Mobile Networks and RMS

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Presentation Outline

- **The Akogrimo Project**
- **Application Scenarios**
- **Architecture Overview**
- **Mobility Challenges**
- **Approach to a Solution**

Akogrimo Project Partners

Telecom Operators & Research

GRID Infrastructure & Research

Grid & IT Industry

## Tool Provider / Business Models / Applications

Mobile Grids – The Big Business?

- Busy yes, but not too much business so far.
- Motivation for telecom operators:
  - Decreasing revenues with the current business model.
  - In the internet model you typically pay a fixed price per access and maybe a fixed price per volume (flat rates)
  - Moving up the value chain, network operators want to sell services and earn money per service.
- Motivation for the IT Industry:
  - Grid means secure and reliable computing. These qualities are essential for doing business.
  - Mobility means new business opportunities.
- Motivation for Grid Research:
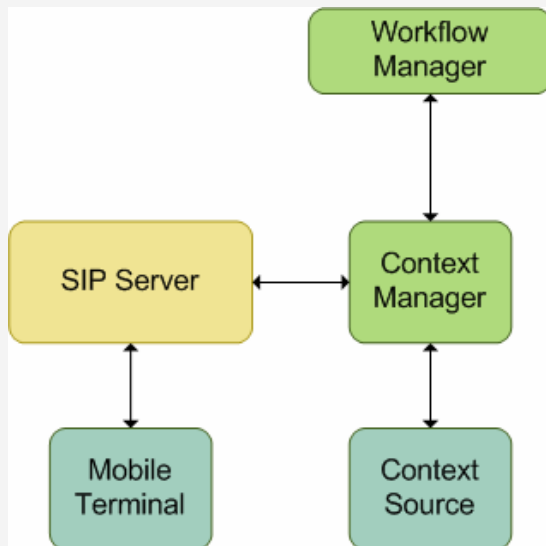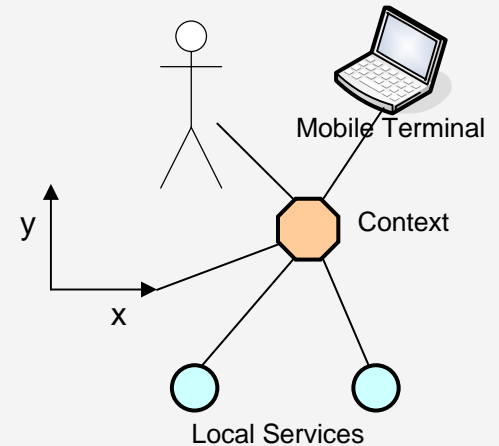 - Because we love the challenge. ;-)

eHealth Scenario - Prototype
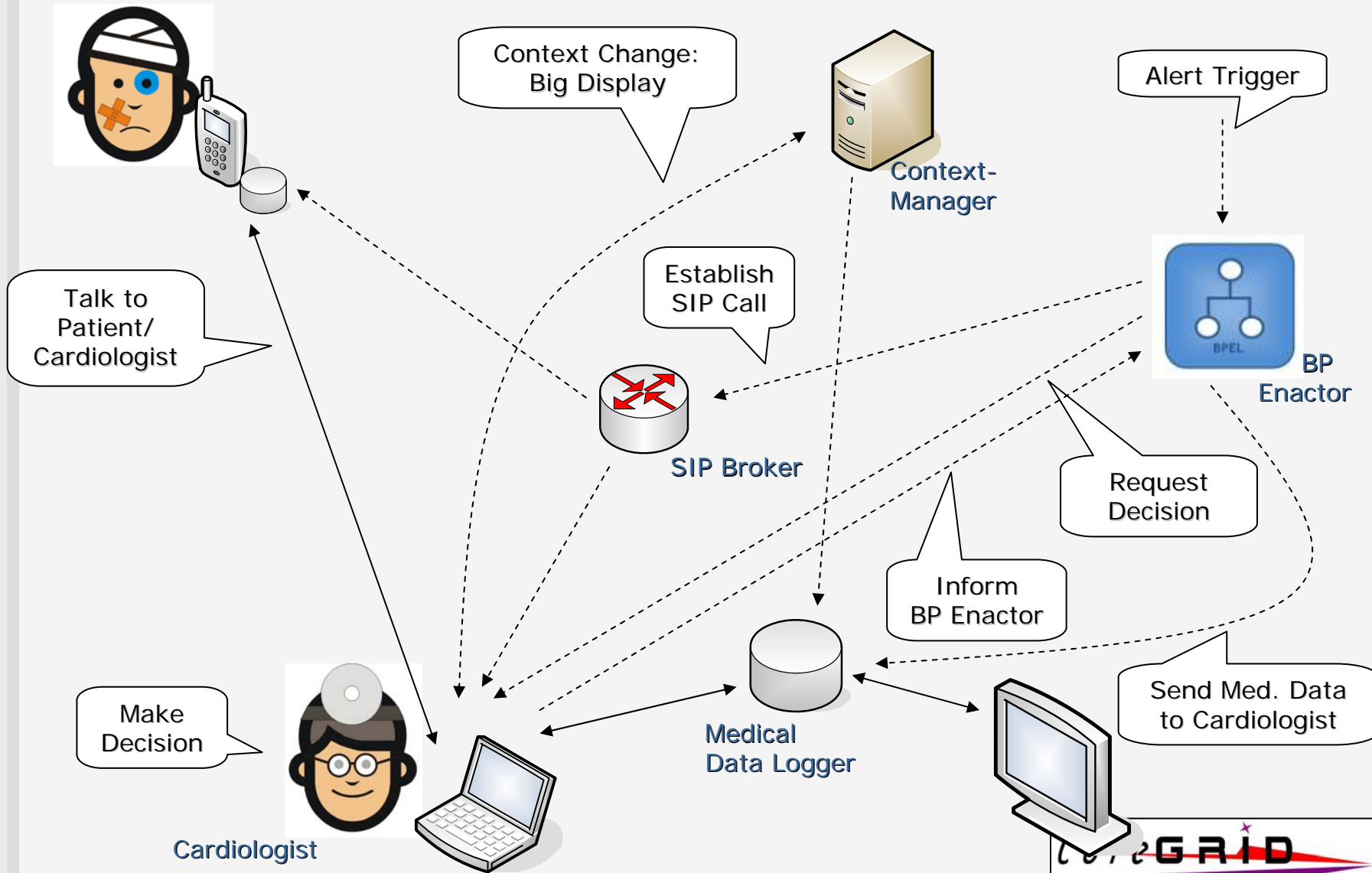
User Context

- **User Context consists of:**
  - Geographical coordinates
  - Device capabilities
  - Locally available services
  - And possibly other information about the environment of the user.

