

D8.1.1

Report on Akogrimo Training Activities

Version 1.0



WP 8.1 Training

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Information Society

Grid for complex problem solving

Proposal/Contract no.: 004293

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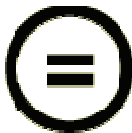
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Context

Activity 8	Training
WP 8.1	The objective of this work package is to provide training courses on AKOGRIMO concepts, both from an academic focus and from an industry focus.
Task 8.1.1	Training of researchers – All the activities made during this period were focused on training of researchers.
Dependencies	No dependencies.

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Abbreviations

AKOGRIMO	Access To Knowledge through the Grid in a Mobile World
VoIP	Voice over IP
SIP	Session Initiation Protocol
OGSA	Open Grid Services Architecture
QoS	Quality Of Service
CoreGRID	European Research Network on Foundations, Software Infrastructures and Applications for large scale distributed, GRID and Peer-to-Peer Technologies
A4C	Authentication, Authorization, Accounting, Auditing and Charging.

1. Summary

Activity 8 of AKOGRIMO is devoted to provide training related to the concepts, technologies and results achieved in the project. This activity has been designed with two specific focuses: academic focus, providing training courses on AKOGRIMO concepts and results, and industry focus, providing training courses on AKOGRIMO application. This document summarizes the training activities and related events that have taken place from the beginning of the project until month 21.

In this period, the training activities have focused on the first objective, academic focus, and with a reduced number of events, since training activities need a number of prerequisites to be fulfilled:

- A mature vision of the overall AKOGRIMO architecture;
- A dedicated vision of the technologies involved in the project;
- An overall and a clear approach to the technological integration of Grid and Mobile Network technologies; and
- A specific list of problems, topics, and challenges, which have been addressed successfully in the course of the project.

So, more specific training only took place at the end of the period when a mature vision of the architecture and technologies was gained.

This report includes the following information:

- AKOGRIMO training seminar held at Madrid in December 12th.
- Internal Training Seminars held at each partner's premises and Regular courses created or influenced by the AKOGRIMO project
- Training material produced from those events
- Cooperation on Training with other projects
- Future plans for training.

The training activity is progressing during the second half of the project, with some already planned events, like another coordinated AKOGRIMO training seminar to be held in another location (possibly collocated with a General Assembly meeting) and the participation of AKOGRIMO in the next CoreGrid summer school in July 2006. Also, this activity will face one of its main challenges: reaching external audiences with different profiles with training of the application itself, like business units and potential practitioners.

2. AKOGRIMO Public Seminar

The first training seminar organized by the AKOGRIMO project was held on 2005, December 12th in the Technical University of Madrid (UPM).

The lectures were senior researchers involved in the AKOGRIMO project and experts in their area, and the approach for defining the contents was a balance among basic technologies of AKOGRIMO (MobileIPv6, OGSA, SIP), technologies application in AKOGRIMO (A4C, Grid Middleware) and specific AKOGRIMO-application lectures (Architecture and Business).

The final structure was the following:

- ✓ 09.30 – 10.30: AKOGRIMO Challenges: Grids and Mobile Networks. AKOGRIMO Architecture
Juergen Jaehnert, Universität Stuttgart
- ✓ 10.30 – 11.30: Business Modelling for Mobile Grid Scenarios
Martin Hafner, University of Hohenheim
- ✓ 11.30 – 12.30: Grid and OGSA Tutorial
Robert Piotter, Universität Stuttgart
- ✓ 12.30 – 13.30: Why Grid? The Middleware in AKOGRIMO
Antonis Litke, National Technical University of Athens
- ✓ 15.00 – 16.00: The Mobile Network: Mobile IPv6 Protocol
David Fernández, Universidad Politécnica de Madrid
- ✓ 16.00 – 17.00: Mobility and Session Management: The Session Initiation Protocol
Manuel Álvarez-Campana and Víctor Villagrà, Universidad Politécnica de Madrid
- ✓ 17.00 – 18.00: AKOGRIMO's A4C Component
Burkhard Stiller, Universität Zürich

The training seminar was announced in all the public universities of Madrid, as well as in several distribution lists and also through the IST Grid collaboration, on training mailing lists to other Grid projects.

The training seminar was also broadcasted to two types of remote sites:

- Open streaming through the Internet
- Collaborative training with a specific tool, which enables to participate actively in the training sessions (Figure 1).

