The Role of Settlements in Internet Economics

CAIDA Workshop
University of California San Diego

Barry Tishgart
Comcast Cable
Economics and Internet Interconnect

• Firms Participating in the Internet Ecosystem Rationally Adhere to Basic Microeconomic Theory such as the Production Curve, \( Q = f(L,K) \)

• There are Many Complex Models Derived from this Theory but let’s Focus on Production, **Inputs and Outputs**

• Outputs – Consider a Sample of What Our Colleagues Produce and Sell
  • Internet Transit
  • Content Delivery and Related Value Added Services
  • Web-Hosting and Storage
  • Consumer and Business Internet Services
  • PaaS, SaaS, IaaS
  • Applications, Search, Gaming, Social Networking, etc.

• Inputs
  • Labor
  • Capital
  • Fixed and Variable Costs Including Internet Interconnect
Economies of Scale

- Companies in the Internet Ecosystem Often Achieve Economies of Scale (when long-run total costs decline as output increases) Faster than Other Industries.
  - Historically this has Been the Case
  - Factors such as Moore’s Law, Metcalf’s Law, Automation, Reach and Productivity Enable More Rapid Unit Costs Declines

- Firms will seek to minimize SATC and LATC with the goal of aligning costs with product/service quality and marketability

- Along with Total Costs (TC), Supply and Demand and Pricing all factor into Profitability of the Firm.

\[ TC = FC + VC \]
\[ ATC = \frac{TC}{Q} \]
Interconnect as an Input

- Internet Businesses that Move Large Amounts of Traffic Depend on Interconnect as a “Product Input.”
- Internet Interconnect includes Peering and Commercial Relationships.
- Nearly all Settled Arrangements are Variable Cost-based.
- Interconnect is a Highly Efficient Market with Many Buyers and Sellers

<table>
<thead>
<tr>
<th>Feature</th>
<th>SFI “Peering”</th>
<th>Commercial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formal Contract between parties Defining Rights, Obligations, Dispute Resolution and Other Terms</td>
<td>Rarely</td>
<td>Yes</td>
</tr>
<tr>
<td>Capacity Management</td>
<td>Best Effort</td>
<td>Yes, as negotiated</td>
</tr>
<tr>
<td>Capacity Delivery</td>
<td>Best Effort</td>
<td>Yes, as negotiated</td>
</tr>
<tr>
<td>Requirements of Network Scope and Scale</td>
<td>Yes</td>
<td>No (However Network Scale May Drive Lower Pricing)</td>
</tr>
<tr>
<td>Service Level Agreements</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Frequency (or Risk) of Change</td>
<td>Anytime - Sometimes Unilateral</td>
<td>Governed by an Agreement</td>
</tr>
<tr>
<td>Alignment with Product Output (Business Reality)</td>
<td>Sometimes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Considering the Impact of Settlements

**Business Opportunity A**
Interconnect Product Input Characterized as “Peering”
SATC Mitigated by Lack of Settlement with an Unknown Impact on LATC and Scale

**Business Opportunity B**
Interconnect Product Input Based on a Commercial Relationship
SATC Increased to Reflect Settlement with a Predictable LATC and Known Scalability

**Business Results versus Short-Term Average Total Cost:**
- Are there differences in Customer Lifetime Value, Overall Profitability, and Customer Satisfaction?
- At what point does “no settlement cost” become worse than some settlement cost?
Role of Peering Policies

• Established Peering Policies Have Worked Effectively and Scaled the Internet for More than a Decade
  • End-to-End Internet growth is Currently Funded by a Balance of Exchange Between Customers and Networks That Share a Relatively Equal Cost Burden.
  • Peering Policies Vary but are designed to Define who is a “Peer” Through Published Criteria Including Traffic Ratio, Overall Traffic Volumes, Geographically Distributed Exchange Points, etc.
  • Are we Constrained by the binary Customer/Peer Distinction?

• New Thinking Proposed by Some Shifts the Cost Burden
  • Cost Burden shifting from one party to another is a Short-Term Phenomenon.
  • Any Business or Industry Massively Increasing its Output Must Scale and to do that, it Must Invest!

• Are we Reaching a Point of Contention Over How to Manage and Share Incremental Investments?
  • Most Agree that Network Resources are not Free and Unlimited.
  • Most Agree we need to Maintain and Grow the Internet so it Remains an Engine for Economic Growth for All Users.
More Complex Economies

- Many Companies have the Means and Desire to Participate in Multiple Lines of Business.
- They have Invested Substantial Sums of Money and Most Have Relatively High Fixed Costs
  - They Expect to Generate Returns in Each Line of Business and Generate Synergies Across their Platforms.
  - The Economics are Not Simple.
- Peering “Stereo-Types” May no Longer Apply Since Many Industry Participants Can No Longer be Defined by a Single Business Model
Possible Outcomes

If Settlements Are an Alternative to Settlement-Free Peering

• A Functioning Production Curve
• More focus on Customers, Growth and Stability
• Price Competition
• Service Innovation

If Settlements are Not an Alternative

• Scaling and Network Coordination Could Suffer
• Quality of Transit May Deteriorate
• External Oversight if the Industry Cannot Create its Own Functioning Agreements
• *Undesirable Outcome: Customer Disruption*