Delivering Business Value with Grid Computing

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IBM Grid Computing & Virtualization

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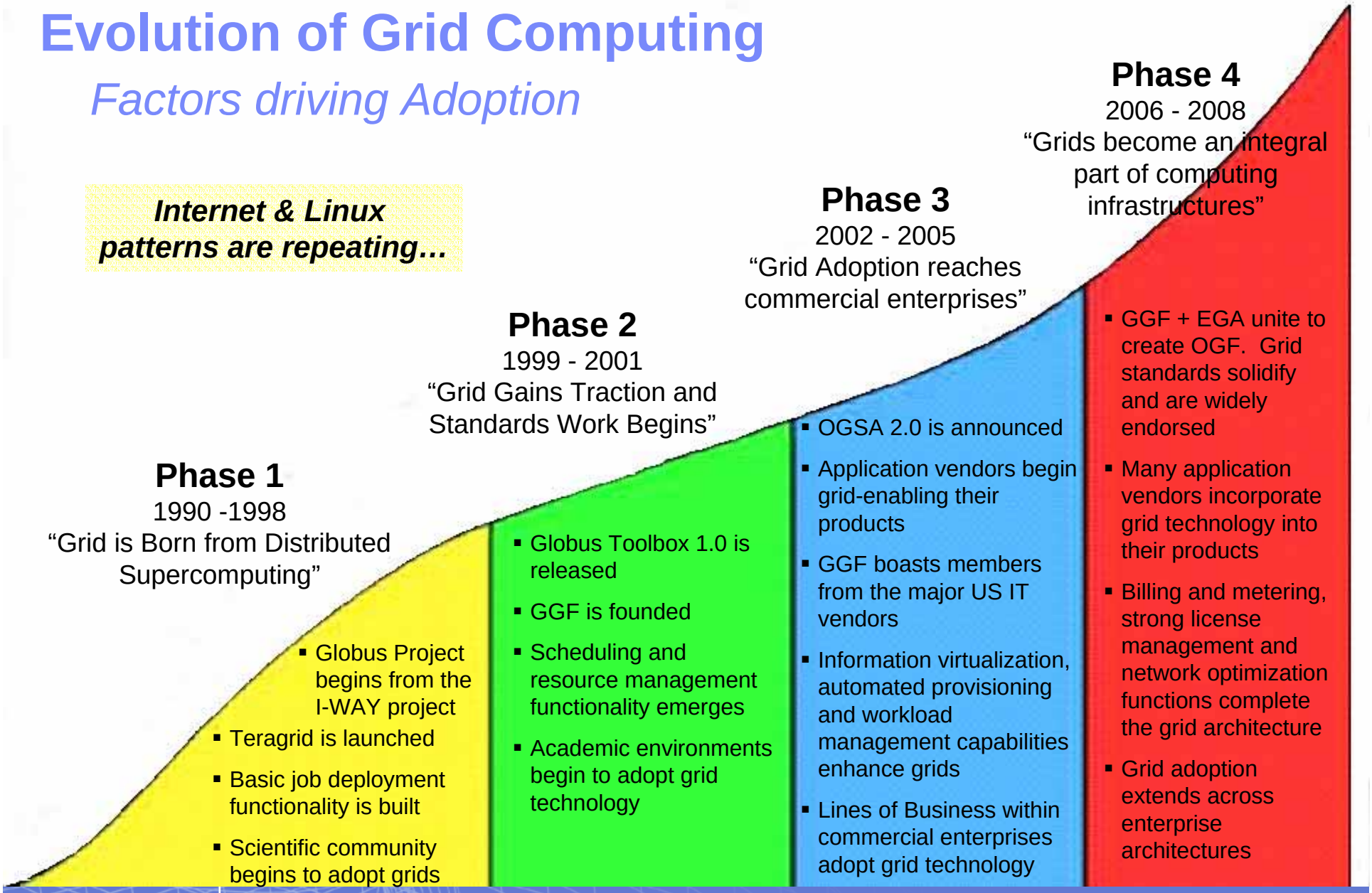
AGENDA

- Evolution of IBM's Grid Computing strategy
- IBM Grid Computing Products & Technologies
- Customer References
- IBM Infrastructure Solutions & Grid
- Conclusions

Evolution of Grid Computing

Factors driving Adoption

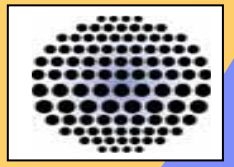
Internet & Linux patterns are repeating…



Grid and Virtualization

IBM is focused on solutions that help clients realize value from the full spectrum of grid computing solutions

Virtualize Outside the Enterprise

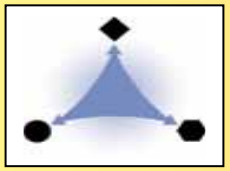


Suppliers, partners, customers and external resources

Virtualize the Enterprise

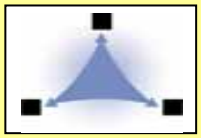
Enterprise wide Grids, Information Insight, and Global Fabrics

Virtualize Unlike Resources



Heterogeneous systems, storage, and networks; Application-based Grids

Virtualize Like Resources



Single System (Partitioning)

Cluster

Simple (2-4)

Sophisticated (4+)

Homogenous systems, storage, and networks

Homogenous Single Organization Tightly Coupled

Heterogeneous Multiple Organizations Loosely Coupled

Realizing Increasing Levels of Business Value

IT Simplification for Enterprise Optimization
Asset Utilization
Workload Prioritization

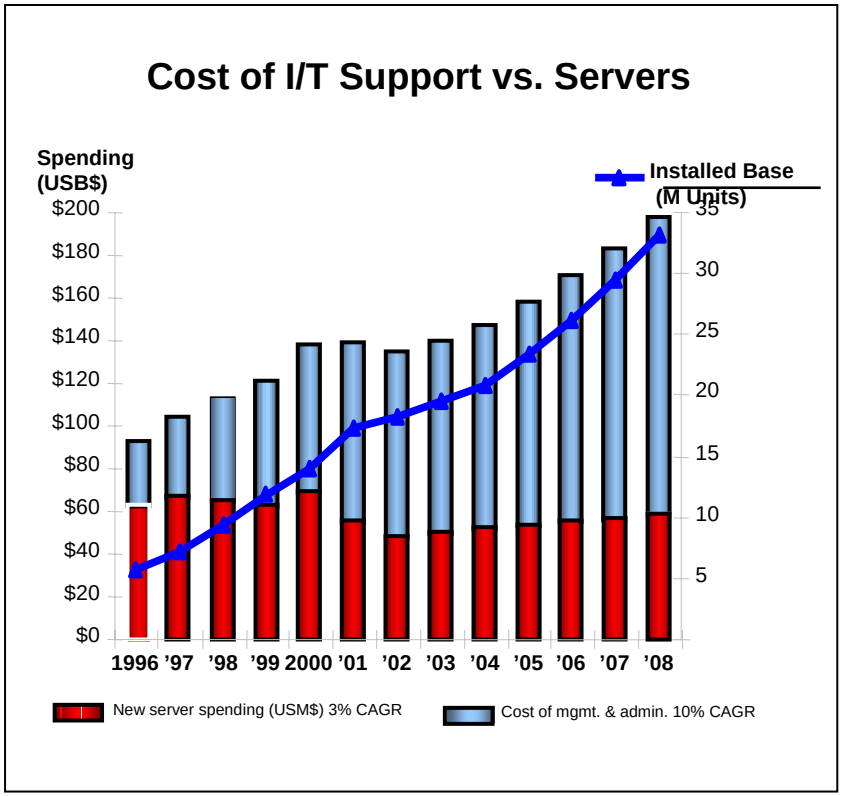
Infrastructure Flexibility
Enabling
Business Resiliency

Aggregating Information
Business Insight
and
Collaboration

Application Acceleration
Time to Results
and
Higher Quality

Why are Organizations moving to Grid Computing & Virtualization ?

