ADVANTAGES OF RUNNING ORACLE11G ON MICROSOFT WINDOWS SERVER X64

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INTRODUCTION

Microsoft Windows has long been an ideal platform for the Oracle database server. Oracle has always fully supported Microsoft Windows and has added Windows- only features to Oracle. This trend has continued with Oracle 11g. In some respects, the choice of the Operating System (OS) is irrelevant and in other situations very important. This choice may depend on several variables, some technical and others business oriented. One may find that Microsoft Windows provides advantages in some environments, and disadvantages in others. Introducing a new OS into an existing Windows infrastructure for the purpose of running a single application such as Oracle, is no small task and can cause unforeseen problems, such as require additional staff or training. Similarly, installing Oracle on Windows in an exclusively UNIX environment can pose similar problems. This paper highlights some of the advantages of running Oracle on the Windows 64-bit operating system. In addition, it addresses some of the basic issues and factors to consider when choosing to deploy a new operating system, such as Windows.

ADVANTAGES OF RUNNING ORACLE 11G ON WINDOWS

Oracle was the first database to run on Windows NT and Itanium Windows, as well as the first to support a 64-bit database on the Windows x64 platform. Oracle continues to support the Windows platform with Oracle11g and includes features which are exclusive to this operating system.   Since it's costly to re-train personnel on the use and management of a new operating system, many IT managers, choose to further leverage the expertise and knowledge of their existing staff. In many cases, this option is cost effective and technically prudent; however, corporations often have mixed environments, where the additional features available on Windows present a strong argument for implementing a Windows-based solution.

EASE OF USE

Oracle installation and configuration is very straight-forward on Microsoft Windows. Because updates to Windows are carefully controlled, Oracle does not require special libraries, packages or options in order to install correctly. This combined with an intuitive interface and features that are easy to use make Windows an ideal host for Oracle databases.

WINDOWS AUTHENTICATION

Oracle 11g authentication has been further integrated with Windows authentication. It is now only necessary to log into the Windows domain. Connectivity to the Oracle database(s) is implemented using Windows authentication. This provides a single point of security, thus enhancing and simplifying Oracle security. This feature is noted later in this paper as a "Windows Only" feature.

PERFORMANCE

Oracle on Windows provides excellent performance as compared to other operating systems running on the same or similar hardware. Oracle was originally designed to run on Windows using a thread model. With the thread model, all Oracle "processes" such as server and background processes run as Windows threads. This approach originally turn out to be a problem for large Oracle on Windows installations, but with the introduction of Oracle for 64-bit Windows, this design proved beneficial in improving database performance.

THREAD MODEL

Using the Windows thread model, all Oracle processes, such as server and background processes, run as Windows threads. As threads, they all share the same virtual memory space, thus reducing the need for process switching. This approach proves an important benefit, because thread switching is more efficient than process switching; however, this inadvertently causes a virtual memory problem. Since the oracle.exe process runs as one process with multiple threads, it is limited to the virtual memory available to a single process, in the case of 32-bit Windows, this is 4 GB. Since all threads share the same 4 GB of virtual memory address space, Oracle would run out of virtual memory address space at about 300 sessions. This is a severe limitation for customers who ran Oracle on 32-bit Windows. So, the thread model turned out to be both an advantage and a disadvantage. Fortunately, this is solved with 64-bit Oracle for 64-bit Windows.

The introduction of 64-bit Windows provides two major benefits; physical memory addressing, and virtual memory addressing. The limitations that caused virtual memory problems have been reduced since the virtual memory size has been increased. This is shown in the following table:

	32-bit Windows Server	64-bit Windows Server
Virtual Memory size	4 GB Total 2 GB kernel /2 GB user or 1 GB kernel / 3GB user with the use of the /3GB flag	8 Terabytes kernel 8 Terabytes user
Physical Memory Limitations	64 GB	1 Terabyte (now) More (later)

By taking advantage of 64-bit hardware, the disadvantages of the Oracle for Windows thread model has been eliminated, thus providing a high-performance database for Windows.

Note: It is highly recommended by Oracle that Oracle on Windows be implemented using 64-bit technology. If you're currently running Oracle on a 32-bit hardware, we recommend you upgrade as soon as possible to 64-bit technology.

LARGE PAGE SUPPORT

For large memory systems Oracle 11g for Windows supports Large-Pages. With Large Pages the Oracle SGA can be configured to use a 2 MB page size rather than the default 4 KB page size. This reduces the number of page table entries required and makes better use of the Translation Lookaside Buffer (TLB). The use of Large Pages improves Oracle performance with large amounts of memory. Large Pages are enabled by setting the ORA_LPENABLE=1 registry parameter under the Oracle key.

