

CoreGRID Periodic progress report format for WP3 (*Programming model*)

Period from 1 September 2004 to 28 February 2005

1.1 Work package objectives

The main objective of the work package 3, Programming model, is the definition of a lightweight component model suitable for the development of efficient grid applications, as stated in the original DoW.

This objective will be achieved through the integration of research activities of the partners involved in the WP3. This integration follows three lines:

1. Basic programming model, that is, the research aiming at the definition of suitable programming model for the implementation of the single components appearing in the grid applications
2. Component model and component composition, that is the research aiming at the definition of the component model along with the features such as component composition and component and component composition semantics
3. Advanced programming models, that is the research aiming at the development of advanced programming models built on top of the component model of the previous line.

It is worth pointing out how the activities of this work package are not really research activity, rather they are activities aimed at integrating the research activities performed by the partners in the context of the projects they are involved in and focusing (possibly in part) the WP3 topics. This is in the full spirit of a NoE project. In particular, as it is stated in the WP3 roadmap document, the research related to the component model has as a goal the assessment of an abstract component model that will be experimented and adopted by the partners in the projects they are involved in, and possibly, to start new projects in the FPx frameworks as well as in their National frameworks.

Within WP3 we actually suppose to have a first deliverable (at month 15) stating the features that hopefully have to be supported by the WP3 component model.

1.2 Overview of the work completed in the reporting period

The strategy to be followed in the workpackage activities were discussed at the preliminary WP3 meeting held in conjunction with the kick off meeting in Charleroi and subsequently assessed during the January 2005 first plenary workpackage meeting in Pisa. We basically identified three phases in the workpackage activities:

- **Phase 1:** during this phase the partners exchange information concerning their research activity that fits the work package objectives and topics. This phase is preliminary to the discussion of the features of the component based programming model whose definition is the ultimate and main goal of the workpackage activities. In particular, contacts have been established aimed at exchanging information on two of the three sub tasks of the workpackage: sub task 3.1 “Basic programming models” for the single component and communication mechanisms and sub task 3.2 “Components and hierarchical composition”. The activities related to sub task 3.3 “Advanced programming models” are planned to start later in the original DoW.
- **Phase 2:** during this phase all the activities aimed at defining the main features of the component based programming model that represents the main goal of the work package are planned. At the end of this phase, the workpackage will produce a preliminary definition of the common component model. Partners should this model as the starting point to address their research as well as to propose new projects that take it into account.
- **Phase 3:** during this phase the component model outlined in phase 2 will be refined and possibly new activities, or even projects, will be started focusing on the

refinement of the component model in all its aspects (basic programming model, component composition mechanisms, advanced programming models built on top of the component model).

The first six months of the workpackage activities have been devoted to establishing a proper integration and interaction structure and to exchanging information as established in Phase 1 design.

In particular:

- During the kick off meeting, in Charleroi, September 2004, all the partners participated and agreed to declare the respective interests and expertise in the WP3 topics. They also agreed on a plenary meeting to be held during the winter to assess the WP3 roadmap structure. After the meeting, the WP leader started collecting short statements of interests from all the partners; they have been collected on a WEB site hosted at UNIPI. This repository of information constitutes the kernel of the official WP3 web site.
- In January 2005 the partners met in Pisa for the first WP3 plenary meeting. During the meeting, each partner briefly explained his/her interest and expertise. After that, in a general discussion, the structure of the WP3 roadmap was discussed and the partners agreed on a procedure to develop the roadmap deliverable by the end of February 2005. The first version roadmap deliverable D.PM.01 has been produced within the deadline by the end of February and it is currently being reviewed following the IMC comments for the final delivery.
- Two further workshops have been planned in June and October 2005. The June workshop is a technical workshop whose goal is to explain the different positions of the WP3 partners with respect to the component model research topic. This is in preparation for the October workshop whose aim is to discuss the features of the WP3 common component model in detail.
- A detailed short visit programme has been started. The programme aims to integrate the research activities at the different partner sites as well as to support the activities more related to the WP3 topics. Short visits are from one day to week visits of researcher(s) from one WP3 partner to another WP3 partner institution. Each visit has a preliminary goal and output. After the visit, researchers involved produce a one page report that is kept in the WP3 records with the topics discussed, results achieved, activities planned, etc. At the moment, the following short visits have been performed/planned (this list is partial and it is continuously changing):
 - UNIPI → INRIA Sophia (Danelutto, Aldinucci) September 2004, *Proactive and structured parallel programming*
 - UPC → QUB (Gabarro) Feb 2005, *work on the Grab and Go model*
 - QUB → UPC (Boyle) March 2005, *grid experiments with Grab and Go*
 - QUB → UPC Summer 2005, *Work on transformation methods in grid environment*
 - QUB → WWU MUENSTER, before September 2005, *Acquire knowledge about the usage of skeletons in grid computing*
 - U-PASSAU → UNIPI, (Groesslinger) December 2004, *Domain specific optimisations in structured programming models for grids*
 - WWU MUENSTER → UNIPI, (Duennweber) October 2004, *Skeletons and components (Lithium/HOC)*
 - UCHILE → INRIA Sophia (Bustos), September 2004 – February 2005, *load balancing*
 - UCHILE → INRIA Sophia (Mateu, Tanter), March 2005, *parallel object monitors*
 - INRIA (Rennes) → UNIPI (Perez, Antoniou) January 2005, *CORBA and fault tolerance in component based grid programming*
 - INRIA (Rennes) → UNIPI (Buisson) February 2005, *Dynamic adaptation of grid programs*

- UNIPI → INRIA Rennes (Aldinucci) Spring 2005, *distributed shared memory and structured parallel programming*
- EIA-FR ↔ UNIPI, Spring 2005, *automatic deployment of parallel distributed application on globus grids*
- UOW → INRIA Sophia (Henrio), Summer 2005, *Components and model features*
- UOW → UNIPI (Henrio) Summer 2005, *Components and model features*

Researchers participating in WP3 activities, along with the sub tasks they are involved in and with a brief summary of their specific interest/expertise in the WP3 topics are summarised in the following table:

Partner	No.	Researchers	Subtasks			Expertise
			3.1	3.2	3.3	
ISTI CNR	4	<i>Domenico Laforenza, Diego Puppini</i>	x	x		Visual environments to design, compose and search (à la google) components
IC	12	<i>Nathalie Furmento, Sofia Panagiotidi, Steve McGough</i>	x	x		High level middleware (ICENI) + layered component model (already in contact with INRIA) <i>Oasis</i> : distributed and parallel models + (distributed) components (ProActive) <i>Sardes</i> : component model specification/semantics + implementation (component based middleware)
INRIA	14	<i>Denis Caromel, J. Bernard Stefani, Christian Perez, Françoise André</i>	x	x	x	<i>Paris</i> : OO SPMD (parallel objects -> components) + implementation + CORBA communication performance & deployment + adaptability Specification transformation / correctness (functional -> GRID/components)
QUB	21	<i>Maurice Clint, Ron Perrott, T. Harmer, P. Kilpatrick, A. Stewart</i>			x	Specification transformation / correctness (functional -> GRID/components)
WWU Muenster	22	<i>Sergei Gorlatch, Jan Duennweber, Martin Alt</i>	x		x	High level/order components (ref impl. On Globus + methodology + transformations (efficiency driven)) + efficient synch. & comm. Mechanisms
UCAM	24	<i>Jon Crowcroft</i>		x		Software tools: pervasive debugging
UCHILE	26	<i>Josè Piquer</i>		x	x	Distr. Objects and Load balancing + distr GC
UNCL	33	<i>Savas Parastatidis, Paul Watson</i>	x			Components & Web services + composition of components. Dynamic adaptivity + fault tolerance. Virtual organizations
U-PASSAU	34	<i>Chris Lengauer, Martin Griebel, Christoph Herrmann, Armin Groesslinger</i>	x	x	x	Loop parallelisation + Metaprogramming for high performance parallelism -> grid + intercomponent optimisations (exploit compile time abstract info to optimize (exploit dynamically))
UNIPI	35	<i>Marco Danelutto, Marco Vanneschi, Marco Aldinucci, Massimo Coppola</i>	x	x	x	Components models (from parallel structured world) Advanced/parallel progr models + implementation of automatic optimizing components + grid adaptivity + heterogeneity

