

HP StorageWorks Command View EVA Software Atomic Multisnap with Oracle Database 10g Release 2 ASM white paper



Introduction	2
Features and benefits.....	2
Example environment overview	3
Hardware configuration.....	3
HP-UX configuration	4
Storage configuration	4
Load Testing	6
Installation and configuration	6
Configuring the operating system.....	6
Configuring the EVA8000.....	6
Installing Oracle Database files	6
Configuring ASM.....	6
Configuring a database.....	7
SSSU overview	7
Configuring SSSU	7
ADD MULTISNAP	7
Example of a SSSU script.....	8
Reference guide to SSSU	9
Executing Multisnap Snapshot with SSSU	10
Performing Multisnap Snapshot.....	10
Starting a database on second node	11
Testing results	11
Conclusion.....	12
References	12
For more information.....	13

Introduction

There are several backup and recovery, or cloning, techniques that allow for fast recovery of an Oracle® database while maintaining it or moving it from production to test and development. Some are server based, some are appliance based, and some are storage based. This white paper highlights the process of performing storage-based real-time backup and recovery, or cloning, using the HP StorageWorks 4000/6000/8000 Enterprise Virtual Arrays (EVA) with HP StorageWorks Command View EVA Storage System Scripting Utility (SSSU) Software. The Multisnap Snapshot is a storage-based solution and an advanced feature of HP StorageWorks Command View EVA Software.

With Multisnap Snapshot you can create a point-in-time copy of disk devices/LUN, which a database can present to a second host for test and development, or backup and recovery. Multisnap Snapshot enables storage solutions such as zero-downtime backup and disaster recovery.

Features and benefits

- Efficient—OS-independent array-based mirroring solution relieves servers of replication tasks
- Effective—Background copy process with little impact to primary production operations
- Integrated—Seamless interoperation in zero-downtime split-mirror backup solutions
- Available—Confidently deploy copy data for disaster recovery protection

To demonstrate the use of Multisnap Snapshot, HP created a real-world Oracle environment. The configuration used an EVA4000/6000/8000 for the database storage and two Oracle nodes, one node for use and a second node to present the database to after Multisnap Snapshot. Oracle's Automatic Storage Management (ASM) virtualizes the database storage into disk groups. You are able to manage a small set of disk groups, and ASM automates the placement of the database files within those disk groups used to manage the database storage on the EVA4000/6000/8000.

The servers used in the configuration were from the HP Integrity server family running HP-UX 11iv2. Therefore, all examples given are based on UNIX®-type commands and operations.

This white paper is not a step-by-step configuration and implementation guide but rather an overview of the process required to implement Multisnap Snapshot functionality with the EVA4000/6000/8000 in an Oracle Database environment where Oracle ASM is used for the database storage management.

Example environment overview

To demonstrate the process of using the EVA4000/6000/8000 and the Multisnap Snapshot functionality with Oracle 10gR2, a test environment consisting of two mid-range HP Enterprise servers, an HP StorageWorks 2/32 SAN Switch (Fibre Channel), and the EVA4000/6000/8000 was assembled.

Note

The EVA4000/6000/8000 with Multisnap Snapshot requires HP StorageWorks Command View EVA firmware v6.0.2 or later.

Table 1. Hardware environment

Equipment	Number Used
HP rx7620 Enterprise Server	2
HP-UX 11.23	
VxFS file system for local storage	
HP StorageWorks XP Auto Path Software version 3.0F	
HP StorageWorks AB465 PCI-X 133 MHZ FC Host Bus Adapter (HBA)	2 per server
HP StorageWorks EVA8000 HSV210	1
HP StorageWorks 2/32 SAN Switch (Fibre Channel)	1
HP ProCurve 1-GB Ethernet Switch	2
HP ProLiant DL580 G4 Server with Microsoft® Windows® 2003 Advanced Server	1

Hardware configuration

The primary servers in the test environment consisted of two HP Integrity 8-way rx7620 servers, using eight 1.1-GHZ Intel® Itanium®2 CPUs. The storage used was an EVA4000/6000/8000 HSV210. The storage area network (SAN) was built around a single Fibre Channel switch, zoned to simulate a high-availability (HA) storage environment. Additional infrastructure hardware such as Gateway and DNS servers for network connectivity were used but are not described.

