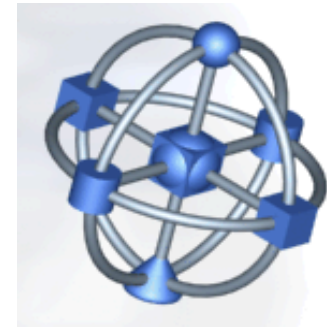




Linux in High Performance Computing and Grids

Creating Value for IT and Business



Dave Williams

IBM Canada Ltd

Business Development Executive



What's driving the interest in Grid Computing?

Market Forces

- 1) **Uncertain economy and budget restrictions putting pressure on companies to do more with less**
- 2) **Management struggles with increasing pace of technology challenges, skills shortages, unpredictable fluctuations in customer/end-user demand**
- 3) **Technology standards are emerging which will enable new approaches to enterprise and inter-enterprise computing**

Business Problems

- 1) **Inability to access and share data at any time and place across multiple servers and platforms and among geographically dispersed users**
- 2) **Need to support cross-departmental and cross company collaborations, while protecting intellectual property and confidential information**
- 3) **Knowledge workers increasingly require access to disparate computing resources from differing systems**
- 4) **Need to quickly deploy new capabilities to address emerging initiatives and competition**
- 5) **How to better leverage the significant investments in IT**



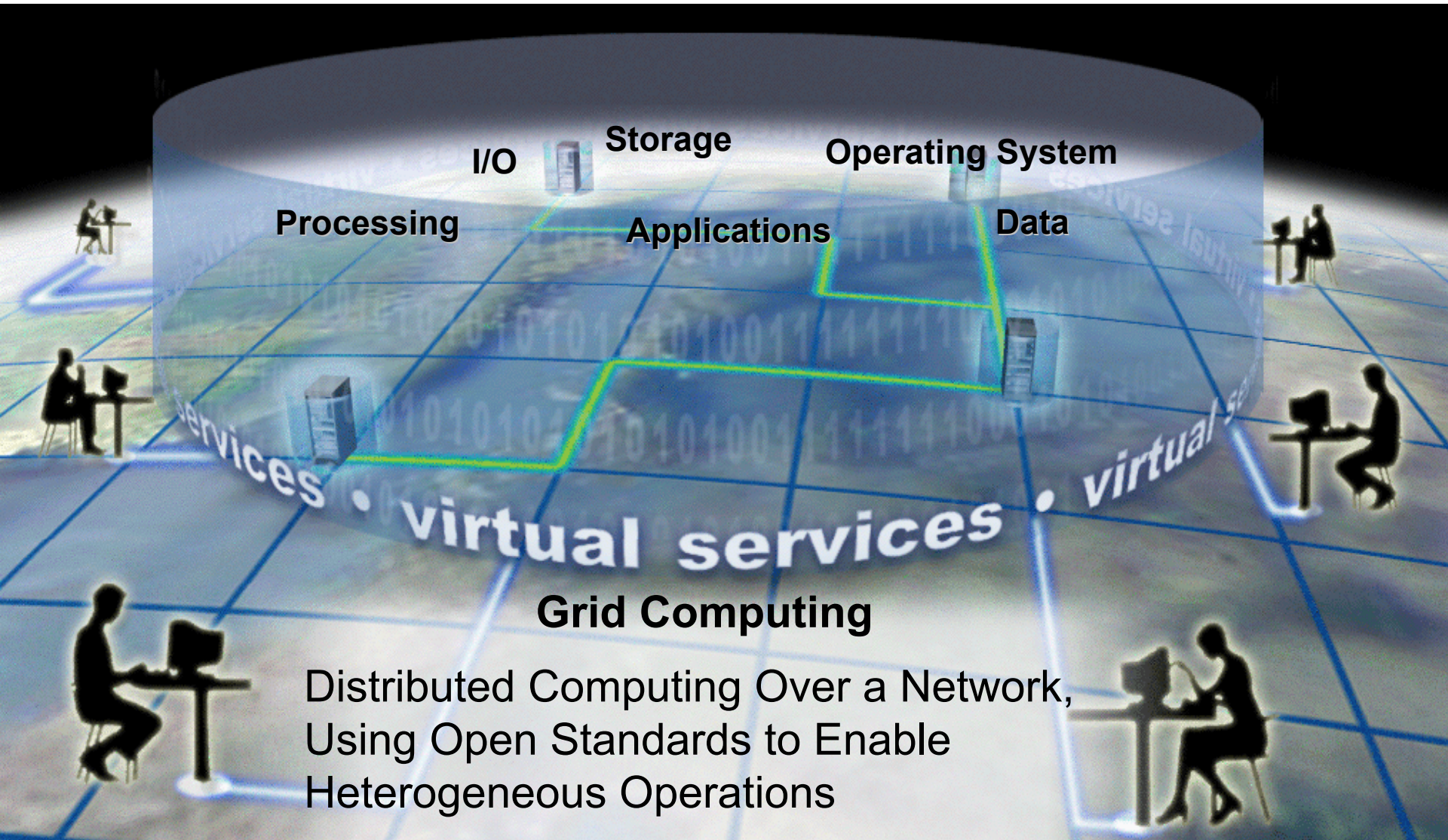
Server / Storage Utilization

	Peak-hour Utilization	Prime-shift Utilization	24-hour Period Utilization
Mainframe	85-100%	70%	60%
UNIX	50-70%	10-15%	<10%
Intel-based	30%	5-10%	2-5%
Storage	N/A	N/A	52%

Source: IBM Scorpion White Paper: Simplifying the Corporate IT Infrastructure, 2000



Grid Computing Defined





Grid Taxonomy – Four types of Grids

It is generally agreed there are four types of Grids

1. *Compute Grids*

- Used for complex number crunching applications
- Weather patterns, atomic blast simulations, aircraft and automotive design