- The Context Manager gathers context information and propages it to the workflow manager or context sensitive services.

Akogrimo Scenarios

- eLearning
  - Study whenever and where ever you want
  - Get information about the place where you are
- eHealth
  - Mobile patient monitoring (ECG, blood pressure, heart beat, …)
  - A tighter interoperation between first responders, paramedics and hospital personnel makes emergency handling more time efficient
  - Context aware services provide hospital personnel with the information they need
  - Secure and reliable service use is essential
- Disaster Handling and Crisis Management
  - Mobile actors like fire fighters are coordinated by an emergency response center
  - Information can be gather from the mobile actors and distributed to where it is needed
- Commonalities
  - Mobile actors
  - Secure and reliable service use in a distributed environment
  - Network integration guarantees end-to-end Quality of Service
  - Standard procedures are supported by a workflow
  - Ad-hoc behavior is supported by Local Service Discovery and ad-hoc service use

Main Akogrimo Domains

Customer

- The Customer Domain maintains the identity information of users.

BaseVO

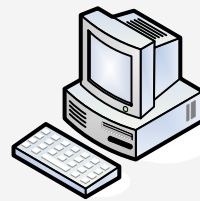- The Base VO is like the administration of a company.

OpVO

- The Operational VO runs a business process on behalf of the customer.
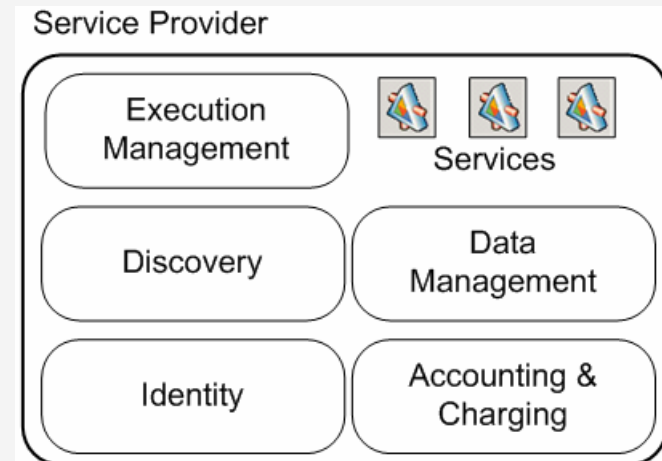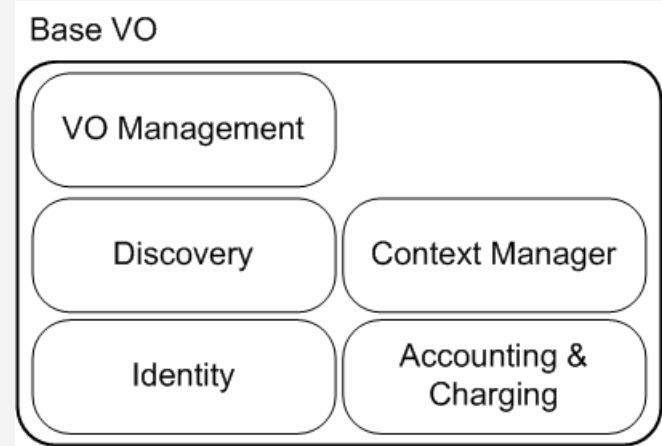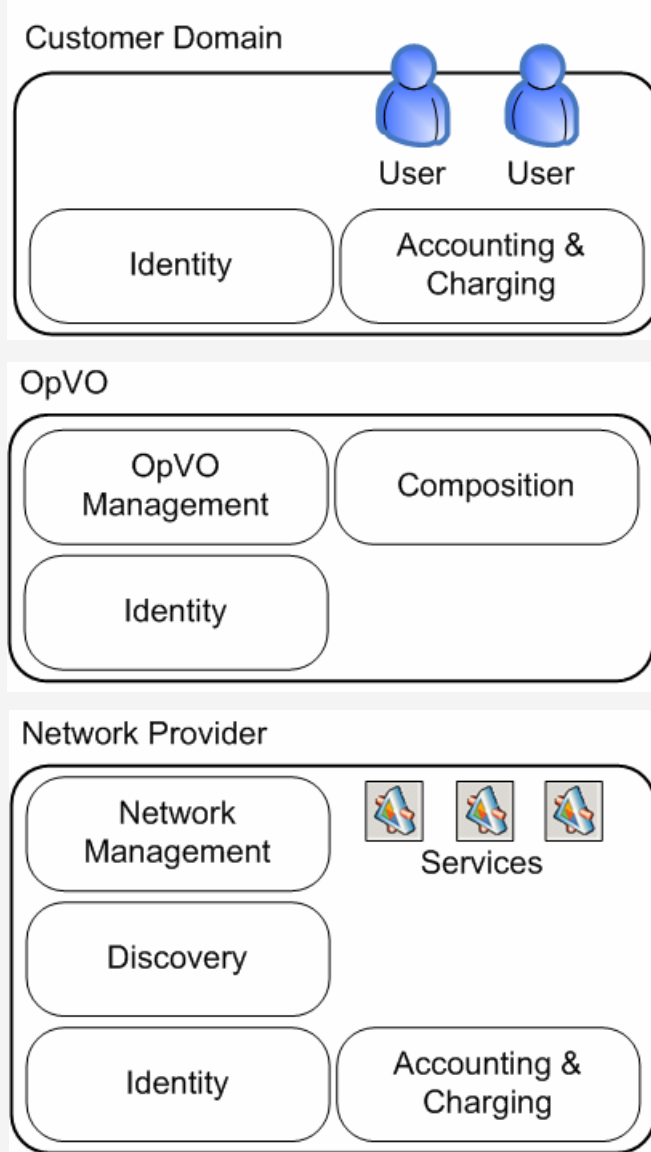
Service Provider