WINDOWS PRIORITY AND AFFINITY ENHANCEMENTS

With Oracle 11g the database server has been enhanced to allow for more fine grain tuning. By modifying the ORACLE_PRIORITY registry key, it is possible to individually set the thread priorities for each Oracle background process. Modifying the ORACLE_AFFINITY registry key allows the administrator to assign threads or the entire oracle process to a particular processor. ORACLE_AFFINITY is set by default when running on a NUMA system.

Another advantage of Oracle on Windows is the ability to run on commodity hardware available through a vast choice of hardware vendors. Commodity hardware provides reasonable prices and also encourages competition, not only among the hardware system vendors, but among the CPU chip vendors as well. In today's market it is increasingly difficult to find a server that is not 64-bit capable. A 64-bit server is flexible and capable of running in 32-bit mode or 64-bit mode, depending on the version of the OS is installed.

> Note: It is always recommended to run production databases on well-known, reliable server brands with proven support.

WINDOWS FEATURES OF ORACLE 11G

There are a number of features of Oracle11g that are specific to the Windows operating systems. These features are designed to make integration with and development for Oracle easier on the Windows platform. These features include .NET integration, security, IIS support and Oracle Fail-Safe.

.NET INTEGRATION

Oracle with Visual Studio integration, greatly improves development productivity by reducing the time it takes to develop and build .NET applications using Oracle. Another benefit for the developer is the integration of Oracle PL/SQL debugger into Visual Studio, allowing .NET code and PL/SQL debugging without having to leave Visual Studio. Native integration is also provided with ADO.NET 2.0 using the Visual Studio development environment. This gives ADO.NET developers the flexibility to build one set of code that works with multiple database vendors' software. This integration also provides the developer the ability to code and debug code faster within the Windows-based toolset. Below are some of the tools included in the toolset.

- Oracle Developer Tools for Visual Studio. This free toolset is powerful and easy to use.

- Oracle Data Provider for .NET. This free add-in allows native access to Oracle from .NET.

- Oracle Data Extensions for .NET. This allows coding Visual C# or Visual Basic procedures for Oracle.

These tools provide for easy, quick and robust development for Oracle on .NET.

SECURITY

Oracle 11g for Windows provides a robust range of security and auditing options. Security is achieved by providing the same functionality, although configured slightly different, as features on the various supported Linux and UNIX platforms. This ensures consistency in building a company's core security and compliance requirements.

WINDOWS SPECIFIC SECURITY FEATURES

Security Options and configuration techniques specific to Windows include:

- Oracle's Native Authentication Adapter for use with Microsoft Active Directory Services

- Certificate-based authentication, possible through the use of Oracle database wallets which can be stored in the Windows client registry for added protection

- Microsoft Certificate Store Integration

- Kerberos implementation interoperates with Microsoft key distribution center

The Sarbanes-Oxley Act of 2002 (SOX) regulates internal controls used for corporate information of publicly traded companies. However, most public and privately owned companies today are pursuing cost-effective compliance readiness. Whether compliance is regulated or self-imposed, Oracle 11g on Windows incorporates innovative configuration and data protection options to provide compliant and secure data.

Secure by Default is a collective out-of-the-box set of security features. These include increased password protection with complexity checking, secure file permissions, optional default audit settings, and new controls on network callouts from the database. The built-in password protection encrypts passwords using the Secure Hash Algorithm cryptographic hash function.

AUDIT BY DEFAULT

Auditing is the monitoring and recording of selected user database actions. Auditing is a way of enabling future accountability for current actions taken in a particular schema, table, or row, or affecting specific content within an Oracle database. Auditing is an important part of the security layer. Accountability thru database auditing has gained visibility through public and private regulations, such as Sarbanes-Oxley Act (SOX), Health Insurance Portability and Accountability Act (HIPPA), Federal Information Security Management Act (FISMA), and Payment Card Industry Data Security (PCI DSS).

New in Oracle 11g, Audit by Default automatically configures the database for auditing and turns on auditing for database connections.

WINDOWS IIS SUPPORT

Whether you choose to use Oracle's application server or Microsoft Internet Information Services (IIS) for web services, both are fully supported. This allows a corporate Windows environment to standardize on one web server throughout the enterprise. Microsoft IIS can be used and easily integrated with Oracle and includes support for Microsoft ASP.Net.

ORACLE FAIL-SAFE

Oracle Fail Safe is a Windows-only feature of Oracle Database 11g that provides High Availability for business solutions deployed on Windows clusters. A cluster provides a redundant set of hardware that can immediately take over in the event of a system failure. This provides for a level of high-availability and quick recovery in the event of a system failure at a fairly low cost. Oracle Fail Safe operating in an active/passive role works with Microsoft Cluster Services to ensure that if a failure occurs on the active server in the cluster, the workload will automatically fail over to the surviving passive server.

