Mobile Devices & Services
- present and future -

Haeyoung Jun
Director
Samsung Electronics

11 Feb, 2014
Ho Chi Minh City, Viet Nam
Evolution of Mobile Device: History

Communication → Multimedia → Intelligence (Smartphone)

1999~

- MP3/TV Phones
- Camera Phone
- Push mail & Qwerty
- High-fidelity Music Phone

2004

- Slimmest Phones
- Multi-touch Smart Phone
- Full Multimedia

2008

- High-end Fashion Phone
- Mobile Projector
- Retina In-plane Switching TFT-LCD

2010

- Super AMOLED Display
- Haptic Touch

2013

- AMOLED Display
- EMOTIONAL Touch Pen (S-Pen)

...
Evolution of Mobile Device: Present

Evolution of Device Tech. has been leading evolutions in Mobile Services

High Performance Application Processors
- Hi-speed processor

Unlimited Expandability
- Operating Systems
- Mobile Application Market

High Resolution Displays & Cameras
- Ultra Brilliant & High Resolution Display
- Full HD Video Recording, High Resolution Camera

Enhanced & Emotional User Interfaces
- Touch/Haptic/Gesture UI / S Pen
- 3D Graphics
- Location awareness/Motion Detection (GPS, Accelerometer, Gyroscope, etc.)

Ubiquitous Network Access
- High-speed Network (LTE, LTE-Adv, 802.11n/ac/ad)
- Enhanced Mobile Browser
Evolution of Mobile Device: Future

New mobile services will be driven by device technology evolutions

Battery Technologies / Ubiquitous Charging

Internet of Things

Ultra High Resolution Camera / Display

Wearable form factors

Low Power Mobile Sensors

High Performance Processors

Ultra High Resolution Camera / Display

Low Power Mobile Sensors

High Performance Processors

Wearable form factors

Internet of Things

Battery Technologies / Ubiquitous Charging

Ultra High Resolution Camera / Display

Low Power Mobile Sensors

High Performance Processors

Wearable form factors
Evolution of Mobile Services: Augmented Reality

See the world in a new way!

Using the camera and GPS, GALAXY Tab brings Augmented Reality to the palm of your hand.

Explore your surroundings in detail, with point-of-interest icons that pop up to show you reviews and information on restaurants, stores and places of interest.
Evolution of Mobile Services: Energy Management

- Dryer Off
- Turn Off
- Delayed Operation

Energy Usage Curve/Day

Energy Saving Mode

AM 8:00, PM 12:00, PM 10:00, AM 3:00

Options:
- Delayed Operation
- Light. Off
Evolution of Mobile Services: Smart Home

- Remote START
- Remote MONITORING
- NW
- Smart Home GW
Evolution of Mobile Services: Connected Car

- Vehicle Maintenance
- In-Vehicle Gateway
- Car Infotainment

ITS (Intelligent Transport System)

- Traveler Information
- Public Transport
- Traffic Management
- Commercial Vehicle Operation
- Vehicle and Highway

Cloud

Vehicle

- HSDPA/ Mobile WiMAX
- LTE
- Cell Phone
- Head Unit
- M2M Unit
- Wireless PAN
- In-car Display
- Multimedia Player

Aftermarket Terminal / Car Blackbox

Social Network

Auto Repair Center

Car Insurance
Evolution of Mobile Services: Connected Health

Cloud

- Blood Pressure
- Calorie
- Glucose

Health Sensor Device

Blood Analyzer

Samsung Medical Center
Evolution of Mobile Services: Mobile Education

(Electronic Whiteboard)
Evolution of Mobile Services: UHD streaming

Wireless UHD Data Transmission

Require **1Gbps** data rate ANYWHERE
Evolution of Mobile Services: Holography

Huge content representation
- Realistic object representation
- High resolution
- Information I/O possibility

Require data implement hologram
- Now, HDTV resolution: 2Mpixels
- 60° field of view 40 inch HDTV resolution: $3.6 \times 10^{12}\text{pixel}$
  1.8 million times high resolution
- Data (RGB 8bit, 60fps): 5,000Tbps

HDTV hologram implement
- Require 2 trillion calculation (1Mpixel)

50inch hologram display realization
- Require thousands Super-HD spatial light modulator

Sufficient visible region (clearly visible to the naked eye looking) real-time hologram image implement
- Require 250,000 times HDTV resolution
- Filed of view 2~60°: 110MB~70GB
Evolution of Mobile Services: All Connected via Cloud

- Connected Health
- Connected Car
- Mobile Education
- Mobile Payment
- Connected CE
- Smart Home

Reliable High Speed Network
Evolution of Mobile Services: Examples

Korea has released a plan for Five Core Services with Future IMT (5G)

- **Future SNS** (1000x Device)
  - Device-to-Device communication without SNS server

- **Mobile Multi-view Video** (1000x Data Rate)
  - Realtime interactive multi-view video streaming service

- **Intelligent Mobile Cloud** (1000x latency Reduction)
  - Private mobile cloud for wearable devices

- **High Mobility Backhaul** (1000x Data Rate)
  - High Quality wireless video streaming on the high speed railroad

- **UHD / Hologram over cellular** (1000x Data Rate)
  - Hybrid broadcasting & communication services
Expected: Mobile Data Traffic

**Evolution of mobile services will derive high traffics & data rates**

**New service** requires **High** data rate
and generates **Large** data traffic

**2000s**
- Voice, Message
  - GSM/CDMA (2G)
  - WCDMA (3G)

**2010s**
- Video Streaming, Web Browsing
  - HSPA (3.5G), LTE/LTE-A (4G)

**2020s**
- UHD Video, Cloud, Real Time QoE
  - Future IMT tech.

**[PB/Month]**

- **2008**
  - Latin America: 52 PB
  - Eastern Europe: 90 PB
  - Middle East and Africa: 231 PB
  - Western Europe: 435 PB
  - North America: 884 PB
  - Asia Pacific: 1,579 PB

- **2009**
  - Latin America: 90 PB
  - Eastern Europe: 231 PB
  - Middle East and Africa: 435 PB
  - Western Europe: 884 PB
  - North America: 1,579 PB
  - Asia Pacific: 2,798 PB

- **2010**
  - Latin America: 231 PB
  - Eastern Europe: 435 PB
  - Middle East and Africa: 884 PB
  - Western Europe: 1,579 PB
  - North America: 2,798 PB
  - Asia Pacific: 4,703 PB

- **2011**
  - Latin America: 435 PB
  - Eastern Europe: 884 PB
  - Middle East and Africa: 1,579 PB
  - Western Europe: 2,798 PB
  - North America: 4,703 PB
  - Asia Pacific: 7,436 PB

- **2012**
  - Latin America: 884 PB
  - Eastern Europe: 1,579 PB
  - Middle East and Africa: 2,798 PB
  - Western Europe: 4,703 PB
  - North America: 7,436 PB
  - Asia Pacific: 11,157 PB

**[Source: Cisco, 2012]**
Motivation for the Future IMT (5G)

Time to prepare Future IMT technologies

Device Tech. Evolution
Wearable, Display, Processor
Battery, Charging, IoT, etc.

New Mobile Services
Health, Augmented Reality
UHD, Hologram, Learning, Car
THANK YOU

Haeyoung Jun, Ph.D.
(haeyoung.jun@samsung.com)

Samsung Electronics