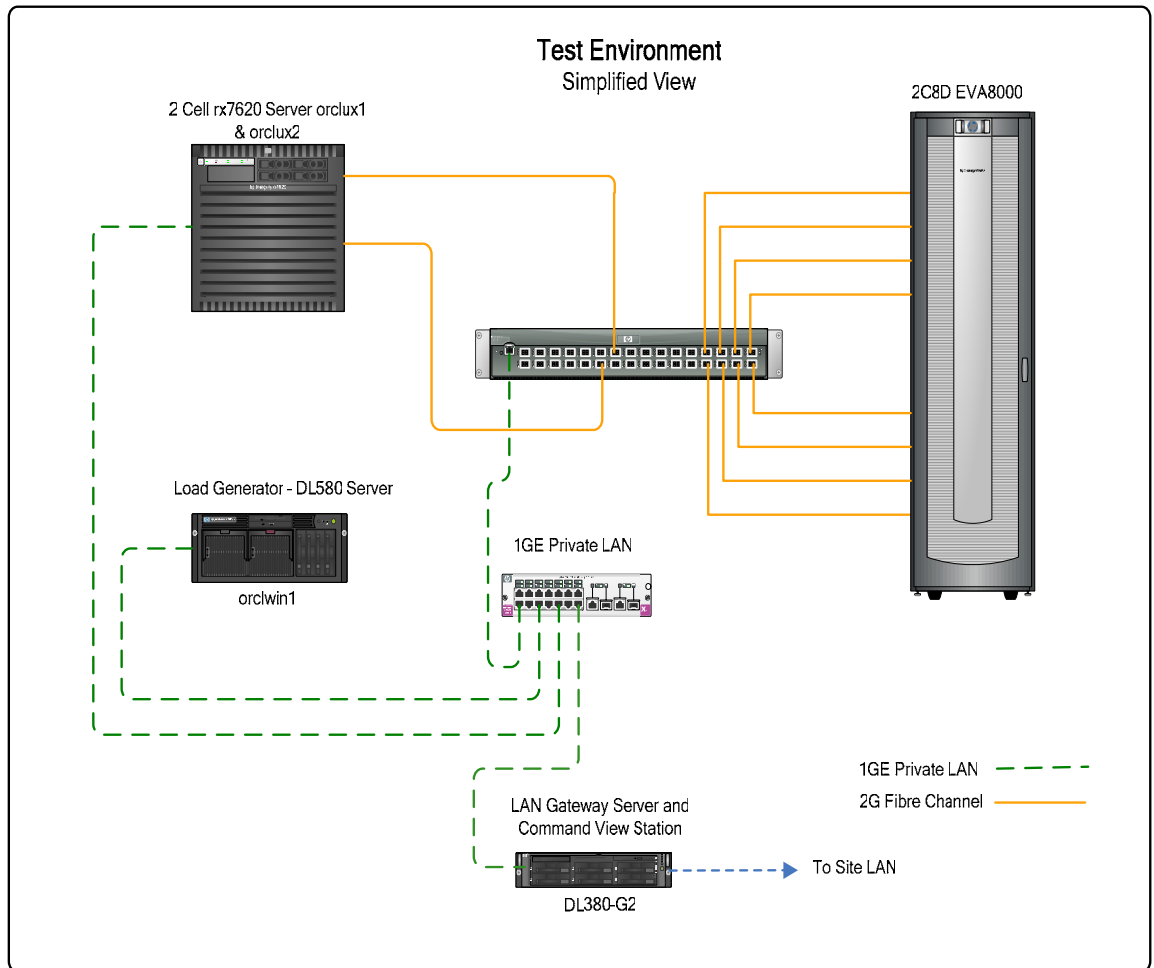
The rx7620 server is a partitionable server supporting two hard partitions, and in this environment both servers were configured with the two partitions—each partition with four CPUs and 16-GB RAM. For this test environment, one partition on two separate servers was used.

Two 2-GB Fibre Channel HBAs were used in each server partition, allowing for HA operations between the servers and the storage array. The switch was also zoned to support the HA configuration. All Ethernet connections were 1 GB, including the private LAN cluster interconnects.

The DL580 server with four CPUs and 2 GB of RAM was loaded with Windows 2003 Advanced Server and was used as the database load generating system.