ORACLE RAC

Oracle RAC option is designed to tolerate server failures with relatively no impact to mission critical applications and its users. As workloads and user connections are increased, additional nodes (servers) can be easily added to the cluster. Scalability and High Availability is the cornerstone of this flagship product utilizing all nodes in the cluster in an active/active configuration – all nodes can access the same database simultaneously. In addition, Oracle RAC 11g new features provide enhanced support for XA transactions in RAC environments, fine-tuned performance, new advanced fault diagnostics, and increased privileges for Automatic Storage Management (ASM), to name a few. Enhancements to the monitoring and diagnostics within Enterprise Manager benefit junior technical staff by providing an easy graphical user interface to depict the state of the cluster and the ability to drill-down into problem areas. Although RAC is not a Windows specific feature, it is fully supported on Microsoft Windows.

ORACLE DATA GUARD AND ACTIVE DATA GUARD

Oracle Data Guard is an efficient comprehensive Disaster Recovery and High Availability solution which provides availability, data protection, and recovery for enterprise data from site outages due to planned downtime, disasters or failures. A Data Guard configuration consists of one production database and one or more standby databases. The databases in a Data Guard configuration are connected by Oracle Net and may be in multiple geographic locations. There are no restrictions on where the databases are physically located, provided they can communicate with each other. Oracle Data Guard's SQL Apply (used with Logical standby database) and Redo Apply (used with Physical standby database) are included with the Oracle Enterprise Edition software.

In Oracle 11g, the new add-on option Oracle Active Data Guard is one of this release's best ROI. With Active Data Guard, the Physical standby database can be open for real-time queries while Redo Apply is active. Oracle Active Data Guard enhances the Quality of Service (QoS) for production databases by off-loading resource-intensive operations to one or more standby database. With Oracle Active Data Guard, a Physical standby database can be used for real-time reporting, with minimal latency between reporting and production data. Active Data Guard also allows backup operations to be off-loaded to the standby database, and allows for very fast backup speeds by using incremental backups.

WHY RUN ORACLE 11G ON WINDOWS?

This paper has discussed a number of advantages of running Oracle on Windows, including a number of Windows-only features in Oracle11g. The choice of which hardware or OS to run is often influenced by factors that are non-technical in nature , such as integration with the current environment, allocation of personnel, or performance, and cost.

INTEGRATION

One of the most compelling reasons to run Oracle on Windows is experience with the Windows OS. If you are in an environment with a number of Windows administrators and no UNIX administrators, it may be more efficient and cost-effective to utilize the existing Windows expertise. Also, if your security model revolves around Active Directory, you should consider running Oracle on Windows to maintain the existing security infrastructure.

PRICE-PERFORMANCE

Microsoft Windows is proven to be one of the most cost-effective OS platforms. This is not only because of the value of Windows, but the fact that it runs on commodity hardware, resulting in excellent price-performance. In fact, the number one place in price-performance for the industry standard TPC-C benchmark is currently held by an Oracle 11g on Windows Server x64 solution. (See http://tpc.org/tpcc/results/tpcc_price_perf_results.asp).

SUMMARY

The Microsoft Windows operating system is a proven operating system platform for Oracle. Since the early days of Windows, Oracle has fully supported Windows and continues to introduce new features and technology improvements into its flagship database products for Windows. Oracle on Windows is designed for performance, stability, and integration into existing Windows infrastructures. The introduction of Microsoft Windows 64-bit along with Oracle 64-bit has enabled Windows to fully support large databases that are important in growing enterprise environments. In addition, Oracle's continued work with Microsoft on integrating key components, such as .NET development tools, security, and Microsoft IIS features into the database further demonstrates Oracle's commitment to Windows as a serious computing platform.

As this paper has illustrated, there are often many considerations when choosing an OS platform. The decision and choice of what operating system to adopt may depend on your existing hardware and software infrastructure, resource and training requirements, availability versus performance trade-offs, and other financial and business requirements. Whatever path you choose, Oracle running on Windows will continue to grow and scale to meet the needs of the most demanding environments now and in the foreseeable future.

ABOUT THE AUTHOR

Edward Whalen is CTO and founder of Performance Tuning Corporation (www.perftuning.com). Performance Tuning Corporation (PTC) is a technology service company that designs, implements and optimizes database systems and applications for companies worldwide. PTC differentiates itself through its holistic approach to system analysis and performance tuning. Some of PTC services include: performance tuning, application workload testing, data migration, technical training, disaster recovery planning and implementation on Oracle and MS SQL Server. Edward Whalen is considered a leading expert and authority in performance tuning, high availability and disaster recovery.
Edward Whalen has written several books on both Oracle and MS SQL Server including:

> Oracle Performance Tuning and Optimization Teach
> Yourself Oracle8 in 21 Days
> Oracle Performance Tuning
> Oracle Database10g Linux Administration
> SQL Server 7 Administrator's Companion,
> SQL Server 7 Performance Tuning Technical Reference,
> SQL Server 2000 Administrator's Companion
> SQL Server 2000 Performance Tuning Technical Reference
> SQL Server 2005 Administrator's Companion