EIA-FR	36	<i>Pierre Kuonen</i>	x	x	Parallel and distributed programming - > parallel object model (semantics & C++ implementation) + run time (grain) adaptivity (Hybrid) Progr. Models and environments involving communication with flexible and adaptable implementation + methodology for components def, usage and composition in grid systems
UOW	37	<i>Vladimir Getov, Ludovic Henrio, Bruce Long, Alexander Bolotov</i>	x	x	
UPC	38	<i>Joaquim Gabarro</i>			x Models for web and grid computing with approximation + library for parallel combinatorial optimisation + program correctness / semantics
VUA	39	<i>Thilo Kielmann, Henri Bal, Gosia Wrzesinska, Jason Maassen, Rob van Nieuwpoort, Niels Drost</i>	x		x OO programming models for grid applications (IBIS) + group communication + load balancing (with D&C) + run time adaptation + fault tolerant progr. Models + componentisation of GAT
VTT	40	<i>Mikka Pennanen</i>	x		Par/distr progr

In the table, FHG is not reported. FHG was supposed to be involved in the WP3 activities, according to the original DoW. However, in December 2004, FHG informed WP3 that, due to the leaving of some personnel involved in WP3 activities, it was no more possible to participate in the activities of this work package. As a consequence, FHG representatives did not participate in the WP3 first plenary workshop held in Pisa in January 2004, nor they participated in the following WP3 activity.

Currently, each one of the partners of the WP3 participated in the activities of the work package as follows:

- ISTI/CNR
 - Domenico Laforenza was organizer of (and panel moderator at) the Workshop on Component Models and Systems for Grid Applications, Held in conjunction with ICS 2004, 18th Annual ACM International Conference on Supercomputing, Saint-Malo, France June 26-July 1, 2004
 - Domenico Laforenza was co-organiser of the Dagstuhl Workshop on Future Generation Grids (1-5 November 2004).
 - Domenico Laforenza is co-Editor of the proceedings of the Dagstuhl Workshop on Future Generation Grids (1-5 November 2004) published by Springer.
 - Diego Puppini attended and presented a paper at Dagstuhl Workshop on Future Generation Grids (1-5 November 2004).
 - Diego Puppini attended the CoreGRID WP3 meeting at Department of Computer Science of University of Pisa (14 January 2005).
 - Diego Puppini, Fabrizio Silvestri, Domenico Laforenza and Salvatore Orlando, contributed with the accepted paper “A search architecture for Grid software components”, to be published on the FGG-Dagstuhl book (CoreGrid/Springer series).
- IC
 - ICENI has been under extensive development and v1.4 is now stable and available for download from <http://www.lesc.imperial.ac.uk/iceni/downloads/1-4-branch/>.
 - ICENI is now undergoing a major re-factoring and there will be no further releases until v2.0.
 - IC group gave a presentation at the Pisa workshop in January 05.

