Radio Access Technology for Telematics Service

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Teleamtics Research Communication Team
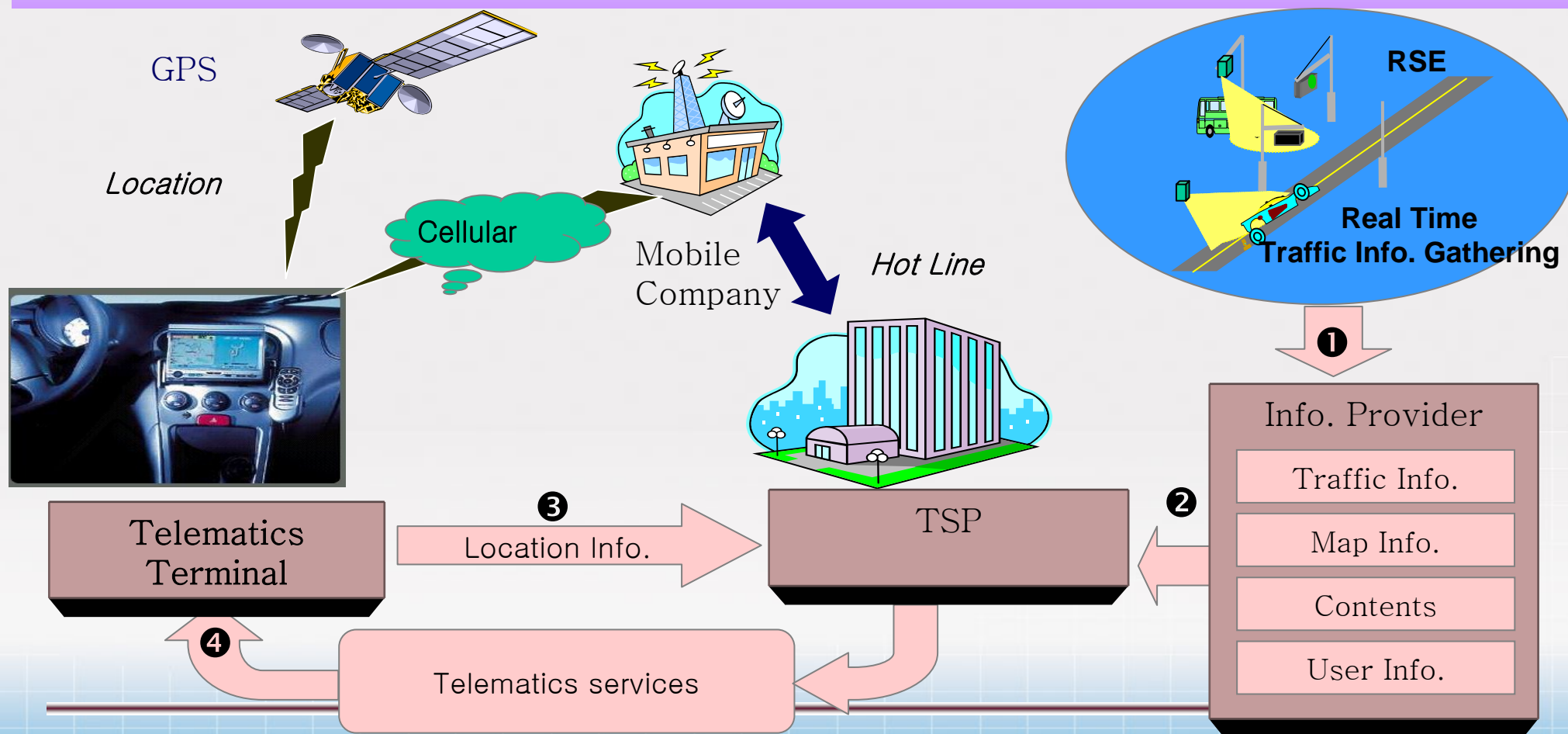
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한국전자통민연구원

Contents

◪ **What's Telematics ?**

◪ **Telematics Service**

◪ **Radio Access Requirement for Telematics**

◪ **ETRI's Research Activities**

◪ **Concluding Remarks**

What's Telematics ?

- Telematics provides the user or driver "Mobile Office Environment" such as traffic information, emergency calling and rescue, mobile internet by using mobile phone and positioning

GPS

Location

Cellular

Mobile Company

Hot Line

RSE

Real Time
Traffic Info. Gathering

❶

Info. Provider

Traffic Info.

Map Info.

Contents

User Info.

❷

TSP

❸ Location Info.

Telematics Terminal

❹

Telematics services

What's Telematics ?

❑ Terminal Types

Types	Service	Content
Portable Terminal	Emergency(911 call)	Location Information, SOS
Car Navigation	Destination Route Guidance	GPS Location to Map Matching
Auto PC	Mobile Information and DB Management, Mobile Black Box	GIS, Mobile Driving Info.
DSRC	ITS : ETC, BIS, Access Control	Billing, Traffic Info.
Multi-mode Terminal	Advanced Telematics Services	Cellular + DSRC + PC + GPS + GIS + SDR

What's Telematics ?

❑ **Service and Applications**

◆ **Mobile Safety & Emergency Rescue**

- **Range Measurement and Speed Control**

- **119(or 911) Emergency Calling**

◆ **Real Time Traffic Information**

- **Collect Traffic Information by every minutes and provide it to mobile drivers**

◆ **CRM(Car Related Management)**

- **Access Control, Parking, Mobile related Insurance, etc**

◆ **Mobile Office**

- **Enjoy Internet, Movie, Music, Game such as in Home and Office**

What′s Telematics ?