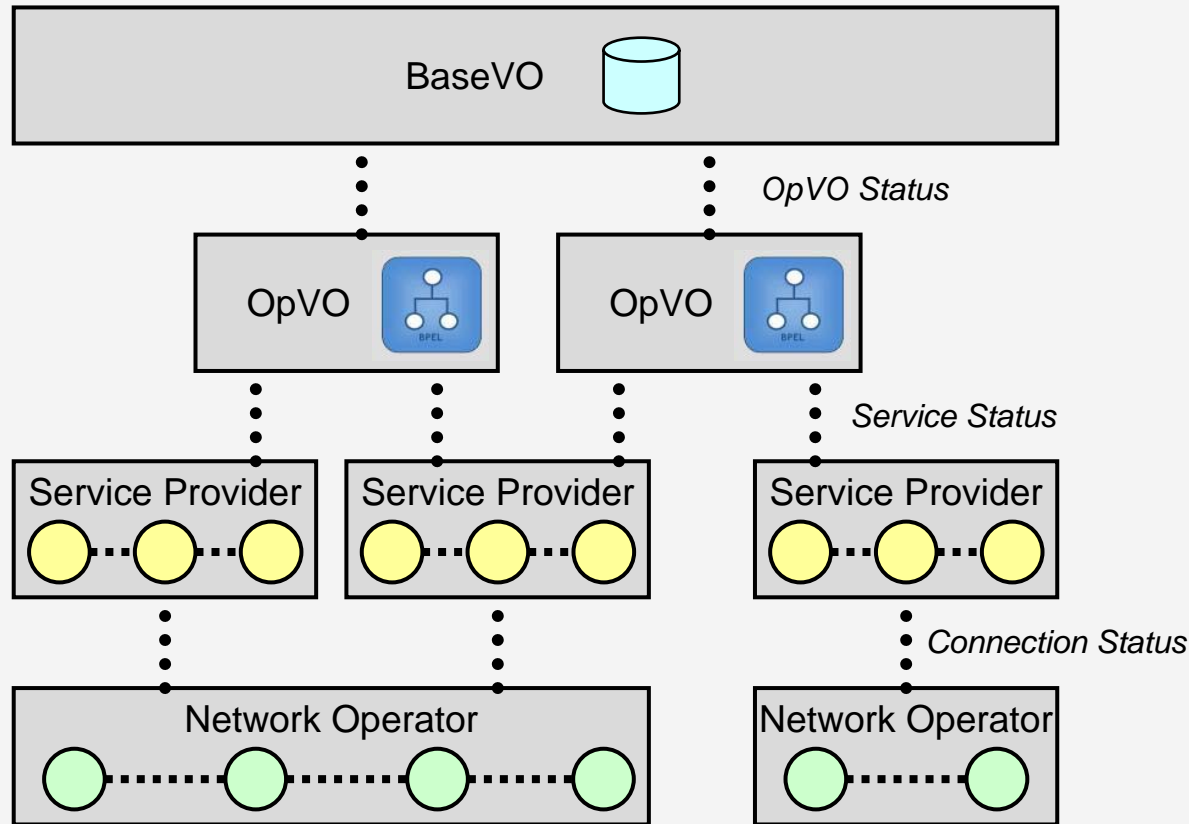- The Service Provider manages the execution of web services.

Network Provider

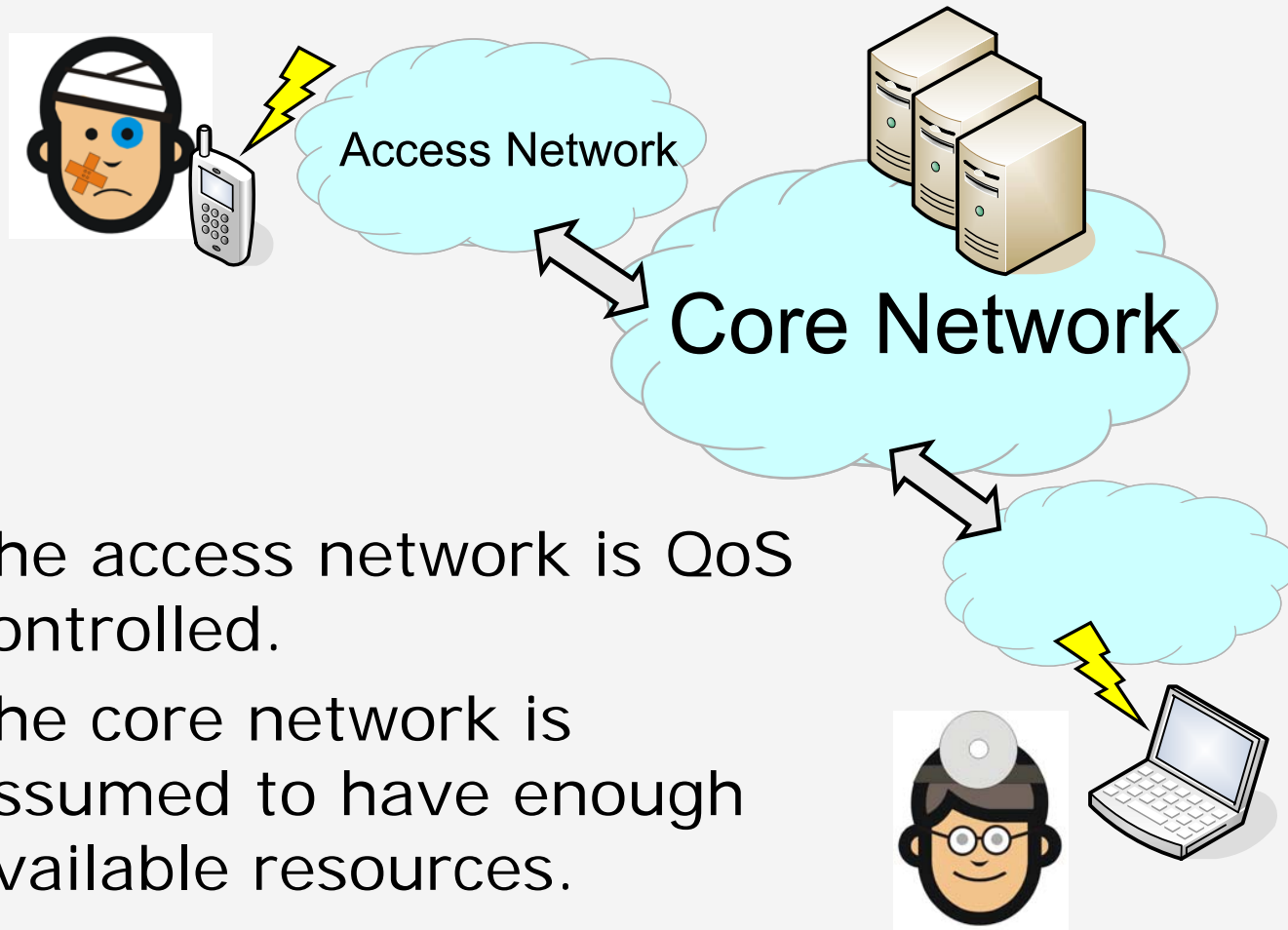- The Network Provider manages a QoS enabled network.

