Accenture Report
mySAP Utilities on NetApp® filers – Benchmark Whitepaper

Document Purpose

This document contains a summary of the mySAP Utilities on NetApp filers benchmark project conducted by Accenture. Additional details regarding this project are available.

Executive Summary:
mySAP Utilities on NetApp filers

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1   Executive Summary

Accenture is the world's leading management consulting and technology services organization. As a founding member of the mySAP.com Partner Network, Accenture has worked directly with SAP to develop and enhance mySAP.com solutions. Accenture has received the SAP Award of Excellence on numerous occasions and has helped implement more than 1,000 SAP software solutions.

Accenture was engaged by Network Appliance (NetApp) to provide an independent assessment of their network storage system (filers) as a storage platform for SAP from a performance, risk, and operational standpoint. To work towards this objective, Accenture worked with Network Appliance, Hewlett-Packard, and SAP to create a testing environment located at Accenture's utilities solution center in St. Petersburg, Florida. The application chosen was SAP's mySAP Utilities Customer Care and Service (IS-U/CCS) system.

The results of these tests have demonstrated that the testing environment, which included the NetApp filers, has provided comparable performance to other IS-U production environments, which utilized direct-attached or other storage area network technologies. In addition, the filers demonstrated a high level of administration and management capabilities.

Filer Performance

The tests focused primarily on the customer billing processes within the mySAP Utilities application. The test objective was to demonstrate that the test environment was capable of supporting a nightly batch-billing run typically seen by a utility company with 3 million customers. This equates to approximately 120,000 accounts to process per night (assuming 25 days for nightly billing per month).

Accenture demonstrated that this environment was capable of a completing the entire batch process in just over 4 hours. (Note that these results are based on the configuration and extensive tuning efforts done within the benchmark testing environment and may not be reproducible or representative of results that others may achieve).

- **Filer Throughput** - Disk utilization input and output (I/O) is the writing and reading of data to and from the Oracle data and logging volumes. During the execution of the Billing batch process, sustained rates of I/O were observed between 20 and 35 MB/sec.
- **CPU Utilization –** Both the application and database servers were tuned such that they were averaging over 80% CPU utilization during test execution. The CPUs for the two NetApp filers averaged lower than 10% utilization.
- **Transactions per Minute** - The key metric derived during batch processing was Transactions per Minute (TPM). This is calculated as the total amount of orders or billed accounts (volume) divided by the elapsed time (duration). A TPM of 4,600 bills/minute was observed during the execution of the Billing batch process.

Operational Results

In addition to the batch performance characteristics, the operational aspects of the NetApp filers were also studied. Table 1 provides some of the durations that were observed during typical operational activities.

It should be noted that the SAP system continued to function properly during the Clustered Failover and giveback tests. Also, the unplanned outage and recovery test involved the restoration of the Oracle data files only. Actual recovery times may vary due to the amount of Oracle redo log activity.

Operational Tests	
Installation	
Physical and Network Connectivity	3.0 hrs
Filer Configuration and Setup	3.0 hrs
Operating System Upgrade	.5 hrs
Cluster Setup	1.0 hrs
Volume Setup	.5 hrs
Total	**8.0 hrs**
Operational Processes	
Unplanned Outage & Recovery	2.0 min
Dynamic Volume Growth	.1 min
Clustered Failover	1.0 min
Cluster Giveback	3.0 min

Table 1 - Operational Test Results

Testing Environment

The benchmark technical environment consisted of two clustered NetApp filers that collectively totaled four terabytes of network storage. The application and database servers consisted of two 8-way partitions within a Hewlett-Packard RP8400 midrange server. Oracle was distributed across both filers by having the Oracle data files on one filer, and the Oracle logs on the other. Figure 1 provides an illustration of the overall testing environment.
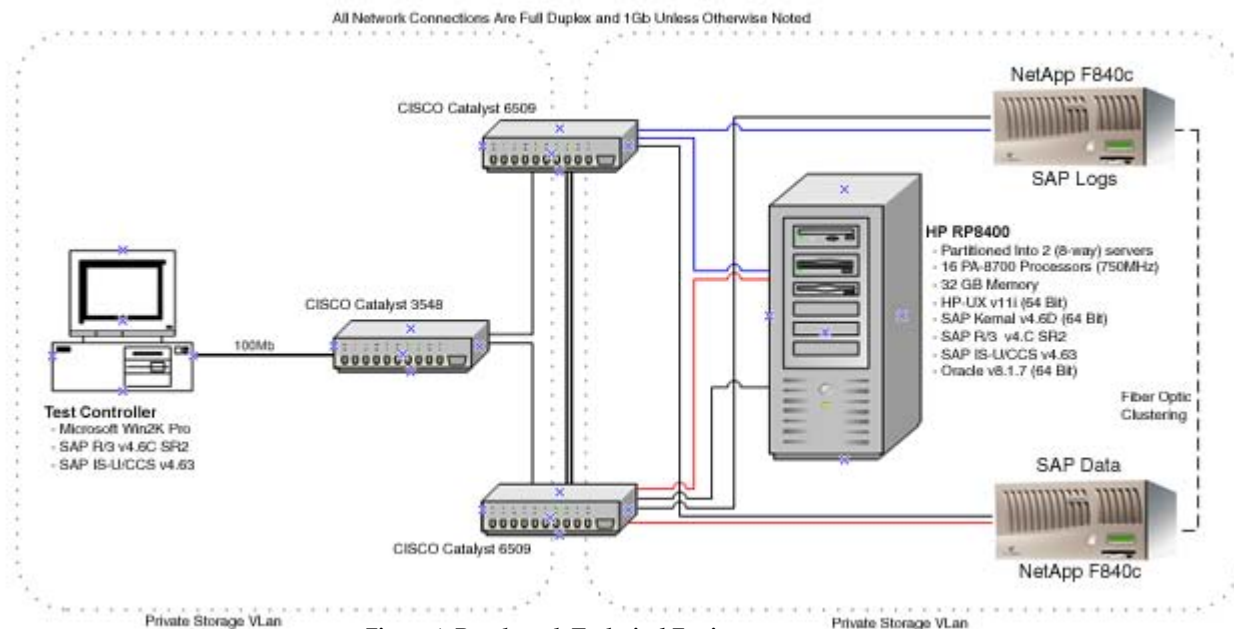

