



IP Daidalos

The Daidalos approach to a future mobile infrastructure



Akogrimo Workshop

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Designing
Advanced network
Interfaces for the
Delivery and
Administration of
Location independent,
Optimised personal
Services

the Daidalos
Acronym

and its
connotation



“Flying over Barriers”

- ▶ technological barriers
- ▶ administrative barriers
- ▶ barriers to entry
- ▶ market access barriers
- ▶ barriers to economic growth
- ▶ ...



Daidalos

Vision



- ▶ Give customers a diverse range of **personalized services – seamlessly and pervasively** supported by the underlying technology
- ▶ Establish mobility via an open, scalable and seamless **integration of complementary heterogeneous network technologies** including broadcast, ad-hoc, moving and sensor networks.
- ▶ Empower network and service operators to develop **new business activities and provide profitable services** in an integrated mobile world.





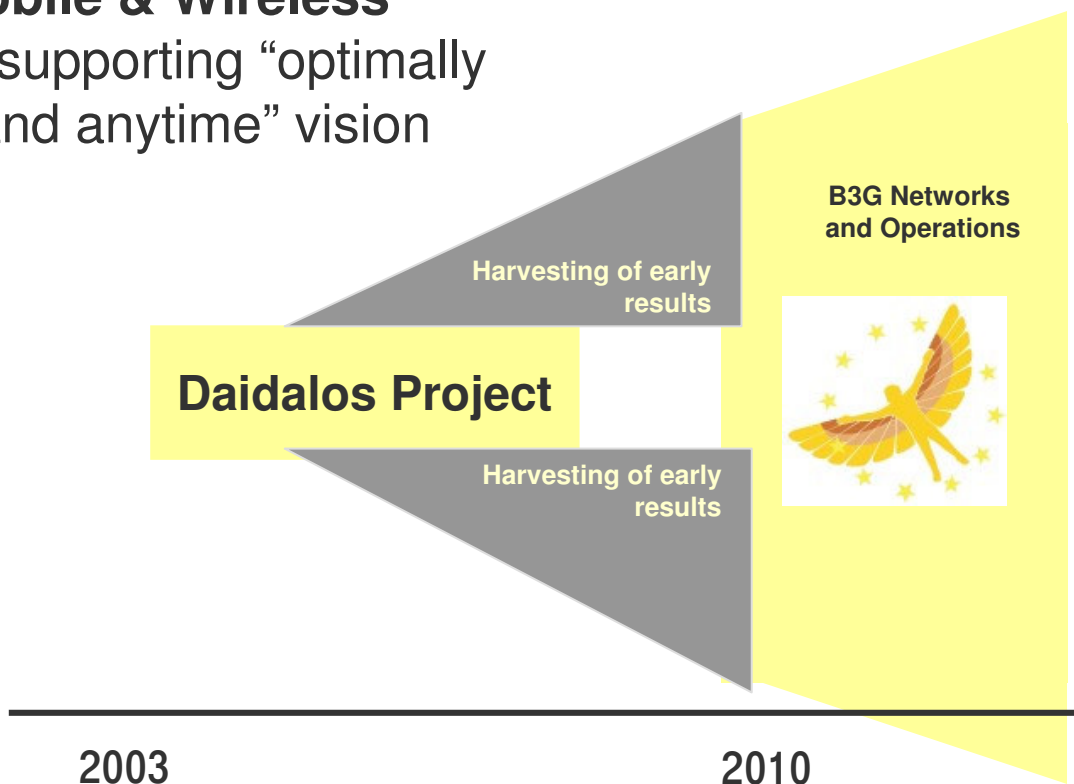
Daidalos in FP6/IST/Systems Beyond 3G

- ▶ IP Daidalos started in November 2003



- ▶ Strategic objective “**Mobile & Wireless Systems Beyond 3G** supporting “optimally connected anywhere and anytime” vision

- ▶ Daidalos II started January 2006 and will end 2008





Operator driven means

- ▶ Special focus
 - on the definition of interfaces between enabling services within an operators domain and 3rd parties
 - on measurement framework
 - on policy based network management (optimization, handover, load balancing)
 - on deployment and migration issues

- ▶ Consortium has operators in the drivers seat
 - Project management, WP leadership
 - Operators know about real world operation of network and service infrastructure (deployment issues, e.g. scalability)



IP Daidalos Consortium



Telco Operators



Industry, SME

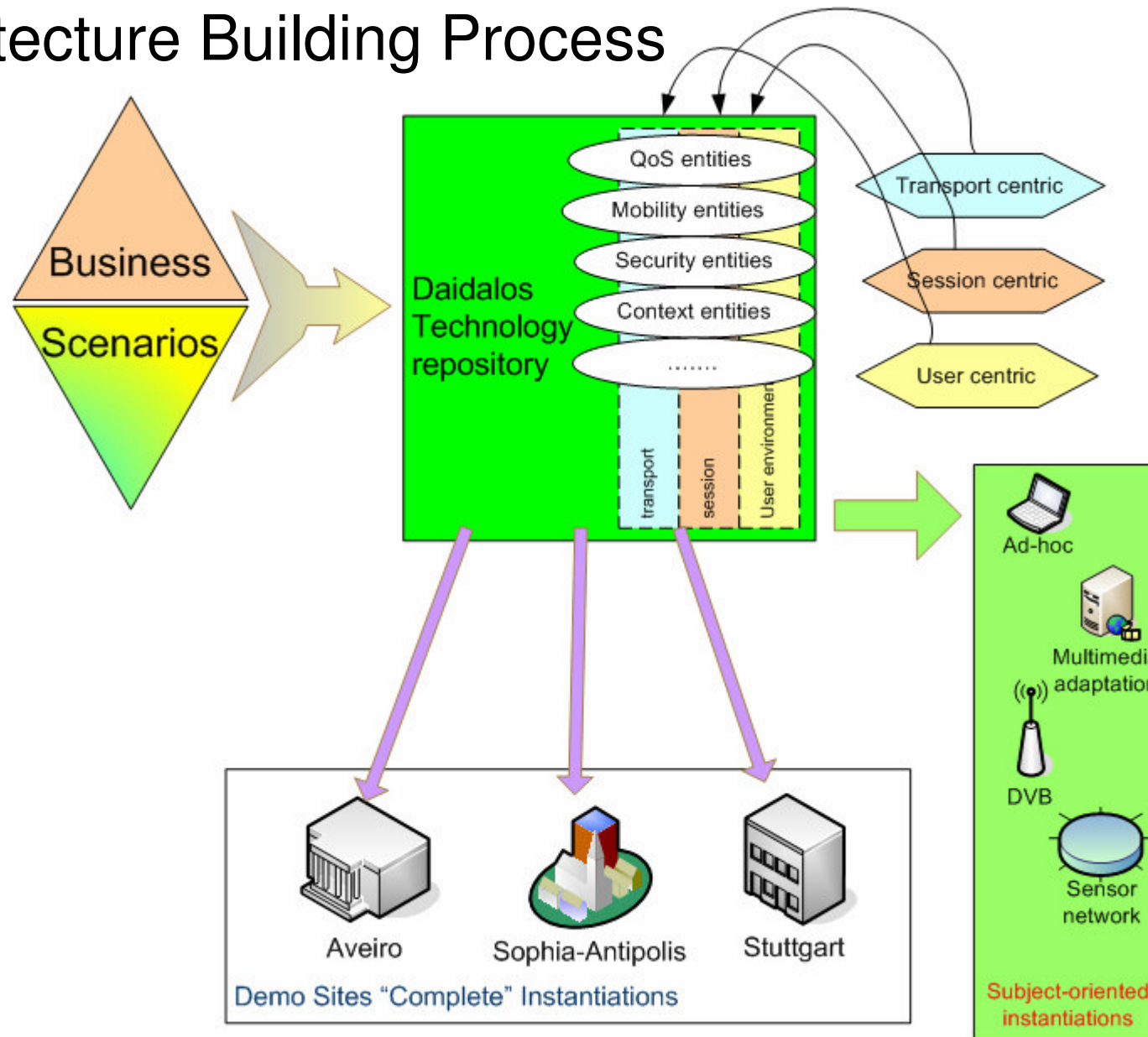


Research labs, academia

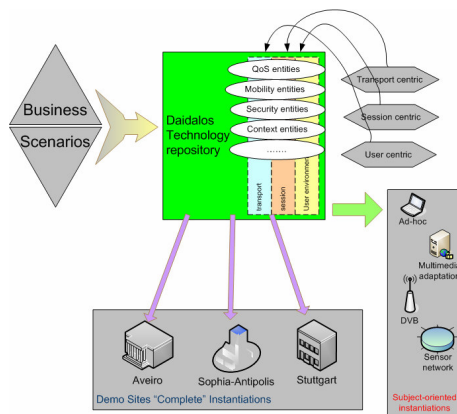


Daidalos

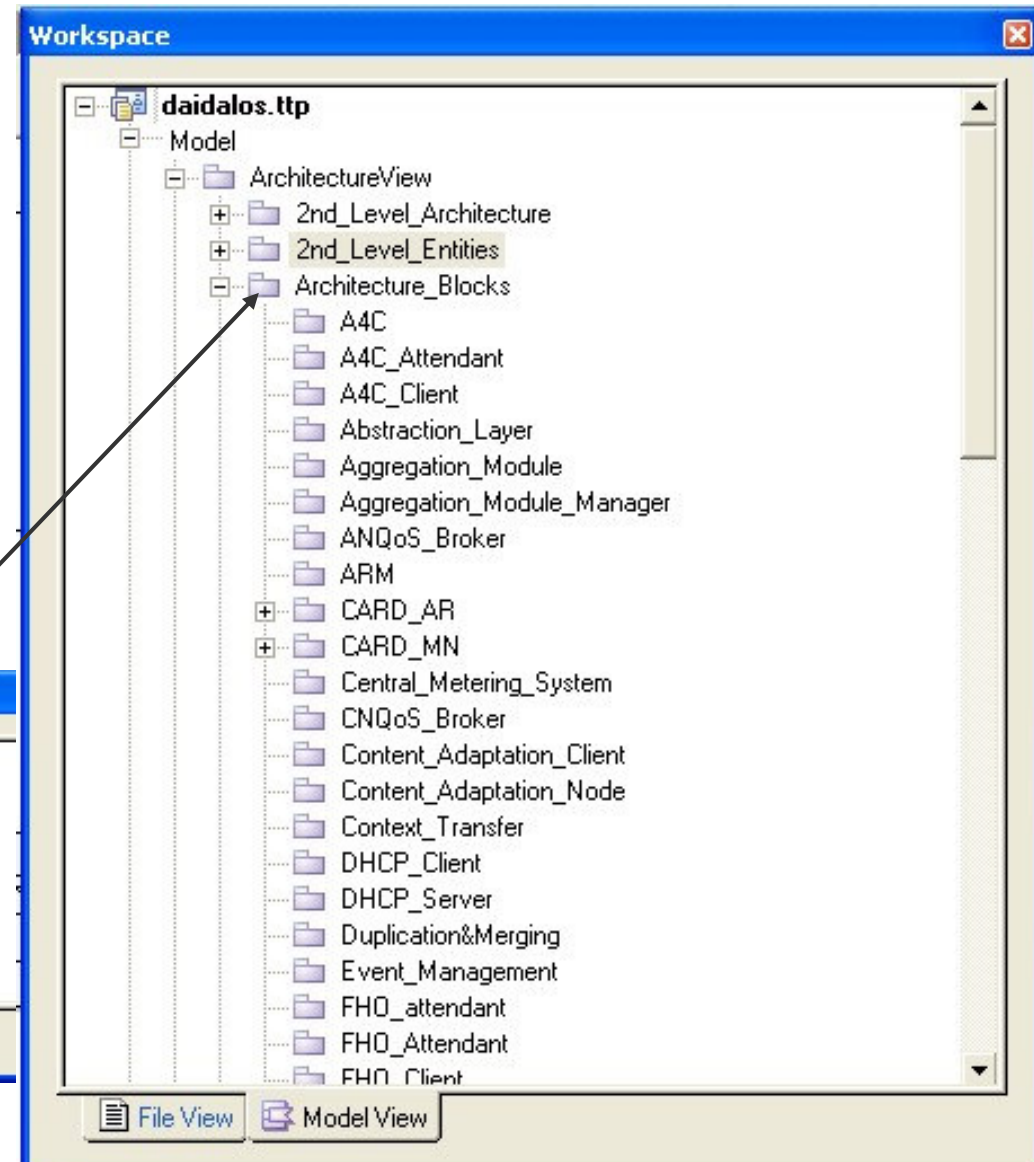
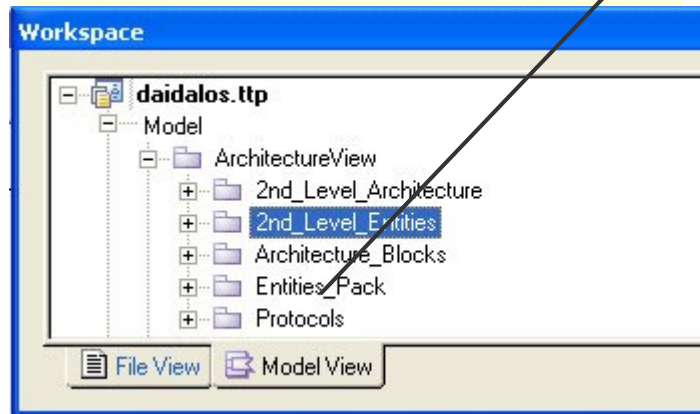
Architecture Building Process