Architecture Overview

Customer Domain

- User
- User
- Identity
- Accounting & Charging

OpVO

- OpVO Management
- Composition
- Identity

Network Provider

- Network Management
- Services
- Discovery
- Identity
- Accounting & Charging

Base VO

- VO Management
- Discovery
- Context Manager
- Identity
- Accounting & Charging

Service Provider

- Execution Management
- Services
- Discovery
- Data Management
- Identity
- Accounting & Charging

Flow of Monitoring Information

The Network

Access Network

Core Network

- The access network is QoS controlled.
- The core network is assumed to have enough available resources.

- ## Terminal Mobility
  - ### User moves while connected
- ## User Mobility
  - ### User may change terminal or access network
- ## Session Mobility
  - ### User may change terminal while using a service
- ## Loss of connection

Terminal Mobility

- ## Description:
  - The user moves while connected wirelessly

Handover

Border Gateways

Access Routers

Access Points

Mobile Node
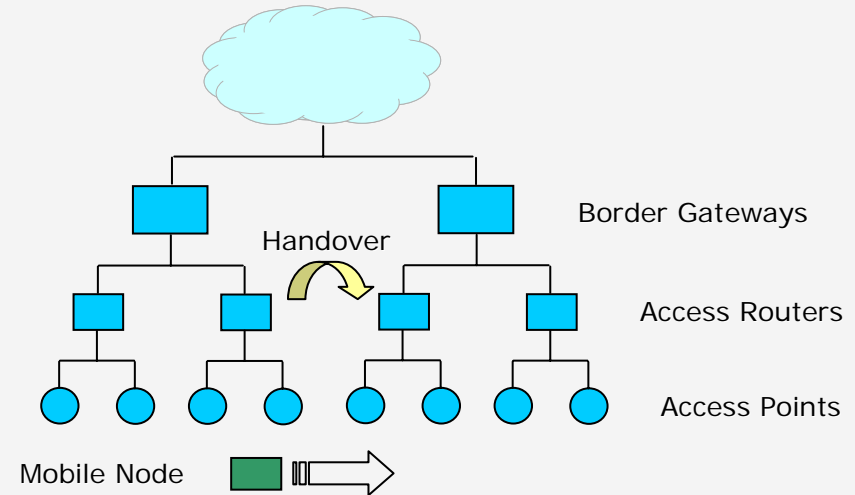
- ## Problem:
  - Scanning for Access Points, authentication with new Access Point and reassociation of the connection have to be managed in real-time.
  - Changing the access router or even changing the network provider while connected.

- ## Approach:
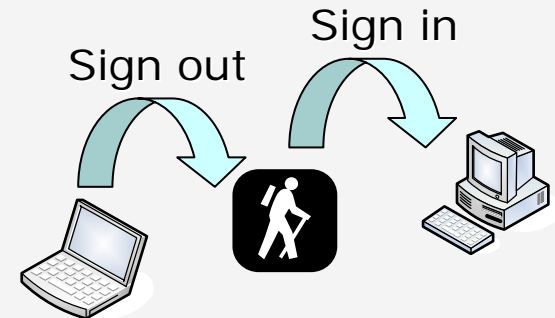 - Fast Handover for Mobile IPv6 with QoS support.

User Mobility

- **Description:**
  - The capability to access personalised services independently of the used terminal or network (nomadic use).

Sign out   Sign in

- **Problem:**
  - Locally available services might be different.
  - Propagation and enforcement of QoS parameters in the visited network.
  - Make sure the user experience and QoS is the same.
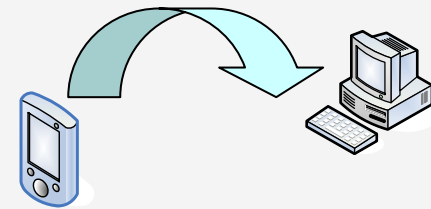- **Approach:**
  - User-oriented security and authentication framework.
  - Trusted communication between the A4C servers of the network operators ensure QoS and propagation of accounting information.
  - Local Service Discovery using SIP (Session Initiation Protocol)

Session Mobility

- **Description:**
  - Session mobility enables the transfer of application sessions between different devices without interruption.

Session Transfer

- **Problem:**
  - Coordination of network and grid related parts of the overall service delivery.

