



Project no. FP6-004265

**CoreGRID**

European Research Network on Foundations, Software Infrastructures and Applications for large scale distributed, GRID and Peer-to-Peer Technologies

Network of Excellence

GRID-based Systems for solving complex problems

European GRID Roadmap (Preliminary Version 2.1)

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Due date of deliverable: 30 May 2005  
Actual submission date: 1 October 2007

Start date of project: 1 September 2004

Duration: 48 months

Organisation name of lead contractor for this deliverable: FHG

Revision 1.1

<b>Project co-funded by the European Commission within the Sixth Framework Programme (2004-2008)</b>		
<b>Dissemination Level</b>		
<b>PU</b>	Public	<b>PU</b>

Keyword List: Grid Architectures, Grid Operating Software, Grid Programming, Grid Data Handling, Grid Applications, Challenges of new Grid Scenarios, Semantic Grid, Trust and Security, Distributed Collaborations.

# Preliminary Version: Overview on Grid Themes, Working areas and Timelines of European Grid Activities

(will be part of the European Grid Roadmap, Version 2.2)

## 1. Summary

Through its activities CoreGRID provides an essential communication channel towards the international Grid community. Not only the CoreGRID internal interactions, but also the cooperation with related projects lead by CoreGRID to collaborate in the preparation and definition of its roadmapping activity. The result of this on-going action is the European Grid Roadmap. It describes the research and developments activities of the actual running Grid projects. The current roadmap document is focusing on the projects, which are participating in the EGRG (see above), mostly project resulting from the second call for proposals of FP6. Future roadmaps will include contributions from and views on projects that will be selected from the proposals received as response of the current fifth call.

The roadmap is developed along nine major Grid themes identified by the EGRG where each theme is build around a couple of working areas. The objectives of the individual FP6 projects together with a brief description of work planned<sup>1</sup> are included in the description of the respective theme.

The document is completed by the Collective European Grid Roadmap (based on the results of the questionnaire) summarized in a table.

## 2. Description of the process

As a first step in the production of the European Grid Roadmap, templates have been proposed by CoreGRID WP9 for both roadmaps of the CoreGRID Virtual Institutes and the roadmaps of other projects. The purpose of these templates was to have a rather common structure of the roadmaps across the CoreGRID Institutes and the other projects to facilitate the later creation of the European Grid Roadmap from these sources. The templates have been discussed and finally distributed by end of 2004 to generate

- Grid project roadmaps (attachment 1), and
- European Grid Roadmap (attachment 2).

After the projects delivered their roadmaps<sup>2</sup> a meeting of the EGRG decided to produce an additional Grid questionnaire (attachment 3) to gather further information from the running FP6 European Grid Projects. The aim was to identify which themes and working areas are covered and how these themes are prioritized by the projects. Along with this, the relevance of the topics for the use of Grids in the academic and the industrial environment is identified. Finally, the information which themes or working areas of Grid R&D are still missing was gathered. The participants of the meeting decided that the European Grid Roadmap should not be organised as a list of the projects and their expected results, but should to be oriented on themes and working areas instead.

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■ <sup>1</sup> Both from the description in the EU Project fact sheets

■ <sup>2</sup> It turned out that STREPS – except for UniGrids – won't produce roadmaps and neither SIMDAT nor NextGRID and Akogrimo had a roadmap in their workplan.

The questionnaire was distributed to the EGRG and additional to the leaders of the Technical Groups of the EU FP6 Concertation Activities. Based on the feedback received, the information from the projects' roadmaps available and other information like brief description of the projects the following European Roadmap emerged.

During the Concertation Event 2005 in Brussels the relation of the Roadmap to the work of the Technical Groups (TGs) was discussed. It was agreed to intensify the collaboration between the TGs and the EGRG. As a first step there will be additional input to the Roadmap coming from the whitepapers that are currently prepared by the TGs. Moreover, it was also agreed to better match the structure of the Roadmap themes (currently six themes based on the CoreGRID roadmaps) with that of the eight TGs. The new structure is described in section 3.

