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Oracle Applications Oracle TruCluster AS DIGITAL UNIX AlphaServer 8400

DIGITAL HiTest Notes

Part Number: EK-HOATB-HN. A01

June 1998

Revision/Update Information: This is a new document.

Digital Equipment Corporation
Maynard, Massachusetts

Table of Contents

1 Advantages of DIGITAL HiTest Suites

2 About This DIGITAL HiTest Suite

3 Configuration Data

4 System Installation and Setup

Contents

5 Tests and Results

6 Problems and Solutions

Contents

7 Detailed Hardware Configuration

A EBU Backup and Database Creation Scripts

Figures

Tables

Contents

Preface

This document provides an overview of DIGITAL HiTest Suites and detailed technical information about the Oracle Applications Oracle TruCluster AS DIGITAL UNIX AlphaServer 8400 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.

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.
Appendix A – EBU Backup and Database Creation Scripts	Contains scripts used to implement this HiTest Suite.

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-HOATB-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 for partners and DIGITAL employees 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.

Hardware Guides

- *AlphaServer 8400 Installation Guide* (EK-T8430-IN)

- *Getting Started: HSZ70 Solution Software 7.0B for DIGITAL UNIX* (AA-R60KB-TE)

Operating System

- *DIGITAL UNIX Installation Guide* (AA-QTLGB-TE)

- *DIGITAL UNIX Software License Management* (AA-PS2ED-TE)

- *DIGITAL UNIX System Configuration and Tuning Guide* (AA-Q0R3F-TE)

- TruCluster Available Server Software manuals:

  - *Hardware Configuration*

  - *Software Installation*

  - *Administration*

  These books are available in HTML format at the following location:

  ```
  http://www.UNIX.digital.com/faqs/publications/cluster_doc
  /cluster_15/BOOKSHELF.HTM
  ```

- Advanced File System and Utilities for DIGITAL UNIX *Guide to File System Administration*. This guide can be found at:
  ```
  http:/www.UNIX.digital.com/faqs/publications/base_doc/
  DOCUMENTATION/HTML/ADVFS_html/advfs_admin_guide.html.
  ```

Backup and Restore

- *NetWorker Save and Restore for DIGITAL UNIX Installation Guide* (AA-Q2H4K-TE)

- *NetWorker Save and Restore for DIGITAL UNIX Administrator's Guide* (AA-QH5CC-TE)

- *NetWorker Save and Restore Database Module for Oracle Installation Guide* (AA-R2ZAA-TE)

- *NetWorker Save and Restore Database Module for Oracle Administrator's Guide* (AA-QV9BB-TE)

- *Oracle7 Enterprise Backup Utility Installation Guide for DIGITAL UNIX, Release 2.1.0.1.2* (Oracle Corp., Part No. A45307-1)

- *Oracle7 Enterprise Backup Utility Administrator's Guide for DIGITAL UNIX* (Oracle Corp., Part No. A48522-2)

Oracle Server

- *Oracle7 Installation Guide for Digital UNIX* (Oracle Corp., Part No. A44212-1)

- *Oracle7 for UNIX Performance Tuning Tips* (Oracle Corp., Part No. 53134-0293)

Oracle Applications

- *Oracle Applications Installation Manual for UNIX* (Oracle Corp., Part No. A47542-1)

- *Oracle Financials and Oracle Government Financials Implementation Manual* (Oracle Corp., Part No. A34161)

- *Oracle General Ledger Reference Manual* (Oracle Corp., Part No. A13114)

- *Oracle Payables Reference Manual* (Oracle Corp., Part No. A43128)

- *Oracle Receiveables Reference Manual* (Oracle Corp., Part No. A 34134)

- *Oracle Applications for MS Windows Clients Installation Manual/Release 10 Smart Client Production 16.1 Unix Server Edition* (Oracle Corp., Part No. A54985-02)

System Management Station

- *DIGITAL PATHWORKS 32 User's Guide* (AA-R36VA-TE)

- *DIGITAL StorageWorks Command Console Getting Started* (AA-R0HJC-TE)

- *ServerWORKS Manager Overview and Installation* (ER-4QXAA-UA)

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 data warehousing or enterprise management.

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 Oracle Applications Oracle TruCluster AS DIGITAL UNIX AlphaServer 8400 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, middleware, database, 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 tape devices 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

The Oracle Applications Oracle TruCluster AS DIGITAL UNIX AlphaServer 8400 HiTest Suite provides a combination of a powerful application and database, robust operating system, high availability, and an industry-leading hardware platform.

Oracle Applications automate the enterprise with more than 40 integrated software modules for financial management, supply chain management, manufacturing, project systems, human resources, and sales force automation. Oracle Applications Release 10.7 is the world's first suite of enterprise business applications based on Java.

TruCluster Available Server Software significantly reduces down time due to hardware and software failures. TruCluster Available Server's integrated organization of systems and external disks connected to shared SCSI buses provides highly available software and disk data to client systems.

The AlphaServer 8400 system includes the fastest CPUs, memory, and input/output (I/O) in the industry. It supports multiple I/O channels that provide up to 1.2 Gbyte-per-second throughput using industry-standard PCI options. The AlphaServer 8400 also offers XMI I/O support for legacy devices. Based on the Alpha 64-bit RISC architecture, the AlphaServer 8400 provides investment protection you can count on.

The Oracle Applications Oracle TruCluster AS DIGITAL UNIX AlphaServer 8400 HiTest Suite includes the following components:

- Oracle Applications 10.7, including:
    - General Ledger
    - Accounts Receiveable
    - Accounts Payable
- Oracle7 Server for DIGITAL UNIX
- TruCluster Available Server for DIGITAL UNIX
- DIGITAL UNIX
- AlphaServer 8400
- StorageWorks ESA 10000

This chapter describes the following characteristics of the Oracle Applications Oracle TruCluster AS DIGITAL UNIX AlphaServer 8400 HiTest Suite and evaluates the Suite in terms of each:

- Availability
- Installability

- Interoperability

- Scalability

- Services

- Year 2000 Compliance

Availability

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

- Data Protection – Ensures long-term data accessibility by providing the facility to do 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 this 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: 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	
Platform Availability	System failover (clustering)	Yes	
	Redundant network	Yes	

Recommendations for This 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, DIGITAL recommends that the following levels of availability features be considered for this HiTest Suite:

- Data Protection

  – Long-term data accessibility is always provided with this HiTest Suite by the TL894 automated tape library which provides up to 3.36 TB of data storage (compressed) with four TZ89 drives.

- Data Availability

  – High performance data access was maintained by using RAID 0+1. Hardware striping is provided by HSZ70 controllers. Host-based software mirroring is provided by using Logical Storage Manager (LSM) to provide data redundancy.

  – The use of shared SCSI bus storage is a requirement of the TruCluster Available Server configuration.

- Platform Availability

  – The TruCluster Available Server configuration provides redundancy at the system level.

  – References are provided to customizeable failover scripts that run on the clustered configurations of this DIGITAL HiTest Suite.

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 RAID 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. If disks of different capacities are mixed, the resulting RAIDset will assign the smallest size disk for each member of the set. 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.

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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.

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

RAID Level

0
Striping - Nonredundant

1
Mirroring

2
Byte Interleaved, ECC

3
Byte Interleaved, Parity

4
Block Interleaved, Parity

5
Block Interleaved,
Distributed Parity
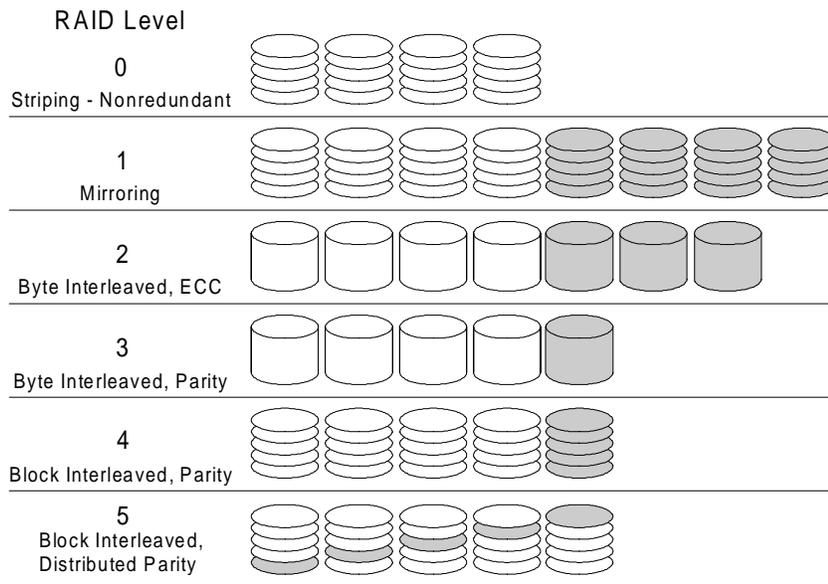
ML014332

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.

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)

RAID Level	Description	Advantages/Disadvantages
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
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

RAID Level	Description	Advantages/Disadvantages
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

Logical Storage Manager (LSM)

DIGITAL UNIX LSM provides low-overhead access to a logical view of storage devices. With LSM, logical disks can be created from any combination of physical disks of any size. LSM accomplishes this through the use of disk striping and mirroring. If a disk fails, the inherent redundancy keeps data available.

LSM includes a visual management interface to simplify storage management. Disk hotspots are highlighted so managers can see which parts of their storage configurations receive the most or least accesses. The graphical interface can be used to rearrange storage layout dynamically, either to grow or compress disk volumes as needs change, or to dynamically tune performance and system utilization.

Clustering

A cluster is a group of systems that works collectively to provide 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.

DIGITAL UNIX TruCluster Solutions include:

• TruCluster Production Server is an environment for providing highly available and scalable database services, with applications like Oracle Parallel Server and Informix OnLine XPS. TruCluster Production Server software consists of the TruCluster Available Server Software and the TruCluster MEMORY CHANNEL Software to provide both high availability for mission-critical applications as well as high-performance database applications.

• TruCluster Available Server is an environment for providing a quick recovery, failover (high availability) environment for many UNIX applications, including standard database products, NFS, printers, network logins, and so forth. The functionality of the Available Server is included in the Production Server. TruCluster Available Server is designed for computing environments that can tolerate a short disruption, but need critical applications automatically restarted.

• TruCluster MEMORY CHANNEL is an enabler for highly optimized applications that require high-performance data delivery over the MEMORY CHANNEL interconnect. The product's software library provides application programming interfaces (APIs) for access to MEMORY CHANNEL data transfer and locking functions.

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.

No problems were found with the hardware installation. A few minor problems were detected that affect the software installation of more complex configurations. See Chapter 6 for more information.

Within the HiTest environment, after removing the system from the shipping skid, it required 8 hours to install and configure the hardware for the maximum configuration. Installation and configuration of the software took 8 hours. Schedule RAIDset configuration for overnight partitioning and formatting of drives. 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.

There are no major interoperability issues in this Suite.

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, database, operating system, server, storage, network) 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: Manageability Features

	Admin.	Alarms	Performance	Security	Accounting
Application	Yes	Yes	Yes	Yes	Yes
Database	Yes	Yes	Yes	Yes	Yes
Operating System	Yes	Yes	Yes	Yes	Yes
Server	Yes	Yes	Yes	Yes	
Storage	Yes	Yes	Yes	Yes	
Network			Yes		

Scalability

For this HiTest Suite, scalability refers to the additional hardware components that can be added to a system within and beyond 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 2-2, 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. Provides the data from which this graph is derived.

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 2-2: 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.

In general, systems can be configured beyond the limits illustrated in Figure 2-2 by adding additional storage cabinets, clusters, and other peripherals.

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 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 May, 1998. Table 2-4 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 2-4: Year 2000 Compliance

Component	Year 2000 Status
Oracle Apps V 10.7	Blue
Oracle 7 for DIGITAL UNIX	Blue
TruCluster Available Server for DIGITAL UNIX	Blue
DIGITAL UNIX	Blue
AlphaServer 8400	Blue
StorageWorks ESA 10000	Blue

3
Configuration Data

This chapter describes the Oracle Applications Oracle TruCluster AS DIGITAL UNIX AlphaServer 8400 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 Oracle Applications Oracle TruCluster AS DIGITAL UNIX AlphaServer 8400 HiTest Suite. These two tables form the DIGITAL HiTest Template. The ranges of hardware provided in this template include two AlphaServer 8400s with 2GB through 8GB of memory, two through eight CPUs, 13.4 GB through 22.5 GB local storage per system, thirty-six 4.3 GB disk through seventy-two 4.3 GB disks shared storage, two Fast Ethernet and one FDDI adapter per system, and a tape library with four TZ89 drives.

Table 3-3 lists the optional system management station hardware and software.

Table 3-4 and Table 3-5 list the revision levels of the components. 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.

The DIGITAL HiTest Template consists of three categories:

- AppSet Software – Includes software specific to one class of customer solutions, in this case Oracle Applications

- Foundation Hardware – Includes the base system, storage, and other hardware options

- Foundation Software – Includes the operating system, middleware, and database software

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.

Configuration Data

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

<table>
<tr><td colspan="6" style="text-align:center">Oracle Applications HiTest AppSet
Oracle TruCluster AS DIGITAL UNIX AlphaServer 8400
HiTest Foundation Hardware</td></tr>
<tr><td colspan="6" style="text-align:center">For documentation and updates: http://cosmo.tay.dec.com and
http://www.businesslink.digital.com, then select Technical Support</td></tr>
<tr><td rowspan="2">Line Item</td><td rowspan="2">Description</td><td rowspan="2">Part Number</td><td colspan="2">HiTest Range</td></tr>
<tr><td>Min</td><td>Max</td></tr>
<tr><td colspan="5" style="text-align:center">AppSet Software</td></tr>
<tr><td>1</td><td>Oracle Applications, Release 10.7 including:
• General Ledger
• Accounts Receivable
• Accounts Payable

Contact Oracle at:
Phone: 1-800-ORACLE1, or
http://www.oracle.com/

Note: This AppSet is not required when the foundation hardware and software is ordered for use with a non-HiTest application.</td><td>Oracle</td><td>1</td><td>1</td></tr>
<tr><td colspan="5" style="text-align:center">Foundation Hardware</td></tr>
<tr><td>2</td><td><i>Select two base systems</i>:

AlphaServer 8400 5/625 System, 2 GB
AlphaServer 8400 5/625 System, 4 GB

<i>Hardware includes</i>:
• Two 5/625 MHz CPUs; 4 MB cache
• I/O module with four I/O channels (KFTHA-AA)
• Memory as shown above
• 4.3 GB 3.5" UltraSCSI disk
• One BN38C-02 2-meter SCSI cable
• 600 MB 12X CD-ROM drive
• One KZPBA-CA, PCI UltraSCSI adapter
• KZPAA-AA, PCI FNSE SCSI ctlr, for CD-ROM only
• BN21H-02 2-meter SCSI cable
• DE500-AA 10/100 Mbit EtherWORKS 32-bit NIC
• BA670-AA StorageWorks Plug-in-unit
• One DWLPB-AA, PCI 12 slot Plug-in-unit (8400)
• Two H7263-<i>Ax</i> non-BBU capable 48 VDC power regulators; includes power cord
• Shielded console cable

<i>Software includes</i>:
• DIGITAL UNIX Operating System and base license
• Unlimited User license
• DIGITAL UNIX Server Extensions
• ServerWORKS
• Internet AlphaServer Administration Software
• DECevent</td><td>DA-292GF-CA❶
DA-292GG-CA❶</td><td>2</td><td>2</td></tr>
<tr><td>3</td><td>Dual 5/625 CPU Module</td><td>758P2-AX</td><td>0</td><td>6</td></tr>
<tr><td>4</td><td>1 GB Memory Module
2 GB Memory Module
4 GB Memory Module
Note: This HiTest Template supports a memory range from 2 GB to 8 GB per system. When selecting memory options, stay within the Template's 8 GB maximum.</td><td>MS7CC-EA
MS7CC-FA
MS7CC-GA</td><td>0</td><td>See Note</td></tr>
<tr><td>5</td><td>9.1 GB UltraWide SCSI disks</td><td>DS-RZ1DB-VW</td><td>2</td><td>4</td></tr>
<tr><td colspan="5">❶Indicates that geography-specific part number variants are available. Check the appropriate price book for details.</td></tr>
</table>

Line Item	Description	Part Number	HiTest Range	
			Min	Max
6	**PCI Expansion Box**	**DWLPB-BA**	2	2
7	**VT510 Console Terminal**	**VT510-KA**❶	1	1
8	**Keyboard**	**LK46W-A2**❶	1	1
Shared Storage				
9	**PCI one-port FWD SCSI controller**	**KZPSA-BB**	4	8
10	**SCSI Y cable, 68-pin**	**BN21W-0B**	4	8
11	**SCSI Differential terminator**	**H879-AA**	2	4
12	**3 m SCSI-3 cable "P" straight/90º**	**BN21K-03**	2	4
13	**Enterprise Storage Array 10000** *Hardware includes*: • Dual DS-HSZ70-AH (2) • BN37A-10 (2) • BN38E-0B (2) • DS-BA370-AA (2)	**DS-SWXES-BA**❶	1	2
14	**4.3 GB UltraWide SCSI disks**	**DS-RZ1CB-VW**	36	72
15	**PCI to FDDI Adapter – Dual Attach**	**DEFPA-DB**	2	2
16	**10-m SC to SC dual fiber-optic cable**	**BN34B-10**	2	2
17	**Fast Ethernet NIC, PCI adapter**	**DE500-AA**	2	2
18	**10BaseT Twisted-Pair Ethernet cable**	**BN25G-07**	4	4
Tape Storage				
19	**52 Cart Tape base library unit w/4 TZ89 drives**	**DS-TL894-BA**	1	1
20	**PCI one-port FWD SCSI controller**	**KZPBA-CB**	2	2
21	**20 m SCSI-3 cable "P" straight/90º**	**BN21K-20**	2	2
22	**System Management Station**	**See Table 3-3**	0	1

Oracle Applications HiTest AppSet
Oracle TruCluster AS DIGITAL UNIX AlphaServer 8400
HiTest Foundation Hardware

For documentation and updates: http://cosmo.tay.dec.com and http://www.businesslink.digital.com, then select Technical Support

❶Indicates that geography-specific part number variants are available. Check the appropriate price book for details.

