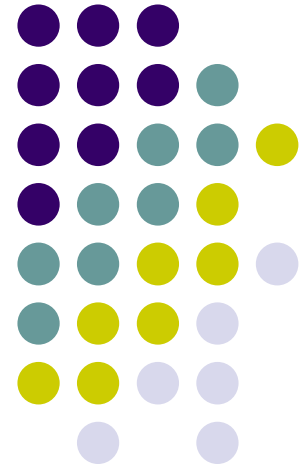
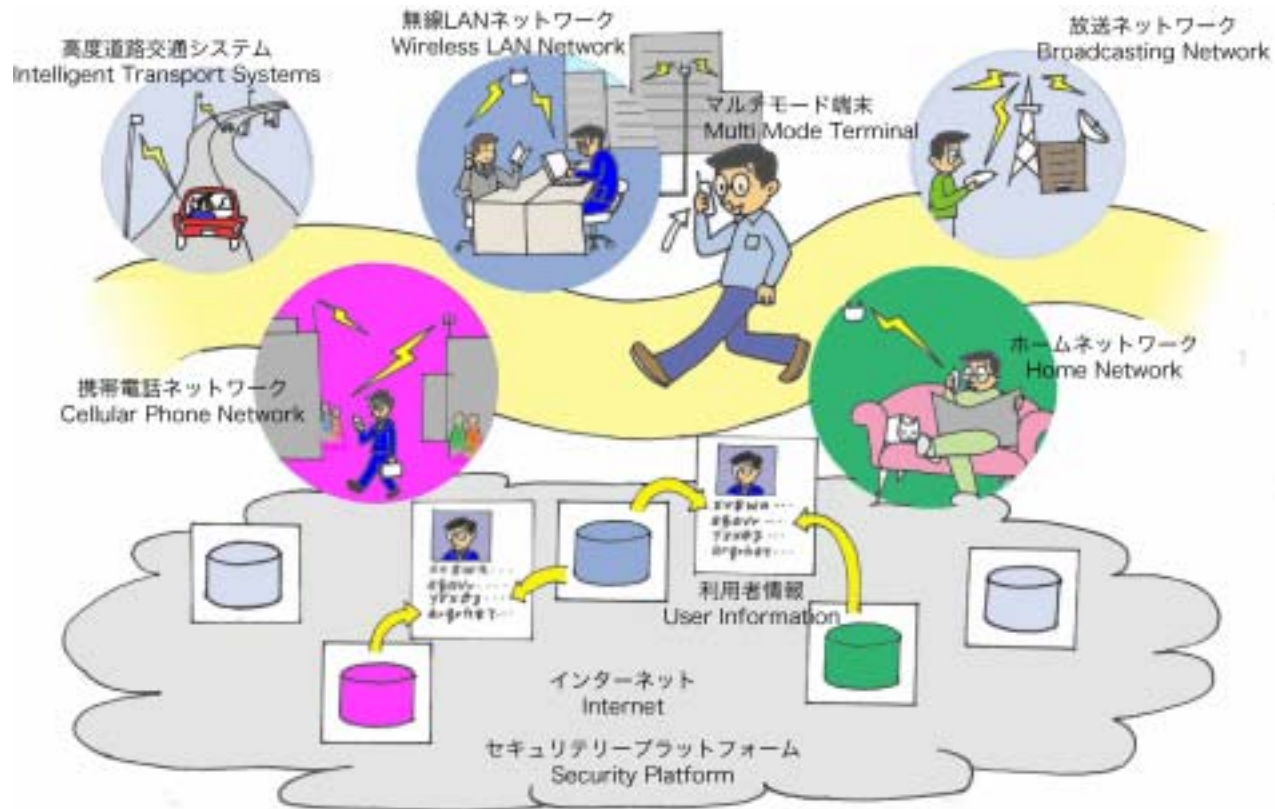


# New-Generation Mobile Network Project



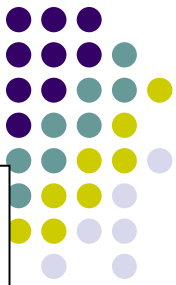
Homare Murakami  
2003.1.23

# New-Generation Mobile Network Project



# 新世代モバイル研究開発プロジェクトの推進戦略

## Strategy for New-Generation Mobile Network Project



### 研究開発体制 R&D Structure

- 企業・大学・CRLの連携による研究開発拠点  
コンソーシアムの形成  
Consortium for collaboration with industries and universities.
- テストベッドの構築 Test-bed construction
- フォーラム等研究組織との連携 Collaboration with R&D organizations

### 世界標準化の推進 Global Standardization

- 国際競争と協調に配慮した世界標準化の推進: Promotion of global standardization considering with international collaboration and competition

### 重点研究開発項目 Target Technologies

- 無線セキュリティプラットフォーム技術 Wireless Security Platform Technology
- メディアハンドオーバー技術 Media Hand-Over Technology
- 無線アクセス技術 Wireless Access Technology

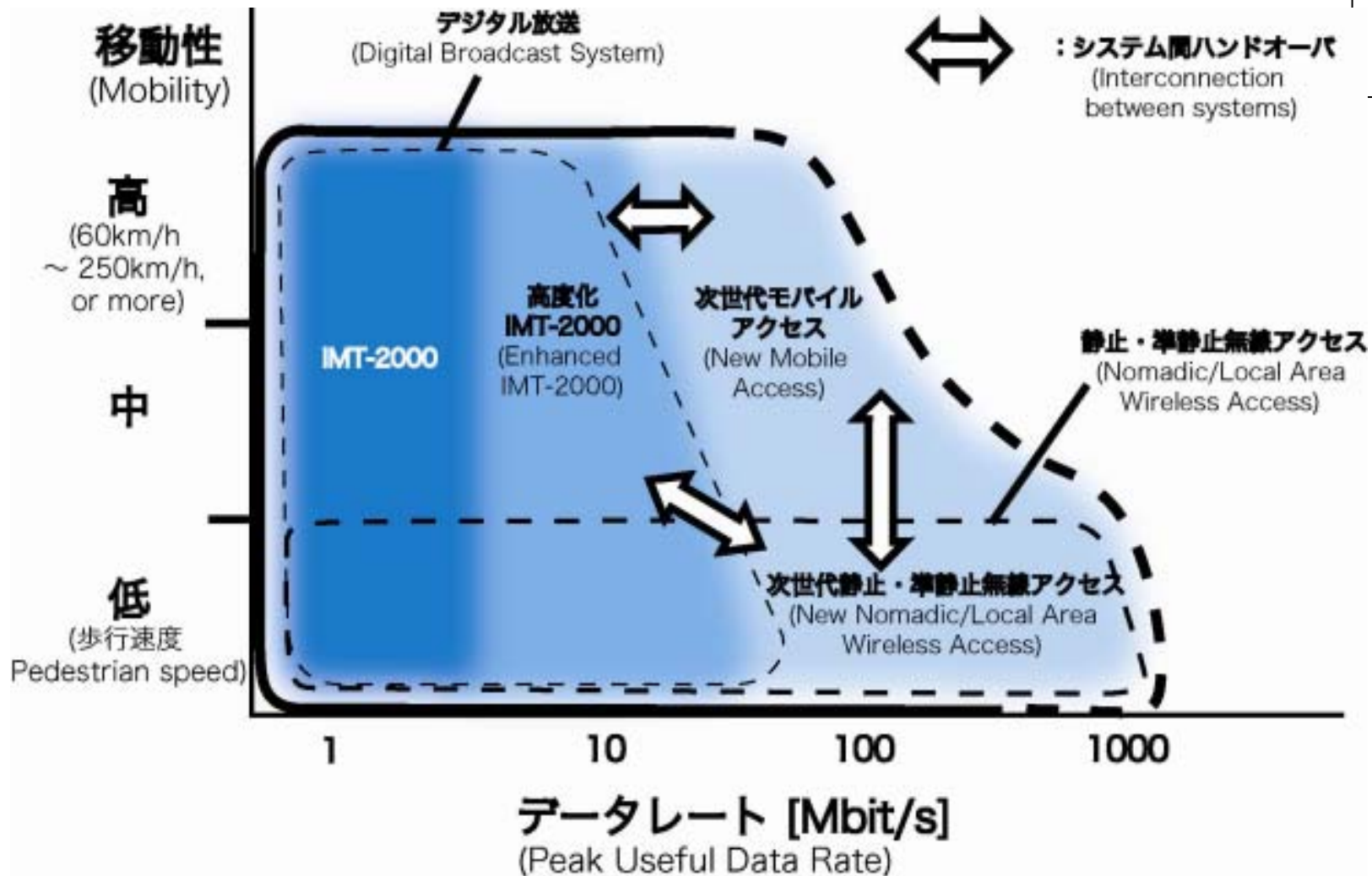
### 国際的な協調の推進 Promotion of International Collaboration

- ITU等の活動への積極的寄与  
Contribution to ITU, etc.
- 欧米、アジア諸国との研究開発・国際標準化等の連携  
Collaboration with Asia-Pacific countries as well as the United States and Europe

### シナリオに即したアプリケーションの開発 Application Development based on Scenarios

- アプリケーションマーケット創出に配慮した研究開発・標準化の推進  
Aim to create markets using developed applications

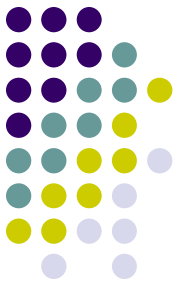
# Mobile Environment for system beyond IMT-2000



濃い青が現在のIMT-2000、中間の青が高度化IMT-2000、薄い青がIMT-2000の次の世代のシステム

Dark blue color indicates existing capabilities, medium blue color indicates enhancements to IMT-2000, and the lighter blue color indicates new capabilities of Systems Beyond IMT-2000