Figure 1 displays the basic test environment. Note that various supporting systems and hardware are not shown.

Figure 1. Test environment



HP-UX configuration

HP-UX 11.23 for Itanium-based servers was used on both servers. The operating system was patched to equal or greater patch levels as required in the document "Oracle Database, Quick Installation Guide 10g Release 2 (10.2) for hp-ux Itanium."

Storage configuration

The EVA4000/6000/8000 HSV210 was configured to present 10 250-GB virtual disks to one server. This is the storage used by ASM to store the Oracle Database and recovery files.

As Oracle is providing the storage management for the shared volumes, they are not configured or mounted by the operating system, but are rather RAW devices. This type of configuration does not allow for shared configuration or binary files, so local storage on each node must be large enough to hold the Oracle Database.

For ASM to access the common storage, each node must refer to each volume with a common device file name. The HP-UX `mknod` command was used to create "Alternative Device" file names for all common storage. Using the HP-UX command `ioscan` and `ls -la /dev/rdisk`, the following tables were developed.

Each table details the particular node's path information to the shared storage as used for this environment.

Table 2. Node: orclux 1

Device File Name	Alt Device		Tgt	LUN	Type	Major #	Minor #
	File Name						
/dev/rdsk/c12f0d1	Asm1-1		0	0	VRAID5	188	0x0c0100
/dev/rdsk/c12f0d2	Asm1-2		0	1	VRAID5	188	0x0c0200
/dev/rdsk/c12f0d3	Asm1-3		0	2	VRAID5	188	0x0c0300
/dev/rdsk/c12f0d4	Asm1-4		0	3	VRAID5	188	0x0c0400
/dev/rdsk/c12f0d5	Asm1-5		0	6	VRAID5	188	0x0c0500
/dev/rdsk/c12f0d6	Asm1-6		0	7	VRAID5	188	0x0c0600
/dev/rdsk/c12f0d7	Asm1-7		0	8	VRAID5	188	0x0c0700
/dev/rdsk/c12f1d0	Asm1-8		1	9	VRAID5	188	0x0c1000
/dev/rdsk/c12f1d1	Asm1-9		1	0a	VRAID5	188	0x0c1100
/dev/rdsk/c12f1d2	Asm1-10		1	0b	VRAID5	188	0x0c1200

Table 3. Node: orclux2

Device File Name	Alt Device		Tgt	LUN	Type	Major #	Minor #
	File Name						
/dev/rdsk/c4f0d1	Asm1-1		0	0	VRAID5	188	0x040100
/dev/rdsk/c4f0d2	Asm1-2		0	1	VRAID5	188	0x040200
/dev/rdsk/c4f0d3	Asm1-3		0	2	VRAID5	188	0x040300
/dev/rdsk/c4f0d4	Asm1-4		0	3	VRAID5	188	0x040400
/dev/rdsk/c4f0d5	Asm1-5		0	6	VRAID5	188	0x040500
/dev/rdsk/c4f0d6	Asm1-6		0	7	VRAID5	188	0x040600
/dev/rdsk/c4f0d7	Asm1-7		0	8	VRAID5	188	0x040700
/dev/rdsk/c4f1d0	Asm1-8		1	9	VRAID5	188	0x041000
/dev/rdsk/c4f1d1	Asm1-9		1	0a	VRAID5	188	0x041100
/dev/rdsk/c4f1d2	Asm1-10		1	0b	VRAID5	188	0x041200

Note

For ease of viewing, the alternate path information is not shown.

Load Testing

To effect change on the test database, Benchmark Factory developed by Quest Software was used. An online transaction processing (OLTP) type of workload with users ranging from 500 to 1,000 was used running against the 1.5-TB tablespace created within the database. Load on the database was used to test the storage environment and to make changes to the database before performing a snapshot.

Installation and configuration

As this is not a detailed step-by-step installation and configuration guide, only the major steps required to bring up the preceding environment are listed, noting specific steps as needed. For a list of documents for this project, see the References section.

Configuring the operating system

1. Starting from an HP-UX 11.23 operating system install, verify the patch levels required for an Oracle 10g installation are installed.
2. Install and configure HP StorageWorks XP Auto Path Software to support the required storage path failover. In this example, HP StorageWorks XP Auto Path Software is configured to support an active/passive path failover.

