Mobile Adventure

Seamless Integration of Heterogeneous Wireless Network Technologies and Services

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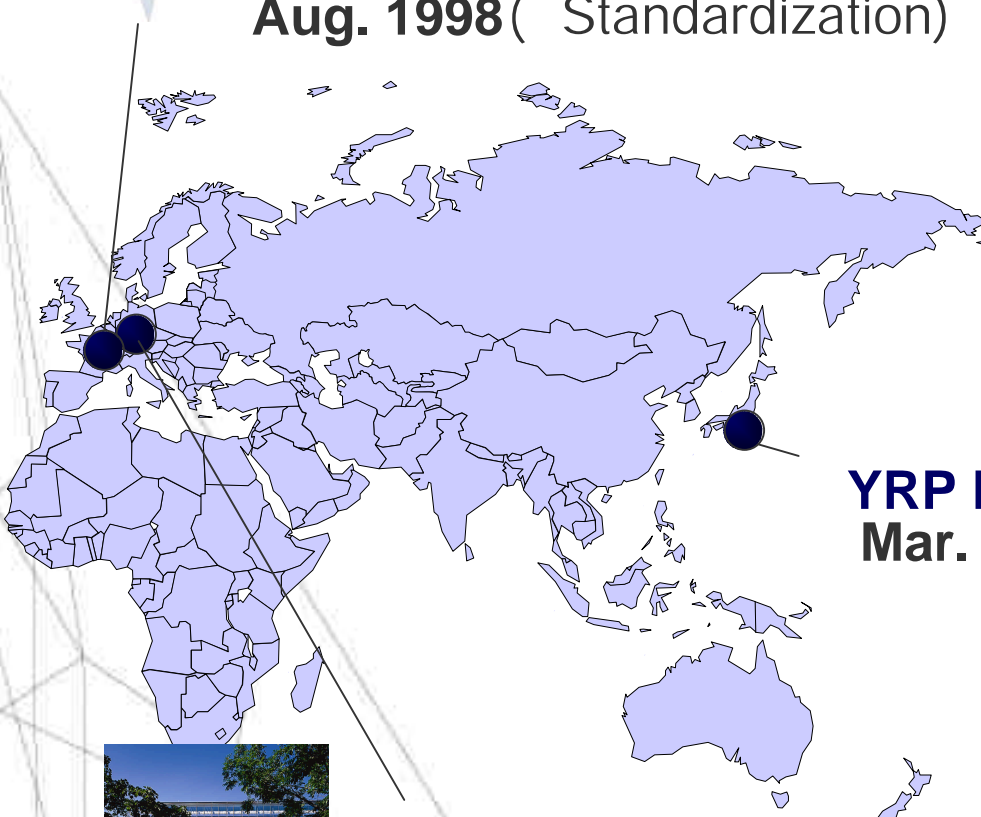
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NTT DoCoMo Research

DoCoMo USA Labs
Nov. 1999

DoCoMo Europe
Aug. 1998（Standardization)

YRP R&D Center
Mar. 1998

DoCoMo Euro-Labs
Nov. 2000

YRP: Yokosuka Research Park

DoCoMo Euro-Labs

- Established on November 10th 2000
  (*Labs opened in April 2001*)

- Research on leading *mobile communications* technologies
  centered on *network infrastructure technologies for the 4th Generation*

- *Collaboration* with European universities and research institutes

- *Standardization* activities
  for 3G (3GPP) and 4G systems
  (including pre-standardization research activities such
  as WWRF or EU projects)

Services and Applications (1)

What services and applications need to be supported in future cellular and wireless networks ?

