

EMC[®] OPEN REPLICATOR MIGRATION FROM HP 3PAR TO EMC VMAX3[™] USING ORACLE DATABASE

ABSTRACT

This white paper describes data transfer using EMC Solution Enabler Open Replicator pull software to transfer disk-to-disk copy from an HP 3PAR to an EMC VMAX3 array.



EMC WHITE PAPER

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Executive summary

Business case

Enterprises today need to create a competitive advantage for their IT infrastructure by placing increasing value on both the location and availability of their Oracle infrastructure. The data needs to be highly available, in the right place, at the right time, and at the right cost to the enterprise.

EMC Solution Enabler Open Replicator Software (ORS) can be used to perform disk-to-disk copy for all third-party arrays listed in the *EMC Support Matrix*, located at <http://elabnavigator.emc.com>, to EMC® storage arrays. One of the rapidly growing applications for the ORS is Oracle database. Investing in Solution Enabler software enables an enterprise's IT/Oracle infrastructure to succeed in this demanding 24x7 world.

Customers may also want to transfer or optimize their database by using an EMC VMAX3™. A refresh of old third-party arrays to VMAX3 can provide better availability, performance, and manageability.

This paper illustrates a live data transfer using Solution Enabler Open Replicator pull software to transfer disk-to-disk copy from an HP 3PAR E200 to an EMC VMAX3 array. All of this data movement was completed without any outage to the application. This type of data relocation offers a significant advantage in 24x7 production level environments.

Solution overview

The EMC VMAX3 is the first storage array that allows the Oracle DBA to tune storage-related database performance by assigning and adjusting service levels. Thus, the DBA can focus on the specific performance issue, rather than the specific implementation details required addressing that issue. A simple, single-click adjustment to the service levels for a specific pluggable database (PDB) is all that is required to address storage-related performance concerns.

Another feature of the VMAX3 is the integration with EMC ProtectPoint™ and EMC Data Domain® to allow the Oracle DBA to create full backups with the same performance and capacity cost as incremental backups. This provides optimal RTO/RPO while also reducing backup complexity.

EMC Open Replicator software enables movement of disk-to-disk data transfer within the Symmetrix VMAX3 array, nondestructive to the host and the Oracle infrastructure.

Key results and recommendations

Solution Enabler software enables an enterprise's IT/Oracle infrastructure to succeed in this demanding 24x7 world with the following success factors:

- Availability
- Performance and scalability
- Manageability

Introduction

As part of overall Oracle data movement process one can use many migration tools EMC offers. These include but not limited to Open Replicator, TimeFinder®, and SRDF® solutions.

In VMAX3, ORS has undergone an architectural change to be more sensitive to host IO, which will result in minimal impact on overall response time. ORS has been structured to be more flexible and dynamic on the port assignments. This new underlying support has resulted in changes to Solutions Enabler (SE) ORS functionality in several areas.

The first release of ORS in VMAX3 supports a maximum of 512 concurrent ORS sessions. For near future only ORS pull sessions are supported with one target per session, scaling up to 512 sessions supporting 512 targets. The functions related to the setting of port throughput ceilings and the reporting of port throughput utilization have changed to reflect the changes to directors and the number of ports.

Prior to Solution Enabler (SE) 8.0.1, ORS control devices were mapped to at least one port for both hot and cold sessions. With the new microcode, SE will not perform this check. Data Services layer within VMAX3 will now dynamically find directors and ports that can access an ORS session's remote devices and it will use these directors and ports for the data transfer. Also prior to 5977, hot ORS sessions required that all ports mapped to the control device have access to the remote device. This restriction has been removed.

Purpose

This paper illustrates a live data transfer using Solution Enabler Open Replicator pull software to transfer disk to disk copy from an HP 3PAR E200 to an EMC VMAX3 array. All of this data movement was completed without any outage to the application. This type of data relocation offers a significant advantage in 24x7 production level environments.

Scope

This white paper uses an HP 3PAR E200 array as the source to test the Open Replicator software. Oracle database residing on a 3PAR array can be transferred to VMAX3 using the latest Open Replicator software. ORS is capable of dynamic movement of data between 3PAR and VMAX3 by using the Pull capabilities of ORS software.