❑ **Telematics Effect**

◆ **Time Saving : takes less time to go to destination by applying route guidance service**

◆ **Economic Profit : Reduction in Gasoline usage**

◆ **Safety Enhancement : driver could be prepared for sudden accident**

◆ **Environment Protection : Reduction of Smog phenomena**

◆ **More Comfortable : feels more comfortable while driving**

◆ **Mobile Security: enhance Mobile Security by using mobile′s location information**

Telematics Service

❑ **Tematics Infra** : Positioning and Traffic Information Gathering Network, Location and Traffic Server, and Communication Network(Cellular, DSRC/WLAN, DMB)
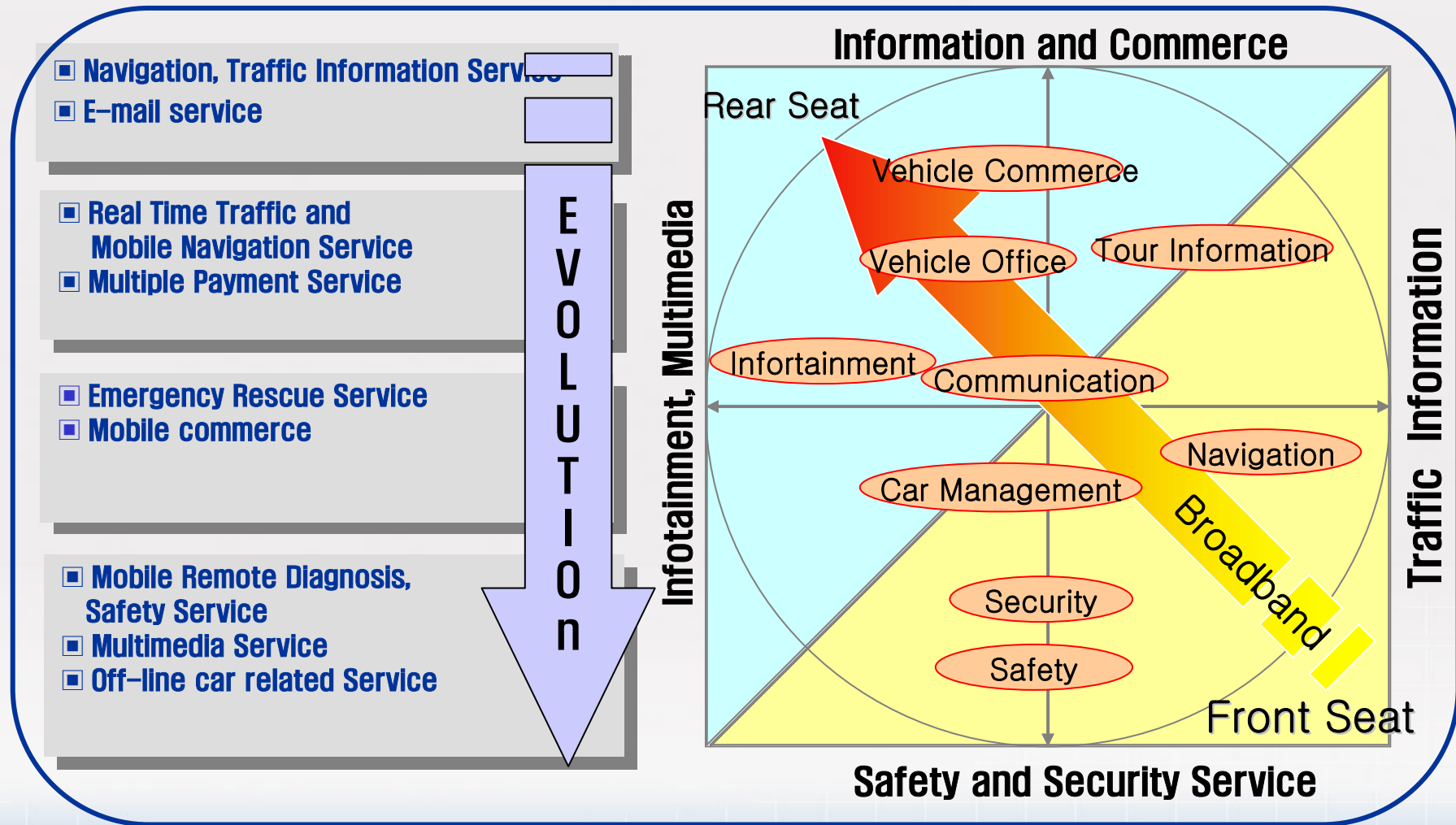
Telematics Service