Figure 1: Benchmark Technical Environment

"These performance results revealed that organizations should be able to deploy their SAP systems on Network Appliance filers to seek the advantages of the simplicity and TCO savings of network-attached storage."

Dale Wickizer, Accenture Associate Partner, Resources

2   Benchmark Overview

2.1 Benchmark Objectives

The first objective of the benchmark project was to determine whether the Network Appliance™ network-attached storage (NAS) system could support the I/O requirements of a mySAP Utilities batch-billing run for a 3-million-customer organization. To accomplish this, Accenture utilized the mySAP Utilities v4.63 Benchmark provided by SAP.   The overall throughput and the I/O characteristics were measured during the execution of this benchmark. These results were then compared against prior executions of the benchmark as well as other live production mySAP Utilities implementations.

The second objective was to research the total cost of ownership characteristics of a NetApp network storage system. To achieve this objective, the benchmark-testing environment was configured so that the SAP R/3 and mySAP Utilities applications, and their underlying database, were installed on the NetApp filer system. The NetApp filer administration console and web-interfaces were then used to perform volume administration and management activities. Metrics were also gathered during these activities to validate the performance characteristics of the NetApp filer system during operational activities.

2.1   Who Should Read This Document

The intended audiences for this document are technical executives from organizations that fall into one of the following groups;

- Organizations that are planning on implementing SAP and need to understand their network storage & DAS options.

- Organizations that are planning on implementing SAP and are investigating performance-tuning opportunities within the system.

- Organizations that have implemented (or are currently implementing) SAP and are investigating a migration to network storage.

3   mySAP Utilities

3.1 General Overview

mySAP Utilities is a collection of automated processes and tools designed specifically for the utility industry that is tightly integrated with the mySAP.com cross-industry solutions. The mySAP Utilities component is used for managing and billing residential, nonresidential, and prospective customers. It also manages and bills customers who receive services, purchase goods, or pay fees and taxes.

mySAP Utilities is bundled with the Plant Maintenance (PM), Customer Service (CS) and Sales and Distribution (SD) application components, enabling the billing of service orders, service contracts, and the sale of goods. The Contract Accounts Receivable and Payable (FI-CA) component manages the large number of postings from billing and budget billing requests.   mySAP Utilities uses the SAP Business Workflow (BC-BMIT-WFM) application component to automate business processes.   Common workflows include initial creation of a service connection and the disconnection of devices.

3.1 Benchmark Details

The mySAP Utilities Benchmark simulates typical processes in a utilities company.   The core business processes can be divided into two main processes: consumption and revenue collection.   Three batch jobs are utilized for collecting information for the consumption process. First, meter reading orders have to be created and printed, and then the results have to be uploaded into the system.   To collect revenues, additional batch jobs produce load on the system, for example, billing the customer, creating invoices, and printing the bill. Overall, the jobs that comprise the benchmark are:

- **Create Meter Reading Orders:** This batch module is used to create a meter reading order for each meter to be billed.

- **Download Meter Reading Orders:** This batch module provides a means of downloading meter reading orders in either raw data format for use in a meter reading device or to a print spool.

- **Upload Meter Reading Orders:**   This batch module is used to upload meter readings (consumption) from an external meter reading device.

- **Billing:** The actual contract billing is performed with this batch module. Contracts are billed automatically. This job results in the creation of billing documents, which are used during the invoicing process.

- **Invoicing:** This batch module is responsible for generating documents from contract accounts receivable and payable for bill receivables or credit memos. The outputs from this component are invoices sent to a print spool or files

- **Bill Printout:** This batch module takes the generated invoicing data, applies a bill template, and outputs the results to a print spool.

