SAMSUNG DIGITall
everyone's invited

Key Technologies for Next Generation Wireless Communication in Ubiquitous Era

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Toward to the Ubiquitous Era

The Evolution of the IT Device and the coming Ubiquitous Era
Ubiquitous Sevice/Network/Terminal

Next Generation Communication

B3G Landscape
Next Generation Mobile Communication
Key Technologies for B3G

Ubiquitous Computing on Chip

Key Technologies for the Ubiquitous Terminal
Low Power
Mobile Sensor
SDR

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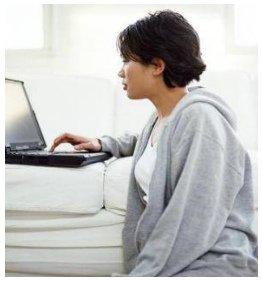
Traditional & Ubiquitous Computing

Traditional

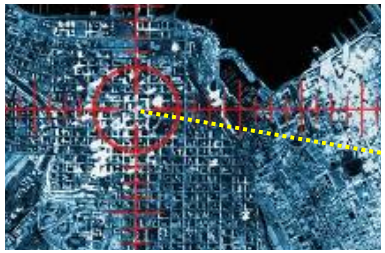
- *The user must learn how to use their computers*





Ubiquitous

- *The machine learns the user's behavior, and offers appropriate solution*

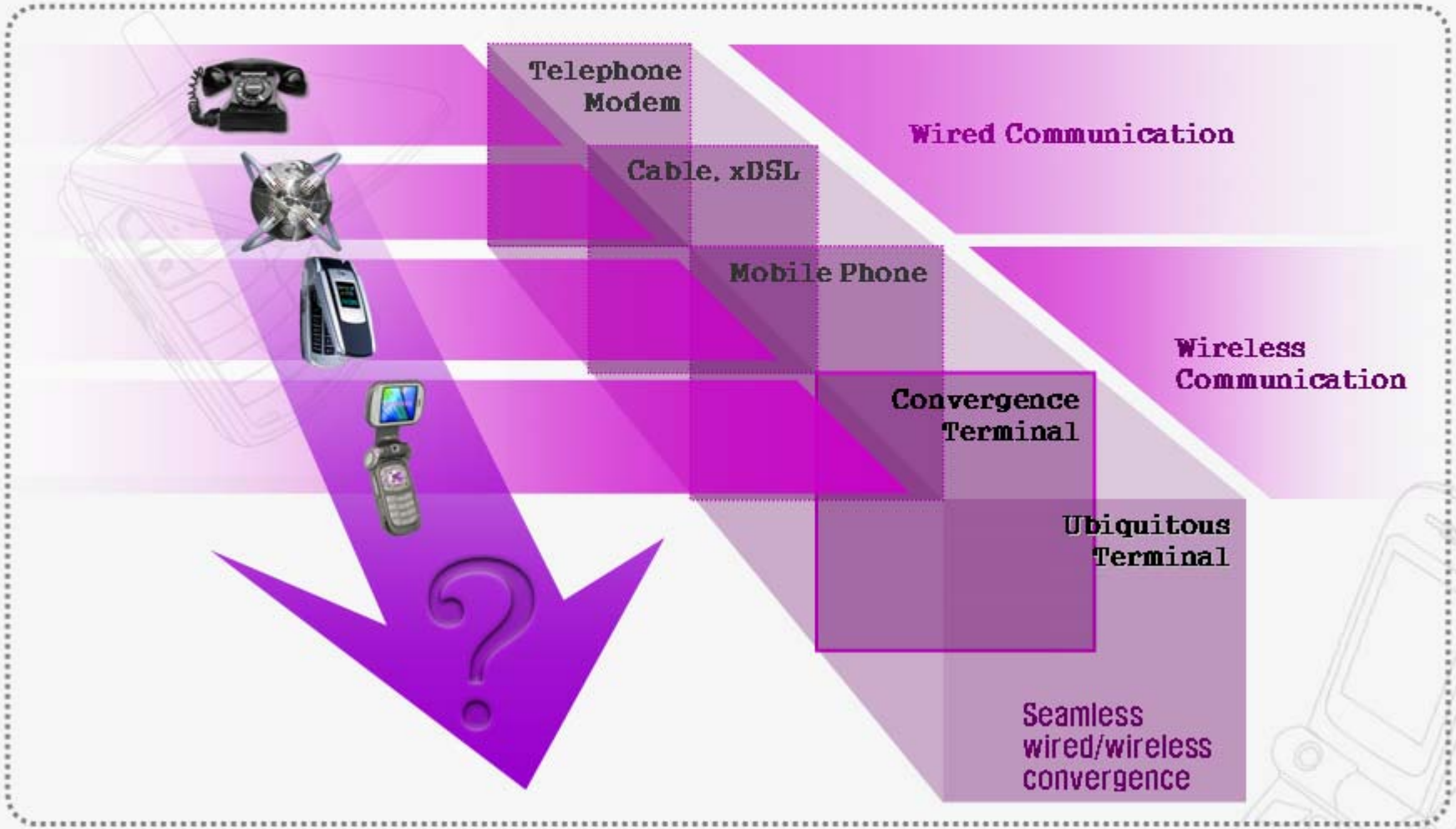



Evolution of Communication Devices

▣ Evolution of Communication Devices

> From wired communication (Modem/Cable/xDSL) to Convergence terminal

> Toward Seamless wired/wireless convergence terminal



4th IT Revolution : Ubiquitous Era

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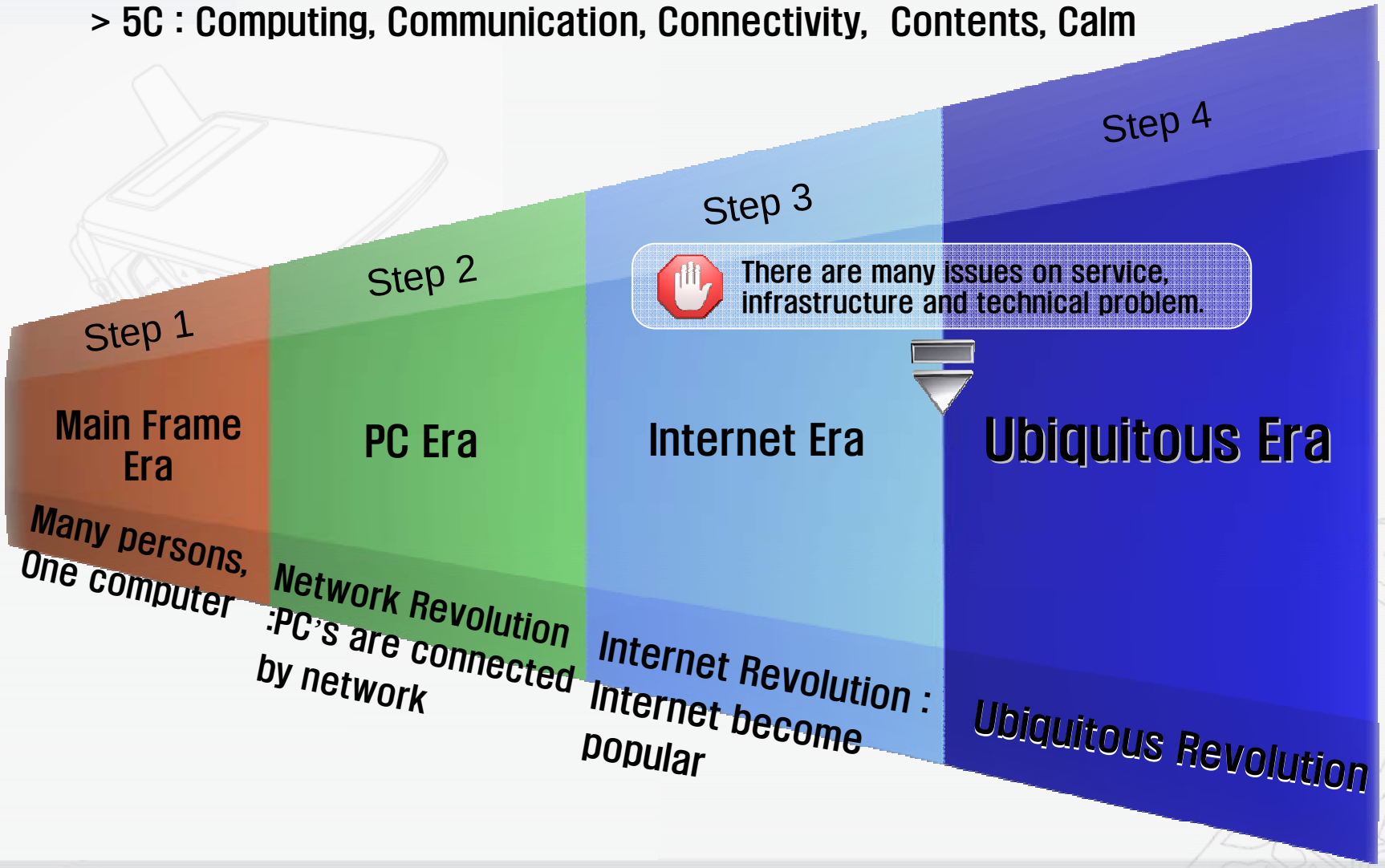
▣ Ubiquitous era