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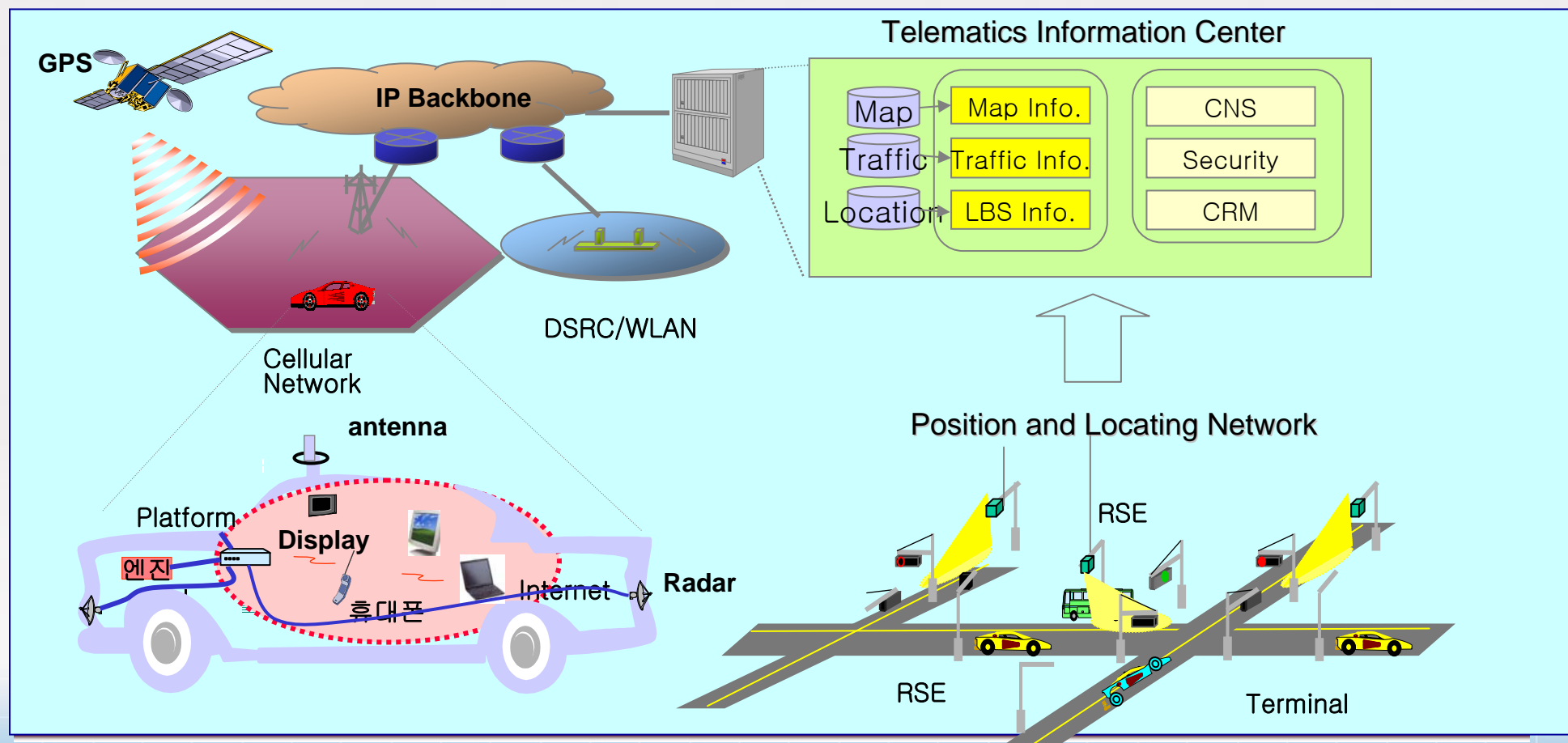
❑ **Telmatics Service**

	Service Definition	Contents
Dynamic Car Navigation	Real time Route Guidance based on traffic	GIS, Traffic Voice Recognition
Emergency Rescue	Mobile's positioning information and Emergency Calling(119 call)	Location and Accident Info.
Dynamic Traffic	Traffic and Accident Information	Traffic, Route
Commerce	On-line Payment, ETC, Parking	Fare, Enforcement
Mobile Internet	Internet Access in Mobiles email., Web Browsing, FTP	DVD, Music and Game, Internet

Telematics Service

- ▣ Navigation, Traffic Information Service
- ▣ E-mail service

- ▣ Real Time Traffic and Mobile Navigation Service
- ▣ Multiple Payment Service

- ▣ Emergency Rescue Service
- ▣ Mobile commerce

- ▣ Mobile Remote Diagnosis, Safety Service
- ▣ Multimedia Service
- ▣ Off-line car related Service

EVOLUTION

Information and Commerce

Rear Seat

Vehicle Commerce

Vehicle Office   Tour Information

Infotainment   Communication

Navigation

Car Management

Security

Safety

Front Seat

Broadband

Infotainment, Multimedia

Traffic Information

Safety and Security Service

Telematics Service

1G(Past)

• **Service : Emegency Call**
• **Terminial : Car Phone**
• **Radio Access : 2GC**
• **Positioning : GPS**
• **Server : Call Center**
• **Product: GM On-star**

2G(Now)

• **Service : Car Navi.**
• **Terminial : PDA, Auto PC**
• **Radio Access : 3GC**
• **Positioning : GPS**
• **Server : Sever**
• **Product: Hyundai Mozen**
        Toyoda G-Book

3G(Future)

• **Service : Driver Assist.**
• **Terminial : Car Sever**
• **Radio Access :WLAN/Cellular/DMB**
• **Positioning : GPS/MEMS DR**
• **Server : Intelligent Platform**

Telematics Service

❑ **Relationship between Telematics and ITS**

◆ Telematics will be evolved with LBS and Telematics service

◆ Key technologies such as radio access, positioning, IPv6 are common partly in ITS, Telematics and LBS