4   Technical Environment

4.1 Overview

The benchmark environment consisted of two clustered NetApp filers that totaled four terabytes of clustered network storage. The application and database servers consisted of two 8-way partitions within a Hewlett Packard RP8400 midrange server. Oracle was distributed across both NetApp filers by having the data files on one, and the log files on the other. The SAP and Oracle binaries were also contained on the filers. Figure 2 provides an illustration of the overall testing environment.
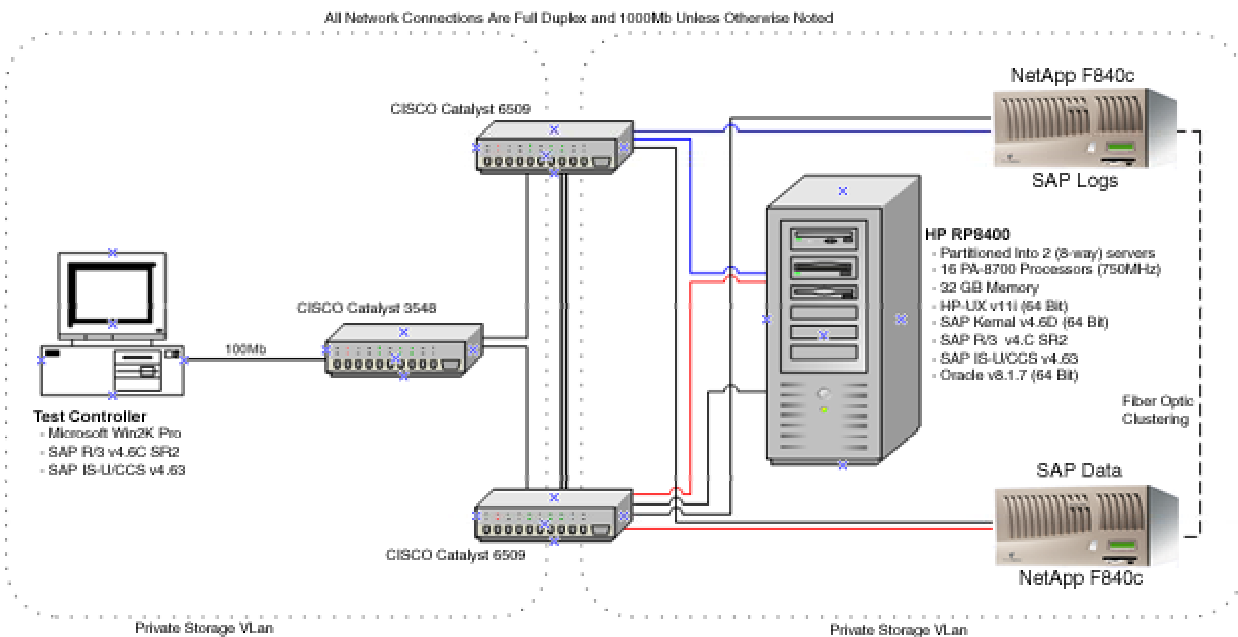

Figure 1 - Testing Environment Blueprint

4.2 Details

The testing environment was comprised primarily of an HP PR8400 midrange server and two NetApp filer storage units. The RP8400 was partitioned with one half acting as an application server and the other acting as both a database and application server. Table 2 provides the technical details for each of the components within the test environment.

Technical Configuration	
Application Server	
Processors	8x750MHz PA8700 processors
Memory	16 GB
Operating System	HP-UX v11i (64 Bit)
Network Cards	(1) HP A4929A PCI 1000Base-T Adapter
SAP	SAP R/3 4.6C (4.6D Kernel) ISU 4.63
Database Server	
Processors	8x750MHz PA8700 processors
Memory	16 GB
Operating System	HP-UX v11i (64 Bit)
RDBMS	Oracle v8.1.7 (64 Bit)
Database Size	180 GB (1 Million Business Partners)
Network Cards	(3) HP A4929A PCI 1000Base-T Adapter
SAP	SAP R/3 4.6C (4.6D Kernel) ISU 4.63b
NetApp Filer 1	
Model	F480c
Operating System	Data ONTAP™ Release 6.1.2R3
Disks	(56) 36GB Drives = 3.8 Terabytes
Volume Configuration	8 Disks = 288GB
Network Cards	(2) Gigabit Ethernet Controller III
NetApp Filer 2	
Model	F480c
Operating System	Data ONTAP Release 6.1.2R3
Disks	(56) 36GB Drives = 3.8 Terabytes
Volume Configuration	10 Disks = 360GB
Network Cards	(2) Gigabit Ethernet Controller III

Table 2 - Testing Environment Details

5   Performance Benchmark

5.1   Overview

The primary objective of the benchmark effort was to validate that the NetApp filers were capable of supporting a nightly batch-billing run typically seen by a utility company with 3 million customers. Assuming that there are 25 days available for nightly billing (conservative), then the total volume of accounts to process per night equates to 120,000. Test cycles were done at this volume or higher through all six batch jobs. Specific metrics were gathered during each of the batch jobs with the emphasis placed on Disk I/O. Memory and CPU utilization of the application and database servers were also observed, but mainly to ensure that the servers were being utilized to their full capability. Overall network I/O was also observed.

5.2   Results

The metric observed during batch processing was Transactions per Minute (TPM), which is calculated as the total amount of orders or billed accounts (volume) divided by the elapsed time (duration). The volume used during the final test cycle was one million orders/bills. Figure 3 provides a comparison of the final TPM values achieved within the benchmark environment against two in-production mySAP Utilities implementations. The results show that the testing environment was capable of providing the performance necessary to meet the benchmark objectives.

