NETAPP TECHNICAL REPORT

Siemens PLM Software—Teamcenter Backup and Recovery Guide

Bikash R.Choudhury and Anand Ranganathan, NetApp
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NETAPP DATA ONTAP FOR TEAMCENTER BACKUP AND RECOVERY

Siemens PLM Teamcenter is the world's most widely used product lifecycle management (PLM) system. This report outlines a backup and recovery solution for Teamcenter environments by leveraging NetApp® SnapManager® 3.0 for Oracle®. A typical Teamcenter environment has a Teamcenter Secure File Management System (TCFS) component and an Oracle database. The solution outlined in this report details the installation and configuration of SnapManager for Oracle and provides sample scripts for backup, restore, and recovery for the Oracle database and the TCFS volumes by leveraging the SnapManager for Oracle CLI and Teamcenter's backup utility. SnapManager for Oracle simplifies and automates complex Oracle database backup and recovery operations by leveraging NetApp Snapshot™ and SnapRestore® technologies to provide fast, space-efficient, disk-based backups and rapid, granular restore and recovery of Oracle databases.

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1 INTRODUCTION

Product lifecycle management (PLM) is an enterprise, business, and information strategy that enables companies to establish global information networks, essential for developing and delivering world-class products in today's highly competitive international marketplace. To address these requirements, Siemens PLM Software offers a portfolio of lifecycle management solutions. Teamcenter, the world's most widely used PLM system, is an industry-driven, customer-proven, Web-centric collaborative PLM system for the engineering enterprise. Teamcenter provides distributed engineering and manufacturing teams with the global sharing, workgroup management, and vaulting capabilities they need to capture, manage, and leverage geometry and engineering data created by multiple CAD, CAM, and CAE systems. The backup and recovery of this critical engineering data in the event of system failure or data corruption is a significant issue to consider during a redesign and operational evaluation of the Teamcenter environment.

NetApp provides robust, high-performance data storage and management solutions for Teamcenter environments. A typical Teamcenter environment has a Teamcenter File Management System (TCFS) component and an Oracle database. NetApp supports backup and restore redesign capabilities using Snapshot and SnapRestore data management products that provide near-instantaneous, consistent backup and recovery of the database and data volumes. This report outlines a backup and recovery solution for Teamcenter environments by leveraging NetApp SnapManager 3.0 for Oracle, Snapshot, and SnapRestore.

SnapManager 3.0 for Oracle automates and simplifies the complex, manual, and time-consuming processes associated with the backup, recovery, and cloning of Oracle databases. SnapManager leverages NetApp technologies like Snapshot, SnapRestore, and FlexClone®, while integrating with the latest Oracle database releases. SnapManager also integrates with native Oracle technology—such as Oracle Real Application Clusters (RAC), Oracle Recovery Manager (RMAN), Automatic Storage Management (ASM), and Direct NFS—and across FC, iSCSI, and NFS storage protocols to enable IT organizations to scale their storage infrastructure, meet increasingly stringent SLA commitments, and improve the productivity of database and storage administrators across the enterprise.

1.1 PURPOSE AND SCOPE

This report details the installation and configuration of SnapManager 3.0 for Oracle, Snapshot, and SnapRestore, and provides sample scripts. You can use the sample scripts to back up, restore, and recover the Teamcenter Oracle database and the TCFS volumes by leveraging SnapManager 3.0 for Oracle from the command line interface (CLI) and Teamcenter's backup utility.

1.2 PREREQUISITES FOR USING TEAMCENTER BACKUP

This report is intended for Teamcenter administrators, Oracle database administrators, storage administrators, and architects who are designing, redesigning, and implementing a backup and recovery solution for the Teamcenter application using Oracle databases running on NetApp data and storage management solutions. Readers should have a solid understanding of the architecture, administration, and backup and recovery concepts of Teamcenter and Oracle databases. It's also helpful to review the following documentation:

- Teamcenter on NetApp Storage over NFS: A Reference Architecture
- Data ONTAP 7.2 System Administration Guide
- SnapManager 3.0 for Oracle Installation and Administration Guide
- SnapDrive 4.1 for UNIX Installation and Administration Guide
- SnapManager 2.2 for Oracle Best Practices Guide
- NetApp Best Practice Guidelines for Oracle
- NetApp Best Practice Guidelines for Oracle Database 11*g*

2 TEAMCENTER BACKUP AND RECOVERY

NetApp recommends using SnapManager 3.0 for Oracle to automate and simplify the complex, manual, and time-consuming processes associated with Teamcenter backup and restore. SnapManager for Oracle

provides the following benefits for anyone who is managing or redesigning backup and restore of Oracle databases, in any environment:

- Provides integrated data management for Oracle9*i*™, Oracle10*g*™, and Oracle11*g*™ databases
- Simplifies and automates backup, recovery, and cloning of Oracle databases
  - Instantaneous and space-efficient backups by using Snapshot
  - Rapid and granular restore and recovery by using SnapRestore
  - Fast and space-efficient clones by using FlexClone
- Seamless integration with Oracle technologies like RMAN, ASM, and RAC
- Policy-driven data protection via integration with NetApp Protection Manager
  - Automates replicating backups from primary to secondary or DR storage by using SnapMirror® or SnapVault®
  - Automates restoring backups from secondary or DR storage
  - Automates cloning of protected backups on secondary or DR storage
- Handles FC, iSCSI, NFS, and Direct NFS storage protocols
- Manages the complexity of the database operations integrated with underlying storage from database and storage administrators

SnapManager for Oracle relies on SnapDrive® for UNIX® to automate storage provisioning tasks and to simplify the process of taking error-free, host-consistent Snapshot copies of the storage. In the solution outlined in this report, SnapManager for Oracle and SnapDrive for UNIX are leveraged in a backup redesign that provides a consistent backup and recovery solution for Teamcenter environments.

2.1 ENVIRONMENT LAYOUT

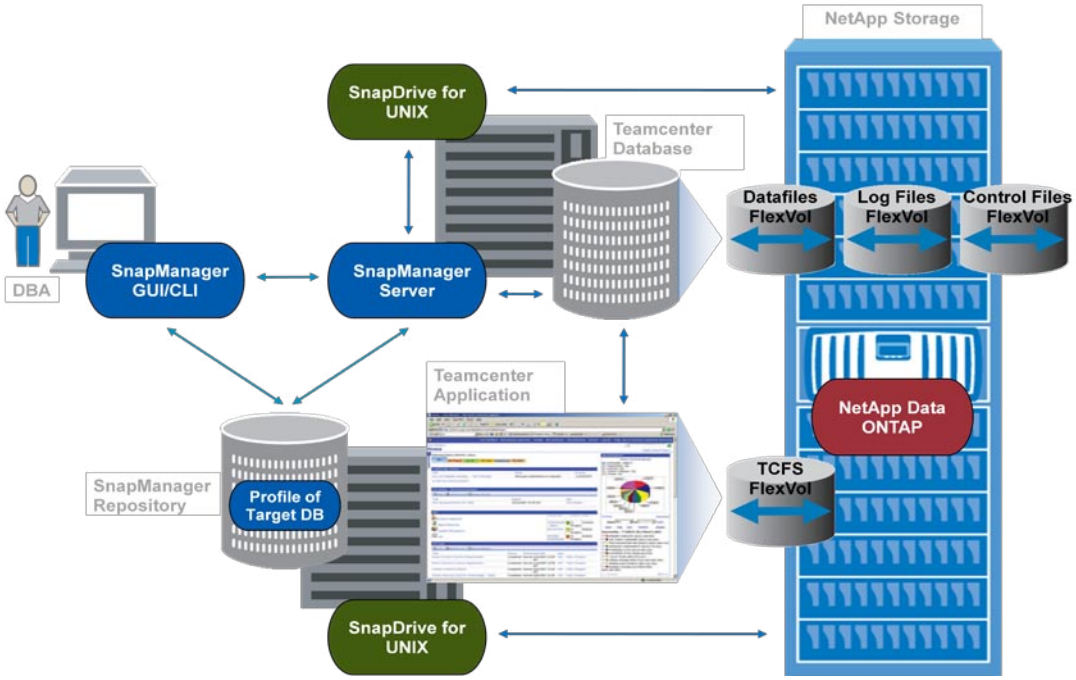


Figure 1) Teamcenter environment layout.

Figure 1 illustrates the architecture of a Teamcenter 2007 MP3 environment that was set up to create and test the backup and recovery solution covered in this report.

Note: In Figure 1, the SnapManager repository database is on the same host that is running the Teamcenter application. In your production environment, you can choose to use a dedicated host for the SnapManager repository database. See Appendix A for details of the hardware and software used to create and test the backup and recovery solution Teamcenter redesign covered in this report.

2.1.1 Components

NETAPP DATA ONTAP

One of the core components of a NetApp storage system is the Data ONTAP® operating system. Data ONTAP 7G is a highly optimized, scalable, and flexible operating system for unified enterprise data management. SnapManager 3.0 for Oracle supports the latest versions of Data ONTAP, starting with 7.0. The following licenses must be enabled on the NetApp storage system:

- The correct protocol (FCP, iSCSI, or NFS)
- SnapManager for Oracle
- SnapDrive for UNIX
- SnapRestore
- FlexClone (mandatory if using NFS, but optional in FCP and iSCSI environments)

SNAPDRIVE

SnapManager for Oracle requires that NetApp SnapDrive for UNIX or SnapDrive for Windows® be installed on the target database host before SnapManager for Oracle is installed. SnapDrive simplifies storage management, reduces operational costs, and improves storage efficiency. Key SnapDrive functionality includes error-free application storage provisioning, consistent data Snapshot copies, rapid application recovery, and the ability to easily manage data with its server-centric approach. See the SnapManager for Oracle Interoperability Matrix to choose the appropriate SnapDrive platform and version based on the operating system running on the target database host.

SNAPMANAGER FOR ORACLE

SnapManager for Oracle has two components:

- SnapManager Client (GUI and CLI)
- SnapManager Server

SnapManager for Oracle can be used either from the CLI on any host on which the SnapManager server is installed or from the GUI on any host. The SnapManager for Oracle server must be installed on every host that has a database that needs to be managed by SnapManager.

SNAPMANAGER REPOSITORY

SnapManager organizes information into profiles. A profile holds information about the database to be managed, including its credentials, backups, and clones. The repository holds data about the operations performed on the profiles. A single repository can hold information about multiple profiles. The repository is created during the installation process and resides in an Oracle database.

Although Figure 1 shows the SnapManager repository database on the same host that is running the Teamcenter application, you can use a dedicated host for the SnapManager repository database.

TEAMCENTER APPLICATION

Teamcenter, the world's most widely used PLM system, is an industry-driven, customer-proven Web-centric collaborative PLM system for the engineering enterprise.

TARGET TEAMCENTER DATABASE

The target Teamcenter Oracle database to be managed by SnapManager can be configured in a variety of ways (standalone or RAC, ASM, or any combination of these). Refer to the Teamcenter Web site and the SnapManager for Oracle Interoperability Matrix for details about the supported Oracle database versions, configurations, host operating systems, and protocols.

2.2 TEAMCENTER BACKUP

Teamcenter has an integrated backup and recovery feature that can leverage third-party software to enhance Teamcenter's Oracle backup and recovery capabilities; which allows Teamcenter to operate continually. To accomplish this, the integrated backup feature places Teamcenter in different modes, as illustrated in figure 2.

