Research Activites on Intelligent Transport System at KDDI R&D Labs.

Mitsuo Nohara

Director, YRP Research Center

KDDI R&D Labs.

ICBN 2004
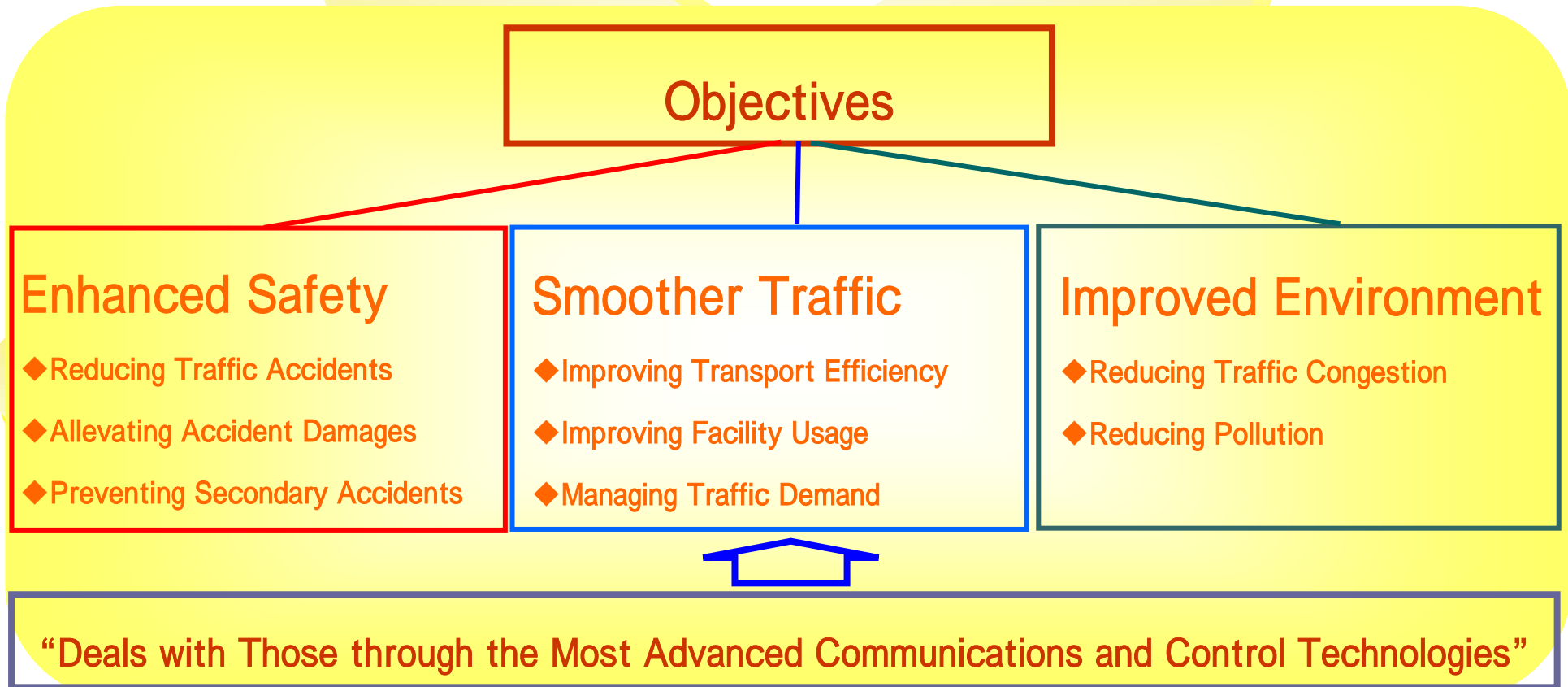
9 April, 2004, Kobe, Japan

KDDI

KDDI R&D LABS

Agenda

- Intelligent Transport System
  - 3 Objectives and 9 Areas
- R&D Activities at KDDI/KDDI R&D Labs.
  - Smart Gateway
  - R&D for ITS
- Topics for Discussions

