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1. Getting Started

1.1 About This Guide
The purpose of this document is to support a self-guided, hands-on evaluation of VMware vCenter™ Chargeback. This document is intended to provide IT professionals with the necessary information to install, configure, and deploy VMware vCenter Chargeback in a VMware vSphere™ 4 environment.

The content includes a product overview, configuration options, and key use cases to demonstrate how Chargeback can help you account for the operational costs involved in providing and maintaining an IT infrastructure, including the costs for IT services and applications, that deploy VMware vSphere infrastructure. Measuring resource utilization and calculating the corresponding IT operational cost enables you to account for the IT resources utilized, and bill for the services provided in a virtual infrastructure.

1.2 How to Use This Guide
This guide will walk you through some key use cases for Chargeback to help you conduct a successful product evaluation. A worksheet provided at the end of this guide will help you track your progress.

A glossary of terms is also available to help explain unfamiliar terms.

1.3 Help and Support During the Evaluation
This guide is not meant to substitute for product documentation. For detailed information regarding installation, configuration, administration, and usage of VMware products, please refer to the online documentation. You may also consult the online Knowledge Base if you have any additional questions.

Should you require further assistance, please contact a VMware sales representative or channel partner.

Below are some links to online resource, documentation, and self-help tools:

VMware vSphere and VMware vCenter Server Resources:
- Product Overview
- Product Documentation
- VMware vSphere 4 Documentation (including hardware compatibility guides)
- White Papers and Technical Papers
- VMware vSphere Evaluator’s Guide

Chargeback Resources:
- Product Overview
- Product Documentation
- Chargeback Release Notes
- User’s Guide
- Chargeback Calculator
- Chargeback Community
- Support Knowledge Base
2. What is VMware vCenter Chargeback?

VMware vCenter Chargeback, a component of the VMware vCenter product family of management solutions, lets customers model, measure, and assign costs associated with virtual machines. Chargeback enables accurate cost measurement, analysis, and reporting. With vCenter Chargeback, you can create cost transparency and accountability so business owners and IT staff can understand the actual cost of the virtual infrastructure required to support business services. VMware vCenter Chargeback is fully integrated with VMware vCenter Server and gives you the ability to map IT costs to business units, cost centers, or external customers — enabling a better understanding of how much resources cost and what can be done to optimize resource utilization to reduce overall spend on IT infrastructure.

Chargeback lets you define a custom hierarchy that maps to different business entities, such as departments, divisions, business units, service level tier, applications, or virtual machines, Flexible cost models allow IT to measure fixed costs, allocated costs, actual utilization, or a mix of all three, tracking costs by business unit or group. With simplified billing and reporting, Chargeback provides cost transparency for IT services by automatically creating detailed billing reports that can be submitted to business units within an organization.

Chargeback allows administrators to:

- **Report Virtualization Costs Precisely**
  Chargeback takes into account many different factors. These range for hardware costs (CPU, Memory, Storage, etc.) to additional elements such as power and cooling. Chargeback can incorporate all of these variables to provide IT with a comprehensive virtualized environment, cost-enabling chargeback to individual business units and the business as a whole.
  - Understand the costs of virtual machines
  - Properly allocate costs across organization units
  - Comprehensive reporting

- **Customize Cost Models and Metrics**
  Chargeback allows for IT organizations to enter their unique cost information and tune chargeback based on their specific requirements.
  - Supports reservation-based costing, utilization-based costing, or a combination of both
  - Allows for entry of cost accounting structures, base cost models, fixed costs, and multiple rates needed to calculate true costs. Templates can also be used to apply existing models quickly to expanding or new environments
  - Export of data to third-party systems or importing of existing hierarchies

- **Simplify Billing**
  Chargeback automatically creates detailed billing reports that can be submitted to business units within an organization. This provides business units with a clear view into resources consumed and their associated costs. Administrators can now transition the IT environment from a cost center to a value center.

Chargeback tightly integrates with VMware vSphere and vCenter Server.
3. System Requirements

3.1 Hardware Requirements
The minimum hardware requirements for a successful evaluation include the following components:

- One physical server (2 are recommended for improved performance) – This is used to install VMware ESX™, VMware vCenter Server, and VMware vCenter Chargeback Server software as well as several test virtual machines to demonstrate the product’s features. Please see the VMware ESX hardware compatibility list for supported server models.

- One Windows workstation or laptop – This is used for remote access to the ESX server with the VMware vSphere Client.

For detailed hardware requirements for ESX Server host(s), refer to the table below:

<table>
<thead>
<tr>
<th>Hardware Requirements for Chargeback Evaluation Use Cases</th>
<th>Minimum</th>
<th>Recommended</th>
<th>Hardware Used in This Guide</th>
</tr>
</thead>
<tbody>
<tr>
<td># ESX Server hosts</td>
<td>1</td>
<td>3 ESX Servers for a small VM population environment</td>
<td>4 (2 for Chargeback infrastructure, 2 for “Compute-Farm”)</td>
</tr>
<tr>
<td>CPU</td>
<td>2 processors of 1500 MHz</td>
<td>2 dual-core processors of 2500 MHz</td>
<td>2 quad-core processors of 2500 MHz</td>
</tr>
<tr>
<td>Memory</td>
<td>4GB</td>
<td>8GB</td>
<td>10GB</td>
</tr>
<tr>
<td>Disk Space</td>
<td>24GB (SAN/Local)</td>
<td>64GB (SAN)</td>
<td>300GB (SAN)</td>
</tr>
<tr>
<td>Network</td>
<td>1 Gigabit NIC</td>
<td>2 Gigabit NIC</td>
<td>2 Gigabit NIC</td>
</tr>
</tbody>
</table>

NOTE: If using the minimum one ESX Server for hosting both Chargeback infrastructure and the “Compute–Farm” cluster used in this guide, there will most likely be performance degradation, depending on the active number of virtual machines. Please use the recommended configuration to avoid issues.
3.2 Software Requirements
For the purpose of this evaluation, you will need the latest versions available for download of the following software:

- VMware vSphere (Standard/Enterprise/Enterprise Plus) Evaluation copy. Note that Chargeback also supports VMware Infrastructure 3.5 (VI3) and that “ESX” in this document refers to both ESX and ESXi.

