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Compaq Data Center Solutions: Certified versus Compatible Applications

Abstract: The Microsoft Windows 2000 Datacenter Server operating system is specifically designed for customers who require high-end server platforms with high reliability and stability. With such importance being placed on stability, Compaq and Microsoft established new qualification processes that expand current hardware compatibility requirements. These processes, including the Microsoft Windows Hardware Quality Lab’s Hardware Compatibility Test and the Certified for Microsoft Windows logo program, have established application testing guidelines for the Microsoft Windows 2000 Datacenter Server operating system. The logistics and terminology of these programs sometimes cause confusion about what is required to ensure that an application will run on the operating system.

To understand application availability on the Datacenter Server operating system, it is essential to know which tests are required and which tests simply add value. This white paper describes the differences between compatibility and certification, and explains when tests are required.

Help us improve our technical communication. Let us know what you think about the technical information in this document. Your feedback is valuable and will help us structure future communications. Please send your comments to: DataCenterCC@compaq.com

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Compaq Data Center Solutions: Certified versus Compatible Applications
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Compaq Data Center Solutions

The Compaq Data Center Solutions Program provides a combination of industry-leading ProLiant servers, StorageWorks enterprise storage, high availability solutions and advanced clustering technology, enterprise management tools, industry-leading lifecycle services, and optimized partner solutions to deliver enterprise-class reliability and stability. The Microsoft Windows 2000 Datacenter Server operating system, which is designed for the most demanding levels of availability and scalability, is included in Compaq Data Center Solutions.

The cornerstones of the Compaq Data Center Program are scalability, reliability and stability, availability, and support.

Program Cornerstones	
<p>Scalability</p> <p>Scale up or scale out options to meet your needs for growth.</p>	<p>Reliability/Stability</p> <p>Stringent certification and change management processes to ensure utmost reliability on deployment and stability in ongoing operations.</p>
<p>Availability</p> <p>High availability server and storage features and up to 4-node disaster tolerant cluster configurations to support business-critical applications.</p>	<p>Support</p> <p>Comprehensive service offerings and a joint Compaq and Microsoft support team to offer unparalleled hardware and OS support.</p>

Application Compatibility and Certification for the Data Center

Applications that run in a Microsoft Windows 2000 Datacenter Server environment are often mission-critical and require high levels of platform availability, scalability, and reliability. Some examples include large data warehouses, econometric analysis, large-scale simulations in science and engineering, online transaction processing (OLTP), and server consolidation. Windows 2000 Datacenter Server is designed for enterprises that need very reliable high-end servers, options and software. In order to get the most optimized applications for your mission critical environment, applications should be able to meet the following requirements:

- Utilize high Physical Address Extension (PAE) memory.
- Operate correctly while under control of Job Objects.
- Scale up on large SMP systems.
- Demonstrate stability under stress.
- Data Center application vendors should also:
 - Provide debug symbols or the equivalent.
 - Document and commit to providing enterprise-caliber 24 x 7 support.

Windows 2000 Datacenter Server is a member of the Windows 2000 product family. As such, an application written to the Windows 2000 APIs works on Windows 2000 Datacenter Server, just as it works on any other member of the operating system family.

Validation of Applications for Windows 2000 Datacenter Server

There are three testing programs for Data Center applications. They are presented in the following sections in order of associated reliability ranking (lowest to highest).

Compaq Data Center Application Compatibility

Data Center applications are required to be compatible with and fully supported on Windows 2000 Datacenter Server.

Applications that run on Microsoft Windows 2000 Server and Microsoft Windows 2000 Advanced Server also run on Windows 2000 Datacenter Server. In most cases, no further steps are needed to validate that the application is compatible with Windows 2000

Datacenter Server. Microsoft maintains a searchable index of Windows 2000 Compatible Software Applications on their website at <http://www.microsoft.com/windows2000/professional/howtobuy/upgrading/compat/search/software.asp>. For additional information about compatible and certified applications, refer to <http://www.microsoft.com/windows2000/datacenter/evaluation/business/isvlive.asp>.

