Cyberspace Primer

Part I

History and Technology

A brief history

- ARPANET developed in 1960s with Department of Defense funding
- 1970s & 80s expansion into several networks among major universities and adoption of TCP/IP protocol
- NSFNET (mid 1980s)
  - Connected 6 NSF supercomputing centers
  - T-1 upgrade and expansion contract awarded to Merit, IBM, MCI, State of Michigan
- In 1990, civilian part of ARPANET was retired (military part merged into Defense Data Net)
- Funding for NSFNET expired in 1995
  - NSF continued funding of transition to private backbone (e.g., Network Access Points NAPs)
  - NSF also funds development of non-commercial vBNS (Very High Speed Backbone Network Service at 155Mbps) and Internet II

Commercialization of backbone

Technology

- Network characteristics
  - Distributed interconnected network
  - Connectionless, dynamically routed
  - Broadband capacity and interoperability
  - Openness and transparency of standards
- “Deep convergence”
  - Digitalization allows broad range of services and applications using one infrastructure
  - Separation of networks and applications

Basic architecture
Part II

Legal Framework

Section 230 Telecom Act 1996:
"It is the policy of the United States to preserve the vibrant and competitive free market that presently exists for the Internet and other interactive computer services, unfettered by Federal or State regulation"

FCC likely to have broad authority under its public interest mandate
De facto jurisdiction of state and federal agency due to links between Internet and traditional services

Status of ISPs

TC Act 1996 distinguishes between "telecom carriers" and "information service" providers

TC carriers are common carriers with all rights and obligations

Status of ISPs ...

"Information service" continues basic-enhanced dichotomy introduced by the Computer II Inquiry

Should ISPs operate as TC carriers or as ESPs?

Market structure

Market access unregulated
Information service providers need to configure their services
Servers
Some network services leased or provided via owned networks
Need access to existing narrowband and broadband platforms
Service provision unregulated
### Internet access options

<table>
<thead>
<tr>
<th>Platform</th>
<th>Configuration</th>
<th>Cost/mth.</th>
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<tbody>
<tr>
<td>Dial-up modem</td>
<td>Dial-up connection using the narrowband voice network</td>
<td>Phone plus ISP/OSP</td>
</tr>
<tr>
<td>DSL</td>
<td>Digital service via regular phone line, up to 128 bps-10 Mbps</td>
<td>$60-250</td>
</tr>
<tr>
<td>Cable modem</td>
<td>Internet access via cable system, speed dependent on # of users</td>
<td>$40-50 plus 3rd party OSP</td>
</tr>
<tr>
<td>Wireless</td>
<td>Via LMDS or satellite, speed of up to 48 Mbps</td>
<td>$50-</td>
</tr>
</tbody>
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### Third party access

- **A contested issue is access of third parties to Internet platform**
  - Independent ISPs as well as content providers claim that DSL and cable are bottlenecks (provided by dominant firms)
  - Further claim that they are an essential input for providing their service
  - Argue in favor of open access rules
- **Differing rules for dial up, DSL, cable**

### Dial-up

- ILECs have to make unbundled network elements available and sell retail services to competitors at a wholesale rate
- LECs have to provide interconnection and access to ISPs and OSPs at just, reasonable and non-discriminatory conditions
- Facilitates narrowband access to ISPs and OSPs

### DSL

- **Basic DSL configuration**
  - Carries circuit switched voice and packet switched data over single local loop
  - Device at customer end distinguishes between voice (routed traditionally) and data (broken up into packets)
  - At the other end of the local loop, the channels are split. Voice is sent via circuit switched network. Data is sent through packet switched network

### Cable modem service

- **Is Internet access via cable MVPS or a common carrier service?**
- **On March 14, 2002, FCC declared the cable modem service as interstate “information service”**
  - Subject to FCC regulation
  - Cable modem service is not cable service (must carry or leased access do not apply)
  - Contain no separate telecommunications service (thus, no common carrier rules apply)
Pros and cons

- Asymmetry of open access rules:
  - Dial-up and DSL: open access.
  - Cable systems: patchwork of rules.
  - LMDS and satellite: no open access obligation.
- Advocates of homogenous open access rules highlight that it would stimulate investment into broadband networks.
- Opponents argue that it would delay network upgrades.

Mobile Internet

- Wireless Internet may become dominant access method
  - Short distance: 802.11b, 802.11a
  - GPRS, 3G mobile network services
- Search for successful business model
  - i-mode by NTT DoCoMo (Japan)
  - FOMA by NTT DoCoMo (Japan)
  - Nate by SK Telecom (South Korea)

Part IV

Integrating the Net into Existing Policy

Policy issues

- Classification and regulatory treatment of Internet-based services
  - Internet telephony (common carrier or enhanced service provider?)
  - Webcasting (Title III broadcasting or enhanced service provider?)
- Interconnection, access, reciprocal compensation
- Privacy and security

Internet backbone market shares (Source: Network World, 2001)

What analogy?
Access charges

- Petition by America’s Carriers Telecommunication Association (ACTA) that FCC regulate ISPs based on the IXC model
- In April 1998, FCC indicated that it may consider access charges for voice over Internet (VON) services
- In February 1999, the FCC stated that is is not addressing the issue

Compensation

- Customer of LEC A accesses ISP, who is customer of LEC B. Must A pay B for the termination of traffic?

