Global IPv6 Summit in Japan 2002

"Outlooks on IPv6 Deployment"

Mobile Packet Network and its Evolution

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   "PacketOne" network with CDMA radio access network

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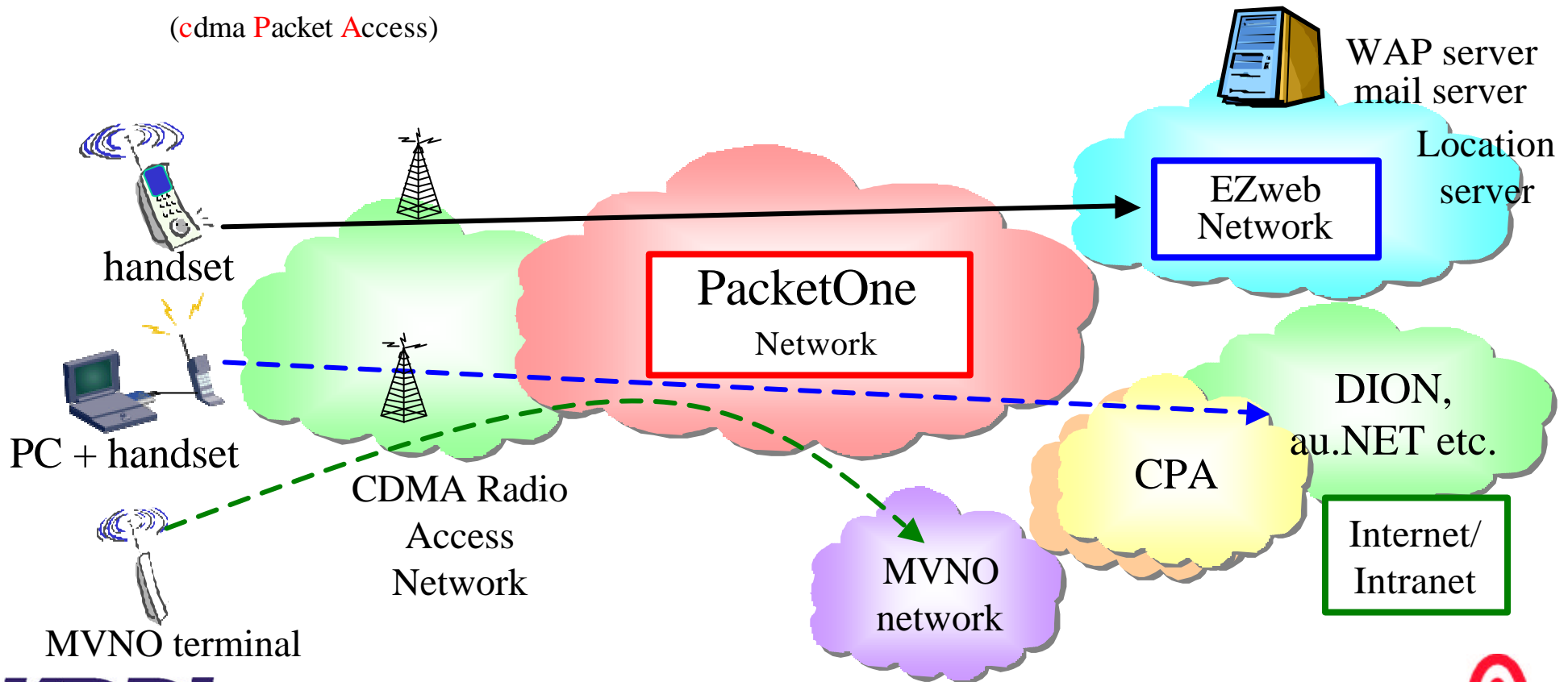
1. Commercial Mobile Packet Network

"PacketOne" network with CDMA radio access network

KDDI mobile data network

Services of "PacketOne" network

- ■ EZweb   Mobile internet access (WAP, e-mail, GPS...)
- ■ CPA / ISP   Intranet / Internet access (PC/PDA)

(cdma Packet Access)

handset

PC + handset

MVNO terminal

CDMA Radio
Access
Network

PacketOne
Network

EZweb
Network

WAP server
mail server

Location
server

DION,
au.NET etc.