Modelling to support the repository

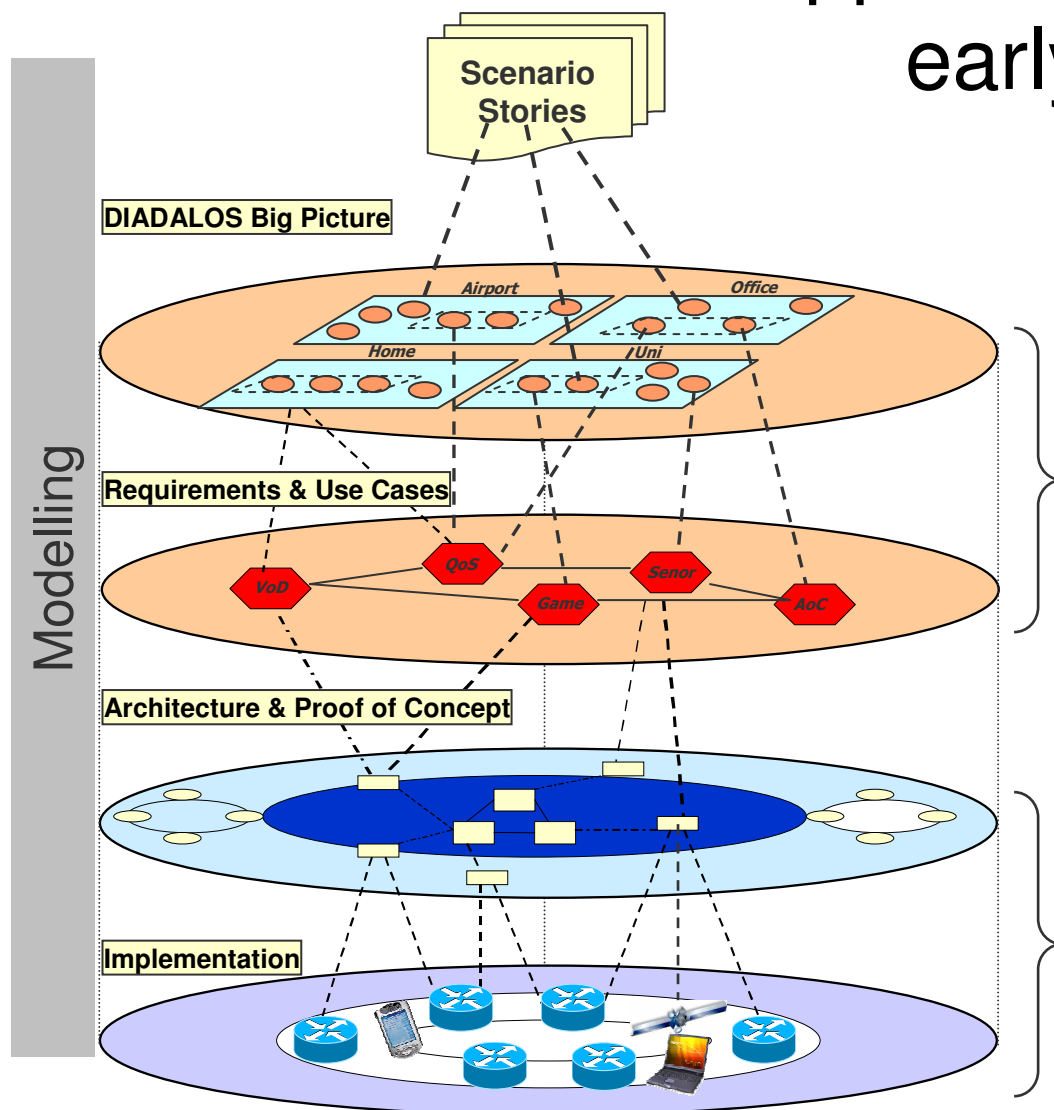


A view of the Daidalos Repository





Scenario-driven approach & early implementations



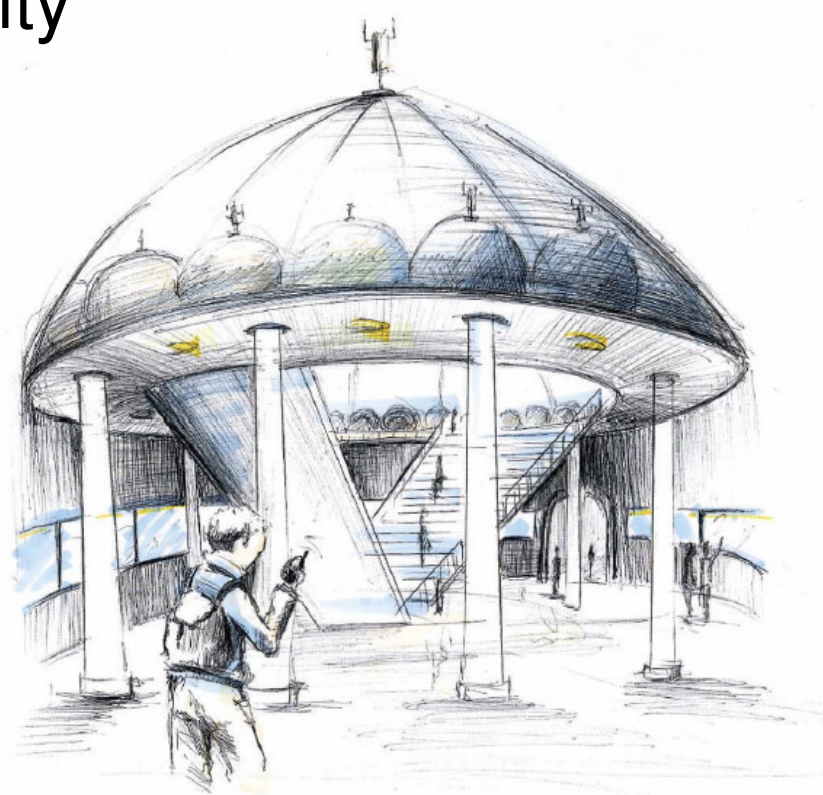
► Scenarios and Use Cases drive the developments

- Prototypes will generate early feedback

► Early implementations will incrementally enhance or replace existing solutions

DAIDALOS scenarios

Mobile University



Roles:

- students
- teachers
- End-user perspective

► Key Vision

- Students studying abroad, having access to their personal set of services and dynamically discovering local services and devices.





The Mobile University Scene 7



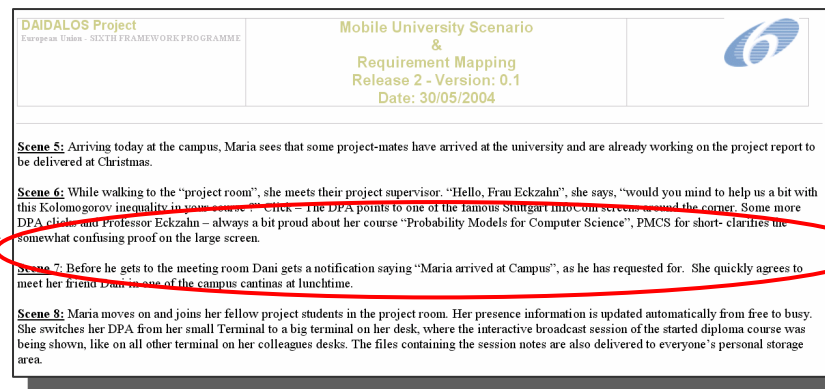
Scene7: Joining the Campus

- ▶ Mobility
- ▶ Registration
- ▶ Service Discovery
- ▶ Network Configuration
- ▶ Location Service



Mobile University Scene 7

Non-technical description from a user perspective

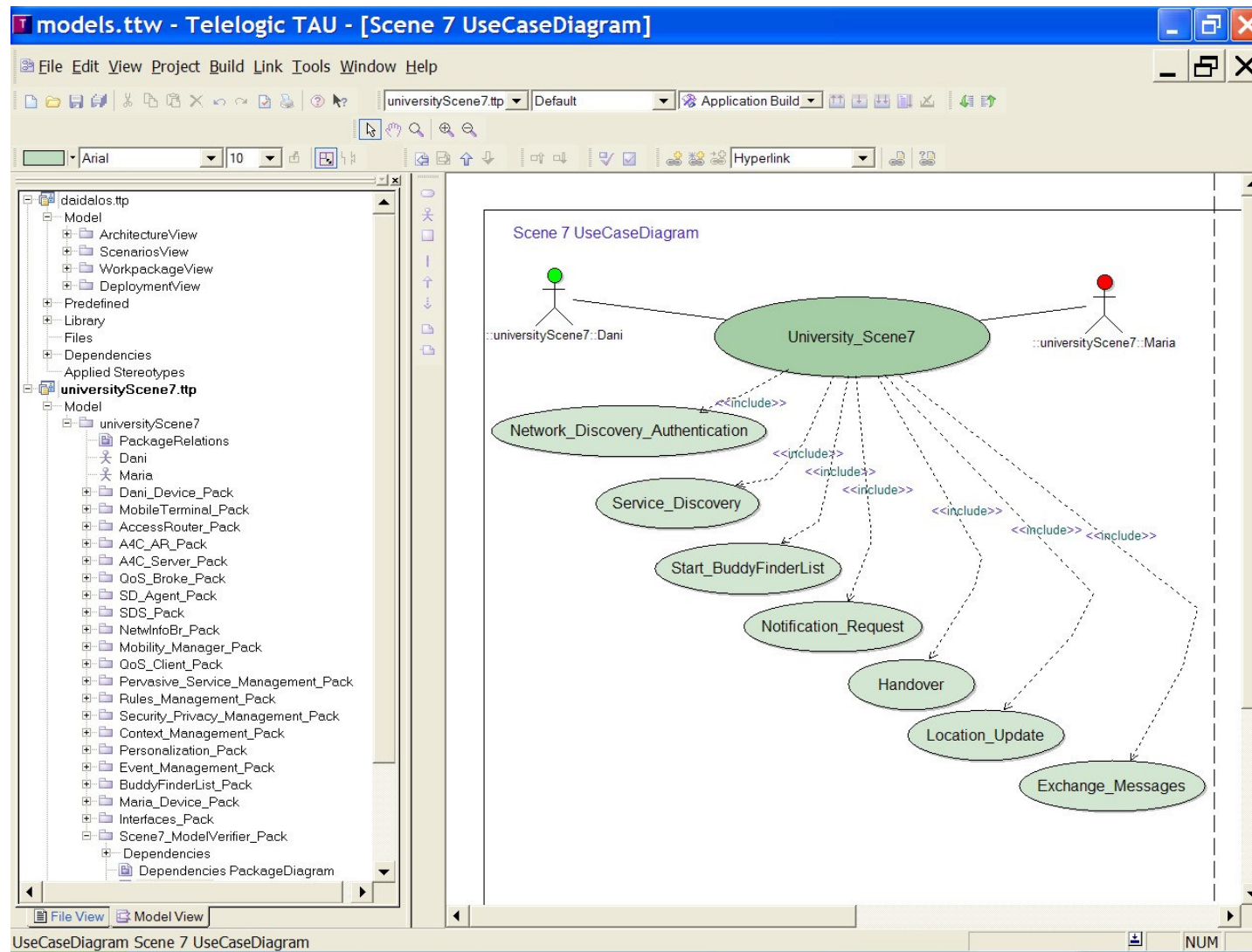


Scene 7: Before he arrives at the meeting room Dani receives a notification saying “Maria arrived at Campus”, as he has requested. *He invites her to meet*, she quickly agrees to meet her friend Dani in one of the campus cantinas at lunchtime.

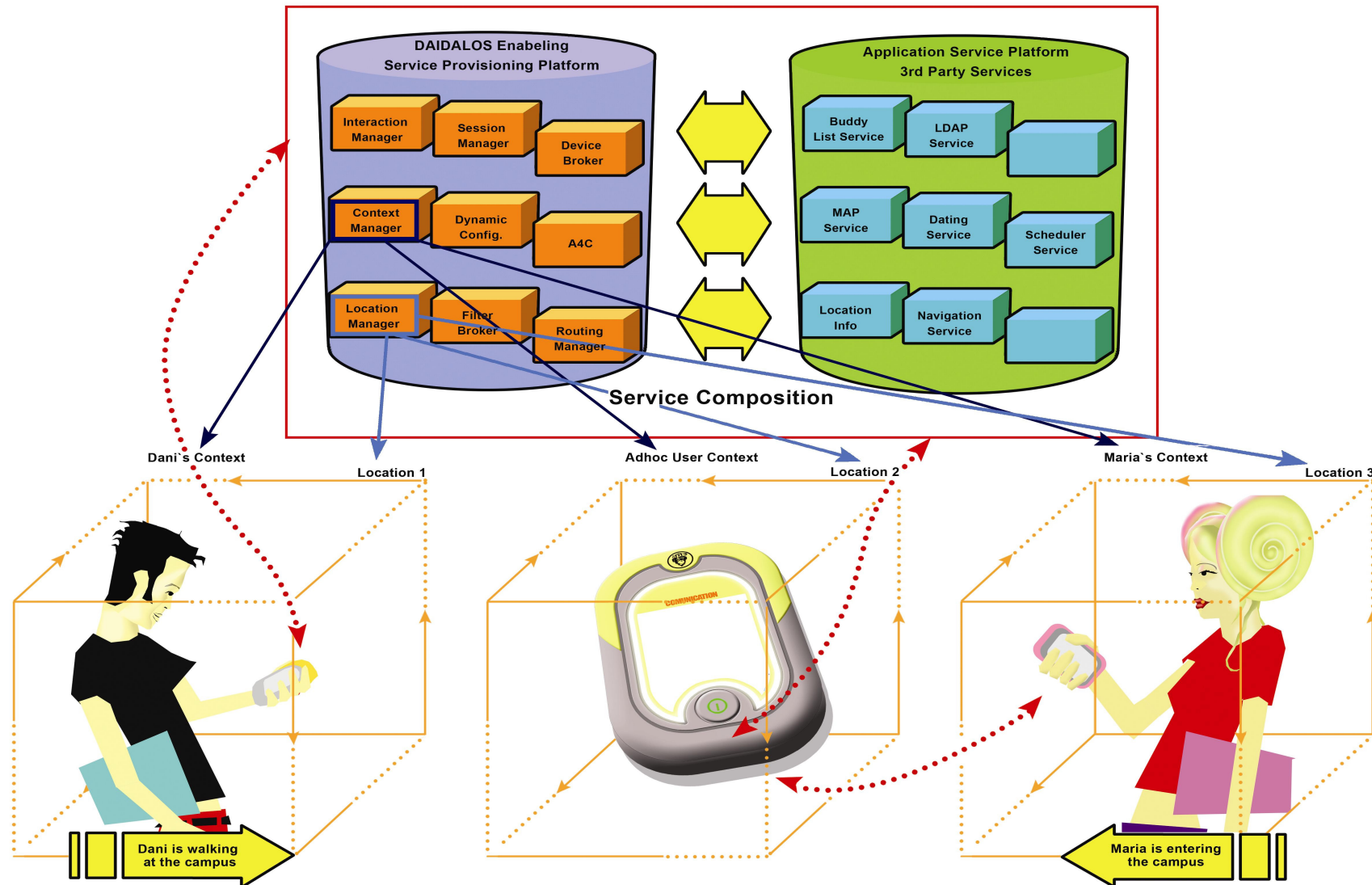




Validation and Verification using TAU

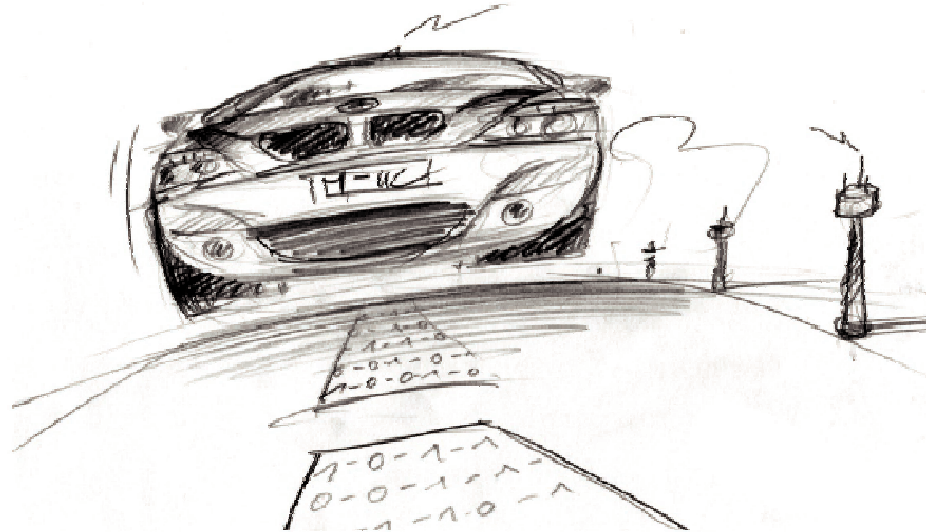


Scene 7 - Key building blocks



DAIDALOS scenarios

Automobile Mobility



Roles:

- mobile worker,
- family,
- boss,
- business partner

End-user perspective

► Key Vision

- Mobility supporting services in and around the vehicle with aspects of personal multimedia, ad-hoc mobile networking and session mobility.