KDDI R&D LABS

Intelligent Transport System

Ref: ITS-Japan Home Page, www.iijnet.or.jp/vertis/its-japan/

Objectives

Enhanced Safety

◆ Reducing Traffic Accidents

◆ Allevating Accident Damages

◆ Preventing Secondary Accidents

Smoother Traffic

◆ Improving Transport Efficiency

◆ Improving Facility Usage

◆ Managing Traffic Demand

Improved Environment

◆ Reducing Traffic Congestion

◆ Reducing Pollution

"Deals with Those through the Most Advanced Communications and Control Technologies"

KDDI

KDDI R&D LABS

Intelligent Transport System

Ref: ITS-Japan Home Page, www.iijnet.or.jp/vertis/its-japan/

Areas

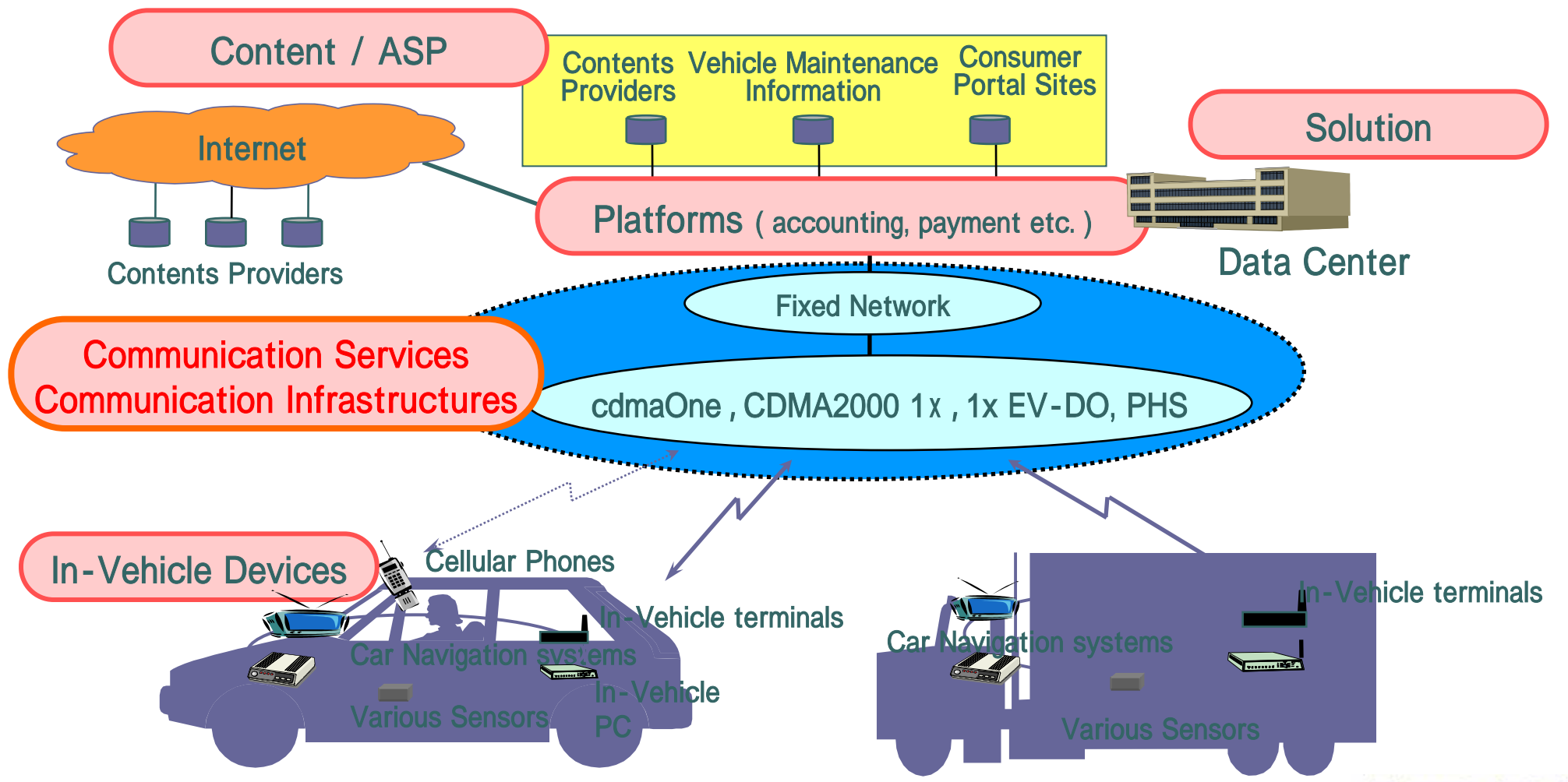|		
Advances in Navigation Systems	Optimisation of Traffic Management	Increasing Efficiency in Commercial
Electronic Toll Collection (ETC)	Increasing Efficiency in Road Management	Support for Pedestrians
Assistance for Safe Driving	Support for Public Transport	Support for Emergency Vehicle Operations

