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Enterprise Manager 12c Cloud Control Metering and Chargeback

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Executive Overview

Oracle Enterprise Manager is Oracle's integrated enterprise IT management product line and provides the industry's first complete cloud lifecycle management solution. Oracle Enterprise Manager's Business-Driven IT Management capabilities allow you to quickly set up, manage and support enterprise clouds and traditional Oracle IT environments from applications to disk. Enterprise Manager allows customers to achieve:

- *Best service levels for traditional and cloud applications* through management from a business perspective including Oracle Fusion Applications
- *Maximum return on IT management* investment through the best solutions for intelligent management of the Oracle stack and engineered systems
- *Unmatched customer support experience* through real-time integration of Oracle's knowledgebase with each customer environment

Introduction

Enterprise Cloud presents new management challenges. The 2010 IOUG Survey on Cloud Computing states that a top benefit expected from private cloud adoption is “cost savings through standardization for operational efficiency.” The survey also states “In this survey, more than half of the “advanced” deployers (with more than 10 services) say their greatest challenge is adequately provisioning server capacity to meet the new demands of the cloud,…” These findings clearly demonstrate that without proper management capabilities, expected economic benefits of cloud computing will not be realized. Oracle Enterprise Manager is Oracle's premiere cloud management solution. It is the industry's first complete solution including self-service provisioning balanced against centralized, policy-based resource management, integrated chargeback and capacity planning and complete visibility of the physical and virtual environment from applications to disk.

I.T. Chargeback

Chargeback is a concept that has been widely employed in the past. It was common in mainframe computing where a mainframe would be purchased centrally by the I.T. department for use by all of the other departments, and the cost would be recovered with an internal cross-charge to “cost centers” based on how the mainframe resources were being used. As I.T. architectures shifted from shared

mainframes towards a client-server model, with servers dedicated to each application, the concept of chargeback became less relevant. This was because systems were purchased on a case by case basis to support specific application workloads, and it was generally easy to determine the physical resources that each application was using and therefore understand the costs.

The emergence of virtualization, cloud computing and consolidation platforms such as Exadata and Exalogic has resulted in a renewed focus on chargeback. Similar to a mainframe, these technologies involve infrastructure being shared by a variety of workloads. As application workloads are abstracted from the physical infrastructure supporting them, it is not possible to build a chargeback model based on the allocation of physical resources. Instead, it is necessary to meter the resources consumed by each application running on the shared infrastructure.

Today, organizations are looking to exploit the benefits of Cloud Computing such as self-service provisioning and rapid elasticity. The shift towards user-driven provisioning means that cloud users are able to consume resources without needing to seek approvals or provide any business justification. In order to ensure that cloud resources are used for activities that deliver business value it is necessary to have a mechanism for metering cloud resources and charging cloud users based on their consumption. Without some form of consumption based chargeback users can be tempted to provision resources that they do not really need. This drives up the overall cost of I.T. as more servers, storage and software licenses are required (a situation that has been coined “VM sprawl” in the virtualization world). Chargeback is used to help cloud users understand how their consumption of resources translates to a cost. This benefits cloud users as it enables them to adjust their consumption in order to control their I.T. costs. It also benefits the I.T. organization as it enables them to achieve higher utilization rates across their servers.

Oracle Enterprise Manager Metering and Chargeback

Enterprise Manager 12c uses the rich monitoring and configuration data that is collected for Enterprise Manager targets as the basis for a metering and chargeback solution. Enterprise Manager Chargeback provides the administrator with:

- Metering for Enterprise Manager targets
- Assignment of rates to metered resources
- Management of a Cost Center hierarchy
- Assignment of resources to Cost Centers
- Usage and Charge Reports
- Integration with Billing applications

This set of features can be used to implement chargeback in a private cloud. It can also be used to implement a chargeback model for applications running on consolidation platforms, including Exadata and Exalogic. Furthermore, API's that allow the exporting of metering and charge data to billing solutions such as Oracle Billing and Revenue Management (BRM) provide a solution for the creation of chargeback and billing solutions for public clouds.

Installing and Configuring Enterprise Manager Chargeback

To use the chargeback capabilities the Oracle Chargeback and Capacity Planning plugin must be deployed on the Oracle Management Server. This is done by logging in to Enterprise Manager as an Administrator and navigating to Setup | Extensibility | Plug-ins.

From the Plug-ins homepage, highlight the Oracle Chargeback and Capacity Planning plugin and select to Deploy on Management Servers.

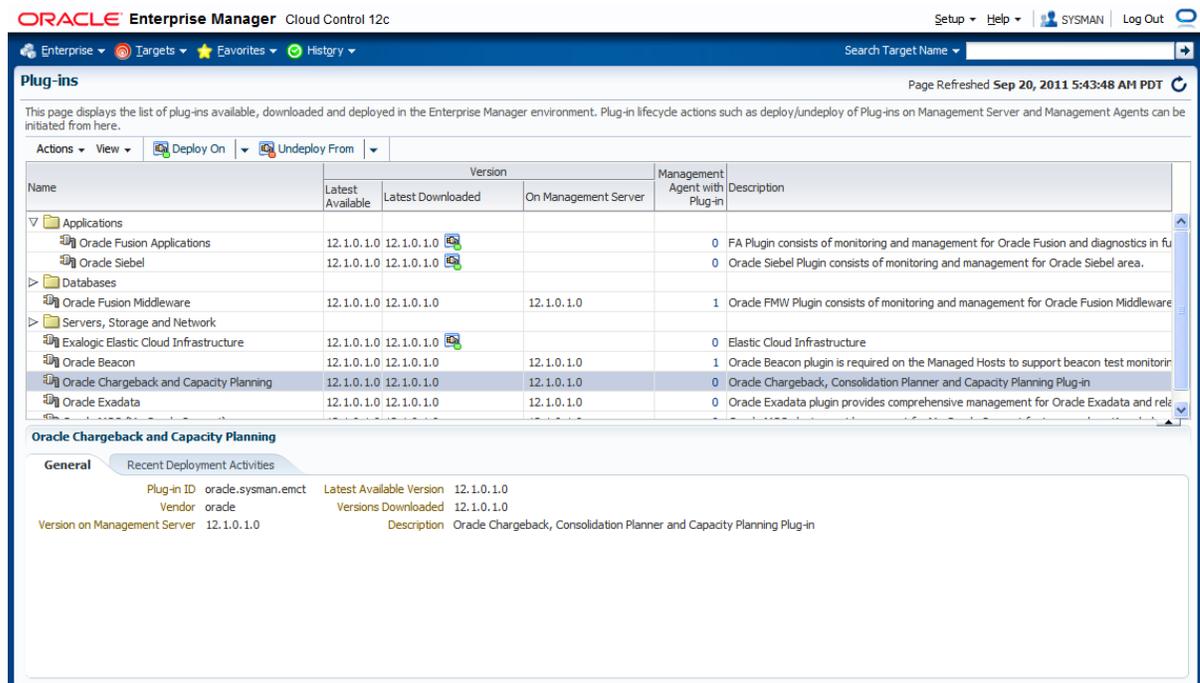


Figure 1: Deploying Oracle Chargeback and Capacity Planning Plugin

Installation of the Oracle Chargeback and Capacity Planning plugin requires a restart of all affected Management Servers

Access to the Chargeback feature is controlled by a set of Resource Privileges that can be granted to a Cloud Control administrator. For convenience, all privileges for managing Chargeback objects are included in the out-of-the-box EM_CBA_ADMIN (chargeback administrator) role.