- Existing computing capacity is highly underutilized
- Operational costs far exceed the budget for new hardware
- Hardware and Software technology now exists that dynamically allocates servers & storage to applications on-demand



Increases: Utilization of existing I/T assets.
Reduces: I/T Support Costs, Administrative Complexity
Improves: ROI, Quality of Service, Staff Productivity

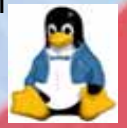
**IDC – CEO Study; Customer Adoption of On-Demand Enterprises.*

The Value of Open Standards

Distributed Computing:
Grid & Virtualization
(Open Grid Forum ~ Globus ~ UNIVA)

Applications:
Services Oriented Architecture

Operating System:
Linux



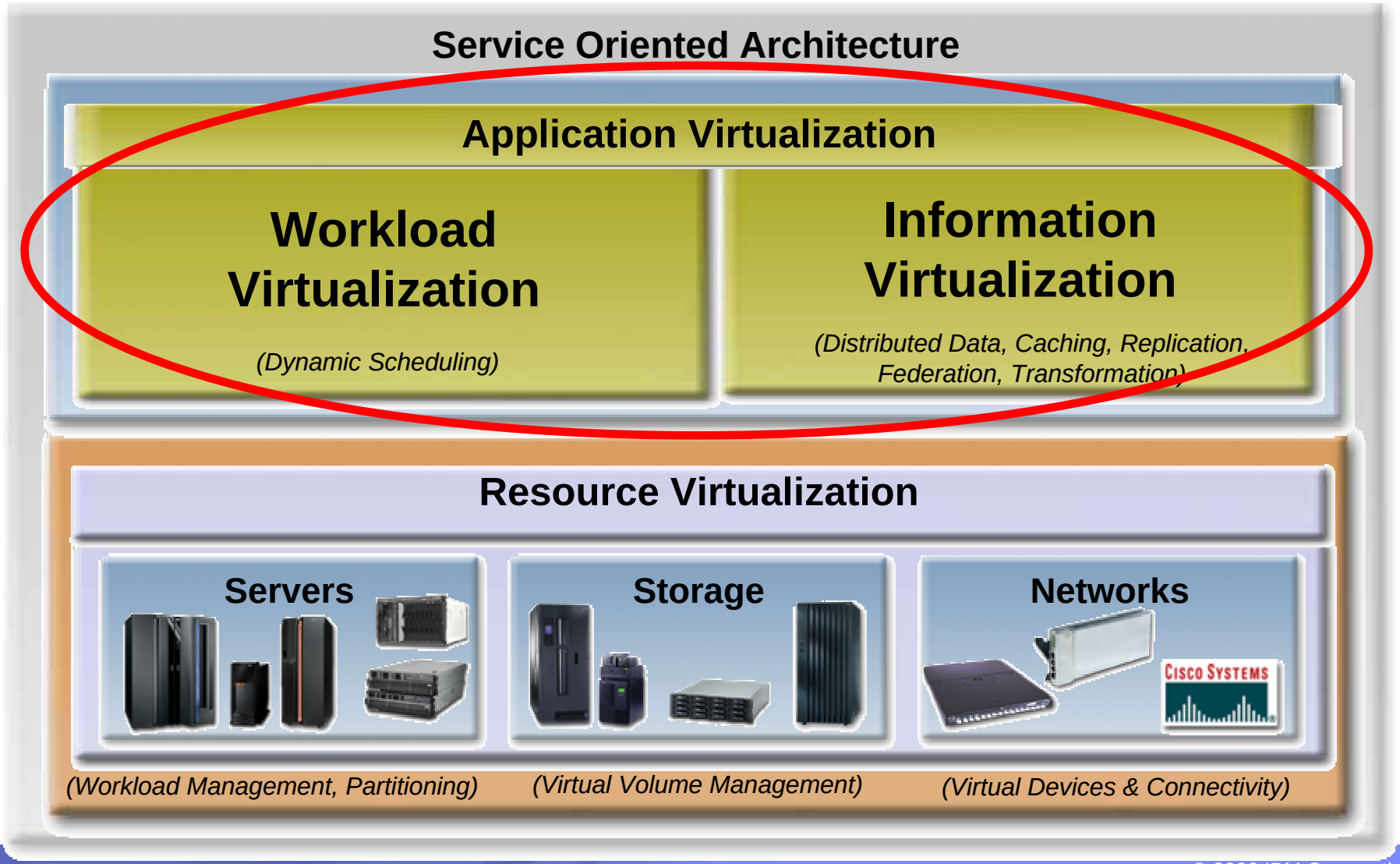
Information:
World-wide Web
(html, http, j2ee, xml)

Communications:
e-mail
(pop3,SMTP,Mime)

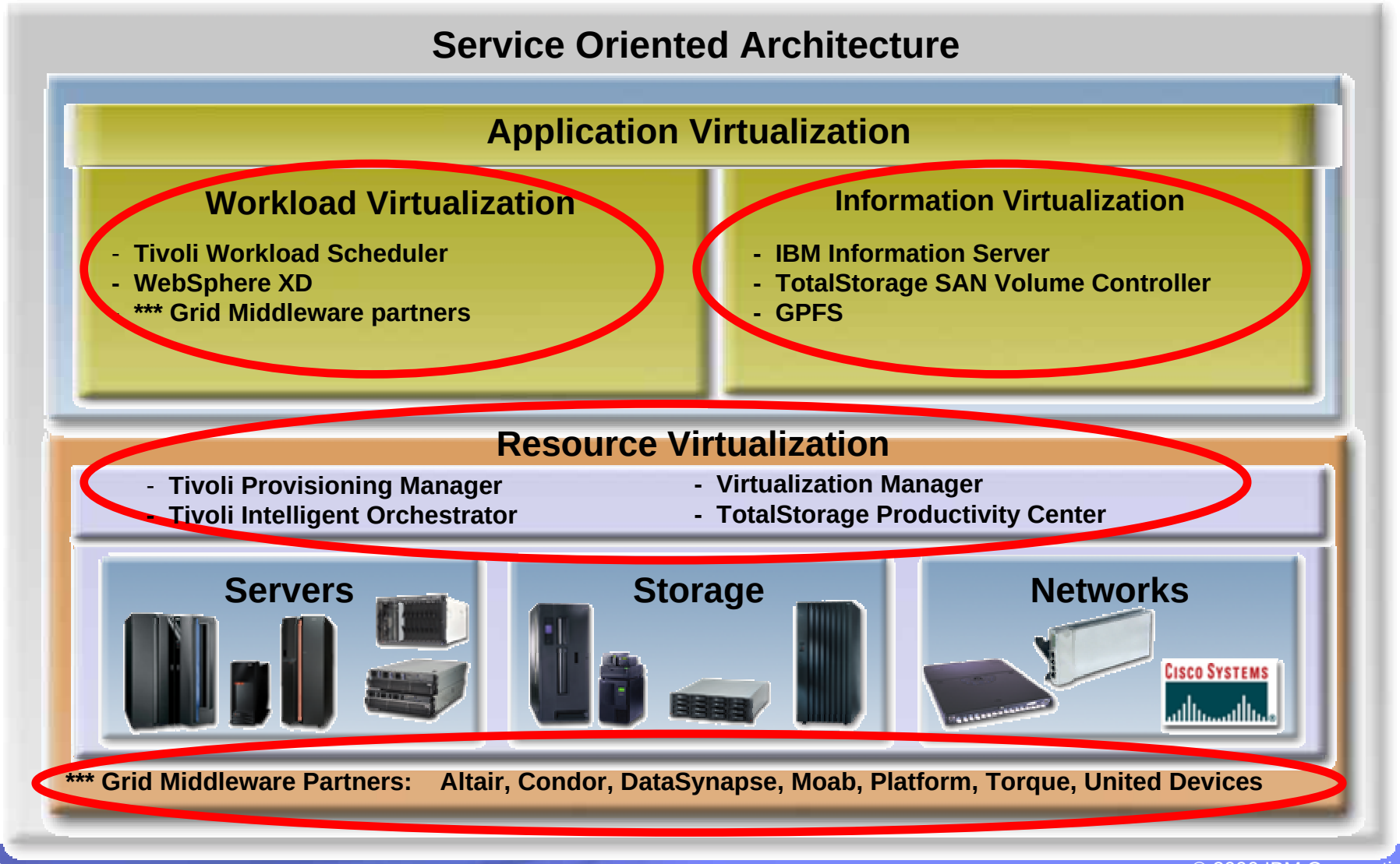
Networking:
The Internet
(TCP/IP)

e-business

IBM' Grid Computing strategy is focused on Workload Virtualization and Information Virtualization