> 5Any : Time, Where, Network, Device, Service

> 5C : Computing, Communication, Connectivity, Contents, Calm



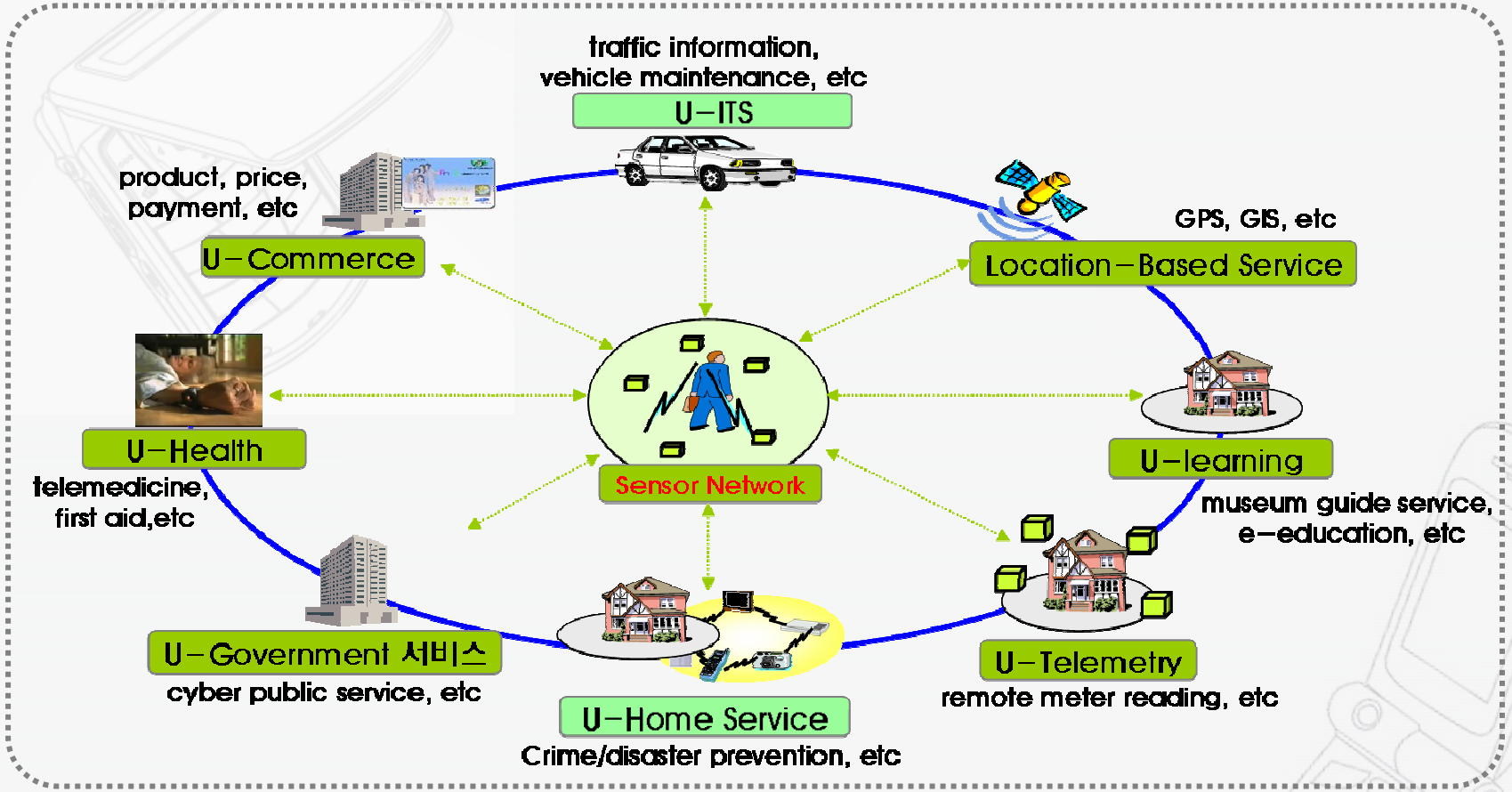
u-Life

▣ e-Life

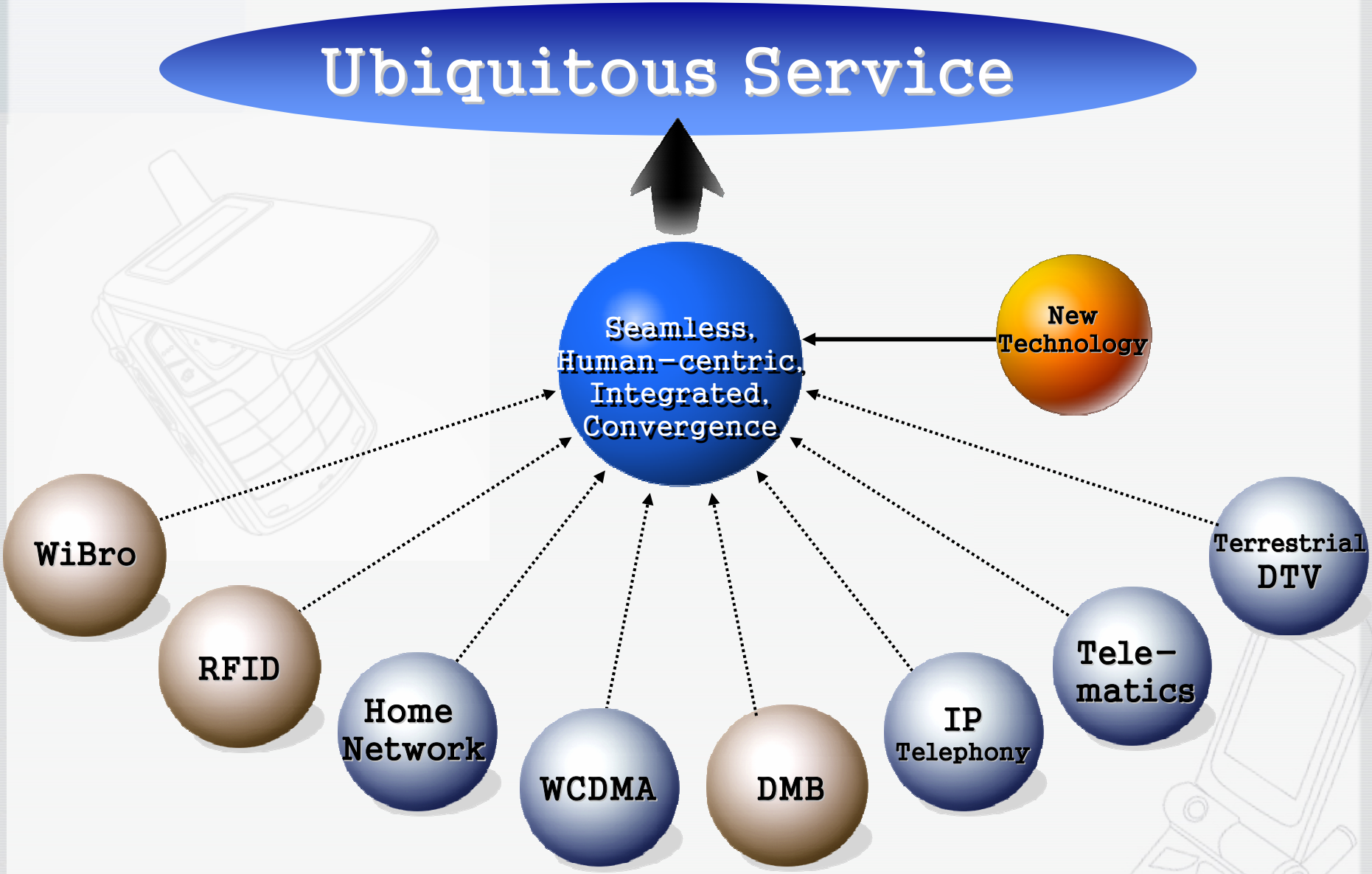
> Enjoy man to man, man to machine services through many kinds of Digital Devices

▣ u-Life

> Become communication Hub for man to man, man to machine, machine to machine through emerging all in one device that can connect to any devices in anytime, anywhere.



Status of the 8 New Services



New Service in Korea : WiBro

▣ WiBro (Wireless + Broadband)

> 2.3GHz, 30Mbps/50Mbps, Mobility (Handover)

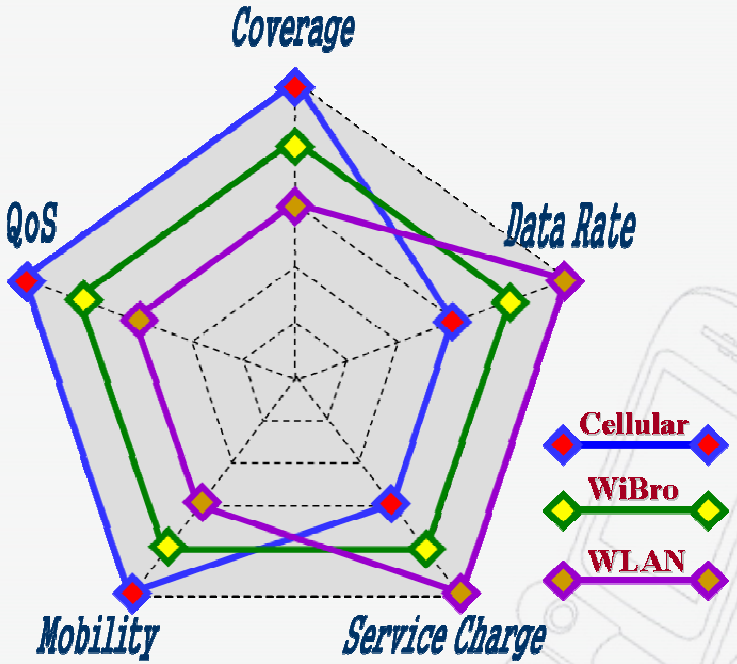
> IEEE 802.16e (Mobile WIMAX)

▣ Samsung status

> Finished bench marking test with Korean operators (May, 2005)

> Demonstrated Handover at 80km/h in 4G Forum in Korea (Aug, 2005)

> Will perform WiBro demo in APEC (Nov 12-19, 2005)

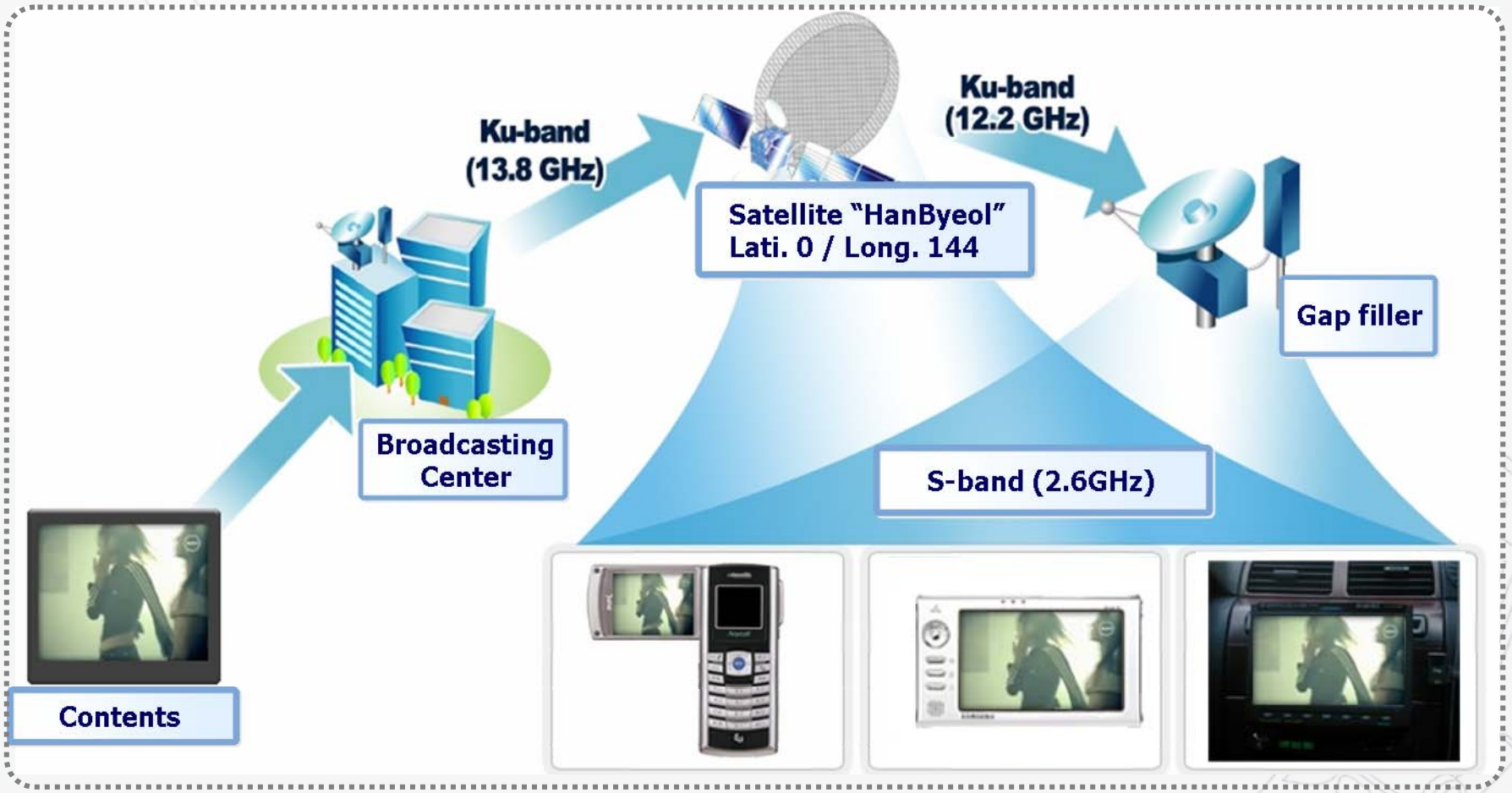


New Service in Korea : Satellite DMB

▣ Commercial service in May 2005

> Samsung developed the world first S-DMB mobile Chipset (2004.1)

> Samsung released the world first S-DMB phone (2005. 1.)