- We have also had a change around of staff with Natalie Furmento going to work for INRIA and Sofia Panagiotidi coming on board.
- We have not yet had a personnel exchange with other groups or co-written any papers; something we hope to address in the near future.
- INRIA
 - Integration:
 - 13-14/09 WP3 Meeting in Charleroi (Coregrid kick off meeting)
 - 13/02 WP3 Meeting in Pisa
 - Active participation in the FGG workshop, Dagstuhl November 2004
 - Organization of the 1st Grid plugtests and contest and 1st ProActive user group meeting, October 2004, to which numerous participants of the NOE participated
 - Visits:
 - 10/01-12/02: visit to UNIPI by C. Perez and G. Antoniu (INRIA).
 - Discussion about the integration of Assist and GridCCM:
 - The feasibility of a parallel extension of the in/out ports of Assist has studied and appears good.
 - A first integration of such a version of Assist and GridCCM seems quite straightforward
 - Preliminary discussion about the support of a "shared space" (offered by Juxmem) across components and the shared memory execution model of Assist.
 - Preliminary discussion about the integration of the component deployment effort made by the two partners
 - 21/02-25/02 : visit of J. Buisson to Unipi (Marco Danelutto, Marco Aldinucci, Sonia Campa, Massimo Coppola & Corrado Zoccolo). This visit targeted the comparison of adaptation models within ASSIST (developed at UNIPI) and AFPAC (developed at IRISA/INRIA Rennes). It leads to define the foundations of a common abstract model. A paper describing the basis of this model has been jointly submitted to PARCO 2005.
 - 15/02 : visit of J. Buisson to VUA (Thilo Kielmann). As the AFPAC framework needs a monitoring system, a first contact has been established to see how the work of VUA on monitoring and environment developed in the context of WP7 may be used.
 - Nathalie Furmento, Research Associate, London E-Science Centre Department of Computing, Imperial College London, from 01/09/04 to 10/01/05 was at INRIA Sophia discussing Knowledge sharing on our respective programming and component oriented models for GRID.
 - Continued development of a formal operational model for distributed component-based programming (Kell calculus), in line with the Fractal model. Results obtained:
 - operational characterization of component sharing (one of the important features of the Fractal component). The Fractal component model constitutes for us a contribution to the consolidation work of WP3 towards a component-based programming model for Grids (task 3.2 in particular).
 - Joint research work with Univ. Westminster, Ludovic Henrio on
 - Distributed Components: Concurrency and Determinacy
 - Non-functional and reconfiguration issues. It can also be seen as a step toward an implementation of a component model following CoreGrid objectives. This is mainly about task 3.2 : design of a component model, and also a little 3.3 for the efficiency of the component model part.
 - Components for coupled problems on the GRID
 - Joint research work with UCHILE, Eric Tanter, and Javier Bustos on

- A transparent load-balancing method of active objects and components that act entirely within the programming
 - A concurrency management solution as an extension of classic monitors, implemented using reflexion techniques and AOP
 - Attendance to the France-Japan Grid Workshop, NII (external funding) and Visit to Titech Tokyo, Satoshi Matsuoka group, December 2004: presentation by Francoise Baude "ProActive: an open source grid programming environment" (Satoshi Matsuoka group is a important actor in grid computing and especially, in Grid programming , in Japan)
 - Invited tutorial in the 5th ObjectWeb annual conference, Lyon, January 2005, "ProActive: Open source middleware for the grid, Distributed Objects and Components", Matthieu Morel, Denis Caromel, Francoise Baude
 - Workshop OSCAR on Programming Languages ,Univ. of Chili, Santiago of Chile, November 2004 (external funding) Denis Caromel "Hierarchical components for the GRID"
- QUB
 - QUB has been working on WP3 task 1 and 3 in particular. A group of 5 staff and PhD students have been having regular discussions on the creation of a programming model for grid computing. The basic premise and long term objective has been that the user (programmer) should describe a solution in the simplest computational terms (using an existing functional or imperative model), press the button, and have a GRID-based solution generated automatically which takes maximum advantage of resources available throughout the execution of the application. In the more immediate future (5-10 years) the user (programmer) must develop explicitly a GRID-based solution and thus needs to work with explicit GRID notions. The purpose of a programming model for the GRID is to identify the core operations of GRID-based computation together with mechanisms for their composition. The model is to be component based, where a component is an object with functionality and an interface. It is proposed that the GRID-based programming model be a (recursively) defined model of a component, so that an application is itself a large component composed (recursively) of sub-components. The QUB contributions have been exclusively to WP3 and its tasks Work has continued on developing and experimenting with the GrabAndGo model, a mechanism for composing restricted classes of components which arise in certain applications areas. The model is currently being implemented in a GRID environment. J Misra's work on "Orchestration Computation" is being studied as a possible basis for the development of a GRID component model. Misra addresses many of the concerns arising in the context of CoreGRID's Work Package 7.
- WWU MUENSTER
 - Within the scope of CoreGRID, the University of Muenster University of Pisa cooperate on the important topic of using high-level component systems for Grid application programming. Both the University of Muenster and the University of Pisa have contributed with their experience and new results obtained in the years 2003-2004 to the mutual efforts during the Vigoni project (a scientific, German-Italian exchange programme). The Muenster Group, led by Sergei Gorlatch, developed efficient, grid-aware optimization techniques for Remote Method Invocation (RMI, the standard technology for distributed Java systems), that were first introduced in [1]. The Pisa Group, led by Marco Danelutto, developed the Lithium system, a Java component library for grid computing based on RMI[2]. The joint work first concentrated on improving the system developed in Pisa by integrating it with the novel optimization techniques originated in Muenster. The results are very promising; they were presented to the international scientific community as a refereed paper at the 4th International Workshop on constructive Methods for Parallel Programming [3].

