The science behind the report:

Upgrade to Dell EMC PowerEdge R940 servers with VMware vSphere 7.0 and gain greater OLTP performance

This document describes what we tested, how we tested, and what we found. To learn how these facts translate into real-world benefits, read the report *Upgrade to Dell EMC PowerEdge R940 servers with VMware vSphere 7.0 and gain greater OLTP performance*.

We concluded our hands-on testing on October 12, 2020. During testing, we determined the appropriate hardware and software configurations and applied updates as they became available. The results in this report reflect configurations that we finalized on August 20, 2020 or earlier. Unavoidably, these configurations may not represent the latest versions available when this report appears.

Our results

	Dell EMC PowerEdge R930	Dell EMC PowerEdge R940	% win for PowerEdge R940
Operations per minute (median result, normalized)	1.00	1.30	30%

System configuration information

Table 1: Detailed information on the system we tested.

System configuration information	Dell EMC PowerEdge R940	Dell EMC PowerEdge R930
BIOS name and version	Dell 2.8.1	Dell 2.8.1
Non-default BIOS settings	N/A	N/A
Operating system name and version/build number	VMware ESXi™, 7.0.0, 16324942	VMware ESXi, 6.7.0, 16316930
Date of last OS updates/patches applied	8/17/2020	8/17/2020
Power management policy	Max Performance	Max Performance
Processor		
Number of processors	4	4
Vendor and model	Intel® Xeon® Platinum 8260	Intel Xeon E7-8890 v3
Core count (per processor)	24	18
Core frequency (GHz)	2.4	2.5
Stepping	Model 85 Stepping 7	Model 63 Stepping 3
Memory module(s)		
Total memory in system (GB)	512	512
Number of memory modules	16	32
Vendor and model	Samsung® M393A4K40BB2-CTD	Hynix® HMA42GR7MFR4N-TFT1
Size (GB)	32	16
Type	DDR-4	DDR-4
Speed (MHz)	2,666	2,133
Speed running in the server (MHz)	2,666	1,600
Storage controller		
Vendor and model	PERC H740p	PERC H730p
Cache size (GB)	8	2
Firmware version	50.9.4-3025	25.5.6.0009

System configuration information	Dell EMC PowerEdge R940	Dell EMC PowerEdge R930
Local storage (type A)		
Number of drives	2	2
Drive vendor and model	Dell 0VXG5N	Dell 0VXG5N
Drive size (GB)	960	960
Drive information (speed, interface, type)	6Gbps, SATA, SSD	6Gbps, SATA, SSD
Local storage (type B)		
Number of drives	4	4
Drive vendor and model	Dell 0HF06W	Dell 09F3GY
Drive size (GB)	800	800
Drive information (speed, interface, type)	12Gbps, SAS, SSD	6Gbps, SATA, SSD
Local storage (type C)		
Number of drives	8	8
Drive vendor and model	Intel SSD DC P4510	Dell 503M7
Drive size (GB)	1,024	960
Drive information (interface, type)	NVMe, SSD	12Gbps, SAS, SSD
Network adapter		
Vendor and model	Intel Ethernet X710/i350 rNDC	Intel Ethernet XXV710
Number and type of ports	2x 1Gb, 2x 10Gb	2x 10Gb
Driver version	19.5.12	19.5.12
Cooling fans		
Vendor and model	Dell GYNRG-A00	Nidec® UltraFlo V12C12BS1M3
Number of cooling fans	8	6
Power supplies		
Vendor and model	Dell 095HR5	Dell 0TFR9VX03
Number of power supplies	2	4
Wattage of each (W)	1,600	1,100

About our testing

Our hands-on testing compared the following four-socket solutions:

- Dell EMC PowerEdge R930 with Intel Xeon E7-8890 v3 processors and VMware vSphere 6.7
- Dell EMC PowerEdge R940 with Intel Xeon Platinum 8260 processors and VMware vSphere 7.0