Audience

This white paper is intended for Systems administrators, Storage administrators, and IT architects responsible for architecting, creating, managing, and using IT environments that focus on continuous availability solutions with HP and EMC storage technologies. The white paper assumes readers are familiar with HP 3PAR, Open Replicator Software (ORS), and the EMC Storage array technologies.

Key technology components

This section provides basic information on the key technology components used in this white paper.

EMC VMAX3

The EMC VMAX3 family includes VMAX 100K, 200K, and 400K arrays, delivering the latest in Tier-1 scale-out multi-controller architecture with consolidation and efficiency for the enterprise. With completely redesigned hardware and software, the new VMAX 100K, 200K, and 400K arrays provide unprecedented performance and scale. Ranging from the single or dual engine VMAX 100K up to the 8-engine VMAX 400K, these arrays offer dramatic increases in floor tile density with engines and high capacity disk enclosures for both 2.5" and 3.5" drives consolidated in the same system bay.

In addition, VMAX 100K, 200K, and 400K can be configured as either hybrid or all-flash arrays. All VMAX3 models come fully pre-configured from the factory to significantly shorten the time from installation to first I/O.

The Dynamic Virtual Matrix Architecture enables IT departments to build storage systems that transcend the physical constraint of competing array architectures. The architecture allows scaling of system resources through common and fully redundant building blocks called VMAX3 engines. VMAX3 engines provide the complete foundation for high-availability storage arrays. Each engine contains two VMAX3 directors and redundant interfaces to the new Dynamic Virtual Matrix dual InfiniBand® fabric interconnect. Each director consolidates front-end, global memory, and back-end functions, enabling direct memory access to data for optimized I/O operations. Depending on the array chosen, up to eight VMAX3 engines can be interconnected via a set of active fabrics that provide scalable performance and high availability.

EMC VMAX3 Storage core allocation

VMAX3 introduces the “Dynamic Virtual Matrix,” by using multiple CPU cores within the system. With the largest VMAX 400K system, there are 384 CPU cores which can be allocated to:

- Front-end resources
- Back-end resources
- Data services

Systems ports are no longer mapped directly to CPU resources. CPU resources are allocated as needed from a pool (front-end, back-end, or data services pool) of CPU cores, which can service all activity in the VMAX3 array. The allocation of cores can be balanced, which is the default, or biased towards front-end or back-end. The allocation is configurable online by EMC support staff.

EMC HYPERMAX OS

VMAX3 arrays introduce the industry's first open storage and hypervisor-converged operating system, HYPERMAX OS. It combines industry-leading high availability, I/O management, quality of service, data integrity validation, storage tiering, and data security with an open application platform.

HYPERMAX OS features the first real-time, nondisruptive storage hypervisor that manages and protects embedded services by extending VMAX3 high availability to services that traditionally would have run external to the array. It also provides direct access to hardware resources to maximize performance. The hypervisor can be nondisruptively upgraded.

HYPERMAX OS runs on top of the Dynamic Virtual Matrix using its scale-out flexibility of cores, caches, and host interfaces. The embedded storage hypervisor reduces external hardware and networking requirements, while it delivers higher levels of availability and dramatically lower latency.

EMC Solutions Enabler Open Replicator for Symmetrix

Open Replicator for Symmetrix (ORS) enables remote point-in-time copies to be used for data mobility, remote vaulting, and migration between VMAX3 arrays and qualified storage arrays with full or incremental copy capabilities. ORS can:

- Pull from source volumes on qualified remote arrays to a VMAX volume
- Perform online data migrations from qualified storage to VMAX with minimal disruption to host applications

Note: ORS support of SRDF and TimeFinder is not supported with HYPERMAX OS.

Oracle infrastructure

The Oracle components used to create the Oracle infrastructure is explained in this section.

Oracle Database 12c

Oracle Database 12c Enterprise Edition delivers industry-leading performance, scalability, security and reliability on a choice of clustered or single servers running Windows, Linux, and UNIX. It provides comprehensive features easily managing the most demanding transaction processing, business intelligence, and content management applications.

Oracle Automatic Storage Management (ASM)

Oracle ASM is an integrated database filesystem and disk manager. With ASM, filesystem and volume management capabilities are built into the Oracle database kernel. This reduces the complexity of managing the storage for the database.