The screenshot displays the ISABEL Video interface. At the top left, there is a video feed of a lecturer. Below it, a list of participants is shown, including B223.madrid, UPM-A., GSIC.Valladolid, B223.madrid, GSIC.Valladolid, ITAV.Aveiro, MS_CERO.DIT - UPM, and UPM-A. At the bottom left, there is a 'Request' button. The main content area shows a presentation slide titled 'Network / Mobility Evolution'. The slide features a timeline from 2000 to 2010. A green bar represents 2G, a light blue bar represents 3G, a pink bar represents IPv4, and a yellow bar represents IPv6. A large blue arrow points to the right, labeled 'IPv6-based network with mobility, QoS and A4C, SOA, Web Services, Grid'. A red oval labeled 'Akogrimo' is positioned over the IPv6 bar. A dashed box labeled 'Release 5 and beyond' is positioned above the 3G bar. The slide also includes the Akogrimo logo and the text 'Kingen Jahnerl, UPM, Madrid' and '12.12.05 4'.

Figure 1: Remote Distribution and Collaborative Training Tool

This tool (ISABEL: a multipoint group collaboration tool developed by the Department of Telematic Engineering of the Technical University of Madrid, <http://isabel.dit.upm.es>) is able to provide:

- Telemeetings which minimize travel of persons and allow timely organization of meetings when needed, reducing activity lead times and increasing the overall productivity of an organization.
- Distributed congresses, conferences or workshop where speakers, organisers and attendees are located in many different auditoriums.
- Distributed classrooms where collaborative educational or training activities among different Faculties or Universities are performed.

In the seminar, the tool was used for a distributed classroom: the lecturer is talking showing some slides, and there is a video transmission of these slides as well as shorter windows with the video of the professor and all the classrooms. The students can request intervention to the lecturer and this must approve it in order for the student to make his questions, which are also broadcasted to all the classrooms.

So, there were two types of attendees to the training event:

- Physical attendees: there were about 30 people who attended from the training room. The attendees were:
 - UPM undergraduate students (7 students)
 - UPM PhD Students (8 students)
 - AKOGRIMO partner researchers (8 researchers)
 - External enterprises researchers (Riverstone Networks, red.es, CIEMAT) (4 people)
 - Other universities researchers: 4 people
- Remote attendees:
 - Remote audience in University of Valladolid with active participation with a specific tool (6 people, university researchers)
 - Around 55 different IP addresses that connected anonymously to the open streaming through Internet. Although it is not possible to know where are they coming from, some of them were identified as connections coming from:
 - CRMPA (Italy)
 - Telefónica (Valladolid and Madrid)
 - Aguascalientes University in Mexico
 - National University of Athens
 - University of Aveiro
 - MSC Software

3. AKOGRIMO Internal Seminars

3.1. UPM Seminars

The Telematic Systems Engineering Department of the Technical University of Madrid is responsible for teaching in the following areas:

- Regular Undergraduate Lectures, with a focus on the speciality of Telematics of Telecommunication Engineering curricula
- PhD Lectures and Activities, in the area of Telematics Engineering
- Postgraduate courses, in the scope of several Master (one-year) and Specialities (four months) related with Telematic Network and Services.

In all those areas, the research group working in AKOGRIMO is responsible for lecturing several subjects, where AKOGRIMO-related concepts are being introduced in a gradual way.

Additionally, several specific internal seminars were organized in order to show, teach and demonstrate the AKOGRIMO technologies.

3.1.1. Undergraduate

The courses that were influenced by the participation in the AKOGRIMO project were the following:

- Switching Technologies I. 4th year course, including the basis of the circuit-switched networks and their evolution to the integrated networks, explaining switching and control aspects for different networks like Intelligent Networks with SS7, GSM, ATM, UMTS and VoIP. Signalling with SIP for VoIP networks is one of the topics that is being progressed with the knowledge gained in the AKOGRIMO project. This course now includes also the SIP integration in a cross-layer architecture allowing its usage for controlling any type of sessions, like Web-Service sessions, and not only multimedia sessions.
- Communications Software. 4th year course including the concepts and techniques used in the design and development of communication software. In this course, we are explaining the basis of Web Services, and influenced by AKOGRIMO, we are now also including some OGSA and Grid Services fundamentals.
- Telecommunication Network Management. 5th year course including the concepts of Network Management and Security. Web Services Security is being included in the “Security of Applications” topic, and also a more detailed explanation of the A4C architectures as influenced by the AKOGRIMO project.

3.1.2. PhD courses

These courses have included or updated their contents influenced by the AKOGRIMO project:

- Applications and Advanced Services in Internet. One of the use cases shown in the course is the AKOGRIMO project, in which it can be clearly appreciated the problematic of the cross-layer interactions between network and services
- Telecommunication Network Security: a new proposed case-study for students is the A4C system in the AKOGRIMO project and its interaction with SAML assertions at the service level.
- Advanced Subjects in Computer Networks. A more in-depth description of Mobile IPv6 is included here and also a new case-study for the students about the possible QoS interactions from service to network, as done in the AKOGRIMO project.