- Future networks: <u>not</u> technology centered
- Future networks: service centered
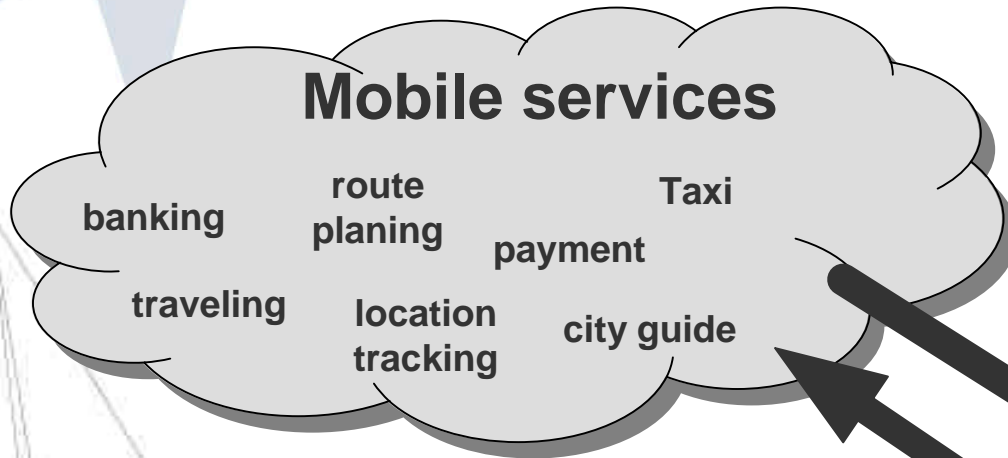- Yet more: user centered

- No killer applications -> killer features (enhanced functionality as evolution basis for innovative services, arises from networks)

- New business model: operators invite 3rd party service providers (cf. i-mode)

Services and Applications (2)

- Key Features
  - Personalization (selection, composition)
  - Context-awareness
  - Ubiquitous computing
  - Intelligent Agents
  - Service-level mobility
  - Seamless Access

- Technologies
  - Programmable Platforms
  - Flexible signaling frameworks
  - Resource constrained middleware (SmartCards,…)
  - Peer-to-Peer
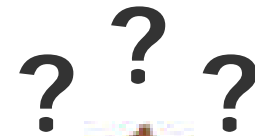 - IP QoS

Example: Personalized Service Discovery

Mobile services

banking

route planing

Taxi

payment

traveling

location tracking

city guide

achieve goal

choose service

Business Meeting at 15:00 in Bern

? ? ?

It's not about using services, it's about supporting your goals!

Michael

Ad-Hoc Networks

Scenarios for mobile ad-hoc networks?

What is Ad-Hoc?

