Beyond the Hope and the Hype:

Customer Perspectives on Achieving the

Vision of Grid Computing

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Open Group Customer Council Survey on Grid Computing

1. How do you anticipate it will impact your industry/market sector?
2. What are your expectations on what it might provide to improve your business operations?
3. What are your expectations of this new technology's development over the next five years?
4. What reservations and/or perceived barriers to using it do you anticipate?

Survey Responses

- Small n representing a large spend
- Respondents were enterprise architects from large organizations across several industry verticals
  - Government/Military
  - Telecommunications
  - Aerospace
  - Petroleum
  - Financial Services
  - Academia

Government/Military

- How do you anticipate it will impact your industry/market sector?
  - There are government groups that are very interested. NIST, DARPA, NRL, SPAWAR, JF-COM, ARL, ESC, DOE, and NOAA (National Weather Service, in particular)
  - The current problem is funding and budget cycle,
  - Lack of readiness for a major infrastructure shift is a not problem
  - Grid Computing is a natural evolution of peer-to-peer and web services computing and would, by necessity, need to coexist with these capabilities.
- Technical issues:
  - Unrecognized business cases
  - Security/privacy concerns
  - Bandwidth constraints.
  - Data content and metadata standards
  - Data providers or knowledge-based service provider?
- Issues to be resolved:
  - Negotiated access
  - Releasability management.
  - The bandwidth problem will only be solved when Internet 2 technology becomes ubiquitous

Telecommunications

- How do you anticipate it will impact your industry/market sector?
  - Grid computing is inherently network centric, which implies that it could have a significant impact on network service providers.
  - In addition to increasing bandwidth utilization, it also represents an opportunity to differentiate service based on network support for performance and the other QoS metrics needed for grid computing.
  - The use of grid computing as a technology foundation for utility computing also represents a potential opportunity to service providers.
- What are your expectations on what it might provide to improve your business operations?
  - As a technology supporting distributed processing, grid computing offers potential advantages in implementing operational systems such as billing, customer support, and network management.
  - There are also potential advantages related to more efficient use of existing hardware resources based on the utility model.

Telecommunications (continued)

- What are your expectations of this new technology's development over the next five years?
  - It seems clear that grid computing technology -- or at least key parts of it -- will evolve from supporting scientific computations to supporting enterprise applications over the next five years.
  - Whether the full vision will be realized in that timeframe is unclear, however.
- What reservations and/or perceived barriers to using it do you anticipate?
  - Significant technical issues still need to be addressed to realize many aspects of the grid computing vision, including:
  - QoS guarantees and related resource management issues.
  - Security especially is a barrier to widespread adoption of the technology.
  - There are also social, management, and legal issues related to sharing computing resources across individuals, departments and organizations.

Aerospace Manufacturing 1

- How do you anticipate it will impact your industry/market sector?
  - Grid computing is expected to significantly reduce the cost of design analysis for mechanical and aeronautical systems
- What are your expectations on what it might provide to improve your business operations?
  - Grid computing is not perceived to be applicable to transactional systems for business; however batch systems used to process payrolls and other accounting resolutions could use grid computing (assuming the appropriate security is in place).
- What are your expectations of this new technology's development over the next five years?
  - It is still perceived to be very formative at present.
  - Where it goes will depend on the strength of the business case.
- What reservations and/or perceived barriers to using it do you anticipate?
  - System management and security are perceived as the key barriers.
  - Security issues involving the authentication of the participating nodes, encryption of communications, and the integrity of results are all key factors.

Aerospace Manufacturing 2

- How do you anticipate it will impact your industry/market sector?
  - Grid computing has three key impacts in manufacturing.
    - Improve engineering processes between members of a virtual organization.
    - Redefinition of everything in the infrastructure as a service, ala .Net. Here, grid computing provides resource management,
    - impact of autonomic computing to reduce operating costs
- What are your expectations on what it might provide to improve your business operations?
  - Improved asset utilization
    - This would be a make/buy decision that happens in milliseconds per corporate policy.
  - Virtual collaboration services
    - Outsourcing of engineering work on a major scale in all areas of manufacturing design. This could have a major impact on national economies.
    - Many of our products will have to be built to feature intelligent subsystems that act as plug and play services per OGSA specs.
    - Think about the impact from software reuse.