- **Approach:**
  - SIP can be used both by the user, and by the Grid infrastructure, to redirect communications to different devices, retaining the user association with the services.
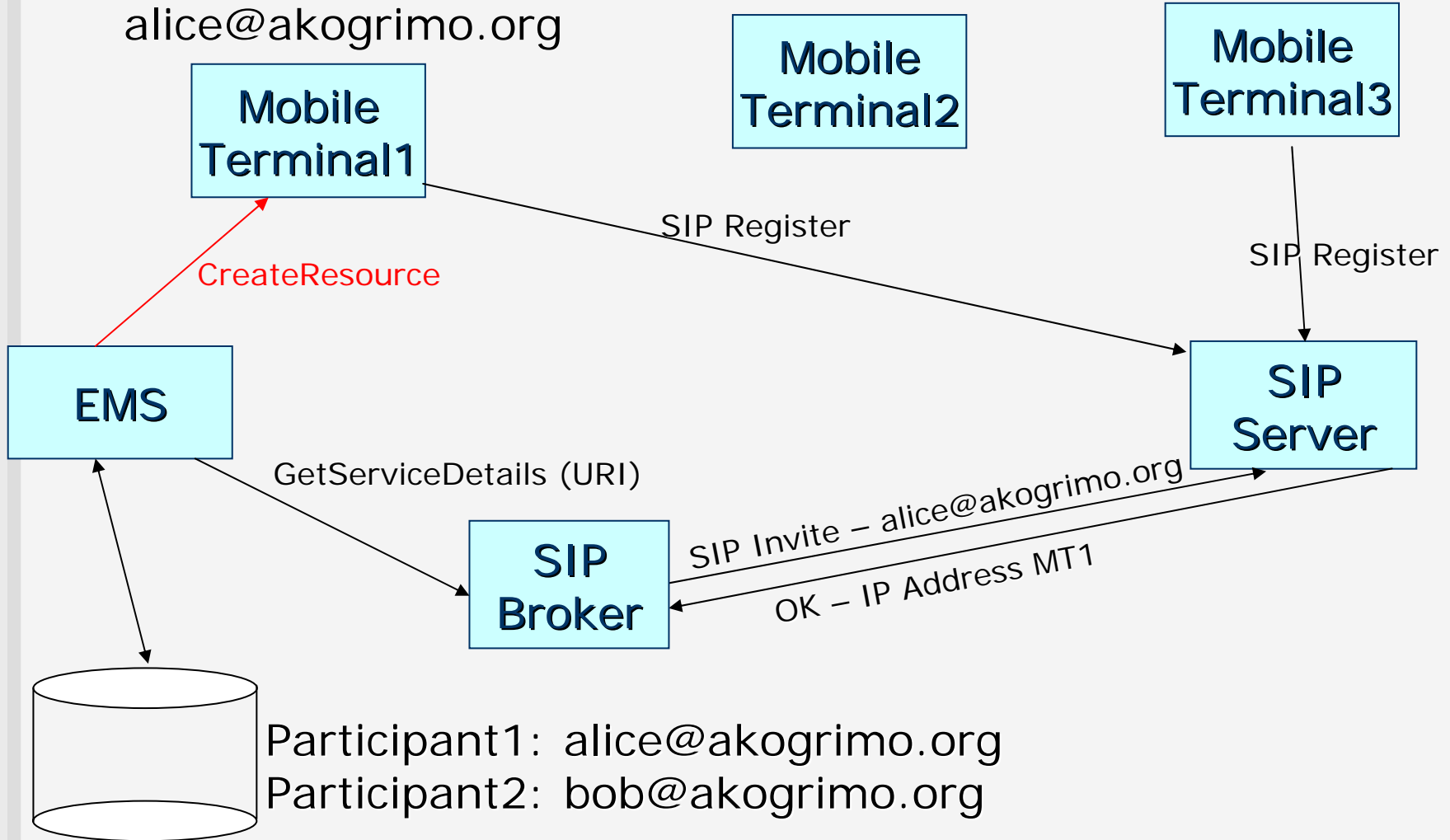
SIP – Session Initiation Protocol

- **Application level signaling protocol:**
  - Session handling (establishment, modification and termination of sessions).
  - Extensible: Support for presence, instant messaging, etc.
  - Can be used to signal anything based on sessions.
- **Common use:**
  - Signaling of videoconference sessions.
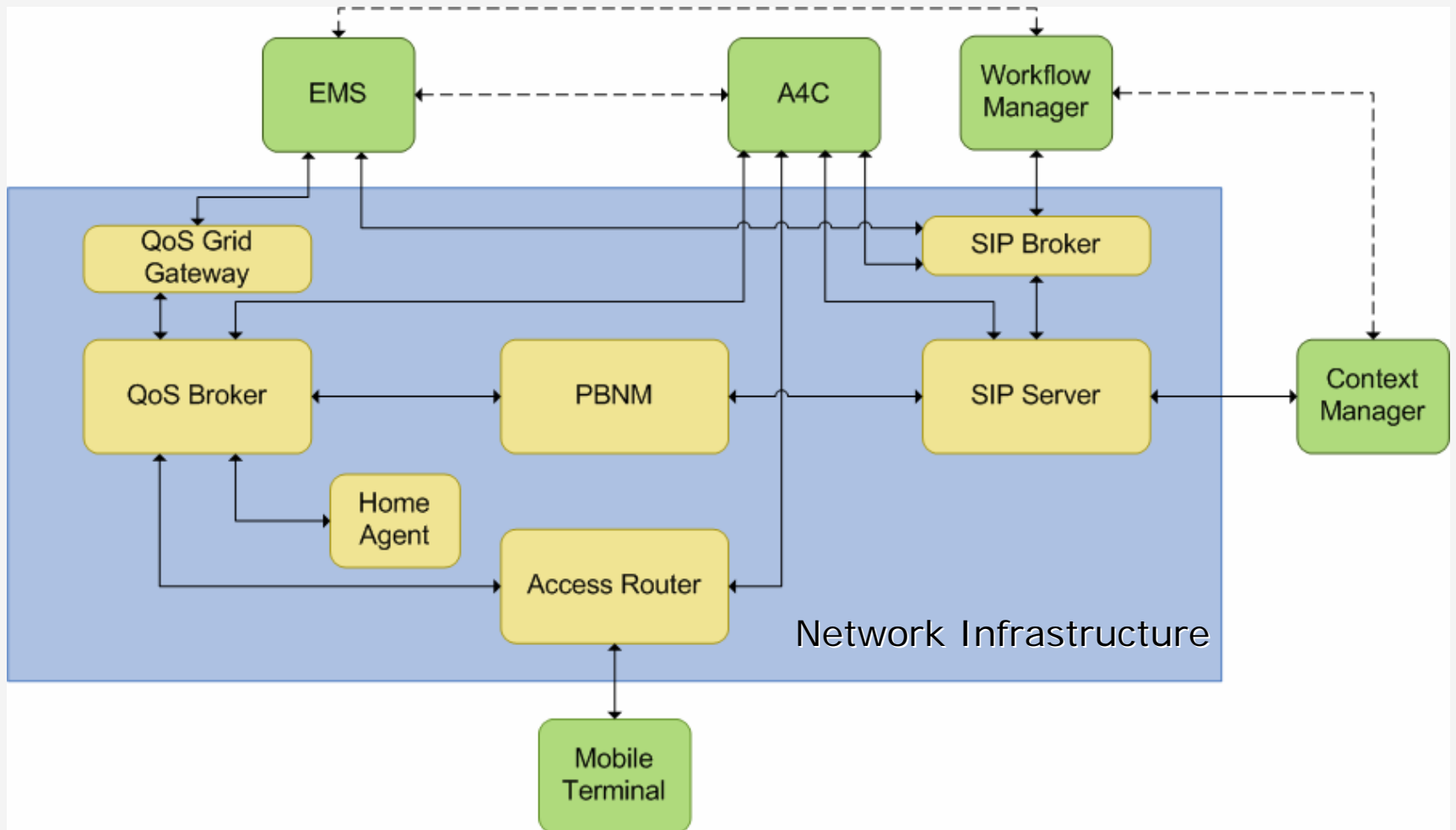- **Uses small human-readable messages.**
- **Scalable infrastructure.**