Table 3-2: DIGITAL HiTest Template – Foundation Software

Line Item	Description	Part Number	HiTest Range		Required By	
			Min	Max	Fnd[†]	App[†]
	Oracle TruCluster AS DIGITAL UNIX AlphaServer 8400 HiTest Foundation Software					
	For documentation and updates: http://cosmo.tay.dec.com and http://www.businesslink.digital.com, then select Technical Support					
	Foundation Software					
1	**DIGITAL UNIX Operating System, Version 4.0D**	**Included with item 2 of Table 3-1**	2	2	Yes	Yes
2	**DIGITAL UNIX Operating System Software Media Kit**	**QA-MT4AA-H8**	1	1	Yes	Yes
3	**TruCluster Available Server 1.5** (Media is item 2)	**QB-05SAQ-KA**	2	2	Yes	Yes
4	**Oracle7 Server,** including: • SQL*Plus • SQL*Net • Application Object Library Contact Oracle at: Phone: 1-800-ORACLE1, or http://www.oracle.com/	**Oracle**	1	1	Yes	Yes
5	**Developer/2000** Contact Oracle.	**Oracle**	1	1	Yes	Yes
6	**Programmer/2000** Contact Oracle.	**Oracle**	1	1	Yes	Yes
7	**HSZ70 Solutions Software for DIGITAL UNIX**, including: • PC Card containing the storage controller software • StorageWorks Command Console • Licenses and documentation	**QB-5SBAB-SA**	1	1	Yes	Yes
8	**HSZ70 Solutions Software for DIGITAL UNIX**, including everything listed in item 7, except documentation	**QB-5SBAB-SB**	3	7	Yes	Yes
9	**StorageWorks PLUS**, including: • NetWorker Save and Restore for DIGITAL UNIX V4.4 • Logical Storage Manager (LSM) • AdvFS Utility	**QB-5RYAQ-AA**	2	2	Yes	Yes
10	**NetWorker Save and Restore Database Module for Oracle, Version 2.0 license**	**QL-3P4AQ-AA**	1	1	Yes	Yes
11	**NSR Jukebox Tier 2 License**	**QL-04VAL-3B**	1	1	Yes	Yes
12	**DIGITAL CD-ROM Software Product Library for DIGITAL UNIX**	**QA-054AA-H8**	1	1	Yes	Yes
13	**SCSI CAM Layered Components for DIGITAL UNIX** Right to use is included with item 9	**Included with item 12**	1	1	Yes	Yes
14	**Hard copy of this Suite's HiTest Notes**	**EK-HOATB-HN**	1	1	Yes	Yes
[†]Fnd = Foundation, App = AppSet						

Table 3-3: System Management Station

Oracle Applications HiTest AppSet				
System Management Station				
Line Item	Description	Part Number	HiTest Range	
			Min	Max
Management Station Hardware				
Note: This HiTest Suite supports the use of a systems management station. When the management station option is included, this HiTest Template identifies the items required. When system management is to be provided through other means, this option may be omitted without invalidating the HiTest Suite.				
1	**DIGITAL PC 5510 ST System** *Hardware includes*: • 233 MHz Pentium II CPU, 32 KB Cache • 512 KB secondary cache • 32 MB SDRAM memory • Integrated Fast Ethernet (10/100) • 24X CD-ROM • Integrated 3D graphics adapter • 3.2 GB Ultra DMA disk drive • 1.44 MB floppy • Integrated Audio • Country Kit, North American *Software includes*: • Windows NT Workstation 4.0 (factory installed) **Note:** A functionally equivalent 80 x 86 system may be substituted without invalidating this HiTest Template.	**FR-G2B2A-VB**	1	1
2	**32 MB SDRAM dual-bank DIMM Memory**	**FR-PCCAM-EC**	1	1
3	**Diamond 56.6K Modem** **Note:** Used for page notification.	**FR-PCXFA-AA**	0	1
4	*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				
5	**Windows NT Workstation 4.0**	**Included with item 1**	1	1
6	**Windows NT Service Pack 3** Contact Microsoft at http://www.microsoft.com or ftp://ftp.microsoft.com/bussys/winnt or call the Microsoft Order Desk in the United States at (800) 360-7561 between 6:30 A.M. and 5:30 P.M., Pacific time.	**Microsoft**	1	1
7	**DIGITAL ServerWORKS Manager, Version 3.3**	**Included with item 2 of Table 3-1**	1	1
8	**StorageWorks Command Console, Version 2.0**	**Included with the StorageWorks kit**	1	1
Software Installed on Managed Systems				
9	**Base UNIX systems management tools**	**Included with DIGITAL UNIX**	1	1
10	**ServerWORKS Manager Agent**	**Included with item 7**	1	1
11	**StorageWorks Command Console Agents**	**Included with item 8**	1	1

Table 3-4: Server Component Revision Levels

Hardware Component	Hardware	Firmware
FNSE SCSI controller (KZPAA-AA)	0002	
FWD SCSI controller (KZPBA-CB)	A01	5.53
FWSE SCSI controller (KZPBA-CA)	A01	
FWD SCSI controller (KZPSA-BB)	N01	A10
Array controller (HSZ70-AH)	H01	V70Z-0
5/625 MHz CPU (758P2-AX)	C02	
System I/O module (KFTHA-AA)	D03	
PCI Plug-in unit (DWLPB-AA)	A03	
PCI Plug-in unit (DWLPB-BA)	A03	
PALcode		V1.21
4.3 GB disks (DS-RZ1CB-VW)	A01	LYJ0
9.1 GB disk (DS-RZ1DB-VW)	A01	LYJ0
Fast Ethernet adapter (DE500-AA)	2.0	
PCI to FDDI adapter (DEFPA-DB)	1	3.1
Tape library (DS-TL894-BA)		1.25
Software Component	**Version/Revision**	**Patch Level**
DIGITAL UNIX	4.0D	
TruCluster Available Server for DIGITAL UNIX	1.5	
Oracle Applications:	Release 10.7 Production 16.1	

Oracle General Ledger
   Oracle Payables
   Oracle Receivables
	9.0.9
	8.0.159
	7.0.152	

GLOBAL Demo Database	Release 10.7 Production 16.1	
Developer/2000: Reports	2.5.5.5.0.0	
Programmer/2000	7.3.3	
Oracle7 Server	7.3.3	
SQL*Plus	3.3.3	
SQL*Net	2.2	
Oracle Enterprise Backup Utility (EBU)	2.1	510127
Oracle Application Object Library	6.1.1	
NetWorker Save and Restore for DIGITAL UNIX	4.4	
Logical Storage Manager (LSM)	4.0D	
AdvFS Utility	4.0D	
SCSI CAM Layered Components for DIGITAL UNIX	3.1C	
Base UNIX systems management tools	4.0D	
SWCC RA200 Agent Configuration Procedure	2.0	
SWCC HS* Agent Configuration Utility	2.0	

Table 3-5: System Management Station Component Revision Levels

Software Component	Version/Revision	Patch Level
Windows NT Workstation	4.0	Service Pack 3
DIGITAL ServerWORKS Manager	3.3	
StorageWorks Command Console Client	2.0	

Special Configuration Rules

There are no special configuration rules for the Oracle Applications Oracle TruCluster AS DIGITAL UNIX AlphaServer 8400 HiTest Suite.

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, and applications on the AlphaServer systems and the system management station.

Hardware Installation

The *AlphaServer 8400 Installation Guide* provides instructions for installing your AlphaServer 8400 system. Chapter 7 of this HiTest Note provides additional information specific to the minimum and maximum configurations of this HiTest Suite.

TruCluster Available Server

The specific hardware rules and restrictions that govern TruCluster Available Server configurations include the following:

1. Disable internal KZPSA SCSI termination. Remove the internal termination resistors (Z1, Z2, Z3, Z4, and Z5) on each KZPSA-BB on shared SCSI buses.

2. Set the boot_reset variable to on:
   ```
   >>> set boot_reset on
   ```

3. Ensure the KZPSA adapters have different SCSI ID numbers, as follows:

   a. Set the SCSI ID for the four shared SCSI bus controllers in the first 8400. For example, HiTest used SCSI ID 7.

   b. Set the SCSI bus controllers in the second 8400. HiTest used SCSI ID 6, as shown in Table 4-1.

4. Enable fast SCSI bus speed for each KZPSA adapter (see Table 4-1).

5. Connect each KZPSA adapter to a shared SCSI bus with a "Y" cable and an external SCSI bus terminator.

Table 4-1: SCSI Controller Configuration Example

Step	Action	Result

1	`>>> show kzpsa*`	`KZPSAa0_fast        1`
		`KZPSAa0_host_id      7`
		`KZPSAa0_termpwr      1`
		`KZPSAa1_fast        1`
		`KZPSAa1_host_id      7`
		`KZPSAa1_termpwr      1`
		`KZPSAa2_fast        1`
		`KZPSAa2_host_id      7`
		`KZPSAa2_termpwr      1`
		`KZPSAa3_fast        1`
		`KZPSAa3_host_id      7`
		`KZPSAa3_termpwr      1`
		
		If any values need to be changed, refer to the next steps.

2	`>>> set KZPSAa0_host_id 6`
	`>>> set KZPSAa1_host_id 6`
	`>>> set KZPSAa2_host_id 6`
	`>>> set KZPSAa3 host_id 6`
		Changes the SCSI ID of the KZPSA-BB controllers from 7 to 6 on the second AlphaServer.

3	`>>> set KZPSAa0_fast 1`
	`>>> set KZPSAa1_fast 1`
	`>>> set KZPSAa2_fast 1`
	`>>> set KZPSAa3_fast 1`
		Fast SCSI mode is enabled when the value is set to 1 (0 = slow mode). Set this value for the controllers on both systems.

HSZ70 Array Controller Setup

The HSZ70 controllers can be configured using either a maintenance teminal with the Command Line Interpreter (CLI) or a graphical user interface available through the StorageWorks Command Console (SWCC). For both methods, use the instructions in the *Getting Started: HSZ70 Solution Software 7.0B for DIGITAL UNIX* guide, which is supplied with the HSZ70.

Before you can use the StorageWorks Command Console, you must complete the following installation procedures:

- Install the DIGITAL UNIX operating system on both AlphaServers

- Install and configure StorageWorks Command Console on the optional System Management Station specified in Table 3-3

- Install and configure the StorageWorks RA200 and HSZ70 Agents on both AlphaServers

- Set up network connections between the AlphaServers and the System Management Station

If you choose not to include a system management station, or want to configure your storage before installing software, you can access the CLI by connecting a maintenance terminal to the maintenance port on the front of the controller. After you have initially configured the controller, making it visible to the host, you can perform all other configuration tasks through a remote connection.

The following procedure describes how to set up the HSZ70 Array Controllers using CLI.

1. Set the number of SCSI target IDs (0 through 3):

   `CLI > SET THIS_CONTROLLER ID = (0, 1, 2, 3)`

2. Set failover to place the controllers in a dual-redundant configuration.

   `CLI > SET FAILOVER COPY=THIS_CONTROLLER`

3. Restart both controllers by pressing the OCP reset button on the front of the controller or entering the following commands:

```
CLI > RESTART OTHER_CONTROLLER
CLI > RESTART THIS_CONTROLLER
```

4. Enter the following commands to determine whether the preceding parameters are set correctly:

```
CLI > SHOW THIS_CONTROLLER FULL
CLI > SHOW OTHER_CONTROLLER FULL
```

5. Set preferred paths to balance the load and improve the performance of the HSZ array controller pair:

```
CLI > SET THIS_CONTROLLER PREFERRED_ID = (0, 1)
CLI > SET OTHER_CONTROLLER PREFERRED_ID = (2, 3)
```

6. Run the CONFIG program to locate and add devices to the array controller's configuration:

```
CLI > RUN CONFIG
```

7. Set up the stripesets using the following commands:

```
CLI > ADD STRIPESET "name" POLICY=BEST_PERFORMANCE "disk1
disk2 disk3"
```

where *name* is the name of the stripeset and *disk1 disk2 disk3* is a list of the disks to be included in the stripeset.

8. Initialize the stripesets:

```
CLI > INITIALIZE name CHUNKSIZE=256
```

Refer to the Disk Storage Configuration section for more information.

9. If a host-accessible logical unit needs to be created from the stripeset, do the following:

```
CLI > ADD UNIT "unit name" "stripeset name" WRITEBACK_CACHE
```

Disk Storage Configuration

Use the StorageWorks HSZ70 Array Controller Utility to configure the StorageWorks HSZ70 controllers and disks (see *Getting Started: HSZ70 Solution Software 7.0B for DIGITAL UNIX*.)

To configure the controllers and disks, do the following:

1. Configure the disks attached to the HSZ70 controllers as stripesets.

   In the HiTest maximum configuration, to minimize disk space waste, one drive was assigned to Oracle Server and Oracle Applications software. A second 12.9 GB virtual drive was assigned to rollback. The remainder of the disks were set up as 17.4 GB virtual disks.

2. Enable the write-back cache option in the HSZ70 Array controller. The write-back cache allocates cache memory to both read and write operations. This allows the I/O to report completion faster.

Operating System Installation

This section describes the installation and configuration of the DIGITAL UNIX Version 4.0D operating system on each of the AlphaServer 8400 systems. It includes:

- Configuring DIGITAL UNIX

- Installing Licenses

- TruCluster Available Server Software

- Logical Storage Manager (LSM)

Configuring DIGITAL UNIX

The AlphaServer 8400 comes with the DIGITAL UNIX Version 4.0D operating system already installed. Configure your system as shown in the following sections. For more information, refer to the *DIGITAL UNIX Installation Guide.*

- Install with all kernel options and set the kernel parameters as shown in the section on UNIX Kernel Parameters.

- Install all DIGITAL UNIX subsets and the TruCluster software for TruCluster Available Server operation.

- Make sure that the Simple Network Management Protocol (SNMP) service and Transmission Control Protocol/Internet Protocol (TCP/IP) are installed for use with ServerWorks and StorageWORKS Command Console.

- Load the software subset OSFOBSOLETE405 (Obsolete Commands and Utilities) for use with Oracle Applications.

Swap Space

Inadequate swap space may cause the Oracle application and many other system operations to function improperly because DIGITAL UNIX maps the active virtual pages of each process to swap space. The response time and throughput of the system degrades rapidly if swapping occurs during processing.

When installing DIGITAL UNIX, use the Deferred Swap Mode to reduce the amount of swap space required, and to reduce the system overhead required for mapping the address space during the creation of processes:

```
mv /sbin/swapdefault /sbin/swapdefault.old
```

Create primary and secondary swap spaces for each system by allocating swap space equal to one-to-three times the system physical memory space.

Configure Additional Swap Space

A secondary swap space can also be assigned during installation to enable complete crash dumps when using 8 GB of memory.

You can assign additional swap space to local drives by including entries in `/etc/fstab` as the following example shows:

```
/dev/rz0b swap1 ufs sw 0 2
```

UNIX Kernel

This section describes UNIX Kernel issues.

Building the UNIX Kernel

Due to a problem in C-shell, you cannot set address space high enough to map a 6 GB SGA. Therefore, the value for `maxdsize` must be changed in `/sys/cont/nodename` to the

proper memory size of the system. This is not a dynamic setting and a kernel rebuild must be performed.

UNIX Kernel Parameters (/etc/sysconfigtab)

Table 4-2 lists the parameter settings for /etc/sysconfigtabs that should be used for the UNIX kernel. The settings are based on a 2 GB minimum and a 8 GB maximum memory configuration, suggested in the *Oracle7 Installation Guide for Digital UNIX* or refer to the *DIGITAL UNIX System Configuration and Tuning Guide*.

Table 4-2: Kernel Parameters

Parameter	Minimum Configuration Value	Maximum Configuration Value	Comments
generic parameters:			
msgbuf_size	16384	16384	Size of the message buffer used to store boot log messages.
vm parameters:			
vm-maxvas	2146483648	4292967296	Maximum virtual address space for user maps.
vm-mapentries	400	400	Maximum number of virtual memory map entries that a user map can have.
ubc-minpercent	1	5	Minimum amount of physical memory allocated for the Unified Buffer Cache (UBC).
ubc-maxpercent	2	20	Maximum amount of physical memory that can be used by the UBC.
ubc-segstartpercent	10	10	Size of a file as a percentage of the UBC.
ubc-segpercent	1	1	Size of the UBC as a percentage of total memory.
new-wire-method	0	0	Disable lightweight wiring when enabling gh-chunks.
vm-page-lock-count	64	64	Size of the lock array used to synchronize access to the vm=page structures.
rt parameters:			
aio-max-num	1024	512	The maximum number of concurrent asynchronous I/O requests that can be outstanding on the system at any point in time.
aio-max-percent	2	2	The percentage of physical memory that the asynchronous I/O database can occupy. This limits the maximum number of concurrent asynchronous I/O requests that can be set by aio-max-num.
proc:			
max-proc-per-user	4096	4096	Maximum number of processes one user can run simultaneously.
max-threads-per-user	4096	4096	Maximum limit of threads a user can create.
max-per-proc-data-size	2146483648	4294967296	Maximum value for the upper limit per process.

