HRG

Harvard Research Group

Experience - Expertise - Insight - Results

HRG assessment

Microsoft Windows Compute Cluster Server 2003 (WCCS)

Moving to Mainstream

Microsoft's recent investments in high performance computing (HPC) technology and business programs have positioned them as an emerging major player in this market. Today, with over 90 million desktop users, of which over 10% are classified as technical computing users, Microsoft has a huge opportunity to bring the advantages of HPC technology into the mainstream. Microsoft and Hewlett-Packard (HP) together are collaborating with leading HPC Independent Software Vendors (ISVs) to provide validated solutions, bringing to market real solution choices for customers preferring Microsoft Windows Compute Cluster Server 2003 (WCCS) over Linux for HPC cluster solutions.

Currently, most new HPC cluster installs continue to be Linux based in the traditional HPC market segments. With more than 90% of the HPC market running on Linux and Unix today, the migration from large, complex SMP Linux and Unix HPC systems to more affordable 64-bit AMD/Intel based Clusters continues.

HRG believes that one of the key HPC market opportunities for WCCS is in the enterprise workgroup and departmental area where Windows workstation clients execute compute intensive workloads that in some cases take as much as 20 hours to complete. With WCCS these workloads can be moved onto back end HPC WCCS AMD/Intel clusters of rack-mounted servers or blade solutions, freeing those Windows workstation clients up for other important non-HPC workloads. Additionally, market growth is expected in the traditional enterprise HPC sites where current users running Microsoft Client and Workstation machines can now have a choice between the transition to Linux for back end compute farms or WCCS, which provides an easy to administer solution.

HPC ISV applications usually provide a Windows workstation client based front end for data capture, calculation, and presentation, with the bulk of the computation being performed on larger SMP servers or clustered machines which in the past have been running on UNIX or Linux. Today Linux is an accepted and familiar environment in many companies, however, in some cases customers will prefer to stay with all-Windows solutions. HRG believes this is likely to be the case across the spectrum of high performance computing within Financial Services, CAE, Digital Content Creation, Oil and Gas, and Life Sciences.

HRG also sees an emerging opportunity for Microsoft in the HPC market with small business and mid market enterprises that may not have the skills or resources to run a two-tier operating system environment. Additional opportunity exists within large enterprises where the central site(s) may have the required skills and experience, but distributed remote or smaller sites that utilize Microsoft’s office applications and need to interact from an application and data consistency viewpoint with their technical counterparts at headquarters may not. This environment is one where WCCS, in combination with HP's Cluster Platforms and Cluster Platform Express solutions, provide significant benefits by delivering on the promise of "shorter time to insight" and increased productivity.

Microsoft Windows Compute Cluster Server 2003 (WCCS)

WCCS comes in two parts. The first is the operating system, Windows Server 2003, Compute Cluster Edition, which is fully compatible with Windows Server 2003, x64 Standard Edition with Service Pack 1 for 64 bit AMD/Intel implementations. The second part is the Microsoft Compute Cluster Pack, which has the job scheduler, MPI, management, deployment, and installation tools. WCCS was built on a mature core OS (Windows Server 2003) that has been in mainstream commercial use for several years.

Through Windows Update Services (WUS), Microsoft provides software updates and patches in a timely manner ensuring systems are kept up to date and secure. Patch management technologies can be deployed on top of cluster technologies.

Industry Standard Expansion

In 2005 HRG observed, "In market segments that are price sensitive, customers are typically willing to trade a level of software functionality for increases in compute power. The 'need for speed' continues with bi-annual chip set performance improvements by AMD/Intel and new additions or replacements in the HPC market are expected to be for the most industry standard Linux clusters."

WCCS is changing the HPC landscape. HRG believes customers are responding positively to the increases in application availability and ease of systems administration associated with Windows and WCCS environments. HP recently told HRG that they have witnessed some applications perform within a range of plus or minus fifteen percent between Linux and Windows environments.

HRG sees an expansion of the HPC market occurring that includes WCCS as a major player for the technical productivity worker who not only performs scientific work but also writes reports and creates presentations about that science. These workers are now able to perform compute intensive analysis and modeling using a single environment, consistent with enterprise office standards, and alleviate the systems administration task of moving between Linux and Windows.