Major parts of the roadmaps of the six Virtual CoreGRID Institutes have been included into this Roadmap. The reason for this is the fact that most of the European Grid research teams have joined CoreGRID and many of these research teams are also active in other FP6 Grid projects thus the Roadmaps defined in CoreGRID may be expected to provide an almost complete view on the European Grid R&D landscape between 2005 and 2008. Additional information has been included from other FP6 Grid projects from their description of the projects' objectives, and, as mentioned above from the TGs.

Next steps planned are further iterations on the roadmap document aiming on refinement and alignment with the projects involved.

The information for this roadmap comes mostly from EU projects proposed in the 2<sup>nd</sup> call for proposals and selected for funding afterwards by DG.F2, Research xxx. There are a few contributions from projects funded by DG.F3 – Research Infrastructure, but clearly the collaboration with these projects has to be increased. After the 5<sup>th</sup> call an extension from 12 to 35 Grid projects has to be included.

### 3. Grid themes and their working areas

The following themes (corresponding to the Technical Groups defined within the concertation activities and the CoreGRID Virtual Institutes) and their main working areas (which mostly are reflected in the Grid projects' activities) have been identified by the EGRG:

- Theme: [Grid Architectures](#) (TG1 – Grid architecture and CoreGRID Institute on Architectural Issues: Scalability, Dependability, Adaptability)  
Areas: Higher Level Services, Lower Level Services, Grid OS, Scalable/Adaptive Grid, [Intelligent Grids](#), [Mobile Grids](#).
- Theme: [Grid Operating Software](#) (TG3 - Workflow, TG4 – Fabric monitoring, CoreGRID Institute on Grid Information, Ressource and Workflow Monitoring Services and CoreGRID Institute on Resource Management and Scheduling)  
Areas: Resource Management, Dynamic resource Discovery, Meta-Scheduling, Monitoring of the “Grid”, Monitoring of Jobs/Tasks, Work flow (Jobs), Work flow (Management), Interoperability, Fault-tolerance & Self-healing, Scalability, [Directory Service](#), [Virtual Hosting & Application Virtualisation](#).
- Theme: [Grid Programming](#) (no corresponding TG, CoreGRID Institute on Programming Models)  
Areas: Programming Models (API), Programming Models (wrapper), Grid User Interfaces, Grid Component Technologies.
- Theme: [Grid Data Handling](#) (TG5 - Data Management and CoreGRID Institute on Knowledge and Data Management)  
Areas: Distributed Data Management, Transactions & Messaging, Replica Management, Handling of Provenance Information, Distributed access to DBs, Federation of DBs, Data Mining.
- Theme: [Grid Applications](#) (TG7 - Business Models ans SLAs, TG9 – Grid Portals and User Interfaces, and CoreGRID Institute on GRID Systems, Tools and Environment)  
Areas: Business Services, Scenarios, Work flow (Applications).
- Theme: [Challenges of new Grid scenarios](#) (TG7 - Business Models ans SLAs, TG8 – Virtual organisations, TG9 – Grid Portals and User Interfaces, and CoreGRID Institute on GRID Systems, Tools and Environment)  
Areas: Business Services, Deployment, Novel e-Applications, [Service Level Agreements \(SLAs\)](#), [Portals](#), [Mobile Scenarios](#).
- Theme: [Semantic Grid](#) (TG2 - Ontologies and CoreGRID Institute on Knowledge and Data Management)  
Areas: Knowledge Discovery, Knowledge Management, Ontologies and Semantic Annotation.
- Theme: [Trust and Security](#) (TG6 – Security and CoreGRID Task Force on Trust and Security)  
Areas: AAA, Privacy, VO Management, [License Management](#), [Portals Security](#), [Incentive Based Mechanisms](#), [Risk Assessment and Management](#).

- Theme: **Distributed Collaborations** (TG3 - Workflow)  
Areas: Grid Collaborative Tools.

After FP6, Call 5, we got some extensions of the working areas in four Grid Themes (highlighted green).

Along these themes and working areas, and aligned to the Technical Groups, the actual R&D activities of the Grid projects will be described.