This paper contains not only the theoretical substantiation of the joint work, but also reports experimental results, in particular the University of Muenster published a technical report including detailed time measurements that document the performance increase gained from the optimized communication mechanisms, for various Lithium applications. A revised and extended version of this paper, including an extended experiments section was submitted to the international journal "future generation computer systems", where it will be published by "Elsevier Science". This modified version of this paper also appeared as a technical report within CoreGRID. We currently continue the cooperation that we began with Vigoni, within the Scope of CoreGRID. Another important direction of the joint work in the project deals with studying novel customization techniques for distributed components in the grid context. Using customizable components, we implemented an experimental system for molecular biological computations in the grid. This software is based on the so-called wavefront-method for parallel programs and is integrated with technologies such as Web services and the Globus Toolkit. A paper on this project and the customization techniques studied within has been submitted to the renowned international conference on parallel processing, Euro-Par 2005 to be held in Portugal [4].

- [1] M.Alt and S.Gorlatch. Future-Based RMI: Optimizing compositions of remote method calls on the Grid. In H.Kosch, L.Boeszoermyeni, and H.Hellwagner, editors, Euro-Par2003, volume 2790 of Lecture Notes in Computer Science, pages 682-693. Springer-Verlag, Aug. 2003.
- [2] M.Aldinucci, M.Danelutto, and P.Teti. An advanced environment supporting structured parallel programming in Java. Future Generation Computer Systems, 19(5):611--626, July 2003.
- [3] M.Aldinucci, M.Danelutto, and J.Duennweber. Optimization techniques for implementing parallel skeletons in grid environments. In S.Gorlatch, editor, 4th International Workshop on Constructive Methods for Parallel Programming (CMPP'04), Stirling, Scotland, UK, pages 35-47. Universitaet Muenster, July 2004.
- [4] J.Duennweber, S.Gorlatch, S.Campa, M.Danelutto, and M.Aldinucci. Behavior customization of grid components. In J.C. Cunha, editor, Euro-Par 2005 Conference. Springer, Sept. 2005. Submitted.

- UCAM

- Developers of e-Science software face a particularly harsh programming environment. Systems are built from heterogeneous collections of machines, connected over wide-area network links and often maintained under separate management. If this complexity is to be invisible at the point of use by programmers then support is needed for the complete software development cycle, including compilation, debugging and profiling in addition to job control and run-time middleware. In this project we are investigating techniques for software debugging. We focus on two areas which have received little attention from the Computer Science community. The first area is controlling complex multi-process applications through a single cohesive debugging interface. We can do this by virtualizing the resources used by the system, thereby allowing the threads that it involves and the network links that it uses to be modelled as a single controllable entity. This method will be applicable for moderately sized systems of perhaps half a dozen nodes.