2. *Data Grids*

- Collaborative applications supporting collaboration among virtual organizations
- Wide area data sharing

3. *Service Grid*

- Introduces web services (Grid services)
- Easier to develop distributed applications over a Grid infrastructure
- Cross platform, program-to-program communications

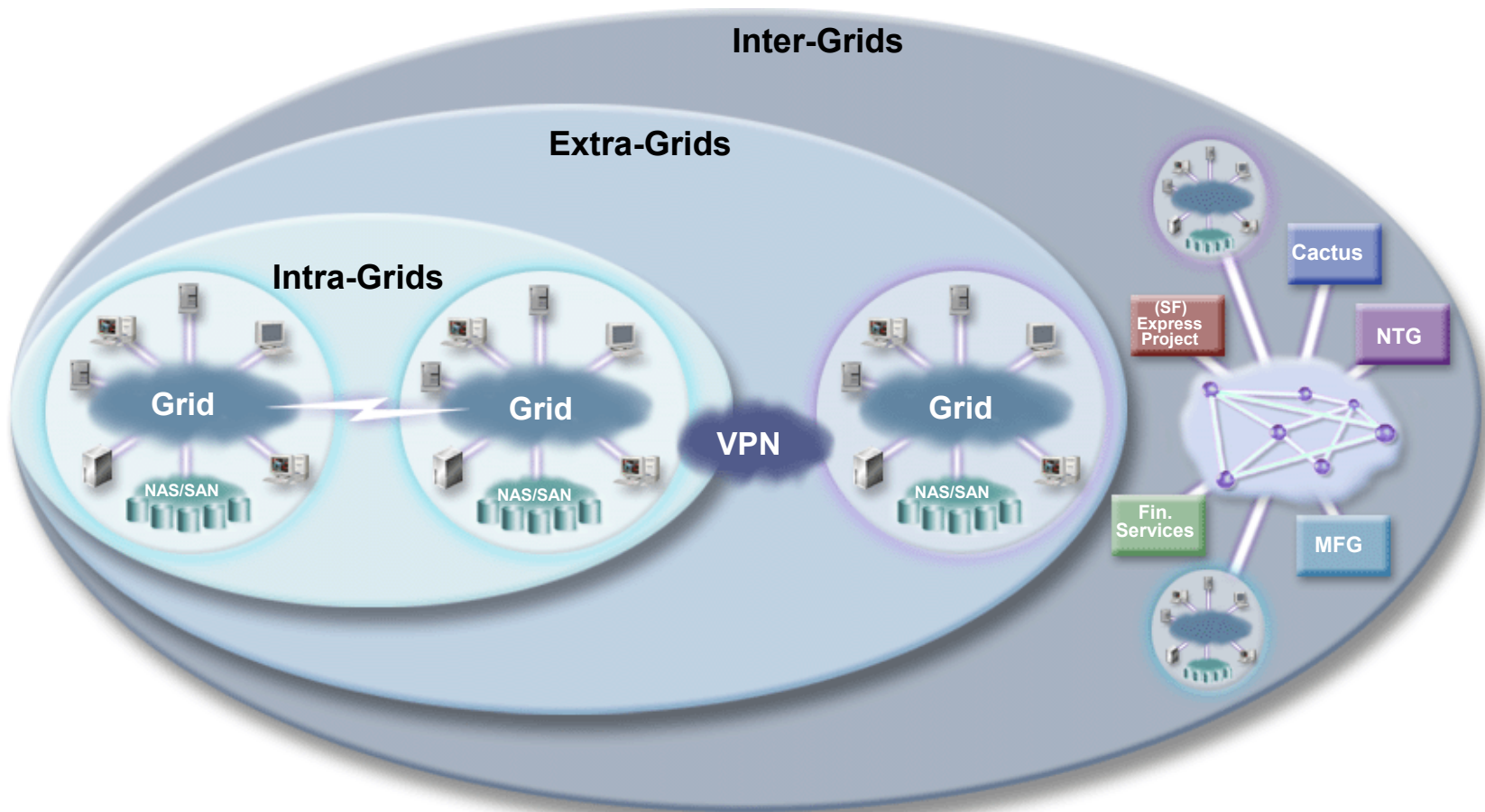
4. *Intelligent Grid*

- Concept of systems/storage/network self-management
- Self managing storage, networking, applications, and databases
- Derives from concepts in Autonomic Computing
- Self heal, self protect, auto-configure, and preventative maintenance.