In addition to providing performance and reliability benefits, ASM can also increase database availability because disks can be added or removed without shutting down the Oracle 12c database. ASM automatically rebalances the files across the disk

group after disks have been added or removed. It supports single-instance Oracle databases and Oracle Real Application Clusters (RAC). ASM is Oracle's recommended volume manager solution.

ASM disks are the storage devices provisioned to ASM disk groups. In this environment an ASM disk corresponds to a LUN in the Symmetrix storage array. The devices are seen by the operating system as block devices. Oracle recommends using Oracle ASMLib on Linux. ASMLib enables the Linux kernel to discover and access block devices used for the Oracle database. It provides device naming and permission persistency.

An ASM disk group is a collection of disks that ASM manages as a unit. The contents of the files stored in a disk group are evenly striped across all the disks in the disk group.

ASM files are allocated from disk groups and behave as any other type of Oracle database file.

An ASM file is completely contained within a single disk group. ASM automatically generates ASM filenames when creating parameter files, controlfiles, redo logs, tempfiles, and datafiles.

Oracle data relocation

This section describes the limitations, setup information, and use case environmental profile, and steps to create Open Replicator Hot Pull migration from HP 3PAR to VMAX3 used by EMC E-Lab™ that illustrates the VMAX3 Oracle data movement. The use case demonstrates methods of data movement using EMC ORS software. The source disk arrays used in this procedure are 3PAR arrays. The destinations are EMC VMAX3 storage systems.

Limitations

Note the following limitations:

- Data migration to EMC VMAX storage systems needs to use data device.
- For maximum LUN size and LUN numbers, refer to [EMC Online Support](#) for EMC Open Replicator documentation. Contact PSE for the maximum size of migration volume and number of maximum concurrent migrations.
- Servers using LUNS from a storage array are only permitted to see those LUNs that they should use and do not see those LUNs that they should not use. Limitations on the functionality of EMC Open Replicator migrations from 3PAR to VMAX is outlined below:
 - On the VMAX, a device file created contains both initiators and LUNs, with rules to prevent duplicate access.
 - 3PAR systems use initiator groups to map various LUNs, with rules to prevent duplicate access.
 - There is no iSCSI support with third-party arrays.
- Open Replicator migration cannot do incremental pull copies from a remote source, such as 3PAR.

Setup

- Source and Target server software version
 - Oracle Linux Server release 6.4 (UEK Kernel - Linux Ben-2 2.6.39-00.17.1.el6uek.x86_64)
 - Oracle Database 12c Enterprise Edition Release 12.1.0.2.0 - 64bit Production
 - Oracle ASMLib version - oracleasm-lib-2.0.4-1.el6.x86_64
- Device Layout

Disk Group	Disk Group purpose	ASM device path	3PAR ARRAY Source LUN S/N	Capacity (kb)	VMAX3 ARRAY Target SID:LUN#	Capacity (kb)
DATA	Data Files	/dev/oracleasm/disks/VOL1	2AC00776	10485760	000196700557:00060	17675520
		/dev/oracleasm/disks/VOL2	2AC00777	10485760	000196700557:00061	17675520
FRA	Flash Recovery Area	/dev/oracleasm/disks/VOL3	2AC00778	10485760	000196700557:00062	17675520
		/dev/oracleasm/disks/VOL4	2AC00779	10485760	000196700557:00063	17675520
		/dev/oracleasm/disks/VOL5	2AC0077A	10485760	000196700557:00064	17675520

Use case environment profile

The use case environment consists of two storage arrays, a source HP 3PAR E200 array and a target EMC VMAX3. A database was created on the source 3PAR array, distributed across five devices, and migrated to the target VMAX3. In the following use case two UCS blade servers were used for the Oracle database. One server is used for the source while the other one is used for the destination server. Both servers were running Oracle Linux release 6.4.

Table 1 outlines the software and hardware components used.

Components	Description
VMAX3	EMC Engenuity™ 5977
HP 3PAR E200	Array code v2.3.1
2 x UCS Blade Servers	Oracle Linux 6.4
Solution Enabler	v8.0.2
Oracle	<ul style="list-style-type: none">Enterprise Edition 12cAutomatic Storage Management (ASM)

Open Replicator Hot Pull migration from HP 3PAR to VMAX3 steps

This section provides steps for migrating EMC Open Replicator from HP 3PAR to the EMC VMAX3 storage system. Figure 1 shows an example of the topology used in this section.