These results showed that the benchmark environment was capable of processing 200,000 bills in just under seven hours.
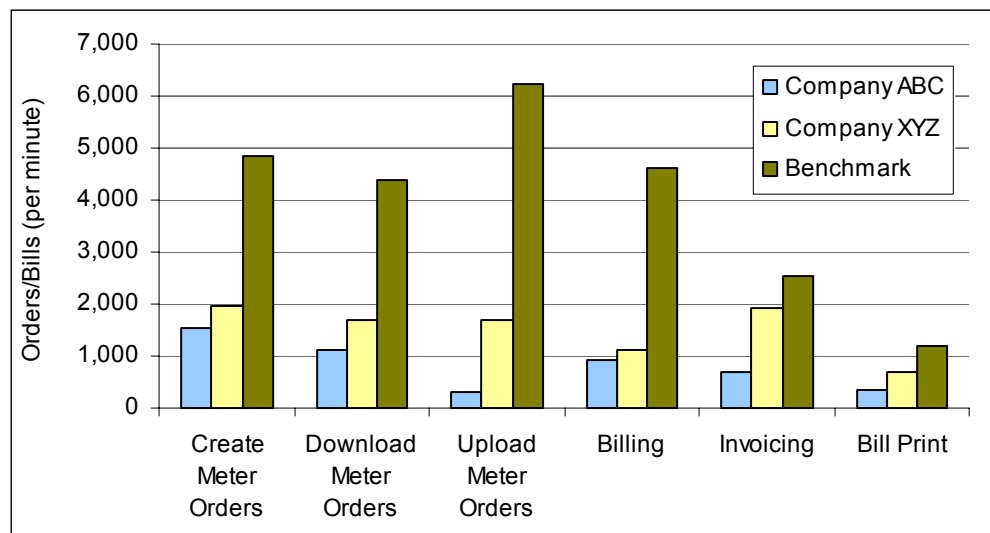

Figure 2 - Benchmark vs. Production Throughput Comparison

The remainder of this section provides details regarding the Disk Input/Output of the NetApp filers, CPU Utilization for the NetApp filers and the application and database servers, and the memory utilization of the application and database server.

5.2.1   Disk I/O (MB/sec)

In this testing environment, disk utilization input and output (I/O) can be best described as the writing (input) and reading (output) to and from the Oracle data and logging disk volumes. The metric used to describe I/O rates is megabytes per second or MB/sec.

The observed disk I/O to and from the two filers varied among the six batch jobs. Some of the jobs were more transactional in nature, which resulted in higher rates of disk writes to the Oracle data and logging files. Other jobs performed extensive reads from the database while writing to local files (or spools). Logging file reads generated the lowest output activity with averages less than .1 MB/sec. Writing to the Oracle logs and data files generated the highest input activity averaging 3 MB/sec across all six batch jobs. Billing and Invoicing saw the highest input activity with sustainted periods of activity over 40 MB/sec.

Results: During the test cycles, the filers operated at well below their performance capabilities (the filer CPU was operating at 8% utilization and a peak throughput value of 10 MB/sec) and were not considered to be performance bottlenecks during benchmark execution.

5.2.2   CPU Utilization (%)

CPU utilization, which is measured as the percent amount utilized against the total available processing power of the server and the NetApp filers. The goal of the project team was to configure the test cycles, both functionally and technically, to maximize the processing capability of the application and database servers, both of which resided on the HP RP8400 midrange server. Over the six jobs, CPU utilization on the database server averaged over 80% with peaks of 100%.

The observed CPU utilization of the two NetApp filers was very low, with averages across all six jobs below 10% with occasional peaks over 80%. The Oracle data filer saw the highest utilization with an average of 21% during Invoicing.

Results: The CPU processing power of the database server was considered the performance-limiting factor during the benchmark.

5.2.3   Memory Utilization (%)

Memory utilization of the application and database servers was observed and recorded during the mySAP Utilities batch jobs. The highest levels of memory utilization were observed on the database server (80% utilization) due to the amount of memory reserved by the Oracle instance (approximately 13GB) and the number of concurrent batch jobs (15-20) running on the server. The application server averaged 40% memory utilization.

Results: The Server memory utilization was not considered a performance limiting factor during the benchmark.

5.2.4 Network I/O (MB/sec)

In this testing environment, network input and output (I/O) can be best described as the writing (input) and reading (output) to and from the two NetApp filers. The metric used to describe I/O rates is megabytes per second or MB/sec.

This metric relevant as it is the network that provides connectivity between the database server and the storage devices (i.e., the NetApp filers). The connectivity between the filers and the database server was configured as a gigabit network. Overall network utilization was generally observed to be low (less than 2%).

Logging file reads generated the lowest output activity, with averages less than .1MB/sec. Writing to the Oracle data filer generated the highest network activity averaging 3MB/sec across all six batch jobs with peaks over 42MB/sec.

Results: The observed loads demonstrated that the network was not a performance bottleneck during the benchmark.

6   Operational Benchmark

6.1   Overview

These tests are not necessarily a race against time or throughput. The goal was to record the time, complexity, and skills needed to perform typical operational tasks. Also documented is the type of skill required to perform specific tasks. For example, a test was done to determine how long it took to expand a storage area and whether a traditional system administrator could perform this task or if it required a specialist from the hardware vendor.   The following is a list of operational tasks that was included in this test:

- **Physical and Network Connectivity** – Unpack the NetApp filers and provide necessary cabling.
- **Filer Configuration and Setup** – Basic configuration of the two filers (hostname, etc.).
- **Operating System Upgrade** – Apply NetApp operating system patches/upgrades.
- **Cluster Setup** – Configure the two filers to function in a clustered configuration.
- **Volume Setup** – Configure for Oracle data and logging volumes.
- **Unplanned Outage & Recovery** – Restore the system after an Oracle data corruption.
- **Dynamic Volume Growth** – Add a new disk to an existing volume.
- **Clustered Failover** – A filer within the cluster goes down and the other filer takes over control.
- **Cluster Giveback** – A failed filer is fixed and brought back into the cluster.