3.1.3. Postgraduate courses

Some simplified variations of the previous courses are offered also in several postgraduate programs, like the Telecommunication Systems and Network Master or the Mobile Communication Master. In specific areas these courses have also progressed including topics taken from AKOGRIMO. The list of topics is not included again since they are very similar to those presented before.

3.1.4. Specific AKOGRIMO seminars

In the context of a PhD course called “Research Seminars”, it was included a specific teaching about the AKOGRIMO approach for combining Grid and Network Services, with a specific focus on the Cross-Layer issues and the proposals and decisions taken in the AKOGRIMO project.

3.1.5. Master’s and PhD Thesis

There are several finished and ongoing thesis related to the AKOGRIMO project. Specifically:

- Finished Master Thesis: Vicente Olmedo. "Development of a SIP infrastructure for mobile and ubiquitous applications"
- Ongoing Master thesis. David Davila: "Development of a Policy-Based Network Management infrastructure. Application to SIP-related policies".
- Ongoing PhD thesis: Vicente Olmedo. "Contribution to the application of session management infrastructures for mobile and ubiquitous Grid and Web services"

3.2. UHOH Seminars

The academic teaching activities of the Chair of Information Systems II of the University of Hohenheim focus on the field of (Business) Information Systems. The chair is responsible for lectures in three study courses a Bachelor and a Master programme (B.Sc./M.Sc. in Information systems) and a Diploma course on economics and business administration with a major on information systems. Within these fields two lectures have a strong relation to topics under research in the AKOGRIMO project. The following paragraphs provide an overview about the major topics, the learning goals and the targeted audience of the “E-Business” and the “Telematics and Society” lectures.

3.2.1. E-Business

The lecture “E-Business I” was given the most recent time in winter semester (WS) 2005/06. It is repeated every year for the students of the Bachelor of Science programme in information systems and consists of 14 units (90 min). For students it is mandatory to visit the lecture and to write the test, the result leads into their final reports.

Goal of the lecture is to teach students about the main differences (from a scientific and practical point of view) between “usual” and “electronic” business concepts. In second part of this lecture, held from another chair, students deepen their knowledge. Technical basics (architectures, middleware, software-standards like XML, etc.) and economical basics (digital goods, disintermediation, provider and customer strategies) of business concepts are given. This was followed by an introduction to business models (types, services, transaction phases, etc.). Finally in last lecture new trends in electronic and mobile business are introduced. In last lecture of WS 2005/06 there was an introduction to new possible business models via mobile Grid Computing. We introduced the AKOGRIMO project, its challenges and the AKOGRIMO value chain. Also we introduced the eHealth scenario to the students.

3.2.2. Telematics and Society

The lecture “Telematics and Society” is compulsory to all students of the Master of Science programme in Information Systems. It will be presented once per year partially in German and English and addresses an audience of about 20 students. The lecture is divided into three main subject areas with an overall duration of 14 units (90 min)

(1) Introduction of the main technologies for Telematics (formed by concatenating the words “télécommunication” and “informatique”) applications like wireless networks (3G, Bluetooth, Zigbee, Near Field Communication) and positioning systems (GPS/Galileo, RFID) and protocols (Mobile IPv6, A4C). This section should enable the students to understand the basic concepts of the technologies (their characteristics, limitations and risks when using it) and to assess the suitability of the technologies for particular application purposes.

(2) Analysis of typical properties of Telematics applications like the support of different kinds of mobility, context awareness and close orientation on the underlying hardware (especially the mobile terminal) and the resulting implications on software development processes and business models.

(3) Discussion of case studies in the logistics domain (toll collection, traffic management) and the healthcare domain (patient monitoring - AKOGRIMO e-health testbed - , health Telematics infrastructure in Germany). Analyzing the use cases the students should understand requirements on Telematics applications specific to different domains and learn how to set up new business in this field successfully or enhance existing products by using Telematics-based services.

3.3. UniZH Seminars

The University of Zurich (UniZH) series of seminars is based on a twofold tradition: Internet Economics and Mobile Systems form the two key seminar series topics. Additionally, communication systems in general are offered as a seminar. Thus, during the course of action within AKOGRIMO - starting in mid 2004 - the Communication Systems Group CSG at the Department of Informatics IFI organized the following seminars so far:

- A. Internet Economics I (Winter Term 04/05)
- B. Mobile Systems I (Summer Term 05)
- C. Internet Economics II (Winter Term 05/06)
- D. Communication Systems I (Summer Term 06)

The typical approach taken to address those tasks was that a researcher with CSG defined the topics, a task description, and provided a list of initial references. The group of students would start working on this and provide a draft written report, which would be discussed and corrected by the researcher in at least two iterations. The final report does contain worked at material from the list of references provided and papers researched from the group. The content of this report has been presented in a 45 min talk and a succeeding, moderated discussion during the seminar with about 30 people in the room.

