

**Zero Data Loss Recovery Appliance Test Drive Manual**

(OEM 13c version 2.1)



**ORACLE®**  
SOLUTION CENTER

(North America)

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## Purpose and Rules

This is to demonstrate the feature functionality of the technology being presented. In particular, Oracle Zero Data Loss Recovery Appliance (ZDLRA or RA).

The machine names and database names may vary depending on their availability on the date of your demo. You will access this demo environment using a web browser running Oracle Enterprise Manager OEM 13c.

Please submit your workshop request at <http://osc.us.oracle.com> and Oracle Solution Center will schedule your access accordingly and an access credential will be provided by OSC.

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## Introduction of Zero Data Loss Recovery Appliance (ZDLRA or RA)

Organizations that rely on Oracle databases to store and manage their most business-critical data deserve a backup solution that's specifically engineered to fully protect the logical data in an efficient, database-optimized manner. The Zero Data Loss Recovery Appliance (Recovery Appliance) offers the highest levels of protection, performance, and backup storage efficiencies for all your Oracle databases, across all supported database versions, hardware and OS platforms.

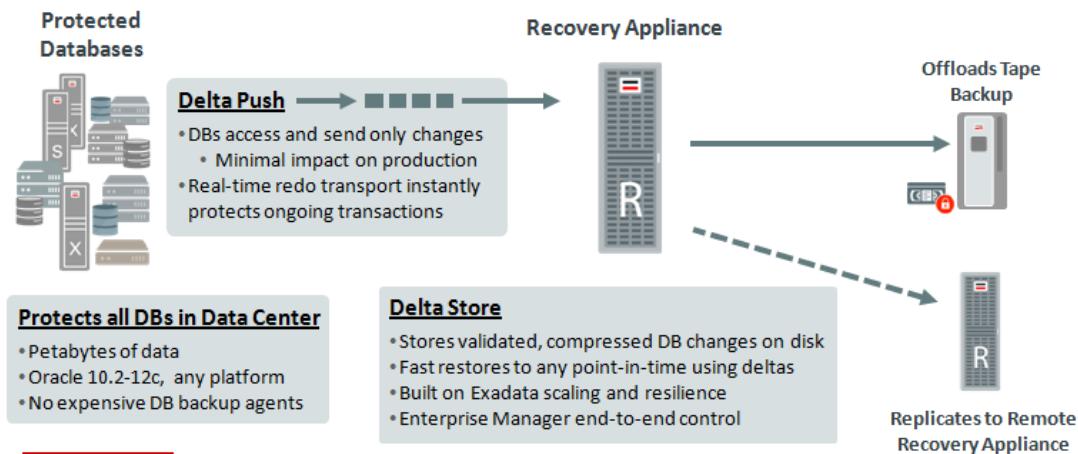


Figure 1: Zero Data Loss Recovery Appliance

The appliance standardizes database backup and recovery processes across the entire enterprise, offering the following Oracle-specific advantages:

- 1) Eliminate data loss
  - a) Recovery Appliance protects your critical business data till the last sub-second. From an RPO perspective, this is significantly better than most backup solutions - with which upon restore you will lose data till the last backup, which could be hours to days
- 2) Zero impact backups
  - a) Most backup processing offloaded to Recovery Appliance; the incremental backups and redo transport operations are asynchronous without interference to production workload
- 3) End-to-end data protection visibility
  - a) From protected databases to Recovery Appliance to replicated Recovery Appliance /tape - it is continuous data validation, plus one unified administrative interface
- 4) Modern cloud scale architecture

- a) With a hardware architecture that is based on Oracle Engineered Systems proven scale out technology, Recovery Appliance easily supports hundreds to thousands of protected databases, and increased storage capacity comes with increased compute plus increased bandwidth

### Module 1. Oracle Recovery Appliance Centralized Management Foundation

Oracle Enterprise Manager (OEM) provides a single-pane-of-glass management interface from database management to data protection and much more. OEM is tightly integrated with the Recovery Appliance and is the recommended interface for managing Oracle database backup / recovery and high availability (HA) in Recovery Appliance environments. With OEM, you will achieve end-to-end visibility of backups to Recovery Appliance, copy-to-tape and/or replication along with real-time monitoring and reporting. The goal of this section is to:

- Introduce you to OEM and demonstrate how easy it is to navigate between targets.
- Introduce you to Recovery Appliance storage management infrastructure.

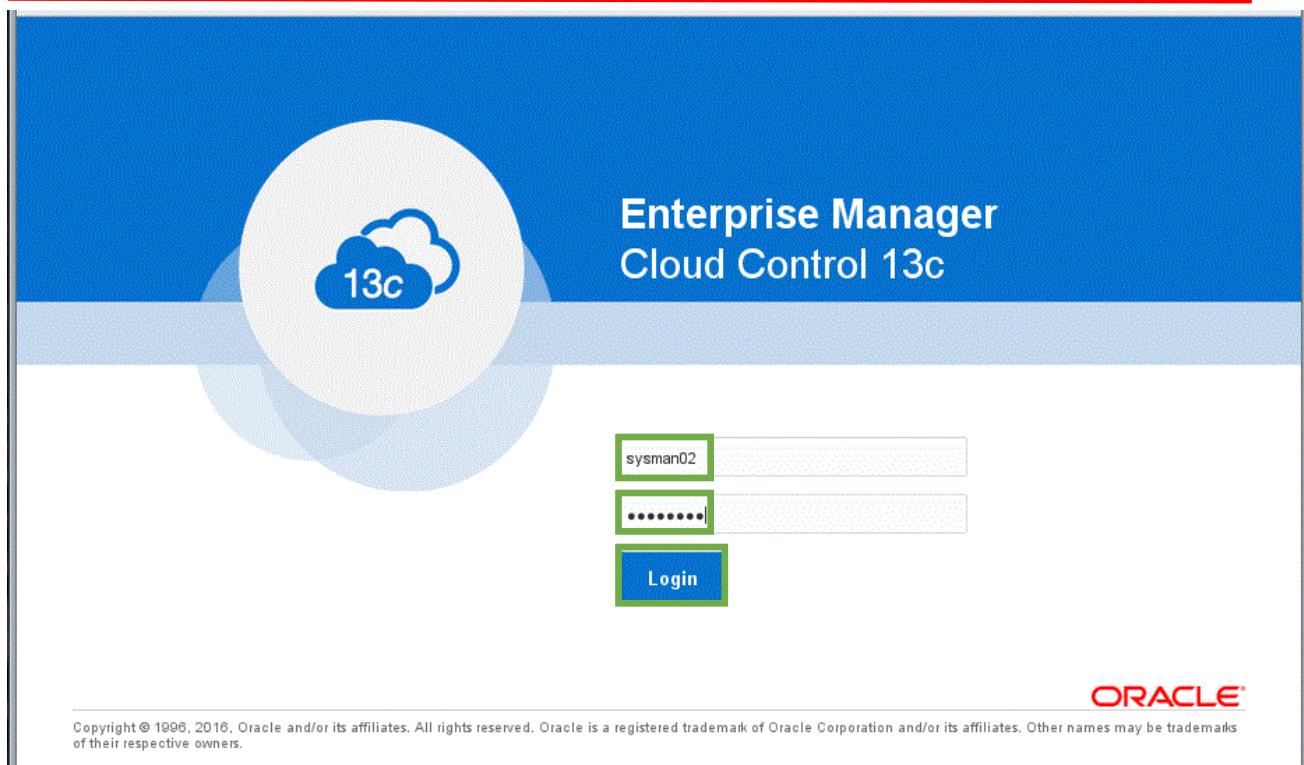
Review the existing demo environment, storage history and how to use Recovery

Appliance Storage Location(s) for effectively managing a large environment.

#### **Exercise 1-1. Oracle Enterprise Manager (OEM)**

Oracle Enterprise Manager provides the unified management interface for Oracle Recovery Appliance.

**Step 1:** In your web browser address field, enter the OEM hostname provided by your instructor along with appropriate username / password credentials.



**Step 2:** After logging into the OEM, from top of the screen, select the drop-down menu for Targets and highlight the Recovery Appliance target. Then click on the Recovery Appliance name. This will take you to the Recovery Appliance Home Page.

The screenshot shows the Oracle Enterprise Manager Cloud Control 13c interface. The main area displays an 'Enterprise Summary' with a pie chart showing target status: 89% Up (123), 9% Unknown (13), and 1% Down (2). Below this is an 'Incidents' section. On the right, a navigation sidebar lists categories like All Targets, Groups, Systems, Services, Hosts, Databases, Middleware, Business Applications, Composite Applications, Exadata, and Recovery Appliances. A green box highlights the 'Recovery Appliances' link under Business Applications. The top bar includes standard navigation icons and the user name SYSMAND02.

A new window opens. Your RA name may be different here. Click on its name to login.

The screenshot shows the 'Recovery Appliances' page. It features a table with columns for Name, Status, Version, Protected Databases, Member Status, and Incidents and Events. One row in the table is highlighted with a green box, showing the name 'SCA-ZDLRA2'. The 'Protected Databases' column for this row contains a red downward arrow icon. The top bar includes standard navigation icons and the user name SYSMAND02.

A login page will display the first time you access the Recovery Appliance pages. Accept the predefined credential for user RASYS and login.

**ORACLE® Enterprise Manager Cloud Control 13c**

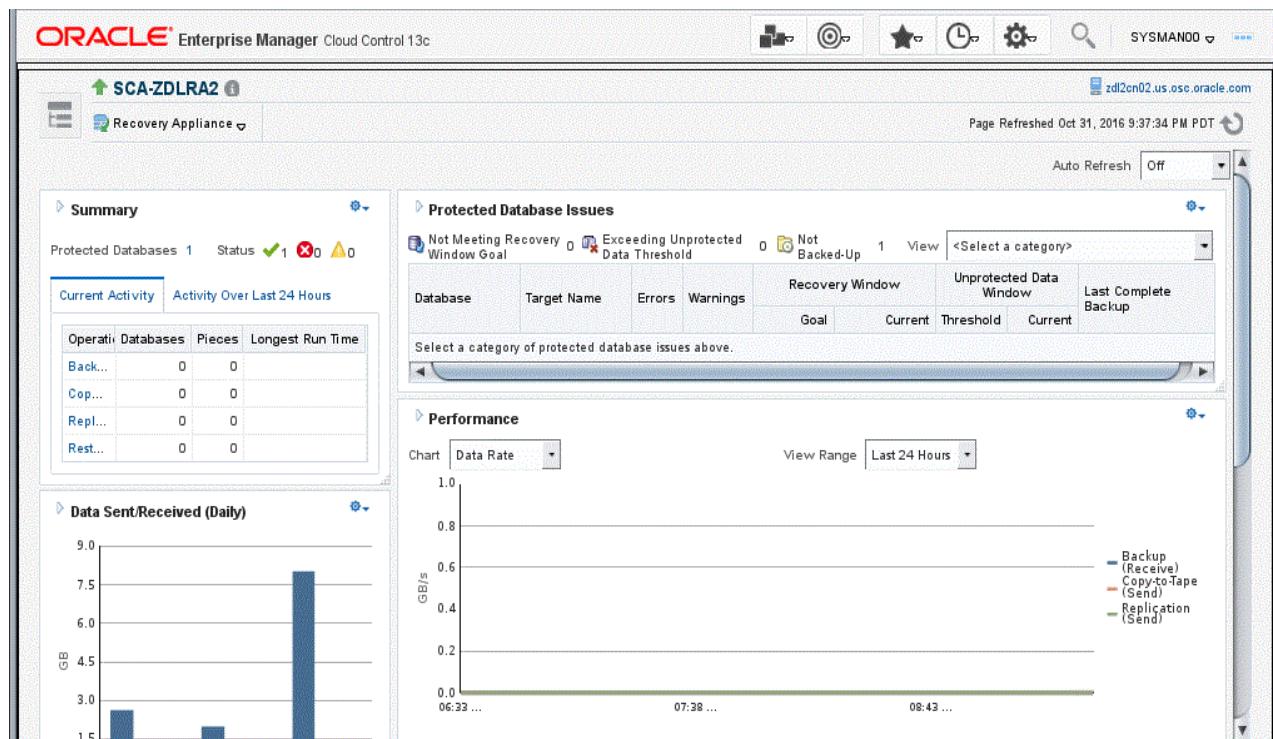
**SCA-ZDLRA2**

**Recovery Appliance Login**

Specify the database user credentials for the Recovery Appliance administrator.

Credential	<input checked="" type="radio"/> Named <input type="radio"/> New
Credential Name	ZDLRA2_RASYS_CRED
Attribute Value	
Username	rasy
Password	*****
Role	normal
<a href="#">More Details</a>	
<b>Login</b> <b>Cancel</b>	

The Recovery Appliance home page is displayed



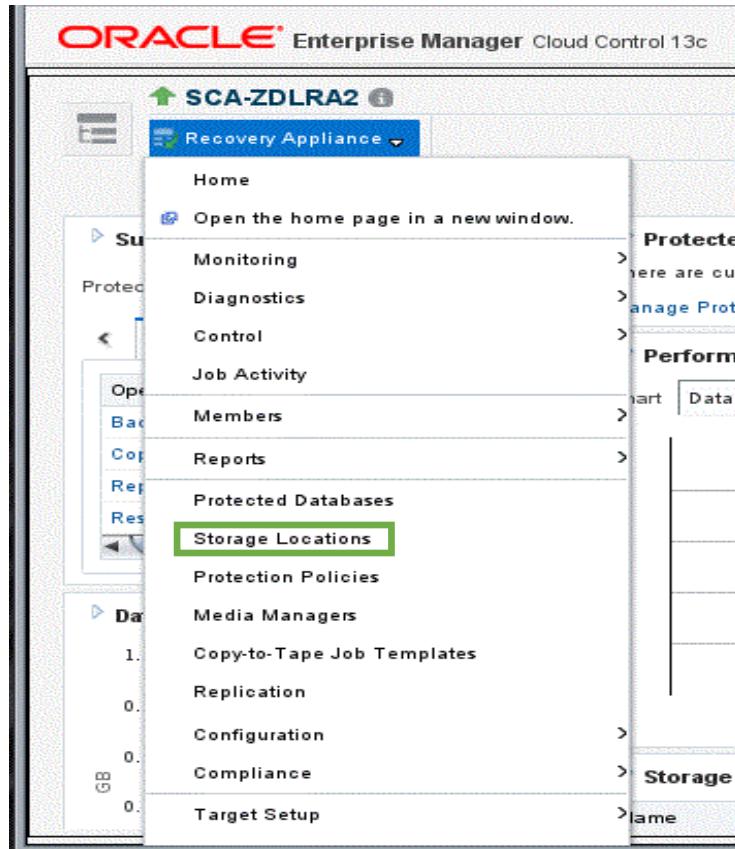
The Recovery Appliance Home Page is a virtual command center providing an overview of all aspects of centralized management of the environment including storage, performance, recent

activity, issues which may need attention and a summary of the overall environment. The Home Page is divided into sections with each providing a snapshot of relevant information. The sections from left to right are described below:

- **Summary** – Number of protected database under management and health status along with current activity and activity within the last 24 hours. Click the links under Operation (e.g. Backup, Copy-To-Tape, Replication or Restore) for more detailed information.
- **Protected Database Issues** – Highlights any issues relating to backup/recovery status for protected databases which may need your attention along with drop-downs allowing you to filter by various key categories.
- **Data Sent/Received** – Displays daily throughput for the last week.
- **Performance** – Charts performance statistics for Data Rate and Queued Data filterable by day, week or month.
- **Media Managers** – Displays the configured media manager for copy to tape operations.
- **Storage Locations** – Displays a summary of total available space and usage by how much is consumed to meet recovery window goals along with what % of the total space has been configured as reserved space for the databases backing up to that storage location. The DELTA storage location is pre-configured leveraging all available useable space on the Recovery Appliance.
- **Replication** – Displays which Oracle Recovery Appliance (s) this appliance is replicating to. It also lists any Recovery Appliance (s) from which this Recovery Appliance is receiving backups.
- **Incidents and Events** – Displays a summary of all warnings or alerts which have been generated by EM monitoring of all targets associated with the appliance. Drill down from this section for further detail on the issues.

### **Exercise 1-2. Recovery Appliance Storage Management**

**Step 1:** Select the “Storage Locations” page from the drop-down menu. A login page will be displayed the first time you access the Recovery Appliance pages or the browser has been inactive for an extended time.



As shown below, the Storage Locations page provides an overview of space usage and allows you to modify as appropriate. This page provides a good graphical representation of how much of the storage location has been reserved and is unreserved.

The screenshot shows the 'Storage Locations' page for the 'SCA-ZDLRA2' recovery appliance. The top header includes the Oracle logo, 'Enterprise Manager Cloud Control 13c', and various navigation icons. The URL 'zdl2cn02.us.oci.oracle.com' and the timestamp 'Page Refreshed Oct 31, 2016 9:44:36 PM PDT' are also visible. The main content area is titled 'Storage Locations' and contains a list of storage locations:

- Storage locations are where the Recovery Appliance stores backups from protected databases.
- A storage location resides on an Automatic Storage Management disk group, consuming all available space in the disk group.
- The total reserved space for all protected databases using a storage location cannot exceed the size of the storage location.
- If the total recovery window space for all protected databases using a storage location exceeds the size of the storage location, there is insufficient space to meet all recovery windows.
- Storage location size can be increased by increasing the size of the underlying disk groups and updating the storage location to use the additional space.

A note indicates:  TIP To configure a protection policy to use a storage location, go to [Protection Policies](#).

Name	Disk Groups	Protection Policies	Size (GB)	Recovery Window Space		Reserved Space	
				%	GB	%	GB
DELTA	+DELTA		4.29600...	0.0	0.0	0.0	6.0

When scroll down to the bottom of the page, you will see two tabs for available charts: Recovery Window and Reserved Space which provide a graphical representation of space usage by the database. The Storage Location page provides information regarding the Storage Location(s) such as:

- Disk Group
- Number of Protection Policies using the location
- Total size in GB and how that space is currently used:
  - Space needed to meet Recovery Window Goals (by % and GB)
  - Total Reserved Space defined (by % and GB)

The Storage Location page expands upon the information provided in the Storage Locations section on the home page. If storage is added to the Recovery Appliance, you would use the Storage Locations page to add the storage to an existing Storage Location or to create another location.

All databases under Recovery Appliance management have a user-defined “reserved space” setting which defines the amount of disk space guaranteed to each protected database to meet its recovery window goal. In general, the Recovery Appliance ignores reserved space settings until there is space pressure at which time reserved space settings along with recovery window goals are utilized to determine which backups will be purged.

Reserved space is measured in GB, not time, and is a component of storage provisioning providing reassurance that a database will have that amount of storage if needed to meet its Recovery Window Goal. The use of recovery window goals along with reserved space allows the Recovery Appliance to dynamically allocate storage to best meet business requirements. At any given time, the database may have more or less than its reserved space which effectively eliminates storage over provisioning.

When a user adds a database to Recovery Appliance using EM, a default reserved space of 2.5x the database size will be allocated. The user may accept that default or input another number. The Recovery Appliance provides extensive space management monitoring and alerting at the storage location as well as at the database level. The most important guidance about space consumption at the aggregate level is knowing when estimated storage needs are approaching the amount of total storage available, allowing the Recovery Appliance administrator adequate time to accommodate the storage demands. The Recovery Appliance provides warnings and error messages regarding aggregate storage usage providing ample time to make any necessary changes.

If the estimated space needed to meet the recovery window goal of all databases:

1. Reaches 85% of total space within the storage location - Warning issued.
2. Reaches 97% of total space within the storage location - Error message issued.

Note that both the default warning and error percentages may be changed to meet your specific requirements. Capacity reports and database level storage usage monitoring will be covered in later sections.

On top of the screen in the Protected Database page, there is a Search section which by default is not expanded and you can filter which databases are displayed by using the search section.

The screenshot shows the Oracle Enterprise Manager Cloud Control 13c interface. The title bar reads "ORACLE® Enterprise Manager Cloud Control 13c". The main content area is titled "Protected Databases (1)" under "SCA-ZDLRA2 > Protected Databases". A search bar at the top contains the text "cust02", which is highlighted with a green box. Below the search bar, there is a toolbar with buttons for View, Add, Edit, Remove, Remove Multiple, and Detach. A table displays two protected databases: CUST01 and CUST02. The table columns include Database, Version, Protection Policy, Database Size (GB), Recovery Window (Goal, Current, Needed Space (GB)), Unprotected Data Window (Goal, Current), Errors and Warnings, Redo Transport, and Copy. Both CUST01 and CUST02 have a protection policy of BRONZE and a database size of N/A. The recovery window for both is set to 3 days. The unprotected data window is also N/A. There are no errors or warnings listed. The redo transport and copy fields are empty. At the bottom of the table, it says "Select a protected database in the table above to see details for that database." A note at the bottom left says "Columns Hidden 1".

## Module 2. Defined Classes of Service – Recovery Appliance Protection Policies

The Recovery Appliance provides a Data Protection as a Service infrastructure allowing you to create an effective data protection private cloud environment including disk backup (to Recovery Appliance), copy- to-tape and / or replication.

This section is to demonstrate flexibility of management and how the Recovery Appliance capabilities can provide consistency across the data center for Oracle database backup:

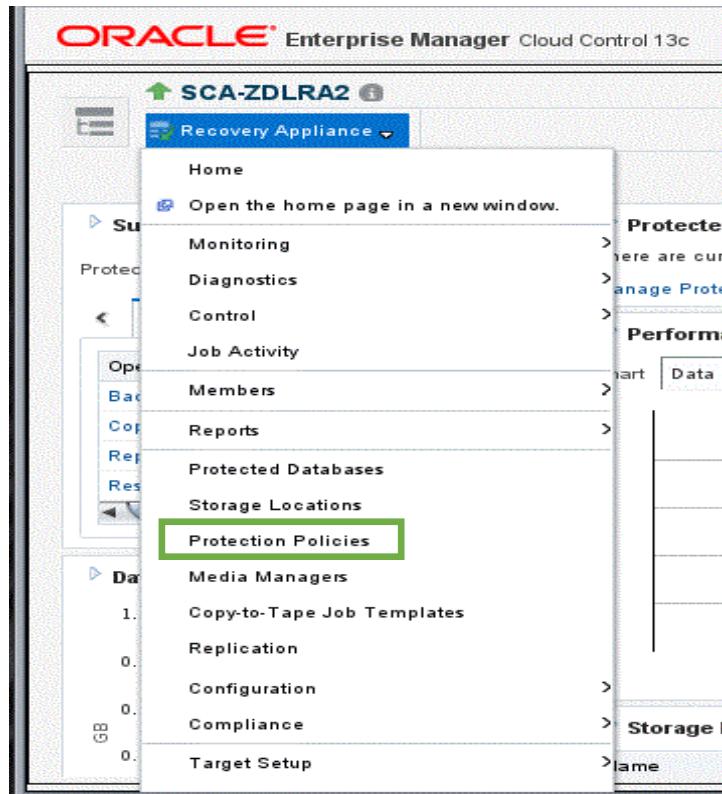
- Create a protection policy
- Configure your assigned database to backup to Recovery Appliance
- Schedule a recurring backup for your assigned protected database

### Exercise 2-1. Create a Protection Policy

Protection policies define a class of service of recovery requirements allowing you to standardize data protection by database tier. For example, you may want to create a "Gold" protection policy for mission- critical databases, "Silver" for business-critical and "Bronze" for Test/Dev databases.

Protection policies are the foundation for "Data Protection As a Service". Each database under Recovery Appliance management must be associated with a protection policy and can then be managed as a group for defining replication and/or copy to tape schedules.

**Step 1:** Select the Protected Policies page from the drop-down menu and the Protection Policies page displays. On this page you can view and edit existing protection policies, add new policies or remove those no longer needed policies.



Protection Policies window opens



The screenshot shows the Oracle Enterprise Manager Cloud Control 13c interface. The top navigation bar includes links for Home, Database, Application, Infrastructure, and Help, along with user information for SYSMAN02. The main title is "SCA-ZDLRA2" with a status of "Up". Below the title, there's a breadcrumb trail: SCA-ZDLRA2 > Protection Policies. The page header is "Protection Policies". A note states: "A protection policy contains Recovery Appliance properties for multiple protected databases in a single object." It lists "Protection policy attributes include:":

- Recovery window goal: The interval of time within which point-in-time recovery will be possible for all databases using the policy.
- Storage location: The storage location where backups from databases using the policy will be stored.
- Polling location: A location that will be polled for backups by the Recovery Appliance.

 A note also says: "Backups for all databases using a protection policy can be:

- Replicated by assigning the policy to a replication server.
- Copied to tape by setting up a copy-to-tape job for the policy.

 TIP To enroll protected databases and assign them to protection policies, go to [Protected Databases](#)."

Name	Disk Recovery Window Goal	Unprotected Data Window Threshold	Media Manager Recovery Window Policy	Maximum Disk Backup Retention	Storage Location	Copy-to-Tape	Replication	Guaranteed Backup Copy	Allow Backup Deletion
BRONZE	3 days			30 days		DELTA			<input checked="" type="checkbox"/>
GOLD	35 days			90 days		DELTA			<input checked="" type="checkbox"/>
PLATINUM	45 days			90 days		DELTA			<input checked="" type="checkbox"/>
SILVER	10 days			45 days		DELTA			<input checked="" type="checkbox"/>

**Step 2:** Click the “Create” button to add a new protection policy. Enter the information similar as following and replace the policy name with your own name. It is your choice of whether to allow the DBA to delete this policy or not. Then click the “OK” button.

**Create Protection Policy**

Name: Robert\_policy

Description:

**Storage Location**

Select the storage location where backups will be placed for all databases using this protection policy.

Name	Size (GB)	Reserved Space %	GB
DELTA	296008.9	1.0	3050.0

**Disk Recovery Window Goal**

Specify a recovery window goal that Recovery Appliance should attempt to meet for point-in-time recovery using disk backups.

Recovery Window: 7 days

**Unprotected Data Window Threshold**

Specify the maximum amount of time in which there is potential data loss exposure for databases associated with this protection policy. If this amount of time is exceeded for a database associated with this policy, a warning will be generated.

Threshold: 5 days

**Media Manager Recovery Window Policy**

Specify a longer window within which point-in-time recovery capability from a media manager (e.g., Oracle Secure Backup) will be maintained.

Recovery Window: 14 days

**Maximum Disk Backup Retention**

Specify the maximum time that disk backups should be retained. This value must be greater than or equal to the disk recovery window goal. If not specified, backups will be retained beyond the disk recovery window goal as space permits.

Maximum Retention: 10 days

**Advanced Parameter:**

**Backup Deletion**

Specify whether Recovery Appliance will allow deletion of backups via the RMAN DELETE command for databases associated with this protection policy.