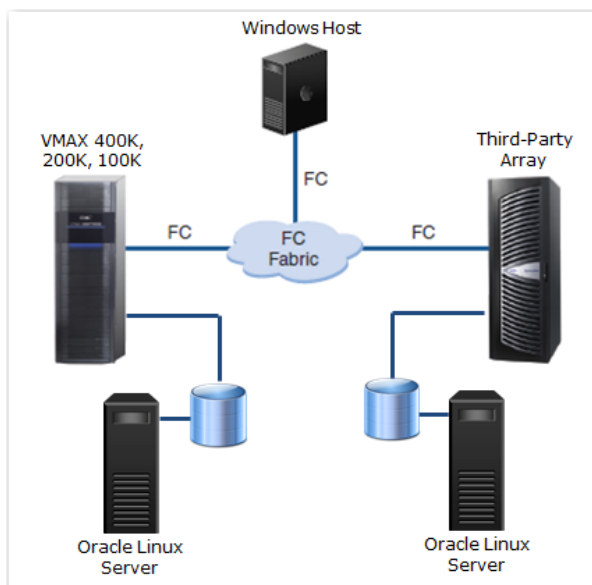


Figure 1. Open Replicator session example

The following steps were used to perform the database migration. The commands were issued using EMC Solutions Enabler (SE) Open Replicator Software (ORS).

Step 1: Create VMAX target LUNs:

1. Use a tool, such as the EMC Unisphere for VMAX (univmax), to create VMAX3 devices for this migration.
2. Install Solution Enabler v8.x on a workstation with access to the VMAX3.
3. Complete the following steps to make sure VMAX3 is visible:
 - a. Check the version of symcli.
 - b. Discover the VMAX3.

```
C:\>symcli
```

```
Symmetrix Command Line Interface (SYMCLI) Version T8.0.2.114 (Edit Level: 2000) built with SYMAPI Version T8.0.2.114 (Edit Level: 2000)
```

```
C:\>symcfg list
```

```

                S Y M M E T R I X
                Mcode   Cache      Num Phys   Num Symm
SymmID      Attachment Model  Version  Size (MB)  Devices   Devices
-----
000196700557 Local    VMAX200K  5977     198656     18        966
```

Step 2: Create VMAX device file:

VMAX devices being used by the Oracle database on the source 3PAR and associated devices on the target VMAX3 were configured, creating this file enabling to take part in the hot pull migration process. A device file was created to include the hot pull devices. This device file contained local devices on the left, with their corresponding target devices on the right for all Oracle components:

```
3Par-pull.txt
Symdev=000196700575:0072 wwn=50002AC007760520
Symdev=000196700575:0073 wwn=50002AC007770520
Symdev=000196700575:0074 wwn=50002AC007780520
Symdev=000196700575:0075 wwn=50002AC007790520
Symdev=000196700575:0076 wwn=50002AC0077A0520
```

Step 3: Create ORS hot pull sessions with donor update

```
C:\>symrcopy create -copy -name Ben_1 -pull -hot -donor_update -file 3Par-pull.txt -nop -v
```

```
'Create' operation execution is in progress for the device list in device file '3Par-pull.txt'. Please wait...
```

STARTING a REMOTE Copy CREATE (PULL) (HOT) (NODIFFERENTIAL) (COPY) (DONOR UPDATE)

SELECTING Control device - Remote devices:

```
(Ctl)Sym: 000196700557 Device: 00060 - LUN WWN: 50002AC007760520 -[SELECTED]
(Ctl)Sym: 000196700557 Device: 00061 - LUN WWN: 50002AC007770520 -[SELECTED]
(Ctl)Sym: 000196700557 Device: 00062 - LUN WWN: 50002AC007780520 -[SELECTED]
(Ctl)Sym: 000196700557 Device: 00063 - LUN WWN: 50002AC007790520 -[SELECTED]
(Ctl)Sym: 000196700557 Device: 00064 - LUN WWN: 50002AC0077A0520 -[SELECTED]
```

STARTING a RCOPY 'CREATE' operation.

