Telecommunications @ Crossroads

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Current Network Infrastructure

![Diagram showing current network infrastructure including RBOC Toll Switches, Local Exchanges, IXC Network, IP Network, and Local ISPs.]
The Traffic Transition Model

Assumptions:
- Installed Capacity closely matched with peak traffic
- Capacity growing at constant compounded rate

Formulation:
- \( C(\tau) = C_0 (1 + r_x)^\tau \)
  where \( C_0 \) is a base capacity, \( r_x \) is a voice or data growth rate, and \( \tau \) is a time duration
- \( C_{ov} = \alpha C_{od} \)
  where \( \alpha \) is a constant determined during the model’s calibration
Model Formulation

* The general function used to plot these graphs was $k(1+x)^t$. A different value of $x$ was used in both the voice and data cases with $x(\text{voice}) < x(\text{data})$. 
Desired Model Results

- Five quantities of interest:

1. $t_l$ or the lead-user point:
   Defn - The point at which packet-data traffic required 10% of the total capacity

2. $t_c$ or the crossover point:
   Defn - The point where both types of service require the same capacity

3. $t_e$ or the eclipse point:
   Defn - The point where packet-data traffic consumes 90% of overall backbone capacity

4. The time interval $t_c - t_l$

5. The time interval $t_e - t_c$
Calibrating the Traffic Transition Model

Four Step Process:

1. Obtain Overall Capacity $C_{\text{total}}$ at known points
2. Decompose $C_{\text{total}}$ into $C_{\text{voice}}$ and $C_{\text{data}}$ components
3. Determine growth rates $r_v$, $r_d$, and $r_{\text{total}}$
4. Determine $t_l$, $t_c$, $t_e$

Process applied to two data sets:
- For a selected MCI POP
- For a selected ATT POP
Model Results - MCI Case

MCI Traffic Transition Results (1988-2010)

<table>
<thead>
<tr>
<th>Year</th>
<th>Log10(Capacity)</th>
<th>Year</th>
<th>Log10(Capacity)</th>
<th>Year</th>
<th>Log10(Capacity)</th>
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<table>
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<tr>
<th>t_1</th>
<th>t_c</th>
<th>t_e</th>
<th>t_c-t_1</th>
<th>t_e-t_c</th>
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Model Results - ATT Case

AT&T Traffic Transition Results (1988-2010)

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<th>tₑ - t₁</th>
<th>tₑ - tₙ</th>
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Model Results - Industry-wide

Industry-Wide Traffic Transition Results (1988-2010)

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<table>
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<th>tₖ</th>
<th>tₑ</th>
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<th>tₑ-tₖ</th>
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<td>1988</td>
<td>Nov 1998</td>
<td>2007</td>
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<td>9 years</td>
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Key Findings - General

- Window in which data traffic increases to contribute 90% of overall traffic is 10 years from 1997.

- Crossover point in 1998.

- Suddenness of the change, as opposed to change itself, is key in determining post “crossover” industry structure.
Key Findings - IP Telephony

- Due to short transition interval, growth of IP telephony will be very sudden and very significant.

- Potential of infrastructure sharing is key driver of IP telephony, not bandwidth savings.
IP.Phusion Technologies, Inc

- **Mission**: To be the premier provider of Open and Cross-Platform Support Systems for IP Telephony
  - “Shrink-wrap” Software: Billing and NMS
  - Customized Software: Billing/CDR Interfaces
  - Solutions: Consulting, System Integration, and Network roll-outs for Service Providers.

- **Founded**: By Researchers from ITC and LCS

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