New Service in Korea : Terrestrial DMB

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▣ Commercial service in Dec, 2005

> Develop World First T- DMB receiver (2003)

> Develop World First DMB receivable Note PC (Feb, 2005)

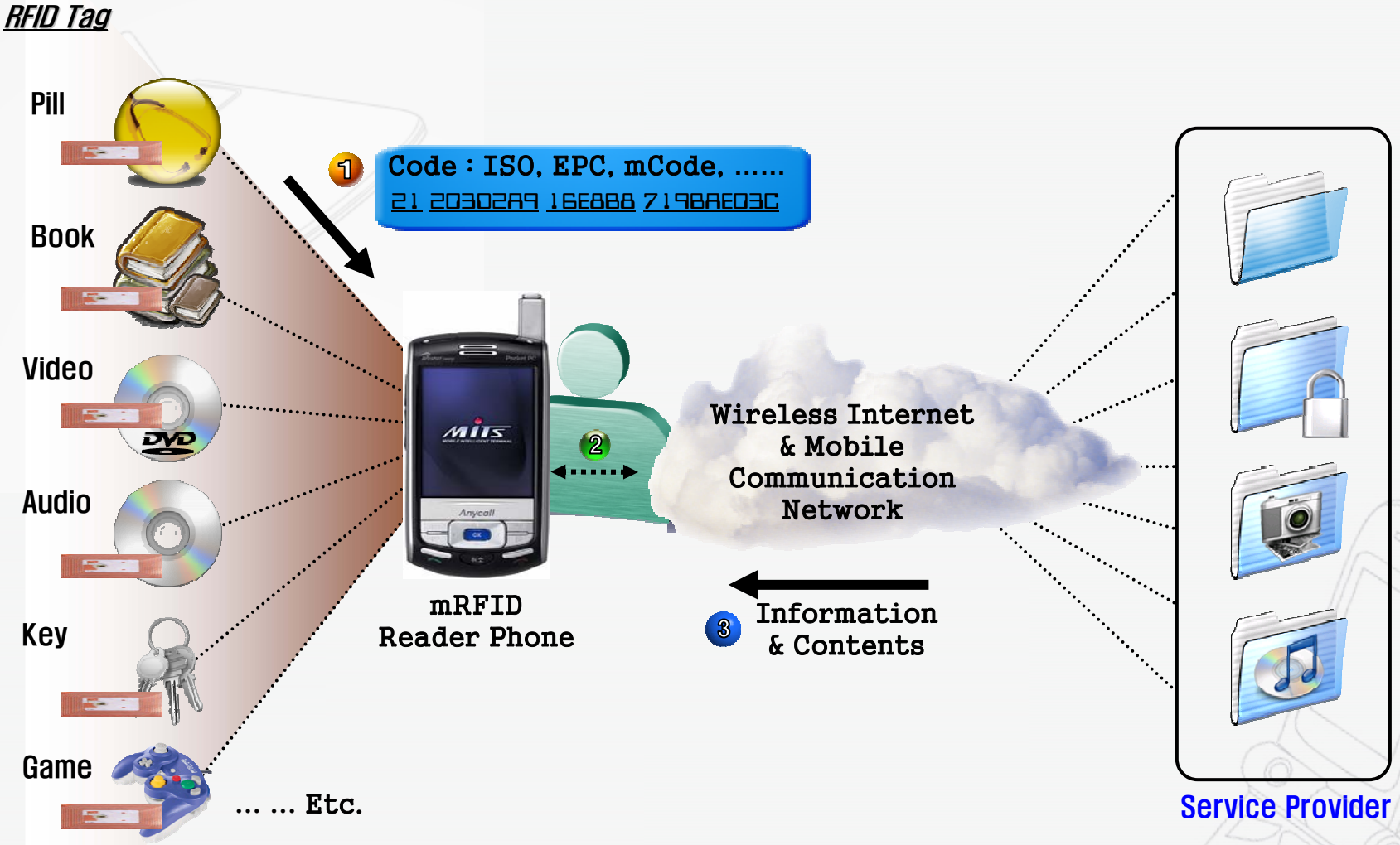
> Develop World First two-way T-DMB Phone (Sep, 2005)

New Service in Korea : mRFID

▣ Commercial service in 2006

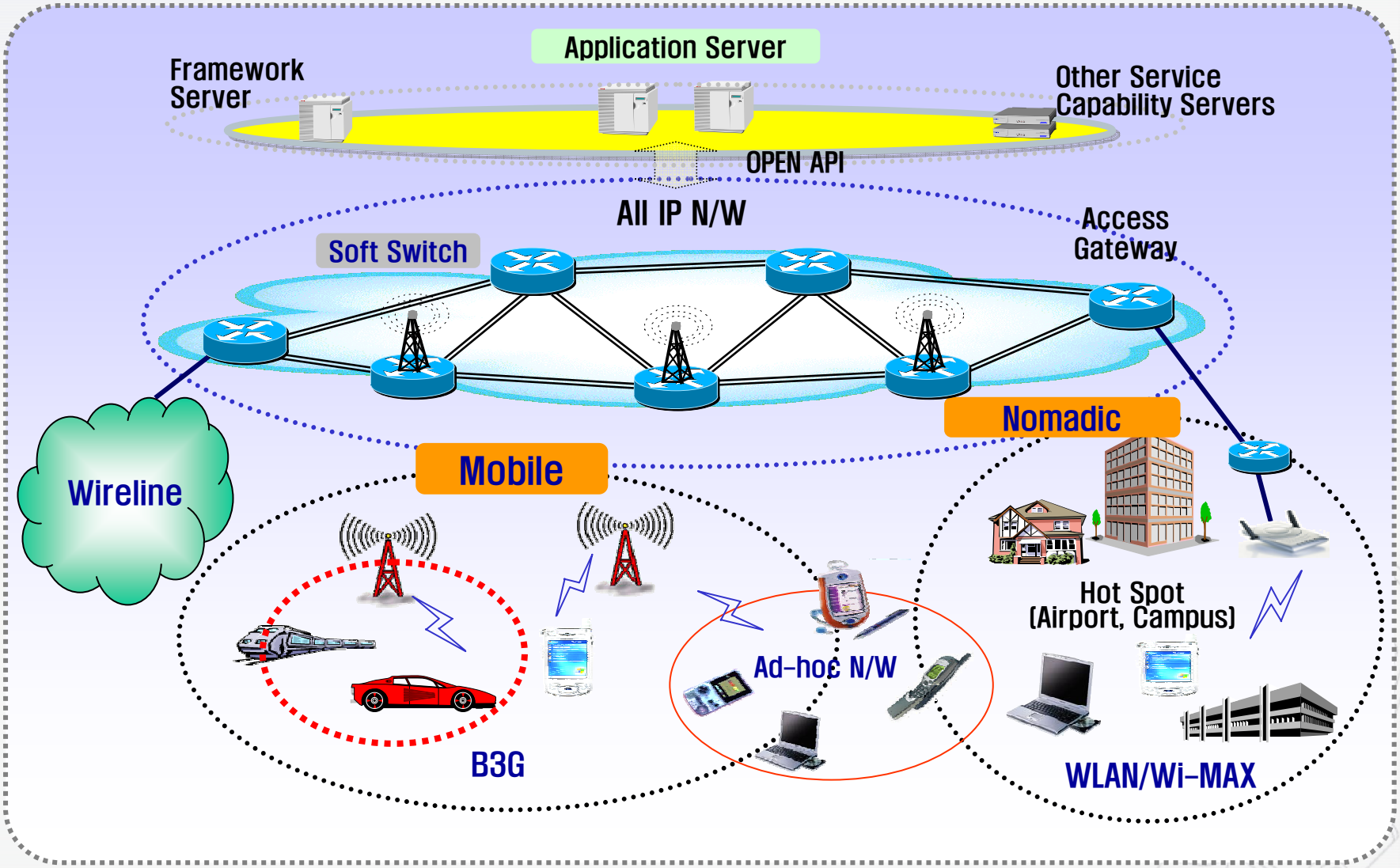
> Samsung demonstrated mRFID Phone in RFID/USN Korea 2005 (Oct, 2005)

- inter-working with CDMA network



B3G World

▣ All IP based Heterogeneous Networks



Three Axes of Innovation for Ubiquitous Device

1. Broadband Communication & Seamless Connectivity

- Air Interface (2G, 3G, 4G ...)
- Connectivity (WMAN, WLAN, WPAN ...)

2. High Performance Multimedia & Computing

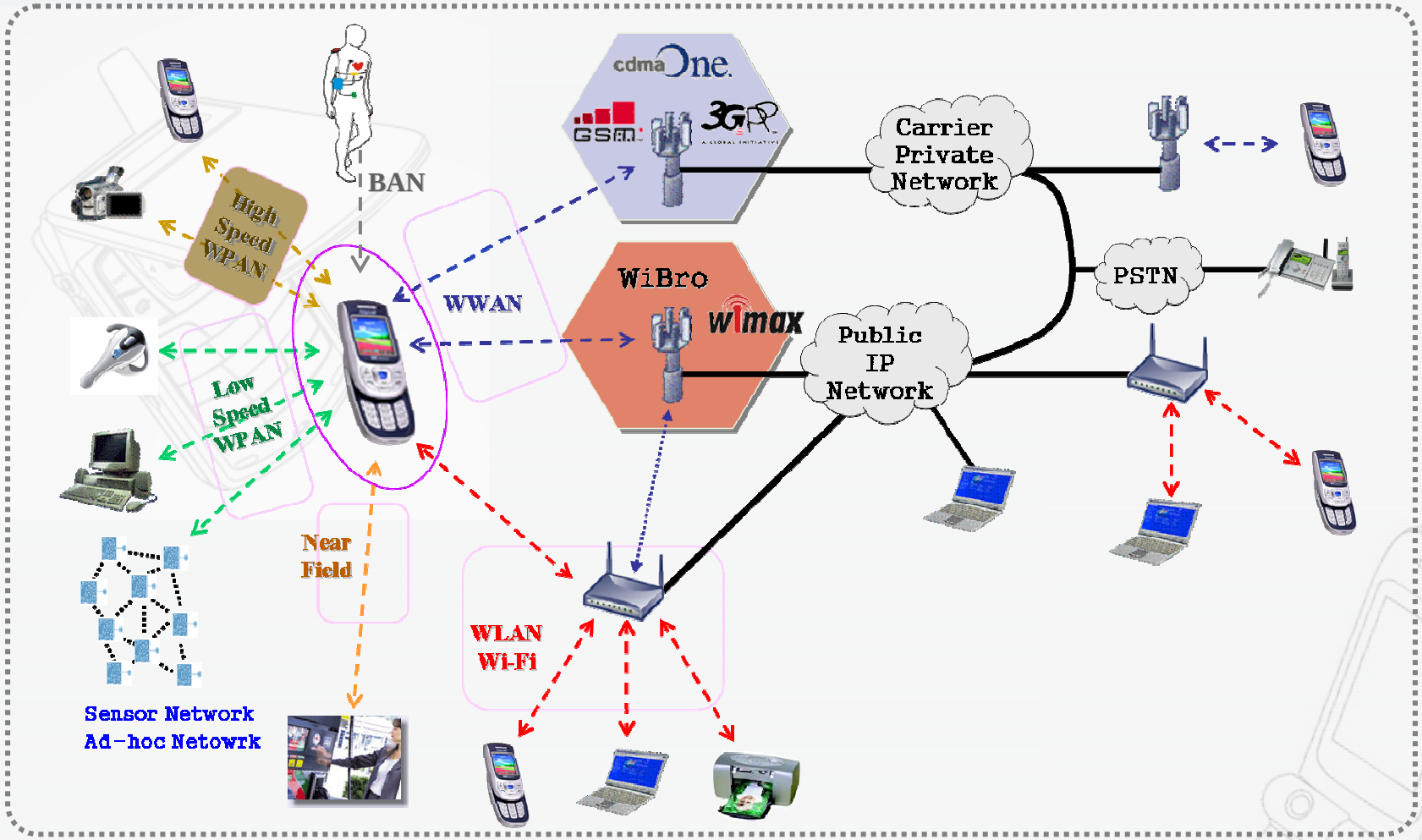
- Camera : DSC, DVC
- M/M Service : MP3, VoD, Game
- Broadcasting : DMB, SDTV
- Computing : PDA, Palm Top

