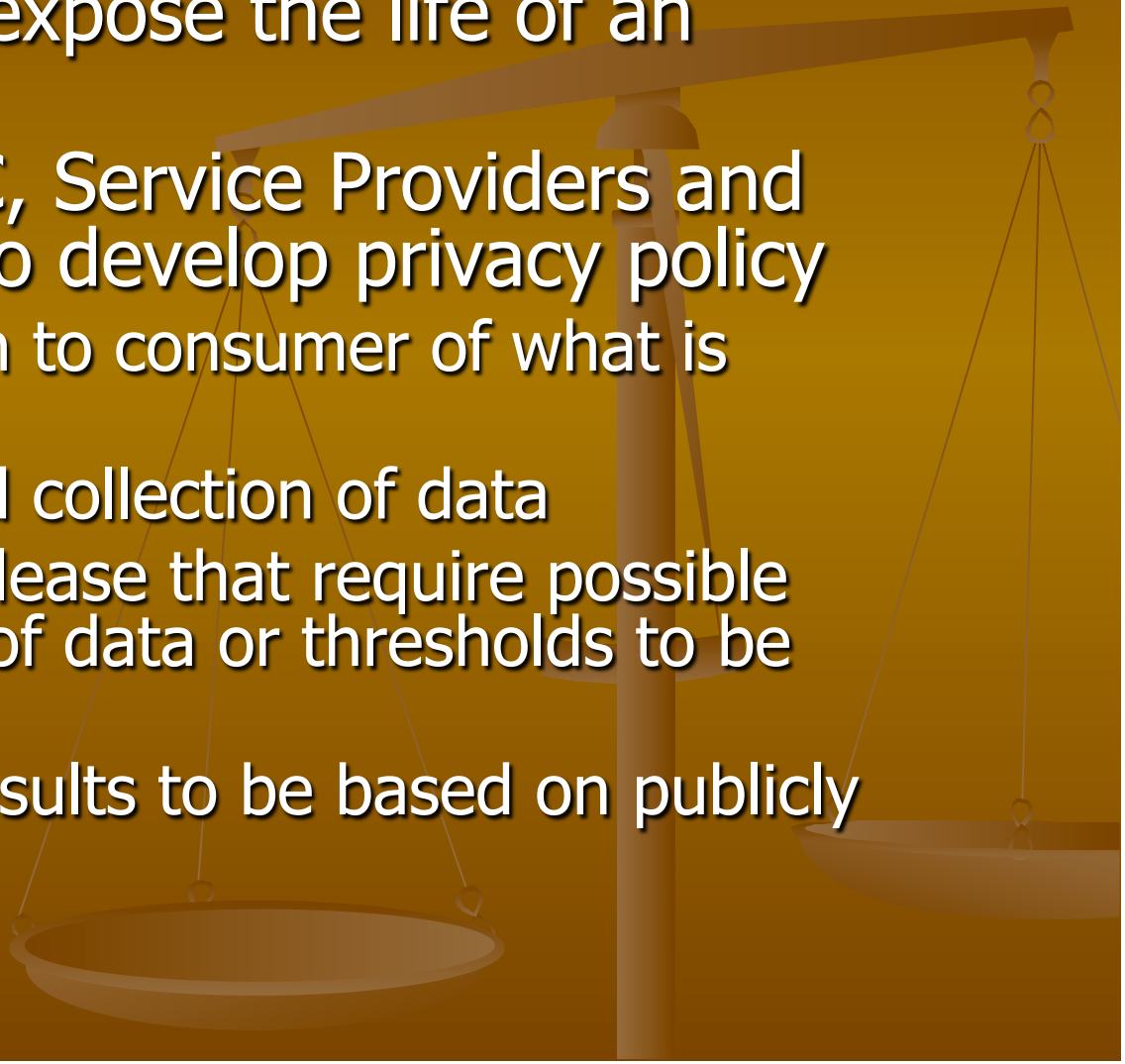
- Examining outreach program with research institutions
- Program has early history of working with academics
  - MIT/Georgia Tech participated in early program and helped critique approach
    - Assisted Georgia Tech Bismarck program
- Proof of concept
  - Allowed Georgia Tech to develop and deploy research project investigating home network congestion
- Reached out to multiple universities to discuss potential collaboration
  - Difficulties in matching research to opportunity
- Looking at additional baseline reports of interest to specific communities
  - E.g. DNSSec requested by CSRIC (FCC expert advisory committee)
- Responsive to requests from other researchers for data cuts supporting their research
  - Working with CAIDA on latency benchmarks
- Looking to leverage investment in any reasonable way to increase value and provide more insight on evolving Internet

mobile Measuring Broadband America

- Goal to extend MBA program to mobile services
  - Incorporate aspects of collaboration and open data from fixed program
- Enlisted active cooperation of AT&T, Sprint, T-Mobile, Verizon and CTIA (major industry trade association)
- Major Issues
  - Consumer Privacy
  - Methodology