The second area is post-deployment debugging of very large-scale distributed applications -- for instance those running over hundreds or thousands of nodes. In such a setting traditional distributed debugging techniques of checkpointing or simulation become infeasible.

We are also interested in location as a first class aspect of any object in a grid,

and to this end have been looking at Internet Coordinate Systems. Understanding the accurate location of services allows one to synchronise state more accurately.

- References:
 - PDB: Pervasive Debugging With Xen Alex Ho, Steve Hand, and Tim Harris in the Proceedings of the 5th IEEE/ACM International Workshop on Grid Computing (Grid 2004), November 2004, Pittsburgh, PA
 - Internet Routing Policies and Round-Trip-Times, Han Zheng, Eng Keong Lua, Marcelo Pias, and Timothy G. Griffin in the Proceedings of the Passive & Active Measurement Workshop 2005 March 2005, Boston, MA
- UCHILE
 - We have been working with Denis Caromel at INRIA, creating cooperation around ProActive and Reflex as Grid Programming Languages. Some milestones:
 - October 2004: Participation of a Student's group at INRIA Grid Plugtests, solving the N-queens problems (report at: www-sop.inria.fr/oasis/ProActive/plugtest_report.pdf news at: <http://www.gridtoday.com/05/0131/104537.html>)
 - November 2004: Eric Tanter's PhD defense, "Versatile Kernels for Aspect-Oriented Programming". Workshop on programming Languages at UChile, with Jose Piquer (advisor), Denis Caromel, Eric Madelaine and other invited speakers.
 - From September 2004 to February 2004, Javier Bustos (UChile PhD student) is visiting INRIA-Sophia for his thesis work on load balancing.
 - February 20th-March 15th, Luis Mateu and Eric Tanter (UChile) visited INRIA-Sophia and worked with Denis Caromel at an OOPSLA paper and at the organization of the 2005 plugtest.
- UNCL
 - Newcastle has been working on applying the ideas of how service-oriented, internet-scale applications (a.k.a. Grid applications) can be developed using services as components and messages for communication. Emphasis is placed on protocol-based integration between the different components of a system. The approach is applied in GOLD (trust in virtual organisations), Dynosoar (dynamic service deployment and provisioning), Distributed Query Processing (distributed queries on the Grid), and other projects currently going on in Newcastle. Newcastle has also started working on a P2P and Web Services paper with Cardiff. Prof. Paul Watson (Director of North-East Regional e-Science Centre) and Chris Fowler (PhD student) attended the CoreGRID kick-off meeting. Dr. Savas Parastatidis (Chief Software Architect of North-East Regional e-Science Centre) and Simon Woodman (PhD student) attended the CoreGRID WP3 workshop in Pisa. Dr. Savas Parastatidis attended and presented at the CoreGRID Architecture workshop in Crete.
- U-PASSAU
 - Travel:
 - November 2004: Participation in Dagstuhl CoreGrid seminar (Armin Gröblinger)
 - December, 12-16, 2004: Visit of Armin Gröblinger at UNIPI for joint work with Marco Danelutto.
 - January, 14, 2005: Participation in Pisa WP3 Workshop (Armin Gröblinger, Chris Lengauer).
 - Group's activity in the last 6 months:
 - Armin Gröblinger: Work on dynamic component restructuring and using domain-specific languages for Grid programming (Tasks 3.1, 3.2). Study of Grid programming models, especially GRID.it's model, the potential

for dynamic restructuring of component compositions and the use of domain specific languages for Grid component programming.