Users who have been granted the EM_CBA_ADMIN role will be able to access by navigating to Enterprise | Chargeback from the Enterprise Global Menu.

Metering for Enterprise Manager Targets

To begin using Enterprise Manager Chargeback the chargeback administrator needs to enable metering on the Enterprise Manager Targets for which chargeback needs to take place. This is done by adding Enterprise Manager targets into the Chargeback application. As Chargeback is integrated with the

Enterprise Manager security model, the chargeback administrator will need to have been granted VIEW access to any targets they wish to add to the Chargeback application.

The Enterprise Manager target types that can be added are:

- Host
- Oracle VM Guest
- Oracle VM Server Pool
- Oracle VM Zone
- Database Zone
- Database Instance
- Cluster Database
- Oracle WebLogic Server
- Oracle WebLogic Cluster
- Oracle WebLogic Domain
- Group
- Generic System

When adding a composite target such as Oracle VM/Database Zone, Cluster Database, Group or System , all chargeable entities within the composite target will be enabled for metering.

Subsequent to adding a target to Chargeback, a daily job will collect target usage and configuration data from the Enterprise Manager monitoring and configuration tables. This data is the basis of metering in Enterprise Manager.

The chargeable entities and associated metrics that are collected are summarized as follows:

Chargeable Entity				
	Host	VM	Dedicated Database	Dedicated WebLogic
Configuration	OS	Allocated Memory	Edition	Nodes of Cluster
	CPU Count	Allocated Storage	Memory Usage	Version
	CPU SPECInt Rate*	HA	Option	
	Disk Space	IP Address	Storage Usage	
	Memory	vCPU Count	Version	
	Software Installed	Size		

Usage	CPU Time	CPU Utilization (%)	CPU Time	CPU Utilization (%)
	CPU Utilization (%)	CPU Utilization	CPU Utilization (%)	CPU Utilization
	CPU Utilization (SPECInt)*	(SPECInt)*	CPU Utilization	(SPECInt)*
	Disk Space Utilization (%)		(SPECInt)*	Memory Usage
	Disk Usage		Network IO	User Requests
	Memory Used			Active Sessions
	Memory Utilization (%)			Request Execution Time
	Network IO			

Figure 2: Dedicated Target Charge Metrics

** Metric derived using SPEC benchmark results and CPU configuration/ utilization*

While the above metrics provide metering for resource consumption associated with any Host, VM, Database or WebLogic Server, the assumption here is that each target is owned either by a single consumer or consumer group. There may, however, be situations where more granular metering is required, for example if a single database or WebLogic Server is used to serve multiple consumer groups it is necessary to provide metering with a greater level of granularity. To support this requirement, both Database and WebLogic targets can be added to Chargeback in a ‘Shared’ mode. When added in Shared mode, a set of metrics are collected for each application served by a database or WebLogic Server. For Databases, these metrics are collected per Database Service, and for WebLogic Servers, they are collected per Application Deployment.

The metrics that are collected for Shared targets are as follows:

	Chargeable Entity	
	Database Service	WebLogic Application Deployment
Configuration	Option Edition	
Usage	CPU Time Per Service CPU Utilization Per Service CPU Utilization Per Service (SPECInt)* DB Time Per Service Disk Read (Physical) Operations Per Service	User Requests per Application Active Sessions per Application Request Execution Time per Application

	Disk Write (Physical) Operations Per Service SQL Executes Per Service User Transactions Per Service	
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Figure 3: Shared Target Charge Metrics

** Metric derived using SPEC benchmark results and CPU configuration/utilization*

By enabling metering with database service or WebLogic application granularity, it is possible for the costs for each database service or WebLogic Server application deployment to be allocated amongst different consumer groups.

Enabling target metering through manual addition of each target works well when targets are added infrequently, however, when managing a cloud, targets can be rapidly provisioned and destroyed by self-service cloud users. This makes the task of manually adding cloud targets to chargeback impractical for the administrator. This is addressed in the chargeback feature with the use of Zones. To enable chargeback automatically on Databases and Virtual machines that have been created using self-service, the administrator simply needs to add the Database Zone or Oracle VM Zone as a Chargeback Target. This will ensure that any Virtual Machines or Databases created within the Zone are automatically enabled for chargeback.

Assignment of Rates to Metered Resources

Subsequent to enabling metering on Enterprise Manager targets, the chargeback administrator must define the resources that will be used for chargeback and set the rates for those resources. These resources and their associated rates are stored in a Charge Plan.

Charge Plans

A Charge Plan is created by the chargeback administrator and it defines the metered resources that should be charged for (Charge Items) and their associated rates. It is important to note that a chargeback target can only be assigned to one charge plan at any one time.

Enterprise Manager Chargeback offers two types of Charge Plan – the Universal Charge Plan and Extended Charge Plans.

Universal Charge Plan

The Universal Charge Plan is the simplest way to enable chargeback and can be used for chargeback across a wide range of chargeback targets. The Universal plan contains 3 metrics and no further metrics can be added. The 3 metrics that comprise the Universal Charge Plan are:

- CPU Usage
- Memory Allocation
- Storage Allocation

The screenshot shows the 'Chargeback' application interface. At the top, there are navigation tabs: Home, Targets, Charge Plans (selected), Cost Centers, and Reports. Below the tabs, there is a section for 'Universal Charge Plan'. It includes a 'Date Range' dropdown set to 'Aug 1, 2011 Onward', and buttons for '+ Add..', 'Edit..', and 'Remove..'. A 'Currency' dropdown is set to '\$'. Below these controls is a table with the following data:

Metric	Type	Rate (\$)	Per Unit	Per Time Period
CPU Usage	sparc sun4u	20	CPU	Day
CPU Usage	Default CPU Architecture	15	CPU	Day
Memory Allocation	Generic	0.5	GB	Day
Storage Allocation	Generic	1	GB	Month

Figure 4: Configuring the Universal Charge Plan

Within the Universal Charge Plan, the chargeback administrator can set the rates that they want to charge for each of these resources. For example they may wish to charge \$1 per day per CPU, \$0.20 per day per GB of Memory and \$0.01 per day per GB of storage. The time period for these rates can be defined as Hourly, Daily, Weekly, Quarterly or Yearly.

The Universal Charge Plan also enables the administrator to set different rates for different CPU architectures that may be present in their enterprise. For example, they might decide to charge a different rate for PA-RISC or Itanium processors than that charged for x86 due to the different costs involved.

The currency symbol is used simply to denote the symbol that appears when setting rates and viewing reports and affects all charge rates within the application.

The rates used in charge calculations can vary from month to month, however, rates can only be modified for the current (active) month. It is not possible to modify the rates associated with a previous month. If rates are modified, the updated rates will be used to re-calculate the charges for all days from the first of the current month onwards. Each monthly period is known as the “Reporting Cycle”.

Extended Charge Plans

The Universal Charge Plan provides a simple plan based on CPU, Memory and Storage that can be used with any type of chargeback target. There may, however be situations where the Chargeback administrator wishes to apply target specific charges. Some examples of target specific charges could be a charge for an Oracle VM based on the VM Size attribute, a charge based on the number of WebLogic User Requests processed or a charge for use of a Database Option.