CPA

MVNO
network

Internet/
Intranet

Features of "PacketOne" network

- **Packet Radio Access**
  - 95B   64Kbps,   14.4Kbps   (down/up stream)
  - 1X   144Kbps,   64Kbps   (down/up stream)
  - EV-DO   2.4Mbps,   153Kbps   (down/up stream)(to be provided 2003)
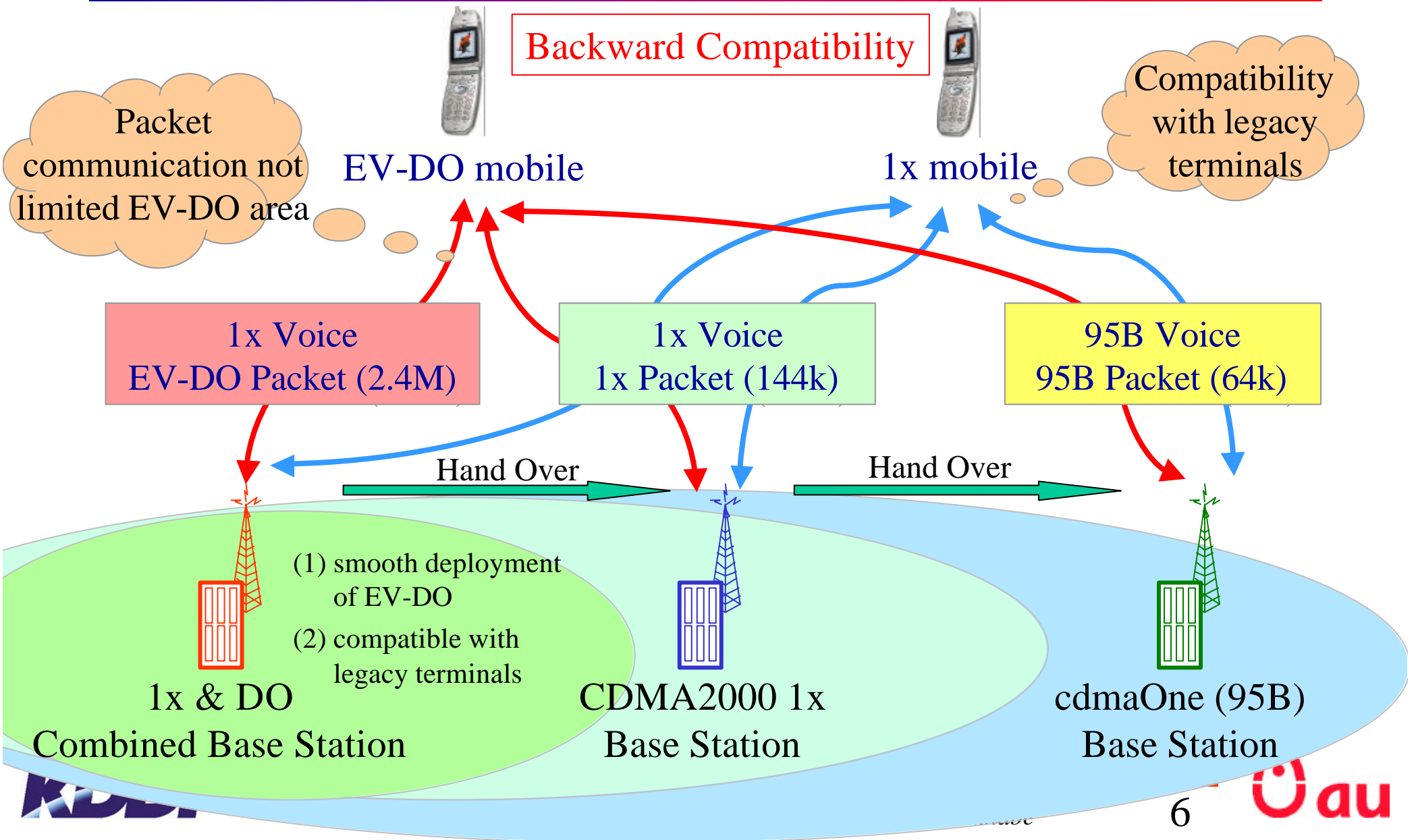
- **Seamless Mobility Support**
  - Continuous data communication while in movement
  - Continuous data communication through 95B, 1x, and EV-DO RANs
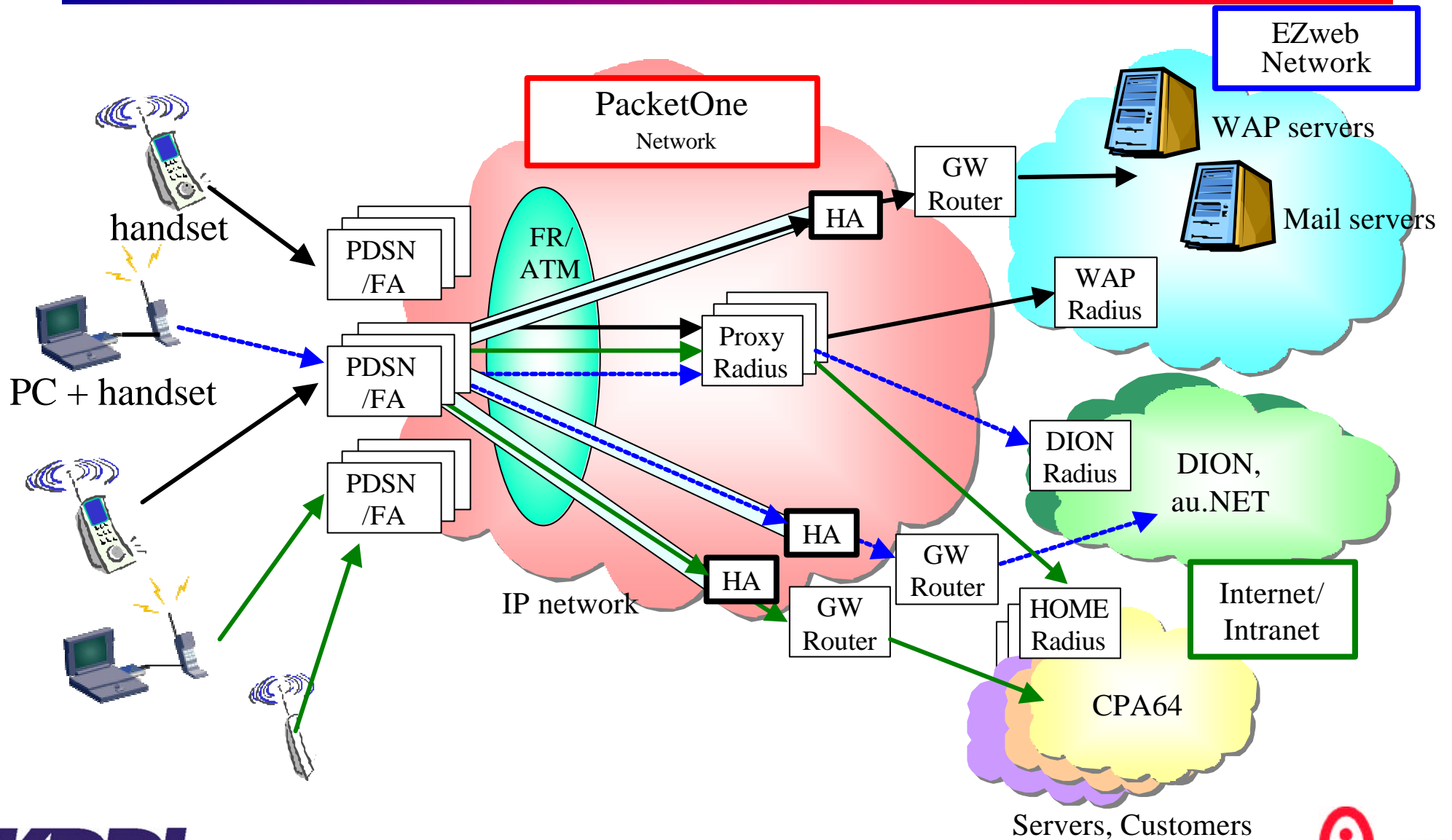
- **IP communication**
  - using IP protocol from Mobile Node to Server

Seamless coverage area and Seamless mobility

Backward Compatibility

EV-DO mobile

1x mobile

Packet communication not limited EV-DO area

Compatibility with legacy terminals

1x Voice EV-DO Packet (2.4M)	1x Voice 1x Packet (144k)	95B Voice 95B Packet (64k)

Hand Over

Hand Over

(1) smooth deployment of EV-DO

(2) compatible with legacy terminals

1x & DO
Combined Base Station

CDMA2000 1x
Base Station

cdmaOne (95B)
Base Station

"PacketOne" Network configuration

IP mobility support

- In PacketOne network, continuous data communications are supported while in movement.

- In case of mobile node H/O, MN and PDSN establish a new ppp link. HA and PDSN make a new mobile IP tunnel.

