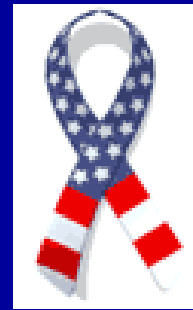
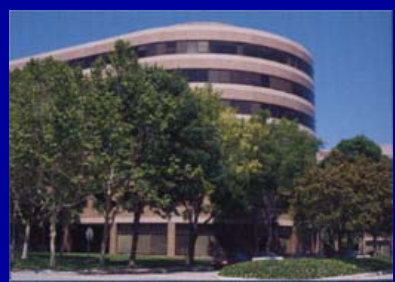


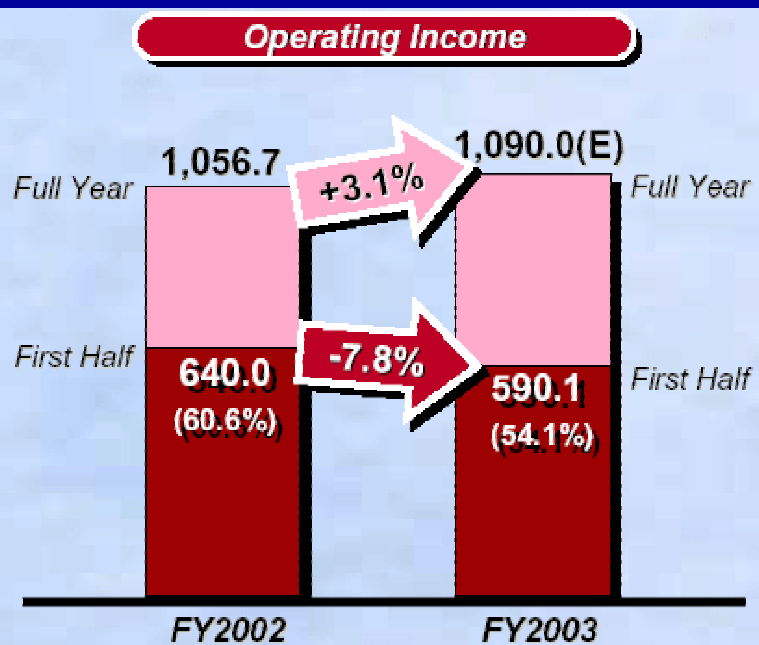
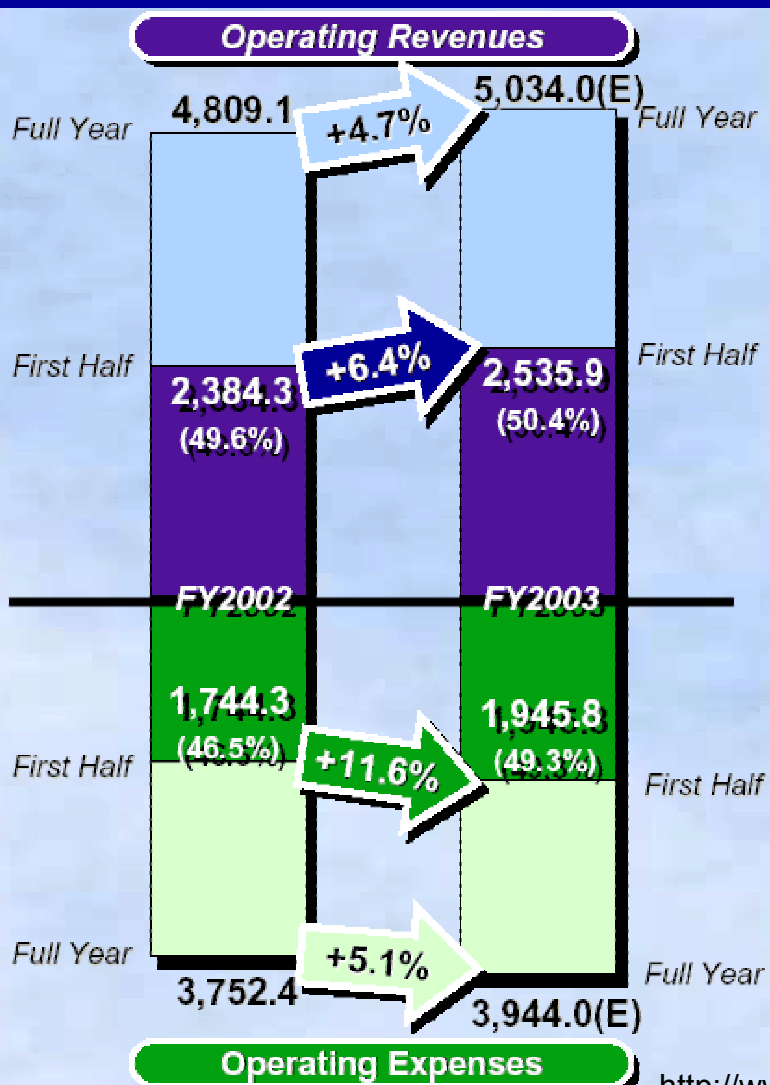
移动网络和服务的下一步将如何发展？

荣藤 稔, 博士
总裁兼首席执行官
都科摩美国通信技术研究中心



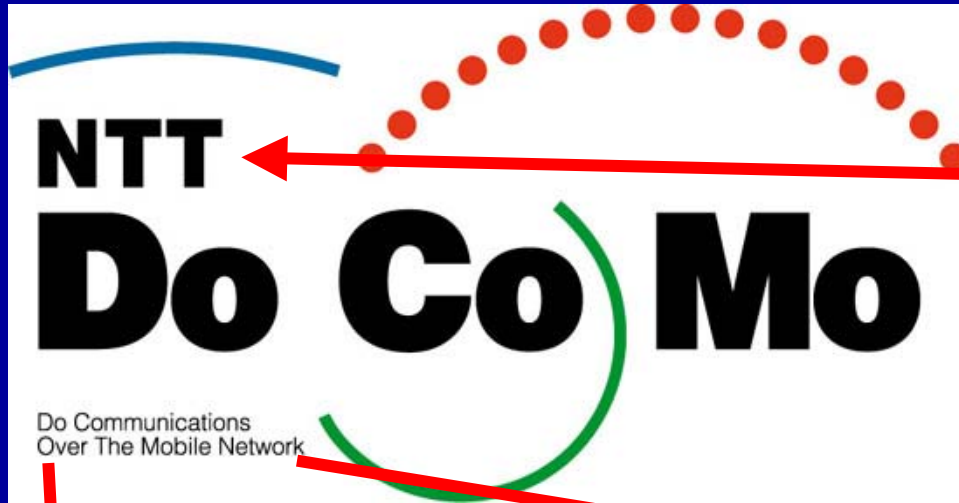
- What are DoCoMo and i-mode?
- Why is next generation mobile network needed?
- What does 4G mobile network look like?