# Organization of New-Generation Mobile Network Project



**Project Director**

**Prof. Adachi, Tohoku University**

**Planning and Management  
by Project Office**

**Wireless Security Platform Technology  
by Wireless Application Group**

**Secure “Anytime and Anywhere” Services  
Safety Reliable Services**

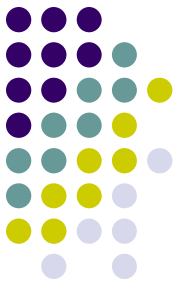
**Media Hand-Over Technology  
by Mobile Network Group**

**Seamless Mobile Networking  
Ubiquitous Networking**

**Wireless Access Technology  
by Wireless Access Group**

**Broadband Macro-Cell Communications  
Wireless Access Traverse for Street Cells**

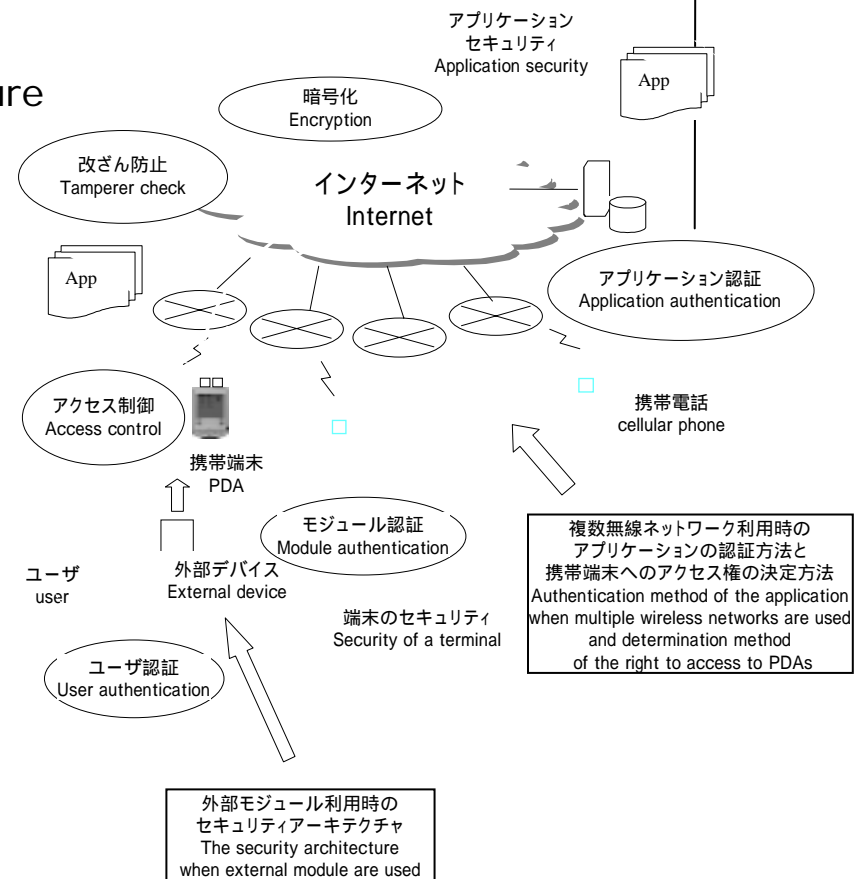
# Wireless Security Platform Technology



A wide range of wireless security technologies, which target secure “anytime and anywhere” services and safety reliable services in the future wireless network, is studied.

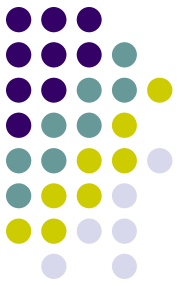


Secure “Anytime and Anywhere” Services

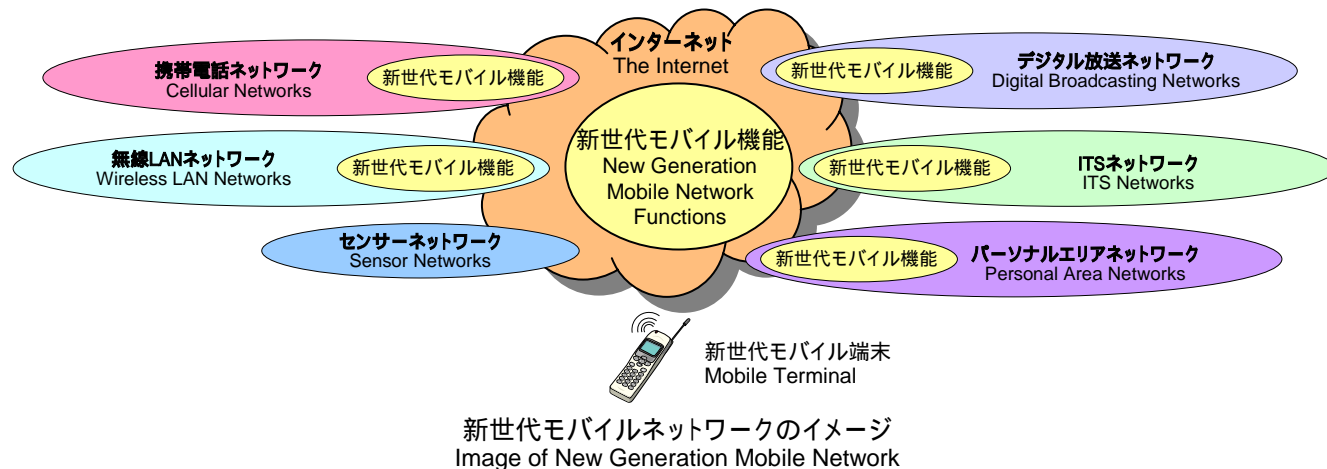


Client/Server Security Framework

# Media Hand-Over Technology

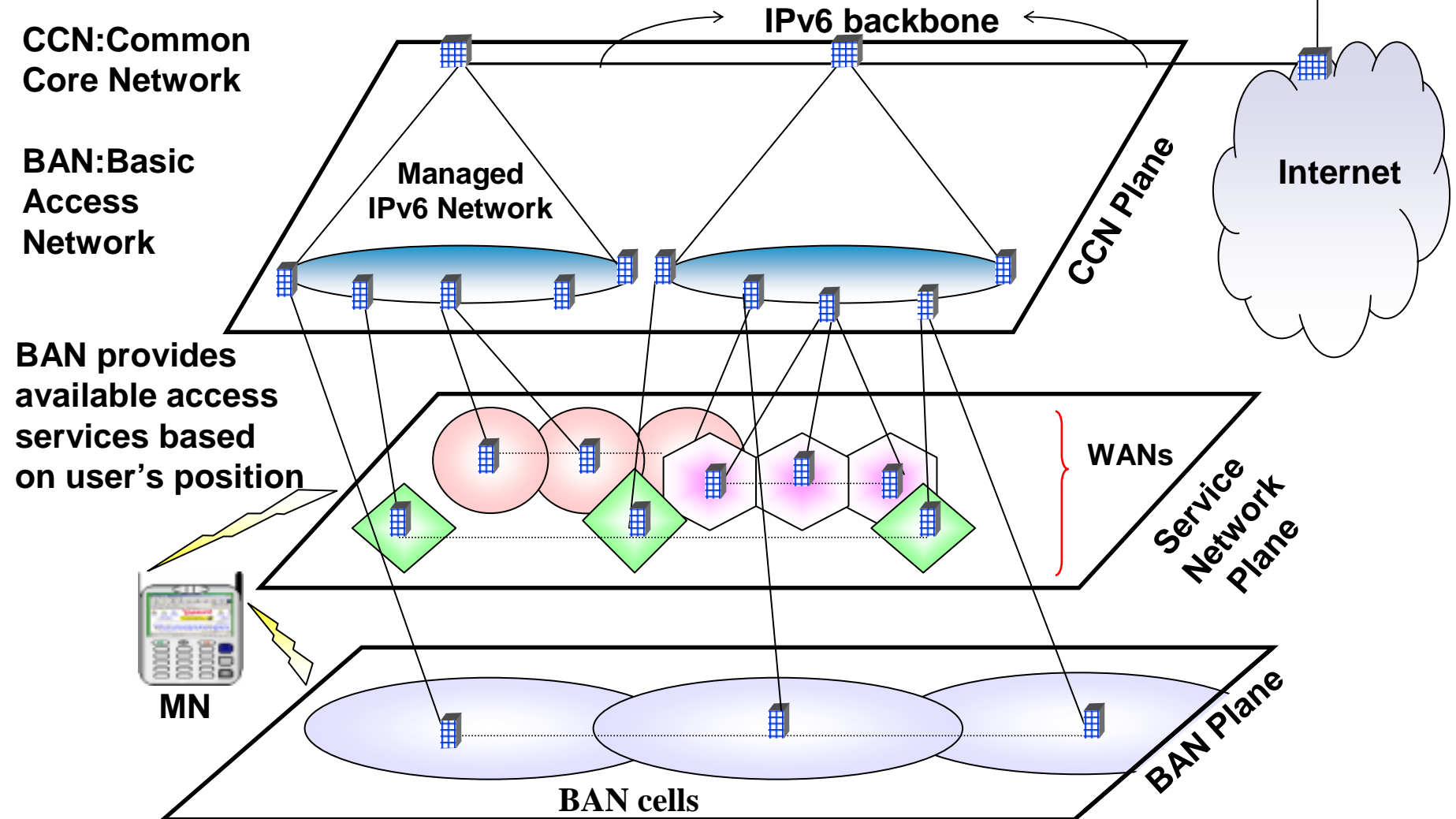


- Seamless handover technology
  - location management of user terminals
  - network discovery, selection and handover
- High speed handover technology
  - efficient transport techniques and handover mechanisms



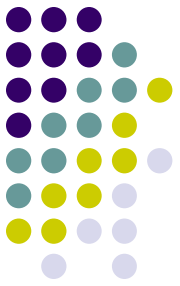


# Media Hand-Over Technology - MIRAI Architecture -





# Wireless Access Technologies



- Broadband macro-cell technology with a data rate of 100 Mbps
- Wireless access technology with a data rate of 1 Gbps for hot-spot type
- A moving speed of 150 km/h for street cell type
- Software defined radio based multimode terminal to realize seamless media handover technology