6.2   Results

Table 3 provides a summary of the times recorded during each of the operational tests. A summary of each test and the activities performed are provided below.

Operational Tests	
Installation	
Physical and Network Connectivity	3.0 hrs
Filer Configuration and Setup	3.0 hrs
Operating System Upgrade	.5 hrs
Cluster Setup	1.0 hrs
Volume Setup	.5 hrs
Total	**8.0 hrs**
Operational Processes	
Unplanned Outage & Recovery	2.0 min
Dynamic Volume Growth	.1 min
Clustered Failover	1.0 min
Cluster Giveback	3.0 min

Table 3: Operational Test Results

6.2.1   Physical and Network Connectivity

This test involved installing the filers within the data center and connecting them to the Gigabit network. The total time for this activity was approximately 3 hours, which included actual unpacking of the filers from their shipping containers, moving them into the data center, connecting the UPSs to the data center power system, and getting them connected to the Cisco switches (Fiber-Gigabit). Two data center personnel performed this activity– the UNIX/Storage Administrator and Network Administrator.

6.2.2   Filer Configuration and Setup

This activity involved configuring the filers for networking and administration function. Tasks included setting the filer hostnames, configuring DNS, creating administrative ids and passwords, and adding auto-email support. Total time for this activity was just under 3 hours with the majority of work being performed by on-site Network Appliance technical support. The Network Administrator was required to provide static IP addresses and other related network information.

6.2.3   Operating System Upgrade

This activity, which was performed by onsite Network Appliance support, took approximately a half hour and involved applying patches to the filer operating system.

6.2.4   Cluster Setup

This activity involved setting up the two filers into a clustered configuration. The total time for this activity was one hour and was performed by onsite Network Appliance support personnel. This task involved fiber cabling and operating system configuration. Upon completion, a failover and giveback test was performed to ensure the cluster was functioning correctly.

6.2.5   Volume Setup

This activity involved the creation of two volumes (one on each filer) for Oracle use. The first volume was created on filer 1 to hold Oracle log files and the Oracle binaries and was configured for 288Gb across 6 disks. The second volume was created on filer 2 to hold the Oracle data files and was configured for 360Gb across 10 disks. This activity took approximately thirty minutes and was performed by Accenture personnel assigned to the project team using the web browser administration utility provided by the NetApp filers. It should be noted that the first volume took the majority of this time as the team member had no prior experience working with the NetApp administration utilities.

6.2.6   Unplanned Outage & Recovery

This test was performed to determine the length of time required to restore the SAP system after a database failure. The results of this test showed that it took just under two minutes to restore the Oracle data files. Below is a detailed list of the steps taken during this test that were performed by Accenture project team personnel.

1. The Create Meter Read Orders batch job was executed.
2. A Snapshot™ was taken of the Oracle data files, which took approximately 2 seconds to complete.
3. The Download Meter Reading Orders batch job was executed.
4. The database was discovered to be 'corrupted.'
5. SAP and Oracle were taken offline.
6. The Oracle data files were restored from the Snapshot created in step 2, which took approximately two minutes to complete.
7. The Database Administrator performed a database recovery.
8. Oracle and SAP were brought back online.

The total time taken to restore the SAP application after being taken offline was approximately 10 minutes.

6.2.7   Dynamic Volume Growth

This test involved increasing the volume by adding another filer disk to an already existing volume. The project executed this test on two occasions, one in which the new disk was already formatted, and another in which the disk needed to be formatted prior to adding to the volume. In the case where the disk was preformatted, this test was

completed in seconds. On the second test it took roughly 40 minutes with the majority of time spent formatting the disk. Accenture project team personnel conducted these tests.

6.2.8   Clustered Failover

This test simulated one of the filers within a filer cluster failing due to a power loss. To conduct the test the power cord was removed from the filer head on one of the filers in the two-node cluster. The unit subsequently went down. After approximately one minute the other filer in the cluster took over responsibility for the downed filer. Users of the system experienced a slight delay in their running dialogs but otherwise no transactions were lost or disrupted. This test was performed by Accenture project team personnel and required no administrative intervention.

6.2.9   NetApp AutoSupport

It is worth noting that during the execution of this test, a representative from the Network Appliance help desk contacted the project team leader to ensure that we were aware that one of the filers at our data center had recently gone down. This call came after approximately 25 minutes.

6.2.10   Cluster Giveback

This test represented the case where a filer would be taken offline by an unplanned outage and was reintroduced into the filer cluster. To mimic the effect of an unplanned outage the filer was manually powered down using the 'Power Off' switch at the back of the filer and powered back up after a short delay. After approximately three minutes, the filer regained control of its assigned volumes and continued to function properly. No operational disturbances were observed. This test was performed by Accenture project team personnel and required no administrative intervention.