Allow Backup Deletion

**Backup Polling Location**

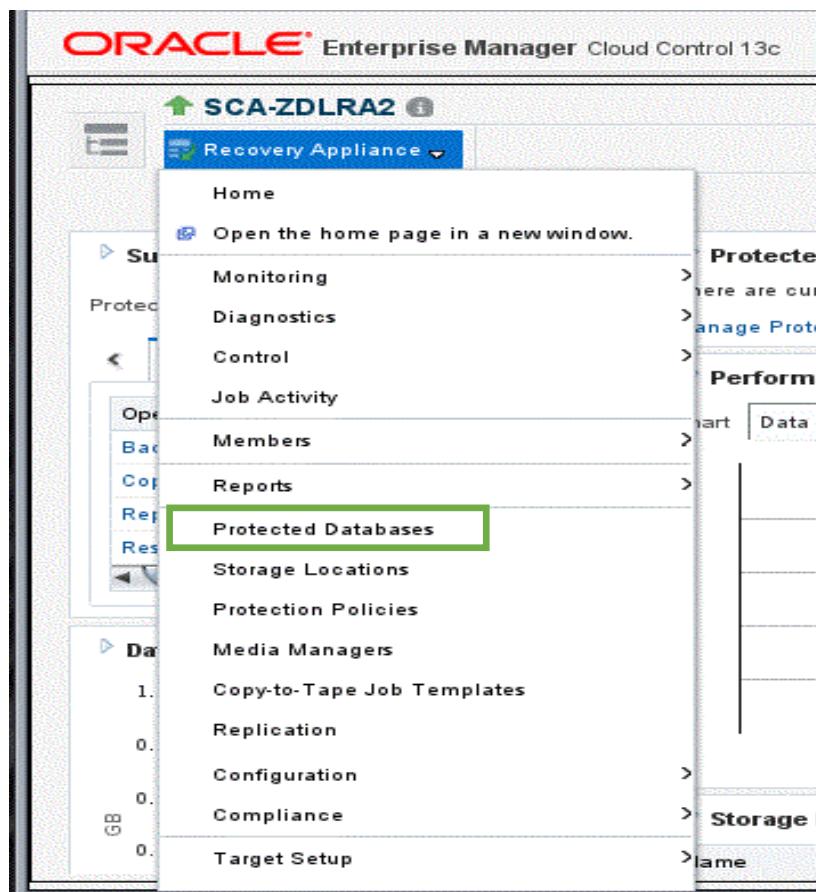
Recovery Appliance can manage conventional disk backups written to a shared directory. Specify the directory that Recovery Appliance will monitor for backups from databases that use this protection policy.

### Exercise 2-2. Configure your assigned database for backups to Recovery Appliance

Adding databases to Oracle Recovery Appliance management is easy and can be done by selecting individual database or multiple databases in one “add” operation. It can also be done using an EM group if defined in your environment. The Protected Database Page provides a listing of all databases under this Oracle Recovery Appliance’s management. We are also to enable the real-time redo shipping in this exercise.

The Protected Database and the Recovery Appliance Home pages are the key management tools to effectively track all database backups in the Recovery Appliance administrators' purview.

**Step 1:** Select the "Protected Database" page from the RA drop-down menu as shown below.

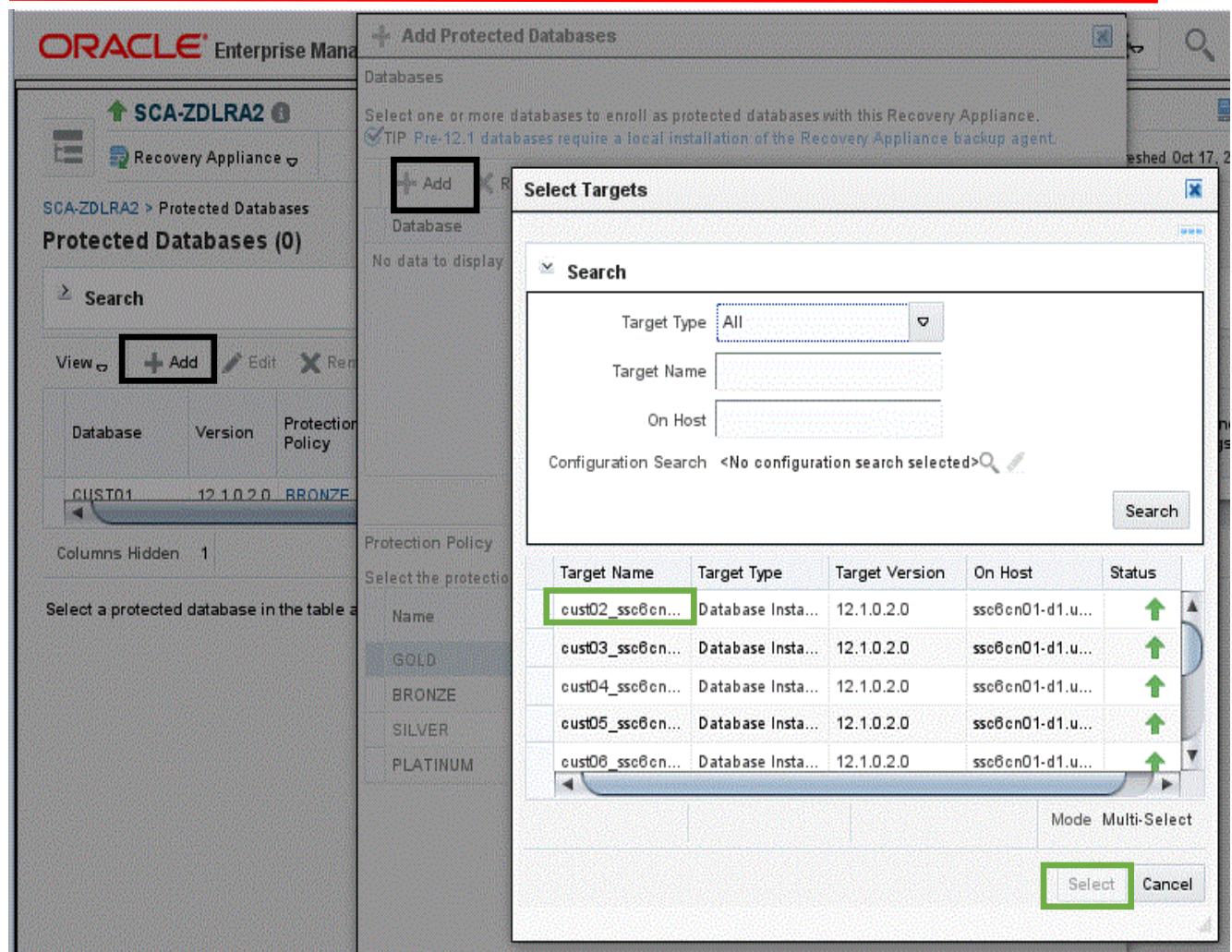


The 'Protected Database' page displays as the following. There may not be any databases yet at beginning of the workshop. Review the columns highlighted by the green box. The Recovery Appliance provides real-time reporting by database of its current Recovery and Unprotected Data Windows as opposed to merely indicating a file retention period which doesn't necessarily communicate whether recovery is possible within that timeframe.

The screenshot shows the Oracle Enterprise Manager Cloud Control 13c interface. At the top, there's a navigation bar with icons for Home, Help, Logout, and a search bar. The main title is "Zero Data Loss Recovery Appliance". Below the title, the page header reads "SCA-ZDLRA2" and "Recovery Appliance". The URL "zdl2cn01.us.osc.oracle.com" is visible in the top right. A message "Page Refreshed Oct 17, 2016 11:15:21 AM PDT" is also present.

The main content area is titled "Protected Databases (0)". It includes a search bar and a toolbar with buttons for "View", "+ Add", "Edit", "Remove", "Remove Multiple", and "Detach". Below this is a table with columns: Database, Version, Protection Policy, Database Size (GB), Recovery Window (Goal, Current), Unprotected Data Window (Goal, Current), Errors and Warnings, Redo Transport, and Copy. A message "No data to display." is shown below the table. At the bottom, there's a note: "Select a protected database in the table above to see details for that database." A scroll bar is visible on the right side of the table area.

**Step 2:** To add your database into the Recovery Appliance, click on the “add” button. The “Add Protected Database” pop-up opens. Click “Add” again and “Select Targets” page lists all the databases available to the Recovery Appliance. Scroll down the list to find your assigned database, highlight it, click “Select”.



**Step 3:** Highlight your own protection policy at the bottom of the wizard and click on Next.

**Add Protected Databases**

Databases

Select one or more databases to enroll as protected databases with this Recovery Appliance.

TIP: Pre-12.1 databases require a local installation of the Recovery Appliance backup agent.

		+ Add	- Remove
Database	Version	Host/Cluster	
cust02_ssc6en01-d1.us.osc.oracle.com	12.1.0.2.0	ssc6en01-d1.us.osc.oracle.com	

Protection Policy

Select the protection policy that will be used for the protected databases specified above.

Name	Recovery Window Goal	Backup Polling Location	Description
GOLD	35 days 00:00		Default Gold Protected Policy
BRONZE	3 days 00:00		Default Bronze Protected Policy
SILVER	10 days 00:00		Default Silver Protected Policy
PLATINUM	45 days 00:00		Default Platinum Protected Pol...

**Next** **Cancel**

**Step 6:** Need to enter “Reserved Space” size and default is appropriately 2.5x of your database size. It can be changed now if you know how much space is needed or later if you would prefer to see a run rate first. It may reject the size you enter in here if it is too small to satisfy your selected policy. In practice the RA will dynamically manage the storage allocation for you.

For this exercise you can simply accept the default value and go to next step.

Please note that your assigned VPC user is specified here. In this case it is ravpc2 and shared among all workshop users. This VPC user will be used for your database backup and restore. In real world, you may want to have different VPC user for different database backup.

**+ Add Protected Databases**

**Reserved Space**  
Specify the minimum amount of disk space that will be reserved for each protected database. The total reserved space for all protected databases being added cannot exceed 296,003.512 GB (the unreserved space in storage location DELTA).

\* Reserved Space  GB

**Recovery Appliance User**  
Specify credentials for an existing Recovery Appliance database user that will be given the ability to backup and restore the protected databases.

Credential	<input checked="" type="radio"/> Named <input type="radio"/> New								
Credential Name	ZDLRA2_RAVPC2_CRED								
<table border="1"> <thead> <tr> <th>Attribute</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>Username</td> <td>ravpc2</td> </tr> <tr> <td>Password</td> <td>*****</td> </tr> <tr> <td>Role</td> <td>normal</td> </tr> </tbody> </table> <a href="#">More Details</a>		Attribute	Value	Username	ravpc2	Password	*****	Role	normal
Attribute	Value								
Username	ravpc2								
Password	*****								
Role	normal								

**Credential Access Grantee**  
Enterprise Manager users that administer backup and restore operations for the protected databases will need access to the above Recovery Appliance database user credentials in order to configure the databases to backup to and restore from the Recovery Appliance. Specify the Enterprise Manager users that will be given access to the credentials.

Enterprise Manager Users

**Back** **OK** **Cancel**

**Step 4:** You will get a confirmation message that your database has been successfully added (to a protection policy). Your database is now listed in the “Protected Databases” page.

In our demo environment, we have a small number of databases making it very easy to quickly see all databases in the Protected Database page and scroll down the list as desired. If there were hundreds of databases, you can easily find what you are looking for by sorting by column. If information on an EM page is represented in table format, you can generally sort by column as desired by moving your cursor over the column heading which display a sort icon as shown below.

Protected Databases (23)			
<input type="button" value="Search"/> <input type="button" value="View"/> <input type="button" value="Add"/> <input type="button" value="Edit"/> <input type="button" value="Remove"/> <input type="button" value="Detach"/>			
Database	Target Name	Version	
CUST01	cust01	11.2.	

In the same page, there is a “Search” section on top of the database listing which by default is not expanded and can be used for advance search when needed.

Database	Target Name	Version
CUST01	cust01	11.2.

In addition, there is another “Search” button at top of your EM screen and you can also utilize it to search for your particular target. Here is a sample of how to search for the protected database cust02 and three related targets are found.

Target Name	Target Type	Target Status	On Remote
<a href="#">cust02_ssc0n01-d1.us.osc.oracle.com</a>	Database Instance		
<a href="#">cust02_ssc0n01-d1.us.osc.oracle.com_cellsys</a>	Oracle Database Exadata Storage ...		
<a href="#">cust02_ssc0n01-d1.us.osc.oracle.com_sys</a>	Database System		

**Step 5:** Let's use this search result above to configure your assigned database and in this case it is cust02. Click the “Search” icon to expand the section as highlighted in the green box on top far right. Enter your database name, cust02, and search for it.

To configure your protected database to backup to Recovery Appliance, you will need to add Recovery Appliance information to your database’s Backup Settings. So navigate to your protected database home page by clicking on the database instance link from your search result, not other targets as shown.

6: Configure your backup settings.

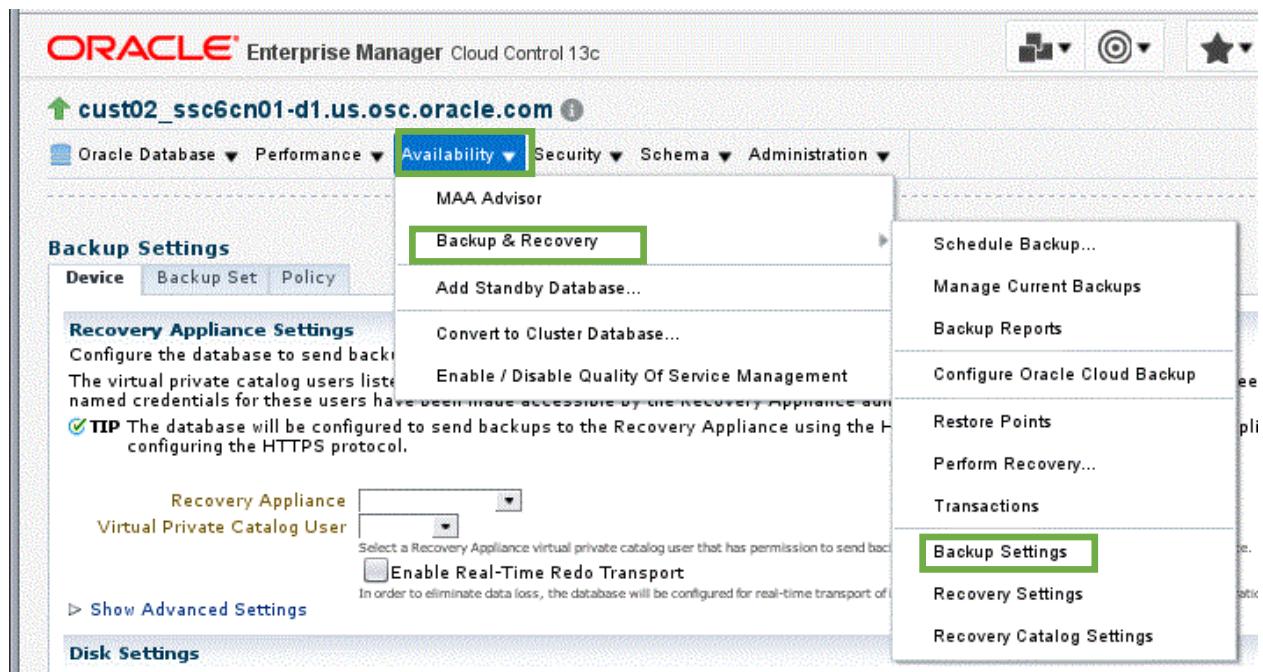
## Zero Data Loss Recovery Appliance

From your database's home page, click on "Availability" drop-down menu at top of the screen and select "Backup & Recovery", then "Configure Oracle Cloud Backup".

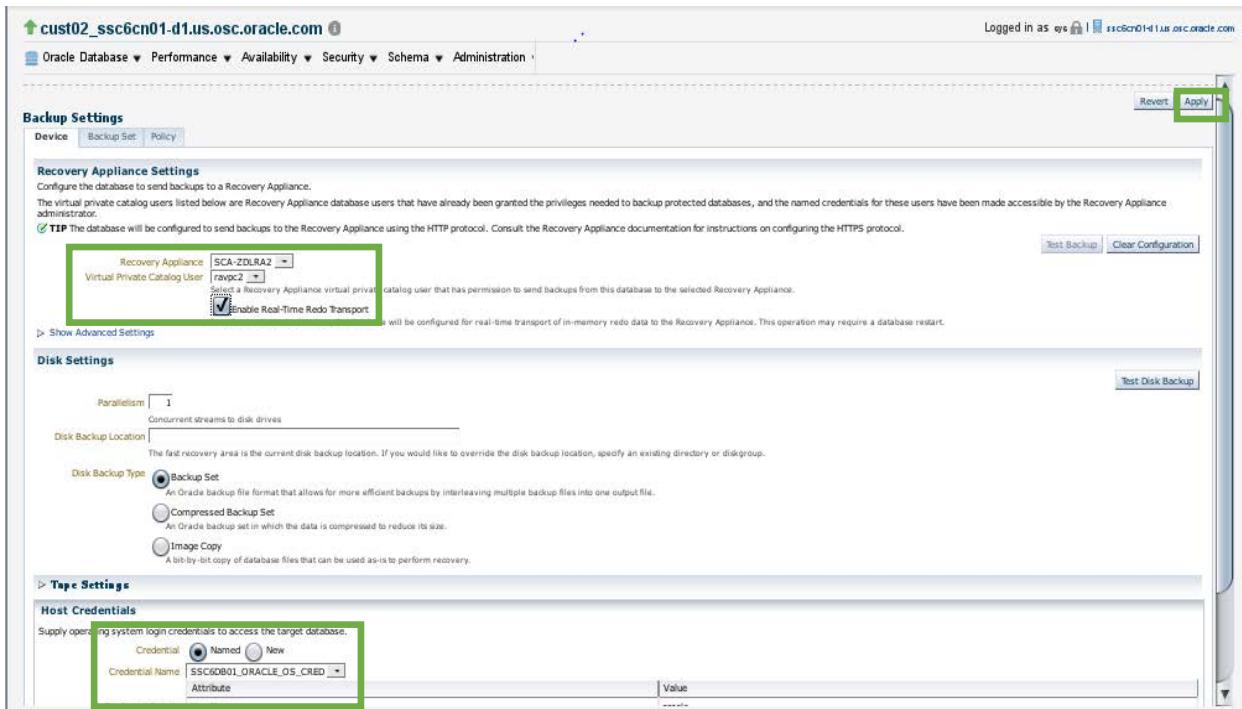
If prompted for database login, select a proper credential from the drop-down menu and login as user sys with "sysdba" privileges.



From your database home page, select "Backup Settings"



**Step 7:** Now enable the real-time redo transport as the following. Select the given Recovery Appliance and the Virtual Private Catalog User (e.g. ZDLRA\_RAVPC1\_CRED) from the drop-down menu, check the box of “Enable Real-Time Redo Transport”. Select the proper host credential and accept rest of settings. Then click “Apply” as shown below.



You will receive a warning that the database may need to be restarted because the real-time redo shipping is enabled. Click on “Yes” button to continue.



**Step 8:** You will be returned to the Backup Settings page and see the following confirmation message on top of the screen. As indicated that adding a database is considered an EM procedure and it is very important to see it run successfully, so click on the link highlighted in green box to watch its execution log.

The screenshot shows a web-based management interface for the Oracle Zero Data Loss Recovery Appliance. At the top, the URL is `cust02_ssc6cn01-d1.us.osc.oracle.com`. To the right, it says "Logged in as sys" with a lock icon and the IP address `ssc6cn01-d1.us.osc.oracle.com`. Below the URL is a navigation bar with links: Oracle Database ▾, Performance ▾, Availability ▾, Security ▾, Schema ▾, Administration ▾. On the far right of the header are "Revert" and "Apply" buttons. A yellow banner at the top displays an "Update Message": "The changes have been successfully applied." Below this, a green box highlights the text: "Procedure BACKUP CONFIG cust02\_ssc6cn01-d1.us.osc.oracle.com 110216204552 has been successfully submitted." Underneath the banner, there is a section titled "Backup Settings" with tabs: Device (selected), Backup Set, Policy. The main content area below is currently empty.

The following screen will be displayed. Click on the refresh button to see the progress and the expand view to see the details of each step. Once the operation completes, you will see the date and time listed as highlighted in the green box below. It may take few minutes for the operation to complete as your database is being added to the Recovery Appliance management and redo transport is configured.

Procedure Activity: BACKUP\_CONFIG\_cust02\_ssc6cn01-d1.us.osc.oracle.com\_110216204552

Elapsed Time: 2 minutes, 39 seconds

Procedure Steps

Select	Name	Status
<input checked="" type="checkbox"/>	Configure Recovery Appliance Protection	✓
<input type="checkbox"/>	cust02_ssc6cn01-d1.us.osc.oracle.com	✓
<input type="checkbox"/>	Initialization	✓
<input type="checkbox"/>	Configure Database Host(s)	✓
<input type="checkbox"/>	Configure Usage of Recovery Appliance R	✓
<input type="checkbox"/>	Register Database with Recovery Appliance	✓
<input type="checkbox"/>	Generate Media Management Settings	✓

Configure Recovery Appliance Protection

Type: Rolling      Start Date: Nov 2, 2016 8:46:01 PM PDT

Elapsed Time: 2 minutes, 35 seconds      Completed: Nov 2, 2016 8:48:36 PM PDT

S/N	Step Name	Status	Type	De
1	cust02_ssc6cn01-d1.us.osc.o...	Succeeded	Database Instance	cu... d1

At this time, if you go to 'Protected Database' page under Recovery Appliance, you may see a check mark under 'Redo Shipping' column and your database size is populated. Please note that it may take some time for the EM to display this info. It is OK if you don't see it at this time as long as you watched the execution log and saw it finished successfully. This new configuration will show up at later time.

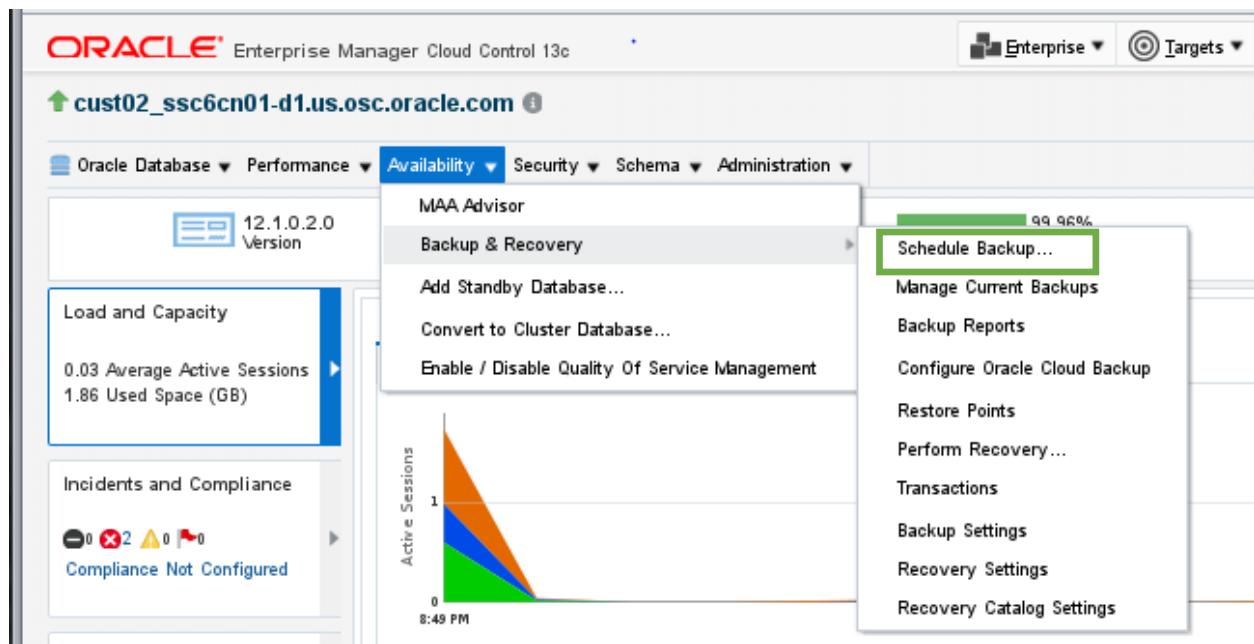
SCA-ZDLRA2 > Protected Databases

Protected Databases (1)

View	Add	Edit	Remove	Remove Multiple	Detach							
Database	Version	Protection Policy	Database Size (GB)	Recovery Window		Unprotected Data Window		Errors and Warnings	Redo Transport	Copy-to-Tape	Replication	Last Complete Backup
				Goal	Current	Needed Space (GB)	Goal					
CUST02	12.1.0....	BRONZE	2.16	3 days	N/A	5.00	N/A	N/A	✓			

## Exercise 2-3. Perform initial level 0 full backup to the ZDLRA

**Step 1:** Return to your database's home page through your EM history tag or using Search Target Name. From top of your database home page, click on "availability" pull-down menu, select "Backup & Recovery", then select "Schedule Backup ..." as shown below:



You will schedule an "Oracle-Suggested Backup" specific to the Recovery Appliance. Before selecting the "Oracle-Suggested Backup", make sure you select the correct "Credential Name" under the "Host Credential" section. By clicking on "Oracle-Suggested Backup", it will automatically perform an incremental level 0 backup operation if one doesn't exist on the Recovery Appliance already.

**Schedule Backup**

Oracle provides a choice of automated backup strategies. Alternatively, you can implement your own customized backup.

**Oracle-Suggested Recovery Appliance Backup**

Schedule a backup to the configured Recovery Appliance using the recommended incremental-forever strategy. This option will back up the entire database.

**Oracle-Suggested Backup**

Schedule a disk or tape backup using Oracle's automated backup strategy. This option will back up the entire database. The database will be backed up on daily and weekly intervals.

**Customized Backup**

Select the object(s) you want to back up.

- Whole Database
- Tablespaces
- Datafiles
- Archived Logs
- All Recovery Files on Disk

Includes all archived logs and disk backups that are not already backed up to tape.

**Host Credentials**

Supply operating system login credentials to access the target database.

Credential	Named <input checked="" type="radio"/>	New <input type="radio"/>
Credential Name	SSC6DB01_ORACLE_OS_CRED	
Credential Details	Attribute	Value
	UserName	oracle
	Password	*****
	More Details	

**Step 2:** Although the redo transport has been enabled for the database so the archived logs will be generated on the ZDLRA, we still want to select the “Also back up all archived logs on disk” box as Oracle recommended best practice for backup. Click on the “Next” button.

**Schedule Oracle-Suggested Recovery Appliance Backup: Options**

Database: cust02\_ssccn01-d1.us.oracle.com

Backup Strategy: Oracle-Suggested Recovery Appliance Backup

Recovery Catalog Username: ravpc2

Recovery Catalog Database: zdira (Cluster Database)

**Advanced**

Also back up all archived logs on disk  
This option should not be selected if the database is configured to ship redo to the Recovery Appliance.

Delete all archived logs from disk after they are successfully backed up

[Return to Schedule Backup](#)

**Step 3:** Review page 2 of 3 and click the “Next” button.

**Step 4:** Review page 3 of 3 and then click the “Submit” Job button.

NOTE: You are submitting an “incremental level1” backup command, but since we have not yet taken any backups for this database, RMAN will create an “incremental level 0” backup by default.

```

RMAN Script:
backup incremental level 1 cumulative device type sbt fileserset = 1 tag '%TAG' section size 32 G database;
run {
allocate channel oem_backup_sbt1 type 'SBT_TAPE' format '%d_%U' parms "SBT_LIBRARY=/u01/app/oracle/product/12.1.0.2/dbhome_1/lib/libra.so,
ENV=(RA_WALLET='location=file:/u01/app/oracle/product/12.1.0.2/dbhome_1/dbs/zdlra credential_alias=zdl2ing-scan:1521/zdlra:dedicated')";
backup fileserset = 1 tag '%TAG' current controlfile;
release channel oem_backup_sbt1;
}

```

**Step 5:** Click "View job" and then "Log Report" in the Job page to watch its execution.

Refresh the page by clicking on the refresh button at top right corner of your screen until the backup job completes and it should complete successfully. You should see it was actually doing level 0 backup.



Upon completion of your initial backup, return to your database home page.

**Step 6:** On the top of your database home page, click the link associated with the last backup as highlighted in the green box to review the Backup Reports page.