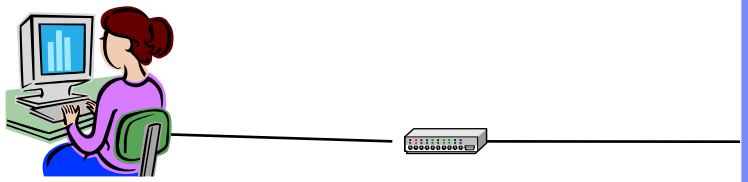


IBM's Grid & Virtualization technologies provide Workload, Information and Resource Virtualization



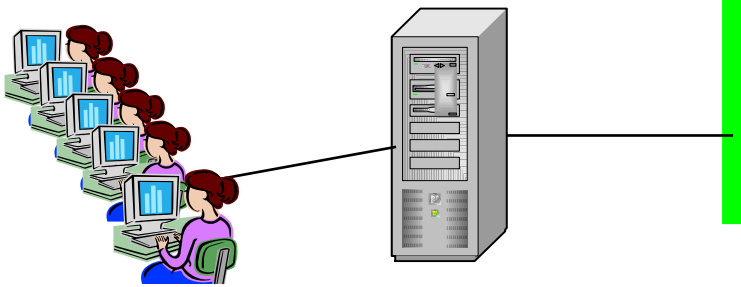
Tivoli Workload Scheduler & Tivoli Intelligent Orchestrator

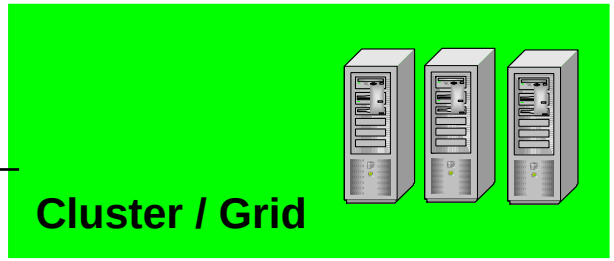
Business Goal:
Improved IT asset utilization, lower costs, achieve SLA's, align IT with business priorities



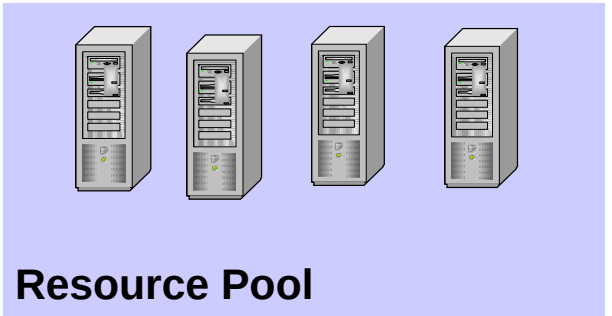
Data Center operator evaluates workloads to determine and manage computing resources

IT Goal:
Allocate server resources between Cluster/GRID and non-GRID users based on workloads and business priorities



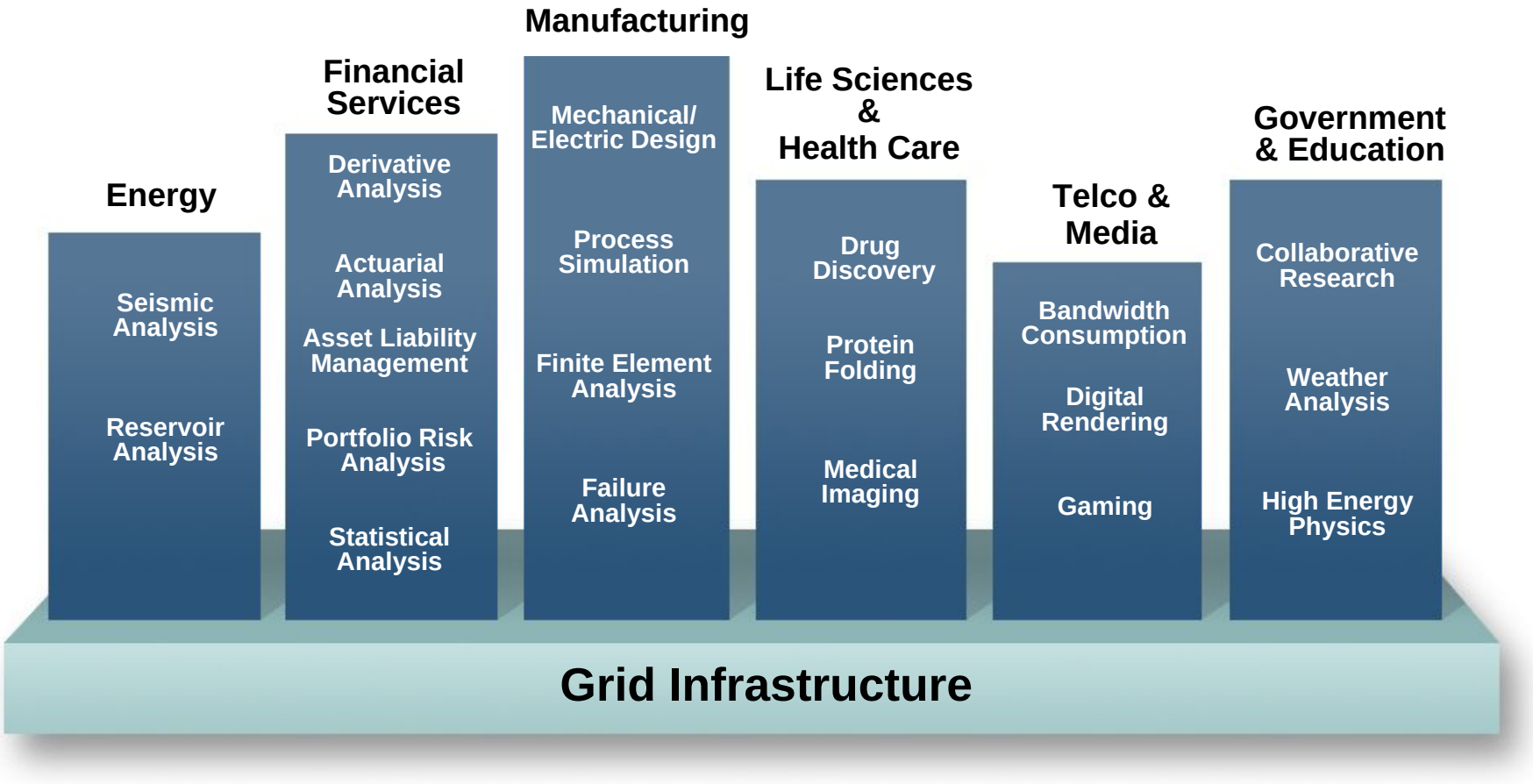


1) **Tivoli** automatically provisions servers to Non-grid (Blue) cluster to match scheduling workload; **Tivoli** also provisions servers to grid pool to as needed and evaluates business policies



Tivoli provides policy based processes for scheduling, monitoring, managing, and controlling cross-enterprise resource capacity for optimal performance across heterogeneous IT environments