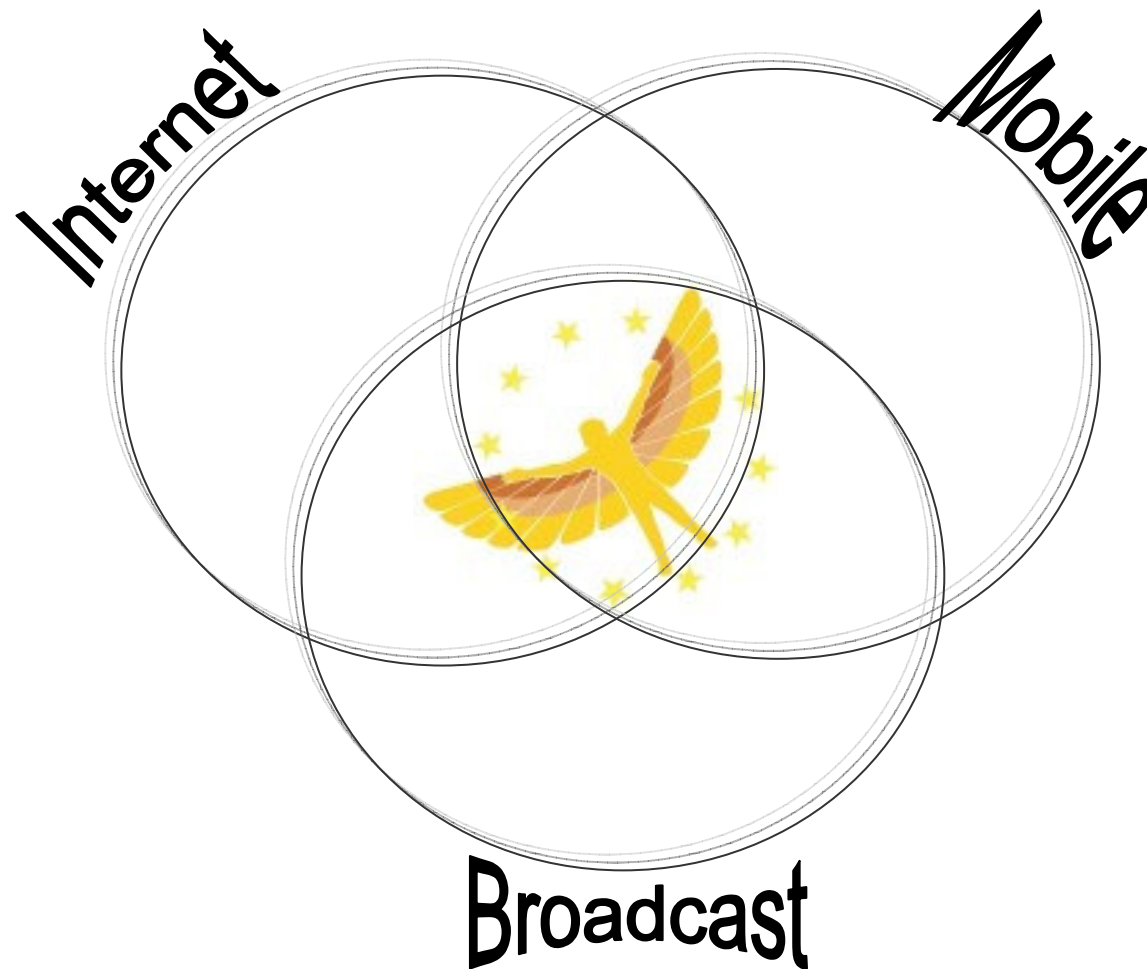




- ▶ See video at www.ist-daidalos.org



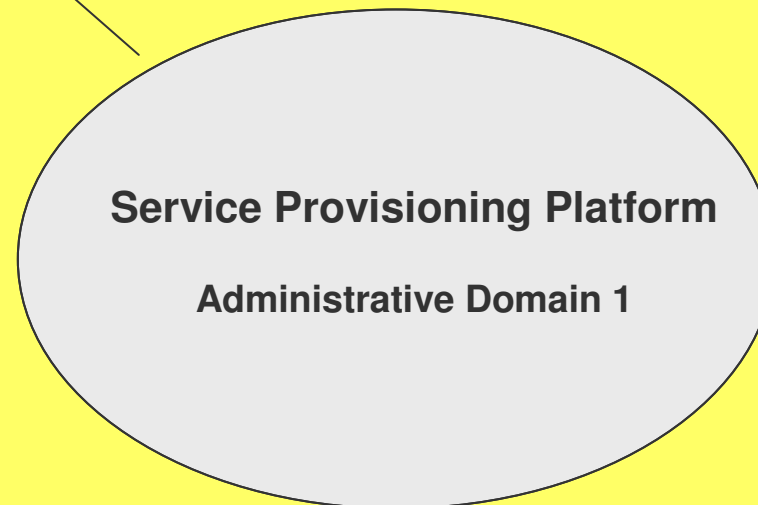
Internet, Mobile, Broadcast Convergence





Architectural components

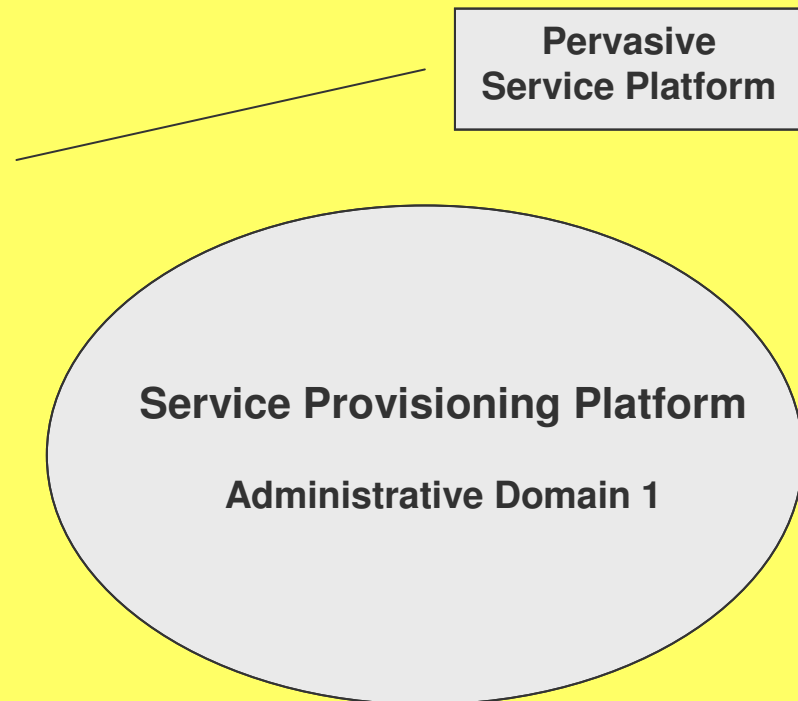
- **Basis for Service & Network Management and Provision**
- A4C
- Key Distribution Center
- Measurement System
- Service Discovery Server
- Security Services
- Policy based Network Mgmt. System
- MM Service Provisioning Platform
- QoS Broker
- Home Agent





Architectural components

- **Enabling pervasive services to the user**
- Service Discovery & Service Composition
- Context Management Subsystem
- Personalization Subsystem
- Rules and Policy Subsystem
- Security / Privacy

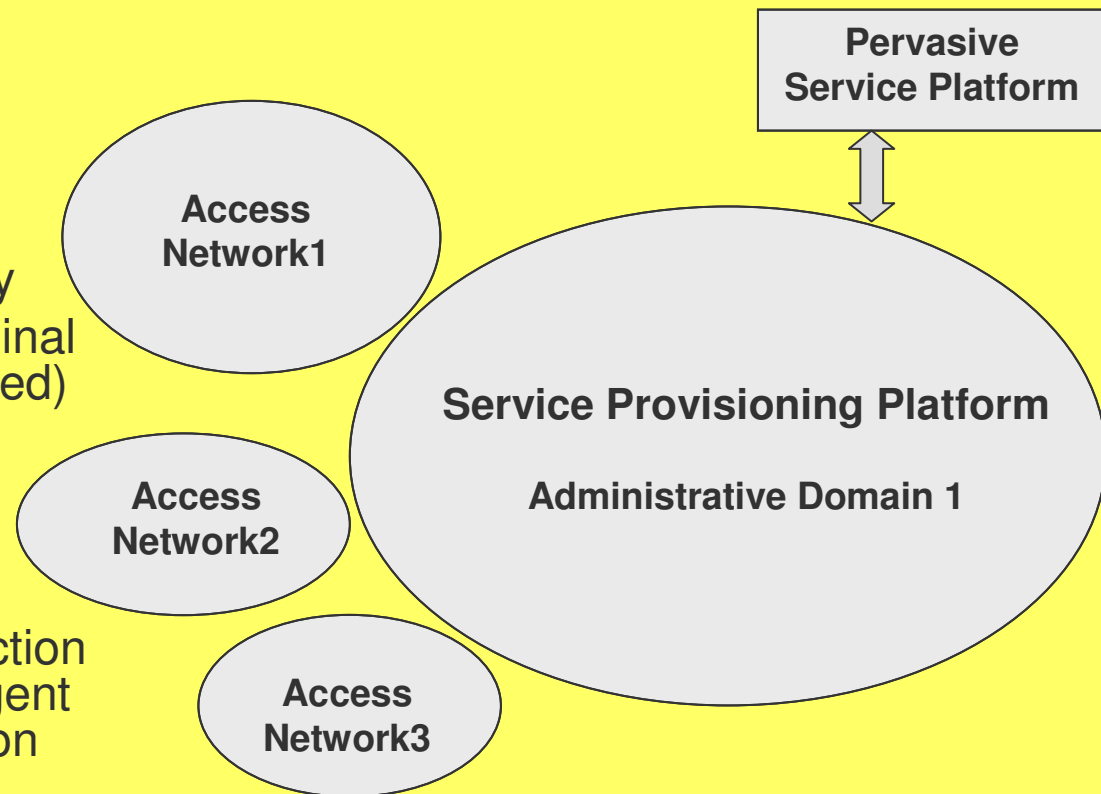




Architectural components

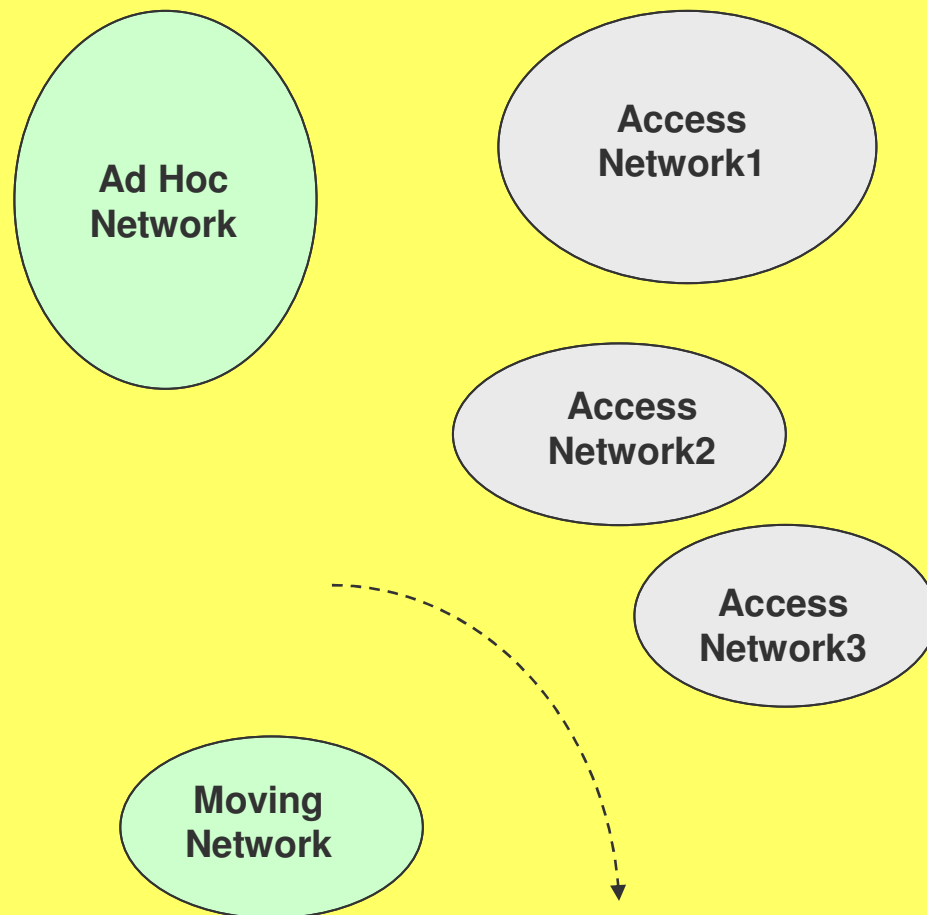
- ▶ **Integration of heterogeneous networks incl. Broadcast**

- ▶ Terminal mobility
- ▶ Handover (Terminal & Network initiated)
- ▶ context transfer mechanisms
- ▶ Access router discovery
- ▶ Interface abstraction layer incl. intelligent interface selection
- ▶ Multi homing
- ▶ Network-level QoS & Security
- ▶ Paging





Architectural components

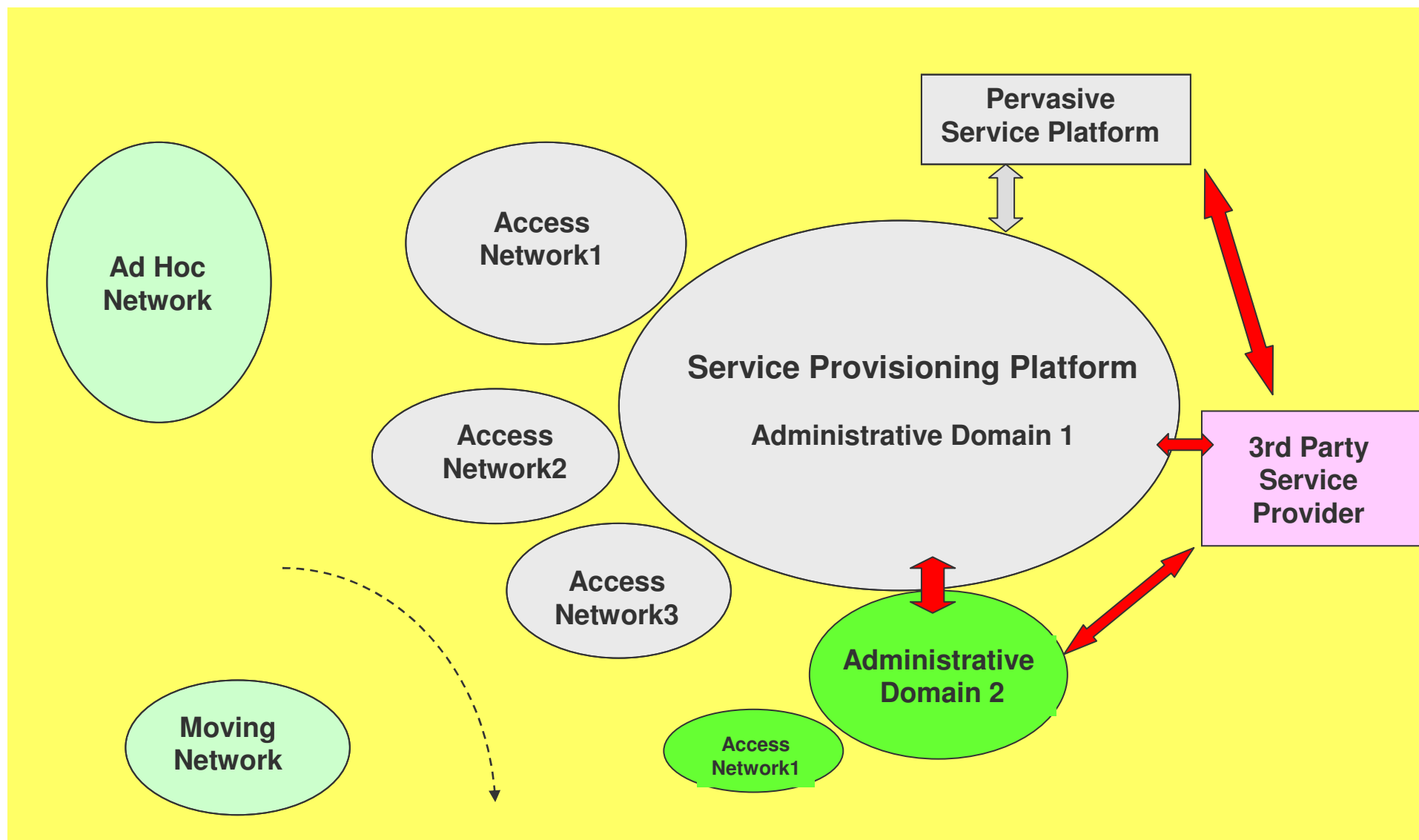


- ▶ **Ad Hoc Networks**
- ▶ Gateway discovery
- ▶ Address auto-configuration
- ▶ Unicast/multicast
- ▶ QoS in Ad Hoc Networks
- ▶ Charging & rewarding
- ▶ Metering

