PURESTORAGE

Using FlashRecover Snapshots to Clone Oracle E-Business Suite R12 Environments

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Contents

Audience

The target audience for this report includes Pure Storage System Engineers (SEs), Technical Support Engineers (TSEs), Certified Partners system engineers, Oracle and Oracle Apps database administrators (DBAs), and others who deploy and support Pure Storage FlashArrays as storage for Oracle databases and applications.

References

Oracle Corporation's general description of cloning an Oracle E-Business Suite System
https://docs.oracle.com/cd/E17559_01/em.111/e18709/T508706T512065.htm

A third party's step-by-step instructions for cloning an Oracle E-Business Suite R12 System
http://blogs.perficient.com/delivery/blog/2016/07/21/cloning-in-oracle-ebs-r12/

Oracle's general description of R12 RapidClone application environment cloning.
http://oracle-latest-technology.blogspot.com/2012/07/step-by-step-oracle-apps-r1213-rapid.html

Introduction

Oracle® E-Business Suite (EBS) is a comprehensive suite of enterprise resource planning (ERP) and customer relationship management (CRM) applications offered by Oracle Corporation. It is among the most widely used applications in the Oracle product portfolio, but it presents several challenges to IT teams. In particular, teams must make periodic *clones* of production environments for patching, quality assurance testing, development and migration to alternative hardware platforms.

Historically, IT teams have created EBS clones by copying production environments in their entirety. With large databases, however, copying takes a long time, requires extra storage, and impacts production performance while in progress. Prior to the R12 release, cloning also entailed EBS downtime. With R12, Oracle introduced *RapidClone* technology to enable EBS environment cloning without downtime. The time and storage required and the impact on production performance, however, are still dependent on the technique used to clone the database and application tier volumes.

Through the use of *FlashRecover* snapshots, Pure Storage® FlashArrays can reduce clone creation time to a few minutes regardless of database size. Moreover, FlashRecover snapshots are *space-saving* (sometimes referred to as *redirect-on-write*); they share unmodified data with the volumes from which they are created, so incremental storage needs are limited to the space required for updates on production and clone volumes. Clones made from FlashRecover snapshots are up-to-date, and at the same time, they sharply reduce both IT labor and incremental hardware needs compared to full copy approaches.

This report describes the use of FlashRecover snapshots to clone an entire Oracle E-Business suite environment—both application and database tiers—quickly and consistently, including a step-by-step example of the process applied to a simple EBS environment.

An Overview of Oracle EBS R12

The Oracle E-Business Suite is a multi-tier distributed computing architecture for business applications. In the EBS model, an *application tier* provides business services to a *client tier* using data in an Oracle database in the *database tier*. The application and database tiers consist of services that run on one or more physical or virtual machines. Figure 1 depicts the Oracle *EBS environment*:

Application tier

Contains the Oracle E-Business Suite application and provides the services to clients.

Database tier

Runs the Oracle database that manages the persistent EBS data, including files that contain tables, indexes, and other database objects. Also contains the database management system executable images and EBS online help information.

The database server communicates with application tier services, which in turn process client-initiated transactions. There is no direct database-client tier communication in an EBS environment.

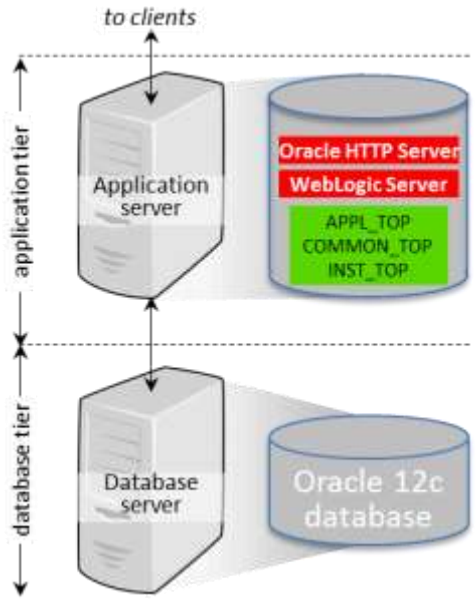

Figure 1: Oracle E-Business Suite Architecture

Cloning EBS Environments

As noted in the introduction, cloning is important to effective EBS utilization. New software releases, changes in application and database configuration, and problem resolution all require unrestricted access to the full environment, but because EBS is typically mission-critical, downtime is seldom if ever acceptable. Recognizing this, Oracle Corporation introduced *RapidClone*[1] technology for environments that utilize version 12c (and newer versions) of the software. RapidClone includes capabilities for creating *images* of EBS environments from which *targets* (clones) can be made, but the images are full copies of both data and software (the latter to guarantee consistent patch levels across tiers), and therefore each one requires incremental storage equal to that of the production environment.

FlashArrays as Storage for Oracle E-Business Suite

The advantages of using FlashArrays to store data for Oracle E-Business Suite deployments go well beyond rapid, economical clone creation:

Rock-solid data reliability

All FlashArrays include redundant hardware that protects against outages caused by component failures. RAID-3D technology protects all data and metadata against a minimum of two, and in many cases more, concurrent read failures. Additionally, multi-path host access maintains connectivity in the event of storage network failures external to the array.

Security for critical data

All data and metadata in a FlashArray, even "in flight" data in NVRAM, is encrypted using AES-256. All SSDs require access keys on startup; arrays refresh keys regularly and distribute them across all SSDs so that more than half of an array's devices are required to unlock any single SSD.

Better overall EBS performance

FlashArrays routinely deliver sub-millisecond response to I/O commands, even when they are close to full capacity and heavily loaded with I/O. With FlashArray storage, multi-hour jobs complete in minutes, systems support more users, and transactions execute faster.

Minimal data center "footprint"

FlashArrays occupy as little as a tenth of the space and require as little as a tenth of the energy for power and cooling compared to disk-based storage solutions.

Technology refresh without "forklift upgrades" or massive data migration

FlashArray components can be replaced, and controller and SSD technology can be upgraded *non-disruptively*, while arrays are serving hosts. With the Pure Storage *Evergreen™ Storage* model, the company offers upgraded controller technology every three years as part of service agreements.