The largest mobile telecommunication company



Operating Revenues USD 50 billion
 Operating Income: USD 10 billion

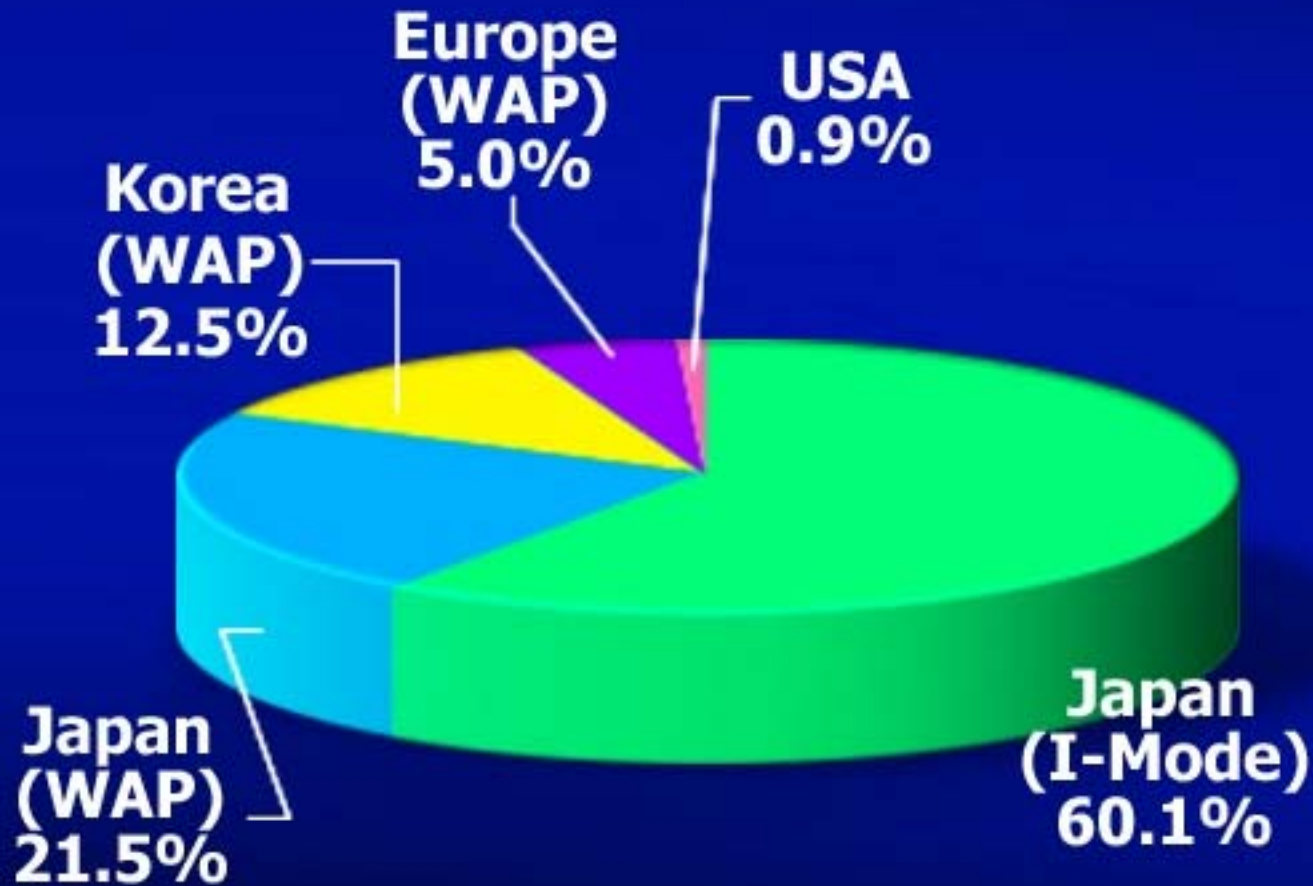
http://www.nttdocomo.co.jp/english/corporate/investor_relations/balance/balanc_e.html



Holding company name

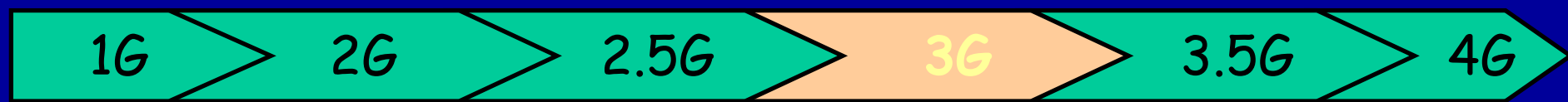
DoCoMo stands for "DO COmmunications
over the MObile Network"
and it sounds like "anywhere" in Japanese.

Mobile Internet Users Worldwide



Generation of Mobile Networks

Application and Transport Technology Trends



GSM/D-AMPS/IS-95/PDC/PHS IMT-2000(W-CDMA/cdma2000)
NMT/AMPS/NTT GPRS/EDGE/i-mode/WAP *HDR/1xtreme*