The following "View Backup Report" page will be displayed. Your backup name, time, and backup size may be different but reflect your related database.

**View Backup Report**  
The following backup jobs are known to the database. The data is retrieved from the recovery catalog. [View Backup Sets And Image Copies](#)

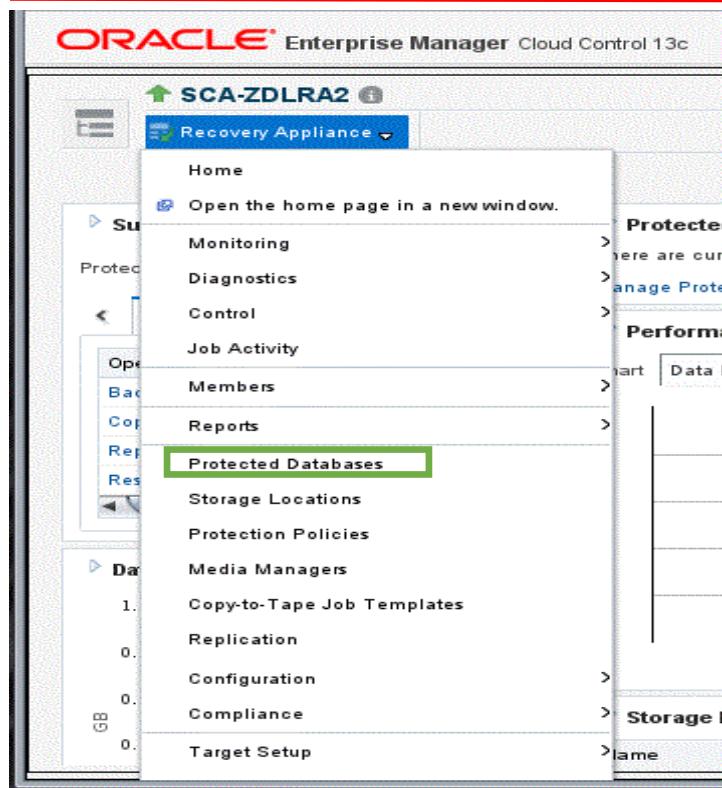
Backup Name	Status	Start Time	Time Taken	Type	Output Devices	Input Size	Output Size	Output Rate (Per Sec)
BACKUP_CUST02_SSC6_110216093209	COMPLETED	Nov 02, 2016 09:32:23 PM GMT-07:00	00:00:33	DB INCR	SBT_TAPE	1.91G	1.64G	50.94M
BACKUP_CUST02_SSC6_102416010104	COMPLETED	Oct 24, 2016 01:01:13 PM GMT-07:00	00:00:31	DB INCR	SBT_TAPE	2.74G	2.47G	81.48M
BACKUP_CUST02_SSC6_102416120954	COMPLETED	Oct 24, 2016 12:10:05 PM GMT-07:00	00:00:18	DB INCR	SBT_TAPE	963.19M	953.50M	52.97M
BACKUP_CUST02_SSC6_102416115113	COMPLETED	Oct 24, 2016 11:51:24 AM GMT-07:00	00:00:34	DB INCR	SBT_TAPE	1.94G	1.66G	50.14M

**TIP:** \* in Output Devices column indicates that backups from this job are on DISK and SBT\_TAPE

The EM Backup Reports page lists the backup jobs, status, date/time, duration of the backup, type, device, input / output size along with the output rate per second. This is a standard EM Backup Reports page and is not Recovery Appliance specific although backups to the Recovery Appliance are included. You will notice that Output Device for Recovery Appliance backups is "SBT\_TAPE" even though the backups are stored on Recovery Appliance disk. The reason is that RMAN uses a Recovery Appliance SBT Library which is installed on the database server.

If you click the link associated with the backup job name, you will view more information about the backup. Unfortunately, this is very slow and is a known issue (unrelated to Recovery Appliance). Therefore, we will NOT click the link as we will focus on Recovery Appliance specific reports showcased in a later section of today's event.

Let's return to the Recovery Appliance Protected Database by Selecting the Recovery Appliance "Protected Database" menu from Recovery Appliance Home page.



From your "Protected Database" Page in Recovery Appliance, look for your database and you should see something like the following which lists your backup and other configuration information.

The screenshot shows the 'Protected Databases' page for the SCA-ZDLRA2 Recovery Appliance. The top navigation bar includes links for 'Enterprise', 'Targets', 'Favorites', 'History', 'Setup', 'SYSMAN', and a search bar. The main content area shows a table with columns: Database, Version, Protection Policy, Database Size (GB), Recovery Window (Goal, Current), Unprotected Data Window (Goal, Current), Errors and Warnings, Redo Transport, Copy-to-Tape Replicati, and Last Complete Backup. The 'CUST02' database row is selected, and its 'Last Complete Backup' status is highlighted with a green box.

Database	Version	Protection Policy	Database Size (GB)	Recovery Window		Unprotected Data Window		Errors and Warnings	Redo Transport	Copy-to-Tape Replicati	Last Complete Backup
				Goal	Current	Goal	Current				
CUST02	12.1.0...	BRONZE	2.15	3 days	N/A	5.00	N/A	N/A	✓		Nov 2, 9:32 PM PDT

It may take a few minutes for the backup to appear in the “Last Complete Backup” column. The time represented is the start time for the backup. Since there is now a backup on the Recovery Appliance and Real-Time Redo Transport is enabled, notice the Unprotected Data Window is now <1 sec.

Depending on Database Activity you might have to switch the log to get the redo transport to happen. This will only be needed for databases like in the workshop environment which are inactive.

### **Module 3. Implement Data Changes and take Level 1 Incremental Backup**

The goal of this section is to simulate data input/change by transporting an existing tablespace into your database. You will then take a Level 1 Incremental Backup illustrating the "Incremental Forever" strategy implemented by the Recovery Appliance. You will use the resulting Virtual Full Backup created on the Recovery Appliance to perform a "Point-In-Time-Recovery" of your database.

You will execute an existing job from Enterprise Manager that will perform the Swingbench workload. You will then create a restore point to identify the System Change Number (SCN) where the Swingbench completed. You will make use of this restore point during your recovery.

#### **Exercise 3-1. To run Swingbench workload.**

**Step 1:** At top of your Enterprise Manager window, click on “Enterprise” tab menu, select “Job”, then “Library” as shown below. A list of jobs is listed.

The screenshot shows the Oracle Enterprise Manager Cloud Control 13c interface. In the top right corner, there is a navigation bar with three tabs: 'Enterprise' (highlighted in blue), 'Targets' (with a dropdown arrow), and 'Favorites'. Below this, a vertical menu is open under 'Enterprise', showing options like 'Summary', 'Monitoring', 'Job' (which is also highlighted in blue), 'Reports', 'Configuration', 'Compliance', 'Provisioning and Patching', 'Quality Management', 'My Oracle Support', and 'Cloud'. The 'Job' option has a sub-menu with 'Activity' and 'Library' (which is highlighted with a green border). On the left side of the main content area, there is a sidebar with a 'SCA-ZDLRA2' icon and a 'Recovery Appliance' dropdown. The main content area displays a table titled 'Protected Databases' with one entry: 'CUST02'. The table has columns for 'Database', 'Version', 'Protection Policy', 'Database Size (GB)', 'Goal', and 'Current'. The 'Protection Policy' column for CUST02 shows 'BRONZE'. The 'Database Size (GB)' column shows '2.15'. The 'Goal' and 'Current' columns both show 'N/A'. The 'Recovery Window' row shows '3 days' in the 'Goal' column and '5.00' in the 'Current' column. At the bottom of the table, there are buttons for 'View', '+ Add', 'Edit', 'Remove', 'Remove Multiple', and 'Detach'.

**Step 2:** Select the “RUN\_BENCHMARK\_<your database name>” Job from the list for your assigned database (you may not see your job listed in the first page) and click “Submit”.

Select	Name	Job Type	Owner	Targets	Target Type
<input checked="" type="checkbox"/>	RUN_BENCHMARK_CUST02	OS Command	SYSMAN	ssc6cn01-d1.us.osc.oracle.com	Host
<input type="checkbox"/>	RUN_BENCHMARK_CUST03	OS Command	SYSMAN	ssc6cn01-d1.us.osc.oracle.com	Host
<input type="checkbox"/>	RUN_BENCHMARK_CUST04	OS Command	SYSMAN	ssc6cn01-d1.us.osc.oracle.com	Host

**Step 3:** From the new “Submit ‘OS Command’ Job From Library Job” window, review and click “Submit”.

**Step 4:** From the job confirmation, click on the submitted job URL to monitor its execution.

**Step 5:** The workload will run for about 5 minutes. If interested, expand the log by click on 'See More' to view its complete content. At end you will see 'Status Succeeded' as shown below.

Summary	
Status	SUCCEEDED
Repeating	Immediately
Scheduled	Jun 22, 2017 10:41:24 AM GMT-07:00
Started	Jun 22, 2017 10:41:26 AM GMT-07:00
Ended	Jun 22, 2017 10:46:31 AM GMT-07:00
Elapsed Time	5 minutes, 5 seconds
Host	SSC6CN01.ORACLE_OS_CRED
Credentials	(oracle*****)
Type	OS Command
Owner	SYSMAN00
Description	To generate some data change using swingbench
Execution ID	5290FE56DE43DF81E0540208205FA9D6
Command	[export/home/oracle/workshop/cust02/scripts/run_bench.sh]
Name	RUN_BENCHMARK_CUST02.1
Target	ssc6cn01-d1.us.osc.oracle.com

**OS Command**

```

Status ✓ Succeeded
Show More

Output Log
Download

Output
10:41:35 AM 50 2441 1544
10:41:36 AM 50 4070 1629
10:41:37 AM 50 5801 1621

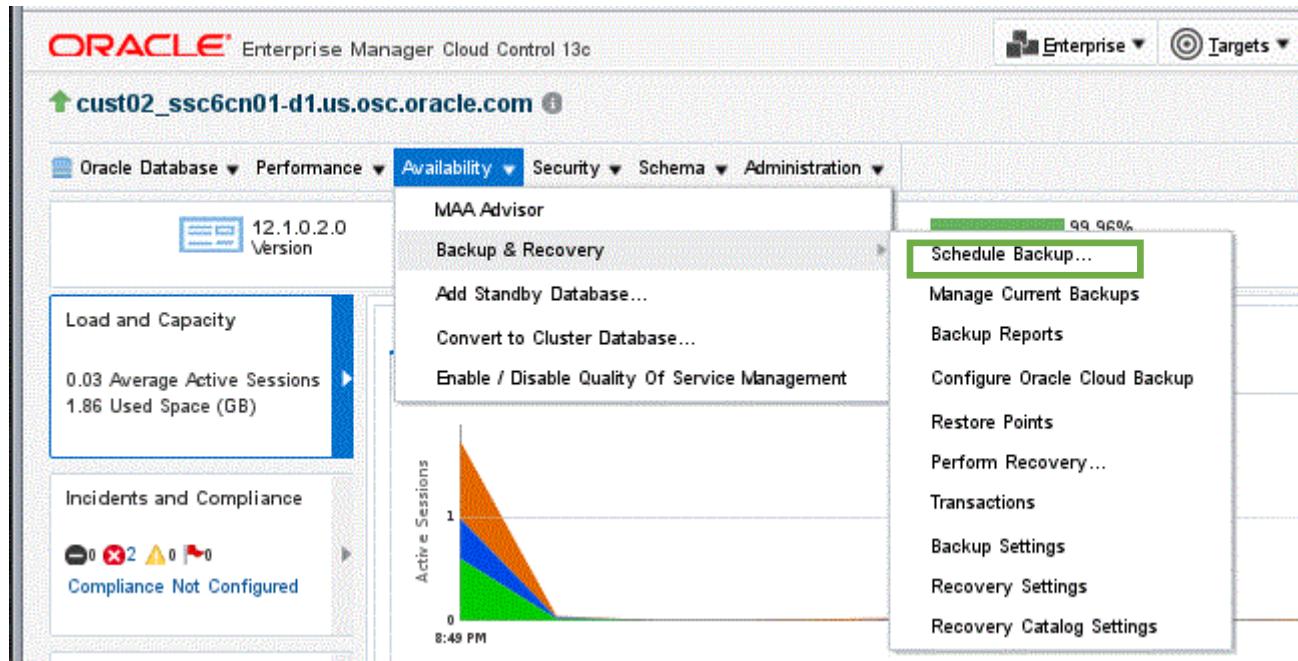
```

**Step 6:** Now go back to your database home page by search for your database name or from your EM history tag on top of the screen.

You may be prompted for the database login again if you left that page for an extended time.

### Exercise 3-2. Perform a level 1 incremental backup

**Step 1:** We are going to perform a level 1 backup after data change. From your database home page, click on “Availability” tag, select “Backup & Recovery”, then select “Schedule Backup ...”



**Step 2:** We will select “Schedule Oracle-Suggested Backup” specific to the Recovery Appliance. This will automatically perform an incremental level 1 backup operation since we have already taken the initial level 0 backup. Make sure the correct credential is selected at bottom of this same screen.



**Step 3:** Again, check the "Also back up all archived logs on disk" box per Oracle recommended best practice for backup. Click "Next".

ORACLE® Enterprise Manager Cloud Control 13c

Schedule Oracle-Suggested Recovery Appliance Backup: Options

Database: cust02\_ssc6cn01-d1.us.osc.oracle.com  
Backup Strategy: Oracle-Suggested Recovery Appliance Backup

Recovery Catalog Username: ravpc2  
Recovery Catalog Database: zdira (Cluster Database)

**Advanced**

Also back up all archived logs on disk  
This option enables the database to be connected to the Recovery Appliance to ship redo to the Recovery Appliance.

Delete all archived logs from disk after they are successfully backed up

[Return to Schedule Backup](#)

CANCEL Step 1 of 3 **Next**

**Step 4:** Make sure the "one time (immediate)" is selected and Click the "Next" button.

ORACLE® Enterprise Manager Cloud Control 13c

Schedule Oracle-Suggested Recovery Appliance Backup: Schedule

Database: cust02\_ssc6cn01-d1.us.osc.oracle.com  
Backup Strategy: Oracle-Suggested Recovery Appliance Backup

Recovery Catalog Username: ravpc2  
Recovery Catalog Database: zdira (Cluster Database)

**Job**

\* Job Name: BACKUP\_CUST02\_SSC6CN01-D1.US.OSC  
Job Description: Recovery Appliance Backup

**Schedule**

Type:  One Time (Immediately)  One Time (Later)  Repeating

[Return to Schedule Backup](#)

CANCEL Back Step 2 of 3 **Next**

**Step 5:** Review and click "Submit Job" button. NOTE: You are submitting an “incremental level 1” backup command.

The screenshot shows the Oracle Enterprise Manager Cloud Control 13c interface. The top navigation bar includes 'SYSMAN ▾' and a three-dot menu. The main title is 'Schedule Oracle-Suggested Recovery Appliance Backup: Review'. Below it, the database is listed as 'cust02\_ssc0cn01-d1.us.osc.oracle.com' and the backup strategy is 'Oracle-Suggested Recovery Appliance Backup'. The recovery catalog username is 'ravpc2' and the recovery catalog database is 'zdlra (Cluster Database)'. A 'Settings' section shows the destination as 'Recovery Appliance', backup type as 'Incremental Cumulative Backup', and backup mode as 'Online Backup'. Media Management Vendor (MMV) Library Parameters are listed with SBT\_LIBRARY='/u01/app/oracle/product/12.1.0.2/dbhome\_1/lib/libra.so', ENV=(RA\_WALLET='location=file:/u01/app/oracle/product/12.1.0.2/dbhome\_1/dbs/zdlra credential\_alias=zdl2ing-scan:1521/zdlra:dedicated'), and Tape Drives 1. The 'RMAN Scripts' section contains the generated RMAN script:

```

RMAN Script:
backup incremental level 1 cumulative device type sbt fileserset = 1 tag '%TAG' section size 32 G database;
run {
allocate channel oem_backup_sbt1 type 'SBT_TAPE' format '%d %U' parms "SBT_LIBRARY=/u01/app/oracle/product/12.1.0.2/dbhome_1/lib/libra.so,ENV=(RA_WALLET='location=file:/u01/app/oracle/product/12.1.0.2/dbhome_1/dbs/zdlra credential_alias=zdl2ing-scan:1521/zdlra:dedicated')";
backup fileserset = 1 tag '%TAG' current controlfile;
release channel oem_backup_sbt1;
}

```

At the bottom, there is a 'Return to Schedule Backup' link and a green 'Step 3 of 3 Submit Job' button.

**Step 6:** Ensure the backup job completed successfully.

Click “View Job” or “OK” to watch its execution.

The screenshot shows the Oracle Enterprise Manager Cloud Control 13c interface. The top navigation bar includes 'SYSMAN00 ▾' and a three-dot menu. A yellow message bar at the top states 'The job has been successfully submitted.' Below it, the 'Status' section indicates 'The job has been successfully submitted. You can view the status of the job by clicking on the View Job button.' At the bottom right, there are 'View Job' and 'OK' buttons.

## Zero Data Loss Recovery Appliance

Make sure it completed successfully before moving on. If you select "View Job", refresh the page until the backup job completes and you will see that the Last Backup field in the Status section as shown below. Click "Show More" to see additional information if interested.

The screenshot shows the Oracle Enterprise Manager Cloud Control 13c interface. The top navigation bar includes links for Oracle Database, Performance, Availability, Security, Schema, and Administration. The main content area displays a job activity titled "Execution: BACKUP\_CUST02\_SS6CN01-D1.US.OSC.ORACLE.COM\_000022". A summary card indicates the status is "Succeeded". The "Name" is listed as "BACKUP\_CUST02\_SS6CN01-D1.US.OSC.ORACLE.COM\_000022" and the "Type" is "Database Backup". There are buttons for Actions, Create Like, Edit, and View Definition.

**OR** If you select "OK", you will be directed to your database home page and from there you will see the updated last Backup status after it completes.

The screenshot shows the Oracle Enterprise Manager Cloud Control 13c database home page. It displays system statistics: Version 12.1.0.2.0, Up Time 0 days, 1 hrs, and Availability for Last 7 Days at 99.92%. A prominent green box highlights the "Last Backup" field, which shows the date and time of the most recent backup: Nov 9, 2016 12:35:22 PM.

**Step 7:** Click the link associated with Last Backup as highlighted in the green box above to review the Backup Reports page. The "View Backup Report" page will be displayed list all your backup pieces. You can click on the link of any of those backup to find out additional information about that particular backup.

**Module 4. Point-in-Time Recovery from a ZDLRA Backup**

The goal of this section is to demonstrate Point-in-Time Recovery of your database using a virtual full backup from the Recovery Appliance. As a best practice before performing "risky" operations, you will create a restore point to identify the System Change Number (SCN) prior to injecting a failure into the database. Then you are going to delete the SOE tablespace from your assigned database to simulate a failure. After that you will recover to the point prior to the delete.

**This module of exercise assumes you successfully completed the exercise 2-3 (Perform initial level 0 backup) in module2 and all exercises in module 3.**

**Optionally, you may skip entire module 3 to run this module and in this case you will restore your database from the initial level 0 backup without any data change in your database.**

**Exercise 4-1. Create a Restore Point**

**Step 1:** Create a restore point as at the current time.

From your database home page, click on “Availability” to select “Backup & Recovery”, then select “Restore Point” as shown in the following 2 pages.

The screenshot shows the Oracle Enterprise Manager Cloud Control 13c interface. The top navigation bar has 'Availability' selected. A red arrow points to the 'Restore Points' option in the 'Backup & Recovery' dropdown menu. The left sidebar displays 'Load and Capacity' and 'Incidents and Compliance' sections. The main area shows a graph of 'Active Sessions' over time, with a sharp peak around 7:39 PM.

cust02\_ssc6cn01-d1.us.osc.oracle.com

Logged in as sys

Oracle Database ▾ Performance ▾ Availability ▾ Security ▾ Schema ▾ Administration ▾

**Manage Restore Points**

A restore point is a user-defined name for a point in time.

**Search**

Enter search criteria to filter the data that is displayed in the result table.

Restore Point Name

Select	Restore Point Name	Restore Point Time	Restore Point Type	Storage Size	Creation SCN
No Rows Found					

**TIP** A non-guaranteed restore point does not require additional storage.

**Step 2:** Click “Create” button, then in the “Create Restore Point page”, enter your PITR name **BEFORE\_DELETE**. **Must use all capital letters with a underscore “\_” sign in between**. Accept default of current time and Click the “Yes” button on the far right of the page. Make sure to delete all previously created PITR before creating yours since these leftover may confuse your database restore at a later time.

cust02\_ssc6cn01-d1.us.osc.oracle.com

Logged in as sys

Oracle Database ▾ Performance ▾ Availability ▾ Security ▾ Schema ▾ Administration ▾

Manage Restore Points > Create Restore Point

**Create Restore Point**

\* Restore Point Name

**Restore Point Type**

**Normal Restore Point**  
A name associated with a past point-in-time of the database. Normal restore points age out of the control file after they are beyond the point of recoverability.

**Current Time**

**Restore Point Time**    PM

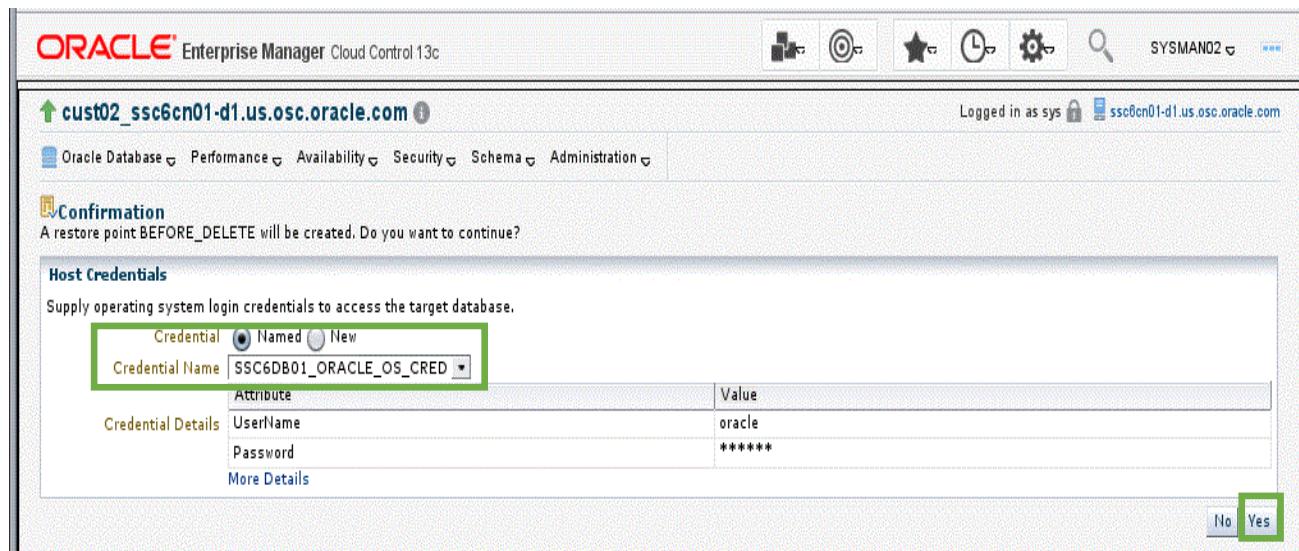
**SCN**   
Specify an SCN that is less than or equal to the current SCN (4936180).

**Preserve This Restore Point**  
Requires a COMPATIBLE setting of 11.1 or greater.

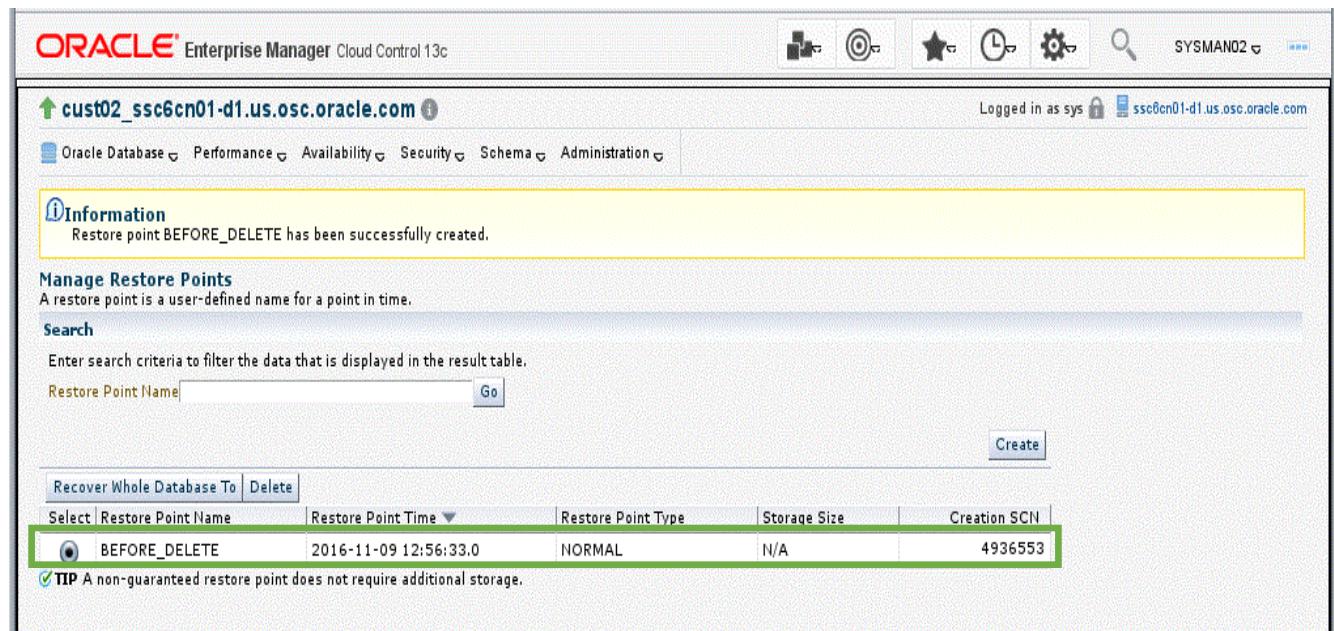
**Guaranteed Restore Point**  
A restore point that ensures flashback can be used to return the database to the time of the restore point. Requires a fast recovery area, ARCHIVELOG mode, and a COMPATIBLE setting of 10.2 or greater.

**Fast Recovery Area and Flashback Logging**

You will see a confirmation message with your newly created Restore Point Name like following. Verify the Credential and click on “Yes” to confirm.



A Restore Point will be created at this time. You will see following confirmation along with the associated SCN number.



### Step 3: Inject a fault by removing the SOE Tablespace from your database

From your assigned database home page, click “Administration”, select “Storage”, then “Tablespace”. A list of tablespaces is displayed.

Select the SOE tablespace. Click on “Delete” to drop it.