KDDI
KDDI R&D LABS

The Business Styles

Content / ASP

Contents Providers   Vehicle Maintenance Information   Consumer Portal Sites

Internet

Contents Providers

Solution

Platforms (accounting, payment etc.)

Data Center

Communication Services
Communication Infrastructures

Fixed Network

cdmaOne   CDMA2000 1   1x EV-DO, PHS

In-Vehicle Devices

Cellular Phones

In-Vehicle terminals

Car Navigation systems

In-Vehicle PC

Various Sensors

Car Navigation systems

In-Vehicle terminals

Various Sensors

SmartGateway

KDDI

KDDI R&D LABS

# "SmartGateway : A Platform for Seamless Communication over DSRC Spots"

Commissioned by TAO (Telecommunications Advancement Organizations, reorganized as NICT as of 1 April 2004)

Fiscal 2000 　 Fiscal 2002

KDDI CORPORATION
KDDI R&D Laboratories
NEC Corporation
TOYOTA MOTOR CORPORATION
NTT DATA CORPORATION
Hitachi, Ltd.

Requirements for The Smart Gateway System

Specific Research Goals
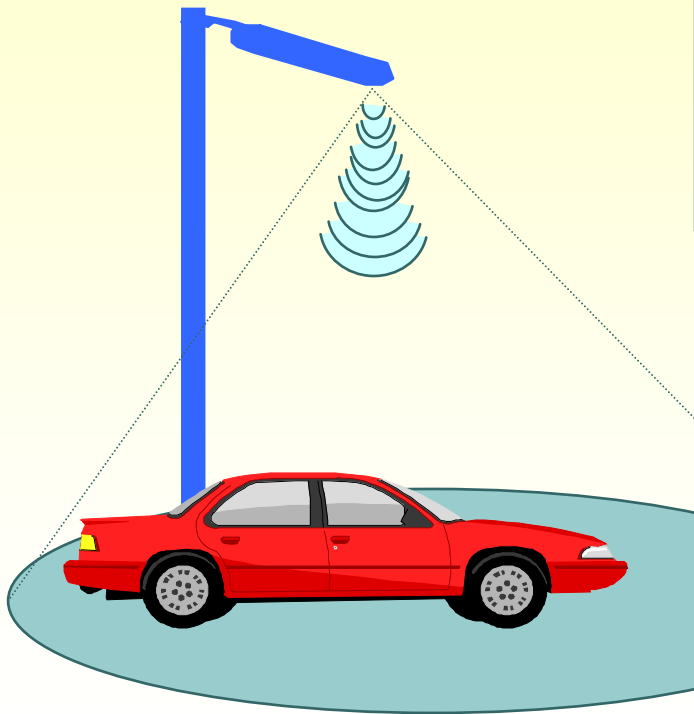
Hand-over Function

- Hand-over Continuing Connection (for Cruise Assist)
- Hand-over Keeping Information (for Multiple Application)
- Hand-over within 100ms
- Keeping up Stable Communication Quality

Highly Reliable Communication

- Initial Verification within 100ms
- Sequential Verification within 10ms with Hand-over
- Warranty for Justice of Users and Terminals
- Proxy Function for Common Payment

30m Spot about 1second passage by 100km/h

KDDI R&D LABS

Technical Elements of The Smart Gateway System

[Lower Layer]

Difficulty to Communicate Continuously

Hand-over Function

With Continuous Communication,
- To Provide Information of Cruise Assist
- To Transmit Large Size of Data

NW-Handover Tech

DSRC-NW

Networking of Plural DSRC Base Stations

Vehicle Location Management

Radio Level Handover Tech

Cruise Assist of Collision Avoidance Navigation Services on Demand

DSRC On-Board-Equipment

Technical Elements of The Smart Gateway System

[Higher Layer]