Voice Analog



Voice over Circuit Switch

Data/Multimedia over Circuit Switch

9.6k - 28.8k - 64k - 384k - 2M

Data/Multimedia/Internet over IP

9.6k - 28.8k - 64k - 384k - 2M - 20M

All over IP

384k - 2M - 20M - 200M

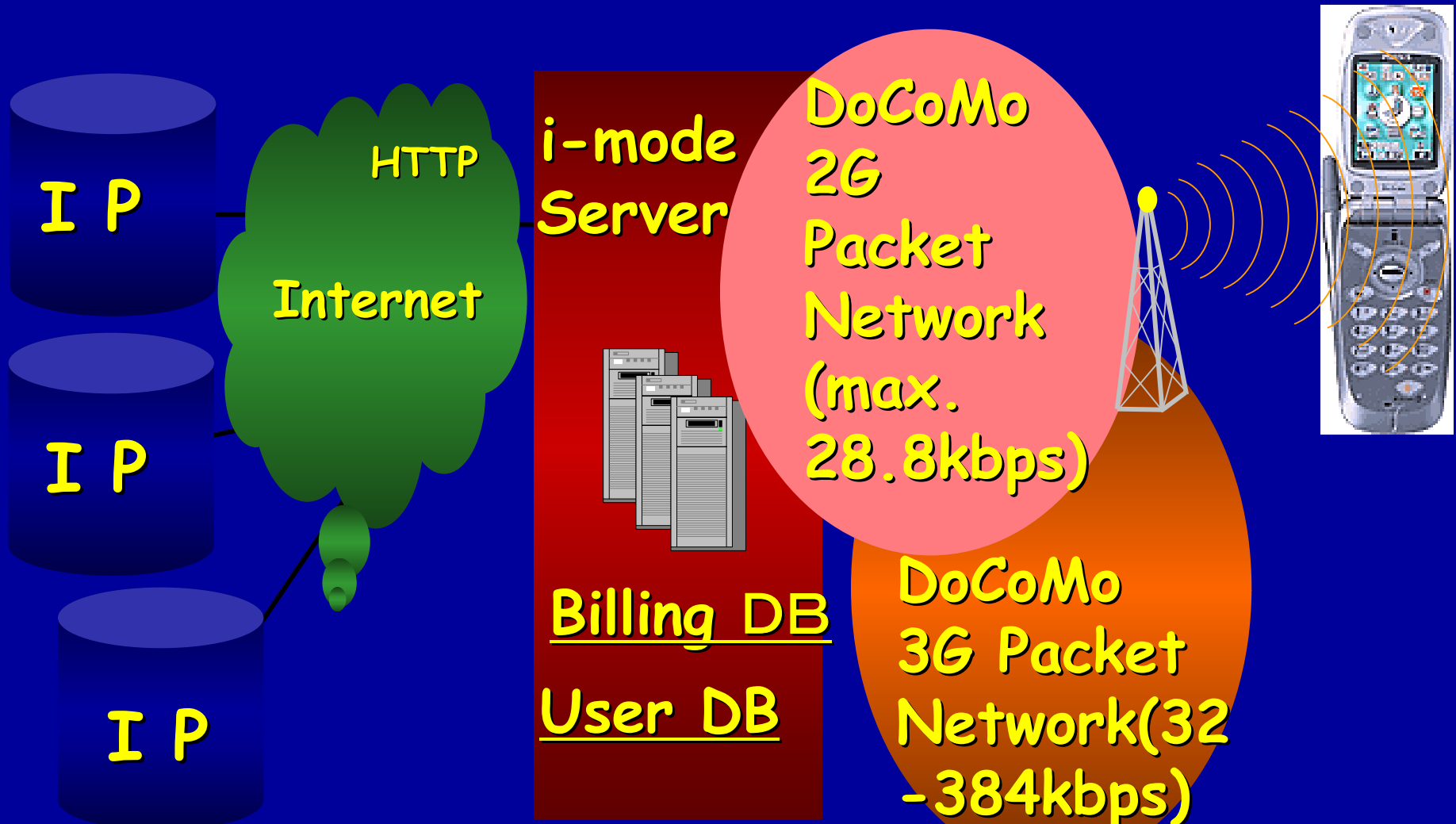


The birth of i-mode, Feb. 22, 1999

Generations and Applications

- 1G: basic mobile telephony
- 2G: mobile telephony for mass users
 - regional roaming
- 2.5G: mobile internet services Before i-mode
After i-mode
- 3G:
 - global roaming
 - enhanced mobile Internet services
- 4G: Seamless ubiquitous internet services that fill the gap between the two worlds

i-mode Services



DoCoMo has 47 million users.

#i-mode subscribers exceeds 40million yesterday !(Oct. 30, 2003)

i-mode Value Chain



- **Spend on one application**

- Application subscription: \$8
- Transport: \$17

- **DoCoMo keeps total of \$17.72**

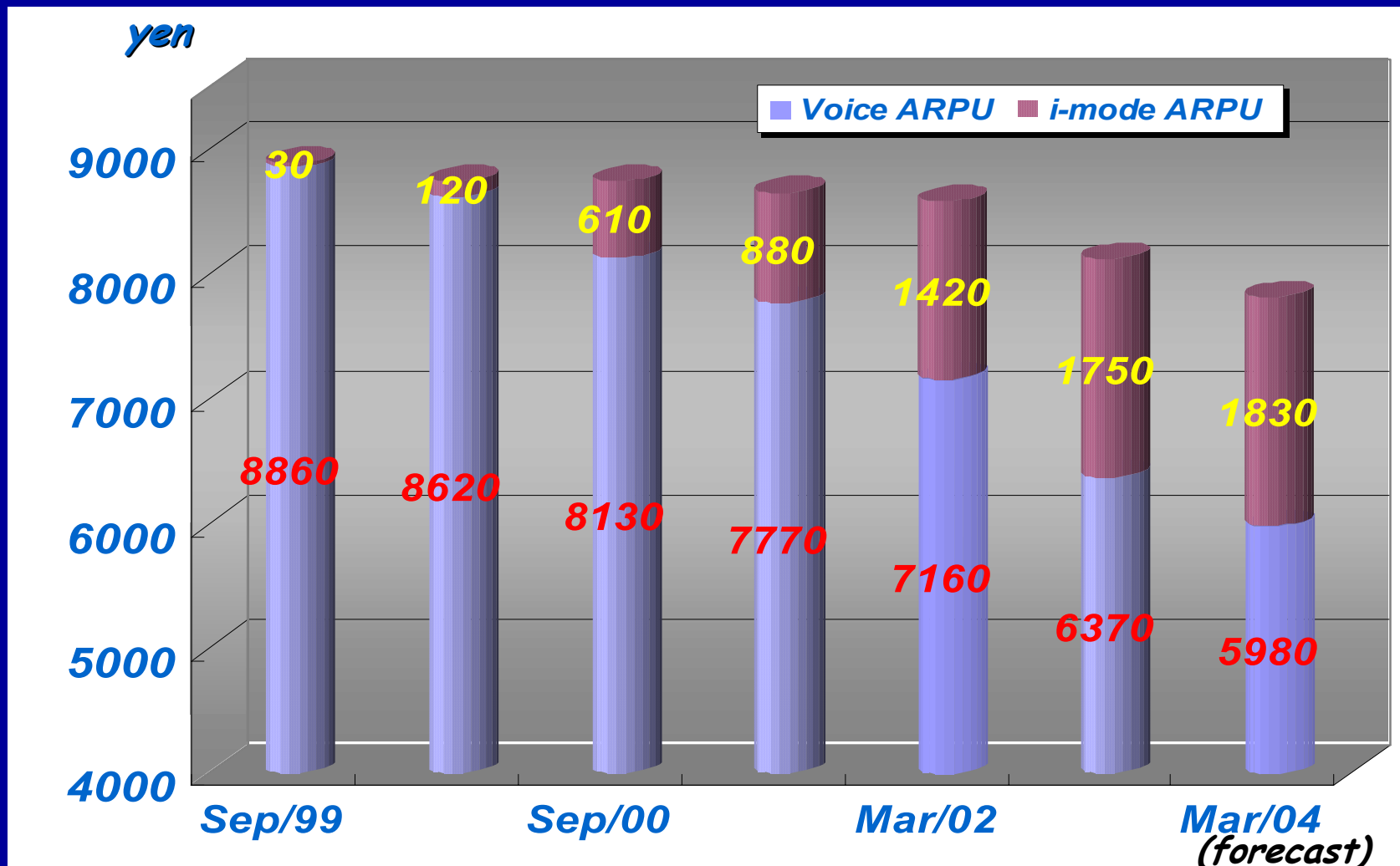
- Transport: \$17
- Billing: \$0.72 (9%)

