Akogrimo – Business Support and Charging Technology for Grid Services

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Access to Knowledge through the Grid in a Mobile World

Work in Progress!

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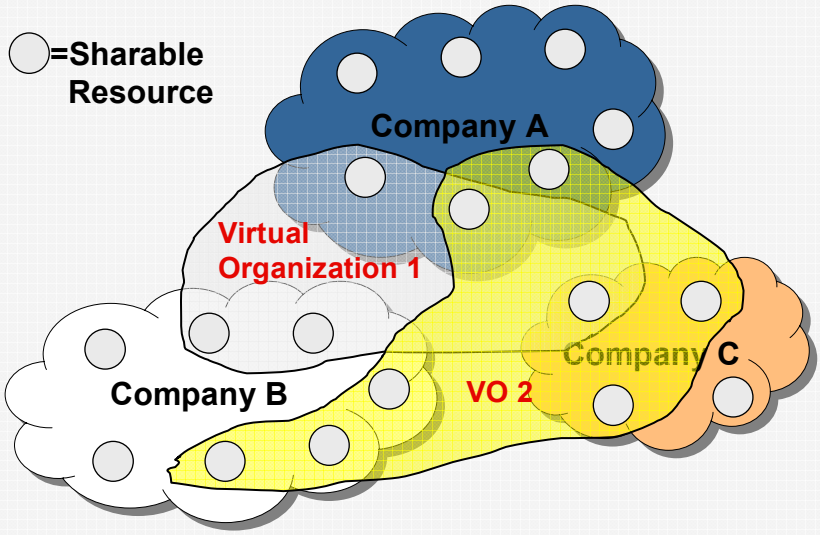
Outline

- Project Overview
- Business Support for Mobile Grids
  - Mobile Dynamic Virtual Organizations (MDVO) Views
  - Scenario
- A4C — Technology for Charging MDVO Services
  - Challenges
  - Architecture
  - Grid Service Interfacing
- Summary and Preliminary Conclusions
- Future Work

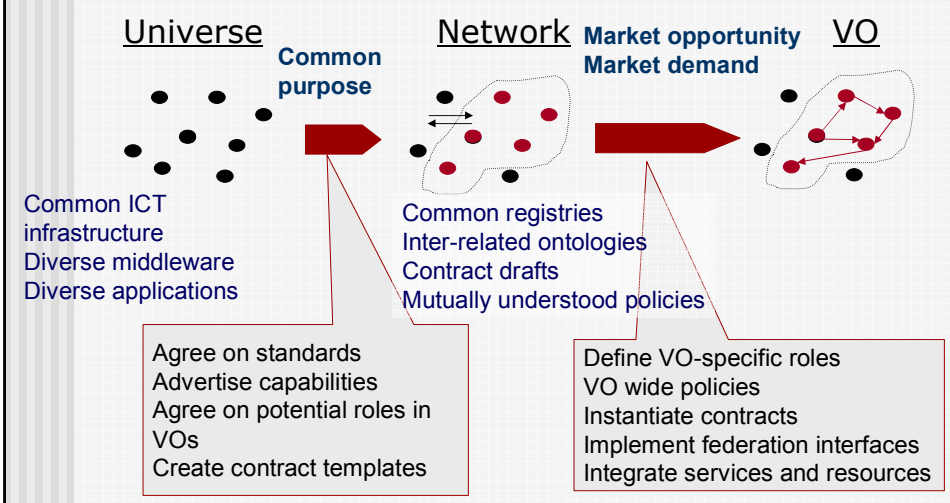
Project Overview

- Akogrimo:
  - Blueprint and architecture for a NGG
  - Mobile Internet and IPv6
- Mobile Dynamic Virtual Organizations:
  - Concept to implement business models
  - E-health, disaster and crisis management
- A4C (Authentication, Authorization, Accounting, Auditing, and Charging):
  - Personalized access to services "everywhere, anytime using any type of access"
  - Security models for MDVOs, creation and management of dynamic trust domains
  - Support for revenue generation