Grid Computing Industry Applications



Public Sector – Grid & Virtualization Opportunities

Government

- Computing Infrastructure Transformation
- Data Sharing
- High Performance Computing Applications
- Economic Development

Health Care & Life Sciences

- Medical Image Management
- Drug Discovery Research
- eMedical Records
- Information Based Medicine

Higher Education

- Research Collaboration & Data Sharing
- High Performance Computing Applications:

Weather Analysis, High Energy Physics, Visualization & Simulation, Life Sciences Research, Environmental Analysis, Nanotechnology, Earthquake Research

IBM's Breadth of Capabilities for Grid Computing

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World Community Grid

world community grid.
technology solving problems

- IBM has established a Global Public Grid for Philanthropic Research

http://www.worldcommunitygrid.org/

- IBM is working with the Mayo Clinic, United Nations, EPA, World Health Organization and United Devices on this worldwide effort

- An advisory Board with members from leading foundations, universities and public organizations is providing oversight to the research projects

- Projects in the following disciplines are being implemented:
  - Medical Research – Genomics, proteomics, epidemiology, and biological system research such as AIDS and HIV studies.
  - Environmental Research – Ecology, climatology, pollution, and preservation
  - Basic Research – Human health and welfare related studies

> Over 50 million results returned

> Over 52,000 years of CPU processing time

> Approximately 400k devices on the Grid

Harvard University - Crimson Grid

Challenge

Provide grid computing to meet the needs of the faculty in Harvard's Division of Engineering Applied Sciences (DEAS) and Harvard's research community, while also enabling users to share complex programs, models, data and storage capacity

Solution

- IBM System p655 & BladeCenter servers
- Globus
- IBM Global Services including: Bladecenter integration, GRID computing, benchmarking, systems planning and software porting

Benefits and Impact

- A scalable infrastructure for research computing
- Collaboration platform which facilitates the sharing of software, data and storage
- Serves as a computing model for academic-industry partnerships

"We moved some of our ocean modeling to the Crimson Grid... we are not using the whole grid.. but have already increased our performance by a factor of 10."
- **Pierre Lermusiaux, Harvard oceanography researcher**

Diamond Computer Service Co., Ltd.

Enterprise Optimization

Grid Technology enables High Reliability and Continuity/Flexibility of Web Servers

Challenge

Quality improvement of Web application services and TCO reduction together by efficient operation

- Reduce investment on servers, software licenses and operational costs by raising operation rates of IT resources
- Build an environment that will enable application updates and server maintenance during system operation
- Control transaction performance automatically with setting service efficiency per user level

Solution Components

- IBM WebSphere Extended Deployment (XD)
- IBM System x 336
- IBM Infrastructure Services

Technology Benefits:

- Automatically deploy servers according to load dynamically and automatically control transaction priorities based on service efficiency set per user
- Realize automatic detection and response to irregularities by centralized monitoring and management of massive application servers

Business Benefits:

- Reduce TCO by increased server operation rates
- Improve service efficiency by increased availability

"It has been proved that Grid infrastructure built by IBM WebSphere Extended Deployment (XD) can significantly increase reliability and service efficiency of Web applications with reducing TCO dramatically. " *-Mr. Tanaka, Diamond Computer Service Co., Ltd.*

The Higo Bank, Ltd.

Grid adoption enhances bank's financing business and customer service

CHALLENGE

Part of Higo Bank's medium-term management plan was to improve customer credit risk management, and upgrade credit control and promotion of loan services. It needed to upgrade processes for collection and analysis of customer information in a systematic and chronologically accumulated fashion under centralized management, and reduce costs by streamlining loan service operations.

SOLUTION:

IBM Global Services used leading technologies/solutions to build a grid infrastructure that virtually integrates disparate databases that have been controlled by separate operations and enables real time system interoperation.

- IBM System p
- WebSphere Information Integrator
- TotalStorage

BENEFITS:

- The bank has enhanced its financing business to better service customers by integrating information from profit calculations and credit risk assessment for use in sales and screening.
- Increases profits by making loan screening activities quicker and more accurate
- Reduces costs by streamlining clerical operations

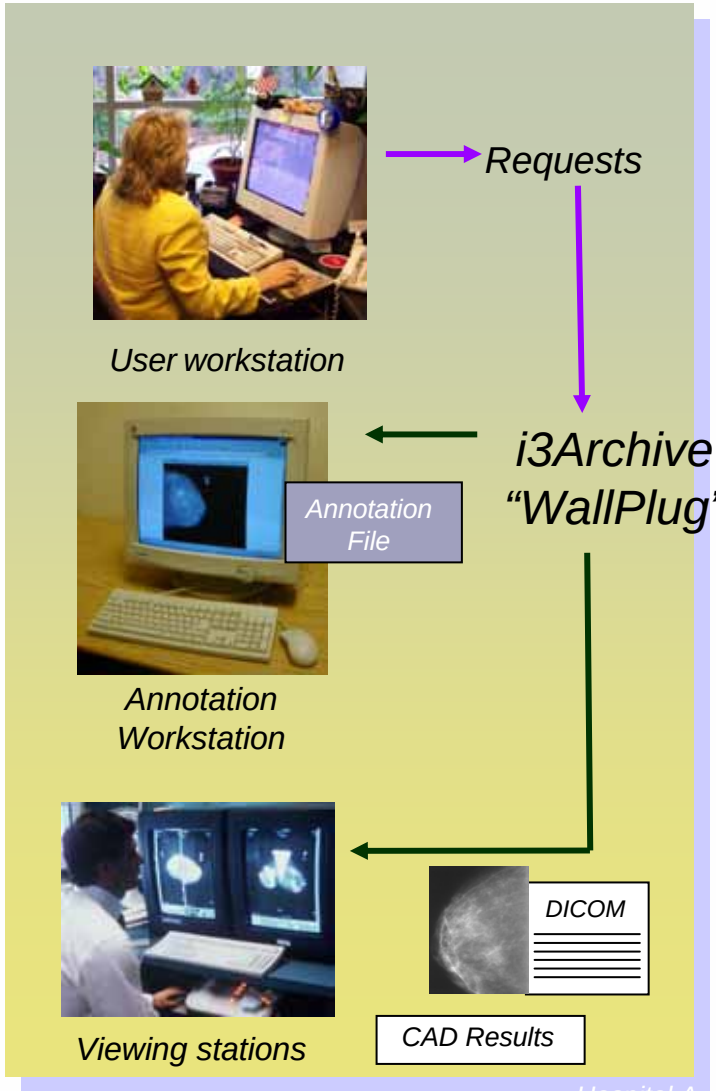
Higo Bank

"We succeeded in creating a flexible and expandable system using existing system resources. We can expect efficient and upgraded loan operations and human-resource development.."