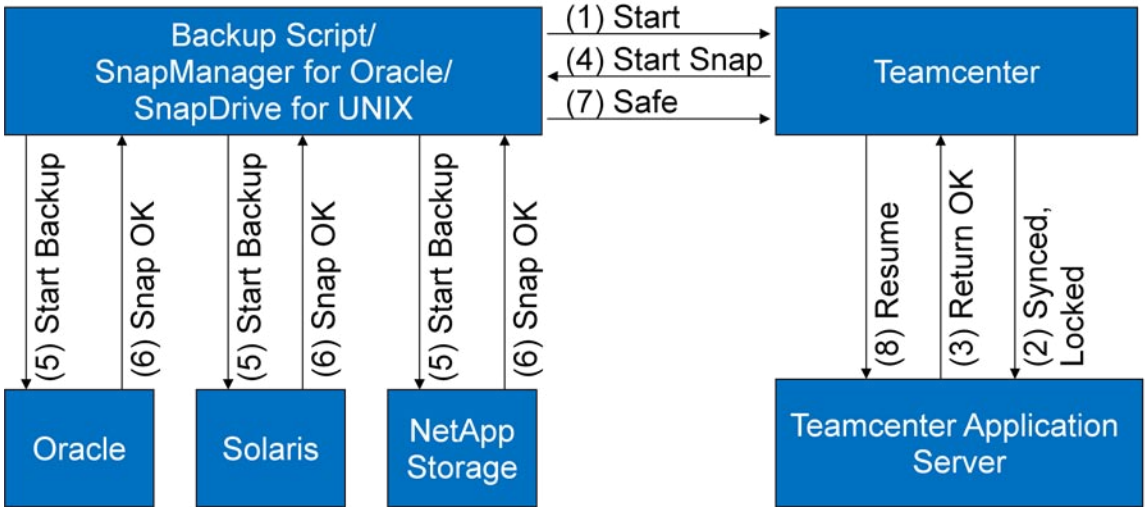


Figure 2) Teamcenter and NetApp backup software integration.

The following table gives an overview of the steps to create a consistent backup of the Teamcenter data volumes and the underlying Oracle database. This whole process typically takes only a few minutes.

Step	

1	The backup script (also available on the NOW™ [NetApp on the Web] site for download) requests Teamcenter to freeze all operations on the TCFS volumes and sends a cautionary message to users to save all files, with a grace period of five minutes. This interval, which is specified in the `pref.xml` file, can be modified as follows:
	• Export the preferences:
	`preferences_manager –u=infodba –p=infodba –g=dba –mode=export –scope=SITE –out_file=/var/tmp/pref.xml`
	• Edit the `pref.xml` file and set the value for the preferences:
	`<preference name="TC_check_tcfsMode_interval" type="String" array="true" disabled="false">`
	`<preference_description>Set default value for TC to check for Fastrax Backup and Recovery Message every X minutes</preference_description>`
	`<context name="Teamcenter">`
	`<value>5</value>`
	`</context>`
	`</preference>`
	• Import the preferences:
	`preferences_manager –u=infodba –p=infodba –g=dba –mode=import –`

	`scope=SITE –file=/var/tmp/pref.xml –action=override`
2	The backup script places Teamcenter in read-only mode.
3	The backup script initiates a Snapshot copy on the NetApp system of the TCFS volumes by using SnapDrive for UNIX. NetApp Snapshot copies are created in less than one second, regardless of the size of the volume or the level of activity on the NetApp storage system.
4	The backup script initiates a full online backup of the Teamcenter Oracle database by leveraging the SnapManager for Oracle CLI. SnapManager then: • Places the entire database in online or hot backup mode. • Takes Snapshot copies of all the volumes that contain database files. • Takes the database out of online backup mode. • Forces a log switch and then archives the log files. This also flushes the redo information to disk. • Generates backup control files. • Takes a Snapshot copy of the log files and the backup control files.
5	The backup script removes Teamcenter from read-only mode and places it into normal mode.

2.3 RESTORE AND RECOVERY

The following table gives an overview of the steps to restore and recover the Teamcenter data volumes and the underlying Oracle database from a backup created in the previous procedure. This whole process typically takes only a few minutes.

Step	
1	The restore script (also available on NOW for download) places Teamcenter in read-only mode.
2	The restore script initiates a full restore and recovery of the Teamcenter Oracle database by leveraging the SnapManager for Oracle CLI.
3	The restore script initiates a SnapRestore on the NetApp system of the TCFS volumes by using SnapDrive for UNIX.
4	The restore script places Teamcenter in normal mode.

3 SNAPMANAGER FOR ORACLE SIMPLIFIES ORACLE DATABASE MANAGEMENT

3.1 REPOSITORY AND PROFILES

SnapManager for Oracle organizes information into profiles in a repository. The profiles hold the information about the database being managed, including its credentials, backups, and clones. The repository holds data about the operations performed on the profiles.

The SnapManager repository records such information as when a backup was created, which files were backed up, and whether a clone was created from the backup. A single repository can hold the information of multiple profiles. The repository can be created by using the SnapManager GUI or CLI; it resides in an Oracle database.

A profile must be created for every database to be managed by SnapManager. When a profile is created for a database, information specific to that database is stored in the repository. By creating a profile, it is not

necessary to specify database details each time an operation is performed on that database. A profile can reference only one database. That same database can also be referenced by more than one profile. However, a backup created by using one profile cannot be accessed from a different profile, even if both profiles are associated with the same database.

3.2 ARCHITECTURE

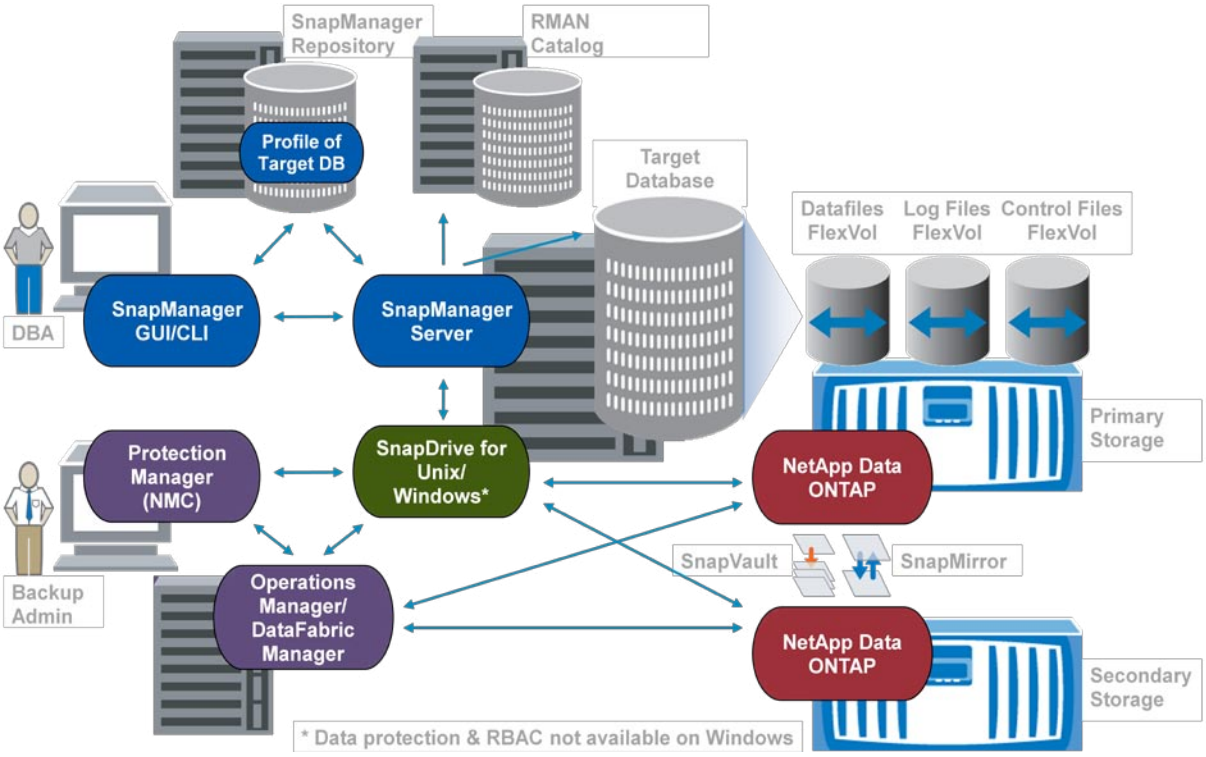
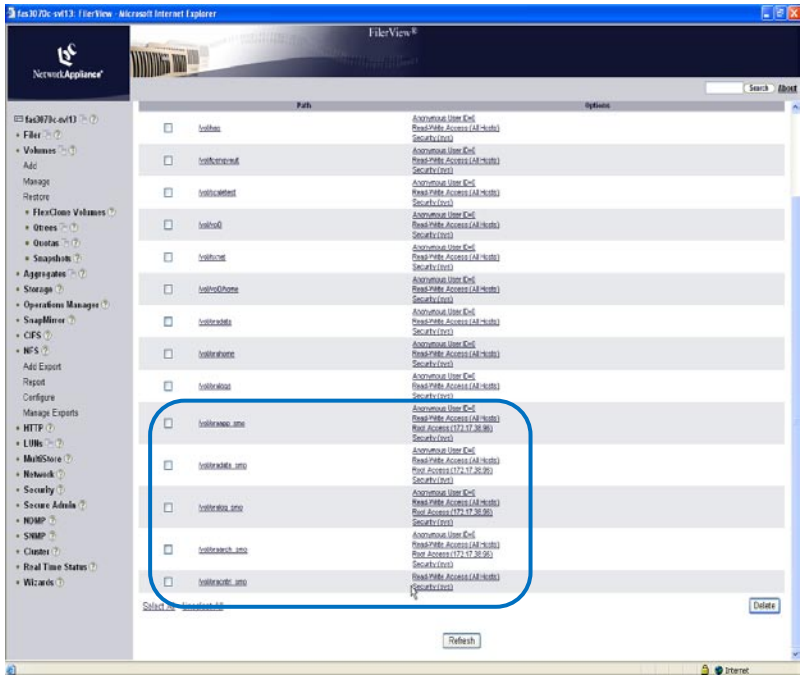
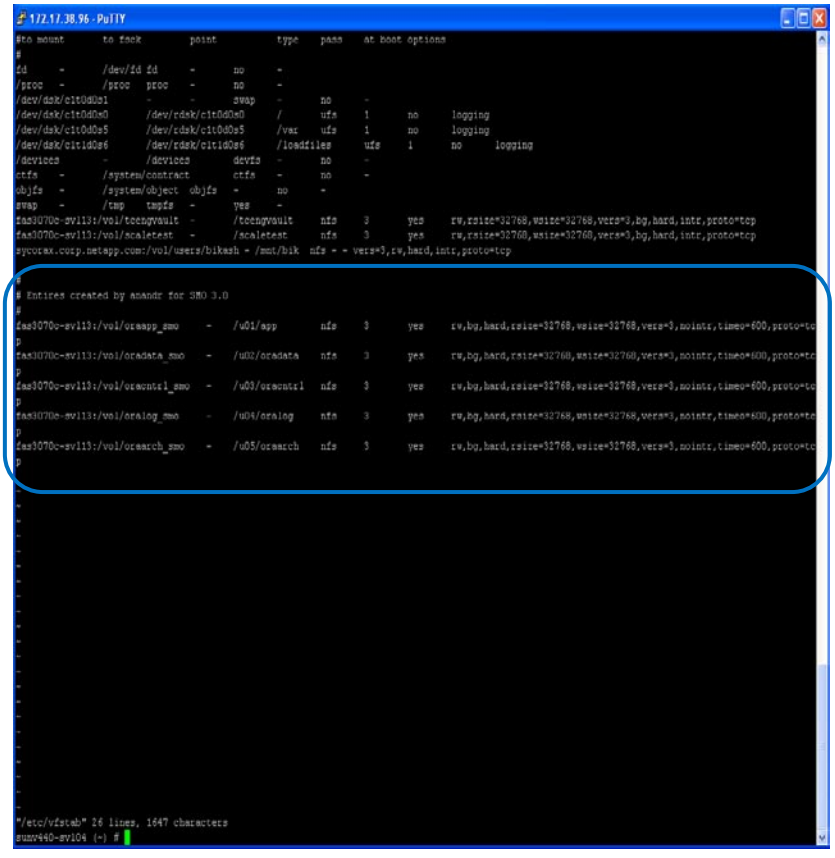


Figure 3) SnapManager for Oracle architecture.