3. Diverse Applications

- m-Commerce : Mobile Banking
- LBS : Telematics
- Network Based Remote Service : u-Health

Features

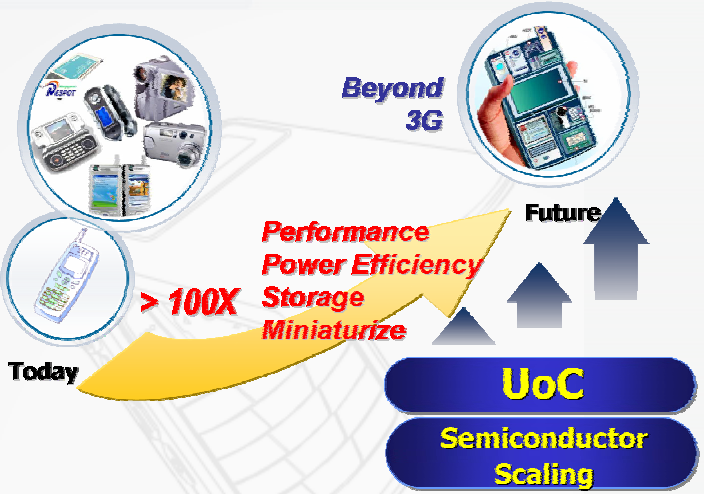
▣ Ubiquitous will connect any networks anytime anywhere

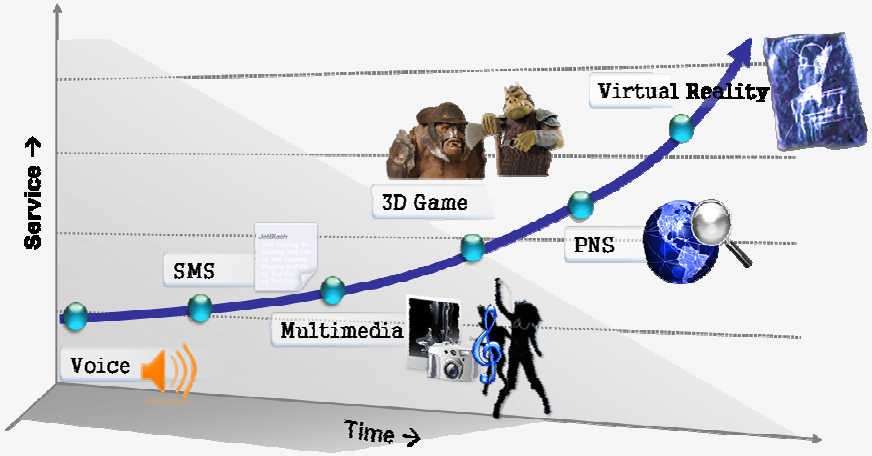


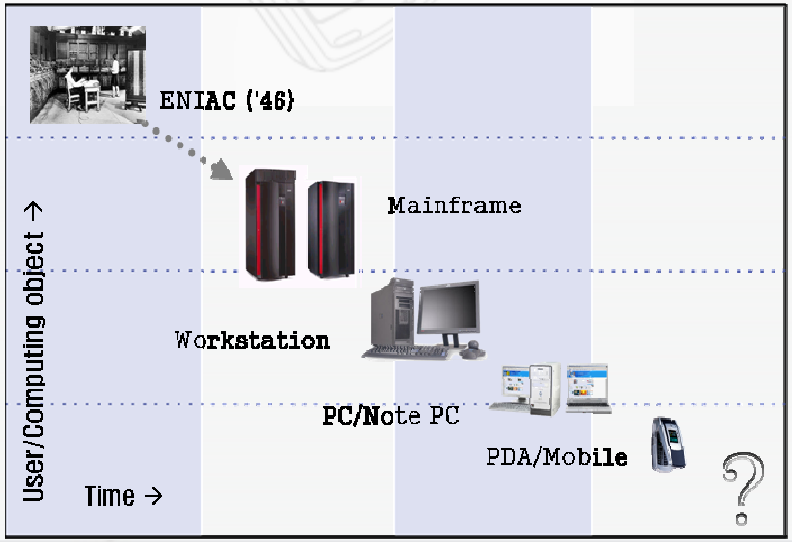
UOC (Ubiquitous Computing on Chip)

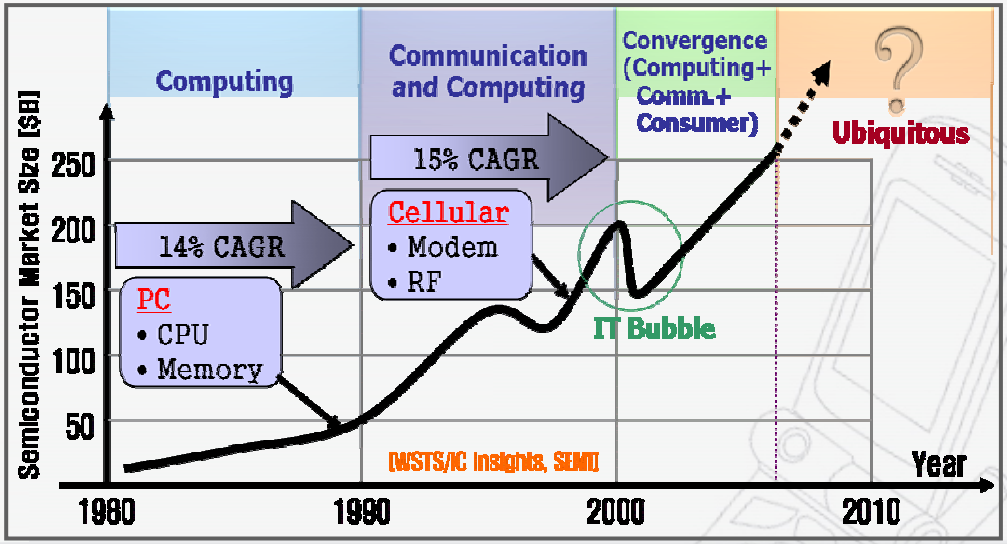
We-Duke Cho Ph.D. (Director of the Center of Excellence in Ubiquitous Computing & Network-CUCN)

- Consumers require more service and function. Mobile terminal become smaller and complex.
  → Role of SOC becomes important
- UOC which able to Ubiquitous computing leads semiconductor industry in near future.










Next Generation Communication
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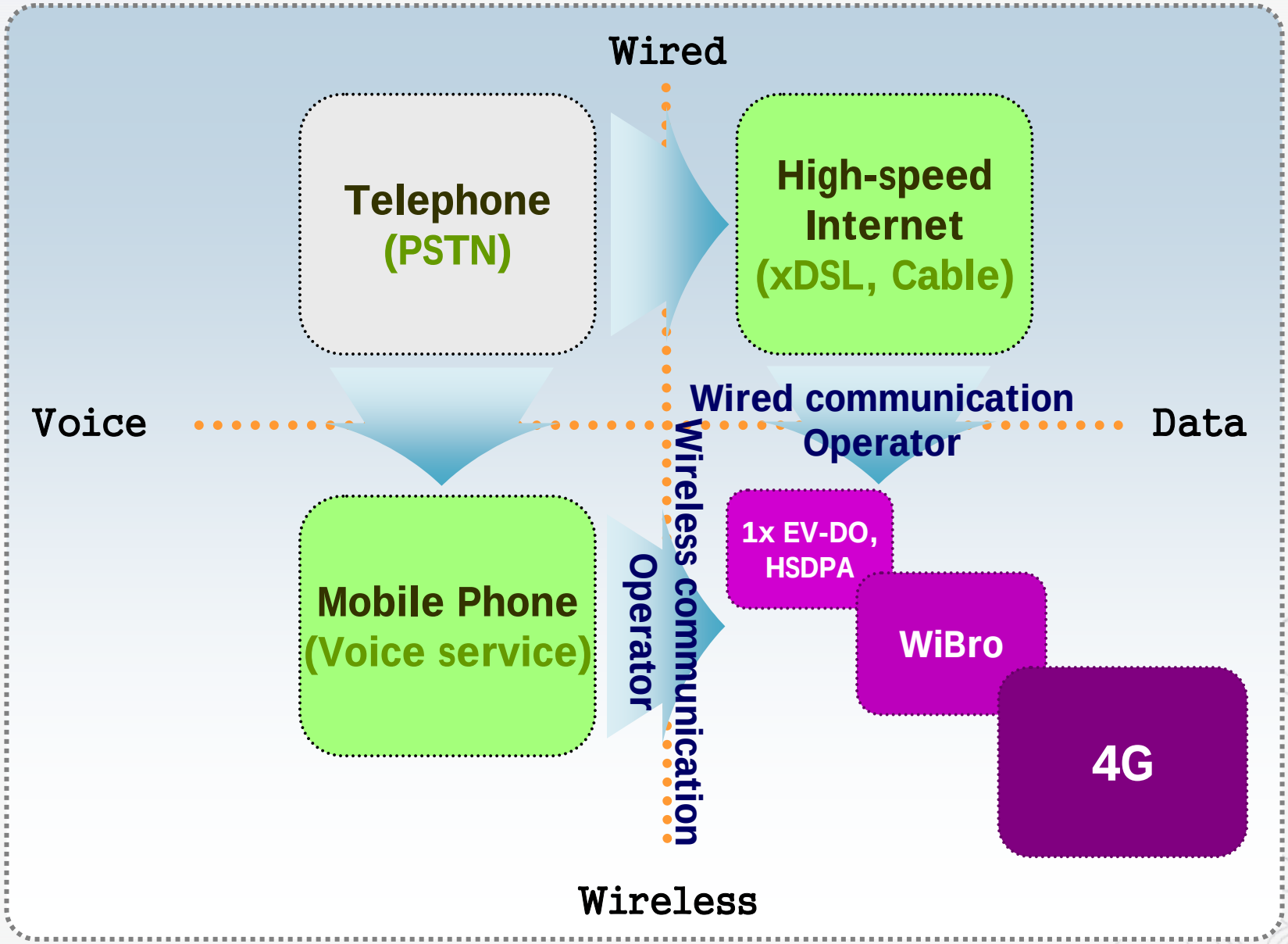
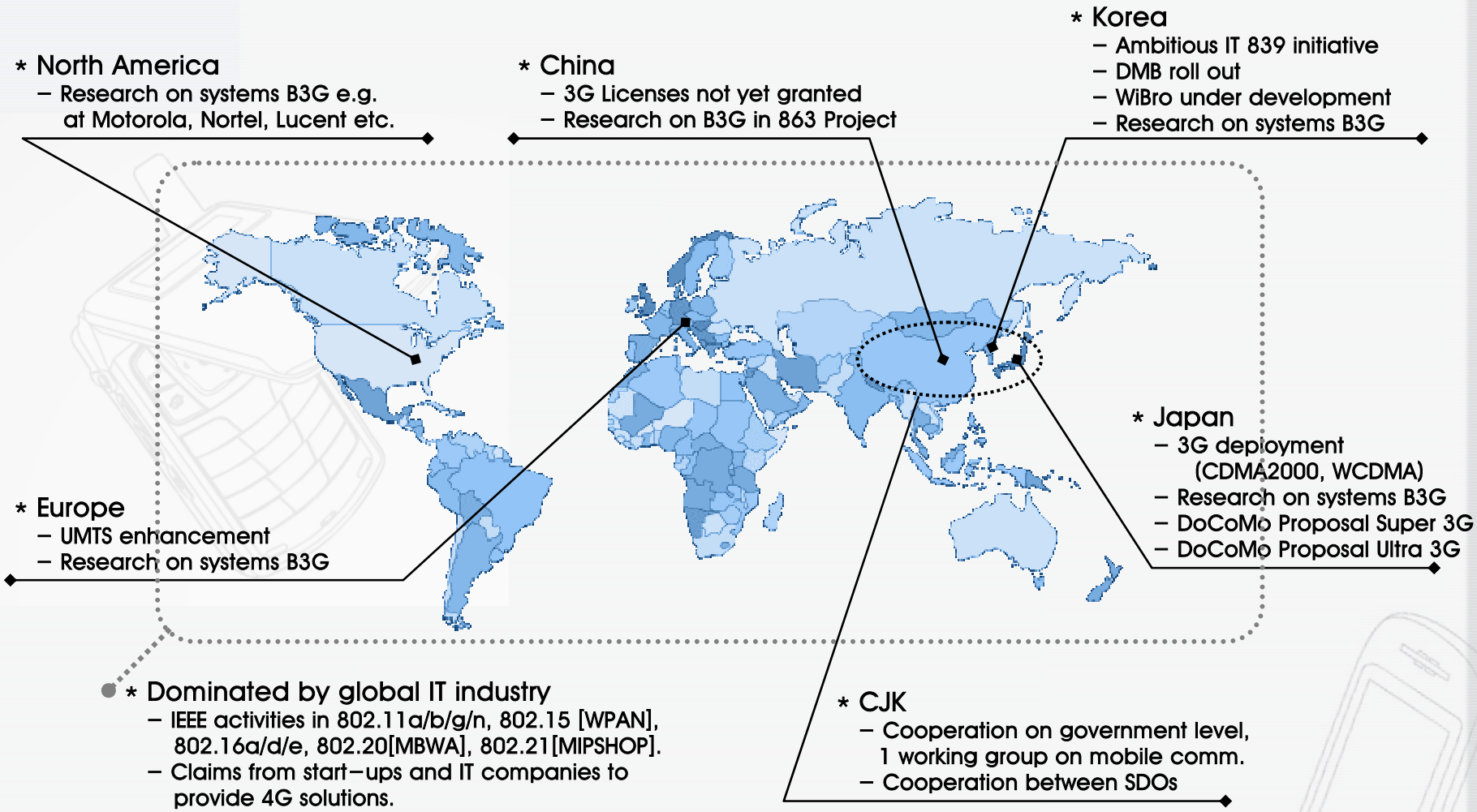
IT Trend