Aerospace Manufacturing 2 (continued)

- What are your expectations of this new technology's development over the next five years?
    - OGSA will stabilize and will be available in many environments:
        - Web services, CORBA, java, c++, and so on.
    - Instrumentation with OGSI will be common.
    - Autonomic computing products will start to appear but only large corporations will be able to afford it. Business impacts will be realized by 2006.
- What reservations and/or perceived barriers to using it do you anticipate?
    - Interoperability. Without this the whole idea dies.
    - It is critical that IBM and Microsoft implement an interoperable version of OGSI. That will probably happen.
    - The next critical item is getting agreement on all the things that go in the meta-OS layer, or OGSA. I expect that won't happen.
    - Security. Grids require that workflow between organizations and across multiple security perimeters. There is little or no work being done on open standards for policy based firewalls.
    - Public service providers. There is no network of businesses selling computing resources in the open market.
    - Semantic web/grid. Will this really work? If not, will it matter?

Petrochemical

- How do you anticipate it will impact your industry/market sector?
  - We have studied several potential business scenarios
- What are your expectations on what it might provide to improve your business operations?
  - We are in a unique position to exploit grid computing and we have genuine need in this space, for example:
    - Exchange rate and commodity market forecasting
    - Process unit modeling, control and optimization
    - Aeromagnetic and seismic imaging
    - Detection of abnormal plant operating conditions and patterns
  - Standardized infrastructure (desktops and servers)
    - Leveraging underutilized desktops could provide access to massive amounts of computing power:
      - What would happen if we could sell our unused capacity?
      - Could we donate unused capacity to research institutions?
  - We could probably begin by using Intragrids

Petrochemical (continued)

- What are your expectations of this new technology's development over the next five years?
    - Evaluating deploying Grids within its global infrastructure
    - What is currently a research curiosity is positioned to become mainstream
    - Need corporate identity management with or without grids
    - Looking beyond the marketing hype
        - What can you do that you couldn't do before
        - How can it enable you to do it cheaper
    - The hype could kill grids
    - Need good working example to initiate the market
- What reservations and/or perceived barriers to using it do you anticipate?
    - Energy sector is a critical infrastructure area and requires protection
    - Need sustainable processes
    - Collaborate in noncompetitive areas
    - Achieve genuine competitive advantage (low risk – high impact areas of study)
        - Enhancing the fault tolerance of computing
    - Need a sound techincal infrastructure
    - Need effective management of the process

Financial Services

- How do you anticipate it will impact your industry/market sector?
  - No common financial services view of Grid Computing
  - There are several financial services firms interested in grid computing
- What are your expectations on what it might provide to improve your business operations?
  - An inexpensive way to handle compute-intensive tasks (supercomputing)
  - A way to achieve capacity-on-demand
  - A way to allocate capital resources (computers) more flexibly to different business processes over time
  - As the basis of a new architectural approach to enterprise IT, i.e. as an aspect of web services
  - As a way to achieve location independence, fault tolerance, automatic recover, and business continuity (autonomic computing)
  - It is NOT seen as a way to address straight through processing
  - It is NOT seen as a way to create a shared industry infrastructure

Academic

- How do you anticipate it will impact your industry/market sector?
  - The collaborative capabilities of Grids, especially access grids, could greatly facilitate higher education by enriching e-learning capabilities and expanding the scope of e-learning from individual experiences to group collaborative experiences.
  - The primary limitation will be on the ability of education institutions to be able to afford access to the technology infrastructure.
  - There will be a significant "Digital Divide" between the have's and the have not's.
- What are your expectations on what it might provide to improve your business operations?
  - For institutions that can afford to leverage grid capabilities, I think they will find new business opportunities to offer high quality e-learning capabilities to corporations that want to be able to design customized internal education and training offerings to their people.

Academic (continued)

