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Microsoft Exchange and IIS Windows NT MSCS DIGITAL Server 3100

DIGITAL HiTest Notes

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Preface

This document provides an overview of DIGITAL HiTest Suites and detailed technical information about the Microsoft Exchange and Internet Information Server (IIS) Windows NT MSCS DIGITAL Server 3100 HiTest Suite. This information includes the HiTest AppSet, the HiTest Foundation, configuration details, installation instructions, tuning parameters, problems encountered and their solutions, tests and test results, and system diagrams. Together, a HiTest Foundation and HiTest AppSet (Application Set) comprise all of the components in a HiTest Suite. The HiTest Foundation includes the hardware, operating system, middleware, and database software. The HiTest AppSet contains a collection of software specific to one class of customer solutions.

The DIGITAL Server 3100 is a rebranded Prioris MX.

Audience

Primary users of this document are DIGITAL and Partners sales representatives and technical support personnel. Secondary audiences include product managers, customers, and the personnel responsible for installing, setting up, and operating a DIGITAL HiTest Suite.

Organization

This document is organized as follows:

Chapter Title	Description
Chapter 1 – Advantages of DIGITAL HiTest Suites	Provides a summary of the benefits of DIGITAL HiTest Suites and an overview of the Suite covered in this document.
Chapter 2 – About This DIGITAL HiTest Suite	Describes the specific characteristics of this HiTest Suite.
Chapter 3 – Configuration Data	Includes tables of configuration data about the hardware and software components that define the DIGITAL HiTest Template, and special configuration rules if any.
Chapter 4 – System Installation and Setup	Provides information for installing and setting up this DIGITAL HiTest Suite.
Chapter 5 – Tests and Results	Describes how the tests were set up including database organization, where data and programs were placed, and how the tests were run. It also describes system limits and characterization data.
Chapter 6 – Problems and Solutions	Discusses any problems and solutions that were discovered during testing.
Chapter 7 – Detailed Hardware Configuration	Contains more detailed information about the configuration of the hardware and software components listed in the Configuration Data chapter.

Customer Feedback

What our readers think of this or any other DIGITAL documentation is important to us. If you have any comments, we would appreciate hearing from you. Send your comments to: *reader-comments@digital.com*.

Please reference the complete document title and part number (EK-HMIND-HN. A01) in your correspondence about this document.

Ordering Information

Copies of this and other DIGITAL documents can be ordered by calling 1-800-DIGITAL.

This document and other HiTest documents can be downloaded from the DIGITAL HiTest web site, which also provides access to other HiTest information such as configuration tools and parts updates.

`http://cosmo.tay.dec.com/public/configsys/config_systems.htm`

You can also visit the Technical Support Center web page, which provides additional information such as pointers to benchmark centers and major technical training and events:

`http://cosmo.tay.dec.com` (Intranet)
`http://www.businesslink.digital.com` , then select Technical Support (Internet)

Related Documents

This document references the following manuals:

- *DIGITAL Server 3100/3200 Series System Reference* (order number ER-B42WW-UA)

  This document is provided with the DIGITAL Server 3100 system.

- *DIGITAL Server 3100/3200 Series Installation Guide*

  This document is provided with the DIGITAL Server 3100 system.

- *Digital ServerWORKS Quick Launch* (order number ER-4WY9A-IM)

  This document is provided with the DIGITAL Server 3100 system.

- *StorageWorks RAID Array 310 Configuration and Maintenance Guide* (EK-SMCS2-UG)
- *RAID Array 310 V3.1 for Windows NT – Intel Installation Guide* (EK-SMRAA-IG)
- *StorageWorks RAID Array 310 Users Guide* (AA-QU63C-TE)
- *Prioris XL 6000 Quick Reference Guide* (order number ER-B60WW-SR)

  This document is provided with the Prioris XL 6200 system.

The following documentation is provided with the respective software:

- *Microsoft Windows NT Server Start Here (Basics and Installation)*
- *Microsoft SQL Server Setup Guide*
- *Microsoft SQL Server Administrator's Companion*
- *Microsoft Systems Management Server for Windows NT Administrator's Guide*

1
Advantages of DIGITAL HiTest Suites

This chapter describes what a HiTest Suite is, the suite components and advantages, and customer add-ons.

What Is a DIGITAL HiTest Suite?

DIGITAL HiTest Suites are guidelines for configuring a set of prequalified computer systems. A HiTest Suite often contains all the hardware and software needed for a complete customer solution. DIGITAL HiTest Suites can be used as a basis for configuring systems that satisfy a wide set of customer requirements. Typically, Suites target specific markets such as mail messaging sites or Internet server sites.

In each HiTest Suite, the components are selected and the configurations designed to ensure system reliability, application performance, and ability to upgrade. The suite's hardware and software components have been successfully tested for interoperability.

The specifications for allowed ranges of hardware and software components, part numbers, description, and revision information are listed in the *DIGITAL HiTest Template* in Chapter 3.

DIGITAL HiTest Suite Components

The Microsoft Exchange and IIS Windows NT MSCS DIGITAL Server 3100 DIGITAL HiTest Suite contains three groups of components: the *DIGITAL HiTest Foundation*, the *DIGITAL HiTest AppSet*, and the *System Management Station*.

The DIGITAL HiTest AppSet contains application software unique to the targeted market. The DIGITAL HiTest Foundation contains the operating system, software, and hardware and can be used as a configuration guideline for the base platform for many applications and target markets. The System Management Station is an optional standalone personal computer system containing software used to manage the HiTest system.

Select components from the HiTest Template to configure a DIGITAL HiTest System. Any system configured as specified in the DIGITAL HiTest Template can be called a DIGITAL HiTest System.

Additional Hardware and Software

Besides the hardware and software specified in a DIGITAL HiTest Suite, additional hardware and software can be added to a HiTest System. Add-on hardware consists of accessory components such as printers, modems, and scanners that are supported by the operating system and other software. Adding these components should not affect interoperability and, therefore, the system can still be considered a DIGITAL HiTest System.

Customers who purchase a DIGITAL HiTest System that is configured below the maximum specified in the Template, can later add additional hardware up to the specified maximum range and still maintain the integrity of a DIGITAL HiTest System.

If additional hardware components beyond the maximum specified in the Template are configured into a system, you still have the assurance that the rest of the system has been thoroughly tested for component interoperability. Therefore, the risk of experiencing problems is greatly reduced.

2
About This DIGITAL HiTest Suite

This HiTest Suite satisfies the needs of customers who require a full-function, high-performance and highly available office automation system.

When configured as a single server, this HiTest Suite provides a highly available system that is suitable for 400 to 750 users. Most organizations would use several servers configured from this HiTest Suite, along with servers to accommodate a wide range of business requirements.

As the AppSet software of this HiTest Suite, Microsoft Exchange provides organizations with the following capabilities:

- Collaboration using discussion groups, web publishing, knowledge bases, and list servers
- The ability to Create and manage corporate white pages containing names, E-mail addresses, telephone numbers, and so on
- The ability to create virtual organizations which include business partners on the *extranet*
- The ability to do group scheduling and manage and assign tasks

The Microsoft Exchange and IIS Windows NT MSCS DIGITAL Server 3100 HiTest Suite includes the following components:

- Microsoft Exchange Server
- Windows NT Server
- DIGITAL Server 3100
- DIGITAL StorageWorks RAID Array 310

This chapter describes the following characteristics of the Microsoft Exchange and IIS Windows NT MSCS DIGITAL Server 3100 HiTest Suite and evaluates the Suite in terms of each:

- Availability
- Installability
- Interoperability
- Manageability
- Price Range
- Scalability
- Services
- Year 2000 Compliance

Availability

Availability, which describes a computer system's ability to quickly recover from a failure, can be described in terms of the following:

- Data Protection – Ensures long-term data accessibility by providing the facility to do offline data backup.
- Data Availability – Stores redundant data on line for rapid, automatic data recovery in the event of a failure. Data availability is typically provided through the use of RAID technology.
- Platform Availability – Enables processing to continue during failure by using technologies that support failover to other components. Clustering, redundant power supplies, battery backup, and other components provide support for platform availability
- Disaster Tolerance – Protects against computer room disasters such as fire, flood, and sabotage. Disaster Tolerant Systems require an additional system at a remote site and are more expensive than the previously defined alternatives. (The DIGITAL HiTest process does not test disaster tolerant configurations. If disaster tolerance is a requirement, your sales person can provide more information.)

Features of Microsoft Exchange and IIS Windows NT MSCS DIGITAL Server 3100 HiTest Suite

The DIGITAL HiTest process verified that each of the availability features provided by this Suite operate correctly and provide the protection required for all configurations.

Table 2-1 indicates availability features that are always included in this HiTest Suite when configured with the AppSet and those that are customer options.

Table 2-1: Microsoft Exchange and IIS Windows NT MSCS DIGITAL Server 3100 Availability Features

Availability Feature	Enabling Technology	Always Included	Customer Optional
Data Protection	Backup and restore	Yes	
Data Availability	Redundant disk storage (RAID)	Yes	
	Redundant disk controllers	Yes	
	Redundant power for disk storage	Yes	
Platform Availability	System failover (clustering)	Yes	
	Redundant network	Yes	

Recommendations for Microsoft Exchange and IIS Windows NT MSCS DIGITAL Server 3100 HiTest Suite

This HiTest Suite provides high availability while maintaining high performance because hardware with a high mean-time-between-failure (MTBF) is used. Use of fault-tolerant and redundant hardware avoids single points of failure, and redundant data storage ensures data availability. To reduce the risk of system failures, this HiTest Suite provides the following levels of availability features:

- Data Protection
  - Long term data accessibility is always provided with this HiTest Suite by the 4/8 GB DAT tape drive, which provides up to 8 GB of compressed data storage.
- Data Availability
  - High data availability is always provided with the RAID Array 310 that includes redundant power.
  - A range of RAID configurations is possible, depending on the storage capacity chosen and whether Microsoft's Internet Information Server is run with the Exchange Server. These choices are explained in Chapter 3.
- System Availability
  - System availability is always provided through the use of dual DIGITAL Server 3100 systems and cluster software from Microsoft. When Microsoft Internet Information Server is run on one DIGITAL Server 3100 system and Microsoft Exchange Server is run on the other, a system failure switches both servers onto the remaining system.

Understanding Availability Features

This section provides background information on the availability features included in this HiTest Suite.

Backup and Restore

Backup and restore ensures that data remains available from one day to the next. It is generally identified as a *data protection* technique because the stored information can also be removed to a remote, protected environment. DIGITAL offers a range of backup and restore capabilities from individual tape systems to automated tape libraries.

Disk Storage Technologies

This section describes the disk storage technologies used to provide availability for DIGITAL HiTest configurations.

Just a Bunch of Disks (JBOD)

Just a bunch of disks (JBOD) refers to a multiple disk drive configuration, internal or external to a host computer, in which there is no storage controller. Disk drives are managed by the host system. To increase availability, JBOD storage systems are often configured with hardware such as redundant power supplies and fans, or multiple SCSI buses.

Redundant Array of Independent Disks (RAID)

A Redundant Array of Independent Disks (RAID) is a collection of disks managed by specialized array management software. When using RAID, all disks in the RAIDset should be the same type. Array management software may be *host-based* (execute in the host computer) or *subsystem-based* (execute in an intelligent disk controller).[1]

Disk striping (RAID Level 0), is technically not RAID because it does not offer redundancy.

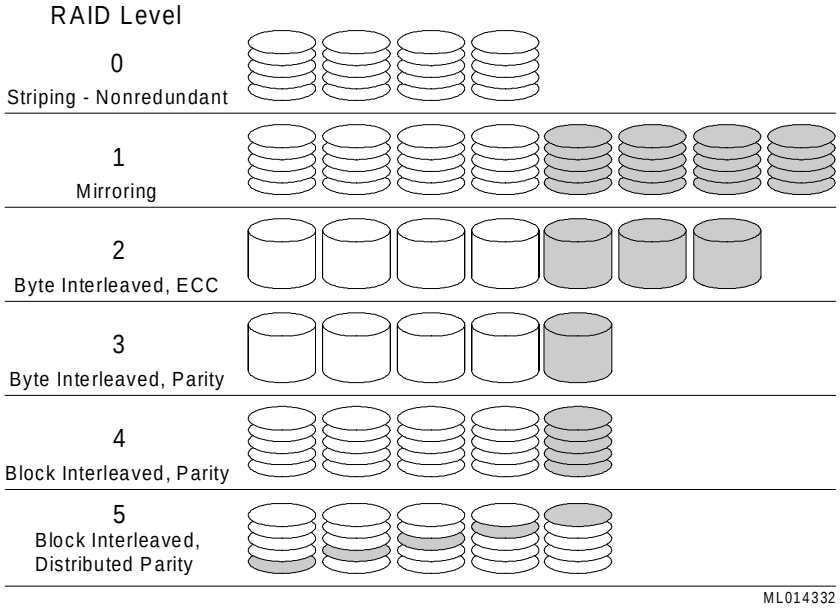
RAID Levels 2 and 3 are parallel access arrays (members are accessed concurrently). To ensure that all disks participate in every I/O request, the minimum chunk size is kept small (for example, a byte).

RAID Levels 4 and 5 are independent access arrays (members are not required to be accessed concurrently). By keeping the minimum chunk size at least as large as a disk sector (block), not all members have to participate in each I/O request.

RAID Levels 2 and 4 are not in general use.

Figure 2-1 summarizes the RAID levels. The shaded areas in Figure 2-1 refer to space used for redundancy features.

Figure 2-1: RAID Level Summary



DIGITAL and other companies also use the terms RAID 0+1, RAID 1+5 and Adaptive 3/5 to refer to the combinations of these, and other, storage technologies. Table 2-2 describes the RAID types to consider when choosing a RAID configuration.

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[1] The RAID technique was described by D. A. Patterson, G. Gibson, and R. H. Katz "A Case for Redundant Arrays of Inexpensive Disks (RAID)," Report No. UCB/CSD 87/391, University of California, Berkeley CA 1987.