ITS Service

Telematics Service

LBS Service

| Celluar,DMB | Traffic Information | Positioning | IPv6 | GIS | DSRC/WLAN |
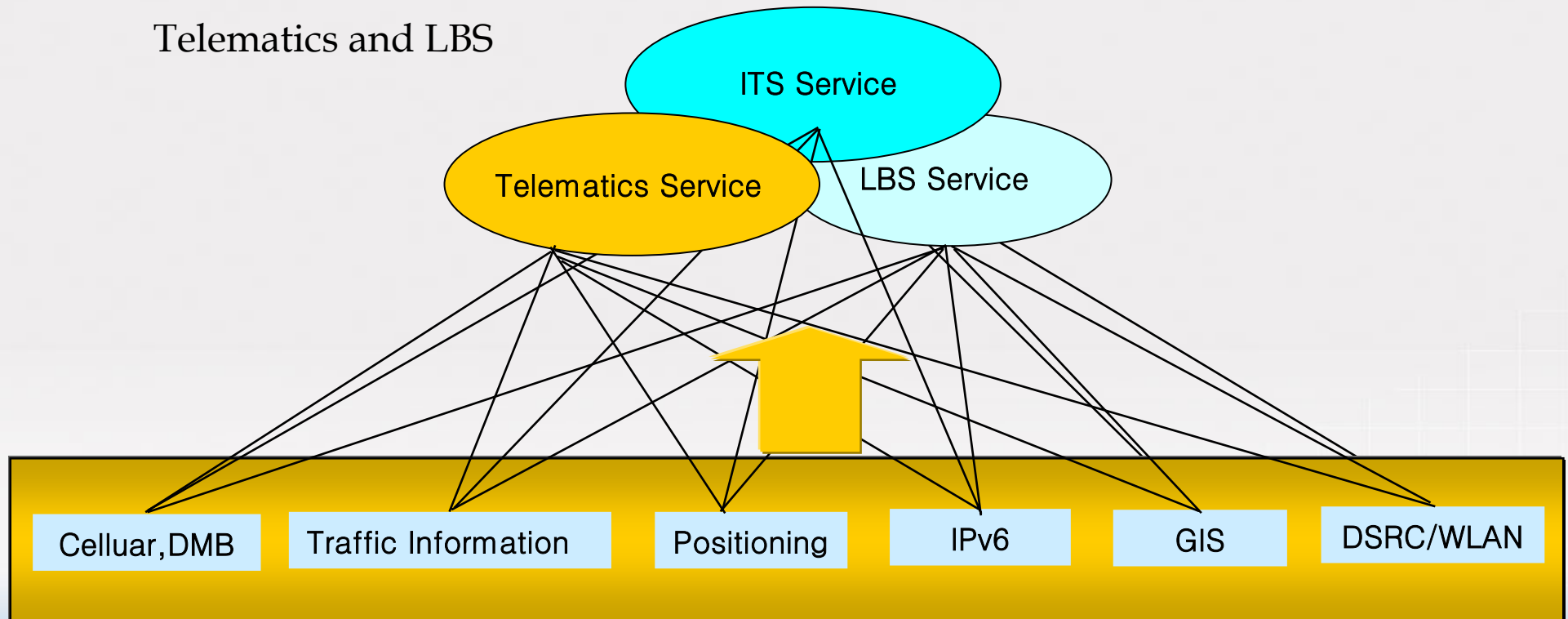
Radio Access Requirement

❑ Basic Requirement

◆ **High Speed Packet Transmission : ~ 10Mbps**

◆ **Compatible with DSRC**

   – **Be able to support ITS : ETC, BIS, Parking Management**

◆ **High Mobility**

   – **Range extension up to 1km**

   – **Hand-over between radio cells**

◆ **Seamless Services**

   – **Roaming among heterogeneous network**

◆ **Mobile Ad-Hoc Communication**

   – **provide collision avoidance, messaging**
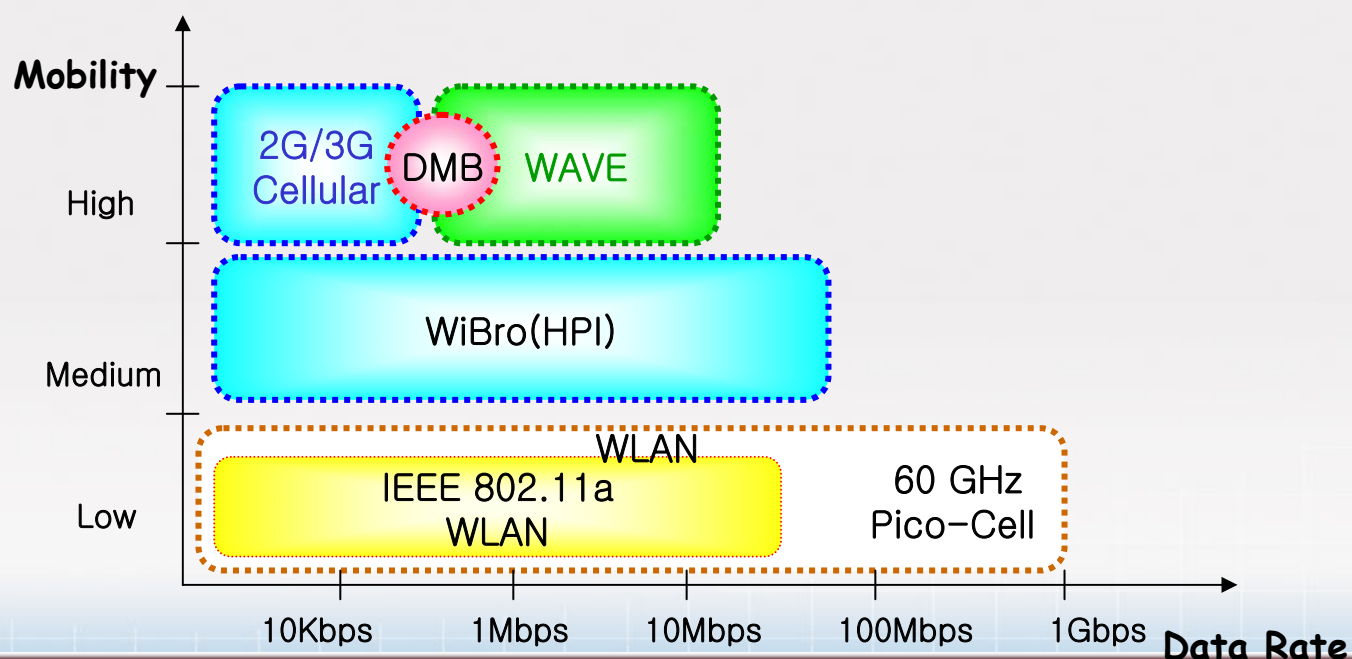
Radio Access Requirement

