Network Paradigm Shift
(From “Telephone era” to “Broadband/IP era”)
~Realization of ubiquitous network society~

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1. Introduction
Advancement of Information & Communications Infrastructure

Telephony

- Fixed Telephone
  - ISDN
- Mobile Phone
  - 3G Mobile

Broadband

- ADSL
- Optical Fiber
- Wireless LAN
- UWB

64k 384k 1.5M 8M 20M 40M 100M

Analog

- Digital

Packet

IP

From Telephone Network to IP Network

Image of Paradigm Shift

Transformation of Market Structure Accompanied by the Development of Competition and Technological Innovation

**From Telephony to Broadband**
- Together DSL, cable and FTTH, 16.9 million broadband subscribers (1.6 million for FTTH)
- Due to the thorough open network policy (including unbundling of optical fiber), a broad range of services competition has developed
- From metered rate to flat rate

**From Fixed to Mobile**
- In Nov. 2000, subscribers of mobile services exceeded those of fixed telephone services
- Out of 82 million mobile subscribers, 86% can use mobile Internet and 20% use 3G mobile
- Mobile phone evolves as ‘multifunction location-free terminal’

Convergence of fixed and mobile network

Ubiquitous network society
Wire/Wireless seamless broadband is realized.
Network access is available anytime, anywhere, with anything and by anyone.
Drivers for network development

Relationship between Supply and Demand

Supply
Improvement of Network

Demand
Expansion of Application

Start from Services-based Competition

To create new applications

To promote sophistication and diversification of network

Transition to Facilities-based Competition

Development of Ubiquitous Network Society
Led by a Virtuous Circle of Supply and Demand

Players in Network Paradigm Shift

• Make rules to make competitive market - government
  Interconnection, unbundling, collocations, etc
• Stimulate demands by setting reasonable prices
  — carriers/operators
• Discover new demands and ways of using new network
  — private/corporate users and suppliers
• Prepare applications corresponding to the new demands
  — suppliers of applications and contents
• Develop more advanced network
  — carriers/operators
• Take policy measures adequate to newly emerging issues
  — government
  privacy, security, intellectual property, unfair enclosure, etc
2. Current Status of Market in Japan

Broadband & Mobile Internet in Japan

Figure 1. International Comparison of Broadband Fees per 100 kbps (July 2004)

Japan’s broadband services are the world’s least expensive and highest in speed. A comparison of costs per 100 kbps also reveals that Japan has the world’s lowest cost broadband services.

Figure 2. Mobile Phone Internet Compatibility Rates* in Leading Countries (September 2003)

Japan’s mobile Internet compatibility rate (89.5%) is the highest in the world. Japan has the highest. No. of 3G subscribers is increasing rapidly (19.5Mil subscribers as of the end of June).

* Percentage of mobile phone subscribers that include mobile phone Internet access.
National average of coverage rate of FTTH network is 80% and FTTH services are widely provided especially among urban areas.

Transition in the coverage rate of FTTH network

Percentage of municipalities where FTTH services are provided (by population size)

Rapid Diffusion of Mobile Communications

Sales of Mobile Communications Operators (Year 2002)

Total Sales: J.Yen 1,3400 Bil
(Mobile: J.Yen 5,860 Bil → 44% of Total Sales)
3. Withering PSTN and expanding IP Network
Shift of network structure (Telephone • Public corporation → IP • Competition)

[PSIN era] Competition [IP era]

In addition to NTT, some new common carriers competitively deployed.

A number of carriers competitively deploy.

※ The importance of local loop is increasing

Diffusion of VoIP

◇ IP telephony has been introduced in 7.3% of households (total: 47.1 million in 2000) and 11.1% of businesses (as of the end of 2003).

- Introduction of IP Telephony
  - Households
    - IP Telephony Used: 7.3%
    - IP Telephony Not Used: 82.7%
    - Unknown: 2.3%

- Use of IP telephony by both households and businesses is increasing.

