



Pervasive concepts in a mobile grid environment

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What are Grids?

A short history of Grids

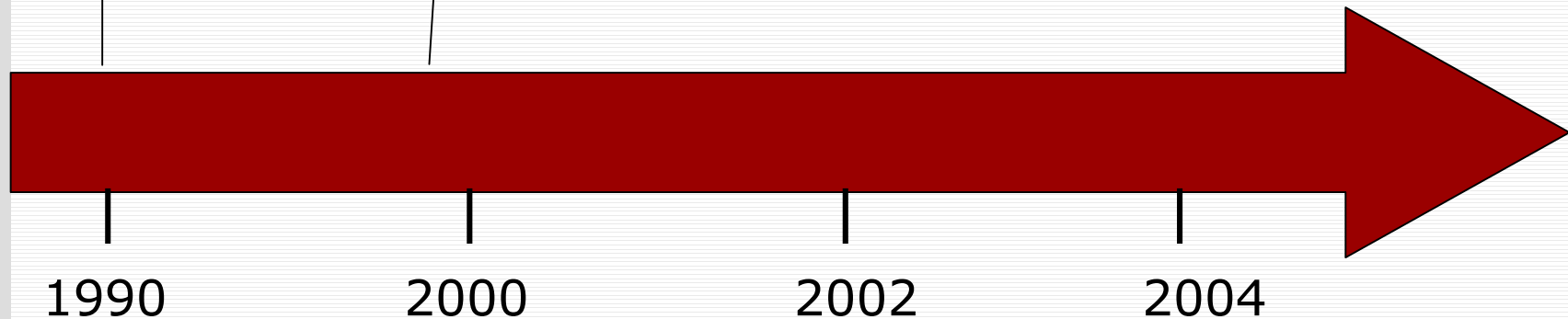


Metacomputing

- Only in the High Performance Computing Domain
- Goal is to build a virtual organisation of individual machines
- Examples: F...

eScience Grids – Virtual Laboratories

- Virtual Organisations are built for collaboration purposes
- Participants are sharing a common goal
- Not money is the driver but to solve more complex problems
- Examples: DataGrid, EGEE, (e)DEISA, GridCC, Int.EU.Grid



A short history of Grids

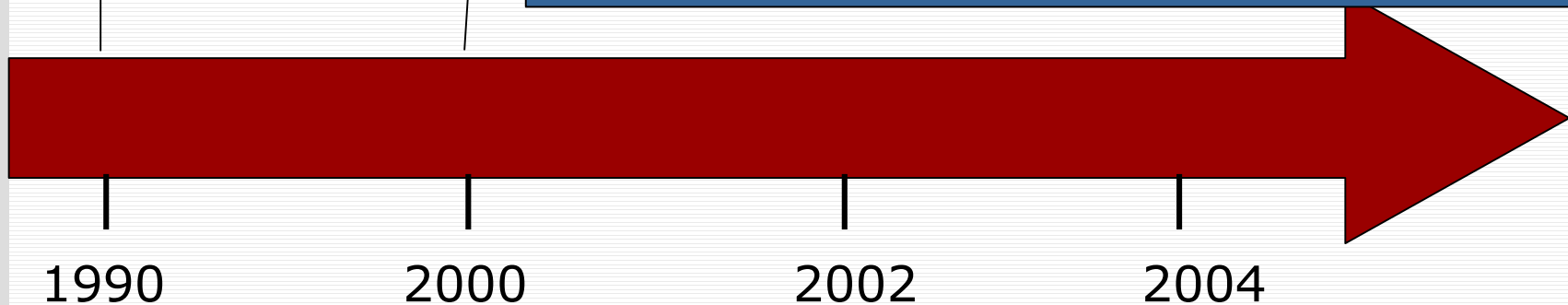


Early Business Grids

- move from proprietary protocols towards open standards (W
- Target the Bu
- At this time “
- Starting point
- Grid efforts
- Examples: GR

Next Generation Grids

- Make Grids a self-sustaining technology as basis for “Collaborative Business”
- Open Grids to new application domains
 - ELearning, EHealth, Media Production, Finance, Disaster Handling, ...
- Explore new technology areas
 - Trust, Mobility, SLAs, ...
- Examples: Akogrimo, NextGrid, SIMDAT, BREIN, BEINGRID



An attempt of a definition...



“A **Grid** provides an abstraction for resource sharing and collaboration action across multiple administrative domains...”

(Source: NGG Expert Group, 16 June 2003 “European Grid Research 2005-2010)

How is this different from SOA in general???