- Martin Griebel: Work on tiling parallel loop programs (Task 3.3). Results: successful defense of habilitation thesis, award of the habilitation degree, submission of a project proposal on tiling for the Grid to the DFG.
 - Christoph Herrmann: Work on metaprogramming of high-performance parallelism (Tasks 3.1, 3.2). Presentations at the IFIP WG 2.11 meeting in Houston and at Texas A&M (Mar. 2005).
 - Chris Lengauer: Supervisory study and discussions of component models and of the application of the polyhedron model to Grid programming (Tasks 3.1-3.3). CoreGrid presentation at the IFIP WG 2.11 meeting in Houston (Mar. 2005).
- UNIPI
 - Participation to the kick off meeting in Charleroi, September 2004 (M. Danelutto)
 - Participation to the Dagstuhl FGG seminar, November 2004 (M. Danelutto, S. Campa, C. Zoccolo, M. Aldinucci)
 - Participation to the CoreGRID workshop on Network Centric operating systems, Bruxelles, March 2005 (M. Danelutto)
 - Organisation of the first WP3 plenary meeting, held in Pisa, January 2005
 - Supervision of the preparation of the first deliverable D.PM.01 First version of the WP3 Roadmap (responsibility UNIPI).
 - Joint research with INRIA (Sophia, ProActive + Structured component programming, visit of M. Aldinucci and M. Danelutto in Sophia in September 2004; Rennes, communication optimization in structured programming, usage of Juxmem with ASSIST, components and component/parallel program dynamic adaptation; visits of C. Perez, G. Antoniou and J. Buisson to Pisa, January – February 2005), with U-PASSAU (domain specific optimization with structured programming, visit of A. Größlinger to Pisa, December 2004) and WWU MÜNSTER (skeletons, components and structured programming, visit of J. Duennweber to Pisa, November 2004)
 - Local organization of the first integration meeting (Pisa, December 2005) in cooperation with Sergei Gorlatch.
 - CoreGRID fellowship program presented and accepted. Start in Spring 2004 (Marcelo Pasin is the current candidate)
 - Local research on component programming models for grid, in the framework of the National GRID.it programme, continued. It includes several of the WP3 topics.
 - EIA-FR
 - Contribution to 1st GRID PLUGTESTS Sophia Antipolis the 18th of October 2005
 - Preparation of a CoreGRID fellowship proposal, with UNIPI, that was accepted and it is going to start this spring
 - Participation to the Dagstuhl Seminar 1-5 November 2005
 - Participation to the WP3 workshop in Pisa the 14th of January.
 - Fellowship program setup for collaboration with University of Pisa (mobility program as define in D.IA.04)
 - UOW
 - Concerning WP3, we performed joint work of UOW is collaboration with INRIA Sophia (including a submitted paper and joint discussions/work). Part of this joint work has been realised during the visit of Ludovic Henrio to Sophia Antipolis: 3 to 8 march. We wrote (with Vladimir Getov) a theoretical paper that deals relations between functional and non-functional aspects of components, and relation between system and application components. The objective is to have tools to assert transparency and safe behaviour of non-functional aspects in an

asynchronous hierarchical component platform. This paper has not been accepted yet.

- UPC
 - We have mainly worked on three different lines.
 - First, we consider the possible application of the Orchestration Model (proposed by Jayadev Misra) to CoreGrid. The model is quite general and concrete applications remain an open field.
 - Second, we continue to work on the Grab and Go model. This gives us two research reports.
 - Third, we try to apply game theory to Core Grid. This topic seems to be quite open and no concrete results were found.
 - From 10th February to 17 February 2005 Joaquim Gabarro visited the Queen's University of Belfast. During this visit the preceding topics were discussed in a set of meetings with R. Perrot, M. Clint, T. Hammer, P. Kilpatrick, A. Stewart and E. Boyle.
 - Rosa Maria Badia and Raul Sirvent attended to the Pisa Meeting.
- VUA
 - For WP3, we have contributed to the roadmap document by presenting the programming model-related work from our Ibis project. We have also contributed to the envisioned grid component model by providing requirements from the viewpoint of system builders (WP7). We have written a book chapter together with our colleagues from partner INRIA (Sophia). This chapter is currently under review. As this chapter is cross-cutting our involvements in WP3 and WP7, we report them as contributions to both: Grid Application Programming Environments Thilo Kielmann, Andre Merzky, Henri Bal (VUA) Françoise Baude, Denis Caromel, Fabrice Huet (INRIA) We are currently investigating how our grid programming environments (Ibis and GAT) can be refactored as component systems. We are planning to investigate component-based implementations of both Ibis and GAT as soon as a CoreGrid-endorsed component model becomes evident.
- VTT
 - VTT has been working on WP3 especially to subtask 3.1.2: Communication. Our specific activities on related research:
 - communication infrastructures in complex and demanding network systems
 - improvements and optimisation techniques
 - e.g. time stamps, priorities, xml, schema
 - Integration:
 - 13.-14.09.2004 WP3 Meeting in Charleroi (CoreGRID kickoff meeting)
 - 13.02.2005 WP3 Meeting in Pisa