- What are your expectations of this new technology's development over the next five years?
  - Grids and related technologies will go through the usual hype cycle, and things will eventually settle out into those applications that actually yield practical payback for the participating organizations.
- What reservations and/or perceived barriers to using it do you anticipate?
  - Business
    - sorting out the applications that generate real value
    - developing the capabilities
    - overcoming organizational intertia and resistance to change
    - preparing people to work in new ways, especially as it relates to collaboration across organizational boundaries
  - Information
    - sorting out ownership of information, knowledge, and other artifacts of collaborative projects
    - interfacing grid content back into mainstream organizational information systems
  - Applications
    - Rearchitecting enterprise applications and tools to support many to many collaborative capabilities
    - designing "loose-tight" security architectures that facilitate authorized participants across organizations to collaborate, while providing solid protection for resources from unauthorized access.
  - Technology
    - building the high performance telecommunications infrastructures and providing cost-effective access
    - promoting a high degree of interoperability across technology elements.
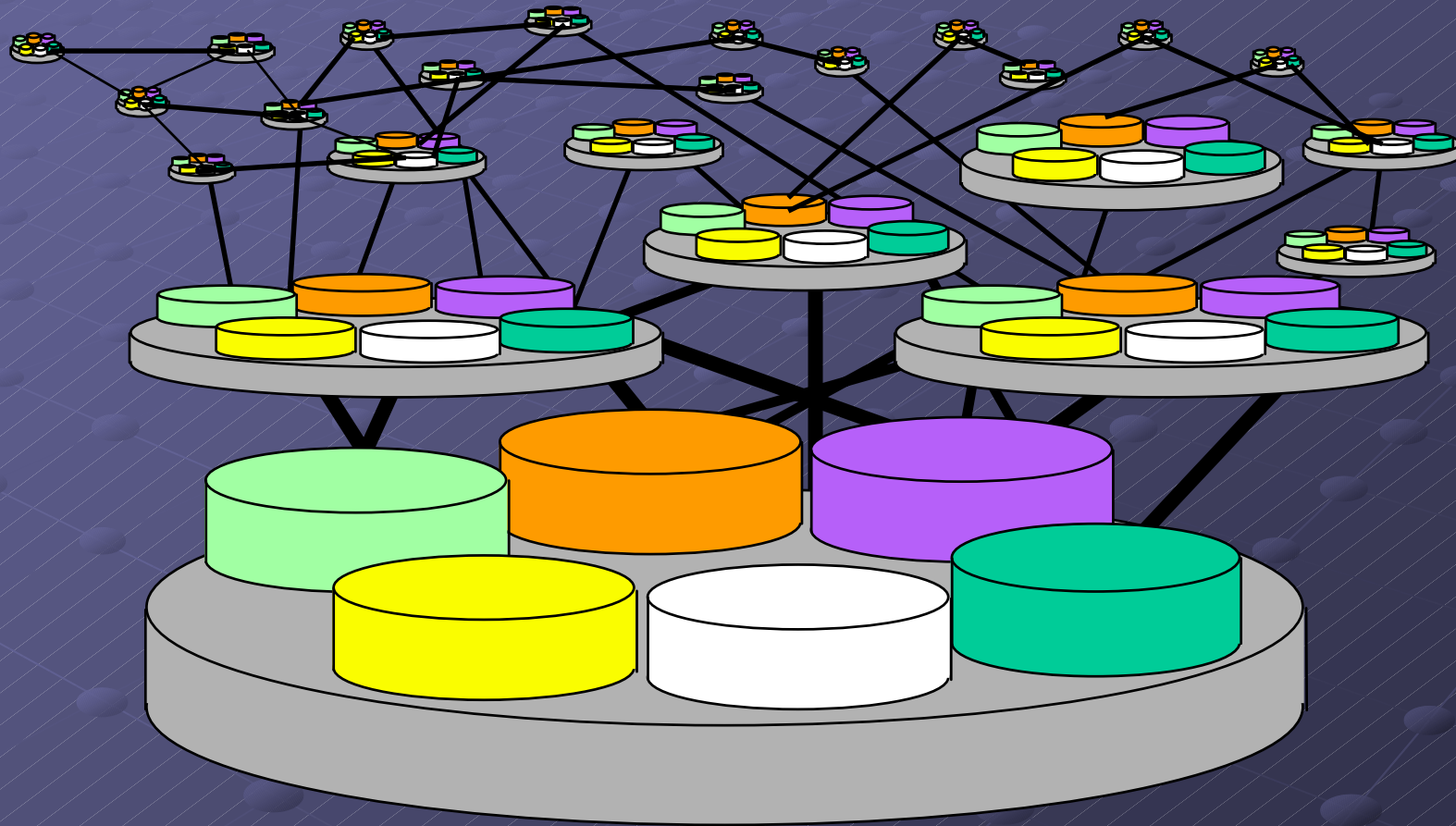
Common Themes