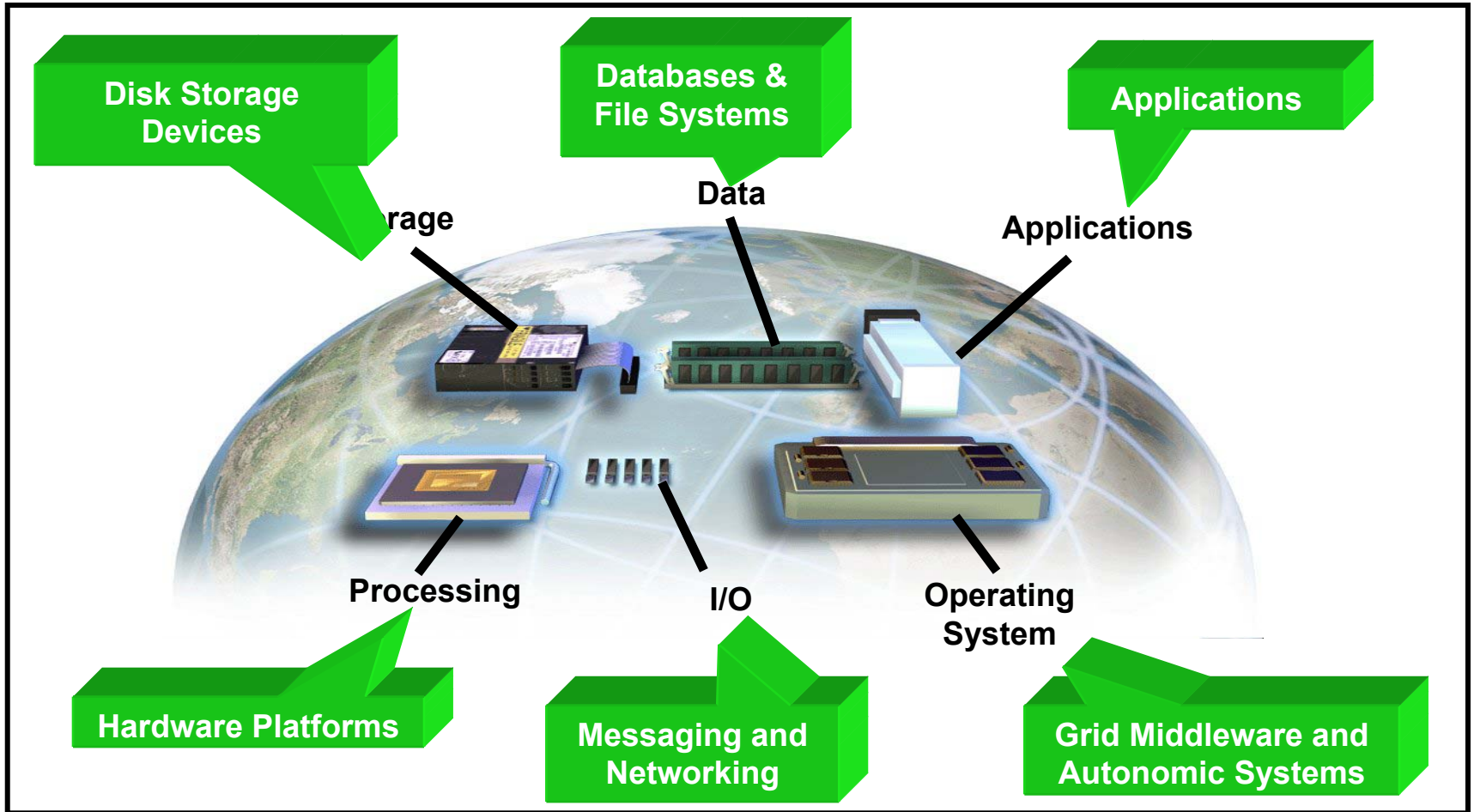
Grid Deployment Options

A function of business need, technology and organizational flexibility





What Makes Up A Grid?

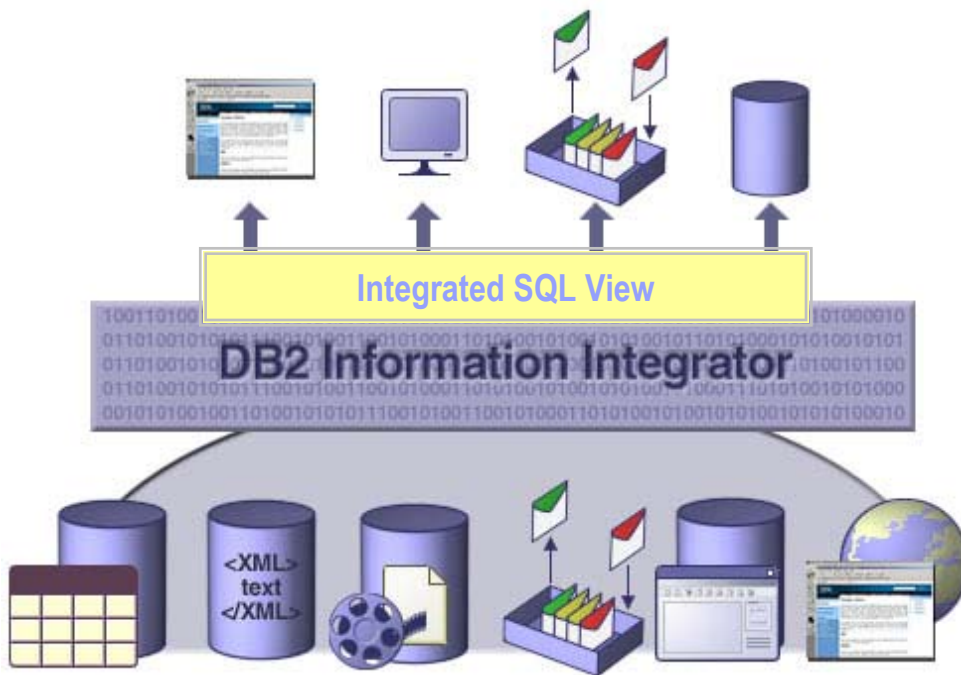


IBM Global Services – Grid Design & Implementation



Virtualized: Single resource view

Access diverse and distributed data as if it were a single resource



▪ Data federation

- Standard SQL programming model and APIs, including Web services
- Access to a wide range of data and content sources
 - R/W for relational stores
 - Extensible access
- SQL or XML results

