CDMA2000 1x Deployment and Associated Multimedia Services Launched in Japan
Cellular Market Outlook in Japan: Shifting to Multimedia Gateway
Cellular Subscriber Growth in Japan

End March of Year

End April 2003
76,315K

W-CDMA
456K
cdmaOne/
CDMA2000 1x
14,298K

PDC (TDMA)
61,561K

No. of Subscribers (x1000)

90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0

92 93 94 95 96 97 98 99 00 01 02 03

/April
Mobile Internet Subscriber Growth

12.72M in total

497% in 34 months

63.27M

i-mode
38.11M
by NTT DoCoMo
(since 02/99)

EZweb
12.85M
by au & TuKa
(since 04/99)

J-Sky
12.32M
by J-PHONE/
Vodafone

06/00 09/00 12/00 03/01 06/01 09/01 12/01 03/02 06/02 09/02 12/02 03/03 04/03

Date (End of Month)

No. of Subscribers (Millions)

Note: The number of subscribers for EZweb or i-mode is counted based on the paid contract, while that for J-Sky represents number of browser enabled phones.
CDMA2000 1x Launch by au

("au" is the brand of KDDI’s cellular service.)
History of au: towards Multi-media Era

- TACS Terminated 2000.9.30
- New PDC-Subscription Terminated 2002.3.31
- cdmaOne 1998.7.14
- 64kbps Packet 2000.1.7
- CDMA2000 1x 2002.4.1
- 10M cdmaOne Subs. 2001.11.6
- 9M EZweb Subs. 2002.7.9
- EZweb 1999.4
- Int’l Roaming 2000.4.21

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Rapid CDMA2000 1x Rollout by au

Population Coverage 99.9%

cdmaOne (IS-95B)

Pop. Cov.=54%
(70% in Central Regions)

CDMA2000 1x

Pop. Cov.=85%
(90% in Central Regions)

Pop. Cov.=90%

Launched on 1st Apr 2002

end Sept 2002  end Dec 2002
The number of CDMA2000 1x subscribers reached 7 million on 8th April.

Number of Subscribers at end April 2003:
- CDMA2000 1x: 7,511,000
- W-CDMA: 455,900
- Total: 7,966,900

Year/Month:
- 01/10
- 01/12
- 02/2
- 02/4
- 02/6
- 02/8
- 02/10
- 02/12
- 03/2
- 03/4

Graph showing subscriber growth from 0 to 8,000,000 with specific data points for each month mentioned.
3G Penetration in au’s Subscriber

Year/Month

No. of Subscribers

01/9 01/11 02/1 02/3 02/5 02/7 02/9 02/11 03/1 03/3 03/4

0 2,000 4,000 6,000 8,000 10,000 12,000 14,000 16,000

Total CDMA
CDMA2000 1x
cdmaOne
Secret of au’s Success in CDMA2000 1x Launch
Technology Led to Success

- **CDMA2000 1x’s inherent backward compatibility to IS-95**, Service coverage was virtually equivalent to the existing cdmaOne service area from Day One

- **Existing equipment upgrade path**, enabled rapid roll-out with low cost

- **Technology maturity inherited from cdmaOne**, led to:
  - No increase in handset physical dimensions
  - No degradation in handset battery life time
  - Same operational stability as cdmaOne
  - Minimal increase in handset cost
CDMA2000 1x Advantage: Backward Compatibility with cdmaOne (IS-95)

- Backward Compatibility with cdmaOne (IS-95)
  - BTS
  - Handset

(i) rapid 1x network rollout without service area reduction
(ii) continued use of existing handsets without any service degradation
Upgrading-approach vs. Overlaid-approach for CDMA2000 1x Network Rollout

**cdmaOne RAN Upgrade**

Pros: less CAPEX needed  
Cons: modification may be required in the current cdmaOne software, causing service interruption risk