- Business use categories are 1) VoIP connection between branches, 2) integration between voice and data services through LAN, 3) VoIP connection with outside lines and 4) introduction of IP Centrex services.
Transition in the Market of VoIP Equipment for Corporate Use

(Unit: 100 million yen)

- VoIP gateway
- IP-PBX
- IP telephone set

Source: Communications and Information Network Association of Japan

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4. Developments of Mobile and Wireless Communications/ Fixed-Mobile Convergence

Development of mobile communication

<table>
<thead>
<tr>
<th>Introduction of new services</th>
<th>Only Telephone service</th>
<th>Internet service</th>
<th>Mobile Phone with camera</th>
<th>First 3G mobile phone</th>
<th>Mobile Phone with TV</th>
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<tbody>
<tr>
<td>1999</td>
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<td>2001</td>
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<td>First 3G mobile phone</td>
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<td>2003</td>
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<td>Mobile Phone with camera</td>
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</table>

- **Video mobile communication**
- **Mobile Phone with camera**
- **Mobile Phone with TV**

**Stock transaction**

Tokyo
12/25 Mon, Temperature 16°C

ABC Company
Opening price: 270
Closing price: 300
High price: 320
Low price: 250
Total transactions:

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E-cash

Insert money into the machine in the store. Deposit e-cash into your mobile phone

Take your shopping item to the cash register

Insert an RFID into your mobile phone to use e-cash. Your mobile phone will become an e-wallet.

Hold your mobile phone in front of the reader at the cash register to pay by e-cash.

Key

Press the button while holding your mobile phone in front of the lock to open and close the door.

Train pass and tickets

Deposit e-cash at the ticket machine or through the Internet. Hold your mobile phone in front of the automatic ticket machine to pay automatically.

Concert tickets

Receive movie tickets through your mobile phone and hold it over the machine at the theater.

Ref: Mobile Watch

RFID in ubiquitous network

Automatic payment

Fridge controls quality preservation period

Cell phone receives commodity information

Barrier free by identifying handicapped person

Safe transportation by sensing RFID on Children, etc.
5. Future Perspectives
- Problems we will face in the ubiquitous era -
Impact on Competition and Business caused by Move to IP

Characteristics of IP Technology

- "Everything on IP" – Various contents and applications are developed on IP
- "IP on Everything" – Various infrastructure is deployed based on IP
- Distributed, not centralized, network architecture and multi-proliferation

Great Impact on the State of Competition and Businesses

<table>
<thead>
<tr>
<th>Positive Impact</th>
<th>Negative Impact</th>
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<tbody>
<tr>
<td>• Inexpensive network facilities compared with PSTN and Market entry without huge capital</td>
<td>• Dramatic decline in sales and traffic of traditional fixed telephone service</td>
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<td>• Cheaper/Flat fees</td>
<td>• Difficult maintenance of PSTN and crisis in ensuring universal service</td>
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<td>• Expanded business opportunities by advanced services utilizing IP</td>
<td>• Unstable quality and reliability</td>
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<td>• Vulnerable security</td>
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New ICT Policy is necessary to respond to new situation affected by the move to IP.

Development of VoIP and Policies to be Considered

<table>
<thead>
<tr>
<th>Development of VoIP</th>
<th>First Stage</th>
<th>Second Stage</th>
<th>Third Stage</th>
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<tbody>
<tr>
<td>Policies to be considered</td>
<td>Allocation of the designated number for VoIP (050)</td>
<td>1) Same numbering as PSTN</td>
<td>Policies to promote 1) VoIP via wireless LAN 2) VoIP via mobile phone 3) Convergence of 1) and 2) Dual mode terminal → Full VoIP, etc.</td>
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<tr>
<th>Main Goals</th>
<th>Diffusion of VoIP</th>
<th>Replacement of PSTN</th>
<th>Integrated and further advanced service Ubiquitous network</th>
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<tr>
<td>[Rural Area]</td>
<td>Only PSTN Increase burden to maintain PSTN</td>
<td>[Rural Area]</td>
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</tbody>
</table>