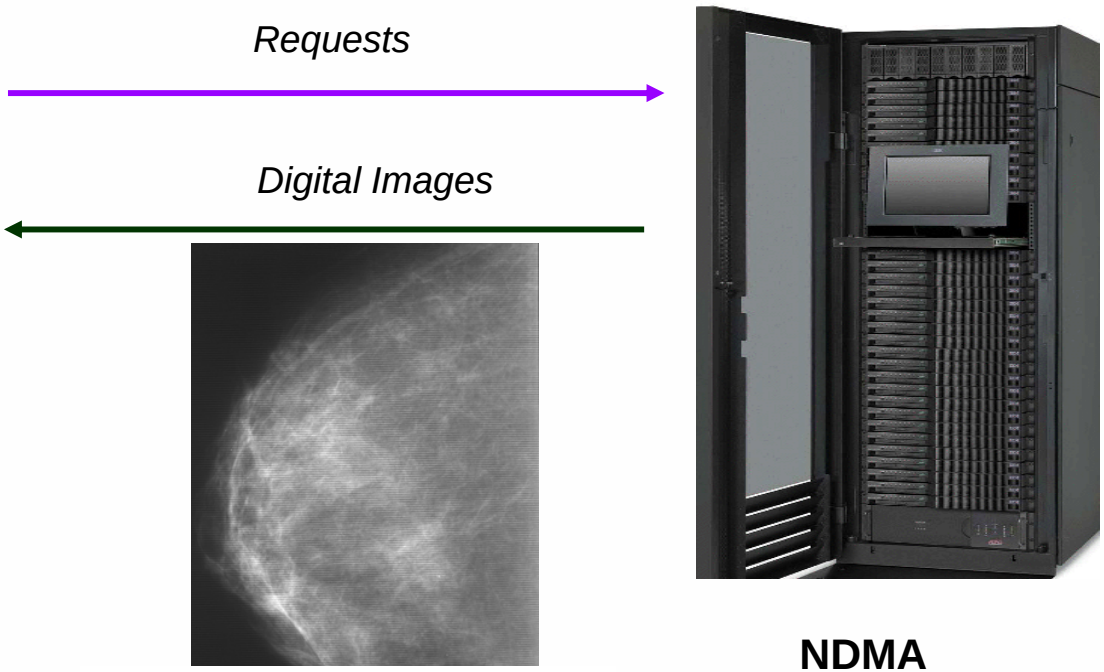
Yuji Segawa, Manager, New Total Financing System Project Office

NDMA: National Digital Medical Archive

Medical Imaging Grid



A national life-time archive of digital medical images and data, gathered from hospitals around the country and made available to patients and doctors



NDMA Archive managed by IBM

Soochow University - China

Grid & Grow

Challenge:

- **Establish high performance computing and storage infrastructure to support the academic research and collaboration in Soochow Univ.**
- **Better utilize the equipment & lower the total operation cost**

Solution:

- IBM BladeCenter JS20 & HS20
- IBM OpenPower 710
- IBM DS4500 & DS4300
- SUSE Linux, xCAT, Cluster Resources Torque, Maui
- Topspin Infiniband

Technology Benefits:

- IBM BladeCenter & OpenPower provide 700GFlops computing capacity
- Infiniband provide standards-based high performance server switching infrastructure
- Open & flexible infrastructure to support growth

Business Benefits:

- Provide High Performance computing capacity to different users
- Simplify the system management for Heterogeneous platforms & storage system
- Generate the resource pool to support more users

Seoul National University (SNU)

Challenge

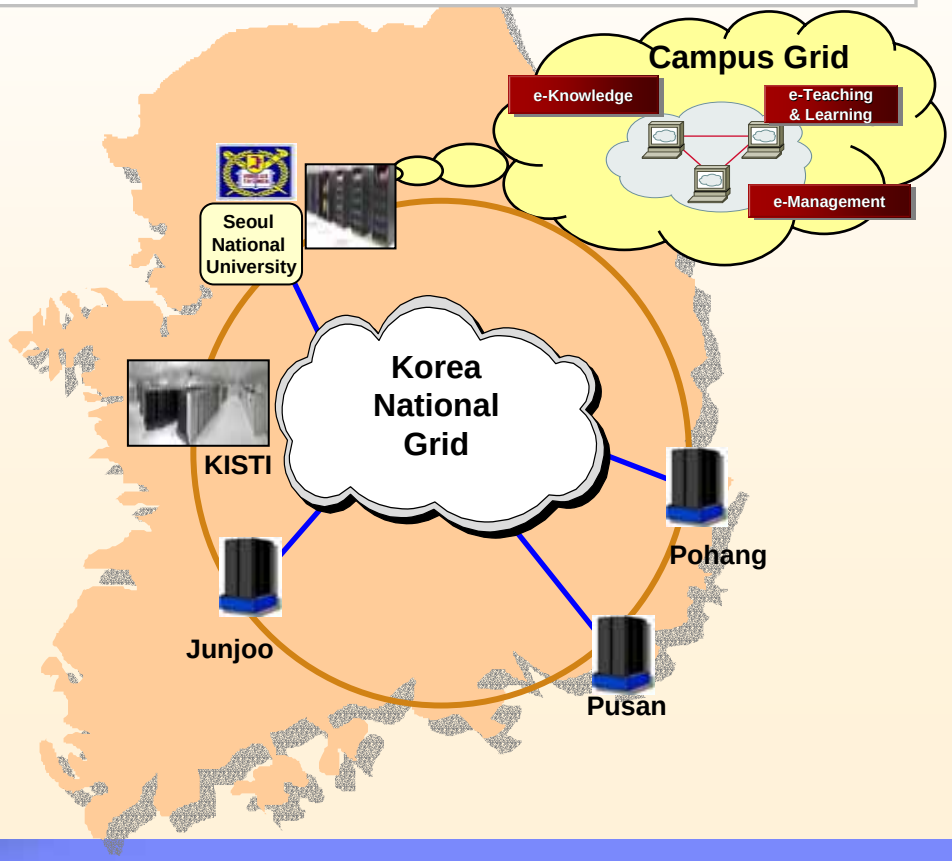
- Provide students and researchers with an IT infrastructure to support HPC workloads
- Establish SNU as one of the leading universities in the world with high technology based education

IBM Solution Offerings

- ✓ IBM BladeCenter (484 Power Nodes)
- ✓ IBM Linux Cluster 1350
- ✓ Grid System Gateway (IBM Web-based Grid Portal)
- ✓ Globus 2.4
- ✓ IBM LoadLeveler
- ✓ IBM Storage FAStT700

Benefits

- Facilitates high-performance computing capabilities with one of the largest Blade Linux cluster based supercomputer in Asia
- Ranked 51th on Worldwide TOP500 list for Supercomputer site (5.148 Tflops)
- Optimizes IT infrastructure by creating a shared computing environment with Web-based Grid Portal system, Grid System Gateway, to produce 'SNU Campus Grid '
- Allows SNU to share computing resources by expanding the grid infrastructure to Korea National Grid project (K*Grid)



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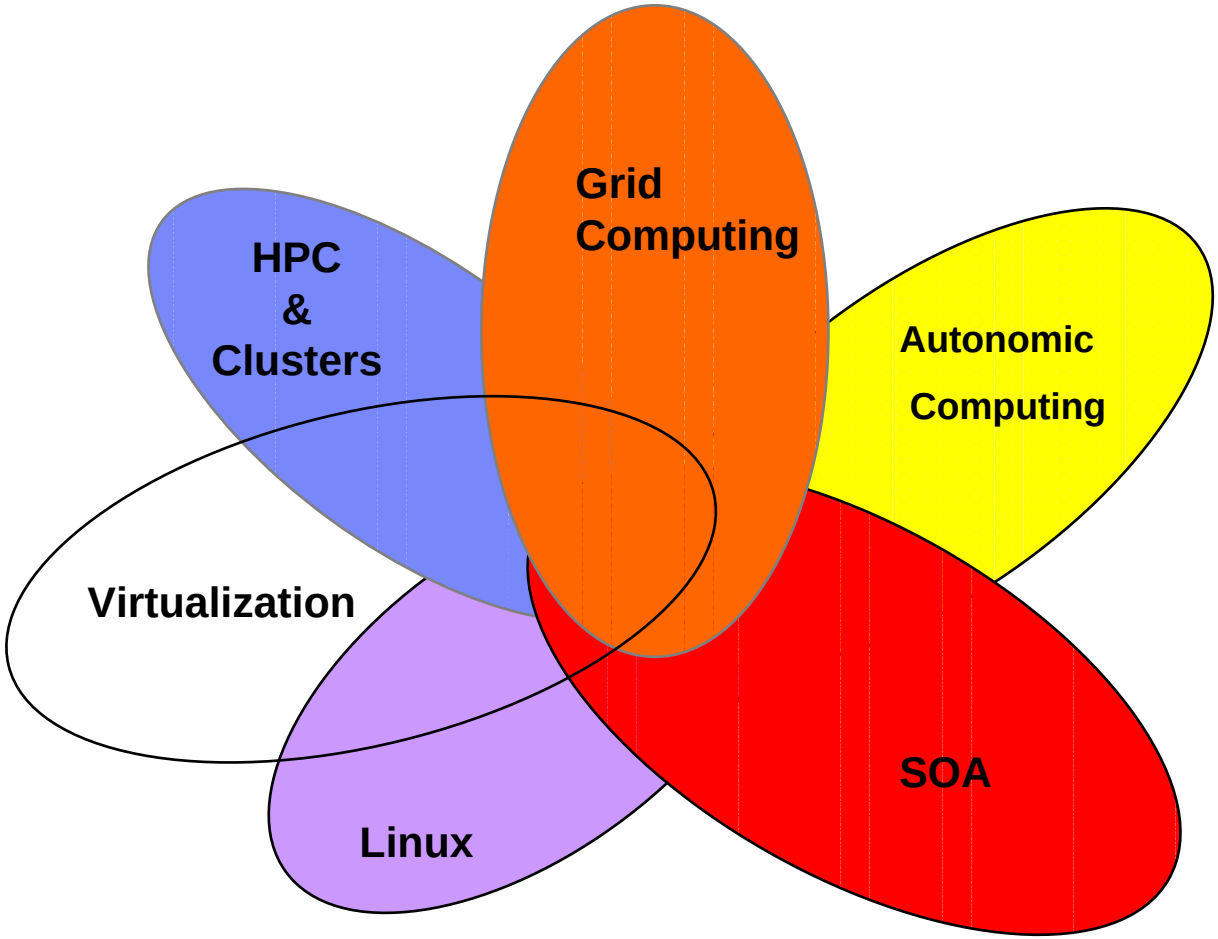
IBM's strategy is to offer Infrastructure Solutions that incorporate strategic technologies that reduce the cost and complexity of running an I/T environment