- VMware vCenter Evaluation copy

- Chargeback Evaluation copy

VMware offers a free 60-day evaluation of the VMware software below. Follow the instructions at http://www.vmware.com/go/try-vcenter-chargeback which will walk you through the process to download the necessary licenses and the following binaries:

<table>
<thead>
<tr>
<th>Binary</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESX 4 (iso file)</td>
<td>You can create a boot CD from this iso file and use this CD to boot your server and install ESX 4.</td>
</tr>
<tr>
<td>VMware vCenter Server (zip file)</td>
<td>The zip file includes an installer for VMware vCenter Server 4.</td>
</tr>
<tr>
<td>Chargeback (zip file)</td>
<td>The zip file includes an installer for Chargeback. Extract the contents to temporary folder and launch executable file to start the install.</td>
</tr>
</tbody>
</table>

Note that Chargeback can also be configured in an existing environment and does not require an isolated dedicated environment for evaluation purposes. The above recommended hardware and software is intended for sites that want to evaluate Chargeback without having access to an existing virtual infrastructure setup.

Chargeback user interface is browser-based and can be accessed using the following supported browsers:

- Microsoft Internet Explorer 6.x and 7.x
- Mozilla Firefox 2.x and 3.x

Although vCenter Chargeback can be accessed through a Microsoft Internet Explorer 6.x or Mozilla Firefox 2.x Web browser, VMware recommends that you use a Microsoft Internet Explorer 7.x or Mozilla Firefox 3.x Web browser.
3.3. Software Installations and Configurations
Before you embark on the evaluation exercises, you need to install and configure the software listed in section 3.2. The table uses time estimates based on the hardware used to write this guide.

<table>
<thead>
<tr>
<th>Step</th>
<th>Installation and Configuration details</th>
<th>Time estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Provision two physical servers with the hardware profile described in Step 3.1.</td>
<td>Varies</td>
</tr>
<tr>
<td>2.</td>
<td>Install ESX Server software on two physical servers, including storage configuration. (See ESX Server 4 Installation Guide for more details).</td>
<td>45 minutes per ESX host</td>
</tr>
<tr>
<td>3.</td>
<td>Install VMware vSphere Client1 on a supported Windows machine (e.g. a laptop).</td>
<td>20 minutes</td>
</tr>
<tr>
<td>4.</td>
<td>Create a virtual machine on one of the ESX hosts using the VMware vSphere Client and install Windows Server 2003 on it. Virtual machine configuration: Operating System: Windows Server 2003 32-bit Enterprise Edition (SP1 or higher)/ Standard Edition (SP1 or higher) Note that 64-bit is supported, although Chargeback runs 32-bit processes. CPU: 2 vSMP Memory: 4GB Disk: 40GB thin provisioned Network: 1 NIC card</td>
<td>60 minutes</td>
</tr>
<tr>
<td>5.</td>
<td>Clone the newly created Windows Server 2003 virtual machine created in Step 4 to a new copy of it. Install VMware vCenter Server on the cloned virtual machine.</td>
<td>30 minutes</td>
</tr>
<tr>
<td>6.</td>
<td>Start the VMware vSphere Client and connect to the VMware vCenter Server just created in Step 5. Add the ESX hosts provisioned in Step 2 to the VMware vCenter Server inventory.</td>
<td>10 minutes</td>
</tr>
</tbody>
</table>
7. Create test virtual machines (preferably from already created template VMs to save time) that will be used as the source for chargeback reporting.

For demonstration purposes, this guide uses a total of 8 virtual machines, with a combination of OS types: Windows XP/2003/2008 and Red Hat Linux. Create a single cluster with at least 2 ESX hosts that contain 2 resource pools, named Development and Production, with the number of VMs split between the 2 resource pools as follows:

![Cluster and resource pool setup](image)

Figure 3.3 a. Hosts, clusters and resource pool setup

Total Estimated Time: 10 minutes

Total estimated time: 5-6 hours excluding server provisioning time in Step 1

---

1 Open a Web browser and connect to your ESX host by typing in the hostname or IP address. Click the Download VMware vSphere Client link. Save the installer to your workstation and install the VMware vSphere client. Launch the client and type in the IP address or hostname of the ESX Server to connect.
3.4. VMware vCenter™ Chargeback Installation and Configuration

Before installing VMware vCenter Chargeback on the virtual machine created in step 4 of section 3.3, you need to ensure the following prerequisites are met:

<table>
<thead>
<tr>
<th>Prerequisites</th>
<th>Details</th>
</tr>
</thead>
</table>
| Windows Server 2003 services and framework | Install:  
• Internet Information Services (IIS) 6.0  
• .NET framework 2.0 (SP1 or higher) |
| Network                                | Prepare:  
• Static IP address for NIC card  
• Gateway  
• Subnet Mask  
• Primary DNS Server  
• (Optional) Secondary DNS Server |
| SQL Server                             | Install either SQL Server 2005 or 2008, Standard or Enterprise Edition. You can also use the SQL Server instance that hosts the VMware vCenter Server database. |
| Chargeback Server                      | Install Chargeback on one of the Windows 2003 virtual machines created during the earlier vsphere setup. |

To install Chargeback, you can simply launch the Chargeback Installation executable listed in section 3.2 in a virtual machine. During the installation process, you will be prompted to enter the information of your database; in this evaluation guide, we are using SQL Server. After Chargeback has been successfully installed, you will be able to evaluate its capabilities as described in the sections below. After installation, log in to the application using the administrative account user name, and add your VMware vCenter Server (created in step 7 of section 3.3) to vCenter Chargeback. Please refer to the Chargeback User’s Guide for detailed instructions on installing this product.

A couple of items to be aware of during the install:

1. Chargeback does not currently support Windows authentication, so verify SQL Authentication by logging in using the "sa" account with SQL Server Management Studio when creating the database for Chargeback. Consult Microsoft documentation as needed and reference Microsoft KB articles 319930 and 269587 for details on how to enable "sa"SQL Server Authentication for Microsoft SQL Server.

2. Install all components of Chargeback during the install, including the Data Collector and Load Balancer. The Data Collector monitors and collects data from multiple vCenter servers and databases. The Load Balancer enables you to have more than one instance of the Chargeback application running, and ensures that no single Chargeback instance is loaded disproportionately with user requests.

3. The following is a sample of the information required when adding a vCenter Server to Chargeback:
EVALUATOR’S GUIDE
VMWARE VCENTER™ CHARGEBACK

Figure 3.4 a. vCenter account setup details

<table>
<thead>
<tr>
<th>vCenter Information</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>vCenter ID</td>
<td></td>
</tr>
<tr>
<td>vCenter Server Hostname/IP</td>
<td><a href="https://v02/ssl/">https://v02/ssl/</a></td>
</tr>
<tr>
<td>vCenter Server Version</td>
<td>4.0.0</td>
</tr>
<tr>
<td>vCenter Server View Type</td>
<td>Hosts And Clusters</td>
</tr>
<tr>
<td>vCenter Server Display Name*</td>
<td>v02</td>
</tr>
<tr>
<td>vCenter Server Description</td>
<td>v02</td>
</tr>
<tr>
<td>vCenter Server Username*</td>
<td>administrator</td>
</tr>
<tr>
<td>vCenter Server Password*</td>
<td>*******************</td>
</tr>
<tr>
<td>Database Name*</td>
<td>tml-local</td>
</tr>
<tr>
<td>Database Username*</td>
<td>v02</td>
</tr>
<tr>
<td>Database Password*</td>
<td>*******************</td>
</tr>
<tr>
<td>Database Type*</td>
<td>SQL Server</td>
</tr>
<tr>
<td>Registrar As Plugin</td>
<td></td>
</tr>
<tr>
<td>Synchronize Enabled</td>
<td></td>
</tr>
</tbody>
</table>

4. If you are setting up LDAP account note that the “username@domain.name” form must be used as follows:

Figure 3.4 b. LDAP setup details

<table>
<thead>
<tr>
<th>Manage LDAP Server</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Server Address:</td>
<td>tml-ad01</td>
</tr>
<tr>
<td>User Name:</td>
<td><a href="mailto:administrator@tml.local">administrator@tml.local</a></td>
</tr>
<tr>
<td>Password:</td>
<td>*******************</td>
</tr>
<tr>
<td>BaseDN:</td>
<td>dc=tml,dc=local</td>
</tr>
<tr>
<td>Port:</td>
<td>389</td>
</tr>
<tr>
<td>LDAP Link:</td>
<td>500</td>
</tr>
</tbody>
</table>

Where tml.local is your domain name hence BaseDN will be dc=tml,dc=local.
5. The following is an example of adding a SMTP email server:

Figure 3.4 c. SMTP setup details

<table>
<thead>
<tr>
<th>Server HostName:</th>
<th>localhost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Server Port:</td>
<td>25</td>
</tr>
<tr>
<td>SMTP Address:</td>
<td><a href="mailto:reports@cbm.local">reports@cbm.local</a></td>
</tr>
<tr>
<td>Authentication Type:</td>
<td>Require Login</td>
</tr>
<tr>
<td>User Name:</td>
<td><a href="mailto:reports@cbm.local">reports@cbm.local</a></td>
</tr>
<tr>
<td>Password:</td>
<td>************</td>
</tr>
</tbody>
</table>
4. VMware vCenter Chargeback Use Cases

This section outlines six scenarios for Chargeback and lists the recommended steps for each scenario. These use cases will provide a better understanding of how Chargeback can be used to migrate from your current billing or cost tracking policy, typically fixed cost per resource based, to allocated or usage-based cost tracking or chargeback. This guide will also show how to automate reporting to align with billing cycles and how to manage access to Chargeback information.

Note that Chargeback is able to calculate costs based on fixed or variable costs. Fixed costs are typically for items where the cost does not change depending on the usage e.g. fixed cost of the OS license per virtual machine. Variable costs are for items that do change depending on their usage, e.g. disk space utilized by a virtual machine.