Administrative simplicity

FlashArrays are self-tuning and self-healing; they eliminate many routine administrative tasks common with other types of storage. Arrays manage their physical storage as a single pool, schedule I/O request execution 'fairly,' and automatically recover from read errors and component failures without administrative assistance.

[1] Described in https://docs.oracle.com/cd/E17559_01/em.111/e18709/T508706T512065.htm

FlashArrays support *FlashRecover snapshots*, images of the contents of customer-defined *protection groups* of volumes captured at a single instant. FlashRecover snapshots are *space-saving*—they occupy incremental storage only when hosts overwrite data on the source volumes—and can be created either automatically at regular intervals or on demand. Snapshot creation takes a few seconds, regardless of the number and size of volumes in a protection group. Snapshots are immutable. Once created, their content does not change until they are destroyed. They are only visible to FlashArray administrators.

To use the data image captured by a volume snapshot, a FlashArray administrator creates a *clone volume* by *copying* the snapshot to a new volume.[2] Like the snapshot, the new volume is *space-saving*—it occupies storage only when a host overwrites its contents or the contents of the original volume. In many cases, a production (source) volume, a snapshot, and a clone volume share nearly all data—the volume and its clone only consume storage when hosts overwrite data on them, and the snapshot contents never change.

FlashRecover snapshots are crash-consistent—they capture all writes to all of a protection group's volumes prior to the snapshot instant in their entirety. Because FlashArrays preserve host write order for each volume, snapshots are write-ordered as well. Finally, the snapshots are time-stamped. Thus, FlashRecover snapshots meet Oracle's requirements for database recoverability, so volumes cloned from them can be used to recover Oracle databases to consistent states.

FlashRecover snapshots and the ability to create mountable volumes from them enable significant improvements in managing Oracle E-Business suite environments. The improvements are based on a single FlashArray protection group that contains all application and database tier data volumes. With this structure, an EBS environment can be cloned in seconds, and the clone volumes connected to alternate hosts and clients for development or testing. The ability to recreate production EBS environments quickly and with minimal incremental storage can fundamentally change the way an IT team manages EBS:

Incremental development
Because environments can be cloned in seconds, development can be done in smaller steps, with less to test and verify at each one.

Non-intrusive reporting and backup
Data can be cloned regularly or on demand, and the clones used for backup or report creation. Clone-based backups and reports are based on consistent data, require little or no incremental storage, and interfere minimally with on-going production.

Non-intrusive patch installation and testing
Patches can be applied to and tested on a cloned environment with little or no impact on production.

Accurate root cause analysis
With scheduled FlashRecover snapshots, root cause analysis of production problems can be performed on data cloned from snapshots taken near the time of problem occurrence.

Reliable database structural changes
Database structural changes can be implemented and tested on clone volumes, and when production-ready, applied to production volumes.

The remainder of this report presents an example of the use of FlashRecover snapshots in conjunction with the Oracle RapidClone procedure to clone a simple EBS environment.

[2] Snapshots can also be used to restore the contents of an existing volume to a previous point in time.

Overview of the Example

Figure 2 illustrates the elements of the example in this report. While the majority of EBS environments run on "bare metal" physical servers, for convenience the example uses four virtual servers running Oracle Enterprise Linux® 7.2 hosted by a VMware® ESXi server to demonstrate the concept. Two virtual machines host the source and target application tiers. The other two host the source and target database tiers.

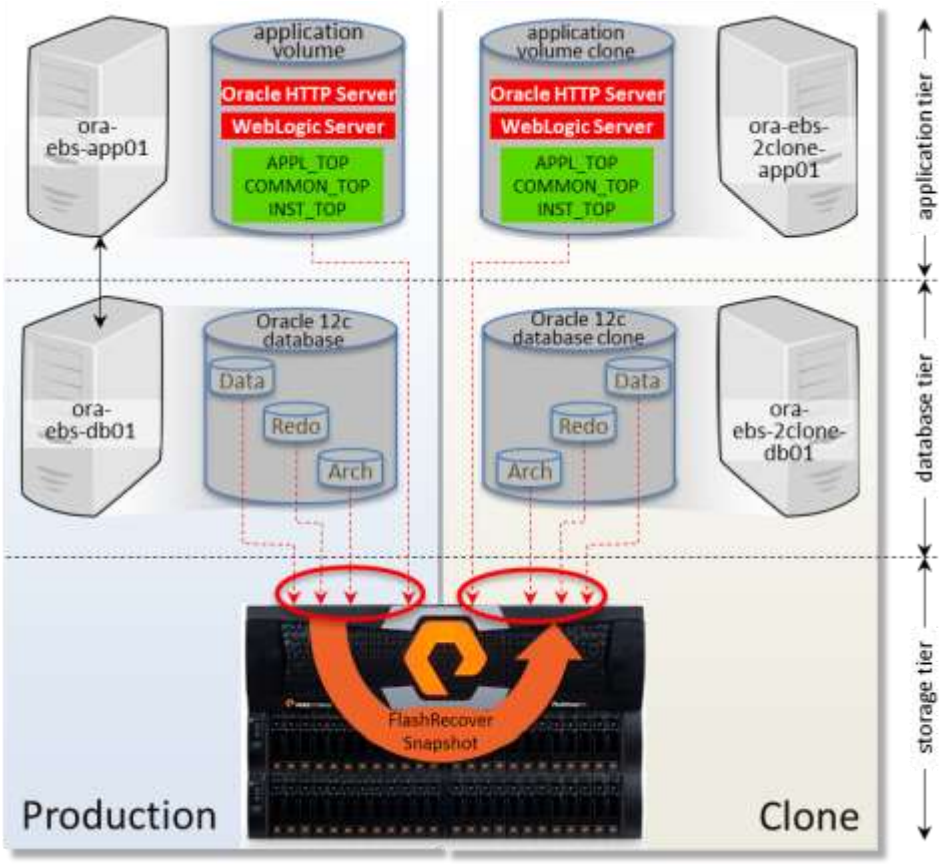

Figure 2: Example Configuration for FlashRecover Cloning of EBS Environment

Both the production application volume and the volumes that contain the production database are virtual volumes (LUNs) presented to their respective virtual hosts by the same FlashArray. All production volumes are members of a single FlashArray *protection group*. The example uses a FlashRecover snapshot to create clones of the production volumes. The clones are attached to and mounted on separate (virtual) hosts that can be used for testing or other purposes with little or no impact on the original production volumes.