## 4. Collective European Grid Roadmap

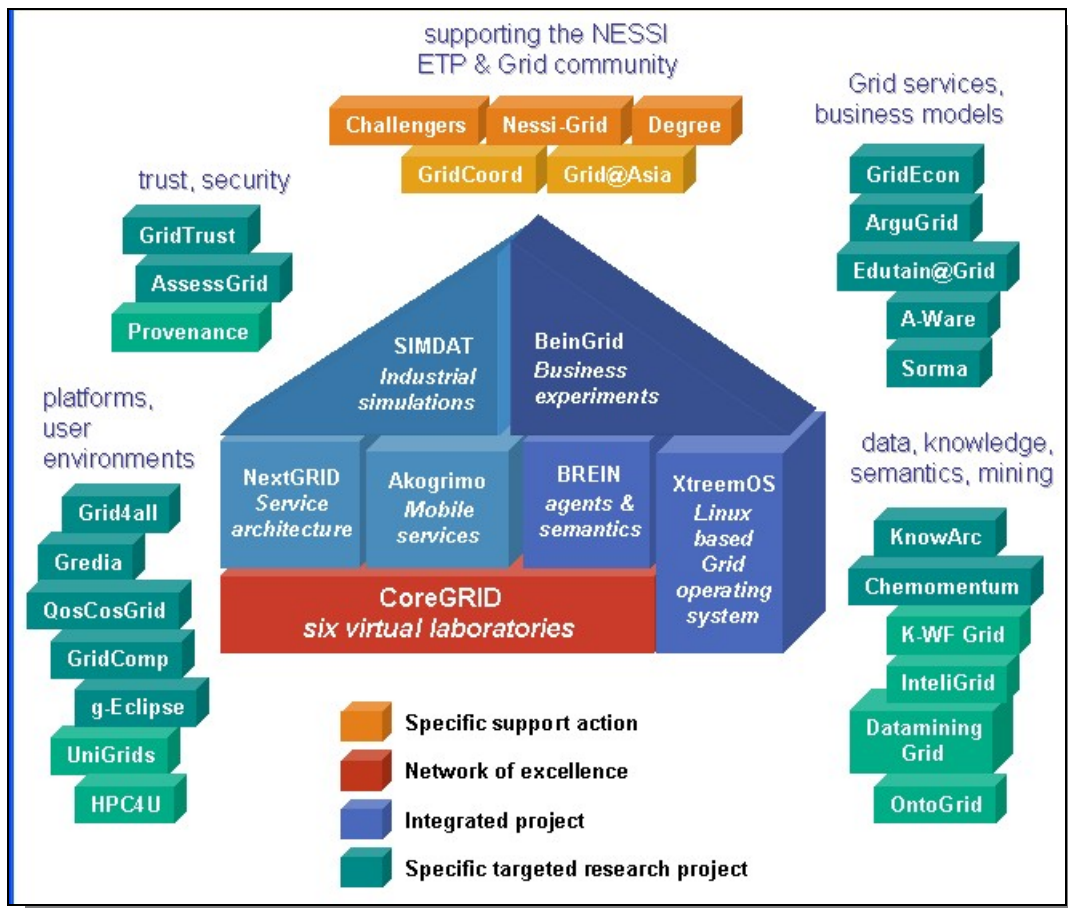
Up to now the following projects provided information and contributed in this collaboration task:

### Call 2

Akogrimo, CoreGRID, DataMiningGrid, GridCoord, HPC4U, InteliGrid, K-WF Grid, NextGrid, OntoGrid, Provenance, SIMDAT, UniGrids.

### Call 5

ArguGrid, AssessGrid, A-WARE, BEinGRID, BREIN, Bridge, Challengers, Chemomentum, DEGREE, EC-GIN, (EchoGrid), Edutain@Grid, g-Eclipse, Gredia, Grid4All, GridComp, (GridEcon), GridTrust, KnownARC, (NESSI-GRID), QosCosGrid, (SORMA), XtremOS.





