UNICORE as a Front End for IBM Infrastructure Solution
1st UNICORE Summit, 11.10.05 France Nice

Thomas Rueter,
IBM STG Infrastructure Solutions Northeast Europe trueter@de.ibm.com
Agenda

- Grid Building Blocks Concept with UNICORE
- IBM Grid and Grow
- IBM Virtualization Engine
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- IBM Grid and Grow
- IBM Virtualization Engine
Zürcher Kantonalbank

**Challenge:**
- To strengthen the quantitative credit risk management, Zürcher Kantonalbank developed new models and algorithms for portfolio credit risk.
- To model the tight interaction between the obligors at a fine grained level with a new approach (awarded with the STOXX 2004 Gold Award “A Simple Model of Credit Contagion”)
- Improve the performance for a factor 1000 compared to the prototype in Matlab

**Solution:**
- Custom C++ implementation based on open source under Debian/Linux
- IBM eServer 1350 Cluster with Intel based x336 server
- Proof of Concept and HPC optimization services in the Grid Design Center in Montpellier.

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**Technology Benefit**
- Solution is capable to run a complete credit risk portfolio simulation with 250k samples within 24h.
- Distributed computing application capable to scale over 1k of CPU’s.
- Highly portable application implementation based on MPI 2 message passing standard
- Solution is very cost efficient.
- Consequent usage of open source ensures leading edge technology.
- Highly motivated development team interacting with the open source community.

**Business Benefit**
- More precise credit risk measurement and management
- Evaluating unpredictable scenarios with stress testing simulations.
- Solution is successfully productive since 30. June 2005

“With our new credit risk application we can calculate total profit and loss of large credit portfolios incorporating full transaction details and based on a sophisticated credit dependency model with macro- and microeconomic factors. From our first single CPU prototype under Matlab we achieved a performance factor increase of 4000 with our new Grid HPC cluster “BigFish 100”,” said Dr. Daniel Egloff, manager financial computing Zürcher Kantonalbank, Switzerland.
Grid Market Dynamics

Internet & Linux patterns are re-occurring...

Phase 1
1990 -1998
“Grid is Born from Distributed Supercomputing”

- Teragrid is launched
- Basic job deployment functionality is built
- Scientific community begins to adopt grids

Phase 2
1999 - 2001
“Grid Gains Traction and Standards Work Begins”

- Globus Toolbox 1.0 is released
- GGF is founded
- Scheduling and resource management functionality emerges
- Academic environments begin to adopt grid technology
- GGF boasts members from the major US IT vendors

Phase 3
2002 - 2004
“Grid Adoption reaches commercial enterprises”

- OGSA 2.0 is announced
- Application vendors begin grid-enabling their products
- Information virtualization, automated provisioning and workload management capabilities enhance grids
- Lines of Business within commercial enterprises adopt grid technology
- Grid standards solidify and are widely endorsed
- Many application vendors incorporate grid technology into their products
- Billing and metering, strong license management and network optimization functions complete the grid architecture
- Grid adoption extends across enterprise architectures

Phase 4
2005 - 2008
“Grids become an integral part of computing environments”

- Grid adoption extends across enterprise architectures
Virtualization Technologies are Key to building an On Demand IT Infrastructure

Grid and Virtualization…

- work together to reduce operational and systems management costs while maintaining needed capacity.
- reduce the complexity of adding to the existing I/T infrastructure
- gather data and information across the organization to promote collaboration
- deliver on SLA response times during spikes in production and test scenarios.
- help create a heterogeneous I/T infrastructure that is more responsive to the organization’s needs
Grid Building Blocks
Base Concept for the Grid Building Blocks

- Compute resource for research projects
- Reusable assets for local authorities
- Coordination of Grid infrastructure with well-established middleware
- Integration of UNICORE

**Example implementations of a Grid Center with multiple Grid Building Blocks**

**GC** := Grid Center
**GB** := Grid Building Blocks
Grid Building Block Concept

**Grid Center**

- **ID Certificate Management**
  - Management of Certificates and Authentication
  - e1350 Cluster Server

- **Master Grid Server**
  - Gateway Function with SLA Oriented Load Balancing
  - e1350 Cluster Server

- **Master Grid Data Source**
  - Distributed File System
  - e1350 Cluster Server and Storage

- **Master Grid Software Stack Repository**
  - Linux NOS with Grid Management Software
  - e1350 Cluster Server and Storage

**Grid Building Blocks**

- **ID Certificate Client**
  - Request and redistribution of Certificates
  - e1350 Cluster Server

- **Local Grid Server**
  - Execution of Service Request by using Faire-Shares
  - e1350 Cluster Server

- **Local Grid Data Source**
  - Distributed File System
  - e1350 Cluster Server and Storage

- **Local Grid Software Stack Repository**
  - Linux NOS with Grid Management Components
  - e1350 Cluster Server and Storage