Concerning the detailed talk topics worked at and presented the following list indicates those ones, which address major areas of technical and business interest in the context of AKOGRIMO, indicating the running talk number, the students responsible and the topic.

A. Internet Economics

1. S. Donzel, M. Morger, E. Giger: "Commercialized Real-time Transport of Data across the Internet"
2. M. Ghindolfi, Y. Roesti: "IP Convergen Networks"
3. J. Steinmann, I. Stierli, F. Gubler: "Identität und Vertrauen im Internet"
4. S. Keller, M. Stocker, A. Wirth: "Technology- and Layer-independent Authentication Schemes for the Internet"
5. A. Müller, L. Keller, N. Lüscher: "DDoS and Other Malicious Attacks — Effects on Enterprises' Budgets"
7. C. Müller, D. Marjanovic, T. Schönenberger: "New Opportunities for B2B and B2C Services Offered by New Mobile Communication Technologies"
8. L. Hausammann, M. Donner, R. Bucciarelli: "Gruppenstrategien für Online-Business am Beispiel Mobilfunk"
9. M. Taugwalder, O. Strelbel, C. Müller: "Overview and Analysis of Content Provider Business"
10. F. Uffer, R. Loosli, M. Biedermann: "Verrechnungsmethoden für Inhalte aus dem Internet"
12. S. Hollenstein, A. Drifte, R. Grütter: "Migration to IPv6"

B. Mobile Systems I

4. R. Schmidiger, G. Zographos: "Fast Handover in Mobile IPv4 and IPv6"
5. L. Fischer, R. Meier: "The Session Initiation Protocol in Mobile Environments"
6. M. Feier, D. Holzer: "Verfahren zur Umsetzung von mobilen DRM-Systemen"
8. S. Förstler, M. Müller: "Security in Wireless Local Area Networks"
9. G. Berther, B. Affolter: "Security in GSM and GPRS"
10. C. Jaldón, L. Schweizer: "Diameter in Wireless Environments"

12. D. Marjanovic, P. Buchmann: "Technologies Beyond 3G"

C. Internet Economics II

1. B. Wasser, E. Beutler: "AAA Support for Multicast Services"
2. C. Jaldón, B. Affolter, S. Bleher: "Incentive Strategies for Cooperation in Ad-hoc Networks"
4. B. Koch, R. Wieser, C. Richartz: "The Business Model: Open Source"
5. B. Krist, M. Sonderegger, R. Haas: "Technical and Economic Aspects of Inter-domain Service Provisioning"
7. T. Schlaginhausen, P. Wild, M. Vazquez: "Financial Clearing for Roaming Services between Mobile Network Operators"
10. M. Eichenberger, V. Saycocie, T. Abdul: "Charging Models in DiffServ Networks"
11. S. Grimm: "Grid Services and their Market Potentials"

D. Communication Systems I

6. D. Heuberger, M. Altorfer, M. Innerhofer: "Next Generation in Signaling (NSIS)"
7. J. Baer et al.: "Voice over IP (VoIP)"
9. Trösch, Steffen, Barzanji: "IP Multimedia System (IMS)"
11. N. Bollow, T. Wolf, T. Rauber: "IPv6 – An Architectural Overview"

Note that due to the teaching language being German at the University of Zurich, some talks and reports have been written in German. All of them are accessible to the public at the following URL <http://www.csg.unizh.ch/publications/> by selecting the publication type "Technical Report".

3.4. NTUA Seminars

The Telecommunication Systems Lab of the National Technical University of Athens (NTUA) provides courses and lectures of undergraduate, master and PhD level. The research fields of this lab include grid technologies, biometrics, multimedia and network systems. The research team working in AKOGRIMO project is responsible among others for presenting AKOGRIMO-related architectures, concepts and technologies through the courses they teach and seminars they organize. In the paragraphs that follow a description of these courses is provided as well as the training seminars presenting AKOGRIMO-related technologies, specifications and architectures are described.

3.4.1. Undergraduate course

Undergraduate NTUA courses that are influenced and thus updated by the AKOGRIMO project are:

- “Network Programming” (8th semester course in Electrical and Computer Engineering department of NTUA) by Professor Theodora Varvarigou. This course includes two units: “Internet technologies” and “Java”. The first one is an introduction in the distribution and the analysis of technologies on which Internet is based. It refers to a number of structural elements of Internet for each of which it develops and presents its main role, its use and its application in the Internet. The areas covered include among others: TCP/IP namespace, communication links and protocols, client server applications, World Wide Web, HTTP, HTML, e-commerce, programming techniques for text, links, images and forms. Apart from that server side programming, CGI scripts and Perl area also covered, whereas a general reference to future applications to be developed in Internet is also presented. The second one comprises an introduction to object-oriented programming, Java programming language and its packages. The issues covered are object oriented programming features (classes, objects and inheritance), Java features (interfaces, exceptions, packages, concurrency, garbage collection, etc.), packages (lang, util, io, networking, awt), applets and security issues. Moreover, students become familiar with web services, SOAP (Simple Object Access Protocol), UDDI (Universal Description, Discovery and Integration), WSDL (Web Services Description Language) followed by a brief introduction in the Grid and grid services. Each of the areas covered includes a small project as a practical approach to the course.