IBM Infrastructure Solution Definition

What makes it an IBM Infrastructure Solution?

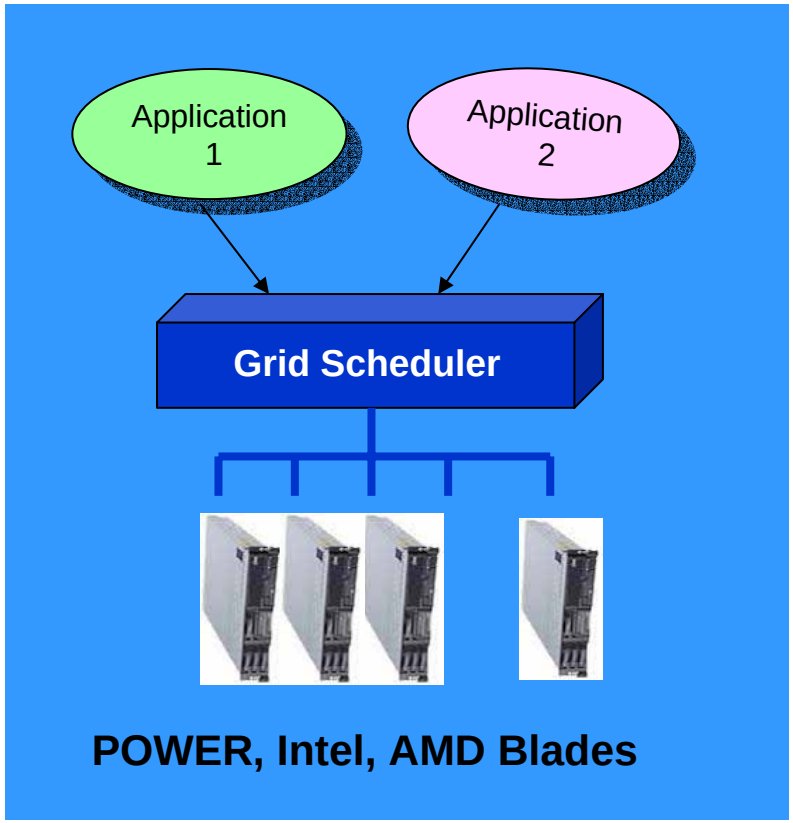
- **Each Infrastructure Solution contains:**
  - ✓ **Pre-integrated Software, Servers, and Storage**
  - ✓ **Technology services to implement the solution**

IBM Infrastructure Solutions & Grid

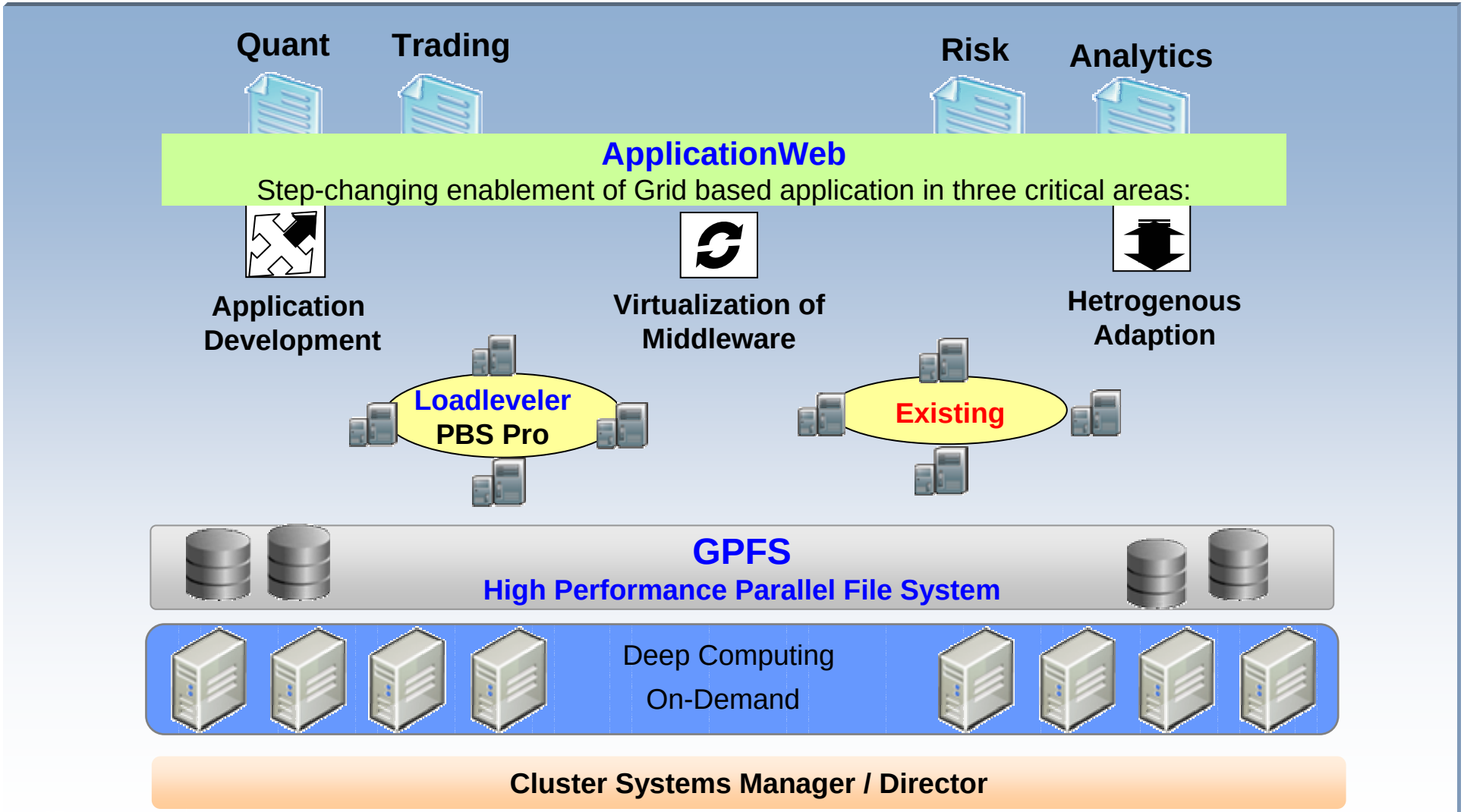
- Grid & Grow
- Optimized Analytics Infrastructure (“OAI”)
- Grid Medical Archive Solution (“GMAS”)
- IT Resource Optimization for Engineering
- Actuarial Grid