We loaded each system with 512 GB of RAM and two SATA SSDs for the OS. On the Dell EMC PowerEdge R930, we used eight 12Gbps SAS SSDs in non-RAID mode for the database VMDKs, and four SATA SSDs in a RAID 10 for the log VMDKs. On the Dell EMC PowerEdge R940, we used eight NVMe SSDs for the database VMDKs, and four SAS SSDs in a RAID 10 for the log VMDKs. We installed VMWare ESXi™ 6.7 U3 on the Dell EMC PowerEdge R930 and VMWare ESXi 7.0 on the Dell EMC PowerEdge R940, and connected them to a VMware vCenter 7.0 appliance. We created and configured a gold VM with Red Hat Enterprise Linux 7.8, Oracle Grid Infrastructure, and Oracle Database 19*c*. We created eight VMDKs for our database files and used Oracle ASM to create a mirrored disk group. For our logs, we created one VMDK and set the disk group redundancy to external in Oracle ASM, since the datastore for the log VMDKs has redundancy from the hardware raid. Once we created the diskgroups and database, we used built-in DVD Store 3 (DS3) scripts to generate CSV files to build and load our 40Gb database. Finally, we created a pfile from the default spfile and tuned it for performance. We used this file to start the database after a full restore between runs.

Once we created and configured the VM and database and loaded it with data, we cloned our gold VM to get our full set of eight test VMs. Because DS3 is a CPU-intensive workload, we configured the VMs to have enough vCPUs so that all of the host's cores would be allocated. On the Dell EMC PowerEdge R930, our eight test VMs had 18 vCPUs and 24 GB of RAM. On the Dell EMC PowerEdge R940, we assigned 24 vCPUs and 24 GB of RAM. We used external client VMs running Windows Server 2019 over a 10Gb network to target our database VMs and run DS3. We measured the transactional database performance of each system using Oracle Database 19*c* and DS3 running an OLTP workload that targets a transactional database and produces a metric of operations per minute. To monitor the performance of each host, we ran esxtop in batch mode and output the data to CSV files.

Installing VMware ESXi

1. Boot to the VMware ESXi installation media using a USB stick or CD/DVD.
2. To contine, press Enter.
3. To accept and continue, press the F11 key.
4. Under Storage Device, select the installation drive, and press Enter.
5. Select US Default for keyboard layout, and press Enter.
6. Enter root password twice, and press Enter.
7. At the Confirm Install window, press F11.
8. At the Installation Complete window, press Enter.
9. After reboot, to configure system, press F2.
10. Log in with root user/password, and press Enter.
11. Scroll to Configure Management Network, and press Enter.
12. Scroll to IPv4 Configuration, and press Enter.
13. Scroll to Static IPv4, and use the spacebar to select it.
14. Set the IPv4 address, Subnet Mask, and Default gateway.
15. To continue, press Enter.
16. Scroll to IPv6 Configuration, and press Enter.
17. Scroll to Disable IPv6, and use the spacebar to select it.
18. To continue, press Enter.
19. Scroll to DNS Configuration, and press Enter.
20. Scroll to Manually configure DNS, and use the spacebar to select it.
21. Add Primary DNS Server and Alternate DNS Server, and provide the hostname for the system.
22. Scroll to Custom DNS Suffixes, and press Enter.
23. Add the suffix that is required for testing, and press Enter.
24. To accept the changes, press ESC.
25. To confirm changes, press Y. The system will reboot.
26. After reboot, to configure system, press F2.
27. Log in with root user/password, and press Enter.
28. Scroll to Troubleshooting Options, and press Enter.
29. Select Enable ESXi Shell, and press Enter.
30. Select Enable SSH, and press Enter.
31. Scroll to Restart Management Agents, and press Enter.
32. To confirm, press F11.
33. To exit, press ESC.
34. To log out, press ESC.