In order to implement target type specific charges, the chargeback administrator can create an Extended Charge Plan and add target type specific charges to this plan. The Extended Charge Plan can contain charge items for a variety of target types, and the charges that prevail will be determined by the type of target that is metered. It is also possible to create additional conditions on the charges that get applied to a particular type of target. As shown in the Sample Charge Plan below, the chargeback

administrator can configure distinct groups of charges for VM's depending on whether the "Machine Size" attribute equals Small, Medium or Large. In this case, the Machine Size attribute of each metered VM is used to automatically determine which rates should be applied.

Figure 5: Creating an Extended Charge Plan

Charge Items that can be added to an extended charge plan include fixed, configuration and usage based charges. Fixed charges enable the administrator to apply a flat rate to a target regardless of its configuration or usage. This is useful for accounting for fixed costs such as data center space and I.T. staff. The configuration based charge will only be applied if a particular configuration is detected in a target. For example, as the configuration information collected by Enterprise Manager includes the Host OS, the chargeback administrator can use this to create a charge plan such that a charge is only applied if the Operating System is of a certain type.

An administrator could use an extended charge plan to create a charge for a Host with a fixed charge of \$50/month and another \$10/month charge for Linux OS as follows:

Item Name	Charge Type	Rate (\$)	Condition	Per Unit	Per Time Period
OS	Flat	10.0000	{x}='Enterprise Linux Server release 5.6	Target Instance	Month
Base Charge	Flat	50.0000		Target Instance	Month

Figure 6: Extended Charge Plan Charge Items

The final step in configuring an extended charge plan is to configure the charges that will be applied for CPU, Memory and Storage. The Universal Rate Adjustment determines what rate will be applied for these resources when an Extended Plan is being used.

The Universal Rate Adjustment in an extended charge plan enables the chargeback administrator to specify a multiplier of the Universal Plan rates for these resources. For example, to have a CPU charge that follows the Universal Plan and to exclude Memory and Storage the administrator would set the CPU Universal Rate factor to 1 and the Memory and Storage Universal Rate factors to 0.

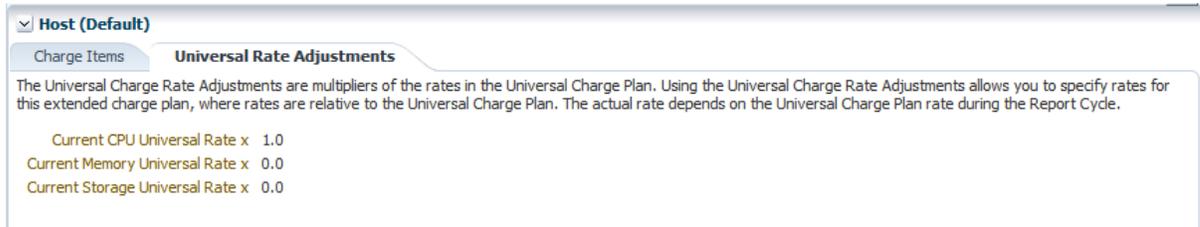


Figure 7: Extended Charge Plan Universal Rate Adjustment

Management of a Cost Center hierarchy

The users of the metered I.T. resources need to be represented in a Cost Center structure for chargeback. These Cost Centers represent the different consumers who own the resources and the chargeback administrator uses the cost centers to assign ownership. The Cost Centers are typically organized in a hierarchical fashion which is used to for aggregation and drill down in tasks such as cost analysis or billing.

A sample cost center hierarchy might look as follows:

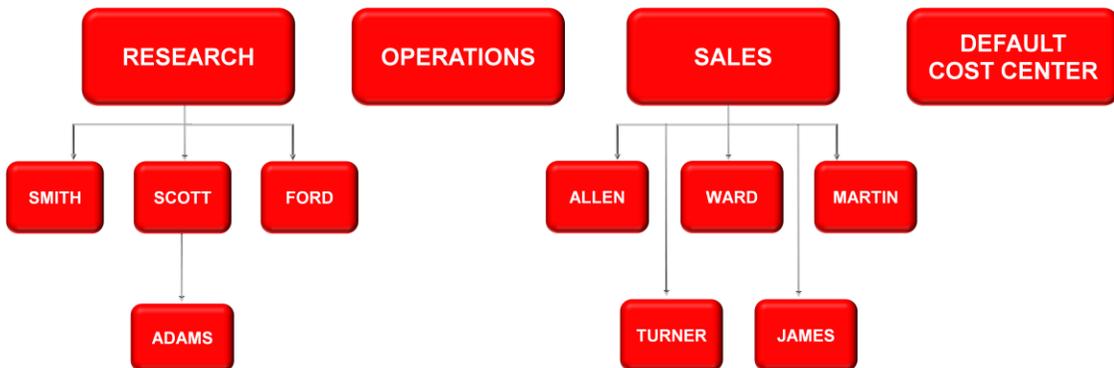


Figure 8: Example Cost Center Hierarchy

This Cost Center hierarchy can be defined and maintained in the Chargeback application.

Enterprise Manager 12c Cloud Control Metering and Chargeback interface showing the Chargeback section. The Cost Centers tab is active, displaying a hierarchy of cost centers. The Date Range is set to Mar 1, 2012 to Mar 31, 2012.

Cost Center	Display Name	Category
▶ OPERATIONS	Operations	Manual
▼ RESEARCH	Research	Manual
▶ FORD	Ford	Manual
▼ SCOTT	Scott	Manual
▶ ADAMS	Adams	Manual
▶ SMITH	Smith	Manual
▼ SALES	Sales	Manual
▶ ALLEN	Allen	Manual
▶ JAMES	James	Manual
▶ MARTIN	Martin	Manual
▶ TURNER	Turner	Manual
▶ WARD	Ward	Manual
▶ Default Cost Center	Default Cost Center	System

Figure 9: Cost Center Hierarchy in Chargeback

In a large organization the Cost Center hierarchy may be large and complex, and to enter this structure manually would require significant effort on the part of the chargeback administrator. Chargeback is able to synchronize and maintain this hierarchy if it is already present in a corporate LDAP server. The LDAP synchronization can be setup to include up to 5 hierarchical levels.

LDAP Settings dialog box configuration:

- * LDAP Server Type: Orade Internet Directory
- * Server Name: Orade Internet Directory
- * Authentication ID: Open LDAP Server
- Username: [Empty]
- Password: [Empty]
- * Port: [Empty]
- SSL (Secure Socket Layer)
- Custom Search Base (e.g. dc=orade,dc=com)
- * Levels: 5

Figure 10: LDAP Server Configuration

When administering a self-service cloud, it is necessary to meter the consumption for each self-service user, and also to roll this up into the higher level cost centers. In Enterprise Manager Chargeback, the Self-Service users who create cloud targets such as databases and virtual machines appear in the Cost Centers page so that the chargeback administrator can assign them to an appropriate higher level cost center. By incorporating self-service users into the cost center hierarchy, the chargeback administrator is able to see the data for each self-service user, and can also aggregate this data for self-service users within a particular department. The assignment of cloud consumers to high level cost centers can be automated if LDAP synchronization has been configured.