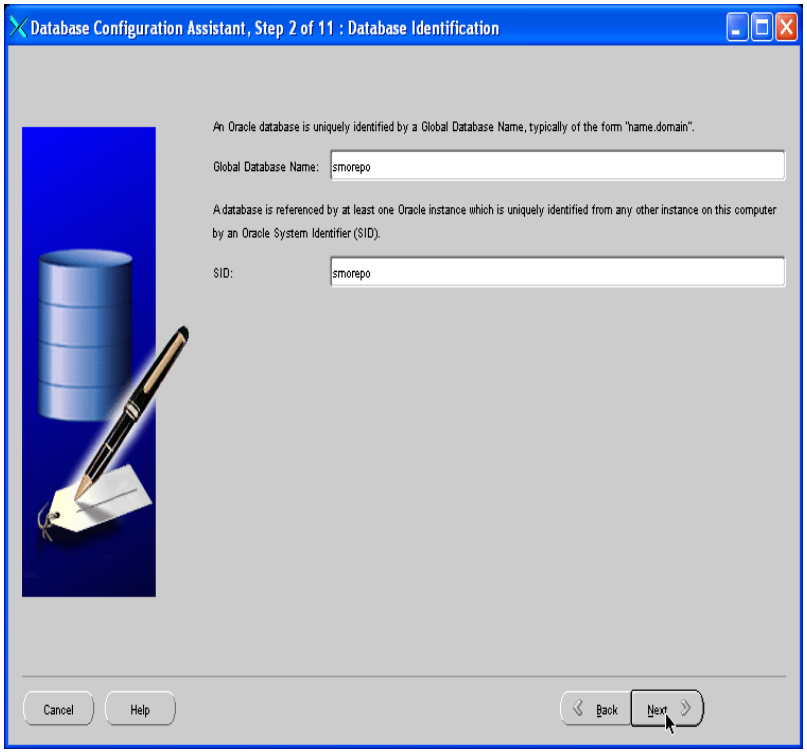
Figure 3 illustrates the SnapManager 3.0 for Oracle architecture and the components that work together to provide a comprehensive and powerful backup, recovery, and cloning solution for Oracle databases.

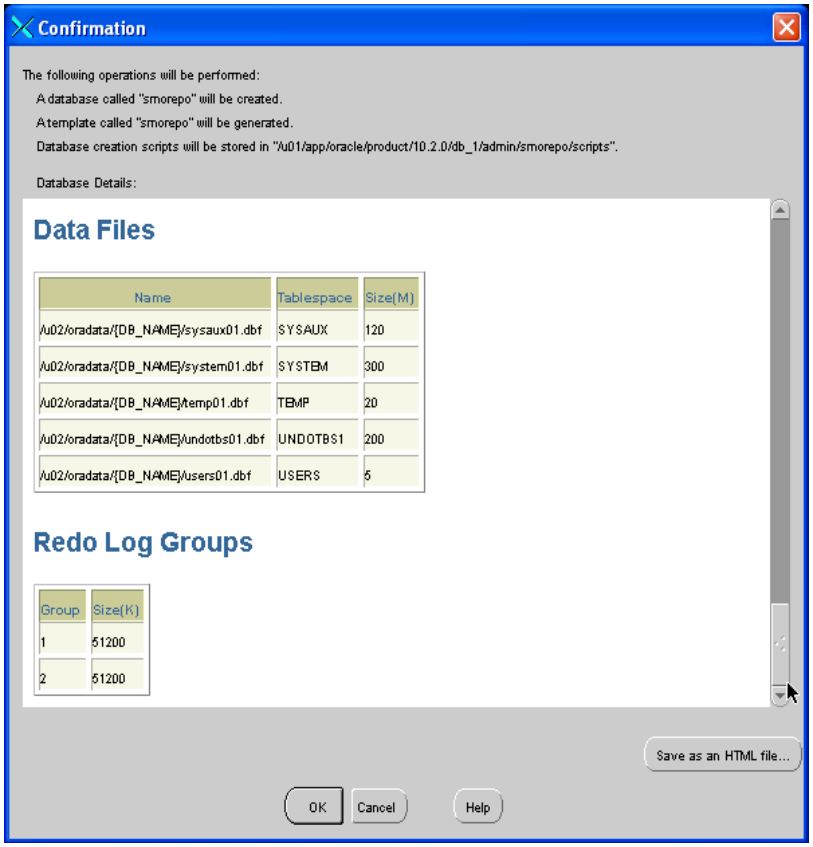
Although in version 3.0, SnapManager for Oracle integrates with NetApp Protection Manager to automatically replicate backups to a secondary storage system, this integration is not used in the solution proposed in this report. The solution outlined in this report is restricted to the backup and recovery of Teamcenter on a primary NetApp storage system.

4 SNAPMANAGER FOR ORACLE INSTALLATION AND CONFIGURATION

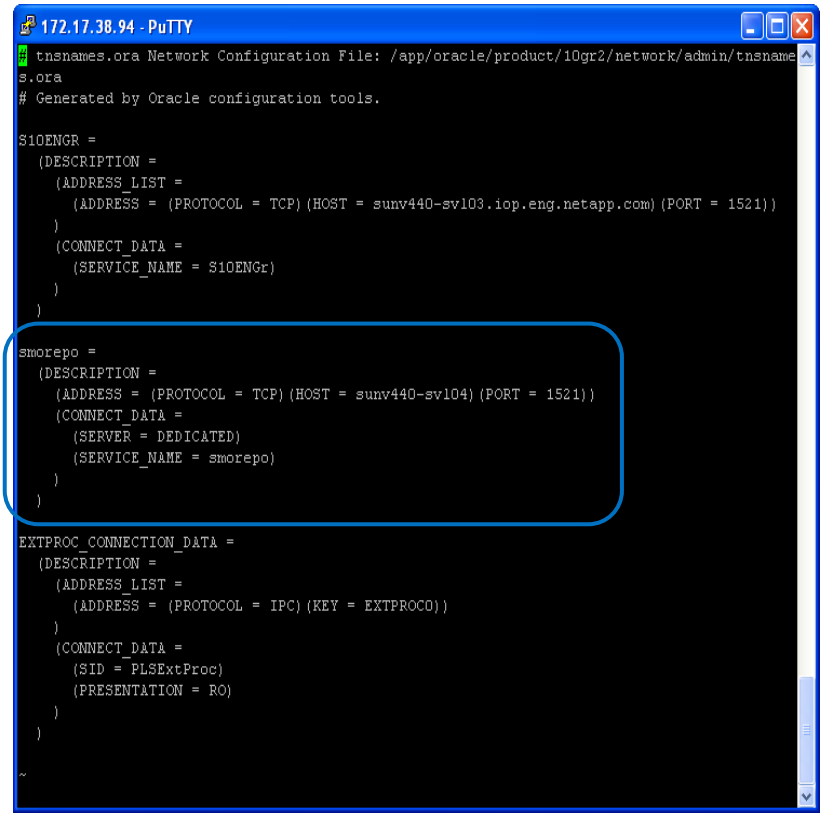
Repository Host Setup	Example Commands
Create new, dedicated flexible volumes in the NetApp storage system, which will store the Oracle binaries, data files, control files, archive logs, and redo logs of the SnapManager repository database.	
Mount the volumes on the SnapManager repository host.	

Create an Oracle database for the SnapManager repository and make sure that the database binary files, data files, control files, archive logs, and redo log files are on the dedicated volumes created in the previous steps.





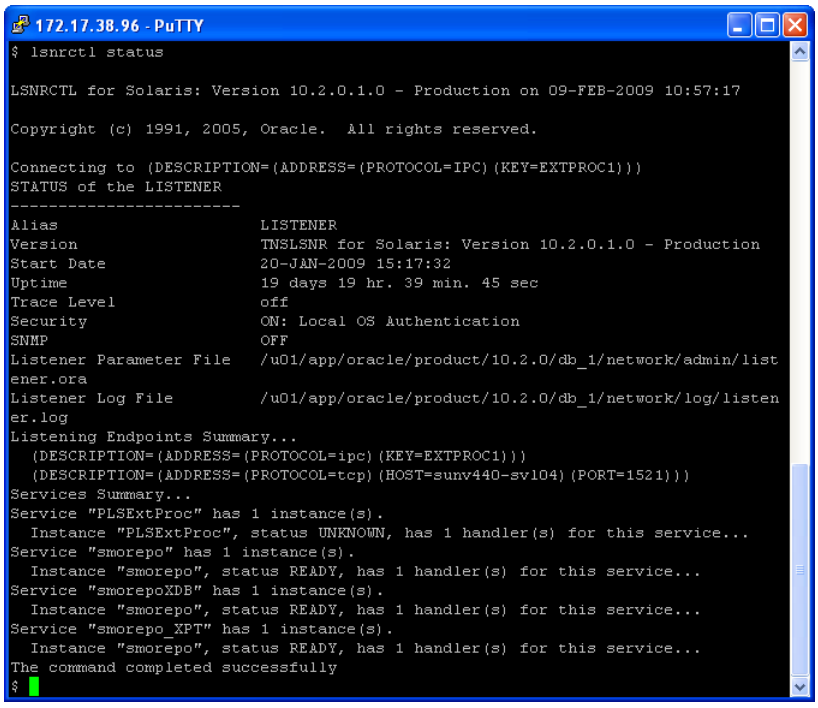
Edit the `tnsnames.ora` file on the SnapManager repository host and make an entry for the SnapManager repository database, if one has not already been created.



Make sure that the Oracle database listener is started and running.