The scenarios are broken down into the following:
1. Create chargeback hierarchy
2. Utilize fixed cost model (charge a fixed cost for each VM)
3. Utilize variable cost model (charge a variable cost for each VM depending on resource usage)
4. Generate comparison report
5. Setup automated reports
6. Manage user access

The table below presents an overview of the scenarios and the associated steps. The time estimates provide an approximation of the expected time that you will spend in each use case. They do not necessarily reflect the exact time needed.

<table>
<thead>
<tr>
<th>Resource</th>
<th>Details</th>
<th>Time Estimate</th>
</tr>
</thead>
</table>
| Create chargeback hierarchy   | 1. Login to Chargeback  
2. Create custom hierarchy | 10 minutes     |
| Utilize fixed cost model      | 1. Define fixed cost template  
2. Define fixed cost model  
3. Configure fixed cost model  
4. Run report with fixed cost model | 20 minutes    |
| Utilize variable cost model   | 1. Define variable cost template  
2. Define variable cost model  
3. Configure variable cost model  
4. Run report with variable cost model | 30 minutes    |
| Generate comparison report    | 1. Run comparison report  
2. Review comparison report results | 15 minutes    |
| Setup automated reports       | 1. Setup a report template  
2. Schedule automated report | 30 minutes    |
| Manage user access            | 1. Add domain group and user  
2. Assign role to domain group  
3. Run report as domain user | 15 minutes    |

Total time estimate: 120 minutes
4.1. Create chargeback hierarchy

Chargeback interacts with the vCenter Server to determine the utilization of the computing resources by various virtual machines that are created in the vCenter Server hierarchy. Chargeback enables you to create different chargeback hierarchies, which can be different from the vCenter Server hierarchies.

A chargeback hierarchy defines how the various virtual machines and ESX Server hosts are assigned to and shared by different departments, cost centers, or business units in an organization.

To start login to Chargeback by a Web browser, create a custom hierarchy to setup the connection between vCenter Server and Chargeback entities.

**Step 1: Login to Chargeback**

1. Open up a browser and enter the address of the server where you installed Chargeback using http (default port is 8080) or https (default port is 443) followed by /cbmui (e.g. https://cbm-app-01.tml.local/cbmui) and login as user ‘admin’ with the password you provided during the install.

2. After you login, click on **System Health** tab and confirm that all lights are green to ensure all back-end components such as vCenter Service are active and connected successfully. If any of the lights aren’t green, you must resolve this issue before moving forward, otherwise you will encounter issues working through the rest of the steps.
**Step 2: Create custom chargeback hierarchy**

A chargeback hierarchy allows you to easily define how virtual machines and ESX server hosts are assigned to and shared by different departments, cost centers, or business units in an organization. You can create a new custom hierarchy as per your requirements, or create a hierarchy that is the same as the vCenter Server hierarchy through synchronization. In this example, a custom hierarchy was created.

1. Select the Manage Hierarchy tab and click on **Create Chargeback Hierarchy**. Enter “my-datacenter-hierarchy” for Name and Description and click on **Create**.

Figure 4.1 c. Create new hierarchy details
2. To add a vCenter Server entity to the newly created Chargeback hierarchy, select the newly created hierarchy name on the left pane and on the right pane select the name of the vCenter Server that was added during the install. Expand the folders until you are able to see your vCenter Server cluster. Select the Compute-Farm cluster by clicking once on the name, releasing the mouse click button to complete the click, do not keep it pressed, otherwise the mouse icon will not change. You will notice that the mouse cursor changes to the name of the cluster you selected, e.g., "Compute-Farm". Now move the changed mouse cursor over to the newly created hierarchy name, e.g., "my-datacenter-hierarchy" and click once on the name to complete the association.

Figure 4.1 d. Add vCenter Server cluster to chargeback hierarchy

This will add the vCenter cluster “Compute-Farm” to the chargeback hierarchy named “my-datacenter-hierarchy”. Expand the folders on the left side to confirm you are able to see all the resources in the cluster you added.
3. (Optional) Move and delete entities within the hierarchy as desired.

4.2. Utilize fixed cost model
Many environments today do not have a current billing or cost tracking policy for virtual infrastructure, so this scenario shows how to start with a simple fixed cost model based on the fixed cost of a virtual machine. With the help of the VMware Chargeback calculator, you can translate physical costs to virtual and determine fixed costs per VM. In this example, the value of $25 per VM per day is used.

The fixed cost model relies on defining fixed costs that are setup in the current environment, and then attaching them to one or more folders in the hierarchy through a cost template. In this scenario, resource pools are used, then a report is run, and the results are verified.

Step 1: Define fixed cost template
Chargeback enables you to create cost templates. A cost template consists of rate factors for each of the chargeable resources, global, and local fixed costs.

Rate factor is the multiplication factor to be used along with the base rate to calculate the charge per unit of a resource for an entity. Rate factors are useful when you want to charge the entities in a hierarchy differently. The rate factors enable you to apply a cost that is a multiple or a fraction of the base rate.

Local fixed cost is a cost that is specific to an entity, a group of entities, or to an entire hierarchy. For example, real estate cost for physical storage of the entities. This cost differs based on the actual geographic location.

The rate factors and local fixed costs are entity-specific. You can set these values in a cost template and use the template to configure the costs at the entity level.

In this scenario, a global fixed cost of $25 per VM per day. This value includes the hypothetical cost of the OS license, cost of disk space, etc. per day will be set up. You can use the Chargeback calculator referenced in the Help and Support During the Evaluation section to calculate your own value.