3.4.2. PhD courses

NTUA provides PhD courses which among others present current advances in grid architectures and technologies. The context of these courses that relate to the Grid is influenced by AKOGRIMO. These courses include:

- “Embedded Systems” (Electrical and Computer Engineering department of NTUA). This course focuses on the main issues concerning embedded systems. It includes a presentation of distributed systems and distributed time, scheduling protocols and techniques with special focus on CAN and TTP protocols, security techniques such as FMEA and FTA and issues of authentication, validation and validity of results. An introduction to the Grid and the main concepts it represents are presented followed by a brief description of the current grid technologies.
- “Fault tolerant Systems” (Electrical and Computer Engineering department of NTUA). This course includes an introduction to the theory of fundamental problems of systems and applications with fault tolerance. The types of faults in Computational systems, methods used for their detection, system reliability, reconstruction from faults in multiprocessing systems, QoS, fault tolerance in high performance applications and embedded applications of hyper-computers with fault tolerance are described in this course followed by an introduction to grid computing and grid technologies.

3.4.3. Specific AKOGRIMO seminars

In the context of the EGEE (Enabling Grids to E-science) project, NTUA has hosted a grid-related seminar including a presentation of AKOGRIMO technologies as part of existing and developing Grid technologies. This seminar was entitled “Introduction to EGEE” and was held on the 20th and 21st March 2006 in Athens, Greece. The total duration of this seminar was 18

hours (9 hours per day) with the audience being mainly from the academic and the business field with technical orientation reaching the number of 30 people.

The scope of this seminar was the introduction to EGEE followed by a presentation of a retrospect of Grids, the current status of Grid technologies, the capabilities offered by the Grid technologies to Science, Grid applications development and Grid administration.

The AKOGRIMO related part of this seminar was actually a presentation of AKOGRIMO technologies, and more specifically WSRF. This presentation included a brief introduction to mobile grids and OGSA specification as well as a description of the middleware used in AKOGRIMO in conjunction with OGSA.

3.5. USTUTT Seminars

3.5.1. Undergraduate course

Mr. Stefan Wesner, deputy director of the HLRS, uses ongoing research work from AKOGRIMO in a regular lecture about “Software Engineering for Technical Systems” to exemplify selected lecture topics with current research. Students are offered to deepen their knowledge about large scale distributed systems in seminars and student thesis’.

3.5.2. Specific AKOGRIMO seminars

- **Hands-on Seminar: Web-services Based Distributed Systems:** A two day training seminar for mechanical engineering students was held in summer 2005. The seminar introduced Web- and Grid-services for distributed systems. Participants were guided in developing their own Web-service using Apache Axis.

3.5.3. Master’s and PhD Thesis

- Ongoing Student thesis. Patrick Montheu: **Extending the Axis Toolkit to Transport and Process Context Information.** In an ongoing student thesis the ability to intercept and process messages using the Apache Axis toolkit is being evaluated. Using a filter, messages are separated into management/context information and application dependent content.

4. AKOGRIMO Training Material

4.1. Public Training Material

This section describes the training material prepared for the lectures of the AKOGRIMO training seminar held on December 12th, 2005 in the UPM premises in Madrid. The target group as mentioned before was a group of telecommunication technology undergraduate and graduate students. All this training material is available in the project web server <http://www.akogrimo.org>, in the download/presentations section.

4.1.1. Lecture on the Mobile IPv6 Protocol

35 slides including the following subjects:

- Motivation: Global Mobility
- Basic Mobile IP Model and Operation
- Mobility in IPv6
- Security in IPv6 Mobility.
- Optimizations: Fast handover & Hierarchical mobility

4.1.2. Lecture on Mobility and Session Management: The Session Initiation Protocol

55 slides including the following subjects:

- Introduction
- Architecture of the SIP systems
- Procedures and messages of the SIP protocol
- SIP Servers
- SIP Extensions

4.1.3. Lecture on Business Modelling for Mobile Grid Scenarios

54 slides subdivided in three main parts, firstly introducing the development from the industry age and society to the information age and society, secondly regarding the genesis of mobile grid business coming from the initial ideas of electronic and mobile business, and thirdly presenting the way from today's telecommunication value chains towards mobile grid value networks and business models.