- To provide the continuity of IP communication, the same IP address must be assigned to MN before H/O. KDDI's network sports two IP address assign methods.
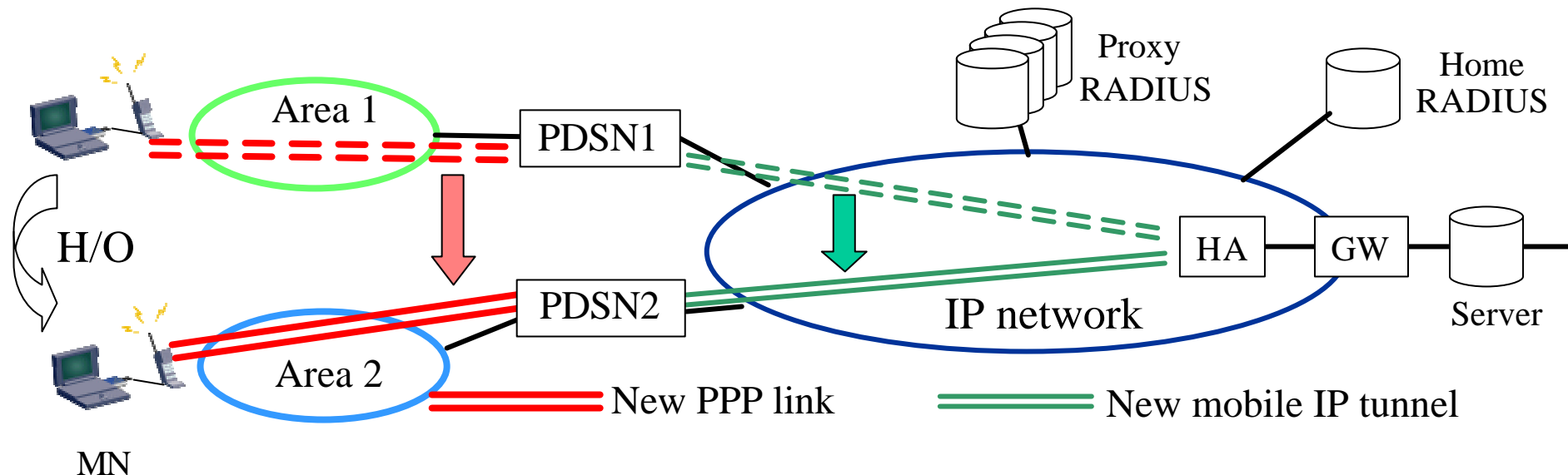
Mobile Node IP address assignment

Two types of IP address assignment methods are available.

1. Carrier assign type

   - IP address is assigned by KDDI dynamically from pooled addresses when mobile node connect to 'PacketOne' network.

   - In case of MN H/O, session management function assign the same IP address before H/O.

2. User assign type

   - IP address is assigned by user's home radius server.

   - Each MN assigned the same its own IP address every time connecting to PacketOne network.
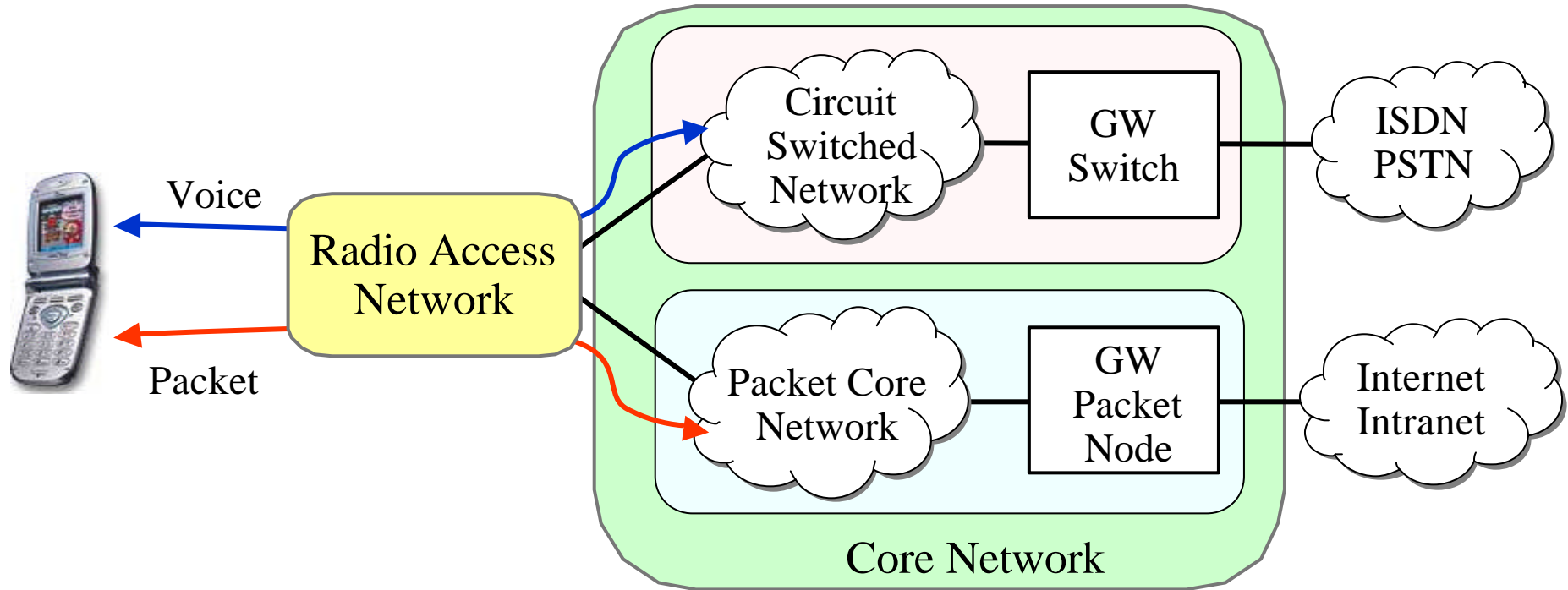
   - 'EZweb' service uses this type.