- ▶ **Moving Networks**
- ▶ Route optimization
- ▶ Multicast management

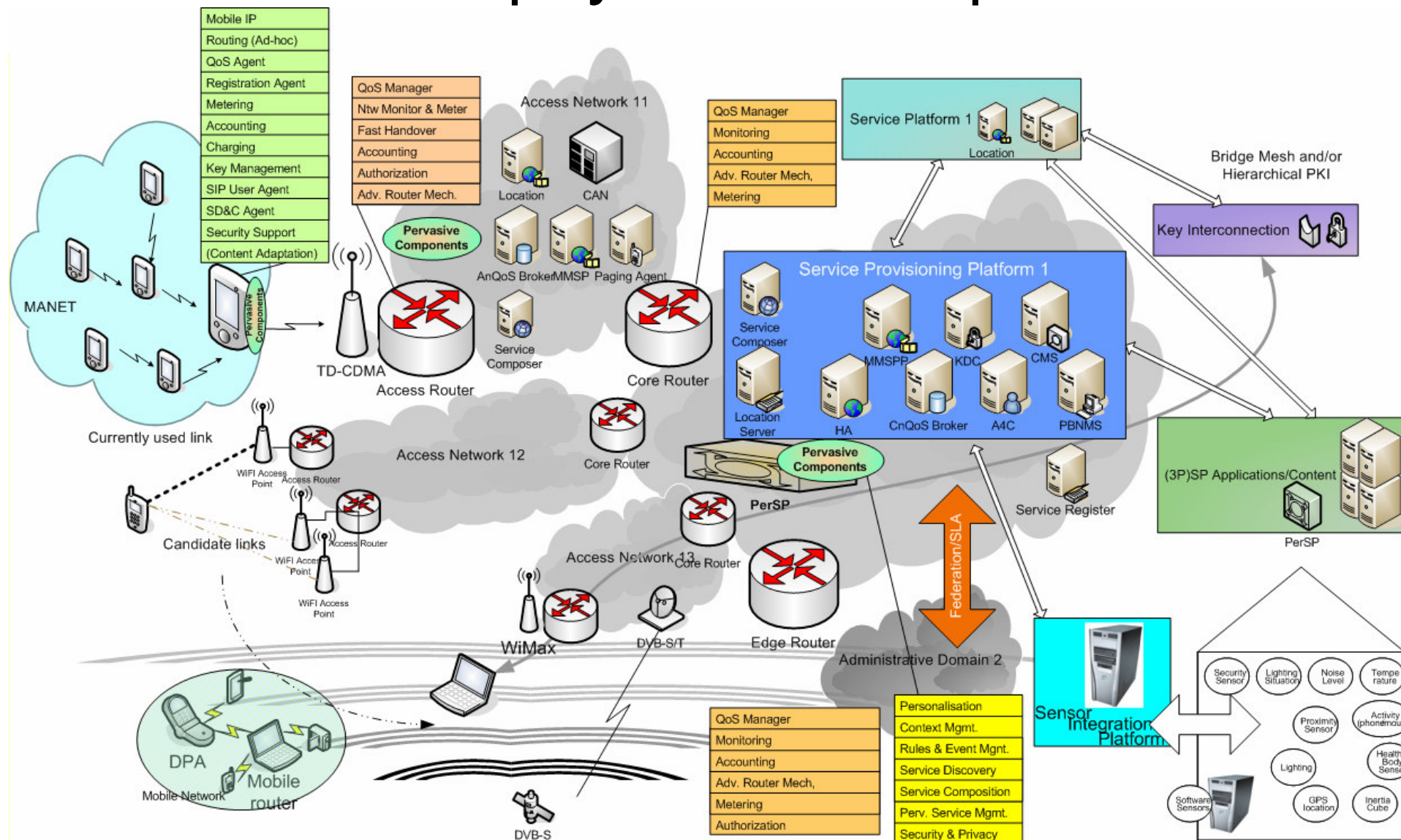


Architectural components





Architecture physical description



Daidalos

Key innovation and Guiding concepts



- ▶ **MARQS** (Mobility Management, AAA, Resource Management, QoS and Security)
 - functional integration for end-to-end services across heterogeneous technologies
- ▶ **VID** (Virtual Identities – personalisation at all levels)
 - separates the user from a device, enables flexibility as well as privacy
- ▶ **USP** (Ubiquitous and Seamless Pervasiveness)
 - enabling pervasiveness across personal and embedded devices, and allowing adaptation to changing contexts, movement and user requests
- ▶ **SIB** (Seamless Integration of Broadcast)
 - at both the technology level, such as DVB-S/T-H, and
 - at the services level, such TV, carousels and datacast
- ▶ **Federation** (“*comperation*”: competitors in cooperation”)
 - allowing network operators and service providers to offer and receive services
 - allowing players to enter and leave the field in a dynamic business environment



MARQS – Terminal Mobility Example



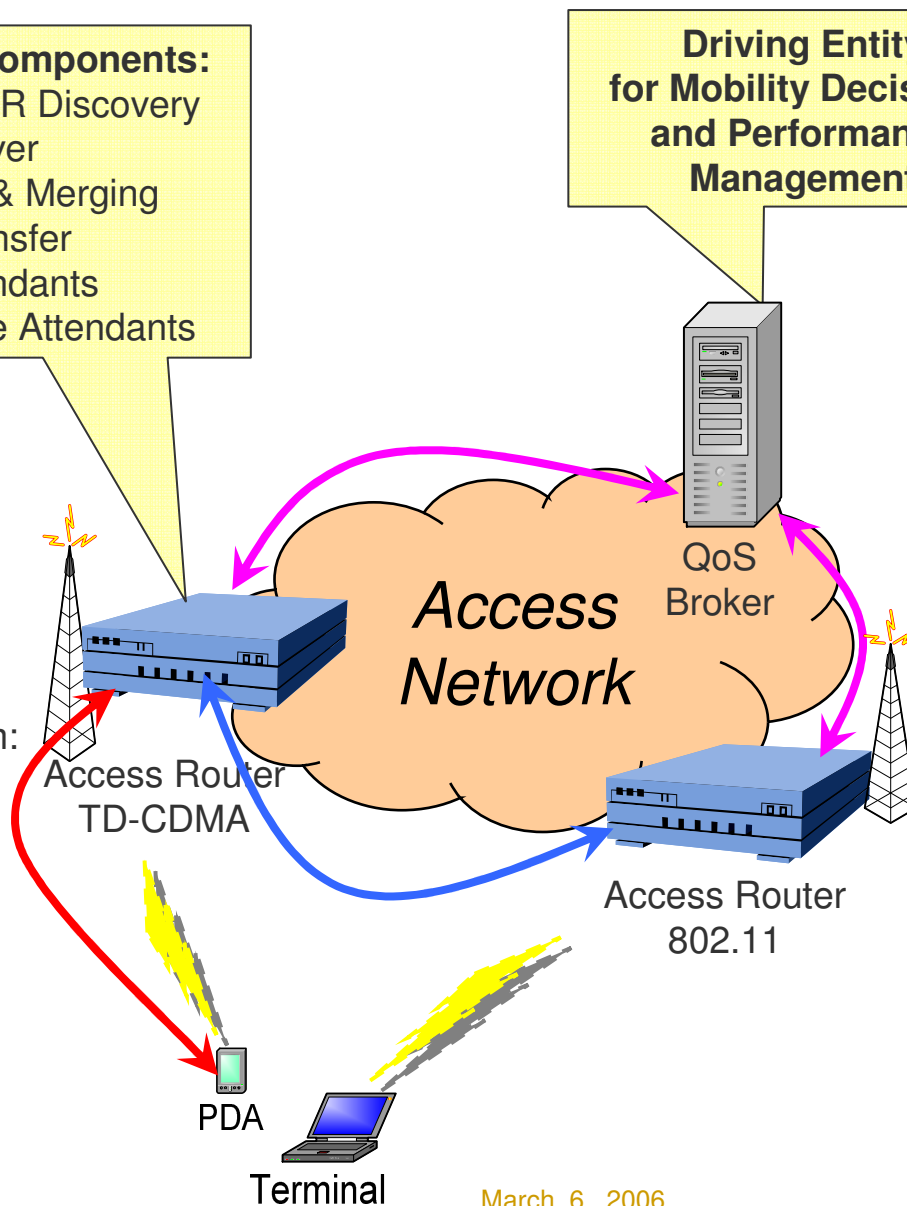
Functional Components:

- Candidate AR Discovery
- Fast Handover
- Duplication & Merging
- Context Transfer
- Paging Attendants
- Performance Attendants

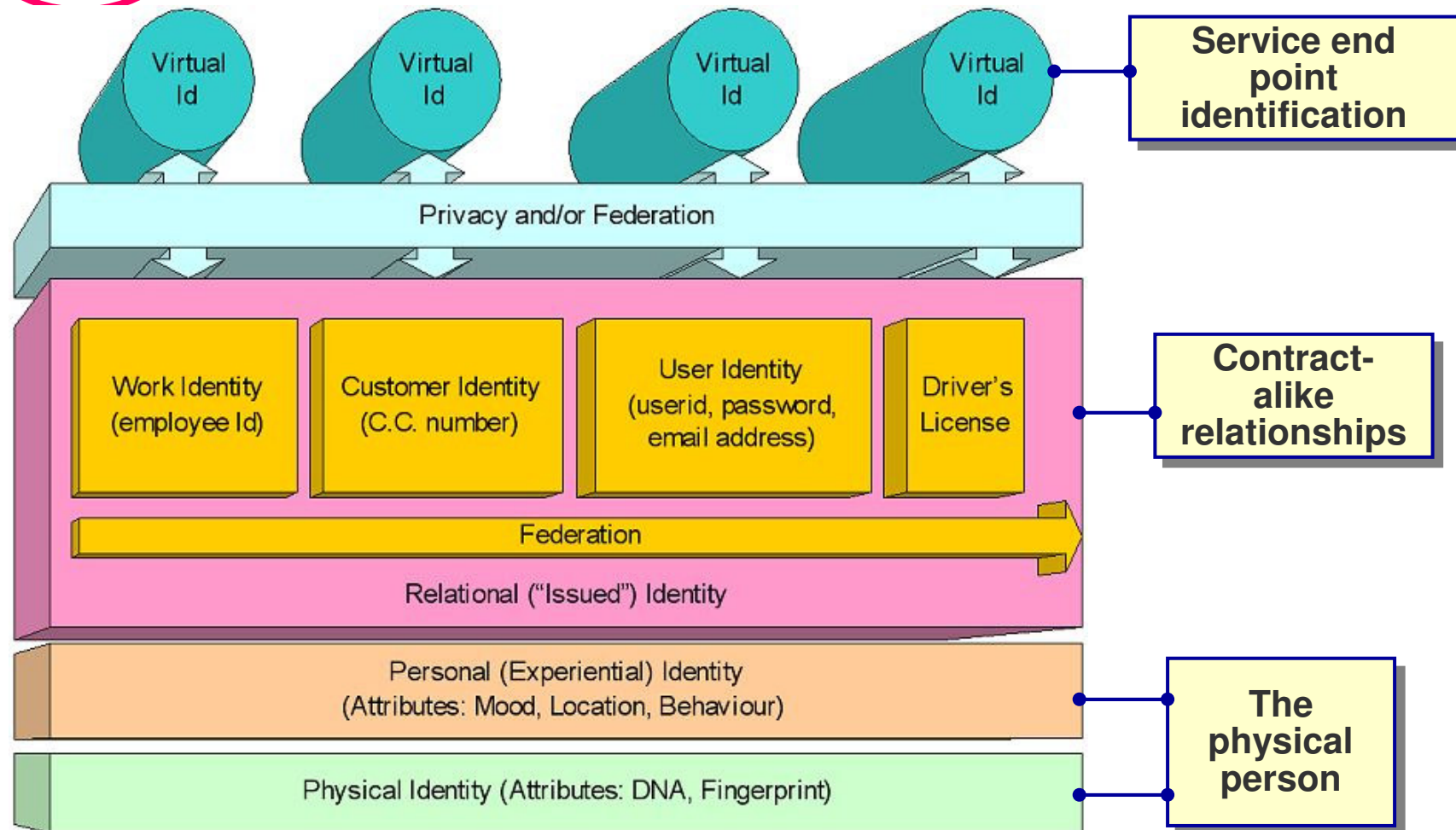
Driving Entity for Mobility Decisions and Performance Management

- Inter Access Router communication:
CARD and **Context Transfer**
Protocol
- Communication between Access
Routers and QoS Broker via **COPS** ¹⁾
for mobility reasons
- Communication on the Wireless Medium:
Fast Handover and **CARD** messages
exchanged

¹⁾ Common Open Policy Service protocol



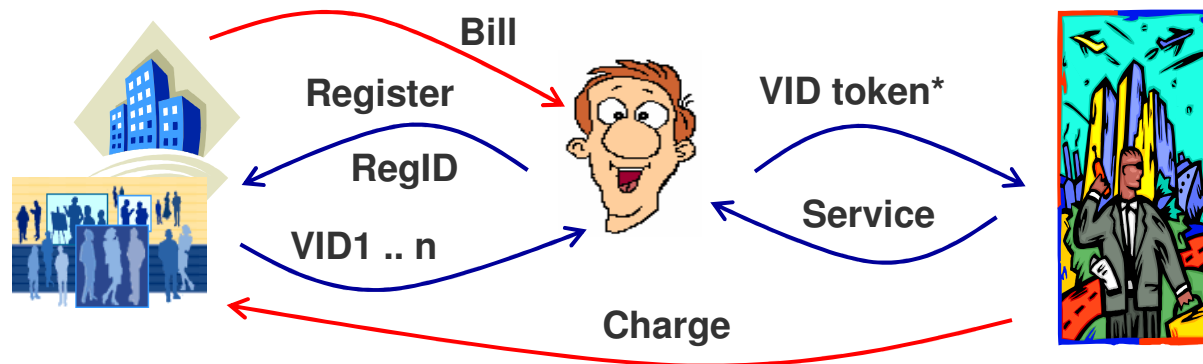
VID - What is a user?



Virtual Identities: Decoupling Users from Devices



- ▶ Virtual IDs contain the profile and attributes of users
 - Issued by a trusted entity, such as an operator, who is responsible for billing the user
 - They are used by the user to access networks, services and content
 - They do not contain the identification of the person (user), so they support privacy
 - If the accessed network, service or content is not the issuing operator, they do not know the identity, but they will get the revenue from the issuing operator



- ▶ Virtual IDs decouple the role of the billing entity, and the provisioning of networks and services
- ▶ Virtual IDs is an enabler for Federation, they can also be used for services.





What is Broadcast (in the DAIDALOS context) ?