- Ensure that the listener has been started:

  `[oracle]$ LSNRCTL> status`



<table>
<tr><td>Create a tablespace to be used by the SnapManager repository in the database just created.</td><td>

- Create a new tablespace for the SnapManager repository:

```
SQL> create tablespace "smo" datafile
'/u02/oradata/smorepo/smorepo01.dbf' size 100m
autoextend on;
```

- SnapManager requires a minimum 4K block size for the tablespace into which it is installed. Check the block size for the SMO tablespace by using:

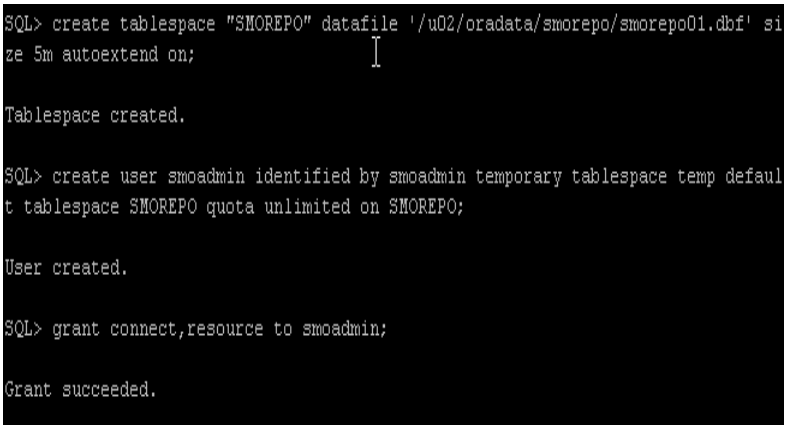
```
SQL> select tablespace_name, block_size from
dba_tablespaces where tablespace_name = 'SMO';

TABLESPACE_NAME                BLOCK_SIZE
------------------------------ ----------
SMO                                  8192
```

</td></tr>
<tr><td>Create an Oracle user who will own the SnapManager repository in the database just created.</td><td>

```
SQL> create user smoadmin identified by adminpw1 temporary
tablespace temp default tablespace smo quota unlimited on
smo;
```

</td></tr>
<tr><td>Grant only the “connect” and “resource” roles to the database user.</td><td>

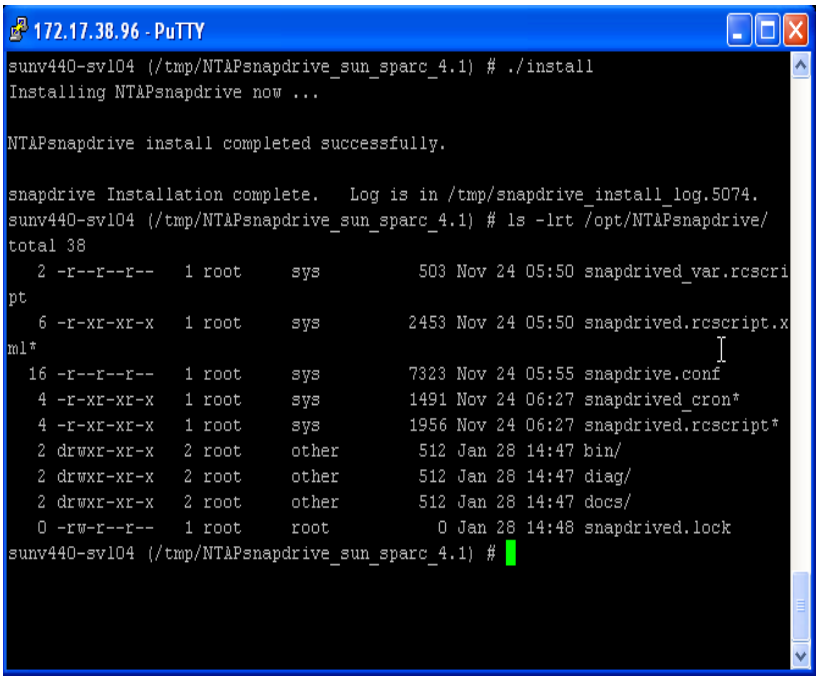
```
SQL> grant connect,resource to smoadmin;
```



</td></tr>
<tr><td>Teamcenter Database Host Setup</td><td>Example Commands</td></tr>
<tr><td>Install, configure, and verify SnapDrive on the Teamcenter database host.</td><td>

- SnapDrive should be installed on every host that has one or more databases that will be managed by SnapManager.
- Log in as root and install the SnapDrive software.

</td></tr>
</table>



- SnapDrive 4.0.1 for UNIX defaults to use the https connection. When upgrading to or installing SnapDrive 4.1 for UNIX, if you would like SnapDrive for UNIX to use the http protocol to communicate to the storage system, then:
  - Edit the `snapdrive.conf` file and set

    `use-https-to-filer=off`

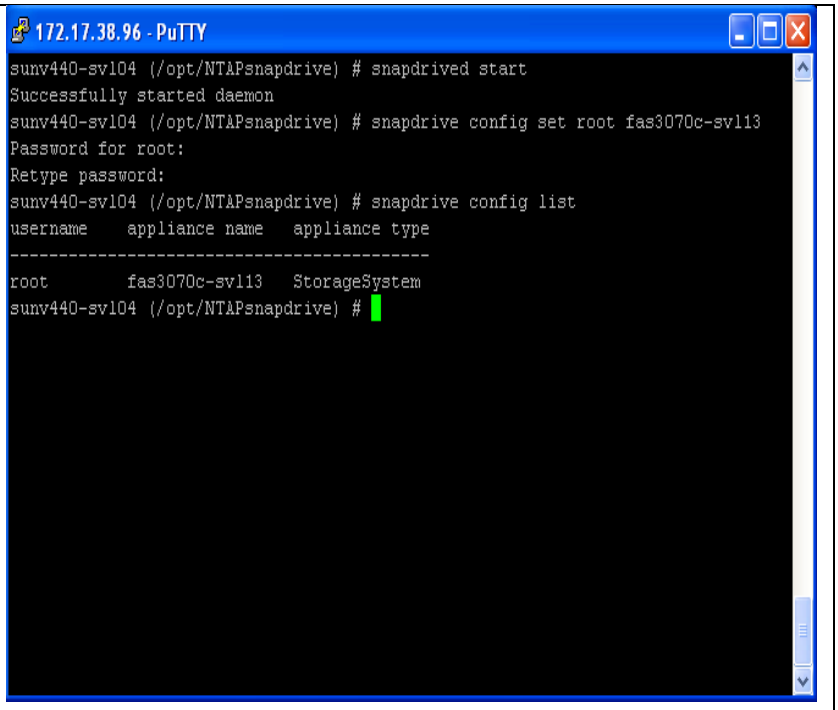
  Or, if your storage system is using the http protocol and you want SnapDrive for UNIX to use the https protocol instead, then:
  - Enable the https connection on your storage system
- Restart the SnapDrive daemon as root:

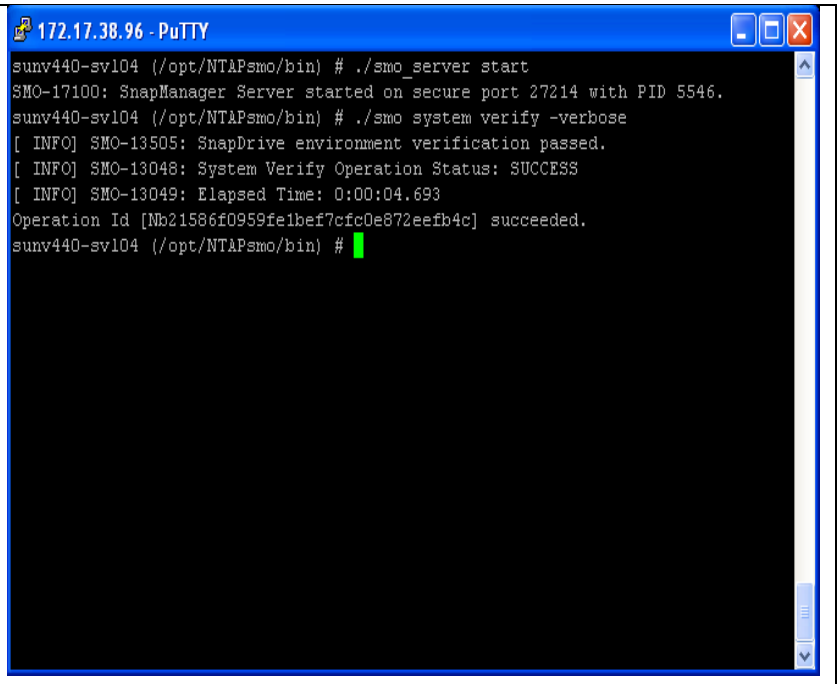
  `[root@172.17.38.94 snapdrive]# snapdrived restart`
- Configure SnapDrive and specify which OS user will be used to access the NetApp storage system used by the target databases:

  `[root@172.17.38.94 snapdrive]# snapdrive config set root my_netapp_storage_system1`
- Verify that the configuration succeeded:

  `[root@172.17.38.94 snapdrive]# snapdrive config list`

```
user name      filer name
-------------------------
    root           my_netapp_storage_system1
```

	
Install the SnapManager for Oracle software on the Teamcenter database host	• SnapManager software should be installed on every host that has one or more databases that will be managed by SnapManager. • Log in as root and install the SnapManager for Oracle software. • For an Oracle RAC or ASM RAC database: • If using the OS-authenticated connection mode, the SnapManager server must be installed and running on each node in the RAC cluster. This is a new requirement of SnapManager 3.0 for Oracle.
Start the SnapManager server on the Teamcenter database host	**[root@172.17.38.94 SMO]# smo_server start** **SMO-17100 [INFO]: SnapManager Server started on secure port 27214 with PID 8235.**
Verify the SnapManager installation	**[root@172.17.38.94 SMO]# smo system verify –verbose** **SMO-13505 [INFO]: Snapdrive verification passed.** **SMO-13048 [INFO]: System Verify Operation Status: SUCCESS** **SMO-13049 [INFO]: Elapsed Time: 0:00:00.243** **Operation Id [N422417e74b8d96200cae6742dacf89d0] succeeded.**

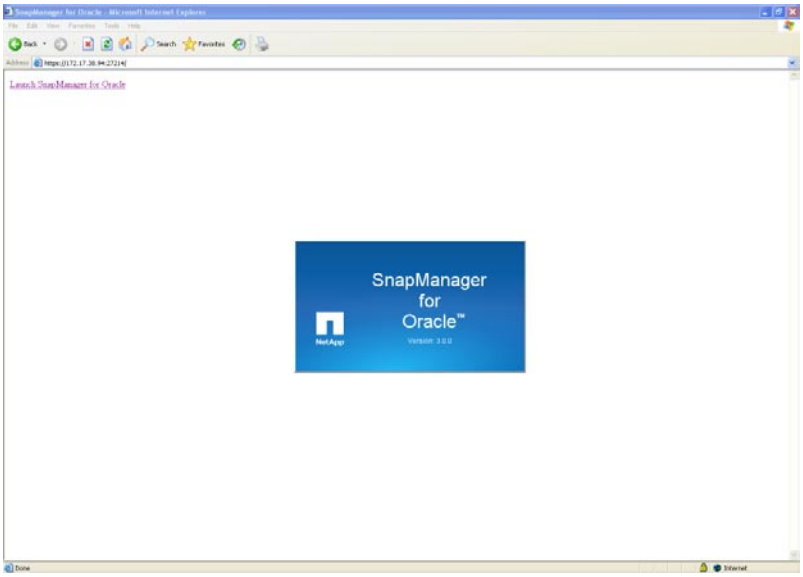
	
Create an Oracle user with the sysdba role for the target database that SnapManager will manage, or use any existing database user who has the sysdba role granted	**SQL> create user smo_oper identified by operpw1;** To manage a database, SnapManager requires that an Oracle user with the sysdba role connect to that database and perform database operations: **SQL> grant sysdba to smo_oper;**
If you want to register SnapManager backups with RMAN, SnapManager requires the target database to be registered with RMAN	**[oracle@172.17.38.94 ~]$ rman target / catalog rmanadmin/rmanpw1@rmanrepo** **RMAN> register database;**
Launching the SnapManager GUI or CLI	**Example Commands**
CLI	• The SnapManager CLI can be accessed from any host where the SnapManager server has been installed. • You can use any target database host where the SnapManager software is already installed to access the SnapManager CLI, or you can use a dedicated host just to issue SnapManager commands via the CLI. The SnapManager software still needs to be installed on this dedicated host to access the CLI. • The SnapManager commands all start with smo (SnapManager for Oracle).

