Distinguished Expert Panel

Grid Computing: Challenges and Opportunities

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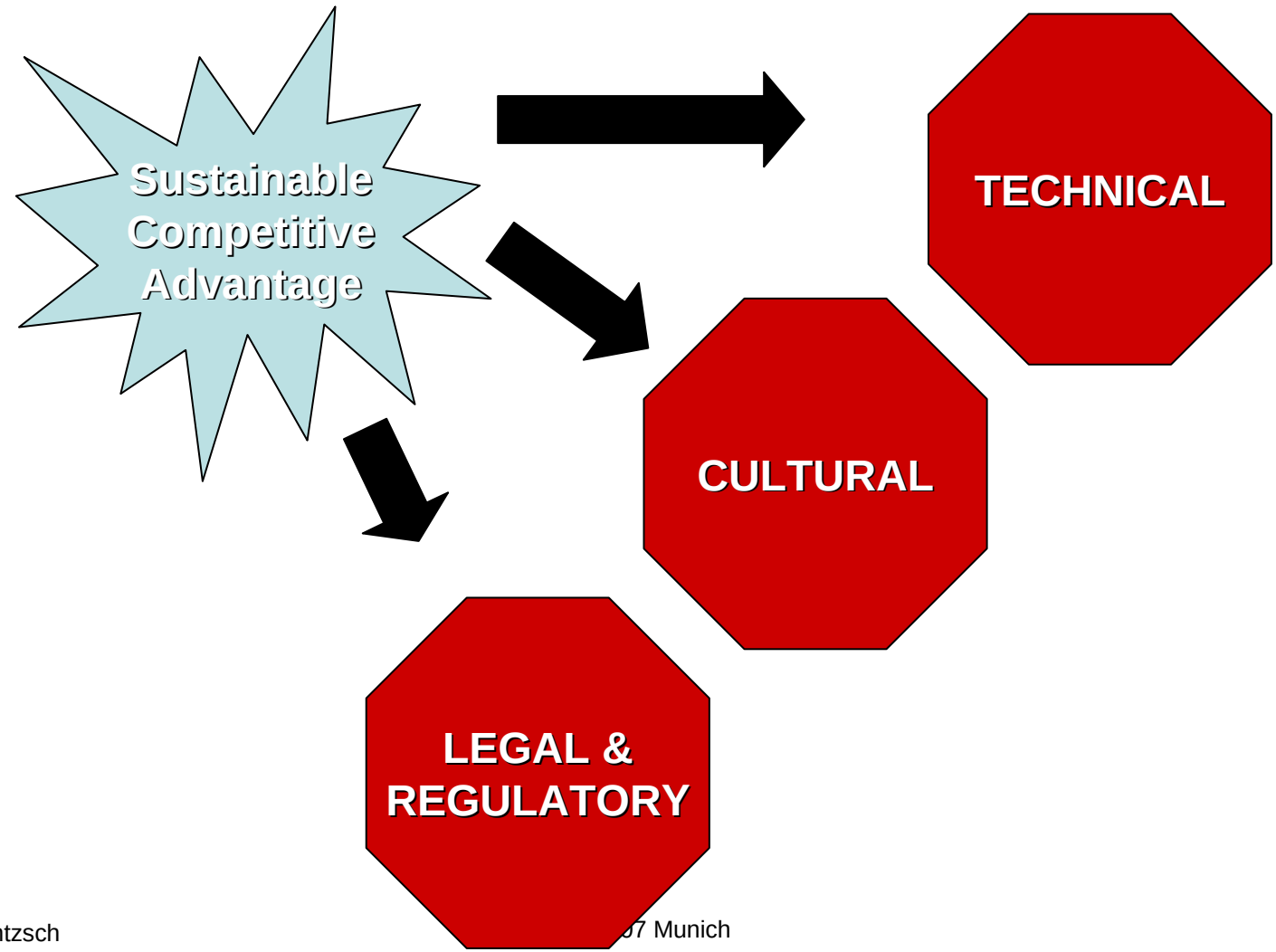
Grid Benefits for Department, Enterprise, Global Grids

- Resource Utilization: increase from 20% to 80+%
- Productivity: more work done in shorter time
- Business Agility: flexible actions and re-actions
- On Demand: get resources, when you need them
- Easy Access: transparent, remote, secure
- Sharing: enable collaboration over the network
- Failover: migrate/restart applications automatically
- Resource Virtualization: access compute services, not servers
- Heterogeneity: platforms, OSs, devices, software
- Virtual Organizations: build & dismantle on the fly

However: Grid Challenges and Barriers



Grid Challenges and Barriers

- Sensitive data, sensitive applications (medical patient records)
- Different organizations have different ROI
- Accounting, who pays for what (sharing!)
- Security policies: consistent and enforced across the grid !
- Lack of standards prevent interoperability of components
- Current IT culture is not predisposed to sharing resources
- Not all applications are grid-ready or grid-enabled
- Open source is not equal open source (read the little print)
- SLAs based on open source (liability?)
- “Static” licensing model don’t embrace grid
- Protection of intellectual property
- Legal issues (FDA, HIPAA, multi-country grids)

WHAT ARE THE RIGHT STEPS TOWARDS A SUSTAINABLE GRID INFRASTRUCTURE ??????????