# Wireless Access Technologies

## - Software Radio Technology -

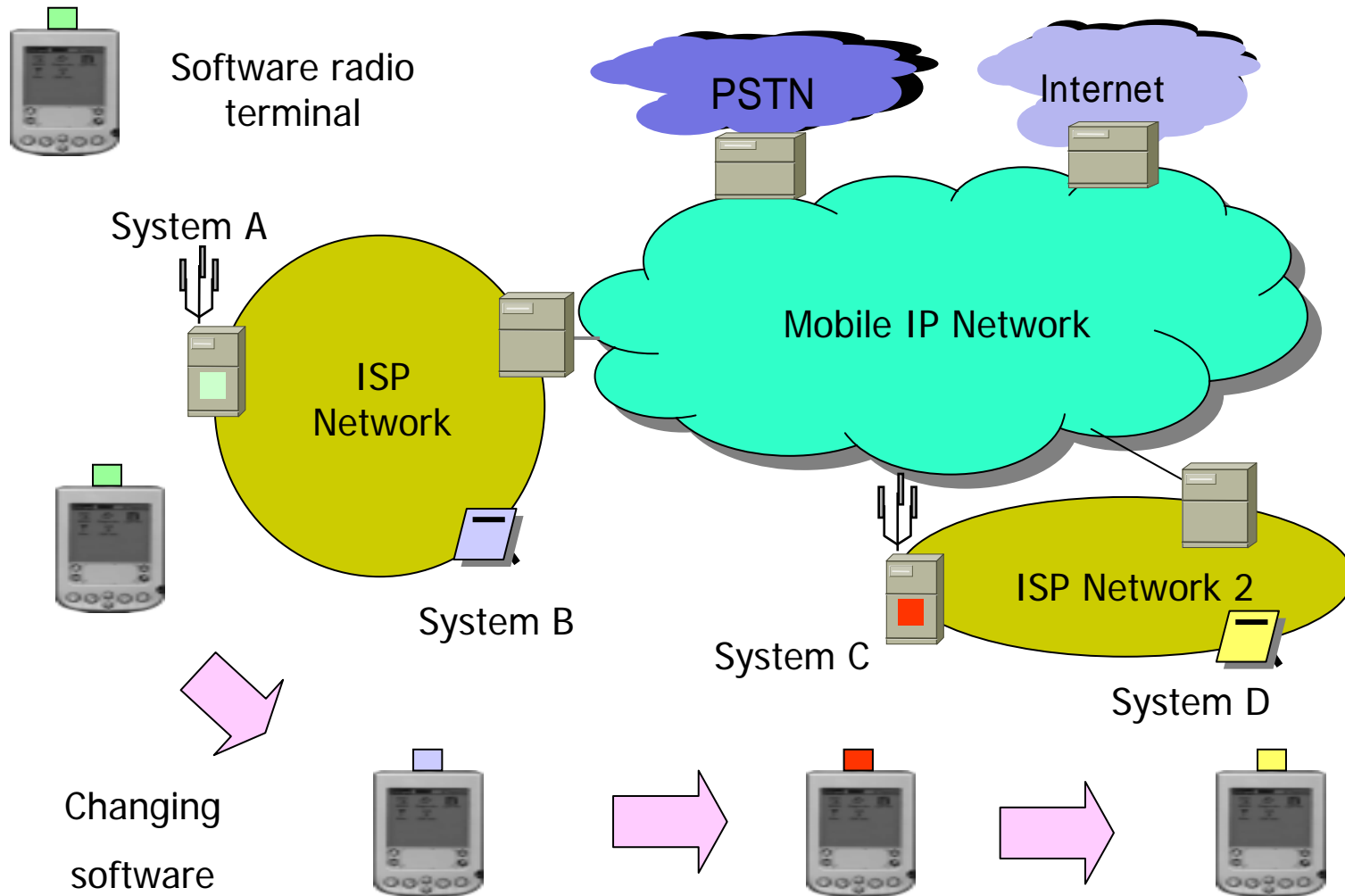
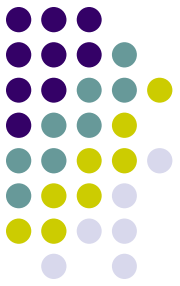


- ETC, VICS, ETC, AM/FM broadcasting, FM Multiple service can be realized **by changing software**
- **Five services** can be used **simultaneously**
- 17.5 cm wide, 19.0 cm deep, 5 cm high
- **DC-12.0V** 2A