<table>
<tr><td>GUI</td><td>

- The SnapManager GUI is launched from a Web browser on any host running any operating system that SnapManager supports:

  `https://smo-server.domain.com:port`

  where:
  - `smo-server` is the name of any host where the SnapManager server was installed and started.
  - `domain.com` is the domain of SnapManager server host.
  - `port` is the port number that the SnapManager server was started on. The default port is 27214.



</td></tr>
<tr><td>Credentials, Repository, and Profiles Setup</td><td colspan="2">Example Commands</td></tr>
<tr><td>Set target database host access credentials for every OS user who will use SnapManager</td><td colspan="2">

- Log in as the OS user on the host where you want to access the SnapManager CLI.
- Make sure that the SnapManager server is installed on the host and started:

  `smo credential set -host 172.17.38.96 -name S10ENGr –username xyz`

  `Enter password for user xyz@172.17.38.96: *******`
- Execute the above command for all target database hosts that this OS user will access using SnapManager.

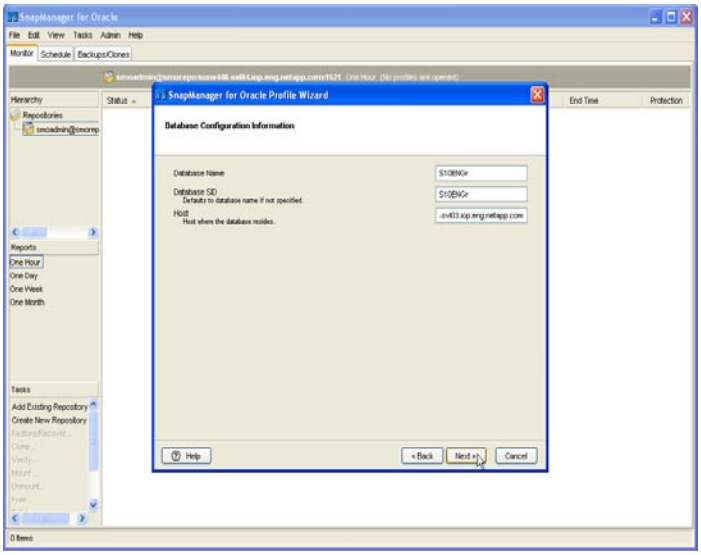
</td></tr>
<tr><td>Set repository access credentials for every OS user who will use SnapManager</td><td colspan="2">

- Log in as the OS user:

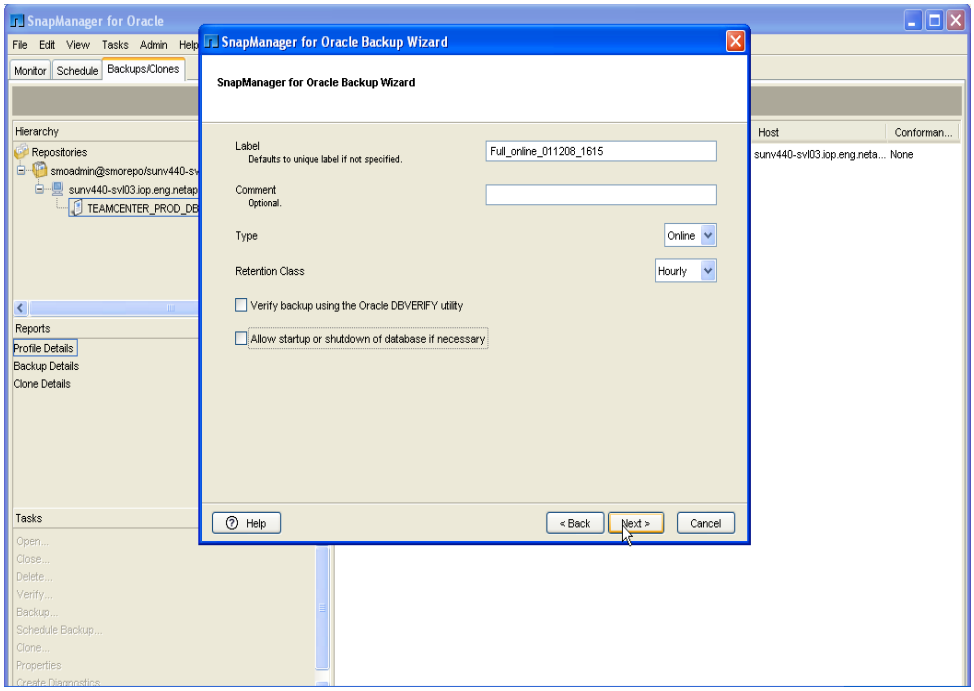
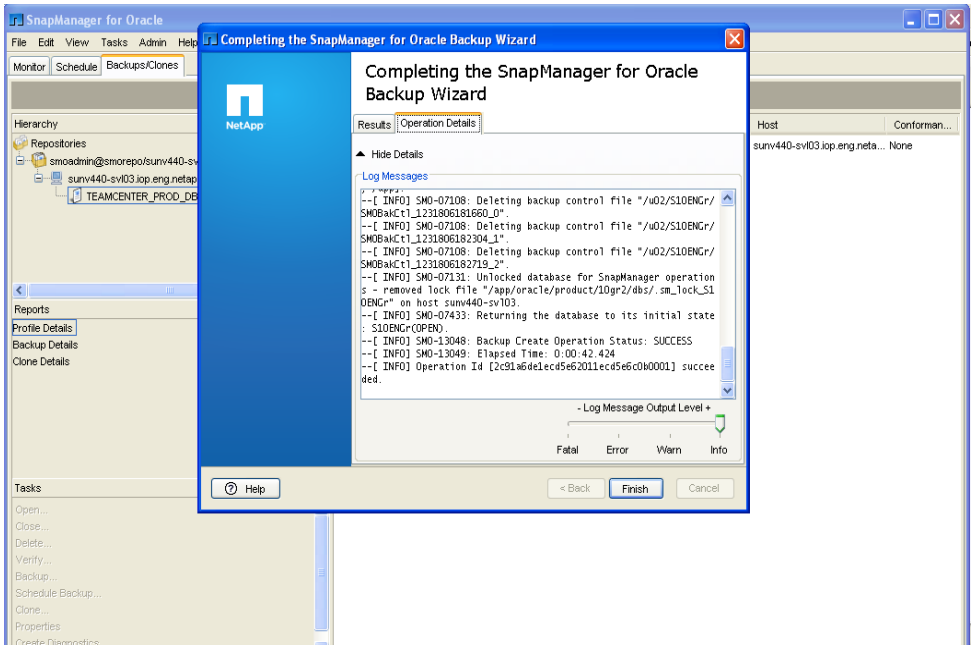
  `smo credential set -repository -host 172.17.38.96 -dbname smorepo -port 1524 -login -username smoadmin`

  `Enter password for database connection smoadmin@172.17.38.96:1521/smorepo: ********`

</td></tr>
<tr><td>Create the SnapManager repository by using</td><td>SMO GUI</td><td>Operations -> Repository -> Create New Repository…</td></tr>
</table>

SnapManager	SMO CLI	**smo repository create -repository -dbname smorepo -host 172.17.38.96 -port 1524 -login –username smoadmin**
Create a profile in SnapManager for every target database that will be managed by SnapManager	SMO GUI	**Operations -> Repository -> Create Profile…** 
	SMO CLI	• Without RMAN **smo profile create -profile teamcenter_prod_db -password tardbpw1 -repository -dbname smorepo -login -username smoadmin -host 172.17.38.96 -port 1524 -database -dbname S10ENGr -login -username smo_oper -password operpw1 -host 172.17.38.94 -port 1521 –sid S10ENGr -osaccount oracle -osgroup dba -retain 100 -verbose** • With RMAN **smo profile create -profile teamcenter_prod_db -password tardbpw1 -repository -dbname smorepo -login -username smoadmin -host 172.17.38.96 -port 1524 -database -dbname S10ENGr -host 172.17.38.94 -login -username smo_oper -password operpw1 -port 1521 –sid S10ENGr -osaccount oracle -osgroup dba -rman -login -username rmanadmin -password rmanpw1 -tnsname rmanrepo -retain 100 -verbose**

5 USING SNAPMANAGER FOR BACKUP, RESTORE, AND RECOVERY

Creating Backups	Example Commands
GUI	Right-click on the profile of the database and select Backup.  
CLI	To create a full online backup that is exempt from being deleted by the backup retention policy and verify the backup: **`smo backup create –online –full –profile teamcenter_prod_db –label full_hot_02052009_11h05m41s –verify –retain-unlimited -verbose`**

Deleting Backups	Example Commands
GUI	Right-click on the backup and select Delete.
CLI	**smo backup delete –profile teamcenter_prod_db -label full_hot_02052009_11h05m41s**
Restore and Recovery	**Example Commands**
GUI	Right-click on the backup and select Restore/Recover.
CLI	To restore an entire backup along with the control files and recover until the last transaction: **smo backup restore –profile teamcenter_prod_db –label full_hot_02052009_11h05m41s –complete –controlfiles –recover –alllogs**

6 BEST PRACTICES

6.1 TEAMCENTER DATABASE LAYOUT BEST PRACTICES

SnapManager for Oracle seamlessly integrates with the latest Oracle database releases with native Oracle technology (such as RAC, RMAN, ASM, and Direct NFS) across FC, iSCSI, and NFS protocols. Before deploying Oracle databases to be managed by SnapManager for Oracle on NetApp storage systems, please review the following:

- NetApp Best Practice Guidelines for Oracle
- NetApp Best Practice Guidelines for Oracle Database 11*g*

BEST PRACTICES AND REQUIREMENTS FOR ORACLE DATABASE LAYOUT AND CONFIGURATION

- NetApp recommends using separate volumes for the Oracle database binaries, data files, transaction log files, archive log files, and control files.
- NetApp recommends separating your Oracle databases into different flexible volumes.
- The database system identifier (SID) must be included in the `oratab` file. SnapManager relies on the `oratab` file to determine which Oracle home to use.
- If you want SnapManager to register SnapManager backups with RMAN, SnapManager requires the target database to be registered with RMAN.
- All LUNs within a volume should reside at the volume level or reside inside qtrees, not a combination of both.
- To leverage the new volume-based restore or full disk group restore capability of SnapManager 3.0 for Oracle, consider the following guidelines related to file systems and volumes or LUNs:
  - Multiple databases cannot share the same volume or LUN.
  - A volume containing data files cannot contain other types of files.
  - The LUN for the data file must be the only object in the storage volume.