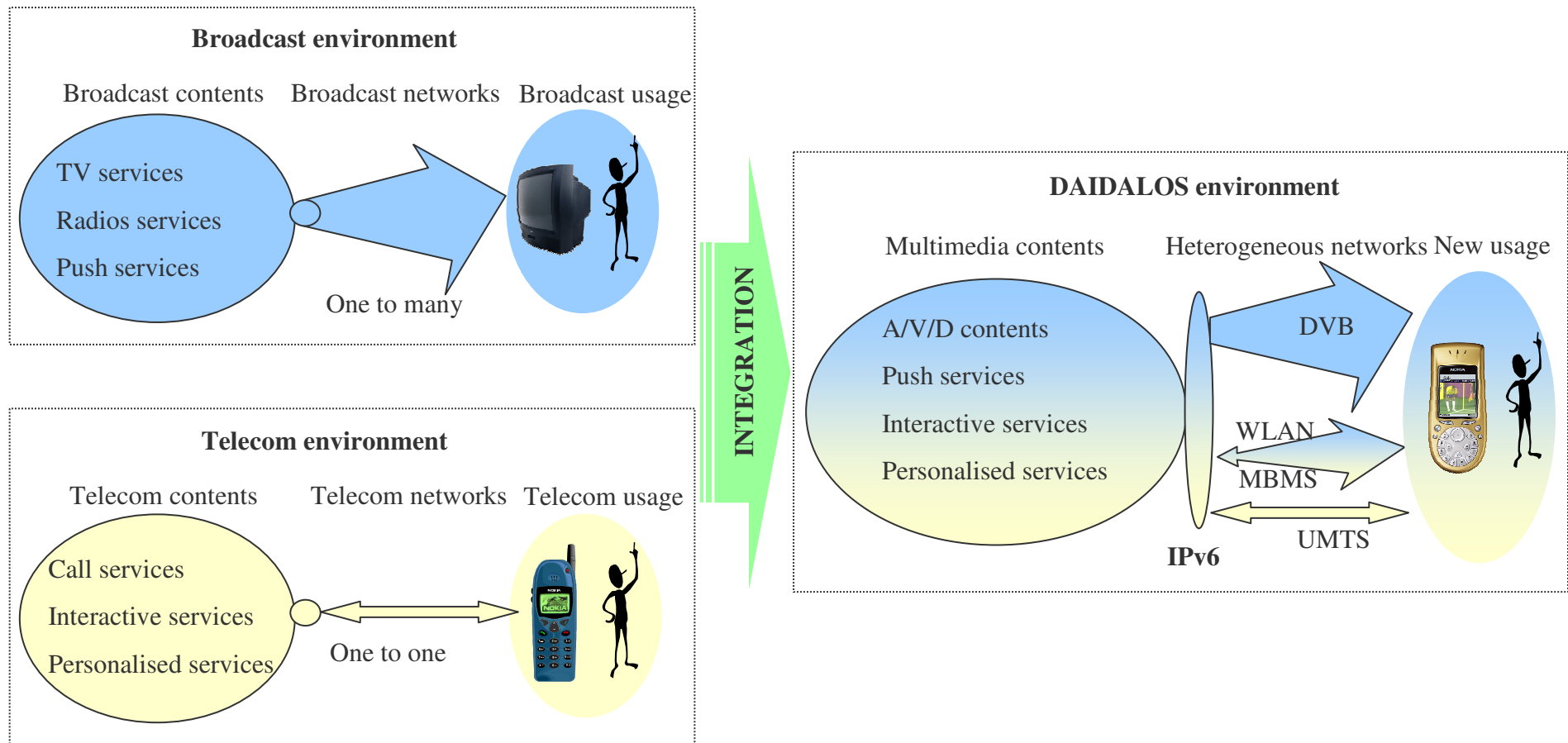
- Broadcast **Networks**
 - DVB (-T, -S, -H)
 - UMTS/MBMS
 - Wireless LAN (broadcast mode)
 - WiMax
- Broadcast **Services**
 - Carousel (Traffic / airport information)
 - Multimedia Multicast (sports events)



Broadcast integration in DAIDALOS

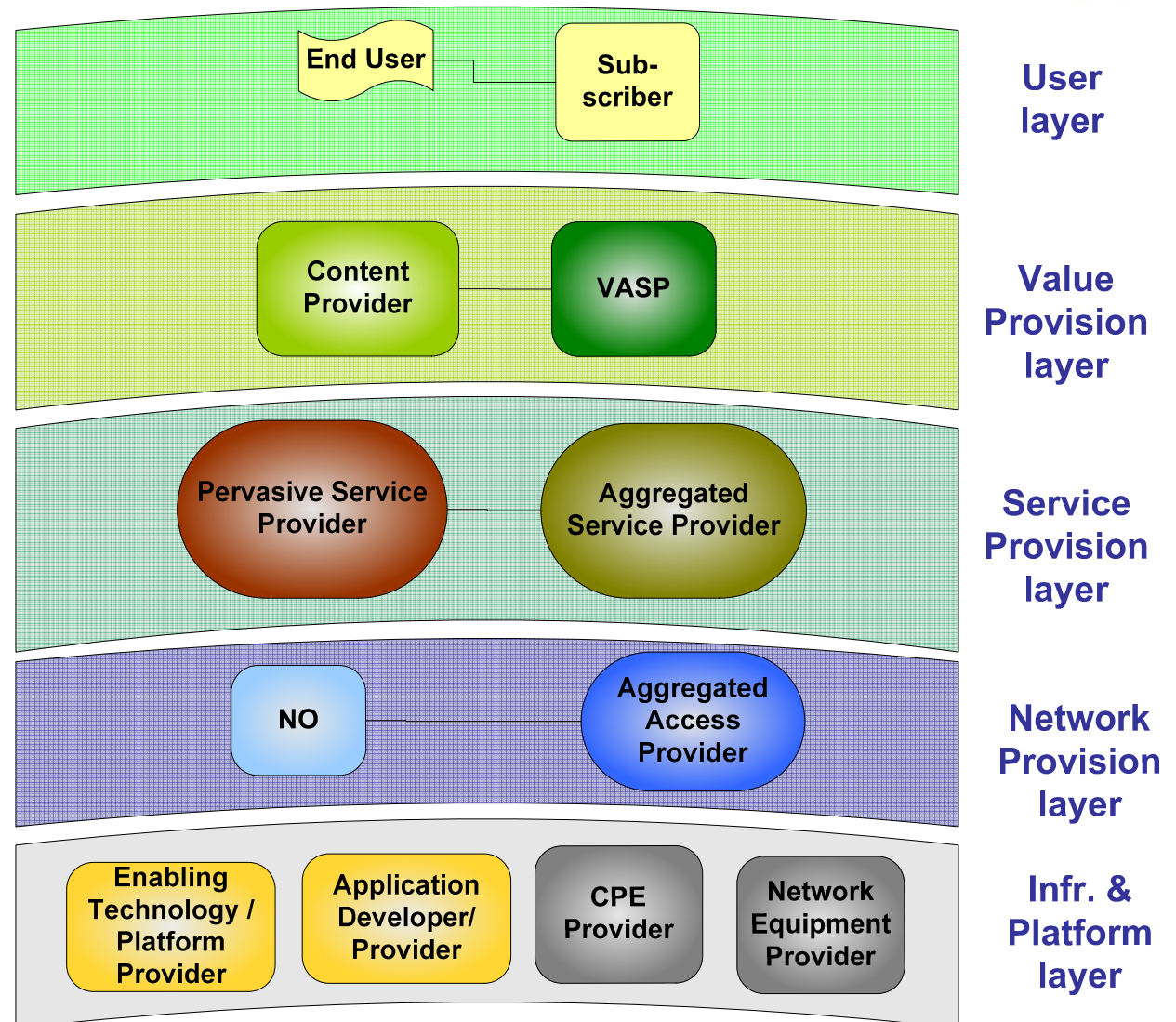


→ The integration of different (“opposite”) worlds

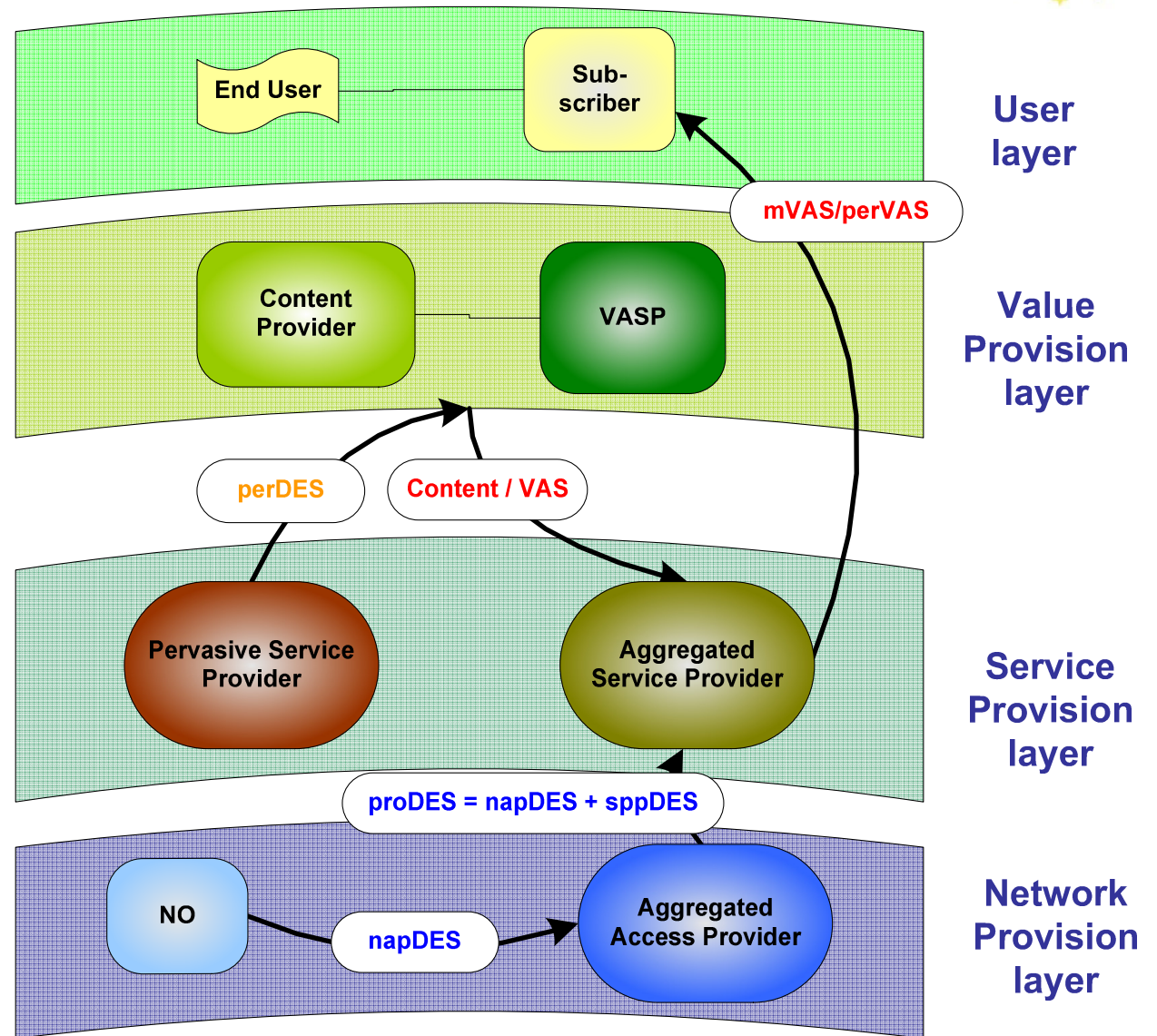


Federation

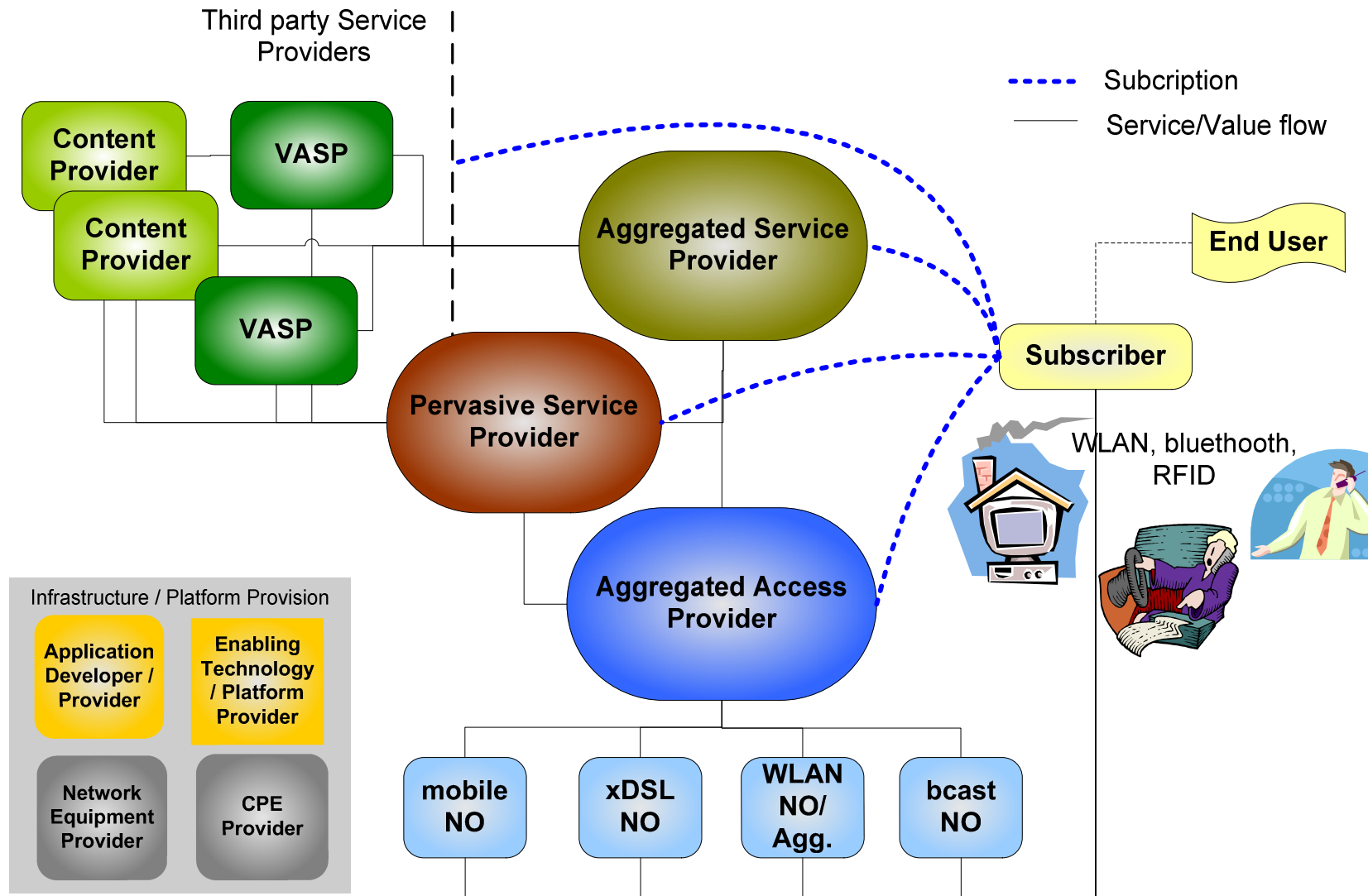
- ▶ Dynamic Business Environments
- ▶ Fragmentation
- ▶ Diversification of Roles
- ▶ “everything” can be provided, discovered and charged as a service
- ▶ VID Concept (beyond IDs for persons only)