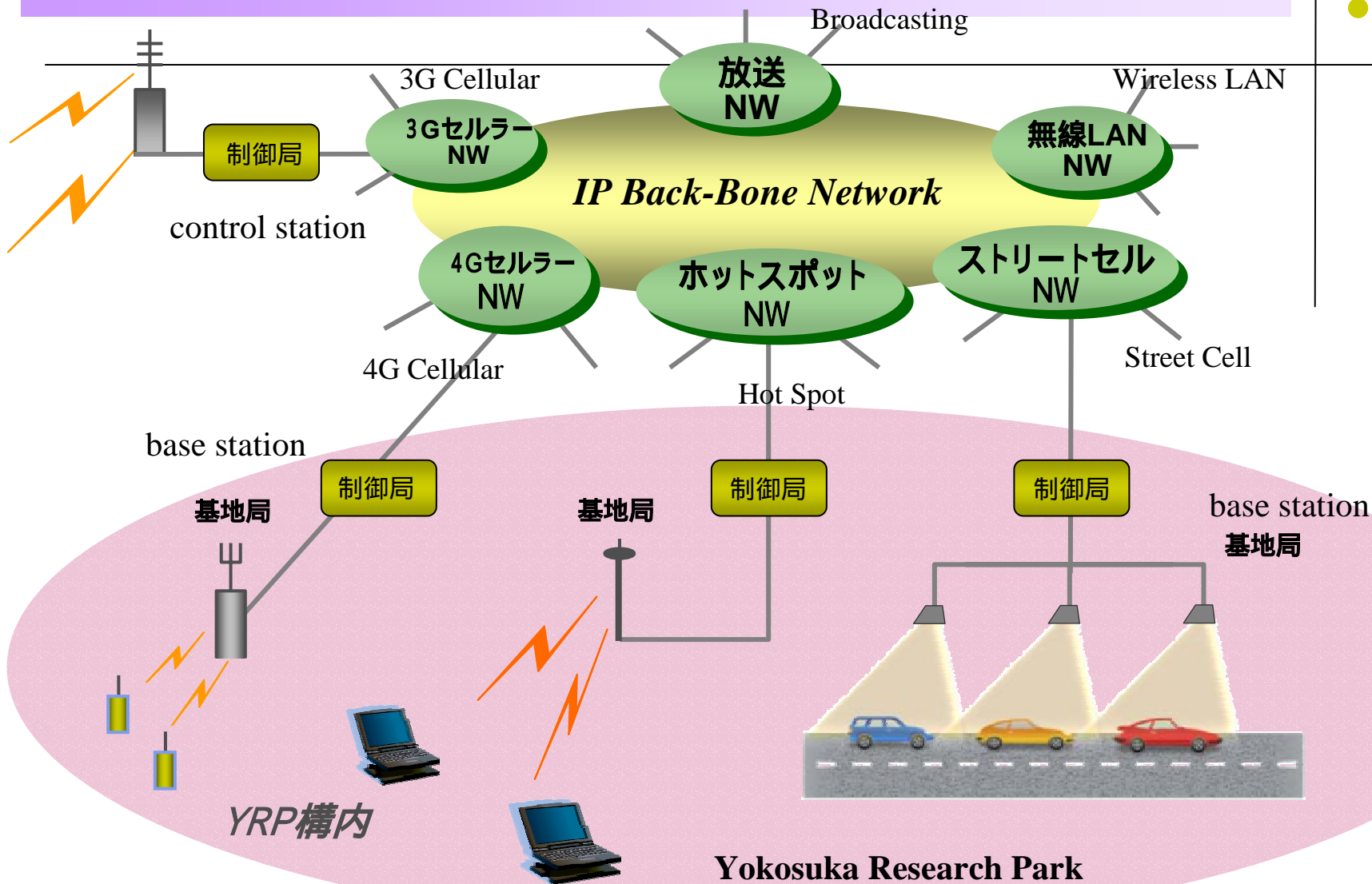


# Wireless Access Technologies

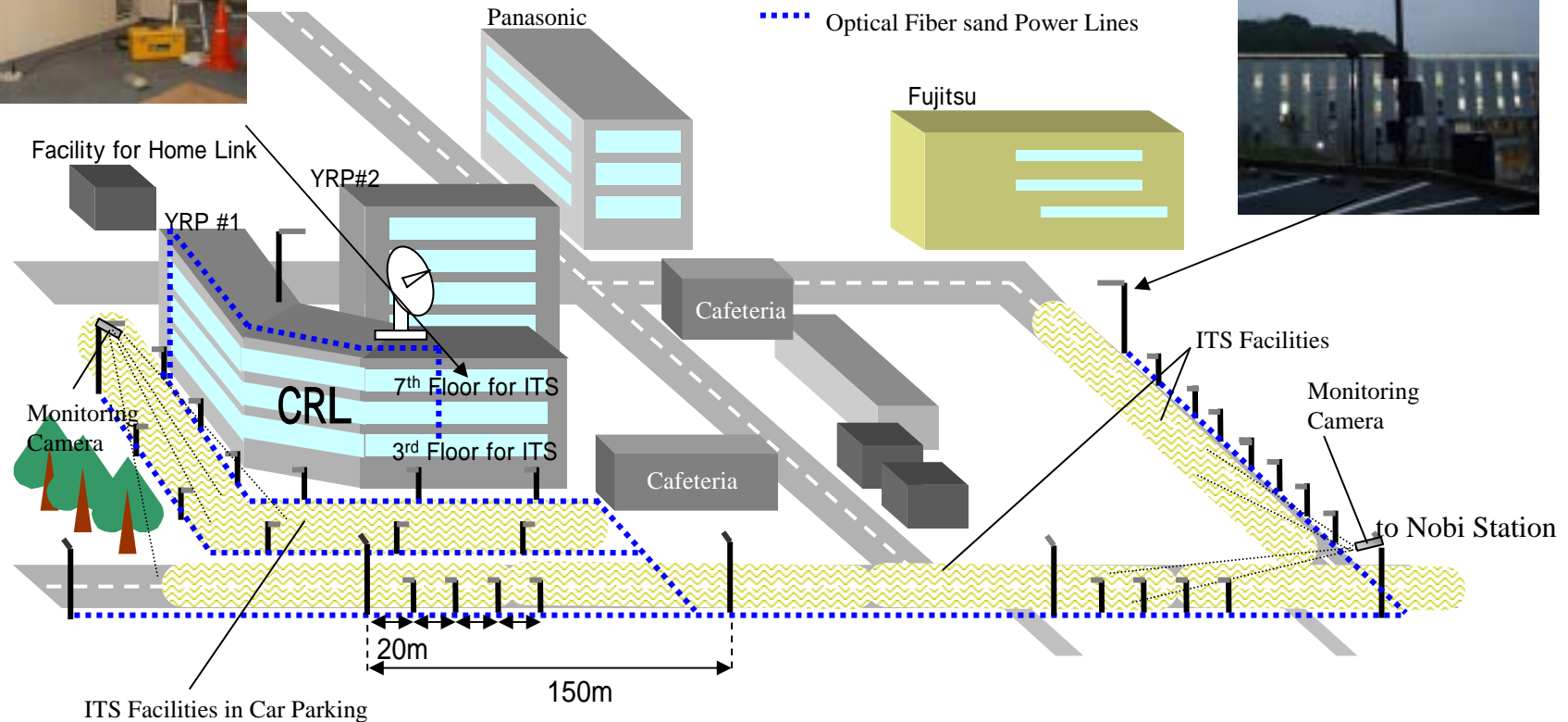
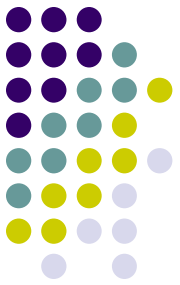
## - Software Radio Technology2 -



# Test Bed in YRP –Concept–

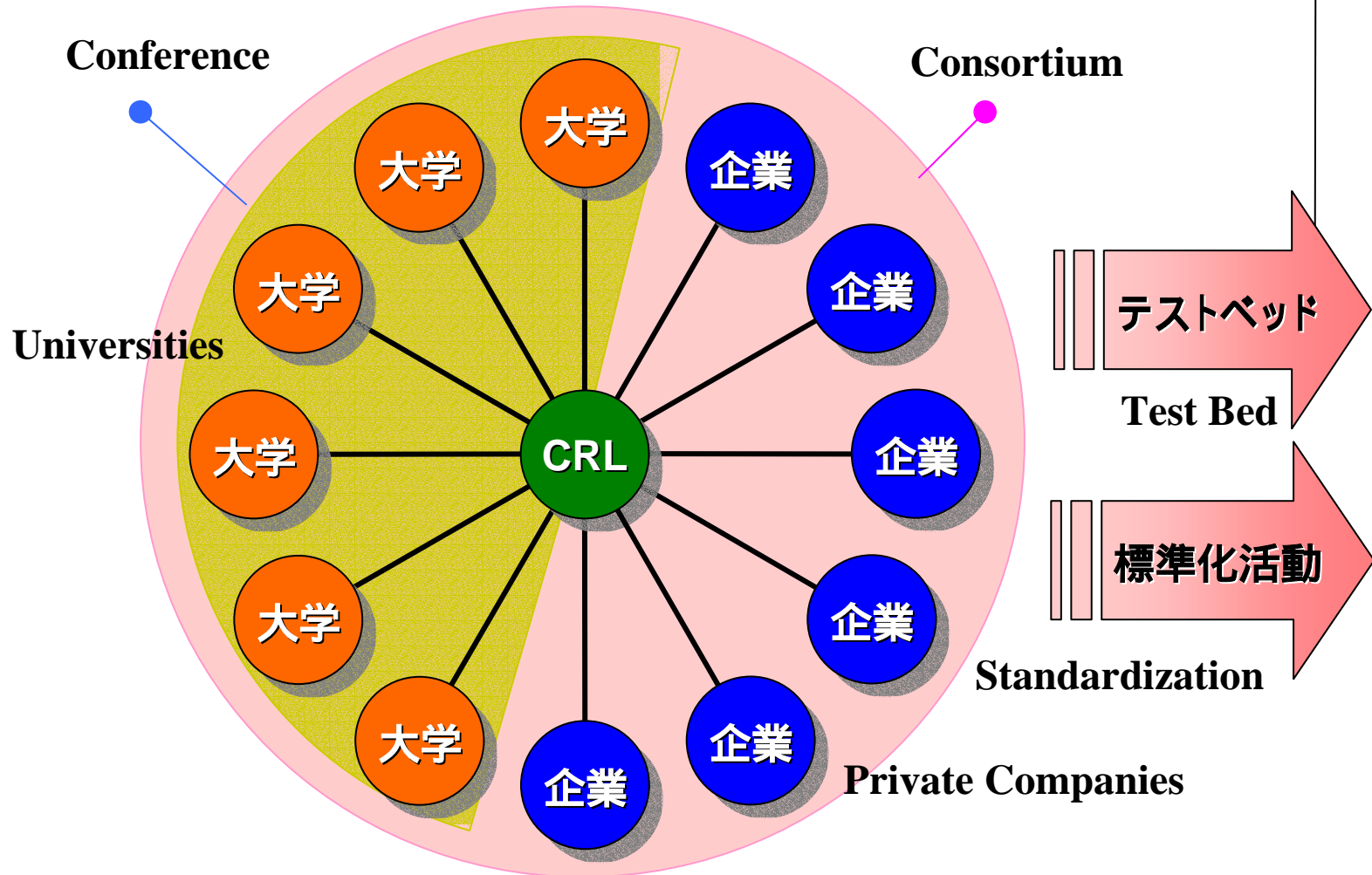
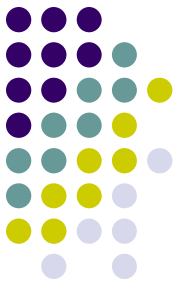