BEST PRACTICES AND REQUIREMENTS FOR USING RAC DATABASES WITH SNAPMANAGER

- The password of the database user that SnapManager uses (typically sys) must be the same for all the Oracle instances in a RAC environment. SnapManager does not support OS-authenticated database connections for RAC databases.
- When using the database-authenticated connection mode, the listener on each node that services an instance of a RAC database must be configured to use the same port number.
- When using the OS-authenticated connection mode, the SnapManager server must be installed and running on each node in the RAC cluster. This is a new requirement of SnapManager 3.0 for Oracle.

BEST PRACTICES AND REQUIREMENTS FOR USING DATABASES ON NFS WITH SNAPMANAGER

- NetApp recommends mounting the file systems following the best practice recommendations in these technical reports:
  - NetApp Best Practice Guidelines for Oracle
  - NetApp Best Practice Guidelines for Oracle Database 11*g*
- All the volumes that contain Oracle data files, control files, redo and archive logs, and the Oracle home must be exported with the `anon=0` or Anonymous User Id=0 option. SnapManager runs as root and must be able to access the file systems containing Oracle data.
- All the volumes that contain Oracle data files, control files, redo and archive logs, and the Oracle home must also have attribute caching disabled and exported with the `noac` (for Solaris™, AIX, HP-UX) or `actimeo=0` (for Linux™) option.
- NetApp recommends not using symbolic links to the location of the database data files if linked from local storage to NFS.

6.2 SNAPMANAGER FOR ORACLE REPOSITORY DATABASE BEST PRACTICES

- SnapManager cannot back up and restore its own repository. NetApp recommends creating at least two SnapManager repositories so that cross backups (that is, Repository X has a profile of Repository Y, and vice versa) can be performed by using SnapManager, as shown in Figure 3. For details, see "Backing up repositories" in the SnapManager 3.0 for Oracle Installation and Administration Guide.
- NetApp recommends using a dedicated database (one that is not shared with other applications) for the SnapManager for Oracle repository.
- NetApp recommends deploying the database used for the SnapManager repository on a NetApp storage system for quick backup and restore capabilities.
- NetApp recommends creating a separate schema with its own tablespace for the SnapManager repository, making it easy to back up and restore.
- SnapManager requires a minimum block size of 4K for the tablespace in which it is installed. Check the block size in SQLPlus by using the following SQL command:

  ```
  select TABLESPACE_NAME, BLOCK_SIZE from dba_tablespaces;
  ```
- Grant only the "connect" and "resource" roles to the database user who will own the SnapManager repository.
- The repository cannot reside in the database being backed up by SnapManager. Therefore, you must have at least two databases (the SnapManager repository database and the target database being managed by SnapManager) up and running when you execute SnapManager.

7 CONCLUSION

NetApp storage solutions provide robust, high-performance data storage for Teamcenter environments. NetApp SnapManager for Oracle, in combination with Teamcenter's backup utility, simplifies and automates complex Oracle database and Teamcenter backup and recovery operations by leveraging NetApp Snapshot and SnapRestore technologies to provide fast, space-efficient, disk-based backups and rapid, granular restore and recovery of Teamcenter environments. The backup redesign for Siemens Teamcenter on NetApp data and storage management products and solutions immensely helps transparency and flexibility for Teamcenter users with minimum downtime and I/O disruption.

APPENDIX A: TEAMCENTER ENVIRONMENT DETAILS

HARDWARE DETAILS

Teamcenter Oracle Database Server	
Model	**Sun Fire™ V440**
CPU	**4 x sparcv9 processor 1593MHz and has a sparcv9 floating point processor**
Memory	**8Gb**
Hard drive	**4 x 72Gb**
OS	**Solaris 5.10 generic**
Teamcenter Application Server	
Model	**Sun Fire V440**
CPU	**4 x sparcv9 processor 1593MHz and has a sparcv9 floating point processor**
Memory	**8Gb**
Hard drive	**4 x 72Gb**
OS	**Solaris 5.10 generic**
NetApp Storage System	
Model	**FAS3070c**
OS	**DATA ONTAP 7.3**
Disk shelves	**DS-14 Fibre Channel (2 total)**
Disk drives	**144Gb: 15k RPM**
NIC	**Gigabit**
FC-AL disk adapters	**2**

SOFTWARE DETAILS

Teamcenter Application	
Version	**V10 or 2007MP3**
Teamcenter Oracle Database	
Version	**10gR2**
Configuration	**Standalone**
Protocol	**NFS**
SnapManager for Oracle Repository Database	
Version	**10gR2**
Configuration	**Standalone**
Protocol	**NFS**
SnapManager for Oracle	
Version	**3.0**
SnapDrive for UNIX	
Version	**4.0.1**

APPENDIX B: TEAMCENTER BACKUP SCRIPT

The following sample script illustrates how the SnapManager CLI, SnapDrive CLI, and the Teamcenter `backup_mode` utility can be leveraged to create a backup of the Oracle database and the TCFS volumes and send out an e-mail notification with the status and log of the backup operation. This script can be modified to suit any Teamcenter environment.

Note: This script is provided as an example only. It is not considered a NetApp product and is not supported.

ASSUMPTIONS

- This script has been tested on a Solaris 5.10 host.
- This script is run by the root user on the Teamcenter database host where SnapManager for Oracle and SnapDrive for UNIX are already installed and configured.
- This script logs into the Teamcenter application host as the `infodba` user whose `.profile` file has the following entries:

```
UGS_LICENSE_SERVER=28000@sunv440-svl04; export UGS_LICENSE_SERVER
export TC_ROOT=/scaletest/released/sol/v200713
export TC_DATA=/scaletest/imandata/testdata_netapp_svl04_v200713
. $TC_DATA/tc_profilevars
preferences_manager -u=infodba -p=infodba -g=dba -mode=import -scope=SITE
-preference=TC_set_tcfsModes -values=TRUE -action=OVERRIDE
```

Setting these environment variables notifies users to save their work to avoid loss of data before the `backup_mode` utility places the Teamcenter application in read-only mode.

```
#!/usr/bin/env bash

#
# This script will:
#
# - Backup the Teamcenter Application using SnapDrive for UNIX
#   - Switch the Teamcenter application to Read only mode
#   - Take a snapshot copy of the application storage volume
#     using SnapDrive for UNIX
#
# - Backup the Teamcenter Oracle database using SnapManager for Oracle
#   - Create a full online backup with a unique label
#     using SnapManager for Oracle
#   - Check the log file if the backup succeeded
#
# - Switch the Teamcenter application to Read-Write mode
#
# - Email the status of and log of the whole operation
#
# Authors:
# - Anand Ranganathan and Bikash Choudhury, NetApp
#

#
# Modify these values to suit your environment
#

# SnapManager for Oracle variables
my_bkup_label=$(date +"full_hot_"%m%d%Y"_"%H"h"%M"m"%S"s")
my_smo_profile=TEAMCENTER_PROD_DB
my_bkup_retention=unlimited
my_bkup_logfile=/users/oracle/smo_logs/smo_bkup_$my_bkup_label.log
my_bkup_status=""
```

```
# Teamcenter Application variables
my_teamcenter_app_host=sunv440-svl04
my_teamcenter_os_userid=infodba
my_teamcenter_app_mountpoint=/tcengvault

# SnapDrive for UNIX variables
my_snapdrive_install_dir=/opt/NTAPsnapdrive/bin/snapdrive
my_snapshot_name=$(date +"teamcenter_app_"%m%d%Y"_"%H"h"%M"m"%S"s")

# Email message variables
my_to_addr=abc@xyz.com
my_header_border="************************************************************"

#
# Below command will rsh to the Teamcenter Application host
# and switch to the application owner's OS userid
# and place the Teamcenter application in Read Only mode
#
echo -e "\n$my_header_border\nLogging into $my_teamcenter_app_host as
$my_teamcenter_os_userid\nPlacing the Teamcenter Application in Read Only
mode\n$my_header_border\n" >> $my_bkup_logfile
rsh $my_teamcenter_app_host su - $my_teamcenter_os_userid -c "'backup_modes -
u=infodba -p=infodba -g=dba -m=rdonly'" >> $my_bkup_logfile
echo -e "\n$my_header_border\nDone switching the Teamcenter Application in Read
only mode.\n$my_header_border" >> $my_bkup_logfile

#
# Below command will rsh to the Teamcenter Application host
# and Snapshot the volumes where the application resides
#
echo -e "\n$my_header_border\nLogging into $my_teamcenter_app_host as the ROOT
user\nCreating a Snapshot copy of the Teamcenter Application volume\nSnapshot
Copy Name: $my_snapshot_name\n$my_header_border\n" >> $my_bkup_logfile
rsh $my_teamcenter_app_host $my_snapdrive_install_dir snap create -fs
$my_teamcenter_app_mountpoint -snapname $my_snapshot_name >> $my_bkup_logfile
echo -e "\n$my_header_border\nDone creating a Snapshot copy of the Teamcenter
Application volume.\n$my_header_border" >> $my_bkup_logfile

#
# SMO command to create a full online backup
#
echo -e "\n$my_header_border\nCreating a SnapManager backup with label
$my_bkup_label ...\n$my_header_border\n" >> $my_bkup_logfile
smo backup create -profile $my_smo_profile -label $my_bkup_label -full -online
-retain -$my_bkup_retention -verbose >> $my_bkup_logfile
echo -e "\n$my_header_border\nBackup operation completed.\n$my_header_border"
>> $my_bkup_logfile

#
# Check the logfile for the status of the backup
#
echo -e "\nChecking the status of the backup operation ...\n"
grep SUCCESS $my_bkup_logfile > /dev/null  2>&1

if [ "$?" -ne "0" ]; then
{
    my_bkup_status="Failed"
    echo "SMO backup $my_bkup_label failed!"
}
else
{
```

```
    my_bkup_status="Succeeded"
    echo "SMO backup $my_bkup_label succeeded!"
}
fi

echo "Please check the logfile $my_bkup_logfile for more details."

#
# Below command will rsh to the Teamcenter Application host
# and switch to the application owner's OS userid
# and place the Teamcenter application in Read Write mode
#
echo -e "\n$my_header_border\nLogging into $my_teamcenter_app_host as
$my_teamcenter_os_userid\nPlacing the Teamcenter Application in Read Write
mode\n$my_header_border\n" >> $my_bkup_logfile
rsh $my_teamcenter_app_host su - $my_teamcenter_os_userid -c "'backup_modes -
u=infodba -p=infodba -g=dba -m=normal'" >> $my_bkup_logfile
echo -e "\n$my_header_border\nDone switching the Teamcenter Application in Read
Write mode.\n$my_header_border" >> $my_bkup_logfile

#
# Send an email notification with the status and the log
#
mailx -s "Teamcenter Backup $my_bkup_label $my_bkup_status" "$my_to_addr" <
$my_bkup_logfile
echo -e "\nSent an email notification to $my_to_addr \n"

exit 0
```