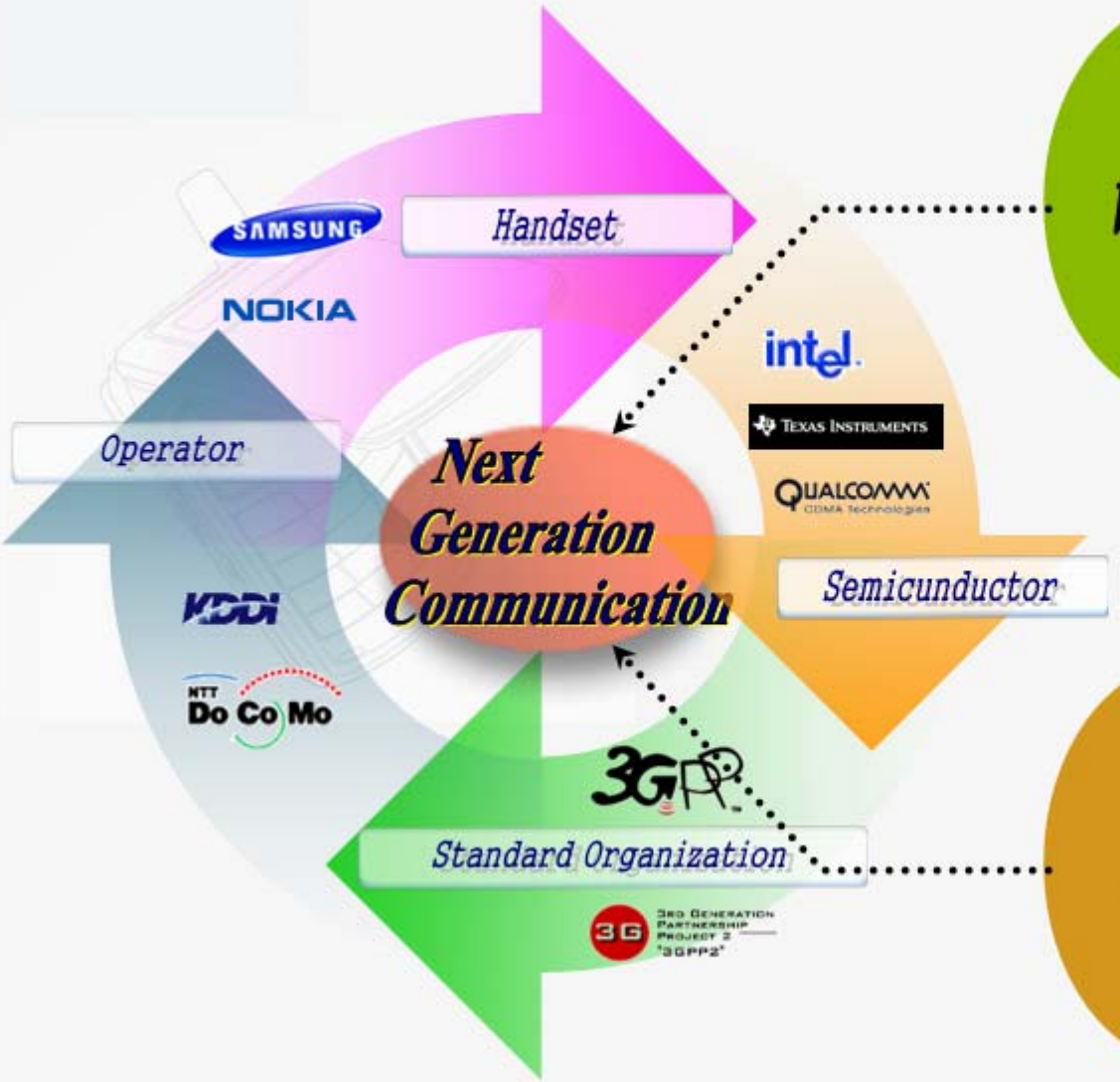
B3G Global Landscape [1]



* 802.16/a/d : Fixed Broadband Wireless Access/WiMax
* 802.16e : Mobile WiMax, WiBro

* MBWA : Mobile Broadband Wireless Access
* MIPSHOP : Mobile IP Signaling and Handoff Optimization
* SDOs : Standards Developing Organizations

B3G Global Landscape [2]



WiBro

- Samsung
  - * '06 1st half : Commercialization
- Intel
  - * Mobile WiMax

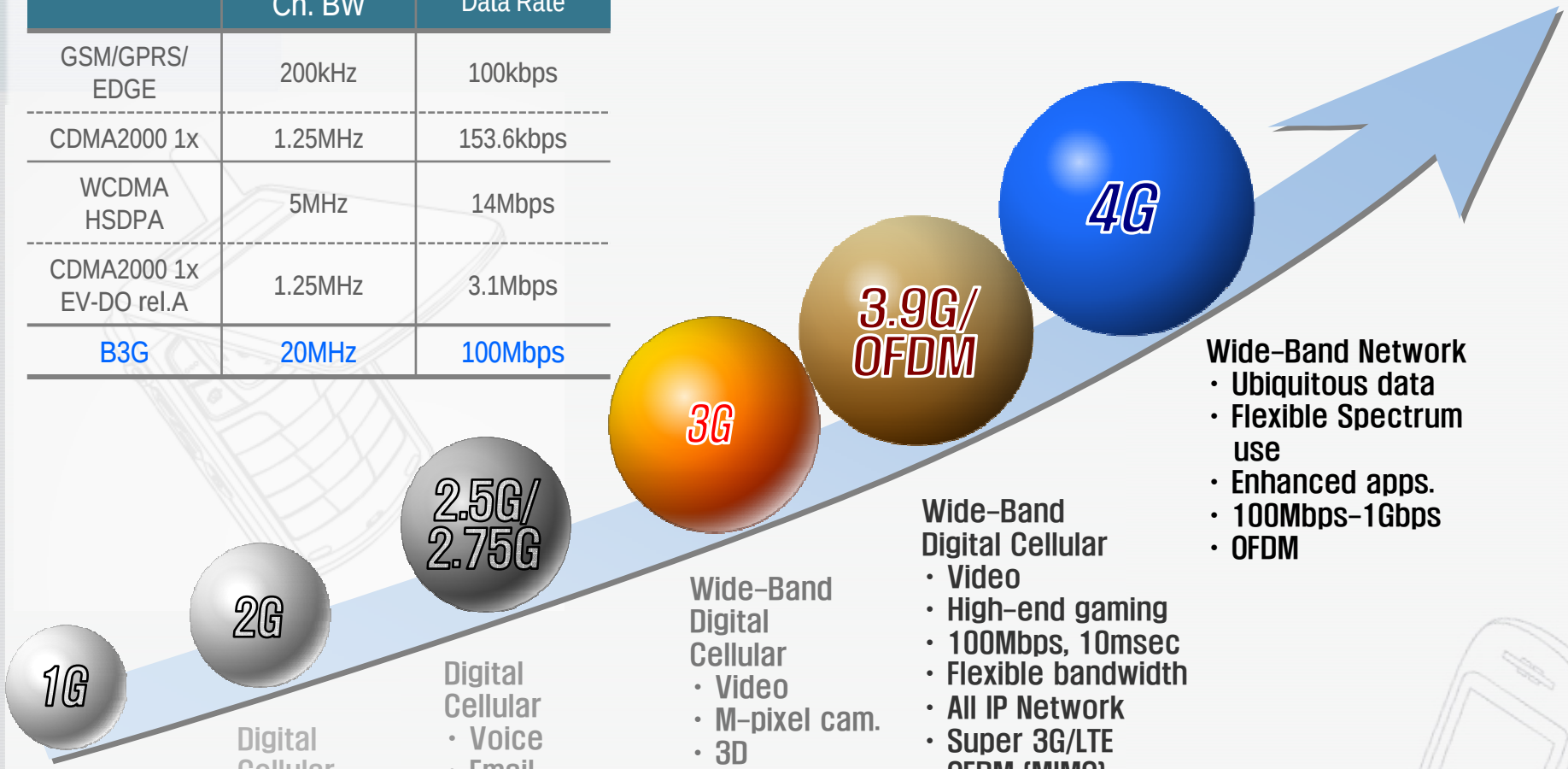
LTE

- 3GPP
  - * '06 3Q : TR Complete
  - * '07 3Q : TS Complete
- 3GPP
  - * '07 3Q : TS Complete
- Ultra 3G [KDDI]
- Super 3G [NTT DoCoMo]