7   Appendix A – Tuning Activities

Several tuning adjustments were made within the testing environment to increase the application performance. Following is a list of activities and settings made during the testing effort to increase the system's efficiency and throughput capability:

- **Oracle Initialization File:** The initB03.ora file was modified to maximize memory usage and reduce the number of trips to disk for data. The most important parameters in this area are:

Parameter	Value
DB_BLOCK_BUFFERS	1638400
DB_BLOCK_SIZE	8192
SHARED_POOL_SIZE	536870912
SORT_AREA_SIZE	10485760
LOG_BUFFER	10485760

Table 4 - Oracle Initialization Settings

- **Oracle Database Structure:** Additional rollback segments were created to improve performance on jobs executing a high number of inserts and updates. Also, additional freelists were added to the following tables to reduce contention on inserts:

Table Name	# Freelists
BALDAT	5
BALHDR	5
DBERCHR	23
DBERCHV	17
DBERCHZ1	7
DBERCHZ2	11
DBERCHZ3	7
DBERDL	10
DBERDLB	10
DFKKKO	10
DFKKOP	5
DFKKOPK	5
EABL	3
EABLG	7
EITERDK	17
EITR	25
ERCH	3
ERCHC	10
ERDB	11
ERDK	10
ETRG	17
TST01	23
TST03	23

Table 5: Oracle Database Structure

- **NetApp Filer Volumes:** The data and log files volumes were distributed between the 2 filers to reduce network contention for data requests. Also, the volumes were created with several disks to allow for better striping.
- **HP-UX Kernel:** The HP-UX Kernel was modified according to SAP and Network Appliance suggested values.

- **SAP Instance Profile:** Each instance profile (application and database server) was tuned to conserve memory and the right number of background processes was configured to optimized performance.

8 Appendix B – Configuration Files

HP-UX Kernel Parameters

The following section provides the final HP-UX kernel configuration settings for both the application and database servers.

```
 * Tunable parameters

STRMSGSZ               65535
dbc_max_pct     4
dbc_min_pct     2
default_disk_ir 1
dnlc_hash_locks        512
maxdsiz         990056448
maxdsiz_64bit   4294967296
maxfiles               1024
maxfiles_lim    2048
maxssiz         0X800000
maxssiz_64bit   0X800000
maxswapchunks          8192
maxtsiz                0X4000000
maxtsiz_64bit   4294967296
maxuprc         400
maxusers        128
msgmnb          65535
msgseg          32767
msgssz          32
msgtql                 2046
nbuf                   50000
nfile                  8192
nflocks                800
ninode                 8192
nproc                  (10*MAXUSERS)
nstrpty                60
semmni          520
semmns          1024
semmnu          256
semume          100
shmmax          17179869184
shmmni          256
shmseg          200
```

Oracle Configuration

This following section contains the Oracle database configuration file from the last test cycle.

```
###########################################################
# PART I, TUNING PARAMETERS                 #
###########################################################

disk_asynch_io = false
db_writer_processes = 10
db_block_lru_latches = 16
hash_join_enabled = false
query_rewrite_enabled = false
replication_dependency_tracking = false
timed_statistics = true
transaction_auditing = false
db_file_multiblock_read_count = 32
session_cached_cursors=300
_log_io_size = 100
cursor_space_for_time = true
db_block_max_dirty_target=0
_db_block_hash_buckets = 1000000

#### SYSTEM GLOBAL AREA BUFFERS
# Total System Global Area = sum(bytes) of all caches
# Variable Size = shared_pool_size (approx.)
# Database Buffers = db_block_buffers * db_block_size
# Redo Buffers = log_buffer
#
# unit of shared_pool_size: bytes
# unit of db_block_buffers: number of cached blocks
# unit of log_buffer: bytes
####
log_buffer = 10485760
shared_pool_size = 536870912
shared_pool_reserved_size = 53687091
db_block_buffers = 1638400

#### MANAGING SORTS
# A small sort requires sort_area_retained_size in
# memory. Larger sorts are allocating segments in
# PSAPTEMP. They are using sort_area_size in memory.
####
sort_area_retained_size = 0
sort_area_size = 10485760

#### PGA-PARAMETERS

open_cursors = 800
cursor_space_for_time =  false

#### LOCKS
# dml_locks = processes * 50
####
dml_locks = 6000
enqueue_resources = 8000

#### ONLINE ROLLBACK SEGMENTS

transactions_per_rollback_segment = 10

#### CONTROL-FILES
# the controlfiles should be mirrored to every new
# database mount point /oracle/B03/sapdata<#>
####
control_files = ( /oracle/B03/origlogA/cntrl/cntrlB03.dbf,/oracle/B03/saparch/cntrl/cntrlB03.dbf )

#### AUTOMATICLY STARTED BACKGROUND PROCESSES

log_archive_start  = false


#### MANAGING LOG SWITCHES
# checkpoints occur only when switching logs, if
# log_checkpoint_interval * size of OS blocks > size of
# the actual redo log

log_checkpoint_interval = 9999999999
log_checkpoint_timeout = 3600
log_checkpoints_to_alert = true
```

```
#### PROCESS-PARAMETERS
# The number of allocated semaphores is equal to the


# number of processes
# sessions = 1.2 * processes

sessions  = 600
processes = 125


###########################################################
# PART III, STATIC PARAMETERS              #
###########################################################

db_name = B03

db_block_size = 8192

db_files = 254

compatible = 8.1.7

#### OPTIMIZER MODE

optimizer_mode = choose
optimizer_index_cost_adj = 10

#### PATHS / DESTINATIONS / TRACES
# /oracle/B03/saptrace/background: trace files of the background
# processes
# /oracle/B03/saptrace/usertrace:  trace files of the user processes
# log_archive_dest is a destination, not a path.
# The archivefiles get the name
# /oracle/B03/saparch/B03arch<thread#>_<log#>

background_dump_dest = /oracle/B03/saptrace/background
user_dump_dest      = /oracle/B03/saptrace/usertrace
core_dump_dest      = /oracle/B03/saptrace/background

log_archive_dest    = /oracle/B03/saparch/B03arch

#### ORACLE OPS PARAMETER
remote_os_authent = true

transaction_auditing = FALSE

# retention time for RMAN backup information in control file
control_file_record_keep_time = 30

MAX_ROLLBACK_SEGMENTS = 700
rollback_segments = (PRS_1,PRS_2,PRS_3,PRS_4,PRS_5,PRS_6,PRS_7,PRS_8,PRS_9,PRS_10,PRS_11,PRS_12,PRS_13,PRS_14,PRS_15,PRS_16,PRS_17,PRS_18,PRS_19,PRS_20,
PRS_21,PRS_22,PRS_23,PRS_24,PRS_25,PRS_26,PRS_27,PRS_28,PRS_29,PRS_30,PRS_31,PRS_32,PRS_33,PRS_34,PRS_35,PRS_36,PRS_37,PRS_38,PRS_39,PRS_40,PRS_41,PRS_42,
PRS_43,PRS_44,PRS_45,PRS_46,PRS_47,PRS_48,PRS_49,PRS_50,PRS_51,PRS_52,PRS_53,PRS_54,PRS_55,PRS_56,PRS_57,PRS_58,PRS_59,PRS_60,PRS_61,PRS_62,
PRS_63,PRS_64,PRS_65,PRS_66,PRS_67,PRS_68,PRS_69,PRS_70,PRS_71,PRS_72,PRS_73,PRS_74,PRS_75,PRS_76,PRS_77,PRS_78,PRS_79,PRS_80,PRS_81,PRS_82,
PRS_83,PRS_84,PRS_85,PRS_86,PRS_87,PRS_88,PRS_89,PRS_90,PRS_91,PRS_92,PRS_93,PRS_94,PRS_95,PRS_96,PRS_97,PRS_98,PRS_99,PRS_100)
```