IBM “Grid and Grow” Offering

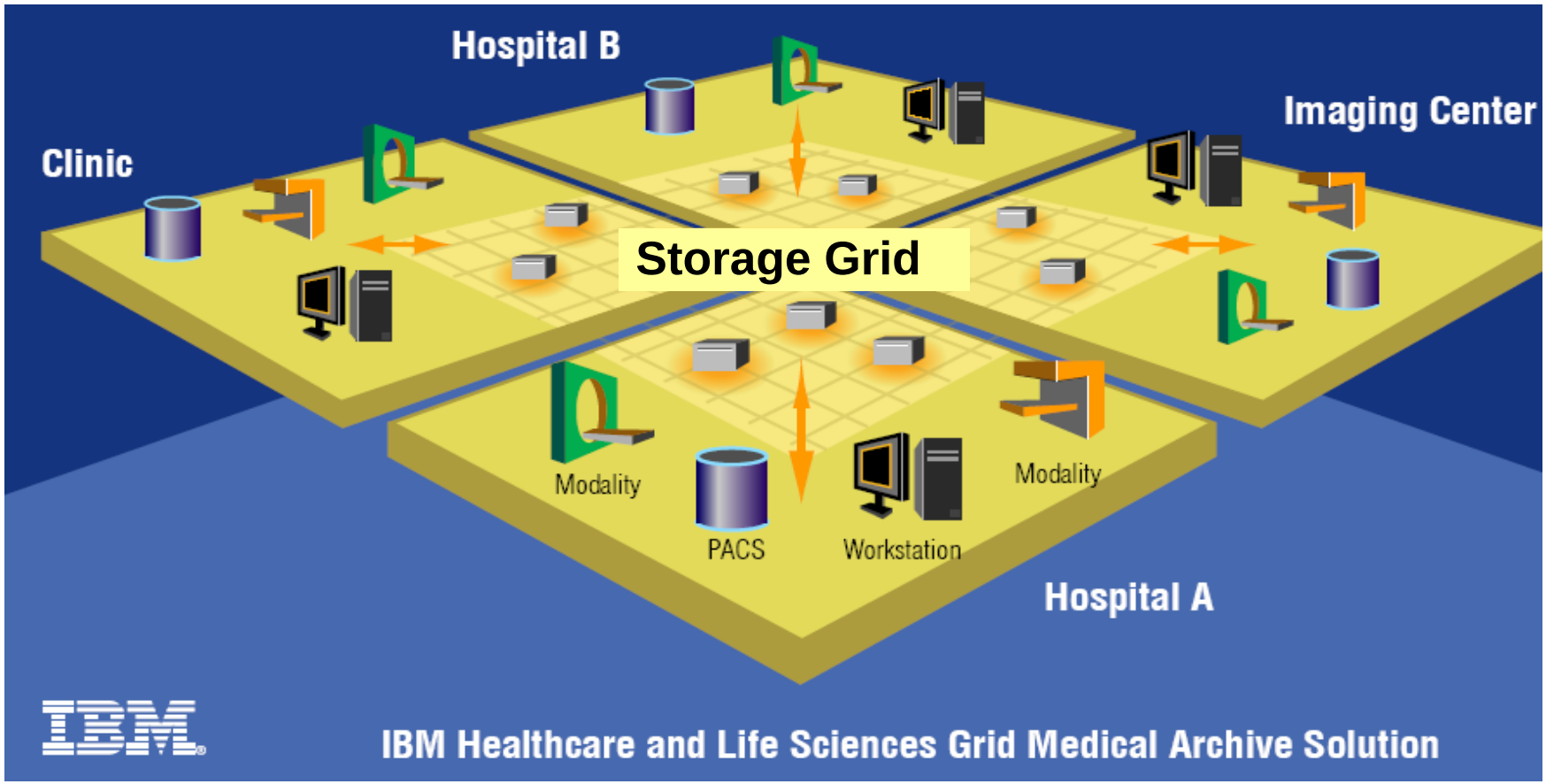
- Packaged set of Hardware, Software and Services for ~$50,000 (US$)
- Simple, get started approach. Can serve as a Grid Computing “test bed”
- Seven (7) blade BladeCenter
- Choice of three (3) Grid middleware schedulers: IBM LoadLeveler, Platform LSF, Altair PBS Pro
- IBM Global Services included to ensure a successful installation
- Focused on compute intensive applications



The **Optimized Analytics Infrastructure ("OAI")** solution addresses the challenges faced by Financial Services companies in creating an automated, low-latency, high performance, truly scalability analytics infrastructure



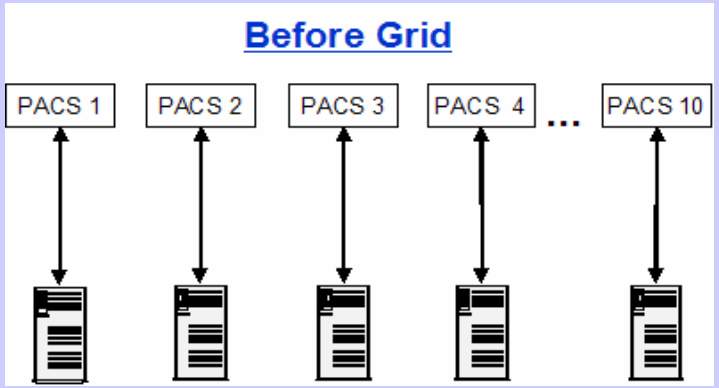
IBM's Grid Medical Archive Solution (GMAS)



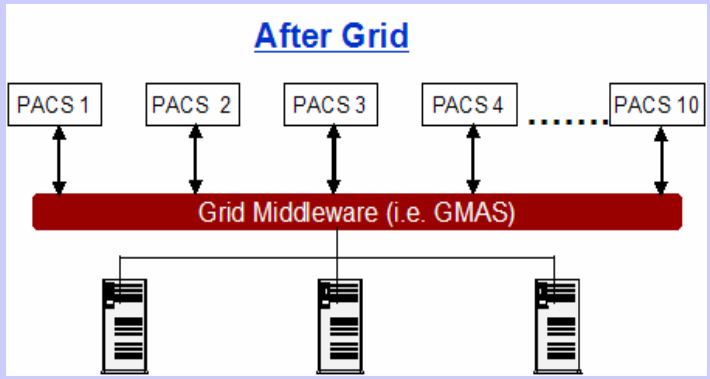
IBM's GMAS is a multi site, multi-tier, multi-application ***fixed content*** *enterprise storage virtualization platform*

Grid Medical Archive Solution – Key Concepts

- GMAS is *software technology* that *intelligently manages* the interaction between an application and its storage resources
- Is Location Independent: Central or Federated
- Is Automated: Self Optimizing & Self Healing
- Is Heterogeneous: At the application & storage level
- Has zero points of failure
- Enables access to any image, anytime, anywhere from any system
- Leverages existing investments



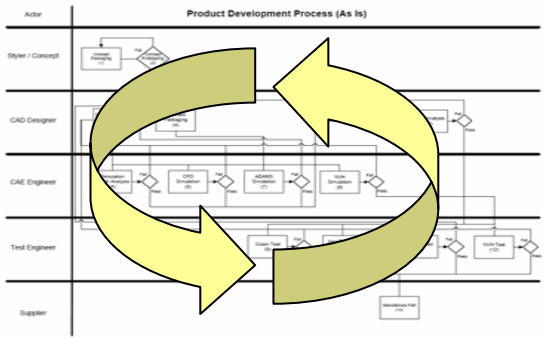
Siloed Storage



Virtualized Storage

GMAS = Automated storage optimization & management for fixed content

ITRO for Engineering is an infrastructure solution designed to significantly improve the efficiency of the Industrial design / analysis cycle