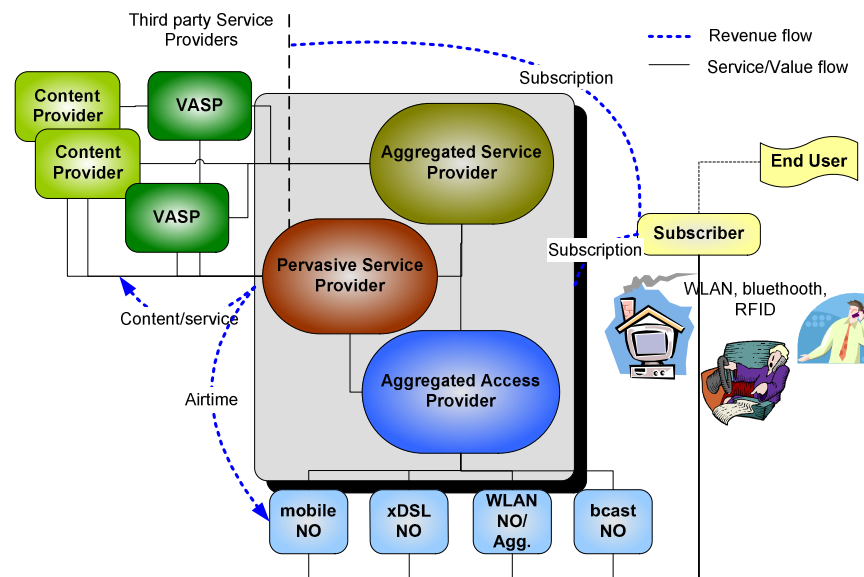
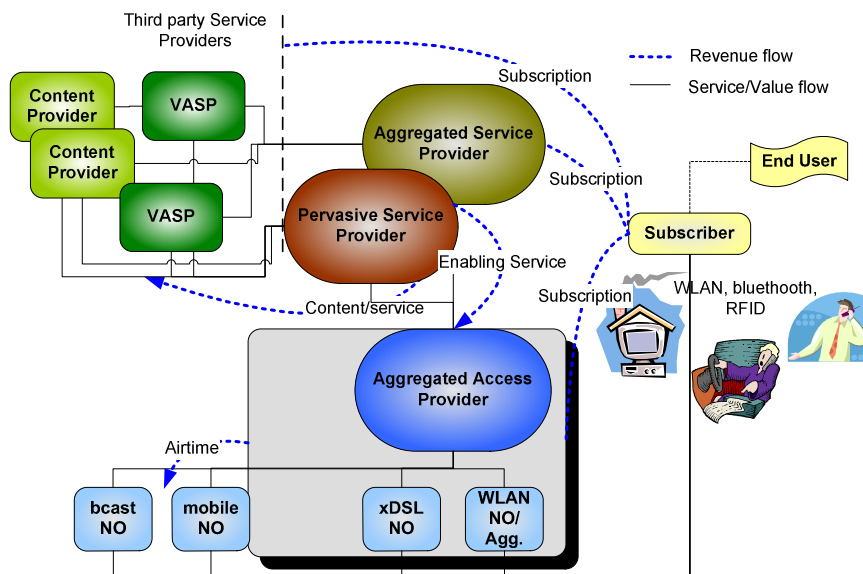
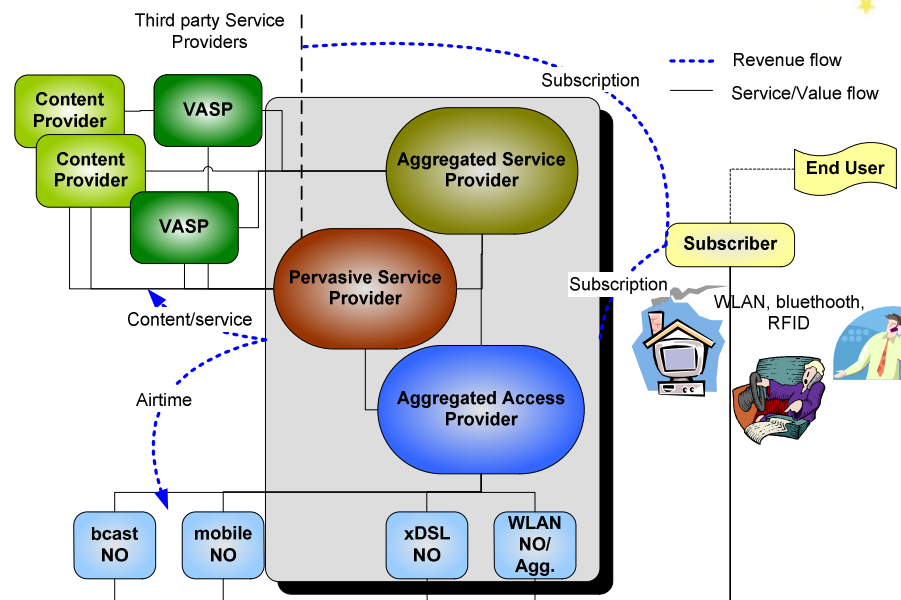
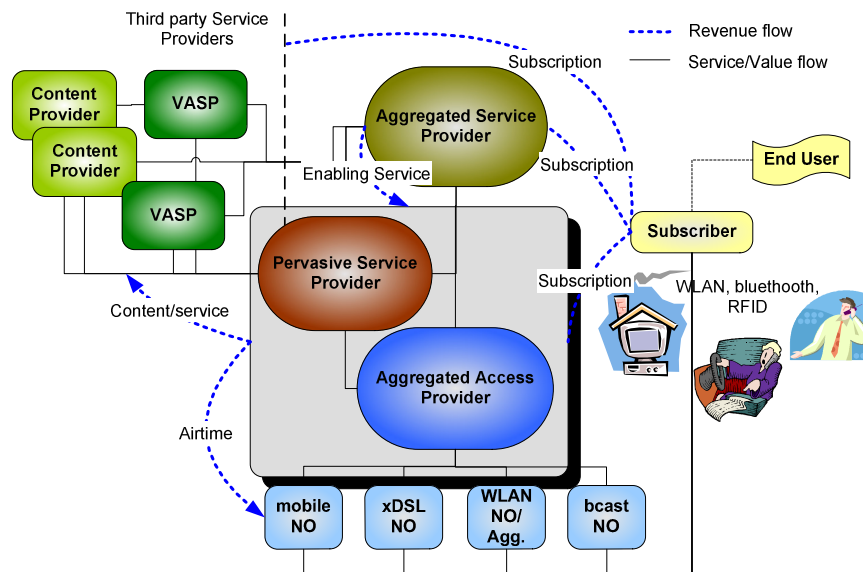
Federation



Business Modeling Framework



Different Models



USP - What is pervasiveness in Daidalos?

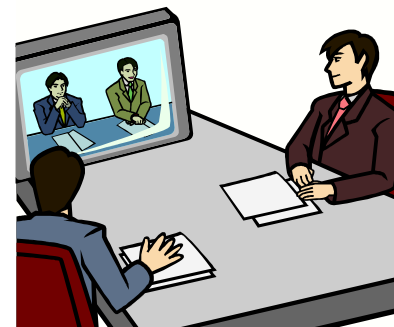


Handheld pervasiveness



Mobile, handheld, wearable.
The focus is on terminal mobility, mobile services, content adaptation, communication services.

Embedded pervasiveness

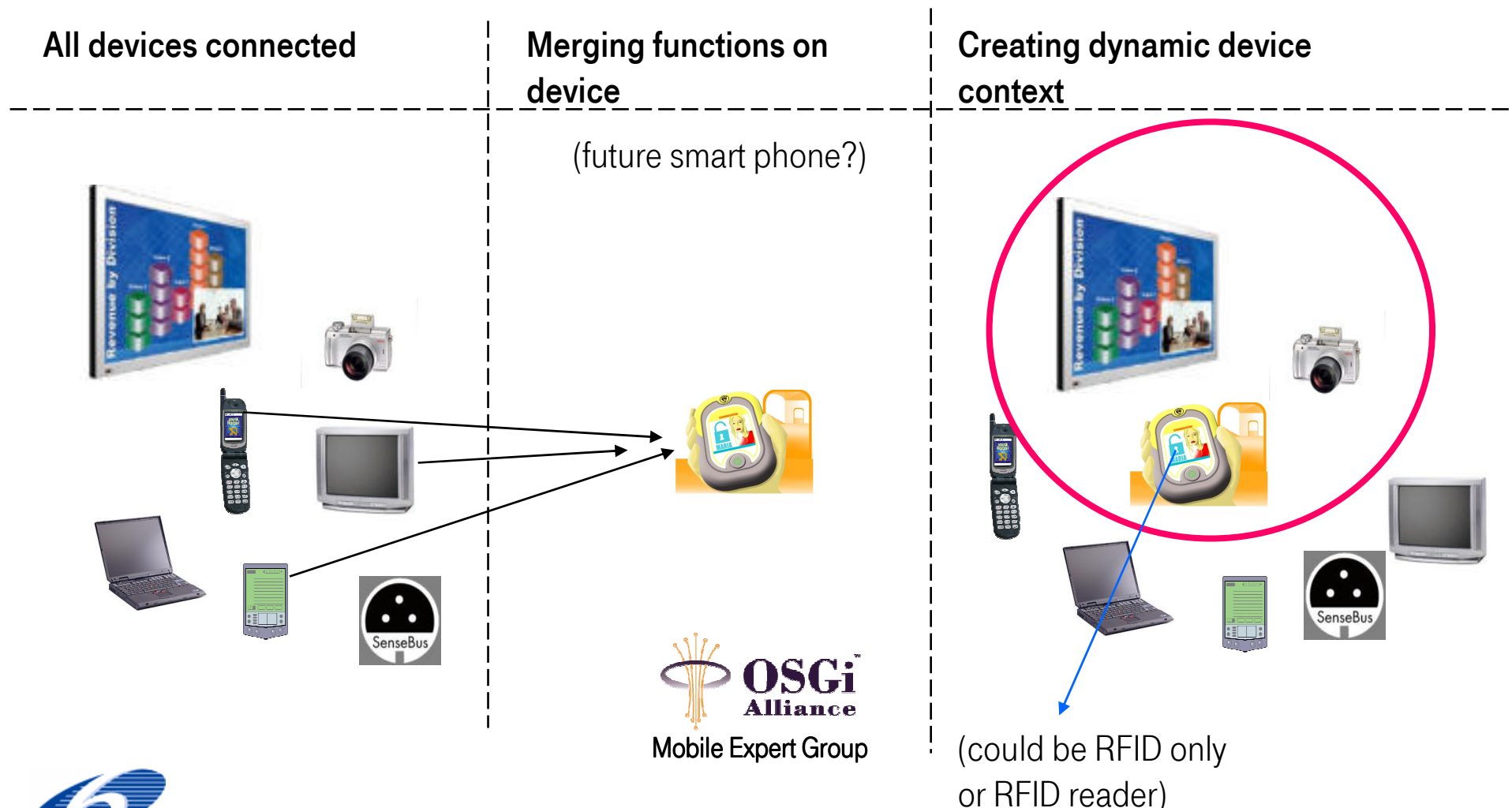


Embedded, specialized devices and sensors, public and shared devices, wireless services, personal area networks, active spaces.





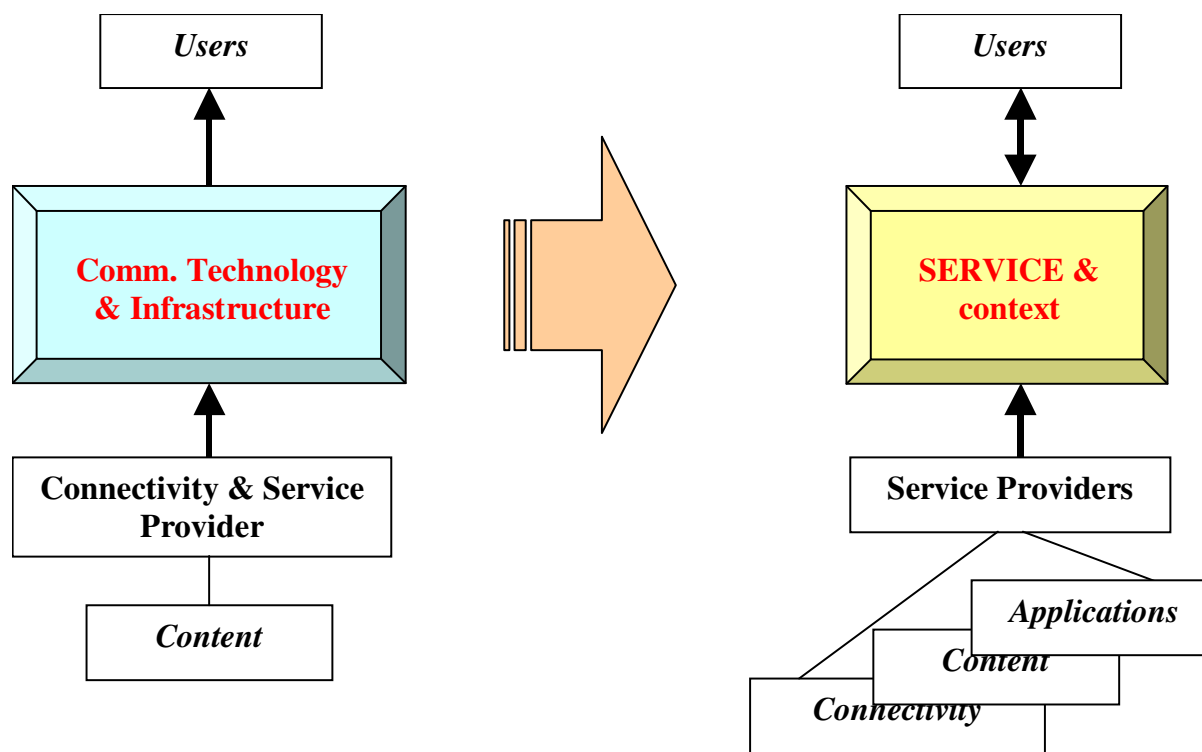
“DAIDALOS Personal Assistant” (DPA)





Service Centricity

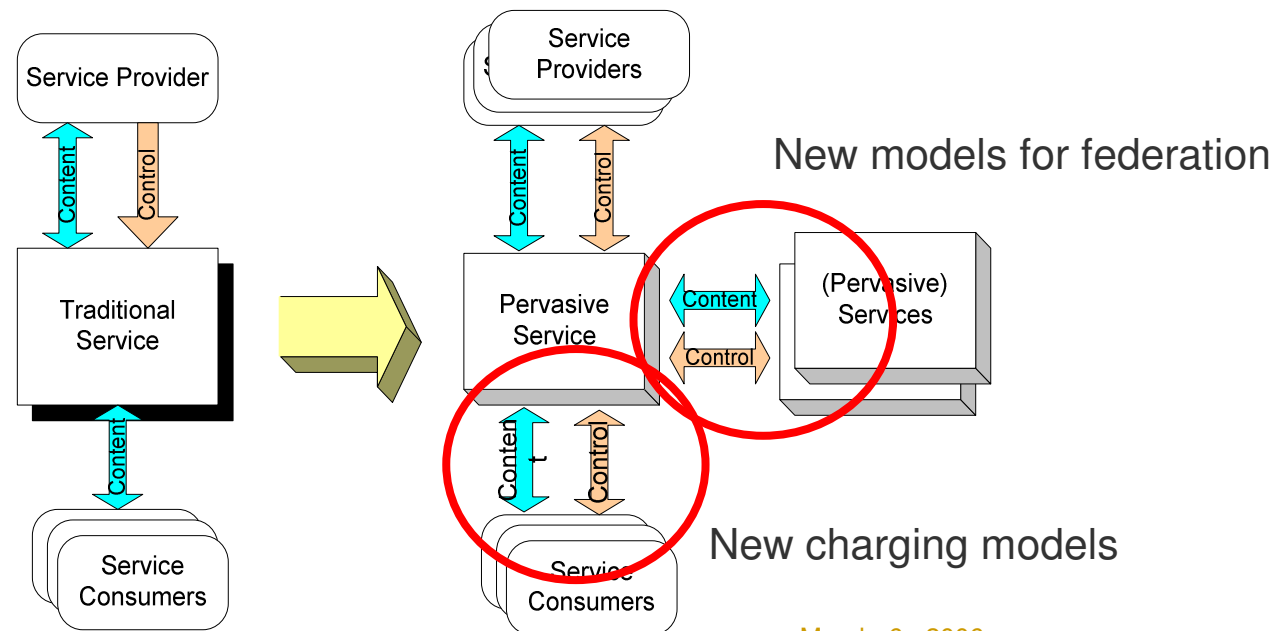
- Value proposition moved from providing access to providing services
- Communication infrastructure becomes transparent to the customer
- Service adapts to user preferences & context of use