D-Grid Workshop on Sustainability

Requirements

- There is a general need for a sustainable infrastructure
- Funding agency demands cost-neutral operation
- Securing long-term investments and ROI
- But: not only monetary considerations: enables long-term research collaboration and competitive research infrastructure
- Benefits for all constituencies
- Access to resources AND long-term data preservation
- International integration
- Acceptance of infrastructure through ease of use
- Long-term planning important for attracting new communities
- Include learning (GridKa), testing, support, and production

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Challenges

- Heterogeneous middleware complicates building sustainable grid, but necessary for international collaboration => sustainability
- Today: grids are complex and user unfriendly environments
- Integrating new hardware from new partners & communities; How ?
- Currently, D-Grid is not a ‘legal’ entity, problem for contractual collab
- Long-term financing of resources and their usage/operation unclear
- Grid-enabled software licensing models still missing
- Broadening community grids beyond their current core members
- Germany: “Laender” investments restricted to ‘regional’ usage

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Steps towards a sustainable infrastructure

- Significantly increase number of grid users, far beyond early adopters
- Govt funding for resources dedicated to D-Grid was key
- Support of several middlewares important
- Long-term goal: independence of D-Grid from funding …
- … but mid-term funding: prototype ➔ production
- Encourage Govt to change current funding policies for resources
- Professional user support of utmost importance (DGI & CGs)
- Excellent support ← excellent people ← long-term contracts
- Industry participation as users (SMEs) and providers (IT companies)

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Conclusions and Recommendations

- D-Grid seems to be on track towards a sustainable infrastructure
- A centralized resource infrastructure is important, but the how still has to be discussed (DGI vs CGs)
- Implementation of sustainable D-Grid only together with users (CGs)
- Sustainable usage (business) models only with users (CGs)
- Integration of D-Grid in European infrastructure is important
- Central D-Grid institution should encourage broad acceptance of D-Grid, incl certification of and support for resources
- Role of industry unclear, but participation possible today

D-Grid: Towards a Sustainable Infrastructure for Science and Industry

- Govt is currently thinking about changing policies for resource acquisition (HBFG !) to enable a service model
- 2nd Call: Focus on Service Provisioning for Sciences & Industry
- Strong collaboration with: Globus Project, EGEE, Deisa, CrossGrid, CoreGrid, GridCoord, GRIP, UniGrids, NextGrid, …
- Application and user-driven, not infrastructure-driven
- Focus on implementation and production, not grid research, in a multi-technology environment (Globus, Unicore, gLite, etc)
- D-Grid is the Core of the German e-Science Initiative

Lessons Learned and Recommendations

- During development, operation, the grid infrastructure should be *modified* and improved in large cycles only: all applications depend on this infrastructure !
- Continuity especially for the infrastructure part of grid projects is important. Therefore, *funding* should be available *after* the project, to guarantee services, support and continuous improvement and adjustment to new developments.
- Interoperability: Use software components and *standards* from open-source and standards initiatives especially in the infrastructure and application middleware layer.
- Close *collaboration* is mandatory between developers of the grid infrastructure and the applications to best utilize grid services and to avoid application silos.
- Infrastructure should be user-friendly for *easy* adoption for new communities. The infrastructure group should offer installation/operation service and support.

Lessons Learned and Recommendations

- For complex projects (infrastructure and application projects), a *management* board (consisting of the leaders of the different projects) should steer coordination and collaboration among the projects.

- On top of grid infrastructure, new projects should *utilize* the generic infrastructure and focus on an application or on a specific service, to avoid complexity and re-inventing wheels and building grid application silos. .

- Centers of Excellence should specialize on specific *services*, e.g. integration of new communities, grid operation, utility services, training, support, etc.

- Participation of industry has to be *industry-driven*. Push from outside, even with government funding, is not promising. Success will come only from real needs e.g. through existing collaborations with research and industry, as a first step.

- Implement *utility computing* in small steps, enhancing existing service models moderately, testing utility models first as pilots. Often, today's government funding models are counter-productive for utility services.