Improve Storage Efficiency on Deploying Oracle Databases for Dev/Test in a Virtualized Environment Over NFS

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NetApp
Deployment Steps

- Migrate DB from Non-NetApp to NetApp using Oracle Data Guard

- Clone Oracle 11gR2, RHEL 5, VM's using NetApp's Rapid Cloning Utility for Dev/Test env.
Oracle Dev/Test on VMware

**Production Site**

- Oracle Data Guard

**Dev/Test Site**

- Thin Provisioning (FlexVol®)
  - 20% to 33% typical savings

- Double Parity RAID (RAID-DP®)
  - Save up to 46%
  - Saves up to 46% versus mirrored data or RAID 10

- Snapshot™ Copies
  - Save over 80%
  - NetApp Snapshot copies do not require "copy" space
  - Serve local backup purposes
  - Deliver savings of up to 80%

- Virtual Clones (FlexClone®)
  - Save over 80%
  - Savings equal size of the original data set minus blocks subsequently changed in clone

**FlexClone®**

- RHEL 5.4, NFS
- Oracle 11gR2
- Oracle

** VMware ESX **

- vCenter RCU
Solution Architecture

vCenter Server
RCU
VSC

Golden VM
with Oracle
11g R2
Database

Rapid Oracle Database Clones

vSphere Dev Test Cluster for Oracle

ESX 1

ESX 2

ESX 3

ESX 4

1GB Network

FAS 3140 High Availability Cluster

Volume containing the
Oracle database VM (Golden VM)
And its clones

Cloned databases
Design Implementation

- Create the “Golden VM” on “Golden datastore”
  - Assign processor, memory and network
  - Assign a separate datastore for SWAP space
- Boot the VM with RHEL5.x ISO and install in vmdk-1
- Create and assign 4 additional vmdk files in “Golden VM” in the Golden datastore

<table>
<thead>
<tr>
<th>#</th>
<th>vmdk</th>
<th>Size</th>
<th>Purpose</th>
<th>Corresponding Path inside the VM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>vmdk-2</td>
<td>15 Gb</td>
<td>Oracle binaries</td>
<td>/dev/sdb1</td>
</tr>
<tr>
<td>2</td>
<td>vmdk-3</td>
<td>20 Gb</td>
<td>Oracle data</td>
<td>/dev/sdc1</td>
</tr>
<tr>
<td>3</td>
<td>vmdk-4</td>
<td>20 Gb</td>
<td>Redo Logs</td>
<td>/dev/sdd1</td>
</tr>
<tr>
<td>4</td>
<td>vmdk-5</td>
<td>20 Gb</td>
<td>Archive</td>
<td>/dev/sde1</td>
</tr>
</tbody>
</table>
- Align all the vmdks’ as per documentation TR 3747

- Format the hard disks using ‘fdisk’ and create ‘ext3’ file systems on them using ‘mkfs’

- Mount the hard disks and install the Oracle 11g R2 Database single instance
Golden Datastore Creation

DevTest_ORCL_CLUSTER

- Add Host...
- New Virtual Machine...
- New Resource Pool...
- New vApp...
- Rescan for Datastores...
- Host Profile
- Add Permission...
- Alarm
- Edit Settings...
- Remove
- Rename

NetApp Datastore Provisioning Wizard

Select the datastore type you would like to create
Which of the 2 types of datastores would you like to use?

- NFS
- VMFS
## SWAP Datastore Creation

### NAS Storage Controllers

<table>
<thead>
<tr>
<th>Datastore</th>
<th>Datastore Capacity</th>
<th>NFS pathname</th>
<th>Access Mode</th>
<th>Storage Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Golden_DataStore</td>
<td>100.000 GB</td>
<td>/Vol/Golden_DataStore</td>
<td>read/Write</td>
<td>Normal</td>
</tr>
<tr>
<td>SWAP_DataStore</td>
<td>25.000 GB</td>
<td>/Vol/SWAP_DataStore</td>
<td>read/Write</td>
<td>Normal</td>
</tr>
</tbody>
</table>

### Details

**Storage Controller:** btcppe-filer35 Partner: btcppe-filer35

### NFS
- VMFS pathname: /vmfs/volumes/d57338d21-e08f778d
- NFS pathname: /Vol/Golden_DataStore
- Status: normal
- File System Security: unix
- Anonymous Username: N/A