- **Application provider keeps \$7.28**

- 91% of subscription fee

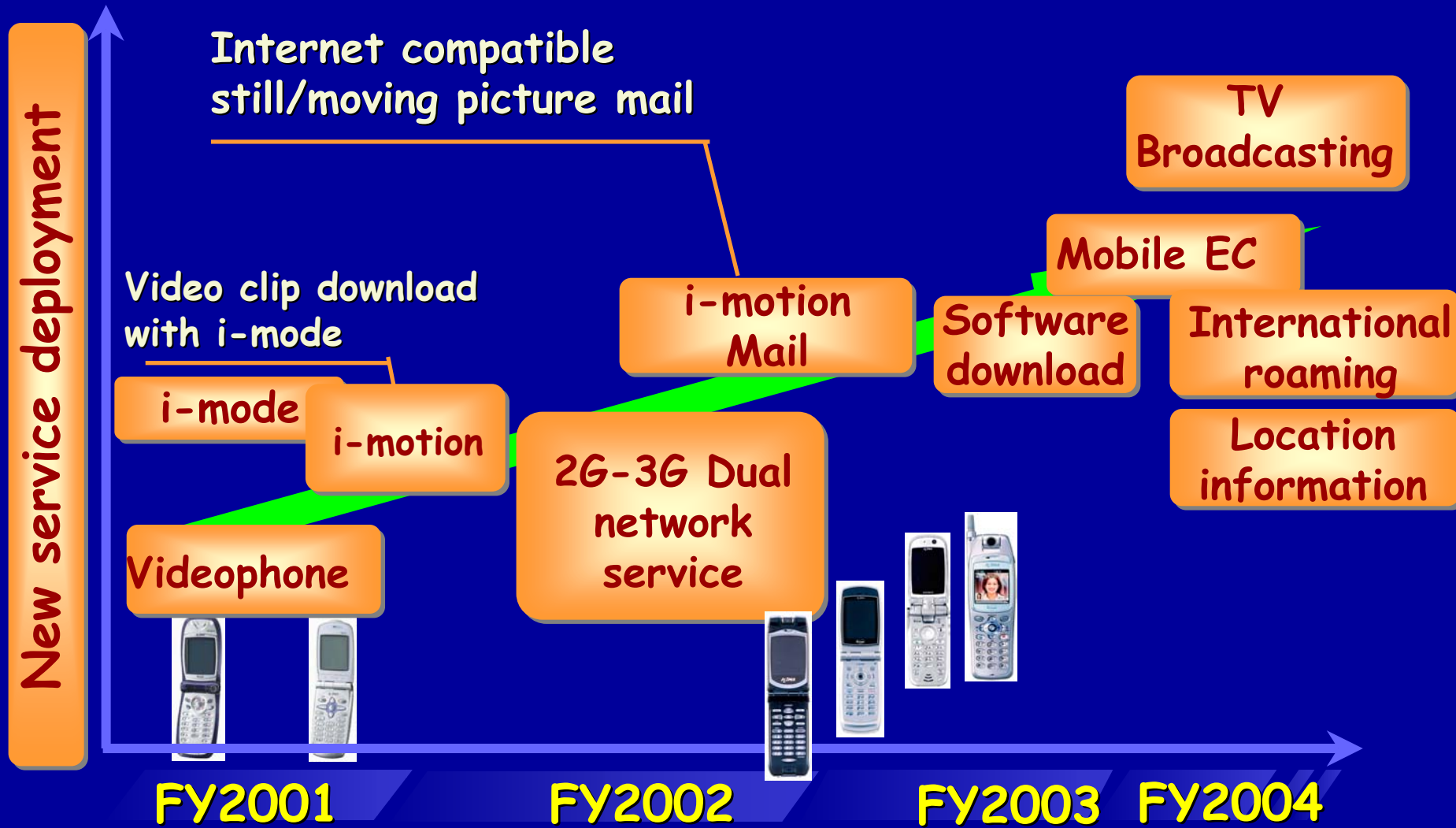
Voice and i-mode Average Revenue Per User