ROADMAP	2005/1	2005/2	2006/1	2006/2	2007/1	2007/2	2008/1	2008/2
<b>Grid Operating Software</b>								
Resource Management	CoreGRID SIMDAT	HPC4U CoreGRID SIMDAT	HPC4U CoreGRID SIMDAT	HPC4U CoreGRID SIMDAT	HPC4U CoreGRID	CoreGRID	CoreGRID	CoreGRID
Dynamic resource Discovery	NextGrid	NextGrid	NextGrid SIMDAT	HPC4U NextGrid SIMDAT	HPC4U SIMDAT	SIMDAT	SIMDAT	SIMDAT
Meta-Scheduling	CoreGRID	CoreGRID	CoreGRID QosCosGrid	CoreGRID QosCosGrid	CoreGRID QosCosGrid	CoreGRID QosCosGrid	CoreGRID QosCosGrid	CoreGRID QosCosGrid
Monitoring of the "Grid"	NextGrid CoreGRID	K-Wf Grid NextGrid CoreGRID	K-Wf Grid NextGrid CoreGRID	K-Wf Grid NextGrid CoreGRID g-Eclipse	K-Wf Grid NextGrid CoreGRID g-Eclipse AssessGrid	K-Wf Grid NextGrid CoreGRID g-Eclipse AssessGrid BREIN	K-Wf Grid NextGrid CoreGRID g-Eclipse AssessGrid BREIN	K-Wf Grid NextGrid CoreGRID g-Eclipse AssessGrid BREIN

Monitoring of Jobs/Tasks	HPC4U	HPC4U							
	SIMDAT	SIMDAT	SIMDAT	SIMDAT					
				g-Eclipse	g-Eclipse	g-Eclipse	g-Eclipse		
			QosCosGrid	QosCosGrid	QosCosGrid	QosCosGrid	QosCosGrid	QosCosGrid	QosCosGrid
				BREIN	BREIN	BREIN	BREIN	BREIN	
				BEinGRID	BEinGRID	BEinGRID	BEinGRID	BEinGRID	BEinGRID
				A-WARE	A-WARE	A-WARE	A-WARE		
				edutain@grid	edutain@grid	edutain@grid	edutain@grid	edutain@grid	edutain@grid
					GridCOMP	GridCOMP	GridCOMP	GridCOMP	GridCOMP
				XrteemOS	XrteemOS	XrteemOS	XrteemOS	XrteemOS	XrteemOS
Work flow (Jobs)				HPC4U	HPC4U				
	SIMDAT	SIMDAT	SIMDAT	SIMDAT	SIMDAT	SIMDAT			
				g-Eclipse	g-Eclipse	g-Eclipse	g-Eclipse		
			QosCosGrid	QosCosGrid	QosCosGrid	QosCosGrid	QosCosGrid	QosCosGrid	QosCosGrid
							BREIN	BREIN	BREIN
							BEinGRID	BEinGRID	
				XrteemOS	XrteemOS	XrteemOS	Chemomentum		
							XrteemOS	XrteemOS	
Work flow (Management)	DataMiningGrid	DataMiningGrid							
		K-Wf Grid	K-Wf Grid	K-Wf Grid	K-Wf Grid				
	CoreGRID	CoreGRID	CoreGRID	CoreGRID	CoreGRID	CoreGRID	CoreGRID	CoreGRID	CoreGRID
				g-Eclipse	g-Eclipse	g-Eclipse	g-Eclipse		
			QosCosGrid	QosCosGrid	QosCosGrid	QosCosGrid	QosCosGrid	QosCosGrid	QosCosGrid
				BREIN	BREIN	BREIN	BREIN	BREIN	
				XrteemOS	XrteemOS	XrteemOS	XrteemOS	XrteemOS	XrteemOS
Interoperability	UniGrids	UniGrids	UniGrids						
				g-Eclipse	g-Eclipse	g-Eclipse	g-Eclipse		
					QosCosGrid	QosCosGrid	QosCosGrid	QosCosGrid	QosCosGrid
				GridCOMP	GridCOMP	GridCOMP	GridCOMP	GridCOMP	GridCOMP
				BREIN	BREIN	BREIN	BREIN	BREIN	BREIN
					Bridge	Bridge	Bridge	Bridge	
				edutain@grid	edutain@grid	edutain@grid	edutain@grid	edutain@grid	edutain@grid
Fault-tolerance & Self-healing	HPC4U	HPC4U	HPC4U	HPC4U	HPC4U				
			SIMDAT	SIMDAT	SIMDAT	SIMDAT			
				AssessGrid	AssessGrid	AssessGrid	AssessGrid		
				BREIN	BREIN	BREIN	BREIN	BREIN	BREIN
				edutain@grid	edutain@grid	edutain@grid	edutain@grid	edutain@grid	edutain@grid
					QosCosGrid	QosCosGrid	QosCosGrid	QosCosGrid	QosCosGrid
				XrteemOS	XrteemOS	XrteemOS	XrteemOS	XrteemOS	XrteemOS
Scalability	NextGrid	NextGrid	NextGrid	NextGrid					
			SIMDAT	SIMDAT	SIMDAT	SIMDAT			
Directory service <sup>1</sup>			XrteemOS	XrteemOS	XrteemOS	XrteemOS	XrteemOS	XrteemOS	