SAP Instance Profile - Database Server

This section provides the final instance configuration settings for the SAP application instance that was located on the database server.

```
#.******************************************************************************
#.*                                    *
#.*     Default profile DEFAULT               *
#.*                                    *
#.*     Version       = 000007              *
#.*     Generated by user = CGALLISA                *
#.*     Generated on = 04.29.2002 , 10:23:34           *
#.*                                    *
#.******************************************************************************
SAPSYSTEMNAME = B03
SAPDBHOST = stpux237
rdisp/mshost = stpux237
rdisp/sna_gateway = stpux237
rdisp/sna_gw_service = sapgw00
rdisp/vbname = stpux237_B03_00
dbs/ora/tnsname = B03
rdisp/enqname = stpux237_B03_00
DIR_ORAHOME = /oracle/B03/817_64
rdisp/btcname = stpux237_B03_00
DIR_CLIENT_ORAHOME = /oracle/B03/817_64
rslg/collect_daemon/listen_port = 3900
DIR_SERVER_ORAHOME = /oracle/B03/817_64
rslg/collect_daemon/talk_port = 4000
rdisp/bufrefmode = sendon,exeauto
```

SAP Instance Profile - Application Server

This section provides the final instance configuration settings for the SAP application instance that was located on the application server.

```
#.******************************************************************************
#.*                                    *
#.*     Default profile DEFAULT               *
#.*                                    *
#.*     Version       = 000007              *
#.*     Generated by user = CGALLISA                *
#.*     Generated on = 04.29.2002 , 10:23:34           *
#.*                                    *
#.******************************************************************************
SAPSYSTEMNAME = B03
INSTANCE_NAME = D00
SAPSYSTEM = 00
rdisp/wp_no_dia = 3
rdisp/wp_no_btc = 20
zcsa/system_language = E
rslg/send_daemon/listen_port = 3700
rslg/send_daemon/talk_port = 1300
abap/buffersize = 500000
rsdb/cua/buffersize = 5000
zcsa/presentation_buffer_area = 20000000
zcsa/table_buffer_area = 50000000
zcsa/db_max_buftab = 10000
rtbb/buffer_length = 200000
rtbb/max_tables = 500
em/max_size_MB = 4092

ipc/shm_psize_10 = 90000000
ipc/shm_psize_40 = 70000000
```

SAP Start Profile – Application Server

This section provides the final SAP startup settings for the SAP application instance that was located on the application server.

```
#----------------------------------------------------------------
SAPSYSTEMNAME    =B03
INSTANCE_NAME    =D00

#----------------------------------------------------------------
# SCSA-Verwaltung starten
#----------------------------------------------------------------

Execute_00 =local $(DIR_EXECUTABLE)/sapmscsa -n pf=$(DIR_PROFILE)/B03_D00_stpux238

#----------------------------------------------------------------
# start application server
#----------------------------------------------------------------

_DW             =dw.sapB03_D00
Execute_01      =local rm -f $(_DW)
Execute_02      =local ln -s -f $(DIR_EXECUTABLE)/disp+work $(_DW)
Start_Program_01  =local $(_DW) pf=$(DIR_PROFILE)/B03_D00_stpux238

#----------------------------------------------------------------
# start syslog send daemon
#----------------------------------------------------------------

_SE             =se.sapB03_D00
Execute_03      =local rm -f $(_SE)
Execute_04      =local ln -s -f $(DIR_EXECUTABLE)/rslgsend $(_SE)
Start_Program_02  =local $(_SE) -F pf=$(DIR_PROFILE)/B03_D00_stpux238

#----------------------------------------------------------------
_SE             =se.sapB03_D00
Execute_03      =local rm -f $(_SE)
Execute_04      =local ln -s -f $(DIR_EXECUTABLE)/rslgsend $(_SE)
Start_Program_02  =local $(_SE) -F pf=$(DIR_PROFILE)/B03_D00_stpux238

#----------------------------------------------------------------
```