SIP for Mobile Servers

bob@akogrimo.org

alice@akogrimo.org

Mobile Terminal1

Mobile Terminal2

Mobile Terminal3

CreateResource

SIP Register

SIP Register

EMS

SIP Server

GetServiceDetails (URI)

SIP Broker

SIP Invite – alice@akogrimo.org

OK – IP Address MT1

Participant1: alice@akogrimo.org
Participant2: bob@akogrimo.org

Network Infrastructure

Mobile Servers

- **The SIP Broker:**
  - Propagates signals from mobile servers to the EMS
  - Can be used as a service to establish audio/video sessions.
- **Mobile services can go online and offline and even change their hosting environment.**
- **Mobile servers signal their availability and IP address via SIP (Session Initiation Protocol)**
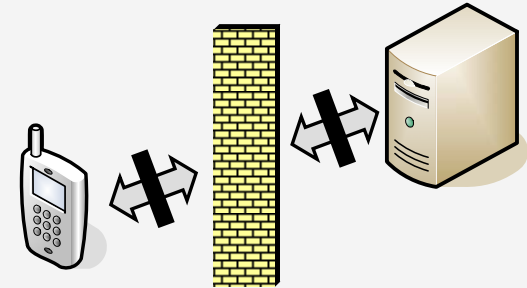- **The SIP Server sends these notifications via the SIP Broker to the EMS.**
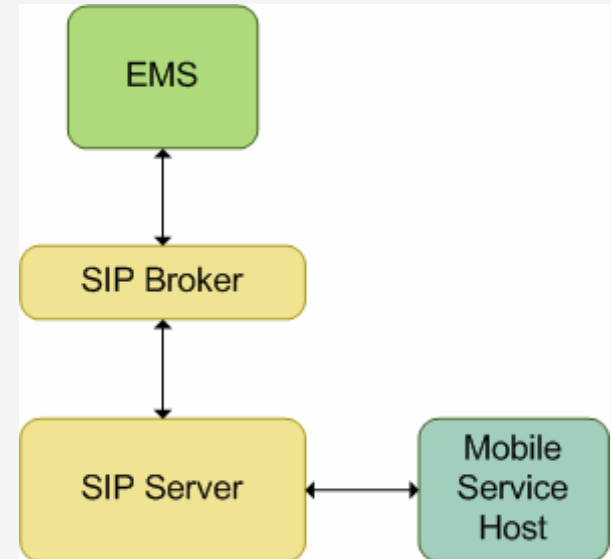
Loss of Connection