# Test Bed in YRP - Overview -



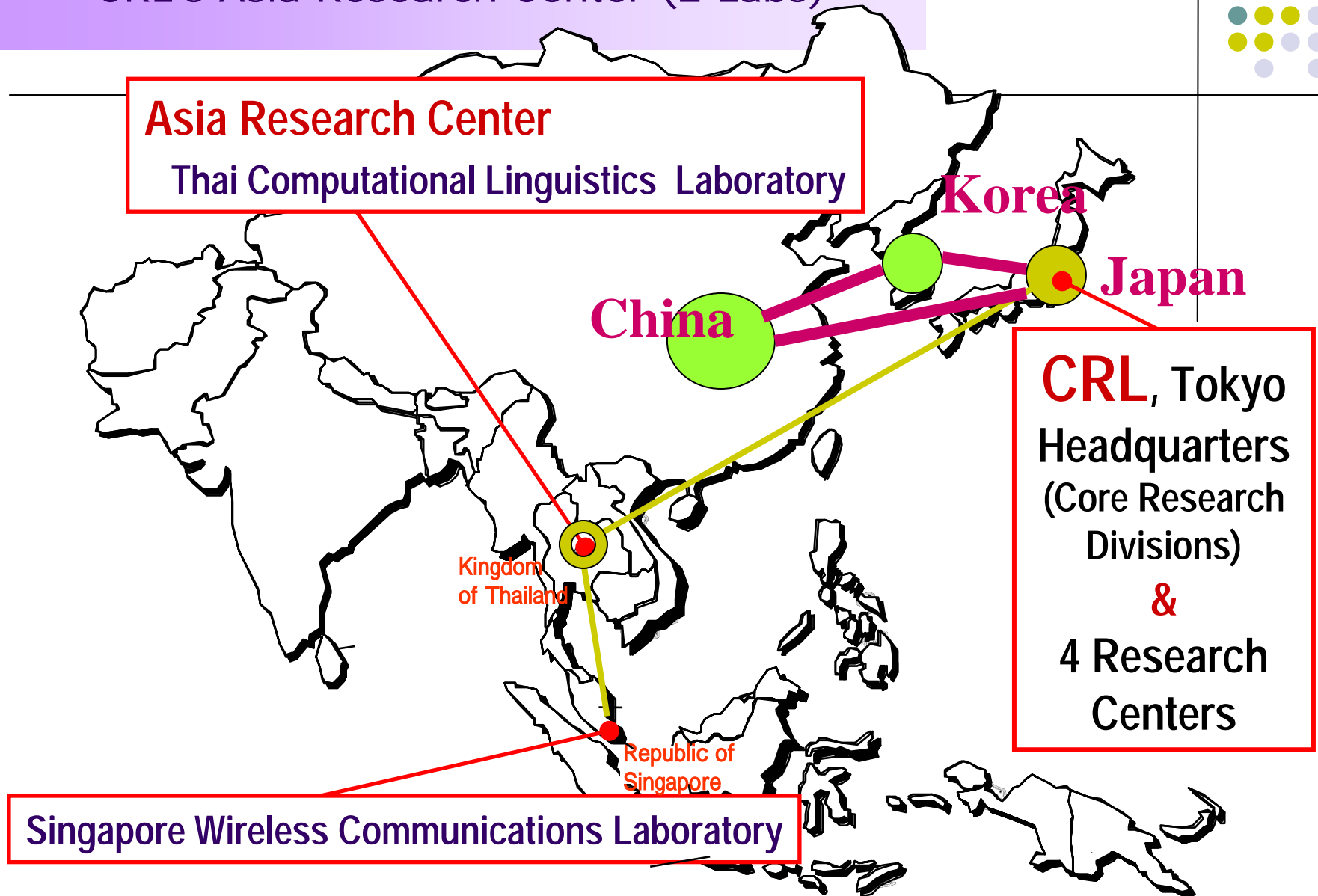
YRP

# Consortium





## Collaboration with Asian Countries and CRL's Asia Research Center (2 Labs)





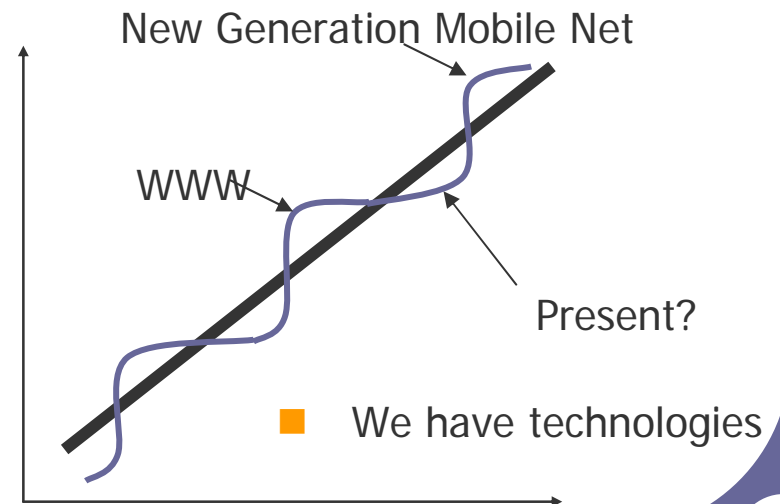
# Activities of Mobile Network Group



Homare Murakami, Khaled Mahmud,  
Mikio Hasegawa, Masugi Inoue,  
Yasuichi Kitamura, Hiroyuki Morikawa  
2003.1.23

# Goal

- Goal
  - Develop core mobile networking technologies to support service-intensive, network-based, mobile applications
  - Demonstrate innovative application prototypes
- Approach: Understanding three key research areas
  - Cross-network services and mobility support
  - Cooperative devices and networks
  - Sensor networks / location info system



# Mobile Network Group

## Goal

- Develop core mobile networking technologies to support service-intensive, network-based, mobile applications
- Demonstrate innovative application prototypes

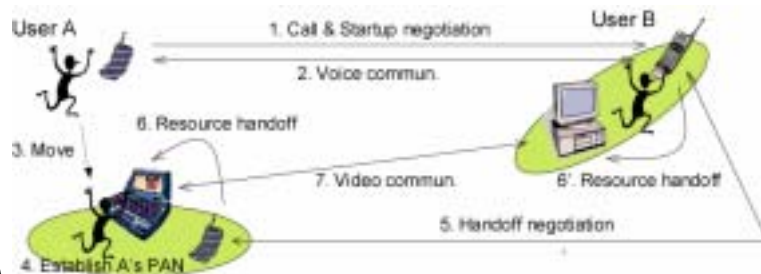
## Approach

Understanding three key research areas:

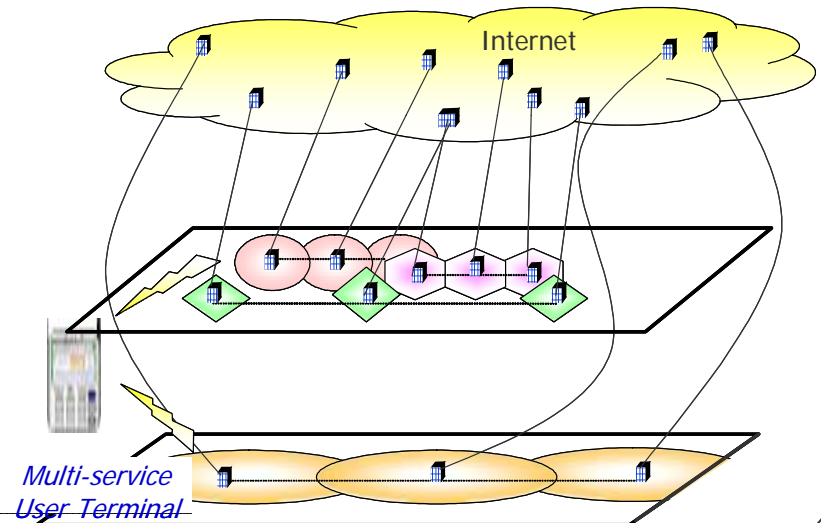
- Cross-network services and mobility mgmt
- Cooperative devices and networks
- Sensor networks / location info system