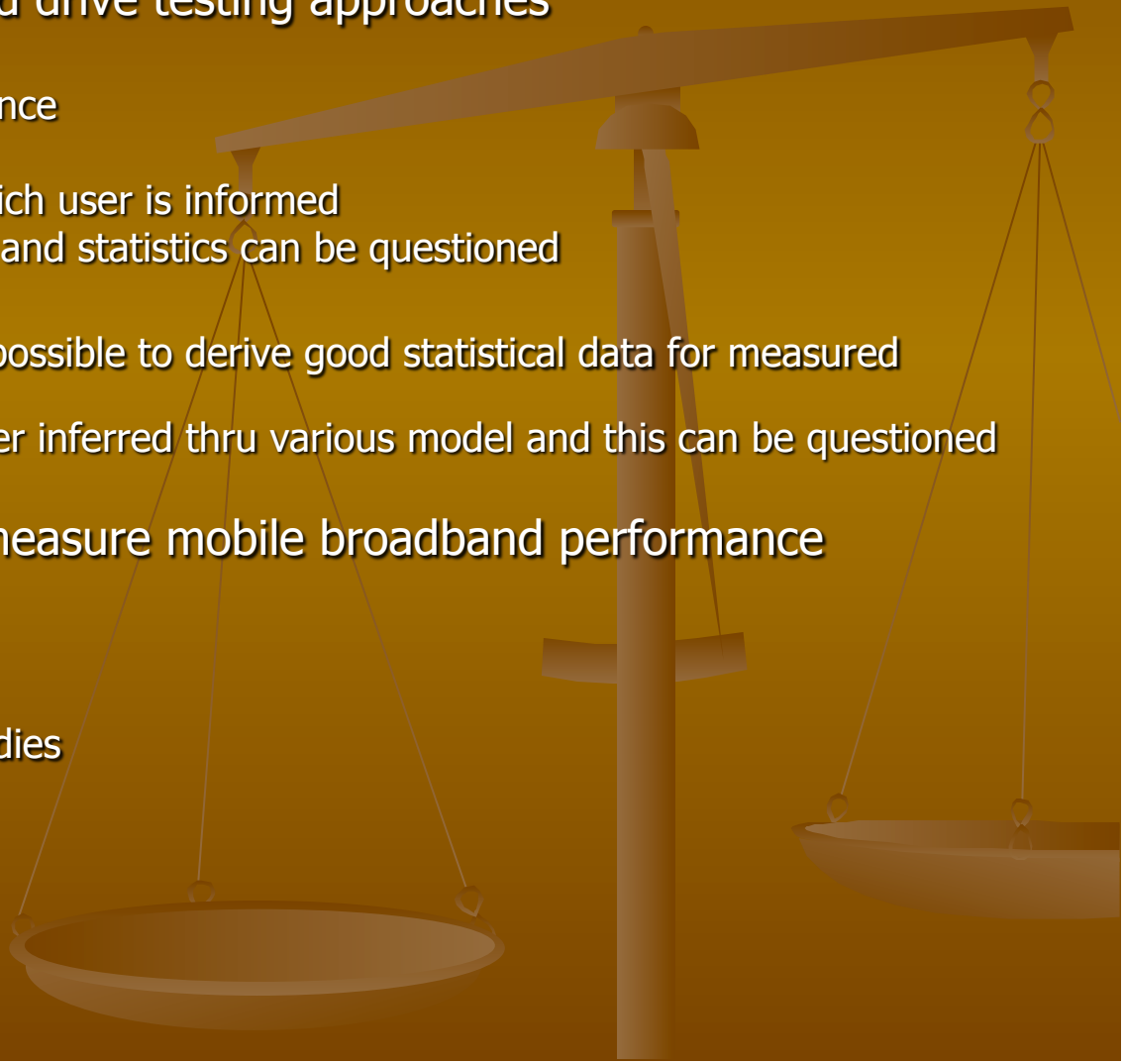
Consumer Privacy

- Mobile data can expose the life of an individual
- Worked with FTC, Service Providers and outside experts to develop privacy policy
  - Clear explanation to consumer of what is collected
  - Fully anonymized collection of data
  - Rules for data release that require possible transformations of data or thresholds to be released
  - FCC published results to be based on publicly releasable data