Deploying VMware vCenter Server 7.0

1. On a Windows server or VM, using a USB stick or CD/DVD, locate the VMware-VCSA installer image.
2. Mount the image, navigate to the vcsa-ui-installer folder, and double-click win32.
3. Double-click installer.exe.
4. Click Install.
5. Click Next.
6. Accept the terms of the license agreement, and click Next.
7. Leave the default Center Server with an Embedded Platform Services Controller selected, and click Next.
8. Enter the FQDN or IP address of the host onto which you are deploying the vCenter Server Appliance.
9. Provide the server's username and password, and click Next.
10. To accept the certificate of the host you chose to connect to, click Yes.
11. Provide a name and password for the vCenter Appliance, and click Next.
12. Set an appropriate appliance size, and click Next.
13. Select the appropriate datastore, and click Next.
14. At the Configure Network Settings page, configure the network settings as appropriate for your environment, and click Next.
15. Review your settings, and click Finish.
16. When the deployment completes, click Continue.
17. At the Introduction page, click Next.
18. At the Appliance configuration page, select the time synchronization mode and SSH access settings, and click Next.
19. Select Create a new SSO domain.
20. Provide an SSO domain name and SSO site name.
21. Provide a password, confirm it, and click Next.
22. At the CEIP page, click Next.
23. At the Ready to complete page, click Finish.
24. At the Warning pop-up, click OK.
25. Once Stage 2 has completed successfully, click Close.

Installing Red Hat Enterprise Linux 7.8

1. Boot to the Red Hat Enterprise Linux 7 installation media.
2. Select Install or upgrade an existing system.
3. Choose English, and click Continue.
4. Under Installation Destination, select the disk on which you wish to install the OS.
5. Under Other Storage Options, select I will configure partitioning, and click Done.
6. To create partitioning automatically, select Click here.
7. Remove the /home partition if it exists.
8. Expand the swap partition to 16GB.
9. Assign all remaining free space to the / partition.
10. Click Done.
11. Click Accept Changes.
12. Select Kdump.
13. Uncheck Enable Kdump, and click Done.
14. Select Network & Hostname.
15. Enter the desired hostname for the system.
16. Turn on the desired network ports, and click Configure.
17. On the General tab, select Automatically connect to this network when it is available.
18. On the IPv4 Settings tab, choose the drop-down option Method, and select Manual.
19. Under Addresses, click Add, and enter the desired static IP information for the server.
20. Enter the desired DNS information.
21. Click Save, and click Done.
22. Select Date & Time. Ensure the date, time, and time zone are correct.
23. To add your NTP server, click the cog next to the Network Time On/Off switch.
24. Add the IP address of your NTP server, and click +.
25. Uncheck all other NTP servers.
26. Click OK.
27. Click Done.
28. Click Software Selection.

29. Choose the Base Environment of Minimal Install.
30. Click Done.
31. Click Begin Installation.
32. Select Root Password.
33. Enter the desired root password, and click Done.
34. When the installation completes, to restart the server, select Reboot.

Configuring Red Hat Enterprise Linux 7.8 for Oracle

1. Log onto the server as root.
2. Disable the firewall:

```
systemctl stop firewalld
systemctl disable firewalld
```

3. Disable SELinux:

```
vi /etc/selinux/config
SELINUX=disabled
```

4. Register your RHEL subscription:

```
subscription-manager register --username <RHEL_USERNAME> --password <RHEL_PASSWORD> --auto-attach
```

5. Install wget, sysstat, and gdisk:

```
yum install -y sysstat wget gdisk
```

6. Update RHEL 7.8:

```
yum update -y
```

7. Disable auditd:

```
systemctl disable auditd
```

8. Disable transparent hugepages persistently by adding "transparent_hugepage=never" to the end of the GRUB_CMDLINE_LINUX option in /etc/default/grub and running the following command to rebuild the grub.cfg file:

```
grub2-mkconfig -o /boot/efi/EFI/redhat/grub.cfg
```

9. Reboot.
10. Download the preinstall RPM:

```
curl -o oracle-database-preinstall-19c-1.0-2.el7.x86_64.rpm https://yum.oracle.com/repo/OracleLinux/
OL7/latest/x86_64/getPackage/oracle-database-preinstall-19c-1.0-2.el7.x86_64.rpm
```

11. Download the compat-libstdc++-33-3.2.3-72.el7.x86_64.rpm package from the <CENTOS7_MIRROR>:

```
wget http://mirror.centos.org/centos/7/os/x86_64/Packages/compat-libstdc++-33-3.2.3-72.el7.x86_64.rpm
```