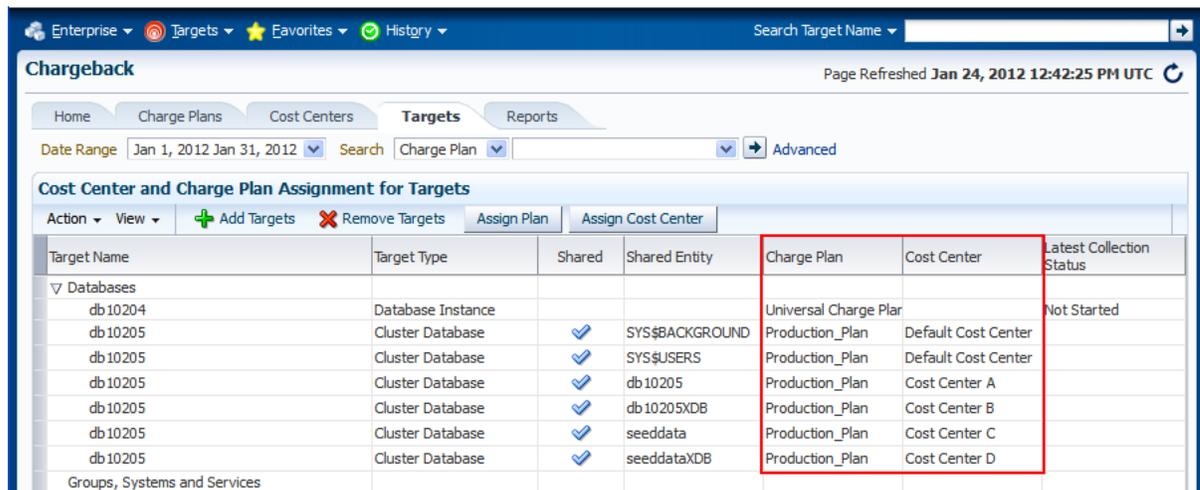
As a Cost Center hierarchy may be subject to frequent updates, the Chargeback application uses the most recent version of the hierarchy. Any updates made to the hierarchy will be applied from the start of the current reporting cycle up to the present date. It will have no impact on prior reporting cycles.

Charge Plan and Cost Center Assignment

The final stage in the setup of chargeback is a two-step process which determines:

- The charge plan used for calculation of charges for a chargeback target
- The cost center the calculated should charges be allocated to

For each chargeback target, the administrator is able to assign a charge plan to a target and a target to a cost center.



Target Name	Target Type	Shared	Shared Entity	Charge Plan	Cost Center	Latest Collection Status
db 10204	Database Instance			Universal Charge Plan		Not Started
db 10205	Cluster Database	✓	SYS\$BACKGROUND	Production_Plan	Default Cost Center	
db 10205	Cluster Database	✓	SYS\$USERS	Production_Plan	Default Cost Center	
db 10205	Cluster Database	✓	db 10205	Production_Plan	Cost Center A	
db 10205	Cluster Database	✓	db 10205XDB	Production_Plan	Cost Center B	
db 10205	Cluster Database	✓	seeddata	Production_Plan	Cost Center C	
db 10205	Cluster Database	✓	seeddataXDB	Production_Plan	Cost Center D	

Figure 11: Charge Plan and Cost Center Assignment

Any changes made to charge plan or cost center assignment will be effective from the start of the current month (reporting cycle), and all previous charge calculations for the affected targets during the current month will be invalidated. This change will have no impact on the charges for prior months.

As chargeback targets are often part of a hierarchy (eg. Oracle VM Guest -> Oracle VM Server -> Oracle VM Zone) the charge plan and cost center can be assigned to a parent. In this case any children that do not have a direct assignment will inherit the settings from the parent.

This inheritance model is typically used for assignment of the Charge Plan to targets that have been created via the Cloud Self-Service Portal. In this situation, the charge plan should be assigned to the Zone and all VMs or databases created within the Zone will inherit the charge plan as per the Zone assignment. For these targets it is not necessary to assign a cost center as the owner of the cloud target is already known to be the associated self-service user.

Chargeback ETL Process

Enterprise Manager Targets that have been configured for chargeback will be part of the chargeback ETL process. This process runs once every 24 hours and does the following:

- Extracts the Configuration and Monitoring data from the Enterprise Manager repository tables
- Performs transformations and aggregations so that the data can be used for chargeback
- Loads the data into separate chargeback tables within the Enterprise Manager repository
- Calculates the charges for the cost centers based on the assigned plans

Following modifications to the chargeback setup (eg charge plan change, cost center hierarchy change, target cost center or plan assignment change), the ETL process must run for the reports to show the results as per the updated configuration.

Checking when the ETL will next run

The ETL job is scheduled to run on a 24 hour schedule. To check when the job will next run, SYSMAN can navigate to Enterprise | Job | Activity | Advanced Search and search for the job called Chargeback Data Loader of Targetless Target Type.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The page title is "Job Activity" and the sub-page is "Advanced Search". The search criteria are: Name (empty), Owner (All), Status (Active), and Scheduled Start (Last 24 hours). The Job Type is set to "Chargeback Data Loader" and the Target Type is set to "Targetless". The search results table shows one job: "CBADATACollector" with a status of "1 Scheduled" and a scheduled time of "Mar 17, 2012 3:00:00 AM GMT+00:00".

Select	Name	Status (Executions)	Scheduled	Targets	Target Type	Owner	Job Type
<input type="radio"/>	CBADATACollector	1 Scheduled	Mar 17, 2012 3:00:00 AM GMT+00:00			SYSMAN	Chargeback Data Loader

Manually forcing the ETL process to run

It is possible to force a manual execution of the Chargeback ETL job by executing the following PL/SQL block as SYSMAN:

```
BEGIN
emct_cba_loader.submit_cba_etl_job('test');
END;
```

After submitting this PL/SQL block the ETL job will run in the background.

For full details please refer to [Note:1377185.1](#)

Chargeback Reports

Any chargeback solution will involve reporting so that users can understand how their use of resources translates to charges.

Enterprise Manager Chargeback provides reports that show both resource usage and charge information.

Summary Reports

Chargeback summary reports show information related to charge or resource utilization broken down by Cost Center, Target Type and Resource. They enable the viewer to quickly assess the targets or cost centers with the greatest charges or resource utilization.

Summary reports are primarily useful for drill-down purposes.

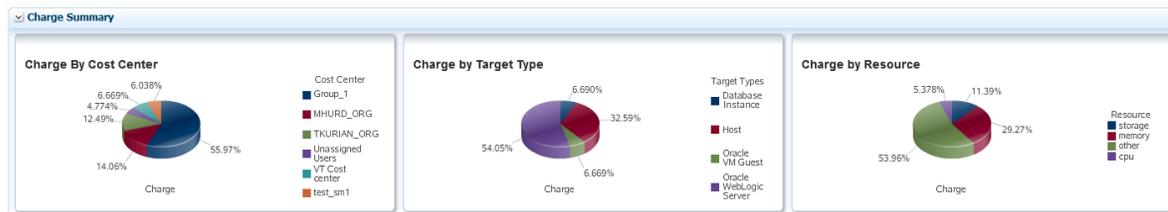


Figure 12: Summary Report

Trending Reports

These reports show metric or charge trends over a defined period of time and are useful for end users who want to see how their charges change over time. They are also useful to the I.T. department for capacity planning purposes.