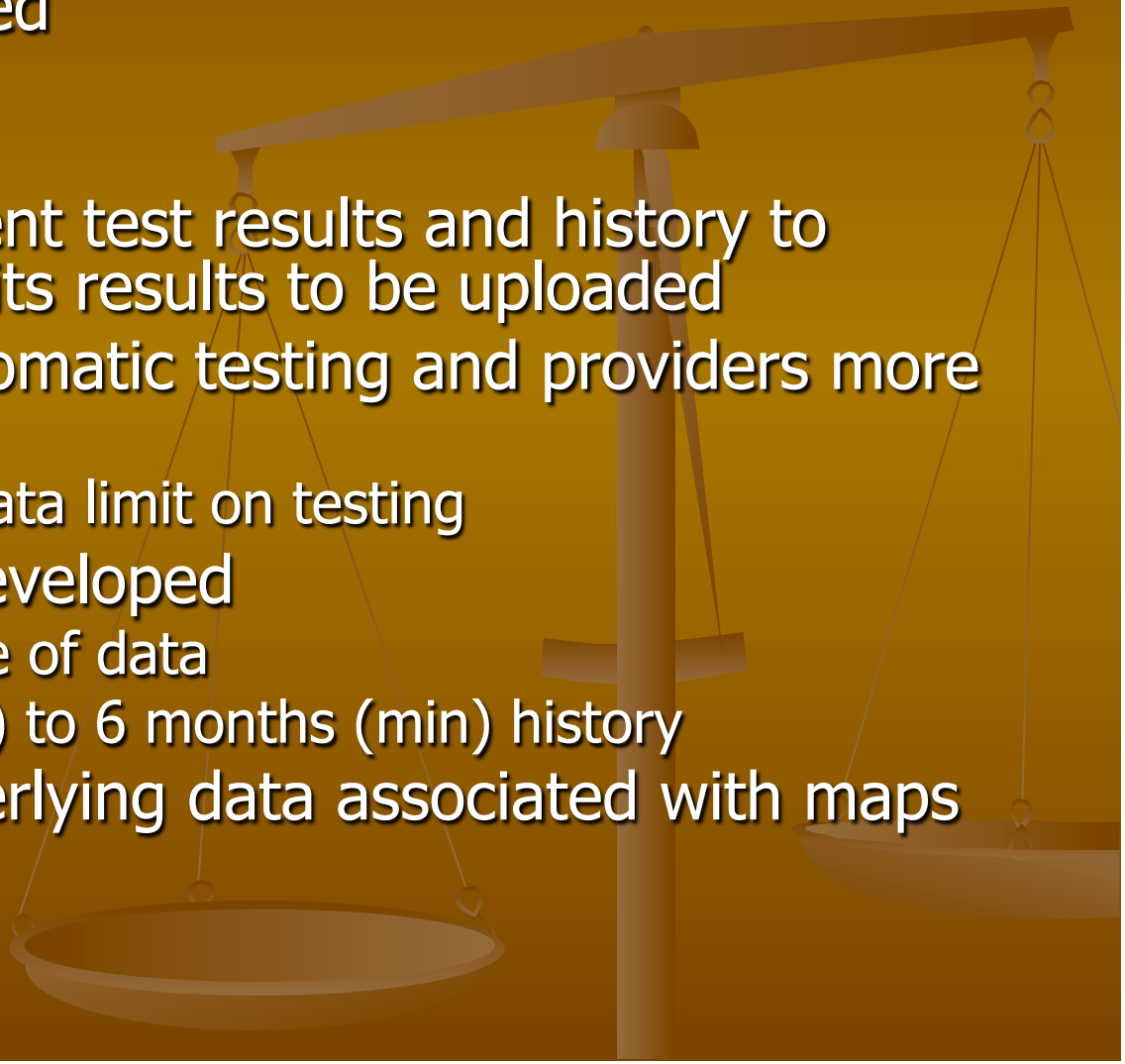
Methodology

- Looked at crowdsourcing and drive testing approaches
- Crowdsourcing
  - Measures actual user experience
  - Easily Scalable
  - Most common method by which user is informed
  - Results not easily repeatable and statistics can be questioned
- Drive testing
  - Results very repeatable and possible to derive good statistical data for measured points
  - Consumer experience however inferred thru various model and this can be questioned
  - Expensive to scale
- There is no perfect way to measure mobile broadband performance
- FCC chose crowdsourcing
  - Most cost efficient
  - Actual consumer experience
  - In-line with many private studies