The price/performance advantage of industry standard COTS-based clusters is driving the expansion of the HPC marketplace. Companies and firms that previously could not afford this type of computing can now make an industry standard cluster investment and improve their overall productivity, product quality, and time to insight. The ISV community is well aware of this growth area. Most of the top application providers in computer aided engineering (CAE), petroleum engineering, and seismic analysis, visualization-rendering and gaming, and bio-life sciences have ported applications from Unix to Linux, and now are actively porting to WCCS.

Why WCCS?

Today there are roughly 90 million desktop users in the world of which 90% are estimated to use Windows on the desktop, and approximately 10%, or roughly 9 million people, are technical computing users, such as mechanical, civil, electrical, petroleum engineers, scientists, chemists, financial and insurance analysts, film and rendering professionals. HRG believes that the majority of these 9 million users would benefit from a WCCS back end. Many of these technical professionals who are more familiar with the Windows environment, would be well served by avoiding time spent on IT systems administration, and job management in Linux or Unix in order to satisfy their high end compute requirements. This is emerging as a key area of interest for Windows desktop users running applications like ANSYS Fluent, MSC Nastran, or LS- Dyna with a need for high performance back end HPC systems.

Microsoft's entry into the HPC arena means that established HPC sites running Linux at their main sites now have the option of running key HPC applications on Windows at remote sites with no additional Linux HPC administrators. This in turn drives IT overhead and complexity down as no new Linux talent need be acquired to administer remote sites. Cost savings are further realized in that the same administrator who manages Microsoft applications (such as Exchange) can now take responsibility for maintaining Windows based HPC applications and WCCS.

Technical professionals currently using Windows on the desktop are likely to be comfortable running a Microsoft cluster for HPC workloads. Microsoft has a significant opportunity in the small, medium, and mid market with life science start-ups, rendering and digital content and creation companies, and engineering firms. Those that are running Windows on the front end, although they may have Linux skills, would be well- served with a WCCS HPC cluster on the back end. The advantages are consistent system administration, consistent look and feel, minimal required training, and no need to learn Linux or Unix commands in order to take advantage of the compute power available through HPC clusters. Organizations can now avoid the cost of hiring more expensive Linux talent by utilizing the readily available pool of Microsoft talent.

Ease of set up and use are two key drivers in the adoption of Windows CCS with key market focus in the enterprise workgroup and departmental segments and commercial SMB market. Installing a cluster configured for a Workgroup or Departmental environment is straightforward using Microsoft's install tools and HP's Rapid Deployment Pack. Now an 8 to 16-node cluster running WCCS takes approximately 2 to 3 hours to set up and install after the hardware is powered on.

With WCCS, organizations should save money on administration costs since the interface for the user is a standard Microsoft Windows- based interface with familiar icons, menus, and functionality. This should significantly reduce end user training, getting those users who are already familiar with the Windows environment, up and running sooner than with traditional Linux and Unix based HPC systems.

A new generation of users will be driving the increased adoption of affordable Windows based HPC clusters. This evolving group of users is from the technical professional fields where Microsoft personal productivity tools like Microsoft Word, Microsoft Excel, and Microsoft PowerPoint are the norm. Through 2011 and beyond HRG expects significant HPC growth in all segments of the SMB market, particularly in architectural firms, life and materials science, oil and gas exploration and services, and independent film companies. As an increasing number of ISV HPC applications like ANSYS Fluent and MSC Nastran are ported to run on Windows CCS, and as they become more affordable, HRG expects a significant increase in the adoption of Windows based HPC by net new accounts principally in the SMB, workgroup, and departmental computing sectors.

WCCS running on 64 bit multi-core AMD/Intel based clusters offers access to the underlying raw compute speed, ease of implementation, and ease of use that many have dreamed of for a fraction of the Total Cost of Ownership (TCO) of more complicated Linux and Unix based HPC solutions. WCCS shields users from the underlying complexity inherent in more traditional previous generation MPI based HPC clusters.