SELECTING Control device - Remote devices:

```
(Ctl)Sym: 000196700557 Device: 00060 - LUN WWN:50002AC007760520 -[CREATED]
(Ctl)Sym: 000196700557 Device: 00061 - LUN WWN:50002AC007770520 -[CREATED]
(Ctl)Sym: 000196700557 Device: 00062 - LUN WWN:50002AC007780520 -[CREATED]
(Ctl)Sym: 000196700557 Device: 00063 - LUN WWN:50002AC007790520 -[CREATED]
(Ctl)Sym: 000196700557 Device: 00064 - LUN WWN:50002AC0077A0520 -[CREATED]
```

The REMOTE Copy 'CREATE' operation SUCCEEDED.

'Create' operation successfully executed for the device list in device file '3Par-pull.txt'.

Step 4: Connect to the Oracle database on source server and create a table in user schema

```
[root@Ben-2 ~]# su - oracle
[oracle@Ben-2 ~]$ sqlplus user1/user1
```

SQL*Plus: Release 12.1.0.2.0 Production on Thu Nov 6 10:58:47 2014

Copyright (c) 1982, 2014, Oracle. All rights reserved.

Last Successful login time: Wed Nov 05 2014 03:43:44 -05:00

Connected to:

Oracle Database 12c Enterprise Edition Release 12.1.0.2.0 - 64bit
Production

With the Partitioning, Automatic Storage Management, OLAP, Advanced
Analytics
and Real Application Testing options

```
SQL> create table ORS_MIG_TEST_2 as select * from CF1;
```

Table created.

```
SQL> insert into ORS_MIG_TEST_2 select * from CF1;
10000 rows created.
```

```

SQL> commit;

Commit complete.

SQL> select count(*) from CF1;

  COUNT(*)
-----
      10000

SQL> select count(*) from ORS_MIG_TEST_2;

  COUNT(*)
-----
      20000

SQL>

[oracle@Ben-2 ~]$ exit
Logout

```

Step 5: Stop Oracle Database and ASM instance on source server

Shutdown database

```

[root@Ben-2 ~]# su - oracle
[oracle@Ben-2 ~]$ export ORACLE_SID=MIGV3
[oracle@Ben-2 ~]$ export ORACLE_HOME=/oracle/12c/db
[oracle@Ben-2 ~]$ sqlplus "/ as sysdba"

SQL*Plus: Release 12.1.0.2.0 Production on Thu Nov 6 11:26:35 2014

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Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.2.0 - 64bit
Production
With the Partitioning, Automatic Storage Management, OLAP, Advanced
Analytics and Real Application Testing options

SQL> shutdown immediate
Database closed.
Database dismounted.
ORACLE instance shut down.
SQL> exit
Disconnected from Oracle Database 12c Enterprise Edition Release
12.1.0.2.0 - 64bit Production
With the Partitioning, Automatic Storage Management, OLAP, Advanced
Analytics
and Real Application Testing options

```

Shutdown AMS Instance

```
[oracle@Ben-2 ~]$ export ORACLE_SID=+ASM
[oracle@Ben-2 ~]$ export ORACLE_HOME=/oracle/12c/grid
[oracle@Ben-2 ~]$ sqlplus "/ as sysasm"
```

SQL*Plus: Release 12.1.0.2.0 Production on Thu Nov 6 11:29:15 2014

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Connected to:

Oracle Database 12c Enterprise Edition Release 12.1.0.2.0 - 64bit
Production

With the Automatic Storage Management option

```
SQL> shutdown immediate
ASM diskgroups dismounted
ASM instance shutdown
SQL> exit
```

Disconnected from Oracle Database 12c Enterprise Edition Release
12.1.0.2.0 - 64bit Production

With the Automatic Storage Management option

Step 6: Activate ORS sessions and query sessions

```
C:\>symrcopy activate -file 3par-Pull.txt -nop
```

'Activate' operation execution is in progress for the device list
in device file '3par-Pull.txt'. Please wait...