2. Evolution towards ALL-IP Network

- 3GPPs Architecture -

3GPP: 3rd Generation Partnership Project
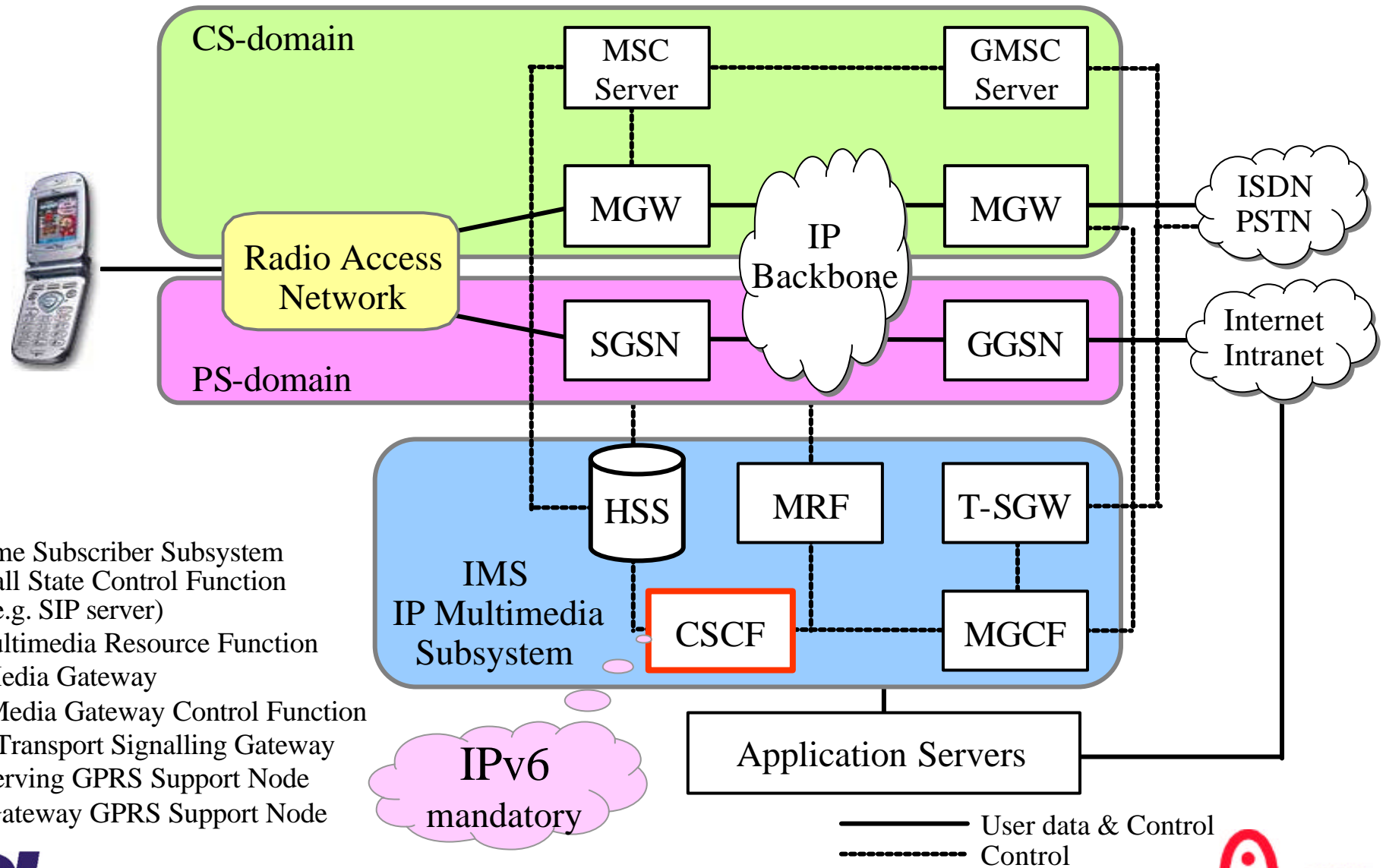3GPP2: 3rd Generation Partnership Project 2

Conventional Mobile Networks

circuit switched network for voice service
+
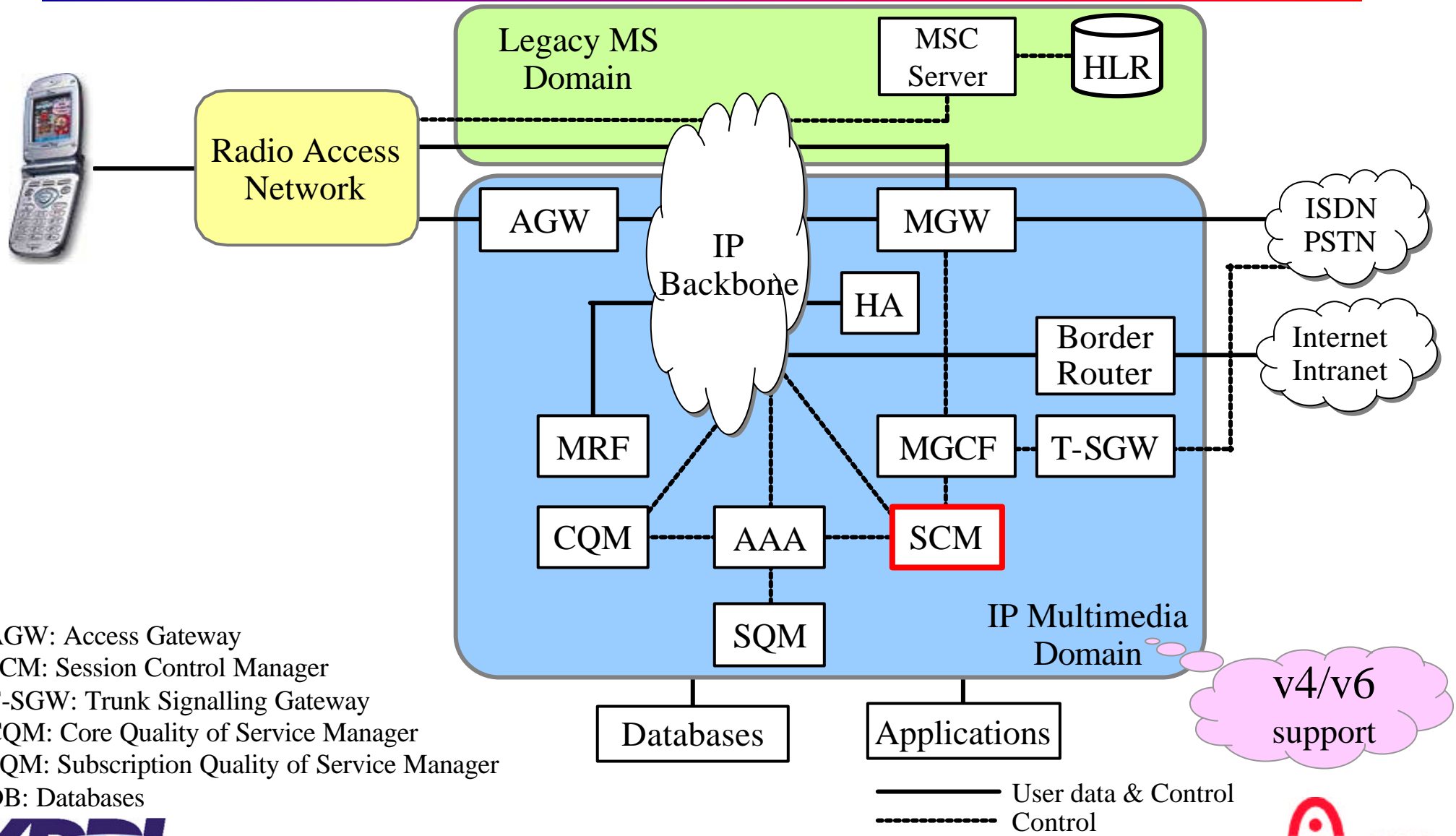additional packet network for data service

