Contents

Mobile Communication Service
Trend Toward 4G

Evolution of Mobile Handset

Vision of Samsung Mobile Biz.
1. Mobile Communication Service Trend Toward 4G
• Seamless services through network convergence & integration
• All IP-based Heterogeneous Network
Evolution of Mobile Communication

• **Current Networks are based on 2~3G technologies**

  **Step 1**
  - **Analog Based**
  - Focus on Simple Telecommunication – the formative period of Wireless communication market
  - Mostly monopolistic market – Driven by one service provider in a country

  **Step 2**
  - **2G Digital Based**
  - Focus on Simple Telecommunication – the formative period of CDMA, GSM based market
  - Better quality of telephone call
  - Sub services – SMS, Mobile phone paging service

  **Step 3**
  - **2.5G Digital Based High speed data**
  - Wireless internet access – WAP technology
  - Various linking services – wireline, wireless internet, Linking among service providers, Offline linking
  - Various additional services – Off-line additional services, Various wireless data services

  **Step 4**
  - **3G Digital Based**
  - A growth of Wireless internet service – Increasing data traffic
  - Other services – GPS, Banking, Broadcasting, etc.
  - Subdivided market – Expansion to Teenager and Thirties Market
  - Multimedia based Data communication – Increasing multimedia contents such as Video, Music, Game
Individual networks of various wireless services will be converged to 4G network.

- OFDMA: Orthogonal Frequency Division Multiplexing Access
- MIMO: Multi Input Multi Output

- 1995:
  - 2G/2.5G
  - Cellular/PCS

- 2000:
  - 3G
  - WCDMA/HSDPA
  - EvDo

- 2005:
  - WiBro/Mobile WiMAX (802.16e)

- 2010:
  - 4G NG Mobile Service

- Fixed Wireless Access
- Connectivity

- 802.16d
- 2.4GHz WLAN
- 5GHz WLAN
- BT
- RFID/Zigbee
- UWB
- Manet

- Data Rate:
  - 100Mbps
  - High Quality Streaming/Multimedia (50Mbps)

- Mobility:
  - High
  - Medium
  - Pedestrian
  - Stationary

- Voice
- Date
- Image/Graphic (384kbps)
- Video

- Wireless Technology Evolution Path
- Communication service delivering image data will be widespread - Video telephony, Multiparty Video Telephony, Simultaneous Interpretation

**Present**

- Video Telephony
  - Talk to each other using real self images or substitutes in the form of 3D avatars
  - Also available at home through TV or monitor connection

**Future**

- Multiparty Video Telephony
  - Multipoint, multiparty voice and video telephony capable
  - Simultaneous interpretation of multiple languages capable
  - Voice recognition function

**4G**

- Hologram Video Telephony
  - Video telephony using hologram images
Services - Entertainment

- Mobile Entertainment will support 3D-game, interactive TV, Augmented/Virtual reality

Present

- Mobile 3D Game
  - Equipped with high performance 3D engines

Future

- Mobile Interactive Education
  - Mobile lectures and quizzes to remote students

- 3D Virtual Museum
  - 3D image viewable headsets
  - Provide information on items displayed in virtual museums or exhibitions

4G

- Virtual Reality
  - Real-time simulation
  - A real-time virtual reality service enabling to see, to hear, to feel, and to touch historical data and images
• **Real-time Data Services - LBS, GPS, and ITS**

**Present**
- **Parking Space Availability Check Service**
  - Available parking space finding service using LBS

**Future**
- **Virtual 3D Locator**
  - Use of augmented reality image
  - Location information service using virtual 3D technology

**4G**
- **AI (Artificial Intelligence) Telematics**
  - Automatic optimal route guidance
  - Real-time car status check
  - Auto driving function with AI
  - AI moving office

- Sensor-attached Tire
- Auto Drive
Service – Commerce/Transactions

• Mobile office, Administration, Mobile Transactions/Delivery, Automatic Distribution

Present

- Mobile Office
  - Unrestricted communication between wireless handheld devices (data exchange, etc.)