Table 2-2: RAID Levels and Descriptions

RAID Level	Description	Advantages/Disadvantages
0	• Striping • Data segmented and distributed across several disks	+ increase in performance due to parallelism in read and write - no fault tolerance (*not* a high availability solution)
1	• Hardware Mirroring • Data written twice to different disk spindles within the disk array	+ good performance in read-intensive applications (data can be read in parallel from several disks) - slower in writes (multiple writes required) - spindle costs doubled
0+1	• Striped Mirroring • Combined level 0 and 1 • Data mirrored onto and striped across several disks • Best for performance-critical, fault-tolerant environments	+ good performance in reads (RAID 1) + write performance improved versus RAID 1 due to parallelism + adequate response maintained in event of disk failure - spindle costs doubled - recovery is I/O intensive
2	• Parallel access array • Striped • ECC on separate drives	+ high data transfer rate + ECC detects and corrects errors - low I/O request rate - not appropriate with modern drives
3	• Parallel access array • Small minimum chunk size • Check bit calculated from data • Parity bits on dedicated disk, data striped across remaining disks	+ good performance in reads due to parallelism (like RAID 0) + costs only slightly increased compared to disks without high availability solutions + good performance with long records (high data transfer rate) - write performance penalty due to check bit calculation - cannot overlap I/O (low I/O request rate)
4	• Independent access array • Parity disk	+ processes multiple requests simultaneously - parity disk is a bottleneck on writes
5	• Independent access array • Parity Bit • Check bit and data distributed (striped) across multiple disks • Best in environments that are mostly read and are not performance sensitive	+ good performance in reads due to parallelism (like RAID 0) + costs only slightly increased compared to disks without high availability solutions + overlapped I/O - write performance penalty due to check bit calculation

RAID Level	Description	Advantages/Disadvantages
1+5	• RAID 5 combined with mirroring • Mirroring provided by LSM or Volume Shadowing • Most reliable and highest performance solution	+ good performance in reads due to parallelism (like RAID 0) + double redundancy makes disk failure barely noticeable - spindle costs more than double - write performance penalty due to check bit calculation
Adaptive 3/5	• The best features of 3 and 5 • Adapts between Level 3 and Level 5 in response to changes in the application's workload	+ good performance in reads due to parallelism (like RAID 0) + costs only slightly increased compared to disks without high availability solutions + performs well with a wide variety of I/O loads even when load characteristics change minute by minute. - write performance penalty due to check bit calculation

Clustering

A cluster is a group of systems that works collectively to provide fast, uninterrupted computing service. Close cooperation can maximize performance and minimize down time. Within a cluster, individual systems and their components do not have to match the characteristics of mainframes, supercomputers, or fault-tolerant systems, yet can cooperate to achieve the same results. Most clusters provide a cost-effective solution to achieve optimal system availability and application performance, extensive scaling capability, and simplified system management.

Microsoft Cluster Server allows two independent Windows NT Servers to be viewed as a single system. Cluster Server manages resources, such as database and files services, that run on each node within the cluster. Client requests are directed by Cluster Server to a specific node within the cluster that can service the request. If a node becomes unavailable, its resources are transferred to another node by Cluster Server and the client requests are redirected. While cluster-unaware applications can be managed by Cluster Server, the failover process with cluster-aware applications can be transparent to the client. Cluster Server may also be installed on a single system and configured to provide multiple virtual servers.

Redundant Components

Providing redundant components with a system increases that system’s availability. If two identical components provide complete redundancy to each other, the availability factor for the set of components can increase by over 99% over a single component. Clustering and RAID are technologies that use redundancy of systems and of disks. Other components may be used in redundant configurations to further improve availability. Examples include disk controllers, power supplies, and network controllers. Many are hot swappable components that further increase availability by eliminating down time during replacement of the failed unit.

Installability

Installability is the ease with which hardware and software components can be installed and configured for use. Factors that are considered when evaluating installability include clarity of installation steps, number of steps and duration appropriate to the complexity of the product, and completeness of the installation and configuration information.

The DIGITAL HiTest process thoroughly examined all aspects of the installation of this HiTest Suite. The installation procedures that were used are documented in Chapter 4.

While HiTest encountered a number of problems during the initial installation verification, these were resolved prior to the final installation and the publication of this HiTest Suite. Provided that the system installer follows the procedures documented in Chapter 4 and in the associated installation guides, no installation problems should be encountered.

Within the HiTest environment, after removing the system from the shipping skid, it required four hours to install and configure the hardware for the maximum configuration. Installation and configuration of the software took eight hours. Expect installation times to vary significantly in other environments depending on factors such as the expertise of the installer and the environment in which the installation occurs.

DIGITAL Multivendor Computer Services (MCS) offers expert installation services.

Interoperability

Major components of this HiTest Suite have been tested for interoperability, including the application, database, operating system, hardware, firmware, and service packs and patches. Since interoperability problems are often related to inappropriate versions of components, the specific versions that are known to interoperate are documented. Minimum and maximum configurations for this Suite have been tested. The specific processes used for testing this Suite are described in Chapter 5.

The HiTest Notes provide solutions to interoperability problems in several ways. First, specific versions of all components are documented in Chapter 3. Second, installation and setup instructions in Chapter 4 are written so that many interoperability problems are avoided. Third, problems and solutions are documented in Chapter 6.

An interoperability issue was discovered that related to the detection of network adapters by Cluster Server. See Chapter 6 for more information and solutions.

Manageability

System manageability is the ease with which a system is managed or controlled. Because a system is composed of many components, manageability is described according to which component (application, operating system, server, storage, cluster) of the system is being controlled. For each of those components, manageability is measured by five features:

- Administration – The ease with which the systems management tools manage the system components
- Alarms – The effectiveness of triggers at detecting problems in system components
- Performance – The tuning and monitoring of system components
- Security – File access, user access, and intrusion detection
- Accounting – Logging the use of system resources

While system management is optional for this HiTest Suite, DIGITAL has specified the best system management solution in Chapter 3. Table 2-3 summarizes the manageability features that this solution provides.

Table 2-3: Microsoft Exchange and IIS Windows NT MSCS DIGITAL Server 3100 Manageability Features

	N/A	Admin.	Alarms	Performance	Security	Accounting
Application		Yes				
Operating System		Yes	Yes	Yes	Yes	
DIGITAL Server 3100		Yes				
Storage		Yes	Yes	Yes		
Cluster		Yes				

During the DIGITAL HiTest process, System Management Server was used to manage the systems. This system management system is part of all the configurations of the Microsoft Exchange and IIS Windows NT MSCS DIGITAL Server 3100 HiTest Suite.

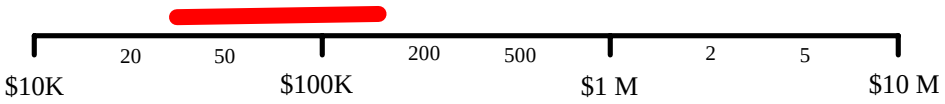
There are no major manageability problem with this Suite.

Price Range

Figure 2-2 shows the approximate list price (U.S. dollars) for the minimum and maximum HiTest Systems that can be configured from the Microsoft Exchange and IIS Windows NT MSCS DIGITAL Server 3100 HiTest Suite. These prices were effective as of March 26, 1998. The price range can vary significantly over time and with the inclusion of service packages, consulting, country-specific prices, and other factors.

The DIGITAL Server 3100, which is the base system of this HiTest Suite, provides powerful application server capabilities for file/print server prices. Systems configured from this HiTest Suite make powerful office automation servers for the business enterprise.

Figure 2-2: Microsoft Exchange and IIS Windows NT MSCS DIGITAL Server 3100 HiTest Suite Price Range



The purchase price of a system is only one factor affecting affordability. The cost of staff, space, maintenance, and upgrade also affect the total cost of ownership. The system value is determined by comparing these costs to the total benefit and deriving the return on investment (ROI). Because these costs and the benefits are unique to each customer, the ROI can best be determined by a joint customer and sales person team.

Scalability

For this HiTest Suite, scalability can be described in two ways. In terms of hardware, scalability refers to the additional hardware components that can be added to a system within and beyond the HiTest configuration. In terms of performance, scalability refers to the workload capability of the HiTest configuration.

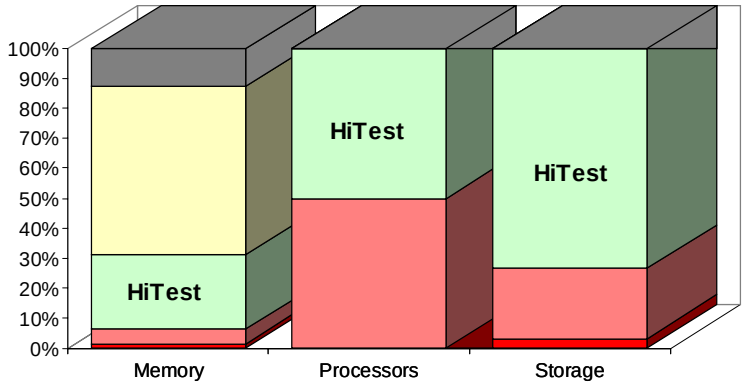
Additional Hardware Components

Systems that are configured from this HiTest Suite can easily be upgraded both within and beyond the ranges specified in the Suite.

In Figure 2-3, hardware scalability for this Suite is illustrated in terms of memory, number of CPUs, and disk space. Within the limits set for the enclosures called for in this HiTest Suite, comparisons are shown for the minimum and maximum limits of the system configuration.

Note that within this DIGITAL HiTest Suite, the choice of system or cabinets can limit future expansion. If expansion is needed, select components that will allow future expansion.

Figure 2-3: Microsoft Exchange and IIS Windows NT MSCS DIGITAL Server 3100 HiTest Suite Scalability



	Systems configured within this range involve tradeoffs between these, and sometimes other components.
	Systems configured within this range generally exceed the requirements of the market.
HiTest	Systems configured within this range meet the requirements of most customers.
	Systems configured within this range are generally insufficient to meet the requirements of the market.
	Systems cannot be configured in this range.

Table 2-4: Scalability Data

Configuration	Memory	Processors	Storage
DIGITAL Server 3100 Minimum	16 MB	1	2.1 GB
HiTest Minimum	64 MB	2	17.2 GB
HiTest Maximum	320 MB	2	63.7 GB
DIGITAL Server 3100 Maximum (without tradeoff)	896 MB	2	63.7 GB
DIGITAL Server 3100 Maximum Configurable	1,024 MB	2	63.7 GB

The DIGITAL Server 3100 configurations of the Microsoft Exchange and IIS Windows NT MSCS DIGITAL Server 3100 HiTest Suite meet the requirements of computational power and availability demanded of an enterprise server while providing memory and storage expansion capability for situations that may reach beyond the scope of this HiTest Suite.

In general, systems can be configured beyond the limits illustrated in Figure 2-3 by adding additional storage cabinets and other peripherals. While this HiTest configuration supports a maximum configuration that completely fills the shared disk storage, the RAID Array 310 can be configured with optional expansion cabinets that go well beyond this limit. This capability provides hardware scalability for users who want to go beyond the HiTest limit.

Workload Capability

Scalability also measures how performance is affected as additional resources and users are added. When scalability is measured by workload capability, the factors that are considered include the effectiveness of additional hardware; whether the system remains consistent as you add to it; and how expensive it is to add to it.

DIGITAL HiTest Suites are selected to provide an appropriate workload capability for the target application area. Often a choice of suites is available, each providing appropriate coverage for specific situations. HiTest works closely with other DIGITAL groups to ensure that a HiTest system will perform appropriately in a production environment. Many HiTest systems are tested and tuned for performance.

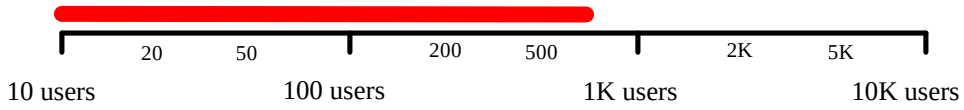
Performance and characterization tests were performed using Microsoft's Load Simulator (LoadSim). LoadSim is a tool that can simulate multiple users of Exchange Server performing common actions such as log in, send, and read messages. Each instance of LoadSim uses a mix of multiple processes and threads to emulate hundreds of users on a single client machine. A collection of several client machines can generate a workload equivalent to of thousands of real users of Exchange Server on a server machine running the Exchange Server application. Parameters defining the tests for a medium user load were set by Microsoft Corporation.

The results of this testing is described in the “Microsoft Exchange V5.5 on DIGITAL Server Systems: Performance Report, 6th March 1998” that is available from DIGITAL at http://www.digital.com/info/lists/performance_WN.HTM. The report shows that as many as 4000 LoadSim users may be supported on a suitably configured DIGITAL Server 3100.

The audit report includes the information required to estimate an everyday workload for servers configured from this HiTest Suite. Performance depends on the number of users who are actively working on the system. Performance will also be affected by the size and amount of mail, the amount of mail sent local or remote, the number of accesses to public and private databases, and the number of Exchange servers and connectors being used. Systems configured from this HiTest Suite will support up to 750 users when used in a single-server environment. When configured in a multiserver environment with a replicated directory structure, the number of users supported by a given configuration depends on the amount of mail sent to other nodes; with 20% *off node* mail, a 15% drop in the number of users supported is typical. When several servers are required, the use of a bridge head server is recommended to alleviate this effect.

Figure 2-4 shows the workload capability.

Figure 2-4: Microsoft Exchange and IIS Windows NT MSCS DIGITAL Server 3100 Workload Capability



Services

DIGITAL offers a range of service options. The following portfolio of Business Critical Services is available for HiTest Suites and is backed by the DIGITAL Uptime Guarantee.

Proof of Commitment: The DIGITAL Uptime Guarantee

The DIGITAL Uptime Guarantee is a formal contract that commits DIGITAL to keeping a client's business critical systems in operation at least 99.5% of the time, excluding outages beyond the control of DIGITAL, such as electrical shutdowns, environmental failures, and downtime caused by application failure. If uptime levels are lower than 99.5%, clients do not pay the full service charge.