Difficulty to Verify continuously

Highly Reliable Communication

With Secure Communication
- To Reject Pretenders
- To Improve Userbility

IP-NW

High level security
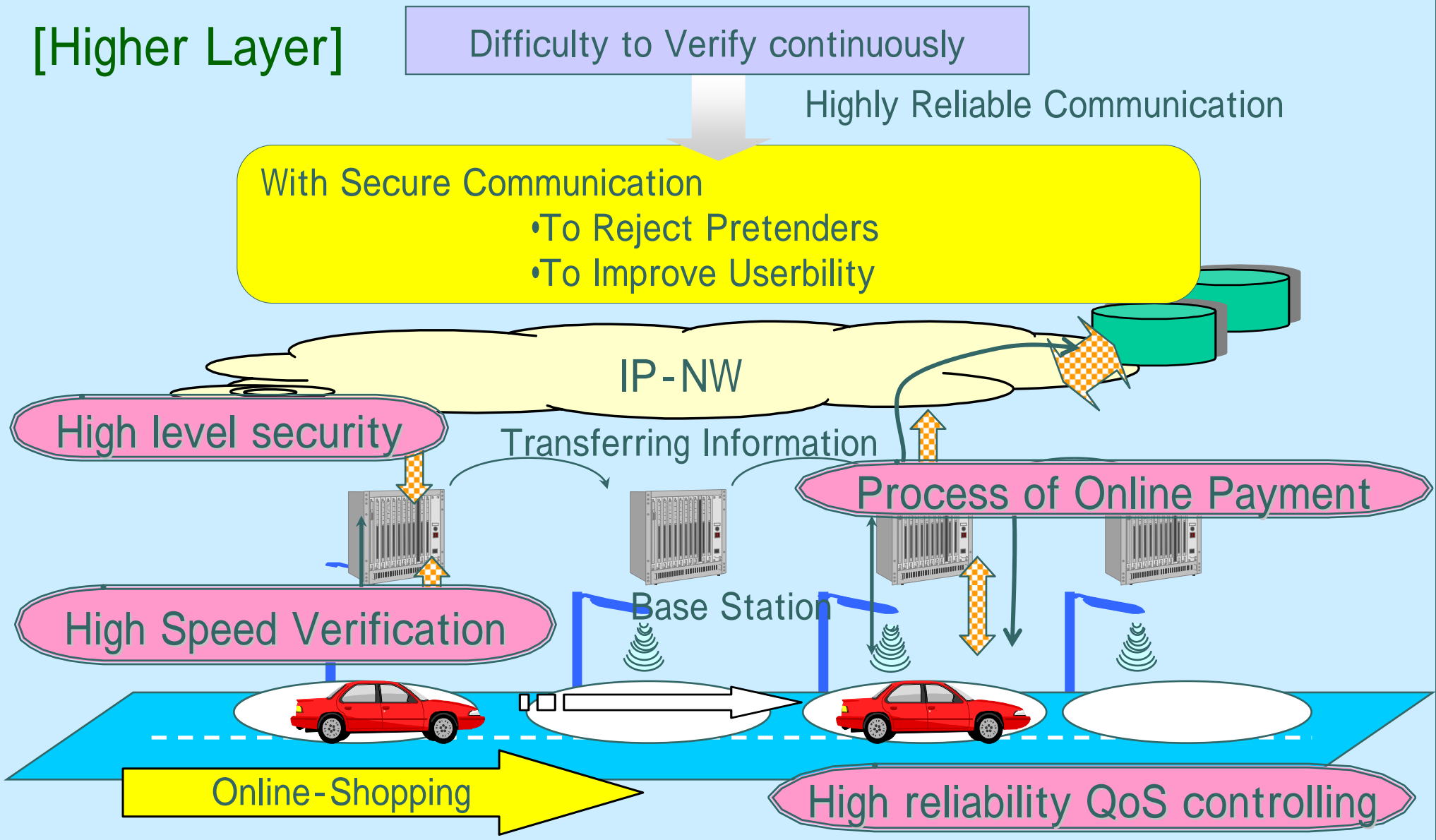
Transferring Information

Process of Online Payment

High Speed Verification

Base Station

Online-Shopping

High reliability QoS controlling

Correlation between Research Goals and Demonstration

Research Goals

Hand-over Function

Highly Reliable Communication

•Streaming Play with High
 Speed Hand-over

•QoS Controlling

•Roadside Clinic

•Online Payment

•Travel Reservation Service

•ETC (Demo)