**Overlaid CDMA2000 1x Rollout**

Pros: no essential modification required in the current cdmaOne software, causing less risk  
Cons: more CAPEX needed

KDDI had adopted Upgrading-approach.
Multimedia Services
by au
au’s Mobile Multimedia Services

eznavigation
- More accurate location-based services powered by gpsOne
- Many new contents associated with ezplus

ezplus
- Java™ application services
- Support of Mobile agent function using HTTP
- Automatic application update from servers

ezmovie
- Video Distribution (available nationwide from Day One)
- Using Industry Standards, i.e. MPEG-4 for video coding and MP4 for video file format

EZweb – WAP2.0-based Internet Access and Browsing Platform

EZweb@Mail – IMAP4-based e-mail platform
Movie-mail

15 sec max recording

Smooth movie at 7.5 fps max

96x80 dpf

Capable of dubbing

Capable of text superposition

Capable of location advice indicated on a map using GPS

Capable of movie exchange with PCs

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**Movie-mail Terminal**

- Movie-mail capable
- Photo-mail capable
- CoCo-SECOM EZ capable

- 310,000-pixel CCD camera
- SD Memory Card for video/picture file storage
- 260,000-color TFT display
- 40-chord melody ring
Photo-mail

*Take a picture anytime, Anywhere.*

Send the picture by e-mail as an attachment.

PNG, JPEG or GIF format available

Location of the spot can also be advised using ez-navigation feature, which can be reproduced in a map format on the recipient side.
Photo-mail Terminal

- 110,000-pixel CMOS camera
- 65,536-color TFT display
- 40-chord melody ring

- 110,000-pixel CCD camera
- 65,536-color TFT display
- 40-chord melody ring
Wow, an e-mail comes in from him! Now I get where he is on a map.

She is too late! She may be lost. Let’s advise her where I am.
Ezweb-capable Terminal

(CDMA2000 1x-based)
eznavigation (GPS Terminal) Associated with Photo-mail

Storing location information with pictures

- easy to advise a recommendable place
- recall vividly memory of travel by pictures with location information
- and for business applications

Restaurants or Shops to Recommend

Impressed Views during Travel

Meeting Place
Since an URL of map site can be inserted in the text part of e-mail, this combined information can also be received by any EZweb-enabled handsets without camera.

Map image is drawn by contents available on Ezweb.
Photo-mail/GPS Terminal

- 110,000-pixel CCD camera
- 260,000-color TFT display
- 40-chord melody ring

- 310,000-pixel CCD camera
- 260,000-color Crystal-Fine LCD display
- 40-chord melody ring
Objectives and Goal for 3G Migration:

*au*’s Next Step
What Do Customers Want for 3G? - Obviously Large-Volume Contents with Low Price

Reducing price/bit is essential to provide rich contents.

Power of Expression/Price per Transaction

By EZwebmulti + Middle Pack tariff

Video/Movie or A Single Title of Music (5MB/JYE965-)

By Packet-discount tariff

Video Clip (100KB/15sec/JYE80-)
Music Clip (85KB/5sec/JYE68-)

By EZweb tariff

Karaoke (30KB/JYE60-)
Ringing Melody - 4 Chords (4KB/JYE8-)
16 Chords (10KB/JYE20-)

An obstacle of advanced applications/rich contents is price per bit.

A low-cost infrastructure for data transactions is required.
au’s Approach towards Multi-media Era: Evoluntional Approach

- **cdmaOne** 1998.7.14
- **64kbps Packet** 2000.1.7
- **EZweb** 1999.4
- **IMAP4 E-mail** 2000.11
- **WAP2.0** 2001.12
- **CDMA2000 1xEV-DO** Autumn 2003
- **BREW** 2003.2
3G Migration Paths for Major Mobile System Standards