- ***Process integration & management***
- ***Design optimization***

Data mgmt

Pre-processing

Analysis

Post – process

Resource Virtualization Infrastructure

- ***Simulation Data Management***
- ***Simulation and Product Data Mgt integration***

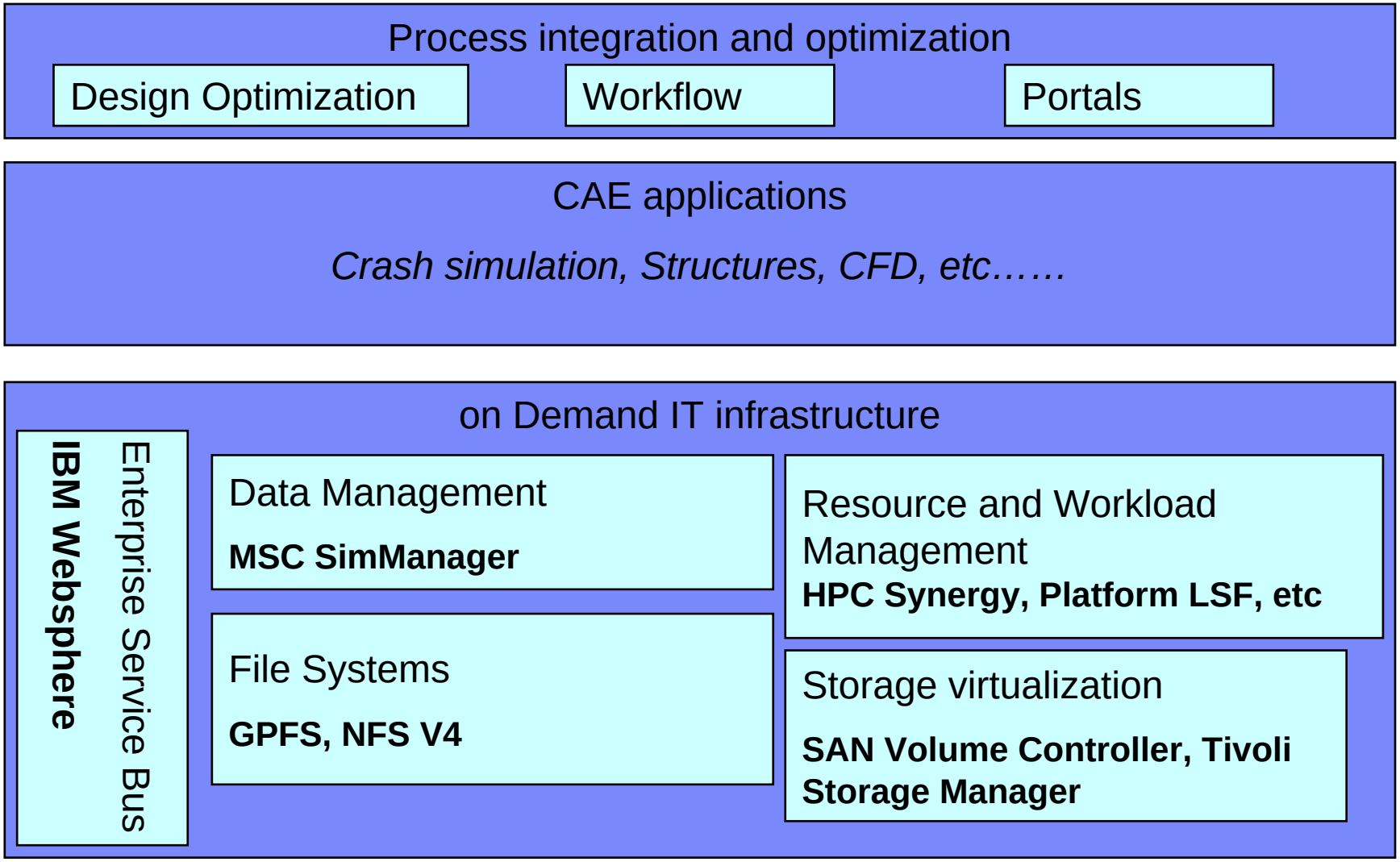
- ***CAD /CAE integration***

- ***CAE application integration and optimization***

- ***Deep Computing visualization***

- ***Engineering Grid***
- ***Storage Management***
- ***Deep Computing Capacity On Demand***

ITRO for Engineering Solution Components



Actuarial Grid

A Grid solution that addresses the performance and data issues facing actuaries using insurance applications for life, pensions and annuity valuations

Benefits include:

- Faster time to results for complex calculations
- Actuaries can run more models; fine tune models; increase data points
  - Supports better decision making including capital and reserve management
  - Increase speed to market for new products

Actuarial Grid components

Actuarial Applications

* MoSes, TAS, MG-Alfa, IWORKS Prophet, AXIS, Advise, GEMS

Grid Middleware

System Software

BladeCenter

IBM Global Services Provides:

- Technical assessment workshop & site readiness
- Grid middleware installation and configuration
- Application installation, configuration with grid scheduling middleware
- Functional testing with standard model
- Demonstrate and measure test job results
- Bladecenter installation; network connect; VLAN configuration; OS installation and configuration
- Project management; Skills transfer; documentation

*** Example list; Not finalized**

Conclusions

- Grid has matured from an emerging technology
  - Well entrenched in HPC
  - Embodied into solutions for commercial applications

- But… challenges remain
  - Standards lagging and inhibiting increased adoption

- IBM's focus is to:
  - Play a leadership role in standardization
  - Include mature technology components into our products
  - Include mature products into our infrastructure solutions
  - Help our customers realize business benefits via solutions

IBM Grid Computing Customers

- Higo Bank
- St Judes Childrens Hospital
- Norwich Union
- Audi
- Petrobras – (Brazil Oil)
- Bowne
- Generations Plus
- Hewitt Associates
- Aventis Pharmaceuticals
- Hyundai – Kia Motors
- LandMark Graphics
- Magna-Steyer
- Intel
- Reuters
- Nippon Steel
- Karmann
- Sinopec
- Wachovia
- Royal Dutch Shell
- Yurion Digital Media
- Siemens Mobile
- Capital One
- Wachovia Bank
- NTT Data
- Credit Suisse
- Ford
- Bell South
- Novartis
- CC-2INP3
- Royal Bank of Canada
- CAA Motors
- Conoco Phillips
- Daimler Chrysler
- Development Bank of Singapore
- Diamond Computer Service
- Charles Schwab
- SURA
- Iowa Health System
- Fitch Ratings
- Aegon Insurance
- Sal Oppenheim
- MTU Aero Engines
- Paradigm
- TaiKang Life Insurance
- University of Texas
- i3Archive
- Generations Plus
- University Health Care – Augusta
- TeraGrid
- China Grid
- DEISA
- EPA
- KISTI
- CERN
- Canada WestGrid
- Harvard
- Germany FZK
- Erste Bank
- LSU
- Marist College
- National Cancer Institute
- FNMOC – Navy Weather
- NCAR
- OneCleveland
- Pfizer
- Seoul National University
- SuzHou University
- Tokushima Hospitals
- University of Kaiserlautern
- Yamanouchi Pharmaceuticals
- Indiana University
- Nissan
- Shell
- University of Cambridge
- Morgan Stanley
- Toshiba
- BNP Arbitrage
- Fiat
- Ferrari
- Mizuho CB
- HVB Group
- ESTECH
- SGIB
- GeoPhysical Services
- SamSung Data Services
- Nordea
- BAE

Thank You