▪ Data placement

- Caching and replication over heterogeneous information

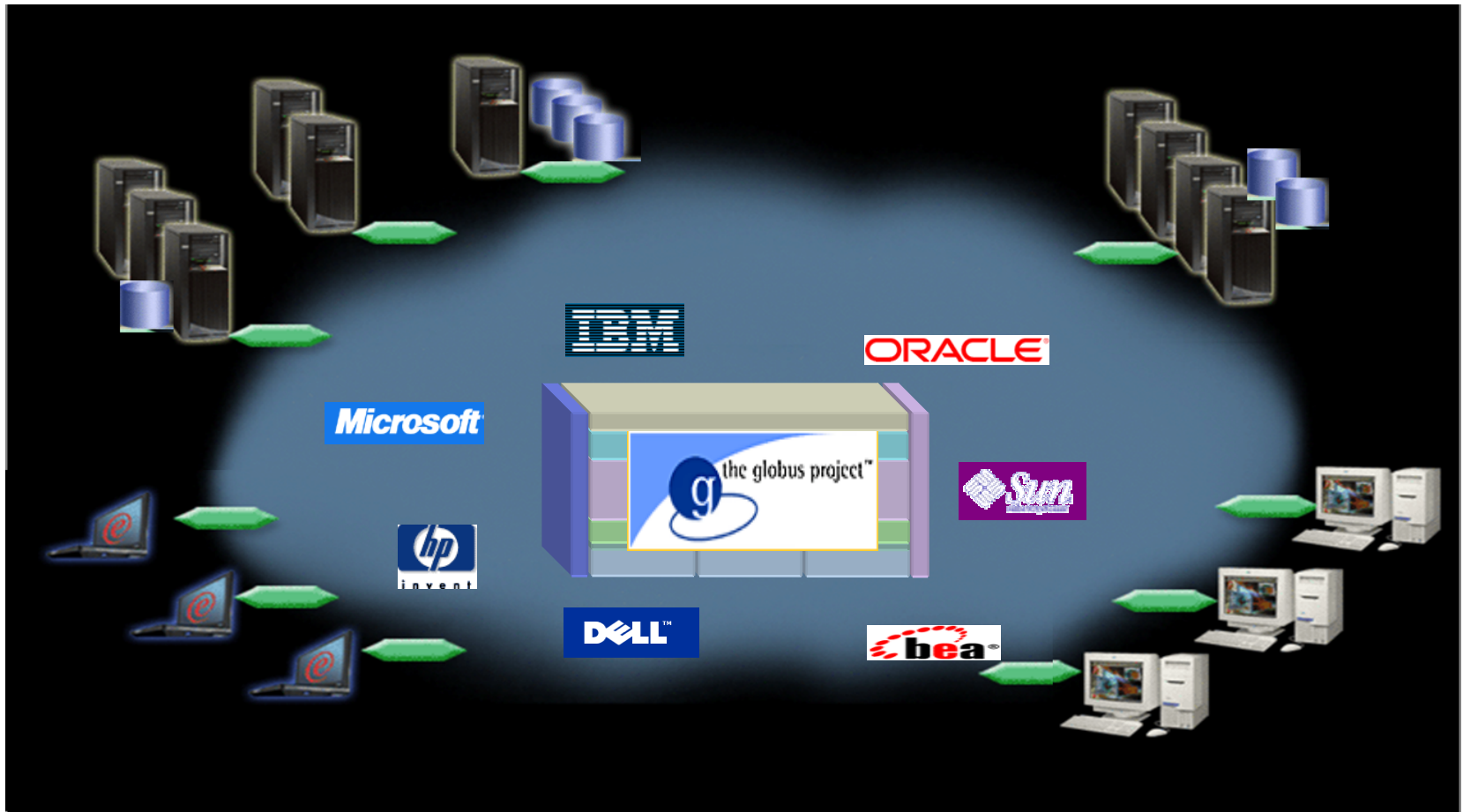
▪ Data transformation

- Leveraging SQL, XML, and Web services

DB2, Oracle, SQL Server, Sybase, Teradata, OLE DB, ODBC, Excel, XML, message queues, Web services, flat files, document repositories, content repositories, LDAP, WWW, email databases, ...



Open Grid Services Architecture (OGSA)