Select	Name	Available Space Used (%)	Allocated Space Used (%)	Auto Extend	Allocated Size (GB)	Space Used (GB)	Allocated Free Space (GB)	Status	Datafiles	Type
<input checked="" type="checkbox"/>	SOE	2.85	39.66 YES		2.300	0.912	1.388	✓	1	PE
<input type="checkbox"/>	SYSAUX	3.55	94.70 YES		1.201	1.137	0.064	✓	1	PE
<input type="checkbox"/>	TEMP	0.02	0.78 YES		1.000	0.008	0.992	✓	1	TE
<input type="checkbox"/>	SYSTEM	2.42	99.01 YES		0.781	0.773	0.008	✓	1	PE
<input type="checkbox"/>	UNDOTBS1	0.02	2.39 YES		0.215	0.005	0.210	✓	1	UN
<input type="checkbox"/>	USERS	0.01	33.75 YES		0.005	0.002	0.003	✓	1	PE

✓ Online   ✘ Offline   🔍 Read Only

**Step 4:** Select “Delete associated datafiles from the OS” and then click on “Yes” to confirm.

The screenshot shows a warning dialog in Oracle Enterprise Manager. The URL is [cust02\\_ssc6cn01-d1.us.osc.oracle.com](#). The navigation bar includes Oracle Database, Performance, Availability, Security, Schema, and Administration. The user is logged in as sys. A warning message states: "Once a tablespace has been dropped, the objects and data in it will no longer be available. To recover them can be a time consuming process. Oracle recommends a backup before and after dropping a tablespace." Below the message is a question: "Are you sure you want to delete Tablespace SOE?". There is a checkbox labeled "Delete associated datafiles from the OS" which is checked. At the bottom right are "No" and "Yes" buttons, with "Yes" highlighted.

Verify that the SOE tablespace is no longer listed.

The screenshot shows the Tablespace list page in Oracle Enterprise Manager. The URL is [cust02\\_ssc6cn01-d1.us.osc.oracle.com](#). The navigation bar includes Oracle Database, Performance, Availability, Security, Schema, and Administration. The user is logged in as sys. The search bar is set to "Object Type: Tablespace". The table lists the following tablespaces:

Select	Name	Available Space Used (%)	Allocated Space Used (%)	Auto Extend	Allocated Size (GB)	Space Used (GB)	Allocated Free Space (GB)	Status	Datafiles	Type
<input checked="" type="radio"/>	SYSAUX	3.43	92.86	YES	1.182	1.097	0.084	✓	1	PE
<input type="radio"/>	TEMP	0.02	0.68	YES	1.000	0.007	0.993	✓	1	TE
<input type="radio"/>	SYSTEM	2.42	99.01	YES	0.781	0.773	0.008	✓	1	PE
<input type="radio"/>	UNDOTBS1	0.06	8.75	YES	0.215	0.019	0.196	✓	1	UN
<input type="radio"/>	USERS	0.01	33.75	YES	0.005	0.002	0.003	✓	1	PE

At the bottom left are filters: ✓ Online, ✘ Offline, 📁 Read Only.

#### Exercise 4-2. Recover your database to the Point-In-Time prior to delete of tablespace SOE

**Step 1.** Navigate to the Perform Recovery page from your database home page, then select “Availability”, “Backup & Recovery”, then “Perform Recovery ...”

The screenshot shows the Oracle Enterprise Manager Cloud Control 13c interface. The main navigation bar includes 'Availability', 'Security', 'Schema', and 'Administration'. A dropdown menu for 'MAA Advisor' is open, showing options like 'Backup & Recovery' (which is highlighted), 'Add Standby Database...', 'Convert to Cluster Database...', 'Enable / Disable Quality Of Service Management', and a graph titled 'Active Sessions' from 7:29 PM to 7:49 PM. To the right of the graph is a sidebar with 'Schedule Backup...', 'Manage Current Backups', 'Backup Reports', 'Configure Oracle Cloud Backup', 'Restore Points', 'Transactions' (which is highlighted), 'Backup Settings', 'Recovery Settings', and 'Recovery Catalog Settings'.

**STEP 2:** Select “Whole Database” for Recovery Scope, leave the radio button selected “Recover to the current time or a previous point-in-time” and click “Recover” button.

The screenshot shows the 'Perform Recovery' dialog box. Under 'User Directed Recovery', the 'Recovery Scope' dropdown is set to 'Whole Database' (highlighted). The 'Operation Type' dropdown is set to 'Recover to the current time or a previous point-in-time' (also highlighted). The 'Recover' button is visible. On the right, there is an 'Overview' panel with a bulleted list of recovery operations:

- Recover database failures as advised by Oracle
- Restore and/or recover the entire database or selected objects
- Restore files to a new location
- Recover tablespaces to a point-in-time based on a timestamp, system change number (SCN), or log sequence number
- Recover datafile data blocks that are marked as corrupted, or based on datafile block IDs or tablespace block addresses
- Flashback database or tables to a specific system change number (SCN) or timestamp

**Step 3:** In the following page, select "Recover to a prior point-in-time" which will then display additional options. Search for your restore point by click on the magnifying icon to display all configured restore points. Click the Select button to choose the "**BEFORE\_DELETE**".

ORACLE® Enterprise Manager Cloud Control 13c

SYSMAN02

Point-in-time   Flashback   Rename   Schedule   Review

Perform Whole Database Recovery: Point-in-time

Database: cust02\_ssc0n01-d1.us.osc.oracle.com  
Recovery Scope: Whole Database  
Operation Type: Restore and Recover  
Recovery Catalog Username: ravgc2  
Recovery Catalog Database: zdira (Cluster Database)

Cancel Step 1 of 5 Next

**Point-in-time**

You may recover the entire database to the current time or a prior point-in-time.

Recover to the current time  
 Recover to a prior point-in-time

Date: Nov 9, 2016   
(example: Nov 9, 2016)

Time: 01 : 08 AM  PM

Restore Point: BEFORE\_DELETE

SCN: 0

Sequence: 0

Restore the control file to the designated point-in-time  
Control file restore is not supported with the Restore Point option and will be ignored.

Open the database in read-only mode to validate data after this point-in-time recovery  
If not selected, the database will be opened in read/write mode and the online redo logs will be cleared.

Return to Perform Recovery

Cancel Step 1 of 5 Next

**Step 4:** If your database is configured in flashback mode, you will have an option to select if to restore your database from flashback or rman backup. It is skipped here (step 2/5) since we want to test the backup.

Review and accept default of “No. Restore the file to the default location”. Click “Next” to continue.

ORACLE® Enterprise Manager Cloud Control 13c

SYSMAN02 ▾ ...

Point-in-time   Flashback   **Rename**   Schedule   Review

**Perform Whole Database Recovery: Rename**

Database `cust02_ssc6cn01-d1.us.osc.oracle.com`  
 Recovery Scope **Whole Database**  
 Operation Type **Restore and Recover**  
 Recovery Catalog Username `ravpc2`  
 Recovery Catalog Database `zdlra (Cluster Database)`

Do you want to restore the files to a different location? If so, the control file will be updated to use the new location.

No. Restore the files to the default location.  
 Yes. Restore the files to a new, common location.  
This option will execute an RMAN 'rename' operation.

Location

Yes. Restore the files as Oracle-managed files. Oracle-Managed Files Location +DATAC1

[Return to Perform Recovery](#)

Cancel | Back | Step 3 of 5 | **Next**

**Step 5:** Review and click “Next” to continue.

ORACLE® Enterprise Manager Cloud Control 13c

SYSMAN02 ▾ ...

Point-in-time   Flashback   Rename   **Schedule**   Review

**Perform Whole Database Recovery: Schedule**

Database `cust02_ssc6cn01-d1.us.osc.oracle.com`  
 Recovery Scope **Whole Database**  
 Operation Type **Restore and Recover**  
 Recovery Catalog Username `ravpc2`  
 Recovery Catalog Database `zdlra (Cluster Database)`

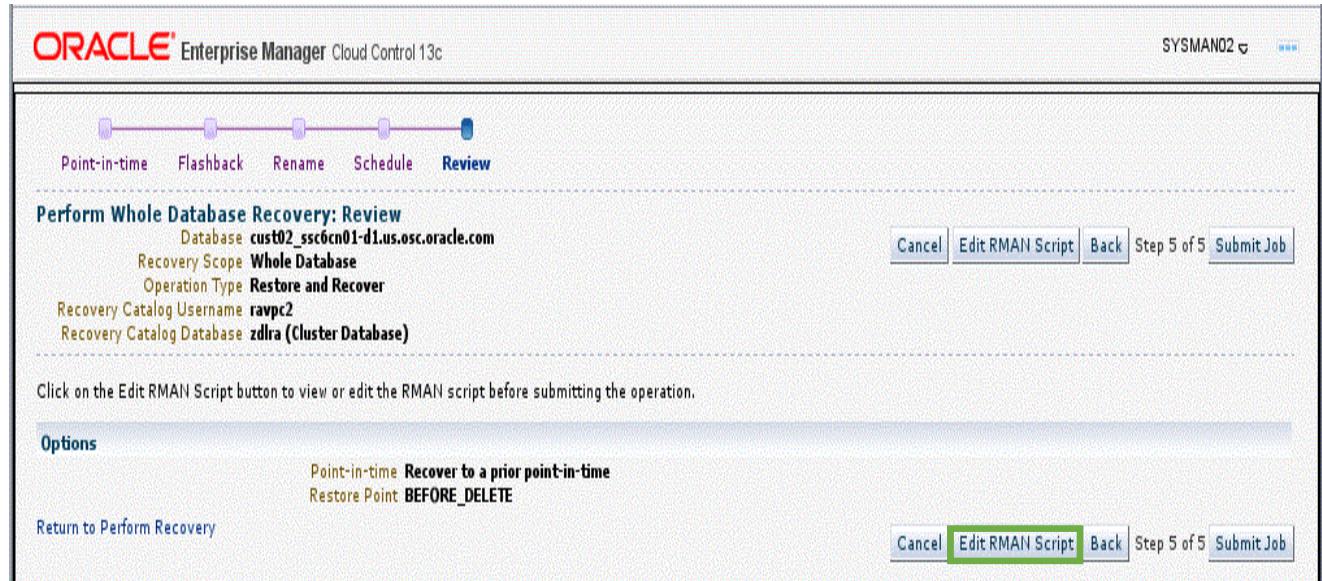
A job will be submitted immediately to run your recovery operation. Provide the name and description for this job.

* Job Name	<code>RECOVERY_CUST02_SSC6CN01-D1.US.C</code>
Job Description	Whole Database Restore and Recover

[Return to Perform Recovery](#)

Cancel | Back | Step 4 of 5 | **Next**

**Step 6:** We are going to update the RMAN script here referencing to the Restore Point BEFORE\_DELETE. **Click on the “EDIT RMAN SCRIPT” button to edit the default RMAN script.**



**Step 7: Edit the default RMAN script by replacing its code with following in the box. Ensure the “BEFORE\_DELETE” is all capitals with underscore “\_” sign in between.**

```

run {

shutdown abort;

startup force nomount;

set until restore point BEFORE_DELETE;

restore controlfile;

alter database mount;

restore database;

recover database;

}

```

The screenshot shows the Oracle Enterprise Manager Cloud Control 13c interface. At the top, it says "ORACLE Enterprise Manager Cloud Control 13c" and "SYSMAN02". Below that is a navigation bar with five steps: Point-in-time, Flashback, Rename, Schedule, and Review (which is highlighted). The main area is titled "Perform Whole Database Recovery: Review: Edit RMAN Script". It contains a text area with the following RMAN script:

```
run {
shutdown abort;
startup force nomount;
set until restore point BEFORE_DELETE;
restore controlfile;
alter database mount;
restore database;
recover database;
}
```

At the top right of this area are "Cancel" and "Submit Job" buttons. At the bottom right of the entire window are "Cancel" and "Submit Job" buttons.

Please double check to ensure no typo before click “Submit Job”.

**Step 8 :** The following confirmation screen will be displayed. Click “View the Job” to accept it and watch its execution.

The screenshot shows the Oracle Enterprise Manager Cloud Control 13c interface. At the top, it says "ORACLE Enterprise Manager Cloud Control 13c" and "SYSMAN02". The main area displays a yellow message bar with the text "The job has been successfully submitted." Below this, under the heading "Perform Recovery: Result", there is another message: "The job has been successfully submitted. You can view the status of the job in Oracle Enterprise Manager Jobs by clicking on the Jobs button." At the bottom right are "View Job" and "OK" buttons.

**Step 9:** Expand the view log to see the execution details if necessary. The backup on Recovery Appliance is being restored and the piece handle names begin with a VB\$ which are virtual backup pieces on the Recovery Appliance. Here are some of the execution logs.

**Job**

Job Activity > Execution: cust01 > Step: Recovery  
Step: Recovery

Status: Running  
Step ID: 90818  
Targets: cust01

Started: Oct 24, 2014 8:26:04 AM GMT-04:00  
Last Agent Update: Oct 24, 2014 8:27:00 AM GMT-04:00  
Agent: znode3011.us.oracle.com:3872

Output Log

statements immediate

RDBMS: Oracle Database 11g Enterprise Edition Release 11.2.0.1.0 - 64bit Production  
Copyright (c) 1982, 2008, Oracle. All rights reserved.  
sga sga Connected  
sga sga sga Data  
Database dismounted  
SGA: 1000M free  
sga sga Disconnected  
With the Partitioned  
Data Mining and Real  
Startup modes

RDBMS: Oracle Database 11g Enterprise Edition Release 11.2.0.1.0 - 64bit Production  
Copyright (c) 1982,  
2008, Oracle. All rights reserved.

SGA: 1000M free

```

using channel ORA_DISK_1
using channel ORA_DISK_2
allocated channel: ORA_SBT_TAPE_1
channel ORA_SBT_TAPE_1: SID=180 device type=SBT_TAPE
channel ORA_SBT_TAPE_1: RA Library (ZDLRA2) SID=062CFD726B776A7EE053421F4598E42E

channel ORA_SBT_TAPE_1: starting datafile backup set restore
channel ORA_SBT_TAPE_1: specifying datafile(s) to restore from backup set
channel ORA_SBT_TAPE_1: restoring datafile 00001 to +DATA/cust01/datafile/system.262.848432501
channel ORA_SBT_TAPE_1: reading from backup piece VB$_1768321009_262149_1
channel ORA_SBT_TAPE_1: piece handle=VB$_1768321009_262149_1 tag=BACKUP_CUST01_0002_102414074003
channel ORA_SBT_TAPE_1: restored backup piece 1

channel ORA_SBT_TAPE_1: restore complete, elapsed time: 00:00:07
channel ORA_SBT_TAPE_1: starting datafile backup set restore
channel ORA_SBT_TAPE_1: specifying datafile(s) to restore from backup set
channel ORA_SBT_TAPE_1: restoring datafile 00002 to +DATA/cust01/datafile/sysaux.259.848432505
channel ORA_SBT_TAPE_1: reading from backup piece VB$_1768321009_262149_2
channel ORA_SBT_TAPE_1: piece handle=VB$_1768321009_262149_2 tag=BACKUP_CUST01_0002_102414074002
channel ORA_SBT_TAPE_1: restored backup piece 1
channel ORA_SBT_TAPE_1: restore complete, elapsed time: 00:00:07
channel ORA_SBT_TAPE_1: starting datafile backup set
channel ORA_SBT_TAPE_1: starting datafile backup set
channel ORA_SBT_TAPE_1: connected to target database: CUST01 (DBID=3145438247, not open)
RMAN>
connected to recovery catalog database

RMAN>
echo set on

RMAN> alter database open resetlogs;
database opened
database reset to incarnation 262731
starting full resync of recovery catalog
full resync complete

RMAN> exit;

Recovery Manager complete.

```

Scroll down the transcript page....

Scroll down the transcript page....

At end, it should complete successfully as shown below.

The screenshot shows the Oracle Enterprise Manager Cloud Control 13c interface. At the top, there's a navigation bar with icons for Home, Database, Performance, Availability, Security, Schema, Administration, and Help. The title bar says "ORACLE Enterprise Manager Cloud Control 13c". On the right, it shows "Logged in as sys" and the URL "ssc0n01-d1.us.osc.oracle.com". Below the title bar, the page path is "cust01\_ssc0n01-d1.us.osc.oracle.com > Job Activity > Execution: cust01\_ssc0n01-d1.us.osc.oracle.com". The main content area displays the execution details for a job named "Execution: RECOVERY\_CUST01\_SSC0N01-D1.US.OSC.ORACLE.COM\_000027". The "Summary" section shows the status as "Succeeded". The "List of Tasks for cust01\_ssc0n01-d1.us.osc.oracle.com" section shows two tasks: "Initialize" and "Recovery", both marked as "Succeeded". The "Recovery" section shows the output log with the command "shutdown immediate".

**Step 11.** If everything appears OK, navigate back to your databases home page as shown below and confirm the SOE tablespace has been restored.

The screenshot shows the Oracle Enterprise Manager Cloud Control 13c interface. The top navigation bar includes links for Oracle Database, Performance, Availability, Security, and Schema, along with a user status message 'Logged in as sys'. The main content area features several cards: 'Load and Capacity' (Version 12.1.0.2.0, 0 days, 0 hrs Uptime), 'Incidents and Compliance' (Compliance Not Configured), and 'Recommendations' (0 ADDM Findings, 1 SQL Tuning). On the right, a large sidebar menu is open under 'Administration'. The 'Storage' section is currently selected. Other sections include Initialization Parameters, In-Memory Central, Oracle Scheduler, Replication, Exadata, Migrate to ASM, ASM Home, Disk Groups, Resource Manager, Database Feature Usage, Datafiles, and Tablespace management. A 'Tables' section is also visible. A timeline on the right shows a backup activity from Nov 9, 2016, at 12:11:58 PM.

**Step 13:** In “Tablespace” window, you should see your tablespace SOE is listed again. If no tablespace displays at all, refresh the browser page. Now, your database is recovered back to the point of "BEFORE\_DELETE".

The screenshot shows the Oracle Enterprise Manager Cloud Control 13c interface. The top navigation bar includes links for Oracle Database, Performance, Availability, Security, Schema, and Administration. The main content area is titled "Tablespaces" and features a search bar with the placeholder "Select an object type and optionally enter an object name to filter the data that is displayed in your results set." Below the search bar is a table with columns: Select, Name, Available Space Used (%), Allocated Space Used (%), Auto Extend, Allocated Size (GB), Space Used (GB), Allocated Free Space (GB), Status, Datafiles, and Type. The table lists several tablespaces: SOE, SYSAUX, TEMP, SYSTEM, UNDOTBS1, and USERS. The SOE row is selected and highlighted with a green border around its entire row. At the bottom of the table, there are status indicators: Online (green checkmark), Offline (red X), and Read Only (blue question mark).

Select	Name	Available Space Used (%)	Allocated Space Used (%)	Auto Extend	Allocated Size (GB)	Space Used (GB)	Allocated Free Space (GB)	Status	Datafiles	Type
<input checked="" type="checkbox"/>	SOE	2.85	39.66	YES	2.300	0.912	1.388	✓	1	PE
<input type="checkbox"/>	SYSAUX	3.55	94.70	YES	1.201	1.137	0.064	✓	1	PE
<input type="checkbox"/>	TEMP	0.02	0.78	YES	1.000	0.008	0.992	✓	1	TE
<input type="checkbox"/>	SYSTEM	2.42	99.01	YES	0.781	0.773	0.008	✓	1	PE
<input type="checkbox"/>	UNDOTBS1	0.02	2.39	YES	0.215	0.005	0.210	✓	1	UN
<input type="checkbox"/>	USERS	0.01	33.75	YES	0.005	0.002	0.003	✓	1	PE

### Exercise 4-3. Perform a backup after recovery

As we just performed a PITR operation, we will perform a new Level 0 backup operation. Performing this extra backup operation would not be necessary in a real environment; it is being used only to simplify the demo.

**Step 1:** From the “Availability” Tab of your database home page, select “Backup & Recovery”, and then “Schedule Backup ...”.

The screenshot shows the Oracle Enterprise Manager Cloud Control 13c interface. In the top navigation bar, the 'Availability' option is selected. A dropdown menu is open under 'Availability' with several options: MAA Advisor, Backup & Recovery, Add Standby Database..., Convert to Cluster Database..., Enable / Disable Quality Of Service Management. The 'Backup & Recovery' option is highlighted with a green border. To the right of the menu, there is a chart titled 'Active Sessions' showing session activity over time. At the top right of the interface, there are 'Enterprise' and 'Targets' dropdown menus.

Choose “Schedule Oracle-Suggested Backup” and then accept the default in next 3 steps to perform a new backup.

The screenshot shows the 'Schedule Backup' page in Oracle Enterprise Manager. The main heading is 'Schedule Backup'. Below it, there are three sections: 'Oracle-Suggested Recovery Appliance Backup', 'Oracle-Suggested Backup', and 'Customized Backup'. The 'Oracle-Suggested Recovery Appliance Backup' section contains a note about automated backup strategies and a button labeled 'Schedule Oracle-Suggested Backup'. The 'Oracle-Suggested Backup' section contains a note about disk or tape backups and a button labeled 'Schedule Oracle-Suggested Backup'. The 'Customized Backup' section has a note about selecting objects to back up and a button labeled 'Schedule Customized Backup'. At the bottom, there is a 'Host Credentials' section where users can supply operating system login credentials. A credential named 'SSC6DB01 ORACLE OS CRED' is selected. The 'Credential Details' table includes columns for Attribute, Username (oracle), and Password (\*\*\*\*\*). There is also a 'More Details' link.

**Module 5. Integrated Copy-To-Tape****Exercise 5-1. Schedule Copy-To-Tape Operations for your Protection Policy**

Copy-To-Tape Operations may be scheduled at the database or Protection Policy level providing flexibility to configure and/or stagger copy-to-tape schedules to meet your requirements.

**Step 1:** From the ZDLRA home page, go to the Media Managers Page as on the left:

The screenshot shows the Oracle Enterprise Manager Cloud Control 13c interface. At the top, it says "SCA-ZDLRA2" and "Recovery Appliance". The left sidebar has a tree view with the following nodes:

- Protected Databases
- Storage Locations
- Protection Policies
- Media Managers** (this node is selected, indicated by a green border)
- Copy-to-Tape Job Templates
- Replication
- Configuration
- Compliance

On the right side, there are several charts showing data in GB and GB/s, all of which are currently at 0.

A Media Manager Library refers to the SBT library configured on the appliance for tape operations. Oracle Secure Backup (OSB) is pre-configured for copy to tape operations on the Recovery Appliance and can be used out-of-the-box using the default configuration. Attribute sets communicate RMAN parameters to the media manager (OSB in this case). The default configuration creates attribute sets to specify how many RMAN streams (channels) should be

used for the backup job. When you schedule copy to tape jobs, you select which attribute set should be used.

In this Test Drive environment, your Recovery Appliance has two Fibre attached tape drive and therefore there are two attribute sets created one of which defines 1 RMAN channel be used and the other uses 2 RMAN channels. As there are two tape drives, the maximum number of RMAN channels used is two. If more tape drives were available, more RMAN channels could be defined (one RMAN channel per tape drive). The number of streams used for each attribute set is highlighted in the green box above.

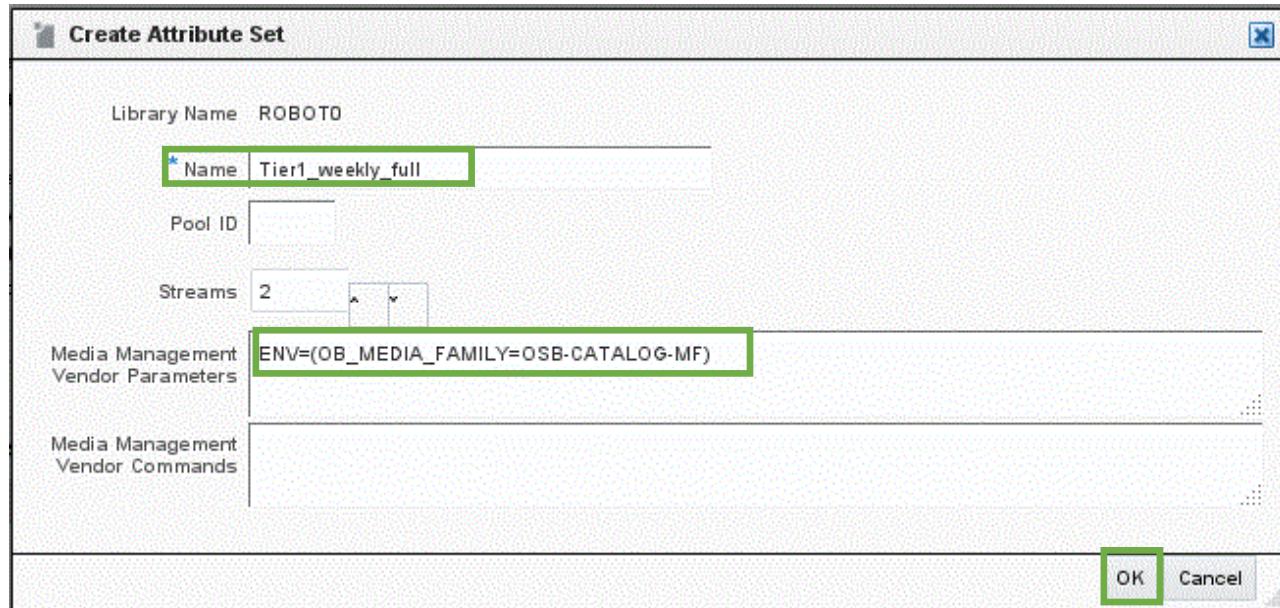
Name	Status	Error	Maximum Drives	Restore Drives
ROBOT0	Green	0	2	0

Name	Pool ID	Streams
ROBOT0_DRIVE_COUNT_1	1	1
ROBOT0_DRIVE_COUNT_2	2	2

We will not be defining attribute sets in today's workshop environment. In a production environment, you may want to customize the copy to tape settings to specify use of another tape pool (referred to as an OSB Media Family) or other RMAN parameters supported by the Media Manager.

**Step 2:** It is very easy to create additional attribute sets by clicking the Create which pops up an attribute box in which you can input desired RMAN parameters. In the example below, the attribute set named “Tier1\_Weekly\_full” would use the OSB Media Family (tape pool) named “OSB-CATALOG-MF” and would leverage two RMAN streams:



As this OSB media family was predefined in the default configuration, you cannot change it to another name unless it had been pre-defined in OSB prior to specifying in an RMAN parameter. The above is for demonstration only and we won't be creating additional attribute sets in today's event.

Let's perform a full backup to tape and setup a recurring backup schedule of a weekly full and daily incremental using the default attribute sets.

**Step 2:** Navigate to the "Copy to Tape" page from ZDLRA "Media Manager" page by clicking the link highlighted in the green box below.

The screenshot shows the Oracle Enterprise Manager Cloud Control 13c interface. At the top, it says "SCA-ZDLRA2" and "Recovery Appliance". The URL is "zdl2en02.us.osc.oracle.com" and the page was refreshed on "Nov 9, 2016 2:16:57 PM PST".

**Media Manager Libraries:**

Name	Status	Error	Maximum Drives	Restore Drives
ROBOTO	Green	0	2	0

**ROBOT0 Attribute Sets:**

Name	Pool ID	Streams
ROBOT0_DRIVE_COUNT_1	1	1
ROBOT0_DRIVE_COUNT_2	2	2

The "copy to tape" page will be displayed. Click "Create" to create your copy-to-tape policy.

The screenshot shows the Oracle Enterprise Manager Cloud Control 13c interface. At the top, it says "SCA-ZDLRA2" and "Copy-to-Tape Job Templates". The URL is "zdl2en02.us.osc.oracle.com" and the page was refreshed on "Nov 9, 2016 2:30:28 PM PST". There is an "Auto Refresh" dropdown set to "Off".

**Copy-to-Tape Job Templates:**

Name	Protection Policy	Database	Media Managers			Tasks			Queued Data (GB)	Last Copy Activity		
Name	▲▼ Protection Policy	Database	Library	Attribute Set	Status	Backup Type	Priority	Scheduled	Queued	Running	Completed (Last 24 Hrs)	Status

Even though you are only performing incremental backups to the Recovery Appliance, you may perform full, incremental and archive log backups to tape. For full backups, the Recovery Appliance creates a virtual full backup to the point of the most recent incremental and copies that to tape. The copies on tape are in standard RMAN backup format and may be restored / recovered the same way as if the backup was performed directly from the protected database to tape.