Portfolio of Business Critical Services

The three vital elements of DIGITAL Business Critical Services are:

- Availability Review

  The first step in initiating a Business Critical engagement with DIGITAL is a customized, in-depth availability analysis of the computing environment, beginning with an overview of operating goals. This review identifies potential risks and trouble spots in hardware, software, operations, physical environment, and network. A comprehensive written report forms the basis for determining serviceability requirements.

- Business Critical Gold Support

  Clients who purchase Business Critical Gold Support work with a named technical account manager who serves as the single point of contact and ensures that problems are resolved quickly. A privileged hotline assures crisis response within 30 minutes. An assigned support team works with the account manager to apply continuous effort to critical problems. The on-site support agreement for Gold Support Customers provides coverage 24 hours a day and seven days a week. Additional benefits include:

  – Notification of software patches as soon as they become available

  – Notification of known problems and fixes

  – Monthly service activity review

  - Operating system upgrade impact planning
  - Bi-annual System Healthcheck assessments. These are conducted using advanced system-based tools to assess the performance and security of systems. The collected data is analyzed against accepted practices, and the findings, together with recommendations for corrective action, are documented in a summary report.

- Availability Partnership

  With Availability Partnership, system availability is maintained at the required level by measuring and analyzing actual system availability, and conducting regular updates to the original Availability Review. Particular focus is placed on:

  - Configuration and topology documentation
  - Availability status reporting
  - Change impact analysis
  - Proactive problem avoidance based on proactive patch/FCO/firmware management
  - Periodic detailed data collection and analysis
  - Availability model update
  - Contingency planning
  - Service planning and advising

Complementary Support Services

The three key Business Critical Services are augmented by:

- On-Site Parts Service

  DIGITAL works with the client to determine the appropriate inventory levels for their environment. A cost-effective *rental* parts solution is developed to maintain an on site inventory of spare parts.

- Installation and Startup

  DIGITAL offers rapid, worry-free implementation of new hardware and software – including systems, PCs, terminals, workstations, networking components, operating systems, layered products, applications, and software updates. Clients can choose hardware installation, software installation and startup, or both.

Meeting Client Needs Locally or Globally

With 450 service center locations in l00 countries, DIGITAL is prepared to deliver consistent and comprehensive service capabilities on a local or multinational basis. These services encompass:

- Total system support for servers, network operating system, applications, switching components, and PCs
- Multivendor support for a diverse range of products including networking equipment, applications, and peripherals
- Microsoft Solution Provider and Authorization Support Centers with the largest concentration of Microsoft certified engineers in the world

For More Information

To find out more about DIGITAL Business Critical Services, contact your local DIGITAL Multivendor Customer Services sales specialist or visit the Business Critical Services web site at `http://www.digital.com/services/mcs/mcs_critical.htm`.

Year 2000 Compliance

Year 2000 Compliance refers to whether computer systems will properly recognize the date change from December 31, 1999 to January 1, 2000. Current information on Year 2000 status of DIGITAL products can be obtained from the DIGITAL Year 2000 Program web site at `http://ww1.digital.com/year2000/`. Current information on the Year 2000 status of other vendor's products should be confirmed with those vendors.

While HiTest does not explicitly test for Year 2000 compliance in the components of this Suite, HiTest does check the published status of components where Year 2000 compliance would be a concern. The Year 2000 information presented here is accurate as of March 23, 1998. Table 2-5 summarizes these findings.

The color codes used in the table represent the following categories of readiness:

- Blue – Version specified is Year 2000 ready today.
- Green – Currently not Year 2000 ready. Version to be Year 2000 ready specified with Year 2000 date noted.
- Yellow – Under evaluation.
- Red – Will not be made ready for Year 2000. Product will be removed from active status on or before 31 March 1998.
- N – Not Applicable - No Year 2000 implications exist for this component.

Table 2-5: Microsoft Exchange and IIS Windows NT MSCS DIGITAL Server 3100 Year 2000 Compliance

Component	Year 2000 Status
Microsoft Exchange	Blue
Internet Information Server (IIS)	Blue
Windows NT Server	Blue
DIGITAL Server 3100	Blue
UltraSCSI storage	Blue

3
Configuration Data

This chapter describes the Microsoft Exchange and IIS Windows NT MSCS DIGITAL Server 3100 DIGITAL HiTest Suite including the hardware, software, and firmware components and their revision levels. If required, special configuration rules are explained.

Hardware and Software Components

Table 3-1 and Table 3-2 identify the range of hardware and software components that can be configured using the Microsoft Exchange and IIS Windows NT MSCS DIGITAL Server 3100 DIGITAL HiTest Suite. These two tables form the DIGITAL HiTest Template. The ranges of hardware provided in this template include the following:

- 64 through 320 MB of memory per server
- One 4.3 GB Wide SSB Disk Drive in each DIGITAL Server 3100
- Four through seven 4.3 GB Wide or 9.1 GB UltraWide disks in the RAID Array 310 Subsystem

Note

The RAID Array 310 can support 4.3 GB Wide disks (FR-CECBA-CA) or 9.1 GB UltraWide disks (FR-RZ1DB-VW). However, 4.3 GB wide disks cannot be used with 9.1 GB UltraWide disks in the same RAIDset.

- One Integral SCSI controller in each DIGITAL Server 3100
- One Integral 10/100 Mbit Fast Ethernet in each DIGITAL Server 3100
- One 4/8 GB DAT SCSI tape drive in each server

Table 3-3 lists the optional system management station hardware and software. Due to the frequent releases of software versions and patches, software interoperability may depend on ordering the exact version/revision of the listed software component. To reduce the chance of interoperability issues, order the exact software version listed in the HiTest Templates. Hardware components can be ordered as listed, and the system installer should ensure that the hardware components version level is the same version or later than those tested.

Table 3-4 lists the revision levels of the components.

The DIGITAL HiTest Template consists of three categories:

- AppSet Software – Includes software specific to one class of customer solutions, in this case Microsoft Exchange
- Foundation Hardware – Includes the base system, storage, and other hardware options
- Foundation Software – Consists of Windows NT Server, Enterprise Edition 4.0

When ordering an item from a HiTest Template, select a quantity that is within the minimum and maximum range for the item. If the minimum quantity is zero (0), then the component is optional. If the minimum quantity is one or more, order at least the minimum quantity, but be cautious about exceeding the maximum quantity. The maximum quantity represents the greatest number of components that were tested for interoperability with all the other components in the Suite.

For more details on the HiTest Suite hardware configuration, see Chapter 7.

Table 3-1: DIGITAL HiTest Template – AppSet Software and Foundation Hardware

Microsoft Exchange and IIS HiTest AppSet **Windows NT MSCS DIGITAL Server 3100 HiTest Foundation Hardware** For documentation and updates: http://cosmo.tay.dec.com and http://www.businesslink.digital.com and select Technical Support				
Line Item	**Description**	**Part Number**	**HiTest Range**	
			Min	**Max**
AppSet Software				
1	*Order two copies of the following AppSet*: **MS Exchange Server 5.5 Enterprise Edition** Contact Microsoft at: `http://www.microsoft.com` **Note:** This AppSet is not required when the foundation hardware and software is ordered for use with a non-HiTest application.	**395-** **(Microsoft Part Numbers)**	2	2
2	**Exchange Client Access License 5.5** **Note:** Obtain the number of licenses required for the number of clients.	**381-** **(Microsoft Part Numbers)**	See Note	See Note
Foundation Hardware				
3	*Order two base systems*: **DIGITAL Server 3105, 512 KB, 200 MHz** *Hardware includes*: • 200 MHz Dual Pentium Pro processors • 512 KB secondary cache per processor • 64 MB EDO Memory • 1 MB Graphics Memory • 300 Watt Power Supply • 12X CD-ROM drive • 1.44 MB 3.5-inch Floppy drive **Note:** Systems ordered in the Americas or Asia Pacific include the keyboard. *Software includes*: • ServerWORKS Management Suite CD-ROM	**FR-B43WW-AA**	2	2
4	**Country kit (accessories, keyboard, docs, mouse, and power cord)**	**FR-PC94K-AA**	2	2

Microsoft Exchange and IIS HiTest AppSet Windows NT MSCS DIGITAL Server 3100 HiTest Foundation Hardware				
For documentation and updates: http://cosmo.tay.dec.com and http://www.businesslink.digital.com and select Technical Support				
Line Item	**Description**	**Part Number**	**HiTest Range**	
			Min	**Max**
5	**128 MB 60ns Parity SIMMs (2 x 64 MB)** **256 MB 60ns Parity SIMMs (2 x 128 MB)** **Note:** This HiTest Template supports a memory range from 64 MB to 320 MB per system. When selecting memory options, stay within the Template's 320 MB maximum.	**FR-PC77M-BM** **FR-PC77M-BN**	0	See Note
6	**4.3 GB Wide SSB Disk Drive (system disk)**	**FR-CECBA-CA**	2	2
7	**DIGITAL StorageWorks RAID Array 310 Subsystem** *Includes*: • RAID Array 310 Hardware subsystem (SWXRA-Z1) • RAID Array 310 Windows NT Intel PCI kit (SWIKT-DA) • RAID Array 310 Windows NT Cluster Upgrade kit (SWDKT-DD) • Cluster Windows NT license/CD-ROM (QB-53V9A-SA) • 30-47712-01 • PCI Ethernet NIC (DE450-CA) • 10/100BaseT Crossover cable (BN24Q-07) • ServerWORKS Mgr. License/CD (QB-4QYAA-SA)	**FR-CK310-RF**	1	1
8	**9.1 GB UltraWide SSB disk drive** **4.3 GB UltraWide SSB disk drive** **Note:** Do not use different SSBs within the same RAIDset.	**FR-RZ1DB-VW** **FR-RZ1CB-VW**	4 4	7 7
9	**4/8 GB DAT SCSI tape drive**	**FR-PCXAT-AJ**	2	2
10	*Select one high-resolution monitor*: **15" Color Monitor** **17" Color Monitor** **Note:** This HiTest Template supports the substitution of any compatible color monitor.	**FR-PCXBV-EZ❶** **FR-PCXBV-FZ❶**	2	2
11	**System Management Station**	**See Table 3-3**	0	1
❶Indicates that geography-specific part number variants are available. Check the appropriate price book for details.				

Table 3-2: DIGITAL HiTest Template – Foundation Software

Windows NT MSCS DIGITAL Server 3100 HiTest Foundation Software						
For documentation and updates: http://cosmo.tay.dec.com and http://www.businesslink.digital.com and select Technical Support						
Line Item	**Description**	**Part Number**	**HiTest Range**		**Required By**	
			Min	**Max**	**Fnd**†	**App**†
Foundation Software						
1	*Order two copies of the following operating system:* **Windows NT Server, Enterprise 4.0** Contact Microsoft at: `http://www.microsoft.com`	**779-00001** **779-00002** **(Microsoft Part Numbers)**	2	2	Yes	Yes
2	**Windows NT Server Client Access License** **Note:** Obtain the number of licenses required for each system.	**351-** **(Microsoft Part Numbers)**	See Note	See Note	See Note	See Note
3	**MS Internet Information Server (IIS) V4.0** Contact Microsoft at: `http://www.microsoft.com`	**Included with item 1 of this table**	0	2	Opt	Opt
4	**Hard copy of this Suite's HiTest Notes**	**EK-HMIND-HN**	1	1	Yes	Yes
†Fnd = Foundation, App = AppSet						

Table 3-3: System Management Station Template

MS Exchange and IIS HiTest AppSet System Management Station				
For documentation and updates: http://cosmo.tay.dec.com and http://www.businesslink.digital.com and select Technical Support				
Line Item	**Description**	**Part Number**	**HiTest Range**	
			Min	**Max**
Management Station Hardware				
Note: This HiTest Suite supports the use of a system management station. When the management station option is included, this HiTest Template identifies the items required. When system management is provided through other means, this option may be omitted without invalidating the HiTest Suite.				
1	**Prioris XL 6200 Server** *Hardware includes*: • 200-MHz CPU with 256-KB cache • 32 MB memory • Integrated Fast Ethernet (10/100) • Integrated Cirrus PCI graphics controller (with 512 KB) • 12X CD-ROM • Integrated UW SCSI controller • 2.0 GB disk drive • 1.44 MB floppy **Note:** A functionally equivalent 80x86 system may be substituted without invalidating this HiTest Template.	**FR-B60WW-XD**	1	1
2	**Country kit**	**FR-PC94K-AA0**	1	1
3	**32 MB 60ns EDO DIMM Memory**	**FR-PCSMA-AC**	1	1

MS Exchange and IIS HiTest AppSet System Management Station				
For documentation and updates: http://cosmo.tay.dec.com and http://www.businesslink.digital.com and select Technical Support				
Line Item	**Description**	**Part Number**	**HiTest Range**	
			Min	**Max**
4	**PCI high-performance video adapter Matrox Millenium**	**FR-PCXAG-AQ**	1	1
5	*Select one high-resolution monitor*: **21" (19.6 view) 1600 x 1200 @75Hz** **19" (18" view) 1600 x 1200 @75Hz** **17" (16" view) 1280 x 1024 @75Hz**	**FR-PCXAV-WZ**ⓘ **FR-PCXAV-TZ**ⓘ **FR-PCXAV-YZ**ⓘ	1	1
Software Installed on Management Station				
6	**Windows NT Server V4.0** Contact Microsoft at: `http://www.microsoft.com`	**Microsoft**	1	1
7	**Windows NT Server Service Pack 3 (SP3)** Contact Microsoft at `http://www.microsoft.com` or `ftp://ftp.microsoft.com/bussys/winnt` or call (800) 360-7561.	**Microsoft**	1	1
8	**System Management Server (SMS) V1.2** Contact Microsoft at: `http://www.microsoft.com`	**Microsoft**	1	1
9	**SQL Server V6.5** Contact Microsoft at: `http://www.microsoft.com`	**Microsoft**	1	1
Software Installed on Managed System(s)				
10	**Microsoft Systems Management Server agents for Intel Systems** **Note:** The Intel variant of Microsoft Systems Management Server (item 8) includes both the Intel and Alpha agents.	**Included with item 8**	1	1
ⓘIndicates that geography-specific part number variants are available. Check the appropriate price book for details.				