After defining the global fixed cost, a cost template that utilizes this global fixed cost will be defined and all the resource rate factors will be set to zero, to indicate that this template will be used for fixed cost modeling instead of resource usage based.
1. Select the Manage Cost tab and then click on Global Fixed Cost, then Create. Enter "fixed-cost-per-VM" for Name and Description, ‘25’ for "Value", leaving duration at 'Daily' and click on Create.

Figure 4.2 a. Create Global Fixed Cost

2. Click on Cost Template then Create… and enter “fixed-cost-template” for Name and Description.

Figure 4.2 b. Fixed Cost Template - General
3. Select **Rate Factors** tab and set all the “Rate Factors” to ‘0’. ‘0’ is entered for each of the rate factors to avoid calculating costs for any of the variable resources, and instead calculate only for the fixed costs associated in the next step.

Figure 4.2 c. Fixed Cost Template – Rate Factors

4. Select **Fixed Costs** tab and select **fixed-cost-per-VM** from the “Global” drop down list. Click **Add** to select it into this template. Click on **Create** to complete setting up the cost template.

Figure 4.2 d. Fixed Cost Template – Fixed Costs
Step 2: Define fixed cost model
Chargeback cost model defines the base rate and billing policy. Base rate is the global rate that you want to charge for a unit of the chargeable computing resource, e.g. CPU, memory, etc. A billing policy determines the cost types and chargeable units to be considered for calculating the chargeback cost. Chargeback provides several types of billing policies, e.g. Fixed Cost, and Actual Usage, etc.

In this scenario a fixed cost model that only defines the billing policy and have the base rates set to zeros defined indicates that resource usage based costs are not to be calculated.

1. Click on Cost Models and then Create. Complete “fixed-cost-model” for Name and Description.

2. Select Billing Policy tab. A billing policy determines the cost types and chargeable units to be considered for calculating the chargeback cost. Leave “Update from now onwards” radio button select and select Fixed Cost for the ‘Billing Policy’ from the drop down list. By selecting a fixed cost billing policy, Chargeback will consider only the fixed cost associated with each entity, and will ignore the actual resource usage and base rates defined for each resource.
3. Select **Base Rates** tab and leave all values at '0'. '0' values for the **Base Rate** are entered because only the fixed costs setup in the cost template are of interest, not in variable resource costs. Click **Create** to complete this step.
Step 3: Configure fixed cost model

The base rates defined in a cost model are global values and will be applied uniformly to the entire hierarchy or part of the hierarchy for which you generate a report.

In real time, however, you might want to charge each entity or a set of entities differently. That is, the resource usage cost for one virtual machine might differ from that for the other. This can be achieved only if the cost for each entity or a set of entities in the hierarchy is configured separately.

You may want to charge some global fixed costs and entity-specific local fixed costs.

In this scenario the same fixed costs at the cluster level are used, i.e. same cost configuration for both the “Development” and “Production” resource pools.

1. Select the Configure Cost tab, click on Edit Entity Cost Configuration, expand “Compute-Farm” in the hierarchy, select Development resource pool, select fixed-cost-model in “Cost Model” drop down list, fixed-cost-template in “Apply Cost Template” drop down list, check Update Rate Factors, check Update Fixed Costs, check the Distribute check box on the line for “fixed-cost-per-VM” and finally the Update button. Click the OK of dialog box that confirms cost configuration has been updated for this entity.

2. Verify the new cost configuration assignment by clicking on View Entity Cost configuration, ensure the “fixed-cost-model” is associated with the resource pool “Development”, that the fixed cost “fixed-cost-per-VM” is listed in the “Fixed Costs” table and that the values are all ‘0’ in the “Rate Factors” table.
3. Repeat previous steps 1 and 2 for the resource pool “Production” with the following identical cost configuration.
Figure 4.2. View Entity Cost Configuration for Fixed Cost Model – Production

Step 4: Run report with fixed cost model

1. Click on the Reports tab, right click on Development resource pool and select Generate Report on this Entity. Enter “fixed-cost-report-development” for Name and Description. Select fixed-cost-model from “Select a cost model” drop down list. Ensure you select a “From:” date in the future (minimum today + 1) and a “To:” date equal or later in the future as the “From:” date. This will make reconciling the report results less complex, due to the fact that Chargeback will take into consideration the current time of today when doing fixed cost calculations e.g., if current time of day is 9pm, then it will prorate the $25/day/VM over 3 hours (24-21) = $3.125 instead of the full $25. Note that Chargeback uses midnight (00:00) as the daily time boundary. Click Generate Report to run the report.
2. Review the report output and verify the results. Note that each VM was charged $25/day by configuring only the cost at the resource pool level and distributing it over the resource pool during the cost configuration.
3. Repeat previous steps 1 and 2 for the "Production" resource pool and verify the results. If there are a different number of VMs, ensure the fixed cost per VM reconciles to the results.

Figure 4.2 m. View Report – Fixed cost Model - Production

4.3. Utilize variable cost model
In this scenario, two variable cost models are setup, one for the development resource pool and one for the production resource pool, demonstrating the flexibility of Chargeback, by having different variable cost models for different tiers of virtual infrastructure.

A variable cost model utilizes the actual resource usage of virtual machines as obtained from vCenter Server. Then Chargeback determines the charge of each resource based on costs configured for each resource type over the period of interest.