Appendix A contains additional hardware and software details about the host and network configuration.

The Cloning Procedure at a Glance

Figure 3 enumerates the steps of the EBS cloning procedure. Blue blocks represent opreations performed on application or database tier hosts. Orange blocks represent operations performed on the shared FlashArray.

As the figure suggests, the procedure has three parts:

- Preparing the EBS environment for cloning
- Creating the FlashArray snapshots and the clones derived from them
- Attaching the cloned volumes to the servers and starting the environment.

The section that follows contains a more detailed description of each step.

Figure 3: The EBS Cloning Process with FlashRecover

Cloning Detail: Step-by-Step

The vSphere Web Client screen capture in Figure 4 shows the pre-configured source and target EBS database and application tier server virtual machines used in this example. Source and target database tiers are hosted by **ora-ebs-db01** and **ora-ebs-2clone-db01** respectively. Source and target application tiers are hosted by **ora-ebs-app01** and **ora-ebs-2clone-app01** respectively.

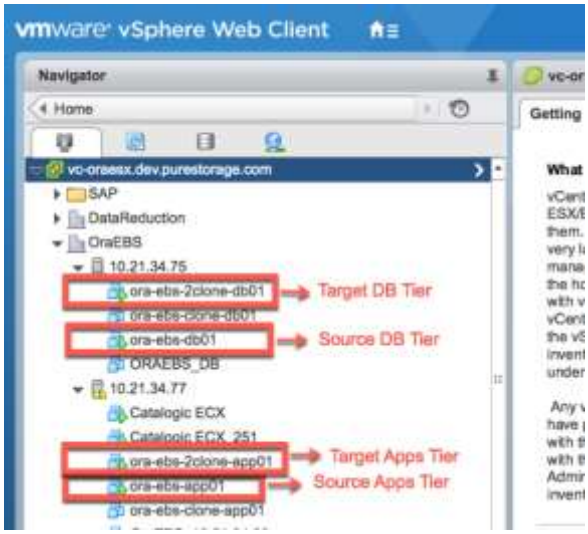

Figure 4: VMware vSphere Web Client View of Source and Target EBS Servers

Part I: Preparing the EBS Environment for Cloning

Step 1

To verify that the EBS environment is up and running, enter the URL for the EBS source environment in a browser search bar to display the EBS login pane and log in as shown in in Figure 5.

Figure 5: Oracle EBS Login Screen

Step 2

On a console, log in to the source database tier server as Oracle user and run the **adpreclone.pl** script to prepare the source database for cloning as shown in the console dialog below.[3] The **adpreclone.pl** perl script is part of the Oracle database software.

```
. /d01/oracle/VIS/12.1.0/VIS_ora-ebs-db01.env
cd /d01/oracle/VIS/12.1.0/appsutil/scripts/VIS_ora-ebs-db01
perl adpreclone.pl dbTier
```

Environment variable values are typically set automatically during software installation and perparation for cloning. Appendix A lists the environment variable settings for this example.

Step 3

Log on to each source application tier server that contains an APPL_TOP as APPLMGR (the example uses a single application tier server) and run the **adpreclone.pl** script, supplied as part of the EBS software, to prepare the application tier for cloning.

```
. /k01/oracle/VIS/fs2/EBSapps/appl/APPSVIS_ora-ebs-app01.env
cd $ADMIN_SCRIPTS_HOME
perl adpreclone.pl appsTier
```

[3] Database tier console dialogs in this report have beige backgrounds; application tier dialog have blue backgrounds.

Part II: Creating Clone Volumes from FlashRecover Snapshots

The screen capture in Figure 6 shows Purity GUI view of the example configuration.

Steps 4 through 8 create a FlashArray protection group containing the application and database source volumes, take a snapshot of the protection group, create clones of each of the volumes, and connect the clone volumes to the respective target hosts.

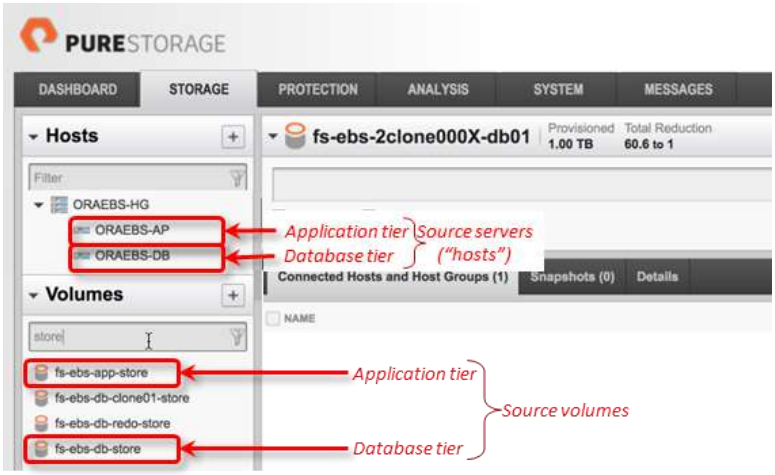

Figure 6: FlashArray GUI View of Source Volumes and Servers

Step 4 **(if required)**

If a protection group containing the database and application tier volumes does not already exist, use any of the FlashArray GUI, CLI, or REST API administrative interfaces to create one and add all database and application tier volumes to it. Figure 7 illustrates the GUI view of protection group **ORAEBSPG** that contains volumes **fs-ebs-db-store** and **fs-ebs-app-store**.

The protection group is only created once, but its membership must be updated whenever volumes are added to or removed from the EBS environment to ensure that snapshots represent the actual environment.

Strictly speaking, snapshots of the application and database tier volumes need not be taken at the same instant (although the volumes in each tier must be snapped atomically), but if all volumes in both tiers are part of the same protection group, target environment patch levels, scripts, environment variables, and other artifacts will be identical to those of the source environment.