The transformation from industry to information age was based on the consequences of strategic use of information technology meaning that the accelerated evolution during the “new economy hype” has to be accompanied by systematic considerations on organisational issues, business processes, and strategic as well as business modelling issues that have to be closely related to each other.

The way from electronic business to mobile grid business was provided in four main steps. Firstly concepts, classification criteria, and partner relationships of electronic business were introduced. Secondly, comparable aspects were treated for mobile business that is characterised by a certain degree of ubiquity. Thirdly, getting from electronic business to grid business means regarding cellular structures within the cooperation of different companies leading towards virtual organisations whose characteristics were described. In the fourth step mobile grid business was outlined by means of a video presenting the AKOGRIMO emergency scenario.

Based on these considerations the success factors for mobile grid business were identified that serve as the basis for the main strategic options for potential mobile grid business participants. A current inter-organisational telecommunication value chain was considered to be quite technology-oriented and thus not very adequate for our considerations. Together with the high degree of uncertainty in future mobile grid business developments a value network was proposed deductively derived from economic theories such as the transaction cost and principal agent theory. For each participant in the value network an adequate strategy was presented based on a survey performed with AKOGRIMO partners. Furthermore a template for business services that are exchanged among the participants within a value network and together performing a complete customer-oriented service was introduced. As the template includes all the main elements of business models it is possible to describe the value network participants’ business models by means of the assignment of the respective business services. Last not least a framework for strategic decisions for potential mobile grid business partners was introduced.

4.1.4. Lecture on AKOGRIMO Challenges - Grids and Mobile Networks

36 slides including the following subjects:

- Introduction to 4G / Evolution of the network towards 4G
- Business Roles and Models
- Grid/ Web Services
- The Service oriented AKOGRIMO Architecture
- Outlook

4.1.5. Lecture on An Introduction to the Open Grid Services Architecture

52 slides presenting Web-services Based Distributed Systems, with a combination of slide presentation and source code fragments used to explain the problem domain on the one hand and provide guidance for the hand-on Web-services programming on the other hand.

4.1.6. Lecture on Why Grid? The Middleware in AKOGRIMO

64 slides presenting an introduction to grids and mobile grids in general. It emphasizes on the question why to use these technologies to build up current IT systems, and presents the concept of grids that are based on the OGSA specification. It provides information on how to build OGSA based grids, by presenting the emerging technology of WSRF, and concludes with the example of the middleware in AKOGRIMO which is based on this architectural concept.

4.1.7. Lecture on AKOGRIMO's A4C Component

40 slides including the following subjects:

- Introduction.
- A4C Challenges
- Radius and Diameter
- AKOGRIMO A4C Scenarios and Process
- AKOGRIMO's A4C: Design and Architecture.
- A4C Implementation
- Summary and Future Work

4.2. Other Training Material

4.2.1. UHOH Lectures

4.2.1.1. E-Business:

For this lecture German presentation slides have been prepared (in average 25 Slides per learning unit)

Conceptual basics

Unit 1/2: E-Business understanding and definition, reference model

Technical basics

Unit 3/4: architectures, middleware, transaction standards (e.g. EDI, XML)

Economical basics

Unit 5: Net effects and positive back coupling

Unit 6: Digital goods and disintermediation

Unit 7: Relations of market participants, participants' strategies

Business models

Unit 8: Typing of e-business models and business strategies

- Unit 9: Web-services and transaction phases
- Unit 10/11: e-Business models: portals, market places, shops, malls, auctions
- Unit 12: Management of supply chain and contents
- Unit 13: New “innovative” business models in e-Business: mobile Grid Computing, electronic Healthcare

4.2.1.2. Telematics and Society:

For this lecture partially German and English presentation slides have been prepared (in average 25 Slides per learning unit)

Telematics technologies

- Unit 1: Telematics: Introduction, Terms, Reference Models, Information Theory (English)
- Unit 2/3/4 Overview on requirements on network architectures, ISO OSI architecture, network protocols and APIs (German)
- Unit 5: Mobile communications fundamentals: network architectures, Air interface access techniques, Hand off/Hand over, 1G/2G network fundamentals (English)
- Unit 6: Mobile network technologies: UMTS, W-LAN, Bluetooth, Zigbee, Near Field Communication (NFC) (English)

Enhanced concepts for Telematics application support

- Unit 7/8: Context models and formalization, context processing, positioning approaches in mobile networks: cell locating, single cell time advance, triangulation; satellite-based positioning, RFID technologies (English)
- Unit 9: Mobility supporting and enabling protocols: Mobility Management, IP Mobility Requirements, IPv6, MIPv6, AAA fundamentals (English)
- Unit 10: Market and business models for telematics applications (German), Domination strategies in supply chain (domination of standards e.g. i-mode), mobile payment systems (German)

Telematics applications and case studies

- Unit 11: Toll collection system in Germany (invited talk, German)
- Unit 12: Telematics applications in the automotive and logistics industry: fleet management, traffic management, tracking and tracing applications; platforms and standards) (German)
- Unit 13/14: Telematics in Healthcare: electronic physician’s letter, electronic receipt; Health Telematics Infrastructure in Germany (German)

4.2.2. UniZH Technical Reports

- Burkhard Stiller, Cristian Morariu, Peter Racz, Martin Waldburger: Internet Economics I. IFI Technical Report, No. ifi-2005.05, March 2005.