- **Description:**
  - The network connection from the terminal to the service is interrupted.
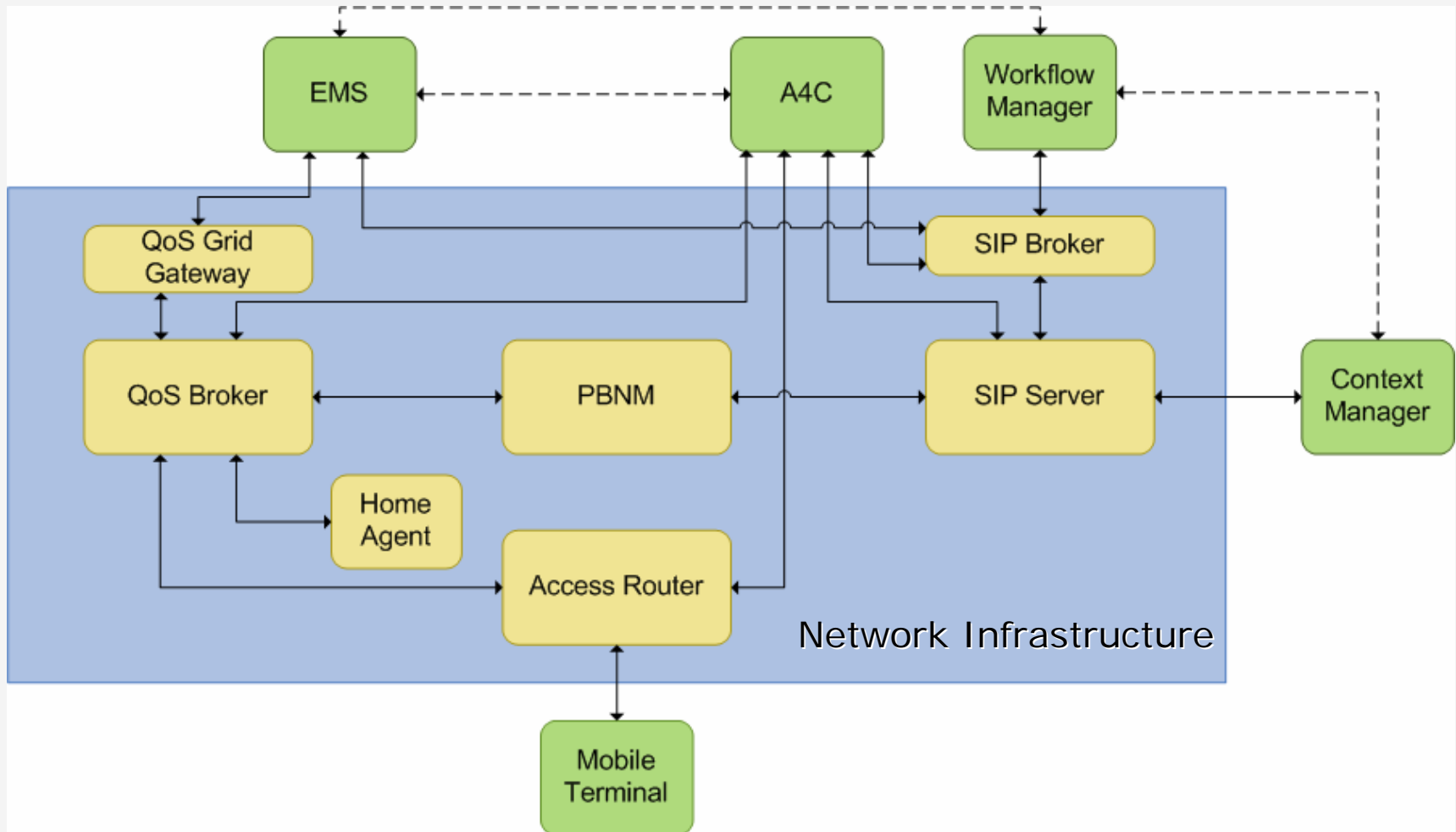
- **Problem:**
  - Early detection of lost connection and propagation of fault information to the involved components.
  - Correct interpretation of the cause.
  - Resuming the application in the correct state.

- **Approach:**
  - Mobile Servers send "alive" messages via SIP to their home EMS.
 - Alternative network operators can be used if available (nomadic use).

Cross Domain QoS

EMS / QoS Broker Interaction

- The Execution Management System can request specific network connection characteristics for each service.

- Network related parts of the service contract (SLA) are propagated to the Network Operator via the QoS Grid Gateway.

- The QoS Broker will inform the EMS in case of a SLA violation.
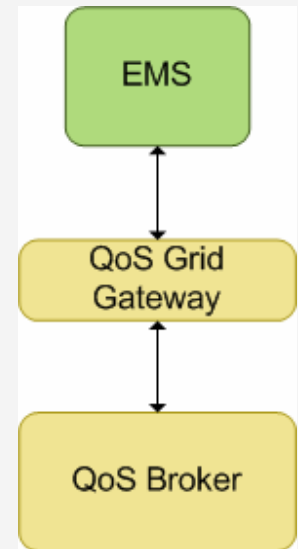
The QoS Bundles

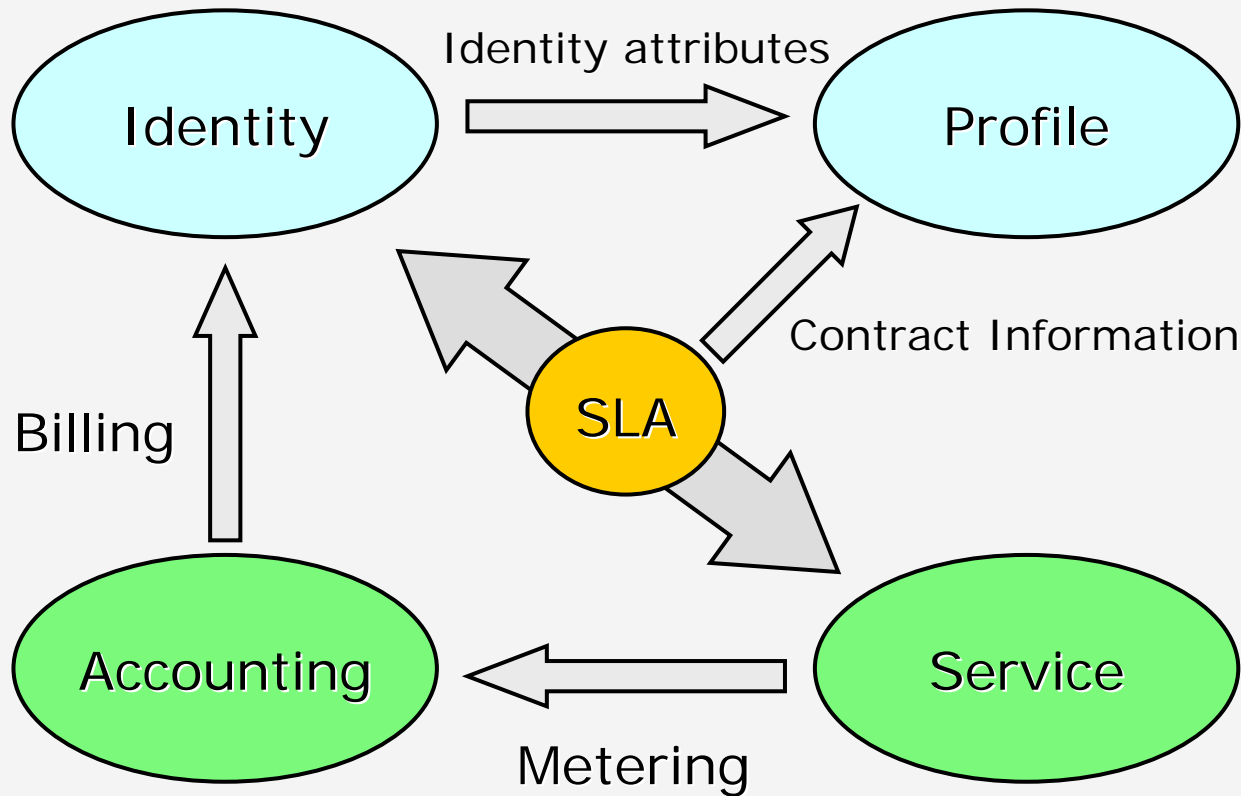| Traffic Type	Bundle 1	Bundle 2	Bundle 3
Interactive	10 kbyte/s	20 kbyte/s	10 kbyte/s
Data	100 kbyte/s	1000 kbyte/s	-
Priority	1 kbyte/s	200 kbyte/s	1 kbyte/s
Signalling	1 kbyte/s	1 kbyte/s	1 kbyte/s
Best Effort	250 kbyte/s	-	250 kbyte/s

