“Ubiquitous e-Japan”

- Industrial & Technological Foresight in the Information & Communication Area -

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Outline

(I) Introduction

(II) Review of industrial impact & technological trend
   II-1) Semiconductor
   II-2) Broadband & Mobile
   II-3) Internet

(III) Future perspective
   Ubiquitous network

(IV) Concluding remarks
Worldwide GDP

31.5 Trillion $ (2000)

Source: MPHPT
Changing from Hardware to Service Solution

Source: MPHPT
Worldwide Semiconductor Production

Total Volume (M$ or M)

Quantity

Sales

Year

Source: World Semiconductor Trade Statistics

The 2nd International Conference on Technology Foresight, Tokyo, Japan 2003. 02.27
Technological Challenges Continue

Source: International Technology Roadmap for Semiconductor 2001
High Frequency Devices

Si MOS is rapidly extending its high freq. performance

Source: NISTEP
Evolution of High Speed Computer Performance

(Source: Earth Simulator Research and Development Center)
Nano-Technology will give a Break-Through
But be Selective

Source: NISTEP
Semiconductor

1. Semiconductor will continue to lead the technology.

2. But will not be the strongest driving force for the industry.

3. Nano-technology is expected to generate a technological break through.
Broadband layers

Source: NISTEP
## DWDM Jump

<table>
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<tr>
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</thead>
<tbody>
<tr>
<td>DWDM</td>
<td></td>
<td>4~16 ch</td>
<td>32~176 ch</td>
<td>176~700 ch</td>
<td>~1000 ch</td>
</tr>
<tr>
<td>DWDM ch Spacing</td>
<td></td>
<td>400G, 200GHz</td>
<td>100G, 50GHz</td>
<td>50G, 25GHz</td>
<td>25GHz</td>
</tr>
<tr>
<td>Bit rate /channel</td>
<td></td>
<td>2.5 Gbps</td>
<td>10G, 2.5Gbps</td>
<td>40G, 10G, 2.5Gbps</td>
<td>40G, 10G, 2.5Gbps</td>
</tr>
<tr>
<td></td>
<td></td>
<td>600M, 150Mbps</td>
<td>600M, 150Mbps</td>
<td>600M, 150Mbps</td>
<td>600M, 150Mbps</td>
</tr>
<tr>
<td>Capacity /fiber</td>
<td></td>
<td>~40 Gbps</td>
<td>320G~1.76Tbps</td>
<td>1.76T~6.8Tbps</td>
<td>~10Tbps</td>
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</tbody>
</table>

DWDM: Dense Wavelength Division Multiplexing  
Source: NISTEP

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2003. 02.27
Progress of Optical Fiber Amplifier

- PDFA (Pr; Praseodymium)
- TDFA (Tm; Thulium)
- Te DFA (Te; Tellurium)
- Raman Amp.
- EDFA
- longer EDFA (Er; Erbium)

Fiber Window: 1250 1300 1350 1400 1450 1500 1550 1600 1650

Wavelength [nm]

Source: NISTEP

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2003. 02.27
Traffic explosion; More than Moor’s Law

Source: NISTEP
Explosion of Information storage

Source: MPHPT
Evolution of Mobile Communication

-mobility-

High speed run

Moving

Fixed

Inside building

Outside building

1995

2000

4th Generation

3rd Generation

High speed Wireless LAN (MMAC)

PHS

Cordless handset

Cellular Phone

Pager

IMT-2000 (WCDMA cdma2000)

Wireless LAN IEEE802.11 a/b

10K 100K 1M 10M 100M

(/sec) Data Rate

Broadband & Mobile in Japan

1. Broadband technology is ahead of existing amount of traffic.

2. But will be caught up by the traffic explosion in a few years.

3. Extension of the mobile subscriber requires wider bandwidth in the mobile technology.
Trends in Internet Penetration in Japan

including internet capable terminals such as Mobile Phone, TV and Game Terminals

Note: The estimated figures for 2005 are based on the Information and Communications in Japan White Paper 2001.
Source: Communications Usage Trend Survey, MPHPT

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Access Line Bandwidth and Internet Services

Access Line
- Dial-up ISDN
- CATV, ADSL
- FTTH

Bandwidth
- Dial-up: 64kbps
- CATV, ADSL: 600kbps, 1.5Mbps, 8Mbps
- FTTH: 100Mbps

Internet Services
- Email, Web Search
- Still Picture
- TV Conference
- TV Movie
- HDTV Movie

Download time
- Music CD: 2.5 hours, 15 mins, 6 mins, 1 min, 6 sec
- Movie: 125 hours, 13 hours, 5 hours, 1 hour, 5 mins

Source: 2002 WHITE PAPER Information and Communications in Japan
Trends in Internet Usage

Internet into Everyday Life
New Service through Broadband

Source: Survey and Analyses of IT and National Life In 2002 WHITE PAPER Information and Communications in Japan
Ubiquitous World is coming!

- Auto-check
- Stock control
- Micro-chip
- Auto-recognition
- Auto-guidance
- Collision prevention
- Stop!

Source: MPHPT
Ubiquitous World

Source: Sony Homepage
Ubiquitous market size Prediction

Source: MPHPT Research Group for Future of Ubiquitous Network Technologies 2001.11
<table>
<thead>
<tr>
<th>Contents, Services</th>
<th>Personalized Services, Content Distribution Mgmnt, Streaming Data Distribution, Context Awareness</th>
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<tr>
<td>Appliances</td>
<td>New PDA for Ubiquitous Environment, Digital Home Appliances, Wearable Computer</td>
</tr>
<tr>
<td>Network</td>
<td>IPv6, Security, Seamless Network, QoS over Heterogeneous Network, Sensor Network</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>Ultra-high-speed Photonic Network, High Performance Computing, Large-capacity Storage</td>
</tr>
<tr>
<td>Devices</td>
<td>Ultra-small One-chip Computer, RFID, Sensors</td>
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</table>
Concluding Remarks

1. The second stage of the IT revolution is taking place in Japan.

2. It is from infrastructure construction to new value creation stage to realize more active, safe, hearty and convenient lifestyles.

3. The main Driving Force will be the creative contents development for Ubiquitous e-Japan!

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