The list of deliverables of WP3 is the following:

- D.PM.01: Roadmap version 1 on Programming Model (due M6, delivered to the committee in time)
- D.PM.02: Proposals for a Common Component Model for GRID (due M15, expected to be delivered at M15)
- D.PM.03: Roadmap version 2 on Programming Model (due M18, expected to be delivered at M18)

While the list of milestones of WP3 is the following:

- M.PM.01: Coordinated research framework infrastructure established and work package web site up & running (due M3, achieved at M3 (web site hosted at UNIPI at M3))

- M.PM.02: Guidelines for the definition of a lightweight, composable, component based programming model for GRIDs. (due M12)

1.3 Publications

This is a partial list of the publications and submitted papers that involve partners of WP3 (from more than a single institution) and are related to topics of interest or related to the activities of WP3:

Accepted:

- L. Baduel and F. Baude and D. Caromel and F. Huet and L. Henrio and S. Lanteri and M. Morel, *Grid Components Techniques: Composing, Gathering and Scattering*, Coupled Problems 2005, an ECCOMAS Thematic Conference, 2005
- M.Aldinucci, M.Danelutto, and J.Duennweber. *Optimization techniques for implementing parallel skeletons in grid environments*. 4th International Workshop on Constructive Methods for Parallel Programming (CMPP'04), Stirling, Scotland, UK, pages 35-47. Universitaet Muenster, 2004 (extended version submitted as a book chapter)

CoreGRID Technical reports:

- Marco Aldinucci & Marco Danelutto (University of Pisa) and Jan Duennweber & Sergei Gorlatch (University of Muenster) *Optimization Techniques for Implementing Parallel Skeletons in Distributed Environments* CoreGRID Technical Report, TR-0001, January 14, 2005 Institute on Programming models

Submitted:

- Javier Bustos and Denis Caromel and Fabrice Huet and Jose M. Piquer (UCHILE, INRIA), *Information Collection Policies: Towards load of communication-intensive parallel applications*, submitted to Europar 2005
- Denis Caromel and Luis Mateu and Eric Tanter (UCHILE, INRIA), *Parallel Object Monitors*, Submitted to OOPSLA 2005
- Ludovic Henrio and Denis Caromel (UOW, INRIA), *Distributed Components:Concurrency and Determinacy*, submitted to Concur 2005
- M. Aldinucci, F. André, J. Buisson, S. Campa, M. Coppola, M. Danelutto, C. Zoccolo (UNIFI, INRIA), *Parallel program/Component adaptivity management*, submitted to PARCO2005
- Thilo Kielmann, Andre Merzky, Henri Bal, Françoise Baude, Denis Caromel, Fabrice Huet (VUA, INRIA) *Grid Application Programming Environments*, book chapter currently under revision
- Eamonn Boyle, Maurice Clint, Alan Stewart and Joaquim Gabarro (QUB, UPC) *Computing with approximate information: a restricted model for web and grid computing* submitted to HLPP 2005
- Eamonn Boyle, Maurice Clint, Alan Stewart and Joaquim Gabarro (QUB, UPC) *A Co algorithm Approach to Parallel Numerical Software Design: Towards Grid Based Eigensolvers* Submitted to PARCO2005
- J.Duennweber, S.Gorlatch, S.Campa, M.Danelutto, and M.Aldinucci, (UNIFI, WWU MUENSTER) *Behaviour customization of grid components*, submitted to Europar 2005.