Collaborative Business Grids



- Are based on Services
 - The assembly of these services is dynamic
 - Structure, behaviour and location of Grid nodes can change
 - Collaboration is between **loosely** coupled services
- Resources are available as “Utilities”
 - On demand
 - Bound to certain conditions of operation (Service Level Agreements)
- Require the usage of semantics to
 - Facilitate the aggregation
 - Automate reaction on data such as context changes



What is Akogrimo?

The Akogrimo Vision



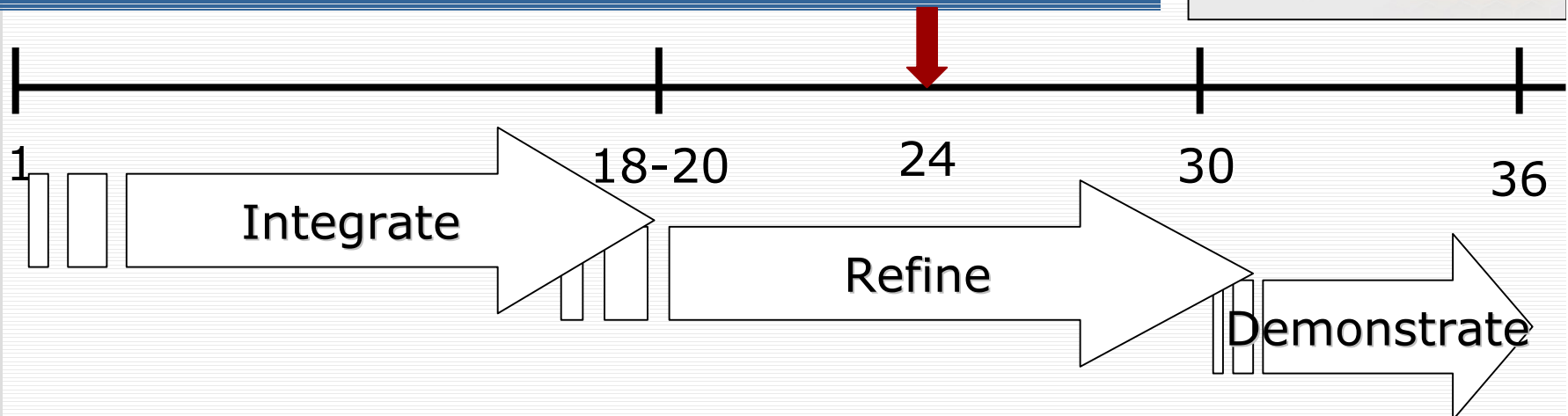
...to produce a breakthrough in current practices for Grids with the creation of a distributed, mobile and pervasive environment to make it a business proposition for Telecom Operators and Service Providers

Basic Assumptions



- The future Telecom Infrastructure is an All-IP network
- For pervasively available Grids commercial infrastructure providers such as TelCos are needed
- The Next Generation Grid should consider the needs of
 - Context changes and all kind of mobility
 - Services that are only available locally
 - RFID technology
 - Integration with SIP and VoIP applications
- From eScience Grids to Business Grids many problems need to be solved:
 - Security
 - Service Level Agreements and QoS
 - Cross organizational Accounting
 - Identity Management
 - Business models that enable a self-sustained Grid infrastructure
- For us Grids are
 - Cross-Organizational and not "Cluster Grids"
 - Dynamically composed as needed from a pre-defined set of collaborators

The Akogrimo Timeline



Refine project vision
Define initial architecture
Deliver initial infrastructure prototypes
Validate the concept
Feed the second cycle

Analyse and critical assess decisions from cycle 1
Refine architecture and prototype
Develop Testbeds