Virtual Organizations (VO) Super High Level view



Virtual Organization (VO) High Level View

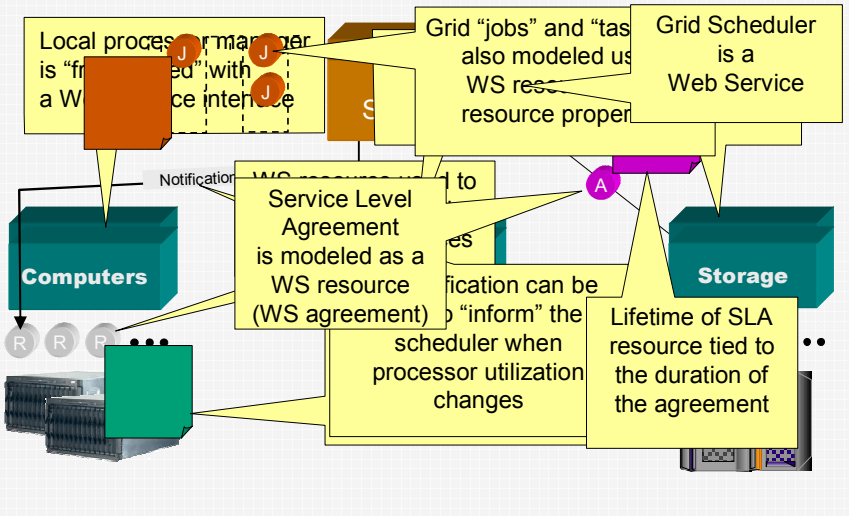


Structural View of an MDVO

- MDVO Topologies

- Mobility:
  - Support of mobile/roaming users and service
- Dynamicity/Self-management:
  - Manage operation and evolution with limited or no intervention from MDVO partners' administrators or parties outside the MDVO
- Scalability:
  - Characteristic to be achieved in different scales depending on objectives of and the kind of partners involved in a MDVO
  - Ability to achieve objectives that MDVO partners could not achieve individually – added value via collaboration
- Security:
  - Ability to satisfy agreed confidentiality, integrity, availability, and accountability requirements

Scenario: Resource Management and Scheduling



From: Carl Kesselman, "When words collide: : Grid Services, Web Services and Ubiquitous Infrastructure"

Akogrimo Network Middleware Layer

- Cross layer A4C services:
  - Based on diameter
  - Exception: some GRID-specific authorization mechanisms will be implemented separately
- Discovery of WEB/GRID services:
  - Services described through OWL-S and located through queries against these meta-data
- User presence and context management:
  - SIP presence
  - Basic context: location, device capabilities, and network connectivity
  - Domain-specific context through ontologies

A4C Challenges for Grid Services

Authentication and Authorization

- Single Sign-on for grid services and network access/service
- Integration with local security solutions
- User-based trust relationships
- Manageability: Identity management, policy management, and key management

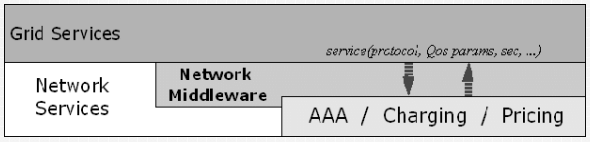
Accounting and Auditing

- Define parameters to be metered and accounted for
- Secure logging of audit information

Charging and Pricing

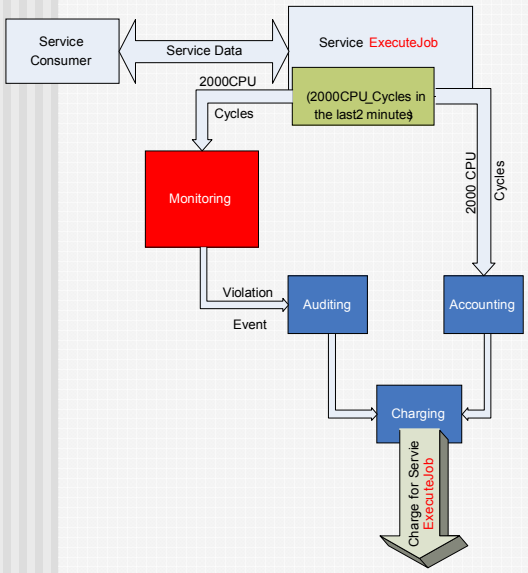
- Define parameters to be charged for
- Integrate multiple pricing schemes from different players
- Unified Billing: Grid services and network transport