## Service Mobility and Personal Mesh

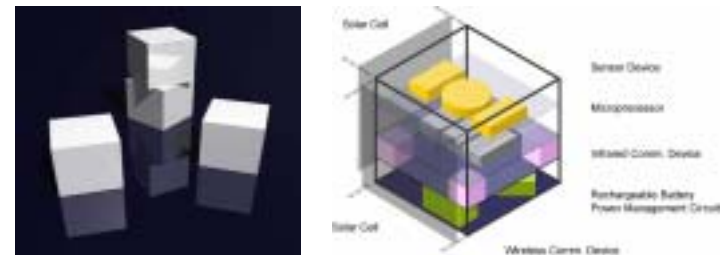
- Device / network confederations



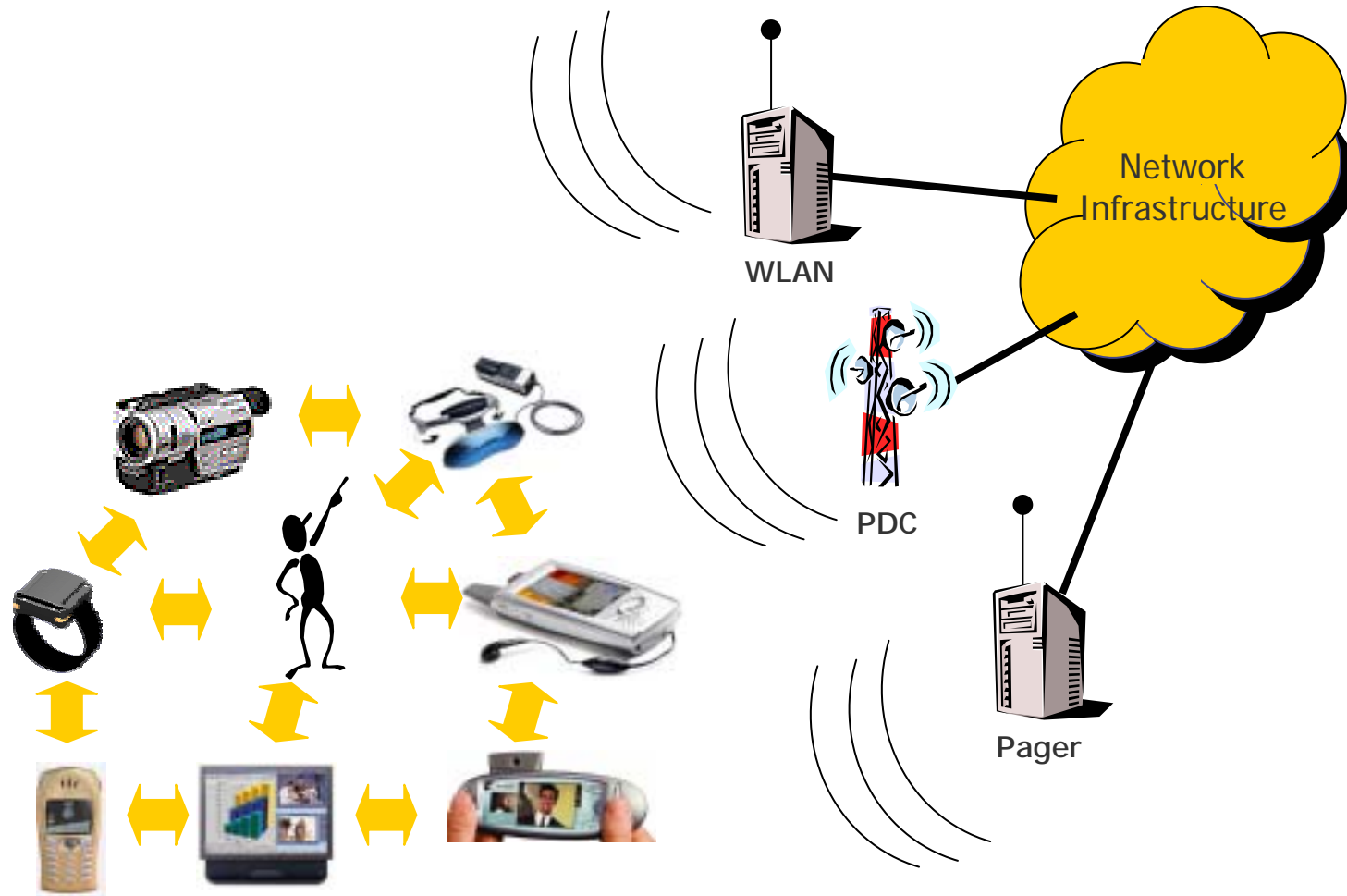
## Seamless Mobility Management



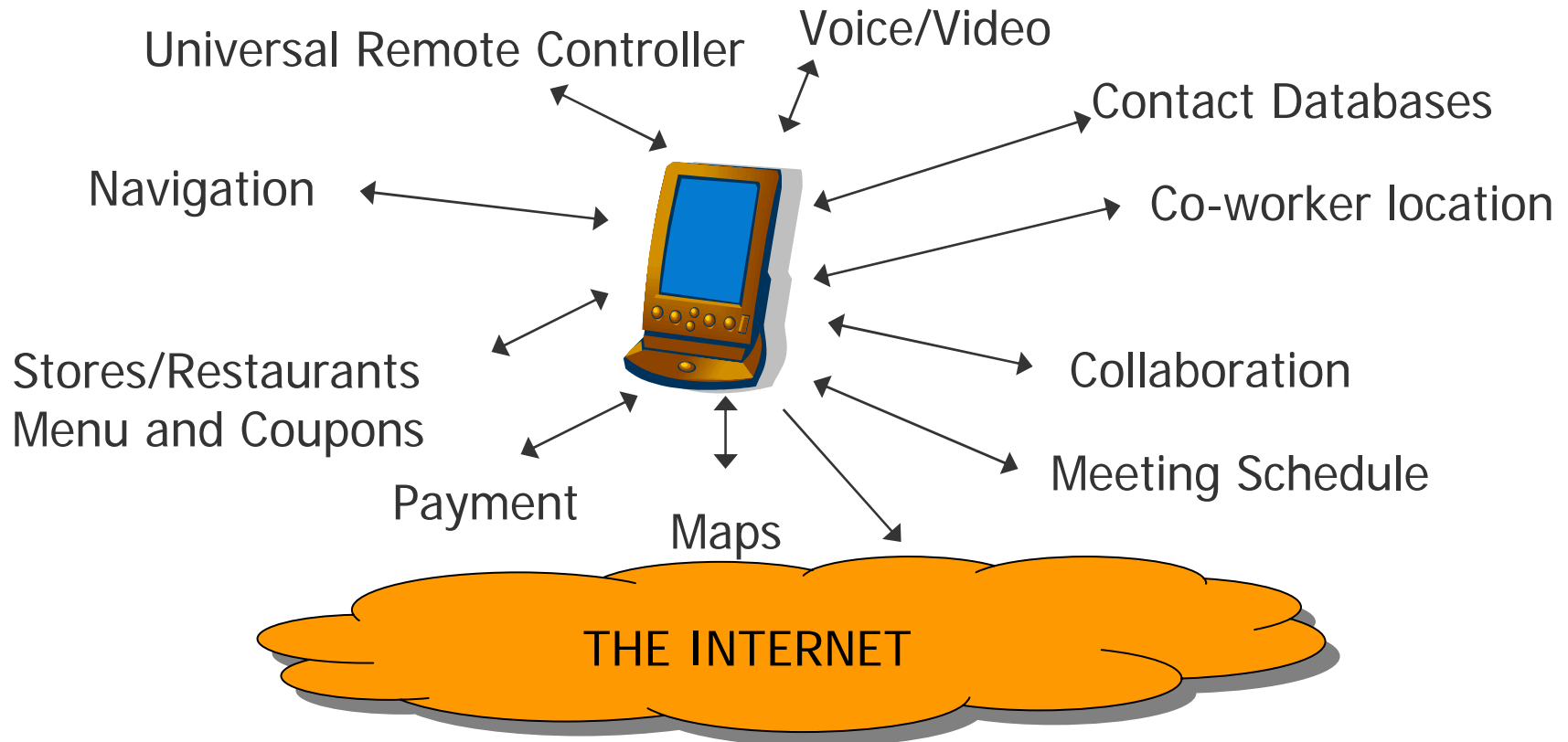
## Sensor Network Testbed



# Cross-Net / Cooperative Net Services



# Wouldn't it be nice if...

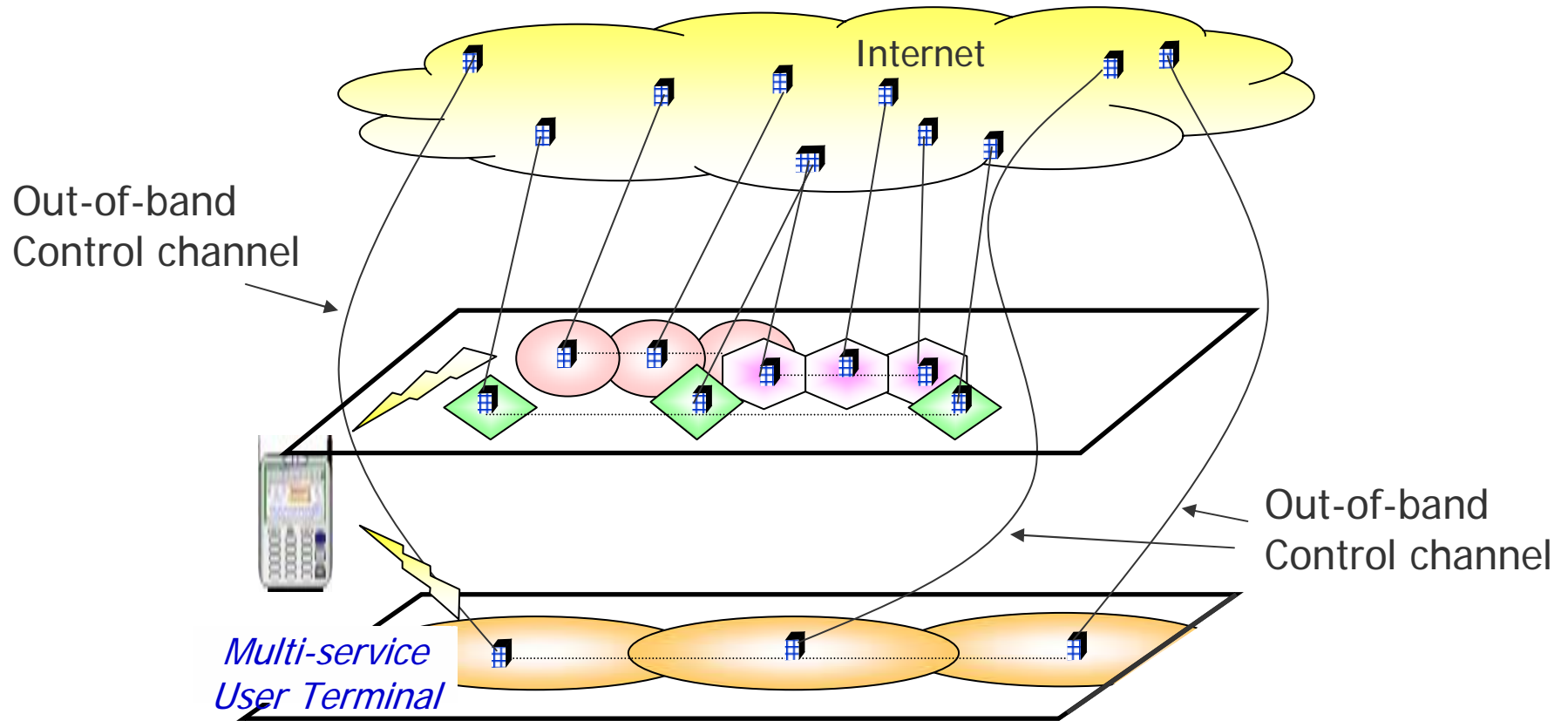


# Issues

- Seamless mobility management
  - Power consumption
  - Multihoming: Seamless location management, paging, AAA (Authentication, Authorization, and Accounting)
  - Fast wireless service discovery / handover
- Service mobility / Personal mesh
  - Service description, location, and cooperation
  - Mobility support
  - Context-aware mobile applications