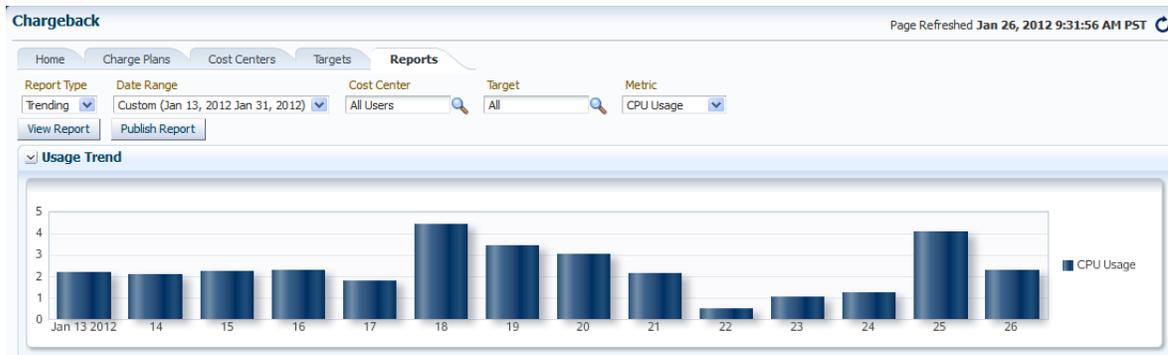


Figure 13: Trending Report

Reporting Interfaces

There are a variety of audiences for chargeback reports. Firstly there is the chargeback administrator who requires a global view of all chargeback activity. Secondly there are self-service portal users who would like to view their own chargeback information within the self-service portal, and finally there are business users who also need to receive chargeback information related to the systems they use. To accommodate these different types of user, the Enterprise Manager Chargeback reports are available through a variety of interfaces.

Chargeback Administrator Reports

Both Summary and Trending reports can be accessed from within the chargeback application. From here the chargeback administrator can get a consolidated view of Charge and Metric information and is able to drill-down by Date-Range, Cost Center, Target, Target Type or Resource.

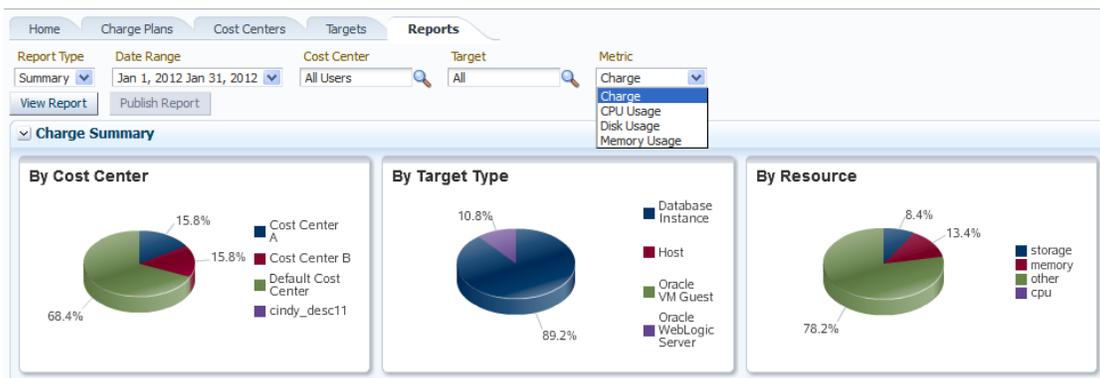


Figure 14: Chargeback Administrator Summary Report Configuration/Drilldown

The usage and charge data can also be seen in a tabular format with a variety of out of the box aggregations:

- All: Shows every selected target and metric for each day. This is the finest level of granularity that is available in the reports
- Target: Aggregates the selected data for the selected period by target
- Resource: Aggregates the selected data for each target in the selected period by resource (CPU, Memory, Storage, Other)
- Metric: Aggregates the selected data for each target in the selected period by metric
- Date: Aggregates the selected data for each target for each day in the selected period

These views allow the chargeback administrator to filter and sort data. From here the administrator can also determine at a glance which charge plan, metric and rate has been used to calculate each charge. An export to Excel feature is also available.

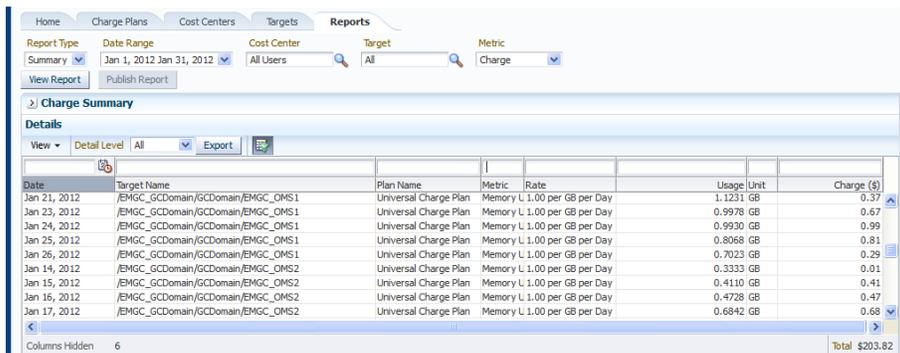


Figure 15: Usage and Charge Details

Self-Service Portal Reports

Chargeback information is available for individual self-service users from within the self-service portal. From here users can see the daily charges they have incurred across various types of resource.

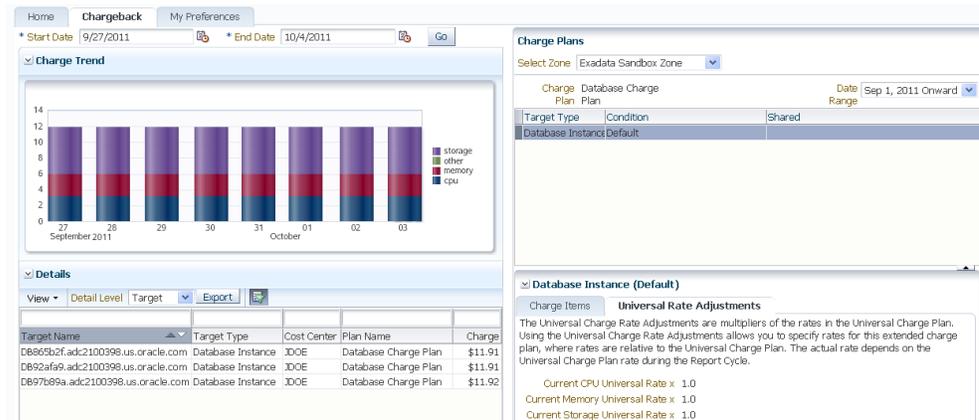


Figure 16: Charge Trend for Self-Service User

BI Publisher Reports

Providing reports to other stakeholders such as business users is a key requirement of chargeback. These recipients would not typically be defined as Enterprise Manager users.

Enterprise Manager Cloud Control 12c provides an out of the box integration with Oracle BI Publisher. This enables the chargeback administrator to define external recipients for chargeback reports and chose from a variety of formats such as HTML, PDF, RTF, Excel and PowerPoint. BI Publisher is able to publish these reports to a website/portal or email them directly to the recipients.