Configuring the EVA8000

1. Create multiple disk groups for data and archiving allowing for enough disk space for snapshot container.
2. Create 10 virtual disks from the disk groups you created, keeping enough disk space in each disk group for a snapshot for presentation to the second Oracle node.

Installing Oracle Database files

The following steps are detailed in the document "Oracle Database, Quick Installation Guide 10g Release 2 (10.2) for hp-ux Itanium."

1. Export the ORACLE_HOME and ORACLE_BASE environment variables and install the Oracle database files onto a local volume on the primary node using the runInstaller application.
2. During the installation, select to install only the Oracle files. You will install and create the ASM instance and database later.
3. Install the Oracle Database Patch Set for 10.2.0.2.0. For pre- and post-installation steps, refer to the Oracle release notes provided with the patch set.

Configuring ASM

Using the Oracle application dbca, install and configure an ASM instance. As outlined in the Storage configuration section, create two disk groups and assign 10 LUNs to each disk group. dbca installs the ASM instance and starts ASM on the node.

Configuring a database

1. Using the Oracle application dbca, configure a database.
2. Use ASM to manage the storage.
 - a. Assign the database to DATADG.
 - b. Assign the Flash Recovery area to ARCHDG.
3. Enable the database to run in Archive Mode.
4. Complete the dbca installation.
5. Verify the new database is operating properly by starting a sqlplus session on the node and reviewing various v\$ views, such as v\$instance.

```
SQL> select instance_name,instance_number,host_name,active_state,status from v$instance;
```

INSTANCE_NAME	INSTANCE_NUMBER	HOST_NAME	ACTIVE_ST	STATUS
-----	-----	-----	-----	-----
Snap1t	1	orclux2	NORMAL	OPEN

To review the overall database, individual instance, and ASM instance status use Oracle Enterprise Manager.

At this point, the 2-node Oracle environment using Oracle software for storage management is operational and ready for the Multisnap Snapshot.

SSSU overview

The HP StorageWorks Command View EVA Storage System Scripting Utility (SSSU) Software is a command line interface that allows you to configure and control EVAs. Use this utility to script and run repetitious and complex configuration commands, such as `ADD MULTISNAP`. The utility is installed on the management server when you install HP StorageWorks Command View EVA Software.

Configuring SSSU

ADD MULTISNAP

The `ADD MULTISNAP` command creates multiple snapshots and snapclones, up to 10 at a time. You can combine snapshots and snapclones.

Syntax

```
ADD MULTISNAP snapname VDISK=source virtual disk name CONTAINER=container name  
SNAPSHOT | SNAPCLONE snapname VDISK=source virtual disk name CONTAINER=container name  
SNAPSHOT | SNAPCLONE snapname VDISK=source virtual disk name CONTAINER=container name  
SNAPSHOT | SNAPCLONE snapname...
```

Options

The following options are available with the `ADD MULTISNAP` command.

`VDISK=`

The name of the virtual disk to be copied.

`CONTAINER=`

The name of the existing container to be used for the virtual disk copy.

`SNAPSHOT`

Creates a snapshot of the virtual disk.

`SNAPCLONE`

Creates a snapclone (copy) of the virtual disk.

For an example, create a multisnap of the virtual disk `payroll` and snapclones of the virtual disks `hrd` and `finance`:

```
ADD MULTISNAP tonightsnap VDISK="\Virtual Disks\payroll" CONTAINER=container1 SNAPSHOT
hrdkp VDISK="\Virtual Disks\hrd" CONTAINER=container2 SNAPCLONE financebkp
VDISK="\Virtual Disks\finance" CONTAINER=container3 SNAPCLONE
```