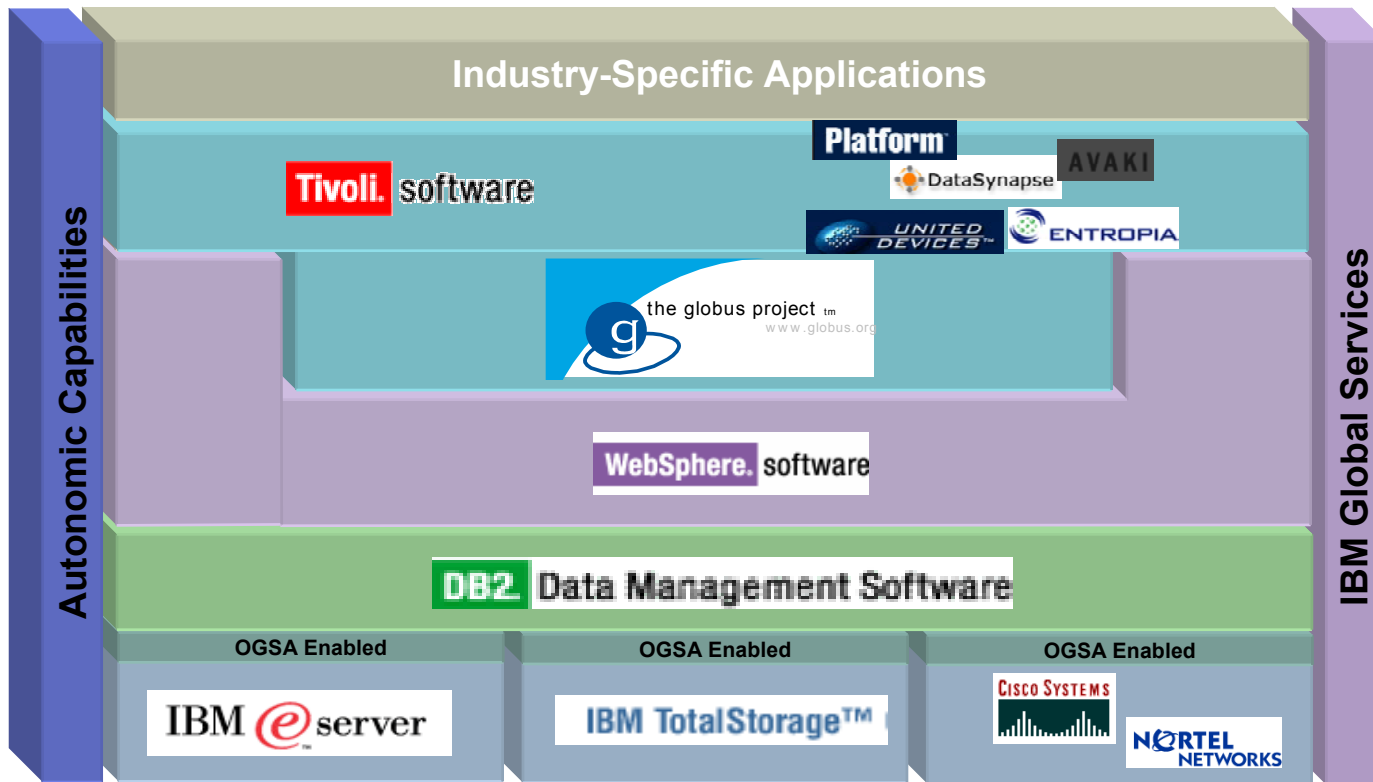


OGSA



Architecture Framework

Products and Services for Grids





IBM is working with these Grid Computing ISVs

Desktop and Server Scavenging



Platform™

- Customers include 60% of Global 500 companies



AVAKI

- Strong in Life Sciences, focused on Data Grid



Data Synapse

- Focused on Financial Services and Energy sectors

Desktop Scavenging



entropia™

- Focused on Life Sciences, Industrial Chemicals, Material Sciences, Financial Services