Proposed A4C Usage



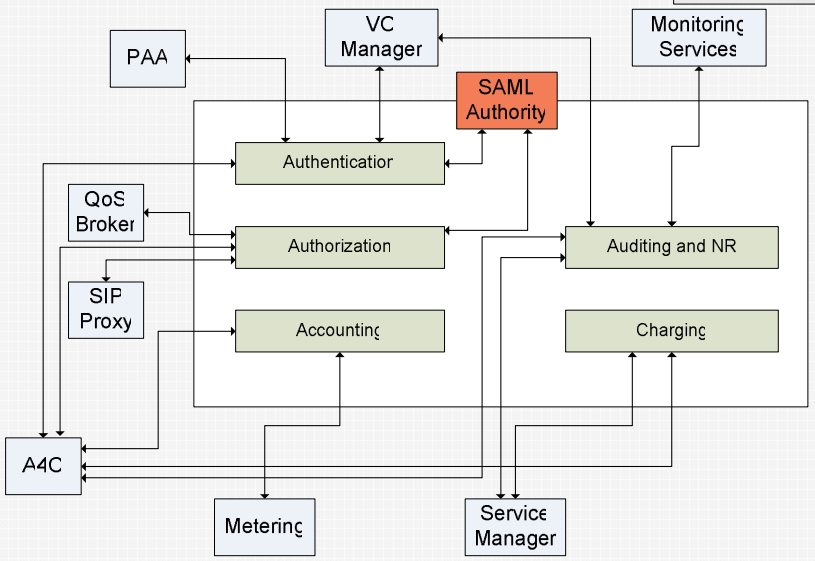
- A4C located in the Akogrimo Network Middleware Layer
- Access through well-defined A4C interfaces
- Interfaces can be "layer-specific":
  - *E.g.*:
    - *register_service(…, service_params, …)*
    - *request_service(…, service_params, …)*
    - *request_user_auth(…, event_params, …)*

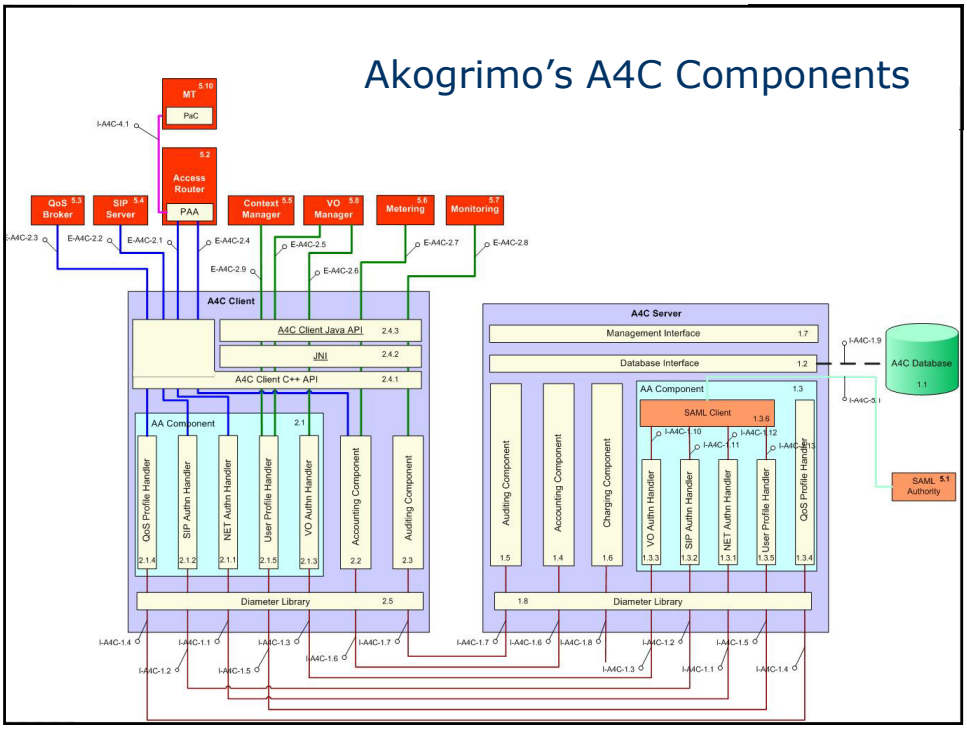
Accounting, Auditing, and Charging Process

