What we’ll cover today

- Drivers of HPC
- Financial Services Sector
- How Microsoft can help in HPC
- Windows HPC Server 2008 Overview
- Roadmap/Discussion
Annual Arms Race in HPC Adoption

GRID COMPUTING - 19 February 2007

Citi Expands Grid OS Environment
LONDON—The recently re-named financial services giant Citi expects to roll out support for Microsoft's Windows Server 2003 operating system (OS) to its grid backbone before the end of this quarter, DWT has learned.

"The Windows environment will host pricing and risk applications within capital markets banking using Platform Computing's Symphony and LSF," he says.

The solution is intended to simplify the management and implementation of grid technology, he allows businesses to either share.

HIGH PERFORMANCE COMPUTING - 16 April 2007

Evolving Risk Models Push Merrill's Grid
NEW YORK—Brokerage giant Merrill Lynch is in the midst of investigating new file systems for its grid computing environment in order to deal with its evolving credit and market risk calculation models across the enterprise, firm officials tell DWT.

"The challenge is that we are moving toward more sophisticated risk models," says Ciaran Henry, managing director, fixed income, currencies and commodities, liquidity and risk CTO with Merrill Lynch. "Our credit risk is now a full Monte Carlo simulation and it needs many thousands of data elements."

The bank's downstream systems that have been calculating corporate risk using data from the firm's upstream systems are now effectively calculating valuations, says Henry.

The downstream systems need almost a super-set of all of the data of the upstream systems to perform these calculations, he adds.

The High-Speed Arms Race on Wall Street Is Leading Firms to Tap High-Performance Computing
Citigroup, Wachovia, Mellon and other major Wall Street firms seeking to take their high-performance computing grids to the next level are considering new products.

By Penny Crosman
Wall Street & Technology
March 19, 2007

In the ongoing arms race on Wall Street, high-performance computing (HPC), also referred to as supercomputing, provides a huge competitive advantage that no firm can afford to miss out on. HPC is the engine that lets firms analyze and run simulation models on complex financial instruments and portfolios, price options, detect fraud, and predict currency shifts. It lets companies analyze risk across portfolios as well as the enterprise, and enables quantitative analysts, traders and portfolio managers to understand the relationship between risks and profitability. But the speed and processing power comes at a substantial -- and continually escalating -- cost.
Cap Markets Trends: HPC Workloads

Credit card scoring and pricing, calculations of fraud risk

Portfolio performance measurement, diversification analysis

Fixed income trading and portfolio modeling

Risk analytics involved in calculating capital adequacy (e.g., for compliance with Basel II regulations) that process large amounts of market and trading data

On-line customer self-service functionality for pension plans, 401k plans, etc.

- High volume concurrent requests for what-if scenario calculations

Derivatives trading and analytics

- Pricing and hedging applications for credit derivatives, complex interest rate derivatives, Mortgage Backed Securities (MBS) and Foreign Exchange (FX)
- Complex pricing scenarios when introducing new high margin structured derivatives
- Assessing risk so that it can be properly factored into contract pricing
Customer Demand Is Driving HPC Growth

- Customer Demand: 45%
- Market competition: 23%
- Regulatory issues: 16%
- Other: 17%

*Gfk 2007 study on HPC in Capital Markets
Importance of HPC to Capital Markets

One in four HPC computing experts plans on expanding their high performance computing capacity 1000 nodes or more in the next 12 to 18 months.

More than half use a Windows Server to run their HPC environment.

* GfK 2007 study on HPC in Capital Markets
Insurance Challenges & Benefits

Industry Challenges driving the need for more sophisticated actuarial tools

- Upcoming regulatory changes for the life insurance industry
- Competitive pressures
- Increased complexity in product and analysis

Benefits to adopting HPC-enabled Solutions

- Meet the demands of the new and emerging regulations
- Increased confidence in information by utilizing larger models and increased numbers of scenarios.
- Improved competitiveness by bringing sophisticated products to market in a timely manner with better insight of the associated risks
The Actuarial Mission

Do we have enough Reserves to Meet our Obligations

The Old Method

- Define Variables
- Write a Formulaic model

- Run the Model

- Check results and refine model

The Principles Based Approach

- New Computationally Intensive planning tools
  - EX. Retirement Studio benefits Planner

- Excel workbooks that have grown very Large
  - Ex. Variable Annuity pre-processing that requires 10 day Excel runs

- P & C catastrophic Risk Management

- Don’t forget the Investment Side of the company, very similar to Cap Markets
Trusted Platform for Financial Services Firms

Barclays Capital
- Fixed Income Trade and Positioning System running on SQL Server 2005
- 30% performance increase, capacity to process 1,000 trades / second

Citigroup
- CitiVision highly scalable, secure, and fully personalized content distribution platform
- 12,000 global users in Investment Banking have access to 270 different data sources

NASDAQ
- Market Data Dissemination System
- 5000 transactions / second, 100k queries / day, running on SQL Server 2005