- WLANs/Infostation (single hop)
- Multi-hop

Mobile Ad-Hoc Networks: complement structured networks to fulfil some certain user requirements:
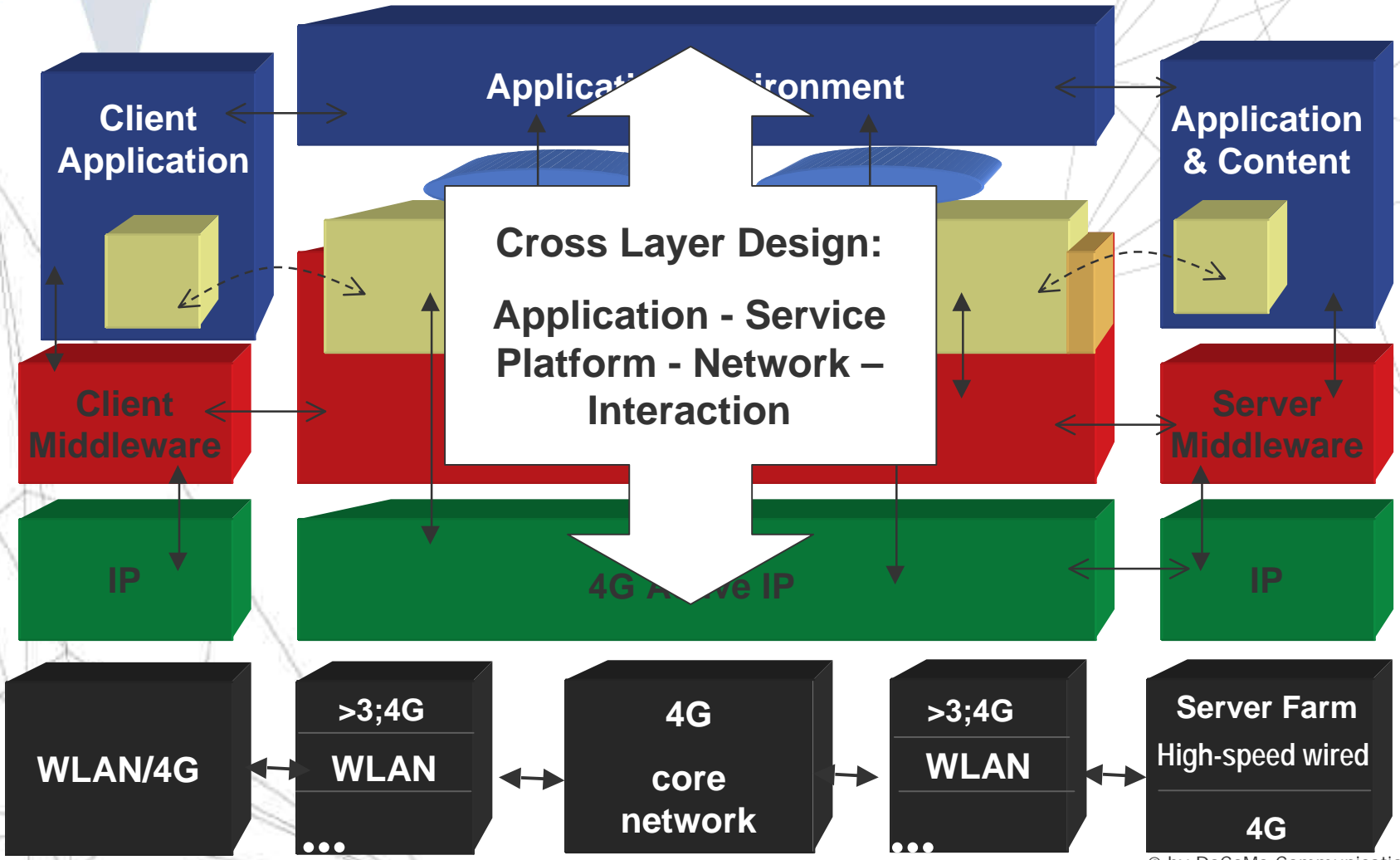
– Provide connectivity in infrastructure-less areas

- Extension of cellular

– Self organizing networks (e.g., sensors)

– Support wireless peer-to-peer communication

- E.g., location based community

Do we need better QoS support in future wireless (IP-) network environments?

- For success IP must become a (flexible*) QoS network
- Ways to achieve:
  – Introduce QoS on several layers independently ✓
  – Adapt IP networks to wireless transmission (again each layer independently) ✓
  – Adapt applications to the channel (without considering IP layers) ✓
  – Solution: combine vertical and horizontal optimization: Cross Layer interworking

  * adapt to challenges of wireless transmission and user requirements

QoS (2) - Cross Layer Design

Client Application

Application Environment

Application & Content

Cross Layer Design:

Application - Service Platform - Network – Interaction

Client Middleware

Server Middleware

IP

4G Active IP

IP

WLAN/4G

>3;4G
WLAN

...

4G
core network

>3;4G
WLAN

...

Server Farm
High-speed wired
4G

User Terminal

Communication Provider / Network Operator

Application Provider

Seamless Integration

Will a seamless integration of networks and services ever happen or will network technologies evolve as stand-alone networks ?

- Seamless integration has already started!

- Integration?
  - Make wireless networks ubiquitously usable
  - Federation between operators needed

- Seamless?
  - Service transfer: functionality or QoS transfer?
  - Quality differences inherent to systems (selections depending on the user preferences/application capabilities)

Summary

- Combination of killer features for innovative services and applications

- Focus on the user

- Integration to enable a seamless user experience

- Integration of focus areas: cross-layer optimization