Traditional Service Provision → Pervasive Service Provision



Ubiquitous **service discovery and dynamic composition** of available resources and capabilities that comprise the service



Pervasive Service Platform (PSP) – Overall objectives

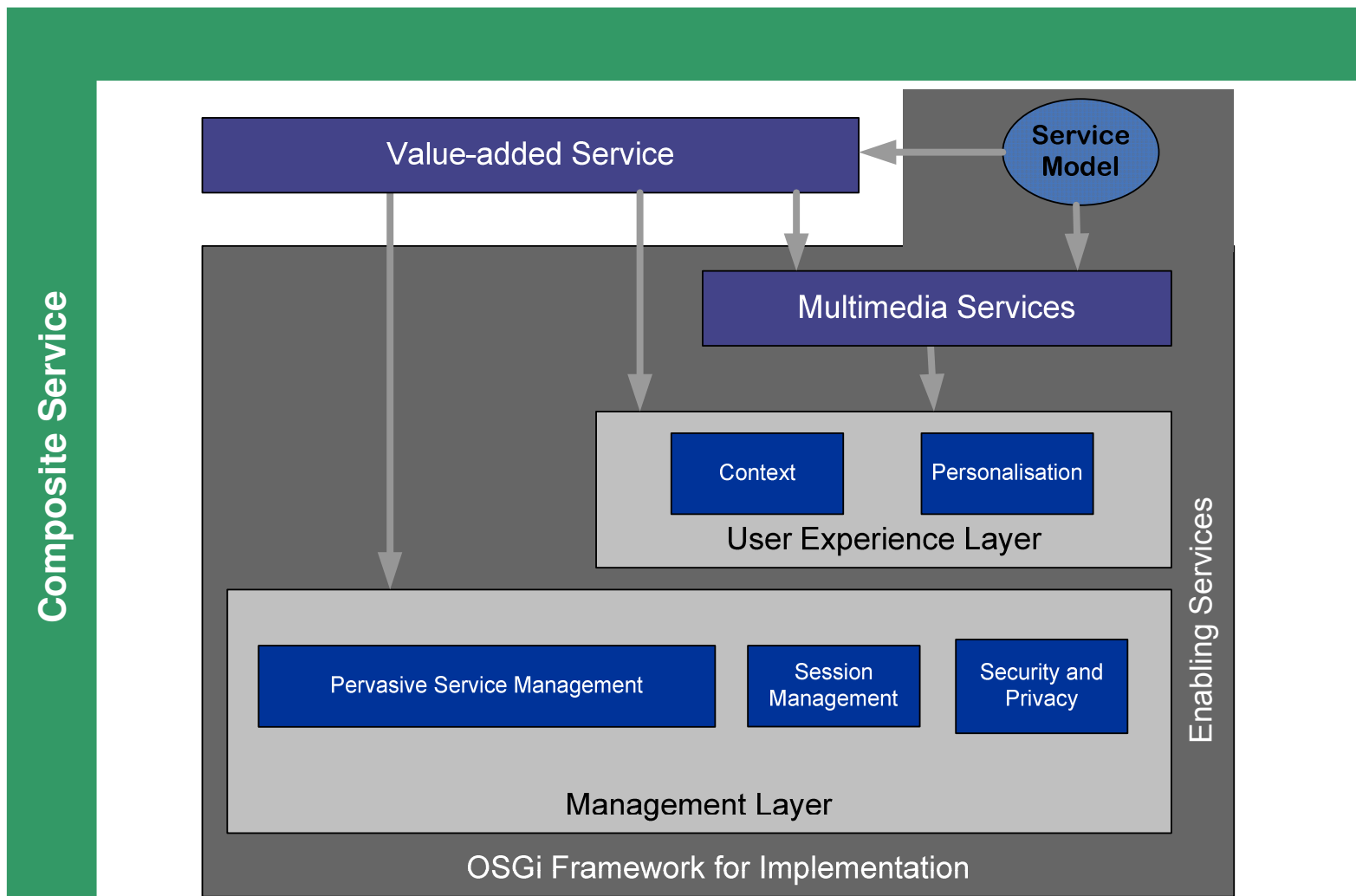


- ▶ generic service model
- ▶ privacy framework for context aware pervasive applications.
- ▶ integration of pervasive system components:
 - Context management component (ontology)
 - Personalization, Profiles
 - Rules and events management (intelligent middleware)
 - Pervasive service management
- ▶ Design and implementation of PSP in form of a prototype with 3.party API and integrated with Service Provisioning Platform





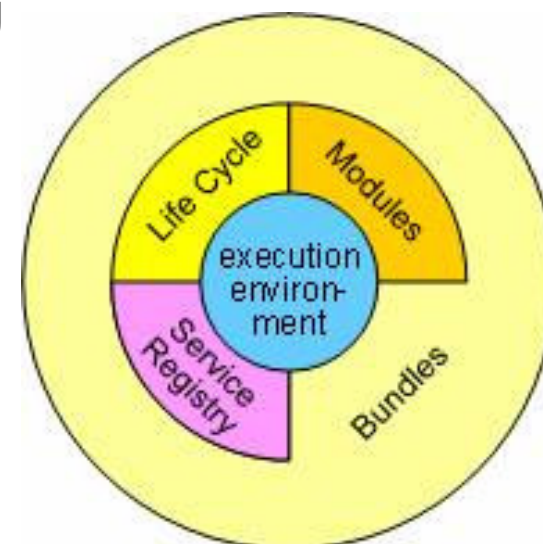
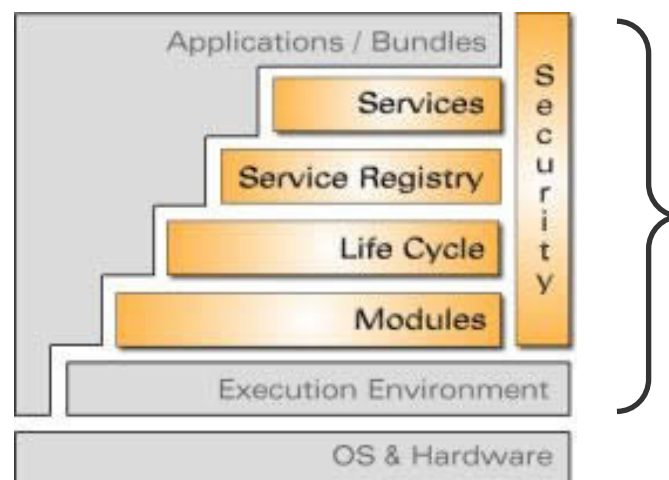
PSP overall architecture



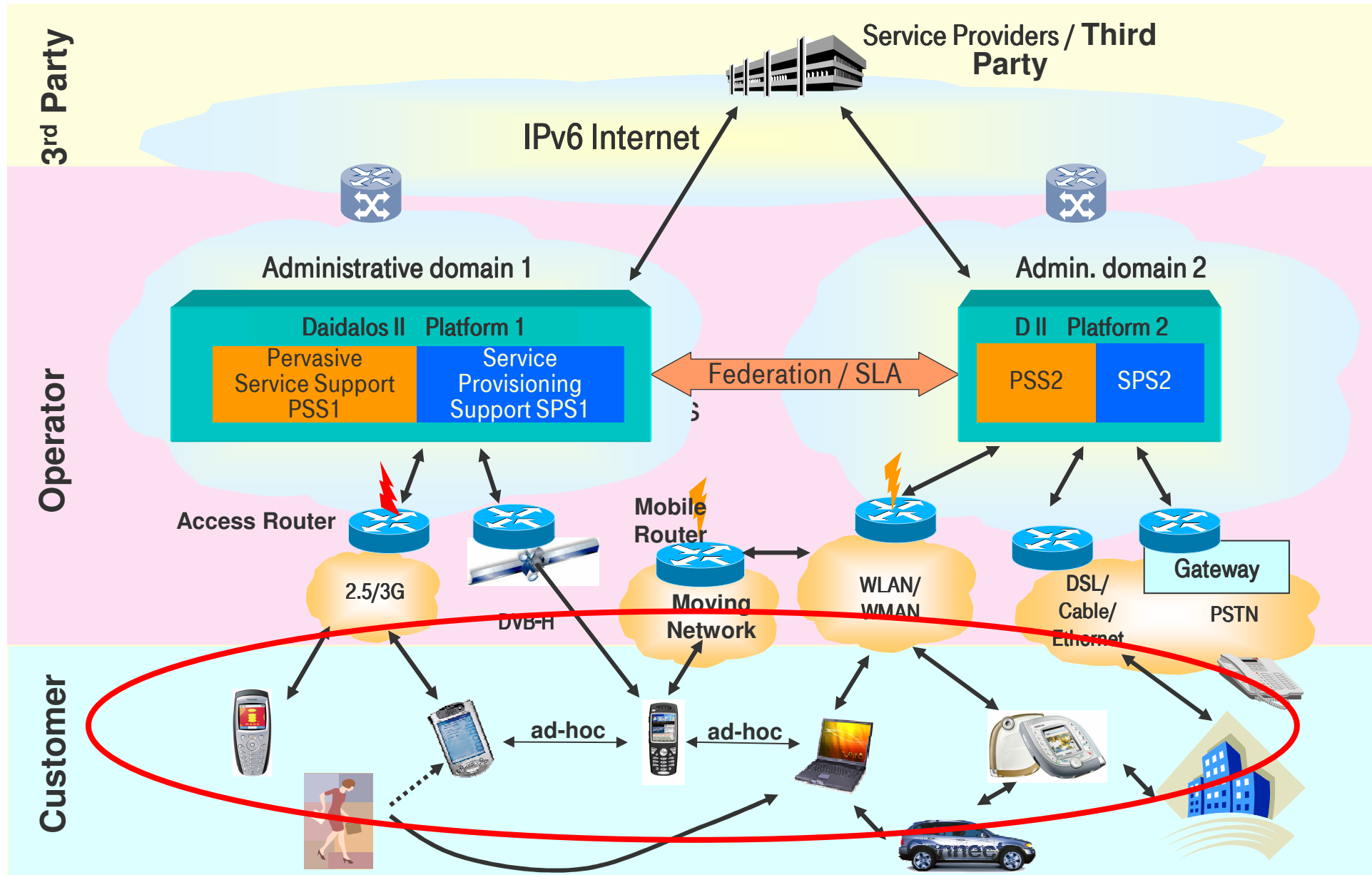


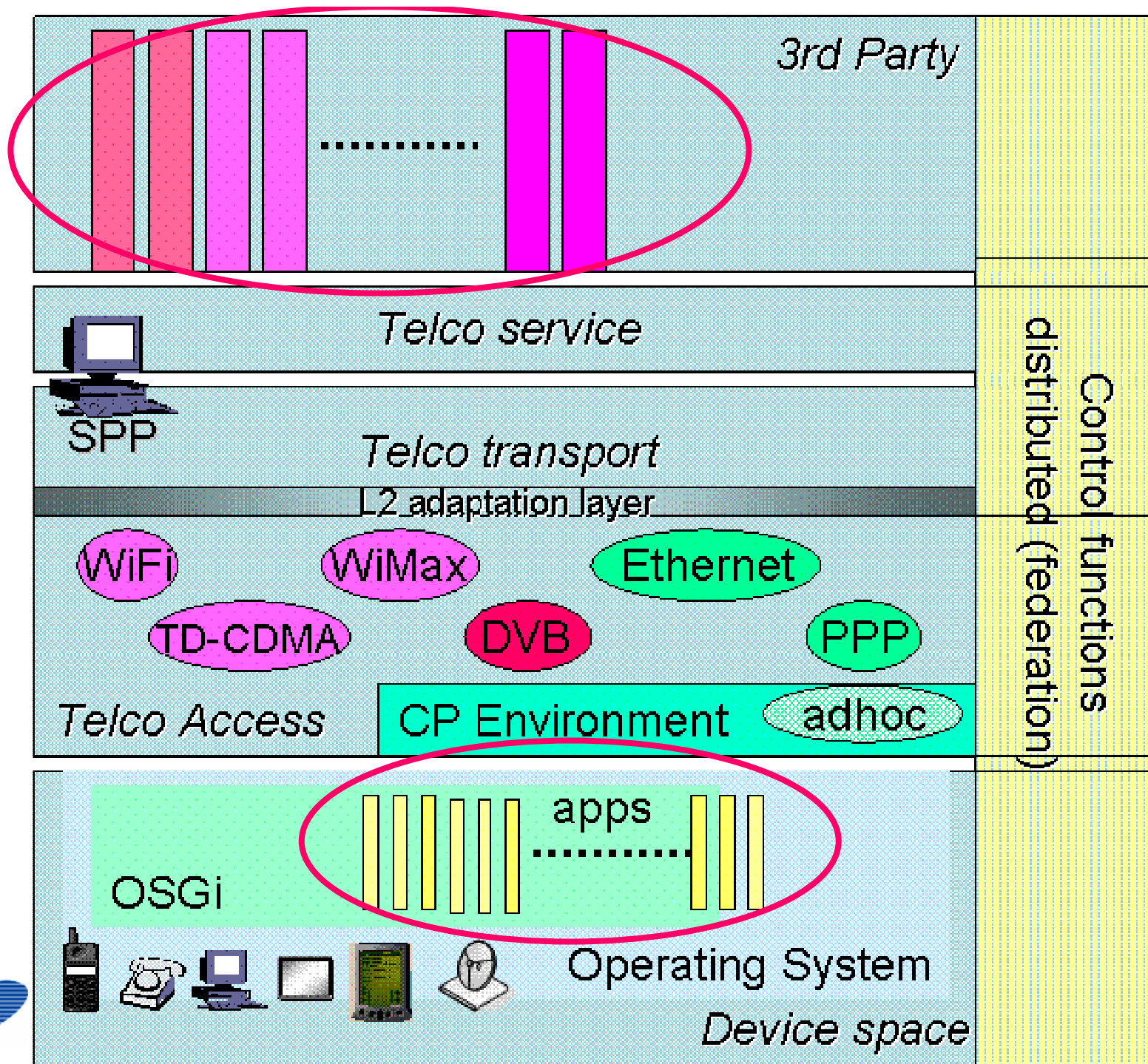
OSGi Technology In A Nutshell

- ▶ What is OSGi technology?
- ▶ An enterprise-class execution environment for dynamically deploying and managing software components that delivers services and applications to networked devices
- ▶ OSGi targets the embedded&mobile device market.
- ▶ OSGi is a java-based light-weight standardized service management framework.
- ▶ OSGi allows for multi-provider service provisioning model.