# Seamless Mobility Support

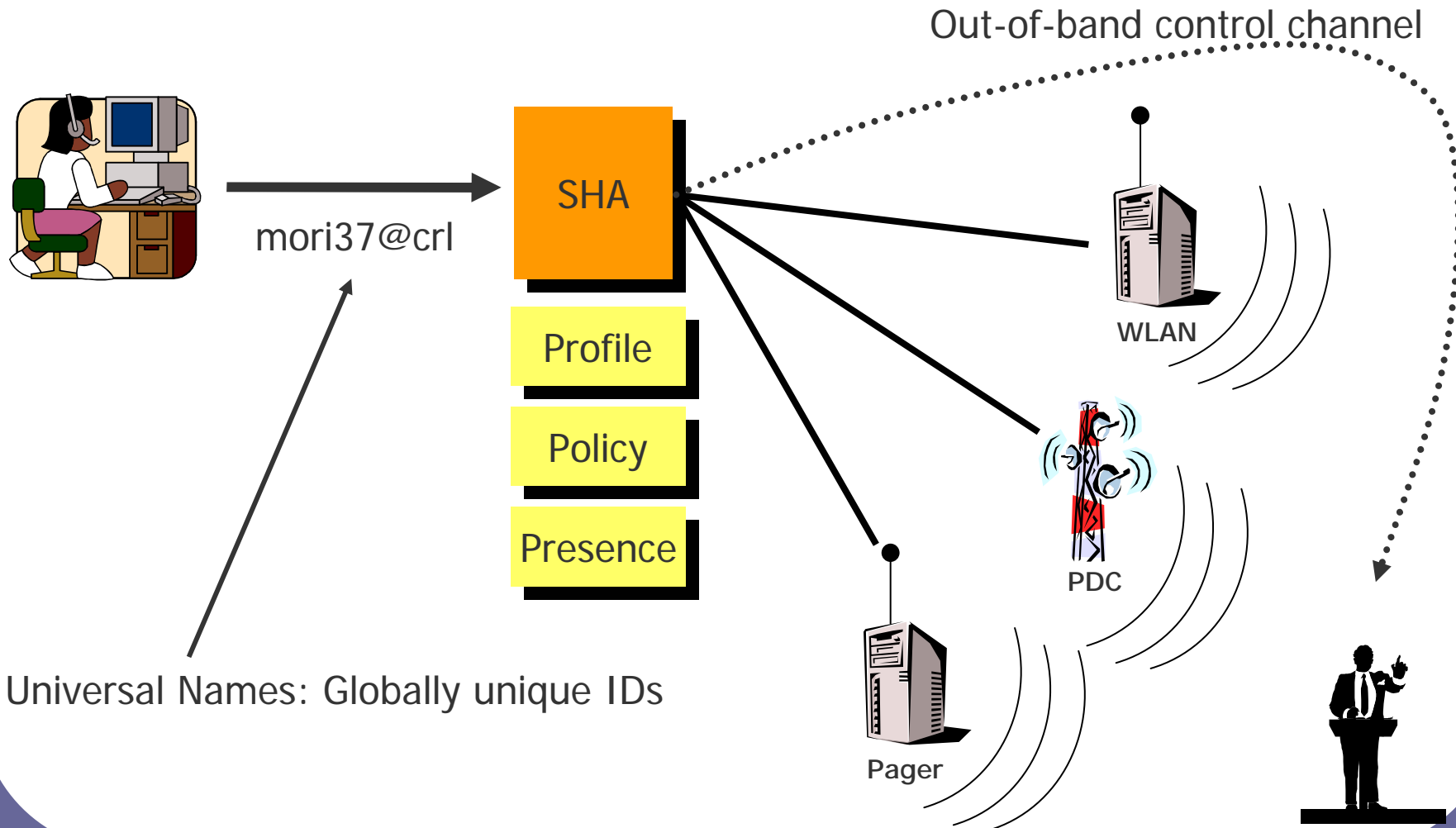




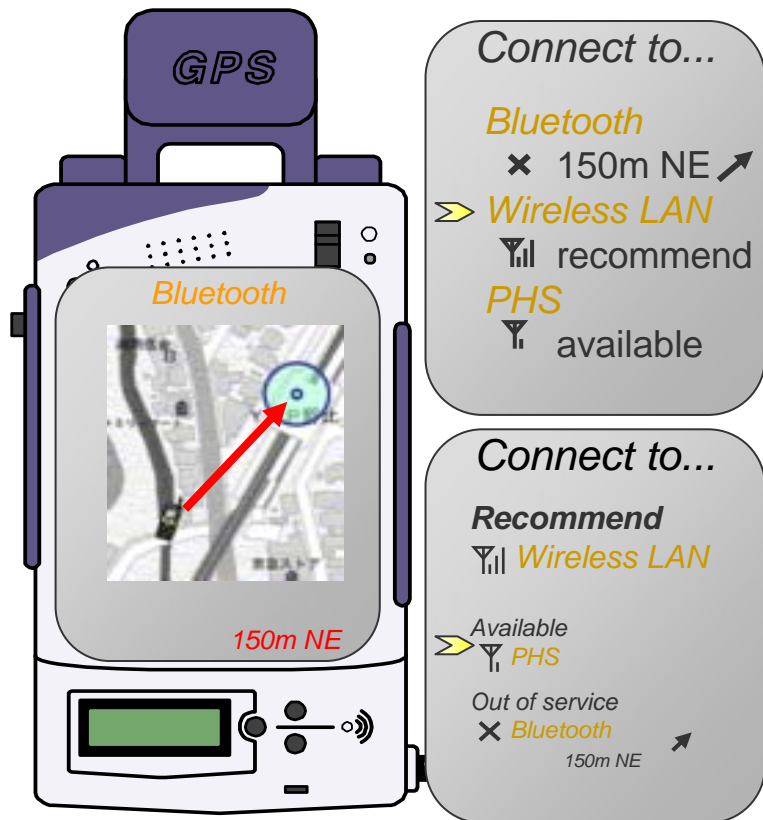
# Out-of-band Control Channel

- Secondary low-power radio
  - Out-of-band low-power radio is always “in the system”, and the rest is off
  - Low-power radio “wakes up” the rest of the system upon receiving the request
  - Upon connection setup, available access networks are informed via low-power radio
- Example of low-power radio: Two-way paging, 2G/3G, PHS, Bluetooth, low power radio...

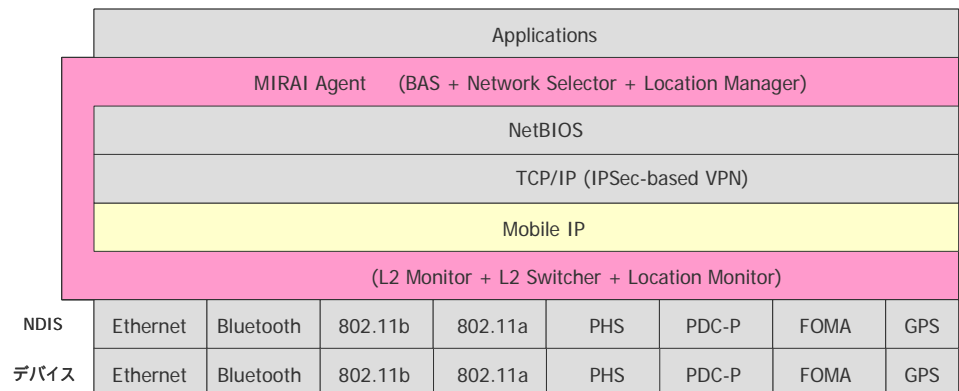
# Signaling Home Agent



# Implementation

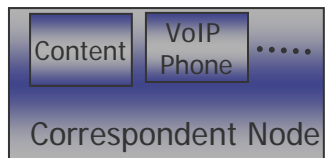
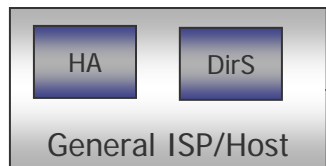
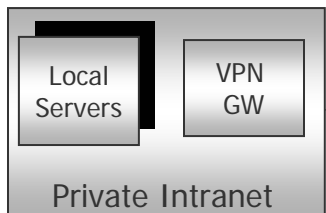
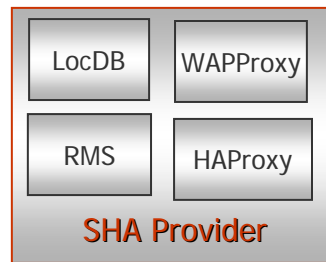


- Bluetooth
- GPS
- IEEE802.11b
- IEEE802.11a
- PHS
- PDC

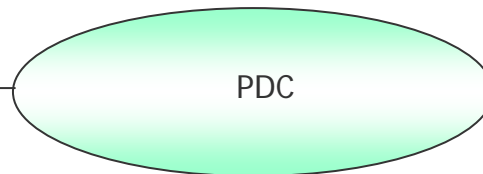


# Implementation

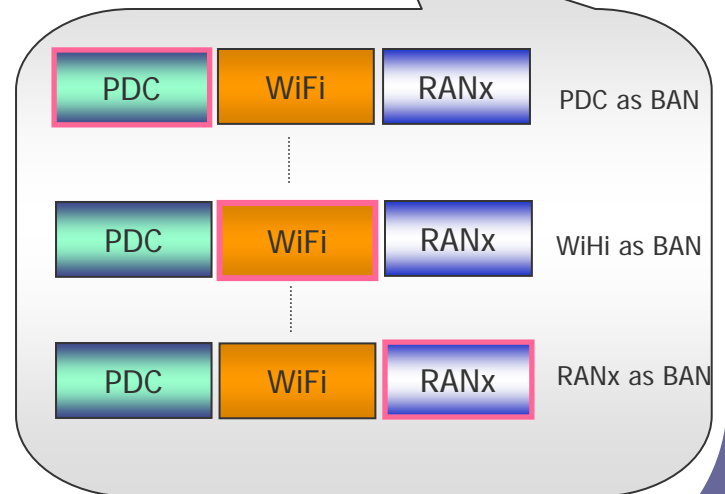
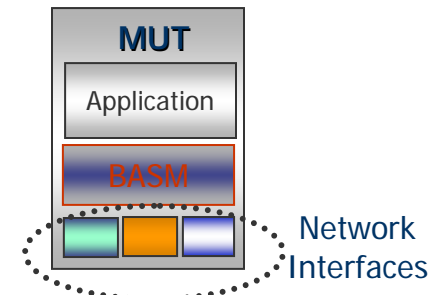
## Contents/Services