The first copy to tape operation must be a level 0 backup, so that subsequent incremental backups have a baseline to work from.

**Step 3:** Edit the wizard using following example:

Name = Yours (e.g. Robert\_Tier1\_weekly)

Protection Policy = Yours

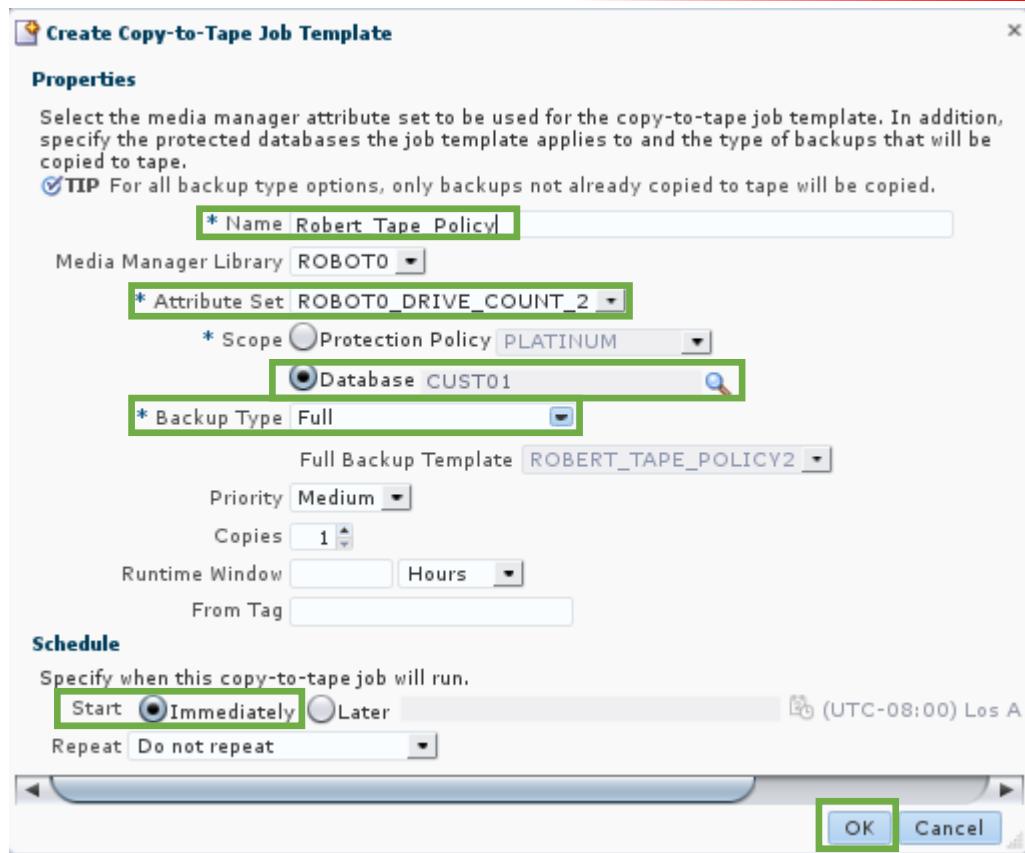
Change Attribute Set = Drive\_Count\_2

Scope = Not select “Protection Policy” but search and select your database instead

Backup Type = Full

Under Schedule :

Start = Immediately



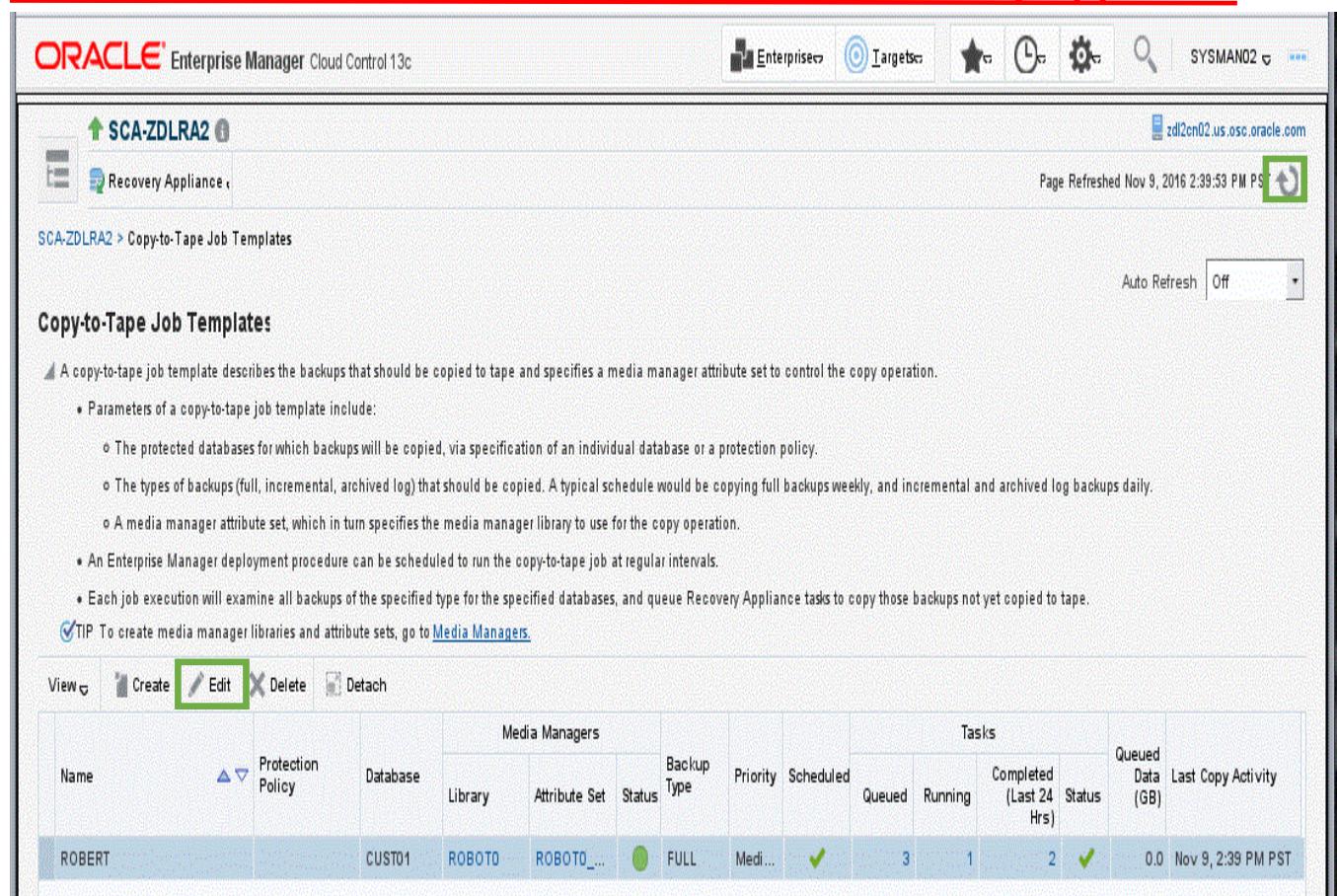
After review, click “OK” to continue.

You will be returned to the “Copy to tape” page as displayed below:

The screenshot shows the Oracle Enterprise Manager Cloud Control 13c interface. The top navigation bar includes links for Enterprise, Targets, Favorites, History, Setup, and Help, along with a search bar and user information for SYSMAN02. The main content area is titled "SCA-ZDLRA2" and "Copy-to-Tape Job Templates". A confirmation message at the top states: "Procedure COPY\_TO\_TAPE SCA-ZDLRA2 robert\_110916143701 has been submitted." Below this, a table lists job templates. The columns include Name, Protection Policy, Database, Media Managers (Library, Attribute Set, Status, Backup Type, Priority, Schedule), and Tasks (Queued, Running, Completed (Last 24 Hrs), Status). One row for "ROBERT" is shown, with its "Status" column highlighted by a green box.

Name	Protection Policy	Database	Media Managers		Priority	Schedule	Tasks		
			Library	Attribute Set			Status	Backup Type	Queued
ROBERT	CUSTOM	ROBOT0	ROBOT0_D...		FULL	Medium			

After you refresh the page, you will see the columns highlighted in the green box above updated as the copy to tape job progresses. Most companies want a recurring backup schedule to consistently meet SLA requirements. It is very easy to setup a backup schedule and the next exercises will demonstrate how to configure a weekly full and daily incremental schedule. As the RECOVERY APPLIANCE offloads processing from database servers, copy to tape jobs may be performed 24 x 7 without any impact on production database servers.



The screenshot shows the Oracle Enterprise Manager Cloud Control 13c interface. The top navigation bar includes links for 'Enterprise', 'Targets', 'SYSMAN02', and a search function. The main title is 'SCA-ZDLRA2' with a status of 'Up'. Below the title, there's a breadcrumb trail: 'SCA-ZDLRA2 > Copy-to-Tape Job Templates'. On the right, there are buttons for 'Auto Refresh' (set to 'Off') and a refresh icon.

**Copy-to-Tape Job Templates**

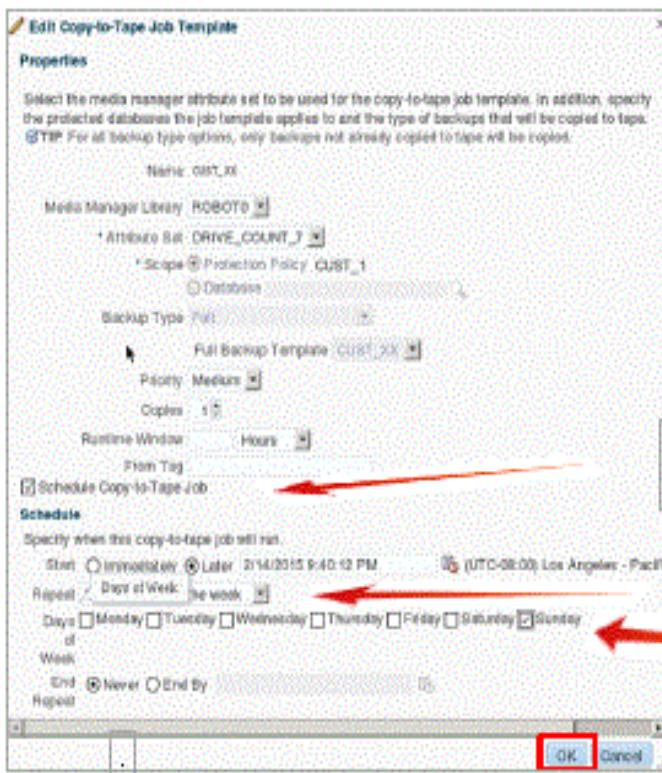
A detailed description of a copy-to-tape job template is provided:

- A copy-to-tape job template describes the backups that should be copied to tape and specifies a media manager attribute set to control the copy operation.
- Parameters of a copy-to-tape job template include:
  - The protected databases for which backups will be copied, via specification of an individual database or a protection policy.
  - The types of backups (full, incremental, archived log) that should be copied. A typical schedule would be copying full backups weekly, and incremental and archived log backups daily.
  - A media manager attribute set, which in turn specifies the media manager library to use for the copy operation.
- An Enterprise Manager deployment procedure can be scheduled to run the copy-to-tape job at regular intervals.
- Each job execution will examine all backups of the specified type for the specified databases, and queue Recovery Appliance tasks to copy those backups not yet copied to tape.

TIP To create media manager libraries and attribute sets, go to [Media Managers](#).

View		Create	Edit	Delete	Detach	Media Managers										Tasks			
Name	Protection Policy	Database	Media Managers			Priority	Scheduled	Tasks			Completed (Last 24 Hrs)	Status	Queued Data (GB)	Last Copy Activity					
			Library	Attribute Set	Status			Queued	Running										
ROBERT		CUST01	ROBOTO	ROBOTO_...	<span style="color: green;">●</span>	FULL	Medi...	<span style="color: green;">✓</span>	3	1	2	<span style="color: green;">✓</span>	0.0	Nov 9, 2:39 PM PST					

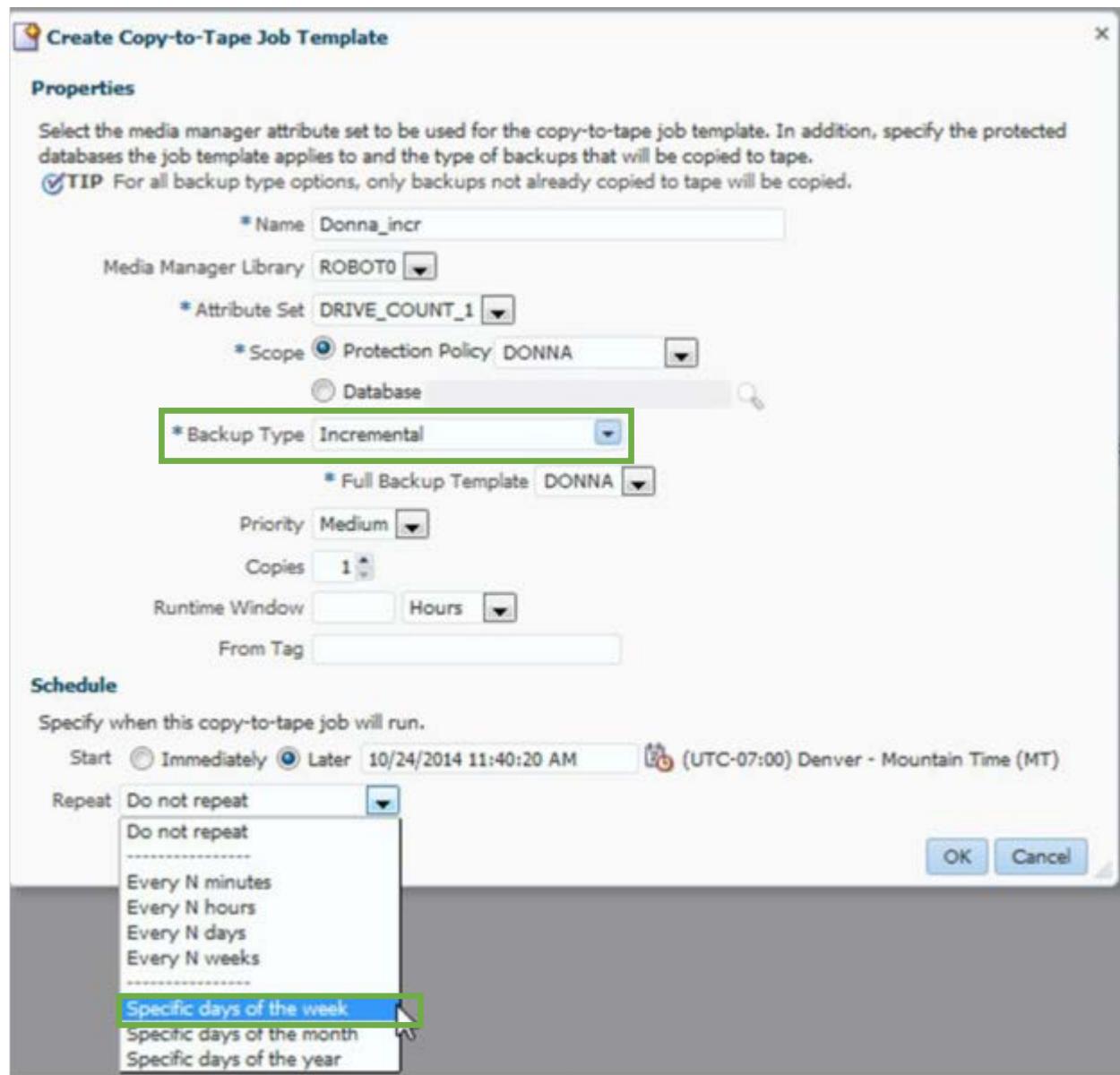
**Step 4:** Edit your copy to tape job to perform a recurring backup schedule. Click the “Edit” button as highlighted in the green box above. Update your configuration per the sample below. After clicking the OK button, you will be returned to the copy to tape page and see a confirmation that the copy to tape procedure has been submitted.



In addition to a weekly full, many customers have requirements of a daily incremental backup on tape. This can be easily scheduled by creating an incremental tape template which references the full template you just created.

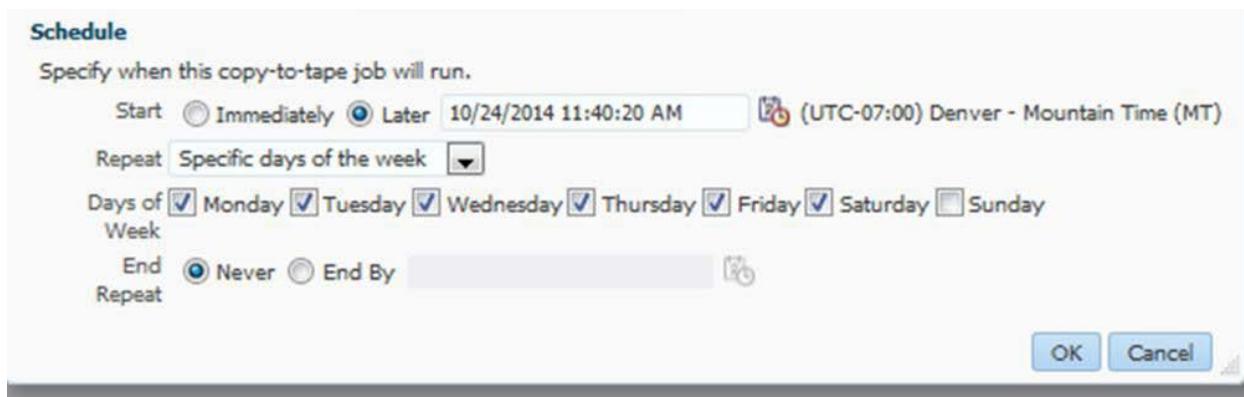
**Step 6:** Click the Create button to create an incremental backup schedule to tape.

**Step 7:** After inputting the information in the box above, select the drop-down menu associated with Backup Type. You can ignore that message as a full backup has already been performed. Uncheck the box beside “Full” and check the box next to “Incremental” as shown below:



**Step 8:** In the Schedule section, select the radio button beside Later and from the Repeat drop-down, select Specific days of the week. The screen will expand allowing you to select Monday

through Saturday as shown in the box above. Click the “OK” button. You will see a confirmation at the top of the page:



**Step 9:** Return to the protected database page. You will see a check mark in the tape column. If you highlight your database, you will see information at the bottom of the page regarding tape backup.

Database	Target Name	Version	Protection Policy	Database Size (GB)	Recovery Window	Unprotected Data Window	Errors/Warnings	Redo Shipping	Copy-to-Tape	Replication Last Complete Backup
CUST01	cust01_exadata07.ora...	12.1.0.2.0	CUST_1	3.55	7.0 0.07	728.42 5.0 min < 1 sec			✓	Feb 14, 9:02 PM PST
ORCL	orcl	11.2.0.4.0	BRONZE	19.19	3.0 0.02	45.0 19.2 days	0 (1)			Jan 25, 11:20 PM PST
ORCL2	orcl2	11.2.0.4.0	BRONZE	17.47	3.0 34.89	7.82 5.0 days	0 (1) 1 (1)			Jan 9, 7:37 AM PST
PEPSI	pepsi	11.2.0.4.0	PEPSI-GOLD	33.98	7.0 10.61	7.3 5.0 min < 1 sec			✓	Feb 10, 3:19 PM PST

Protected Database Detail: CUST01

Status: Incidents and Events

Unprotected Data and Recovery Window

Backup Space

De-Duplication Ratio: 1.2 : 1  
Keep Backup Space: None  
Next Scheduled Backup: View  
Last Copy To Tape: Feb 14, 9:40 PM PST  
Last Replication: N/A

TIP: For more information, view the following reports for this database:  
Protected Database Report  
Backup Report

It should be noted that in this exercise, you have performed a Full backup to tape and only scheduled incremental backups to tape. As you have just performed a full backup to tape, an incremental copy to tape would not be needed at this time. This exercise was intended to demonstrate the process and flexibility of scheduling tape copies.

### **Module 6. Centralized Management of 100s – 1000s Database Backup**

As demonstrated in earlier sections, Recovery Appliance policy-based management delivers a framework for effective management of large numbers of databases in a consistent manner across the data center. This one-to- many approach increases standardization and consistency by reducing configuration complexities.

Recovery Appliance increases high availability and protection policies address recovery requirements in multi-tiered environments. While recovery is the arguably the most important aspect of any backup solution, what about scheduling 100s of database backups or how will the administrator know if there is a problem with backups for 1 out of 1000 databases or capacity trends?

The goal of this section is to address all of those questions and more. We will dive into:

- EM groups and backup templates/scheduling
- Out of the box monitoring
- Recovery Appliance pre-defined reports

#### **Exercise 6-1. Group Backup**

Groups are an efficient and effective way to logically organize the targets in Enterprise Manager. It is a user-defined set of targets organized as a single entity. It simplifies the task of monitoring and managing the targets by allowing you to manage multiple targets from a single location. A group can include a homogenous set of targets (for example, all your production databases) or a heterogeneous set of targets (for example, all targets comprising your business's application).

The goal of this section is to demonstrate how you can leverage Group Backup capabilities in RECOVERY APPLIANCE environments for an additional layer of standardization and ease of management.

For purposes of backups to Recovery Appliance, you would create a group of databases. This Group could be used to manage a set of databases, as an easy way to add databases to the Recovery Appliance management and schedule all the group or subset of the group to backup on a specific schedule. Groups are an effective way of standardizing backup operations. For example let's assume you have created a group and scheduled backups. A week down the road, you have a new database which was just configured to backup to the Recovery Appliance. All you have to do is add that database to the group and it will automatically leverage the recurring backup schedule.

If you don't have an existing group, you need to create one (or more) and select which databases are to be included. To leverage the Group Backup capabilities, you would then create backup configuration (templates) so that when you schedule backup operations you then select which configuration should be used. In this lab, you will create a group, a backup template and perform a group backup.

**Step 1:** From the Target drop-down menu on top of your screen, select Groups as blow.



**Step 2:** From the Group home page, click the Create button. We encourage you to explore the power of EM Groups once you return to your office as we are just scratching the surface in this demo by creating a basic group.

The screenshot shows the 'Groups' page in Oracle Enterprise Manager. At the top, there's a search bar with 'Search Name' and a 'Save...' button. Below the search is a toolbar with 'View', 'Create', 'Edit', 'Remove', 'View Members', 'Administration Groups and Template Collections', and 'Associate Template Collection'. The main area has a table with columns 'Name', 'Group Type', and 'Members'. A 'Member Status Summary' section includes icons for red, green, yellow, and grey status. The 'Incidents' section has several colored icons. The top right shows 'Auto Refresh Off' and 'Page Refreshed Nov 9, 2016 3:44:45 PM PST'.

**Step 3:** Type your name for the group name in the Name box. Click the “Add” button in the Members section which displays a list of Targets. Search for your database instance from the given list, then click the Select button. After back to the **Add Target** page, click “OK”.

The screenshot shows the 'Add Target' page. It has tabs for 'General', 'Charts', 'Columns', 'Dashboard', and 'Access'. In the 'General' tab, the 'Name' field is filled with 'Robert\_group' and the 'Privilege Propagation' checkbox is checked. The 'Members' section contains a table with one row: 'cust01\_ssc6cn01-d1.us.osc.oracle.com' under 'Name' and 'Database Instance' under 'Type'. The 'Time Zone' dropdown is set to '(UTC-08:00) Los Angeles - Pacific Time (PT) (PST)'. On the right, there's an 'Overview' section with a bulleted list of features. At the bottom right are 'OK' and 'Cancel' buttons.

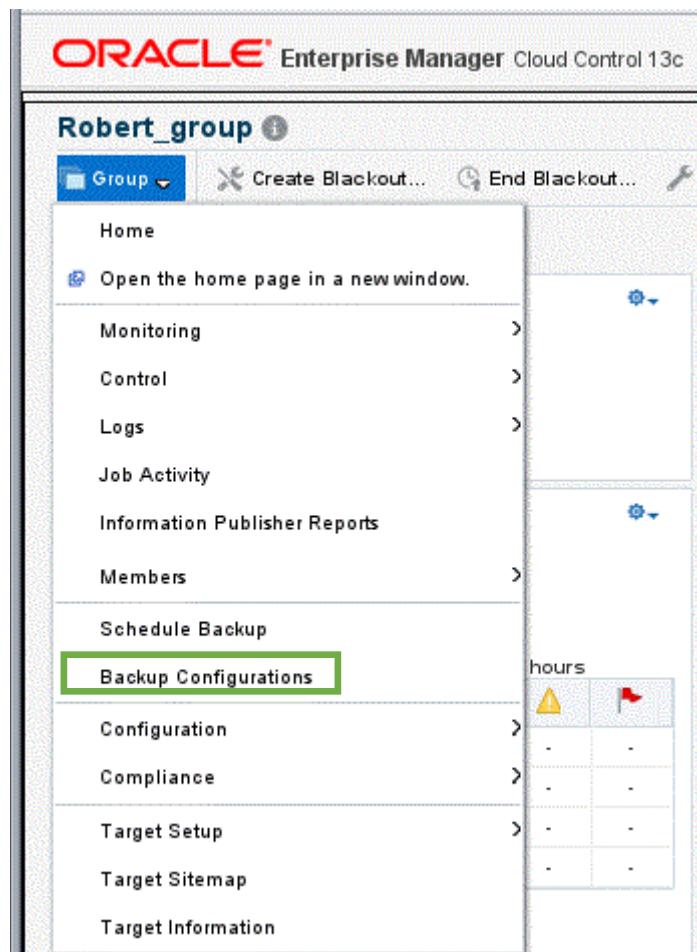
Obviously, the advantage of using Groups is when you have multiple databases associated with a group, while our demo just shows an example with only one database in your group. You will be returned to the "Groups" home page and will see a confirmation that your group was successfully created as shown below.

The screenshot shows the Oracle Enterprise Manager Cloud Control 13c Groups page. At the top, there is a search bar with 'Search Name' and 'Advanced Search' buttons. A modal window titled 'Information' displays the message 'Group Robert\_Group has been added.' with an 'OK' button. Below the search bar, there are buttons for 'View', 'Create', 'Create Like', 'Edit', 'Remove', 'View Members', 'Administration Groups and Template Collections', 'Associate Template Collection', and 'Disassociate Template Collection'. The main table lists a single group entry: 'Robert\_Group' with 'Database Instance (1)' member. The 'Members' column shows a green status icon. The 'Member Status Summary' and 'Incidents' columns show various status icons and counts (e.g., 1 N/A).

**Step 4:** Click “OK” to close the pop-up and then select the Group Name link associated with the group you just created which will lead you to your group home page.

This screenshot shows the same Groups page as above, but with a different view. The 'Robert\_Group' entry is now highlighted with a green border. The 'Members' column for this group shows a blue status icon, indicating it is currently selected or being viewed. The rest of the interface is identical to the previous screenshot, including the search bar, modal window, and status summary.

**Step 5:** From your group home page, select “Backup Configurations” from the Group drop-down menu to go to its backup configuration page.



**Step 6:** Click the “Create” button. In “Create Backup Configuration” page configure following as minimum then click the “Save” button to save your configuration.

Name = Your name (No space)

Under the “Storage” tab, select the RA unit from the Drop-down menu if there are multiple RA units and also select the VPC user from the drop-down menu.

Click “Policy” and “Recovery Catalog” tabs to review their contents but no need to do anything.

Optionally, if you prefer and a tape library is available, you can scroll down the screen to add your tape backup before click the “Save”.