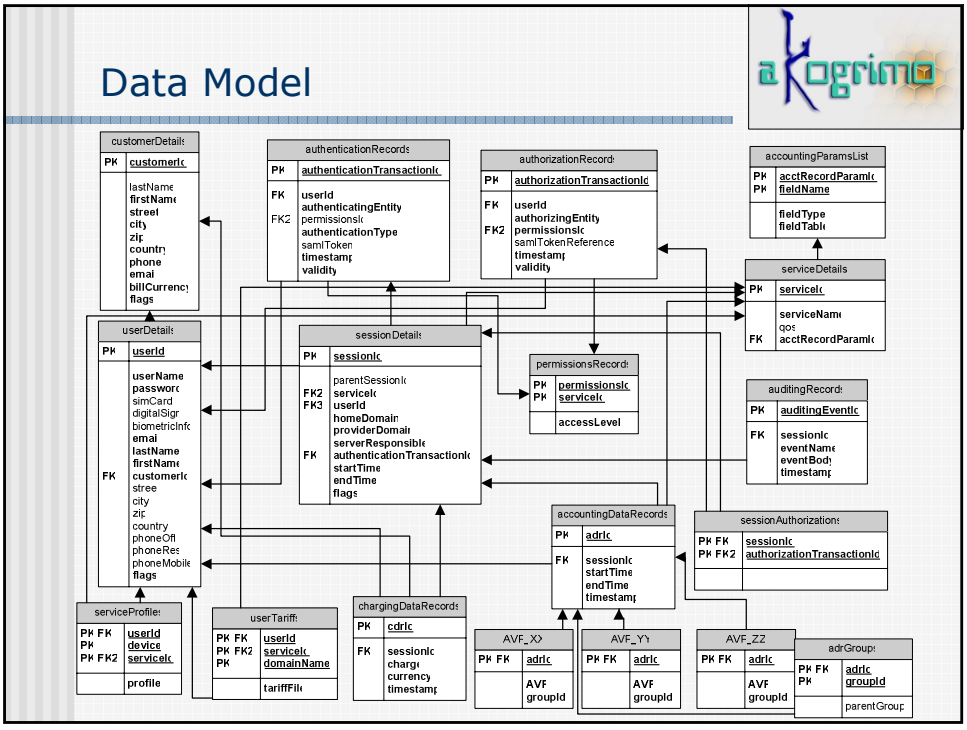


- Every service needs to implement a meter for the parameters it wishes to account for
- The meter will feed the accounting and monitoring (external to A4C) components
- All the accounting records and audited events generated in a service session will be fed to the charging component
- According to the charging scheme the service charge is calculated and added to a user's monthly bill

A4C Functional Architecture

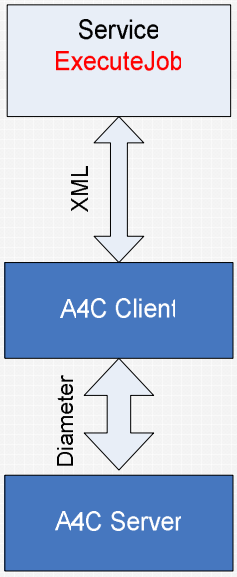



Akogrimo's A4C Components
MT
PaC
Access Router
PAA
QoS Broker
SIP Server
Context Manager
VO Manager
Metering
Monitoring
A4C Client
A4C Client Java API
JNI
A4C Client C++ API
AA Component
QoS Profile Handler
SIP Authn Handler
NET Authn Handler
User Profile Handler
VO Authn Handler
Accounting Component
Auditing Component
Diameter Library
A4C Server
Management Interface
Database Interface
AA Component
SAML Client
Auditing Component
Accounting Component
Charging Component
VO Authn Handler
SIP Authn Handler
NET Authn Handler
User Profile Handler
QoS Profile Handler
Diameter Library
A4C Database
SAML Authority


Data Model
customerDetails
authenticationRecords
authorizationRecords
accountingParamsList
serviceDetails
userDetails
sessionDetails
permissionsRecords
auditingRecords
accountingDataRecords
sessionAuthorizations
serviceProfiles
userTariffs
chargingDataRecords
AVP_XX
AVP_YY
AVP_ZZ
adrGroups