Migration to "**ALL IP**"
- Multimedia service
- Cost reduction

3GPP ALL IP architecture model

CS-domain

MSC Server

GMSC Server

ISDN PSTN

Radio Access Network

MGW

IP Backbone

MGW

PS-domain

SGSN

GGSN

Internet Intranet

IMS IP Multimedia Subsystem

HSS

MRF

T-SGW

CSCF

MGCF

HSS: Home Subscriber Subsystem
CSCF: Call State Control Function
    (e.g. SIP server)
MRF: Multimedia Resource Function
MGW: Media Gateway
MGCF: Media Gateway Control Function
T-SGW: Transport Signalling Gateway
SGSN: Serving GPRS Support Node
GGSN: Gateway GPRS Support Node

IPv6 mandatory

Application Servers

—— User data & Control
---- Control

3GPP2 ALL IP architecture model

Legacy MS Domain

MSC Server — HLR

Radio Access Network

IP Multimedia Domain

AGW — IP Backbone — MGW — ISDN PSTN

HA

Border Router — Internet Intranet

MRF

MGCF — T-SGW

CQM — AAA — SCM

SQM

Databases

Applications

v4/v6 support

AGW: Access Gateway
SCM: Session Control Manager
T-SGW: Trunk Signalling Gateway
CQM: Core Quality of Service Manager
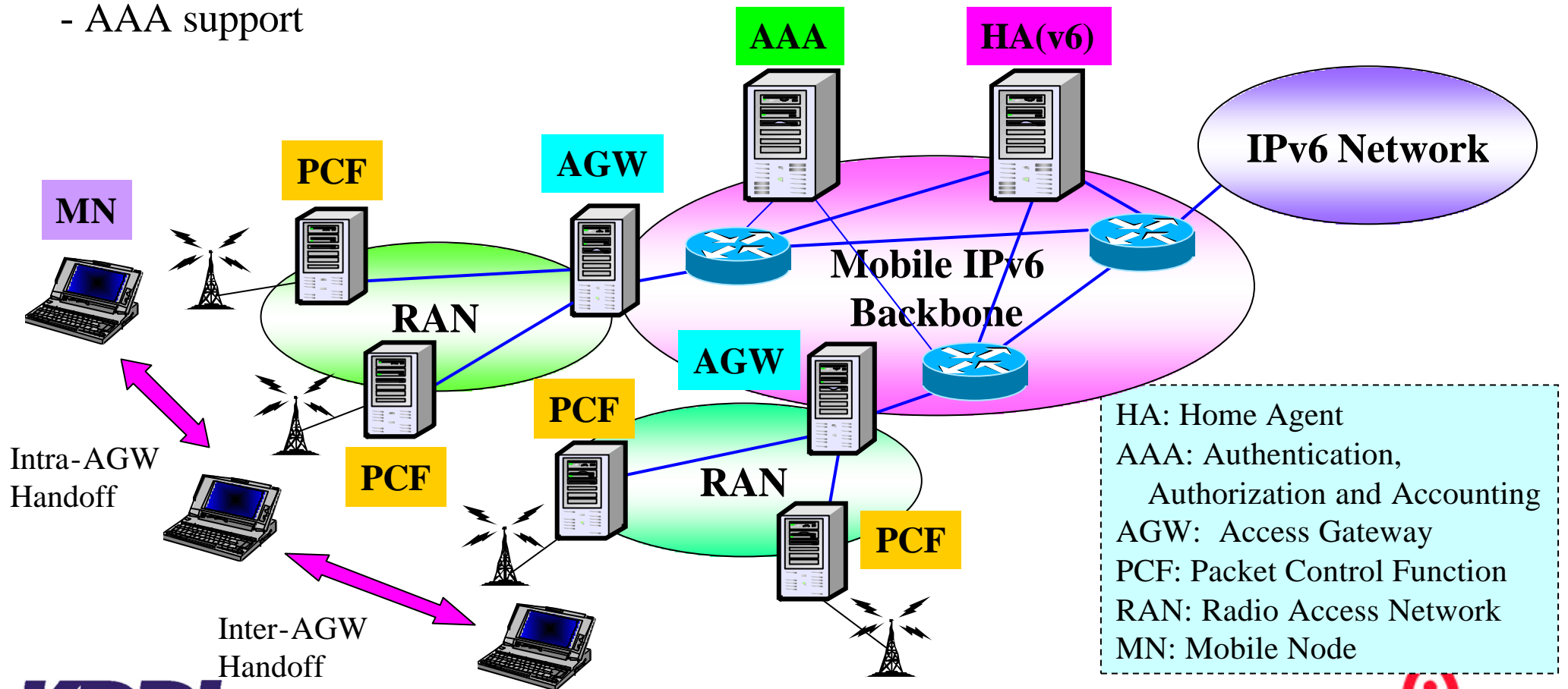SQM: Subscription Quality of Service Manager
DB: Databases

——— User data & Control
·········· Control

KDDI

au

# 3. Mobile related Research Activities on IPv6 by KDDI

Mobile IPv6 Test bed

- Verification of Mobile IPv6 based cellular network
- PC-based implementation of HA, AAA, AGW and PCF
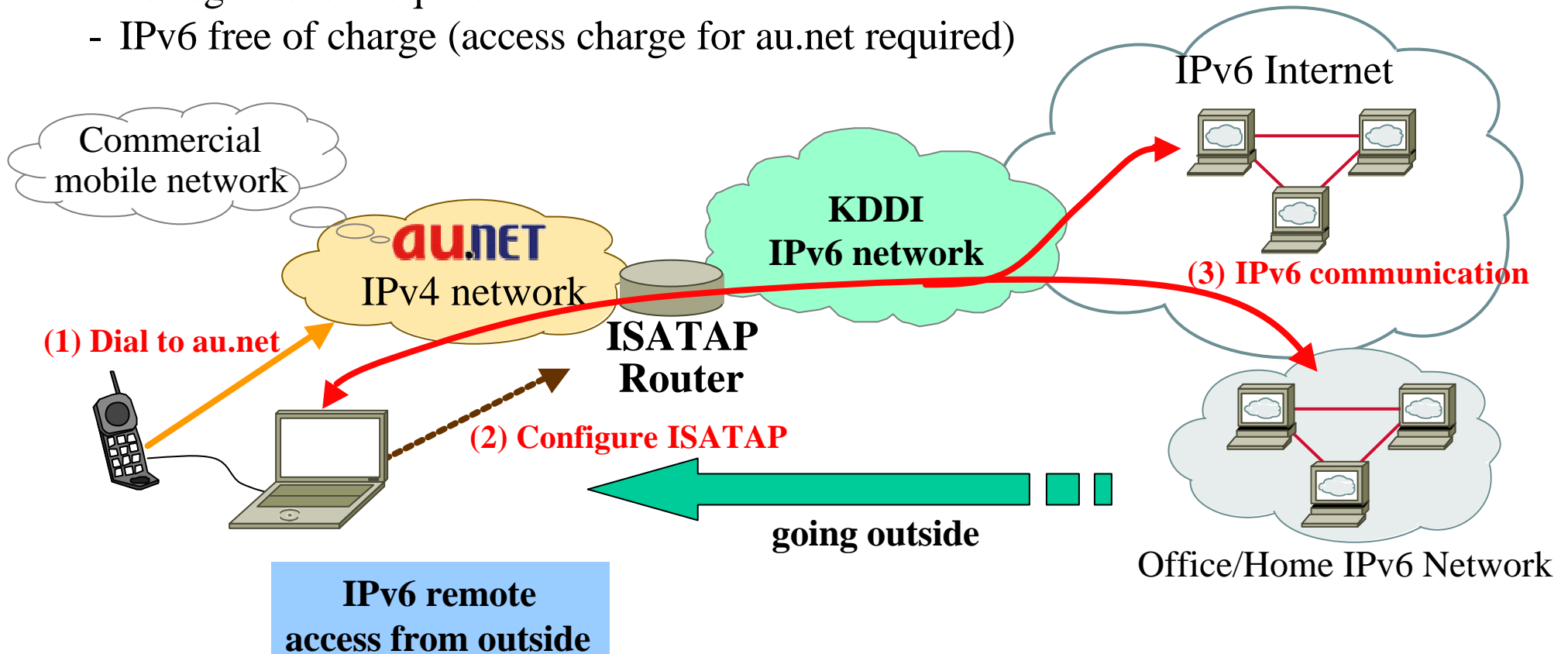- Intra-AGW and Inter-AGW handoff support
- AAA support