Step 1: Define variable cost template
1. If not already logged into Chargeback, log back in as user admin.
2. Select the Manage Cost tab, click on Global Fixed Cost, click Create. Enter "cost-per-OS-license" for Name and Description, enter 5 for 'value', and leave the default of "Daily" for "Duration". Click Create to complete.
3. Click **Cost Template**, click on **Create**., and enter “variable-cost-template-production” for Name and Description.

---

**Figure 4.3 a. Fixed Cost detail for Variable Cost Model**

**Figure 4.3 b. Variable Cost Template – Production – General**
4. Select the **Rate Factors** tab and enter a rate factor of 1 for all computing resources. This time a value of ‘1’ instead of ‘0’ (fixed cost template) is entered, to indicate calculating costs for each of the variable resources. The actual dollar amount will be configured in the cost model in a later step.

Figure 4.3 c. Variable Cost Template – Production – Rate Factors

5. Select **Fixed Costs** tab and select **cost-per-OS-license** from the drop down list, click on **Add**, then finally, **Create** to complete the cost template creation.

Figure 4.3 d. Variable Cost Template – Production – Fixed Costs
6. Repeat above steps 3 – 5 for the development variable cost template by using “variable-cost-template-development” for Name and Description. Use the same settings for “Rate Factors” and “Fixed Costs” as in previous steps. The only exception will be the rate factor of “Storage” on the “Rate Factors” tab, that will be set to 0.5 to indicate the cheaper tier 2 storage hosting development virtual machines.

Figure 4.3 e. Variable Cost Template – Development – Rate Factors

7. You should now have two variable cost templates and you can click on the Details link in the description column to see a quick summary.

Figure 4.3 f. Variable Cost Templates – Development and Production
**Step 2: Define variable cost model**

1. Click on **Cost Models**, then **Create**, and enter “variable-cost-model” for Name and Description.

Figure 4.3 g. Variable Cost Model - General

2. Select **Billing Policy** tab and select **Fixed Cost and Actual Usage** from “Billing Policy” drop down list. Leave **Update from now onwards** radio button selected.

Figure 4.3 h. Variable Cost Model – Billing Policy
3. Select the **Base Rates** tab and for base rates enter the values 0.9, 0.8, 0, 0, 0.02, 0, 0, 0, 0.1 as displayed below. Click **Create** to complete the cost model setup. Please refer to the base rate calculations in section “Variable Cost Base Rates Calculations” for how the amounts were derived.

Figure 4.3 i. Variable Cost Model – Base Rates

**Step 3: Configure variable cost model**

1. Select the **Configure Cost** tab, click on **Edit Entity Cost Configuration**, expand the hierarchy, and select the **Development resource pool**. Select variable-cost-model in “Cost Model” drop down list, select variable-cost-template-development in “Apply Cost Template” drop down list, check **Update Rate Factors**, check **Update Fixed Costs**, check **Distribute**, and click **Update** to complete the new cost configuration for the “Development” resource pool. Click **OK** of dialog box that confirms the cost configuration has been updated for this entity.
2. Repeat the previous step for the “Production” resource pool but this time select variable-cost-template-production in the “Apply Cost Template” drop down list.
Step 4: Run report with variable cost model

1. Click on the Reports tab, right click on “Development” resource pool, and select Generate Report on this Entity. Enter “variable-cost-report-development” for Name and Description. Select variable-cost-model from Select a cost model drop down list. Ensure you select a date in the future (minimum today + 1) as it will make reconciling the report results less complex, due to the fact that Chargeback will take into consideration the current time of today when doing fixed cost calculations, e.g., if current time of day is 9pm, then it will prorate the OS-License over 3 hours (24-21) = $0.625 instead of the full $5.
2. Review the report output and verify the results. To reconcile the results, note that currently only storage resource utilization is reported, as at least one hour has to pass before other resource metrics will be available to be reported on. Take an example reconciliation for the VM: 3.52GB * $0.10 ($/GB/hr) * 0.50 (rate factor) * 24 (hrs/day) = $4.22 + $5/day/OS-license = $9.22 (TOTAL).
3. Repeat the same report for the “Production” resource pool. This time you will notice higher cost in the Production pool report than for Development pool for the same sized VM of 3.52GB. The reconciliation for this VM in Production is as follows: 3.52GB * $0.10 ($/GB/hr) * 1.00 (rate factor) * 24 (hrs/day) = $8.45 + $5/day/OS-license = $13.45 (TOTAL).

Figure 4.3 n. Report Output – Variable Cost – Production
4.4. Generate comparison reports

Chargeback has the ability to generate comparison reports that show the results of one cost model compared to another cost model.

In this scenario the results of the fixed cost model are compared to the variable cost model for the Development resource pool. The results are particularly valuable when migrating from a fixed cost to a variable cost billing strategy and to ensure that calculated resource costs, fixed costs, and rate factors are in line with expectations.

**Step 1: Run comparison report**

1. If not already logged into Chargeback, log back in as user admin.
2. Select the Reports tab, expand the hierarchy and select the Development resource pool.
3. Right click and select **Generate Comparison Report on this Entity**.
4. Enter the value “comparison-report-development” for Name and Description. Select **fixed-cost-model** in the first drop down list and **variable-cost-model** in second drop down. Choose a date in the future for a duration of one day for the “From” date (minimum today + 1) and a “To” date equal or later in the future as the “From” date. This will make reconciling the report results less complex. Click **Generate Report** to run the report.