■ Multiple Radio Access

◆ **To provide telematics service, cellular, WAVE/WLAN, DMB and GPS will be mounted in telematics terminal**

GPS

WLAN
5.8 GHz

IVC

LCD

WLAN/IVC/DMB/
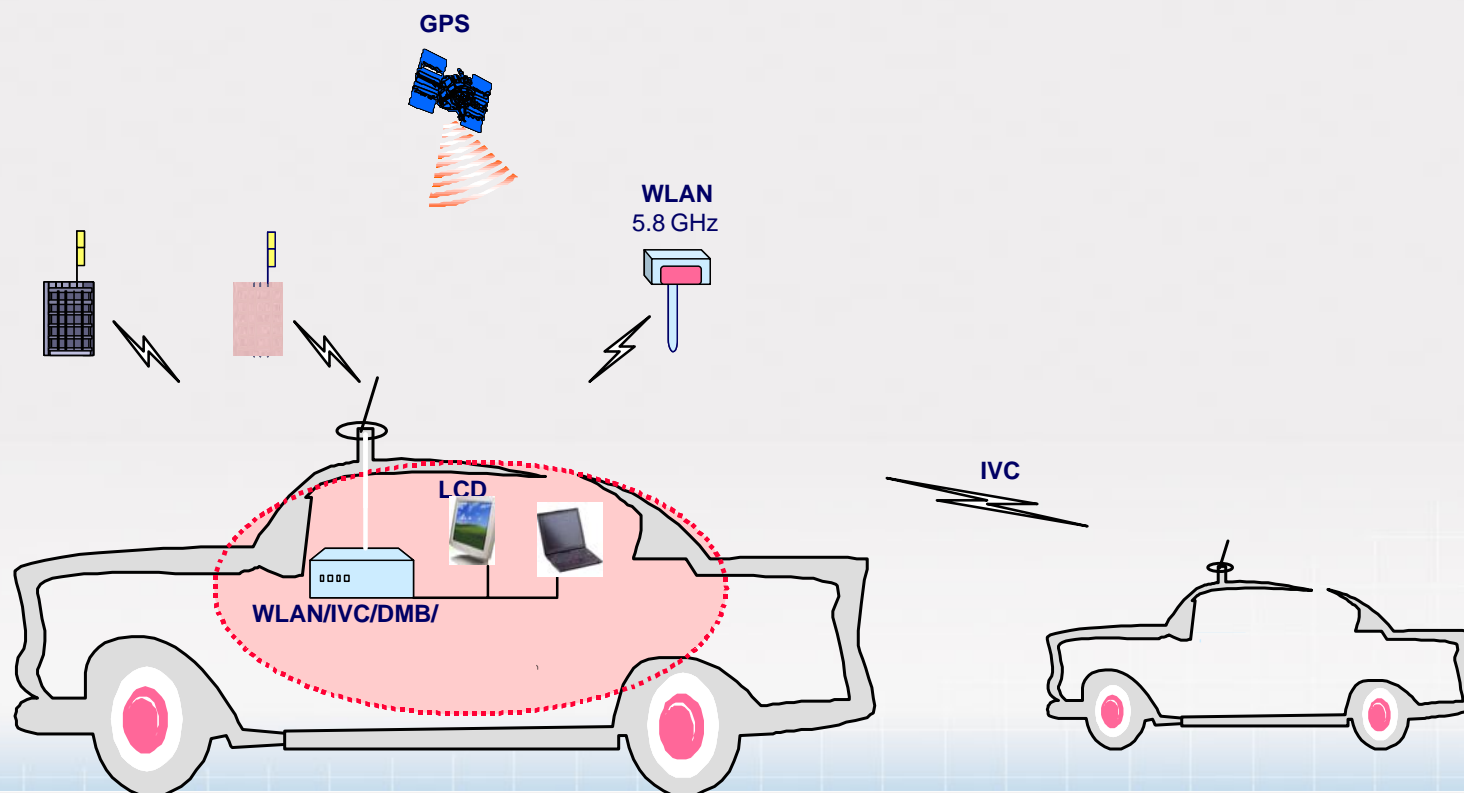
Radio Access Requirement

◼ High Speed Mobile Environment

◈ WLAN provide high speed packet in low mobility and WiBro(HPi) support 50 Mbps in medim mobility

