Big Telco – Semi-Monopoly of a Communications Revolution

Brad Smith

11/17/11
The Punchline

- Incumbent Local Exchange Carriers (ILECs) maintain infrastructure in public right-of-ways...
  - In exchange for access to public resources ILECs are obligated to lease access to Competitive Local Exchange Carriers (CLECs) at rates set by e.g. CPUC.
- Communication world going through revolutionary change...
- ILEC strategy... *block competition*
  - Provide services at a price that keeps new competition out of the market (and no lower!).
    - E-rate
    - Only sell "managed" services for long (5 year) terms
    - Only sell services with established market
- *Clear problem!!*
- Nobody wants to lease UCSC fiber... we need to build.
The Story – “Big Data”

• Capacity of networks
  – Transfer 100TB/day at 10Gbps... not possible due to overhead and inefficiencies.
  – Assume 30TB/day.

• Genomics
  – TCGA and personalized health care
  – 2.5PB uploaded over 3 year project for few thousand genomes.
  – ~10 sites download, so additional 25PB of traffic.
  – Round up to 30PB... 10PB/year.
  – 10PB / 30TB/day ~= 1month
  – Would like 100's of thousands of cancer genomes
  – Would like much wider distribution
Source: Lincoln Stein

- **NGS (bp/$)**
  - Doubling time: 5 months

- **Hard disk storage (MB/$)**
  - Doubling time: 14 months

- **Pre-NGS (bp/$)**
  - Doubling time: 19 months

The graph illustrates the cost of DNA sequencing, MB/s disk storage, and bp/s NGS over time from 1990 to 2012, with a logarithmic scale on the y-axis.

Source: Lincoln Stein
## Genomics as a Big Data Science

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Duration</th>
<th>Size</th>
<th># Devices</th>
</tr>
</thead>
<tbody>
<tr>
<td>HEP - LHC</td>
<td>10 years</td>
<td>15 PB/year</td>
<td>One</td>
</tr>
<tr>
<td>Astronomy - LSST</td>
<td>10 years</td>
<td>10 PB/year</td>
<td>One</td>
</tr>
<tr>
<td>Genomics - NGS</td>
<td>2-4 years</td>
<td>0.5 TB/genome</td>
<td>Hundreds</td>
</tr>
</tbody>
</table>
Chancellor’s presentation...
UCSC’s Problem

• UCSC only UC to not have own fiber...
• We need redundancy... sabotage event
• We need more flexible service... on-demand circuits for short-to-mid term projects.
• We need ability to push the state of the art... higher bandwidths, new service architectures
The Fiber Project

• “FiberCo” business model
  – Anchor tenant pays for most of build
  – Sell services to schools and libraries via e-rate type programs

• Challenges
  – Pole loading problems
  – Jurisdictions
Northbound Fiber Map
UCSC Benefits of Fiber

- ATLAS project... download LHC data
- TCGA CGhub project
- SDSC for administrative backup
- Lack redundancy!
Google Earth of new project
Internet Architecture Limitations

• TCP doesn't do well with high bandwidth-delay product transfers
• Firewalls... get in the way
• DYNES approach... go back to circuit switching
DYNES presentation
Punchline

• Communications is undergoing a revolution
  – Everybody deploying communications services
  – Set of services very dynamic
  – Organizations run their own communications infrastructure

• Current communications infrastructure model
  – Semi monopoly granted to telcos to manage
  – Scale favors semi-static set of services... all return on large investments
  – Leads to strategy of limiting access/competition

• Monopoly only needed for infrastructure investment?
  – Should this be handled by government... think roads?

• Seems like there’s are huge opportunities...
Opportunities

• OSNL

• Inventory communications infrastructure in cities of Watsonville and Santa Cruz