Whether the application is ANSYS Fluent on Linux or Windows the application is the same. Now with the HPC ISVs porting their applications to WCCS, users will no longer have to make application choices based on the operating system. Customer experience and application availability will increasingly dictate the operating system choice.

Today, WCCS users can run a Wizard to install hardware in much the same way that they would use a Wizard on a Windows desktop to install a new printer. With regard to HPC the user can point and click to select a network to be used for MPI traffic as well as the network to be used for management traffic from the Windows CCS installation and configuration wizard.

The WCCS ISV Ecosystem

Some key members of Microsoft's software ecosystem are listed in the following two tables

Applications

ABAQUS	ANSYS	The Bio Team	CD-Adapco
Dassault Systems	Digipede	ESI Group	ANSYS/Fluent
Landmark	LSTC	Macrovision	The MathWorks
Mecalog Group	MSC Software Corporation.	Parallel Geoscience Corporation	Platform Computing
Schlumberger	Wolfram Research		

Tools & Utilities

Absoft	The Portland Group	AMD	Broadcom
Cisco	Dolphin	Foundry Networks	Intel
Mellanox	Myricom	QLogic	SilverStorm
Voltaire	PolyServe		

Customer Experience

Microsoft has worked successfully with customers running ANSYS/Fluent. Recently one customer decided to install a new cluster and initially thought that they would have to hire a Linux administrator specifically for that cluster thereby significantly increasing the effective cost of the cluster. After Microsoft made their announcement with ANSYS Fluent that they would offer a Windows version of ANSYS Fluent, this customer decided to give it a try and within two weeks they were able to get the new cluster up and running while leveraging existing Windows infrastructure and support staff to manage the cluster. The result was a negligible (almost zero) additional support cost for the new cluster and a significantly lower effective TCO than a similar Linux cluster running ANSYS Fluent would have delivered.

Microsoft is also working with large enterprise customers in the Aerospace and DOD sectors that have an established Linux HPC environment in place to support many of their HPC requirements. However, in many cases there is a large opportunity for departmental clusters where the technical professionals are primarily running Windows on the desktop. These organizations may have top secret requirements with the government where it can take as long as 6 months to get a newly hired Linux systems administrator cleared for security. Typically they will already have Windows system administrators with security clearances on staff that can be utilized to manage a WCCS cluster. This allows them to purchase and install WCCS clusters right away rather than having to wait to get a special administrator who knows both HPC and Linux cleared for security purposes. Microsoft sees a number of new opportunities in this segment as well as with smaller companies that may be using Windows workstations today and have not considered clusters in the past. Previously these users have thought, "Its Unix it's too complex we're a small shop." Now they can install a 4 to 8-node WCCS cluster, manage it with minimal overhead, reduce the time to produce results (insights), and significantly improve productivity.

The CAE environment represents yet another good opportunity for Microsoft. There are design shops in the aerospace, automotive design, and manufacturing sectors where simulation is being pushed out to suppliers. These suppliers now have to do the simulations and many are using Windows desktops to run CAD applications and some MSC Nastran, and ANSYS jobs. Now that they are being asked to do more simulation, these shops are realizing that they could benefit by having a cluster to run the increased workloads and free up their workstations for other tasks. This scenario represents only a portion of the available workgroup HPC opportunity.

Regarding the higher end of the departmental computing opportunity today, Microsoft claims a number of large clients in the financial services industry and the Oil and Gas industry (seismic processing) that are running

Windows on thousands of nodes. In a number of cases they are using custom applications and their own custom job schedule running successfully on top of the Windows platform. Rather than using off the shelf job schedulers from vendors like Microsoft these clients build customized applications on the Windows Server operating system.

WHY HP?

HP's High Performance Computing Division, along with the HP Industry Standard Server Division, work together across a range of partner driven applications in support of Microsoft. About three years ago HP began working with the major application providers, ANSYS Fluent, MSC Software Nastran, LS-Dyna, and StarCD, to test those applications on 64-bit Windows, providing customers the confidence that the hardware and software stacks they purchase are interoperable. HP was also interested in the performance differences that may be discovered when moving from Linux to Windows and have told HRG that they found negligible differences in performance for several key applications they benchmarked. .