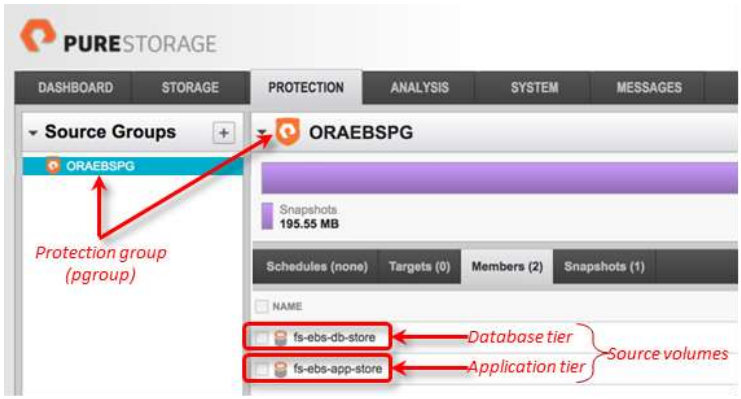

Figure 7: FlashArray GUI View of Protection Group Containing Source EBS Volumes

Step 5

Use any of the FlashArray administrative interfaces to take a snapshot of the source volume protection group. Figure 8 illustrates the FlashArray GUI popup command for taking an on-demand snapshot of the **ORAEBSPG** protection group.

Figure 8: Creating an Atomic Snapshot of All Source EBS Volumes

Step 6

Use any of the FlashArray administrative interfaces to create mountable target database volumes by "copying" each of the source database volumes. Figure 9 illustrates the GUI **Copy Snapshot** command for creating one of the target database volumes for this example.

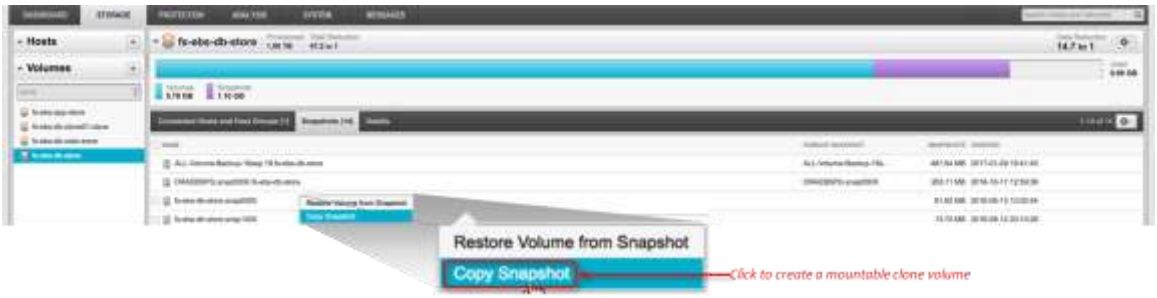

Figure 9: Creating a Target Database Volume by Copying the Snapshot of the Source Volume

Step 7

Use any of the FlashArray administrative interfaces to create mountable target application volumes by "copying" source application volumes. As with database volumes, target application volumes consume no additional physical space when first created. Figure 10 illustrates the GUI command to create a target application volume for this example.

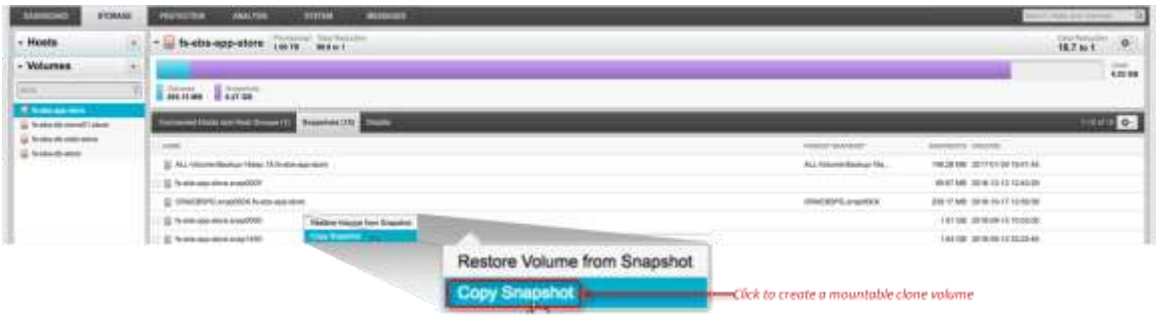

Figure 10: Creating a Target Application Volume by Copying a Snapshot of the Source Volume

Initially, target volume contents are identical to those of the snapshots from which they are created, which in turn are identical to those of the source volumes. Neither snapshots nor target volumes consume any additional physical space until clients write data to either source or target volumes.

Step 8

Use any of the FlashArray administrative interfaces to connect each of the newly-created target database and application volumes to the FlashArray host group that contains the target servers. For example, Figure 11 illustrates the GUI command to connect target database volume **fs-ebs-2clone000X-app01** to target host group **ORAEBS-HG**.

Figure 11: Connecting a Target Volume to the Target Virtual Machines

Part III: Configuring and Activating the Cloned Environment

Step 9 (required if the cloned environment is to run virtual machines)

If the target environment is implemented with virtual machines, attach the cloned volumes to the target virtual machines. Appendix B illustrates the use of the VMware vSphere Web client to attach the cloned volumes to their respective server virtual machines..

Step 10

Log on to the target database tier server as ORACLE_USER and delete the **`oraInventory`** directory created during pre-cloning, along with all of its contents.

```
cd /d01/oracle/oraInventory
rm -rf *
```

Step 11

On the target database tier server, execute the **`adcfgclone.pl`** script (included with the Oracle database software) with the **`dbTechStack`** argument to configure the cloned database.

```
cd /d01/oracle/VIS/12.1.0/appsutil/clone/bin/
./adcfgclone.pl dbTechStack
```

Step 12

On the target database tier server, start the database by executing the **`addbctl.sh`** script. The script is included with the Oracle database software.

```
cd /d01/oracle/VIS/12.1.0/appsutil/scripts
./addbctl.sh start
```

Step 13

On the target database tier server, execute the **adupdlib.sql** script from the **sqlplus** prompt. For Linux operating systems, pass **so** as an argument.

```
cd /d01/oracle/VIS/12.1.0/appsutil/install/VIS_ora-ebs-2clone-db01
sqlplus / as sysdba
SQL>@adupdlid.sql so
```