- Business
  - Finding the business case
  - Standards for Workflow in the extended enterprise
  - Organizational change
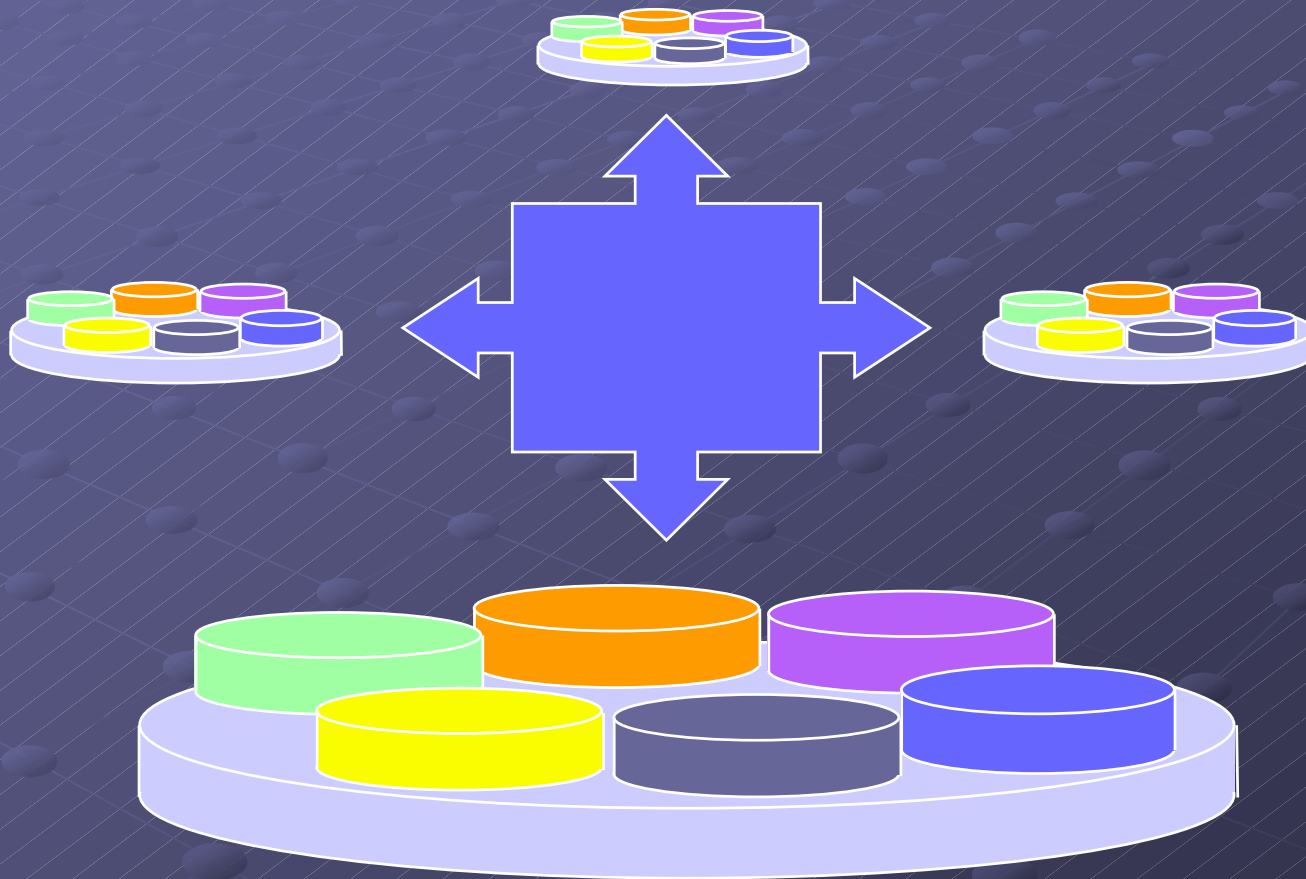 - Risk Management
  - Viability
- Technical
  - Interoperability
  - Security/Privacy
  - Manageability
  - Network Capacity and QoS

The Overextended Enterprise:
Oh,What a Tangled Web We Weave...

Toward the Virtual Enterprise

Being Virtual

- The enterprise is becoming increasingly virtual

- Agency Theory defines the enterprise in terms of its <u>core value proposition</u> and its <u>relationships</u>

- Service-oriented architectures have the potential to greatly lower the barriers to establishing Inter-Enterprise relationships

Virtual Enterprise: Critical Success Factors

- Fluidity
  - "Soft-wired" organizational structure
  - Roles vs. rigid job descriptions
  - Dynamic/continuous teaming to get work done
- Flatness
  - Flattened information channels for sharing, reassuring, lobbying, coaching, etc.
  - Constant informal involvement vs. formal/meeting intervention
- Trust
  - Collaboration among members is expected
  - Individual performance and "reputation risk" matters
- Culture
  - Chemistry varies within each organization – no one model works for everyone – all CSF's must exist in some degree to be successful.

Source: Philip Evans (2000). Blown to Bits

"Make things as simple as possible, but no simpler"

Albert Einstein

How Can Open Group Contribute?

- Architectural Coherence
- Customer Requirements
  - definition and validation
- Sponsoring Technology Development
- Conformance Testing
- Certification and Branding

Summary

- Service-oriented architectures are continuing their evolution and grid computing is the next stage in that evolution
- Service-oriented architectures will have a significant impact on the means by which Information Technology solutions are sold, delivered, and deployed
- Service-oriented architectures will enable further virtualization of the enterprise

Summary

- Virtual Enterprise techniques such as Business Collaboration can provide numerous benefits to participating organizations

- Interoperability and security are prerequisite requirements, but there are others

- Although the technical issues are daunting, the real challenges of the Virtual Enterprise relate to human and organizational factors