Future

- Automatic Delivering
  - Robot shopping items pick-up delivery service using RFID reader and tag technology
  - Delivery tracking

4G

- Multilateral wireless collaboration based on multipoint conferencing
  - Real-time task collaboration through multilateral voice and video phones

- AI Manager
  - Automatic management of meeting schedule and flight & hotel reservation
  - Automatic account settlements through handheld devices
2. Evolution of Mobile Handsets
Hub of Ubiquitous World

- All-in-one Incorporating State-of-art Technologies and Services Enablers
Design Trends

- Diverse Designs maximizing Functionality and Mobility
Connectivity

• Enabling connection to various devices
  - Information control and transmission device: UWB, Zigbee, Bluetooth
  - Industrial tag control and short distance e-commerce: NFC, RFID
Introduction of new Human-to-Machine Interfaces enabled by BT/IT/NT

Next Generation Display and Keyboard

Security/Recognition

Ultra Small Modem Chip
3. Vision of Samsung Mobile Biz
• WiBro & DMB will lead Beyond 3G era

- High Mobility
- Mobile
- 2G: GSM, IS-95, IS-136
- 3G: EDGE, CDMA1x, WCDMA
- 4G: WiBro, IEEE802.16, Wi-Max, Wi-Fi, Bluetooth, UWB

- Nomadic
- LTE: HSDPA, IEEE802.16e, WiBro, DMB

- Low Mobility
WiBro - Service and Technology

- Seamless and Ubiquitous Wireless Broadband Access

- **Air Interface**: OFDMA/TDD
- **Bandwidth**: 10MHz @ 2.3GHz
- **Mobility**: ~120Km/h
- **Handoff**: ~ 150msec
- **Global Standard (IEEE 802.16e)**
Both WiBro & Mobile WiMax based on IEEE802.16e standard

WiBro/ Mobile WiMax

• Mobile Wireless Internet Service
  • OFDMA mode (IEEE 802.16e) based
  • Supporting Profile implemented by Samsung

WiMAX

• Fixed Wireless Internet Service
  • OFDM mode (IEEE 802.16d) based

• Mobile Wireless Internet Service
  • OFDMA mode (IEEE 802.16e) Based
  • Supporting Profile implemented by Samsung
  (Will be covered by WiBro’s Profile)
## WiBro vs. WiMAX (2)

### Mobile WiMAX vs. Fixed WiMAX (For Fixed Applications)

<table>
<thead>
<tr>
<th>Technology General</th>
<th>Mobile WiMAX/WiBro</th>
<th>Fixed WiMAX</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access Technology</td>
<td>OFDMA / TDD</td>
<td>OFDM / TDD</td>
<td></td>
</tr>
<tr>
<td>Standard</td>
<td>802.16d + 802.16e</td>
<td>802.16d</td>
<td>IEEE802.16-2004 = 16d</td>
</tr>
<tr>
<td>FFT Size</td>
<td>2048, 1024, 512, 128</td>
<td>256</td>
<td>Scalable OFDMA in 16e</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cell Deployment</th>
<th>Mobility support</th>
<th>Full mobility, Fixed</th>
<th>Fixed</th>
<th>Handover in 16e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coverage</td>
<td>Full coverage</td>
<td>Limited coverage</td>
<td></td>
<td>Delay spread, Low rate coding</td>
</tr>
<tr>
<td>Low Rate Coding</td>
<td>QPSK 1/12</td>
<td>BPSK 1/2</td>
<td></td>
<td>No freq. planning for FRP=1</td>
</tr>
<tr>
<td>Frequency Reuse pattern (FRP)</td>
<td>1 or n (n≥3)</td>
<td>n (n≥3)</td>
<td>Robust FEC, Fast link adaptation, Band-AMC, Hybrid-ARQ in 16e</td>
<td></td>
</tr>
<tr>
<td>Building Penetration</td>
<td>Mobile WiMax is &gt; 3dB deeper than WiMax (estimated)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Throughput Performance (8.75MHz)</th>
<th>Peak Throughput (SISO)</th>
<th>Average Throughput (Fixed application)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DL: 19.97Mbps, UL: 5.53Mbps</td>
<td>DL: 18.32Mbps, UL: 6.11Mbps</td>
</tr>
<tr>
<td></td>
<td>DL : UL = 2 : 1</td>
<td>Mobile WiMax is &gt; 30% higher than WiMax (estimated)</td>
</tr>
</tbody>
</table>
## WiBro vs. WiMAX (3)