Parameter	Minimum Configuration Value	Maximum Configuration Value	Comments
max-per-proc-address-space	1610612736	4294967296	Maximum value for the upper limit per process.
per-proc-data-size	1610612736	2147483648	Current data size.
per-proc-address-space	1610612736	2147483648	Current address space.
max-per-proc-stack-size	33554432	33554432	Upper limit of stack size.
per-proc-stack-size	1610612736	2147483648	Current stack size.
ipc parameters:			
msg-max	8192	8192	Maximum message size.
msg-mnb	16834	16834	Maximum number of bytes on the queue.
msg-mni	1024	1024	Number of System V message queue identifiers.
msg-tql	4096	4096	Number of System V message headers.
sem-aem	16384	16384	Adjust on exit maximum value.
sem-mni	200	400	Number of message queue identifiers.
sem-msl	200	1600	Number of semaphores per ID.
sem-opm	200	400	Maximum number of operations per semop call.
sem-ume	200	400	Maximum number of undo entries per process.
sem-vmx	32767	32767	Semaphore maximum value.
ssm-thres-hold	0	0	Disable when enabling gh-chunks. These parameters are mutually exclusive.
shm-max	1069547500	2118123520	Maximum shared memory segment size.
shm-min	1	1	Minimum shared memory segment size.
shm-mni	512	512	Number of shared memory identifiers.
shm-seg	512	512	Maximun attached shared memory segments per process.

After editing `/etc/sysconfigtab`, perform a regular system reboot so that the values will be recognized.

TruCluster Available Server Software

The implementation of a high availability system, as described in this document, requires the use of TruCluster Available Server software and available server environment (ASE) failover. The specific services used in this configuration are UFS file systems and AdvFS. For more information about the implementation of ASE failover, see Chapter 5.

Partitions of a single stripeset cannot be shared among multiple ASE services due to ASE limitations regarding ownership and locking.

Installing TruCluster Available Server

Before you install TruCluster Available Server:

- Add each host's name and IP address to the other nodes /etc/hosts file.

- Set up a distributed time service such as the Network Time Protocol (NTP) on each member system.

- Using the information in the *DIGITAL UNIX Network Administration* manual, set up your network and configure basic network services such as the Berkley Internet Name Domain (BIND) and the Network Information Service (NIS).

- Register the TruCluster Product Authorization Key (PAK) for each system.

  For information on installing a PAK, see the DIGITAL UNIX *Software License Management* manual, lmf(8), and lmfsetup(8).

Install and set up the TruCluster Available Server as follows:

1. Load and mount the Associated Products Volume 2 CD-ROM to /mnt.

2. Use the setld -l /mnt/TCR150 command to load the TruCluster Available Server Software subsets. The installation procedure starts after the subsets are loaded.

3. Install all mandatory and optional subsets.

4. Ensure the system is in ASE 0 and enable the ASE logger. The kernel is automatically rebuilt.

5. Identify the shared SCSI buses.

6. Move the new kernel to the root file system.

7. Reboot the systems and execute asemgr to add the ASE members.

For more detailed information, refer to the following TruCluster Available Server Software manuals: *Hardware Configuration* and *Software Installation*.

Configuring a TruCluster Available Server with ASEMGR

Configure one of the servers using ASEMGR.

_____ **Note** _____

It is important that only one of the servers be configured, with the second node added to this configuration. If the second node is configured separately, failover will not work.

_____

To configure an available server:

1. Start ASEMGR on one of the systems.

2. Configure an available server using ASEMGR.

   a. Add a user defined service.

   b. Select an Automatic Service Placement Policy for the two nodes.

   c. Add the second node to the Available Server Environment on the first node.

Logical Storage Manager (LSM)

The Logical Storage Manager (LSM) software is installed during the DIGITAL UNIX installation.

To use LSM with TruCluster Available Server (ASE), set up LSM and create a rootdg disk group on all the member systems. For more information about LSM utilities, display the manpages for volintro.

_____ **Note** _____

LSM setup is the same on both systems. When LSM setup is done for one server, TruCluster performs the LSM setup on the second server automatically.

The following procedure describes how to initialize and mirror one pair of disks. You can create a script capturing these steps for each mirrorset, or you can repeat the commands in each step for all disks that will use LSM.

_____

1. Execute the `/usr/sbin/volinstall` command. This command also sets up the system for automatic LSM start at boot time (see `/etc/inittab`).

2. Execute `volsetup` to create the root disk group (`rootdg`). Partition h of the system disk will be used. The `volsetup` command:

    - initializes vold

    - initializes the root disk group (rootdg), which has information from its own disk group, and all other disks and disk groups defined with LSM

3. Initialize a pair of disks that will mirror each other using LSM.

4. Create the disk group for the mirrorset and assign a media name to the first disk.

5. Create the LSM mirrored volume and specify its size.

6. Add the next disk to the LSM disk group and assign it a media name.

7. Create a mirrorset in the background, consisting of the pair of disks added to the disk group.

8. Repeat steps 3 through 6 for all the disks being mirrored.

The following table is an example showing the LSM disk groups created for the minimum configuration in the HiTest Environment:

Disk Group	Disk	Mirrored by	LSM Volume	Size
ora_data	rz8-01	rz16-01	vol01	4.3 GB
ora_apps	rzb8-01	rzb16-01	vol02	4.3 GB
ora_data	rz9-01	rz17-01	vol03	8.6 GB
ora_data	rzb9-01	rzb17-01	vol04	8.6 GB
ora_data	rz10-01	rz18-01	vol05	8.6 GB
ora_data	rzb10-01	rzb18-01	vol06	8.6 GB
ora_data	rz11-01	rz19-01	vol07	8.6 GB
ora_data	rzb11-01	rzb19-01	vol08	8.6 GB
ora_data	rz12-01	rz20-01	vol09	8.6 GB
ora_data	rzb12-01	rzb20-01	vol10	8.6 GB

Configuring AdvFS

Create the domain for the Oracle database on one of the LSM volumes.

For more information, see the Advanced File System and Utilities for DIGITAL UNIX *Guide to File System Administration.* For Help on AdvFS, display the `advfs` manpages.

1. Use the `mkfdmn` command to create the AdvFS domain.

2. Use the `mkfset` command to create a file set on the domain.

In the HiTest configuration, the file set `orausr` in the domain `ora_apps` was created on LSM `vol02`.

Creating Oracle Mount Points

To create the Oracle mount points and assign ownership:

1. Create the mount points for the Oracle database.

    In the HiTest environment, the following UFS mount points were created.

/ora_data_hdr	/ora_icx_hdr
/ora_data_btch	/ora_idx_btch
/ora_data_lns	/ora_idx_lns
/ora_data_log	/oradata1
/ora_data_rbs	

    The `/orausr` file system was created as AdvFS in the `ora_apps` domain.

2. After all the moint points are created, assign ownership to `oracle`, as follows:

    ```
    chown -R oracle:dba /ora*
    ```

3. Assign ownership of the Oracle Applications mount points to `applmgr` as follows:

    ```
    chown -R applmgr:dba /orausr/applmgr
    ```

Mounting LSM File Systems

Mount the LSM file systems created in the section Logical Storage Manager (LSM) earlier in this chapter.

In the HiTest environment, the file systems to be used by Oracle were mounted as follows:

LSM Volume	File Type	Mount Point
vol01	UFS	/ora_idx_btch
vol02	AdvFS	/orausr
vol03	UFS	/ora_data_hdr
vol04	UFS	/ora_data_btch
vol05	UFS	/ora_data_lns
vol06	UFS	/ora_idx_hdr
vol07	UFS	/oradata1
vol08	UFS	/ora_idx_lns
vol09	UFS	/ora_data_rbs
vol10	UFS	/ora_data_log

Creating an ASE Service for Failover

Create an ASE disk service to link the LSM driveset to the operating system for ASE failover. The disk service makes use of a network alias, which allows access to the service from the network, irrespective of which physical system it is currently mounted on.

Chapter 5 describes the testing of ASE failover, and provides a pointer to failover scripts that you can cutomize for your environment.

Before you begin to create the disk service:

1. Create the network alias in the `/etc/hosts` file on each system and assign it a unique TCP/IP address.

2. Download the ASE failover scripts from the Enterprise Applications and Data Warehousing Information Center (ERP) website:

   `http://www-ase.zko.dec.com/WebOracleApps.htm`

3. Untar the scripts, and copy them to the `/usr/local/ase/ora_apps` directory.

To create the disk service:

1. Log in as root and start the ASE manager.

2. Choose Managing the ASE Service → Add a New Service → Disk Service.

3. When prompted, enter the disk service name. This becomes the ASE alias and must be a unique name that matches the name in the ASE failover scripts. For more information, see the section Failover Test Process and Results in Chapter 5. HiTest used the name `dbserv`.

4. When asked if you want to assign an IP address to the service, enter Y. The IP address you added to `/etc/hosts` will be used.

5. Enter one or more device special files, AdvFS filesets, or LSM volumes to define the disk storage for this service.

6. When prompted, define the disk storage for the service by entering the names and mount points for AdvFS fileset and LSM volumes you created for the Oracle software and database, and specifying the user and group quotas. Table 4-3 shows the disk storage as it was defined in the HiTest environment.

Table 4-3: HiTest Disk Storage Example

AdvFS Fileset or LSM Volume	Mount Point	User Quota	Group Quota
`ora_apps_dmn#orausr_fs`	`/orausr`	none	none
`/dev/vol/ora_data/vol01`	`/ora_idx_btch`	none	none
`/dev/vol/ora_data/vol03`	`/ora_data_hdr`	none	none
`/dev/vol/ora_data/vol04`	`/ora_data_btch`	none	none
`/dev/vol/ora_data/vol05`	`/ora_data_lns`	none	none
`/dev/vol/ora_data/vol06`	`/ora_idx_hdr`	none	none
`/dev/vol/ora_data/vol07`	`/oradata1`	none	none
`/dev/vol/ora_data/vol08`	`/ora_idx_lns`	none	none
`/dev/vol/ora_data/vol09`	`/ora_data_rbs`	none	none
`/dev/vol/ora_data/vol10`	`/ora_data_log`	none	none

7. Specify the mount point for the disk service. For example: `/orausr`

8. Choose Read-Write access.

9. ASEMGR allows you to modify mount options and start and stop action scripts.

   To use the ASE failover scripts described in Chapter 5, the disk service must be configured with a script to start and stop the service. This script, `/usr/local/ase/ora_apps/db_service.stub`, requires that a `start` parameter be configured to start the service and a `stop` parameter be configured to stop the service. The service is also configured with a time delay of 60 seconds to give time for the various components to start or stop.

10. When prompted, select an Automatic Service Placement (ASP) Policy. In the HiTest environment, Balanced Service Distribution was chosen.

   _____ **Note**_____

   For use with the ASE failover scripts, the disk service should be set up to use one of the host members as primary and the other as the secondary and to not automatically fail back over, if a more highly favored host becomes available while the service is located on a less favored host. Not failing back reduces the number of disruptions to users. Both of these options may be changed to fit the needs or requirements of the customer.

   In addition, the Oracle user needs to be set up the same on both systems. In other words, the same UID, GID, user directory, passwords, and so forth must be used. It is set up so that the home directory is located on a local device on both systems.

   _____

When you have finished creating the ASE service, examine the following files on both AlphaServer systems to be sure they contain the same Oracle values:

```
/etc/sysconfigtab
/etc/passwd
/etc/group
/etc/services
/etc/hosts
/etc/listener.ora
```

Application Installation

This section describes installing the Foundation Software and Appset Software including middleware, database software, and data warehouse application software.

DIGITAL Layered Products

The following DIGITAL Layered Products are required for the Oracle Applications Oracle TruCluster AS DIGITAL UNIX AlphaServer 8400 HiTest Suite:

- SCSI CAM Layered Components for DIGITAL UNIX

- NetWorker Save and Restore (NSR) for DIGITAL UNIX

- NetWorker Save and Restore Database Module for Oracle (DMO)

The media for these products is provided on the *DIGITAL UNIX V4.0D Associated Products* CD-ROMs. Except where noted, install the products using standard defaults.

This section discusses in detail the installation and configuration of NetWorker Save and Restore (NSR).

NSR must be installed before DMO; otherwise there is no preferred sequence for installation of these products. Follow the installation instructions for each product as well as the additional information provided in this section.

NetWorker Save and Restore

This section describes the installation and setup of NetWorker Save and Restore.

Installing NetWorker Save and Restore

NetWorker Save and Restore (NSR) must be installed before DMO. Install the NSR software and licenses with the help of the *NetWorker Save and Restore for DIGITAL UNIX Installation Guide.* Except as noted, take the standard defaults.

In the configuration recommended for this HiTest Suite, the tape library (jukebox) is connected to a single system. This means that although clustering is used in the Suite, backup is *not* in a clustered environment. When the installation asks "Is this system a member of a NetWorker cluster server?" respond with "No."

Setting Up the Tape Library

Set up the automated tape library (jukebox) for backup, using the *NetWorker Save and Restore for DIGITAL UNIX Administrator's Guide,* as follows:

1. Log in as root and change to the /dev directory:

   ```
   # cd /dev
   ```

2. Execute the command `MAKEDEV.MC mcxx` to produce the /dev/mcxx files.

   Where $xx = (SCSI\ Bus\ ID * 8) + y$
   y = value of the LUN

   For this HiTest Suite, the SCSI Bus ID is 6 and the LUN value is 0. Therefore the value of xx is equal to 48 and the command is:

   ```
   # ./MAKEDEV.MC mc48
   ```

3. Add the following entry to the Medium Changer Capabilities Database /etc/mcicap:

   ```
   Mc48|juke_1:\
   :mc=/dev/mc48:\
   :nd#4:dn=nrmt0h,nrmt1h,nrmt2h,nrmt3h:tc=t1810
   ```

4. To use the jukebox with NSR, configure it by executing the NetWorker `jb_config` command. This utility creates and stores the necessary resource data that NetWorker requires to manipulate the jukebox.

   The jb_config command prompts you for jukebox values including the jukebox name and the device path, tape drive path, and tape drive type for each of the tape drives.

5. Label the tapes using the following command. All 48 tapes are labeled.

   ```
   # nsrjb -L -j juke_1 -v -Y -f /dev/nrmt0h -b oracle -S "1-48"
   ```

   Once this command has been issued, the tape library will appear when the NSR Juke Box Labeling dialog box is displayed.

Configuring NetWorker Save and Restore (NSR)

Use the NetWorker Administrator's utility, `nwadmin`, to set up NSR according to the *NetWorker Save and Restore Database Module for Oracle Administrator's Guide.*

Before running `nwadmin`, make sure that at least one ASE service has been created using ASEMGR. See the section earlier in this chapter on Configuring a TruCluster Available Server with ASEMGR.

- Setting Up NetWorker Directives

  Set the NetWorker Directives for Oracle using the Directives window of the Customize pull-down menu in the NetWorker Administrator window.

  To set Oracle directives, create the following directive named `Oracle`:

Directive	Tells the process to:
`<</>>`	Start at root
`forget`	Forget previous directives
`ignore`	Ignore directives in the file system (.nsr files)
`+obkasm:*`	Run obkasm on all files under root (the + indicates all subdirectories)

  The Oracle directive will be associated with the client performing the backup/restore. The `obkasm` is a DMO-specific program that specifies how a set of files is to be backed up and recovered. This directive instructs the client to run `obkasm` on all files specified in the backup/restore.

- Setting Up a NetWorker Group

  Set up a single NetWorker Group for Oracle from the Groups window of the NetWorker Administrator Customize pull-down menu, according to the *NetWorker Save and Restore Database Module for Oracle Administrator's Guide.* For example, set up one Group called Oracle to correspond with the environment variable NSR_GROUP. This is used by the client processes using Oracle7 Enterprise Backup Utility.

- Setting Up a NetWorker Client

  Set up NetWorker Client for Oracle7 database backup from the Clients window of the Client Setup pull-down menu.

  In the HiTest configuration, NetWorker Save and Restore and the database resided on a single system, therefore it was defined using NetWorker Administrator. `Depot1` was specified as the client system name (this is where the database resided); and `Oracle` was specified as the directive; and as the group.

- Setting Up Backup Schedules

  From the Schedule window of the Customize pull-down menu, set up backup schedules for NetWorker Save and Restore.

- Setting Up NetWorker Volume Pools

  From the Pools window of the Customize pull-down menu, set up a volume pool to include all tape volumes.

- Setting Up NetWorker Save and Restore Server

  To set up the NetWorker Save and Restore Server, follow the instructions in the *NetWorker Save and Restore for DIGITAL UNIX Administrator's Guide*. Use the NSR Server settings for paralellism shown in Table 4-4.

Table 4-4: NSR Server Settings

Item	Setting
Parallelism	2
Active Devices	1
Sessions per Device	2

Preinstallation Requirements for Oracle Products

Before installing Oracle7 Server and Oracle Applications, complete the following procedures:

- Add users and create the dba group.

- Create directories for use by Oracle.

- Set environment variables for the Oracle installations.

Adding Users for Oracle and Creating the dba Group

When you run the Oracle Installer, your login ID must belong to the group designated as the DBA group. The default group ID is dba.