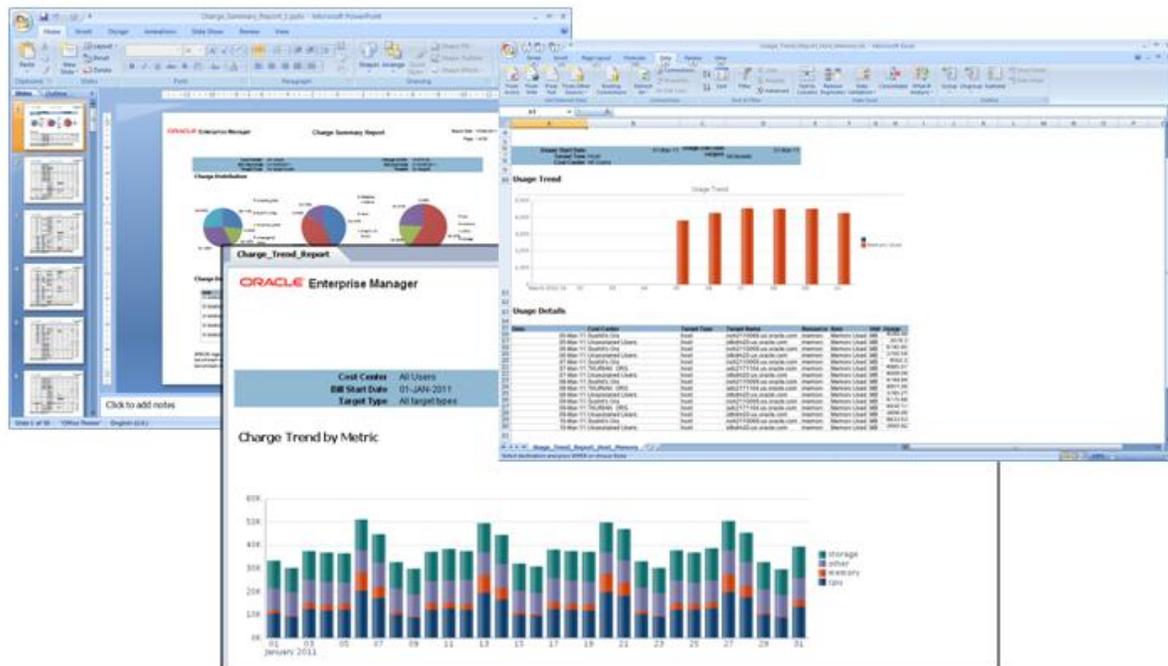


Figure 17: BI Publisher Reports

Integration with Billing Applications

Enterprise Manager Chargeback provides a solution for metering the use of Enterprise Manager targets and assigning costs to the associated consumers. In a private cloud, this is generally useful as a “showback” solution as there is unlikely to be a requirement to issue a bill, however, this is not the case with a public cloud. In order to meet the requirements of service providers to implement sophisticated pricing plans, or to issue bills to consumers, chargeback provides a mechanism to export usage and charge information from Enterprise Manager in CSV format using the EMCLI command line interface. This interface could be used to:

- Integrate with a billing system with different rate plans for small, medium and large configurations.
- Calculate chargeback for a flexible time period (eg. months starting from 15th and ending on the 15th).
- Rationalize chargeback based on other attributes that are not captured by Enterprise Manager.
- Adjust or round up chargeback based on usage. For example charge is calculated for the full-day even if the usage is for the partial day.

Using EMCLI, either the metering data, or both metering and charge data can be extracted from Enterprise manager for use in external billing applications such as Oracle Billing and Revenue Management.

```
$ emcli get_metering_data -cost_center="All Users" -target_type=oracle_database
Cost Center,Target Type,Target Name,Item Type,Category Name,Shared Entity,Item
Name,String Value,Collection Time,Usage,Data Type,Unit
CC_A,oracle_database,db10205_db102051,config,instance,db10205,Edition,Enterprise
Edition,2012-01-27 00:00:00,1,string,null
CC_A,oracle_database,db10205_db102051,config,instance,db10205,Option,Data Mining,2012-
01-27 00:00:00,1,string,null
CC_A,oracle_database,db10205_db102051,config,instance,db10205,Option,OLAP,2012-01-27
00:00:00,1,string,null
CC_A,oracle_database,db10205_db102051,config,instance,db10205,Option,Partitioning,2012-
01-27 00:00:00,1,string,null
CC_A,oracle_database,db10205_db102051,fixed,instance,db10205,Base Charge Per
Service,null,2012-01-27 00:00:00,1,number,null
CC_A,oracle_database,db10205_db102051,fixed,service,db10205,Backup Charge Per
Service,null,2012-01-27 00:00:00,1,number,null
CC_A,oracle_database,db10205_db102051,metric,activity,db10205,SQL Executes Per
Service,null,2012-01-27 00:00:00,0,number,Execute
CC_A,oracle_database,db10205_db102051,metric,activity,db10205,SQL Executes Per
Service,null,2012-01-27 01:00:00,0,number,Execute
CC_A,oracle_database,db10205_db102051,metric,activity,db10205,SQL Executes Per
Service,null,2012-01-27 02:00:00,0,number,Execute
```

Conclusion

The growing number of applications that are deployed on shared infrastructure and the emergence of cloud computing has resulted in a new interest in I.T. chargeback. Enterprise Manager Cloud Control 12c leverages the rich monitoring and configuration data collected by Enterprise Manager to provide a simple to use metering and chargeback solution. This solution enables administrators to meter resources, assign costs to the metered resources, manage cost centers and issue usage and charge reports to consumers. The solution can also be integrated with enterprise billing engines such as Oracle Billing and Revenue Management (BRM).

Appendix: Real World Scenarios

The following are examples of how Enterprise Manager could be used to implement various different charge models based on the services provided. The examples assume:

- The cost of providing each service has been calculated in advance.
- The Universal Charge Plan has been configured using rates of
 - CPU = \$5 per CPU per day
 - Memory = \$0.50 per GB per day
 - Storage = \$0.02 per GB per day

Example 1: IAAS Private Cloud

Background

An I.T. department has is implementing an IaaS private cloud with OracleVM and would like to charge the users of the private cloud the following rates for their consumption:

Small VM: \$0.50 per day

Medium VM: \$0.70 per day

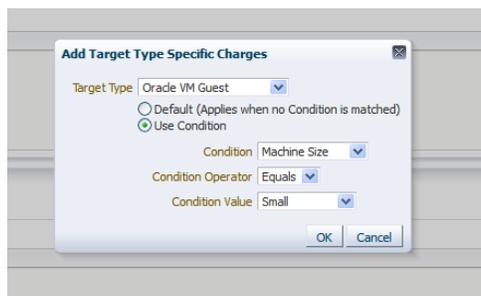
Large VM: \$1.00 per day

They would like to levy an additional charge of \$0.05 per day if a static IP address is used.

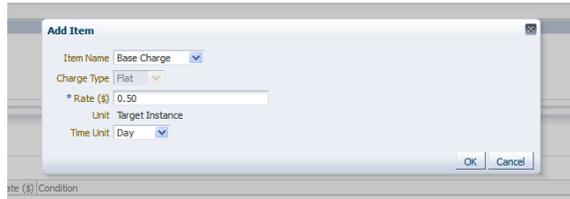
Chargeback Setup

Step 1: Create Extended Charge Plan IAAS_Cloud_Plan

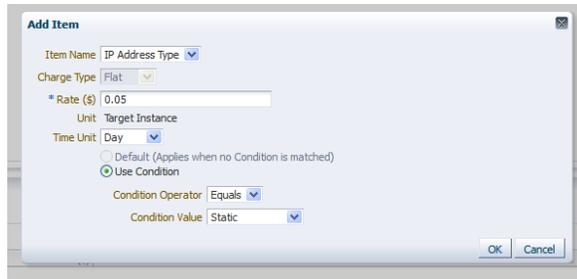
Step 2: Add Target Type specific charges for OracleVM Guest with Condition of VM Size = Small