Example of a SSSU script

This example would be in Notepad.

```
set options NOcommand_delay
select manager localhost username=Administrator password=password
select system Oracle

set VDISK "\Virtual Disks\ASM-SNAP1-DG1-1" WRITECACHE=writethrough
set VDISK "\Virtual Disks\ASM-SNAP1-DG1-2" WRITECACHE=writethrough
set VDISK "\Virtual Disks\ASM-SNAP1-DG1-3" WRITECACHE=writethrough
set VDISK "\Virtual Disks\ASM-SNAP1-DG1-4" WRITECACHE=writethrough
set VDISK "\Virtual Disks\ASM-SNAP1-DG1-5" WRITECACHE=writethrough
set VDISK "\Virtual Disks\ASM-SNAP1-DG1-6" WRITECACHE=writethrough
set VDISK "\Virtual Disks\ASM-SNAP1-DG1-7" WRITECACHE=writethrough
set VDISK "\Virtual Disks\ASM-SNAP1-DG1-8" WRITECACHE=writethrough
set VDISK "\Virtual Disks\ASM-SNAP1-DG1-9" WRITECACHE=writethrough
set VDISK "\Virtual Disks\ASM-SNAP1-DG1-10" WRITECACHE=writethrough
```



```

ADD MULTISNAP Copy-of-ASM-SNAP1-DG1-1 VDISK="\Virtual Disks\ASM-SNAP1-DG1-1"
CONTAINER=copy-DG1-1 SNAPSHOT
Copy-of-ASM-SNAP1-DG1-2 VDISK="\Virtual Disks\ASM-SNAP1-DG1-2" CONTAINER=copy-DG1-2
SNAPSHOT
Copy-of-ASM-SNAP1-DG1-3 VDISK="\Virtual Disks\ASM-SNAP1-DG1-3" CONTAINER=copy-DG1-3
SNAPSHOT
Copy-of-ASM-SNAP1-DG1-4 VDISK="\Virtual Disks\ASM-SNAP1-DG1-4" CONTAINER=copy-DG1-4
SNAPSHOT
Copy-of-ASM-SNAP1-DG1-5 VDISK="\Virtual Disks\ASM-SNAP1-DG1-5" CONTAINER=copy-DG1-5
SNAPSHOT
Copy-of-ASM-SNAP1-DG1-6 VDISK="\Virtual Disks\ASM-SNAP1-DG1-6" CONTAINER=copy-DG1-6
SNAPSHOT
Copy-of-ASM-SNAP1-DG1-7 VDISK="\Virtual Disks\ASM-SNAP1-DG1-7" CONTAINER=copy-DG1-7
SNAPSHOT
Copy-of-ASM-SNAP1-DG1-8 VDISK="\Virtual Disks\ASM-SNAP1-DG1-8" CONTAINER=copy-DG1-8
SNAPSHOT
Copy-of-ASM-SNAP1-DG1-9 VDISK="\Virtual Disks\ASM-SNAP1-DG1-9" CONTAINER=copy-DG1-9
SNAPSHOT
Copy-of-ASM-SNAP1-DG1-10 VDISK="\Virtual Disks\ASM-SNAP1-DG1-10" CONTAINER=copy-DG1-10
SNAPSHOT

```

```

ADD LUN 1 VDISK="\Virtual Disks\ASM-SNAP1-DG1-1\Copy-of-ASM-SNAP1-DG1-1"
HOST=\Hosts\orclux1
ADD LUN 2 VDISK="\Virtual Disks\ASM-SNAP1-DG1-2\Copy-of-ASM-SNAP1-DG1-2"
HOST=\Hosts\orclux1
ADD LUN 3 VDISK="\Virtual Disks\ASM-SNAP1-DG1-3\Copy-of-ASM-SNAP1-DG1-3"
HOST=\Hosts\orclux1
ADD LUN 4 VDISK="\Virtual Disks\ASM-SNAP1-DG1-4\Copy-of-ASM-SNAP1-DG1-4"
HOST=\Hosts\orclux1
ADD LUN 5 VDISK="\Virtual Disks\ASM-SNAP1-DG1-5\Copy-of-ASM-SNAP1-DG1-5"
HOST=\Hosts\orclux1
ADD LUN 6 VDISK="\Virtual Disks\ASM-SNAP1-DG1-6\Copy-of-ASM-SNAP1-DG1-6"
HOST=\Hosts\orclux1
ADD LUN 7 VDISK="\Virtual Disks\ASM-SNAP1-DG1-7\Copy-of-ASM-SNAP1-DG1-7"
HOST=\Hosts\orclux1
ADD LUN 8 VDISK="\Virtual Disks\ASM-SNAP1-DG1-8\Copy-of-ASM-SNAP1-DG1-8"
HOST=\Hosts\orclux1
ADD LUN 9 VDISK="\Virtual Disks\ASM-SNAP1-DG1-9\Copy-of-ASM-SNAP1-DG1-9"
HOST=\Hosts\orclux1
ADD LUN 10 VDISK="\Virtual Disks\ASM-SNAP1-DG1-10\Copy-of-ASM-SNAP1-DG1-10"
HOST=\Hosts\orclux1