Windows 2000 Datacenter Hardware Compatibility Test

Applications with kernel-mode drivers must pass the Datacenter Hardware Compatibility Test.

Kernel mode drivers have the potential to crash the system and compromise security and integrity of the system. It is critical that any kernel-mode application (often referred to as kernel-touching applications, such as anti-virus products, and disk and tape

management) be thoroughly tested in the Windows Datacenter Program Hardware Compatibility Test (HCT). The HCT is a rigorous 7-day stress test administered at the Compaq Data Center Solutions Lab in Bellevue, Washington. See <http://www.compaq.com/solutions/datacenter/application.html> for kernel-mode applications that have been tested by the Compaq Data Center Certification lab. See <http://www.microsoft.com/hwdev/driver/driververify.htm> for more information on using the Driver Verifier Manager and diagnosing driver problems.

For server platforms to be placed on the Microsoft Datacenter Hardware Compatibility List (HCL), the following Windows Datacenter components must be tested over an extended period:

- All hardware components
- All hardware drivers
- All software that works at the kernel level, including virus software, disk and tape management, backup software, and similar types of software

Microsoft requires participating vendors to demonstrate that they meet or exceed 99.9 percent scheduled availability. For further information about hardware compatibility testing refer to the [What is Datacenter Certification?](#) section below.

Windows 2000 Datacenter Application Logo Certification

Logo certification is an optional program that provides the highest level of reliability ranking for Windows 2000 Datacenter applications.

The Logo Certification program was created with the specific objective of driving the creation of applications that are designed, tested, and optimized to run on Datacenter. It is a functional test process conducted by an independent third party who certifies that an application will run well on the Datacenter platform. It includes exclusive testing on a Compaq ProLiant 8500 8-way, 4-node cluster platform. The [Application](#)

[Specification](#) for Windows 2000 defines the technical requirements for applications to earn the “Certified for Microsoft Windows” logo. When an application meets the standards in the Windows 2000 Datacenter Application Specification, this means that it is optimized for Windows 2000 Datacenter and it has passed certification tests conducted by an independent third party, VeriTest (http://www.veritest.com/mslogos/windows2000/Win2k_datacenter.asp).

For additional information regarding how applications are tested for the “Certified for Windows” logo, see <http://msdn.microsoft.com/certification>.

Microsoft Windows Hardware Quality Lab Certification

What is Datacenter Certification?

Microsoft Datacenter Certification is the process of running a series of tests in an environment that represents a system platform a customer is likely to run. The traditional Windows testing process only exercises hardware interactions with the operating system in isolation. These tests do not take into account the integration of all the hardware and software components required to run a system under stress. It is this lack of integration testing that typically has caused NT system stability issues.

Being granted Microsoft Datacenter Certification status means that the system platform, comprised of hardware, OS, and kernel-touching applications, has passed a Microsoft test that is intended to ensure that there are no hardware compatibility issues. There are two parts to the test: a hardware compatibility test and a stress test.

Certification provides three benefits for the customer:

1. Confidence in the platform and operating system.
2. Confidence that hardware and kernel-mode software will not interfere with kernel OS integrity.
3. Confidence, because of rigorous configuration and change control, that product updates will not compromise OS integrity.

Why Certify the System?

Microsoft discovered that 43% of NT 4.0 Blue Screen failures were caused by non-operating system kernel-mode components.

Microsoft studied the causes of “Blue Screen” failures in NT 4.0 servers and discovered that 43% were caused by non-operating system kernel-mode components. Kernel-mode components include device drivers, anti-virus software, archive software, and other software components.

Normally, OS kernel code has exclusive access to certain system resources, such as areas of memory reserved for the kernel. Generally applications do not have direct access to these resources but communicate with the OS via APIs (Application Program Interfaces). Kernel-mode applications are those that have privileges to access these resources of the OS; for instance, they can change contents of memory that is shared with the OS Kernel. Due to this interaction, these applications have the potential of disrupting the OS which could result in various failures. Blue screens are the most predominant and disruptive of these failures.