•Reduction of DSRC Radio Interference

Applications for Demonstration

KDDI R&D LABS

R&D for ITS

In-Vehicle Communication Card

Voice Agent
 (Voice Recognition and Agent Technologies)

Seamless Communication Technology over Heterogeneous media

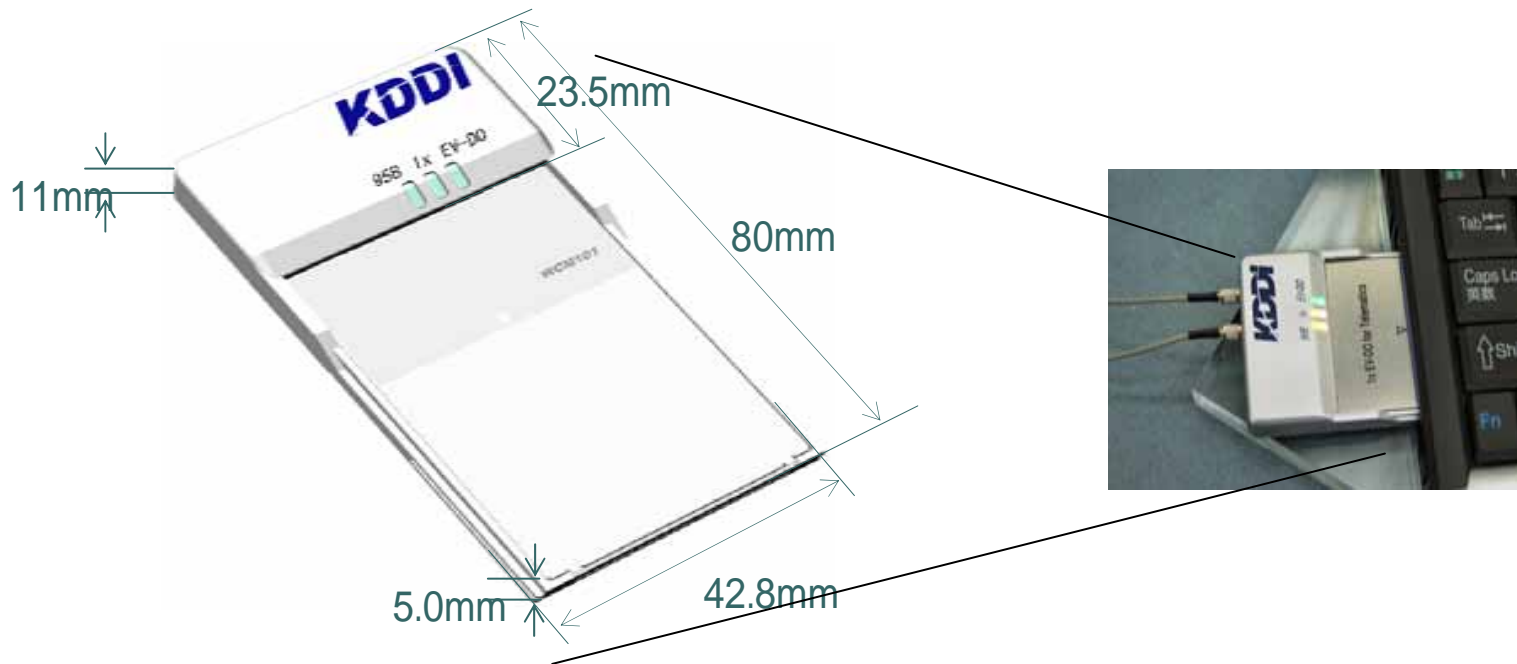Interworking of Communication and Broadcast

Others
security, SVG(Scalable Vector Graphics), IPv6, Wreless-LAN, etc.