USD 1 = JPY 108

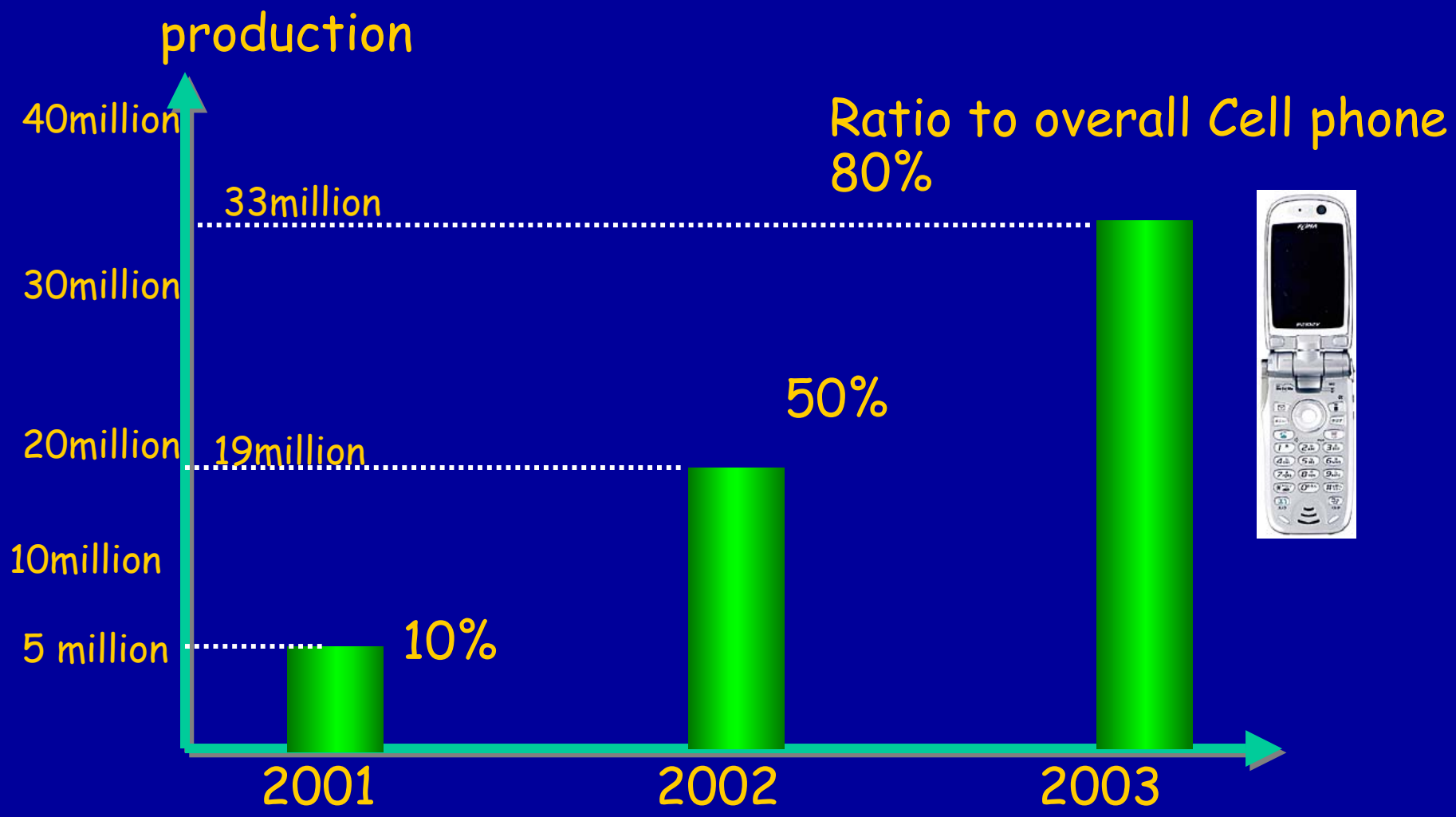


***3G Services:
to explore non-voice applications***

DoCoMo's Enhanced Mobile Services



Cell Phone with Camera in Japan Market



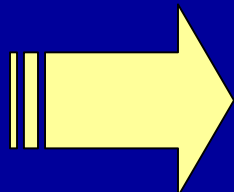
Source: <http://ma.nikkeibp.co.jp/>

DoCoMo's Java Phone

is now comparable to i-PAQ, and more than Palm.

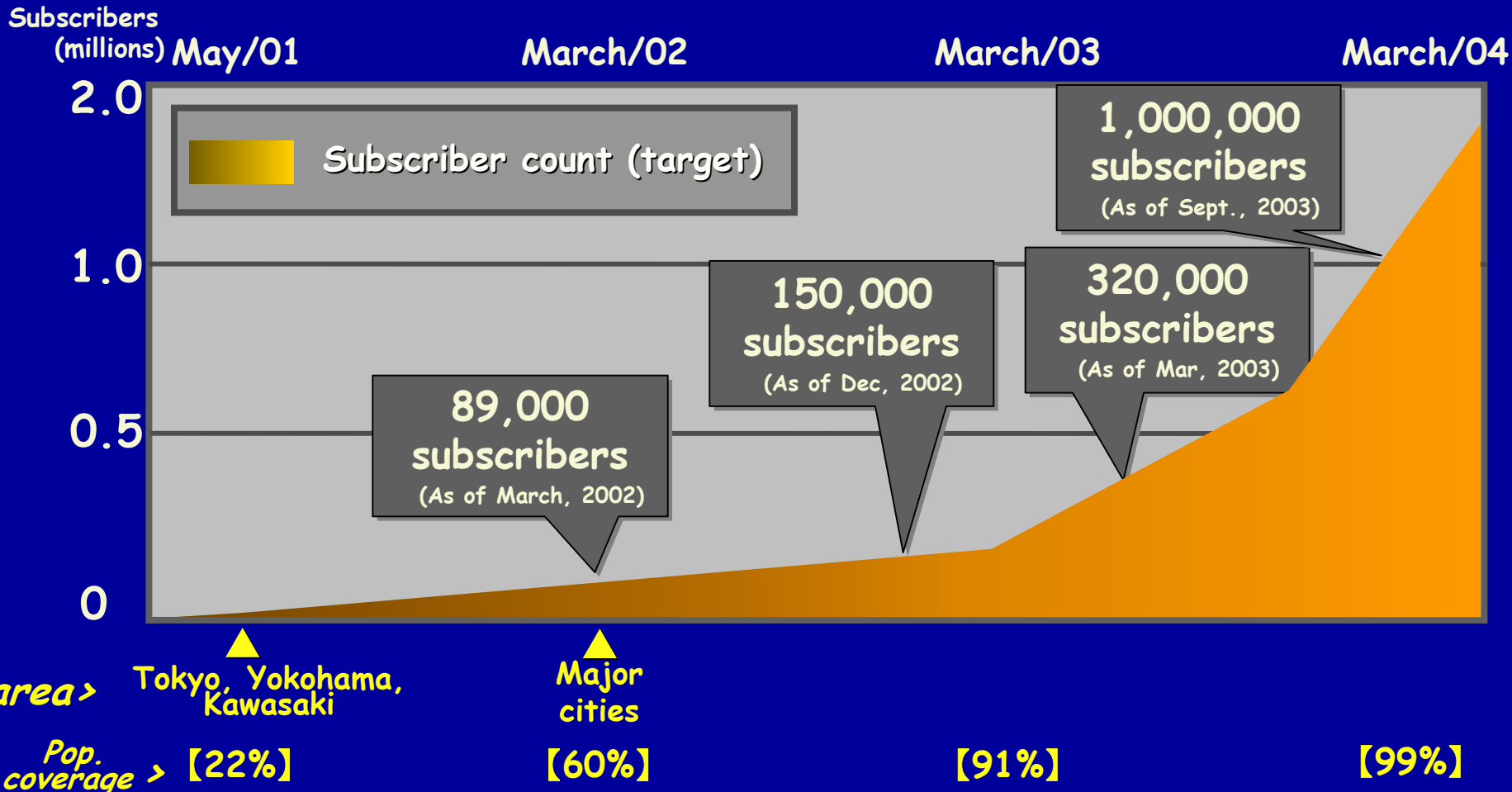
Ubiquitous Computing
World enabled by

APIs for IrDA,
Bluetooth and Non-
contact IC,
100KB footprint
10MB Memory Space
Authorized download
XML-protocol, etc.