One way to minimize the problems caused by kernel-mode components is to rewrite applications to remove these components. Where this is not possible, the interaction between kernel-mode

components can be identified by thoroughly testing complete servers (including applications, drivers, and hardware), which is the approach taken by the Windows 2000 Datacenter Server Program.

To ensure stability for servers running Windows 2000 Datacenter Server, the key is testing over an extended period of time. Microsoft has defined a test suite that consists of a server (the Compaq ProLiant 8500 Data Center) running Windows 2000 Datacenter Server and 8 client workstations. This test suite must successfully run the Microsoft Hardware Certification Test (HCT) for 7-14 days without a single fault, depending upon the configuration. The requirement for system platforms running Windows 2000 Datacenter Server is to achieve 99.9% or better planned availability.

Why 14 or 7 Days?

The certification process requires a test period long enough to statistically confirm that 99.9% system availability has been achieved. The 14-day test period is the statistically confirmed test period for 99.9% availability of a new base hardware platform. Once the base hardware platform is established, it is sufficient to run the software application tests, such as a network controller or an anti-virus product, for 7 days to confirm that no anomalous behavior has been introduced.

Empirical studies of Windows NT/2000 failures show that the mean time to recover from a failure is approximately 20 minutes. To achieve 99.9% availability, a Windows 2000 Datacenter Server must have a mean time between failures (MTBF), under normal customer load, of 13.875 days. Microsoft designed the Windows 2000 Datacenter Server test to be 3 times normal customer load; this means that the MTBF under test load must meet or exceed 41.625 days.

What Must Be Certified?

For systems running Windows 2000 Datacenter Server, Microsoft requires that any platform configuration shipped to a customer must be certified in accordance with the Windows Datacenter HCT Specification. The configuration must include:

- All hardware components
- All drivers
- All software that contains kernel-mode (kernel-touching) components

Running uncertified applications containing kernel-mode components on a certified configuration may compromise reliability, therefore no availability guarantee will be provided for these configurations.

The certification test must include every item mentioned above, whether supplied by Compaq or another vendor. Customers should work with Compaq to define certified configurations that meet their needs.

Performing certification tests for every possible combination of products would be prohibitively expensive, as well as impractical. The Hardware Compatibility Test specification states that, if a configuration passes the certification test, any subset of that configuration is also certified. Compaq is able to load several peripherals and applications onto a single large scale (8-way server with 16 GB memory) ProLiant 8500, creating a superset. As long as all the components in the superset configuration can coexist, Compaq runs a single test that covers a large number of potential configurations.

In addition, the Microsoft test only uses the drivers, so if a configuration with a single network interface card passes the test, the customer could install several of the same type of card without needing to re-certify. While not an exhaustive behavioral test, this approach, along with all the other engineering testing that products undergo before they are considered for Data Center Solutions, has been shown to be an effective validation of real world deployments.

How Do We Certify?

Compaq has established a dedicated certification lab in Bellevue, Washington, where we complete each certification with the following responsibilities:

- Set up the Windows Datacenter test programs and Windows Datacenter servers.
- Successfully completing all Windows Datacenter program HCT for the required length of time (14-day test on the initial configurations).
- Submit the resulting logs to the Windows Hardware Quality Lab (WHQL) for review and approval.
- Submit the system configuration file that is automatically created testes server and include it with the logs that are sent to WHQL. It is WHQL who will review the test logs and maintain the list of approved Windows Datacenter Program configurations.

The Microsoft certification program for servers running Windows 2000 Datacenter Server requires that:

- All kernel drivers must pass driver compatibility testing and be digitally signed.
- Any kernel driver installed on the server is tracked by date and version and cannot be changed without updating the Windows Datacenter configuration file.
- Initial Windows Datacenter program HCT must run continually for 14 days without failure.
- Updated Windows Datacenter configurations require a 7-day test.
- If large memory (using Physical Address Extensions, or PAE) support is used, the driver must pass the PAE tests.
- Servers must be tested with maximum number of processors and memory.