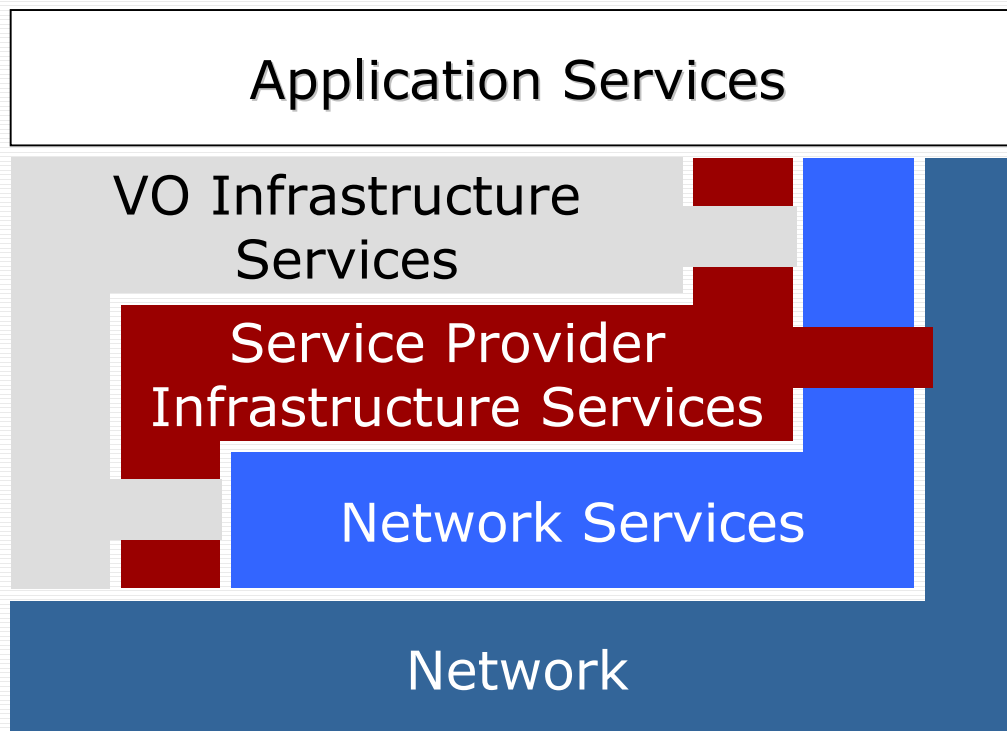
Demonstrate and Validate the results in larger scale
Refine and update results

Inhibitors preventing so far commercial uptake of Grids



- Boundary to be passed for providing or using Grid services are high
- Cross Organisational Accounting is not solved or in their infancy
- Providing Services bound by an SLA are not yet deployed and specification are still moving targets
- Economic models and Value Chain are not defined (e.g. working item of the Telco-CG of GGF)
- Business services are much more diverse and not limited to data and computational services...
- Many standards are still not agreed and moving targets...

Fundamental Concept: Cross Layer Co-Operation



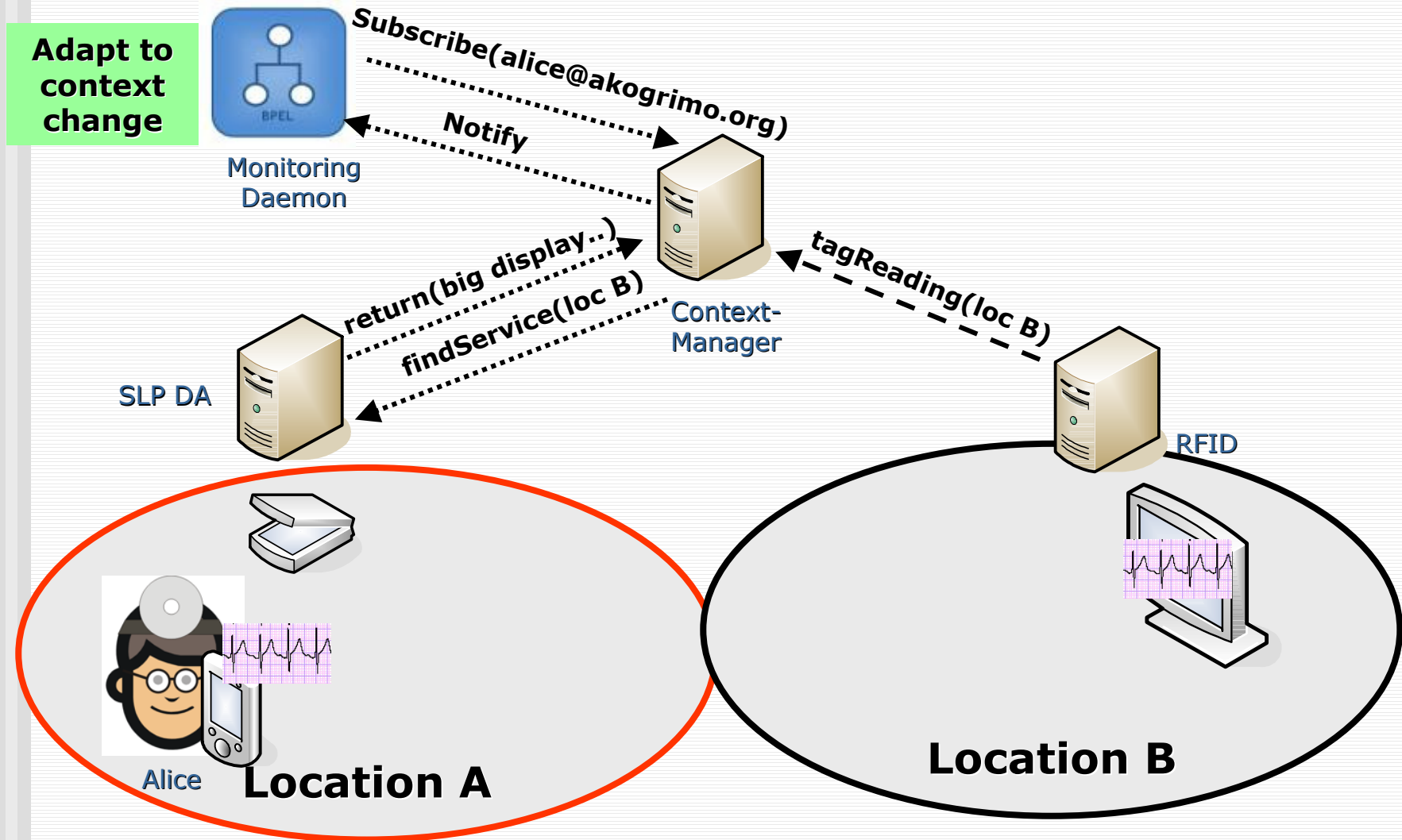
- Virtualization of all resources via Web Services
- No strict layer concept (from a SOA perspective only two layers)
- Role sharing is more function based rather than a protocol stack
- Major principle is to allow bidirectional exchange of all information between the layers such as identity, context, ...