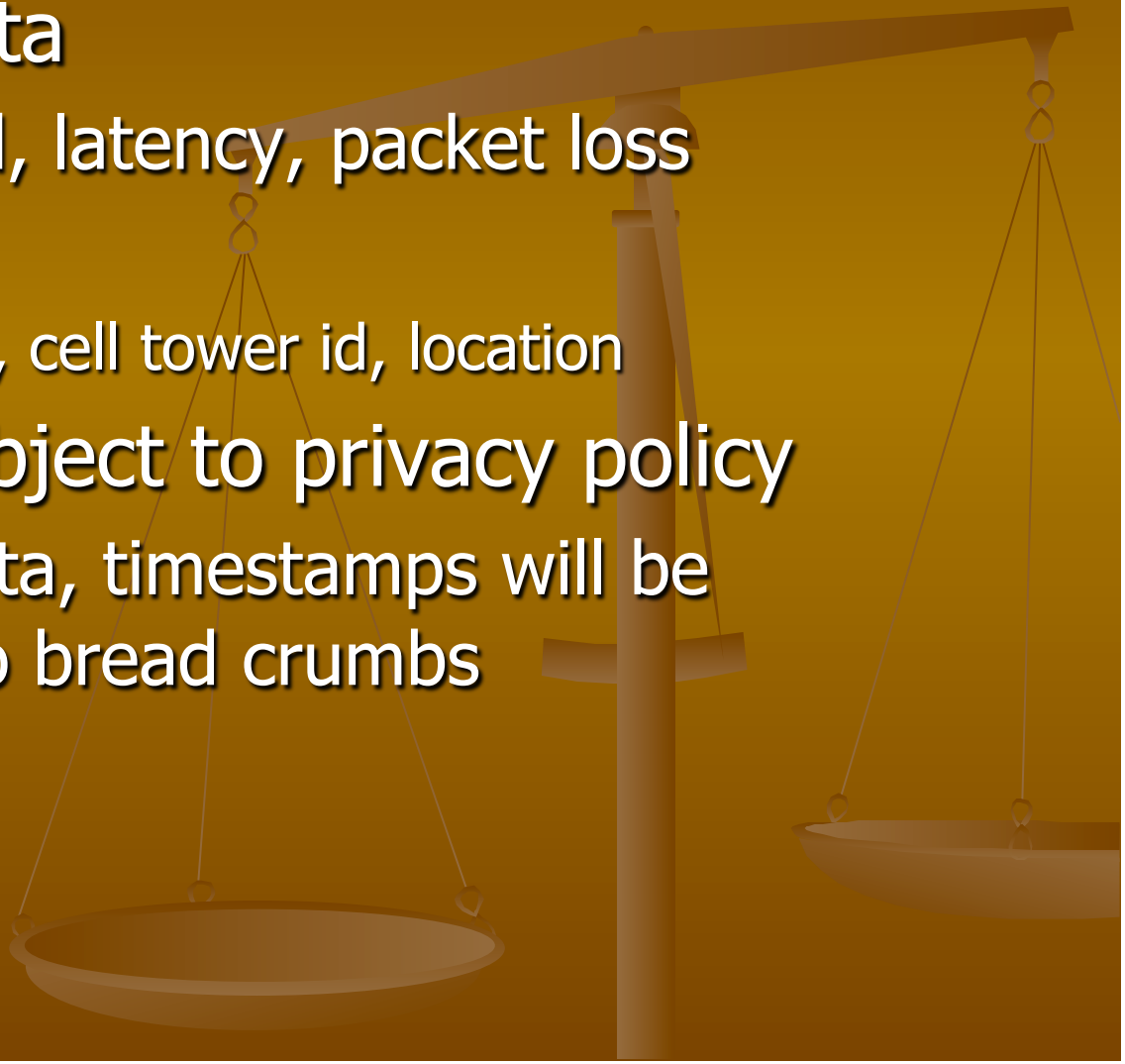
Progress

- Two clients developed
  - Android (Nov 2013)
  - iPhone (Feb 2014)
- Clients provide current test results and history to consumer and permits results to be uploaded
- Android permits automatic testing and providers more network metadata
  - Volunteer can set data limit on testing
- Mapping platform developed
  - Permits daily update of data
  - Expect 1 year (max) to 6 months (min) history
- We will release underlying data associated with maps



Data Collected

- Performance data
  - Up/Down speed, latency, packet loss
  - Metadata
    - Bearer channel, cell tower id, location
- Data release subject to privacy policy
  - E.g. location data, timestamps will be transformed, no bread crumbs



FCC MBA Program

- Program influencing other areas of Commission
  - E.g. Connect America Fund expected to incorporate aspects of MBA methodology
- Evolving with needs of Public and Commission
- Committed to transparency
  - Open data
  - Open methodology
- Transitioning to baseline reporting of Internet characteristics
  - Open Internet metrics collected year over year
- Seeking other evolution objectives