Table 3-4: Component Revision Levels

Hardware Component	Hardware	Firmware	Software
4.3 GB disks (FR-CECBA-CA)	A01	–	–
9.1 GB disk (FR-CFCBA-CA)	A01	–	–
Tape Drive (FR-PCXAT-AJ)	A02	0172	–
Software Component		**Version/Revision**	**Patch Level**
Windows NT Server		4.0	Service Pack 3 (SP3) with the `clusfixi.exe` hot fix
Internet Explorer		4.0	–
Microsoft Exchange		5.5	–
Internet Information Server (IIS)		4.0	–

Special Configuration Rules

The special configuration rules for the Microsoft Exchange and IIS Windows NT MSCS DIGITAL Server 3100 HiTest Suite include:

- The shared disk storage may be connected to each server, but must *not* be powered up with both servers running until at least one server has Cluster Server installed.
- An IP Address consists of a Network portion and a host portion; For the Private Network, the Network portion of the IP Address must be different from the Network portion of the Client Network IP Address.
- If Internet Information Server (IIS) 4.0 is to be installed, it must be installed last.
- NT sticky drive letters must be assigned to each server and must coincide with each other for all disks including the System disk.
- Microsoft Exchange 5.5 requires that the hot fix `clusfixi.exe` be installed just prior to the installation of Microsoft Exchange.
- Internet Explorer 4.0 must be installed before IIS can be installed.
- If the cluster will use registered IP addresses, then a minimum of 5 registered IP addresses must be assigned as follows:
  - One IP address for each server
  - One virtual IP address for cluster administration
  - One virtual IP address for Exchange
  - One virtual IP address for IIS
- There is one IP Address for the private network. (Note that the IP Address for the private network is not visible to the client network; as such, the IP Address for the private network does not need to be a registered IP Address.)

Note

The previous special configuration rules are also described in the Software Installation section in Chapter 4.

Supported Disk Configurations

Table 3-5 shows the disk configurations that are supported in this HiTest Suite.

Table 3-5: Supported Disk Configurations

Four-Disk Option		Five-Disk Option		Six-Disk Option		Seven-Disk Option	
MS Exchange	IIS	MS Exchange	IIS	MS Exchange	IIS	MS Exchange	IIS
2x2 RAID-1	*	2x2 RAID-1	1 JBOD	2x2 RAID-1	1x2 RAID-1	2x2 RAID-1	1x3 RAID-5
–	–	–	–	3x2 RAID-1	*	3x2 RAID-1	1 JBOD
–	–	–	–	2x3 RAID-5	*	2x3 RAID-5	1 JBOD
* IIS is not supported under this disk configuration option.							

4
System Installation and Setup

This chapter describes how to install and set up a DIGITAL HiTest System configured from this DIGITAL HiTest Suite. System preparation includes installing hardware, operating system, management station, and applications.

Hardware Installation

The *DIGITAL Server 3100/3200 Series Installation Guide* provides instructions for installing your DIGITAL Server 3100 system. Chapter 7 of this HiTest Note provides additional information specific to the minimum and maximum configurations of this HiTest Suite.

Verify that each server in the cluster has its system disk and tape drive, as well as all of its memory options, installed. Then do the following for each server in the cluster:

1. Open each server and install the PCI Ethernet NIC (DE450-CA) that is part of the DIGITAL StorageWorks Raid Array 310 Subsystem (FR-CK310-RF) in an available PCI slot.
2. Install an Adaptec 2944 SCSI controller from the cluster kit into an available PCI slot.
3. Power up each server and verify that the correct amount of memory is present and that no power up diagnostic errors occur.
4. Turn off each server.
5. Referring to Figure 7-1 in this document and the *RAID Array 310 V3.1 for Windows NT – Intel Installation Guide*, do the following:
    a. Connect crossover cable BNQ-4QYAA-SA between each of the DE450-CA network adapters.
    b. Connect a BN21W-OB “Y” cable to each Adaptec 2944 external connector.
    c. From one of the “Y” cables, connect a BN21K-05 cable to the connector on the back of the Raid Array 310.
    d. From the same “Y” cable, connect the BN31G-02 cable to a “Y” cable on Server 2.
    e. On the remaining “Y” cable connection, plug in an H879-AA SCSI terminator.
    f. Using two H8511-J adapters and a BC16E-10 Serial cable, connect the console port on the back of the Raid Array to either COM1 on Server 1 or to any other Windows NT workstation or server that will be used as the Raid Array 310 command console. (Any Windows NT workstation or server can be used as the RAID Array 310 Command Console.)

6. Power up the Raid Array (Note there are two power supplies). After the power up self checks are complete, there should be no LEDs on the disks illuminated. If the right LED on any disks remain illuminated it is an indication of a disk problem. Correct any problems before proceeding.
7. Turn off the Raid Array 310 and leave it off until instructed to turn it on.

Software Installation

The following sections describe how to install the software in this Suite, including the Windows NT Operating System, Network Card Drivers, Internet Explorer, Cluster Software, Internet Information Server, and Microsoft Exchange.

The following sections also describe the setup tasks which must be performed in conjunction with the installation of the software in this Suite. The setup tasks include setting TCP/IP Properties, configuring the RAID Array 310, and partitioning the Mirror Sets.

The install and setup of software in this Suite should be performed in the following order:

1. Operating System Installation
2. Replacing the Installation-default Card Drivers
3. Setting the TCP/IP Properties
4. Joining the Domain
5. RAID Array 310 Configuration
6. Partitioning the Mirror Sets
7. Installing the Cluster Software
8. Microsoft Exchange Installation
9. Installing Internet Explorer 4.0
10. Installing Internet Information Server 4.0

Performing the installation and setup tasks in the specified order ensures that the Cluster will have sufficient resources to run the application software.

Note

It may take several hours to perform all of the install and setup procedures described in the following sections.

Operating System Installation

This section describes how to install the Windows NT operating system, including licenses, and service packs.

Note

Do not power up the shared SCSI drives until you are directed to do so in the following procedure.

The following procedure must be performed twice. The first time it is performed to install Windows NT on the first server in the cluster, henceforth called Server 1. The second time it is performed to install Windows NT on the second server in the cluster, henceforth called Server 2.

Note

The distinction between Server 1 and Server 2 is arbitrary and is merely used to indicate the first and second servers on which Windows NT is installed. The first server on which Windows NT is installed can be either server in the cluster.

Install Windows NT on a Server in the cluster as follows:

1. Place the Digital ServerWORKS Quick Launch CD in the CD-ROM drive of the Server on which you want to install Windows NT.
2. Boot the server in which you have installed the DIGITAL ServerWORKS Quick Launch CD. When the Server is finished booting, the Windows NT language prompt is displayed.
3. Select the language for Windows NT from the Windows NT language prompt screen by pressing a number from 1 through 6. A list of “copied file” messages is displayed. Then the DOS partition prompt is displayed.
4. Enter 100 MB as the DOS partition size.
5. Press the Enter key. The system is rebooted and a DOS partition for Windows NT is formatted.

   When the DOS partition is formatted, the Quick Launch Main Menu is displayed.
6. Select the “Installations & Utilities” icon from the Quick Launch Main Menu. The Server selection list and the Express folder are displayed.
7. Click the Windows NT Server action button in the Express folder. A dropdown list is displayed with “Windows NT Server 3.51” as the top entry in the list.
8. Select “Windows NT Server Enterprise Edition 4.00” from the dropdown list.
9. Click the Continue button on the Express folder. The NT Enterprise Edition 4.0 Install screen is displayed.
10. Enter the following information on the NT Enterprise Edition 4.0 Install screen:
    - User Name
    - Organization Name
    - Server Name
    - NT CD key
    - NT Server Type (selected from a pull-down list)
    - Time Zone (selected from a pull-down list)
    - License (selected from a pull-down list)

    Note

    If the “Server” type license is selected, the next time you click an action button on this screen, you will be prompted for the number of users (see step 11).
11. Click the Domain Name radio button and, if prompted, enter the number of users.

12. In the Domain Name text field, type the name of the Domain that you are joining or creating.

Note

The NT Server on which Windows NT is being installed must either *be* a domain or it must *join* a domain.

13. Click the "NTFS" radio button in the File System group.
14. Click the "Install TCP/IP" selection box in the Networks group. This displays the TCP/IP Configuration dialog box.
15. In the IP Address, DNS Configuration, and WINS Configuration folders of the TCP/IP Configuration dialog box, enter the TCP/IP information that is appropriate for your site.
16. Click the Done button in the TCP/IP Configuration dialog box. This returns you to the NT Enterprise Edition 4.0 Install screen.

Caution

Before proceeding to the next step in this procedure, ensure that the "Internet Information Server" box and the "Install Service Packs" box are NOT selected.

17. Click the Done button in the NT Enterprise Edition 4.0 Install screen. File copied messages will be displayed and the Windows NT disk partition will be formatted. This process may take several minutes.
18. When the file copying and disk formatting has completed, the system will prompt you to place Disk 1 of the Microsoft Windows NT Server Enterprise Edition Base CDs in the CD-ROM drive.
19. Insert the Microsoft Windows NT Server Enterprise CD (Disk 1) in the CD-ROM drive of the computer on which Windows NT Server is being installed.
20. With the CD installed, enter 1 to continue the Install. The system will now begin the reading of source files. This process may take several minutes.

    When the reading of source files is complete, the system will prompt you to remove Disk 1 from the CD-ROM drive.
21. Remove Disk 1 from the CD-ROM drive.
22. Press 1 to continue. This starts the Windows NT Server Setup. This process may take several minutes.
23. When the Windows NT Server Setup is complete, the Adapter Setup dialog box is displayed.
24. Click the Continue button in the Adapter Setup dialog box. After several seconds of processing, an error message is displayed in a dialog box. The error message states that the Workgroup name is not properly formatted.
25. Click the OK button in the dialog box that contains the error message. (The condition described in this error message will be corrected when you replace the default card drivers as described in the next section of this chapter. Until then, this error message can be safely ignored.)

    The Windows NT Server Setup dialog box is displayed.

26. Click the Workgroup radio button in the Windows NT Server Setup dialog box.
27. Click the Next button in the Windows NT Server Setup dialog box. After several seconds of processing, a prompt for viewing log files is displayed in a dialog box.
28. Click the No button in the dialog box that prompts for viewing the log files. This continues the Adapter setup processing for Windows NT.

    At various points during setup processing, the Windows NT desktop is displayed. The server is also rebooted several times.

    After the system finishes rebooting, a Quick Launch screen containing the following message is displayed:

    ```
    Thank you for using ServerWORKS Quick Launch. Your
    automated installation is now complete.
    ```

29. Exit the Quick Launch program by clicking the open door icon at the bottom of the Quick Launch screen.

    This completes the install of Windows NT Server.

30. Install Windows NT Service Pack 3 (SP3).

    Windows NT Service Pack 3 (SP3) can be obtained by downloading from `ftp://ftp.microsoft.com/bussys/winnt` or by contacting Microsoft at `http://www.microsoft.com` or (800) 360-7561.

    Windows NT Service Pack 3 (SP3) is also on the Window NT Enterprise Edition installation CD-ROM.

After Windows NT has been installed on Server 1, it must be installed on Server 2. To install Windows NT on Server 2, repeat steps 1 through 30 on Server 2.

When Windows NT has been installed on both Server 1 and Server 2, you should proceed with the next procedure, Replacing the Installation-default Card Drivers.

Replacing the Installation-Default Card Drivers

After Windows NT Server is installed, the installation-default Card Drivers must be replaced.

To replace the installation-default Card Drivers, do the following:

1. Place the ServerWORKS Quick Launch CD in the CD-ROM drive of any Windows NT system. The Quick Launch Main Menu is displayed.

   Note

   The replacement Network Card drivers will be extracted from the ServerWORKS Quick Launch CD.

2. Select “Installation & Utilities” from the Quick Launch Main Menu. A pull-down list of Server Types is displayed.
3. From the pull-down list of Server Types, select the Server Type of the server on which you just installed Windows NT Server.
4. Click the Create Diskettes tab on the Installation & Utilities screen. A screen containing several Operating Systems action buttons is displayed.
5. Click the Windows NT action button. A pull-down list of Windows NT versions is displayed.

6. From the pull-down list of operating systems, select “Windows NT Server 4.00 Enterprise.”
7. Click the Continue button in the screen of Operating Systems. A list of drivers, diagnostics, and so on is displayed.
8. Insert a blank formatted diskette in the floppy drive of the server where the Quick Launch CD is mounted.
9. Select “DIGITAL ON-BOARD ETHERNET 21142/21143” from the displayed list of drivers, diagnostics, and so on.
10. Click the Continue button on the screen that displays the list of drivers, diagnostics, and so on.
11. When prompted, press the Enter key to extract the selected driver to the mounted diskette. The process of extracting the driver may take several seconds.
12. When the extract operation is complete, type “N” to decline another copy. This returns you to the display of drivers, diagnostics, and so on.
13. Remove the diskette to which DIGITAL ON-BOARD ETHERNET 21142/21143 has been extracted.
14. Insert another diskette in the floppy drive from which you just removed the diskette containing the DIGITAL ON-BOARD ETHERNET 21142/21143.
15. Select “Digital PCI Ethernet DE450” from the displayed list of drivers, diagnostics, and so on.
16. Click the Continue button on the screen that displays the list of drivers, diagnostics, and so on.
17. When prompted, press the Enter key to extract the selected driver to the mounted diskette. The process of extracting the driver may take several seconds.
18. When the extract operation is complete, type “N” to decline another copy. This returns you to the display of drivers, diagnostics, and so on.
19. Remove the diskette to which the DIGITAL PCI ETHERNET DE450 driver has been extracted.
20. Click the Exit button on the Installation & Utilities screen to exit Quick Launch.

After the DIGITAL ON-BOARD EHTERNET 21142/21143 and the DIGITAL PCI ETHERNET DE450 drivers have been extracted to diskette, they must be installed on Server 1 and Server 2.