The Windows 2000 Datacenter Server Hardware Compatibility List (HCL) will only contain the specific configurations that have successfully completed and passed the Windows Datacenter program HCT.

What About Change Control?

The Compaq Engineering process to track, test, and certify all changes prior to release is change control.

Compaq provides customers with a complete Datacenter Server product that has been well tested on the current versions of Windows 2000 Datacenter Server. Servers must be recertified with every Microsoft Windows 2000 Datacenter Server patch or service pack, or change in processor type, peripheral adapter, driver, or application with kernel-mode components. When the new Windows Datacenter configuration is available, the previous configuration is still valid, which allows customers to retain configurations they are comfortable using in their environment.

Upgrading to a new configuration or service pack should be done after the customer has reviewed their requirements and system availability with Compaq. The Compaq engineering team refreshes the list of Compaq certified configurations on a periodic basis (approximately every 6 months) to incorporate problem resolutions and new features or products. These periodic refreshes include fixes, updates, and new versions that have been released by Compaq and various vendors participating in the Compaq Data Center Program. The Compaq release cycle is a strict, controlled engineering process designed to ensure high reliability and offer guaranteed system availability. The Compaq Engineering process to track, test, and certify all changes prior to release is *change control*.

The Joint Support Queue (JSQ) is also part of the Compaq change control process for the hardware and OS. In the case of a critical problem, the JSQ can authorize a customer to install a hot fix prior to certification, a change that would otherwise take that system out of certification. This authorization is, however, preceded by JSQ testing to ensure it will not impact the customer's system availability. In this case, the JSQ "flags" the hot fix for that specific customer and then deem that the system is "certified" with that particular hot fix. The JSQ then passes the hot fix to the Compaq Engineering team to ensure that it is included in the next round of certification tests. Upon certification of that hot fix, the JSQ re-releases it to the customer and the customer's system is considered officially certified once again. The value of this process is that Compaq supports the customer from start to finish when implementing a hot fix.

The Compaq Data Center Partner program extends the change control process to our ISV partners through coordinated change management processes (based upon Microsoft Operation Framework and ITIL standards), and a commitment from the software vendor to provide enterprise-level, 24x7 support for their application on the Compaq Data Center platform.

For more information about Compaq's unique Data Center change management program, refer to <http://www.compaq.com/solutions/datacenter/chgmanage.html>.

What Should Customers Do?

The key to installing and maintaining highly reliable Windows 2000 Datacenter servers is good initial planning, operating procedures, and change control. Prior to installing a Windows 2000 Datacenter Server, Compaq Global Services will work with customers to:

- Identify workloads and servers they are going to run with Windows 2000 Datacenter Servers.
- Determine the specific hardware configuration for these servers, including all required adapters.
- Identify all the installed non-Microsoft kernel drivers required for these systems.
- Create a certified configuration.
- Identify patch and Service Pack plans and policies.
- Ensure that change control and operation procedures for maintaining certified configurations are in place.

Once the desired configuration has been identified, Compaq will ensure that the customer has a Windows 2000 Datacenter certified configuration. Windows Datacenter Server configuration files are available on both the Microsoft WHQL website and the Compaq website, and can be downloaded from either website to check system configurations.

How Do You Identify Kernel-Mode Components?

You have several options when determining whether your configuration has kernel-mode components.

- Ask the vendor of the application.
- Ask your Compaq Technical Account Manager (TAM).
- Check your system settings.
 1. Go to Start | Programs | Administrative Tools | Computer Management.
 2. Expand System Information and Software Environment to open the Drivers folder.

This will list all device and file system drivers (see Figure 1 below). Kernel-mode components are indicated with Kernel Driver in the Type column.