Virtual Hosting Env. & Appl. Virtualisation <sup>1</sup>		BEinGRID	BEinGRID	BEinGRID	BEinGRID	BEinGRID	BEinGRID	BEinGRID	BEinGRID	BEinGRID
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ROADMAP	2005/1	2005/2	2006/1	2006/2	2007/1	2007/2	2008/1	2008/2		
<b>Grid Programming</b>										
Programming Models (API)	CoreGRID	CoreGRID	CoreGRID	CoreGRID GREDIA g-Eclipse XrteemOS	CoreGRID GREDIA g-Eclipse XrteemOS	CoreGRID GREDIA g-Eclipse XrteemOS	CoreGRID GREDIA g-Eclipse XrteemOS	CoreGRID GREDIA g-Eclipse XrteemOS	CoreGRID GREDIA g-Eclipse XrteemOS	CoreGRID GREDIA g-Eclipse XrteemOS
Programming Models (wrapper)	SIMDAT	SIMDAT	DataMiningGrid SIMDAT	DataMiningGrid SIMDAT g-Eclipse	g-Eclipse	g-Eclipse	g-Eclipse	g-Eclipse		
Grid User Interfaces	UniGrids	UniGrids	SIMDAT UniGrids	SIMDAT g-Eclipse edutain@grid A-WARE BEinGRID	SIMDAT g-Eclipse edutain@grid A-WARE BEinGRID Bridge	SIMDAT g-Eclipse edutain@grid A-WARE BEinGRID Bridge	SIMDAT g-Eclipse edutain@grid A-WARE BEinGRID Bridge	SIMDAT g-Eclipse edutain@grid A-WARE BEinGRID Bridge	SIMDAT g-Eclipse edutain@grid A-WARE BEinGRID Bridge	SIMDAT g-Eclipse edutain@grid A-WARE BEinGRID Bridge KNOWARC Chemomentum
Grid Component Technologies	CoreGRID UniGrids	CoreGRID UniGrids	CoreGRID SIMDAT UniGrids	BEinGRID CoreGRID SIMDAT	BEinGRID CoreGRID SIMDAT	BEinGRID CoreGRID SIMDAT	BEinGRID CoreGRID SIMDAT	BEinGRID CoreGRID SIMDAT	BEinGRID CoreGRID SIMDAT	BEinGRID CoreGRID SIMDAT Grid4All BREIN g-Eclipse