3G "FOMA" Development Plan - Subscriber -

Planned nationwide deployment in approx. 3 years from launch (pop. coverage 99%)



- Dramatic bandwidth gap between wired and wireless networks.
- Seamless services over different networks

Cost per Mega Byte in Japan Market

	2000	2001	2002	2003	2004	2005
Network Download Cost/MB	¢ 11.3	¢ 7	¢ 7	¢ 3.5	¢ 3	¢ 2.5
Package Cost/MB	¢ 3.75	¢ 3.5	¢ 3.17	¢ 3	¢ 2.67	¢ 2.5



\$2.30 over DoCoMo 3G Network
\$2 - \$7 over GPRS networks.

Source: DSE Strategic Marketing Laboratory, Inc.

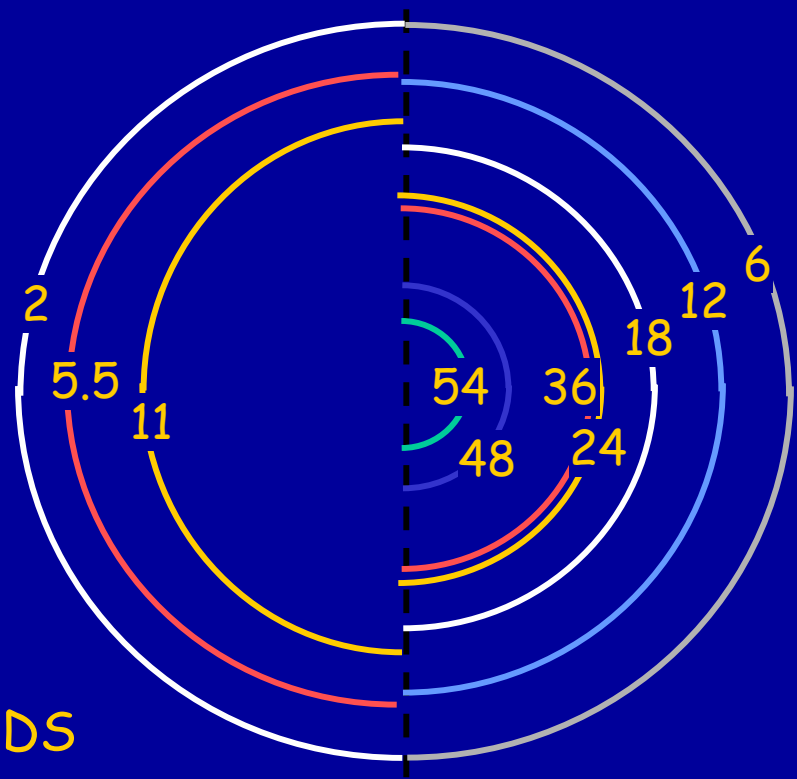
- "Major Opportunity"
 - Sky Dayton, CEO Boingo Wireless



- "Unbridled Hype"
 - Irwin Jacobs, CEO Qualcomm



- high power consumption
- no high speed mobility and coverage



Primarily a laptop medium

802.11b

2.4GHz/DS

802.11a

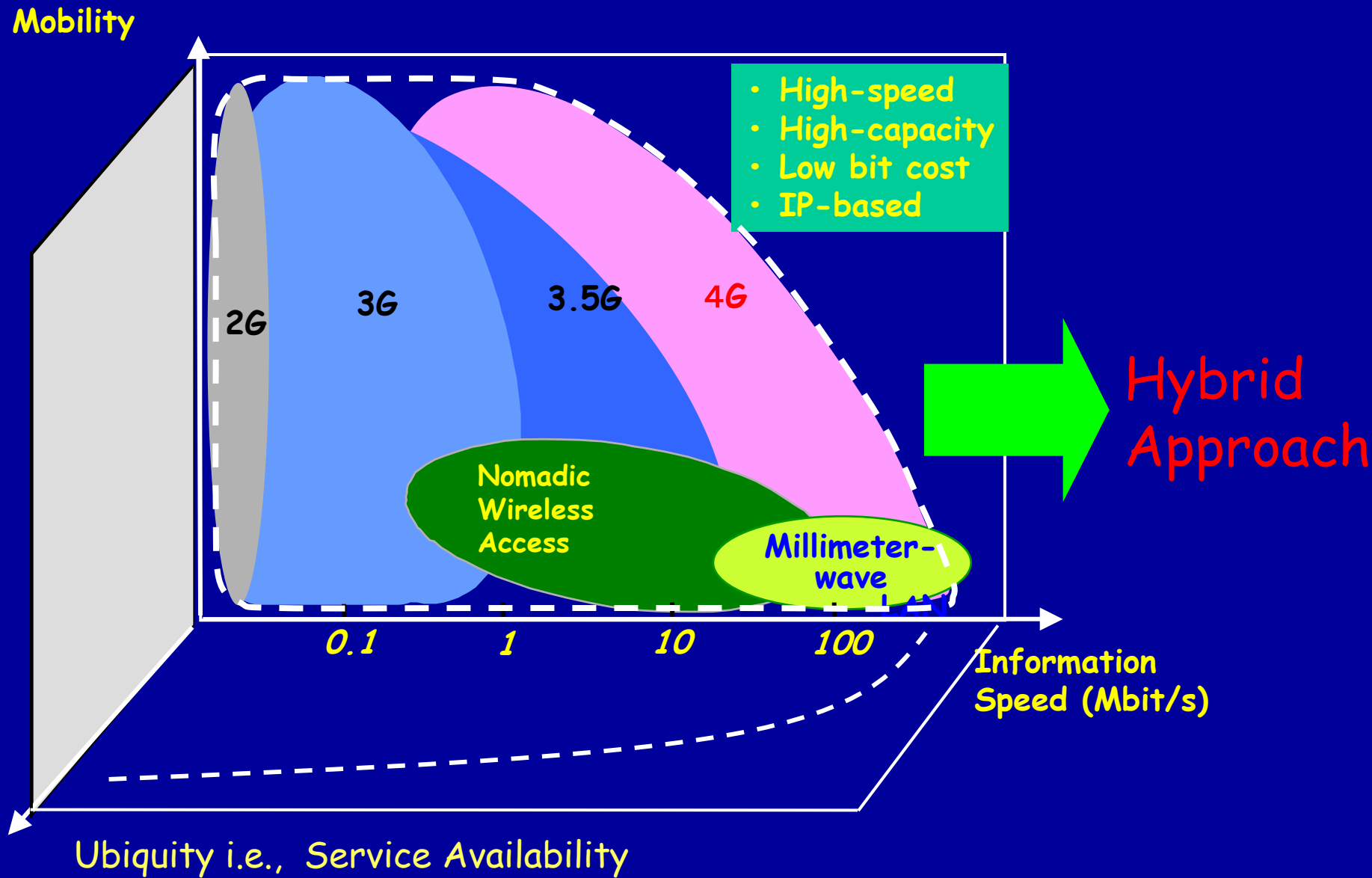
5GHz/OFDM

Four to 24 Channels

60m 30m Range/Speed 30m 60m

Source: Gartner~ 2003, courtesy of Ken Dulaney

Radio Access Network: Ubiquity is Vital





i-mode Fortress

- DoCoMo Network Center in Shinjuku
Center in Shinjuku
Result of Gateway
Centric Model