SAP Start Profile – Database Server

This section provides the final startup settings for the SAP application instance that was located on the database server.

```
#.*********************************************************************************
#.*                                                          *
#.*     Start profile START_DVEBMGS00_STPUX237               *
#.*                                                          *
#.*     Version          = 000003                  *
#.*     Generated by user = CGALLISA                 *
#.*     Generated on = 04.26.2002 , 17:11:27          *
#.*                                                          *
#.*********************************************************************************
#---------------------------------------------------------------
SAPSYSTEMNAME = B03
INSTANCE_NAME = DVEBMGS00

#---------------------------------------------------------------
# SCSA-Verwaltung starten
#---------------------------------------------------------------

Execute_00 = local $(DIR_EXECUTABLE)/sapmscsa -n pf=$(DIR_PROFILE)/B03_DVEBMGS00_stpux237

#---------------------------------------------------------------
# start message server
#---------------------------------------------------------------

_MS = ms.sapB03_DVEBMGS00
Execute_01 = local rm -f $(_MS)
Execute_02 = local ln -s -f $(DIR_EXECUTABLE)/msg_server $(_MS)
Start_Program_01 = local $(_MS) pf=$(DIR_PROFILE)/B03_DVEBMGS00_stpux237

#---------------------------------------------------------------
# start application server
#---------------------------------------------------------------

_DW = dw.sapB03_DVEBMGS00
Execute_03 = local rm -f $(_DW)
Execute_04 = local ln -s -f $(DIR_EXECUTABLE)/disp+work $(_DW)
Start_Program_02 = local $(_DW) pf=$(DIR_PROFILE)/B03_DVEBMGS00_stpux237

#---------------------------------------------------------------
# start syslog collector daemon
#---------------------------------------------------------------

_CO = co.sapB03_DVEBMGS00
Execute_05 = local rm -f $(_CO)
Execute_06 = local ln -s -f $(DIR_EXECUTABLE)/rslgcoll $(_CO)
Start_Program_03 = local $(_CO) -F pf=$(DIR_PROFILE)/B03_DVEBMGS00_stpux237

#---------------------------------------------------------------
# start syslog send daemon
#---------------------------------------------------------------

_SE = se.sapB03_DVEBMGS00
Execute_07 = local rm -f $(_SE)
Execute_08 = local ln -s -f $(DIR_EXECUTABLE)/rslgsend $(_SE)
Start_Program_04 = local $(_SE) -F pf=$(DIR_PROFILE)/B03_DVEBMGS00_stpux237
```

9 Appendix C – References

Further Information on Network Appliance

Network Appliance, Inc. (NetApp), is a world leader in open network storage solutions for today's data-intensive enterprise. Since its inception in 1992, Network Appliance has pioneered technology, product, and partner firsts that continue to drive the evolution of storage. NetApp storage platforms (NetApp filers, NearStore™ appliances, and NetCache® appliances) are coupled with powerful data management, content delivery, and reporting software, offering seamless storage management. Major corporations and service providers, including Citicorp Securities, Lockheed, Merrill Lynch, Oracle, Texas Instruments, and Yahoo!, utilize NetApp global data management solutions. Information about Network Appliance™ solutions and services is available at *www.netapp.com*.

The company pioneered the concept of the "network appliance," an extension of the industry trend toward dedicated, specialized products that perform a single function. NetApp storage and content delivery platforms (filers and NetCache appliances) are coupled with powerful content distribution and reporting software. This Center-to-Edge™ solution offers seamless data management from the back-end data center to the edge of the network quickly, simply, and reliably. The Network Appliance product portfolio utilizes the company's innovative data access software, known as the Data ONTAP operating system, as well as standards-compliant hardware. It also offers multiprotocol support and transparent integration for UNIX® and Windows environments. For more information, please visit Network Appliance's Web site at www.netapp.com.

Further Information on SAP

SAP is the world's leading provider of e-business software solutions. Through the mySAP.com® e-business platform, people in businesses around the globe are improving relationships with customers and partners, streamlining operations, and achieving significant efficiencies throughout their supply chains. Today, more than 18,000 companies in over 120 countries run more than 50,000 installations of SAP® software. With subsidiaries in over 50 countries, the company is listed on several exchanges including the Frankfurt stock exchange and NYSE under the symbol "SAP." (Additional information at www.sap.com).

Further Information on Accenture

Accenture is the world's leading management consulting and technology services organization. Through its network of businesses approach – in which the company enhances its consulting and outsourcing expertise through alliances, affiliated companies and other capabilities – Accenture delivers innovations that help clients across all industries quickly realize their visions. Its home page is www.accenture.com.