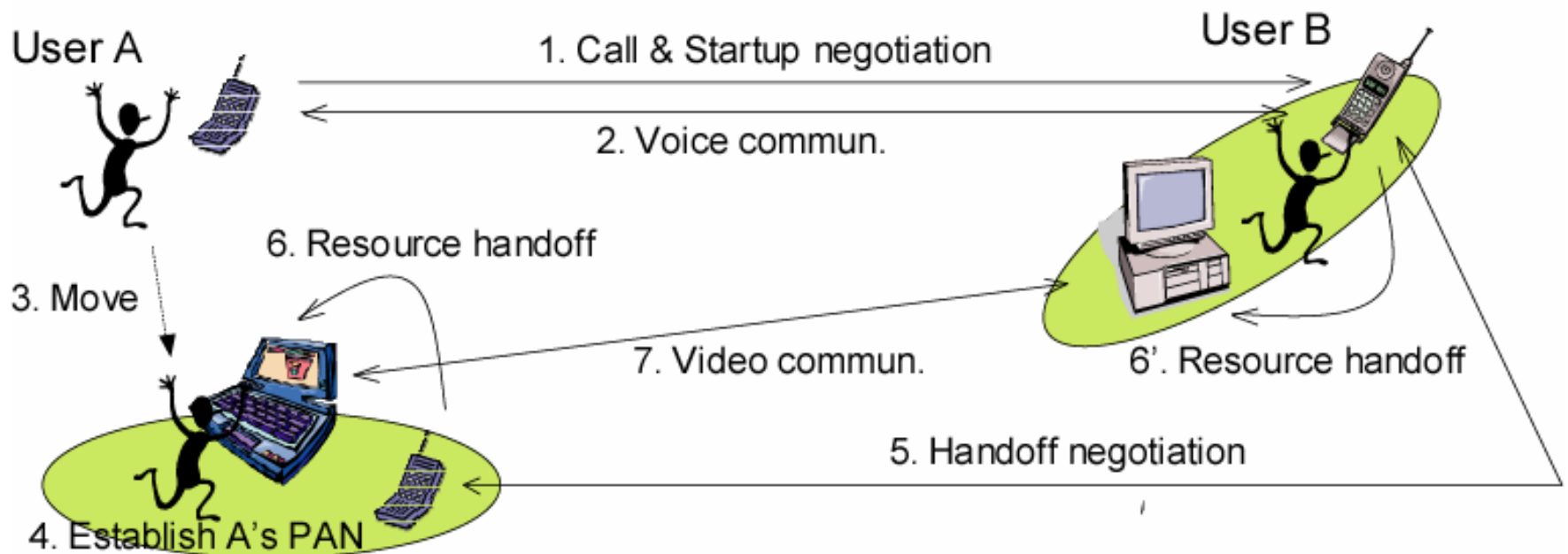
## Carrier/Provider



## Mobile Terminal

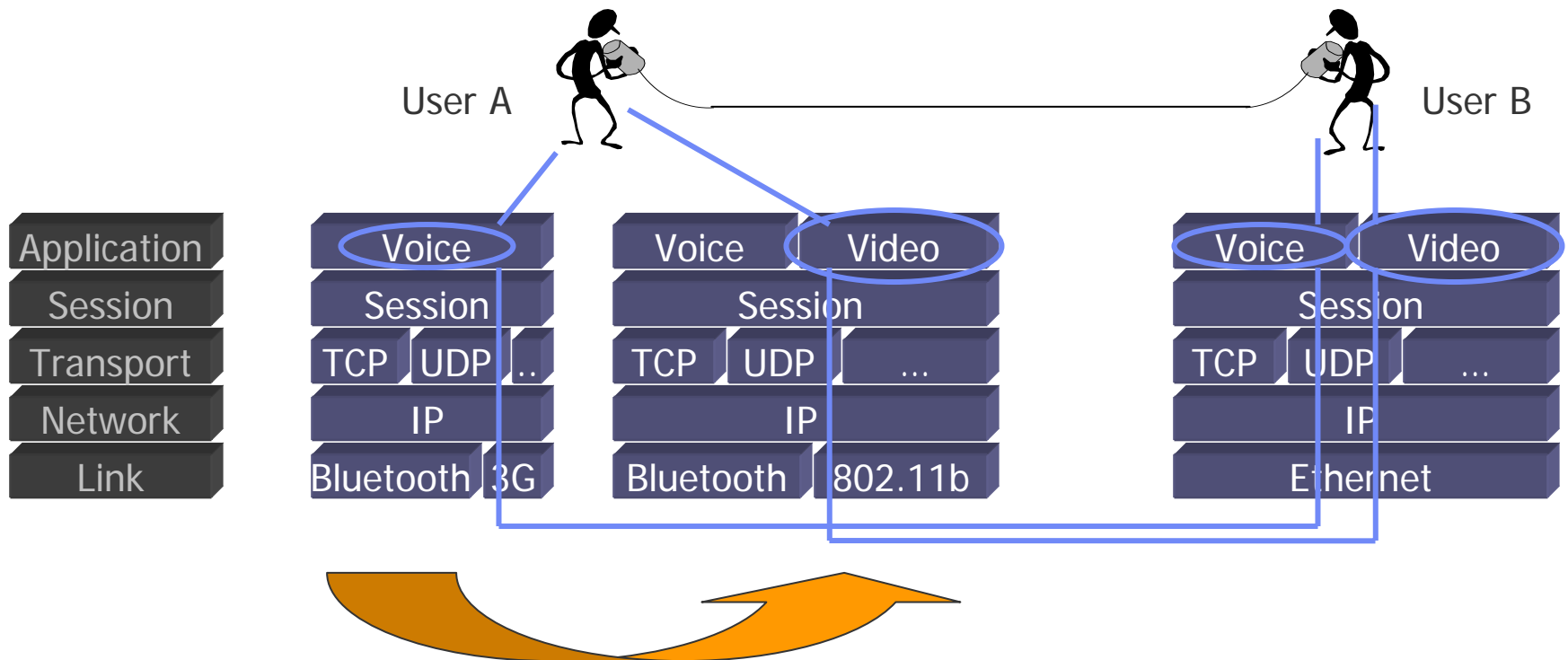


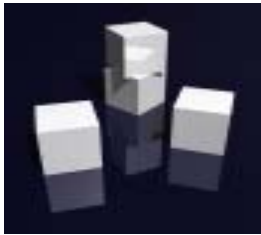
# Service Mobility



- Device discovery and authentication
- Description of device functions, services, and applications
- Context transfer and negotiation
- Application migration

# Different View: Service Migration



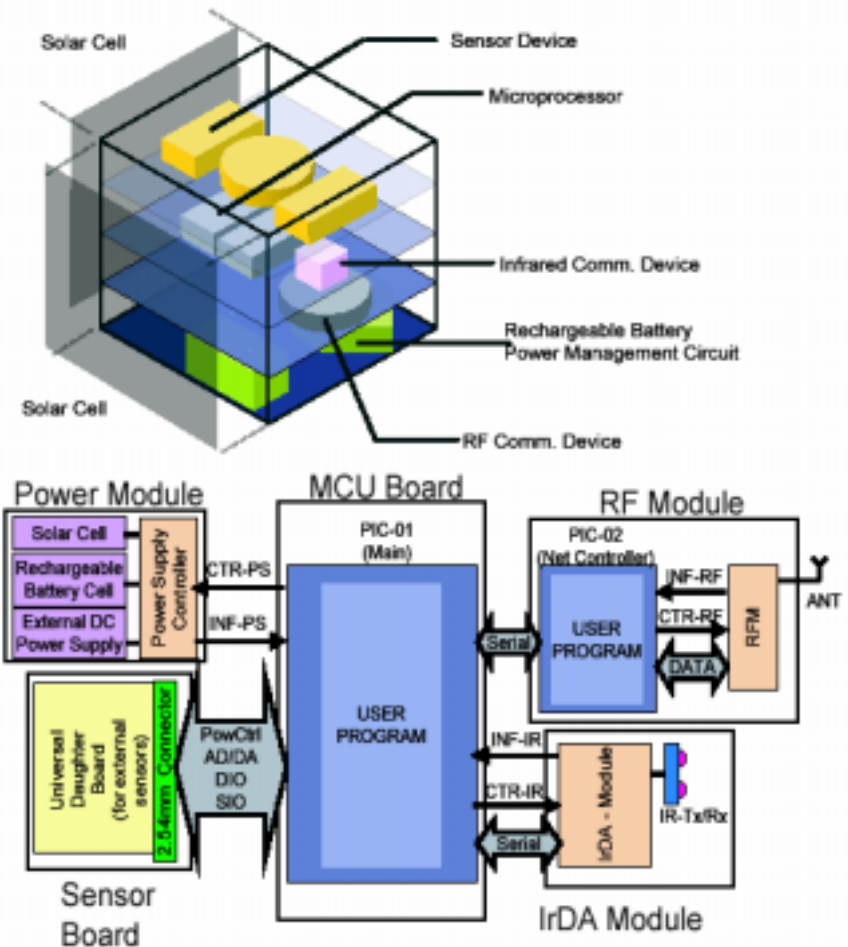


# Sensor Network

- Communication board
- Microprocessor board
- Battery
- Daughter board

## Specification

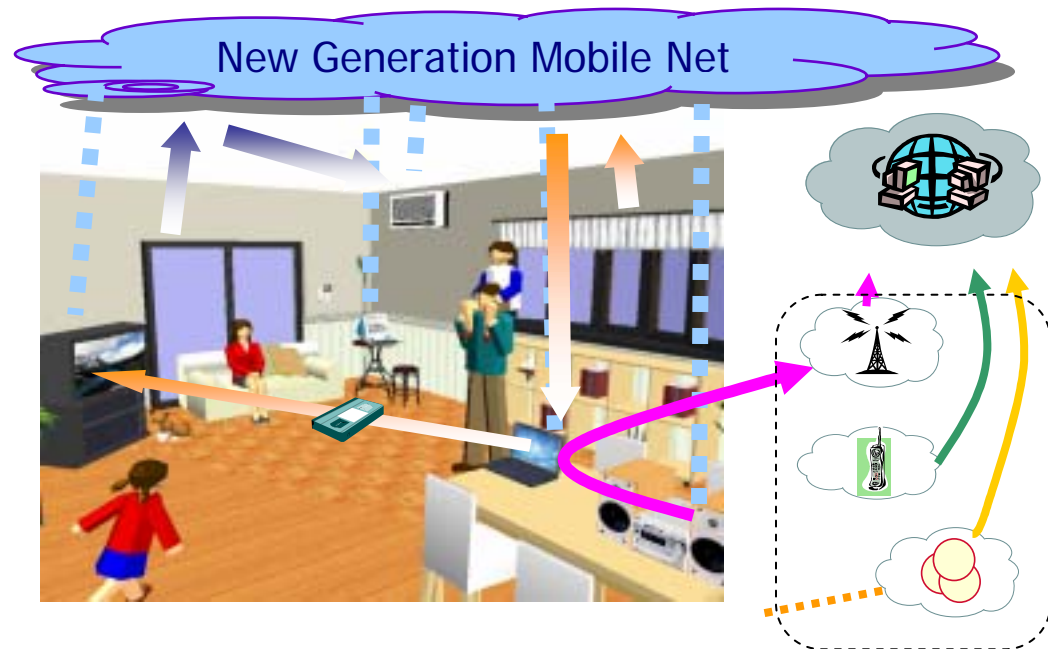
CPU : Microchip PIC18F452 20MHz × 2  
           ROM 16Kwords/RAM 1.5KB  
 RF : CDC-TR-02  
 IrDA : IrDA1.1  
 Power : UM4 & Solar Cell  
 I/F : I2C, A/D, DIO, RTC  
 Size : 50mm × 50mm × 50mm  
           (Batt. Included)





# Smart Space Testbed

- Testbed for demonstrating seamless mobility support, service mobility/ personal mesh, and sensor network
- Develop context-aware application prototype



# Schedule