- Burkhard Stiller, Cristian Morariu, Peter Racz, Martin Waldburger: Mobile Systems I. IFI Technical Report, No. ifi-2005.06, July 2005.
- Burkhard Stiller, Thomas Bocek, Cristian Morariu, Peter Racz, Martin Waldburger: Internet Economics II. IFI Technical Report, No. ifi-2006.02, February 2006.
- Burkhard Stiller, David Hausheer, Cristian Morariu, Peter Racz, Gregor Schaffrath, Martin Waldburger: Communication Systems I. IFI Technical Report, to appear (planned July 2006).

4.2.3. NTUA Tutorial

In the training seminar on “Introduction to EGEE” the training material included slide presentation enriched with enlightening diagrams and source code fragments. Especially, the AKOGRIMO related presentation slides focused on an introduction to mobile grids and a brief description of AKOGRIMO technologies, and more specifically WSRF, emphasizing on the middleware used based on OGSA specification.

4.2.4. UPM Lectures

UPM has training material available for all the lectures and courses introduced in section 3.1. Most of this training material is available as a set of slides in Spanish to be presented in the lectures, although there is also additional material in English.

4.2.5. USTUTT Lectures

In the internal training seminar about Web-services Based Distributed Systems a combination of slide presentation and source code fragments was used to explain the problem domain on the one hand and provide guidance for the hand-on Web-services programming on the other hand. Selected sections of public AKOGRIMO deliverables are used as illustrations in the lecture on “Software Engineering for Technical Systems” to give examples of how the lecture topics are put into practice in an IP project.

5. AKOGRIMO Training Cooperation

In the context of the Collaboration Task 7, Training Activities performed in collaboration of the Grid related projects funded by the FP6 IST Call 2, under Strategic Objective “Grid-based systems for solving complex problems”, AKOGRIMO project has contributed to:

- Contribution to the CoreGrid Deliverable CPC1- T7 [1], being part of the focus group for this collaboration task.
- Contribution to the Training Roadmap [2] of this collaboration task.
- Continuous contact for dissemination of training events. In particular, the AKOGRIMO training public seminar was announced to the rest of the Grid project through this channel.
- Participation in coordinated training events. It is foreseen the participation of an AKOGRIMO researcher for the next CoreGrid Summer School to be held in Bonn in summer 2006. The topic of the lecture will be related to specific concepts that AKOGRIMO is providing in the scope of the resource management area, explaining the cross layer relationship taken in the AKOGRIMO project with the Network Quality of Service.

6. Future plans for training

The plan for next years of the AKOGRIMO project is focused on externalizing the training activities that have been held mostly in internal-partner seminars. This plan addresses a number of different players in terms of an audience and shall not be limited to research only, since teaching and academic lectures will found the basis for future generations of students, who will be – in our case of AKOGRIMO – aware of inherent problems of trying to integrate two – until now – different and unrelated areas of research:

1. Grids and grid service provisioning
2. Networking and Internet infrastructure services

Thus, in general the audience expected to be interested in AKOGRIMO will consist out of:

- AKOGRIMO partners;
- New AKOGRIMO test-bed partner;
- A generic research audience;
- Potential users of AKOGRIMO services;
- Potential practitioners of the AKOGRIMO platform; and
- Students of respective universities.

Note that some of these groups are clearly reachable in the next months, while others may require some dedicated choices to be willing to travel to locations in Europe, where the training event will be performed. Additionally, these actions will be run in a distributed manner always, since term times of universities vary and course structures are defined differently.

6.1. Training Audiences

It is worth to note first the difference between training and dissemination in terms of the reached audience: while in dissemination it is possible to focus the activities towards multiple types of audiences, training is directed towards very specific audiences, which are in fact interested and registered in these training courses with clear motivation. So, we have identified several potential audiences:

- **Researchers:** this is the main and first-reachable audience for a training activity derived from a research project like AKOGRIMO, since a training related to the project activities and results is including very advanced topics for a generic training like graduate students or postgraduate courses. These topics in principle are more oriented towards a PhD audience or area researchers
- **Business Units:** in the exploitation activities, it is planned to organize personalised workshops directed to business units, where the AKOGRIMO product will be presented and demonstrated. These seminars will also contain specific training for these business

units, in order for them to get a correct understanding of the technology challenges that the AKOGRIMO product is covering.