ROADMAP	2005/1	2005/2	2006/1	2006/2	2007/1	2007/2	2008/1	2008/2	
<b>Grid Data Handling</b>									
Distributed Data Management	CoreGRID OntoGrid SIMDAT	CoreGRID OntoGrid SIMDAT	CoreGRID OntoGrid SIMDAT	CoreGRID OntoGrid SIMDAT  GREDIA g-Eclipse  BEinGRID  edutain@grid GridCOMP XrteemOS	CoreGRID OntoGrid SIMDAT  GREDIA g-Eclipse  BEinGRID  edutain@grid GridCOMP XrteemOS	CoreGRID OntoGrid SIMDAT  Grid4All GREDIA g-Eclipse  BEinGRID KNOWARC edutain@grid XrteemOS	CoreGRID OntoGrid SIMDAT  Grid4All GREDIA g-Eclipse  BEinGRID KNOWARC edutain@grid XrteemOS	CoreGRID OntoGrid SIMDAT  Grid4All GREDIA g-Eclipse  BREIN BEinGRID KNOWARC edutain@grid XrteemOS	CoreGRID OntoGrid SIMDAT  GREDIA g-Eclipse  BEinGRID KNOWARC edutain@grid XrteemOS
Transactions & Messaging	SIMDAT	SIMDAT	SIMDAT	SIMDAT	SIMDAT QosCosGrid BREIN	SIMDAT QosCosGrid BREIN	SIMDAT QosCosGrid BREIN	SIMDAT QosCosGrid BREIN	
Replica Management				g-Eclipse BEinGRID edutain@grid XrteemOS	g-Eclipse BEinGRID edutain@grid XrteemOS	g-Eclipse BEinGRID edutain@grid XrteemOS	g-Eclipse BEinGRID edutain@grid XrteemOS	g-Eclipse BEinGRID edutain@grid XrteemOS	
Handling of Provenance Information	Provenance	Provenance	Provenance	Provenance	edutain@grid	edutain@grid	edutain@grid Chemomentum	edutain@grid	
Distributed access to DBs	NextGrid SIMDAT UniGrids	NextGrid SIMDAT UniGrids	DataMiningGrid NextGrid SIMDAT UniGrids	DataMiningGrid NextGrid SIMDAT	BEinGRID	BEinGRID	BEinGRID	BEinGRID	
Federation of DBs			SIMDAT	SIMDAT BEinGRID	SIMDAT BEinGRID	SIMDAT BEinGRID	SIMDAT BEinGRID	SIMDAT BEinGRID	
Data Mining	DataMiningGrid	DataMiningGrid	DataMiningGrid	DataMiningGrid					

ROADMAP	2005/1	2005/2	2006/1	2006/2	2007/1	2007/2	2008/1	2008/2
<b>Grid Applications</b>								
Business Services	NextGrid	NextGrid	NextGrid	NextGrid	NextGrid	NextGrid		
Scenarios	SIMDAT	SIMDAT	SIMDAT	SIMDAT				
Work flow (Applications)	SIMDAT	K-Wf Grid	K-Wf Grid	K-Wf Grid	K-Wf Grid	SIMDAT		
Challenges of new Grid scenarios								
Business Services		Akogrimo	Akogrimo	Akogrimo	Akogrimo			
			GREDIA	GREDIA	GREDIA	GREDIA	GREDIA	GREDIA
			BEinGRID	BEinGRID	BEinGRID	BEinGRID	BEinGRID	BEinGRID
				QosCosGrid	QosCosGrid	QosCosGrid	QosCosGrid	QosCosGrid
			GridTrust					
			XrteemOS	XrteemOS	XrteemOS	XrteemOS	XrteemOS	XrteemOS



ROADMAP	2005/1	2005/2	2006/1	2006/2	2007/1	2007/2	2008/1	2008/2
<b>Trust and Security</b>								
AAA	NextGrid SIMDAT	NextGrid SIMDAT	NextGrid SIMDAT	HPC4U NextGrid SIMDAT			KNOWARC	KNOWARC
Privacy	SIMDAT	SIMDAT	SIMDAT	SIMDAT edutain@grid BEinGRID	SIMDAT edutain@grid BEinGRID	SIMDAT edutain@grid BEinGRID	BREIN edutain@grid BEinGRID	BREIN edutain@grid BEinGRID
VO Management	SIMDAT UniGrids	SIMDAT UniGrids	SIMDAT UniGrids	SIMDAT GREDIA BREIN	SIMDAT GREDIA BREIN ARGUGRID	SIMDAT GREDIA BREIN	SIMDAT GREDIA BREIN	SIMDAT GREDIA BREIN
<i>License Management<sup>1</sup></i>				BEinGRID	BEinGRID	BEinGRID	BEinGRID	BEinGRID
<i>Portals Security<sup>1</sup></i>				BEinGRID	BEinGRID	BEinGRID	BEinGRID	BEinGRID
<i>Incentive Based Mechanisms<sup>1</sup></i>					EC-GIN	EC-GIN	EC-GIN	EC-GIN
<i>Risk assessment and management<sup>1</sup></i>			AssessGrid	AssessGrid	AssessGrid	AssessGrid	AssessGrid	AssessGrid