'Activate' operation successfully executed for the device list
in device file '3par-Pull.txt'.

```
C:\>symrcopy query -file 3par-Pull.txt -nop
```

Device File Name : 3par-Pull.txt

Control Device	Remote Device	Flags	Status	Done

	Protected			
SID:symdev	Tracks Identification	RI CDSHUTZ	CTL <=> REM	(%)

000196700557:00060	73531 50002AC007760520	.W X..XXS.	CopyInProg	10
000196700557:00061	73178 50002AC007770520	.W X..XXS.	CopyInProg	10
000196700557:00062	73648 50002AC007780520	.W X..XXS.	CopyInProg	10
000196700557:00063	73253 50002AC007790520	.W X..XXS.	CopyInProg	10
000196700557:00064	73639 50002AC0077A0520	.W X..XXS.	CopyInProg	10

Total	-----			
Track(s)	367249			
MB(s)	45906.1			

Step 7: Bring up the Oracle database on the target server

```
[oracle@Ben-1 ~]$ export ORACLE_SID=+ASM
[oracle@Ben-1 ~]$ export ORACLE_HOME=/oracle/12c/grid
[oracle@Ben-1 ~]$ sqlplus "/" as sysasm"
```

SQL*Plus: Release 12.1.0.2.0 Production on Wed Nov 5 23:31:23 2014

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Connected to an idle instance.

SQL> **startup**

ASM instance started

```
Total System Global Area 1140850688 bytes
Fixed Size                  2933400 bytes
Variable Size               1112751464 bytes
ASM Cache                   25165824 bytes
ASM diskgroups mounted
ASM diskgroups volume enabled
```

SQL> **exit**

Disconnected from Oracle Database 12c Enterprise Edition Release
12.1.0.2.0 - 64bit Production

With the Automatic Storage Management option

```
[oracle@Ben-1 ~]$ export ORACLE_HOME=/oracle/12c/db
[oracle@Ben-1 ~]$ export ORACLE_SID=MIGV3
[oracle@Ben-1 ~]$ sqlplus "/" as sysdba"
```

SQL*Plus: Release 12.1.0.2.0 Production on Wed Nov 5 23:35:06 2014

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Connected to an idle instance.

SQL> **startup**

ORACLE instance started.

```
Total System Global Area 2466250752 bytes
Fixed Size                  3713816 bytes
Variable Size               838862056 bytes
Database Buffers           1610612736 bytes
Redo Buffers                13062144 bytes
Database mounted.
Database opened.
```


Wait for the ORS session to complete

```
C:\> symrcopy query -file 3par-Pull.txt -nop
```

```
Device File Name      : 3par-Pull.txt

Control Device      Remote Device      Flags      Status      Done
-----
Protected
SID:symdev          Tracks      Identification  RI CDSHUTZ  CTL <=> REM  (%)
-----
000196700557:00060  0          50002AC007760520 .W X..XXS.  Copied      100
000196700557:00061  0          50002AC007770520 .W X..XXS.  Copied      100
000196700557:00062  0          50002AC007780520 .W X..XXS.  Copied      100
000196700557:00063  0          50002AC007790520 .W X..XXS.  Copied      100
000196700557:00064  0          50002AC0077A0520 .W X..XXS.  Copied      100

Total      -----
Track(s)      0
MB(s)        0.0
```

Step 8: Connect to the Oracle database on target server and check the test table data

```
[oracle@Ben-1 ~]$ sqlplus user1/user1
```

```
SQL*Plus: Release 12.1.0.2.0 Production on Wed Nov 5 23:37:58 2014
```

```
Copyright (c) 1982, 2014, Oracle. All rights reserved.
```

```
Last Successful login time: Thu Nov 06 2014 10:58:48 -05:00
```

```
Connected to:
```

```
Oracle Database 12c Enterprise Edition Release 12.1.0.2.0 - 64bit  
Production
```

```
With the Partitioning, Automatic Storage Management, OLAP, Advanced  
Analytics  
and Real Application Testing options
```

```
SQL> select count(*) from ORS_MIG_TEST_2;
```

```
  COUNT(*)  
-----  
      20000
```

```
SQL>
```

Step 9: Turn off donor update using -consistent option

```
C:\> symrcopy -file 3Par-Pull.txt set donor_update off -consistent -nop
```

```
'Set Donor Update Off' operation execution is in progress for the device  
list in device file '3Par-Pull.txt'. Please wait...
```

```
'Set Donor Update Off' operation successfully executed for the device  
list in device file '3Par-Pull.txt'.
```

Step 10: Terminate ORS session

```
C:\> symrcopy -file 3par-Pull.txt terminate -nop
```

```
'Terminate' operation execution is in progress for the device list  
in device file '3par-Pull.txt'. Please wait...
```

```
'Terminate' operation successfully executed for the device list  
in device file '3par-Pull.txt'.
```