12. Install compat-libstdc++-33:

```
yum localinstall -y compat-libstdc++-33-3.2.3-72.el7.x86_64.rpm
```

13. Install the Oracle preinstall:

```
yum localinstall -y oracle-database-preinstall-19c-1.0-1.el7.x86_64.rpm
```

14. Create groups for ASM by running these shell commands:

```
groupadd -g 54327 asmdba
groupadd -g 54328 asmoper
groupadd -g 54329 asmadmin
```

15. Modify the Oracle user to add the ASM groups:

```
usermod -G asmdba,asmoper,asmadmin -a oracle
```

16. Create passwords for the Oracle account with passwd:

```
passwd oracle
```

17. Enable the RHEL optional repository to install the tuned profile:

```
subscription-manager repos --enable=rhel-7-server-optional-rpms
```

18. Install the Oracle tuned profile:

```
yum install -y tuned-profiles-oracle
```

19. Enable the Oracle tuned profile:

```
tuned-adm profile oracle
```

20. Verify that the profile is set and running:

```
tuned-adm active
tuned-adm verify
```

21. Create the following directories, and assign the following permissions:

```
mkdir -p /u01/app/19.0.0.0/grid
mkdir -p /u01/app/oracle/product/19.0.0.0/dbhome_1
chown -R oracle:oinstall /u01
chmod -R 775 /u01/
```

22. Append the following to the /etc/security/limits.conf:

```
oracle - nofile 65536
oracle - nproc 16384
oracle - stack 32768
oracle - memlock 134217728
soft memlock unlimited
hard memlock unlimited
```

23. Log into the Oracle user:

```
su - oracle
```

24. Add the following lines to the .bash_profile:

```
export TMP=/tmp
export TMPDIR=$TMP
export ORACLE_HOSTNAME=<HOSTNAME>
export ORACLE_UNQNAME=orcl
export ORACLE_BASE=/u01/app/oracle
export GRID_HOME=/u01/app/19.0.0.0/grid
export DB_HOME=$ORACLE_BASE/product/19.0.0.0/dbhome_1
export ORACLE_HOME=$DB_HOME
export ORACLE_SID=orcl
export ORACLE_TERM=xterm
export BASE_PATH=/usr/sbin:$PATH
export PATH=$ORACLE_HOME/bin:$BASE_PATH
export LD_LIBRARY_PATH=$ORACLE_HOME/lib:/lib:/usr/lib
export CLASSPATH=$ORACLE_HOME/JRE:$ORACLE_HOME/jlib:$ORACLE_HOME/rdbms/jlib
alias grid_env='. /home/oracle/grid_env'
alias db_env='. /home/oracle/db_env'
```

25. Create the following files in the Oracle user's home folder:

```
>>>grid_env<<<
export ORACLE_SID=+ASM
export ORACLE_HOME=$GRID_HOME
export PATH=$ORACLE_HOME/bin:$BASE_PATH
export LD_LIBRARY_PATH=$ORACLE_HOME/lib:/lib:/usr/lib
export CLASSPATH=$ORACLE_HOME/JRE:$ORACLE_HOME/jlib:$ORACLE_HOME/rdbms/jlib
>>>db_env<<<
export ORACLE_SID=orcl
export ORACLE_HOME=$DB_HOME
export PATH=$ORACLE_HOME/bin:$BASE_PATH
export LD_LIBRARY_PATH=$ORACLE_HOME/lib:/lib:/usr/lib
export CLASSPATH=$ORACLE_HOME/JRE:$ORACLE_HOME/jlib:$ORACLE_HOME/rdbms/jlib
```

26. As the root user, install the ASMLib kernel module package:

```
yum install -y kmod-oracleasm
```

27. Download the OracleASM support and lib packages from here:
    https://www.oracle.com/linux/downloads/linux-asmlib-rhel7-downloads.html.
28. Copy the packages to your RHEL server.
29. From the directory you copied the packages to, install the Oracle ASM lib and support packages:

```
yum localinstall -y oracleasm*
```