◈ WAVE support 10 Mbps Packet Transmission, DMB provide traffic information, DGPS, multimedia services
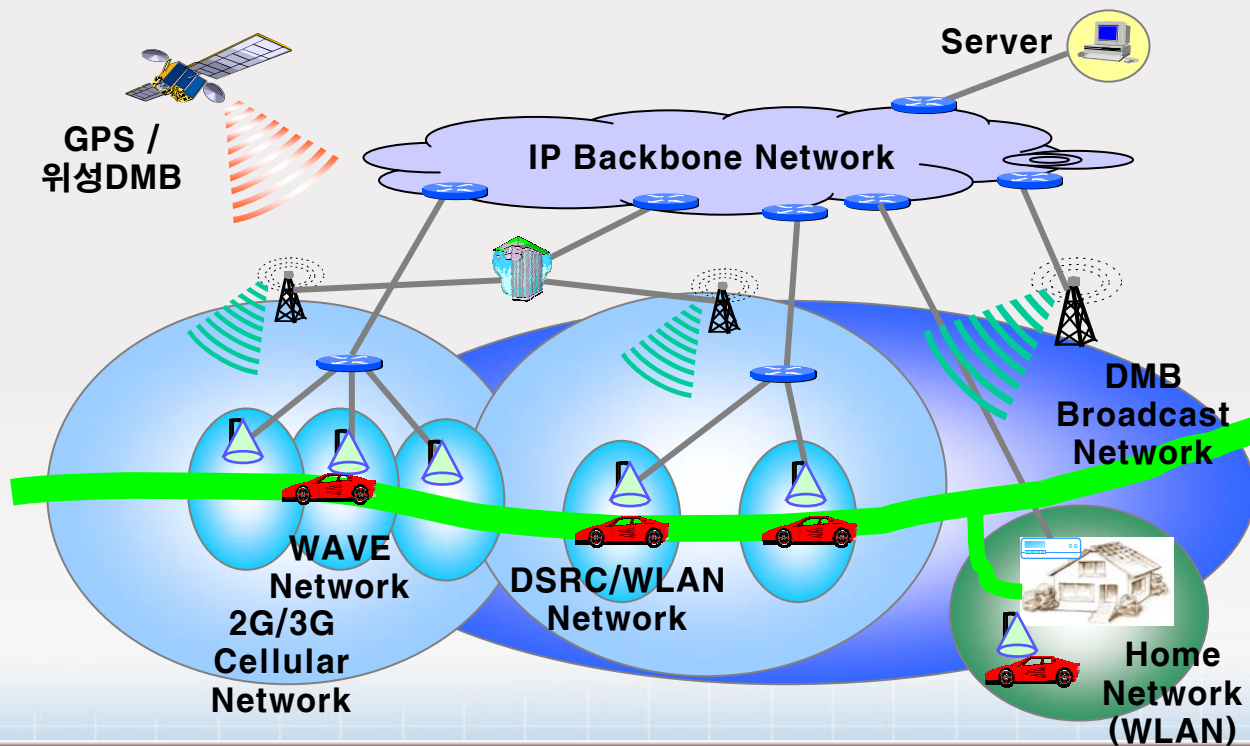
Radio Access Requirement

■ Features of Multiple Access

|	WAVE	1xEV-DO	WiBRO	HSDPA	DMB
• Radio Freq.	5.8 GHz(TBD)	2.3~2.4 GHz	2.3~2.4 GHz	1.855~2.055GHz 2.11~2.2GHz	174~216 MHz (42MHz)
• Duplexing • Multiple Access • Ch. BW	TDD TDMA 10 MHz	CDMA 1.25MHz	TDD OFDMA 10MHz	FDD, TDD TDM/CDM 5MHz	:Eureka-147 OFDM 1.536MHz
• Modulation • Modulation Level	OFDM BPSK, QPSK, 16 and 64QAM	QPSK 8-PSK 16QAM	QPSK 16QAM	QPSK 16QAM	OFDM π/4 DQPSK
• Data Rate	Medium : 27Mbps High:10 Mbps	2.457Mbps	Down > 3Mbps Uplink > 1Mbps	2~14Mbps 2~4Mbps/Subs.	0.8~1.7Mbps
• Mobility	> 200km		<60Km	10~20Km	> 150Km

Radio Access Requirement

■ **Seamless Services**

◆ **Terminal should be able to connect WLAN, WAVE and DMB**

◆ **Mobile IP to provide roaming among cellular, WLAN and WAVE**

◆ **WAVE support hard handover between cells**

Server

GPS /
위성DMB

IP Backbone Network

DMB
Broadcast
Network

WAVE
Network
2G/3G
Cellular
Network

DSRC/WLAN
Network

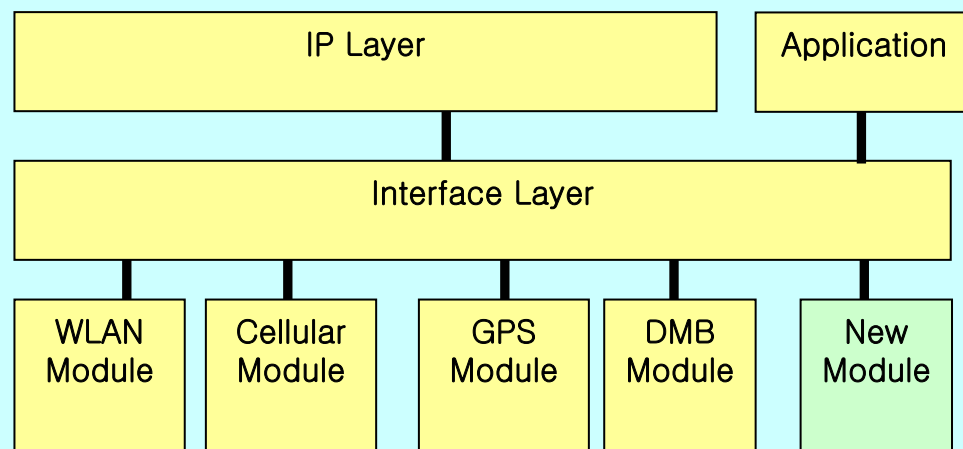Home
Network
(WLAN)