Step 14

On the target database tier server, execute the **adcfgclone.sql** script to configure the database with a context file, passing the **dbconfig** command and the context file path as an argument (**/d01/oracle/VIS/12.1.0/appsutil/VIS_ora-ebs-2clone.db01.xml** in the dialog below).

```
cd /d01/oracle/VIS/12.1.0/appsutil/clone/bin
./adcfgclone.pl dbconfig /d01/oracle/VIS/12.1.0/appsutil/VIS_ora-ebs-
2clone.db01.xml
```

Step 15

Log on to each target application tier server that contains an APPL_TOP as APPLMGR (the example uses a single application tier server), mount the cloned application tier volume, and delete the oraInventory and FMW_Home directories and all their contents.

```
cd /k01/oracle/oraInventory
rm –rf *
cd /k01/oracle/VIS/fs1
rm –rf FMW_Home
```

Step 16

Execute the **adcfgclone.pl** script on each target application tier server to configure the clone. After the script completes successfully, it prompts the logged-on user to start application tier services.

```
cd /k01/oracle/VIS/fs1/EBSapps/comn/clone/bin
./adcfgclone.pl appsTier
Do you want to startup the Application Services for VIS? (y/n) [y]:
```

Step 17

Enter the target EBS environment's URL in a browser search panel to verify that the target environment is up and running on the target application server. Figure 12 illustrates this for the example server.

Figure 12: Target EBS Environment Login Screen

At this point, the target environment is available for its intended purpose.

Conclusion

Reducing the time and cost of provisioning a test or development environment is critical for organizations that rely on EBS for business applications. In conjunction with Oracle's RapidClone facility, Pure Storage FlashRecover snapshot technology enables users to clone existing E-Business suite environments quickly and with minimal incremental storage consumption. FlashRecover snapshots along with FlashArrays' industry-leading data reduction not only save enormous time and effort but also keeps the incremental hardware cost of snapshots to a minimum.

FlashArray volumes created by cloning occupy space only in proportion to the amount of data that changes on the source volume and the clone. In many instances, this can be less than 1% of a source volume's space, as compared to 100% when full backup and restore techniques are used. Substantial space saving, along with near-instant creation and near-zero impact on source volues combine to make a RapidClone with FlashRecover snapshots a compelling value proposition for EBS users.

Appendix A: Configuration Used in the Example

This appendix lists and describes the components and parameters used for the example in the main body of the report.

Hardware Components

Figure 13 illustrates the hardware configuration used for the example in this paper. The chassis contained 2 identical Intel CPU-based Cisco® UCS B-series B200 M4 blade servers running ESXi and hosting the source and target EBS environments.

The server contains Cisco UCS VIC 1350 cards connecting four ports from each fabric extender in the chassis to the Fabric Interconnect, which were in turn connected to the Cisco MDS 9148S switches for access to the Pure Storage FlashArray//m50 array.

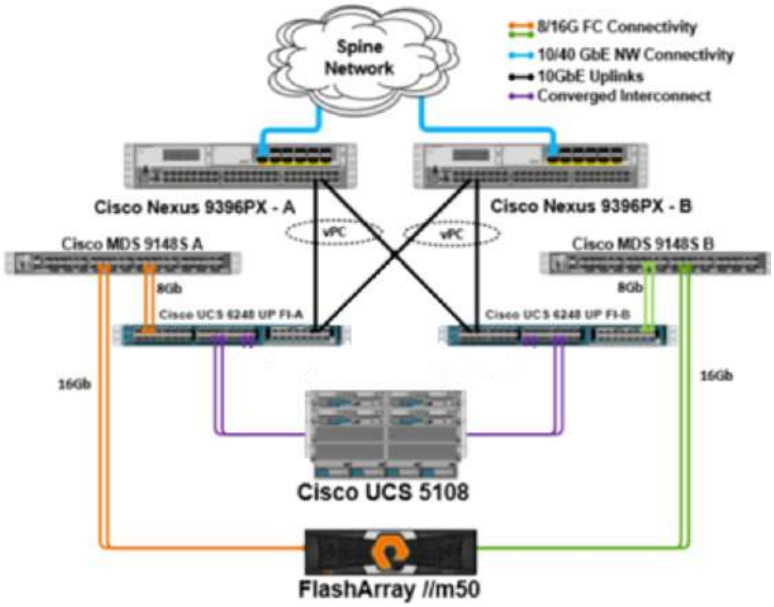

Figure 13: Hardware Configuration Used in the Example

Computing

Component	Description
Processor	2 x Intel® Xeon E5-2697 V3 2.6 GHz (2 CPUs with 14 cores each)
Memory	256GB @ 2.1GHz (8 x 32GB)
HBA	4 x 10G Ports on Cisco UCS VIC 1350 (UCS-IOM-2208XP) 40Gbps
NIC	4 x 10G Ports on Cisco UCS VIC 1350
BIOS	Turbo Boost, Hyper Threading, Virtualization Technology (VT), VT for Directed IO, Intel ATS Support were enabled

Table 1: Computing Resource Details

Network

Component	Description
Cisco UCS 6248UP Fabric Interconnect (FI)	A 1U 48-port 10 Gigabit Ethernet switch configured for End-Host Mode. FIs are typically deployed in redundant pairs providing uniform access to both network and storage.
Cisco Nexus 9396PX	The Cisco UCS 6248UP FI is connected via 10GbE to the Nexus Nexus 9396PX, which is in turn connected to the external network.
Cisco MDS 9148S	The Cisco MDS 9148S 16G Multilayer Fabric Switch includes up to 48 auto-sensing line-rate 16-Gbps Fibre Channel ports in a 1U form factor.

Table 2: Network Resource Details

Storage

Component	Description
Storage	FlashArray//m50 3U chassis running Purity version 4.7.6 software
Capacity	20TB physical flash in the base chassis (11.17 TB usable)
Connectivity	4 x 16 Gb/s redundant Fibre Channel ports per controller 1 Gb/s redundant Ethernet (Management port)

Table 3: Storage Resource Details

Host Software

Component	Description
Compute Layer	VMware vCenter™ Server ESX® or ESXi™ 6.0 VMware vSphere® Client 6.1.0
Source & target server OS	Oracle Enterprise Linux 7.2
Oracle database	Oracle Enterprise Edition 12.1.0.2
Oracle E-Business Suite	Version 12.2 for Linux x86, 64 bit.

Table 4: Host Software Details

Oracle Rapid Clone

RapidClone is an Oracle utility used to clone Oracle application environments, including Oracle E-Business Suite (EBS).