B3G : Expectations

Ch. BW & Data Rate

	Ch. BW	Data Rate
GSM/GPRS/ EDGE	200kHz	100kbps
CDMA2000 1x	1.25MHz	153.6kbps
WCDMA HSDPA	5MHz	14Mbps
CDMA2000 1x EV-DO rel.A	1.25MHz	3.1Mbps
B3G	20MHz	100Mbps



Next Generation Mobile Communication

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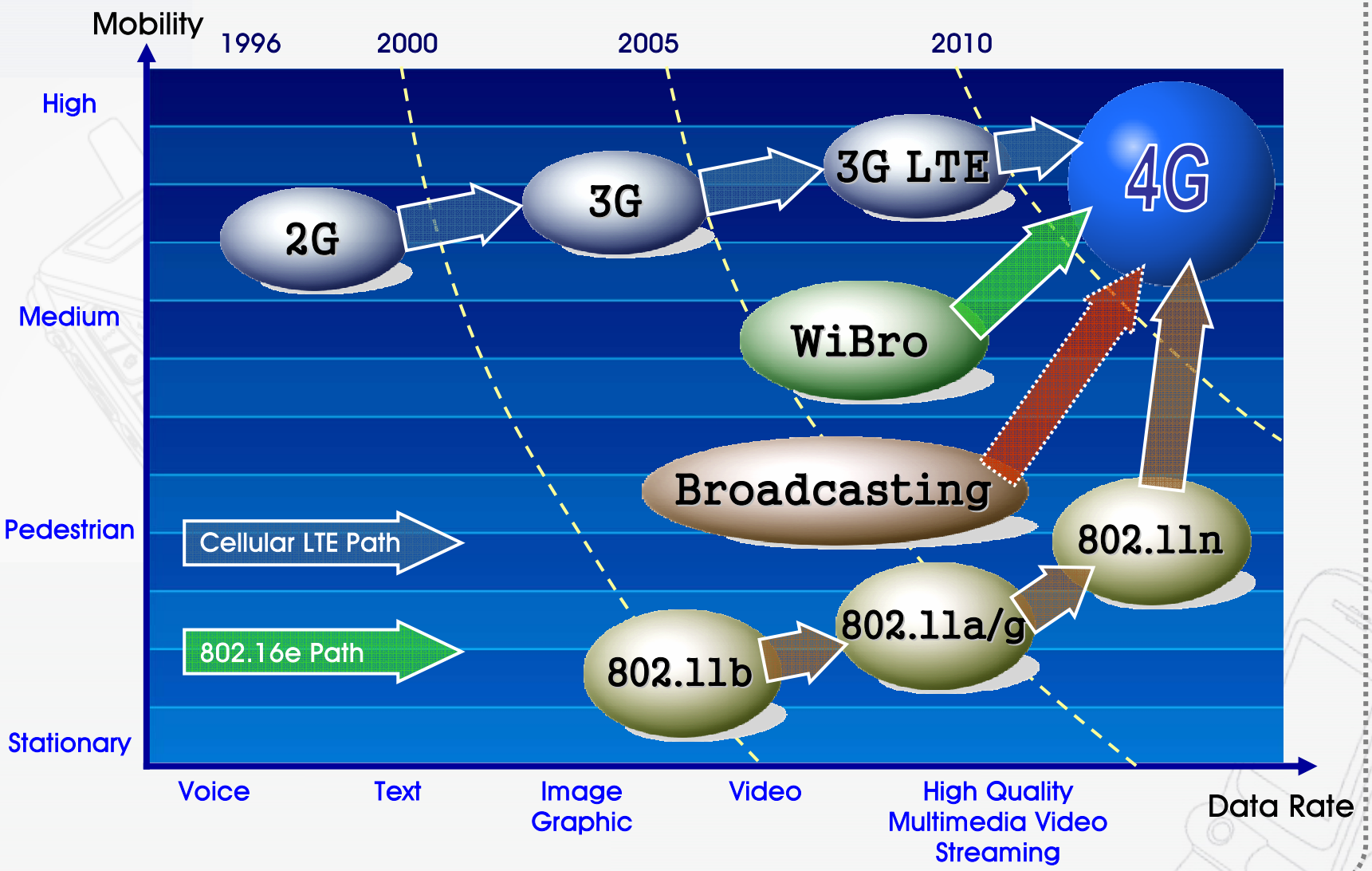
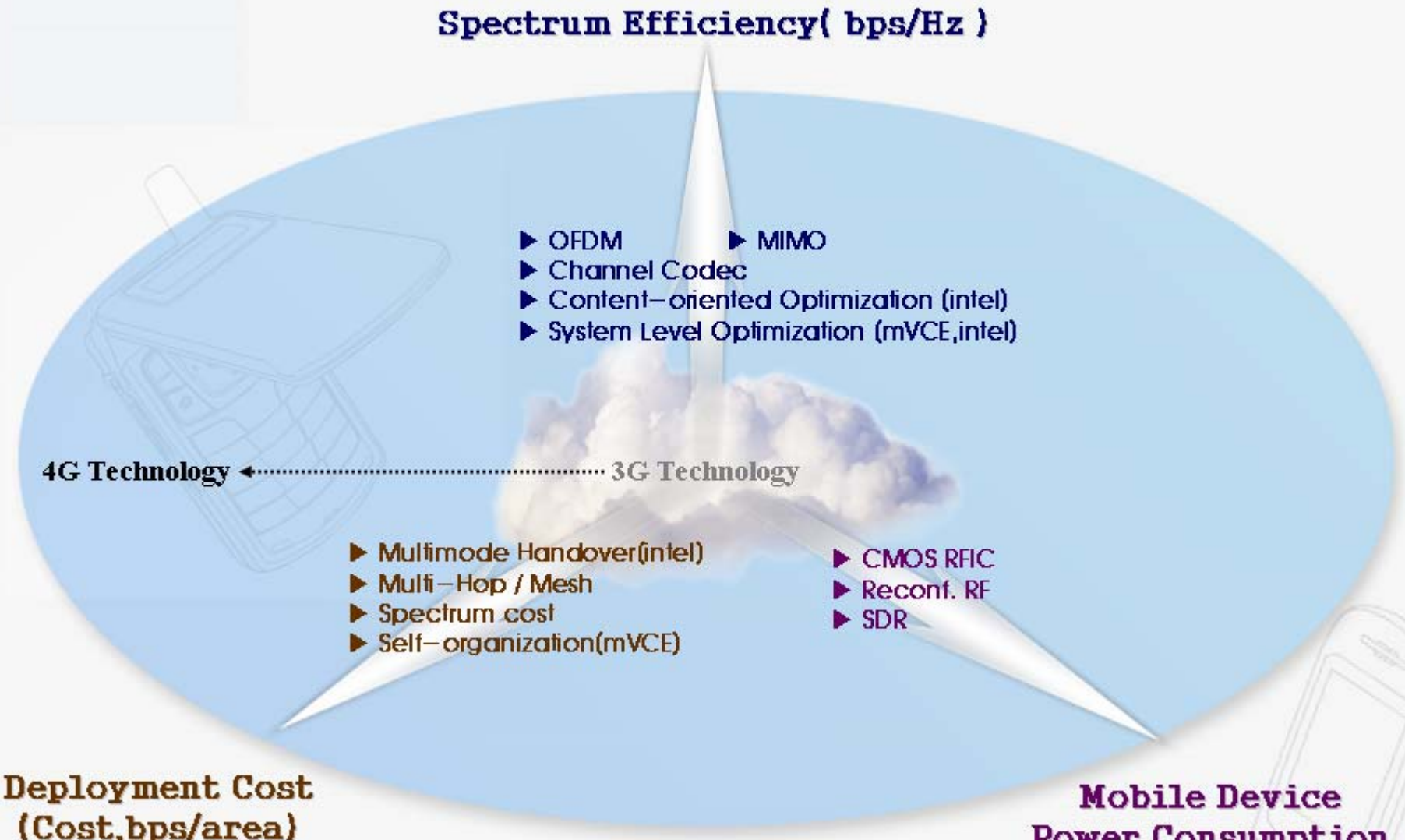
▣ Standard Trends



B3G Key Technologies




Key Technologies for
Ubiquitous computing On Chip
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Key Tech. for Ubiquitous Terminal

▣ **Semiconductor technology is essential for Ubiquitous Terminal**

Health & Bio Sensors :
Lab-on-a-chip, DNA Chip

Low Power :