- FCC declared that traffic to ISP is interstate (not covered by RC rules)

Internet telephony

- Petition by America’s Carriers Telecommunication Association (ACTA) that FCC regulate ISPs based on the IXC model
- In February 1999, the FCC stated that is is not addressing the issue
- On November 6, 2003 the FCC announced the beginning of Internet Telephony Proceedings

LEC interconnection (Sec. 251)

- LECs must make interconnection, UNEs, and wholesale rates available to requesting TC carriers
- ISPs are not TC carriers and are not covered under section 251 unless they also offer TC services
- ISPs have attempted to attain TC carrier status. Triggers interconnection privileges and obligations

Backbone interconnection

- Traditional access pricing models
  - Sender keeps all (SKA)
  - Peer to peer bilateral model
  - Hierarchical bilateral model
  - Third party administrator model
- Emerging arrangements
  - Tier 1 ISPs exit public peering points and establish private peering
  - More hierarchical, explicit charges

Part IV

Internet Governance and Domain Names
**Self-regulation**
- Internet Society (ISOC)
- Internet Assigned Numbers Authority (IANA)
- Internet Engineering Task Force (IETF)
- Internet Research Task Force (IRTF)
- Internet Architecture Board (IAB)
- Internet Corporation for Assigned Names and Numbers (ICANN)

**ICANN**
- Internet Corporation for Assigned Names and Numbers engaged in:
  - IP address space allocation
  - Protocol parameter assignment
  - Domain Name System management
  - Root server system management
- Domain name dispute resolution:
  - No accredited registrar takes action before instructions from domain name holder, court, arbitrator’s or other neutral party

**Supporting organizations**
- Address Supporting Organization (ASO) is concerned with system of IP addresses
- Domain Name Supporting Organization (DNSO) is concerned with the Domain Name System (DNS). Its Names Council currently studies new global top level domain names (e.g., .arts, .shop, .firm, .sex)
- Protocol Supporting Organization (PSO) deals with Internet protocol issues

**Domain names**

- www.tc.msu.edu

  - Root (unnamed, InterNIC)
  - 7+7 GTLDs
    - com, org, edu, mil, gov, int
  - 180+ NTLDs
    - uk, fr, de, ca, au, my, ...
  - Generic categories
    - co, ac, state, province, ...
  - Organization names
  - Organization subdomains
  - Subdomains

**Domain names ...**
- Approximately 100 registries authorized by ICANN (+40 pending)
- Work under the supervision of three regional registries (ANIC, RIPE, APNIC)
- Domain name process includes:
  - Provisions for establishment (e.g., cc based on ISO 3166, regional domains)
  - Rules to settle conflicts over domain names
  - Wait period in new domains (e.g., .info)

**UDRP**
- Uniform Domain Name Dispute Resolution Policy (UDRP)
  - Followed by registrars in .aero, .biz, .com, .coop, .info, .museum, .name, .net, .org
  - Stipulates that most trademark disputes need to be resolved by agreement, court action, or arbitration before registrar will cancel, suspend or transfer a domain name
  - Trademark owner needs to (a) file complaint in court, or (b) in cases of abusive registration to approved service provider
**Challenges**

- **ICANN perceived by many countries as U.S. agency with strong U.S. bias**
  - Organizational structure based on U.S. DOC White Papers
  - English as lingua franca of the Internet does not represent user structure
  - Cultural conflict over conduct of meetings
- **Legitimacy of Internet governing bodies** (membership a large process)

**Numbering in networks**

- **Multiple numbering systems**
  - Telephone numbers (E.164)
  - Data network numbers (X.121)
  - Int’l Mobile Subscriber Identities (IMSIs) (E.212)
  - Object identifiers (X.660 series)
- **Administrative coordination**
  - International: ITU (e.g., country codes)
  - Regional, e.g. European Numbering Forum (ENF), North American Numbering Plan Administration (NANPA), North American Numbering Council (NANC)
  - National coordination (FCC and state PUCs)

**Part VI**

**Content Regulation, Cybercrime**

**CDA 1996**

- **Communications Decency Act 1996**
  - Sought to protect minors from harmful material on the Internet
  - Declared the “knowing transmission” of obscene and indecent messages as well as the “patently offensive display” of information to any recipient under 18 years of age a felony
- **Overturned in ACLU v. Reno (1997)**
  - U.S. Supreme Court found 7-2 that indecency part of CDA 1996 is overly broad and vague

**COPA 1998**

- **Child Online Protection Act of 1998**
  - Established criminal penalties for any "commercial" distribution of material deemed "harmful to minors"
  - Sought a limitation of access through control requirements (e.g., credit card check)
  - Challenged by ACLU and EPIC (ACLU v. Reno II, now Ashcroft v. ACLU)
  - Preliminary injunction granted by USC in 2/99; on May 13, 2002 affirmed, sent back to lower court

**Virtual child pornography**

- **Child Pornography Prevention Act of 1996**
  - Intended to ban techniques, such as computer generated images and use of youthful looking adults, conveying the impression of minors engaging in sexual behavior
  - U.S. Supreme Court in 6-3 ruling found Act unconstitutional, because "overbroad" (Ashcroft v. Free Speech Coalition, 2002)
Continuing challenges

- Offensive/harassing messages and fantasy violence
  - Jake Baker (Fantasy story posted on Usenet about rape, torture and murder of woman whose name matched UoM student)
  - LamdaMOO (virtual, violent and sadistic rape of several virtual persons by “Bungle”)
- Filtering by public libraries
- Anonymity, forgeries, pseudonyms

Forms of cybercrime

- Defined as “crime committed with aid of computer”
- Forms of cybercrime include
  - Fraud (e.g., credit card, identity theft)
  - Pornography
  - Stalking
  - Industrial espionage
  - Piracy (of intellectual property)
  - Cyberattacks (e.g., denial of service attacks)
  - Information warfare

Resources

Printed Resources

Internet Resources
Electronic Frontier Foundation [http://www.eff.org](http://www.eff.org)
Electronic Privacy Information Center [http://www.epic.org](http://www.epic.org)