The Evolution of Grid Computing and the Emergence of Utility Model

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Agenda

• What defines a Grid?
• What are the emerging categories for Grid?
• What are suppliers saying, customers demanding and what is the opportunity for both?
• What is the customer approach to adoption and what are the inhibitors?
• How does Grid relate to utility computing concepts and where will the end user “sweet spot”?
Some Quotes of Note

“We want to lower cost, we want to shrink dollars out of our hardware, but we certainly don’t want to jeopardize the service level”
- Large Publishing House considering a grid

“It was more sort of a grass roots movement than sort of a big bang, bring it in”
- Independent Oil & Gas Producer having deployed a grid

“We have identified a couple of applications that require compute power that has been heretofore too expensive to apply”
- Large Financial Services Firm strongly considering a grid

 “[The grid] needs to be simple to administer in order to provide the value and I don’t think the vendors have done a good enough job at demonstrating that”
- Large Pharmaceuticals Company considering a grid

“You need to be able to do more with less and the smarter way to do it is to have a piece of software that manages that environment for you”
- Large Telecommunications Provider considering a grid

What Is the Opportunity for Customers and Suppliers?

Source: IDC

<table>
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<th>Spending (USM$)</th>
<th>Installed Base (M Units)</th>
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<td>$0</td>
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New server spending (USM$) 3% CAGR
Cost of mgmt. & admin. 10% CAGR

Source: IDC
What Are Enterprise Customers Demanding?

Q: How Valuable Are the Following Potential Benefits of Grid Computing?

- Lower IT operating costs
- Provide better service-level performance
- Ability to respond faster to changing business
- Ability to shift budget from maintaining IT
- Pay-as-you-go / usage based pricing

Source: Project Barometer II, IDC March, 2004
N = 414 Worldwide; 126 in the U.S.

Where Are the Operational Costs Going?

Server Management and Administration Costs

- Initial system and software deployment (19%)
- Maintenance and tuning (15%)
- Migration (13%)
- Planning for upgrades, expansion, and capacity (15%)
- System monitoring (8%)
- System maintenance (7%)
- Upgrades, patches, etc. (11%)
- Other (15%)

2004 Total = $95B

Source: IDC Survey Data, 2002–2004
Customer Demands: Driving Utility Computing

**Grid Infrastructure**
- Legacy infrastructure is costly to migrate
  - IT provides unique business value
  - IT is costly to manage

**High Performance**
- Cost reduction
- “IT” is a commodity
- Adopt standards & multiple sourcing

**Transaction**
- Align with business unit priorities
- Adapt to business change
- Integrate with partners & suppliers

**Compute**
- Add throughput to reduce the time to solution and minimize cost of the solution

**Data**
- Integrate data sources in order to make better, more informed decisions

**Optimization**
- Pool resources together for better economy of scale
- Provide methods to streamline mundane manual tasks of the Admin
- Provide means for provisioning and change management

Compute Grids Remain Specialized, Incremental Opportunity is in Hardware

**Compute Conclusions**
- Compute grids are a specialized market—early adopters but limited growth opportunity
- Incremental revenue is almost all HW
- Primary opportunity is establishing credibility

**Key Assumptions**
- Large projects attempt to harvest disparate compute cycles
- Specialized applications require access to specific services/resources
- Most deployments are HPC-related with R&D apps: Oil, Financial, Bio, Content Creation, etc.
- Custom software development and implementation largely done in-house (tight budgets, technically proficient early adopters, and few packaged solutions)
- Predominant services is training: small/cheap, up-front, and non-recurring
- Prove technical merits, seed the market, establish foothold for the future
- Value is predominantly in buying an option for future
Data grids are a specialized market where information integration not efficiency or performance drive the market.

Spending will be more evenly spread across hardware, software, and services.

Opportunity is a niche but an important one in bridging technical and commercial gap.