Figure 4.4 a. Generate Comparison Report – fixed vs. variable - Development
Step 2: Review comparison report results

1. Review the results of the comparison report. Note the difference in billing for the "Development" resource pool when using fixed (Total = $ 200) vs. variable (Total = $ 110.54).

Figure 4.4 b. Comparison Report Results – fixed vs. variable - Development

2. From the comparison report one can see one of the key capabilities of Chargeback in action, for instance compare the results of one cost model with that of another. This is particularly useful when considering various cost models for a specific entity in that one can easily and quickly perform what-if scenarios when determining the optimal cost model for a specific entity.
4.5 Setup automated reports
In addition to generating reports on-demand, Chargeback can automatically generate reports at predefined intervals to further automate and support the business billing cycle.

This scenario will show how to setup automated scheduled reports.

Step 1: Setup report template
1. If not already logged into Chargeback, log back in as user admin.
2. Select the Settings tab and click on the Report Template button. Select the Header tab.
3. Select Section One and then the radio button for Text and enter the text “Monthly Charges”.

Figure 4.5 a. Report Template – Header – Section 1

4. Select Section Two and then the radio button for “Report Name”.

Figure 4.5 b. Report Template – Header – Section 2
5. Select the **Title** tab, then **Section One**, then the radio button for **Text** and enter "Monthly Charges".

Figure 4.5 c. Template – Title – Section 1

6. Select **Section Two** and then the radio button for **Report Name**.

Figure 4.5 d. Template – Title – Section 2
7. Select the **Footer** tab, then **Section One**, then the radio button for **Report Creation Time**.

![Figure 4.5: Template – Footer – Section 1](image)

8. Click **Save** to save the changes that will be used next to generate automated reports using this report template.

**Step 2: Schedule automated report**

1. Select the **Reports** tab and select **Create Reports**.

2. Expand the hierarchy and right click on **Compute-Farm** cluster, select **Generate Report on this Entity** and enter “monthly-billing-report-production” for Name and Description. Next, generate a report on all resources in this cluster, where previously the resource pool level reporting was the focus.

3. Select **variable-cost-model** from drop down list.

4. Select **Generate This Report Now** option if not already selected. Complete the “Effective Period” From and To dates. Typically this would be from the beginning of the month to the end of the month.
5. Select the **Cost Info** tab, uncheck **Include resource summary in report**, uncheck **Show these columns in the usage table**, uncheck **Show these details in report**. Uncheck the **Show cost model info**. At this point, unchecking all these details provides only summary amounts, not the detailed lines in the monthly billing report to finance.
6. To first validate the report output before setting up a schedule, click **Generate Report** and view the report output. Note the placement of the template items in the Header and Footer of the Report as per the Report template configured earlier. Also, note the placement of the Report Name and Description you entered during the report creation. (Note: Template Title Text and Report Name are on page 1 only. Template Header Text and Report name are on the remaining pages)

Figure 4.5 h. Report Output – Utilizing New Report Template

7. Note the options for saving the report output by the various icons along the top of the report, i.e., Email, Save to Word, Save to PDF, Save to Excel. Test saving the report as an Excel file by clicking on the Excel icon. A Report Format box will pop-up and the **Click to Download** link (may be grey). Click it to save or open this report in Excel.
8. The output has been verified and the report template is producing the desired results, now schedule the report to run monthly by clicking the Reschedule this report icon (is in the same row of icons we used previously to save to Excel).

9. Specify it to run “Monthly”, on the 1st day of every month, and to start the first of the next month and do not specify an end date. Click on Schedule to submit the report to run on a schedule vs. immediately.
Figure 4.5 j. Scheduling Report to run automatically each month

10. Now select **Schedule Reports** to verify the scheduled report exists. Now, add the ability for the scheduled report to be emailed out when it runs on the defined schedule. This is achieved by selecting the report and then clicking on the **e-mail icon**. Complete the appropriate information and then click **Send** which will then present a dialog stating that the report will be emailed the next time it runs according to its definite schedule.

Figure 4.5 k. Emailing report
This concludes the setting up of automated reports utilizing the report template, setting up a schedule, and emailing of these reports when they run.

**4.6 Manage user access**

Chargeback includes appropriate user management features. The application has pre-defined a set of default permissions and roles. In addition, it allows you to create roles and users as per your own requirements.

This scenario will show how to setup access for a new Active Directory user with a pre-defined Report Viewer role. This role will allow the user to generate, archive, and view cost reports.

**Step 1: Add domain group and user**

1. If not already logged into Chargeback, log back in as user admin.
2. Ensure you know the name of a valid Domain User for your test domain as well as its primary domain group membership and password to use in this scenario. The Domain User “user1” and Domain Group “Domain Users” are used in the setup below.
3. Select the **Users & Roles** tab, click on the **Users** then click on **Create**. Select **LDAP Group** in the “User Type” drop down list, select your domain, in this example ‘tml-ad01’ in “LDAP Server” drop down list and enter the name of your Domain User in the search field and then select it in the search result list. Make sure the radio button **Do not define any role now…** is selected. Click **Add** to complete.

![Figure 4.6 a. Users – Add domain group](image)

4. Verify the Domain Group “Domain Users” has been added to the list of users. Repeat the same steps and add the Domain User “user1” and verify it’s added in the list afterwards. Remember to change User Type to “LDAP User” this time around.
Step 2: Assign “Report Viewer” role to domain group

1. Click on Permissions.
2. Select the hierarchy name my-datacenter-hierarchy, select Domain Users in list of users.
3. Select Report Viewer in “Set Role” drop down list and click Apply. Ensure the green checkmark appears next to the “Domain Users” under the “Roles” column.
Step 3: Run report as domain user

1. Log out of the current browser session and log back in as the AD user "user1". Remember to select "LDAP" for the "Login in to" option this time.