Sample e-mail alert sent out by the previous script:

```
*******************************************************
Logging into sunv440-svl04 as infodba
Placing the Teamcenter Application in Read Only mode
*******************************************************

Importing preference TC_set_tcfsModes=
TRUE

Successfully imported.
 The Teamcenter volumes are in read only mode

*******************************************************
Done switching the Teamcenter Application in Read only mode.
*******************************************************

*******************************************************
Logging into sunv440-svl04 as the ROOT user Creating a Snapshot copy of the
Teamcenter Application volume Snapshot Copy Name:
teamcenter_app_02172009_04h23m23s
*******************************************************

Starting snap create /tcengvault
  WARNING:  DO NOT CONTROL-C!
            If snap create is interrupted, incomplete snapdrive
              generated data may remain on the filer volume(s)
              which may interfere with other snap operations.
Successfully created snapshot teamcenter_app_02172009_04h23m23s on fas3070c-
svl13:/vol/tcengvault

       snapshot teamcenter_app_02172009_04h23m23s contains:
```

```
       file system: /tcengvault
       filer directory: fas3070c-svl13:/vol/tcengvault

************************************************************
Done creating a Snapshot copy of the Teamcenter Application volume.
************************************************************

************************************************************
Creating a SnapManager backup with label full_hot_02172009_04h23m23s ...
************************************************************

[ WARN] SMO-20005: Credential cache for OS user "root" has invalid password for
profile "TEAMCENTER_PROD_DB".  To set the password, run "smo credential set -
profile -name TEAMCENTER_PROD_DB".
[ WARN] SMO-20028: Profile password for profile "TEAMCENTER_PROD_DB" bypassed -
repository user "smoadmin" is the schema owner for the "SMO_30_PROFILE" table.
This bypass should be used with caution - typically only to reset a forgotten
password.
[ INFO] SMO-13046: Operation GUID 2c91a6de1f843191011f84319bd00001 starting on
Profile TEAMCENTER_PROD_DB [ INFO] SMO-07431: Saving starting state of the
database: S10ENGr(OPEN).
[ INFO] SMO-07431: Saving starting state of the database: S10ENGr(OPEN).
[ INFO] SMO-07127: Locked database for SnapManager operations - created lock
file "/app/oracle/product/10gr2/dbs/.sm_lock_S10ENGr" on host sunv440-svl03.
[ INFO] ORACLE-20024: Spooling control file for database S10ENGr to trace as
/var/tmp/SM_49817.
[ INFO] ORACLE-20024: Spooling control file for database S10ENGr to trace as
/var/tmp/SM_49818.
[ INFO] ORACLE-20024: Spooling control file for database S10ENGr to trace as
/var/tmp/SM_49819.
[ INFO] ORACLE-20019: Placing database S10ENGr into online backup mode.
[ INFO] SD-00016: Discovering storage resources for /u02.
[ INFO] SD-00017: Finished storage discovery for /u02.
[ INFO] SD-00001: Beginning snapshot with name
smo_teamcenter_prod_db_s10engr_f_h_1_2c91a6de1f843191011f84319bd00001_0 for
[/u02].
[ INFO] SD-00022: Querying for snapshot fas3070c-
svl13:/vol/oradata:smo_teamcenter_prod_db_s10engr_f_h_1_2c91a6de1f843191011f843
19bd00001_0.
[ INFO] SD-00023: Finished querying for snapshot fas3070c-
svl13:/vol/oradata:smo_teamcenter_prod_db_s10engr_f_h_1_2c91a6de1f843191011f843
19bd00001_0.
[ INFO] SD-00002: Created snapshot with name
smo_teamcenter_prod_db_s10engr_f_h_1_2c91a6de1f843191011f84319bd00001_0 for
[/u02].
[ INFO] ORACLE-20020: Taking database S10ENGr out of online backup mode.
[ INFO] ORACLE-20025: Forcing archival of all online redo logs for database
S10ENGr.
[ INFO] ORACLE-20023: Backing up control file for database S10ENGr to
/u02/S10ENGr/SMOBakCtl_1234873476761_0.
[ INFO] ORACLE-20023: Backing up control file for database S10ENGr to
/u02/S10ENGr/SMOBakCtl_1234873477276_1.
[ INFO] ORACLE-20023: Backing up control file for database S10ENGr to
/u02/S10ENGr/SMOBakCtl_1234873478139_2.
[ INFO] SD-00016: Discovering storage resources for /app.
[ INFO] SD-00017: Finished storage discovery for /app.
[ INFO] SD-00016: Discovering storage resources for /u02.
[ INFO] SD-00017: Finished storage discovery for /u02.
[ INFO] SD-00001: Beginning snapshot with name
smo_teamcenter_prod_db_s10engr_f_h_2_2c91a6de1f843191011f84319bd00001_0 for
[/u02, /app].
[ INFO] SD-00022: Querying for snapshot fas3070c-
```

```
svl13:/vol/oradata:smo_teamcenter_prod_db_s10engr_f_h_2_2c91a6de1f843191011f843
19bd00001_0.
[ INFO] SD-00023: Finished querying for snapshot fas3070c-
svl13:/vol/oradata:smo_teamcenter_prod_db_s10engr_f_h_2_2c91a6de1f843191011f843
19bd00001_0.
[ INFO] SD-00022: Querying for snapshot fas3070c-
svl13:/vol/orahome:smo_teamcenter_prod_db_s10engr_f_h_2_2c91a6de1f843191011f843
19bd00001_0.
[ INFO] SD-00023: Finished querying for snapshot fas3070c-
svl13:/vol/orahome:smo_teamcenter_prod_db_s10engr_f_h_2_2c91a6de1f843191011f843
19bd00001_0.
[ INFO] SD-00002: Created snapshot with name
smo_teamcenter_prod_db_s10engr_f_h_2_2c91a6de1f843191011f84319bd00001_0 for
[/u02, /app].
[ INFO] SMO-07108: Deleting backup control file
"/u02/S10ENGr/SMOBakCtl_1234873476761_0".
[ INFO] SMO-07108: Deleting backup control file
"/u02/S10ENGr/SMOBakCtl_1234873477276_1".
[ INFO] SMO-07108: Deleting backup control file
"/u02/S10ENGr/SMOBakCtl_1234873478139_2".
[ INFO] SMO-07131: Unlocked database for SnapManager operations - removed lock
file "/app/oracle/product/10gr2/dbs/.sm_lock_S10ENGr" on host sunv440-svl03.
[ INFO] SMO-07433: Returning the database to its initial state: S10ENGr(OPEN).
[ INFO] SMO-13048: Backup Create Operation Status: SUCCESS [ INFO] SMO-13049:
Elapsed Time: 0:00:45.174 Operation Id [2c91a6de1f843191011f84319bd00001]
succeeded.

*********************************************************
Backup operation completed.
*********************************************************

*********************************************************
Logging into sunv440-svl04 as infodba
Placing the Teamcenter Application in Read Write mode
*********************************************************

Importing preference TC_set_tcfsModes=
TRUE

Successfully imported.
 The Teamcenter volumes are in normal mode

*********************************************************
Done switching the Teamcenter Application in Read Write mode.
*********************************************************
```

APPENDIX C: TEAMCENTER RESTORE AND RECOVERY SCRIPT

The following sample script illustrates how the SnapManager CLI and the Teamcenter `backup_mode` utility can be leveraged to restore and recover the Oracle database and the TCFS volumes from a backup created by the sample script in Appendix B and send out an e-mail notification with the status and log of the restore and recovery operation. This script can be modified to suit any Teamcenter environment.

Note: This script is provided as an example only. It is not considered a NetApp product and is not supported.

ASSUMPTIONS

- This script has been tested on a Solaris 5.10 host.
- This script is run by the root user on the Teamcenter database host where SnapManager for Oracle and SnapDrive for UNIX are already installed and configured.
- This script logs into the Teamcenter application host as the `infodba` user whose `.profile` file has the following entries:

```
UGS_LICENSE_SERVER=28000@sunv440-svl04; export UGS_LICENSE_SERVER
export TC_ROOT=/scaletest/released/sol/v200713
export TC_DATA=/scaletest/imandata/testdata_netapp_svl04_v200713
. $TC_DATA/tc_profilevars
preferences_manager -u=infodba -p=infodba -g=dba -mode=import -scope=SITE
-preference=TC_set_tcfsModes -values=TRUE -action=OVERRIDE
```

  Setting these environment variables notifies users to save their work to avoid loss of data before the `backup_mode` utility places the Teamcenter application in read-only mode.

```
#!/usr/bin/env bash

#
# This script will:
#
# - Switch the Teamcenter application to Read-only mode
#
# - Restore  and recover the Teamcenter Oracle database
#   using SnapManager for Oracle
#   - Restore and recover the database from a previous backup
#     using SnapManager for Oracle
#   - Check the log file if the restore and recovery succeeded
#
# - Restore the Teamcenter Application  from a Snapshot copy
#   using SnapRestore
#
# - Switch the Teamcenter application to Read-Write mode
#
# - Email the status and log of the whole operation
#
# Authors:
# - Anand Ranganathan and Bikash Choudhury, NetApp
#


#
# Modify these values to suit your environment
#

# SnapManager for Oracle variables
my_bkup_label="full_hot_02172009_04h23m23s"
```

```
my_smo_profile=TEAMCENTER_PROD_DB
my_restore_logfile=/users/oracle/smo_logs/smo_restore_$(date
+""%m%d%Y"_"%H"h"%M"m"%S"s").log
my_restore_status=""

# Teamcenter Application variables
my_teamcenter_app_host=sunv440-svl04
my_teamcenter_os_userid=infodba
my_teamcenter_app_filer=fas3070c-svl13
my_teamcenter_app_filer_vol=/vol/tcengvault
my_teamcenter_app_snapshot=teamcenter_app_02172009_04h23m23s

# Email message variables
my_to_addr=anand.ranganathan@netapp.com
my_header_border="**************************************************
****"

#
# Below command will rsh to the Teamcenter Application host
# and switch to the application owner's OS userid
# and place the Teamcenter application in Read Only mode
#
echo -e "\n$my_header_border\nLogging into $my_teamcenter_app_host as
$my_teamcenter_os_userid\nPlacing the Teamcenter Application in Read
Only mode\n$my_header_border\n" >> $my_restore_logfile
rsh $my_teamcenter_app_host su - $my_teamcenter_os_userid -c
"'backup_modes -u=infodba -p=infodba -g=dba -m=rdonly'" >>
$my_restore_logfile
echo -e "\n$my_header_border\nDone switching the Teamcenter Application
in Read only mode.\n$my_header_border" >> $my_restore_logfile

#
# SMO command to restore and recover the database
#
echo -e "\n$my_header_border\nRestoring and recovering the database
using the SnapManager backup with label $my_bkup_label
...\n$my_header_border\n" >> $my_restore_logfile
smo backup restore -profile $my_smo_profile -label $my_bkup_label -
complete -controlfiles -recover -alllogs -force -verbose >>
$my_restore_logfile
echo -e "\n$my_header_border\nDatabase restore and recovery
completed.\n$my_header_border" >> $my_restore_logfile

#
# Check the logfile for the status of the restore and recovery
operation
#
grep SUCCESS $my_restore_logfile > /dev/null  2>&1

if [ "$?" -ne "0" ]; then
{
    my_restore_status="Failed"
    echo "SMO restore and recovery $my_bkup_label failed!"
}
else
{
```

```
    my_restore_status="Succeeded"
    echo "SMO restore and recovery $my_bkup_label succeeded!"
}
fi

#
# Below command will rsh to the NetApp storage system
# where the Teamcenter Application's TCFS volumes
# are created and restore them from a previous Snapshot
#
echo -e "\n$my_header_border\nLogging into
$my_teamcenter_app_filer\nRestoring  volume
$my_teamcenter_app_filer_vol\nfrom Snapshot $my_teamcenter_app_snapshot
using SnapRestore\n$my_header_border" >> $my_restore_logfile
rsh $my_teamcenter_app_filer  snap restore -f -t vol -s
$my_teamcenter_app_snapshot $my_teamcenter_app_filer_vol >>
$my_restore_logfile
echo -e "\n$my_header_border\nDone restoring the Teamcenter TCFS
volume.\n$my_header_border" >> $my_restore_logfile

#
# Below command will rsh to the Teamcenter Application host
# and switch to the application owner's OS userid
# and place the Teamcenter application in Read Write mode
#
echo -e "\n$my_header_border\nLogging into $my_teamcenter_app_host as
$my_teamcenter_os_userid\nPlacing the Teamcenter Application in Read
Write mode\n$my_header_border\n" >> $my_restore_logfile
rsh $my_teamcenter_app_host su - $my_teamcenter_os_userid -c
"'backup_modes -u=infodba -p=infodba -g=dba -m=normal'" >>
$my_restore_logfile
echo -e "\n$my_header_border\nDone switching the Teamcenter Application
in Read Write mode.\n$my_header_border" >> $my_restore_logfile

#
# Send an email notification with the status and the log
#
mailx -s "Teamcenter Restore and Recovery $my_restore_status"
"$my_to_addr" < $my_restore_logfile
echo -e "Sent an email notification to $my_to_addr \n"

echo "Please check the logfile $my_restore_logfile for more details."

exit 0
```