In the HiTest environment, the following procedure was used to create the dba group and add users:

1. Log in as root.

2. Add a user:

   # adduser

3. When prompted, specify oracle as the user name and dba as the group name. This creates the group dba in /etc/group.

4. Add the user applmgr and assign it to the dba group.

For ASE failover, make sure that the group ID (GID) and user ID (UID) for both Oracle and Oracle Applications are the same on both servers. To verify this:

1. View the /etc/passwd file and the etc/group file on each server.

2. If necessary, edit the files to make them match.

Creating Directories for Use by Oracle

Create directories to be used by the Oracle7 installation. For HiTest, the following directories were created:

ORACLE_HOME	/orausr/oracle/app_/oracle/product/7.3.3
local bin directory	/orausr/oracle/app_/oracle/product/7.3.3/bin
temporary directory	/orausr/tmp

Setting Environment Variables

To make installation easier, log in as oracle and set environment variables in .profile or .log before beginning the installation. For HiTest, the following environment variables were set:

Environment Variable	Description	Sample Value
TERM	Terminal definition to be used by installer	VT100
ORACLE_OWNER	Log in id	oracle
ORACLE_HOME	Path to Oracle home directory	/orausr/oracle/app/oracle/ product/7.3.3
Set the following environment variable based on the installation situation:		
ORACLE_SID	System identifier of the database being created	GLOBAL when configuring the Oracle database BKCT when configuring the Oracle Enterprise Backup Utility (EBU)

The ORACLE_HOME and ORACLE_SID environment variables can also be set or changed during the installation.

_____ **Note** _____

When installing Oracle Applications immediately after installing Oracle Server, do NOT set the $TWO_Task variable, as specified in the Oracle documentation. This variable overrides the ORACLE_SID variable and can cause errors.

_____

Oracle7 Server

This section describes the installation and configuration of the Oracle7 Server. For more information see the *Oracle7 Installation Guide for Digital UNIX.*

Install Oracle on shared storage using standard defaults.

Installing Oracle7 Server

Install Oracle7 Server using the *Oracle Installer* from the *Oracle7 Server Version 7.3.3 for Digital UNIX* CD-ROM.

The instructions that follow document the Oracle7 installation for HiTest. Use the chapter on Installation Decisions in the *Oracle7 Installation Guide for Digital UNIX* to determine your responses to installation questions.

1. Log in as oracle.

2. Mount the Oracle7 Server CD-ROM.

3. Change to the /mnt/orainst directory.

4. Execute the ./orainst program. The Install Type screen is displayed.

    Within the Install program, use the Tab or Arrow keys to navigate.

    The Back option, which allows you to back out of a screen, may return you to an earlier part of the installation program, requiring you to re-enter some information.

5. Respond to the screen prompts to begin the installation. The HiTest team made the following choices:

    a. Install Type   Default Install

    b. Installation Activity Choice   Install, Upgrade, or De-install Software

    c. Installation Options   Install New Product – Do Not Create DB Objects

    HiTest did not create a database during Oracle7 installation because the GLOBAL demo database was used, as described in the section GLOBAL Demo Database Installation later in this chapter.

    On successive screens, except where noted, the HiTest team took the installation defaults.

6. At the OPS Install screen, select No to install products only on the shared storage.

7. After completing the preliminary installation screens, a summary of your installation choices and the location of install logs is displayed. Check the values and select OK if they are correct.

8. At the Software Asset Manager screen, select the components you want to install by using the arrow key to move to a component and the space bar to select it. For the HiTest configuration, the following components were selected:

Oracle Context Option	Oracle7 Parallel Query option
Oracle Intelligent Agent	Spatial Data Option
Oracle Names	SQL*Net (V2)
Oracle On-Line Text Viewer	SQL*Plus
Oracle Server Manager	TCP/IP Protocol Adapter
Oracle UNIX Installer	Oracle7 Server (RDBMS)
Oracle7 Distributed Database	PL/SQL
Oracle7 Enterprise Backup Utility	

9. Select `dba` for the DBA group and `osper` for the System group.

10. When asked whether to create a parallel database, select No. The database for the HiTest configuration is installed only once, on the shared storage.

11. Accept the default character set. If you want to use a different character set, you must set the environment variable ORA_INSTALL before installing.

12. Enter passwords as prompted for the following:

    SYS and SYSTEM accounts
    `dba` and `oper` group users
    TNS Listener

13. Do *NOT* configure MTS and start SQL*Net Listener.

14. Accept the default locations and sizes for control files, redo log files, and database files.

15. Specify a Filesystem-Based Database as the Database Objects Storage Type.

16. When you have made all required installation choices, screen messages inform you of the files the Installer is installing. When all files are installed, the Software Asset Manager screen is displayed. Verify that all the products you selected have been installed, then EXIT the install and perform the postinstallation tasks.

Oracle7 Postinstallation Tasks

After installing Oracle 7, complete the following tasks:

Run the `root.sh` Script

The Installer creates the root.sh script in the `$ORACLE_HOME/orainst` directory. This script sets the necessary file permissions for Oracle products and performs other required setup activities.

To run the script:

1. Change to root as superuser. To keep the Oracle environment variables, do not use (-).

   `$ su root`

2. Change directory to `$ORACLE_HOME/orainst`.

3. Run the script file created by the Oracle7 installation:

   `# sh ./root.sh`

4. Enter the full pathname of the local bin directory. Note that the path for ORACLE_HOME does not have to match the home directory for Oracle.

Check `oratab`

Evaluate the file `/etc/oratab` to verify that the following are set correctly:

- `ORACLE_SID`

- `ORACLE_HOME`

- The flag (Yor N) that specifies whether or not the database is started when the server is booted

For example:

```
ORACLE_SID:<------------ORACLE_HOME-------------->:Flag

     GLOBAL:/orausr/oracle/app/oracle/product/7.3.3:N
```

Verify the Database

If you created a database during installation, verify that it is valid by entering the following commands to mount and open the database:

```
> svrmgrl
svrmgr> connect internal
Connected
svrmgr> startup
```

You will see messages that the database has been mounted and opened.

Configure and Start the SQL*Net Listener

The SQL*Net Listener listens for transmissions coming into the server through a specific TCP port connection. The file `/etc/listener` contains entries that assign the ASE alias to the correct port:

```
(PROTOCOL=TCP)
(HOST=dbserv)
(KEY=1521)
```

To configure the Listener:

1. On both servers, create a link for the SQL*Net `lsnrctl` utility by adding the following entry to `/etc/services`:

   ```
   listener 1521/tcp
   ```

2. Make sure that the Oracle values in the file `/etc/listener.ora` are the same on both servers.

3. On the clients connected to the Oracle database, verify the following:

   - The host file contains the IP addresses for both servers, and the IP address for the ASE alias

   - In the file `tnsnames.ora`, the host name (ASE alias), port entries, and ORACLE_SID value are the same as on the servers

To start the Listener:

1. Enter the following command:

   ```
   > lsnrctl start
   ```

   A screen message indicates that the Listener has been started.

2. To confirm that the Listener is running, check the status of the Listener as follows:

   ```
   > lsnrctl status
   ```

Oracle Initialization Parameters

The implementation of a shared database using the Oracle Server on a DIGITAL UNIX TruCluster requires the setting of some parameters to ensure the proper and efficient use of the application.

Use of both a common and instance-specific parameter file allows the flexibility of constant and variable parameters across instances. The common initialization parameter file is included in the instance-specific parameter file, through use of the Oracle IFILE parameter.

Table 4-5 shows the optimizations made to the Oracle7 server and database for Oracle Applications Oracle TruCluster AS.

Table 4-5: Oracle 64-Bit Option Parameters

Parameter	Value
db_name	GLOBAL
db_files	70
open_cursors	500
db_file_multiblock_read_count	32
db_block_size	4096
db_block_buffers	64000
shared_pool_size	104857600
log_buffer	5242880
sort_area_size	5242880
log_simultaneous_copies	12
log_small_entry_max_size	400
sessions	3072

Developer/2000

Install the Reports component of Developer/2000 from the *Developer/2000* CD-ROM. Developer/2000 uses the same install procedure as Oracle7 Server.

1. Mount the Oracle 7 Server CD-ROM and change to the `orainst` directory.

2. Execute the `./orainst` program.

3. Choose Install New Products – Do Not Create DB Objects.

4. On the Environment Variables screen, in the ORACLE_HOME field, change the 7.3.2 to 7.3.3.

5. After completing the preliminary installation screens, a summary of your installation choices and the location of install logs is displayed. Check the values and select OK if they are correct.

    If a `root.sh` file exists (from the Oracle7 install), a screen message tells you that the file `root.sh0` will be created.

6. At the Software Asset Manager Screen, select Reports 2.5.5.5.0.0.

7. Select No when asked whether you want to install PL/SQL documentation or demos.

8. When asked to specify a GUI, choose both Character Mode Interface and Motif Bitmapped Interface.

9. After completing the installation, log in as root and run the script file `root.sh0` to complete the setup.

Oracle7 Enterprise Backup Utility

This section describes how to set up the Oracle7 Enterprise Backup Utility.

Before installing the Oracle7 Enterprise Backup Utility (EBU):

1. Acquire patch kit #510127 - TNS Authentication by contacting Oracle Client Relations at 1-800-223-1711. You must provide the CSI number you received with your Oracle7 media.

2. Log in as `oracle`.

3. Set up SQL*NET for use by EBU by modifying the entries for the catalog database (BKCT) and the target database (GLOBAL) in the following files:

   ```
   tnsnames.ora          (on the client)
   /etc/listener.ora     (on the server)
   ```

   These entries must contain `PROTOCOL`, `HOST` and `KEY` values specific to your environment. See Appendix A for the `tnsnames.ora` and `listener.ora` files used by HiTest.

4. Start the SQL*Net Listener:

   ```
   $ lsnrctl start
   ```

5. Create the catalog database, BKCT, to store the backup catalog.

6. Set the following environment variables:

   ```
   ORACLE_HOME=/orausr/oracle/app/oracle/product/7.3.3
   ORACLE_OWNER=oracle
   ORACLE_SID=BKCT
   NSR_SERVER=depot1
   NSR_GROUP=Oracle
   ```

To install and configure the Oracle7 Enterprise Backup Utility (EBU):

1. Install the EBU executables using the Oracle Installer. Do this after NSR and DMO are installed because it has to link against them.

   During installation, select Legato NetWorker as the third-party media management software vendor. Enter `/usr/shlib` as the directory path for the NetWorker API library.

2. Apply Patch # 510127 - TNS Authentication, which allows you to register the EBU target database successfully and use the `Connect Internal` command without requiring a password.:

   a. Tar the patch file:

      ```
      tar -xvf bg510127.tar
      ```

   b. Run the following shell script under the `oracle` account (not `root`).

      ```
      $ ./patch.sh
      ```

3. From svrmgrl, run the following `sql` scripts to create the EBU user catalog:

   ```
   $ svrmgrl
   svrmgrl> connect internal
   svrmgrl> @$ORACLE_HOME/rdbms/admin/catalog.sql
   svrmgrl> @$ORACLE_HOME/rdbms/admin/catproc.sql
   ```

4. Connect to the target database:

```
svrmgrl> connect system/manager
svrmgrl> GRANT CONNECT,RESOURCE,UNLIMITED TABLESPACE TO obk
         _IDENTIFIED BY obk
```

5. Check the connection to the target database, then exit:

```
svrmgrl> connect obk/obk
svrmgrl> connected
svrmgrl> exit
```

6. Check that you can connect to the catalog database:

```
$ sqlplus obk/obk@bckt.world
```

This verifies that entries in tnsnames.ora are correct.

7. Make sure that the file catalog.obk in the $OBK_HOME/admin directory contains the following:

```
$ obk/obk@bkct.world
```

8. Use the ebutool utility to create a backup user, under which all EBU operations will be performed:

```
$ ebutool -cretrgtusr
```

The utility prompts you for the SYS user password and other necessary information. A screen message instructs you to be sure the OS user running EBU is in the dba group. This user must also be added to the Operator Group set in /etc/passwd.

9. If a version of EBU prior to 7.3.3 is installed, perform an upgrade at this time.

10. Register the target database in the catalog using the OBACKUP REGISTER operation.

The following script was used by HiTest to register the target database.

```
db_name = "GLOBAL"
oracle_home = "/orausr/oracle/app/oracle/product/7.3.3"
oracle_sid = "GLOBAL"
pfile = "/orausr/oracle/app/oracle/product/7.3.3/dbs/initGLOBAL.ora"
log = "register.log"
trace = "register.trace"
```

For a full discussion of installing EBU, see *Oracle7 Enterprise Backup Utility Installation Guide for DIGITAL UNIX, Release 2.1.0.1.2.* You should also use this guide to create the backup scripts needed for EBU.

Oracle Applications for DIGITAL UNIX

This section describes the installation of the components of Oracle Applications Release 10.7 for DIGITAL UNIX.

Preinstallation for Oracle Applications

Before installing Oracle Applications, do the following:

1. If you have not already done so, create the user applmgr and assign it to the dba group.

2. Create the /orausr/applmgr directory and give it read/write access (775).

3. Make sure the UNIX subset OSFSOBSOLETE405 (obsolete commands and utilities) has been installed with the UNIX operating system.

Installing Oracle Applications

Complete the following procedure to install Oracle Applications Release 10.7:

1. Log in as root.

2. Mount the Oracle Applications CD-ROM as read only.

3. Log out and login as `applmgr`.

4. Verify that this account is running in the Bourne or Korn shell.

5. Change to the mount point directory and view the file README.FIRST. This file describes an issue with cpio and tar.

6. Set your path as follows:

    ```
    $ PATH=/usr/opt/obsolete/usr/bin:$PATH
    $ export PATH
    ```

7. Set the following environment variable:

    ```
    $ set APPL_TOP=/orausr/applmgr
    $ export APPL_TOP
    ```

8. Enter the following command:

    ```
    $ unload.cmd
    ```

    This command checks that the default directory is APPL_TOP.

9. When prompted, choose option "1, Regular Product Group."

    This moves the base installation archive from the CD-ROM to the server.

10. Change to the install directory:

    ```
    $ cd $APPL_TOP/install
    ```

11. Enter the following command:

    ```
    $ adsetup
    ```

    The script prompts for the machine containing the media and the CD device (the mount point of the CD-ROM).

    When a prompt asks "Unload files from 'DISKA1' ?", enter Y to confirm the unload and initiate the decompression of the files. The unload of the files takes approximately 30 minutes and ends with a success message.

12. Set the environment variables necessary to run `adaimgr` (the install program):

    ```
    $./adsetenv
    ```

13. Execute the `adaimgr` program (located in `$APPL_TOP/ad/2.3.19/bin/`) to start autoinstall:

    ```
    $ adaimgr
    ```

    Autoinstall displays the value of the environment variable $APPL_TOP and allows you to confirm that this is the correct database and directory to use to install Oracle Applications.

14. Confirm that you are running a certified release combination. The configuration specified for this HiTest Suite is a certified release combination.

15. When prompted for the password for the SYSTEM Oracle schema, enter the system password. The password will be echoed on the screen.

16. When prompted for the password for the Application Object Library, press Return to take the default.

17. After a message that a successful connection has been made, choose "1. Continue to use Oracle Applications for commercial or for-profit use."

18. Choose American Only as a language.

19. Choose "1. Select products to install or upgrade." This installs all the Oracle Applications components.

GLOBAL Demo Database Installation

While the GLOBAL demo database is not a required component of an Oracle Applications installation, it is a useful starting point for building your custom database. In the HiTest environment, it was used as the foundation for building the test database.

To install the GLOBAL demo database:

1. Log in as root, mount the GLOBAL demo database CD-ROM as read only (-r), then log out.

2. Log in as `oracle` and change directory to the mount point.

3. View the `readme.txt` file at the top level. This file describes the directory structure of the disk. The compressed data files for the GLOBAL demo database are in the `/dbf` directory.

4. Create the user database directory structure on your shared storage in the following format. In the HiTest environment, the location of the database directory structure was /oradata1:

```
$ mkdir /oradata1/USR
$ mkdir /oradata1/SYS
$ mkdir /oradata1/TMP
$ mkdir /oradata1/OFF
$ mkdir /oradata1/IDX
```

5. Create the /LOG directory on its own disk as follows:

```
$ mkdir /ora_data_log/LOG
```

6. Create the following subdirectories under it:

```
$ mkdir /ora_data_log/LOG/TRC
$ mkdir /ora_data_log/LOG/AUD
$ mkdir /ora_data_log/LOG/DMP
$ mkdir /ora_data_log/LOG/ARC
$ mkdir /ora_data_log/LOG/CORE
```

7. Create the /RBS directory to contain the RollBack Segments, as follows:

```
$ mkdir /ora_data_rbs/RBS
```

8. Copy the files in the /dbf directory to a temp directory and uncompress them.

9. Copy the uncompressed files to their corresponding directories as follows:

```
$ cp index*.dbf /oradata1/IDX
$ cp data*.dbf /oradata1/USR
$ cp off*.dbf /oradata1/OFF
$ cp temp*.dbf /oradata1/TMP
$ cp sys*.dbf /oradata1/SYS
```

```
$ cp log*.dbf /ora_data_log/LOG
$ cp rbs*.dbf /ora_data_rbs/RBS
```

10. If you are installing remotely, uncompress and tar the zip file in the `/mnt/AD` subdirectory. View the readme.txt file to determine whether you need to install patch 458461. HiTest testing did not install this patch.

11. Copy `init.ora` and `recrctrl.sql` from the `/mnt/dbs` directory to $ORACLE_HOME and edit them to meet the requirements of your specific environment. The references in `recrctrl.sql` must reflect the directory structure created in steps 3 through 6. The example scripts in Appendix A show how these files were modified for the HiTest environment.

12. Run the Oracle manager `svrmgrl`.

13. Execute `recrctrl.sql` to create the control file for the GLOBAL demo database.

14. Create the tablespace directory structure as follows:

```
$ mkdir /ora_data_hdr/GLDATA
$ mkdir /ora_data_btch/GLDATA
$ mkdir /ora_data_lns/GLDATA
$ mkdir /ora_idx_hdr/GLIDX
$ mkdir /ora_idx_btch/GLIDX
$ mkdir /ora_idx_lns/GLIDX
$ mkdir /ora_data_rbs/GLRBS
```

15. Modify the following scripts to reflect your directory structure:

create_gl_tablespaces.sql	Creates tablespaces
create_gl_table.sql	Creates tables
create_gl_indexes.sql	Creates indexes
create_small_rbs_segments.sql	Creates rollback segments

Samples of the scripts used to create the HiTest GLOBAL demo database are provided in Appendix A.