Do the following to install the DIGITAL ON-BOARD ETHERNET 21142/21143 and the DIGITAL PCI ETHERNET DE450 drivers on a Server:

1. Open the Windows NT Control Panel on the Windows NT Server desktop.
2. Select the Network icon from the Windows NT Control Panel. This displays the Network screen.
3. Click the Adapters tab on the Network screen. The “DEC PCI Ethernet DECchip 21041” driver will be highlighted.
4. Click the Remove button on the Network screen. This removes the “DEC PCI Ethernet DECchip 21041” driver and displays a “Do you wish to continue?” prompt.
5. Click the Yes button in the dialog box that contains the “Do you wish to continue?” prompt. The Network screen is redisplayed.

6. Click the Close button on the Network screen. A prompt for restarting the computer is displayed.
7. Click the Yes button in the dialog box that contains the prompt for restarting the computer. The system is restarted and an error dialog is displayed. The error dialog states that a service or driver has failed.

   This error dialog is displayed because the drivers were intentionally removed. It is safe to ignore this error dialog.
8. Click the OK button in the error dialog. A login prompt is displayed.
9. Log in to the system.
10. When you are logged in to the system, select the Network icon from the Control Panel.
11. Click the Adapters tab in the Network screen. The Adapters folder is displayed.
12. Click the Add… button on the Adapters folder. The Select Network Adapter dialog box is displayed.
13. Click the Have Disk… button on the Select Network Adapter dialog box. The Insert Disk dialog box is displayed.
14. Insert the diskette containing the DIGITAL ON-BOARD ETHERNET 21142/21143 driver in the floppy drive of the System on which Windows NT Server was just installed.
15. In the Insert Disk dialog box, enter the path for the diskette that contains the DIGITAL ON-BOARD ETHERNET 21142/21143 driver.
16. Click the OK button in the Insert Disk dialog box. This displays the Select OEM Option dialog box.
17. Select “DEC PCI Fast Ethernet DC21143” from the pull-down list in the Select OEM Option dialog box.
18. Click the OK button in the Select OEM Option dialog box. This displays the DEC DC 21143 Based Adapter Setup dialog box.
19. Select “100BaseTx” or “10BaseT” from the pull-down list of Connection Types in the DEC DC 21143 Based Adapter Setup dialog box.
20. Click the OK button in the DEC DC 21143 Based Adapter Setup dialog box. The DEC PCI Ethernet DC 21143 driver should display in the list of Network Adapters in the Network dialog box.
21. Repeat steps 12 through 18 to copy the DIGITAL PCI ETHERNET DE450 driver to the system to which Windows NT Server has been copied.

    After you have performed step 18 for the DIGITAL PCI ETHERNET DE450 driver, the Network screen will display with both the DEC PCI ETHERNET DC 21143 driver and the DIGITAL PCI ETHERNET DE450 driver displayed in the list of Network Adapters.
22. Select the “Digital PCI Ethernet DE450” adapter.
23. Click the Adapters tab on the Network dialog box. The Adapters folder for the DIGITAL PCI ETHERNET DE450 driver is displayed.
24. Click the Properties button on the Adapters folder. A pull-down list of properties is displayed.
25. Select “TP” from the pull-down list of properties on the Adapters folder.
26. Click the Close button on the Network dialog box. This displays the Microsoft TCP/IP Properties dialog box.

After the DEC PCI ETHERNET DC 21143 driver and the DIGITAL PCI ETHERNET DE450 driver have been installed on the server, the TCP/IP dialog box is displayed. The TCP/IP dialog box is used to set the TCP/IP properties for the server on which the DEC PCI ETHERNET DC 21143 driver and the DIGITAL PCI ETHERNET DE450 driver have been installed.

Note

While setting the TCP/IP properties, keep in mind that the 21143 Adapter is for the client network and the DE450 Adapter is for the Private Network. Also, the client Network and the Private Network MUST NOT have the same Network ID.

27. Select the 21143 Adapter from the pull-down list of adapters in the Server TCP/IP Properties dialog box.
28. Click the “Specify an IP Address” radio button in the TCP/IP dialog box.

Note

Microsoft Dynamic Host Protocol (DHCP) is not supported; the settings on the DHCP folder should not be selected.

29. Enter the IP Address, Subnet Mask, and Default Gateway for the client network.
30. Select the DE450 Adapter from the pull-down list of Adapters in the Microsoft TCP/IP Properties dialog box.
31. Click the “Specify an IP Address” radio button in the TCP/IP dialog box.
32. Enter the IP Address and Subnet Mask for the Private Network.
33. Click the OK button in the TCP/IP dialog box. This displays the Network Settings Change dialog box with a prompt to restart the computer.
34. Click the Yes button in the Network Settings Change dialog box to restart the computer.
35. Log in when prompted.
36. Repeat steps 1 through 35 to install the DC 21143 driver and the DE450 driver and set the TCP/IP properties on the other server.

This concludes the basic install and setup of Windows NT Server.

Joining the Domain

After the TCP/IP Properties have been set as described in the previous section, Server 1 and Server 2 must be joined to the domain.

To join Server 1 and Server 2 to the domain, perform the following procedure twice, first to join Server 1 to the domain and then to join Server 2 to the domain.

To join a Server to the domain, do the following:

1. Open the Network icon on the Windows NT Control Panel of the Server. This displays the Network dialog box.
2. Click the Change… button in the Network dialog box. This displays the Identification Changes dialog box.

3. Click the “Domain” radio button in the “Member of” group on the Identification Changes dialog box.
4. In the Domain field, enter the name of the Server Domain in which Windows NT Server was installed.
5. Click the “Create a Computer Account in the Domain” selection box in the Identification Changes dialog box.
6. Enter the name and password of an administrator account in the domain.
7. Click the OK button in the Identification Changes dialog box. A message dialog is displayed with a message that welcomes you to the network.
8. Click the OK button in the message dialog. The Network dialog box is displayed.
9. Click the Close button in the Network dialog box. A dialog box with a prompt for starting the computer is displayed.
10. Click the Yes button in this dialog box to restart the computer.
11. Log in to the server when prompted.

    The Server is now joined to the domain.
12. Repeat steps 1 through 11 for Server 2.

    Server 1 and Server 2 are now joined to the domain.

RAID Array 310 Configuration

After Windows NT Server has been installed, TCP/IP Properties have been set, and the domain has been joined, the RAID Array 310 must be configured.

Caution

Do not configure the RAID Array 310 until after Windows NT Server has been installed and verified on both Servers as described in the preceding sections.

To configure the RAID Array 310, do the following:

1. Shut down Server 2 using the Shutdown… utility from the Windows NT Start menu.
2. Boot Server 1.
3. When prompted by the boot program, press Control+A to start SCSISelect. This will display the SCSISelect screen.
4. Select the “Configure/View Host Adapter Settings” option from the SCSISelect screen. This will display the SCSISelect configuration screen.
5. Use the arrow keys (↑ and ↓) to highlight “SCSI Device Configuration” from the Additional Options group of the SCSISelect Configuration screen.
6. With “SCSI Device Configuration” highlighted, press the Enter key. The SCSI Device Configuration screen is displayed.
7. Use the arrow keys (↑ and ↓) to highlight “Include in BIOS Scan” on the SCSI Device Configuration screen.
8. Select “no” as the value of “Include in BIOS Scan” for column 0 through column 7.

To select a value of “no” in a column, press the Enter key in the column. This will display a pop-up box. Highlight the word “no” in the pop-up box and press the Enter key again.

9. Use the arrow keys (↑ and ↓) to highlight “Host Adapter SCSI Termination” on the SCSI Device Configuration screen.
10. Select “Low OFF/High OFF” as the value of “Host Adapter SCSI Termination.”

    To select a value of “Low OFF/High OFF” for “Host Adapter SCSI Termination,” press the Enter key while “Host Adapter SCSI Termination” is highlighted. This will display a pop-up box. Highlight “Low OFF/High OFF” in the pop-up box and press the Enter key again.
11. Press the escape key to exit the SCSI Device Configuration screen. The SCSISelect configuration screen is redisplayed.

Note

Ensure that the “Host Adapter SCSI ID” in the SCSISelect configuration screen is set to 6.

12. Press the Escape key to exit the SCSISelect Configuration screen.
13. Select “Yes” when prompted to save changes.
14. Press the Escape key to exit the Utility. The “Exit Utility” prompt is now displayed.
15. Select “Yes” in response to the “Exit Utility” prompt. The “Press any key to reboot” prompt is displayed.
16. Press any key to reboot Server 1.
17. When Server 1 is finished rebooting, power on the RAID Array 310.
18. Insert the RAID Array 310 installation CD into the CD-ROM drive of the server or workstation that will act as the RAID Administrator.

Note

Any workstation or server can act as the RAID Administrator.

19. Double click the My Computer icon of the computer that is now powered up. This displays the My Computer window for that computer.
20. Select the CD-ROM icon in the My Computer window. This displays the CD-ROM window.
21. Select the client folder from the CD-ROM window. This displays the client window.
22. If there is a Patches folder in the CD-ROM Client Window, do the following:
    a. Open the Patches folder in the CD-ROM Client Window.
    b. Follow any instructions in the Patches folder for installing patches.
23. Double click the install icon in the client window. This runs the Command Console install program.
24. Follow the prompts to install the Command Console.

Note

If the system displays a prompt to cancel Setup, click the "No" button in response to this prompt.

When Command Console is installed, the system will display a dialog box containing the following message:

```
Command Console Setup was completed successfully.
```

25. Click the OK button in the dialog box that contains the previous message. This displays a dialog box that contains the following prompt:

```
If you already have Digital's ServerWORKS application
installed and are interested in integrating Command
Console with ServerWORKS, please press the YES button.
Otherwise, press the NO button to complete the Command
Console installation.
```

26. Click the "No" button in the dialog box that contains the prompt for integrating Command Console with ServerWORKS.
27. Select Start→Run… from the Windows NT Taskbar. The Run dialog box is displayed.
28. Type swcc.exe direct in the text entry field of the Run dialog box.
29. Click the OK button in the Run dialog box. The Command Console Control Panel is displayed.
30. Select Settings→Controller Communication→Serial… from the Command Console Control Panel menu bar. The Connect Local dialog box should be displayed.
31. Install RAID Array 310 by double clicking the Install icon in the CD-ROM Client window and following the prompts.
32. In the COMM Port group of the Connect Local dialog box, select the Communications Port where the RAID controller is connected.
33. Enter a system name for the RAID Array.
34. Select the 9600 radio button from the Band group in the Connect Local dialog box.
35. Select "7-device Pedestal (Config setting 1)" from the pull-down list of Subsystem Views in the Connect Local dialog box.
36. Click the Connect button in the Connect Local dialog box. This will display a status message, and finally the Subsystem Configuration dialog box.
37. Select Do→Configure Subsystem from the Command Console menu bar. The Subsystem Configuration Window is displayed.
38. Click the Subsystem View tab in the Subsystem configuration dialog box. The Subsystem View folder is displayed.
39. Click the Create button in the Volumes group in the Subsystem configuration dialog box. The Create dialog box is displayed.
40. Click RAID 1 from the Volume group in the Create dialog box.
41. Type a Container Name for the Volume in the Create dialog box.
42. Accept the default values (Single) for Container and 0 for Target.

43. Click the Options… button in the Create dialog box. The Advanced Options dialog box is displayed.
44. Click the OK button in the Advanced Options dialog box. The Create dialog box is redisplayed.
45. Click the OK button in the Create dialog box. A prompt to click at least two devices, and then click Create, is displayed.
46. Click the top two drives in the Subsystem View to be the mirror set.
47. Click the Create button in the prompt dialog. This creates the first volume.
48. Repeat steps 39 through 47 for the remaining disks in the RAID array, only increment the Target group in step 42 by 1.

    It will take an hour or longer for the volumes to be created. After the last volume has been created, you will get an error message dialog box.
49. Click the OK button in this error message dialog box.
50. Select File→Exit from the Command Console menu bar to exit the Command Console.

Partitioning the Mirror Sets

After the mirror sets are created as described in the preceding procedure, the mirror sets must be partitioned.

To partition the mirror sets, do the following:

1. Open the Administrative Tools (Common) program group and start the Disk Administrator program on Server 1. This displays the Disk Administrator window.

   A dialog box displays informing you that the system configuration will now be updated.
2. Click the OK button in this dialog box. Another dialog box is displayed which asks you if you want a disk signature.
3. Click the Yes button in this dialog box. The Disk Administrator Window is displayed.
4. Do the following for each of the mirror sets that was created in the previous procedure:
   a. Partition the shared disks and format them as NTFS.
   b. Assign sticky drive letters to the shared disks that were formatted in step a. It is recommended that you select letters at the end of the alphabet (for example, “y”, “z”) for the sticky drive letters.
   c. Exit from the Disk Administrator.
5. Shut down Server 1.
6. Power down the RAID Array 310.
7. Boot Server 2.
8. When prompted by the boot program, press Control+A to start SCSISelect. The SCSISelect screen is displayed.
9. Select the “Configure/View Host Adapter Settings” option from the SCSISelect screen. This will display the SCSISelect configuration screen.
10. Use the arrow keys (↑ and ↓) to highlight “SCSI Device Configuration” from the Additional Options group of the SCSISelect Configuration screen.
11. With “SCSI Device Configuration” highlighted, press the Enter key. The SCSI Device Configuration screen is displayed.

12. Use the arrow keys (↑ and ↓) to highlight "Include in BIOS Scan" on the SCSI Device Configuration screen.
13. Select "no" as the value of "Include in BIOS Scan" for column 0 through column 7.

    To select a value in a column, press the Enter key in the column. This will display a pop-up dialog box. Highlight the word "no" in the pop-up dialog box and press the Enter key again.
14. Use the arrow keys (↑ and ↓) to highlight "Host Adapter SCSI Termination" on the SCSI Device Configuration screen.
15. Select "Low OFF/High OFF" as the value of "Host Adapter SCSI Termination."

    To select a value of "Low OFF/High OFF" for "Host Adapter SCSI Termination," press the Enter key while "Host Adapter SCSI Termination" is highlighted. This will display a pop-up box. Highlight "Low OFF/High OFF" in the pop-up box and press the Enter key again.
16. Press the escape key to exit the SCSI Device Configuration screen. The SCSISelect configuration screen is redisplayed.