Sample e-mail alert sent out by previous script:

```
*******************************************************
Logging into sunv440-svl04 as infodba
Placing the Teamcenter Application in Read Only mode
*******************************************************

Importing preference TC_set_tcfsModes=
TRUE

Successfully imported.
```

```
 The Teamcenter volumes are in read only mode

*********************************************************
Done switching the Teamcenter Application in Read only mode.
*********************************************************

*********************************************************
Restoring and recovering the database using the SnapManager backup with label
full_hot_02172009_04h23m23s ...
*********************************************************

[ WARN] SMO-20005: Credential cache for OS user "root" has invalid password for
profile "TEAMCENTER_PROD_DB".  To set the password, run "smo credential set -
profile -name TEAMCENTER_PROD_DB".
[ WARN] SMO-20028: Profile password for profile "TEAMCENTER_PROD_DB" bypassed -
repository user "smoadmin" is the schema owner for the "SMO_30_PROFILE" table.
This bypass should be used with caution - typically only to reset a forgotten
password.
[ INFO] SMO-13046: Operation GUID 2c91a6de1f845f4b011f845f56290001 starting on
Profile TEAMCENTER_PROD_DB [ INFO] SMO-07431: Saving starting state of the
database: S10ENGr(OPEN).
[ INFO] SMO-07431: Saving starting state of the database: S10ENGr(OPEN).
[ INFO] SMO-07127: Locked database for SnapManager operations - created lock
file "/app/oracle/product/10gr2/dbs/.sm_lock_S10ENGr" on host sunv440-svl03.
[ INFO] ORACLE-20000: Changing state for database instance S10ENGr from OPEN to
STARTED.
[ INFO] SMO-07200: Beginning restore of database "S10ENGR".
[ INFO] SD-00022: Querying for snapshot fas3070c-
svl13:/vol/orahome:smo_teamcenter_prod_db_s10engr_f_h_2_2c91a6de1f843191011f843
19bd00001_0.
[ INFO] SD-00023: Finished querying for snapshot fas3070c-
svl13:/vol/orahome:smo_teamcenter_prod_db_s10engr_f_h_2_2c91a6de1f843191011f843
19bd00001_0.
[ INFO] SD-00022: Querying for snapshot fas3070c-
svl13:/vol/oradata:smo_teamcenter_prod_db_s10engr_f_h_2_2c91a6de1f843191011f843
19bd00001_0.
[ INFO] SD-00023: Finished querying for snapshot fas3070c-
svl13:/vol/oradata:smo_teamcenter_prod_db_s10engr_f_h_2_2c91a6de1f843191011f843
19bd00001_0.
[ INFO] SD-00016: Discovering storage resources for /u02.
[ INFO] SD-00017: Finished storage discovery for /u02.
[ INFO] SD-00010: Beginning single file restore of file(s)
[/u02/S10ENGr/SMOBakCtl_1234873476761_0,
/u02/S10ENGr/SMOBakCtl_1234873477276_1, /u02/S10ENGr/SMOBakCtl_1234873478139_2]
from snapshot
smo_teamcenter_prod_db_s10engr_f_h_2_2c91a6de1f843191011f84319bd00001_0.
[ INFO] SD-00011: Finished single file restore of file(s)
[/u02/S10ENGr/SMOBakCtl_1234873476761_0,
/u02/S10ENGr/SMOBakCtl_1234873477276_1, /u02/S10ENGr/SMOBakCtl_1234873478139_2]
from snapshot
smo_teamcenter_prod_db_s10engr_f_h_2_2c91a6de1f843191011f84319bd00001_0.
[ INFO] PLAT-00001: Copying file "/u02/S10ENGr/SMOBakCtl_1234873477276_1" to
"/u02/S10ENGr/control03.ctl".
[ INFO] PLAT-00001: Copying file "/u02/S10ENGr/SMOBakCtl_1234873477276_1" to
"/u02/S10ENGr/control02.ctl".
[ INFO] PLAT-00001: Copying file "/u02/S10ENGr/SMOBakCtl_1234873477276_1" to
"/u02/S10ENGr/control01.ctl".
[ INFO] ORACLE-20000: Changing state for database instance S10ENGr from STARTED
to MOUNTED.
[ INFO] ORACLE-20009: Attempting to reconnect to instance S10ENGr after
shutdown/startup.
[ INFO] ORACLE-20009: Attempting to reconnect to instance S10ENGr after
```

```
shutdown/startup.
[ INFO] ORACLE-20011: Reconnect to instance S10ENGr successful.
[ INFO] SD-00022: Querying for snapshot fas3070c-
svl13:/vol/oradata:smo_teamcenter_prod_db_s10engr_f_h_1_2c91a6de1f843191011f843
19bd00001_0.
[ INFO] SD-00023: Finished querying for snapshot fas3070c-
svl13:/vol/oradata:smo_teamcenter_prod_db_s10engr_f_h_1_2c91a6de1f843191011f843
19bd00001_0.
[ INFO] SD-00016: Discovering storage resources for /u02.
[ INFO] SD-00017: Finished storage discovery for /u02.
[ INFO] SD-00016: Discovering storage resources for /u03.
[ INFO] SD-00017: Finished storage discovery for /u03.
[ INFO] SD-00016: Discovering storage resources for /u02.
[ INFO] SD-00017: Finished storage discovery for /u02.
[ INFO] SD-00016: Discovering storage resources for /app.
[ INFO] SD-00017: Finished storage discovery for /app.
[ INFO] SD-00010: Beginning single file restore of file(s)
[/u02/S10ENGr/sysaux01.dbf, /u02/S10ENGr/idata01.dbf,
/u02/S10ENGr/undotbs01.dbf, /u02/S10ENGr/system01.dbf, /u02/S10ENGr/indx01.dbf,
/u02/S10ENGr/perfstat01.dbf, /u02/S10ENGr/ilog01.dbf] from snapshot
smo_teamcenter_prod_db_s10engr_f_h_1_2c91a6de1f843191011f84319bd00001_0.
[ INFO] SD-00011: Finished single file restore of file(s)
[/u02/S10ENGr/sysaux01.dbf, /u02/S10ENGr/idata01.dbf,
/u02/S10ENGr/undotbs01.dbf, /u02/S10ENGr/system01.dbf, /u02/S10ENGr/indx01.dbf,
/u02/S10ENGr/perfstat01.dbf, /u02/S10ENGr/ilog01.dbf] from snapshot
smo_teamcenter_prod_db_s10engr_f_h_1_2c91a6de1f843191011f84319bd00001_0.
[ INFO] ORACLE-30009: Recovery will be performed using backup controlfile.
[ INFO] ORACLE-30008: Beginning recovery process for database S10ENGr.
[ INFO] ORACLE-30010: Database recovery point objective: latest committed
transaction for the incarnation [ INFO] ORACLE-30016: Recovery point objective
reached: latest committed transaction for the incarnation [ INFO] ORACLE-20000:
Changing state for database instance S10ENGr from MOUNTED to OPEN.
[ INFO] ORACLE-20005: Opening database S10ENGr with RESETLOGS option.
[ INFO] SMO-07131: Unlocked database for SnapManager operations - removed lock
file "/app/oracle/product/10gr2/dbs/.sm_lock_S10ENGr" on host sunv440-svl03.
[ INFO] SMO-07433: Returning the database to its initial state: S10ENGr(OPEN).
[ INFO] SMO-13048: Backup Restore Operation Status: SUCCESS [ INFO] SMO-13049:
Elapsed Time: 0:03:56.803

Restore Plan:
  Review:

    The following files have been restored completely via: storage side file
restore
      /u02/S10ENGr/SMOBakCtl_1234873476761_0
      /u02/S10ENGr/SMOBakCtl_1234873477276_1
      /u02/S10ENGr/SMOBakCtl_1234873478139_2
      /u02/S10ENGr/idata01.dbf
      /u02/S10ENGr/ilog01.dbf
      /u02/S10ENGr/indx01.dbf
      /u02/S10ENGr/perfstat01.dbf
      /u02/S10ENGr/sysaux01.dbf
      /u02/S10ENGr/system01.dbf
      /u02/S10ENGr/undotbs01.dbf

  Analysis:

    The following reasons prevented certain files from being restored
completely via: storage side file system restore
        Files in file system /u02 not part of the restore scope will be
reverted.
    Files not in restore scope:
```

```
      /u02/a
    Files restored:
      /u02/S10ENGr/SMOBakCtl_1234873476761_0
      /u02/S10ENGr/SMOBakCtl_1234873477276_1
      /u02/S10ENGr/SMOBakCtl_1234873478139_2

    The following reasons prevented certain files from being restored
completely via: storage side file system restore
        Files in file system /u02 not part of the restore scope will be
reverted.
    Files not in restore scope:
      /u02/S10ENGr/control03.ctl
    Files restored:
      /u02/S10ENGr/idata01.dbf
      /u02/S10ENGr/ilog01.dbf
      /u02/S10ENGr/indx01.dbf
      /u02/S10ENGr/perfstat01.dbf
      /u02/S10ENGr/sysaux01.dbf
      /u02/S10ENGr/system01.dbf
      /u02/S10ENGr/undotbs01.dbf

Operation Id [2c91a6de1f845f4b011f845f56290001] succeeded.

*********************************************************
Database restore and recovery  completed.
*********************************************************

*********************************************************
Logging into fas3070c-svl13
Restoring  volume /vol/tcengvault
from Snapshot teamcenter_app_02172009_04h23m23s using SnapRestore
*********************************************************
Volume tcengvault: revert successful.

*********************************************************
Done restoring the Teamcenter TCFS volume.
*********************************************************

*********************************************************
Logging into sunv440-svl04 as infodba
Placing the Teamcenter Application in Read Write mode
*********************************************************

Importing preference TC_set_tcfsModes=
TRUE

Successfully imported.
 The Teamcenter volumes are in normal mode

*********************************************************
Done switching the Teamcenter Application in Read Write mode.
*********************************************************
```

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