Oracle Environment Variables

For reference, Table 5 shows the database tier environment variables used in the example. Environment variables can be set by sourcing the <RDBMS_ORACLE_HOME>/<CONTEXT_NAME>.env file.

Variable	Value
CONTEXT_FILE	/d01/oracle/VIS/12.1.0/appsutil/VIS_ora-ebs-db01.xml
CONTEXT_NAME	VIS_ora-ebs-db01
HOSTNAME	ora-ebs-db01
ORACLE_BASE	/d01/oracle/VIS
ORACLE_HOME	/d01/oracle/VIS/12.1.0
ORACLE_SID	VIS

Table 5: Database Tier Environment Variables Used in the Example

Table 6 shows the application tier environment variables used in the example. The environment variables can be set by sourcing the <APPL_TOP>/<APPS_CONTEXT_NAME>.env file.

Variable	Value
ADMIN_SCRIPTS_HOME	/k01/oracle/VIS/fs1/inst/apps/VIS_ora-ebs-app01/admin/scripts
AD_TOP	/k01/oracle/VIS/fs1/EBSapps/appl/ad/12.0.0
APPL_TOP	/k01/oracle/VIS/fs1/EBSapps/appl
APPL_CONFIG_HOME	/k01/oracle/VIS/fs1/EBSapps/appl
COMMON_TOP	/k01/oracle/VIS/fs1/EBSapps/comn
CONTEXT_FILE	/k01/oracle/VIS/fs1/inst/apps/VIS_ora-ebs-app01/appl/admin/VIS_ora-ebs-app01.xml
CONTEXT_NAME	VIS_ora-ebs-app01
HOSTNAME	ora-ebs-app01
INST_TOP	/k01/oracle/VIS/fs1/inst/apps/VIS_ora-ebs-app01
ORACLE_HOME	/k01/oracle/VIS/fs1/EBSapps/10.1.2
ORACLE_CONFIG_HOME	/k01/oracle/VIS/fs1/inst/apps/VIS_ora-ebs-app01/ora/10.1.2
ORA_CONFIG_HOME	/k01/oracle/VIS/fs1/inst/apps/VIS_ora-ebs-app01/ora

Table 6: Application Tier Environment Variables Used in the Example

Appendix B: Attaching Cloned Volumes to Virtual Machines

This appendix describes the vSphere Web Client procedure for creating datastores and attaching them to VMware virtual machines.

Step B1

Log in to vSphere as administrator and perform a storage scan as shown in Figure B1 to identify added (and modified) volumes.

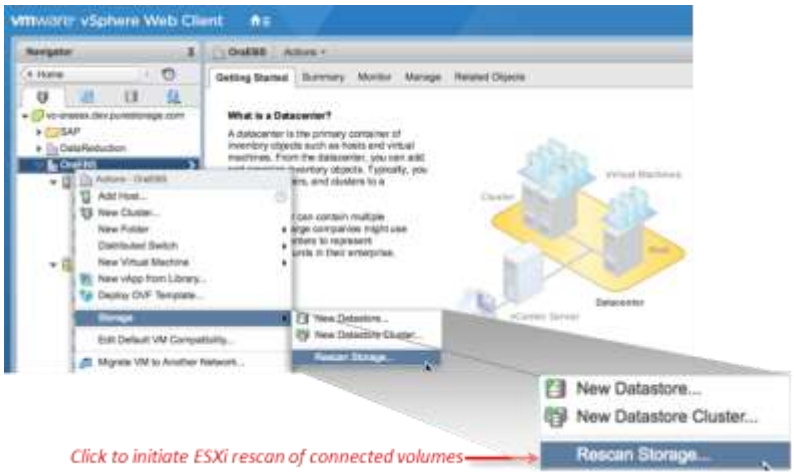

Figure B1:Sphere Storage Rescan

Perform steps B2 through B6 for each of the volumes in the cloned EBS environment.

Step B2

When the rescan completes, initiate new datastore creation by right-clicking on the ECX host's IP address and selecting the **New Datastore** option from the **Storage** menu as shown in Figure B2.

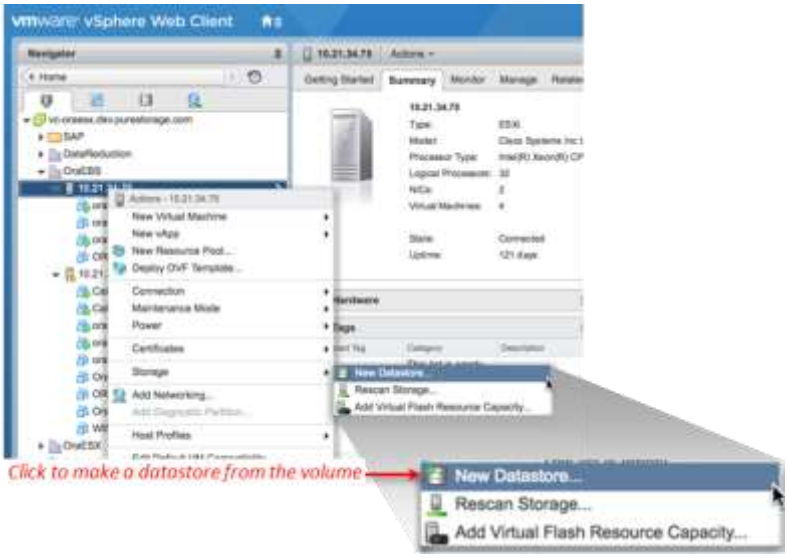

Figure B2: Using vSphere to Create a New Datastore from a Volume

Step B3

In the dialog that displays, select file system type **VMFS** for the datastore.