So why should we do this integration?



- The future is Collaborative Business
 - All this makes clearly no sense for client/server or monolithic applications!
- Grid is for all and not only for High Energy Physics Scientists
- Grids are extended from virtualised computational and storage resources towards generalised utility services
- Role sharing is beneficial
 - Possibility to rely on existing infrastructures e.g. for Identity Management or Cross-Organisation Accounting
 - Interpretation of information is not done on network level but close to the application
- An intermediary between application and network makes sense

A selected example: Adaptation to changing context



Realised "role" sharing



- Network
 - Detect the context change and provide information on the new context (e.g. maximum bandwidth)
- Network Services
 - Virtualised Service "Context Manager" providing a homogenous interface to potentially unlimited different context sources
- Service Providers Infrastructure Services
 - Based on Standard Specifications such as WS-N the event "Context has changed" is delivered to all "subscribers"
- VO Infrastructure and Application Services
 - Mostly consuming role of context
 - Workflow Manager
 - Application Services
 - SLA Evaluator

Possibilities for reacting on changing context



- Changing the behaviour of the service
 - E.g. to change the resolution of the delivered picture
 - Highly complicated for the application developer as she needs to maintain the state of all consumers and must be able to interpret the context change
- Replace a service
 - A VO wide service is interpreting the context change and is generating a derived event to foster the replacement of a Service Provider with another one according to an updated set of search criteria
- Replace/Change branch of the workflow
 - Also require the interpretation of the context change to find the “right” workflow
 - Might take some time
- Stop the operation until context is changed again to an acceptable status

Challenges



- The description of context information is not standardised
- The interpretation of context information is complex knowledge processing
 - Raw context must be combined and assembled to a more abstract layer (e.g. leaving "corporate zone")
 - Akogrimo approach is "only" to select from pre-defined solutions
- Adaptation to context changes is a source of conflicts
 - Who decides that a service provider needs to be replaced?
 - Who decides that a workflow needs to be changed possibly making the service of company Foo unnecessary?
 - Akogrimo approach is to base consumer/provider relationships on SLAs that regulate also these elements



Beyond Akogrimo...

Future Directions



- More semantics
 - The description of all kind of metadata is still of very basic nature
 - More autonomy reaching for self-* system require better semantic descriptions and more complex knowledge processing
- Learning from agents
 - Akogrimo shows how adaptive applications can be done using the info from the “lower” layers
 - The mechanisms are however pre-defined and not able to react on unknown/unplanned conditions
 - For settings such as crisis management support or disaster handling this might be not flexible enough as the workflows are only partially pre-defined
- Service composition across layers
 - Akogrimo address this issue in a very basic manner (e.g. QoSBroker, Execution Management, SLA management)
- Service Management
 - No formal models in place (ITIL cannot be mapped 1:1 ☹)
 - SLA Management/EMS is an initial but only external interfaces are considered



Thank you !

For further information/slides look at
<http://www.mobilegrids.org>

or contact me

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