<table>
<thead>
<tr>
<th></th>
<th>WiBro/ Mobile WiMAX</th>
<th>Fixed WiMAX</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>VoIP</td>
<td>Efficient</td>
<td>Bad</td>
<td>Header compression (ECRTP, ROHC), ErtPS in 16e</td>
</tr>
<tr>
<td>Handover</td>
<td>Provided (FBSS, Hard)</td>
<td>Not provided</td>
<td></td>
</tr>
<tr>
<td>Broadcasting Service</td>
<td>Provided</td>
<td>Not provided</td>
<td>MBS in 16e</td>
</tr>
<tr>
<td>Power saving</td>
<td>Awake mode Idle &amp; Sleep mode</td>
<td>Always Awake</td>
<td>Hand-held device in 16e</td>
</tr>
</tbody>
</table>

- ECRTP : Enhanced Compressed RTP, ROHC : Robust Header Compression
- ErtPS : Enhanced Real Time Protocol
- FBSS : Fast BS switch
WiBro - Service Positioning

Personal Communication
- Integrated Messaging Service
  - SMS/MMS
  - Instant Messaging/Chatting
  - Group Messaging
- Mobile Blog
  - Web Blog + Mobile
- Telematics
  - Traffic Info.
  - Location search

Innovative Telephony
- VoIP
- Video Telephony
- PTA
  - PTT (Push to talk - 1:N telephony)
  - PTD (Push to Data - Send data during PTT)
  - PTV (Push to Video - 1:N Video telephony)

Internet Access
- Web Internet
  - E-mail
  - Web Search
- Information On Demand
  - Personalized Info. offer
- M-Commerce

Entertainment
- AOD/MOD
- VOD
- Streaming Broadcasting
- 3D/Interactive Game

“Anytime, Anywhere and Any devices”
WiBro - Terminals

- **Type I**
  - Card Type or Built-in
    - WiBro Built-in
    - PCMCIA/CF/MMC Type

- **Type II**
  - Smartphone/PDA
    - WiBro + GSM
    - WiBro + DMB

- **Type III**
  - Converged Terminal
    - WiBro + DMB + GSM
    - WiBro + DMB + GPS/Game

**Terminal Requirements**

- User-centric services: easy-to-use user interface
- Mobile & Broadband converged services: WiBro+GSM
- Multimedia, Multi-purpose (Personal and Business)
WiBro – Plan toward 4G

- WiBro Roadmap

WiBro

30Mbps/10MHz

WiBro Evolution

- Multiple bandwidth support
- 210Mbps/40MHz
- MIMO/Smart Ant.

WiBro- Smart Antenna

50Mbps/10MHz

4G

Migration Path to 4G through improvement of WiBro performance
DMB – Convergence of Mobile Communication and Broadcasting

- Mobile communication services and DMB receiver are operating in mobile handsets
DMB Mobile Concept

- Digital Mobile Broadcasting Reception Capability
- S-DMB, T-DMB, DVB-H and MediaFlo
DMB - Evolution path

Conventional Broadcast
One way service

Selecting Contents
Interactive service

Creating Contents
Interactive service

Infra

Communication N/W
(EV-DO, WCDMA)

Broadcasting N/W
(DMB)

Communication N/W + Broadcasting N/W
(EV-DO, WCDMA + DMB)

Communication N/W + Broadcasting N/W
(WiBro, 4G + DMB)

Service

One way
Conventional
Broadcasting

+ Select contents
Via communication networks

+ Personal Contents

Core Tech.

DMB Technology
(Compression Tech.,
CAS, Low Power)

+ DMB Middleware

+ High-Speed Uplink
Transmission Technology
DMB - Changing Life Style

TV - Watching
- Gathering
- Quality Time

Purchasing
- Advertisement for all
- Shopping zones

Info Sources
- Printed media
- Traffic, Weather, Stock, Game

Mobile TV
- Anytime
- Anywhere
- Any info
DMB and Wibro will be a Bridge

Toward 4G
Thank You!