16. Execute the scripts in the order given, using the GLDEMO user and GL password.

17. Edit the `initInstance.ora` file to reflect the additional rollback segment variables

System Management Station Installation

Table 3-3 recommends a system management station for the Oracle Applications Oracle TruCluster AS DIGITAL UNIX AlphaServer 8400 HiTest Suite. The system management station can be used to configure software for the AlphaServers and storage, and to manage the system after installation.

The inclusion of a system management station in this HiTest Suite is optional. If you choose not to include a management station, you can install and configure software components using a VT510 terminal or X-windows capable terminal connected to the maintenance port on the front of the controller. Using this terminal, you can configure storage using the Command Line Interface (CLI). After you have initially configured the controller, making it visible to the host, you can perform all other configuration tasks through a remote connection.

If you have selected a system 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 system management station hardware using the instructions in the documentation provided with your DIGITAL PC 5510 ST system or compatible 80x86 system.

Software Installation

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

Operating System Installation

Install and configure the Windows NT Workstation operating system using the operating system installation documentation.

Install and configure the SNMP agent on the system management station as follows:

1. Select the Network item from the Windows NT Control panel.

2. Click the Services tab of the Network property page to install SNMP and configure it.

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

ServerWORKS

To install and configure ServerWORKS, you must:

- Install ServerWORKS Manager on the system management station.

- Install ServerWORKS Agents on the managed systems. The AlphaServer systems specified in this HiTest configuration come with the ServerWORKS Agents factory installed.

- Define the managed systems to the system management station.

Installing ServerWORKS Manager

Install ServerWORKS Manager, which is provided with your AlphaServer 8400 system, using the instructions provided in the *ServerWORKS Manager Overview and Installation* Guide.

1. Insert the DIGITAL ServerWORKS Manager CD-ROM. The installation screen is displayed.

2. Choose a language, then click Install. The selected language becomes the default when you install or uninstall ServerWORKS components.

3. Choose "ServerWORKS Manager Console," not "Manager Agents" as recommended by the ServerWORKS documentation. The manager agents for DIGITAL UNIX V4.0D are pre-installed on the AlphaServer systems. If you install the Manager Agents at this point, you will have to remove them.

4. At the intermediate installation screen, click "Step 1: Agents for Digital Servers on Windows NT (includes ClientWORKS)." The ClientWORKS installation proceeds automatically after the ServerWORKS Manager Console installation.

   Follow the messages in the prompts to install a ServerWORKS agent on the system management station. Be sure to start SNMP when prompted. When the agent installation is completed you are returned to the intermediate installation screen.

5. Click "Step 3: Install the Data Access Paks." When prompted, choose Data Access Drivers. When the Data Access Pak installation is completed, you are returned to the intermediate installation screen.

6. Click "Step 4: ServerWORKS Manager Console" and follow the prompts until the installation is complete.

After the ServerWORKS Manager installation finishes, the ClientWORKS installation begins automatically.

7. Follow the instructions for the ClientWORKS installation. When this installation is complete, you are returned to the component screen.

8. Exit the installation at this point. Do *NOT* choose "RAID Storage Management."

    Version 1.1B of StorageWorks, which is bundled in the ServerWORKS product, cannot be used to configure HSZ70 storage components. The section StorageWorks Command Console later in this chapter describes how to acquire and install a later version of StorageWorks Command Console.

Defining the Managed Systems

After installation, make sure that SNMP is running on the AlphaServer systems. Then complete the following procedure to define the AlphaServers as managed systems using the ServerWORKS Manager.

1. Start the ServerWORKS Manager.

2. From the Action menu, click Discover IP objects.

    The Networks to Discover dialog box displays, with your subnet as the default network address.

3. Select the Network Address(es) you want to discover. You can add to the list that is displayed.

4. Click Next when all addresses have been added.

5. On the Types to Discover dialog box, click Next to discover all types.

6. On the Discovery Options dialog box, choose Ping Spray.

StorageWorks Command Console

To install and configure StorageWorks Command Console, you must:

*   Install the StorageWorks Command Console Client on the system management station

*   Install and configure the RA200 Agent and the HSZ70 Agent on the AlphaServer systems

StorageWorks Command Console has recently been upgraded to provide the capability to both configure and manage HSZ70 storage. This upgrade will soon be shipping on a CD-ROM with the HSZ70 Soultions kit. If the software and documentation is not provided with your HSZ70 Solutions kit, you can access it by downloading it from the web as described in the following procedure.

StorageWorks Command Console Client

Install and configure the StorageWorks Command Console Client on the system management station using the instructions provided in the *DIGITAL StorageWorks Command Console Getting Started* Guide.

1. Log on to the system management station as a member of the administration group.

2. Download the following items from the StorageWorks web site, located at:

    `http://www.storage.digital.com/homepage/support/swcc/index.htm`

README.TXT File	Release Notes
Getting Started Guide (PDF)	Installation guide
StorageWorks Command Console V2.0 Client Software (zip)	Client software
StorageWorks Command Console V2.0 Agent for DIGITAL UNIX	Agent software

3. Navigate to the web site `http://www.cdrom.com/pub/infozip/` and download the unzip utilities for Windows NT and Digital Unix (OSF/1) / Ultrix.

4. Print and read the release notes and installation guide, *DIGITAL StorageWorks Command Console Getting Started.*

5. FTP the Digital Unix unzip utility and the Agent software (`SWCC20DUNIX.zip`) to a directory on each of your AlphaServer systems.

6. Unzip the Client software (`SWCC20client.zip`) on the Windows NT system.

_____ **Note** _____

You must unzip the files you download on the target operating system and retain the directory structure. Unzip the Client files on the system management station using the Window NT unzip utility. Unzip the Agent files on the AlphaServer systems using the Digital Unix unzip utility, as described in the section StorageWorks RA200 and HSZ70 Agents later in this chapter.

_____

The unzip utility creates the subdirectory NTINTEL\CLIENT under the directory where you unzip the file.

7. Run `NTINTEL\CLIENT\setup.exe`.

8. Enter the appropriate information in response to the prompts. The installation installs a Start menu item.

After the Client is installed, you can access online help for information about configuring and using the Command Console.

StorageWorks RA200 and HSZ70 Agents

The StorageWorks RA200 and HSZ70 Agents work with the StorageWorks Command Console Client to configure, operate, and monitor the AlphaServer 8400 storage subsystems.

Install Agents on each AlphaServer 8400 system using the instructions provided in the *DIGITAL StorageWorks Command Console Getting Started* Guide.

All Agent installations must be performed locally: do not attempt to install an Agent over the network.

To install the RA200 Agents:

1. If you have not already done so, complete steps 1 through 4 of the procedure for installing the StorageWorks Command Console Client to copy the file `SWCC20DUNIX.zip` and the Digital Unix unzip utility to a directory on each AlphaServer system. HiTest copied the files to the `/swcc` directory.

2. Log in as root.

3. Enter the following command:

4. `setld -l /swcc/DUNIX/Agents/mlg`

5. When the menu displays, select "1 All of the Above". Confirm your choice when prompted.

6. When prompted, enter and verify a case-sensitive password between 4 and 16 characters long.

7. Enter the host name of the system management station (where you installed the StorageWorks Command Console Client).

8. Complete the installation by responding to the screen prompts with the help of the documentation. Information you will be asked for includes:

    *   Subsystem access level

    *   Client notification scheme

    *   Access level

9. Confirm the information you have entered. After completing the installation of the first Client, you can add additional clients if you have installed the StorageWorks Command Console Client on more than one system.

You can modify the information you provide in the initial installation of the RA200 Agent by running the file `/usr/bin/RA200config.sh` and following the instructions in the chapter on Configuring the RA200 Agents in the *Getting Started* Guide.

To install the HSZ70 Agents:

1. Enter the following command:

    `setld -l /swcc/DUNIX/Agents/hsa`

2. When the menu displays, select 1 "All of the Above". Confirm your choice when prompted. Screen messages tell you that the subset has been installed and loaded.

3. Enter the host name of the system management station (where you installed the StorageWorks Command Console Client.)

4. Complete the installation by responding to the screen prompts with the help of the documentation. Information you will be asked for includes:

    *   Subsystem access level

    *   Client notification scheme

    *   Password to be used for remote configuration

    *   RAID subsystem names and monitoring intervals

    *   Name and address of a person or persons to be notified (by E-mail)

    *   Level of notification to be used

    When the installation finishes, the system automatically starts the new Agent.

You can modify the information provided in the initial installation of the HSZ70 Agent by changing to the `/usr/opt/swcc200/scripts` directory and running the shell script `swcc_config.sh`.

Configuring ServerWORKS to Launch StorageWorks Command Console

The StorageWorks software includes integration files for use with ServerWORKS. To configure ServerWORKS to use these files to launch StorageWorks Command Console:

1. Navigate to the directory where you unzipped the `SWCC20CLIENT.zip` file.

2. Select all the files in the subdirectory `\NTIntel\srvrwrks`.

3. Copy them to the directory to which you installed the StorageWorks Command console. If you took the defaults, the location is `C:\Program Files\swcc\`.

4. Run the integration program `SWInt32`.

5. Start ServerWORKS and discover systems, using the ServerWORKS documentation. Nodes with Command Console agents will display the Command Console icon in the tool bar. Click the icon to launch Command Console.

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 the 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, and the test process.

Overview of Results

Interoperability testing was performed successfully on the Oracle Applications Oracle TruCluster AS DIGITAL UNIX AlphaServer 8400 HiTest Suite. Tests were performed to ensure the HiTest Suite met installability, interoperability, availability, and manageability criteria.

Oracle database tests were executed on the AlphaServer 8400 TruCluster to verify the ability to process queries, in which all data resides in a local Oracle7 database on shared storage.

All tests demonstrated typical data warehousing type queries and verified interoperability of the Oracle Applications Oracle TruCluster AS DIGITAL UNIX AlphaServer 8400 HiTest Suite components.

Test Environment

Figure 5-1 shows the test environment.

Figure 5-1: Test Environment

LJ-06480.AI4
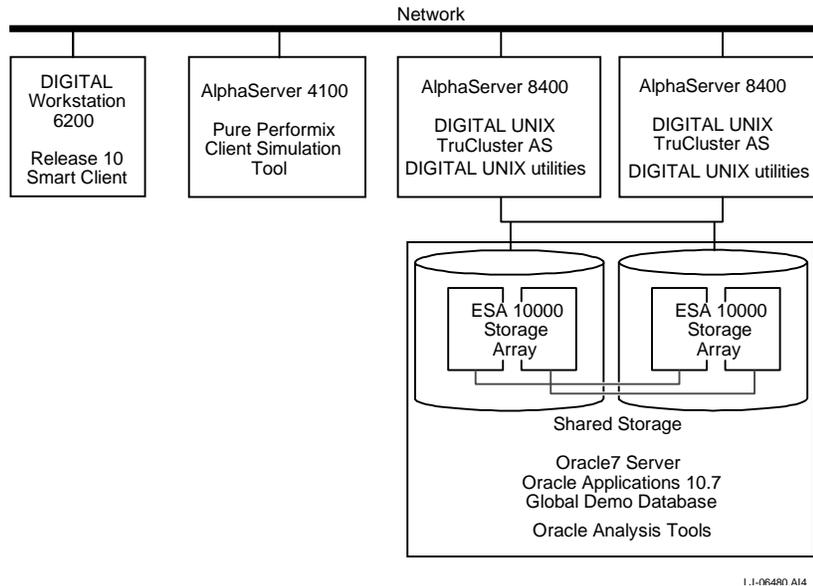
Test Tools

The following tools were used for interoperability testing:

- Client Simulation Tool

  Pure Performix Character Application (CA) from Rational Software was used as the load testing software.

  With the recording agent, Performix captures user activities, including keystrokes, mouse movements and SQL requests, to automatically generate scripts that represent a realistic client load.

  Performix is available for testing client/server, web-enabled, and character applications.

- Oracle Analysis Tools

  The following SQL Scripts were used as test tools:

utlbstat.sql	Oracle data analysis utility to start data capture process
utlestat.sql	Oracle data analysis to end data capture process
rem_oracle_stat.sql	Customized script that interprets data output

- DIGITAL UNIX utilities used in testing:

  vmstat
  memstat

- Test Client

  DIGITAL 6200 Workstation running:

Operating system	Windows NT Workstation 4.0
Oracle Client	Oracle 10 Smart Client (SC) for Windows 95 and Windows NT

Test Configuration

This section shows the configuration of the shared storage for the minimum and maximum configurations of this HiTest Suite.

For both the minimum and maximum configurations, the DIGITAL UNIX operating system and TruCluster Available Server were installed on the local disks of each AlphaServer.

Minimum Configuration

The shared storage for the minumum configuration included 18 4.3 GB disks, mirrored using LSM, as shown in Table 5-1.

Table 5-1: Disk Configuration for Shared Storage – Minimum Configuration

LSM Volume	Number of Disk Drives	Mount point	Disk Drive Content and Data	Group Type	Usable Capacity
Vol01	1	/ora_idx_btch	Batch index tablespace	RAID 0+1	4.15 GB
Vol02	1	/orausr	Oracle7 and Oracle Applications	RAID 0+1	4.15 GB
Vol03	2	/ora_data_hdr	Data header tablespace	RAID 0+1	8.3 GB
Vol04	2	/ora_data_btch	Data batch tablespace	RAID 0+1	8.3 GB
Vol05	2	/ora_data_lns	Data lines tablespace	RAID 0+1	8.3 GB
Vol06	2	/ora_idx_hdr	Index header tablespace	RAID 0+1	8.3 GB
Vol07	2	/oradata1	GLOBAL demo database	RAID 0+1	8.3 GB
Vol08	2	/ora_idx_lns	Index lines tablespace	RAID 0+1	8.3 GB
Vol09	2	/ora_data_rbs	Rollback segments	RAID 0+1	8.3 GB
Vol10	2	/ora_data_log	Oracle database log files	RAID 0+1	8.3 GB
					Usable Total: 74.7 GB

Maximum Configuration

The shared storage for the maximum configuration included 36 4.3 GB disks, mirrored using LSM, as shown in Table 5-2.

Table 5-2: Disk Configuration for Shared Storage – Maximum Configuration

LSM Volume	Number of Disk Drives	Mount point	Disk Drive Content and Data	Group Type	Usable Capacity
Vol01	4	/ora_idx_btch	Batch index tablespace	RAID 0+1	16.6 GB
Vol02	1	/orausr	Oracle7 and Oracle Applications	RAID 0+1	4.15 GB
Vol03	4	/ora_data_hdr	Data header tablespace	RAID 0+1	16.6 GB
Vol04	4	/ora_data_btch	Data batch tablespace	RAID 0+1	16.6 GB
Vol05	4	/ora_data_lns	Data lines tablespace	RAID 0+1	16.6 GB
Vol06	4	/ora_idx_hdr	Index header tablespace	RAID 0+1	16.6 GB
Vol07	4	/oradata1	GLOBAL demo database	RAID 0+1	16.6 GB
Vol08	4	/ora_idx_lns	Index lines tablespace	RAID 0+1	16.6 GB
Vol09	3	/ora_data_rbs	Rollback segments	RAID 0+1	12.45 GB
Vol10	4	/ora_data_log	Oracle database log files	RAID 0+1	16.6 GB
					Usable Total: 109.4 GB

Test Description

The Oracle Applications workload is designed to emulate the work typically done by a group of clerks, analysts, and supervisors performing Oracle General Ledger functions on an Oracle Applications 16.1 database. These functions include a series of inter-related operations such as journal line entry, account inquiry, and the generation of posted and unposted journal reports. These business functions are used by nearly all Oracle Applications customers, independent of industry.

During the tests, each of the users connected to the Central Server through SQL*Net to execute lines of General Ledger Journal Entry accounting transactions. The Oracle General Ledger entry transactions that were performed and the probability of their being executed during the test period were:

- General Ledger Journal Entry 80% (update)

- Unposted/Posted journals/accounting inquiry 20% (queries)

General Ledger entry transactions used the most system resources of any transactions in the Oracle Application Financial package. HiTest used a larger percentage (approximately 80%) of General Ledger transactions as part of the test workload. This was done to create as heavy a load as possible on the Server.

General Ledger Database

In most Oracle Application installations, the production system workload is spread over many of the Oracle Application Financial modules so that the processing is spread over multiple tables in the database. For example, under normal workload conditions at a customer site, all user activity is being spread over approximately 250 tables. However, because the test workload was skewed to a higher percentage of resource-intensive General Ledger entries, a much larger number of accesses to a smaller number of tables occurred.

The HiTest workload accessed only the following three tables:

- GL-JE-Lines

- GL-JE-Batches

- GL-JE-Headers

Using only three tables to handle 80% of the workload created an extraordinary demand on the database in terms of sharing resources.

Client Simultation

Client simulation was accomplished by the use of:

- The Pure Performix Character Application (CA) running on an AlphaServer 4100

- Oracle 10 SmartClient (SC) running on a DIGITAL PC 6200 workstation

Pure Performix scripts were created to capture keystrokes, emulating a journal entry clerk's daily activities. The same process was used to create Performix test scripts for both journal inquiry and account inquiry clerks. These scripts were then linked into the Pure Performix driver system.

These scripts provided the basis for each line item command. These commands were weighted with wait states to emulate an actual work load. Each journal entry *user* had a 60 second wait state and each inquiry *user* had a 65 second wait state.