ETRI Research Activities

❑ **Goal – Radio Access Integration Technology Development of WLAN/IVC, Cellular and, DMB in Telematics Terminal**
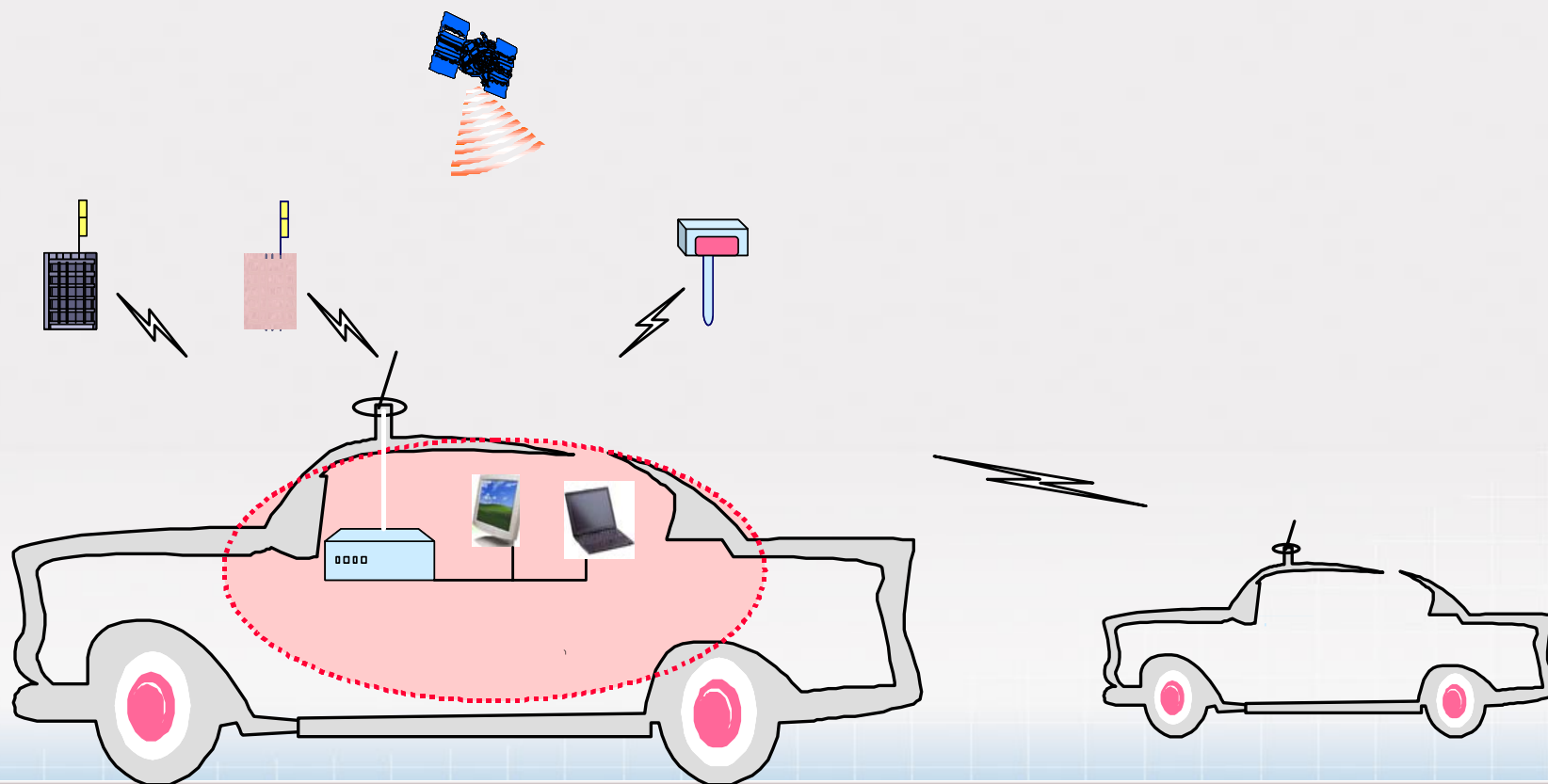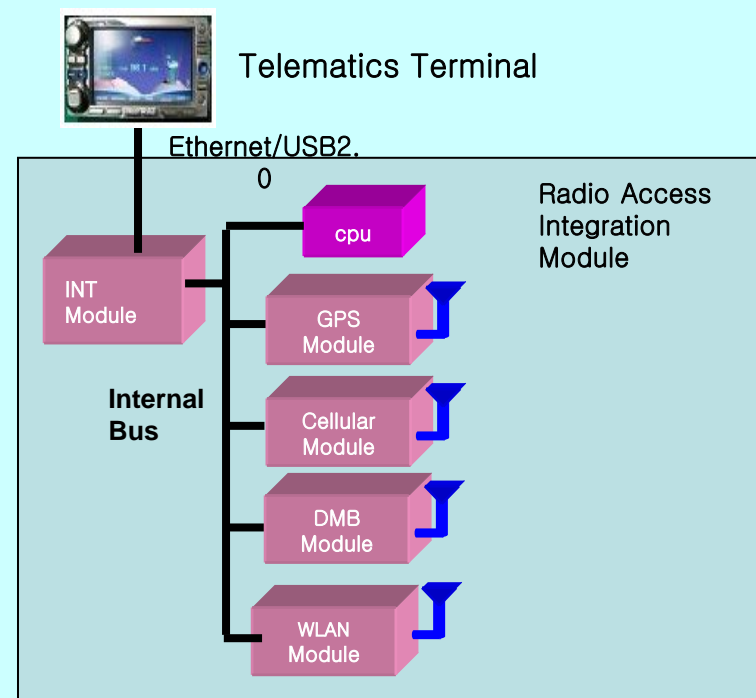
ETRI Research Activities