The screenshot shows the Oracle Enterprise Manager Cloud Control 13c interface. The top navigation bar includes links for 'Enterprise', 'Targets', 'Dashboard', and 'SYSMAN02'. Below the navigation is a header for 'Robert\_group'. A toolbar with icons for 'Group', 'Create Blackout...', 'End Blackout...', 'Target Operations', and 'Dashboard' is visible. The main content area is titled 'Create Backup Configuration'. It features a form with fields for 'Name' (containing 'Your First Name (No space)') and 'Description'. Below the form are tabs for 'Storage', 'Policy', and 'Recovery Catalog', with 'Storage' currently selected. On the right side of the form are 'Save' and 'Cancel' buttons, both highlighted with a green box. The 'Recovery Appliance Settings' section contains dropdown menus for 'Recovery Appliance' (set to 'SCA-ZDLRA2') and 'Virtual Private Catalog User' (set to 'ravpc02'). It also includes a 'Parallelism' slider set to '2', a 'Backup Type' radio button group ('Backup Set' is selected), and a 'Compressed Backup Set' checkbox. A tip message states: 'TIP Compressed backup sets are not recommended when using the Oracle-recommended incremental-forever backup strategy with a Recovery Appliance.' Below this are sections for 'Disk Settings' and 'Database Backups'.

You will return to your Group's home page and a confirmation message will be displayed.

**Step 7:** Click "OK" to close the confirmation pop-up and then select "Schedule Backup" from the group drop-down menu.

The screenshot shows the Oracle Enterprise Manager Cloud Control 13c interface. In the top left, it says "ORACLE® Enterprise Manager Cloud Control 13c". In the top right, there's a "Enterprise" logo. The main title is "Robert\_group". The left sidebar has a "Group" dropdown, "Create Blackout...", "End Blackout...", and "Target Operations" buttons. The "Schedule Backup" button is highlighted with a green box. Below it are "Backup Configurations", "Configuration", "Compliance", "Target Setup", "Target Sitemap", and "Target Information". The "Configuration" section is expanded, showing a table with one row:

Last Modified Date	Description
Nov 9, 2016 4:22:01 PM PST	

A confirmation dialog box titled "Confirmation" is overlaid on the page, containing the message "Backup configuration Robert has been created." with an "OK" button.

The following page will be displayed. Review it and accept the default settings of a whole database backup and to include all databases associated with the group.

If you included tape backup at step6 (bottom of page 69), you also need to select the “Oracle Secure Backup Domain” from the pull-down menu as shown in following otherwise no need to enter “Oracle Secure Backup Domain” and leave it with “No Selection”. Click the “Next” to continue.

**Schedule Backup: Databases**

Select the databases to include in the backup. A backup of the specified scope will be performed for all selected databases. If an Oracle Secure Backup domain is specified, associated Oracle Homes and additional files (specified on the Files page) can be included in the backup.

Oracle Secure Backup Domain: ZDLRA OSB zd12en01.us.osc.oracle.com

**TIP:** Version 10.2 and higher databases can be included in the backup. Backups of prior database versions can be done individually from the database target home page.

Backup Scope: Whole Database

Backup All Databases in Group

Include Oracle Homes

Backup Selected Databases

**Group Backup Overview**

Back up the databases in a group, along with associated Oracle Homes and files, in a single procedure.

- Membership changes automatically detected across recurring backups for Backup All Databases option.
- Optionally select a subset of member databases.
- Include database Oracle Homes from hosts configured as Oracle Secure Backup client hosts.
- Include files and directories from member hosts configured as Oracle Secure Backup client hosts.
- Databases of different versions and platforms can be included in the same backup operation.
- Database and file backup settings are applied uniformly from a single backup configuration.

**Step 8:** Click “Named” for both “Database Credential” and “Host Credential” and ensure a proper credential is selected from the drop-down menu. Then go to “Next” page.

**Schedule Backup: Credentials**

Specify the credentials that will be used to connect to all databases included in the backup operation. If preferred credentials are specified, target-specific preferred credentials will be obtained for each database at the time the backup operation runs. If named or new credentials are specified, the same credentials will be used for all databases.

**Database Credentials**

Credential:  Preferred  Named  New  
Credential Name: SSC06DB01\_ORACLE\_SYS\_CRED

Attribute	Value
Username	sys
Password	*****
Role	sysdba

Normal (non-SYSDBA) database credentials can be specified if the specified host credentials are for a user in the operating system DBA group. Otherwise, SYSDBA database credentials are required.

**Host Credentials**

Specify the operating system credentials that will be used to perform the backup for all databases. If preferred credentials are specified, target-specific preferred credentials will be obtained for each host at the time the backup operation runs. If named or new credentials are specified, the same host credentials will be used for all database backups.

Credential:  Preferred  Named  New  
Credential Name: SSC06DB01\_ORACLE\_OS\_CRED

**Step 9:** Select backup to the Recovery Appliance and highlight your Backup Configuration (e.g. Robert\_group\_backup in this case). Click the “Next” to continue.

ORACLE® Enterprise Manager Cloud Control 13c

SYSMAN02 ▾ ...

Robert\_Group ①

Databases Credentials Files Settings Options Schedule Review

Schedule Backup: Settings

Back Step 4 of 7 Next Cancel

Destination Media

Select the destination media for this backup. The selected media will be used for all objects in the backup. Only databases can be included in disk backups, while both databases and files can be included in tape backups.

Disk

Tape

Recovery Appliance

Oracle Cloud

Select Backup Configuration

Select the backup configuration that will be used for this backup. The settings in the selected backup configuration will be applied to all databases and files included in the backup.

View

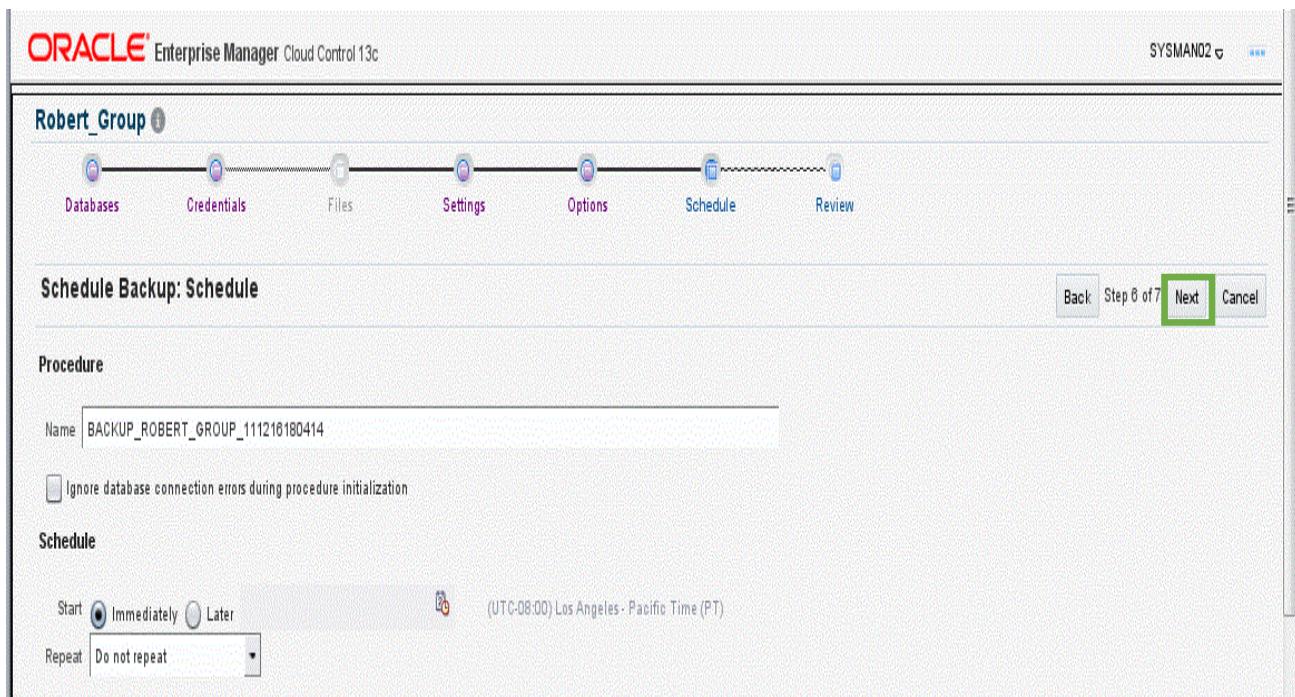
Name	Owner	Last Modified Date	Description
Robert_group_backup	SYSMAN02	Nov 12, 2016 5:42:43 PM PST	
Robert	SYSMAN02	Nov 9, 2016 4:22:01 PM PST	

**Step 10:** Please check the box regarding "Also backup all archived logs on disk that have not already been back-up" per Oracle recommended best practice for backup and click the “Next” button to proceed.

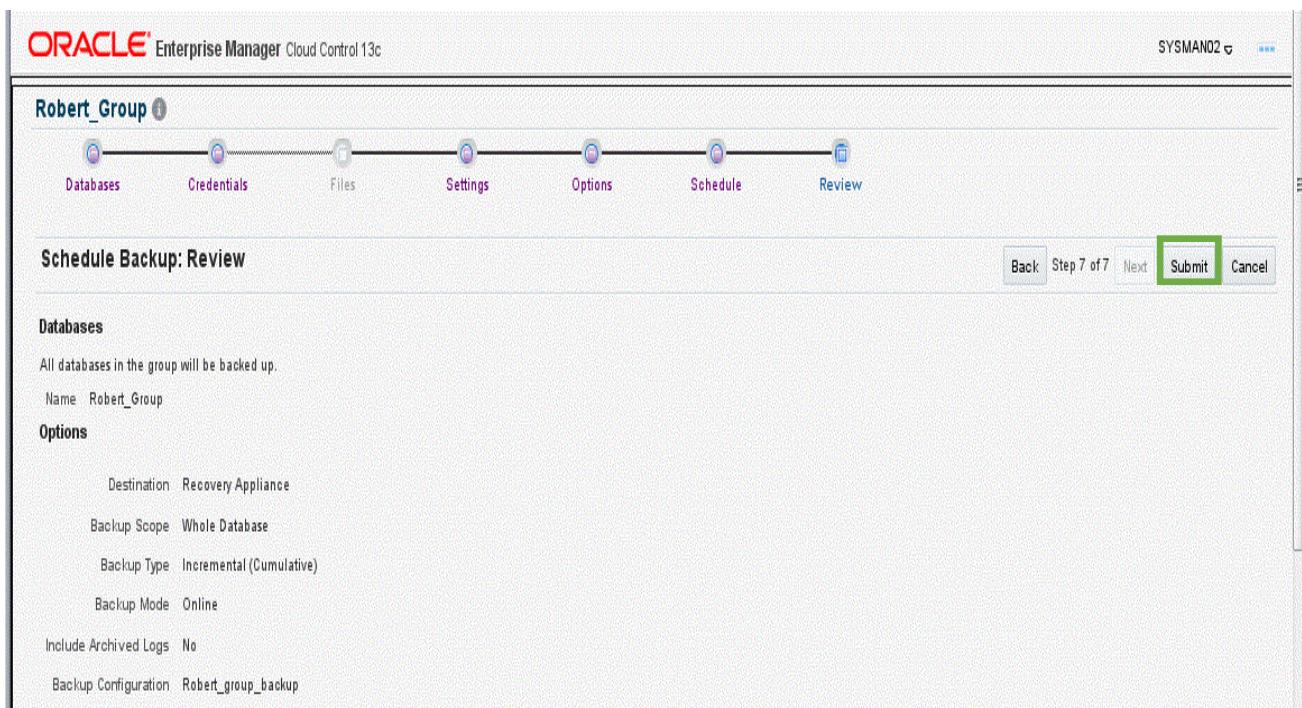
The screenshot shows the Oracle Enterprise Manager Cloud Control 13c interface. At the top, it says "ORACLE® Enterprise Manager Cloud Control 13c" and "SYSMAN02". Below the header, there's a navigation bar with tabs: Databases, Credentials, Files, Settings, Options, Schedule, and Review. The "Options" tab is selected. The main content area is titled "Schedule Backup: Options". It has a sub-section titled "Database Backup Type" with the following text: "Specify the type of backup that will be performed. Oracle recommends an incremental-forever backup strategy when backing up to a Recovery Appliance." There are two radio buttons: "Full" (unchecked) and "Incremental" (checked). Below the radio buttons are two checkboxes: "Use as the base of an incremental backup strategy" (unchecked) and "Perform differential instead of cumulative backup" (unchecked). A tip message says: "TIP This option is not recommended when using an incremental-forever strategy." Under "Database Backup Mode", it says "Specify the mode the databases will be in during the backup." There are two radio buttons: "Online" (checked) and "Offline". A tip message says: "TIP Regardless of which backup mode is selected, an offline backup will be performed for databases in NOARCHIVELOG mode." Under "Advanced Database Options", there is a note: "Also backup all archived logs on disk that have not already been backed-up" with an information icon.

**Step 11:** In this page, review and accept defaults and click the “Next” button.

While we are just scheduling an immediate, one-time backup operation, you can schedule recurring backups operations the same way that as you did in the earlier exercise.



**Step 12:** Click the “Submit” button to run it.

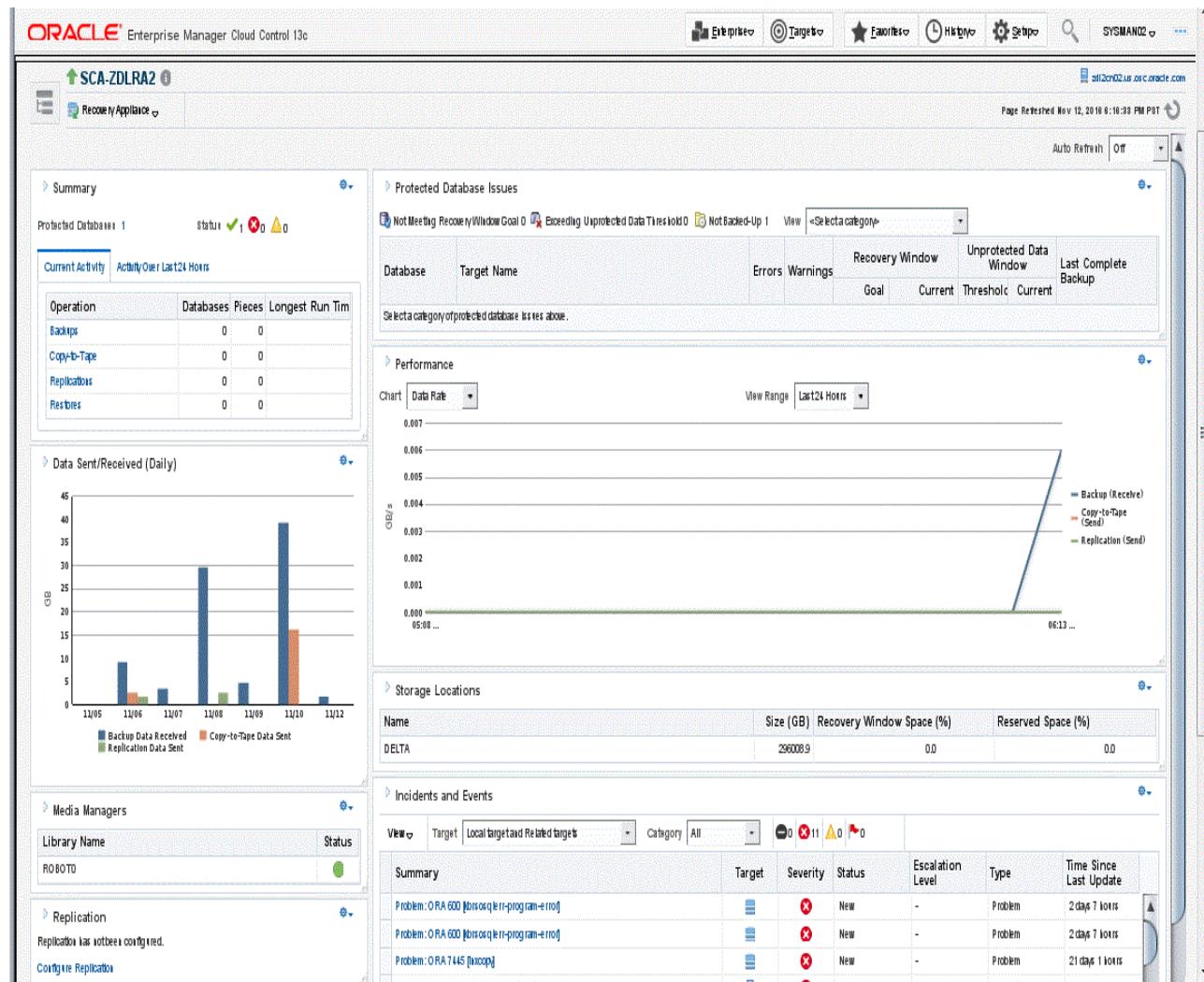


You will be returned to the group home page. Now you are done with this exercise. Please go back to the Recovery Appliance home page.

### Exercise 6-2. Monitoring

Oracle Recovery Appliance and EM integration provides extensive out-of-the-box monitoring and alerting for backups, storage usage and overall health of the appliance. In addition, you can customize settings to meet your specific management goals. Warnings and errors are prominently displayed on the relevant Recovery Appliance pages allowing administrators to quickly determine what situations may need attention and if desired, email alerts may be configured to receive immediate notification of issues without having to login to the system.

The Recovery Appliance Home page displays warnings and alerts in several ways as highlighted on the screenshot below:



While all warnings and alerts are represented on the home page, we'll take a look at the metrics used and how to customize for your environment as desired.

The EM incident and event notification integrated with Recovery Appliance is commonly used by Database, System and Storage administrators. It is a very effective manner of managing issues, assigning ownership and tracking the issue until resolution. While we don't have time to explore all of the advantages in today's Test Drive, we will show how it can be leveraged at a high level.

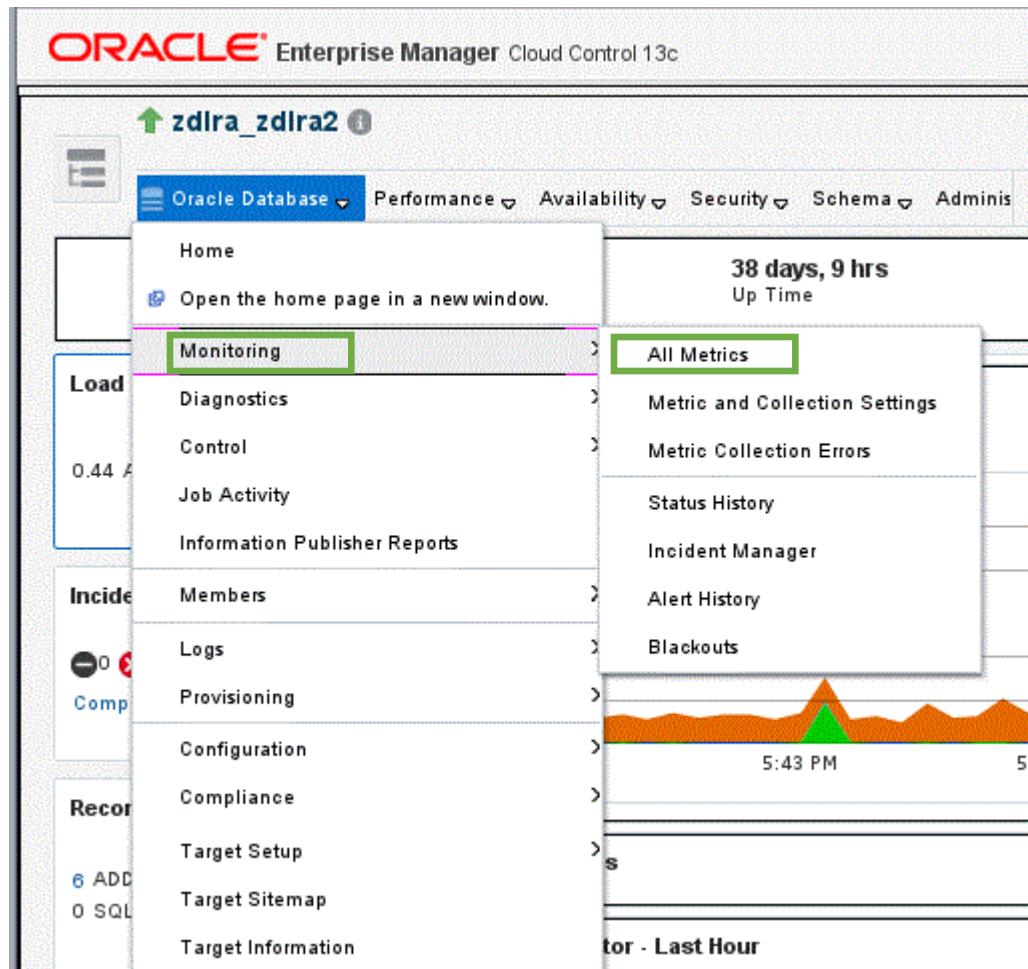
EM alerts will automatically clear once the underlying issue is resolved. For more information about an event or incident, click the link which will open the incident page as shown below:

The screenshot shows the Oracle Enterprise Manager Cloud Control 13c interface. The top navigation bar includes links for Enterprise, Targets, Favorites, History, Setup, and SYSMAN. The main title is "Incident Manager" with a sub-link "Incident Details". A message box indicates a critical alert: "Cable is present on Port 12 but it is polling for peer port. This could happen when the peer port is unplugged/disabled." The status is "Unassigned, Not acknowledged". Below the message are tabs for General, Events, Notifications, My Oracle Support Knowledge, All Updates, Related Events, and Related Metrics. The General tab is selected. The main content area is divided into sections: "Incident Details" (containing fields like ID, Metric, Metric Group, Port number, Target, Incident Created, Last Updated, Summary, Internal Event Name, Event Type, and Category) and "Tracking" (containing Escalated, Priority, Status, and a note about automatic clearing). There is also a "Guided Resolution" section with links for Diagnostics, Actions, and Corrective Actions. At the bottom left is a "Metric Data" section with fields for Critical Threshold, Warning Threshold, Number of Occurrences, Last Known Value, and Last Collection Timestamp. A "Show internal values for attributes ..." link is located near the bottom of the "Metric Data" section.

From this page, one can drill down for more guidance or choose to “Suppress” the warning for “x” amount of time or until explicitly unsuppressed by the user.

Enterprise Manager gathers metrics on key information which will trigger warnings or error messages as appropriate which depending on the metric have user defined thresholds. Let's navigate to metrics in Recovery Appliance environments.

**Step 1:** From your Recovery Appliance home page, select to view “All Metrics” as shown below.



The following page will be displayed with some incidents. Your screen may vary:

The screenshot shows the Oracle Enterprise Manager Cloud Control 13c interface for the Zero Data Loss Recovery Appliance (ZDLRA). The top navigation bar includes links for Enterprise, Targets, Favorites, Clock, Settings, and SYSMAN02. The main title is "SCA-ZDLRA2" with a status icon. The URL is "zdl2cn02.us.osc.oracle.com". The page was last refreshed on Nov 12, 2016, at 6:38:28 PM PST.

The left sidebar lists monitoring categories: SCA-ZDLRA2 (selected), Data Sent/Received, Health, Protected Databases, Queued Data, Replication Status, Response, Storage Locations, and Other collected items.

The main content area displays the following metrics:

- Open Metric Events:** 0 Open Alerts (0 Critical, 0 Warning)
- Metric Collection Errors:** 1 Metric Collection Error
- Important Metric charts:** A message states "No metric is added to target overview. You can add/remove any additional metrics by clicking the options menu of metric value history." It includes "View Data" dropdown set to "Last 24 Hours" and "Auto Refresh" dropdown set to "Off".
- Deployed Metric Extensions:** A table with columns: Name, Display Name, Runs On, Version, Description, and Is Latest. The message "No data to display." is shown. A "Columns Hidden" dropdown is set to 2.

Let's review the default monitoring settings which can be customized for your environment.

**Step 2:** Select “Metric and Collection Settings” as shown in the screenshot below.

SCA-ZDLRA2

Recovery Appliance

Metrics

- Home
- Monitoring**
- Diagnostics
- Control
- Job Activity
- Members
- Reports
- Protected Databases

TIP

View

Expansion

Metrics

SCA-ZDLRA2

Collection Settings

- All Metrics
- Metric and Collection Settings**
- Metric Collection Errors
- Status History
- Incident Manager
- Blackouts
- Alert History

Note the default settings for Storage Location as discussed in the early section.

Metric	Comparison Operator	Warning Threshold	Critical Threshold	Corrective Actions	Collection Schedule	Edit
SCA-ZDLRA2					Every 5 Minutes	
Health						
Severity	=	WARNING	ERROR	None		
Response					Every 5 Minutes	
Status	=		Down	None		
Storage Locations	>	85	97	None	Every 15 Minutes	

**TIP** Empty Thresholds will disable alerts for that metric.

Related Links

- Advanced Threshold Management
- Pending Apply Operations
- Create Monitoring Template Using Target
- Past Apply Operations

**Step 3:** Select to view "All Metrics" as shown in screenshot below.

The screenshot shows the Oracle Enterprise Manager Cloud Control 13c interface. At the top, it says "SCA-ZDLRA2" and "Recovery Appliance". Below that, it says "Metric and Collection Settings". There are two tabs: "Metrics" (selected) and "Other Collected Items". A tip message is displayed: "Consider using Adaptive Thresholds for performance metrics or Time-based thresholds. See the 'Threshold Management' page." Below this, there is a dropdown menu labeled "View" with the following options: "All metrics" (highlighted in green), "Metrics with thresholds", "Metrics with Adaptive thresholds", and "Metrics with Time-based Static thresholds".

**Step 4:** Expand the Protected Databases link and scroll down to Recovery Window Space as a Percentage of Reserved Space.

You would edit a metric setting as well as message to be displayed by clicking on the pencil icon on the right of the page. But we will not be modifying the metrics during this demo.

Occasionally your pre-allocated backup space may not be sufficient. If you would like to receive warnings when the space is not able to meet its recovery window by "X" percent of its reserved space setting, you would configure that here. As you can see, by default it is not enabled. If you enable it for your environment, you would get warning as shown in the following example from the Protected Database page:

SCA-ZDLRA2

Recovery Appliance: SCA-ZDLRA2 > Metric and Collection Settings

Metric and Collection Settings

Metrics Other Collected Items

TIP Consider using Adaptive Thresholds for performance metrics or Time-based Static Thresholds for metrics whose thresholds vary based on target workload. Configure these thresholds in the "Advanced Threshold Management" page.

View All metrics

Expand All | Collapse All

Metric	Comparison Operator	Warning Threshold	Critical Threshold	Corrective Actions	Collection Schedule	Edit
SCA-ZDLRA2						
Health					Every 5 Minutes	
Protected Databases					Every 15 Minutes	
Response					Every 5 Minutes	
Storage Locations					Every 15 Minutes	
Incoming Backup Data Rate (GB/s)						
Key						
Number of Storage Locations						
Recovery Window Space (GB)						
Recovery Window Space as a Percentage of Reserved Space	>			None		

Alert manage page opens



**Alert Message**

Edit Alert Message  Reset Alert Message

Alert Message: The space required to meet the recovery window for database %db\_unique\_name% is %value% of the reserved space for the database.

TIP The length of the alert message cannot be more than 4000 characters.

**Alert Message Properties**

These properties can be used in message. Property names are case-sensitive. To escape '%', use '%#%'.