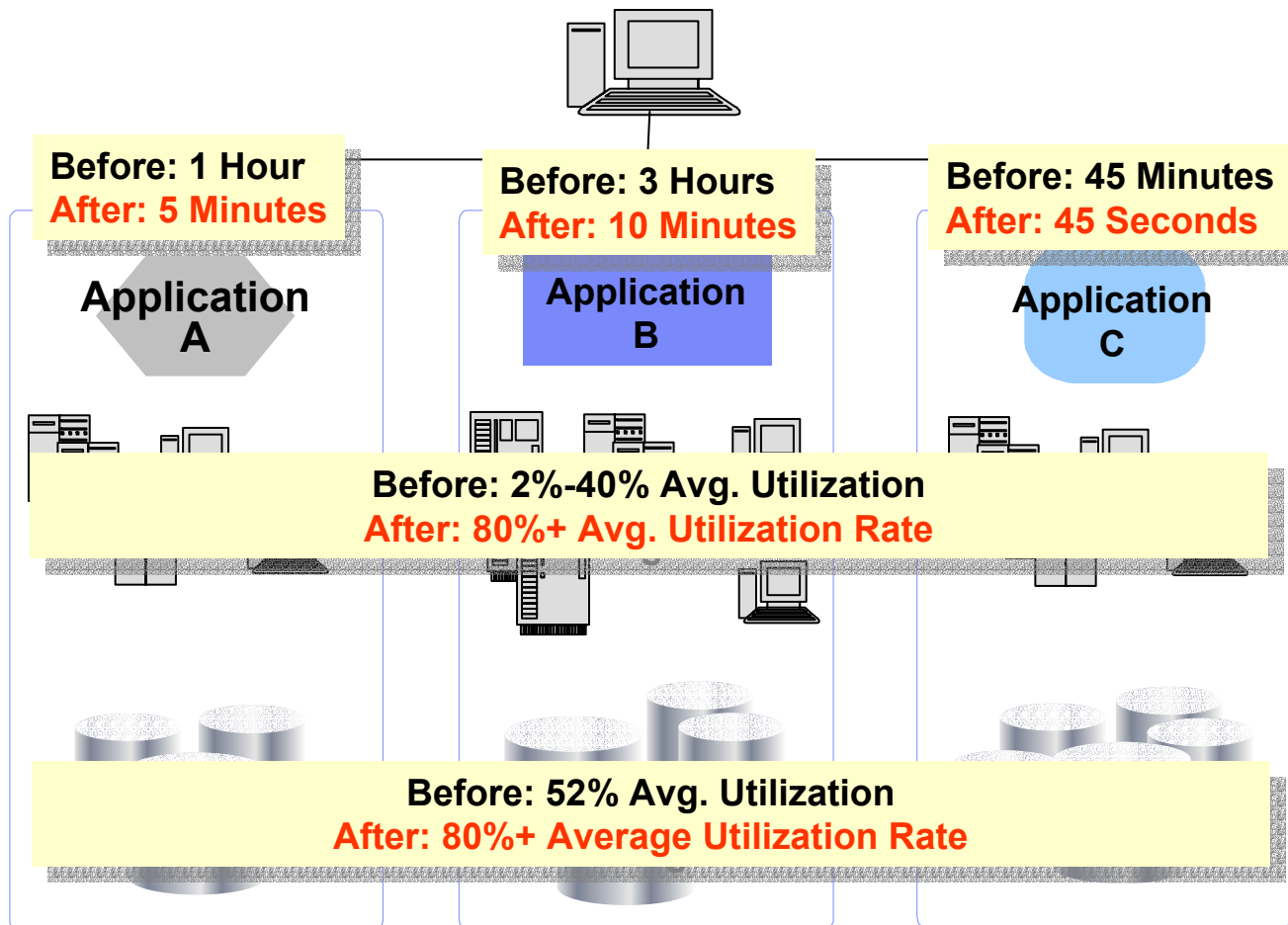


UNITED DEVICES™

- Focused on Life Sciences, Engineering, Geo Sciences



AFTER GRID: Significant Efficiency & Productivity Gains



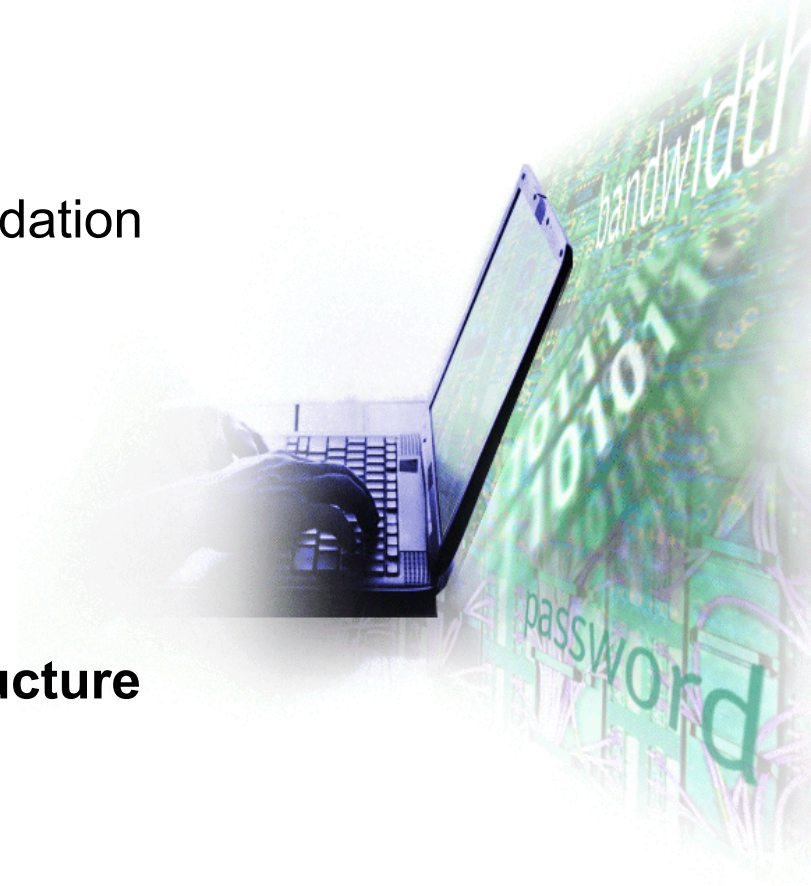
Additional Benefits:

- Better Return on Assets
- Facilitates Collaboration
- Improves Resiliency
- Increases Scalability



Grid Technology Enables

- **Increased Server Utilization**
 - Workload Management and Consolidation
 - Reduced Cycle Times
- **Collaboration and Access to Data**
 - Federation of Data
 - Global Distribution
- **Resilient / Highly Available Infrastructure**
 - Business Continuity
 - Recovery and Failover



Supporting Heterogeneous Resources Through Open Standards...



Aventis

■ Challenge

- Distributed, diverse data sources across continents
- Limited ability to consolidate, construct and analyze data sets

■ Solution

- Linux
- IBM @server
- IBM Discovery Link



Technology Benefits:

- Using IBM DiscoveryLink to bring together data sources in one coherent view

Business Benefits:

- Significant increase in researcher productivity due to improve collaboration
- Better data quality and currency



Enterprise Optimization

Butterfly.net

- **Challenge**
 - Scalable, resilient infrastructure for running massive multiplayer games
- **Solution**
 - IBM @server
 - Globus Toolkit
 - IBM WebSphere Application Server
 - DB2 Universal Database
 - IBM e-business Hosting Services

**Technology Benefits:**

- Improved end-user experience supporting over one million simultaneous sessions

Business Benefits:

- Developers avoid huge upfront costs
- Announced with Sony Computer Entertainment
- The Butterfly Grid for PlayStation2 unveiled at Games Developers' Conference in San Jose March 2nd



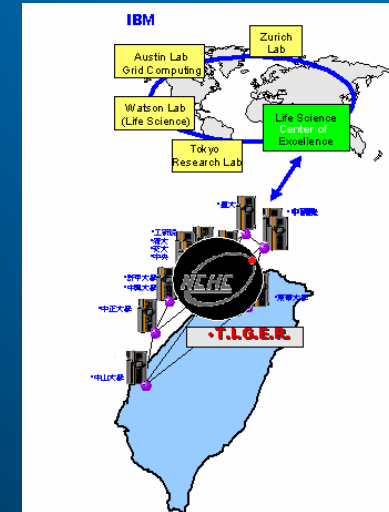
Tiger

■ Challenge

- The Taiwanese government is building a grid between their leading academic and research institutions for research and collaboration in the areas nanotechnology and life sciences

■ Solution

- IBM and NCHC building National Grid Test Bed
- IBM is assisting in the planning and implementation of the grid infrastructure.



Technology Benefits

- Integrate in-country academic and research computing resources
- Test implementations and investigations into billing and provisioning systems will take place

Business Benefits

- Stimulate research in Life Sciences and Nanotech



RBC Insurance

■ Challenge

- Reduce the time it takes for an insurance policy valuation application to run

■ Solution

- IBM @server
- IBM Infrastructure Technology Services
- Platform Computing (ISV)



RBC
Royal Bank

Technology Benefits:

- Reduced processing time from eighteen hours to thirty-four minutes
- Automated job-scheduling
- Expanding implementation

Business Benefits:

- Can run more complex scenarios to reduce risk exposure
- Actuaries can spend less time scheduling application



Royal Dutch/Shell

Business Analytics

■ Challenge

- Improve accuracy and speed of summarization and scientific modeling applications

■ Solution

- IBM @server
- Linux
- Globus Toolkit

"Grid computing is important to Shell because it offers the potential to create a truly unlimited resource, with a uniform interface to a variety of services. This is a significant opportunity for Shell to engage its independent companies in closer cooperation." J.N. Buur, Principal Research Physicist, Shell International Exploration and Production B.V.