❑ **Terminal Architecture**

  ▪ To be able to connect Existing Communication Module

  ▪ To be expandable to New Communication Module

Telematics Terminal

Ethernet/USB2.0

Radio Access Integration Module

cpu

INT Module

Internal Bus

GPS Module

Cellular Module

DMB Module

WLAN Module

IP Layer	Application

Interface Layer

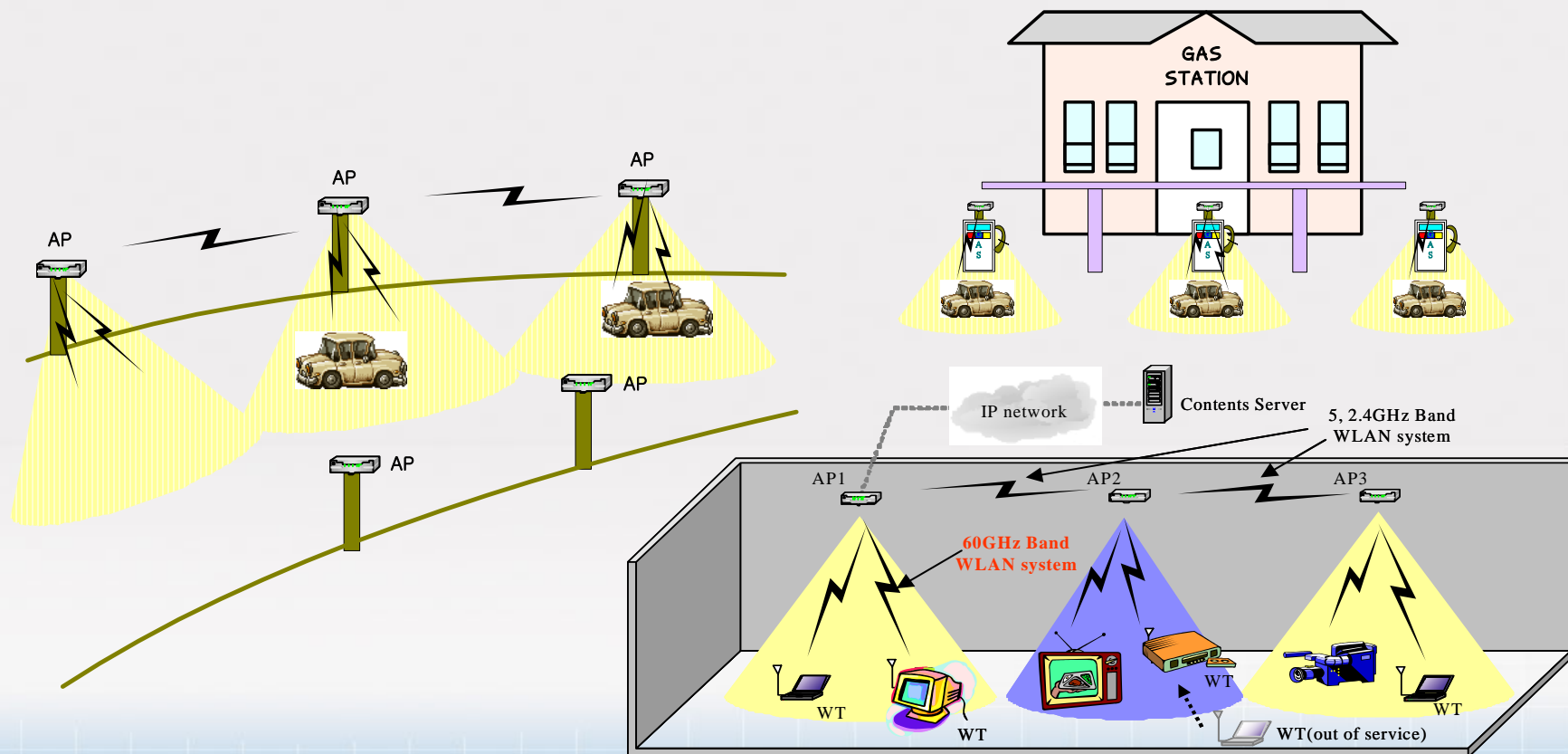| WLAN Module	Cellular Module	GPS Module	DMB Module	New Module

SW Architecture

HW Architecture

ETRI Research Activities

☐ **Goal - 1Gbps Rate Broadband Radio Transmission Technology Development for Telematics and Home Network Service**

Concluding Remarks

■ **Telematics is a new valued-added service**

- ◆ Telematics provides new value-added services such as mobile safety, Traffic Information, CRM, finally "Mobile Office Environment as like Home and Office
- ◆ ETRI have done research on
  - – Cellular/WLAN/DMB radio access technology intergation in terminal
  - – Wideband Packet Transmission Technology of 1Gbps rate

■ **Telematics are closely related to ITS**

- ◆ ITS and Telematics are related with regarding to key technologies and its service
- ◆ Standardization Activities on Radio Access Technology to support Telematics and ITS should be followed