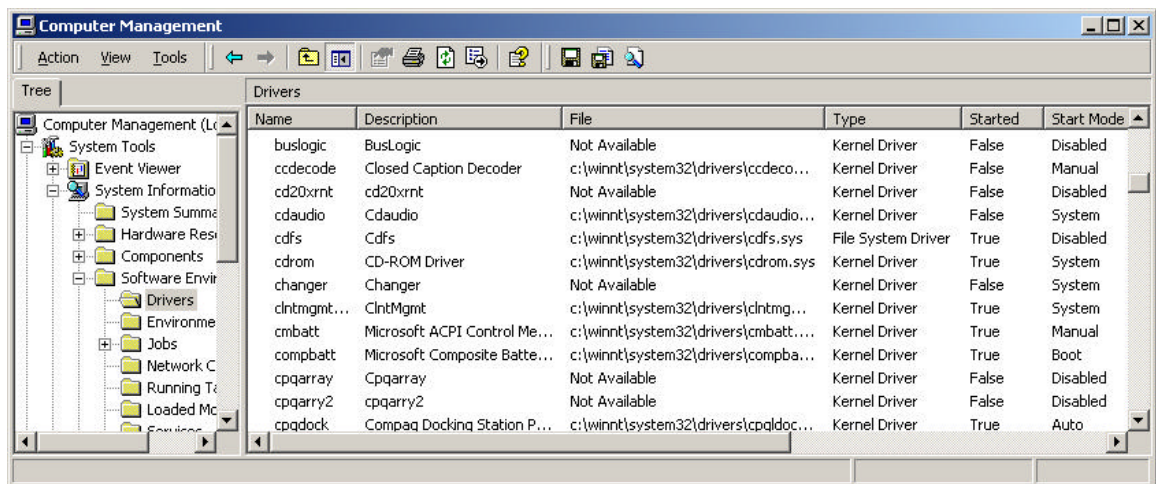


Figure 1. Device and file system drivers window.

What if Customers Want to Use Non-certified Products?

Hardware

In order to remain in a certified and supported configuration, only option cards or hardware certified for a specific Data Center configuration may be added to the system. This policy provides the customer with a solid, reliable base platform. If there is an option card or hardware that the customer wants that has not been certified, the customer should contact their Compaq Technical Account Manager (TAM) to begin the customer-driven certification process.

Software

Customers may run any application supported by its vendor on the Compaq Data Center platform (Windows 2000 Datacenter Server on the ProLiant 8500 Data Center server). A few of the vendors who support applications on our platform include SAP, Oracle, SAS, JD Edwards, and Lotus. If the application contains a kernel-mode driver, the application must be certified with the hardware configuration in a Hardware Compatibility Test (HCT) to insure stability. If the customer wants a kernel-mode application that has not been certified, the customer should contact their Technical Account Manager (TAM) to begin the customer-driven certification process.

Configuration Support

Compaq ships our Windows 2000 Datacenter Server solution within certified configurations and provides the level of support purchased for Windows 2000 Datacenter and the ProLiant 8500 under the Compaq Data Center Enterprise Support Plan (http://www.compaq.com/services/software/datacenter/dc_enterprise.html).

Certification is very important if Compaq is to offer any guarantee of availability because we need to minimize the risk of failure. Compaq has certified the leading products in the major areas, such as virus protection, enterprise systems management, and backup and restore software. The customer should consider using a product that has been certified instead of one that has not; however, we are always interested in addressing customer preferences, so customers should contact their Compaq Technical Account Manager (TAM) with specific requests.

How do You Verify that a Configuration is Certified?

Microsoft's Datacenter Configuration Manager tool (<http://www.microsoft.com/windows2000/zipdocs/cfgcmp.exe>) uses a "snapshot" of the system configuration to compare against other system configurations. Datacenter configurations can be verified by comparing customer system configuration collections against known certified Datacenter configurations maintained by the Compaq Data Center Support Center. If the customer configuration includes kernel-mode applications or options that are not on the Compaq Data Center certified list, they must be removed.

What is the Difference Between Microsoft Certification and Compaq Qualification?