HA: Home Agent
AAA: Authentication,
    Authorization and Accounting
AGW: Access Gateway
PCF: Packet Control Function
RAN: Radio Access Network
MN: Mobile Node

Mobile IPv4/v6 Co-operation

- Efficient mobility management by Mobile IP cellular backbone
- Co-operation of Mobile IPv4 and Mobile IPv6 protocols
- Support of IPv6 home network access (ISP, enterprise etc.)
- Support of IPv6, IPv4 and IPv4/v6 dual stack mobile nodes
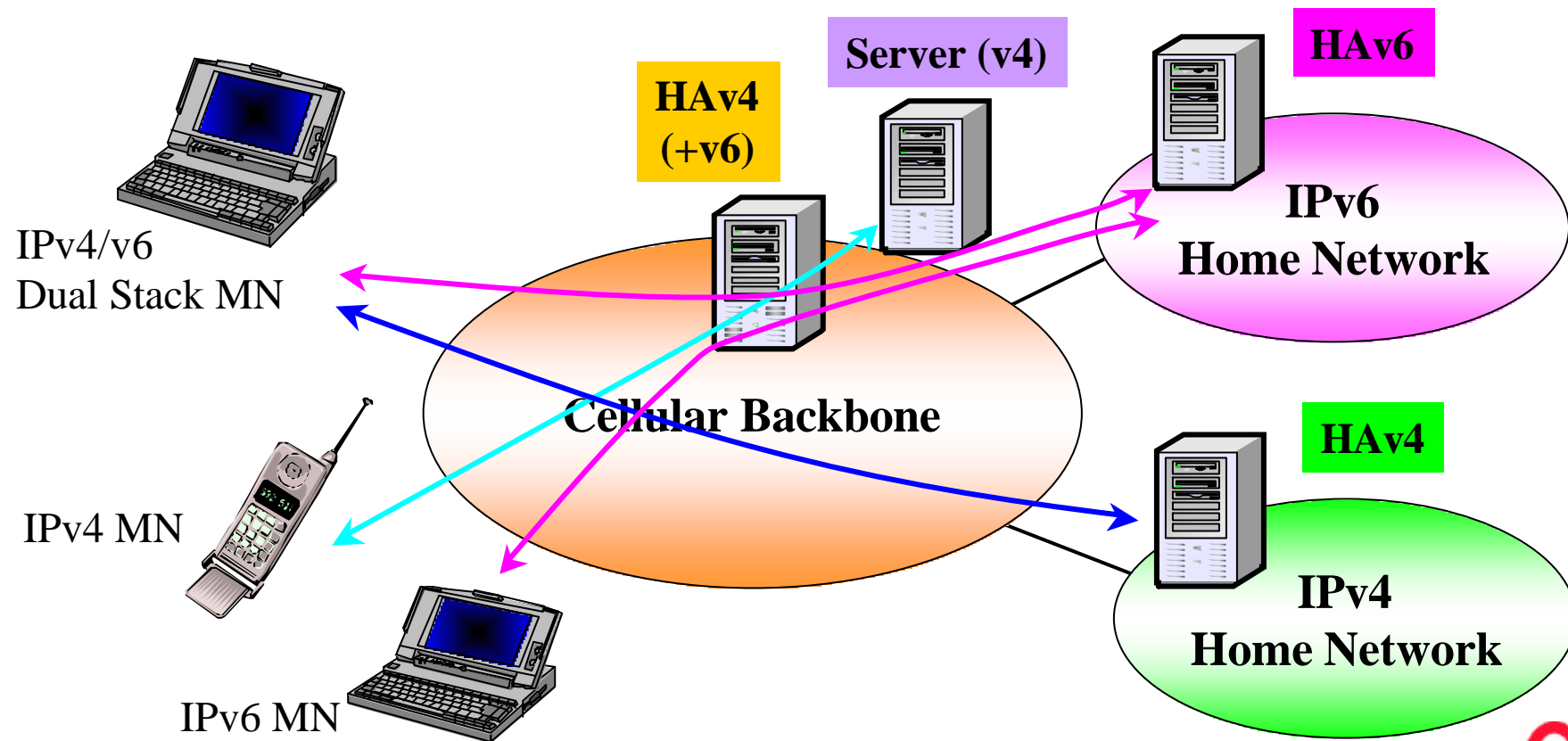
IPv6 Remote Access Field Trial from au.net

- Intra-Site Automatic Tunnel Addressing Protocol
- open to au.net users (KDDI's mobile Internet service)
- no registration required
- IPv6 free of charge (access charge for au.net required)

