Grid Computing in the Industrial Sector

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Agenda

- Key Messages
- Industry Trends, Directions and Issues
- What is on demand computing and how does grid play?
- How are grids being deployed today?
- Evolution of grid computing
- Customer examples
Key Messages

- Grid Computing is the **key infrastructure** for On-Demand
- Grid Computing is about **virtualizing** resources
- Grid Computing is about **IT Optimization**
- Grid Computing is delivering real **business value today** through business transformation
- Heavy Investment in Grid Enabling Technologies, currently imbedded in many IBM products
Industry Segments in the Industrial Sector

**Automotive**
- Light Vehicles
- Commercial Trucks
- Heavy Equipment
- Auto Suppliers

**Chemicals & Petroleum**
- Petroleum (upstream, midstream, downstream)
- Chemicals
- Mining

**Aerospace & Defense**
- Commercial Transports
- Military Aircraft and Missiles
- Space
- Aircraft Engines
- Shipbuilding

**Electronics**
- OEMs - Computer, Consumer, Industrial, Telecom
- Components
- Semiconductors
- Manufacturing Services
## Industry Trends & Directions

<table>
<thead>
<tr>
<th>Automotive</th>
<th>Electronics</th>
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<tbody>
<tr>
<td>✓ Complex, cyclical industry</td>
<td>✓ Product lifecycles short, getting shorter due to rapid changes in technology</td>
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<td>✓ Market saturation</td>
<td>✓ Customer demand for smaller, faster, more portable electronics</td>
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<td>✓ Excess capacity driving SCM focus</td>
<td>✓ Fierce competition, tight margins driving innovation, cost and reliability</td>
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<td>✓ Expanded alliances and acquisitions</td>
<td>✓ Reductions caused by downturn driving efficiency and consolidation</td>
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<td>✓ Competition based on product differentiation</td>
<td>✓ Need for global collaborative capability through the value chain</td>
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<td>✓ Environmental and legal regulations</td>
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<td>✓ Moving to modular design and manufacturing</td>
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<tr>
<th>Aerospace &amp; Defense</th>
<th>Chemicals &amp; Petroleum</th>
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<td>✓ Major revenue reductions as airlines cut back on orders</td>
<td>✓ Fluctuating oil prices</td>
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<td>✓ Focus on cost containment</td>
<td>✓ Mature, cyclical industries impacted by global and regional economic factors</td>
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<td>✓ Military spending increase will not offset impact in commercial</td>
<td>✓ Aging physical assets</td>
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<td>✓ Worldwide over supply and more intense cost competition</td>
<td>✓ Over capacity and poor asset utilization</td>
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<td>✓ OEMs moving to new aftermarket business in services and maintenance</td>
<td>✓ Fragmented supply chain</td>
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<td>✓ Globalization with regional markets</td>
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<td>✓ Product differentiation and brand loyalty</td>
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<td>✓ Aging workforce in skills-based industry</td>
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Business Issues Challenging Industrial Customers

✓ Fierce competition
✓ Excess capacity, lower capital spending
✓ Cost/price pressures
✓ Globalization
✓ Complex supply chain
✓ Consolidation and alliances
✓ Government regulation
✓ Time-to-market
✓ Product innovation and differentiation
✓ Reduced staffing, shortage of technical skills
An on demand business is an enterprise whose business processes—integrated end-to-end across the company and with key partners, suppliers and customers—can respond with speed to any customer demand, market opportunity or external threat.
On Demand Considerations: Optimizing Your Infrastructure

- Leverages existing assets
- Enables integration
- Infrastructure design matches business design
  - Modular
  - Built for change
  - Standards-based

Flexible Financial & Delivery Options
On Demand Operating Environment

Open standards are table stakes for an on demand operating environment

Business Flexibility

Integration
Business flexibility through integration of people, processes and information within and beyond the enterprise

Infrastructure Management
IT simplification through automation and virtualization, enables access to and creates a consolidated, logical view of resources across a network
The Capabilities You’ll Need

- Business Flexibility
  - Business Modeling
  - Process Transformation
  - Application & Information Integration
  - Access
  - Collaboration
  - Business Process Management

- IT Simplification
  - Automation/Virtualization
    - Availability
    - Security
    - Optimization
    - Provisioning
    - Policy-based Orchestration
    - Business Service Management
    - Resource Virtualization of Servers, Storage, Distributed Systems/Grid and the Network

Integration
Grid Computing
“Virtualizing and sharing distributed IT resources to solve common problems”

Enabling secure access to distributed IT resources in an open heterogeneous environment.
Grid Computing

Key Enablers

- Increased Software Sophistication
  - Workload Mgmt.
  - Provisioning
  - Scheduling
  - Billing and Metering

- Availability and Cost of Bandwidth

- Industry Acceptance of Open Standards
  - OGSA
  - LINUX
  - WSDL
  - TCP/IP
The Value of Standards
Open Grid Services Architecture (OGSA)

“The TCP/IP of Grid Computing”
Why should grid be important?

**Grid lowers cost**
- Grid protects investments by better utilizing existing compute, storage and data resources in heterogeneous environments.

**Grid increases performance**
- Grid gives more users access to more compute power and data resources and increases resiliency.