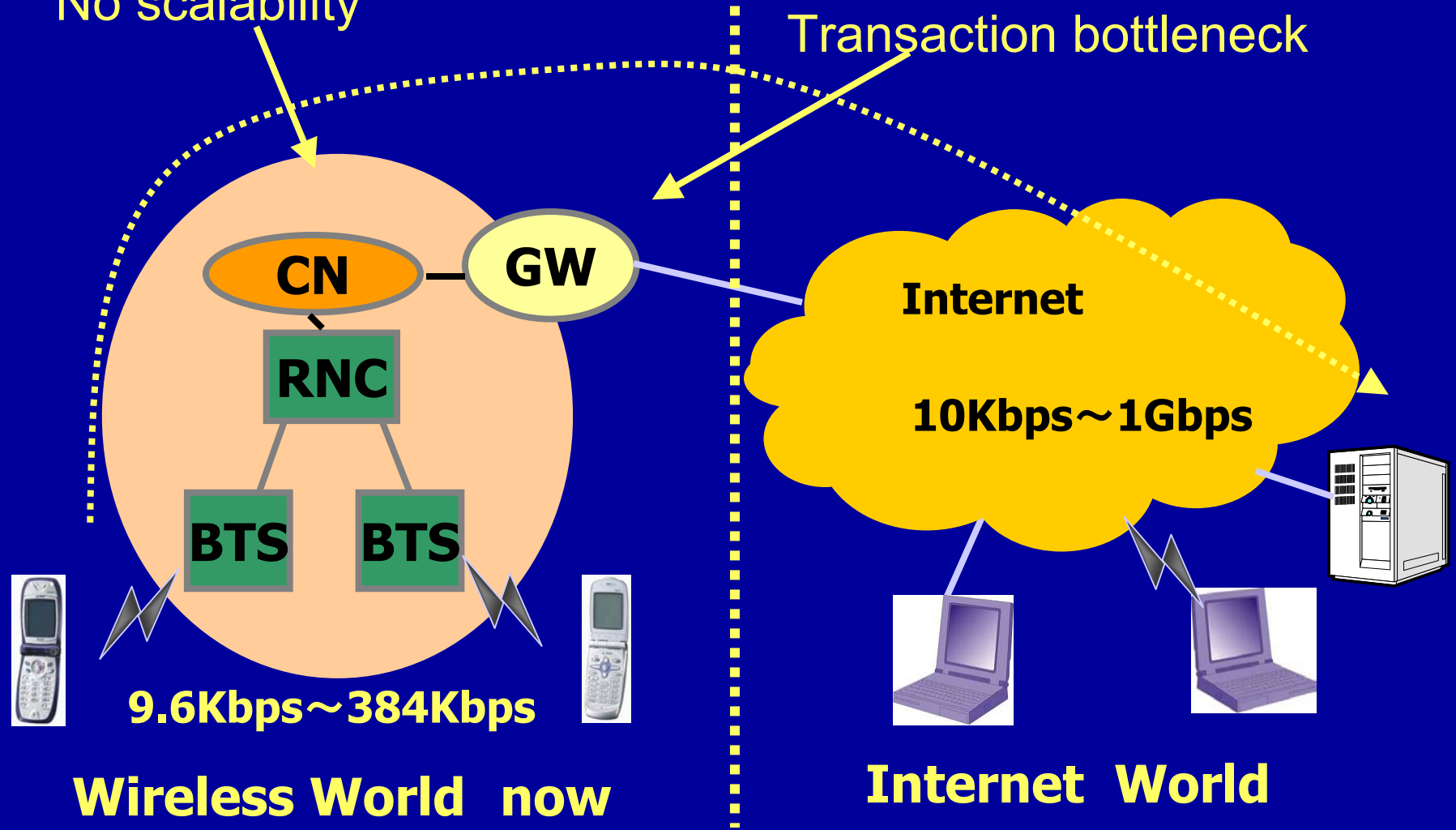
courtesy of Mica Imamura@Vodafone, Japan

Source, http://www.gsmworld.com/technology/mms/mms_presentations.shtml

Asymmetric IP-address Reachability
Bandwidth Gap

No scalability

Transaction bottleneck



9.6Kbps ~ 384Kbps

Wireless World now

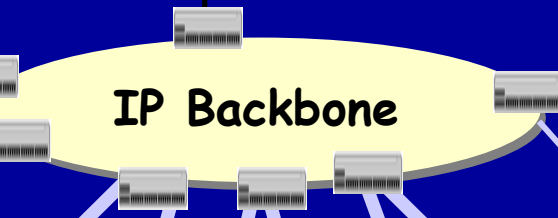
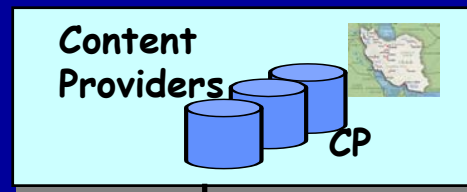
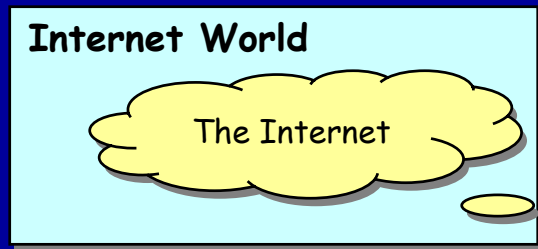
Internet