<b>Distributed Collaborations</b>					
Grid Collaborative Tools	<b>g-Eclipse</b>	<b>g-Eclipse</b>	<b>g-Eclipse</b>	<b>g-Eclipse</b>	<b>QosCosGrid</b>
		<b>QosCosGrid</b>	<b>QosCosGrid</b>	<b>QosCosGrid</b>	<b>QosCosGrid</b>
	<b>BREIN</b>	<b>BREIN</b>	<b>BREIN</b>	<b>BREIN</b>	<b>BREIN</b>
	edutain@grid	edutain@grid	edutain@grid	edutain@grid	edutain@grid

Remarks: Working areas with high relevance to the project are high-lighted with bold characters.

Note <sup>1</sup>:These are new working areas of the Grid themes, which have been proposed by Call 5 Grid projects.

## 5.0 SWOT Analysis (summary slides)

Strengthens of weak Grid areas after FP6 Call 2:



1. Welcome and Introduction  
2. Actions of the EGR task  
3. Generation of the EGR document

3. Past achievements in CT5  
4. Actions to produce EGR Vers. 2.0  
5. Discussion: State, plan, expectations

### Action 4: Overview Grid Themes and Working Areas – Strengthens of weak Grid areas of Call 2?

#### Grid Architectures

- Higher level services
- Lower level services
- Grid OS
- Scalable/Adaptive Grid (2, 6)
- Intelligent Grids
- Mobile Grid

#### Grid Data Handling

- Distributed Data Management
- Transactions/d Messaging (1, 3)
- Replica Management (1, 4)
- Handling of Provenance Information (1, 3)
- Distributed access to DBs
- Federation of DBs
- Data Mining

#### Semantic Grid

- Knowledge Discovery
- Knowledge Management
- Ontologies and Semantic Annotation

#### Grid Operating Software

- Resource Management
- Dynamic resource Discovery
- Meta-Scheduling (1, 3)
- Monitoring of the Grid
- Monitoring of Jobs/Tasks (2, 10)
- Workflow (Jobs) (2, 8)
- Workflow Management
- Interoperability (1, 7)
- Fault-tolerance/Self-healing (2, 7)
- Scalability
- Directory Service
- Virtual Hosting Env. & Appl. Virtualisation

#### Grid Applications

- Business Services
- Scenarios (1, 6)
- Workflow (Applications) (2, 10)

#### Challenges of new Grid scenarios

- Business Services (1, 7)
- Deployment
- Novel e-Applications (1, 4)
- Service Level Agreements (SLAs) (1, 4)
- Portals
- Mobile Scenarios

#### Trust and Security


- AAA
- Privacy (1, 4)
- VO Management (2, 9)
- License Management
- Portals Security
- Incentive Based Mech.
- Risk Assessment and Management

#### Grid Programming

- Programming models (API) (1, 4)
- Programming models (Wrapper) (2, 3)
- Grid User Interface (2, 9)
- Grid Component Technologies


#### Distributed Collaborations

- Grid Collaborative Tools (1, 4)



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# Opportunities for Synergies of Grid R&D after FP6 Call 5:



1. Welcome and Introduction
2. Actions of the EGR task
3. Generation of the EGR document
3. Past achievements in CT5
4. Actions to produce EGR Vers. 2.0
5. Discussion: State, plan, expectations