30. Edit /etc/sysconfig/oracleasm to contain the following:

```
# ORACLEASM_ENABLED: 'true' means to load the driver on boot.
ORACLEASM_ENABLED=true
# ORACLEASM_UID: Default UID owning the /dev/oracleasm mount point.
ORACLEASM_UID=oracle
# ORACLEASM_GID: Default GID owning the /dev/oracleasm mount point.
ORACLEASM_GID=oinstall
# ORACLEASM_SCANBOOT: 'true' means fix disk perms on boot
ORACLEASM_SCANBOOT=true
# ORACLEASM_USE_LOGICAL_BLOCK_SIZE: 'true' means use the logical block
# size reported by the underlying disk instead of the physical. The
# default is 'false' ORACLEASM_USE_LOGICAL_BLOCK_SIZE=false
```

31. Run the following command to initialize oracleasm:

```
oracleasm init
```

32. Create a partition on all disks using gdisk.
33. Run the following commands to configure all of the disks for Oracle ASM:

```
oracleasm createdisk DATA1 /dev/<DISK1>
oracleasm createdisk DATA2 /dev/<DISK2>
oracleasm createdisk DATA3 /dev/<DISK3>
oracleasm createdisk DATA4 /dev/<DISK4>
oracleasm createdisk DATA5 /dev/<DISK5>
oracleasm createdisk DATA6 /dev/<DISK6>
oracleasm createdisk DATA7 /dev/<DISK7>
oracleasm createdisk DATA8 /dev/<DISK8>
oracleasm createdisk LOG /dev/<DISK9>
```

Installing Oracle Grid Infrastructure 19*c*

1. Log in as the Oracle user.
2. To set the Oracle grid environment, type `grid_env`
3. Change directories to the grid home directory:

```
cd $ORACLE_HOME
```

4. Unzip linuxx64_193000_grid_home.zip:

```
unzip -q <grid_zip_location>/LINUX.X64_193000_grid_home.zip
```

5. To start the installer, type `. /gridSetup.sh`

6. In the Select Installation Option screen, select Install and Configure Grid Infrastructure for a Standalone Server, and click Next.
7. Choose the language, and click Next.
8. In the Create ASM Disk Group screen, choose the Disk Group Name (DATA), and change redundancy to Normal.
9. Change the path to /dev/oracleasm/disks, and select the DATA disks.
10. In the Specify ASM Password screen, choose Use same password for these accounts, enter the passwords for the ASM users, and click Next.
11. At the Management Options screen, click Next.
12. Leave the default Operating System Groups, and click Next.
13. Leave the default installation, and click Next.
14. Leave the default inventory location, and click Next.
15. Under Root script execution, leave the defaults, and click Next.
16. In the Prerequisite Checks screen, verify that everything is correct.
17. In the Summary screen, verify that everything is correct. To install Oracle Grid Infrastructure, click Finish.
18. At one point during the installation, the installation prompts you to execute a configuration script as root. Follow the instructions to run the scripts.
19. At the Finish screen, click Close.
20. To run the ASM Configuration Assistant, type `asmca`
21. In the ASM Configuration Assistant, click Create.
22. In the Create Disk Group window, name the new disk group LOG, choose redundancy Normal Redundancy, and select the four LOG disks.
23. Click Advanced Options.
24. Set the database compatibility level to 19.0.0.0.0, and click OK.
25. Exit the ASM Configuration Assistant.

Installing Oracle Database 19c

1. Type `db_env` to set the Oracle Database environment.
2. Change directories to the database home directory:

   ```
   cd $ORACLE_HOME
   ```

3. Unzip LINUX.X64_193000_db_home.zip:

   ```
   unzip -q <database_zip_location>/LINUX.X64_193000_db_home.zip
   ```

4. Run . /runInstaller.
5. Wait for the GUI installer to load.
6. On the Select Configuration Option, click Set Up Software Only, and click Next.
7. On the Select Database Installation Option, select Single instance database installation, and click Next.
8. On the Select Database Edition, select Enterprise Edition, and click Next.
9. On the Specify Installation Location, leave the default Oracle base, and click Next.
10. On the Privileged Operating System groups, keep the default, and click Next.
11. On the Perform Prerequisite Checks, wait for the verification results, fix any errors, and click Next.
12. On the Summary page, review, and click Install.
13. Once the Execute Configuration scripts prompt appears, ssh into the server as root, and run the following command:

    ```
    /u01/app/oracle/product/19.0.0.0/dbhome_1/root.sh
    ```

14. Return to the prompt, and click OK.
15. Once the installer completes, click Close.

Creating and configuring the database

1. Using SSH -Y, log into the host.
2. To switch to the first database environment, type `db_env`
3. Type `dbca`. To open the Database configuration assistant, press Enter.
4. At the Database Operation screen, select Create Database, and click Next.
5. Under Creation Mode, select Advanced configuration, and click Next.
6. At the Database Deployment Type screen, select Data Warehouse, and click Next.
7. Enter a Global database name and the appropriate SID, uncheck Create as Container database, and click Next.
8. At the storage option screen, select Use the following for the database storage attributes.
9. In the drop-down menu, select Automatic Storage Management (ASM), select +DATA for the file location, and click Next.
10. At the Fast Recovery Option screen, check the box for Specify Fast Recovery Area.
11. In the drop-down menu, select ASM, select +DATA for the Fast Recovery Area, and enter 500GB for the size.
12. At the Specify Network Configuration Details, select the listener, and click Next.

13. At the Specify Oracle Data Vault Config Option screen, leave the default options, and click Next.
14. At the Specify Configuration Options screen, leave the memory selections to defaults, and click Next.
15. At the Specify Management Options screen, select Configure Enterprise Manager (EM) Database Express, and click Next.
16. At the User Credentials screen, select Use the same administrative password for all accounts, enter and confirm the desired password, and click Next.
17. At the Creation Options, select Create Database, and click Next.
18. At the summary screen, click Finish.
19. Close the Database Configuration Assistant.

Configuring Oracle redo log and creating pfile

Alter the tablespaces on both systems as we show below. To enter SQL prompt, as sysdba, type `sqlplus /`

```
ALTER DATABASE ADD LOGFILE GROUP 11 ( '/tmp/temp1.log' ) SIZE 50M;
ALTER DATABASE ADD LOGFILE GROUP 12 ( '/tmp/temp2.log' ) SIZE 50M;

ALTER SYSTEM SWITCH LOGFILE;
ALTER SYSTEM SWITCH LOGFILE;
ALTER SYSTEM CHECKPOINT;

ALTER DATABASE DROP LOGFILE GROUP 1;
ALTER DATABASE DROP LOGFILE GROUP 2;
ALTER DATABASE DROP LOGFILE GROUP 3;

ALTER SYSTEM SWITCH LOGFILE;
ALTER SYSTEM SWITCH LOGFILE;
ALTER SYSTEM CHECKPOINT;

ALTER DATABASE ADD LOGFILE GROUP 1 ( '+LOG/redo01.log' ) SIZE 20G;
ALTER DATABASE ADD LOGFILE GROUP 2 ( '+LOG/redo02.log' ) SIZE 20G;

ALTER SYSTEM SWITCH LOGFILE;
ALTER SYSTEM SWITCH LOGFILE;
ALTER SYSTEM CHECKPOINT;

ALTER DATABASE DROP LOGFILE GROUP 11;
ALTER DATABASE DROP LOGFILE GROUP 12;

SHUTDOWN

STARTUP

HOST rm -f /tmp/temp*.log
create pfile='/home/oracle/pfile.ora' from spfile;
```

Installing and deploying the DVD Store 3 database

1. Navigate to the staging area for DVD Store 3.
2. Clone the DS3 repository into the directory:

```
git clone https://www.github.com/dvdstore/ds3.git
```

3. Change directories into the install directory:

```
cd ds3/ds3
```

4. Run the Install_DVDStore.pl script, and enter the appropriate values for your database size and type. For our configuration, we used:
   - Size: 40
   - Units: GB
   - Database: ORACLE
   - OS: LINUX
   - Filepath: +DATA/ORCL/DATAFILE/