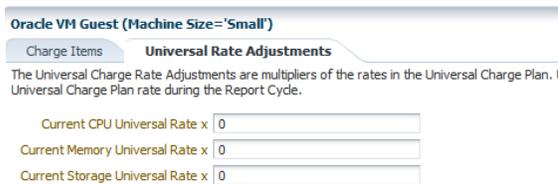
Add Base Charge Charge Item at \$0.50 per day



Add IP Address Type charge of \$0.05 where IP Address Type = Static



Ensure Universal Rate Adjustment is set to 0 for CPU, Memory and Storage



Step 3: Add Target Type specific charges for OracleVM Guest with Condition of VM Size = Medium

Add Base Charge Charge Item at \$0.70 per day

Add IP Address Type charge of \$0.05 where IP Address Type = Static

Ensure Universal Rate Adjustment is set to 0 for CPU, Memory and Storage

Step 4: Add Target Type specific charges for OracleVM Guest with Condition of VM Size = Large

Add Base Charge Charge Item at \$1.00 per day

Add IP Address Type charge of \$0.05 where IP Address Type = Static

Ensure Universal Rate Adjustment is set to 0 for CPU, Memory and Storage

Step 5: Add VM Zone to Chargeback from Targets tab

Step 6: Assign IAAS_Cloud_Plan to the VM Zone

Example 2: DBaaS Public Cloud

Background

An organization would like to offer external users access to databases through a self-service portal. The model for charging these users is as follows:

Fixed charge of \$5 per day per database

CPU charge: \$10 per CPU per day

Memory charge: \$0.50 per GB per day

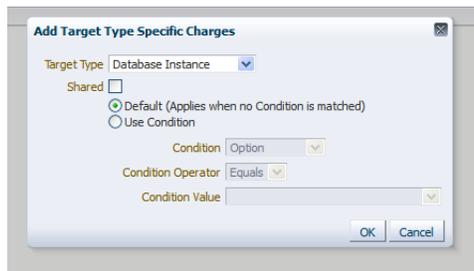
Storage charge:\$0.10 per GB per day

Additional charge of \$1 per day if Partitioning option is used

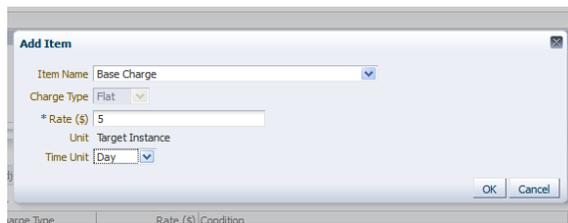
Chargeback Setup

Step 1: Create Extended Charge Plan DBaaS_Cloud_Plan

Step 2: Add Target Type specific charges for Database Instance with Default condition



Add Base Charge of \$5 per day



Add conditional charge for Option where Option=Partitioning



Set Universal Rate Adjustment for CPU, Memory and Storage

Step 3: Add Database Zone to Chargeback from Targets tab

Step 4: Assign DBaaS_Cloud_Plan to DB Zone

Step 5: Periodically extract metering data using emcli get_metering_data and import into billing engine

Example 3: Exadata Consolidation

Background

Customer has purchased Exadata and would like to consolidate several different applications onto the Exadata platform. They would like to incentivize application owners to migrate their applications to Exadata, so wish to charge higher rates for applications that have not been migrated to Exadata. For the applications that are running on Exadata they would like to chargeback for each application databases based on the resources consumed as follows:

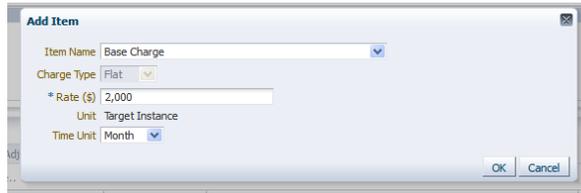
- Fixed charge: \$1000 per month if running on Exadata and \$2000 per month if non-Exadata
- CPU charge: \$10 per CPU per day (Exadata), \$12 per CPU per day (non-Exadata)
- Memory charge: \$1 per GB per day (Exadata), \$1.20 per GB per day (non-Exadata)
- Storage charge: \$0.10 per GB per day (Exadata), \$0.12 per GB per day (non-Exadata)

Chargeback Setup

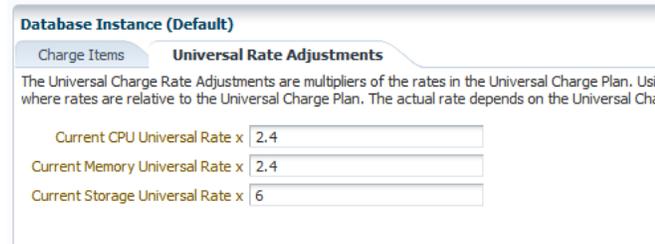
Step 1: Create Extended Charge Plan non_Exadata_Plan

Step 2: Add Target Type specific charges for Database Instance with Default condition

Add Base Charge of \$2000 per month

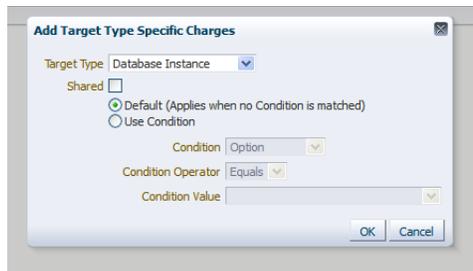


Set Universal Rate Adjustment for CPU, Memory and Storage



Step 3: Create Extended Charge Plan Exadata_Plan

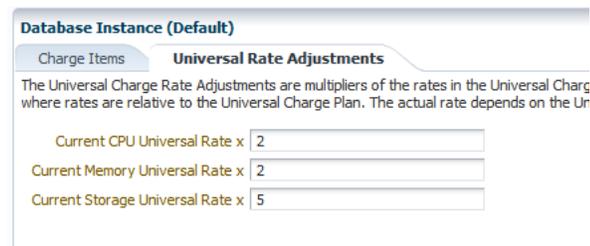
Step 4: Add Target Type specific charges for Database Instance with Default condition



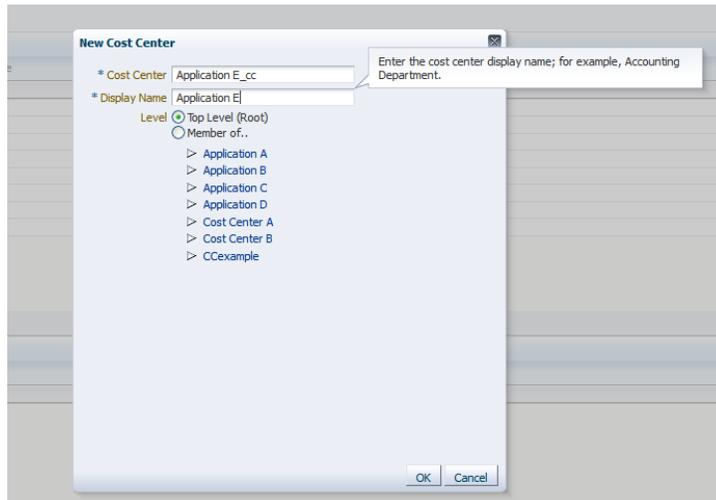
Add Base Charge of \$1000 per month



Set Universal Rate Adjustment for CPU, Memory and Storage



Step 5: Using the Cost Centers tab, create a Cost Center for each application



Step 6: Go to the Chargeback Targets tab and add each Database to Chargeback

Step 7: Assign the databases running on Exadata to Exadata_Plan and the other databases to non_Exadata_Plan

Step 8: Assign each database to the appropriate Cost Center.