To ensure emergency calls To dissolve geographical divide Interconnections between IP networks, quality of service, security, etc. Possible change of competition policy from PSTN era to IP network era
Ensuring Universal Service Reflecting Diffusion of IP Telephony

- For the time being, the prospect is that the number of users of IP telephony will keep growing within the number of broadband subscribers and traffic passed by switches will be decreasing.
- However, it is also expected that the number of fixed-telephone subscribers will not fall rapidly.
- Therefore, for at least a few years, IP telephony cannot be a viable alternative for fixed-telephony and it is anticipated that fixed-telephony keep will bearing the role of the “last resort.”

In the midst of decreasing investment on PSTN, how to view universal service regarding fixed-telephony?

Digital Divide Issues Regarding Broadband and Mobile

- Japan achieved success to some degree regarding diffusion of broadband and mobile based on the principle of private initiatives.
- However, there is the reality that these services have not been sufficiently provided among non-profitable areas, e.g., depopulated areas and remote islands.

It is necessary to correctly identify the limit of principle of private initiatives and to play the role required of the public sector

Problems to be solved for realizing Ubiquitous network society

- Building Infrastructure: Asymmetrical regulation, Interconnection rule, allocation of spectrum, etc
- Preparation of legislation and practice suitable to cyber society
- Protection of privacy
- Prevention of harmful effect on Environment and human body
- Protection from cyber attacks: Terrorism, Virus, spy ware
- Dissolution of geographical divide (universal access)
- Safe e-commerce: e-government, private authorization, intellectual property
- Bridge the divide for the elderly and handicapped (universal design)
- Restriction of illegal and harmful contents
- Diffusion of IT literacy
- Cyber ethics
- Digital divide

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Cross-Layered and Comprehensive Policy Development

ICT POLICY

Application
- Promotion of ICT usage
  - e-Learning, e-Health, etc.
  - e-Government

Platform
- Development of Basis for Content Distribution
  - Ensuring security
    - (Charging, Authorization, etc.)
  - Protecting privacy
  - Copyright clearance

Terminal
- RFID
- Computer
- TV
- Telephone

Infrastructure
- Wire (copper, optical fiber)
- Wireless (terrestrial, satellite)

Ensuring Network Connectivity
- Level playing field
- Efficient usage of spectrum
- Bridging the digital divide

Advancement of Infrastructure
- Next-Generation backbone

Utilization

Mutual Interaction

Infra-structure

Ubiquitous network Society

Examples of policy viewpoints in IP era (1)

Ex. 1 Review of telephone-oriented competition policy

• Collapse of long distance business model with emergence of IP network and reconsideration of competition policy presupposing distance-based fire-wall.
• Shift from switch-based interconnections policy to new framework that can smoothly connect different IP networks

Ex. 2 Continuing importance of local loops

• Access lines as a basis for all services
• Shift of goal from ‘the scope of Universal Services’ to ‘Securing of Universal Access’ (Cost burden of physical access lines as a measure of service provision)
• Foresight of interaction between service-based competition and incentives to invest in new infrastructure (including the relation between unbundling regulation and FTTH deployment)
Examples of policy viewpoints in IP era (2)

**Ex. 3 Appearance of flat rate business model**
- Disincentives to expand communication traffic
- Incentives to enter into markets in other layers in seeking more revenue

**Ex. 4 Interactive influence among the markets in each layer**
- Appearance of new market structure to promote content and applications by penetration of broadband services
- Desirable interactive stimulation between the provision of content and applications and the deployment of advanced infrastructure
- Distinction between fair business activities and unfair deprivation of users' right of choice
- Careful watch over status of interfaces between each layer, vertical integration, moves to enclose end users, ability to choose and provide content, control of portal or charging system, etc.

Thank you!

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