On the classification and value of communications

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Telecom Costs

Traditional

Future

- Long Distance
- Switching
- Access
Size of telecom industry:

- world GDP: approx. $70,000 B
- world telecom service revenues almost $2,000 B
- world advertising: approx. $500 B

- Google worldwide 2011 revenues: $38 B
Where are the money and the traffic?

- World revenues: more than half from wireless
- World revenues: mostly from voice, texting second
- Traffic: about 40,000 PB/month at year-end 2012, around 5% from wireless, under 1% from voice
- Level 3 (incl Global Crossing and CDN arm): around 10% of world traffic, 2011 revenues of $6 B
- Akamai: 2011 revenues of $1.2 B
**Revenue per MB (v. approximate):**

<table>
<thead>
<tr>
<th>Service</th>
<th>Revenue per MB</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMS:</td>
<td>$1,000.00</td>
</tr>
<tr>
<td>cellular calls:</td>
<td>1.00</td>
</tr>
<tr>
<td>wireline voice:</td>
<td>0.10</td>
</tr>
<tr>
<td>residential Internet:</td>
<td>0.01</td>
</tr>
<tr>
<td>backbone Internet traffic:</td>
<td>0.0001</td>
</tr>
</tbody>
</table>
## US wireless industry statistics

<table>
<thead>
<tr>
<th>Year</th>
<th>Revenues ($B)</th>
<th>Capex ($B)</th>
<th>Capex/Revenues</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>102.1</td>
<td>27.92</td>
<td>27.3%</td>
</tr>
<tr>
<td>2005</td>
<td>113.5</td>
<td>25.24</td>
<td>22.2</td>
</tr>
<tr>
<td>2006</td>
<td>125.5</td>
<td>24.42</td>
<td>19.4</td>
</tr>
<tr>
<td>2007</td>
<td>138.9</td>
<td>21.14</td>
<td>15.2</td>
</tr>
<tr>
<td>2008</td>
<td>148.1</td>
<td>20.17</td>
<td>13.6</td>
</tr>
<tr>
<td>2009</td>
<td>152.6</td>
<td>20.36</td>
<td>13.3</td>
</tr>
<tr>
<td>2010</td>
<td>159.9</td>
<td>24.89</td>
<td>15.6</td>
</tr>
<tr>
<td>2011</td>
<td>169.8</td>
<td>25.32</td>
<td>14.9</td>
</tr>
</tbody>
</table>
4 dimensions of communications technology:

- **volume**: How much data can it transmit?
- **transaction latency**: How long does it take to do something?
- **reach**: Where can the service be provided?
- **price**: How much does it cost?
- **reliability**, …
Quantitative measures:

- Sarnoff’s Law: Value of content distribution network grows like $n$
- Metcalfe’s Law: Value of connectivity network grows like $n^2$
- Briscoe, Odlyzko & Tilly: Metcalfe’s Law wrong, value of general connectivity network grows like $n \cdot \log(n)$

$n \cdot \log(n)$ grows faster than $n$, but difference is sufficiently slow to enable the “content is king” dogma to persist

$n = \text{number of participants}$
Other quantitative heuristics:

- Value of bandwidth (or computing, or storage) as proportional to log of raw capacity: 10 bps, 1 Kbps, 1 Mbps, and 1 Gbps links have approximate values 1, 3, 6, and 9.

- Locality: gravity models, with intensity of interaction between populations of sizes X and Y at distance d proportional to X*Y/d.