The system was connected by network access and after each user was loaded into memory, each succeeding user process was cached in memory.

Test generations of 400, 600, and 800 users were evaluated in a one hour period after all user scripts were loaded and in full operation.

Test Results

Test results were obtained for the following areas:

Library Cache Efficiency

This area contained shared SQL and PL/SQL areas. Total reloads should be near zero. If the ratio of Reloads to PINS (= misses) is more than 1%, reduce library cache misses by applying the following tuning recommendations:

Tuning Recommendations:

- Increase the amount of memory available to the library cache by increasing the value of SHARED_POOL_SIZE.

- Increase the number of cursors available to a session by increasing the value of OPEN_CURSORS.

Table 5-3: Library Cache Efficiency

Results	Number of Users		
	400	**600**	**800**
Minimum Results			
Executions	2745	3673	4340
Cache Misses	5	45	75
Shared Pool Cache % Hit	0.998	0.988	0.983
Maximum Results			
Executions	3223	3452	4786
Cache Misses	25	35	95
Shared Pool Cache % Hit	0.992	0.99	0.98

Data Dictionary Cache Efficiency

For frequently accessed dictionary caches, the ratio of Misses to total Gets should be less than 10%. If this ratio continues to increase above this threshold while the application is running, allocate more memory to the Data Dictionary Cache.

Tuning Recommendations:

- Increase the value of SHARED_POOL_SIZE.

Table 5-4: Data Dictionary Cache Efficiency

Results	Number of Users		
	400	**600**	**800**
Minimum Results			
Data Dictionary Gets	6815	9351	9827
Data Dictionary Misses	344	344	344
Dictionary Cache Hit %	.9912	.9632	.9650

Results	Number of Users		
	400	**600**	**800**
Maximum Results			
Data Dictionary Gets	8827	9275	9981
Data Dictionary Misses	344	344	344
Dictionary Cache Hit %	9610	.9679	.9655

Buffer Cache Efficiency

Determine the ratio of requests for data and the number of times the request resulted in a disk access.

Hit Ratio = 1 - (physical reads/(db block gets + consistent gets))

Tuning Recommendation:

- If the hit ratio is less than 80%, increase the number of db buffers in the cache by increasing DB_BLOCK_BUFFERS.

Table 5-5: Buffer Cache Efficiency

Results	Number of Users		
	400	**600**	**800**
Minimum Results			
Db block Gets	2240	3267	3421
Consistent Gets	7978	10175	10603
Physical reads	1329	1329	1329
DB Buffer Cache Hit %	.8699	.9011	9052
Maximum Results			
Db block Gets	3074	3251	3457
Consistent Gets	9768	10081	10793
Physical reads	1329	1329	1330
DB Buffer Cache Hit %	.8965	.9003	.9067

Recursive Calls

These calls are generated by misses on the data dictionary cache; firing of database triggers; dynamic segment extension; execution of SQL statements within stored procedures, functions, packages, and anonymous PL/SQL blocks; enforcement of referential integrity constraints; and execution of Data Dictionary Language statements.

The ratio of recursive calls to user calls should be no more than 10%. If it grows, apply the following tuning recommendations.

Tuning Recommendations:

- Increase data dictionary and db buffer cache with SHARED_POOL_SIZE.

- Rebuild segments with storage clauses that have few large extents.

Table 5-6: Recursive Calls

Results	Number of Users		
	400	**600**	**800**
Minimum Results			
user calls	257	887	1352
recursive calls	12598	13482	13745
Maximum Results			
user calls	577	732	1662
recursive calls	13738	13415	13892

Redo Log Space Requests

This statistic reflects the number of times a user process waits for space in the redo log buffer. This value should be near zero, otherwise processes have to wait for space in the log buffer.

Tuning Recommendation:

- If this value increases consistently, increase the size of the redo log buffer with LOG_BUFFER. This value is expressed in bytes.

Table 5-7: Redo Log Space Requests

Results	Number of Users		
	400	**600**	**800**
Minimum Results	0	0	0
Maximum Results	0	0	0

Sorts

Determine if there are sorts occurring on disk instead of in memory. This value should be near zero.

Tuning Recommendation:

- If many sorts use temporary segments on disk, increase the value of SORT_AREA_SIZE.

Table 5-8: Sorts

Results	Number of Users		
	400	**600**	**800**
Minimum Results			
Sorts (disk)	0	0	0
Sorts (memory)	28	52	70
Sorts (rows)	498	1174	1681
Maximum Results			
Sorts (disk)	0	0	0
Sorts (memory)	40	46	82
Sorts (rows)	836	1005	2019

Free List Contention

Contention for free lists is reflected by contention for free data blocks in the buffer cache. Compare the total number of waits for free blocks with the total number of requests for data over the same period.

Tuning Recommendation:

- If the number of waits for free blocks is greater than 1% of total number of requests, add more free lists to avoid contention.

Table 5-9: Free List Contention

Results	Number of Users		
	400	**600**	**800**
Minimum Results			
Total Gets	10218	13442	14024
Maximum Results			
Total Gets	12842	13332	14250

Rollback Segment Contention

Compare the total number of waits for each block class with the total number of requests for data over the same period of time.

Tuning Recommendation:

- If the number of waits for any class is greater than 1% of the total number of requests, increase the number of rollback segments.

In the HiTest environment, there were enough rollback segments loaded into memory that there was no contention, as indicated by the results shown in Table 5-10.

Table 5-10: Rollback Segment Contention

Results	Number of Users		
	400	**600**	**800**
Minimum Results			
system undo header	0	0	0
system undo block	0	0	0
undo header	0	0	0
undo block	0	0	0
Maximum Results			
system undo header	0	0	0
system undo block	0	0	0
undo header	0	0	0
undo block	0	0	0

Server System Statistics

Table 5-11 provides the server system statistics:

Table 5-11: Server System Statistics

Results	Number of Users		
	400	**600**	**800**
Minimum Results			
% CPU User	27.2	43.5	58.8
% CPU System	3.9	6.9	11.6
% CPU Idle	68.9	49.6	29.6
Maximum Results			
% CPU User	6.8	10.3	14.0
% CPU System	1.2	1.8	2.3
% CPU Idle	92.0	87.9	83.7

Failover Test Process and Results

The TruCluster Available Server software detects and responds to the following failure events:

- Member node failure (host down)

- Critical SCSI path failure

- Device failure

- Network interface failure

- Network partition failure (Two ASE member nodes cannot communicate with each other over the cluster interconnect.)

A service can be automatically relocated by ASE if a failure stops a member system from providing the service. The ASE disk service created in Chapter 4 was used to failover services to the backup node. In the HiTest environment an ASE disk service dbserv was created to failover from the primary server depot1 to the backup server depot2.

Oracle Applications Failover Scripts

The failover processes documented in this section used custom scripts. These scripts and the process to use them are documented in the white paper Implementing Oracle Applications with TruCluster ASE. This paper is available at the internal DIGITAL web site for the Enterprise Applications and Data Warehousing Information Center (ERP),
http://www-ase.zko.dec.com/WebOracleApps.htm
under the topic Reliability, Availablility, Clusters.

In the db_service_start script, there is one section that has not been generalized to use information from the rc_service script. This is the section that verifies that the database disks are mounted. Currently, it is hard-coded with the AdvFS domain and fileset names as well as the LSM volume names. There are plans to generalize this and to update the scripts on the ERP web page, but until that has been completed, the scripts must be manually modified for the specific environment in which they are run.

The Oracle Applications implementation represented by the scripts is a two-tier Client/Server configuration with a database server and multiple clients located on the users' desktops. Any other configuration will require modifications to at least the scripts and possibly other aspects of the configuration.

Storage Configuration

Services that need to be failed over require that any storage used by the service be on shared devices. In the test configuration, all of the shared drives were located in a storage array. LSM, AdvFS and UFS were used to configure the storage used by the service that was to have the ability to fail over. Some of the LSM disks were used to create an AdvFS domain with one fileset containing both the Oracle and Oracle Applications software. The Oracle database storage was created with UFS using the balance of the LSM storage. Chapter 4 provides an overview of the installation processes used to create this environment.

Script Locations

The Oracle Applications specific ASE scripts are designed to be located in the directory `/usr/local/ase/ora_apps.` By allocating them to their own directory, it is easier to distinguish between scripts used by the service and those used by other services created on the system. The scripts were used to start up and shut down the services on the appropriate nodes. The scripts used by Oracle were located in the `ORACLE` user account home.

UNIX Remote User Configuration

The scripts used for the implementation used `rsh` commands to execute scripts on the member systems. The file `/.rhosts` was set up on all ASE members so that the `root` account from all members was able to issue these commands. An example of an entry in the file would be `hostname.nio.dec.com`. The manpages for `rhosts` provide details on this file and its configuration.

Manual Test of Failover Using ASEMGR

ASE Manager was used to manually relocate the user-defined service to make sure that ASEMGR could relocate the service from the original node to the surviving node during failover.

This manual operation stopped the service on the member currently running the service and started the service on the member selected. The service's placement policy can be overridden by selecting a member to run the service.

The procedure for manually testing failover using ASE Manager was as follows:

1. Start the ASE manager.

2. Choose Managing the ASE Services.

3. Choose "r) Relocate a service."

4. When prompted, select the ASE disk service on the primary node as the service to relocate.

5. Select the backup server as the member to run the disk service.

   Screen messages confirm that the disk service has been relocated.

6. Reverse the process and use ASE Manager to relocate the service from the backup server to the primary server.

7. Using ASE Manager, make sure that the disk service can be set online, offline, and restarted on both member nodes.

Failover Test Results for Hardware Failures

Once configured and tested with `asemgr`, the service was tested by introducing real failures into the environment, such as the following:

- Routine shutdown of the member node that the service was running on

- Simulated system crash

  While the service was running, the system the service is located on was powered off. The service relocated to the other system and remained available for use.

- Power failure of one member node

- The SCSI cable at the back of the system was disconnected. The service failed over to the appropriate node, was started and was accessible.

  Depending on the storage configuration and the activity on the system, ASE may take a while to determine there is a fault and take action. This can be speeded up by issuing an `ls` command for a directory on the shared SCSI but it still could take a while.

- Disconnection of network connections on one member node

  The network cable was disconnected. The service relocated to the appropriate node, was started and was accessible.

The TruCluster Available Server and user-defined scripts performed without problems in all cases.

Failover is not instantaneous; it takes time for other nodes to recognize that the node providing this service has failed. In the case of power down or system reboot, it happens quickly. In the case of a network connection failure it takes longer. There is also an inherent delay in starting Oracle Applications.

There are limitations to failover and availability. The system keeps running only if it has levels of redundancy greater than or equal to the number of failures.

Backup and Restore Test Process and Results

Database backups using NSR and EBU were executed to demonstrate interoperability. The tests were run with the GLOBAL database with the following NSR server settings:

parallelism=2
tape devices =1
sessions per device =2

The backup I/O rates are greatly effected by the storage layout of tablespaces and data files. Also of importance is the sequence in which the tablespaces, data files, and full database are created (or added) to the database. EBU determines the order of backup streams by ordering the tablespaces by create date. All data files associated with a tablespace are then ordered by their create dates before the next tablespace in chronological order is chosen.

Table 5-12 shows the results of the backup tests performed, including the elapsed time to backup database files. Actual data written to tape may vary depending on compression.

Table 5-12: Backup Test Results

Parallelism	Devices	Database File	Elapsed Time
2	1	Dbfile gl_index_batch.dbf	2 hr. 06 min.
2	1	Dbfile gl-index_header.dbf	1hr. 04 min.
2	1	Dbfile gl_index_line.dbf	1 hr. 06 min.
2	1	Tablespace GL_IDX_LNS	1 hr. 26 min.
2	1	Tablespace GL_IDX_HDR	1 hr. 21 min.
2	1	Tablespace GL_IDX_BTCH	1 hr. 23 min
2	1	Tablespace RBS (Rollback Segement)	0 hr. 20 min
2	1	Tablespace RBS2 (Rollback Segement)	0 hr. 21 min
2	1	Tablespace User_Data	0 hr. 21 min
2	1	Tablespace User_Index	0 hr. 21 min

Table 5-12 shows performance on all the tablespace and datafiles that are local to the backup node. Multiple I/O streams per tape device may cause contention. Increasing the dedicated KZPSAs to one per tape drive is recommended for better performance.

The following sections describe the scripts and backup procedures used for:

- Full Online backup and restore

- Full Offline backup and restore

Full Online Backup and Restore

This section describes the online backup and restore scripts, and two online backup scenarios.

Online Backup Script

The following script was used for online full backup:

```
backup online database
db_name="GLOBAL"
oracle_sid="GLOBAL"
parallel=2
log = "/ora_data_log/obackup/GLOBALonline521.log"
```

Online Restore Script

The following script was used for online full restore:

```
restore database
db_name="GLOBAL"
ORACLE_SID="GLOBAL"
log="/ora_data_log/obackup/GLOBALrestore521.log"
parallel=2
```

Online Backup – Scenario 1

The following error was reported in GLOBALretore521.log

```
IO Error during restore

Beginning restore of file "/oradata1/USR/data3.dbf"
size 100M bytes from tape file "129895777019"
EBU-7008: Sbtopen: I/O Error
on 05/21/1998 15:50:39 [ 4627 : main/brsstopn() ]
EBU-5508: Error in sbtopen of "129895777019"
on 05/21/1998 15:50:39 [ 4627 : brtp ]
Job 28 with pid=4626 completed on 21-MAY-98 15:50:45
EBU-2006: Job 28 failed due to Tape API (sbt) error on vendor
```

```
side
on 21-MAY-98 15:50:46 [ 4626 : brccmd ]
```

```
RESTORE job FAILED
```

This type of error indicates a problem with the tape media rather than the restore operation. The error can be ignored, although it may require several restore operations before the restore will be performed successfully.

Online Backup – Scenario 2

One of the backup tests was a point-in-time incomplete recovery to restore files to a point in time before tables were dropped.

After an apparently successful restore, the following error was encountered when trying to start the database:

```
SVRMGR> startup;

ORACLE instance started.
Total System Global Area       424585160 bytes
Fixed Size                         50832 bytes
Variable Size                  157147448 bytes
Database Buffers               262144000 bytes
Redo Buffers                     5242880 bytes
Database mounted.
ORA-01113: file 1 needs media recovery
ORA-01110: data file 1: '/oradata1/SYS/system1.dbf'
```

Oracle will open the database only if all the redo for the thread is applied. Because all the redo for the thread were not available (the control file and data files were from a point after the RESETLOGS was done), an incomplete recovery was done, as follows:

1. The database was opened:

    ```
    SVRMGR> alter database open resetlogs;
    alter database open resetlogs
    *
    ORA-01113: file 1 needs media recovery
    ORA-01110: data file 1: '/oradata1/SYS/system1.dbf'
    ```

    This marks the database so that the redo that was skipped cannot be applied accidentally.

    The screen message indicates that media recovery is necessary.

2. The `recover database` command with the `until time` option was used to roll forward one log at a time to a specific point in time within the redo log file:

    ```
    SVRMGR> recover database until time '1998-05-21:15:32:59'
       using backup controlfile;
    ORA-00279: Change 723038 generated at 05/21/98 15:33:44
    needed for thread 1
    ORA-00289: Suggestion : /ora_data_log/LOG/ARC/1_185.dbf
    ORA-00280: Change 723038 for thread 1 is in sequence #185
    Specify log: {<RET>=suggested | filename | AUTO | CANCEL}
    /ora_data_log/LOG/log1.dbf
    ORA-00310: archived log contains sequence 183; sequence 185
    required
    ORA-00334: archived log: '/ora_data_log/LOG/log1.dbf'
    ```

    The log file specified was `/ora_data_log/LOG/log1.dbf`. The screen message indicates that this is the wrong redo log file. Because all the redo for the thread was not available, it was necessary to check the alert_GLOBAL.log and *.trc file in the `$ORACLE_HOME/rdbms/log` directory to find the related redo log files to try.

Tests and Results

3. The recover data command was tried again with a second redo log file: /ora_data_log/LOG/log2.dbf.

```
SVRMGR> recover database until time '1998-05-21:15:32:59'
   using backup controlfile;
ORA-00279: Change 723038 generated at 05/21/98 15:33:44
needed for thread 1
ORA-00289: Suggestion : /ora_data_log/LOG/ARC/1_185.dbf
ORA-00280: Change 723038 for thread 1 is in sequence #185
Specify log: {<RET>=suggested | filename | AUTO | CANCEL}
/ora_data_log/LOG/log2.dbf
Log applied.
Media recovery complete.
```

This was the correct redo log file and the media recovery was successful.

4. The alter database command was reissued and processed successfully.

```
SVRMGR> alter database open resetlogs;
Statement processed.
```

Full Offline Backup and Restore

This section describes the offline backup and restore scripts, and one offline backup scenario.

Offline Backup Script

The following script was used for offline full backup:

```
backup offline database
db_name="GLOBAL"
oracle_sid="GLOBAL"
parallel=2
log = "/ora_data_log/obackup/GLOBALoffline522.log"
```

Offline Restore Script

The following script was used for offline full restore:

```
restore database consistent
db_name="GLOBAL"
restore database consistent
db_name="GLOBAL"
ORACLE_SID="GLOBAL"
log="/ora_data_log/obackup/GLOBALrestoff522.log"
recover
parallel=2
```

Offline Backup Scenario

The following backup error occurred:

```
Starting Automatic Recovery
  Issuing Statement: CONNECT ...;
  Connected to idle instance.
  Issuing Statement: STARTUP DBA MOUNT;
  Database mounted.
  Issuing Statement:    ALTER DATABASE RECOVER AUTOMATIC;
UPI call failed during:
   ALTER DATABASE RECOVER AUTOMATIC
with error:
ORA-00264: no recovery required
  Automatic Recovery FAILED.
Ended Automatic Recovery.
Job 35 with pid=4540 completed on 22-MAY-98 18:17:03
EBU-2002: Job 35 failed due to Target Database error
  on 22-MAY-98 18:17:03 [ 4540 : brccmd ]

RESTORE job FAILED
```

This error log is misleading. Although it says that the recovery failed, it did not.