Compaq qualification is performed to ensure that the ProLiant 8500 and attached components perform as designed in terms of functionality, ease of installation and use, basic performance, and stability. The products are installed, executed, and stressed using a variety of tools and measurement techniques. Compaq qualifies hardware and software products that are sold by Compaq. The products are qualified for a specific platform, such as the ProLiant 8500.

Microsoft Datacenter Certification gives the customer confidence that platform components interact together in the ProLiant 8500 Data Center environment. Certification does not test platform or component functionality, ease of installation and use, basic performance, and stability, as does the Compaq qualification process. In addition, certification does not imply support. The product vendor or manufacturer provides support for product functionality. Compaq provides support for the ProLiant 8500 Data Center system combination and interactions with external components.

Applications with kernel-mode components are qualified for the Compaq Data Center platform upon successful completion of the Hardware Compatibility Test (HCT) conducted by Compaq. Applications without kernel-mode components are considered qualified (without an HCT) if they have

- Successfully ported to and are fully supported on Windows 2000 Datacenter Server and are listed on the [Microsoft Windows 2000 Compatible Software Applications website](#); or,
- Completed proof of concept, benchmark or other testing on the Compaq Data Center platform; or, Completed the Certified for Microsoft Windows logo program. Compaq Solutions Centers are available to work with customers and partners in successfully planning,

deploying, and operating targeted solutions and provide facilities where solutions can be tested. See <http://www.compaq.com/solutions/centers> for more information.

What Products are Included in Certified Configurations?

The list of certified configurations will evolve as hardware and software products are released or withdrawn from the market. Compaq will select market-leading products in all major categories, but it would not be cost effective to certify every product available.

For details of ProLiant 8500 configurations that have been certified for the Compaq Data Center Solution, go to the Compaq Data Center website at <http://www.compaq.com/solutions/datacenter/certified-configurations.html>.

In addition, Compaq has evaluated a number of software products that require certification. The current certification status of these products is also available on the Compaq Data Center website at <http://www.compaq.com/solutions/datacenter/application.html#linkA>. Certification information is also available on the Microsoft Windows 2000 Datacenter web page located at <http://www.microsoft.com/windows2000/datacenter/HCL/default.asp#results>.

If customers are interested in deploying products that are not listed in the resources above, they are encouraged to contact their Compaq TAM or account executive and express their interests.

Conclusion

The Hardware Compatibility Test (HCT) is the only mandatory test for the Datacenter Server platform. It is required for all hardware components and it is only required of applications with kernel-mode components (which represent about 5% of all applications). All other software applications have the option of completing the Certified for Microsoft Windows logo program, which provides an added value of validation of the application functionality on the Datacenter Server OS. Compaq has gone above and beyond these requirements with our qualification and change control process and ISV Partner program. These processes and investments make Compaq's Data Center Solution the most reliable Windows platform in the industry.

Appendix – Resources

The table below lists useful Data Center resources that are referenced in this document.

Resource	URL
Compaq Data Center Program	http://www.compaq.com/datacenter
Compaq Data Center Solutions	http://www.compaq.com/solutions/datacenter/application.html
Compaq Data Center Enterprise Support Plan	http://www.compaq.com/services/software/datacenter/dc_enterprise.html
Compaq Change Management Program	http://www.compaq.com/solutions/datacenter/chgmanage.html
Application Specification for Windows 2000	http://msdn.microsoft.com/certification/appspec.asp
“Certified for Windows” Logo Program	http://msdn.microsoft.com/certification
VeriTest Logo Lab	logolab@veritest.com
“Certified for Windows” Logo email	winlogo@microsoft.com
Windows 2000 Developer information	http://msdn.microsoft.com/windows2000
Windows 2000 Compatible Applications	http://www.microsoft.com/windows2000/professional/howtobuy/upgrading/compat/search/software.asp
Microsoft Datacenter Hardware Compatibility List	http://www.microsoft.com/windows2000/datacenter/HCL/default.asp#results