## Action 4: Overview Grid Themes and Working Areas – Opportunities for Synergies of Grid R&D (>6 projects) !

- Grid Architectures**
  - Higher level services (13)
  - Lower level services (11)
  - Grid OS
  - Scalable/Adaptive Grid
  - Intelligent Grids
  - Mobile Grid
- Grid Operating Software**
  - Resource Management (13)
  - Dynamic resource Discovery (9)
  - Meta-Scheduling
  - Monitoring of the Grid (11)
  - Monitoring of Jobs/Tasks (10)
  - Workflow (Jobs) (8)
  - Workflow Management (7)
  - Interoperability (7)
  - Fault-tolerance/Self-healing (7)
  - Scalability
  - Directory Service
  - Virtual Hosting Env. & Appl. Virtualisation
- Grid Programming**
  - Programming models (API)
  - Programming models (Wrapper)
  - Grid User Interface (9)
  - Grid Component Technologies (7)
- Grid Data Handling**
  - Distributed Data Management (12)
  - Transactions/& Messaging
  - Replica Management
  - Handling of Provenance Information
  - Distributed access to DBs
  - Federation of DBs
  - Data Mining
- Grid Applications**
  - Business Services (8)
  - Scenarios
  - Workflow (Applications) (10)
- Challenges of new Grid scenarios**
  - Business Services (7)
  - Deployment (8)
  - Novel e-Applications
  - Service Level Agreements (SLAs)
  - Portals
  - Mobile Scenarios
- Semantic Grid**
  - Knowledge Discovery
  - Knowledge Management
  - Ontologies and Semantic Annotation
- Trust and Security**
  - AAA (8)
  - Privacy
  - VO Management (9)
  - License Management
  - Portals Security
  - Incentive Based Mech.
  - Risk Assessment and Management
- Distributed Collaborations**
  - Grid Collaborative Tools


**Exchange of information in TG's!**

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## Weak/new Grid R&D Activities after FP6 Call 5:



1. Welcome and Introduction
2. Actions of the EGR task
3. Generation of the EGR document

3. Past achievements in CT5
4. Actions to produce EGR Vers. 2.0
5. Discussion: State, plan, expectations

### Action 4: Grid Themes and Working Areas –

### Weak Grid R&D Activity after Call 2 and 5 (1 or 2 projects)?

#### Grid Architectures

- Higher level services
- Lower level services
- Grid OS
- Scalable/Adaptive Grid
- Intelligent Grids(-, 1)
- Mobile Grid(-, 1)

#### Grid Data Handling

- Distributed Data Management
- Transactions/& Messaging
- Replica Management
- Handling of Provenance Information (1,3)
- Distributed access to DBs
- Federation of DBs (1,2)
- Data Mining (1, 1)

#### Semantic Grid

- Knowledge Discovery (2,2)
- Knowledge Management
- Ontologies and Semantic Annotation (1,2)

#### Grid Operating Software

- Resource Management
- Dynamic resource Discovery
- Meta-Scheduling
- Monitoring of the Grid
- Monitoring of Jobs/Tasks
- Workflow (Jobs)
- Workflow Management
- Interoperability
- Fault-tolerance/Self-healing
- Scalability (2,2)
- Directory Service(-, 1)
- Virtual Hosting Env. & Appl. Virtualisation (-, 1)

#### Grid Applications

- Business Services
- Scenarios
- Workflow (Applications)

#### Trust and Security

- AAA
- Privacy (1, 4)
- VO Management
- License Management (-, 1)
- Portals Security (-, 1)
- Incentive Based Mech. (-, 1)
- Risk Assessment and Management (-, 1)

#### Challenges of new Grid scenarios

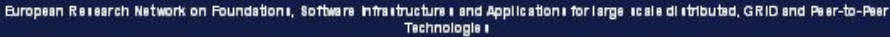
- Business Services
- Deployment
- Novel e-Applications
- Service Level Agreements (SLAs)
- Portals(-, 1)
- Mobile Scenarios(-, 1)

#### Distributed Collaborations


- Grid Collaborative Tools

#### Grid Programming

- Programming models (API)
- Programming models (Wrapper)
- Grid User Interface
- Grid Component Technologies



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This is only a short, preliminary version of the European Grid Roadmap. More and detailed information about the roadmaps of the Grid Themes (incl. Technical Groups roadmaps, CoreGRID institute roadmaps, and roadmaps of specific projects like CHALLENGERS, DEGREE, 3S) will be published in Spring 2008.