Display Driver IC:
3D Display, Hologram

Modem :
Seamless connecting

Flash Memory :
Mass Storage (Card),
Code/Data Storage

Connectivity/Positioning :
WBAN

RF/Analog :
Digital/Re-configurable RF/Analog

Processor :
Re-configurable processor

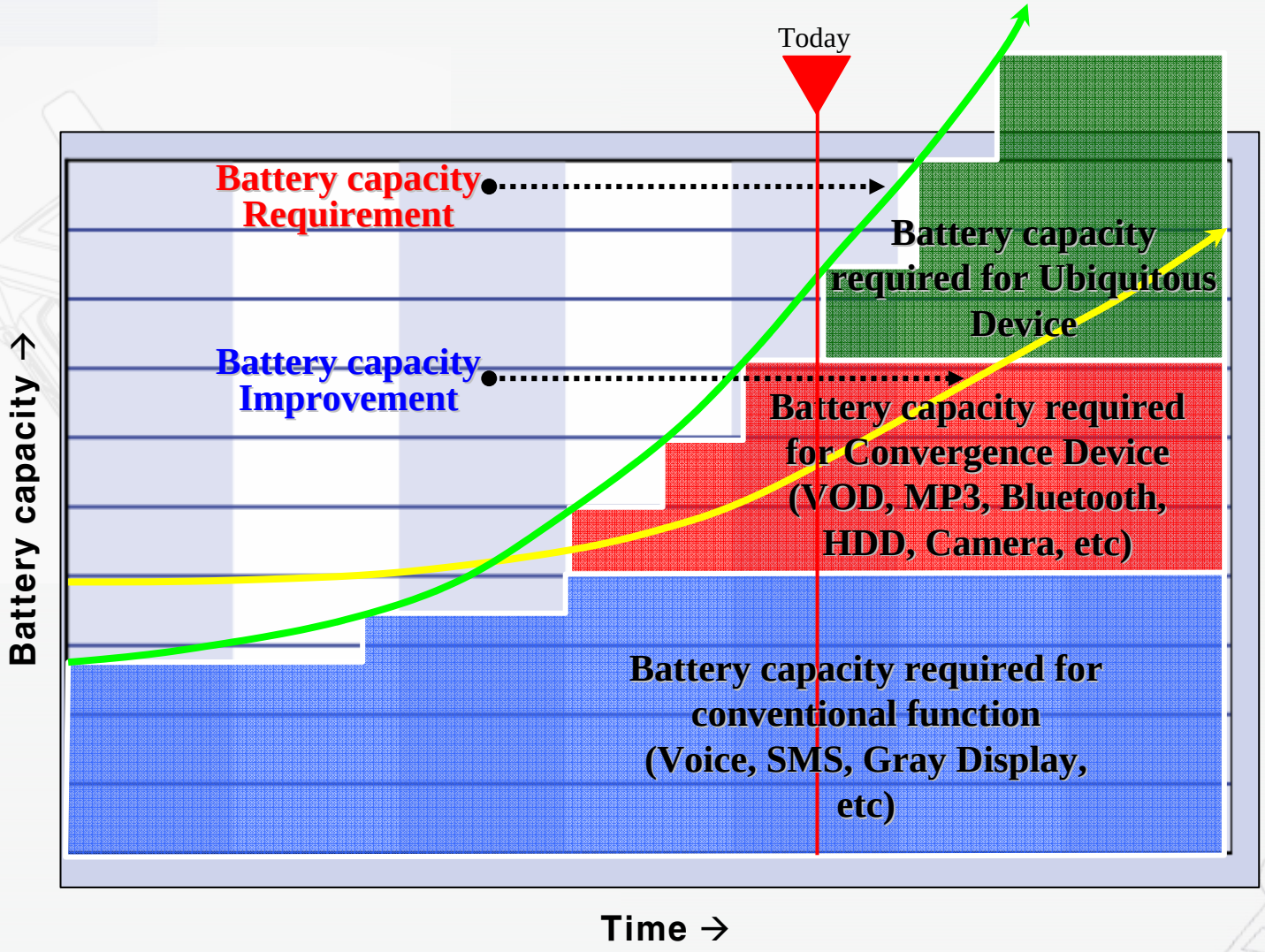
Smart Card :
Security

RAM :
Fusion Memory

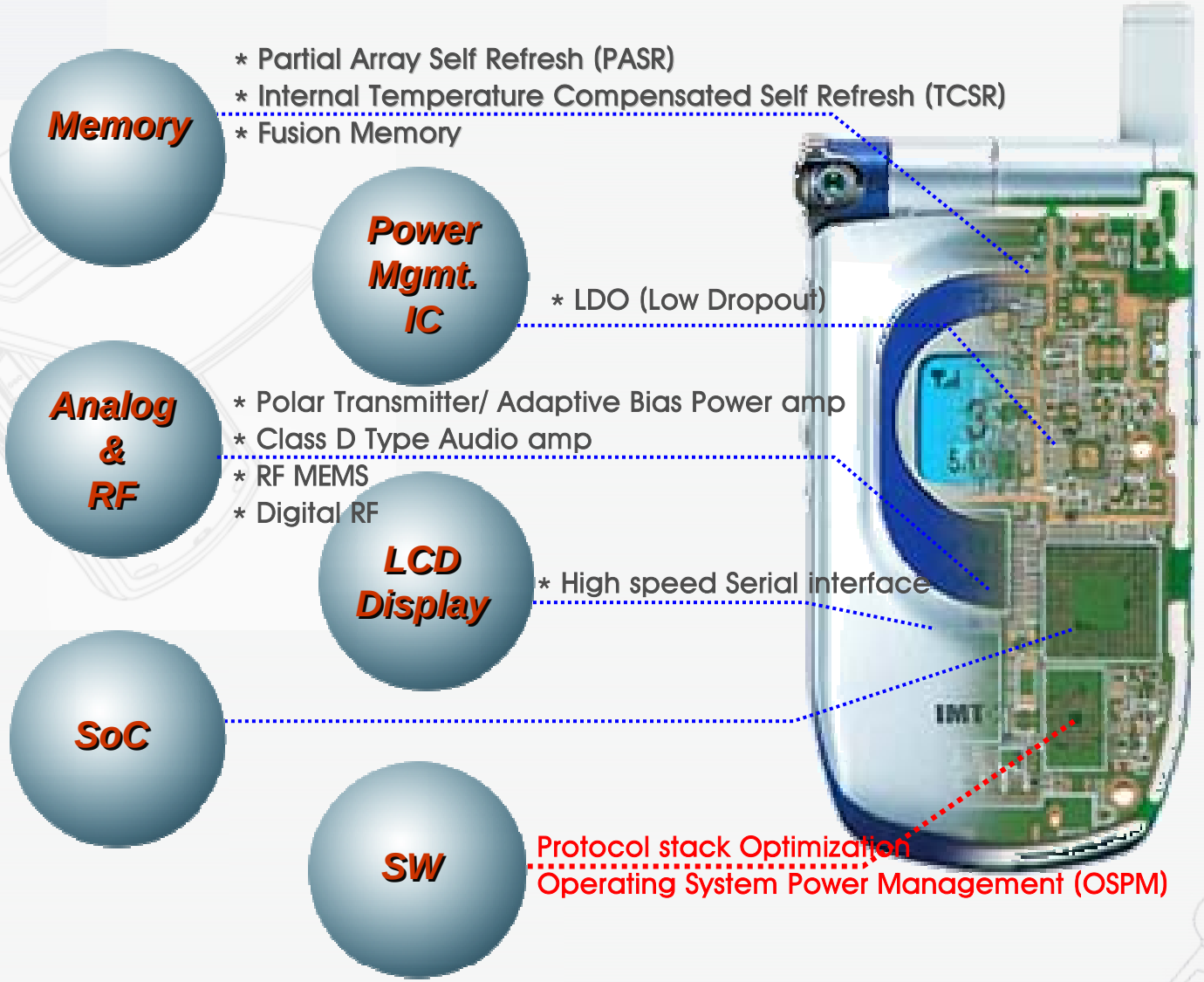
SIP (System In Package),
MCP (Multi Chip Package),
POP (Package on Package)

Power Issues of the Ubiquitous Device

- **With the increasing functions of Ubiquitous devices, battery improvement can NOT meet the users' needs.**



Low Power Design in Terminal

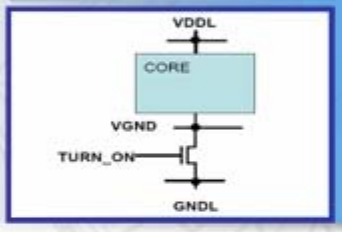


Power Issues in SoC

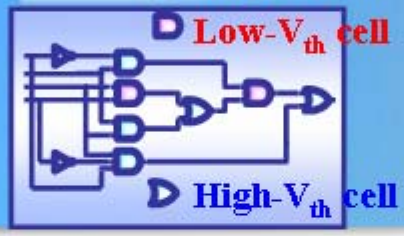
Should consider the power consumption during all design steps