```

```

set VDISK "\Virtual Disks\ASM-SNAP1-DG1-1\Copy-of-ASM-SNAP1-DG1-1" NOWRITE_PROTECT
set VDISK "\Virtual Disks\ASM-SNAP1-DG1-2\Copy-of-ASM-SNAP1-DG1-2" NOWRITE_PROTECT
set VDISK "\Virtual Disks\ASM-SNAP1-DG1-3\Copy-of-ASM-SNAP1-DG1-3" NOWRITE_PROTECT
set VDISK "\Virtual Disks\ASM-SNAP1-DG1-4\Copy-of-ASM-SNAP1-DG1-4" NOWRITE_PROTECT
set VDISK "\Virtual Disks\ASM-SNAP1-DG1-5\Copy-of-ASM-SNAP1-DG1-5" NOWRITE_PROTECT
set VDISK "\Virtual Disks\ASM-SNAP1-DG1-6\Copy-of-ASM-SNAP1-DG1-6" NOWRITE_PROTECT
set VDISK "\Virtual Disks\ASM-SNAP1-DG1-7\Copy-of-ASM-SNAP1-DG1-7" NOWRITE_PROTECT
set VDISK "\Virtual Disks\ASM-SNAP1-DG1-8\Copy-of-ASM-SNAP1-DG1-8" NOWRITE_PROTECT
set VDISK "\Virtual Disks\ASM-SNAP1-DG1-9\Copy-of-ASM-SNAP1-DG1-9" NOWRITE_PROTECT
set VDISK "\Virtual Disks\ASM-SNAP1-DG1-10\Copy-of-ASM-SNAP1-DG1-10" NOWRITE_PROTECT

```

Reference guide to SSSU

<http://h20000.www2.hp.com/bc/docs/support/SupportManual/c00605847/c00605847.pdf>

Executing Multisnap Snapshot with SSSU

Performing Multisnap Snapshot

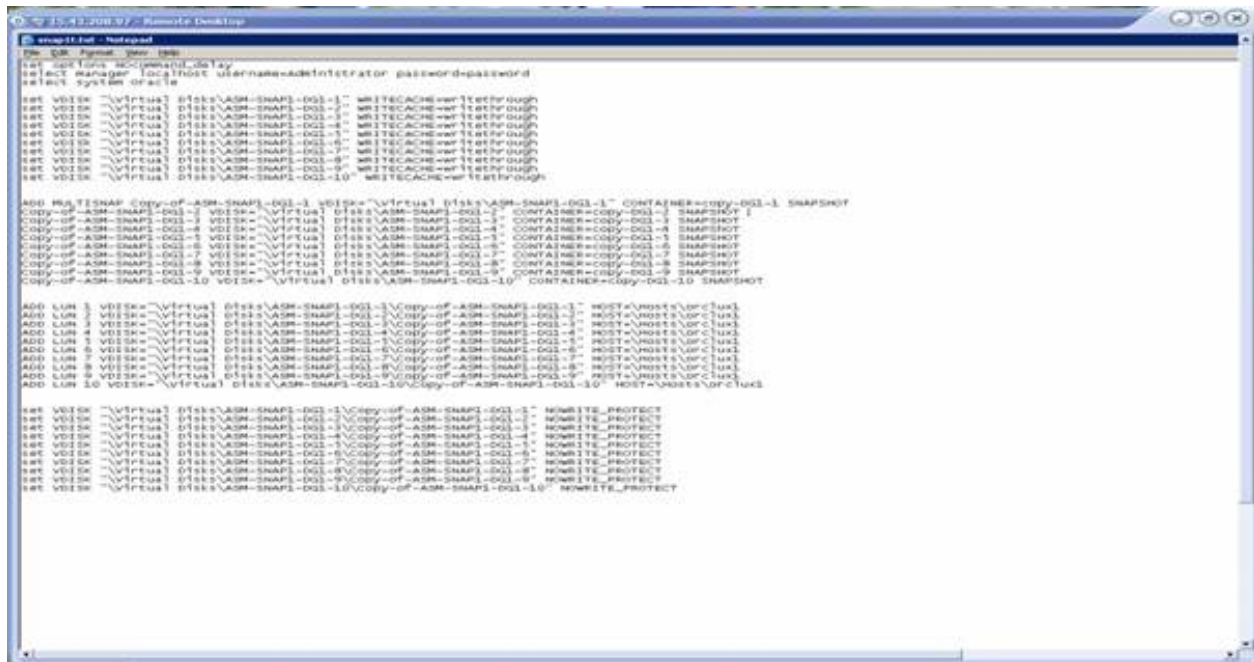
Oracle recommends placing the database in hot backup mode before triggering the copy operation, for example, Multisnap Snapshot.

```
SQL > alter database begin backup;
```