Interfacing Grid Services

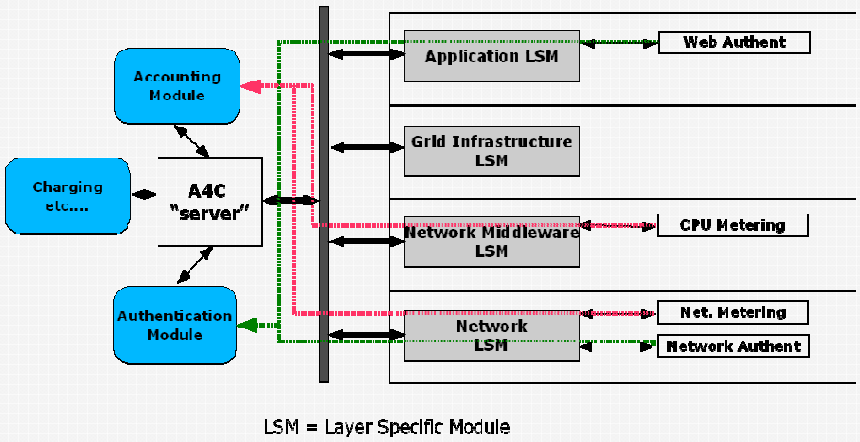
- Not every component is able to speak DIAMETER
- Grid components will access an A4C Client via XML or Web Services:
  - XML Authentication Messages
  - XML Accounting Messages
  - XML Auditing Messages
- Parameter set and SLA depends on Web Service/application



Current Grid Service Accounting Extensions

- TransferredData
- CPUUsage
- DiskUsage
- StartTime
- EndTime
- HostName
- JobName
- MachineName
- MemoryUsage
- ProcessId
- ProcessorCount
- NodeCount
- QueueName
- ScratchUsage
- StartTime
- Status
- SubmitHost
- SwapUsage
- TempUsage

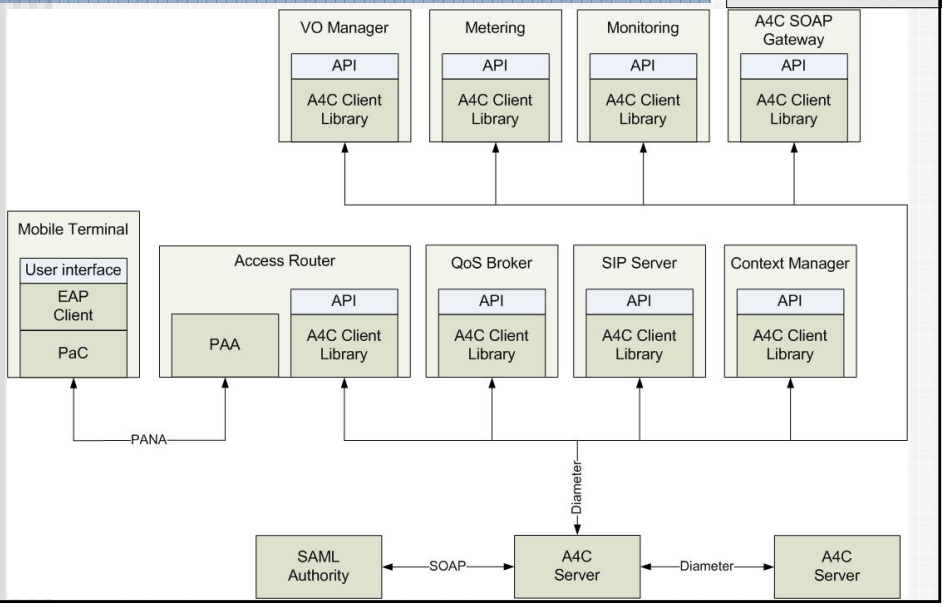
Implementation Architecture



Ongoing Implementation

- A4C Server
  - Based on OpenDiameter framework
  - Linux, C++
- A4C Client
  - Linux, C++
- Data Storage
  - MySQL database
  - Linux, C++
  - Standalone component
  - C++ interfaces for accessing data

A4C Deployment



Summary and Preliminary Conclusions

- A4C eases the merger of the Grid and Networking worlds.
- A4C will support the creation of diverse business processes by offering user access control and resource usage accounting across different administrative domains.
- DIAMETER is the right choice for an AAA protocol, although the client implementation in every service is not yet feasible!

Future Work

- Short-term
  - Integration of grid authorization in A4C
  - Sample parameter set/SLA mappings
  - Exposing of A4C services as web services
- Medium-term
  - Mobile Dynamic Virtual Organization awareness to be made explicit within A4C
  - Integration of a billing settlement entity

Thanks for your attention!

Questions?

Many thanks are addressed to Cristian Morariu, Peter Racz, David Hausheer, Martin Waldburger of UniZH, Stefan Wesner of UniSTUTT, and all other Akgrimo partners for lively and open discussions.