Bundle 1: Mixed data + audio

Bundle 2: High data + video
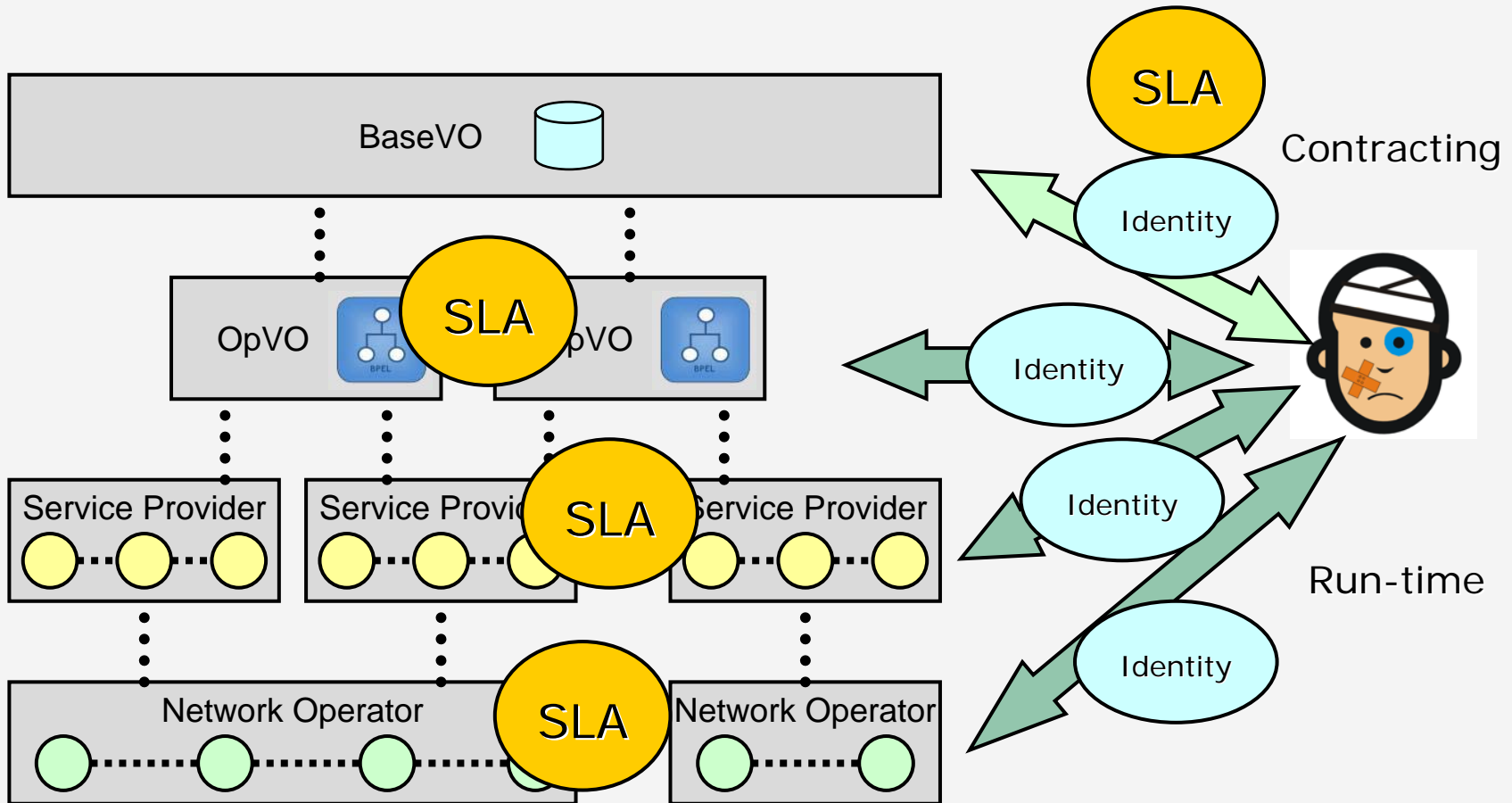
Bundle 3: Mostly audio

SLA – The Central Element

Identity and profiles are maintained in the network to enable QoS from network selection to service use. Network related SLA parameters are stored therefore in the profile.

User-oriented Service Delivery

Conclusion

- There is a multitude of challenges for a network integrated service provision.

- Federated identity management and accounting via network infrastructure makes sense.

- Intra domain signalling is essential to an anywhere, anytime, any device solution.

- Mobile grids can profit from network related technologies like SIP.

References

- ## Akogrimo:
  - http://www.akogrimo.org
  - Architecture Deliverable D3.1.3 (Sep.06)
- ## RFC's see IETF http://ietf.org
- ## SIP - Session Initiation Protocol
  - RFC 3261 and related
- ## Mobile Networks
  - RFC 3775 - Mobility Support in IPv6
  - RFC 4068 - Fast Handover for Mobile IPv6

Thanks

Questions?