Commercial mobile network

IPv6 Internet

au.net
IPv4 network

KDDI
IPv6 network

(3) IPv6 communication

(1) Dial to au.net

ISATAP
Router

(2) Configure ISATAP

going outside

Office/Home IPv6 Network

IPv6 remote access from outside

http://isatap.kddilabs.jp

Efficient Macro/Micro Motility

- Mobility between Heterogeneous Mobile Networks (Macro Mobility)
- Hierarchical Mobile IP / L2 Assisted Fast Handoff (Micro Mobility)
- Coordination of Authentication and Mobility Management
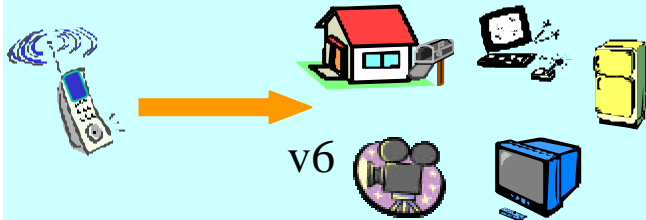- Preservation of Address / Session / QoS Context
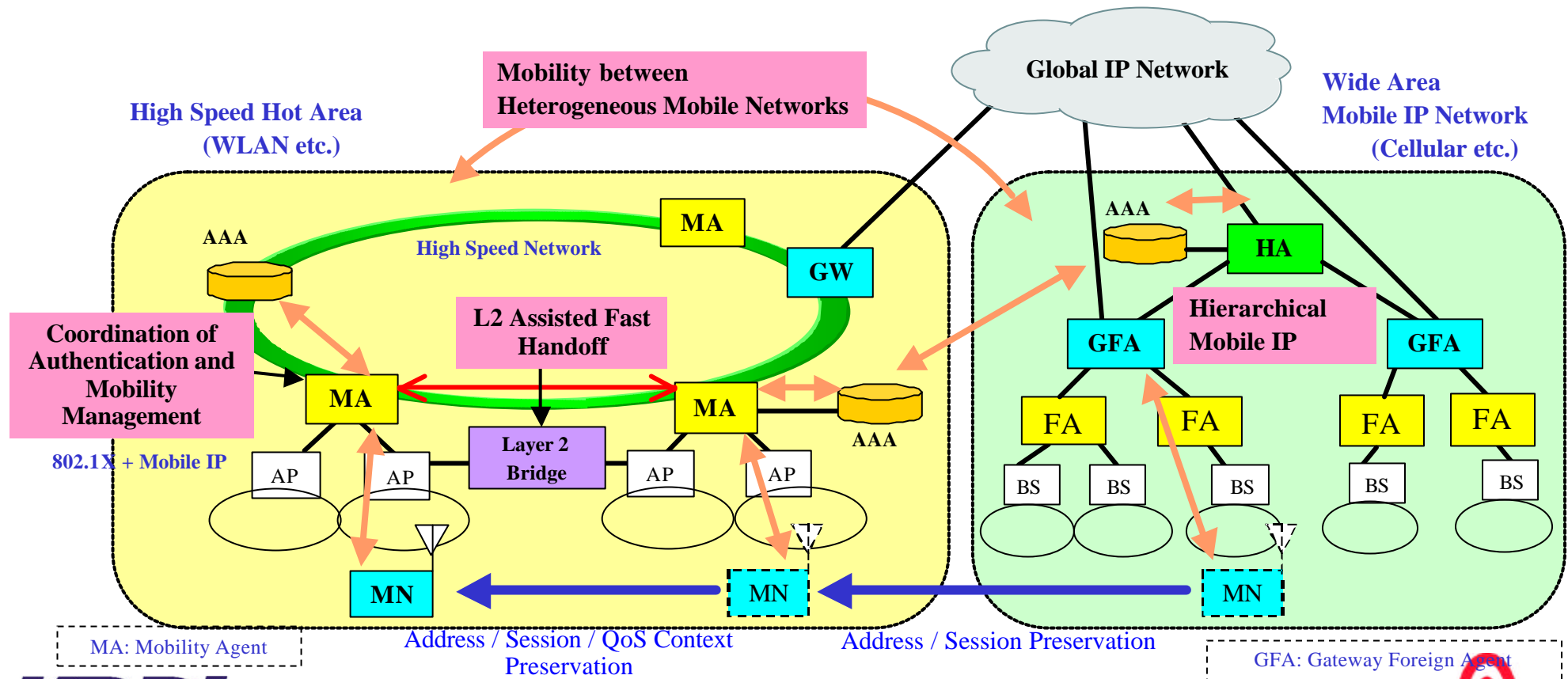
4. KDDI Vision of IPv6

IPv6 Network to support user demands

Consumer Demands   Home Access from Outside

Motivation:
Home network appliances will be available by 2003.
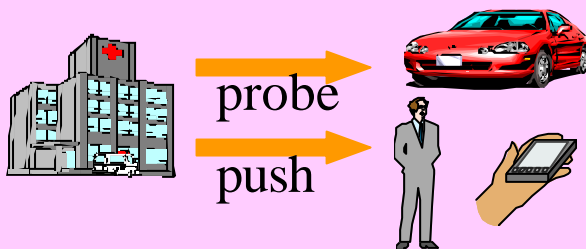(use of IPv6 necessary to solve address shortage problems)

Solution:
IPv6/IPv4 dual-stack broadband (ADSL/FTTH/CATV) service
IPv6 access from browser phones via IPv4/v6 translator
Native IPv6 access from mobile/PHS terminals

v6

Enterprise Demands   Probe car Info (ITS)
Push information to sales representatives outside

