Broadband Network Penetration
Challenges for Future: Lessons from Experiences of Japan

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Broadband User in Japan

Total Internet Traffic in Japan
## Use Mode of Internet (2007)

<table>
<thead>
<tr>
<th>Mode</th>
<th>Thousand Users</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC</td>
<td>78,130</td>
<td>(88.7%)</td>
</tr>
<tr>
<td>Cell phone</td>
<td>72,870</td>
<td>(82.7%)</td>
</tr>
<tr>
<td>Game machine</td>
<td>3,580</td>
<td>(4.1%)</td>
</tr>
<tr>
<td>Use All</td>
<td>59,930</td>
<td>(68%)</td>
</tr>
<tr>
<td>PC only</td>
<td>14,690</td>
<td>(16.7%)</td>
</tr>
<tr>
<td>Cell phone only</td>
<td>9,920</td>
<td>(11.3%)</td>
</tr>
</tbody>
</table>
Short History of Telecommunication Policy

1985  Privatization of NTT incumbent carrier
1986  ISDN
1990’s  Started B-ISDN and installation of optical fiber subscriber line
Mid 1990’s  Subscriber carrier system using optical fiber
2000’s  ADSL unbundling of copper wire world lowest collocation fee
         $1.5/month
2004  Competitive optical fiber price
Position of the Author on Broadband Penetration Policy of Japan

- 1985–2004: member of telecommunication council of MIC, Japan

Formulated major policy on competition and broadband penetration.
New Technology Requires New Law

Creation of service ideas beneficial for people taking advantage of new technology is the key to enhance welfare of people.
Telecommunication carrier status

Structure of Telecommunication Law in Japan

Carrier License is basically facility based

1985 Law  
Type1 carrier: transmission facility
Type2 carrier: switching and computer facility through which signal is transmitted

2003 Law  
Unification of Type1 and 2

This rule simplify the definition of telecommunication business

To have carrier status is easy
just registration by sending a form to MIC
If registered as a carrier, no additional obligation.
Universal service fund contribution is on assigned telephone number.
Optical Fiber Penetration in Japan

- Average of major cities
- Business area in major cities
- National average
## Competition Accelerated Broadband

Optical fiber was not successful until 2000. ADSL unbundling started competition in pricing.

\[
2\text{Mbps}: ¥7000/m \rightarrow 50\text{Mbps}: ¥4000/m
\]

In ADSL service incumbent carrier failed to have major share. In 2003–2005 share of NTT was about 35–40%.

To compete with ADSL competitor, incumbent started low flat rate price optical fiber for internet access. In FTTH share of NTT is around 60%.

### Current Broadband Access Price

<table>
<thead>
<tr>
<th>Service</th>
<th>Speed (Mb/s)</th>
<th>Price (¥)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADSL</td>
<td>50</td>
<td>2600~4200</td>
</tr>
<tr>
<td>Optical fiber</td>
<td>100</td>
<td>3500~6500</td>
</tr>
</tbody>
</table>
Cost of Access Line

- Price of Optical fiber by core is lower than copper in recent 10 years.
- Current cost of including construction of optical fiber is in between the cost of 0.4mm copper and 0.65mm copper both for aerial and underground installation.
- Lives in field are also not very much different.
European Possibility

Current optical access line cost is not very much different from copper line.
Underground subscriber line cost is not very high including construction cost if underground tunnel is available.
Permission of aerial line shorted construction delay for competitors.
Appropriate competition policy among access carrier is important to realize affordable broadband.
# Saturation of Current IT Market

<table>
<thead>
<tr>
<th>Year</th>
<th>Communication Terminals</th>
<th>Computers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>$10^8$</td>
<td>$10^5$</td>
</tr>
<tr>
<td>1970</td>
<td>$10^8$</td>
<td>$10^7$</td>
</tr>
<tr>
<td>1990</td>
<td>$10^9$</td>
<td>$10^9$ personalized</td>
</tr>
<tr>
<td>2010</td>
<td>$10^9$</td>
<td>$10^9$ ubiquitous</td>
</tr>
<tr>
<td>2030</td>
<td>$10^{11}$</td>
<td></td>
</tr>
</tbody>
</table>

To overcome saturation of market, cultivation of new applications is important. Vehicle Market is the first market to be attacked by new telecommunication network.
## Improvement of processors

<table>
<thead>
<tr>
<th>Year</th>
<th>Model</th>
<th>Transistors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1971年11月</td>
<td>4004</td>
<td>2,300 Transistors</td>
</tr>
<tr>
<td>1974年4月</td>
<td>8080</td>
<td>6,000 Transistors</td>
</tr>
<tr>
<td>1978年6月</td>
<td>8080</td>
<td>29,000 Transistors (5～10MHz)</td>
</tr>
<tr>
<td>1985年10月</td>
<td>386</td>
<td>275k Transistors (16～33MHz)</td>
</tr>
<tr>
<td>1993年3月</td>
<td>Pentium</td>
<td>5M Transistors (60～300MHz)</td>
</tr>
<tr>
<td>2000年11月</td>
<td>Pentium4</td>
<td>80M Transistors (1.4～3.8GHz)</td>
</tr>
<tr>
<td>2007年11月</td>
<td>Itanium dual core</td>
<td>2B Transistors</td>
</tr>
</tbody>
</table>

(10^6 in 36 years) (source Intel Dec.2007)
Technically terminal needs identical layer set as service providers.
Network Neutrality

Network is free from restrictions on:
- equipment
- mode of communication
- content
- site
- platform
Neutral Network Service

Surrounding a neutral network, many contents and application service providers can develop services.

To expand market Standardization of platform and application is important.
Cost Performance Improvement Gap

<table>
<thead>
<tr>
<th>Processing Capability</th>
<th>18months/double</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Storage</td>
<td>15months/double</td>
</tr>
<tr>
<td>Bandwidth</td>
<td>28months/double</td>
</tr>
</tbody>
</table>

Performance bottleneck
- Core network transmission bandwidth
- Congestion in server system

800Gb/s
30M subscribers
25kb/s/subscriber

Higher utility is needed for future developments. Network use having less traffic in core network is requested.
New ideas by openness of network
voice video data, new commerce
Creation of rich services and contents by lowering entry barrier.
Skype and JOOST are typical examples successful in neutral network.
Resilience, Economy of Scale, Decentralized Control
new P2P
Traffic localization
hybrid P2P, P4P
Effective use of broadband access system

Cost Effectiveness of P2P
  Use of high speed access without core network overload
  reduction of proxy servers
  long line capacity of core network
  better quality of information
End-User Generated Information Distribution
  everybody can be information source
Locality in Internet
  local information can be handled locally
Network neutrality is essential to enrich usage of broadband by user initiative.
Social issues caused by internet

1. Overflow of spam mail
2. Phishing and fraud using mail and VoIP
3. Effects on young people
   - Improper relationship caused by internet mail
   - Loss of social reality
   - Fraud targeting young people
4. Menacing by block.
Variety means needed to overcome issues

1. Technical measure
   Authentication of user ID and content
   Confirmation of information source
2. Low enforcement
   Prevention of spam mail and fraud mail
3. Education to cope with crime
Broadband to enrich society

We still have many technical, business and social issues for future internet society.

Shortage of IP address should be solved by rapid penetration of IPv6.

Applications using elaborate techniques of v4 should be identified and improved.

Society need effective means to overcome issues.

Total effort to overcome the issues and to create rich society is the key for the future.

Effort to create rich future society will depend on technology and wisdom of society.