From your management command view station, launch the SSSU shortcut you created when HP StorageWorks Command View EVA was installed.

- Enter manager: IP or hostname
- Username:
- Password:
- Select system (EVA4000/6000/8000 Identification Name)
- (EVA4000/6000/8000 Identification Name) > file "c:\multisnap\snapshot.txt—This statement executes the SSSU script that was created.
- Figure 2 is an example of a SSSU script in Notepad that was written to execute the snapshot.

Figure 2. Example of a SSSU script in Notepad



The database can now be taken out of backup mode.

```
SQL> alter database end backup;
```

Starting a database on second node

The second host has the ability to see the new LUNs that were presented from the snapshot. Verify the following device files have been created and are accessible to the second host.

- `ioscan -f`
- `autopath discover`
- `autopath display`

Start the ASM instance from `sqlplus`.

- `Export + ASM`
- `Sql > startup`

Start the database instance from `sqlplus`.

- `Export Oracle_SID`
- `Sql > startup mount;`
- `Sql > alter database end backup;`
 - Because the database was in hot backup mode during the snapshot, if the database is not taken out of backup mode you need to perform a recover database procedure to open the database.
- `Sql > alter database open;`

Testing results

This intent of this example was to prove that a Multisnap Snapshot can be used to perform a point-in-time backup and recovery of an Oracle database in a complex Oracle environment.

The test sequence was:

1. Use 10 LUNs for the ASM disk group.
2. Use Benchmark Factory running high I/O load to 1.5-TB tablespace.
3. Place the database in hot backup mode.
4. Take Multisnap Snapshot of database.
5. Run a large query using `scn` to output file on primary database.
6. Shut down database running on primary ASM disk group.
7. Restart the database on copy with original archive logs.
 - Does ASM instance start?
 - Take the database out of backup mode.
 - Does database start?
8. Run the same large query using `scn` on secondary database.
9. Perform checksum for integrity.
10. Perform diff on both output files for data validation.
11. Perform `DBVerify` on secondary database, and validate physical data structure.

- Targeted configuration–Configure two hosts, one running a complete database and the other with database software installed.
- Test description/Objectives–Verify the ability of the EVA to create multiple copies automatically without any adverse effect or corruption. The stress point in this test was the ability of the EVA to create timely copies so a smaller database could be use.
- Expected outcome/Completion criteria–Creating copies can be time consuming, and the delay may affect the ASM instance. This test verifies that the ASM instance can be properly started on the copies and that the database can also be started.

Conclusion

There are many ways to back up or copy/clone an Oracle 10g database and this white paper documented such a method. HP StorageWorks Command View EVA Storage SSSU Software performed the task of providing an efficient and timely backup method for an Oracle Database while not affecting the operation of the primary database. These solutions are not server-based, but are storage-based and do not require processing power from the servers. Multisnap Snapshot offers you the ability to back up your data onto your EVA4000/6000/8000 and clone the database and present the data to another host for maintenance or move your production database into a test and development.

References

- “Oracle Database Backup and Recovery Advanced Users Guide,” 10g Release 2(10.2), Oracle Corporation
- “Oracle Database, Quick Installation Guide, 10g Release 2 (10.2) for hp-ux Itanium,” B25294-01, January 2006, Oracle Corporation
- “Oracle Database Administrator’s Guide 10g Release 2 (10.2),” B14231-01, June 2005

For more information

- www.hp.com/go/oralce
- www.hp.com/go/storageworks

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