10Kbps ~ 1Gbps

Internet World

IP-based integration of access channels

ITU-R Vision



2G/3G network

High Speed Downlink Packet Access (HSDPA) up to 12Mbps

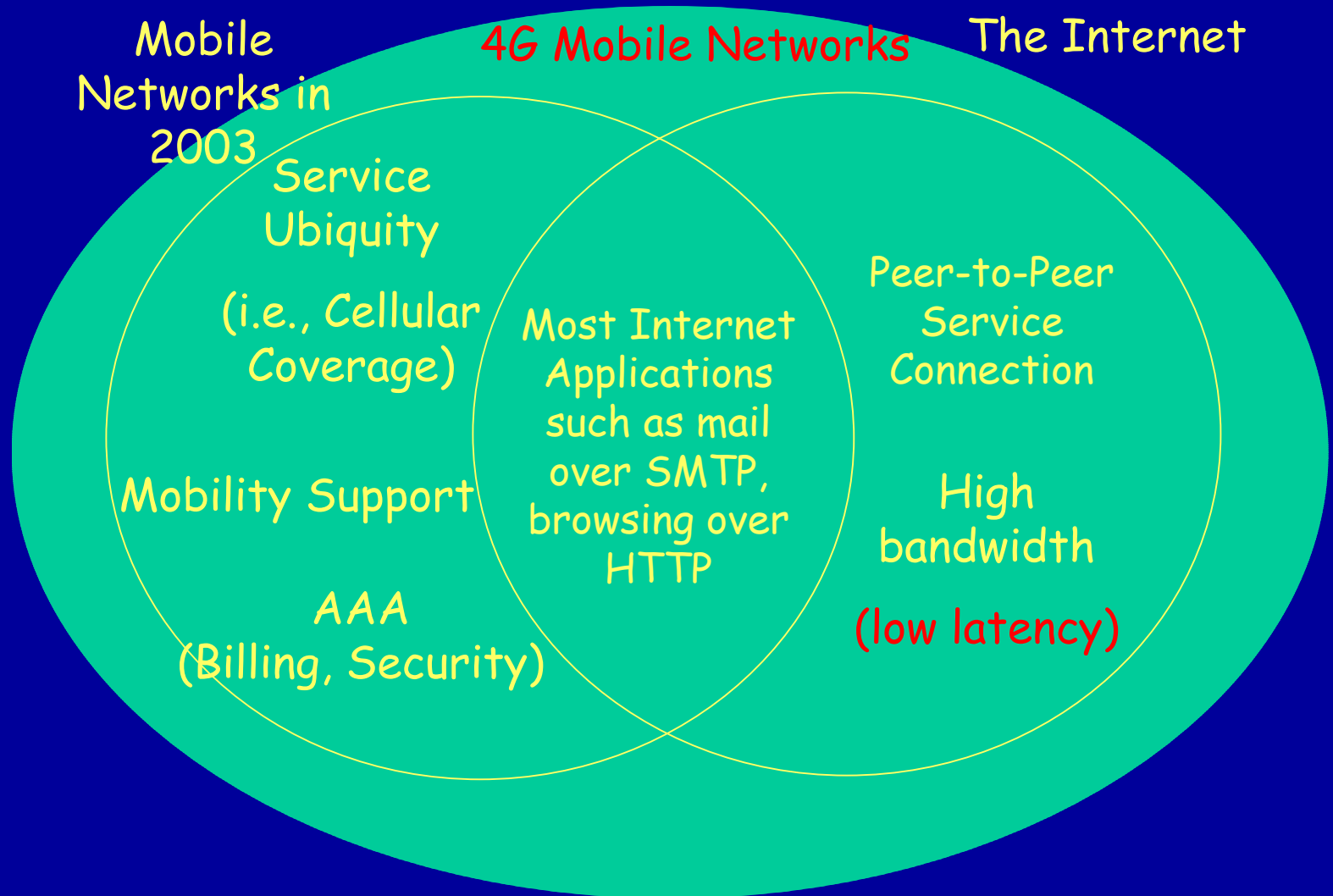
Wireless LAN (IEEE802.11b)

4G Network
e.g., Orthogonal Frequency And Code Division Multiplexing (OFCDM) upto 100Mbps



What is 4G?

in the user oriented perspective



Example in Consumer Electronics

- Killer Application: Sony's Walkman
- Key Technologies: miniaturization technologies + LSI

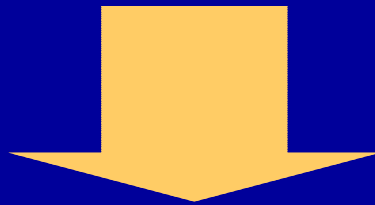
Mobile Services

- Killer Application: E-mail and web browsing in i-mode
- Key Technologies: DoCoMo 2.5G Internet connectivity

- Killer Application: E-commerce
- Key Technologies: Internet connectivity + Java+ SSL

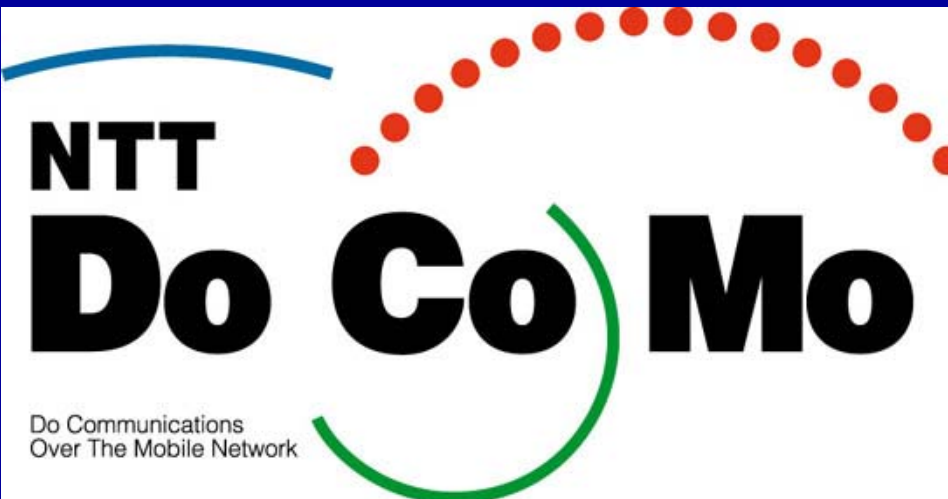
- Killer Application: Multimedia Mail
- Key Technologies: 384Kbps Internet connectivity

- High Speed Radio Access Network
- IP Backbone with advance functionality
(AAA, mobility support)
- Open APIs for Ubiquitous Service Platform



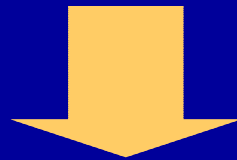
- Killer Application: ??????
- Key Technologies: high-bandwidth/low-latency
ubiquitous Internet Connectivity + Peer-to-Peer Seamless
Connection

- What are DoCoMo and i-mode?
Mobile Internet Service Provider
- Why 4G?
fill the gap between wired and wireless networks
- What is 4G?
the Internet + mobile functionalities (including new radio access networks)
- Open Issues
 - Technical: system security, etc.
 - Regulation: **Licensed spectrum is vital resource.**
 - Business: access charge model, etc.



最终的理想

都科摩美国通信技术研究中心



可盈利的 XEROX PARC