Daidalos Ecosystem

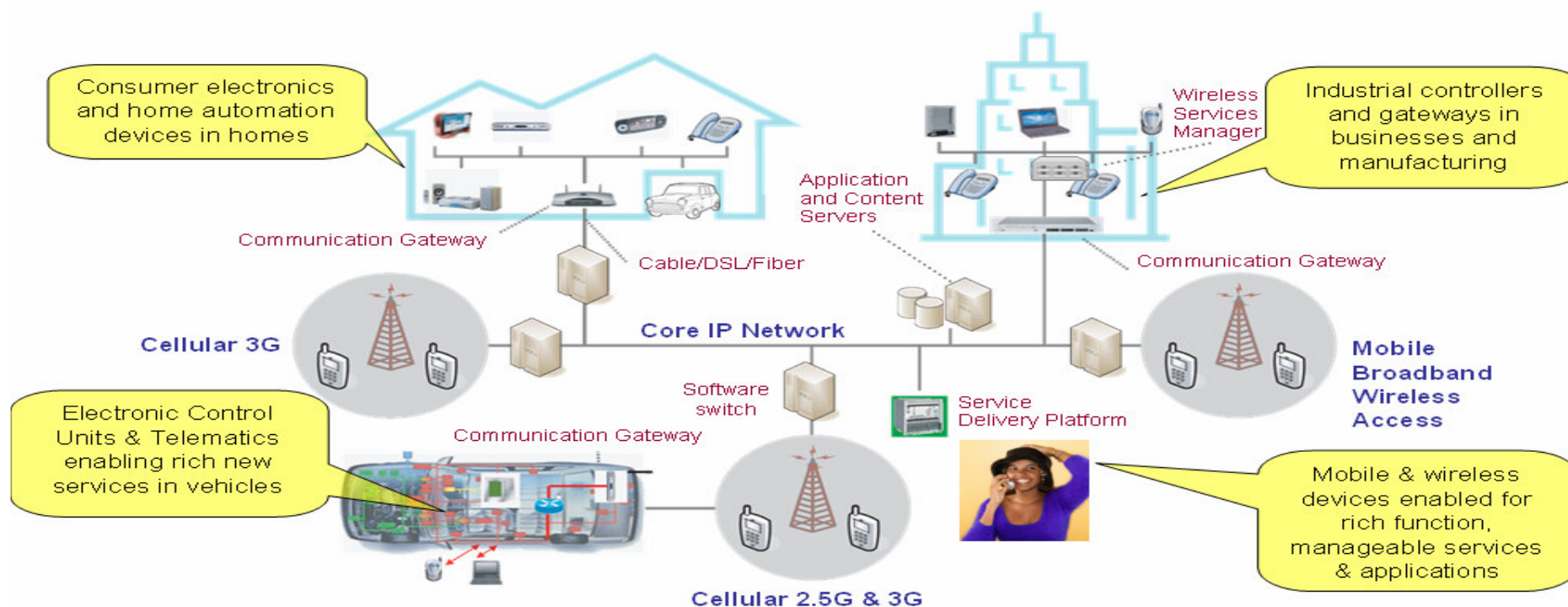






Delivery of OSGi enabled solutions

OSGi technology is currently being implemented by member companies in user environments such as **HOMES**, **BUSINESSES**, **MOBILE** and **AUTOMOBILES**.



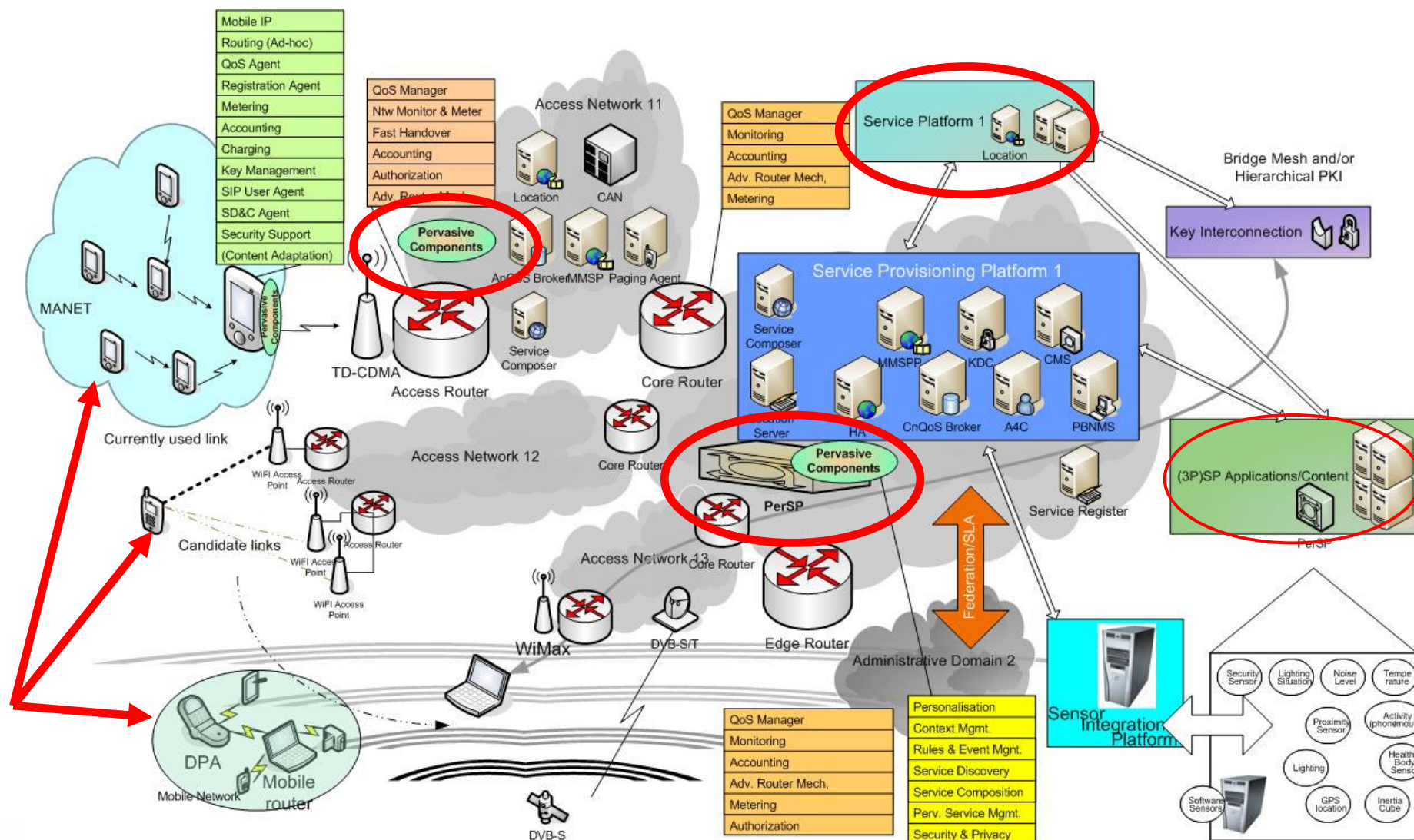
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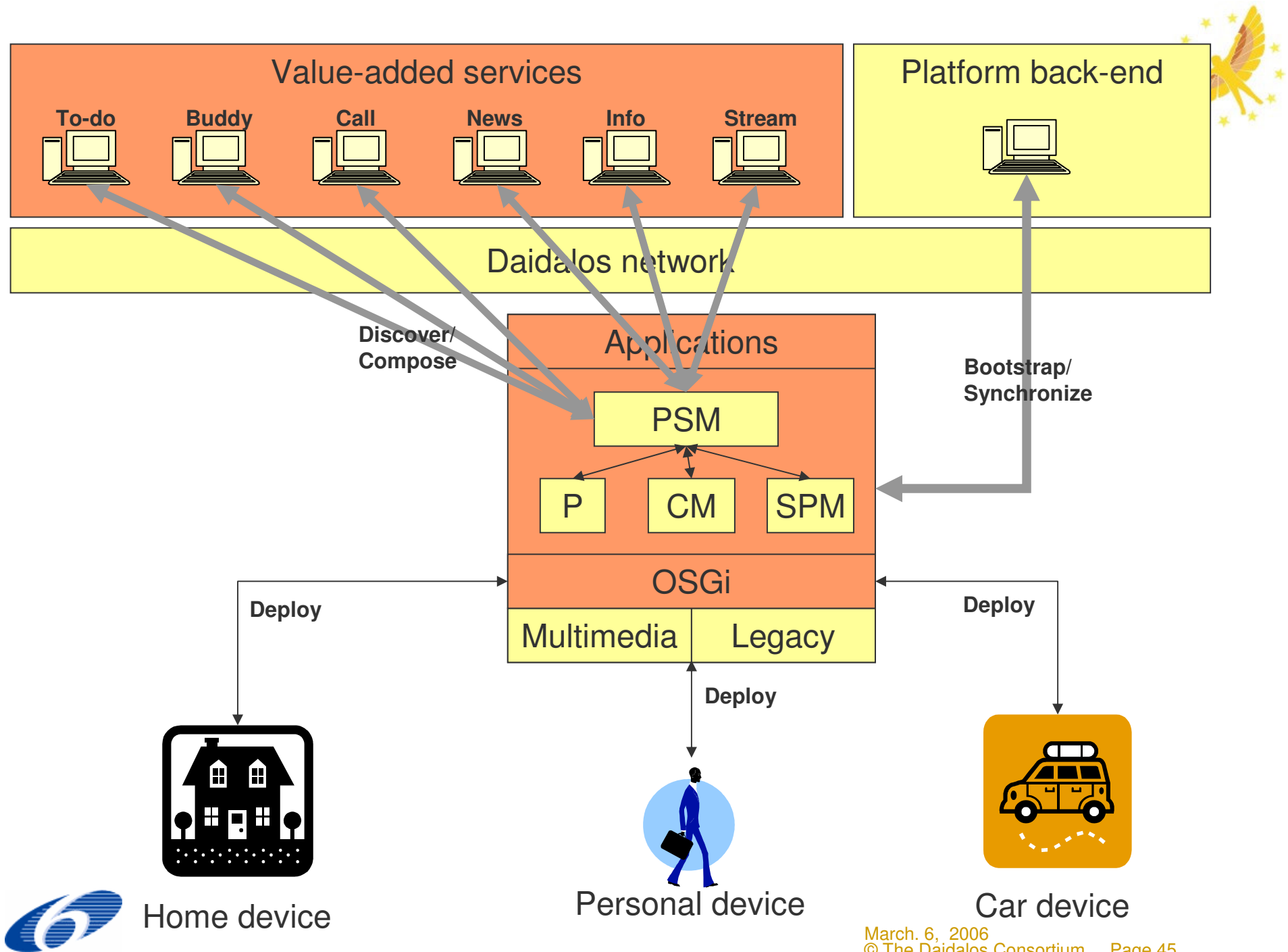
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PSP – Mapping into Architecture





Global, large-scale pervasiveness



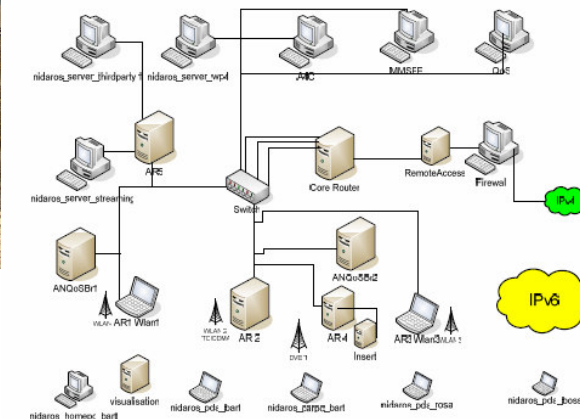
- Questions to be answered

- ▶ How can pervasive computing architectures **scale up to millions** of users and millions of services?
 - Architectural deployment options
- ▶ What pervasiveness functionality should a platform provide to **3rd party services**?
 - Development of API for 3.parties
- ▶ What are the **operational requirements** of pervasive service platforms?
 - Device management, A4C integration, QoS integration, dynamic deployment,...
- ▶ How can we protect **user privacy**?
 - How can the Virtual-ID concept protect user privacy?
 - How can we cope with private, at the same time context-aware service usage?
- ▶ What about **usability** of pervasive services?
 - How can privacy terms be negotiated among services?
 - How can personalization of services be simplified?
- ▶ How can **raw data from sensors** be processed into more meaningful information?

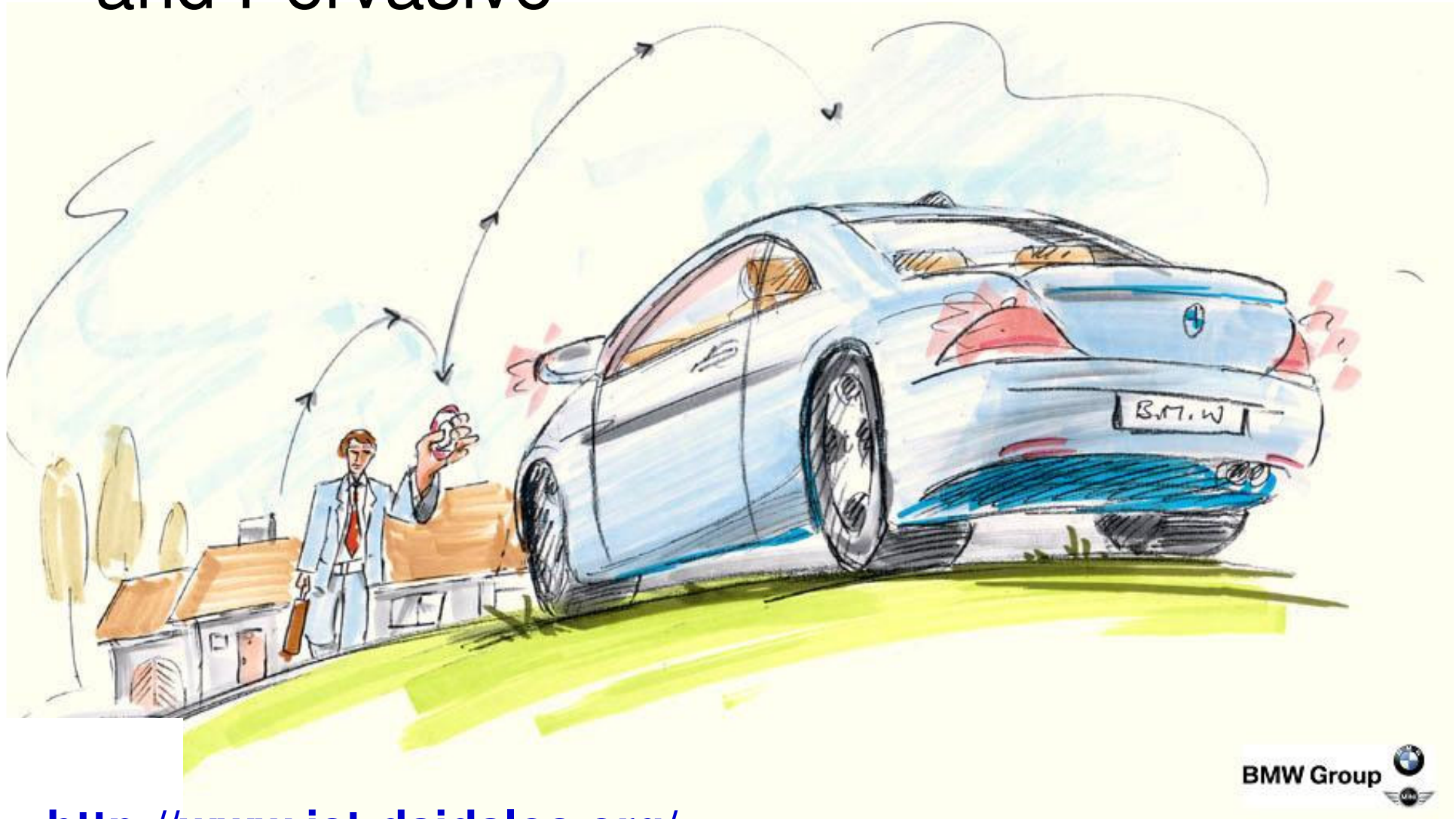


Integration Testbeds

Aveiro, Stuttgart, Sophia Antipolis (Dec. 2005)



Personalized Services – Seamless and Pervasive



<http://www.ist-daialos.org/>



Thank You