User
Possible Projects with Grid Building Blocks

1. Integration of industries to work with Grid Building Blocks
2. Measurement system for grid infrastructure
3. Reliable and secure transaction in the grid
4. Content management over the grid
5. Grid library: Management of electronic content (Migration of local government archives to grid systems)
6. Support Grid Infrastructure
7. Analyze Toolbox (Pattern Matching for instance in LS and identity control)
8. Support Grid Infrastructure
9. e-learning library as network of institutes to offer multimedia content to a broader community
10. e-learning toolbox for content creation (Rendering, compilation, real-time content)
11. Federated grids, well defined connectors (based on Web Services (WS-RF), service oriented architecture)
12. Start grid on Grid Building Blocks for non expert first time grid users
13. Interface Grid Building Blocks with classical non-grid resources like mobile phones, GPS, environmental measurement systems
Example: Task Execution with Grid Building Blocks

**Execution of job within the GB(A)**

User GB

GB_A

creates job

Starts job

locale data at GB_A

locale data at GB_B

**Remote execution of job at the GB(B)**

User GB

GB_A

creates job

Starts job

locale data at GB_A

locale data at GB_B

**Drupal**

submit

locale data

GB_G

locale data

GB_A

locale data

GB_B

locale data

**Grid Building Blocks**

Remote execution of job at the GB(B)

Execution of job within the GB(A)
Hardware Design of Grids Building Blocks

Grid Center

- Air Duct Kit
- Cisco 5503 Ethernet Supervisor
- Blank
- Blank
- x346 Mgmt Node
- Console Switch
- Terminal Server
- NetBAY 2U Monitor
- No Kbd.

- Management Nodes
- Network
- KVM Unit
- Disk Subsystem
- Blades
- BladeCenter

Grid Building Blocks

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# Software Design Grid Building Block

## GC - Grid Center

<table>
<thead>
<tr>
<th>Function</th>
<th>Product Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management of certificate authority</td>
<td>IBM Identity Manager</td>
</tr>
<tr>
<td>UNICORE gateway</td>
<td>UNICORE</td>
</tr>
<tr>
<td>Globus Toolkit</td>
<td>IBM Grid Toolbox/UNIVA</td>
</tr>
<tr>
<td>Distributed file system</td>
<td>IBM General Parallel File System (GPFS)</td>
</tr>
<tr>
<td>Cluster management software</td>
<td>IBM Cluster Systems Management (CSM)</td>
</tr>
<tr>
<td>Load balancing Fair-Share</td>
<td>IBM LoadLeveler</td>
</tr>
</tbody>
</table>

## GB - Grid Building Block

<table>
<thead>
<tr>
<th>Funktion</th>
<th>Name des Produkts</th>
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</table>

## GU - Grid User

<table>
<thead>
<tr>
<th>Funktion</th>
<th>Name des Produkts</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNICORE Client</td>
<td>UNICORE</td>
</tr>
<tr>
<td>Java based</td>
<td></td>
</tr>
</tbody>
</table>

Systeme basieren auf Linux als Betriebssystem
Agenda

- Grid Building Blocks Concept with UNICORE
- IBM Grid and Grow
- IBM Virtualization Engine
New IBM® Grid and Grow™ Offering

Offering Objectives

- A simple, affordable introduction to grid technology
- Easy to deploy, open solution that demonstrates business improvements and growth
- Provides an ‘on-ramp’ to On Demand infrastructure
- Positions for future growth including more robust Grid technology and industry solutions

Target Markets

- Departments in large industry accounts needing to accelerate business results
  - Financial Services, Industrial, Public Sector
- Mid Market
- Existing enterprise accounts needing additional capacity

Offering Package

- Grid Scheduler
- BladeCenter and Blades
- Operating system
- Services
- Advanced optional components
IBM® Grid and Grow™ Components

### Base Offering

| Grid Scheduler | Choice dependent on industry & workload  
|                | • Platform LSF  
|                | • Altair PBS Pro  
|                | • DataSynapse GridServer  
|                | • IBM Loadleveler  
| **Blade Server** | BladeCenter chassis & servers  
|                | • 7 blades (7 slots for growth)  
|                |  
|                | Intel HS20, Power JS20 or AMD LS20  
|                | each with 2 CPUs and 2 GB memory  
|                | • Gigabit Ethernet  
|                | • Redundant power supply  
|                | • Management console and cables  
|                | • IBM Director  
| **Operating System** | SW licenses for Linux, Windows or AIX  
| **Services** | • Hardware, operating system and scheduling software installation  
|                | • Application assessment  
|                | • Client Training  

### Optional Components

| provisioning Manager | Tivoli Provisioning manager (TPM)  
| **Services** | TPM Installation and Implementation assistance  
| **High Speed Interconnect** | Maximize I/O and inter blade communication plus dynamic I/P addressing  

Starting at $49,000 USD

List Price
IGS Services for IBM® Grid and Grow™ Offering:

