

## Grid-based Environment for Mobile Operators

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## Presentation Outline

- **OGSA-based Layered Architecture**
- **Akogrimo Architecture**
- **Grid Infrastructure Services Layer**
- **Network QoS and Mobility**
- **Application Services Layer**
- **E-Health testbed**



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## OGSA-based Layered Architecture

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An OGSA compliant architecture aims to

- Manage resources across distributed heterogeneous platforms
- Deliver seamless access control and quality of service
- Provide a common base for autonomic management solutions
- Define open, published interfaces



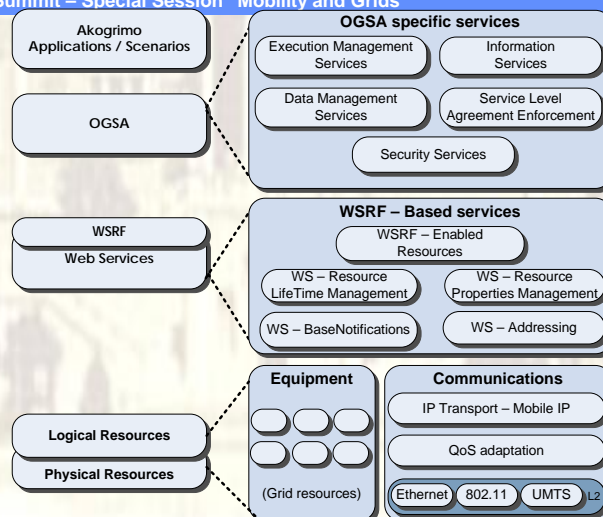
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## Akogrimo Architecture

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# Akogrimo Architecture

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## •Physical and logical resources layer

- Resources comprise each and every capability of the Grid
  - Physical resources, which include servers, storage, and network and Logical resources.
  - Logical resources are above the physical and provide additional functionality by virtualizing and aggregating the resources in the physical layer.
  - In Akogrimo communication resources are also incorporated in logical resources



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# Akogrimo Architecture

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## •Web services layer

- All Grid resources are modelled as services
- Web Services Resource Framework (WSRF) defines a family of specifications for accessing stateful resources using Web services

## •OGSA architected grid services layer

- Overall grid management functionality

## •Grid applications layer

- High - level applications a client might require
- For Akogrimo we have deployed an E - Health application offering a suite of E - Health services.



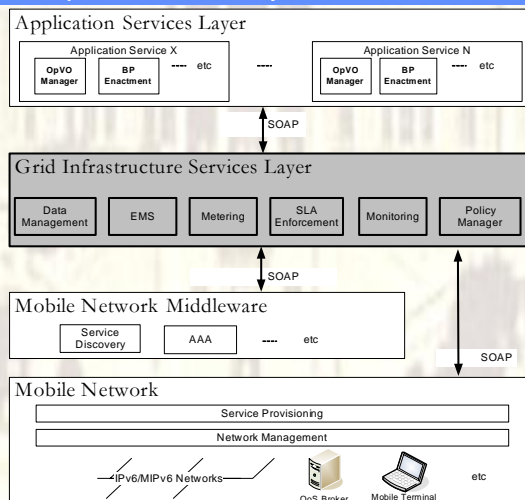
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# Grid Infrastructure Services Layer

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## Grid Infrastructure Services Layer

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•Provides services to manage the execution of jobs coming from the Application Service Layer.

•Addresses the performance issues while conforming to the determined Service Level Agreement (SLA).

•Major interactions to:

- Application Services layer
  - Receive the jobs to be executed
  - Identify the corresponding SLAs and Policies
- Mobile Network Middleware layer
  - Discover services
  - Access to A4C.
- Mobile Network layer
  - Network QoS reservation



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# Mobility

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## •Terminal mobility

- Allows a mobile terminal to maintain its connection to the network when it changes access points (Provided by the Mobile IPv6 protocol)

## •User mobility

- Allows the user access to personalized services independently of the user's device
- Having performed his registration in the network, the user is associated with the terminal

## •Session mobility

- Enables the transfer of application sessions between different devices without interruption (Achieved with the SIP protocol)



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# Network QoS

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•The Mobile Network Layer implements end-to-end Quality of Service, for all types of mobility

- Make an effective use of network resources
- Assure that a user can utilize the services he is entitled to without disruptions

•The QoS implementation

- Allows fine-grained QoS control at the access networks
- Aggregates different flows with the same QoS requirements in the core network