Name	Description
%metric_id%	Metric name for which the alert has been triggered
%columnName%	Metric column name for which the alert has been triggered
%warning_threshold%	Threshold for which warning violation has been triggered
%critical_threshold%	Threshold for which critical alert has been triggered
%severity%	Severity level of the alert or violation
%operator%	Comparison operation used to trigger the alert
%num_of_occur%	Number of Occurrences after which alert has been triggered
%value%	Current metric value on which alert has been triggered
%keyValue%	Current metric value for a key on which alert has been triggered

**Monitored Objects**

The table lists all Database Unique Name/Protection Policy objects monitored for this metric. You can specify different threshold settings for each Database Unique Name/Protection Policy object.

Select	Database Unique Name	Protection Policy	Comparison Operator	Warning Threshold	Critical Threshold	Corrective Action
<input checked="" type="radio"/> All others	All others	>				None

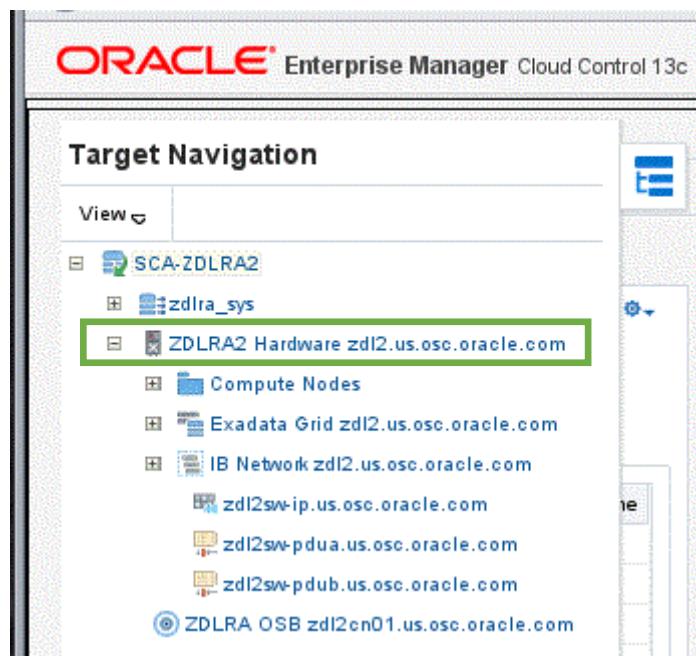
TIP Empty Thresholds will disable alerts for that metric.  
 TIP You can optionally use "%" wildcard character to represent multiple objects. (Example: /u1% represents /u11, /u12 etc)  
 TIP If the object name contains "%" or "\", specify it as "%\" (Example: 'c:\temp' needs to be entered as 'c:\\temp')

The alert can be easily resolved / cleared by increasing the “Reserved Space” amount for the database. Please note that the Recovery Appliance is capable to dynamically allocate space to meet database recovery window goals when there is available space which is not needed to meet other databases’ recovery window goal. When this happens, this database is able to use more than its reserved space. The alert is issued to ensure the Recovery Appliance Administrator is aware of a potential space issue.

There are also HW monitor reports available as following and from there you can monitor Location and status of HW components, "Compute nodes", "Exadata Grid", "IB network switches" and a lot more. To see these reports, click “Target Navigation” from RA home page:



Click on the “+” sign to expand your view of the component, then select the particular component to view its details. E.g. this is to view HW components of my RZLDR unit 2



### Exercise 6-3. Reporting

The Oracle Enterprise Manager monitoring and alerting framework provides comprehensive real-time alerts for relevant data protection SLAs.

The Oracle Enterprise Manager Business Intelligence (BI) Publisher delivers out-of-the-box Oracle RECOVERY APPLIANCE reports and additional reports may be created and customized to meet your specific reporting requirements. The Oracle Recovery Appliance pre-configured reports are:

- 1) Protected Database Detail

- 2) Capacity Planning Summary
- 3) Capacity Planning Detail
- 4) Recovery Window Summary
- 5) Top 10 Databases by Data Transfer

From the Protected Database page, you can easily access a key report specific to data protection details associated with a particular database as shown below.

**Step 1:** From Recovery Appliance protected database page, click on your assigned database from the list. Its details will be listed at bottom of the same screen as below. Click the link for “Protected Database Report” as highlighted by the green box.

The screenshot shows the Oracle Enterprise Manager Cloud Control 13c interface. The top navigation bar includes links for Enterprise, Targets, and SYSMAN02. The main content area is titled "Protected Databases (1)". Below this, there is a search bar and a toolbar with options like View, Add, Edit, Remove, Remove Multiple, and Detach. A table lists one database, CUST02, with the following details:

Database	Version	Protection Policy	Database Size (GB)	Recovery Window		Unprotected Data Window		Errors and Warnings	Redo Transport	Copy-to-Tape	Replication	Last Complete Backup
				Goal	Current	Needed Space (GB)	Goal					
CUST02	12.1.0.2.0	BRONZE	2.22	3 days	0 days 03:23	6.00	N/A	< 1 sec				Nov 12, 6:10 P

Below the table, a message says "Columns Hidden 1". The "Protected Database Detail" section for CUST02 is expanded, showing the "Status" tab selected. This tab contains two charts: "Unprotected Data and Recovery Window" and "Backup Space". The "Unprotected Data and Recovery Window" chart shows a blue vertical bar at day 0.22 labeled "Used: 0.62 GB". The "Backup Space" chart shows three bars: a blue bar at 0.62 GB labeled "Used: 0.62 GB", a light blue bar at 6.0 GB labeled "Needed: 6.0 GB", and an orange bar at 6.0 GB labeled "Reserved: 6.0 GB". To the right of these charts, status information is listed: De-Duplication Ratio 1.0:1, Keep Backup Space, Next Scheduled Backup View, Last Copy To Tape N/A, and Last Replication N/A. A note at the bottom says "TIP For more information, view the following reports for this database." with links to "Protected Database Report" and "Backup Report".

The Protected database report contains extensive information, including status and recovery window about the database, its assigned Protection Policy and Storage location, Reserved Space setting. The existing backup, copy to tape, and replication usage for that protected database is summarized. This report may be useful for the DBA and Recovery Appliance users to get an overview of the status of a specific protected database. The data sent/received over time gives a good overview of the traffic coming to and from the protected database to Recovery Appliance. For backup "Cloud" providers, this report may be used to help calculate charge back costs. In some cases, the protected databases details are useful in a troubleshooting scenario when this protected database is not meeting recovery window targets.

You will be asked to login to BI Publisher.

**Step 2:** Enter username and password provided by your instructor.

Sign In  
Please enter username and password

Username  
sysman02

Password  
••••••••••

Accessibility Mode

Sign In

English (United States)

After login, a detailed report for your database will be displayed as shown in the example below:

The screenshot shows the Oracle BI Publisher Enterprise interface. At the top, it displays "Protected Database Details" for "Protected Database CUST02" and "Recovery Appliance SCA-ZDLRA2". The main content area is titled "Recovery Appliance: Protected Database Details". It contains several sections:

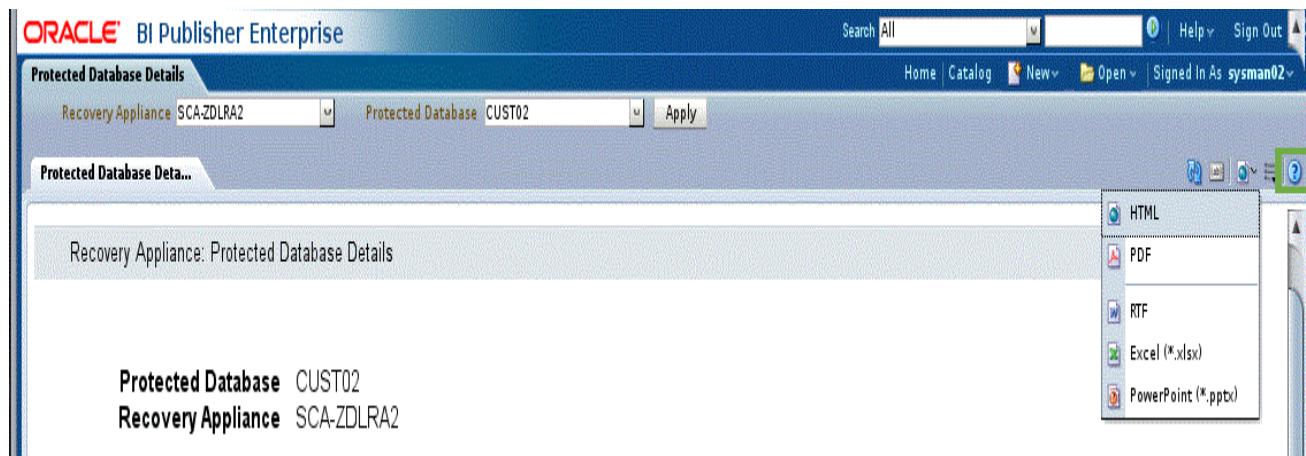
- Database**: Shows EM Target Name (cust02\_ssc0cn01-d1.us.ose.oracle.com), Type (Single-Instance Database), Version (12.1.0.2.0), Host (ssc0cn01-d1.us.ose.oracle.com), Database Size (2.22 GB), and Oracle Home (/u01/app/oracle/product/12.1.0.2/dbhome\_1).
- Appliance Settings**: Protection Policy (BRONZE), Recovery Window Goal (3 days), Storage Location (DELTA), Unprotected Data Window Threshold, Reserved Space (6.00 GB), Real-Time Redo Transport (Enabled).
- Backup/Recovery**: Used Space (0.62 GB), Last Complete Backup (Nov 13, 2016 2:10 AM GMT), Needed Space\* (0.00 GB), Next Scheduled Backup\*\*\*, Keep Space\*\* (0.00 GB), Current Recovery Window (0.13 days), Backup Data, Last 24 Hrs (1.70 GB), Unprotected Data Window (< 1 sec), De-Duplication Ratio (1:1).
- Copy-to-Tape**: Last Copy, Queued Data Size (0.00 GB), Total Data on Tape (0.00 GB).
- Replication**: Last Replication, Queued Data Size (0.00 GB).

\* Space needed to meet the recovery window goal.  
\*\* Space used by KEEP FOREVER backups.  
\*\*\* Includes only backups scheduled through Enterprise Manager.

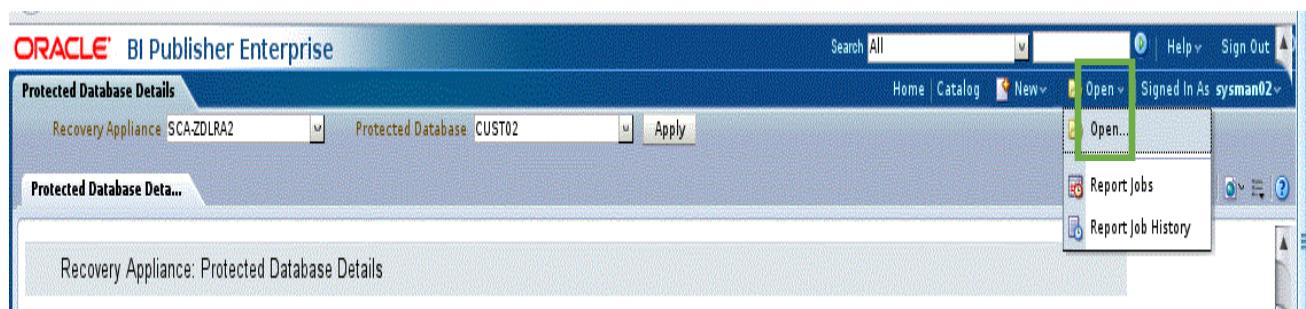
**Step 3:** From this page, you can select which Recovery Appliance and which protected database you would like to see a detailed report of by search for it. This is shown in the following screenshot.

The screenshot shows the Oracle BI Publisher Enterprise interface. The search bar at the top contains the query "CUST02". The search results list shows "Protected Database CUST02" and "Protected Database CUST02" again, with the second entry highlighted. The main content area is titled "Recovery Appliance: Protected Database Details".

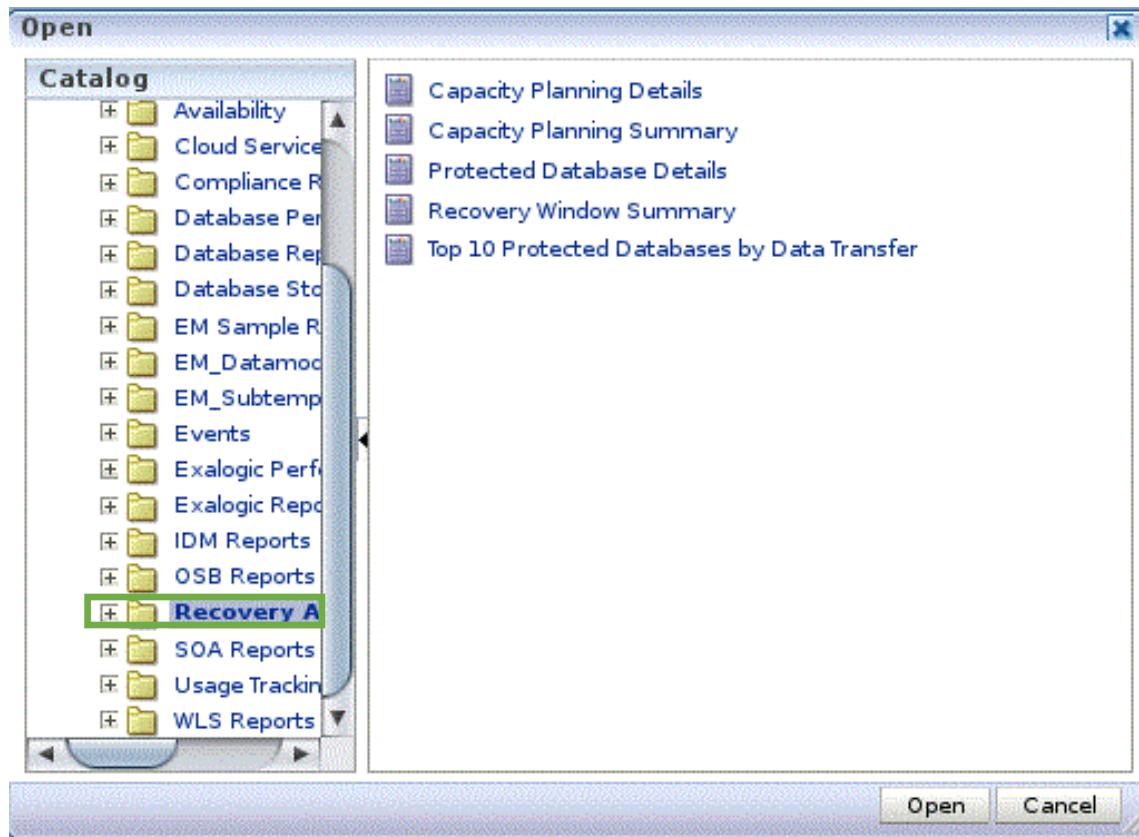
All reports may be viewed in various formats by clicking drop-down on the upper right side of the page as shown in this screenshot:



**Step 4:** To access additional Oracle Recovery Appliance reports navigate to the “Open” drop-down menu as highlighted in the green box.



Then click on “Open ...” again. The following window will be opened. If needed, expand the Enterprise Manager folder in the Catalog column to display the specific Recovery Appliance reports as shown in the screenshot below. Click these 5 Recovery Appliance related reports to see their contents.

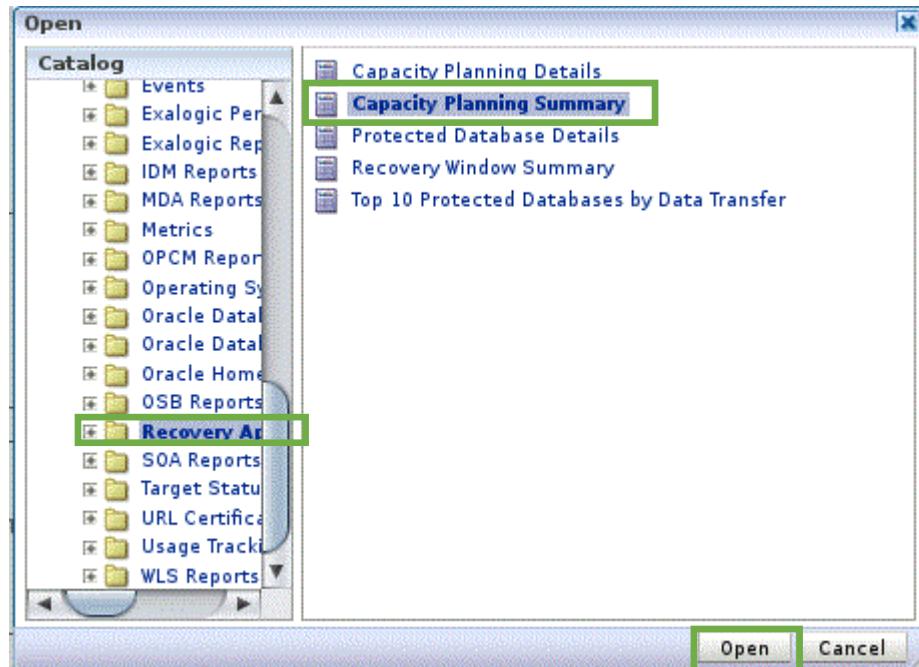


The Capacity Planning Summary report is an excellent tool to proactively manage and forecast storage and throughput needs. The planning summary reports Storage Growth Rate (GB day, average) as well as the estimated days until capacity is exceeded along with Network Capacity and usage. This historical information represented graphically and in table format provides a management framework to most effectively manage data growth to meet SLA requirements.

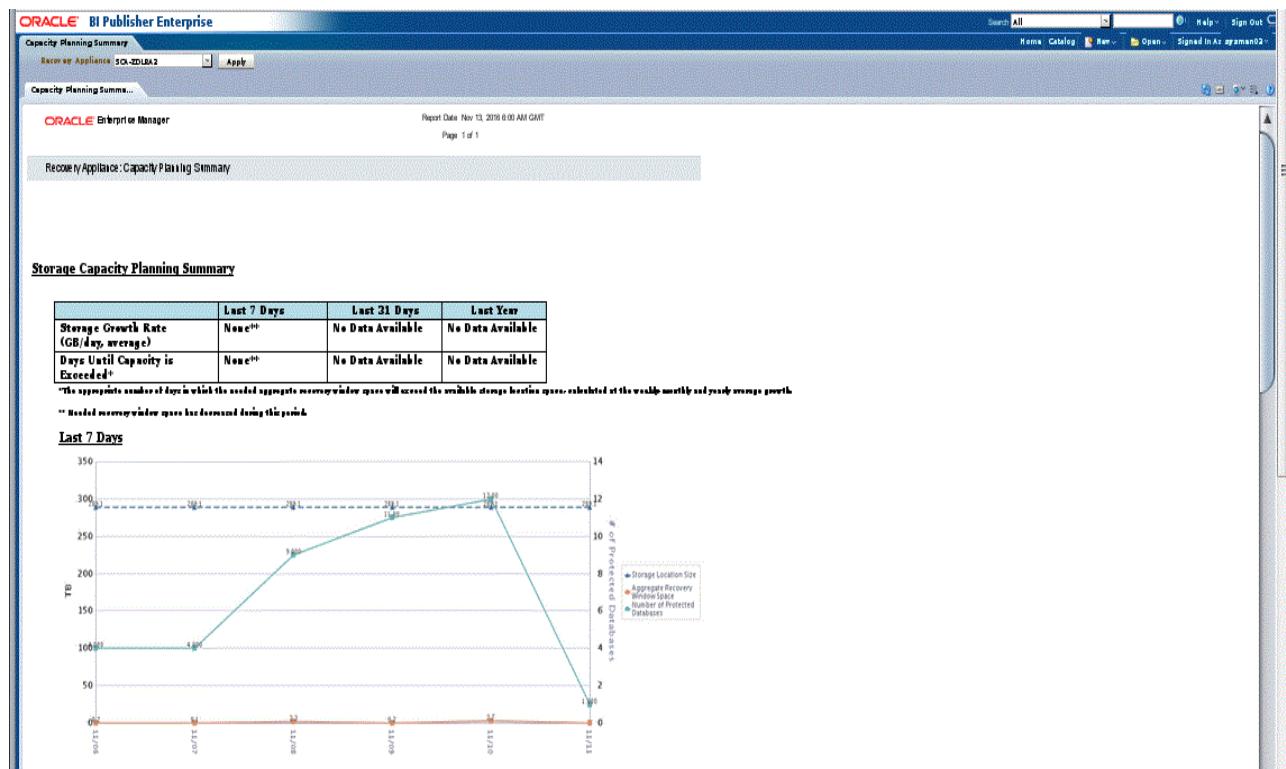
Using this report, the Recovery Appliance administrator can plan for additional capital investments (e.g. expand the Recovery Appliance), slow down the addition of new protected databases to Recovery Appliance or adjust protection policies so that the aggregate recovery window space will reduce. The network capacity planning summary will provide a view of the aggregated network traffic over various time periods (24 hours, 7 days and 30 days). The maximum network throughput is 40 Gb/sec across all database servers within one Recovery Appliance rack and may be increased by adding additional racks. Network sampling is done so both average and maximum rates are graphed to show the broad range of possible values.

Best practice would be to schedule the report to run automatically on a regular schedule (e.g. weekly) and distributed via email to the backup management team. In addition, it can be generated on an ad hoc, as needed basis which is what will be demonstrated today.

**Step 5:** Highlight the “Capacity Planning Summary” report as shown to the right and click Open. (Note that it may take a few minutes for the report to load)



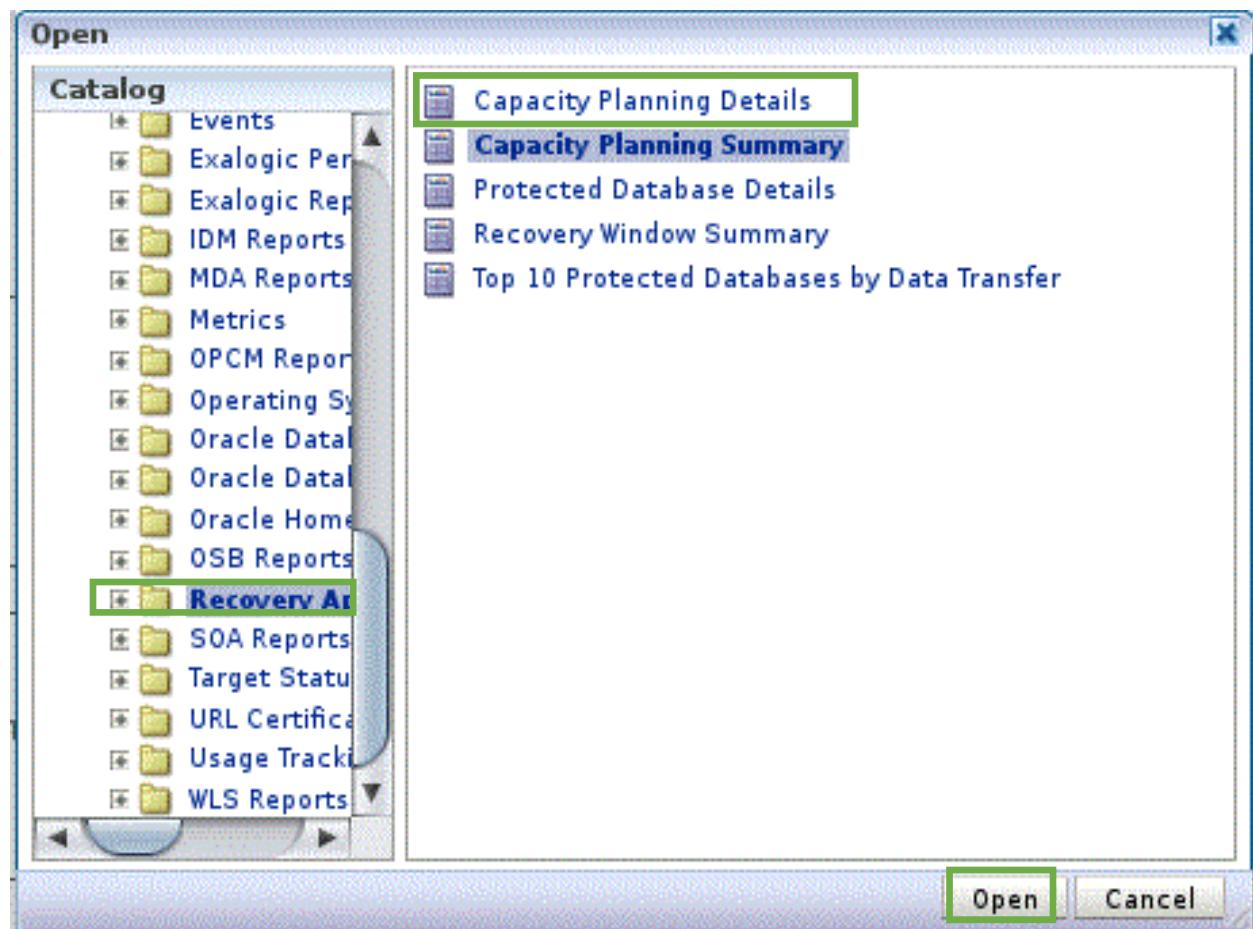
The Capacity Planning report will be displayed as shown below. You can scroll down the report page for more graphs on speeds and feeds.



When more additional capacity detail is needed, the Capacity Planning Details Report is the place to go. This informative report provides historical data for storage, network, CPU utilization per server and disk as well IO throughput. Review storage throughput, CPU and read/write IO statistics details for the last 24 hours, week, month or year.

This report includes information on Memory and IOPS which are not represented in the Capacity Planning Summary. For additional performance tuning and troubleshooting, this detailed report can be included in the service request to provide a good view of system performance and activity. (Not Available in this lab.)

**Step 6:** Highlight the "Capacity Planning Details" Report as shown and click Open. (Note it may take a few minutes for the report to load).



The report will be displayed as shown below and you can scroll down the report for more detailed graphs and information.

**ORACLE BI Publisher Enterprise**

Capacity Planning Details

Recovery Appliance SCA-ZDLRA2

Capacity Planning Detail...

ORACLE Enterprise Manager Report Date Nov 13, 2016 6:04 AM GMT Page 1 of 1

Recovery Appliance: Capacity Planning Details

[Storage Capacity Planning Details](#)

[Network Capacity Planning Details](#)

[CPU Capacity Planning Details](#)

[IO Capacity Planning Details](#)

[Storage Capacity Planning Details](#)

Last 7 Days

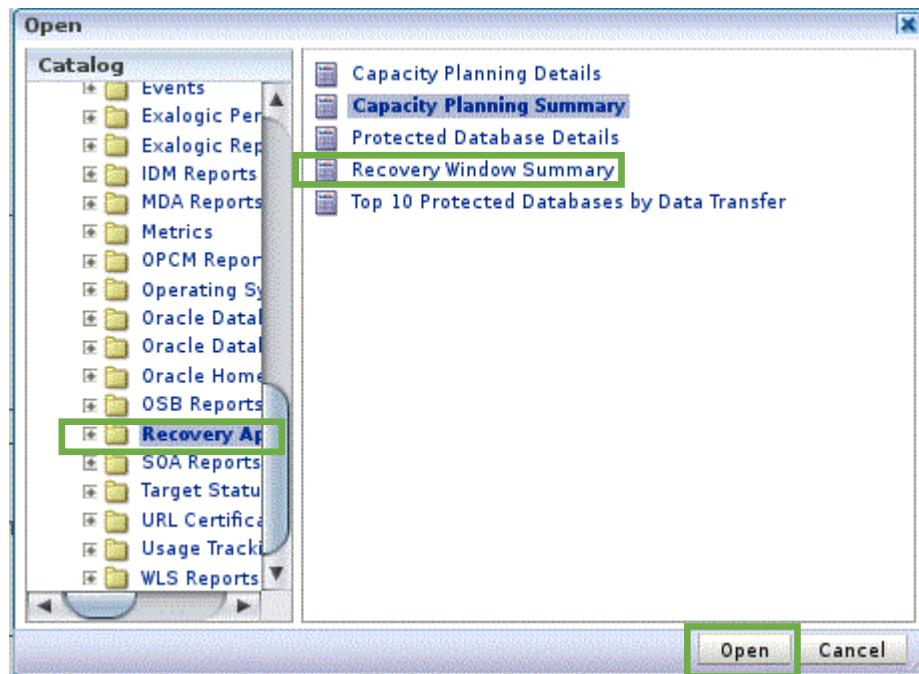
Date	Actual Capacity	Projected Capacity
Nov 06	298.1	298.1
Nov 07	298.1	298.1
Nov 08	298.1	298.1
Nov 09	298.1	298.1
Nov 10	278.1	278.1
Nov 11	288.1	288.1
Nov 12	298.1	298.1
Nov 13	308.1	308.1

The Enterprise Manager monitoring system provides warnings on the Recovery Appliance Home and Protected Database Pages for any database that isn't meeting its user-defined recovery window.