Core Networks
- 3rd-Gen
- 2nd-Gen

Radio Access Technologies
- 2nd-Gen
- 3rd-Gen
- 3rd-Gen & beyond

CDMA2000 Family
- ANSI-41
- cdmaOne
- cdma2000 1x
- cdma2000 1xEV-DO
- cdma2000 1xEV-DV
- All IP Core
- D-AMPS
- UWC-136
- GPRS
- EDGE
- GSM-MAP
- GSM
- PDC-MAP
- PDC
- W-CDMA (UMTS)
- HSDPA

1xEV-DO: 1x Evolution-Data Only
1xEV-DV: 1x Evolution-Integrated Data & Voice

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au’s Scenario for Mobile Data Infrastructure

- **au launched in April 2002**
  - **cdmaOne**
    - 64kbps Packet
    - (1.25MHz Bandwidth)
  - **CDMA2000 1x**
    - 144kbps Packet
    - (1.25MHz Bandwidth)
  - **CDMA2000 1xEV-DO**
    - 2.4Mbps Max Packet
    - (1.25MHz Bandwidth)

- **GSM/GPRS or PDC**
  - 9.6-28.8kbps Packet
  - (50kHz Bandwidth)

- **W-CDMA**
  - 384kbps Packet
  - (5MHz Bandwidth)

- **au to launch in 2003**

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CDMA2000 1xEV-DO: Further Upgrade Path towards Multimedia Era
CDMA2000 1xEV-DO (1x Evolution-Data Only)

- A radio interface tailored for asymmetric high data rate packet communication with mobility
  - A forward link sector throughput at the rate of 600kbps or higher average with 2.4Mbps peak, which performs very much higher (bps/Hz) than CDMA2000 1x or W-CDMA
  - Best-effort type wireless data communication system, where subscriber terminals with better link conditions will automatically have higher data rates
  - 1.25MHz spectrum occupancy per radio carrier that is compatible with CDMA2000 1x
  - A simple IP-based core network design

- A radio interface of the cdmaOne/CDMA2000 family
  - Spectrum Occupancy, RF Characteristics and Link Budgets equivalent to CDMA2000 1x, allowing collocation of CDMA2000 1xEV-DO carriers and base stations with those of CDMA2000 1x network
### Positioning of CDMA2000 Family in Major Mobile System Standards

<table>
<thead>
<tr>
<th>System</th>
<th>CDMA2000 1xEV-DO</th>
<th>cdmaOne (IS-95B)</th>
<th>CDMA2000 1x</th>
<th>W-CDMA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Spectrum Occupancy</strong></td>
<td>1.25 MHz</td>
<td>1.25 MHz</td>
<td>1.25 MHz</td>
<td>5 MHz</td>
</tr>
<tr>
<td><strong>Services</strong></td>
<td>Data Only</td>
<td>Voice + Data</td>
<td>Voice + Data</td>
<td>Voice + Data</td>
</tr>
<tr>
<td><strong>Connection Mode</strong></td>
<td>Packet Only</td>
<td>Circuit + Packet</td>
<td>Circuit + Packet</td>
<td>Circuit + Packet</td>
</tr>
<tr>
<td><strong>Max Data Rate per User</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F/L</td>
<td>2.4 Mbps</td>
<td>64 kbps</td>
<td>153.6 kbps</td>
<td>384 kbps (up to 2Mbps)</td>
</tr>
<tr>
<td>R/L</td>
<td>153.6 kbps</td>
<td>14.4 kbps</td>
<td>64 kbps (153.6 kbps)</td>
<td>64 kbps (384 kbps)</td>
</tr>
<tr>
<td><strong>Sector Throughput (F/L)</strong></td>
<td>600 kbps or more</td>
<td>approx. 125 kbps</td>
<td>approx. 220 kbps</td>
<td>approx. 1000 kbps</td>
</tr>
<tr>
<td><strong>Spectral Efficiency (bps/Hz)</strong></td>
<td>0.48</td>
<td>0.1</td>
<td>0.18</td>
<td>0.2</td>
</tr>
</tbody>
</table>

**Higher Spectral Efficiency**
Thank You

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