Figure 4.6 d. Login – LDAP user

2. After logging in you will notice the reduced number of tabs in the interface as “user1” is only assigned the "Report Viewer" role, allowing this user only to generate, archive, and view reports.

3. Select the Reports tab and run a variable cost report for the “Development” resource pool.

4. Verify that the user “user1” can run and view the report output.
Figure 4.6 e: Run Report – Domain User
5. Next Steps

With Chargeback, you can easily reap the following benefits:

- Create a simple, flexible, and accurate model for measuring costs in a shared IT services environment
- Make better resource utilization and allocation decisions by ensuring accurate measurement of the true costs of virtualized workloads
- Help end users make informed decisions about service levels requested with better visibility of their associated costs

In this paper, six basic use cases of Chargeback have been presented. Chargeback offers many additional features such as sophisticated billing policies of actual usage combined with resource reservations, virtual machine cost sharing, enterprise-wide chargeback reporting across multiple vCenter Servers, and more. You are welcome to try these features. Please refer to the VMware vCenter Chargeback User’s Guide for more details.

5.1. VMware Contact Information

For additional information or to purchase VMware vCenter Chargeback, VMware’s global network of solutions providers is ready to assist. If you would like to contact VMware directly, you can reach a sales representative at 1-877-4VMWARE (650-475-5000 outside North America) or email sales@vmware.com. When emailing, please include the state, country and company name from which you are inquiring.

5.2. Providing Feedback

VMware appreciates your feedback on the material included in this guide, and in particular would be grateful for any guidance on the following topics:

- How useful was the information in this guide?
- What other specific topics would you like to see covered?
- Overall, how would you rate this guide?

Please send your feedback to the following address tmdocfeedback@vmware.com, with “VMware vCenter Chargeback Evaluator’s Guide” in the subject line. Thank you for your help in making this guide a valuable resource.
## 6. Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LDAP User</td>
<td>Active Directory domain user</td>
</tr>
<tr>
<td>LDAP Group</td>
<td>Active Directory domain group</td>
</tr>
<tr>
<td>LDAP Server</td>
<td>Active Directory server</td>
</tr>
<tr>
<td>Compute-Farm</td>
<td>Name of ESX cluster in vCenter Server hosting VMs that are used as the source for cost reporting</td>
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EVALUATOR’S GUIDE
VMWARE VCENTER™ CHARGEBACK

7. VMware vCenter Chargeback Evaluation Worksheet

You can use the worksheet below to organize your evaluation process.

**Hardware Checklist:**

___ Physical server compatible with VMware ESX 4.0 Qty: ___
___ Storage (Shared/Local) >= 24GB
___ One desktop/laptop running MS Windows (e.g. XP/Windows Server 2003)

**Software Checklist:**

___ Windows Server 2003 Installation CD image
___ VMware ESX Server 4 Installation DVD image
___ VMware vCenter Server 4 installation zip file
___ VMware vCenter Chargeback installation file
___ License keys for all software components

**Installation Checklist:**

___ VMware ESX Server 4 installed on physical server(s)
___ VMware vSphere Client installed on the desktop/laptop running MS Windows
___ Virtual machines created on the ESX Server hosts prepared above
___ Windows Server 2003 (W2K3) installed as the guest operating system
___ VMware vCenter Server and database installed on one of the W2K3 virtual machines
___ VMware vCenter Chargeback installed on the other W2K3 virtual machine
___ VMware vCenter Chargeback installed on the other W2K3 virtual machine
___ AD/LDAP credentials to setup integration between Chargeback and AD
___ SMTP credentials to setup integration between Chargeback and email server

After you have successfully checked off the lists above, you can proceed to perform the evaluation of VMware vCenter Chargeback. For each scenario, you can use the corresponding checklist below to ensure that you are following the proper sequence.

**Use Case 1: Create chargeback hierarchy**

___ Step 1 - Login to Chargeback
___ Step 2 - Create custom hierarchy

**Use Case 2: Utilize fixed cost model**

___ Step 1 – Define fixed cost template
___ Step 2 – Define fixed cost model
___ Step 3 – Configure fixed cost model
___ Step 4 – Run report with fixed cost model

**Use Case 3: Utilize variable cost model**

___ Step 1 – Define variable cost template
___ Step 2 – Define variable cost model
___ Step 3 – Configure variable cost model
___ Step 4 – Run report with variable cost model

**Use Case 4: Generate comparison reports**

___ Step 1 – Run comparison report
___ Step 2 – Review comparison report results

**Use Case 5: Setup automated reports**

___ Step 1 – Setup a report template
___ Step 2 – Schedule automated report

**Use Case 6: Manage user access**

___ Step 1 – Add domain group and user
___ Step 2 – Assign role to domain group
8. Variable Cost Base Rates Calculations

Note that these calculations are only intended for illustrating how to calculate the base rates for various resources and not meant to represent any specific customer’s environment. Please refer to the Chargeback calculator link provided in the Help and Support During the Evaluation section to perform your own base rate resource calculations.

### Cluster Characteristics

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<td>Effective Number of Servers (n-1)</td>
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### CPU Usage Costs

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<th># of hours/day</th>
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