### Host Privileges
- View Read-Only Hosts...
- View Read-Write Hosts...
- View Root Access Hosts...

### Deduplication (Advanced Single Instance Storage)
- State enabled
- Status: idle

### Capacity
- Datastore Usage: 0%
- Volume Usage: 0%
- Aggregate Usage: 7%

### Volume
- Name: Golden_DataStore
- Status: online
- Type: flex
- Guaranteed: none
- Aggregate: VG6EU
- Snapshot Reserve: 0%
- Autogrow Increment: 1.000GB
- Autogrow Max Size: 30.000GB
SWAP Location

DevTest_ORCL_CLUSTER Settings

Cluster Features
- VMware HA
  - Virtual Machine Options
  - VM Monitoring
- VMware EVC
- Swapfile Location

Swapfile Policy for Virtual Machines

- Store the swapfile in the same directory as the virtual machine (recommended)
- Store the swapfile in the datastore specified by the host
  - If not possible, store the swapfile in the same directory as the virtual machine.

A host specified datastore may degrade VMotion performance for the affected virtual machines.
Virtual Machine Swapfile Location

The virtual machine swapfiles are stored in the location below. An individual virtual machine can override this setting.

This host is in a cluster which specifies that the virtual machine swapfiles are to be stored in a swapfile datastore. The host inherits this configuration. You can choose to select the swapfile datastore here.

Swapfile Location: No datastore specified. Location defaults to the virtual machine...

Virtual Machine Swapfile Location

- Store the swapfile in the same directory as the virtual machine. This is a recommended option.
- Store the swapfile in a swapfile datastore selected below. This option could degrade VMotion performance for the affected virtual machines.

<table>
<thead>
<tr>
<th>Name</th>
<th>Capacity</th>
<th>Provisioned</th>
<th>Free</th>
<th>Type</th>
<th>Th</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Golden_DataStore]</td>
<td>20.00 GB</td>
<td>864.00 KB</td>
<td>20.00 GB</td>
<td>NFS</td>
<td>Su</td>
</tr>
<tr>
<td>[SWAP_DataStore]</td>
<td>25.00 GB</td>
<td>1.02 MB</td>
<td>25.00 GB</td>
<td>NFS</td>
<td>Su</td>
</tr>
<tr>
<td>[Storage1]</td>
<td>135.25 GB</td>
<td>33.98 GB</td>
<td>101.27 GB</td>
<td>VMFS</td>
<td>Su</td>
</tr>
</tbody>
</table>
VMDKs for Oracle

[Code snippet from the image]

```
[root@goldenvm ~]# df -h
Filesystem      Size  Used  Avail  Use%  Mounted on
/dev/mapper/VolGroup00-LogVol00  166 2.6G 13G 18%  /
/dev/sda1       99M 13M  82M 14%   /boot
tmpfs           1086M 524M 483M 53%   /dev/shm
/dev/sdb1       156 4.2G  9.9G 30%  /u01/app
/dev/sdc1       206 1.7G 18G  9%   /oradata
/dev/sdd1       206 323M 19G  2%   /redologs
/dev/sde1       206 1.7G 18G  9%   /archive

[root@goldenvm ~]# su - oracle
[oracle@goldenvm ~]$ sqlplus / as sysdba
SQL*Plus: Release 11.2.0.1.0 Production on Fri Mar 5 08:57:30 2010
Copyright (c) 1982, 2009, Oracle. All rights reserved.
Connected to:
Oracle Database 11g Enterprise Edition Release 11.2.0.1.0 - 64bit Production
With the Partitioning, OLAP, Data Mining and Real Application Testing options

SQL>
```
Cloning the database

What is a Host?
A host is a computer that uses virtualization software to run virtual machines. Hosts provide the physical resources that virtual machines need and gives access to storage and networks.
New datastore for clones

Choose a datastore for the virtual machine

Where do you want to store the virtual machine files?

<table>
<thead>
<tr>
<th>Datastore name</th>
<th>Datastore type</th>
<th>Capacity (GB)</th>
<th>Free space (GB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Golden_DataStore</td>
<td>NFS</td>
<td>100.00</td>
<td>86.39</td>
</tr>
<tr>
<td>SWAP_DataStore</td>
<td>NFS</td>
<td>25.00</td>
<td>25.00</td>
</tr>
<tr>
<td>DevTest_DataStore</td>
<td>NFS</td>
<td>67.68</td>
<td>67.68</td>
</tr>
</tbody>
</table>
Clones Created