Restore the database as follows:

1. Connect to an internal instance of Oracle:

    ```
    SVRMGR> connect internal
    Connected to an idle instance.
    ```

2. Mount the database:

    ```
    SVRMGR> startup mount
    ORACLE instance started.
    Total System Global Area      424582568 bytes
    Fixed Size                        50832 bytes
    Variable Size                 157144856 bytes
    Database Buffers              262144000 bytes
    Redo Buffers                    5242880 bytes
    Database mounted.
    ```

3. Recover the database. The `until cancel` qualifier is used in the case of an incomplete recovery.

    ```
    SVRMGR> recover database until cancel;
    Media recovery complete.
    ```

4. Open the database:

    ```
    SVRMGR> alter database open resetlogs;
    Statement processed.
    ```

It took four hours to do the offline GLOBAL database full restore.

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 problem was identified:

Restore Failure

Problem   **Restore failed**

The following error was reported in GLOBALretore521.log

```
Beginning restore of file "/oradata1/USR/data3.dbf"
size 100M bytes from tape file "129895777019"
EBU-7008: Sbtopen: I/O Error
on 05/21/1998 15:50:39 [ 4627 : main/brsstopn() ]
EBU-5508: Error in sbtopen of "129895777019"
on 05/21/1998 15:50:39 [ 4627 : brtp ]
Job 28 with pid=4626 completed on 21-MAY-98 15:50:45
EBU-2006: Job 28 failed due to Tape API (sbt) error on vendor side
on 21-MAY-98 15:50:46 [ 4626 : brccmd ]

RESTORE job FAILED
```

Impact   **Database cannot be restored**

Solution   **Retry restore**

The I/O error indicates a bad tape. Repeat the restore until it succeeds.

Foundation Software

The following problems were identified:

Oracle7 Server Installation Error

Problem   **Oracle7 server installation hangs without an error message**

If the option "MTS Multi-Threaded Service and Autostart TNS Listener" is chosen during installation, the installation hangs.

Impact   **Installation cannot proceed**

Solution   **Do not select the "MTS Multi-Threaded Service and Autostart TNS Listener" option during installation**

Start the Listener after installation is complete.

NetWorker Save and Restore Error

Problem	**Error starting NetWorker Save and Restore Administrator (nwadmin)**
	A segmentation fault and core dump occur when running `nwadmin`.
Impact	**NSR cannot be configured**
Solution	**Create an ASE service before running `nwadmin`**
	Before running nwadmin, create an ASE disk service using ASEMGR. See the section Creating an ASE Service for Failover in Chapter 4.

AppSet Software

The following problems were identified:

Oracle Applications Installation Error

Problem	**File not found error message**
	The installation documentation instructs the user to execute the `adaimgr` program immediately after executing `adsetup`.
	When executing the `adaimgr` program to install the software, error messages were returned that files were not found.
Impact	**Installation cannot proceed**
Solution	**Execute `adsetenv` before executing `adaimgr`**
	A step is missing from the installation documentation. The `adsetenv` program must be executed before executing `adaimgr`.
	Use the installation procedure for Oracle Applications in Chapter 4. This procedure indicates the prerequisites for installation and summarizes the installation process.

$TWO_Task Variable Error

Problem	**Required files not found**
	Oracle Applications was installed with the $TWO_Task variable set in the profile, as specified in the documentation. An error message reported that information from `tnsnames.ora` could not be found.
Impact	**Installation could not proceed**
Solution	**Do not set the $TWO_Task variable**
	When installing Oracle Applications immediately after installing Oracle Server, do not set the $TWO_Task variable.

System Management Station

The following problem was identified:

StorageWorks Version Issue

Problem	**StorageWorks bundled with ServerWORKS is obsolete**
	If you use the ServerWORKS CD-ROM to install StorageWorks, the version installed (V1.1b) cannot be used to manage HSZ70s.
Impact	**Shared storage cannot be managed from system management station**
Solution	**Download StorageWorks 2.0**
	Follow the instructions for installing StorageWorks in Chapter 4, which include information on how to download StorageWorks 2.0.

7
Detailed Hardware Configuration

This chapter describes the minimum and maximum hardware configuration for the Oracle Applications Oracle TruCluster AS DIGITAL UNIX AlphaServer 8400 HiTest Suite by providing the following:

- System Diagram
- HiTest System Slot Configurations
- Input/Output Slot Usage
- 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
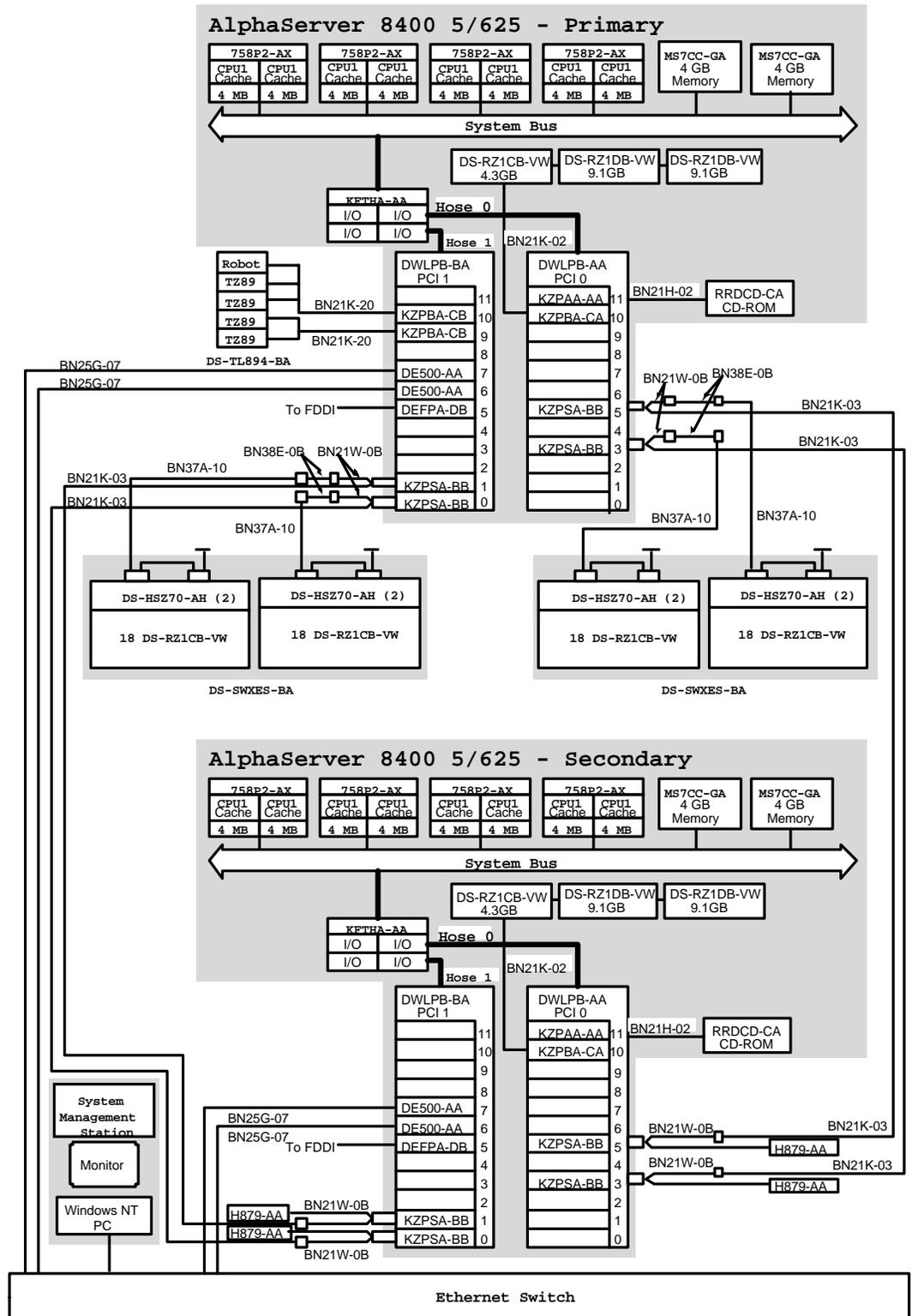
LJ-06481.AI7

Table 7-1: Configuration Cabling

Part Number	Min Qty	Max Qty	Description	From	To
BN21W-0B	4	8	SCSI Y cable	KZPBA-CB	Shared SCSI buses
BN38E-0B	2	4	SCSI VHDCI female to HD68 male connector	SCSI Y cable (BN21W-0B)	SCSI bus cable (BN37A-10)
BN37A-10	2	4	SCSI bus cable	SCSI VHDCI	HSZ70
BN38C-02	2	4	10 m SCSI-3 "P" straight/90°	SCSI Y cable (BN21W-0B)	SCSI Y cable (BN21W-0B)
BN34B-10	2	2	SC to SC dual fiber optic cable	DEFPA-DA in requirements	FDDI ring(s)
BN25G-07	4	4	10BaseT twisted-pair Ethernet cable	Ethernet adapter	Ethernet switch
BN21K-20	2	2	20 m SCSI-3 "P" straight/90°	KZPBA-CB	Tape library
BN38C-02	2	2	2 meter Ultra 68VHD/68VD cable	SCSI Y cable (BN21W-0B)	SCSI bus cable (BN37A-10)
BN21K-02	2	2	2 m SCSI-3 "P" straight/90°	KZPAA-AA	DWZZB-VW
BN21H-02	2	2	2 meter SCSI cable	KZPAA-AA	CD-ROM

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 in this HiTest Template.

Figure 7-2: HiTest System Slot Usage

ML014331
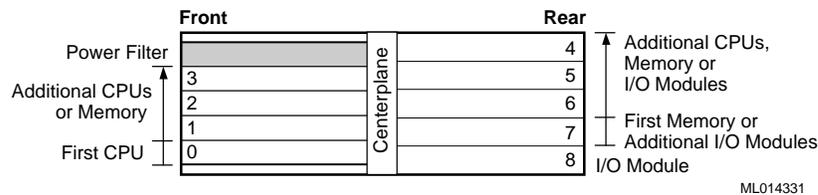
Table 7-2: System Slot Usage (Minimum and Maximum Configurations)

Slot	Minimum Configuration Options	Maximum Configuration Options	Description
0	758P2-AX	758P2-AX	5/625 MHz Dual CPU
1		758P2-AX	5/625 MHz Dual CPU
2		758P2-AX	5/625 MHz Dual CPU
3		758P2-AX	5/625 MHz Dual CPU
4			
5			
6		MS7CC-GA	4 GB Memory Module
7	MS7CC-FA	MS7CC-GA	4 GB Memory Module
8	KFTHA-AA	KFTHA-AA	System I/O Module (4 channel)

Input/Output Slot Usage

Figure 7-3 and Tables 7-3 through 7-6 show the input/output (I/O) slot usage for the minimum and maximum configurations of this HiTest Template.

Figure 7-3: I/O Slot Usage
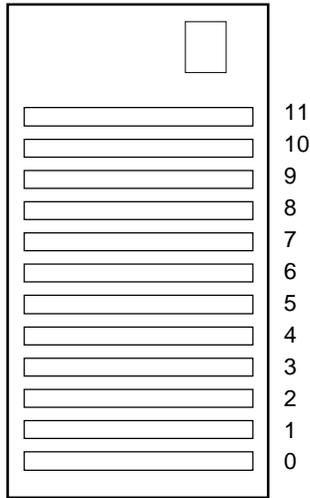
ML014125

Table 7-3: PCI #0 Primary System Devices (Minimum and Maximum Configurations)

Slots	Minimum Configuration	Maximum Configuration	Description
11	KZPAA-AA	KZPAA-AA	PCI one-port FNSE SCSI controller
10	KZPBA-CA	KZPBA-CA	PCI one-port FWSE SCSI controller
9	Available	Available	
8	Available	Available	
7	Available	Available	
6	Available	Available	
5	KZPSA-BB	KZPSA-BB	PCI one-port FWD SCSI controller
4	Available	Available	
3	Available	KZPSA-BB	PCI one-port FWD SCSI controller
2	Available	Available	
1	Available	Available	
0	Available	Available	

Table 7-4: PCI #1 Primary System Devices (Minimum and Maximum Configurations)

Slots	Minimum Configuration	Maximum Configuration	Description
11	Available	Available	
10	KZPBA-CB	KZPBA-CB	PCI one-port FWD SCSI controller
9	KZPBA-CB	KZPBA-CB	PCI one-port FWD SCSI controller
8	Available	Available	
7	DE500-AA	DE500-AA	Fast Ethernet Adapter
6	DE500-AA	DE500-AA	Fast Ethernet Adapter
5	DEFPA-DB	DEFPA-DB	PCI to FDDI Adapter
4	Available	Available	
3	Available	Available	
2	Available	Available	
1	Available	KZPSA-BB	PCI one-port FWD SCSI controller
0	KZPSA-BB	KZPSA-BB	PCI one-port FWD SCSI controller

Table 7-5: PCI #0 System Secondary Devices (Minimum and Maximum Configurations)

Slots	Minimum Configuration	Maximum Configuration	Description
11	KZPAA-AA	KZPAA-AA	PCI one-port FNSE SCSI controller
10	KZPBA-CA	KZPBA-CA	PCI one-port FWSE SCSI controller
9	Available	Available	
8	Available	Available	
7	Available	Available	
6	Available	Available	
5	KZPSA-BB	KZPSA-BB	PCI one-port FWD SCSI controller
4	Available	Available	
3	KZPSA-BB	KZPSA-BB	PCI one-port FWD SCSI controller
2	Available	Available	
1	Available	Available	
0	Available	Available	

Table 7-6: PCI #1 System Secondary Devices (Minimum and Maximum Configurations)

Slots	Minimum Configuration	Maximum Configuration	Description
11	Available	Available	
10	Available	Available	
9	Available	Available	
8	Available	Available	
7	DE500-AA	DE500-AA	Fast Ethernet Adapter
6	DE500-AA	DE500-AA	Fast Ethernet Adapter
5	DEFPA-DB	DEFPA-DB	PCI to FDDI Adapter
4	Available	Available	
3	Available	Available	
2	Available	Available	
1	Available	KZPSA-BB	PCI one-port FWD SCSI controller
0	KZPSA-BB	KZPSA-BB	PCI one-port FWD SCSI controller

Storage Architecture

Figure 7-4 and Figure 7-5 describe the virtual storage architecture.

Figure 7-4: Virtual Storage Architecture – Minimum Configuration

18 4.3 GB disks
LSM mirrored

HSZ70 controller
HSZ70 controller

HSZ70 controller
HSZ70 controller

LJ-06513A.AI4
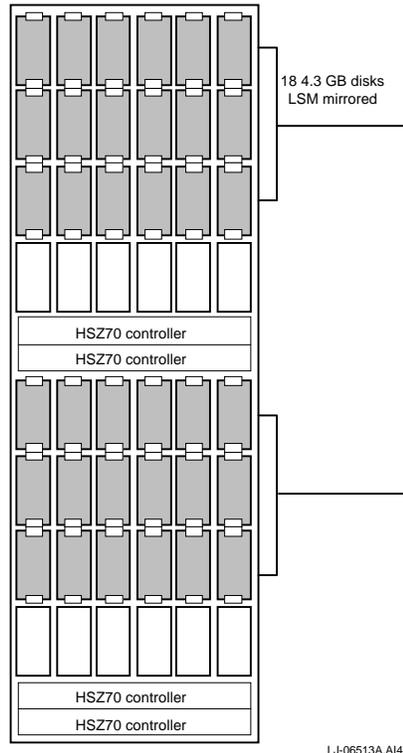
Figure 7-5: Virtual Storage Architecture – Maximum Configuration

16 4.3 GB disks
LSM mirrored

HSZ70 controller
HSZ70 controller

20 4.3 GB disks
LSM mirrored

HSZ70 controller
HSZ70 controller

HSZ70 controller
HSZ70 controller

HSZ70 controller
HSZ70 controller

LJ-06512A.AI4
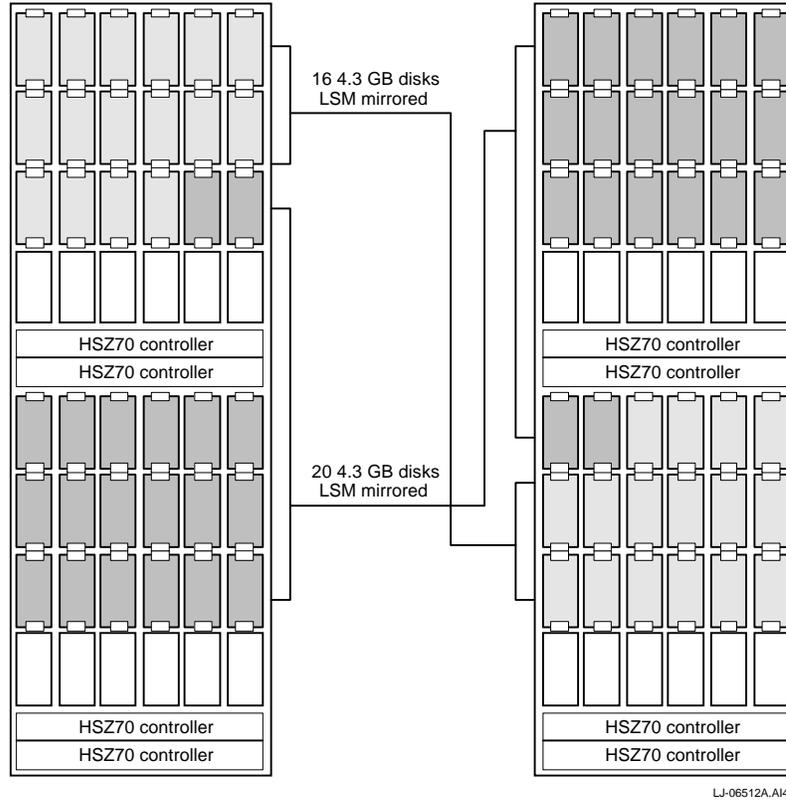
A
EBU Backup and Database Creation Scripts

This appendix provides some of the scripts used to implement the Oracle Applications Oracle TruCluster AS DIGITAL UNIX AlphaServer 8400 HiTest Suite. These scripts are provided as templates to illustrate how Oracle7 and Oracle Applications were implemented in the HiTest environment. They must be modified to reflect the location and naming of files in the specific environment in which they are to be run.