Technology Benefits:

- More robust, scalable IT infrastructure that adjusts as volumes fluctuate
- Open standards permit easy integration of existing software

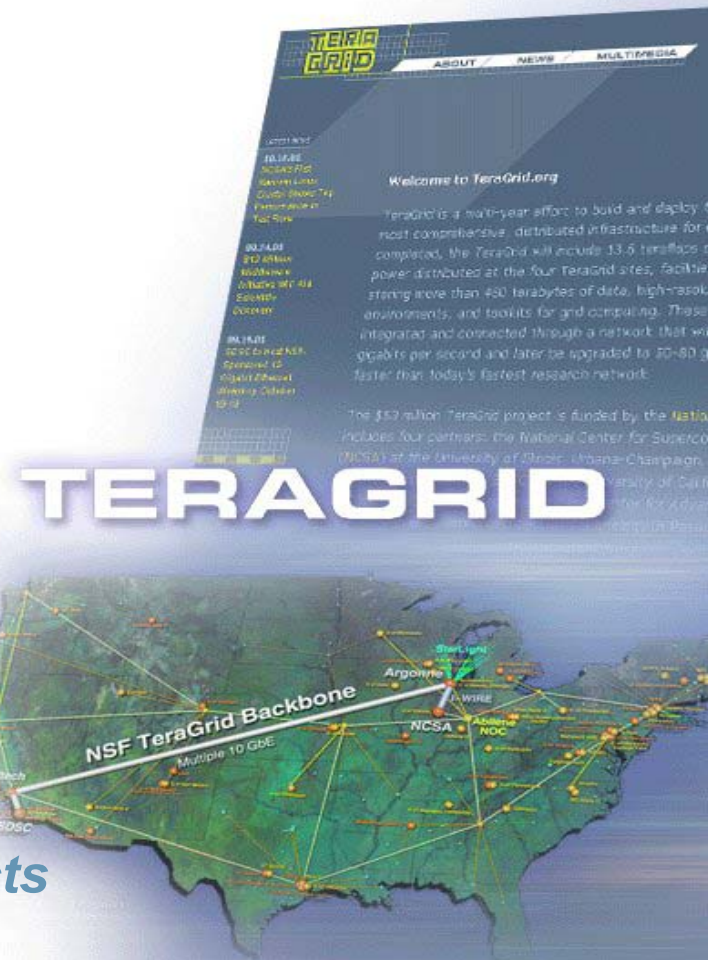
Business Benefits:

- Cut processing time of seismic data, while improving the quality of the output
- Focus employees on key scientific, not IT problems



The TeraGrid

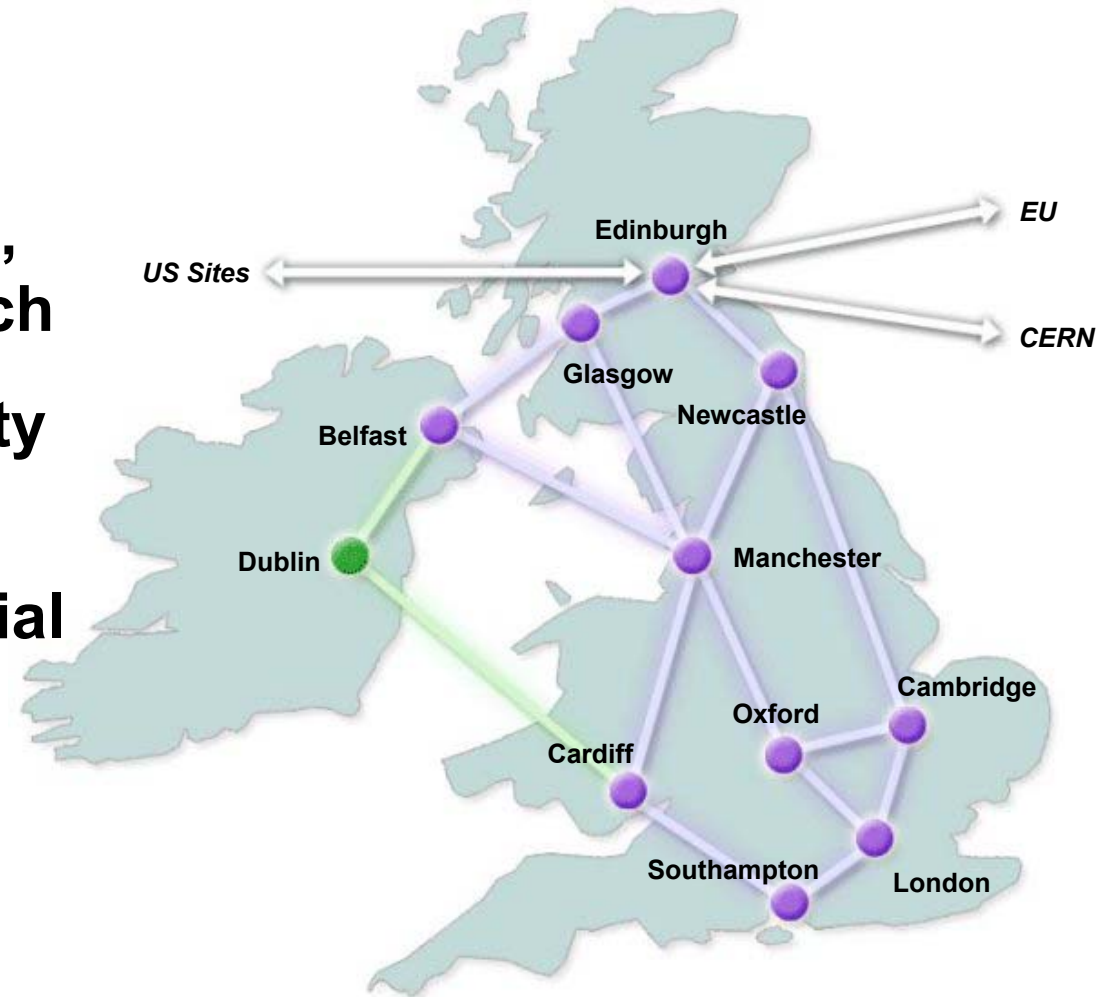
- **Heterogeneous Systems:**
 - National Center for Supercomputing Applications
 - San Diego Supercomputing Center
 - Argonne National Laboratory
 - California Institute of Technology
 - Pittsburgh SuperComputing Center
- *20+ Teraflops of processing power*
- *900+ Terabytes of Data Storage*
- *40 Gigabits per Second*
- *Accessible to thousands of university researchers working on multiple projects*