**Grid provides more flexibility**
- Grid customers better react to peaks and valleys in an “on demand” environment.
Industrial environments: TODAY

**Environment:** Cluster(s) typically on a LAN in a single department running batch schedules and limited to a specific design tool.

**Issues:**
- **Clusters are labor intensive**
  - Not well automated
  - Not well integrated across the enterprise
  - Difficult to manage SLAs
- **Data Management and Data Placement** is a challenge
Industrial environments: Near Future

Environment:
- Integrated, global design organizations (within and outside the enterprise)

Issues:
- Security and Bandwidth associated with distributing design data
- Ability to manage design organization as a single entity
- Data Management and Data Placement is a challenge
Typical evolution of clusters into an integrated global grid environment

- Cluster(s) typically on a LAN in single department using schedulers (PBS, LSF)
- Enhance Base Grid to
  - add more users (more compute resources)
  - optimize data (data virtualization)
  - simplify grid management (automated provisioning)
- Extend Base Grid to
  - remote users (web-based access)
  - more groups, departments and geos within the enterprise
  - partners, suppliers and customers outside the enterprise
Industrial Sector Grid Adoption Today

- Transaction Management: WebSphere
- Billing and Metering: Tivoli
- Workload Management: @server Tivoli
- Automated Provisioning: Tivoli
- Resource & Information Virtualization: @server
- Scheduling: WebSphere Tivoli
- Web Services, Grid Services (OGSA): @server WebSphere
Grid Adoption in the Industrial Sector

Today

Enterprise

Value

Department

Time to Adoption

Virtualization of Information Resources (structured/unstructured)

Virtualization of Departmental HPC Clusters (multiple application support)

Islands of HPC Clusters (app-specific: CAE, CAD, EDA, E&P)
## Industry-Specific Focus ISVs

### E&P
- Landmark
- Schlumberger Information Solutions
- WesternGeco
- Paradigm

### EDA
- Cadence
- Mentor
- Synopsys

### CAE
- Livermore Software Technology Corp.
- ESI Group
- ABAQUS
- ANSYS
- MSC Software

### PLM
- Dassault Systemes
- DATASYNAPSE
- AVAKI
- Fluent
- Exa
- Engineous Software
Factors hindering deployment of Extended Enterprise Grid

Grid is a catalyst for changing business processes … companies are going to have to figure out new ways to structure their businesses, and then move into grids … one of the clear advantages of grids is not just sharing resources, but making all IT resources at a company visible to everyone.

Industrial Examples

**Electronics Client**

**Value:**
- Projects can now be parsed into smaller chunks and spread across a virtual environment for faster response times
- Semiconductor design costs have decreased due to the price-to-performance ratio of the xSeries servers and the increased availability of the design center resources

**Solution:**
- More than 60 IBM eServer® xSeries® running Red Hat Linux.
- Platform LSF
- IBM Business Partners: Sandata for system installation and S&C Computing for Linux integration and cluster management services

**Aerospace Client**

**Value:**
- Cut analysis and simulation time, while improving the quality of the output
- Improve the productivity of the Design Office
- More robust, scalable IT infrastructure that adjusts as requests fluctuate
- Open standards permit easy integration of existing software

**Solution:**
- IBM
- Open standard Linux-based operating system
- Globus Toolkit
- GridXpert technology

**Large Manufacturing Client**

**Value:**
- Storage resources are pooled to allow more efficient use
- Robust security and auditing capabilities
- Seamless access to data regardless of the Operating System, Hardware and Applications
- Highly available, resilient and easily scalable

**Solution:**
- Avaki Technology
- xSeries, pSeries, ESS, Websphere, Tivoli Systems Mgmt
- Applications Supported - Rational, Catia, DB2, Oracle
Current Issues related to clash analysis

- **Too much time required to effectively run clash tests between complex sub-assemblies**
  - Clash test of complete vehicle takes 72 hours. Manual effort is necessary to split the assemblies into smaller packages so that the clash test can be carried out.
  - As a consequence the overall clash of a complete vehicle is done once at the end of the design cycle of the car.
  - If clashes are detected significant redesign activities have to be started.

- **Unproductive engineers waiting for clash test of their sub assemblies**
  - An engineer submits a clash test and has to interrupt his current design activity.
  - Running the subassembly clash test on grid shortens the interruption and enhances engineer productivity.

- **Too much administrative time required from design engineers**
How is grid addressing these issues?

- Grid enabled clash environment running Platform Computing as grid middleware with Dassault Systemes CATIA & ENOVIA DMU applications
  - The clash testing of Catia DMU Navigator is split up and distributed by a scheduler.

- The clash test of complete vehicle can now be done daily overnight and takes about 4 hours!

- For the near future it is planned to allow the design engineers to submit the subassembly clash testing to grid.
What are the benefits realized to date?

- Significant performance improvement (72 – 4 hours)
- All system complexity shielded from the engineers
- Risk and Error Reduction
  - Iterative clash testing enhances design quality and speeds up design cycle
  - As a byproduct erroneous (corrupted) models can be identified
- Cost Reduction
  - Increased accuracy of data improves quality and reduces late changes
- Improved Time to Market
  - Faster evaluation of design alternatives
  - More accurate and timely product development
Product Lifecycle Management (PLM) is the set of critical activities needed to conceive, develop, test and manufacture products.
Summary

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