<table>
<thead>
<tr>
<th>Service Description</th>
<th>No-charge tools</th>
<th>Base Offering</th>
<th>Optional Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid Value at Work Lite</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tools to help identify where to get started (coming soon)</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hardware &amp; Software ordering, including Grid scheduler</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Hardware - site readiness, hardware install, network connect, troubleshoot, resolve any issues</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>OS install and configuration, VLAN configuration</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Grid Scheduler installation and configuration</td>
<td></td>
<td>X</td>
<td></td>
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<tr>
<td>Client application assessment</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Performance testing and documentations</td>
<td></td>
<td>X</td>
<td></td>
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<tr>
<td>Client skills transfer</td>
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<tr>
<td>Grid Innovation Workshop</td>
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<td>X</td>
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<tr>
<td>Full Grid Value at Work Workshop</td>
<td></td>
<td>X</td>
<td></td>
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<tr>
<td>Supportline services for Linux</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Hardware Maintenance</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Grid Scheduler Maintenance</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Tivoli Provisioning Manager / Tivoli Orchestration Services</td>
<td></td>
<td>X</td>
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Innovation Inhibitors

“Every time we add new applications interfaces, we added degree of complexity”

“There is a huge operational and reputational risk”

“How can you provide reliability if one of the 100 goes down?”

“We have to speed the evolution of our company”

Source: IBM Board of Advisors
**Why IT optimization is important & necessary?**

**Fuel growth by managing costs:**
- 80% of CEO’s view growth as a key focus area
- Operational costs far exceed the budgets for new hardware, they are growing at approximately 2 ½ times the compound annual growth rate*

**Complexity is growing:**
- Existing computing capacity is highly underutilized
- Gartner predicts that enterprises that don't leverage virtualization technologies will spend as much as 25 percent more for their x86 servers

**Business Flexibility:**
- Agility has been made a high priority across the organization . . . [however] only 13 percent of the CEOs rate their organization’s ability to respond to changing business conditions as very responsive **

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**Optimize IT assets now to fuel growth, improve ROI, increase staff productivity and improve quality of service.**

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*IDC, 2004 **CEO Study of 456 WW CEOs IBM Corporation, 2-04; Graphic: IDC Directions 4-7-04 Customer Adoption of On-Demand Enterprises.*
Flexible & Manageable

Big Things
Look Like Little Things

Little Things
Look Like Big Things
Virtualization Solutions: Stages of Deployment

—Virtualization does not mean you change your whole IT environment in one major re-engineering project.

—Virtualization is best implemented in stages

—Virtualization is most effective when IT governance and management processes are also updated

Virtualize Outside The Enterprise: Suppliers, partners and customers

Virtualize The Enterprise: Enterprise wide Grids and Global Fabrics

Virtualize Unlike Resources: Heterogeneous systems, application based Grids and networks

Virtualize Like Resources: Homogenous systems, storage and networks

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IBM Virtualization Engine™ is all-encompassing

Virtual Planning Tools

Virtual Resource Access
- Programmatic Interface
- Virtual View

Virtual Resource Management
- Workload & performance managers
- Resource management, modeling, mapping

Virtual Resources
- Resource virtualizers
- Partitioning, virtual machines, I/O, networks, VTS
- IBM Server & Storage Systems

Virtualized view

Virtualized management

Virtualized resources
IBM Virtualization Engine™ and the real world

- Manage your application service level
- Manage your heterogeneous servers
- Manage your datacenter fabric

**x86 World**
- Other Enterprise Applications
- Microsoft Windows
- Linux
- Non IBM x86 Server

**IBM BD2**
- IBM WebSphere

**z/OS AIX I5/OS**
- Linux

**Virtual Processors, Memory, I/O, Storage, Networks**
- IBM Server and Storage

**Datacenter Fabric**
- Storage Area Network, Storage and Archive System, Complex Switches for LAN, WAN, VPN’s

**UNIX World**
- ISV Applications
- Solaris
- HP-UX
- Non IBM Unix Server

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IBM Virtualization Engine™ and the real world

IBM Virtualization Engine
managing business applications on heterogeneous platforms
with open standards

- IBM DB2
- IBM WebSphere
- ISV Applications
- Other Enterprise Applications

IBM Virtualization Engine
can communicate with all operating systems

- Microsoft Windows
- Linux
- AIX i5/OS zOS
- Solaris
- HP-UX

IBM Virtualization Engine
contributing to the standard bodies

- Intelligent Platform Management Interface (IPMI)
- Web Services Management (WS-Management)
- Common Information Model Standards (CIM)

✓ IBM Virtualization Engine is designed to work with all management systems which will support open standards.

✓ IBM cooperates in the standards bodies like DTMF, GGF and Oasis to help our customer harmonizing their management platforms.
Wrap Up

- UNICORE is a stable well accepted grid software
- Grid and Grow is using stable, mature technology
- Grid is leading on the workload user space level
  Virtualization will complement on systems level to enable a real on demand operating environment.
- IBM is interested in cooperating with the UNICORE Forum contributing to the UNICORE project by leveraging Grid and Grow announcements.