- Leakage Power Reduction
- Power Analysis / Integrity
- Dynamic Power Reduction

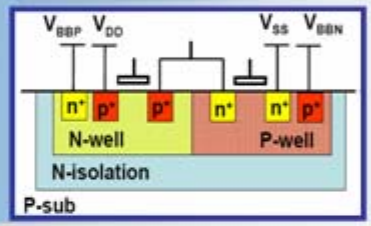
MTCMOS



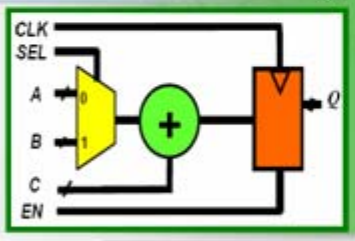
Multi-Vth



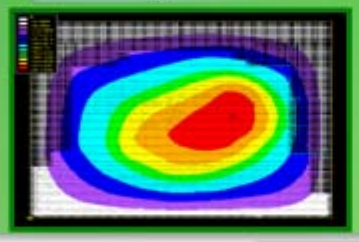
VTMOS



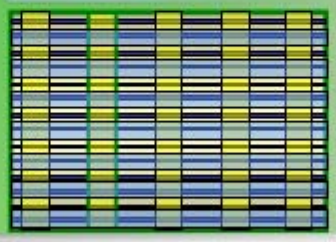
RTL/Vectorless Analysis



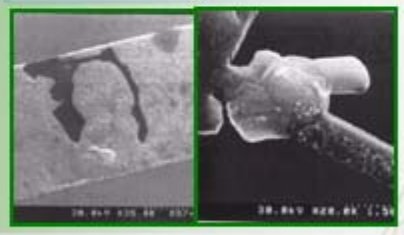
IR-drop



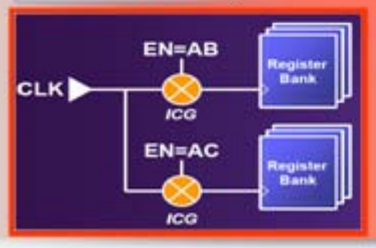
Power Mesh



Electro Migration

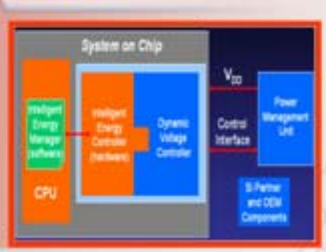


Clock Gating

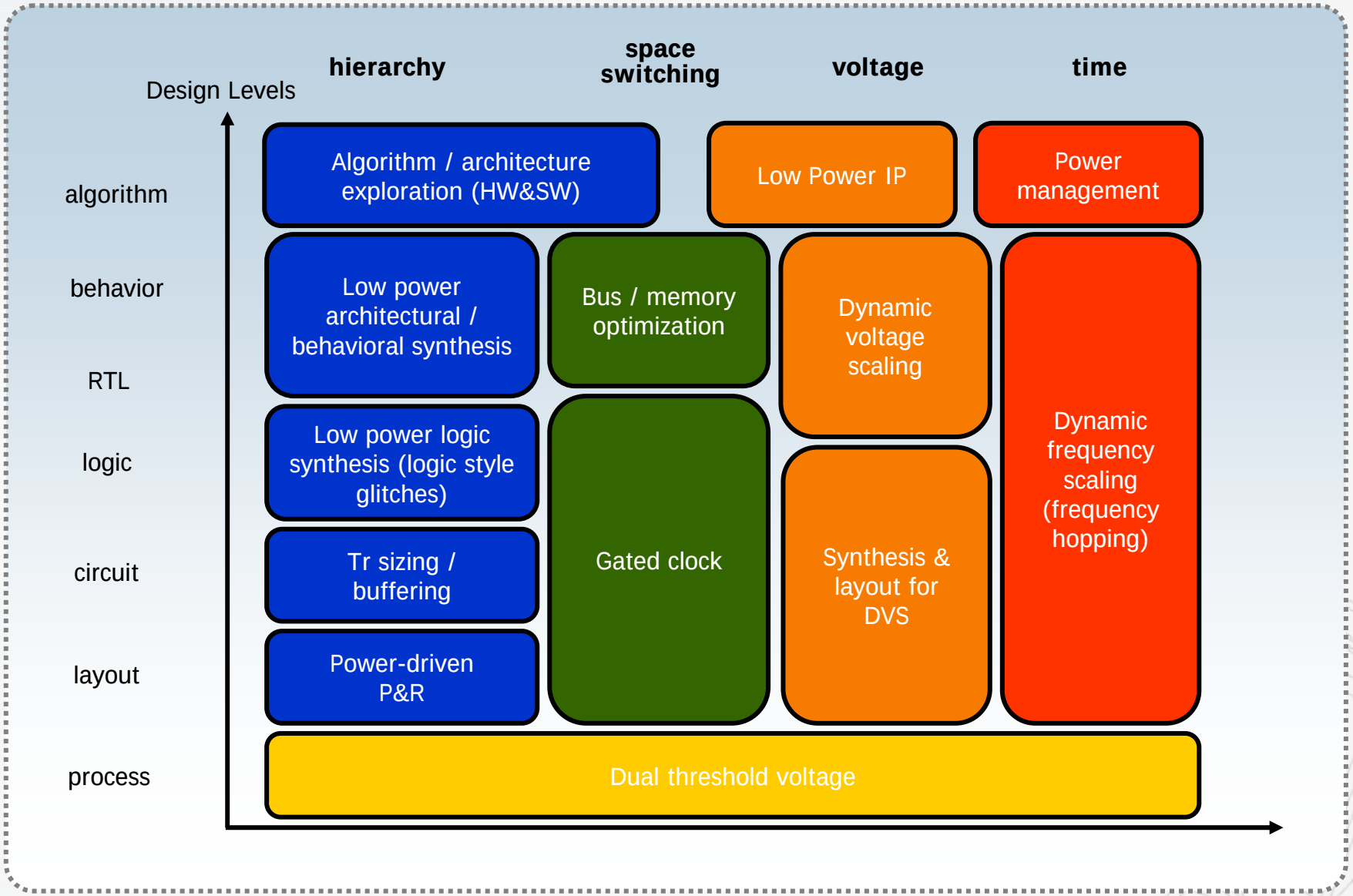


Multi-Vdd

DVFS



Low Power Design Methods for SoC



Mobile-Sensor for Ubiquitous terminal

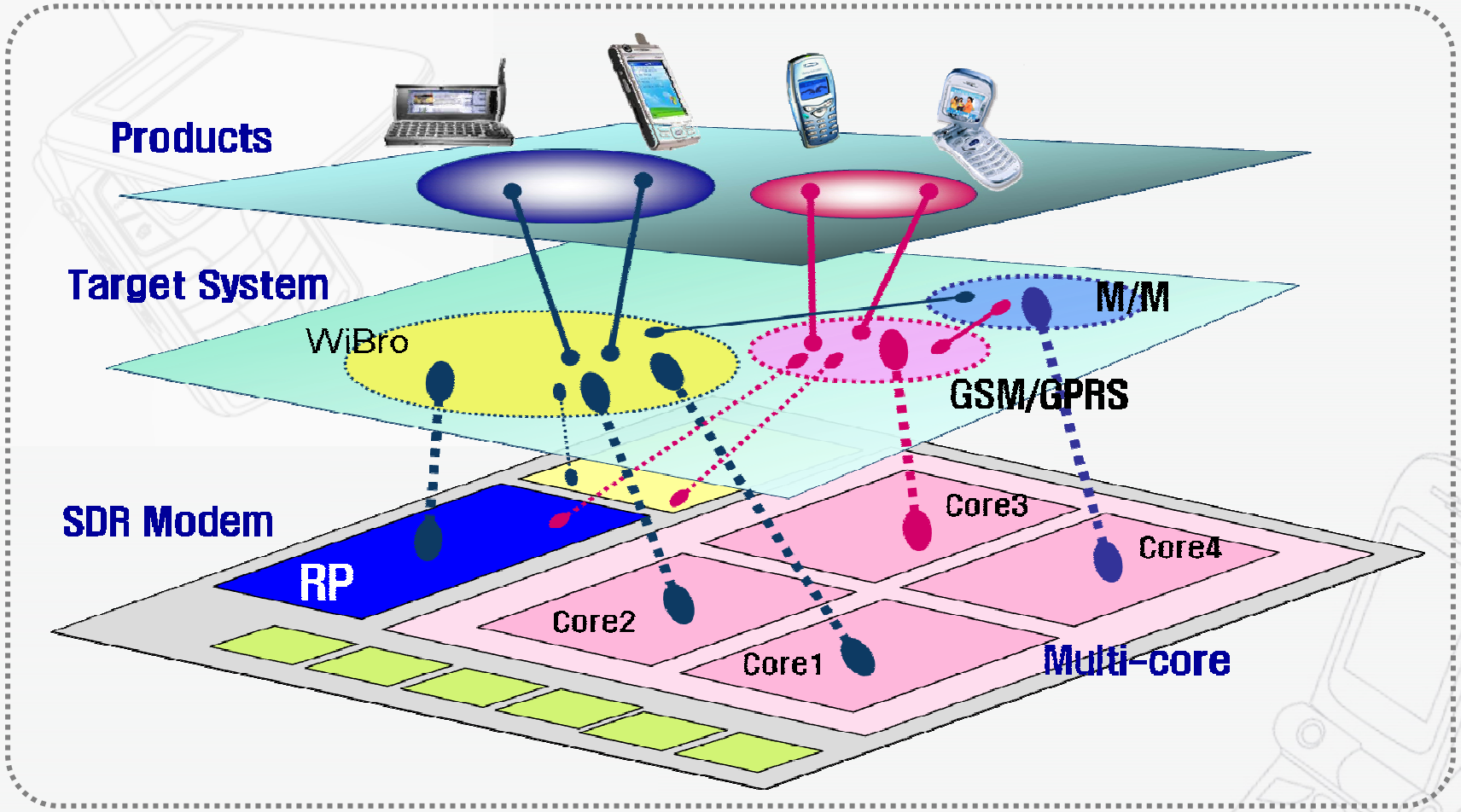
SDR Modem

▣ **Convergence : Multiple standards, Multiple functions , Etc.**

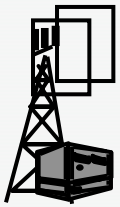
▣ **SDR means**

> **One device platform for all features/applications**

> **Ability to track standard/feature evolution**



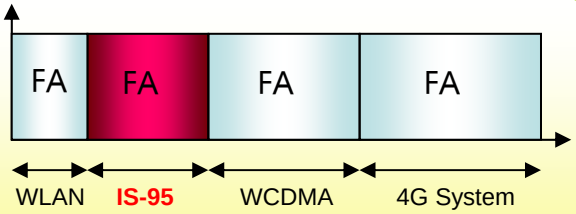
SDR based Cognitive Systems



Cognitive Basestation

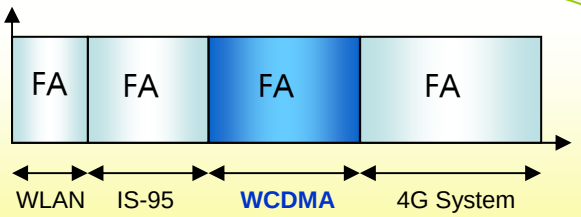
- Reliable service
- Intelligent service
- Efficient spectrum
- Interference avoidance

Multi−Band



Multi-FA

Multi−Band



Multi-FA

Old Connection (IS−95)

Software Reconfiguration

New Connection (WCDMA)

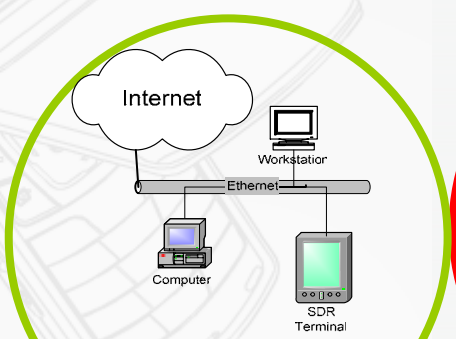
Agile Terminal

Service	*System*	*Download*
1. Voice	1. IS−95	1. OTA
2. Audio	2. WCDMA	2. Smart Card
3. Movie	3. WLAN	3. Ethernet
:	:	:

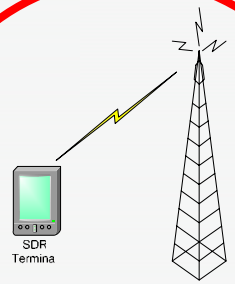
Agile Terminal

Software Download Technology

- Objectives of Software Download
  - > For bug fix
  - > For system upgrade for new services
  - > For system change in case of roaming



Internet-based Download



Over-the-air Download

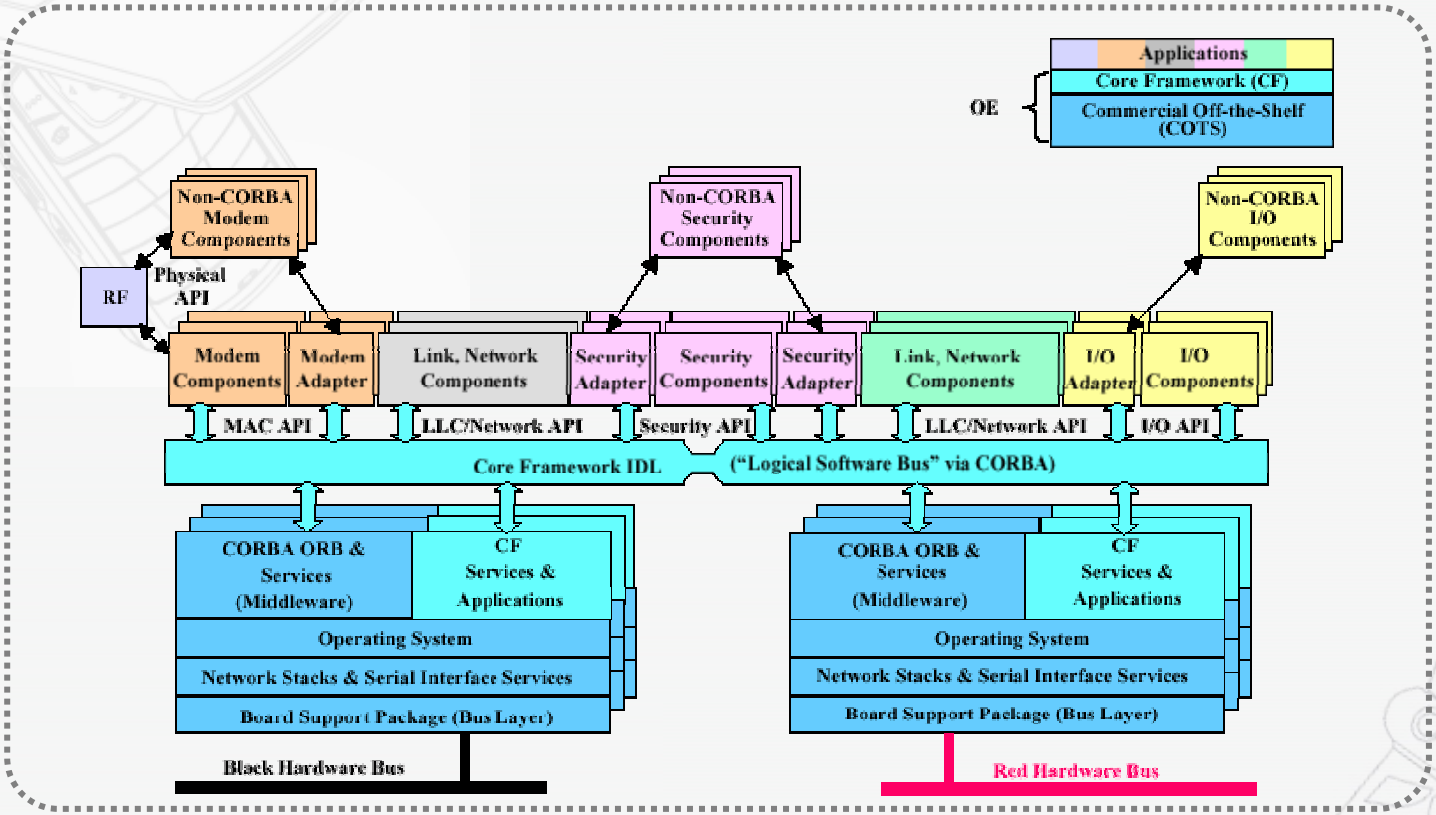
Advanced SIM Card Download

Dedicated Sale-point Download

Embedded Hardware and Software

Software Technology

- Protocol Stack Software
  - > Configuration Information Exchange
  - > Inter-System Information Exchange
- Software Communication Architecture (SCA)
  - > Open System Architecture
  - > Object-Oriented Architecture



Summary

- There are many social issues as well as technical barriers on going ubiquitous era.
  - → We need the social consensus for international standard in Ubiquitous era.
  - → The next generation communication and UoC are crucial core technologies

- B3G technologies are the evolution path (LTE) from 3GPP/3GPP2, the revolution path from WiBro (Mobile WiMax) and combined path from these two paths.
  - → Important factors of the B3G communication system are Spectrum Efficiency, Deployment Cost and Mobile Device Power Consumption.

- The key technical factors in Ubiquitous terminal include Low Power, Mobile Sensor and SDR.
  - → Extremely important and challenging problems.

"The Future is not to be predicted ;
It is to be created."