Thomson
- Thomson PORTIA PMS is used by more than 300 asset managers in 40 countries, managing more than U.S.$10 trillion in assets
- PORTIA Workspace built using WPF, WCF, and WF
Where we started in HPC

- Microsoft Entry into HPC
- Personal And Workgroup Technical Computing
- End User Applications available for Windows
- Parallel and HPC Development Tools
- Ease of Management and Deployment
Fund manager improves performance, eases administration with computing cluster

**Customer Business Challenge**
- Needed more powerful computing resources to analyze growing volume of financial data
- Wanted a solution that would be easy to use and manage

**Solution**
- Implemented a high-performance computing solution based on Windows® Compute Cluster Server 2003
- Integrated with Active Directory® service in Windows Server® 2003

**Customer Results/Benefits**
- Improved performance
- Streamlined development and management
- Seamless workflow integration
- Expedited delivery, improved return on investment

“Windows Server 2003 high-performance computing helps us take better advantage of the skills of our researchers and the information contained in our high-frequency data.”

Christopher Mellen, Head of Research, Grinham Managed Funds
Microsoft HPC Today

Personal Super Computing
- Microsoft Entry into HPC
- Personal And Workgroup Technical Computing
- End User Applications available for Windows
- Parallel and HPC Development Tools
- Ease of Management and Deployment

Broad Reaching HPC
- Support Traditional & Emerging HPC
- Larger Cluster support & Top500 Range
- Greater Accessibility for Windows-based Users
- Broader Developer support with tools and SOA
- Improved Management and Deployment
Improved Productivity with Windows HPC Server

**Administrator**
- An easier way to deploy, manage, and troubleshoot HPC systems
- Integration with applications and scale from a few, to many nodes
- Interoperability with existing infrastructure.

**Application Developer**
- Support for standard programming environments such as OpenMP and MPI
- Ability to design interactive or service oriented (SOA) HPC solutions
- Comprehensive parallel programming tools that support familiar languages

**End - User**
- Calculation and simulation Performance beyond the PC
- Applications to work transparently and securely with a cluster
- Submit and monitor jobs from within familiar Windows-based applications without specialized training.

**Accomplish more, in less time, with reduced effort by providing seamless parallelism across devices while leveraging the existing skills, tools, and applications users, administrators, and developers are already using today.**

Addressing the unique needs of those managing, developing, or using HPC Systems
Complete, integrated platform for HPC Clustering
- Built on top Windows Server 2008 64-bit Operating System
- Addresses the needs of traditional and emerging HPC

Windows Server 2008 HPC Edition
- Secure, Reliable, Tested
- Support for high performance hardware (x64, high-speed interconnects)

Microsoft HPC Pack 2008
- Job Scheduler
- Resource Manager
- Cluster Management
- Message Passing Interface

Microsoft Windows HPC Server 2008
- Integrated Solution out-of-the-box
- Leverages investment in Windows administration and tools
- Makes cluster operation easy and secure as a single system
What’s new in Windows HPC Server 2008?

- New System Center UI
- PowerShell for CLI Management
- High Availability for Head Nodes
- Windows Deployment Services
- Diagnostics/Reporting
- Support for Operations Manager

Systems Management

Job Scheduling

Networking & MPI

Storage

- Support for SOA and WCF
- Granular resource scheduling
- Improved scalability for larger clusters
- New Job scheduling policies
- Interoperability via HPC Profile

NetworkDirect (RDMA) for MPI
- Improved Network Configuration Wizard
- Shared Memory MS-MPI for multi-core
- MS-MPI integrated with Windows Event Tracing

- Improved iSCSI SAN & parallel file system Support in Win2008
- Improved Server Message Block (SMB v2)
- New 3rd party parallel file system support for Windows
- New Memory Cache Vendors
How Customers are Using HPC

- Using Microsoft HPC to accelerate financial planning models
- Excel based Stochastic modeling for high net worth management (S.A.M - Stochastic Analysis Model)
- Comprehensive after-tax cash flow projections

- Using Microsoft HPC to develop complex pricing models for structured derivatives
- Pricing and hedging applications for various derivatives
- Risk assessment based on parameters including interest rates, moves in FX values/rater or credit rates
Microsoft HPC in the Future

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- Parallel and HPC Development Tools
- Ease of Management and Deployment

**Broad Reaching HPC**
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- Broader Developer support with tools and SOA
- Improved Management and Deployment

**Seamless Parallelism**
- Parallel Computing Everywhere
- Ultra-Scale/Cloud Computing
- Transparent User Access
- Implicit parallelism for .NET developers
- Dynamic and Virtualized workloads
- Mainstream Management of HPC and IT Infrastructure
• Microsoft in Financial Services
  – http://www.microsoft.com/financialservices
• Microsoft Office Excel
  – http://office.microsoft.com/excel
• Technology Community for Financial Services
  – http://www.financialdevelopers.com
• Architecture Community in Financial Services
  – http://msdn.microsoft.com/architecture/industry/finservs/
• Financial Services Companies Case Studies
  – http://www.microsoft.com/resources/casestudies