1x - FT For Telematics

○ CF Card Type

○ Dual Mode Data Transmission of 1x EV-DO and 1x/95B

23.5mm

11mm

80mm

5.0mm

42.8mm

KDDI R&D LABS
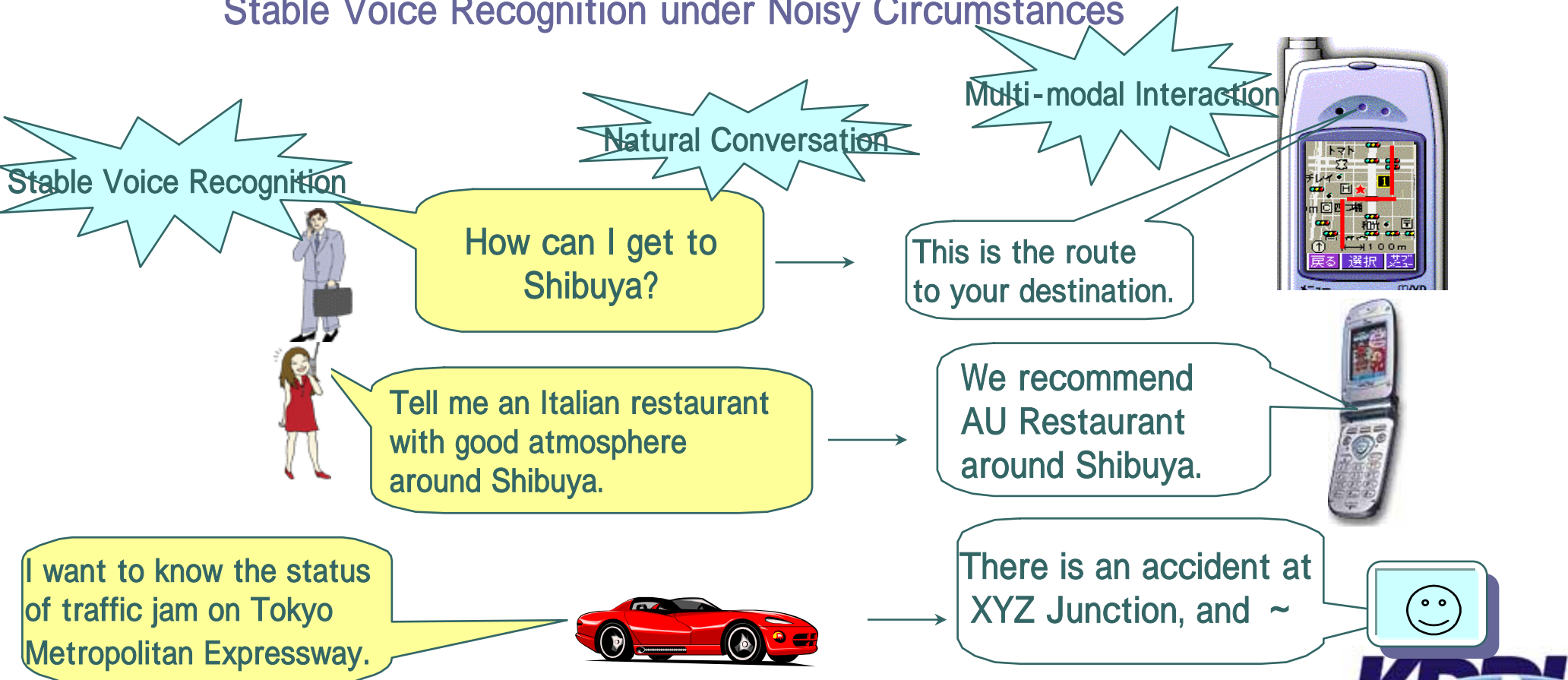
Seamless Communication Technology by In-Vehicle Mobile Router

In-Vehicle Mobile Router supports heterogeneous media (e.g. 3G Cellular PHS Wireless LAN, DSRC etc.), and selects the best media from them.