Custom Map

OracleDevTestClone01
OracleDevTestClone02
OracleDevTestClone03
OracleDevTestClone04
OracleDevTestClone05
OracleDevTestClone06
OracleDevTestClone07
OracleDevTestClone08
OracleDevTestClone09
OracleDevTestClone10
OracleDevTestClone11
OracleDevTestClone12
OracleDevTestClone13
OracleDevTestClone14
OracleDevTestClone15
OracleDevTestClone16
OracleDevTestClone17
OracleDevTestClone18
OracleDevTestClone19
OracleDevTestClone20
OracleDevTestClone21
OracleDevTestClone22
OracleDevTestClone23
OracleDevTestClone24
OracleDevTestClone25
vCenter_0.1
vCenter_0.2
OracleDevTestClone01
OracleDevTestClone02
OracleDevTestClone03
OracleDevTestClone04
OracleDevTestClone05
OracleDevTestClone06
OracleDevTestClone07
OracleDevTestClone08
OracleDevTestClone09
OracleDevTestClone10
OracleDevTestClone11
OracleDevTestClone12
OracleDevTestClone13
OracleDevTestClone14
OracleDevTestClone15
OracleDevTestClone16
OracleDevTestClone17
OracleDevTestClone18
OracleDevTestClone19
OracleDevTestClone20
OracleDevTestClone21
OracleDevTestClone22
OracleDevTestClone23
OracleDevTestClone24
OracleDevTestClone25
vCenter_0.1
vCenter_0.2
Database on Clones

```
[root@OracleDevTestClone06 ~]# df -h
Filesystem Size Used Avail Use% Mounted on
/dev/mapper/VolGroup00-LogVol00 16G 2.6G 13G 18% /
/dev/sdal 99M 13M 86M 14% /boot
tmpfs 1006M 0 1006M 0% /dev/shm
/dev/sdb1 15G 4.2G 9.9G 30% /u01/app
/dev/sdc1 20G 1.7G 18G 9% /oradata
/dev/sdd1 20G 323M 19G 2% /redologs
/dev/sde1 20G 1.7G 18G 9% /archive
[root@OracleDevTestClone06 ~]#
[root@OracleDevTestClone06 ~]# su - oracle
[oracle@OracleDevTestClone06 ~]$ sqlplus / as sysdba
SQL*Plus: Release 11.2.0.1.0 Production on Sat Mar 6 16:48:59 2010
Copyright (c) 1982, 2009, Oracle. All rights reserved.
Connected to an idle instance.
SQL> startup
ORACLE instance started.
Total System Global Area 839282688 bytes
Fixed Size 2217992 bytes
Variable Size 629147640 bytes
Database Buffers 205520896 bytes
Redo Buffers 2396160 bytes
Database mounted.
Database opened.
SQL>
```
## Space savings

### Details

**Storage Controller:** btcpp-filer35  **Partner:** btcp-ppe-filer36

**NFS**
- Volumes: /mfs/volumes/6702e5-9f01e6
- NFS path: /vol/Test_DataStore
  - Status: normal
- File System Security: unix
- Anonymous Username: N/A

**Host Privileges**
- View Read-Only Hosts
- View Read-Write Hosts
- View Root Access Hosts

**Deduplication (Advanced Single Instance Storage)**
- State: enabled
- Status: idle
- Space Savings: 94%
- View Mounted Hosts

### Capacity

<table>
<thead>
<tr>
<th>Datastore Usage (21%)</th>
<th>Volume Usage (21%)</th>
<th>Aggregate Usage (52%)</th>
</tr>
</thead>
</table>

### Volume

- Name: DevTest_DataStore
  - Status: online
  - Type: flex
  - Guarantee: none
  - Aggregate: VGBBU
  - Snapshot Reserve: 6%
  - Autogrow Increment: 16.00GB
  - Autogrow Max Size: 100.00GB
  - convert_update: off
  - create_update: off
  - no_auto_update: on

### Controller | Datastore | Datastore Capacity | NFS Pathname | Access Mode | Storage Status
---|---|---|---|---|---
btcpp-filer35 | SWAP_DataStore | 23.00GB | /vol/SWAP_DataStore | readWrite | Normal
btcpp-filer35 | Golden_DataStore | 100.00GB | /vol/Golden_DataStore | readWrite | Normal
btcpp-filer35 | DevTest_DataStore | 67.00GB | /vol/DevTest_DataStore | readWrite | Normal
Key Takeaways

- Oracle dev/test can be done in a virtual environment
  - With NetApp’s flexclone technology cloning is fast, easy and cost effective
  - Clones can be created and automated through RCU
  - Faster provisioning times and greater utilization for servers and storage
  - Great disk space savings for clones with NetApp De-duplication
Thank You!