In a later phase, when the technologies are mature enough and exploitation activities reach their objective, with a commercialization of products based on AKOGRIMO technology, we can identify more training necessities:

- **Users** of the products, which are using some of the AKOGRIMO products. This training is more oriented towards the final usage, installation and configuration of the AKOGRIMO products.
- **Students:** since the technology will be in a mature state, the topics that AKOGRIMO is focused on can be considered to be part of a training curriculum as part of a Grid-related training. This type of training should be integrated in a Computing Systems and/or Networking/Telecommunication studies. Furthermore, Internet Economics related courses will address the charging areas of AKOGRIMO.

6.2. AKOGRIMO Training Added Value

The added value that the AKOGRIMO training can provide is based on the different list of AKOGRIMO inventions as listed in the AKOGRIMO deliverable D6.3.2 “Initial Exploitation Plan” [3].

So, AKOGRIMO specific training is directed to complement a more generic Grid training activity and provide training on the specific challenged that arise when combining Grid with a mobile environment and the Grid actors are mobile and ubiquitous.

So, the main training added value coming from this invention list can be the following:

For a research and student audience:

- **Accounting Capabilities and Identity Management:** application of the A4C architecture for a centralized authentication, authorization and accounting for both a network operator and Grid service providers.
- **Vertical Context Awareness, QoS from Network to Application:** integration of network-related parameters for optimizing the provision of Grid services, like the quality of service of the network infrastructure and context-awareness for a mobile and ubiquitous user.
- **Mobile Collaborative Business and Virtualization of Network Resources:** integration of mobile network services in the Grid service provisioning, such as videoconference for mobile users based on SIP taking advantage of specific network services features like a 3PCC (call establishment and call transfer initiated by a 3rd party, such as a Grid service).

For business units:

- **Business Modelling for Grids and Adaptive Business Process Enactment:** how to enable business processes to adapt to varying conditions resulting from mobility and

pervasiveness, so the selection or variation of alternative responses to diverse contexts and service conditions can be made in a transparent specification controlling a business process.

- **Process Oriented Knowledge Management for Service Development:** The AKOGRIMO Roadmap method integrates modelling methods for the requirement modelling, for the system architecture and design with a process-oriented knowledge management approach, enabling a complete specification of the business requirements, the derived software design decision and the usage of process-oriented best-practice reports on AKOGRIMO service development.

This specific training added value must be complemented when necessary with more generic training when it is not covered by the audience expected background or other training parallel activities. So a researcher is expected to have some knowledge about advanced mobile network technologies and Grid architecture for taking advantage of this added value training. If that's not the case, training on those concepts should also be incorporated.

6.3. Training Activities

Taking into account all the above considerations, we foresee the following training activities:

- **Training Seminar for a new AKOGRIMO test-bed partner.** As it is expected to involve a new partner in the project, it is very important to provide him the adequate specific training on the technologies and AKOGRIMO architecture in order to speed up his involvement in the project. This training will be based on an ad-hoc designed training seminar covering from the basic technologies up to training related to the AKOGRIMO invention list and prototype usage.
- **Training of researchers:**
 - It is expected to organize at least two public AKOGRIMO Training seminars with a training of the AKOGRIMO added values from a researcher's perspective, as identified previously, and including basic technologies training when it is considered necessary. The first one has already been organized in Madrid in December 12th, 2005, with a physical attendance of around 30 researchers and remote connections from more than 50 sites, as explained in section 2.

During the third year, it is planned to organize a similar training event in another location to be decided, but most probably collocated with a General Assembly meeting of the project.
 - It is expected to cooperate with the training organized by other projects in the Grid unit for training of researchers. Specifically we have been invited to provide AKOGRIMO-specific training in the next CoreGrid summer school, where this training will be based on the AKOGRIMO added value "Vertical Context Awareness and QoS from Network to Application", for aligning with the global topic of summer school: resource management, planning and monitoring, but

providing the added value of how to incorporate network-specific parameters like QoS and Context in that area.

- **Training of business units:** aligned with the exploitation activities, there will be specific and personalized training for business units related to a global view of the involved technologies (not so detailed as for the researchers' audience) and the business-related AKOGRIMO added values specified previously.
 - These seminars will be held in coordination with the exploitation working group when they organize exploitation workshops with the different involved business units.

References

- [1] Training Roadmap. Workpackage “Collaboration with IST Grid- related projects”. Task 7: Training activities
- [2] CoreGrid Deliverable CPC1- T7: Draft Collaboration Plan for Task 7: Training activities.
- [3] AKOGRIMO Deliverable D6.3.2 “Initial Exploitation Plan”.