HP in its partnership with Microsoft hosts a 64-node dual-core HP ProLiant DL145 cluster with Voltaire and Mellanox InfiniBand interconnects and three 16- to 32-node HP BladeSystem blade and rack-mount server Clusters in its ISS HPC Resource Room – http://www.hp.com/go/hpc-resource-room. These clusters are dedicated to Microsoft and HP's internal ISV validations as well as external ISV and customer use for proof of concepts, benchmarking, and customer proprietary and ISV code migration. This service provided by HP in support of Microsoft demonstrates the commitment and strong partnership HP has with Microsoft.

HP Servers and the HP OEM version of WCCS

WCCS is available for purchase as an HP factory pre-installed option, or on CD media only, with HP Cluster Platform or Cluster Platform Express. This must be done at the time of purchase of the server.
In cases where customers want to build and configure a high-performance compute cluster by themselves, they can order WCCS from HP as a factory installed option (either pre-installed or CD media only) for each individual ProLiant server they order. Customers will also need the required networking infrastructure, and will be responsible for configuring the cluster to meet the WCCS requirements. If customers want a fully configured system, including servers, racks, interconnects, cabling, and power, they should purchase WCCS from HP using HP Cluster Platform or Cluster Platform Express.

The HP OEM version of WCCS includes a third CD with HP documentation, scripts and utilities. This version of WCCS includes HP-MPI and Voltaire InfiniBand drivers (the licenses for HP-MPI need to be purchased separately). HP-MPI uses enhancements whenever appropriate to provide low latency and high bandwidth point-to-point and collective communication routines. It supports multi-protocol execution of MPI applications on clusters of shared-memory servers so that applications can take advantage of the shared memory for intra-node communications. HP-MPI is a viable alternative for customers who are familiar with using HP-MPI with Linux or Unix. The Voltaire GridStack for Windows provides support for customers using high-speed InfiniBand interconnects.

Also included in the HP OEM version of WCCS are custom installation scripts and supporting documentation. HP can pre-install and integrate Windows CCS on HP Cluster Platforms CP3000, CP4000, and Cluster Platform Express (CPE) clusters as well as on standalone servers for those who want to build their own cluster.

One option provided by HP for customers who have rapid scale out requirements for Windows clusters is a preconfigured HP Cluster Platform, stand alone server, or HP Cluster Platform Express offering that is ready for installation. For those HPC customers who just want to "set it and forget it" they now have a single call to make to get support for servers, OS, and cluster software. These benefits combine to provide a more productive environment for knowledge workers and a shorter time to insight when problem solution is on the critical path.

Conclusion

The world is changing for high performance computing users. Microsoft's entrance in the marketplace with WCCS opens up a whole new world of possibility for users who previously were either reluctant or unable to deal with a dual operating system strategy either in small business, departmental operations, or large enterprises. The introduction of WCCS opens the HPC market for personal parallel computing and single user or collaborative computing without having enterprise IT dictate their needs. Simple administration, ease of use, reduced TCO, enhanced productivity, and a single operating system for both the front and back end make WCCS a significant addition to the current HPC marketplace.

Prospective workgroup and departmental cluster users want a solid configuration that is easy to purchase, install, run and administer, and this need fits very well with HP's Cluster Platform Express offering. For many of these prospects a key challenge will be configuring their HPC applications on top of the cluster platform. HP and Microsoft as a team are very well positioned to meet these requirements.

http://www.microsoft.com/windowsserver2003/ccs/default.mspx is the MS Web Site for additional WCCS information.

Harvard Research Group is an information technology market research and consulting company. The company provides highly focused market research, consulting services, and business modeling tools to vendors and users of computer hardware, software, and services. For more information contact Harvard Research Group as follows:

Harvard Research Group™
P.O. Box 297
Harvard, MA 01451 USA
Tel. (978) 456-3939
(978) 925-5187
Fax (978) 263-0033

E-mail: hrg@hrgresearch.com
http://www.hrgresearch.com