Note

Ensure that the "Host Adapter SCSI ID" in the SCSISelect configuration screen is set to 7.

17. Press the escape key to exit the SCSISelect Configuration screen. The SCSISelect Main screen is redisplayed.
18. Press the escape key to exit the SCSISelect Main screen. The "Exit Utility" prompt is now displayed.
19. Select "Yes" in response to the "Exit Utility" prompt. The "Press any key to reboot" prompt is displayed.
20. Press any key to reboot Server 2. Server 2 is now rebooted.
21. Power on the RAID Array 310 and wait for the RAID Array 310 self-checks to complete.

Note

Do not log in to Server 2 until after the RAID Array 310 self-checks have completed.

22. After the RAID Array 310 self checks have completed, log in to Server 2 and start the Disk Administrator program.
23. Assign Server 2 the same sticky drive letters that were assigned to Server 1 in step 4b of this procedure.
24. Exit from the Disk Administrator program.

Note

You must reboot Server 2 to make the changes take effect.

Installing the Cluster Software

After the Mirror Sets have been partitioned, the cluster software can be installed.

To install the cluster software, do the following:

1. Shut down Server 2 using the Shutdown… utility from the Windows NT Start menu.
2. Power on the RAID Array 310.
3. Power on Server 1.
4. Log in to Server 1 when prompted.
5. Insert Disk 2 of the Windows NT Server 4.0 Enterprise Edition CD set in the CD-ROM drive of Server 1.
6. Run `Mscs/cluster/i386/setup` on Disk 2 of the Windows NT Server 4.0 Enterprise Edition CD.
7. Follow the prompts to install the cluster software on Server 1.
8. When prompted for the operation that will be performed, select the "Form a new cluster" radio button.
9. Enter a name of your choosing for the cluster.
10. Click the Next button on the same screen.

Note

The shared cluster disks will be displayed in a "Shared cluster disks" list.

11. Click the Next button in the screen that contains the "Shared cluster disks" list.
12. When prompted for a Network Name for the DE 450_2 network, enter a descriptive name of your choice, such as "Private."
13. Click the "Use only for internal cluster communications" radio button on the same screen.
14. Click the Next button on the same screen.
15. When prompted for a name for the other (DC21X41) network, enter a descriptive name of your choice, such as "Client" and click the "Use for all communications" radio button for this network.
16. When prompted for network priority, assign the highest priority to the Private network.
17. When prompted for an IP Address for administering the network, enter an IP Address with the same Network ID as the Server. This is a virtual IP address.
18. After the cluster services have started, reboot Server 1.
19. Log in to the system when prompted.
20. Verify that the Cluster software was successfully installed by doing the following:
    a. Run the Cluster Administrator program.
    b. In the "Open Connection to Cluster" dialog box, enter the name of the Cluster.
    c. Click the Open button in the "Open Connection to Cluster" dialog box.

The Cluster Administrator Window should display the name of the Server on which the Cluster software has been installed. The resources in the "Active Resources" folder for the Server should all have a status of Online.

21. Power on Server 2.
22. Log in to Server 2 when prompted.
23. Insert Disk 2 of the Windows NT Server 4.0 Enterprise Edition CD set in the CD-ROM drive of Server 2.
24. Run `Mscs/cluster/i386/setup` on Disk 2 of the Windows NT Server 4.0 Enterprise Edition CD.
25. When prompted for the operation that will be performed, select the "Join an existing cluster" radio button.
26. Enter the IP Address or the name of the Cluster that you will be joining.
27. When prompted, enter the password for the domain.

    When the Cluster software install is complete, you will see Server 2 in the Cluster Administrator window.
28. After the system reboots, start the Cluster Administrator on Server 2.
29. Open the connection to the IP Address of Server 2.

    After the connection is opened, the Cluster Administrator window should show a status of "Up" for both Server 1 and Server 2.
30. Verify that the Active Group resources can be moved from Server 1 to Server 2 and back to Server 1 again. (To move a resource, select it and then right click the `Move Group` in the pop-up menu.)

Microsoft Exchange Installation

This section describes how to install Microsoft Exchange on Server 1 and Server 2.

Installing Microsoft Exchange on Server 1

The first server on which Microsoft Exchange is installed is Server 1.

Before Microsoft Exchange can be installed on Server 1, the hot fix `clusfixi.exe` must be installed on Server 1.

To install `clusfixi.exe` on Server 1, do the following:

1. Download `clusfixi.exe` from `ftp://ftp.microsoft.com/bussys/winnt/winnt-public/fixes/usa/nt40/hotfixes-postp3/roll-up/`.
2. Install the `clusfixi.exe` hot fix on Server 1.

Note

After the `clusfixi.exe` hot fix is downloaded from the web site specified in step 1, it can be installed on the server by double clicking on the filename.

3. Shut down Server 1.
4. Power up Server 1.

The `clusfixi.exe` hot fix is now installed on Server 1.

After `clusfixi.exe` hot fix is installed on Server 1, Microsoft Exchange can be installed on Server 1.

To install Microsoft Exchange on Server 1, do the following:

1. Insert the Windows NT Option Pack 4.0 disk in the CD-ROM drive of Server 1.
2. Start the Cluster Administrator program on Server 1.
3. Select File→New→Group from the Cluster Administrator menu bar. The New Group dialog box is displayed.
4. In the New Group dialog box, assign a descriptive name, such as “APPLICATIONS,” to the new group.
5. Click the Next button in the New Group dialog box. The new group is created and the Preferred Owners dialog box is displayed.
6. Assign preferred nodes to the new group. (You must assign at least one Preferred Node.)
7. Click the Finish button in the Preferred Owners dialog box. A message dialog is displayed saying that the Cluster group created successfully.
8. Click the OK button in the message dialog. The Cluster Administrator Window is redisplayed.
9. Open the Active Groups folder for Server 1 and select the new group that was created in steps 3 through 8 of this procedure.
10. Select New→Resource from the File menu in the Cluster Administrator menu bar. The New Resource dialog box is displayed.
11. Select IP Address from the Resource Type list in the New Resource dialog box.
12. Enter a Descriptive Name for the Resource in the Name field of the New Resource dialog box.
13. Click the Next button in the New Resource dialog box. This displays the Possible Owners dialog box.
14. Click the Next button in the Possible Owners dialog box. This displays the Dependencies dialog box.
15. Click the Next button in the Dependencies dialog box. This displays the TCP/IP Address Parameters dialog box.
16. Enter a virtual IP Address with the same network ID as the Client Network in the Address field.
17. In the Subnet Mask field, enter a subnet mask which is the same as the subnet mask for the Client Network.
18. Click the Finish button in the TCP/IP Address Parameters dialog box. This returns you to the Cluster Administrator window.
19. Right click a physical disk resource in the Cluster Administrator window.
20. Change the group of the physical disk resource to the group that you created in steps 3 through 8 of this procedure. Do this by selecting the resource, clicking the right mouse button, and selecting New→Group from the displayed pop-up.
21. Repeat steps 19 and 20 for each physical disk resource that you want to assign to the group that you created in steps 3 through 8.

22. Right click the group that was created in steps 3 through 8 of this procedure and select New→Resource. The New Resource dialog box is displayed.
23. Select Network Name from the Resource Type list in the New Resource dialog box.
24. Enter a descriptive name in the Name field of the New Resource dialog box.
25. Click the Next button in the New Resource dialog box. The Possible Owners dialog box is displayed.
26. Click the Next button in the Possible Owners dialog box. The Dependencies dialog box is displayed.
27. In the Dependencies dialog box, add the IP Address and any Physical disk resources that were assigned to the group created in steps 3 through 8 of this procedure.
28. Click the Next button in the Dependencies dialog box. The Network Name Parameters dialog box is displayed.
29. Enter a descriptive Network Name in the appropriate field of the Network Name Parameters dialog box.
30. Click the Next button in the Network Name Parameters dialog box.
31. If the newly created resources are off line, bring them on line.
32. Place the Microsoft Exchange Server 5.5 Enterprise Edition CD in the CD-ROM drive of Server 1. This displays the Main Menu of the Microsoft Exchange install program.
33. Select “Setup Server and Components” from the Main Menu of the Microsoft Exchange install program. This displays the “Choose To Install…” screen.
34. Select “Microsoft Exchange Server 5.5” from the “Choose To Install…” screen. This displays a dialog box informing you that Microsoft Exchange is being installed on a cluster.
35. Click the OK button in the dialog box informing you that Microsoft Exchange is being installed on a cluster. This displays a dialog box containing a dropdown list of cluster groups.
36. From the dropdown list of cluster groups, select the Cluster Group that was created for Microsoft Exchange.
37. Click the Continue button in this dialog box. This displays a dialog box containing copyright information for Microsoft Exchange.
38. Click the Accept button in the dialog box containing copyright information for Microsoft Exchange. This displays a dialog box with install options.
39. Select the install option which is appropriate for your site. (The choices are Typical, Minimum, and Custom Complete.) The CD Key Entry dialog box is displayed.

Note

If you get a message dialog telling you that the IIS Services will be stopped temporarily, click the OK button in this message dialog.

40. Enter a CD key in the CD Key Entry dialog box.
41. Click the OK button in the CD Key Entry dialog box. A dialog box containing your Product ID Number is displayed.

42. Write down your Product ID Number and store it in a safe place. You may need to refer to it in the future.
43. Click the OK button in the dialog box containing your Product ID Number. The Licensing dialog box is displayed.
44. Click the “I agree that” check box in the Licensing dialog box.
45. Click the OK button in the Licensing dialog box. The Organization and Site dialog box is displayed.
46. Enter the appropriate information in the Organization and Site dialog box. (You can join an existing site or create a new site.)
47. Click the OK button in the Organization and Site dialog box. A dialog box containing a prompt for a password is displayed.
48. Enter a password in this dialog box.
49. Click the OK button in the password prompt dialog box. The install of the Microsoft Exchange files now begins. This process may take several minutes.

    After the software has installed, the Setup program starts the Microsoft Exchange Directory service. If you are joining another site, the system will replicate your Microsoft Exchange Server to the servers in the site being joined.

    Then the Setup program starts the Microsoft Exchange Information Store service, installs services, and modifies the registry.

    This process may take several minutes. A variety of message dialogs will display as this happens. When it is finished, the following message dialog is displayed:

    ```
    Replication within the site has been initiated. This is
    not an immediate process. Depending on the size and
    structure of your network it may take some time before the
    organization is fully replicated with this new server.
    ```

50. Click the OK button in this dialog box.

    The system continues to do replication. When replication is finished, the following message dialog is displayed:

    ```
    Microsoft Exchange Server has been installed on this
    cluster node. To complete the installation, you must run
    Setup on all other nodes in the cluster.
    ```

51. Click the OK button in this dialog box.

    This displays another dialog box prompting you to run Optimizer.

52. Click the Run Optimizer button in this dialog box.

    This displays the Optimizer informational dialog box.

53. Click the Next button in the Optimizer informational dialog box to proceed with optimization.

    After several seconds a dialog box is displayed which prompts for number of users, Type of server, Users in Organization, and Memory Usage.

54. Fill in the information in this dialog box with settings appropriate to your site.
55. Click the Next button in this dialog box.

    This displays another dialog box with a progress bar and information about disk analysis.

56. Click the Next button in this dialog box.

    This displays a list of suggested locations for Microsoft Exchange files and services.

57. Make changes as desired in these locations.

58. Click the Next button in this dialog box.

    This displays the final screen of the Optimizer. This screen tells you where the log file will be written.

59. Click the Finish button in this dialog box.

    This will save parameters and start services. (The process of saving parameters and starting services may take several minutes.)

    When all of the services are started, the "Choose To Install…" Menu will is redisplayed.

60. Click the Exit button on the "Choose To Install…" Menu. The Windows NT desktop is redisplayed.

61. Run the Cluster Administrator and select the Active Resources group on the Server where Microsoft Exchange was installed.

62. Verify that all of the resources in the Active Resources group are in the "Online" state.

Installing Microsoft Exchange on Server 2

After Microsoft Exchange is installed on Server 1, it must be installed on Server 2.

Before Microsoft Exchange can be installed on Server 2, the hot fix `clusfixi.exe` must be installed on Server 2.

To install `clusfixi.exe` on Server 2, do the following:

1. Download `clusfixi.exe` from `ftp://ftp.microsoft.com/bussys/winnt/winnt-public/fixes/usa/nt40/hotfixes-postp3/roll-up/`.
2. Install the `clusfixi.exe` hot fix on Server 1.

Note

After the `clusfixi.exe` hot fix is downloaded from the web site specified in step 1, it can be installed on the server by double clicking on the filename.

3. Reboot Server 2.

The `clusfixi.exe` hot fix is now installed on Server 2.

After `clusfixi.exe` hot fix is installed on Server 2, Microsoft Exchange can be installed on Server 2.

To install Microsoft Exchange on Server 2, do the following:

1. Place the Microsoft Exchange Server 5.5 Enterprise Edition CD in the CD-ROM drive of Server 2.
2. Select "Microsoft Server and Components" from the Main Menu of the MS Exchange install program. The Applications & Tools Menu is displayed.
3. Select "Microsoft Exchange Server 5.5" from the Applications & Tools Menu. An informational dialog box is displayed. The informational dialog box informs you that Microsoft Exchange is being installed on a cluster.

4. Click the OK button in this informational dialog. A dialog box that contains the “Update Node” and “Remove All” action buttons is displayed.
5. Click the “Update Node” action button in this dialog box. The CD key dialog box is displayed.
6. Enter the CD key in the CD key dialog box.
7. Click the OK button in the CD key dialog box. A dialog box containing your Product ID Number is displayed.
8. Write down your Product ID Number and store it in a safe place. You may need to refer to it in the future.
9. Click the OK button in the dialog box containing your Product ID Number. The password prompt dialog box is displayed.
10. Enter a password in the password prompt dialog box.
11. Click the OK button in the password prompt dialog box.