Key Assumptions:
- Large projects attempt to disparate information sources together
- Data integration applications are available for the grid and early adoption is underway
- Most deployments are R&D efforts: Bio, Financial, Computer/IT
- Complexity of bringing sources together translates to more services and software spending.
- Motivation is faster more informed decisions—hardware utilization less of an issue
- Predominant services is system integration: up-front and non-recurring but high dollar
- Prove technical merits, seed the market, establish foothold for the future
- Value is predominantly in buying an option for future
Optimization Grid Opportunity Fragmented, Constrained by ISV Business Model

**Optimization Conclusions**
- Optimization opportunity is the most balanced
- Large-scale adoption depends on key applications becoming grid-enabled...
- But ISV migration constrained by business model (pricing) more than technical

**Key Assumptions**
- Spread across HW, SW, Services
- The largest vertical (Fin Svcs) is only ~20%
- Early adoption starts with non-mission critical applications
- Few high-volume packaged applications are grid-enabled
- Many commercial deployments use custom apps with no license fees; the need for custom software development limits commercial appeal
- ISV migration to grid platform likely to be slower than expected (e.g., 64-bit computing)
- Current licensing models incongruent with grid usage patterns—homegrown apps and Linux early
- ISV licensing models will need to migrate: from Box to CPU to User, eventually pay as you go
- Grid-enabling by ISVs will ultimately depend on customer pull from HW and operational savings and lost software opportunity
User Challenges & Constraints for Grid

- Cultural, Economic, and Technical
  - Grids require a different way of thinking about how to deliver cycles – normal resistance to changing behavior is always the toughest hurdle to overcome in technology adoption
  - Lack of Software Tools—lack of good management tools for the grid, lack of standards
  - Lack of tools means it's going to be hard to implement and deploy applications
  - Lack of vendor support
Connecting Motivations to Grid Computing

- Simplify IT Operations
- Reduce Operational Costs
- Deliver Better Services
- Improve Time to Market
- Create Competitive Advantage
- Improves Flexibility
- Reduce Capital Costs
- Improved System Utilization

Data Center Management

Server Consolidation

High Availability

Linux Clusters

Data Grid

Compute

Grid Computing

On Demand “Utility” Computing

The Vision of On Demand Computing—Thinking Globally

Phase 1
Consolidation

Phase 2
Sharing compatible resources, automation, virtualization

Phase 3
Sharing all resources
What Are the Process and Technology Solutions?

Customer Adoption for IT Utility Infrastructure

- **Service Level Automation**
  (SLA for departments / customers, resource priorities, billing)
- **Infrastructure Virtualization**
  (Pooling scale-out infrastructure to meet workload demand)
- **Application Provisioning**
  (Deployment of software above the OS)
- **Infrastructure Provisioning**
  (Bare metal through OS)

**Platform Management and Control**
(Remote Group Management)

**Platform Monitoring**
(Remote Group Monitoring)

Adoption Inhibitors

- Full Virtualization Model Assumes Solid Security
- Segment Growth Relies on Wide Industry Standards
- Software Vendors Resist to Preserve License Revenue
- Solutions are Complex – Not Easy to Implement
- Customer LOB and Departments Fight for Ownership & Control

Co-Location  System Consolidation  Application Consolidation

Customer Adoption for IT Utility Infrastructure

- **End-User Adoption: Share of Total Server Shipments**

  - Hardware monitoring
  - Hardware management & control
  - Infrastructure provisioning
  - Application provisioning
  - Virtualization
  - SLA management

Source: IDC Document # 30426
Is the Utility Computing Vision What Customers Will Adopt?

Service-Level Automation  
Infrastructure Virtualization  
Application Provisioning  
Infrastructure Provisioning  
Platform Management and Control  
Platform Monitoring

Spending (US$)

1996 '97 '98 '99 '00 '01 '02 '03 '04 '05 '06 '07 '08

Better Management  
Better Utilization: Reduce Capital Costs  
Better Management: Reduce Operational Costs

Grid Market Futures

- Grids today largely connote technical applications in the users minds, but increasingly interest is emerging in the commercial market

- Licensing issues and the lack of applications for the commercial market holds back adoption

- Only through addressing the needs of a broader market will Grid technology reach critical mass

- Users will need to see Grid as a means to provide cost benefits, productivity and business policy improvements to both batch and transactional workloads

Source: IDC, 2004
Essential Guidance

Grid and utility computing are becoming synonymous—though open versus proprietary approaches are impacting the time to market

Address customer pain points directly — slowing the velocity of operational expense growth

Market and introduce incremental solutions that reduce operational costs

Realize the market for virtualization and service-level automation will be some time in maturing

Remember — When customers internalize “Utility Computing”, expect many to deploy something different

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