UK Research Grid

- Collaborative, multidisciplinary, scientific research
- Test bed for utility computing
- Future commercial applications





National Digital Mammographic Archive

Sponsored by: *University of Pennsylvania*





Government: Enterprise Optimization

▪ IBM Grid Offering for Information Access

- **Can maximize exploitation of existing data resources/assets to enhance the information awareness process necessary to assist in activities such as national security decision making by:**
 - **Enabling novel lead identification approaches through innovative information analysis. e.g., mining, associating diverse data sources**
 - **Simplifying data access and integration through unified cross-platform data/file interfaces**
 - **Providing an extensible infrastructure focused on transparent data availability**



Grid Innovation Workshop: Cross-Industry

▪ **Grid Innovation Workshop**

- **Can help companies examine how Grid technologies can benefit their organization by providing a detailed grid opportunity description, including:**
 - – **Identifying and Prioritizing Grid Computing applications**
 - – **Impact on organizational processes**
 - – **Quantifying the business value of implementing Grid Computing by using the IBM Grid Valuation tool**



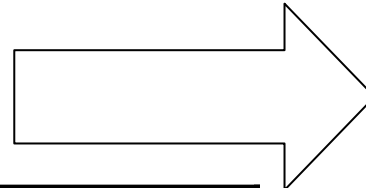
Grid Focus Areas

Research & Development	Engineering & Design	Business Analytics	Enterprise Optimization	Government Development
Accelerate and enhance the R&D process by enabling the sharing data and computing power seamlessly for research intensive applications	Share data and computing power, for computing intensive engineering and scientific applications, to accelerate product design	Enable faster and more comprehensive business planning and analysis through the sharing of data and computing power	Optimize computing and data assets to improve utilization, efficiency and business continuity	Create large-scale IT infrastructures to drive economic development and/or enable new collaborative government services



Customers Interested in Grid Computing

LOB Exec
(IT and/or Business)



Enterprise CIO
CTO/Tech Visionaries

Research & Development	Engineering & Design	Business Analytics
<ul style="list-style-type: none"> • VP New Product Development • Head / Director of R&D • Head of R&D Technology • VP/Head of Research computing • Director, Collaboration Services 	<ul style="list-style-type: none"> • Head of Product Development • VP Engineering • Vice President – Quality (Assurance) 	<ul style="list-style-type: none"> • Managing Director, Credit Risk • VP Marketing/CMO • Head ... Trader (e.g. derivatives) • MD/Dir. Asset & Liability Management • VP Enterprise Risk Management • VP Customer Analysis • And planning

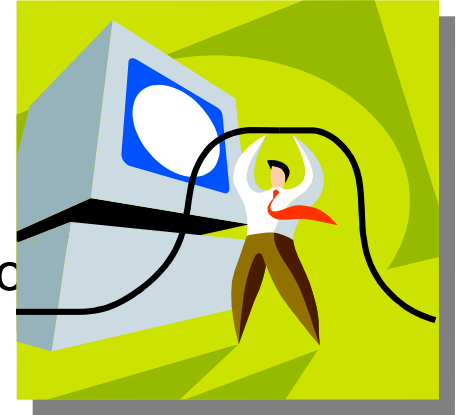
Enterprise Optimization	Government Development
<ul style="list-style-type: none"> • Corporate CIO • CTO • CFO • VP IT Infrastructure • VP High Performance Computing • Director MIS 	<ul style="list-style-type: none"> • Department/ Agency CIO



Grid Computing Enables IT and Business Value

■ IT Needs

- Improve Asset Optimization
- Integrate Heterogeneous Resources
- Enable Data Access, Integration and Collaboration
- Strengthen Redundancy and Resiliency
- Quickly Respond to Variable Demands



■ Business Needs

- Improve Operating Efficiency/ROI
- Reduce Capital Expenses
- Accelerate Business Processes
- Enhance Enterprise Collaboration
- Quickly Adapt to Changing Requirements





Getting Started

- **IBM can tailor one of the Grid offerings available today to meet your specific needs**
- **Take one of IBM's classes on Grid Computing and the Globus Toolkit**
- **IBM's Grid Innovation Workshops can help you identify appropriate solution areas and develop and prioritize a list of Grid pilot implementations**
- **With the IBM Grid ROI Tool you can quantify the value of Grid to your organization**
- **WW Design Centers where you can architect and validate complex Grid solutions**
- **Grid Pilots where you can utilize established technologies to solve similar problems to those that you are attempting to address**



For More Information

- ***The Globus Project and Architectural Work***
 - *Open Grid Services Architecture (OGSA)*
 - <http://www.globus.org>
- ***Papers***
 - *The Anatomy of the Grid*
 - <http://www.globus.org/research/papers/anatomy.pdf>
 - *The Physiology of the Grid*
 - <http://www.globus.org/research/papers/ogsa.pdf>
- ***Forums***
 - <http://www.gridforum.org/>
- ***IBM***
 - <http://www.ibm.com/grid>



Make Grid a part of your competitive strategy

Higher Quality of Service

Increased Efficiency

Increased Productivity

Reduced Complexity

Improved Resiliency