Wireless LAN

cdma2000 1x

Internet

PHS

1x EV-DO

Contents Server

DSRC

Home Office

PC

Camera

cdma2000 1x

Car Navigation

Mobile Router

PHS

PDA

Wireless LAN

Example of in-vehicle network

In-Vehicle Mobile Router (1DIN size)
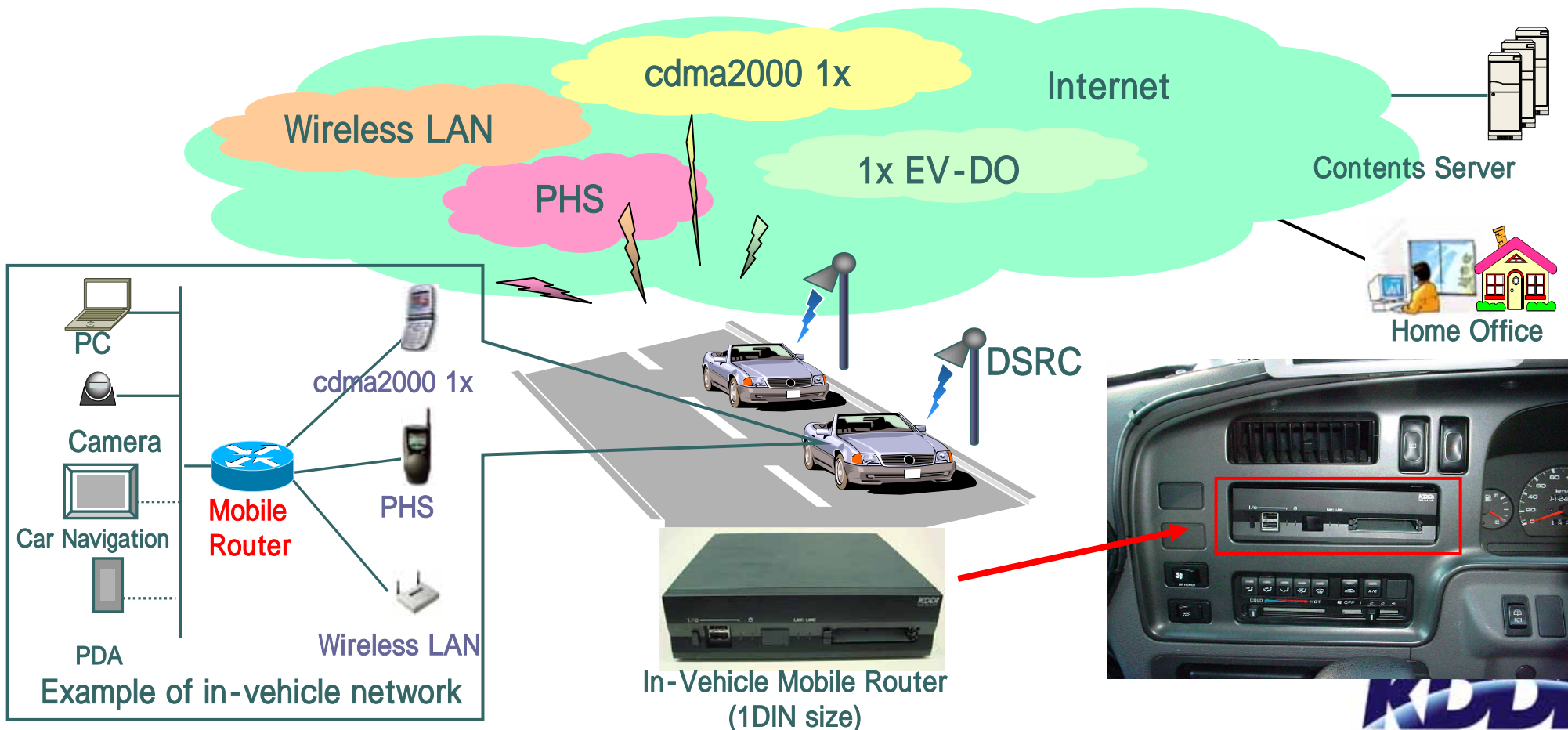
Interworking of Communication and Broadcast

Equipment of Digital Broadcast Receiver in a Cellular Phone.

Interworking of Digital Broadcast and Internet Access by a Cellular Phone

Creating New Services

Broadcast

communication

Internet
(Public Network)

Contents Server

The user watches the broadcast program (e.g. jazz festival)

The user checks the detail of players

The user can get information of players and ticket sales.

Topics for Discussions

◆ Broadband Wireless Access on the Fast-Move

<- New Generation Mobile Communications

◆ Fast and Seamless Hand-over among various Heterogeneous Wireless Access Media (Cellular, Hot Spot, DSRC, etc.)

◆ Seamless ITS Applications and Services

<- Mobile IP, IPv6, NEMO, AAA, etc.

◆ P2P Applications over Ad-hoc Network

◆ Business Model

KDDI
KDDI R&D LABS