•The network supports well defined QoS bundles

Bundle 1	Bundle 2	Bundle 3
Mix audio + data	High data + video	Mostly voice
10 – Interactive	20 – Interactive	10 – Interactive
100 – Data	1000 – Data	1 – Priority
1 – Priority	200 – Priority	1 – Signalling
1 – Signalling	1 – Signalling	250 – Best Effort
250 – Best Effort		



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## Cross-layer network QoS

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- **QoS Broker handles Quality of Service**

- Has information about the user,
- and about the current status of the network

- **Interface to EMS**

- Based on Web Services and OGSA standards
- Network services become part of the workflow

- **After receiving instructions from the grid layer,**

- The network layer handles mobility, session movement and QoS independently
- If non-expected changes happen (e.g. session mobility from a cell phone to a high-quality display) the network layer requests and receives (again) instructions about how to handle them



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## Application Services Layer

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- **Each application service requested by a client is modeled as a business process**

- **Workflows represent the automation of the business process**

- Each workflow coordinates and manages component services or entities involved into the automation of business process

- **A Virtual Organization (VO) provides services and the means to manage and coordinate Business Processes**

- **Implementation of a Business Process implies**

- Creation of an Operational Virtual Organisation (OpVO) out of a base VO.



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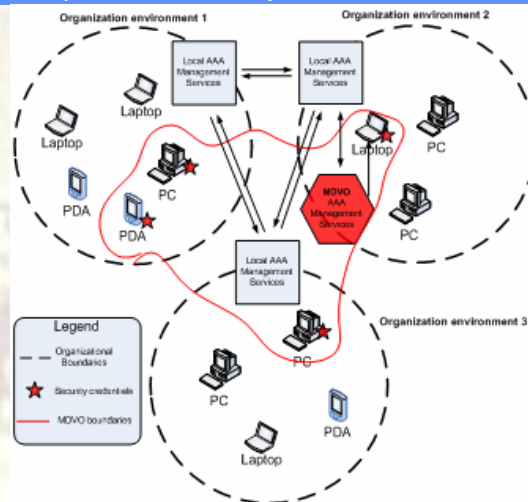




## MDVO example focused on AAA

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## E-Health testbed

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### •The organizational framework consists of

- a university hospital
- regional hospitals
- medical specialists
- general practitioners
- emergency medical services
- emergency dispatch center



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## E-Health testbed

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- This regional health network collaborates with a health service provider (HSP) and a network operator (NO)
- The NO hosts an infrastructure to provide telemedicine services over its network
  - Computational
  - network
  - and data collection services
- The HSP
  - provides advanced medical analysis services
  - configures application services specific to the health network's needs
  - responsible of the patient-side accounting and billing



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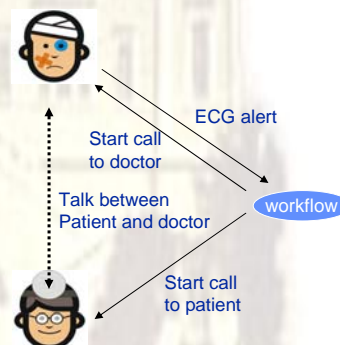


## E-Health scenario

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- A patient on holidays in a foreign country carries a wearable ECG device that forwards data to his mobile phone
- The device detects an anomaly and starts the workflow
- A SIP call is established between the patient and his doctor



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## E-Health scenario

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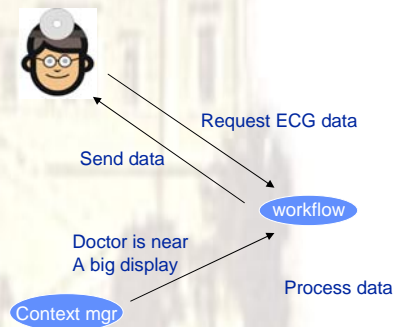
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- After talking to the patient, the doctor requests ECG data

- The workflow process is informed by the Context Manager that a big display is available to the doctor

- ECG data is retrieved and sent to the doctor's big display

- The doctor analyses the data and makes his diagnosis



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## Conclusion

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- We presented an architecture to integrate network aspects in the traditional OGSA environment

- Based on interactions with QoSBrokers

- This provides the capability to deploy mobile-oriented grid services

- demonstrated in a simple e-Health scenario.

- Work still with large potential to improvement!!



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Thank you!



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