    After several minutes, a message dialog is displayed with the message that Microsoft Exchange has been installed.
12. Click the OK button in the dialog box that states that Microsoft Exchange has been installed. The “Choose To Install…” menu is displayed.
13. Click the Exit button on the “Choose To Install…” menu. The Windows NT desktop is redisplayed.
14. Start the Cluster Administrator on Server 2. The Cluster Administrator window is displayed.
15. Click the Active Groups folder for Server 1 on the data side of the Cluster Administrator window. The Active Groups folder for Server 1 is expanded.
16. Click the Active Groups folder for Server 2 on the data side of the Cluster Administrator window. The Active Groups folder for Server 2 is expanded.
17. Verify that the Active Group resources can be moved from Server 1 to Server 2 and back to Server 1 again. (To move a resource, select it and then right click the `Move Group` in the pop-up menu.)

Installing Internet Explorer 4.0

Internet Explorer 4.0 must be installed before Internet Information Server is installed.

Install Internet Explorer 4.0 after the cluster software has been installed as described in the previous section.

The following procedure must be performed twice. The first time it is performed to install Internet Explorer 4.0 on Server 1. The second time it is performed to install Internet Explorer 4.0 on Server 2.

To install Internet Explorer 4.0 on a server, do the following:

1. Insert the Internet Explorer disk in the CD-ROM drive of the server.
2. Run `Ie401/I386/Ie4setup` on the Internet Explorer CD. This runs the Internet Explorer install program.
3. Follow the prompts through the Internet Explorer install program and enter appropriate responses as prompted.
4. Log in to the Server when prompted.

5. After Internet Explorer 4.0 has been installed on Server 1, repeat steps 1 through 4 to install Internet Explorer 4.0 on Server 2.

Installing Internet Information Server 4.0

After the Installing Internet Explorer 4.0 software is installed on both servers, Internet Information Server 4.0 may be installed. The following procedure installs Internet Information Server 4.0 on Server 1 and Server 2.

To install Internet Information Server 4.0, do the following:

1. Create a group for Internet Information Server as described in steps 1 through 28 of the Installing Microsoft Exchange on Server 1 section.

Note

During the creation of a group for Internet Information Server, you will be prompted for a Group Name and a Network Name. In response to these prompts, enter a Group Name and a Network Name that is appropriate for Internet Information Server.

2. Insert the Windows NT Option Pack 4.0 disk in the CD-ROM drive of Server 1.
3. Start the Cluster Administrator program on the Server where Internet Information Server 4.0 is to be installed.
4. Select File→New→Group from the Cluster Administrator menu bar. The New Group dialog box is displayed.
5. In the New Group dialog box, assign a descriptive name, such as “APPLICATIONS,” to the new group.
6. Click the Next button in the New Group dialog box. The new group is created and the Preferred Owners dialog box is displayed.
7. Assign preferred nodes to the new group. (You must assign at least one Preferred Node.)
8. Click the Finish button in the Preferred Owners dialog box. A message dialog is displayed saying that the Cluster group created successfully.
9. Click the OK button in the message dialog. The Cluster Administrator Window is redisplayed.
10. Open the Active Groups folder for Server 1 and select the new group that was created in step 1 through 5 of this procedure.
11. Select New→Resource from the File menu in the Cluster Administrator menu bar. The New Resource dialog box is displayed.
12. Select IP Address from the Resource Type list in the New Resource dialog box.
13. Enter a Descriptive Name for the Resource in the Name field of the New Resource dialog box.
14. Click the Next button in the New Resource dialog box. This displays the Possible Owners dialog box.
15. Click the Next button in the Possible Owners dialog box. This displays the Dependencies dialog box.
16. Click the Next button in the Dependencies dialog box. This displays the TCP/IP Address Parameters dialog box.

17. Enter a virtual IP Address with the same network ID as the Client Network in the Address field.
18. In the Subnet Mask field, enter a subnet mask which is the same as the subnet mask for the Client Network.
19. Click the Finish button in the TCP/IP Address Parameters dialog box. This returns you to the Cluster Administrator window.
20. Right click a physical disk resource in the Cluster Administrator window.
21. Change the group of the physical disk resource to the group that you created in step 2. Do this by selecting the resource, clicking the right mouse button, and selecting New→Group from the displayed pop-up.
22. Repeat steps 20 and 21 for each physical disk resource that you want to assign to the group that you created in steps 1 through 5.
23. Right click the group that was created in step 2 and select New→Resource. The New Resource dialog box is displayed.
24. Select Network Name from the Resource Type list in the New Resource dialog box.
25. Enter a descriptive Network Name in the Name field of the New Resource dialog box.
26. Click the Next button in the New Resource dialog box. The Possible Owners dialog box is displayed.
27. Click the Next button in the Possible Owners dialog box. The Dependencies dialog box is displayed.
28. In the Dependencies dialog box, add the IP Address and any Physical disk resources that were assigned to the group created in steps 1 through 5.
29. Click the Next button in the Dependencies dialog box. The Network Name Parameters dialog box is displayed.
30. Enter a new Network Name in the Name field of the Network Name Parameters dialog box. This will be the name of the new network.
31. Click the Finish button in the Network Name Parameters dialog box. The Cluster Administrator window is redisplayed.
32. Click the Resources folder on the data side of the Cluster Administrator window. The Resources folder is expanded.
33. Right click the IP Address Resource that was created in this procedure and select “Bring Online.”
34. Right click the Network Name Resource that was created in this procedure and select “Bring Online.”
35. Run setup in the root directory of the Windows NT Option Pack 4.0 disk. This starts the install program for Internet Information Server 4.0. (The Windows NT Option Pack 4.0 disk should still be mounted in the CD-ROM drive of the server on which Internet Information Server 4.0 is to be installed.)
36. Follow the prompts to install Internet Information Server 4.0, customizing your install as appropriate.

When the install is finished, *do not* press the OK button in the dialog box that contains the following message:

```
Setup has just completed installation on the first node of
this cluster. Please run setup on the other nodes in the
cluster at this time. After setup has completed on all
other nodes, press "OK" to continue.
```

37. Being sure *not* to click the OK button in the above dialog box, remove the Windows NT Option Pack 4.0 disk from the CD-ROM drive on Server 1.
38. Place the Windows NT Option Pack 4.0 disk in the CD-ROM drive of Server 2.
39. Run setup on the root directory of the Windows NT Option Pack 4.0 disk. This starts the install program for Internet Information Server 4.0.
40. Follow the prompts to install Internet Information Server 4.0, customizing your install as appropriate.

    When the install is finished, you will be prompted to restart your computer.
41. Move the Windows NT Option Pack 4.0 disk to the Server 1 CD-ROM drive.
42. Click the Yes button in the dialog box that prompts to restart the computer. This restarts Server 2.
43. After Server 2 is restarted, click the OK button on Server 1. (Make sure that the Internet Information Server CD is in the CD-ROM drive of Server 1.)
44. Reboot Server 1.

Management Station Installation

If you have selected a Management Station, use the instructions in this section to install and configure the hardware and software on the management station and the software on the systems being managed.

Hardware Installation

Install the Management Station hardware using the instructions in the *Prioris XL 6000 Quick Reference Guide* provided with your Prioris XL 6200 system.

Software Installation

This section describes how to install the Management Station software, including the operating system, the management applications installed on the management station, and the clients and agents installed on the systems to be managed.

Operating System Installation

Install and configure the Windows NT Server operating system using the *Microsoft Windows NT Server Basics and Installation Guide*. Install Windows NT Service Pack 3 (SP3).

Management Station

The System Management Station manages the servers and workstations on your network using Systems Management Server (SMS). Using SMS, you can monitor network activity and distribute software packages and audit and inventory hardware and software.

To use SMS you must first install SQL Server on the machine that will become the SMS server. SMS stores all of its data in the SQL database.

SQL Server Installation

To install SQL Server Version 6.5, refer to the *Microsoft SQL Server Setup Guide* and the *Microsoft SQL Server Administrator's Companion* as you complete the following steps:

1. Make sure that you have 100 MB of space for the SQL Master Device.
2. Insert the SQL Server CD-ROM and run `setup.exe`.
3. When SQL Server installation prompts for the "sa" account password, leave it blank. Even if you enter a password at this point, it is not used by SQL Server after installation.
4. The SQL Server Service Pack 1 (SP1) installation launches automatically after the SQL Server installation is completed. When prompted for the "sa" password, again leave it blank.
5. After installing SQL Server and SP1, set the password "sa" by launching SQL Enterprise Manager and selecting Logins from the Manage menu.

SMS Server Installation

To install SMS Server Version 1.2, refer to the *Microsoft Systems Management Server for Windows NT Administrator's Guide* as you complete the following steps:

1. Make sure that all the servers and workstations you want to include in your SMS site are up and available on the network.
2. Insert the SMS Server CD-ROM and run `setup.exe`.
3. Complete the installation, taking the defaults.
4. When prompted, select "Install Primary Site."
5. When prompted, select "Detect logon servers during setup."
6. Include the software for Alpha as well as Intel clients.
7. When prompted for the SQL server name, take the defaults.
8. When prompted for the "sa" password, enter the password you set after the SQL Server installation.
9. The SMS Server Service Pack 1 (SP1) installation launches automatically after the SMS Server installation is completed.
10. Reapply Windows NT Service Pack 3 (SP3).

Managed Systems

Install the following software on any workstation or server that you wish to manage from the System Management Station.

SMS Client

To install the SMS client, refer to the *Microsoft Systems Management Server for Windows NT Administrator's Guide* as you complete the following steps:

1. From the DIGITAL Server 3100 system, launch Network Neighborhood and expand the SMS server.
2. Expand the SMS_SHR file share.
3. Double click `Runsms.bat` to install client utilities for Intel and Alpha based clients. The installation detects the platform and installs the appropriate software.
4. When prompted, provide the appropriate `.mif` file information, which includes user name, site name, and so forth.

5. Save the `.mif` information and exit.
6. Reapply Windows NT Server Service Pack 3 (SP3).
7. Reboot the DIGITAL Server 3100.

5
Tests and Results

The DIGITAL HiTest program tests for several types of problems that affect the system. The HiTest program works together with other organizations to obtain and share test information for other categories.

This chapter describes the overview of test results, how the tests were set up, and where the data and programs were placed.

Also covered in this chapter is the test environment, tools used for testing, test configuration, test management, and the test process.

Note

The systems that were tested for this HiTest Suite were Prioris MX systems. (The Prioris MX system has since been rebranded as the DIGITAL Server 3100.) This chapter describes the tests that were performed on Prioris MX systems and the results that were obtained from those tests.

Overview of Results

Interoperability testing was performed successfully on the Microsoft Exchange and IIS Windows NT MSCS DIGITAL Server 3100 HiTest Suite. Tests were performed to ensure the HiTest Suite met installability and interoperability criteria.

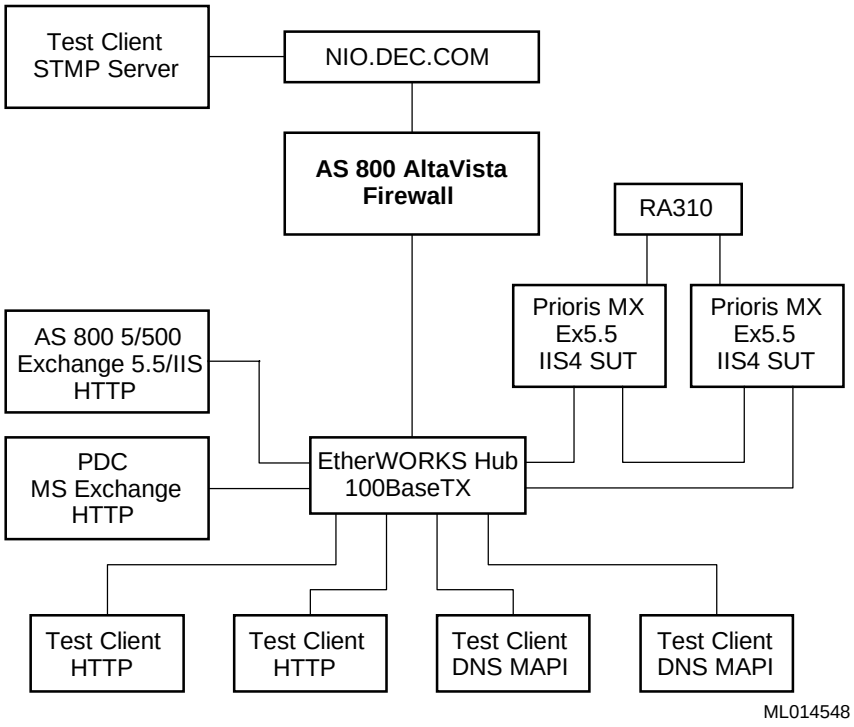
During the 40-hour load test, of the maximum configuration, approximately 1.39 million mail messages were successfully sent and received with full data integrity checking. Approximately 2.91 million web pages were successfully served at the same time. During the 40-hour load test of the maximum configuration, the average CPU usage was approximately 70%.

Several manual tests were also performed successfully during the 40-hour load test. These manual tests included tape backups and restores, FTP operations, file I/O, SMTP mail operations from an Exchange client, and a variety of failure insertion tests.

Test Environment

Figure 5-1 shows the Microsoft Exchange and IIS Windows NT MSCS DIGITAL Server 3100 test environment.

Figure 5-1: Test Environment



Test Tools

The following tools were used for interoperability testing:

- **Ste_mapi –** A custom DIGITAL MAPI test tool which exercises Exchange mail by logging in multiple mail senders and receivers and then sending messages between them with full data integrity checking.
- **Webstone 2.0 –** An industry standard HTTP tool used for performance characterization.
- **WebTool –** A custom DIGITAL Visual Basic script similar to Webstone but with full data integrity checking.
- Manual tests of FTP, Failover, and File IO were performed.
- A DIGITAL custom LotusScript tool exercised the Exchange SMTP connector.

Test Configuration

The test load was generated as follows:

- Multiple NT client drivers with the previously listed tools were run concurrently against the cluster in two 40-hour test runs.
- Tape backups, FTP operations, and failover testing were included during the two 40-hour test runs.

Minimum Configuration

The minimum configuration included six disks connected to the Adaptec 2944 Adapter as shown in Table 5-1.