The following scripts relate to the Oracle Enterprise Backup Utility (EBU):

* `tnsnames.ora`
* `listener.ora`

The following are examples of scripts and partial scripts used to create the HiTest GLOBAL demo database:

* `initGLOBAL.ora`
* `recrctrl.sql`
* `create_gl_tablespaces.sql`
* `create_gl_table.sql`
* `create_gl_indexes.sql`
* `create_small_rbs_segments.sql`

tnsnames.ora

The `tnsnames.ora` file resides on the client and is used by the Oracle Enterprise Backup Utility. The entries for PROTOCOL, HOST, and KEY are specific to your environment and must match the entries in `listener.ora` on the AlphaServer system.

```
BKCT.world=
  (DESCRIPTION=
        (ADDRESS=
            (PROTOCOL=IPC)
            (HOST=depot1)
            (KEY=BKCT)
        )
        (CONNECT_DATA=
            (SID=BKCT)
            (GLOBAL_NAME=BKCT.world)
        )
    )
```

```
        GLOBAL.world=
          (DESCRIPTION=
                (ADDRESS=
                    (PROTOCOL=IPC)
                    (HOST=depot1)
                    (KEY=GLOBAL)
                )
                (CONNECT_DATA=
                    (SID=GLOBAL)
                    (GLOBAL_NAME=GLOBAL.world)
                )
          )
```

listener.ora

The listener.ora file resides in the /etc directory on the server and is used by the
Oracle Enterprise Backup Utility. The entries for PROTOCOL, HOST, and KEY are specific
to your environment and must match the entries in tnsnames.ora on the client systems.

```
LISTENER =

  (ADDRESS_LIST =
        (ADDRESS =
            (PROTOCOL=IPC)
            (HOST=DEPOT1)
            (KEY=BKCT)
        )
  )

  (ADDRESS_LIST =
        (ADDRESS =
            (PROTOCOL=IPC)
            (HOST=dbserv)
            (KEY=GLOBAL)
        )
  )

  (ADDRESS_LIST =
        (ADDRESS =
            (PROTOCOL=TCP)
            (HOST=dbserv)
            (KEY=1521)
        )
  )

STARTUP_WAIT_TIME_LISTENER = 0

CONNECT_TIMEOUT_LISTENER = 10

TRACE_LEVEL_LISTENER = 16

trace_directory_listener=/tmp

SID_LIST_LISTENER =
  ( SID_LIST =
    (SID_DESC =
        (SID_NAME = BKCT)
        (ORACLE_HOME = /orausr/oracle/app/oracle/product/7.3.3)
        (PROGRAM=oracle)
     )
    (SID_DESC =
        (SID_NAME = GLOBAL)
        (ORACLE_HOME = /orausr/oracle/app/oracle/product/7.3.3)
        (PROGRAM=oracle)
     )
  )
```

initGLOBAL.ora

The file initGLOBAL.ora is used to specify the instance variables that correlate to the control file in the creation of the GLOBAL demo database. Instructions at the beginning of the file describe how to modify it for your environment.

```
###############################################################
# $Header: init.ora 7.14 94/04/07 11:39:16 nsingh Osd<unix> $
# init.ora Copyr (c) 1991 Oracle
#
###############################################################
# Example INIT.ORA file
#
# This file is provided by Oracle Corporation to help you customize
# your RDBMS installation for your site.  Important system parameters
# are discussed, and example settings given.
#
# Some parameter settings are generic to any size installation.
# For parameters that require different values in different size
# installations, three scenarios have been provided: SMALL, MEDIUM
# and LARGE.  Any parameter that needs to be tuned according to
# installation size will have three settings, each one commented
# according to installation size.
#
# Use the following table to approximate the SGA size needed for the
# three scenarious provided in this file:
#
#    -------Installation/Database Size------
#         SMALL         MEDIUM        LARGE
#  Block  2K 4500K      6800K         17000K
#  Size   4K 5500K      8800K         21000K
#
# To set up a database that multiple instances will be using, place
# all instance-specific parameters in one file, and then have all
# of these files point to a master file using the IFILE command.
# This way, when you change a public
# parameter, it will automatically change on all instances.  This is
# necessary, since all instances must run with the same value for many
# parameters. For example, if you choose to use private rollback segments,
# these must be specified in different files, but since all gc_*
# parameters must be the same on all instances, they should be in one file.
#
# INSTRUCTIONS: Edit this file and the other INIT files it calls for
# your site, either by using the values provided here or by providing
# your own.  Then place an IFILE= line into each instance-specific
# INIT file that points at this file.
#####################################################################


#
#ENVIRONMENT:
#rollback_segments = (BIG_RBS1)
# rollback_segments = (rbs1, rbs2, rbs3, rbs4)
rollback_segments=(rbs1, rbs2, rbs3, rbs4, rbs5, rbs6, rbs7, rbs8, rbs9, rbs10,
   rbs11, rbs12, rbs13, rbs14, rbs15, rbs16, rbs17, rbs18, rbs19, rbs20,
```

```
   rbs21, rbs22, rbs23, rbs24, rbs25, rbs26, rbs27, rbs28, rbs29, rbs30,
   rbs31, rbs32, rbs33, rbs34, rbs35, rbs36, rbs37, rbs38, rbs39, rbs40,
   rbs41, rbs42, rbs43, rbs44, rbs45, rbs46, rbs47, rbs48, rbs49, rbs50)

#
 control_files = /oradata1/CTRL/GLOBAL_ctrl.dbf # PROD16.1
 audit_file_dest = /ora_data_log/LOG/AUD/
 background_dump_dest = /ora_data_log/LOG/DMP/
 core_dump_dest = /ora_data_log/LOG/CORE/
 log_archive_dest = /ora_data_log/LOG/ARC/
 user_dump_dest = /ora_data_log/LOG/TRC
# temporary_sort_file_dest = /oracle/tmp
# timed_statistics = true      # utlbtat/utlestat
# sql_trace = true             # trace
# audit_trail = true           # if you want auditing
 log_archive_start = true      # if you want automatic archiving

#DATABASE:
 COMPATIBLE = 7.3.3
 db_name = GLOBAL
 db_files = 70
 open_cursors = 500                   #1000
 db_file_multiblock_read_count = 32   #34
 db_block_size = 4096                 # PROD16.1
 db_block_buffers = 64000             # 3800  29472
 shared_pool_size = 104857600         #51457280    # 100MB
 log_buffer      = 5242880            # 5MB 163840, 327680
 sort_area_size  = 5242880            # 5MB
#
#
# db_writers = 2                      # as many as the # of disks
# above grnerates ORA-01041: internal error. hostdef extension doesn't exist
# db_block_write_batch = 10           # twice db_writers
  db_file_multiblock_read_count =20

  log_simultaneous_copies = 12       # 3X the # of CPU
  log_small_entry_max_size = 400     # was 800: reduce redo latch contention
  sessions = 3072
  processes = 3072
  transactions = 3072
  spin_count = 128
  async_write = 1

# mts_dispatchers = 4
# mts_max_dispatchers =
# mts_max_servers =
# mts_servers =

 shared_pool_reserved_size=10000000
 shared_pool_reserved_min_alloc=10000
 log_checkpoint_interval = 100000000
 dml_locks = 3072

 sequence_cache_entries = 500         #100
```

```
 sequence_cache_hash_buckets = 500    #89
 max_dump_file_size = 10240
 max_rollback_segments = 100
 enqueue_resources = 75000            #15000
 row_locking = always
optimizer_mode = rule

event="10076 trace name context forever, level 1"

# AD requires this date format
nls_date_format = DD-MON-YY
nls_numeric_characters = ".,"

# This is the LAST line of initGLOBAL.ora
```

recrctrl.ora

The `recrctrl.ora` file creates the control file, which specifies the location and tablespace size for the GLOBAL demo database. Entries in this file must correlate to the directories created when the GLOBAL demo database is installed. See the section GLOBAL Demo Database Installation in Chapter 4.

The following example is the `recrctrl.ora` file used in the HiTest environment.

```
set echo on;

spool crdb.log

connect internal;

startup nomount;

create controlfile reuse
set database GLOBAL
logfile  '/ora_data_log/LOG/log1.dbf' size 10M,
 '/ora_data_log/LOG/log2.dbf' size 10M,
       '/ora_data_log/LOG/log3.dbf' size 10M resetlogs
datafile '/oradata1/SYS/system1.dbf' size 300M,
        '/oradata1/SYS/system2.dbf' size 200M,
        '/oradata1/SYS/system3.dbf' size 75M,
        '/oradata1/SYS/system4.dbf' size 100M,
        '/oradata1/TMP/temp.dbf' size 100M,
        '/oradata1/USR/data1.dbf'  size 300M,
        '/oradata1/USR/data2.dbf'  size 200M,
        '/oradata1/USR/data3.dbf'  size 100M,
        '/oradata1/USR/data4.dbf'  size 100M,
        '/oradata1/USR/data5.dbf'  size 75M,
        '/oradata1/IDX/index1.dbf'  size 200M,
        '/oradata1/IDX/index2.dbf'  size 100M,
        '/oradata1/IDX/index3.dbf'  size 100M,
        '/oradata1/IDX/index4.dbf'  size 50M,
        '/oradata1/IDX/index5.dbf'  size 75M,
        '/oradata1/OFF/office.dbf' size 50M,
        '/ora_data_rbs/RBS/rbs.dbf'     size 100M ;

     ALTER DATABASE OPEN RESETLOGS;

     exit;
```

create_gl_tablespaces.sql

The following script is a partial example of the `create_gl_tablespaces.sql` script used to create the general ledger tablespaces: headers, batches and lines. Note that this script was not tuned for maximum efficiency.

The example shows the syntax used to specify the location and size of the data header and index header tablespaces.

Ellipsis indicate where each sequence is repeated to provide the location and size of the data batch and data lines tablespaces and the index batch and index lines tablespaces. Only one entry is needed to create tablespace for the rollback segments.

```
connect internal;

create tablespace GL_DATA
        datafile '/ora_data_hdr/GLDATA/gl_data_hdr.dbf' size 5000M
        default storage(initial 10M next 10M minextents 1 maxextents 121)
        online;
            .
            .
            .
create tablespace GL_INDEX
        datafile '/ora_idx_hdr/GLIDX/gl_index_hdr.dbf'  SIZE 5000M
        default storage(initial 10M next 10M minextents 1 maxextents 121)
        online;
            .
            .
            .

create tablespace RBS2
        datafile '/ora_data_rbs/GLRBS/rbs2.dbf' size 5000M
        default storage(initial 10M next 10M minextents 1 maxextents 121)
        online;
```

create_gl_table.sql

The following script is a partial example of the HiTest script used to create general ledger tables for the GLOBAL demo database.

The example shows the syntax for the creation of tables in the data batch tablespace.

Ellipsis represent similar specifications for the creation of tables in the data header and data lines tablespaces.

```
CREATE TABLE "GLDEMO"."GL_JE_BATCHES" (
"JE_BATCH_ID"                   NUMBER(15, 0) NOT NULL,
"LAST_UPDATE_DATE"              DATE NOT NULL,
"LAST_UPDATED_BY"               NUMBER(15, 0) NOT NULL,
"SET_OF_BOOKS_ID"               NUMBER(15, 0) NOT NULL,
"NAME"                          VARCHAR2(100) NOT NULL,
"STATUS"                        VARCHAR2(1) NOT NULL,
"STATUS_VERIFIED"               VARCHAR2(1) NOT NULL,
"ACTUAL_FLAG"                   VARCHAR2(1) NOT NULL,
"DEFAULT_EFFECTIVE_DATE"        DATE NOT NULL,
"BUDGETARY_CONTROL_STATUS"      VARCHAR2(1) NOT NULL,
"CREATION_DATE"                 DATE,
```

```
            "CREATED_BY"                    NUMBER(15, 0),
            "LAST_UPDATE_LOGIN"             NUMBER(15, 0),
            "STATUS_RESET_FLAG"             VARCHAR2(1),
            "DEFAULT_PERIOD_NAME"           VARCHAR2(15),
            "UNIQUE_DATE"                   VARCHAR2(30),
            "EARLIEST_POSTABLE_DATE"        DATE,
            "POSTED_DATE"                   DATE,
            "DATE_CREATED"                  DATE,
            "DESCRIPTION"                   VARCHAR2(240),
            "CONTROL_TOTAL"                 NUMBER,
            "RUNNING_TOTAL_DR"              NUMBER,
            "RUNNING_TOTAL_CR"              NUMBER,
            "RUNNING_TOTAL_ACCOUNTED_DR"    NUMBER,
            "RUNNING_TOTAL_ACCOUNTED_CR"    NUMBER,
            "ATTRIBUTE1"                    VARCHAR2(150),
            "ATTRIBUTE2"                    VARCHAR2(150),
            "ATTRIBUTE3"                    VARCHAR2(150),
            "ATTRIBUTE4"                    VARCHAR2(150),
            "ATTRIBUTE5"                    VARCHAR2(150),
            "ATTRIBUTE6"                    VARCHAR2(150),
            "ATTRIBUTE7"                    VARCHAR2(150),
            "ATTRIBUTE8"                    VARCHAR2(150),
            "ATTRIBUTE9"                    VARCHAR2(150),
            "ATTRIBUTE10"                   VARCHAR2(150),
            "CONTEXT"                       VARCHAR2(150),
            "PACKET_ID"                     NUMBER(15, 0),
            "USSGL_TRANSACTION_CODE"        VARCHAR2(30),
            "CONTEXT2"                      VARCHAR2(150),
            "POSTING_RUN_ID"                NUMBER(15, 0),
            "REQUEST_ID"                    NUMBER(15, 0),
            "UNRESERVATION_PACKET_ID"       NUMBER(15, 0),
            "AVERAGE_JOURNAL_FLAG"          VARCHAR2(1) NOT NULL,
            "ORG_ID" NUMBER(15, 0))
            PCTFREE 10 PCTUSED 40 INITRANS 1 MAXTRANS 255
            STORAGE(INITIAL 16M NEXT 16M MINEXTENTS 1 MAXEXTENTS 80
            PCTINCREASE 0 FREELISTS 1 FREELIST GROUPS 1)
            TABLESPACE "GL_DATA_BTCH" ;

            CREATE TABLE "GLDEMO"."GL_JE_HEADERS" (
                            .
                            .
                            .
            TABLESPACE "GL_DATA_HDR" ;

            CREATE TABLE "GLDEMO"."GL_JE_LINES" (
                            .
                            .
                            .
            TABLESPACE "GL_DATA_LNS" ;
            exit;
```

create_gl_indexes.sql

The following script provides a partial example of the script used to create indexes for the general ledger tables used by the HiTest GLOBAL demo database.

The example shows the syntax for the creation of a single index for each type of table:

- batches

- headers

- lines

Ellipsis represent similar specifications for additional indexes for each table type.

```
CONNECT GLDEMO/GL;

CREATE INDEX "GLDEMO"."GL_JE_BATCHES_N1" ON "GL_JE_BATCHES" ("STATUS" )
PCTFREE 0 INITRANS 2 MAXTRANS 255
STORAGE (INITIAL 2621440 NEXT 2621440 MINEXTENTS 1 MAXEXTENTS 120
PCTINCREASE 0 FREELISTS 1)
TABLESPACE "GL_INDEX" ;
                    .
                    .
                    .
CREATE INDEX "GLDEMO"."GL_JE_HEADERS_N1" ON "GL_JE_HEADERS"
("JE_BATCH_ID" ) PCTFREE 0 INITRANS 2 MAXTRANS 255
STORAGE (INITIAL 2150400 NEXT 2150400 MINEXTENTS 1 MAXEXTENTS 120
PCTINCREASE 0 FREELISTS 1)
TABLESPACE "GL_INDEX" ;
                    .
                    .
                    .
CREATE INDEX "GLDEMO"."GL_JE_LINES_PA1" ON "GL_JE_LINES" ("REFERENCE_1" )
PCTFREE 10 INITRANS 2 MAXTRANS 255
STORAGE (INITIAL 10752000 NEXT 10752000 MINEXTENTS 1 MAXEXTENTS 120
PCTINCREASE 0 FREELISTS 1)
TABLESPACE "GL_INDEX" ;
                    .
                    .
                    .
```

create_small_rbs_segments.sql

The following script is a partial example of the HiTest script used to create rollback segments for the GLOBAL demo database. The first and last instances are shown. Ellipsis indicate additional instances.

```
create rollback segment rbs5 tablespace RBS2
    storage (initial 1M next 1M minextents 2 maxextents 100 optimal 2M);
                .
                .
                .
create rollback segment rbs50 tablespace RBS2
    storage (initial 1M next 1M minextents 2 maxextents 100 optimal 2M);
```