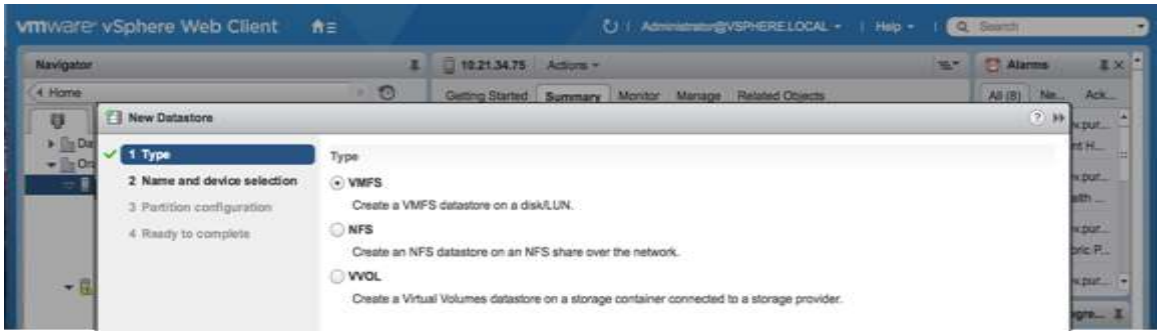

Figure B3: Creating a VMFS File System on a New Datastore

Step B3

In the next dialog pane that displays, name the datastore.

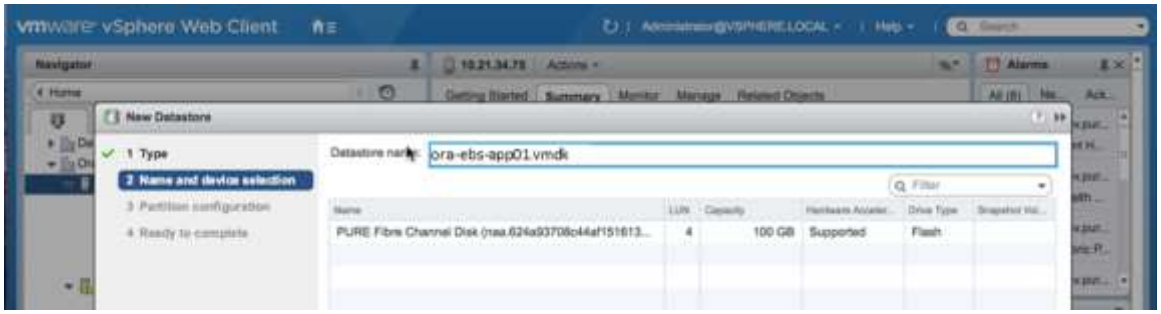

Figure B4: Naming a New Datastore

Step B4

In the next dialog pane, select **Assign a new signature** to re-signature the volume. This avoids duplication of volume uuids and completes creation of the datastore.

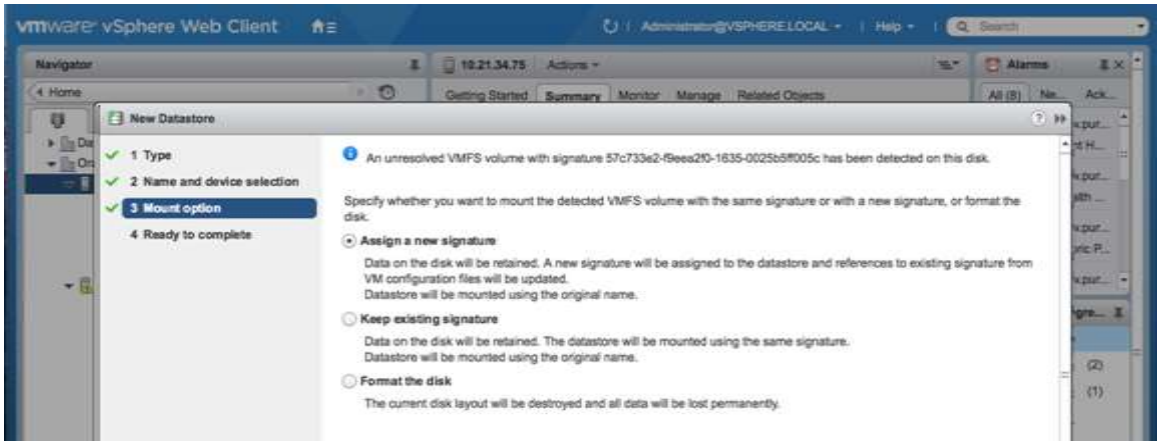

Figure B5: Assigning a New Signature to Complete Datastore Creation

Step B5

Select the target virtual machine to which the new volume is to be attached. Under the Settings tab select the edit option and click on “Existing Hard Disk”.

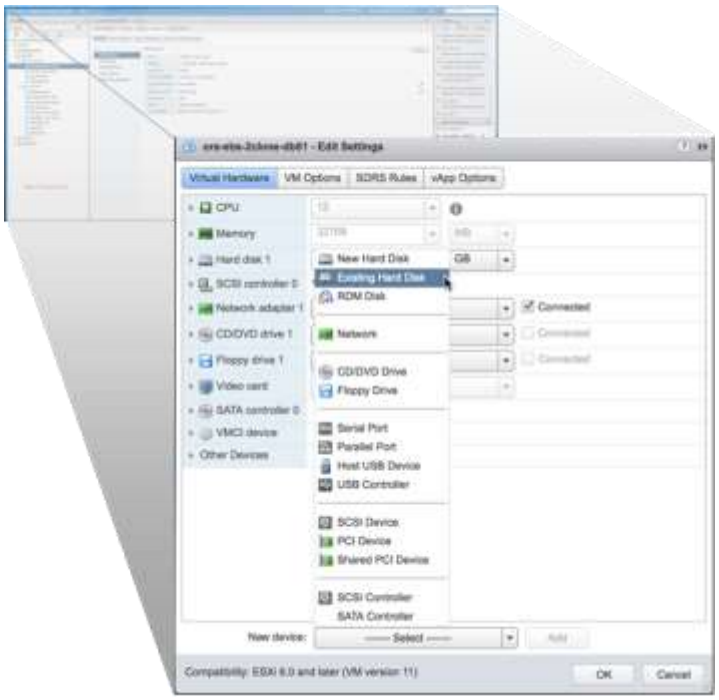

Figure B6: Editing the New Volume Settings

Step B6

Select the datastore in the left pane of the displayed dialog and assign the matching VMDK file as shown in Figure B7.

Repeat steps B2 through B6 for each of the volumes in the cloned EBS environment.