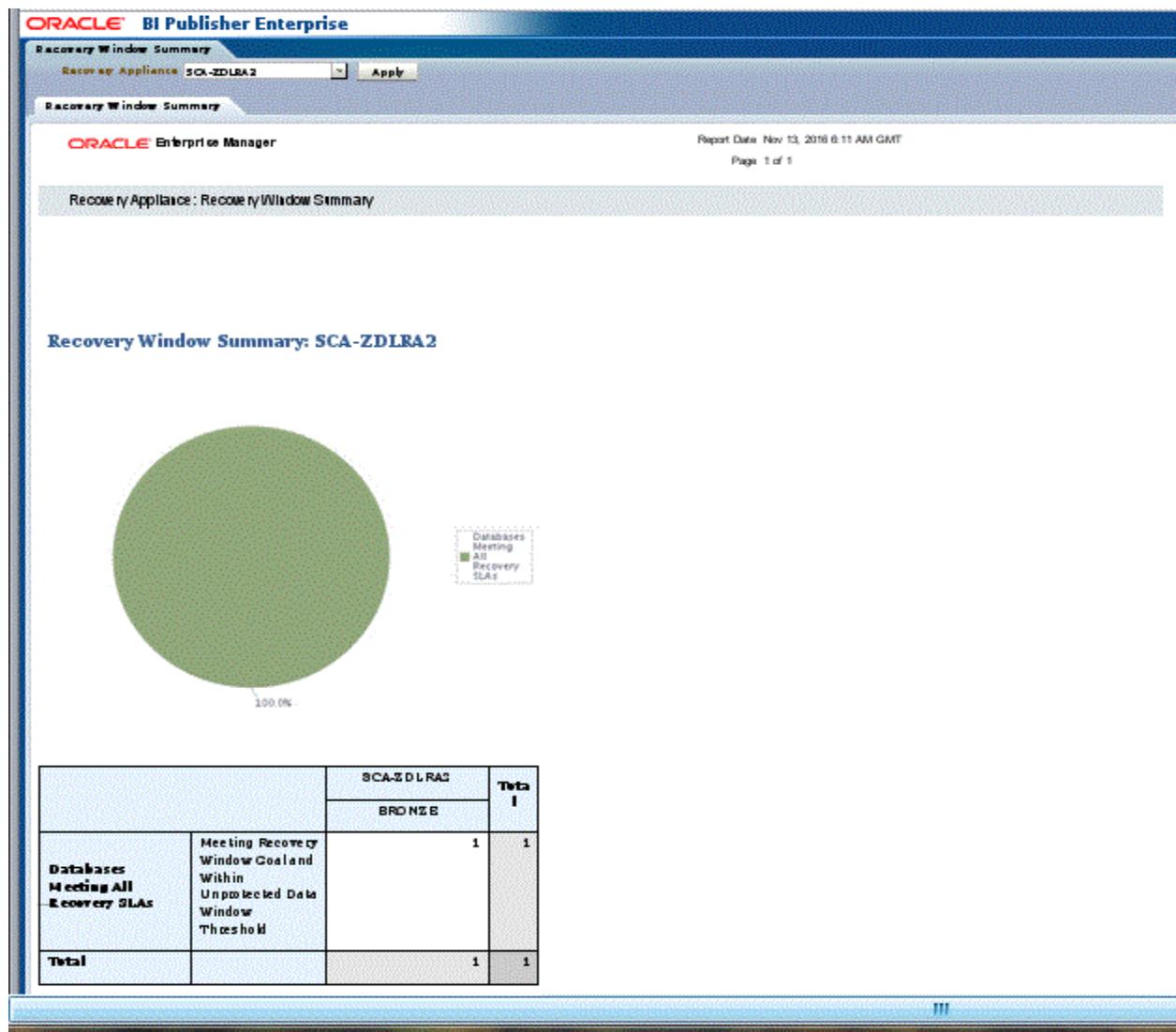
As meeting recovery window requirements is critical, the Recovery Appliance includes an out-of-the-box report listing any databases which are not meeting recovery goals.

The administrator can leverage this report as a quick status report of all protected databases. They can then subsequently follow up on each individual protected database information through the protected database report or through Enterprise management.

**Step 7:** Highlight the “Recovery Window Summary” Report as shown below and click “Open”.



The report will be displayed as shown below. All databases in our demo environment are meeting their Recovery Window SLAs. The report is designed to list only databases which have been configured within the environment long enough to meet the recovery goal. For example, if a database is added today with a 7 day recovery window goal, it has not had time to reach the goal and therefore would not be included in this report.



The Recovery Window Summary Report provides current status by Protection Policy of how well databases are meeting their Recovery Window and within their Unprotected Data Window Threshold:

- 1) Meeting all Recovery SLAs
- 2) Databases Not Meeting Recovery SLAs broken down by category

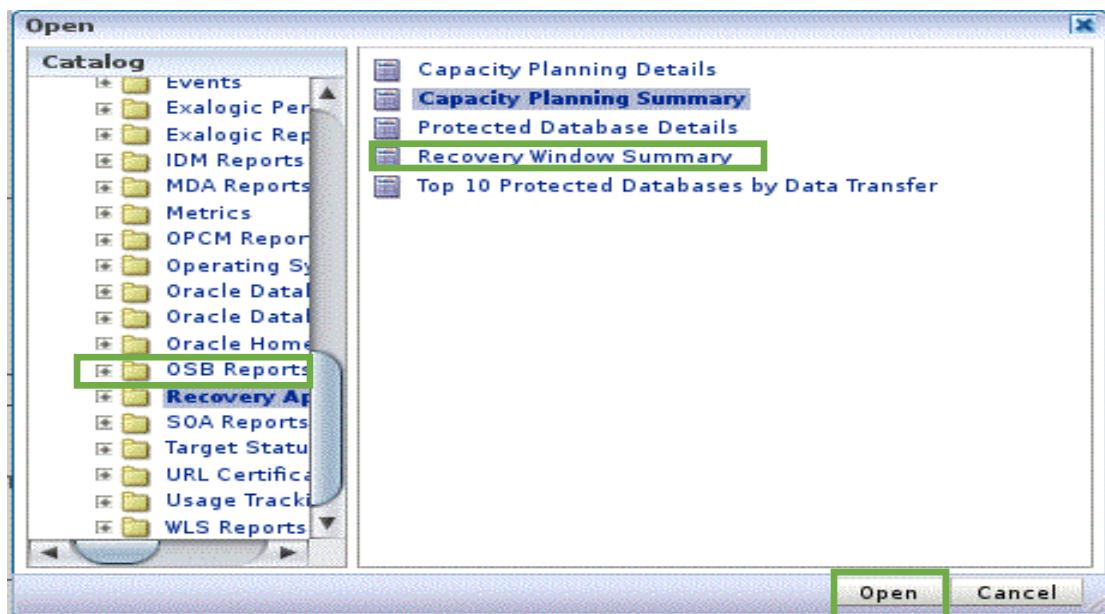
		SCA-ZDLRA2	Tot al
		BRONZE	
Databases Meeting All Recovery SLAs	Meeting Recovery Window Goal and Within Unprotected Data Window Threshold	1	1
Total		1	1

The Top 10 Protected Databases by Data Transfer report provides information on which databases are sending the most data categorized in three ways:

- 1) By Backup Data
- 2) By Replication Data
- 3) By Copy to Tape Data

The report includes two graphs for each database with the category showing data throughput aggregated by database by hour for the last 24 hours and an aggregated by data for the last 7 days.

**Step 8:** Highlight the "Top 10 Protected Databases by Data Transfer" as shown and click "Open".



The report will be displayed as shown below.

**ORACLE BI Publisher Enterprise**

Top 10 Protected Databases by Data Transfer

Recovery Appliance: 5CX-ZD-LRA2   

Report Date: Nov 13, 2016 6:26 AM GMT  
Page: 1 of 1

Recovery Appliance: Top 10 Protected Databases by Data Transfer

**Top 10 Databases by Backup Data**

**Top 10 Databases by Replication Data**

**Top 10 Databases by Copy-to-Tape Data**

**Backup Data**

**Last 24 Hours (Aggregated By Hour)**

Hour	CB
000111	1.7
000112	0.0
000113	0.0
000114	0.0
000115	0.0
000116	0.0
000117	0.0
000118	0.0
000119	0.0
000120	0.0
000121	0.0
000122	0.0
000123	0.0

The top 10 ranking is based on the aggregate data over the last 24 hours.

**Last 7 Days (Aggregated By Day)**

## Module 7. Replication

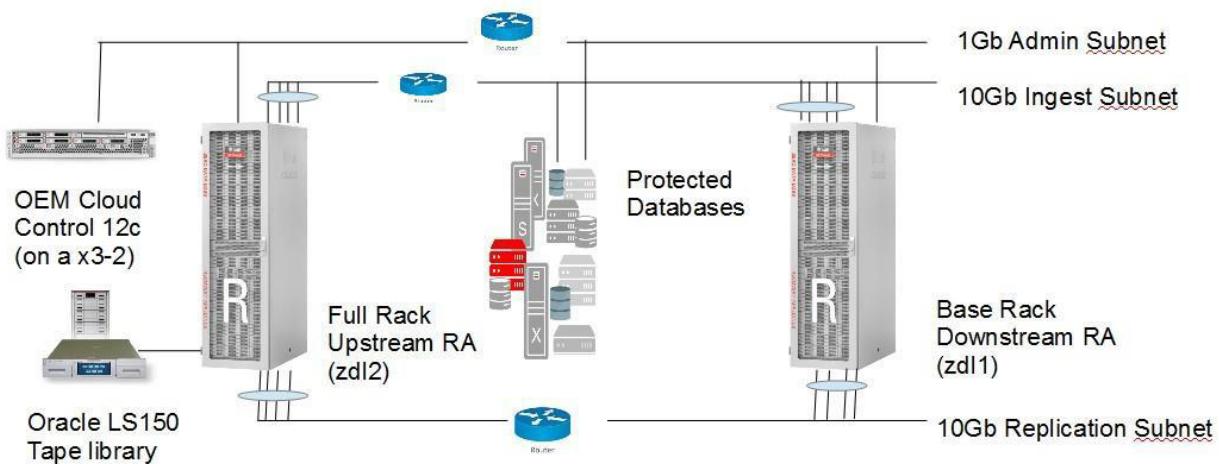
This module is based on Chapter 8 of ZDLRA Administrator's Guide and will guide you through the steps required to configure ZDLRA replication by OEM. The command line option is not covered in this workshop. This exercise is optional depends on availability of the second ZDLRA unit.

### Prerequisites

- The upstream and downstream Recovery Appliance (RA) can communicate with each other over the network.
- Every protected database whose backup data will be replicated must be enrolled with the upstream RA.
- The downstream RA must be started and configured to receive backups.
- Following related credentials are available: "oracle" user on both RAs; ZDLRA database sys user "rasys"; and Virtual Private Catalog user ("ravpc1" in this case).
- Note that the RA unit name and VPC user name may be different, verify them with your workshop instructor.

### Assumptions

- A protected database is backed up to upstream RA (i.e. zdl2).
- You want upstream RA (zdl2) to replicate to downstream RA (zdl1).
- A replication user account named ZDLRA1\_RAVPC1\_CRED exists on the downstream RA(zdl1) in the OEM.
- A virtual private catalog account named ZDLRA2\_RAVPC1\_CRED exists on the upstream RA(zdl2) in the OEM.
- The credentials for the Operating System user who owns the upstream RA (zdl2) Database installation is available. It is user oracle in this case.
- This exercise is OEM based but command line option is also available but not covered in this workshop.

**Network Review****Overview of steps to configuring ZDLRA Replication:**

- Step 0: Both RA should be discovered by a single OEM. (Already done)
- Step 1: Create your protection policy on the upstream RA.
- Step 2: Register your protected database in the policy created in step 1 on the upstream RA
- Step 3: Enable real-time redo transfer in your protected database
- Step 4: Create your protection policy on the downstream RA
- Step 5: Register your protected database in the policy created in step 4 on the downstream RA
- Step 6: Create a 'replication server' on the upstream RA and add your protection policy
- Step 7: Verify your replication is running

**Exercise 7-1 Configure Replication****Step 1 and Step2:** Create protection Policy and enroll your database on upstream RA

Let's utilize what you did in previous sections since you have already configured a protection policy and enrolled your database in zdl2. Let's make zdl2 to be your upstream RA, so you don't need to repeat what you just did.

**Step 3:** Verify and enable real-time redo shipping

Verify if the real-time redo shipping is enabled by going to the protected database page of the upstream RA (zdl2) and you should see a green check mark under "Redo Shipping" for your database. Now you can go to step 4.

If the real-time redo shipping is not enabled yet, you need to enable it by following the instructions in Exercise 2-2 Step 6, 7, and 8. Verify again after enable it.

**Step 4 and Step 5:** Create a protection policy and enroll your database on downstream RA

Now you need to create a protection policy and enroll your database to this policy in

the downstream RA (zdl1). The instructions are the same as that in Exercise 2-1 and 2-2. Make sure to use those credentials for downstream RA (zdl1) during your configuration.

*Caution:*

*If you create the 'replication server' on the upstream Recovery Appliance before the downstream Recovery Appliance has added the databases to a protection policy and granted database access, then replication will not work.*

**Step 6: Create a replication server on the upstream RA (by only one person)**



Since **only one replication server** can be configured between a ZDLRA server pair, please select a "lucky person" among you to perform this particular step or let your instructor to run it for you as shown in step 6 and step 7 below.

To create a replication server, go to the upstream RA (zdl2) home page. From the drop-down menu on the left, select **replication**. Select **RASYS** credential for the upstream RA (zdl2) and login.

The screenshot shows the Oracle Enterprise Manager Cloud Control 13c interface. On the left, there is a navigation tree with several categories like 'Protected Databases', 'Storage Locations', 'Protection Policies', etc. Under the 'Replication' category, the 'Replication' option is highlighted with a green box and a red arrow pointing to the right. To the right of the navigation tree, there is a 'Recovery Appliance Login' dialog box. It has fields for 'Credential Name' (set to 'ZDLRA2\_RASYS\_CRED'), 'Username' (set to 'rasys'), 'Password' (set to '\*\*\*\*\*'), and 'Role' (set to 'normal'). There are 'Login' and 'Cancel' buttons at the bottom. A large red arrow points from the 'Replication' option in the navigation tree to the 'Login' button in the dialog box.

Click “Create Replication Server” tab to open following:

Select / Enter the required information as on the right:

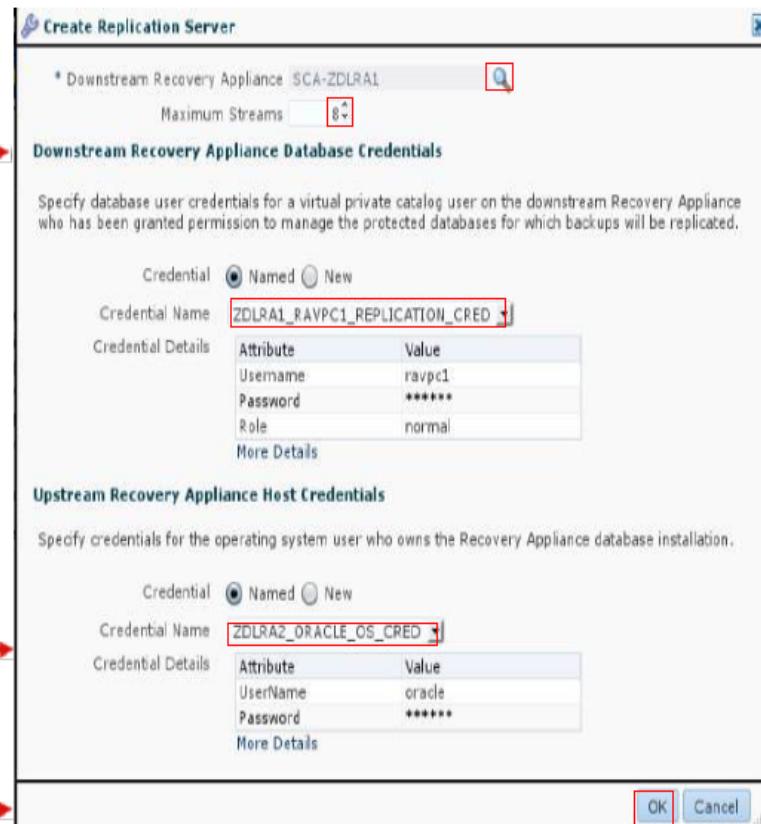
Downstream RA = **zdl1** (search for it)

Maximum Streams =**<your choice>**  
e.g. **8**

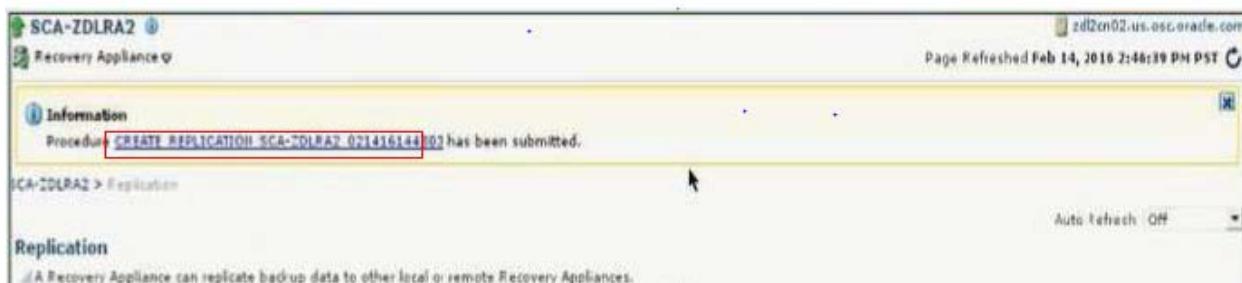
Downstream RA VPC user credential =  
**ZDLRA1\_RAVPC1\_REPLICATION\_CRED**

Upstream RA Host Credential =  
**ZDLRA2\_ORACLE\_OS\_CRED**

Click **OK** to continue.



Click the link to the procedure log on top of the screen to watch its execution and it may take few minutes to complete.



### Step 7: Verify replication status upon completion

Go to upstream RA home page again and select “**Replication**”. It should be in “**Pause**” state since it does not have any replication policy associate to it yet.

#	Replication Server	Downstream Recovery Appliance	Maximum Streams	Protection Policy	Tasks			Queued Data (GB)	Status	Last Replication Activity
					Queued	Running	Completed (Last 24 Hrs)			
1	ZDRA_REP	SCA-ZDRA1	8					0	Paused	

### Step 8: Start your replication

From this same page, you can activate it by adding a protection policy to the server. Click on “**Add Protection Policy**” and select a policy from the list.

#	Replication Server	Downstream Recovery Appliance	Maximum Streams	Protection Policy	Tasks			Queued Data (GB)	Status	Last Replication Activity
					Queued	Running	Completed (Last 24 Hrs)			
1	ZDRA_REP	SCA-ZDRA1	8					0	Paused	

After a policy is attached, the replication server state will change to green as shown in following. All databases associated with that policy start replicating immediately as you can see from the green box below and more policy can be added from now now.

Now everyone can add his / her policy to this replication server from their own EM window.

The screenshot shows the Oracle Recovery Appliance Management interface. At the top, it displays the title 'SCA-ZDLRA2' and 'Recovery Appliance'. The main area is titled 'Replication' and contains a list of tasks. One task is highlighted with a green border: 'ZDLRA\_REP' (Replication Server) to 'SCA-ZDLRA1' (Downstream Recovery Appliance) using 'REP\_ZDL2\_TO\_ZDL1' (Protection Policy). The status of this task is 'Completed (Last 24 Hrs)' with a value of '8'. Other columns include 'Queued' (0), 'Running' (0), 'Status' (green), and 'Last Replication Activity' (Feb 4, 1:14 PM PST). Below the table, there are buttons for 'Create Replication Server', 'Edit Replication Server', 'Add Protection Policy', 'Remove', and 'Pause'.

If interested, you can click on the link (#8 in this sample) under “**Completed (Last 24 Hrs)**” column to see which backup pieces have been replicated. If there are some replication running, you will see them under “**Queued**” and “**Running**” column respectively.

This concludes our replication configuration. Now let's review our replication status on both upstream RA and downstream RA.

## Exercise 7-2 Review Replication Status

### Step 9: Verify your replication status

Navigate to the **Protection Database** page of your upstream RA (zdl2) and you will see that your database now has a green checkmark in the "Replication" column as highlighted below.



A checkmark appears in the “**Replication**” column only when the backups are being replicated to a downstream Recovery Appliance.

Let's review your database backup on the downstream (replication target) Recovery Appliance (zdl1).

Navigate to the downstream RA (zdl1) first and then navigate to its “**Protected Database**” page to see backups from your database that has been replicated.

Notice that on the downstream Recovery Appliance, your database does not have a checkmark in the “**Redo shipping**” or “**Replication**” column because redo shipping is configured on the upstream Recovery Appliance only. The replication backup will show a date/time in the “**Last Completed Backup**” column which comes from the backup on upstream RA. Once a log

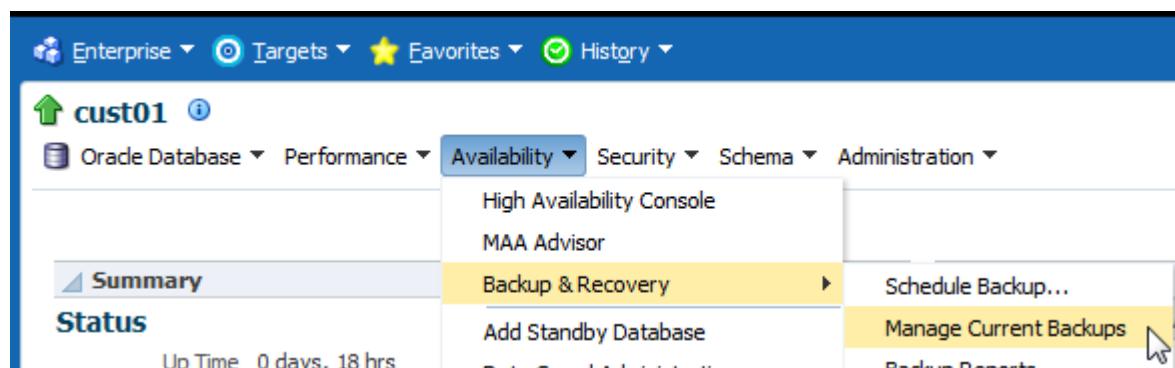
switch occurs, the upstream Recovery Appliance would receive a backup of the archived log which is then automatically replicated over to the downstream RA.

On the EM Recovery Appliance home page of the upstream Recovery Appliance, the replicated backup throughput is seen in the performance chart. On the downstream Recovery Appliance, replicated backups are considered the same as incoming backups and are shown on the performance chart as incoming backup.

#### **Step 10: Review backup pieces**

Return to your assigned database home page by searching for its target name.

From the home page of your assigned database and from the **Availability** tab, navigate to the **Manage Current Backups** page. The following page will be displayed:



This backup data was retrieved from the recovery catalog.

**Backup Sets** **Image Copies**

**Search**

Status: Available  
Contents: Datafile, Archived Redo Log, SPFILE, Control File  
Completion Time: Within a month

**Results**

<input type="checkbox"/>	43961	BACKUP_CUST01_0000_100814061005	Oct 14, 2014 9:30:58 AM	DATAFILE	SET_TAPE	AVAILABLE NO
<input type="checkbox"/>	43962	BACKUP_CUST01_0000_100814061005	Oct 14, 2014 9:30:58 AM	DATAFILE	SET_TAPE	AVAILABLE NO
<input type="checkbox"/>	43963	TAG20141006T175904	Oct 14, 2014 9:30:58 AM	CONTROLFILE, SPFILE	SET_TAPE	AVAILABLE NO
<input type="checkbox"/>	43964	TAG20141006T175700	Oct 14, 2014 9:30:53 AM	SPFILE, CONTROLFILE	SET_TAPE	AVAILABLE NO
<input type="checkbox"/>	43965	BACKUP_CUST01_0000_100814061005	Oct 14, 2014 9:30:53 AM	DATAFILE	SET_TAPE	AVAILABLE NO

Click a link associated with a backup piece to display information as shown on the screenshot below.

The following page with details regarding your backup will be displayed:

Manage Current Backups > Contents in Backup Set: 79551

Contents in Backup Set: 79551

**Input Files**

File Type	Datafile Number	File Name	Size (bytes)	Tablespace	File Creation SCN	File Checkpoint SCN	File Checkpoint/Last Modified Time
DATAFILE	4	+DATA/cust01/dstfile/users.258.64843259	2556984320	USERS	16152	27146601	Oct 14, 2014 10:05:55 AM

**Output Files**

Key	File Name	Tag	Device Type	Status	Size (bytes)	Compressed	Media
79552	VB\$_1785331009_79504_4	BACKUP_CUST01_0000_101414100446	SET_TAPE	AVAILABLE	32364608	YES	n/a
79565	VB\$_2083647083_15171_4	BACKUP_CUST01_0000_101414100446	SET_TAPE	AVAILABLE	32364608	YES	ZDLRA1_RDP

OK

Notice the Media column highlighted by the Green Box shows the backup location. In this example, you see that the file is at two locations. Media "n/a" represents the upstream Recovery Appliance once the backup piece has been processed and the Media "**Recovery Appliance (ZDLRA)**" represents the file on the downstream Recovery Appliance. If you did not backup the archived log during your early exercises, you will see your archived log is saved only at one location by selecting 'archived log' from the listing.

There is one VB\$\_xxx\_xxx\_# piece created per incremental backup piece and a VB\$\_xxx\_xxx\_n created for each datafile. You may also note that the backup is compressed on the Recovery Appliance whereas the backup received from the protected database was not.

You can click "**OK**" to return to the **Manage Current Backup** page and click on other backup pieces to see their associated output. Optionally, you can perform another database backup to upstream RA (zdl2) as described in exercise 2-3 and when a new log switch occurs, the new backup will be replicated to the downstream RA which will be the zdl1 in this case.

You have completed with this workshop.

Document Control

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## Change Control

Date	Author	Version	Change Reference
11/16/2016	Robert Tsai	2.0	Based on EM 12c Manual v 5.4.4 without replication
10/2/2017	Robert Tsai	2.1	Added replication section



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