Table 5-1: Disk Configuration for the Minimum Configuration

Disk Drive Group Name	Number of Disk Drives	Disk Drive Locations	Disk Drive Content and Data	Group Type	Usable Capacity
System	1 per server	Server	Windows NT system and paging file	JBOD	4.3 GB
Vol1	2	RAID Array 310 (shared)	MS Exchange *	RAID 1	4.3 GB
Vol2	2	RAID Array 310 (shared)	MS Exchange *	RAID 1	4.3 GB
* Exchange Performance Optimizer allocates disks according to system usage specifications.				Usable Total: **8.6 GB (Shared)**	

Maximum Configuration

The maximum configuration included eight disks connected to the Adaptec 2944 Adapter as shown in Table 5-2.

Table 5-2: Disk Configuration for the Maximum Configuration

Disk Drive Group Name	Number of Disk Drives	Disk Drive Locations	Disk Drive Content and Data	Group Type	Usable Capacity
System	1 per server	Server	Windows NT system and paging file	JBOD	4.3 GB
Vol1	2	RAID Array 310 (shared)	MS Exchange *	RAID 1	8.6 GB
Vol2	2	RAID Array 310 (shared)	MS Exchange *	RAID 1	8.6 GB
Vol3	3	RAID Array 310 (shared)	Internet Information Server	Raid 3/5	17.2 GB
* Exchange Performance Optimizer allocates disks according to system usage specifications.				Usable Total: **34.4 GB (Shared)**	

Test Management

The HiTest configuration was managed using the Systems Management Server (SMS) Administrator, as described in the following procedure:

1. Launch the SMS Administrator and enter the “sa” password when prompted.
2. Select the Sites Window type (this is the default) and click OK.
3. To view domains, double click the site icon in the left pane.
4. To view the SMS clients in the domain, click the domain icon in the left pane. The SMS clients appear in the right pane.
5. To view information relevant to the client machine, double click the client in the right pane.
6. To view the various attributes and values for the client machine, click the property icons in the left pane.

Test Process and Results

The following information describes the test results:

- During each 40-hour test, the following test load was generated:
  - **Minimum configuration –** Approximately 1.19 million mail messages were sent and received with full data integrity checking. The average CPU usage was approximately 70%.
  - **Maximum configuration –** Approximately 1.39 mail messages were sent and received with full data integrity checking. Approximately 2.91 million web pages were served at the same time. No errors encountered in either test. The average CPU usage was approximately 70%.
- During each 40-hour test, the following manual tests were performed:
  - Tape backups and restores
  - FTP operations
  - File I/O
  - SMTP mail operations from an Exchange client
  - Failure tests, which consisted of the following actions and results:

    Action: Remove disk from RAIDset while system is running.
    Result: System continues running. Alarm sounds.

    Action: Insert new disk and initiate disk reconstruction.
    Result: Reconstruction of new disk was successful.

    Action: Turn off power to server with active resources.
    Result: In about one to two minutes all resources start up on the second server. While services are restarting they are unavailable.

6
Problems and Solutions

This chapter describes problems encountered during the testing. Where appropriate, a solution for each problem is given which provides a fix or workaround. An impact statement is also provided.

Foundation Hardware

The following problems were identified:

Network Adapter Problem

Problem The Cluster Server does not detect two network adapters.

Impact The Cluster Server cannot communicate with the network.

Solution Assign a different Network ID or subnet to each network adapter. This problem can be avoided by following the software installation instructions described in Chapter 4.

RAID Array 310 Command Console Problem

Problem The RAID Array 310 Command Console does not run.

Impact The features of the RAID Array 310 Command Console are unavailable to the user.

Solution The Command Console patches must be installed on the server or workstation that is going to be used as the RAID Administrator. To install the Command Console patches on this server or workstation, do the following:

1. Log in to Server 1 as Administrator.
2. After logging in to Server 1 as Administrator, insert the RAID Array 310 installation CD into the CD-ROM drive of the server or workstation that will act as the RAID Administrator.
3. Double click the My Computer icon of the computer that is now powered up. This displays the My Computer window for that computer.
4. Select the CD-ROM icon in the My Computer window. This displays the CD-ROM window.
5. Select the client folder from the CD-ROM window. This displays the client window.
6. If there is a Patches folder in the CD-ROM Client Window, do the following:
   a. Open the Patches folder in the CD-ROM Client Window.
   b. Follow any instructions in the Patches folder for installing patches.

This problem can be avoided by following the software installation instructions described in Chapter 4.

Foundation Software

No problems were encountered.

AppSet Software

The following problems were identified:

Application Software Installation Problems

Problem Microsoft Exchange cannot be installed.

Impact Self-explanatory

Solution Obtain the `clusfixi.exe` hot fix from `ftp://ftp.microsoft.com/bussys/winnt/winnt-public/fixes/usa/nt40/hotfixes-postp3/roll-up/` and install it on Server 1 and Server 2 before installing Microsoft Exchange. The correct sequence for installing the `clusfixi.exe` hot fix and Microsoft Exchange on Server 1 and Server 2 is documented in the Microsoft Exchange Installation section of Chapter 4.

Problem The Microsoft Exchange SMTP service does not install correctly on Server 2; the Registry is not completely updated.

Impact The Microsoft Exchange SMTP service does not failover.

Solution To resolve this problem, do the following:

1. Install the SMTP connector on Server 1 in the Exchange resource group.
2. Set the SMTP resource property to “do not restart.”
3. Move the Exchange group to Server 2.
4. Use Exchange Administrator on Server 2 to delete the SMTP connector.
5. Reinstall the SMTP connector on Server 2.
6. Verify that the SMTP resource can be moved from server to server without error.

This problem can be avoided by following the software installation instructions described in Chapter 4.

Problem System crashes occur when Internet Information Server 4.0 is run.

Impact Self-explanatory

Solution To avoid this problem, follow the order for installing software applications that is documented in Chapter 4.

System Management Station

No problems were encountered.

7
Detailed Hardware Configuration

This chapter describes the minimum and maximum hardware configuration for the Microsoft Exchange and IIS Windows NT MSCS DIGITAL Server 3100 HiTest Suite by providing the following:

- System Diagram
- HiTest System Slot Configurations
- Storage Architecture

System Diagram

Figure 7-1 shows a diagram of the maximum configuration of this HiTest Suite and Table 7-1 lists the major cables.

Figure 7-1: System Diagram

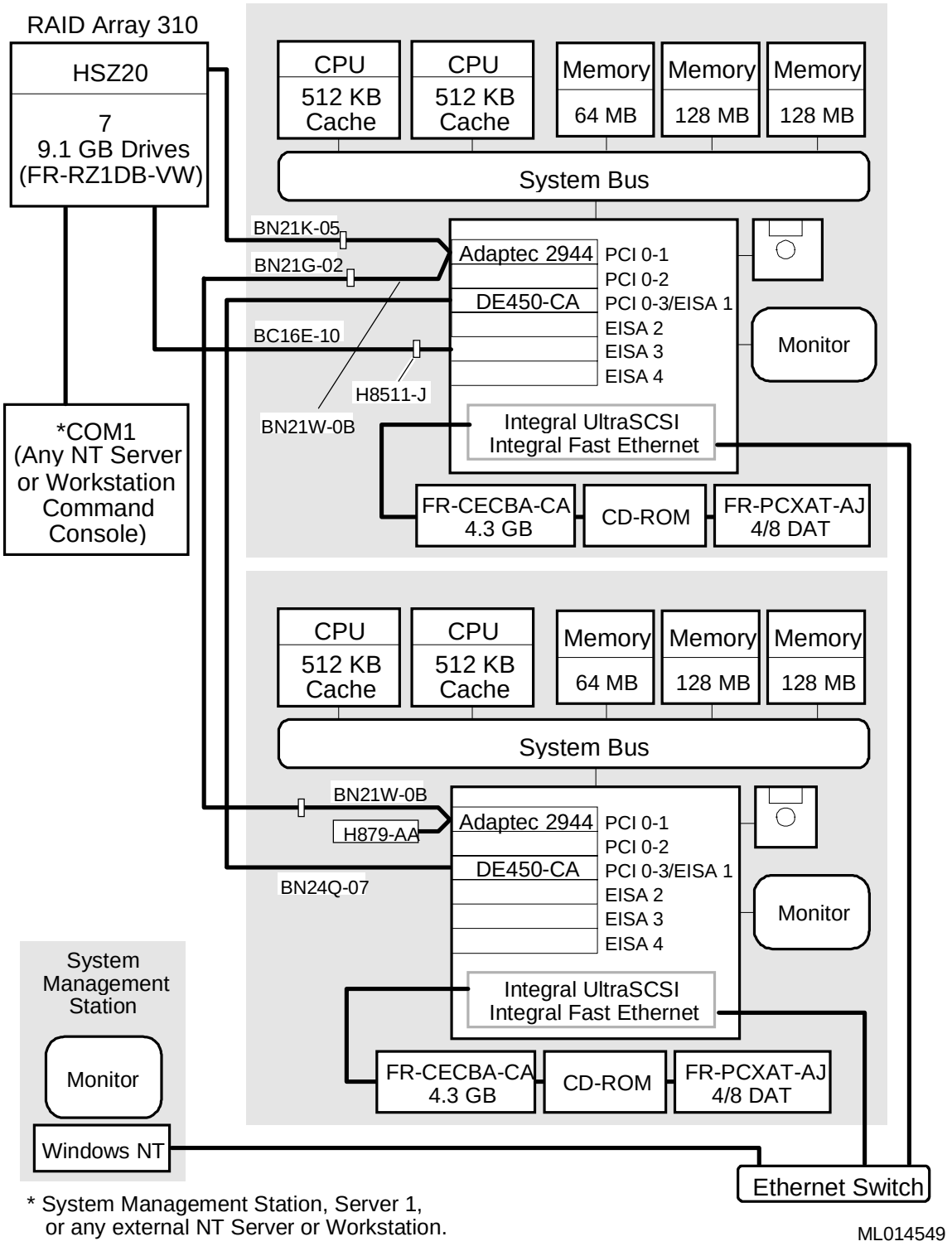


Table 7-1: Configuration Cabling

Part Number	Qty	Description	From	To
H8511-J	2	Adapter	RAID Array 310	RAID Command Console
BC16E-10	1	Cable, Serial	RAID Array 310	RAID Command Console
BN21K-05	1	SCSI Cable	RAID Array 310	Server 1
BN21W-0B	2	Y Cable	Server AHA 2944	–
BN31G-02	1	SCSI Cable	Y Cable Server 1	Y Cable Server 2
BN24Q-07	1	Crossover cable	Server 1 DE450	Server 2 DE450

HiTest System Slot Configuration

Figure 7-2 shows the HiTest System Slot Usage and Table 7-2 describes the minimum and maximum hardware configurations used for both DIGITAL Server 3100 systems in this HiTest Template.

Figure 7-2: HiTest System Slot Usage

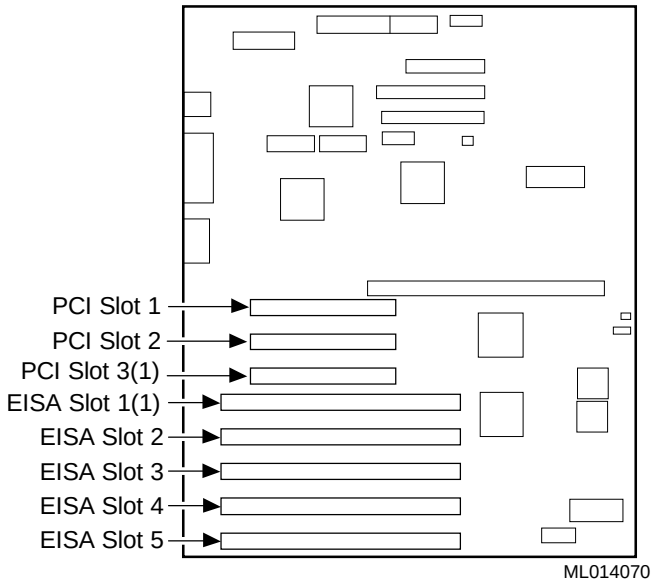


Table 7-2: System Slot Usage (Minimum and Maximum Configurations)

Slot	Minimum Configuration	Maximum Configuration	Description
PCI 0-1	SWXA3-BD	SWXA3-BD	Adaptec 2944 UW
PCI 0-2	DE450-CA	DE450-CA	Ethernet

Storage Architecture

The following figure describes the storage architecture for each of the DIGITAL Server 3100 systems in this HiTest Template. Table 7-3 lists the SCSI storage for each of the DIGITAL Server 3100 systems in this HiTest Template.

Figure 7-3: Storage Architecture

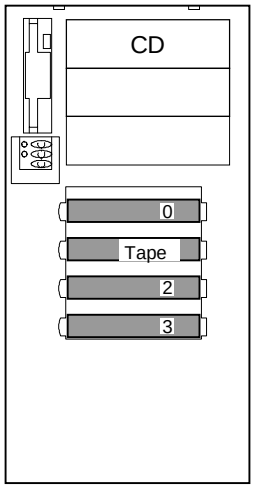


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Table 7-3: SCSI Storage (Minimum and Maximum Configurations)

Slot/Device	Part Number	Description
0	FR-CDCBA-CA	Windows NT system and paging file
Tape	FR-PCXAT-AJ	4/8 GB DAT SCSI Tape Drive
CD	–	Integral SCSI 12X CD-ROM Drive

Table 7-4 and Table 7-5 describe the RAID storage architecture for the minimum configuration and the maximum configuration.

Table 7-4: RAID Storage Architecture (Minimum Configuration)

Volume	Port	ID #	Capacity
1	1	0	4.3 GB
1	1	1	4.3 GB
2	1	2	4.3 GB
2	1	3	4.3 GB

Table 7-5: RAID Storage Architecture (Maximum Configuration)

Volume	Port	ID #	Capacity
1	1	0	9.1 GB
1	1	1	9.1 GB
2	1	2	9.1 GB
2	1	3	9.1 GB
3	2	0	9.1 GB
3	2	1	9.1 GB
3	2	2	9.1 GB