Motivation:
needs to access mobile terminals directly

Solution:
IP push by static IPv6 address
IPv6 push to mobile terminals (via IPv6 gateway)
Native IPv6 access to mobile/PHS terminals
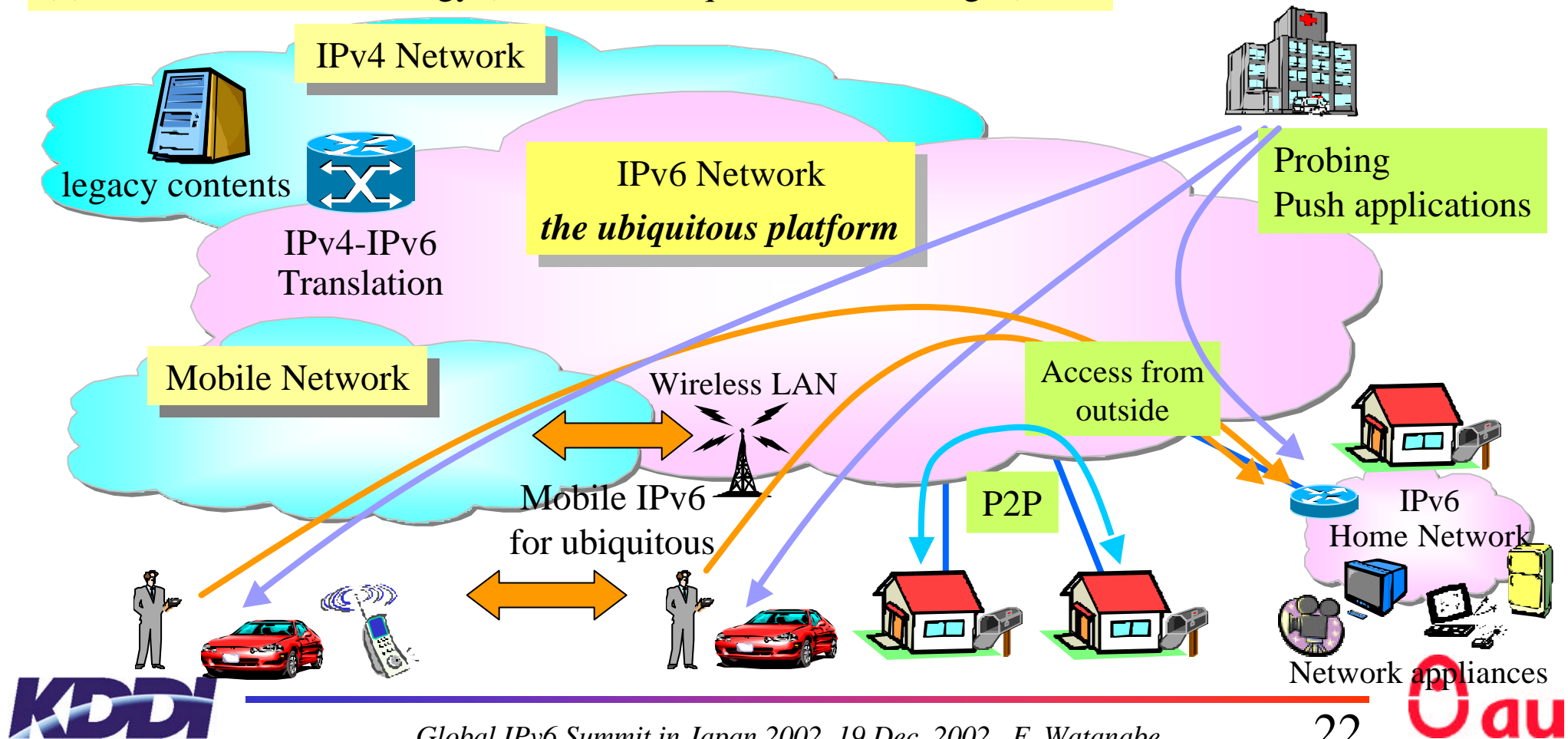
probe

push

KDDI IPv6 Commercial Service

- IPv6 over IPv4 Tunneling Service (Planned FY2002)
- IPv6 Native Access Service (Started Nov. 2002)
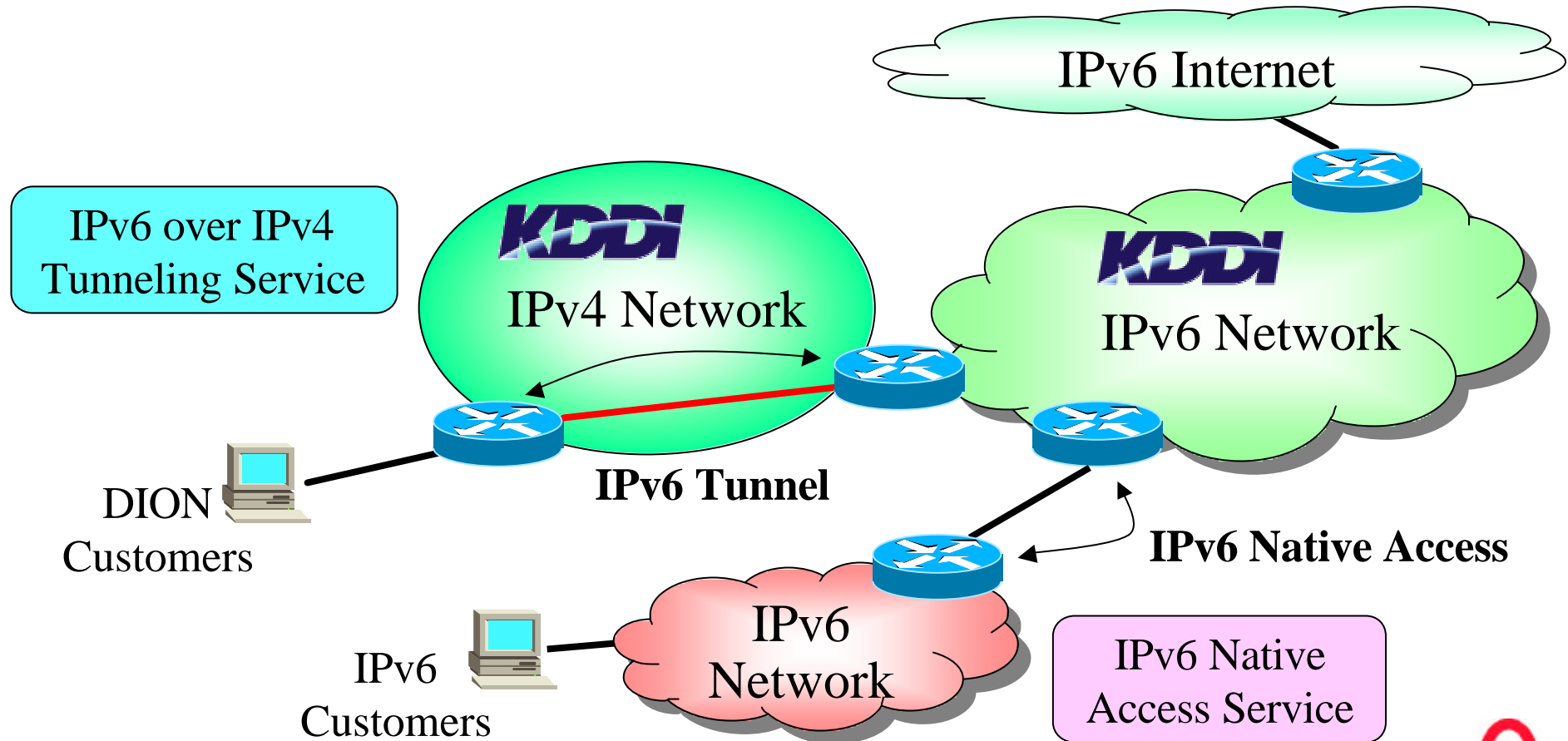
KDDI's Ubiquitous Networking Vision

Key Technologies:
(1)   IPv6 enabled mobile network (realization technology may vary…)
(2)   IPv4-IPv6 interworking (for smooth migration of v4 contents)
(3)   Mobile IPv6 technology (for "true" ubiquitous networking…)

IPv4 Network

legacy contents

IPv4-IPv6
Translation

IPv6 Network
the ubiquitous platform

Probing
Push applications

Mobile Network

Wireless LAN

Access from
outside

Mobile IPv6
for ubiquitous

P2P

IPv6
Home Network

Network appliances

Thank You

www.kddi.com

www.au.kddi.com

www.dion.ne.jp