From Grids to Service-Oriented Knowledge Utilities
research challenges

Thierry Priol
The early age of Grid Computing

- Grid computing emerged in the end of the 90’s
  - An evolution rather than a revolution (from metacomputing)
  - Made possible by basic research carried out during the last 20 years in distributed and parallel computing
  - Computing as a utility like Electricity
  - Targeted for e-Science applications

- One concept, several implementations
  - Virtual Supercomputer
  - Internet Computing
Next Generation Grids
*steps towards service infrastructures*

- Expert Group conveyed by the EC (NGG)
  - Experts are both from the industry and academia
  - To identify potential European Research priorities for Next Generation Grid(s)
  - Enlarge the scope of applications for Grid Technologies
    - From e-Science to e-Engineering and e-Business

- Define a vision
  - A fully distributed dynamically reconfigurable scalable solution for business & science applications, with not only compute power but also access to information and knowledge through a coordinated set of services

http://www.cordis.lu/ist/grids
Service-Oriented Knowledge Utilities

Business/Enterprise - End-User - Manufacturing/Industrial

Service-Oriented Knowledge Utilities

Some Research Topics

Lifecycle Management
Trust and Security in Virtual Organizations
Dependability, Scalability, Adaptability
Raising the Level of Abstraction
Pervasiveness and Context Awareness of Services
Semantic Technologies

FP7 Challenge 1: Pervasive and Trusted Network and Service Infrastructures

Grid Technologies

Scientific Grand Challenges
Lifecycle Management

- On the fly creation of services
  - Deployment, migration on heterogeneous resources
- Robust, efficient and semantically aware service discovery
  - Versioning support, peer-to-peer approaches
- Composition of services based on semantics
  - Orchestration / Choreography
- Management of functional and non-functional properties
  - Performance, quality of service (QoS), dependability and security aspects.
- Support multiple economy models
  - Support reliable and scalable accounting, billing, secure access to resources
Dependability, Scalability & Adaptability

- Dependability
  - To paraphrase Leslie Lamport, "You know that you are dealing with a distributed system when you are prevented from getting your work done because a node you never heard of has crashed."
  - Especially important for mission or life-critical services
  - How to deliver dependable systems with acceptable performance?

- Scalability
  - How to handle millions of entities (services, resources, …)
  - SOA means services and thus servers…
    - Using non-centralized methods (from client/server to peer-to-peer)

- Adaptability
  - Self-* systems is central to future service infrastructures
Raising the level of abstraction

- Web services are just an instruction set of a service infrastructure
  - Low level abstraction

- Higher level programming models and tools are required
  - to express orchestration and coordination of services

- Rapid development, prototyping, debugging of generic services
Conclusion

- Grid Technologies paved the way towards the building of Service infrastructures
  - Many research challenges have been addressed by the Grid community especially in Europe (see http://www.coregrid.eu)
- Service oriented Knowledge Utilities will shape the future of Grid research in Europe
  - It extends the Grid vision to cover a broader range of applications and thus a wider impact on economy
  - It gives more challenges to researchers to realize this vision
  - A strong research community in Europe able to work in a cooperative way to address these research challenges
  - Well covered by the FP7 with a European Technology Platform on Software and Services (NESSI)

Let the research community and the industry work together and let’s take risks!