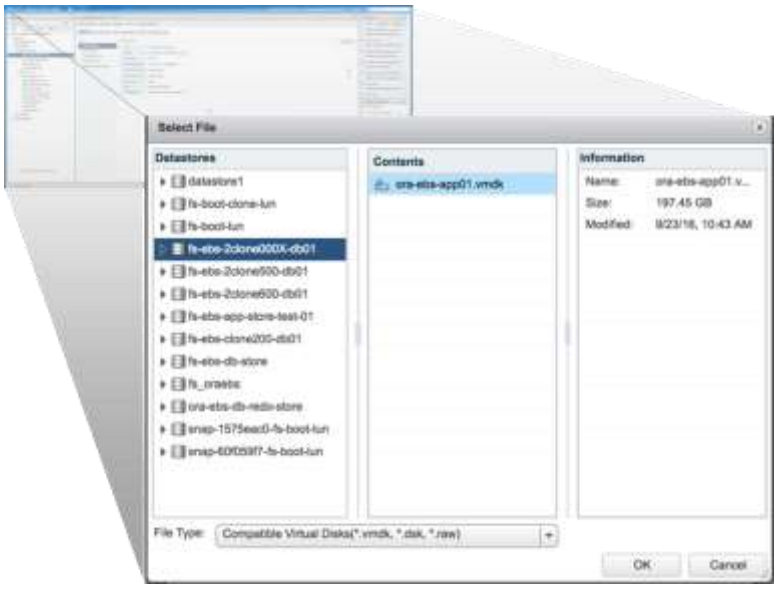

Figure B7: Assigning a VMDK File to the New Volume

Appendix C: Oracle EBS Startup and Shutdown

This appendix contains step-by-step instructions for starting an Oracle E-Business suite instance illustrated by sample console commands.

Starting Oracle E-Business Suite

Step 1

Log in to the database tier server as Oracle user and start the Oracle Database Listener.

```
cd /d01/oracle/VIS/12.1.0/appsutil/scripts/VIS_ora-ebs-db01/
./addlnctl.sh start
```

Step 2

As Oracle user, start the database.

```
cd /d01/oracle/VIS/12.1.0/appsutil/scripts/VIS_ora-ebs-db01/
./addbctl.sh start
```

Step 1

Log in to the application tier server as applmgr user and start all application tier services.

```
$INST_TOP/admin/scripts/adstrtal.sh
```

Stopping Oracle E-Business suite

Step 2

Log in to the database tier server as Oracle user and stop the database.

```
cd /d01/oracle/VIS/12.1.0/appsutil/scripts/VIS_ora-ebs-db01/
./addbctl stop
```

Step 3

As Oracle user the stop the listener.

```
cd /d01/oracle/VIS/12.1.0/appsutil/scripts/VIS_ora-ebs-db01/
./addlnctl.sh stop
```

Step 4

Log in to application tier server as applmgr user, stop all application tier services.

```
$INST_TOP/admin/scripts/adstpall.sh
```

Appendix D: FlashRecover Snapshots vs Conventional Data Copy

Conventional backup-restore copies all data, so copy time is directly proportional to the volume of data. FlashRecover snapshot creation and instantiation time is essentially independent of volume size at about two seconds. Table 7 shows the results of tests run by Pure Storage to compare FlashRecover snapshot creation time to RMAN back up and restore time for volumes of various sizes. Figure 14 presents the same information in graphical form, dramatizing the increase on operational impact of backup-restore cloning as volume sizes increase. The approximately linear relationship between database size and backup and restore time suggests that for much larger databases cloning time can run into hours (roughly 50 minutes per terabyte).

Data Volume (GB)	Backup and Restore time (seconds)	FlashRecover Snapshot Creation time (seconds)
6	20	2
10	32	2
15	49	2

Table 7: Comparison of FlashRecover and Bakup-Restore Clone Creation Times

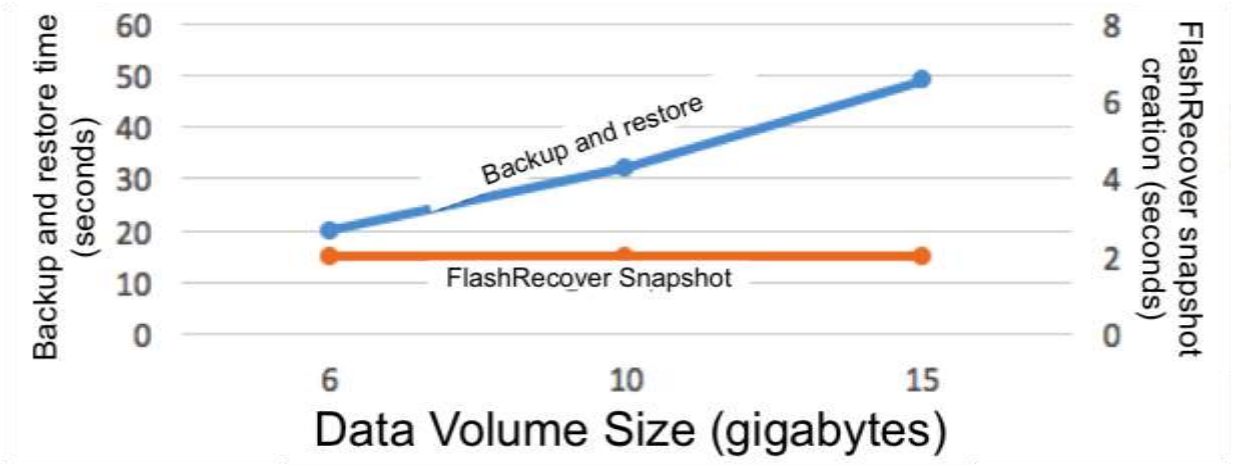

Figure 14: Comparison of FlashRecover and Bakup-Restore Clone Creation Times

About the Author

Sourav Bhattacharya is the Pure Storage Architect for Oracle Solutions. He is responsible for defining ideal database solution architectures that incorporate Pure Storage products and communicating them to customers, performing benchmarks and preparing reference architectures for Oracle databases that incorporate Pure Storage products.

Sourav has over 19 years of experience with Oracle databases that encompass all aspects of implementing, managing, and growing large-scale data platforms. Working in the A-team of the Oracle development organization for over a decade has given him extensive experience with Oracle databases, including Cluster Ready Services (CRS), Real Application Cluster (RAC), Automatic Storage Management (ASM), performance tuning and SQL tuning.

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