Example 4: Schema Consolidation

Background

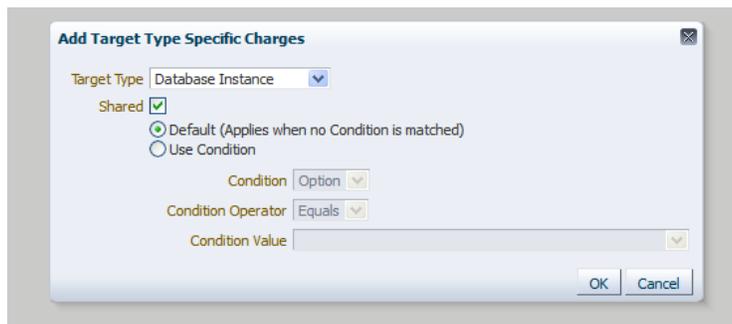
An organization has consolidated multiple applications into different schemas within the same database. They would like to meter and chargeback for the resources consumed by each application. Based on the available metrics they have decided to use “DB Time” as the charge metric and would like to charge 1/10th of a cent for each second of DB time consumed. They would also like to apply a fixed charge of \$1000 per month for each application.

Chargeback Setup

Step 1: Create a SQL*Net Database Service for each application

Step 2: Create Extended Charge Plan Schema_Plan

Step 3: Add Target Type specific charges for Shared Database Instance and tick the Shared checkbox



Add a Base Charge per Service of \$1000 per month

The screenshot shows a dialog box titled "Add Item". It contains the following fields:

- Item Name: Base Charge Per Service
- Charge Type: Flat
- * Rate (\$): 1,000
- Unit: Service
- Time Unit: Month

 There are "OK" and "Cancel" buttons at the bottom right.

Add charge for DB Time Per Service of \$0.001 per second

The screenshot shows a dialog box titled "Add Item". It contains the following fields:

- Item Name: DB Time Per Service
- Charge Type: Usage
- * Rate (\$): 0.01
- Unit: second

 There are "OK" and "Cancel" buttons at the bottom right.

Ensure Universal Rate Adjustment is set to 0 for CPU, Memory and Storage

The screenshot shows the "Database Instance (Default)" page with the "Universal Rate Adjustments" tab selected. Below the explanatory text, there are three input fields:

- Current CPU Universal Rate x: 0
- Current Memory Universal Rate x: 0
- Current Storage Universal Rate x: 0

Step 4: Using the Cost Centers tab, create a Cost Center for each application (service)

The screenshot shows a dialog box titled "New Cost Center". It contains the following fields:

- * Cost Center: Application E_cc
- * Display Name: Application E

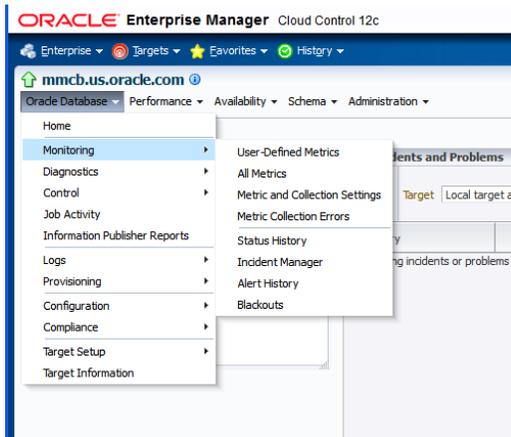
 Below these fields is a "Level" section with radio buttons for "Top Level (Root)" (selected) and "Member of..". A tree view shows a hierarchy of applications and cost centers:

- Application A
- Application B
- Application C
- Application D
- Cost Center A
- Cost Center B
- CCexample

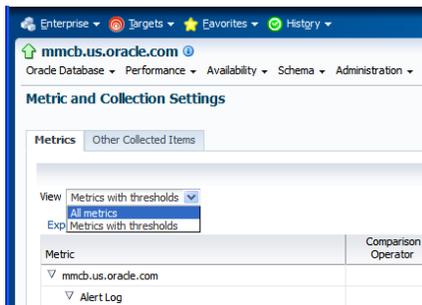
 There are "OK" and "Cancel" buttons at the bottom right. A tooltip is visible over the "Cost Center" field with the text: "Enter the cost center display name; for example, Accounting Department."

Step 5: Enable 'EM Database Services' metric collection on database target

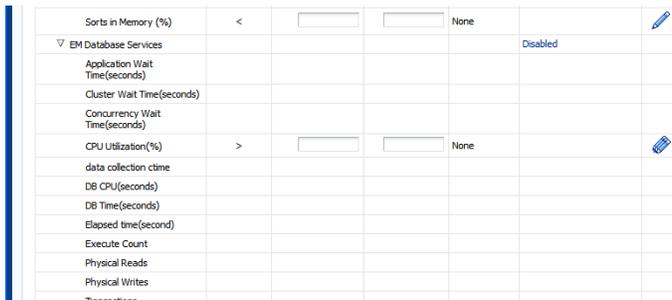
Navigate to the database homepage and select Oracle Database | Monitoring | Metric and Collection Settings



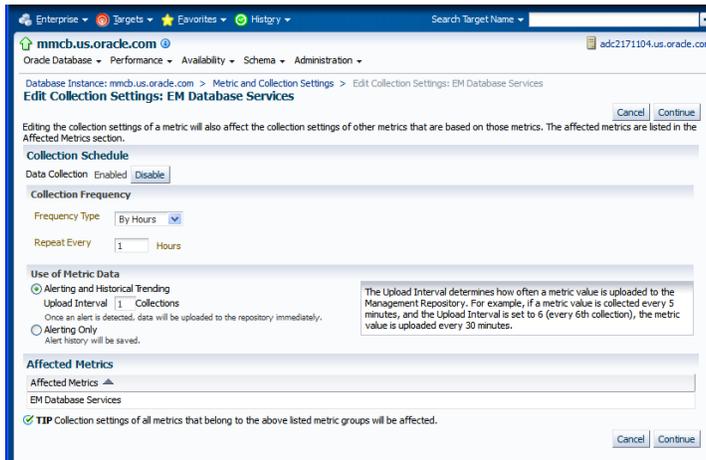
Select All Metrics



Navigate to EM Database Services and click on the 'Disabled' hyperlink

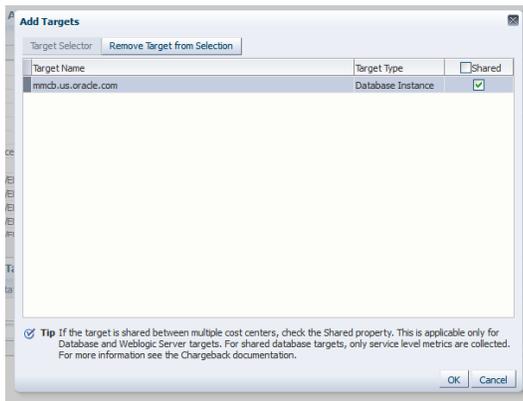


Enable the collection and leave the collection schedule with default settings



Click continue, and OK to apply the changes

Step 6: On the Targets tab in Chargeback, add Database as a Shared target



Step 7: Assign database to Schema_Plan charge plan

Step 8: Wait for ETL job to run (or manually force ETL)

Step 9: Assign each service to the appropriate Cost Center.



Enterprise Manager 12c Cloud Control
Metering and Chargeback

April, 2012

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