Step 11: Bring up the Oracle database on the Source server

```
[oracle@Ben-2 ~]$ export ORACLE_SID=+ASM  
[oracle@Ben-2 ~]$ export ORACLE_HOME=/oracle/12c/grid  
[oracle@Ben-2 ~]$ sqlplus "/ as sysasm"
```

```
SQL*Plus: Release 12.1.0.2.0 Production on Thu Nov 6 13:11:33 2014
```

```
Copyright (c) 1982, 2014, Oracle. All rights reserved.
```

```
Connected to an idle instance.
```

```
SQL> startup  
ASM instance started
```

```
Total System Global Area 1140850688 bytes  
Fixed Size 2933400 bytes  
Variable Size 1112751464 bytes  
ASM Cache 25165824 bytes  
ASM diskgroups mounted
```

```
SQL> exit  
Disconnected from Oracle Database 12c Enterprise Edition Release  
12.1.0.2.0 - 64bit Production  
With the Automatic Storage Management option
```

```
[oracle@Ben-2 ~]$  
[oracle@Ben-2 ~]$ export ORACLE_SID=MIGV3  
[oracle@Ben-2 ~]$ export ORACLE_HOME=/oracle/12c/db  
[oracle@Ben-2 ~]$ sqlplus "/ as sysdba"
```

```
SQL*Plus: Release 12.1.0.2.0 Production on Thu Nov 6 13:13:36 2014
```

```
Copyright (c) 1982, 2014, Oracle. All rights reserved.
```

```
Connected to an idle instance.
```

```
SQL> statrup  
SP2-0042: unknown command "statrup" - rest of line ignored.  
SQL> startup  
ORACLE instance started.
```

```
Total System Global Area 2466250752 bytes  
Fixed Size 3713816 bytes  
Variable Size 838862056 bytes
```

```
Database Buffers          1610612736 bytes
Redo Buffers              13062144 bytes
Database mounted.
Database opened.
SQL> exit
Disconnected from Oracle Database 12c Enterprise Edition Release
12.1.0.2.0 - 64bit Production
```

With the Partitioning, Automatic Storage Management, OLAP, Advanced Analytics

EMC Open Replicator advantage

The migration is now fully completed and no interruption or manual operation from the customer's application perspective was necessary. The above commands were issued using Solutions Enabler ORS.

Solution Enabler ORS terminated after the completion of this process nondisruptively between different storage tiers.

All of this data movement was completed without any outage to the application. This type of data relocation offers a significant advantage in 24x7 production level environments.

Conclusion

Enterprises today need to create a competitive advantage for their IT infrastructure by placing increasing value on both the location and availability of their Oracle infrastructure. The data needs to be highly available and the data needs to be in the right place, at the right time and at the right cost to the enterprise.

The migration had no interruption or manual operation from the customer's application perspective. Solution Enabler ORS terminated after the completion of this process nondisruptively between different storage tiers. All of this data movement was completed without any outage to the application. This type of data relocation offers a significant advantage in 24x7 production level environments.

Therefore, investing in Solution Enabler software enables an enterprise's IT/Oracle infrastructure to succeed in this demanding 24x7 world with the following success factors:

Availability:

The solution illustrated the ease with which data can be moved by using the SE ORS. ORS illustrates the capability doing a disk to disk copy, across different storage tiers to ensure the highest availability service levels to the customer, without disruption to the Oracle database. Data remains fully available to systems and applications that require that information, throughout the migration across the different tiers of data storage

Performance/scalability:

The EMC VMAX3 system delivers scalable performance to meet the most demanding access, protection, and distribution requirements.

Manageability:

Solution Enabler enables ease-of-use management of new storage tiers. With this no disruptive method of data movement using Solutions Enabler, the storage administrators can monitor the data movement progress visually and, once completed, it is transparent where their Oracle data resides on the storage array. This is a far more effective solution for data movement online and avoids any extra cycle's necessary to complete an offline migration. This creates operational efficiency within the enterprise's IT/Oracle infrastructure. Those enterprise people resources (storage and Oracle administrators) can now be deployed on other pressing enterprise storage and Oracle issues.

References

The following document is located on EMC Support Zone at <https://support.emc.com>.

- *EMC VMAX3 with Oracle Database 12c White Paper*