5. After the program has generated the .csv files, navigate into the Oracle directory:

```
cd oracleds3/
```

6. To load the database, run the script generated with your specific database size:

```
sh oracleds3_create_all_40gb.sh
```

7. After Oracle has created the database, navigate to the build directory:

```
cd build/
```

8. Run the sql script included to collect statistics:

```
sqlplus ds3/ds3@orcl @oracleds3_analyze_all.sql
/
```

Backing up and restoring the database

To back up the database, do the following:

1. Log into the server as the Oracle user.
2. Log into RMAN:

```
# rman target /
```

3. Once in the RMAN console, run the following:

```
SHUTDOWN IMMEDIATE;
STARTUP FORCE DBA;
SHUTDOWN IMMEDIATE;
STARTUP MOUNT;
CONFIGURE DEVICE TYPE DISK PARALLELISM 8;
BACKUP AS COMPRESSED BACKUPSET DATABASE TAG 'BACKUP_DS3_40GB';
ALTER DATABASE OPEN;
```

To restore the database, do the following:

1. Log into the server as the Oracle user.
2. Log into RMAN"

```
# rman target /
```

Once in the RMAN console, run the following:

```
SHUTDOWN ABORT;
STARTUP NOMOUNT;
RESTORE CONTROLFILE FROM AUTOBACKUP;
ALTER DATABASE MOUNT;
CONFIGURE DEVICE TYPE DISK PARALLELISM 8;
RESTORE DATABASE FROM TAG 'BACKUP_DS3_40GB';
RECOVER DATABASE FROM TAG 'BACKUP_DS3_40GB';
ALTER DATABASE OPEN RESETLOGS;
SHUTDOWN DATABASE IMMEDIATE;
STARTUP PFILE='/home/oracle/pfile.ora';
```

Running the test

1. Log into each Windows client VM.
2. Navigate to the directory where your ds3oracledriver.exe file is located.
3. In a separate terminal window, log into the host via ssh.
4. Run the following command to start esxtop:

```
esxtop -a -b -n 565 -d 5 > <path>/esxtop.csv
```

5. Run the following command in each VM to start the test. The config file we used is in the Test scripts section below.

```
.\ds3oracledriver.exe --config_file=<PATH>\<configfile>.txt
```

6. After the run, collect the OPM CSV file on each VM and the esxtop CSV file from the host.
7. Restore the database, and reboot the VMs and host.
8. Repeat steps 1 through 7 twice more for a total of three runs, and take the median score of each.

Test scripts

DVD Store 3 configuration file

```
target=<IP_ADDRESS>/orcl
n_threads=40
ramp_rate=10
run_time=30
db_size=40GB
warmup_time=15
think_time=0
pct_newcustomers=20
n_searches=3
search_batch_size=5
n_line_items=5
page_type=php
detailed_view=y
out_filename=C:\vmXX_OPM.csv
```

Oracle pfile

```
orcl.__data_transfer_cache_size=0
orcl.__db_cache_size=7952400384
orcl.__inmemory_ext_roarea=0
orcl.__inmemory_ext_rwarea=0
orcl.__java_pool_size=0
orcl.__large_pool_size=100663296
orcl.__oracle_base='/u01/app/oracle'#ORACLE_BASE set from environment
orcl.__pga_aggregate_target=3221225472
orcl.__sga_target=9663676416
orcl.__shared_io_pool_size=134217728
orcl.__shared_pool_size=1442840576
orcl.__streams_pool_size=0
orcl.__unified_pga_pool_size=0
*.audit_file_dest='/u01/app/oracle/admin/orcl/adump'
*.audit_trail='db'

RESTORE DATABASE FROM TAG 'BACKUP_DS3_40GB';
RECOVER DATABASE FROM TAG 'BACKUP_DS3_40GB';
ALTER DATABASE OPEN RESETLOGS;
SHUTDOWN DATABASE IMMEDIATE;
STARTUP PFILE='/home/oracle/pfile.ora';
```

Read the report at http://facts.pt/szO7jA6 ▶

This project was commissioned by Dell Technologies.

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