

# How to Implement Chargeback in a Virtualized Datacenter Using the Resource Consumption Model

A Step by Step Guide to Calculating Chargeback Rates for Memory, CPU and Storage

A Whitepaper by **Alex Bakman**  
*Founder and CEO, VKernel Corporation*  
abakman@vkernel.com



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## The Case for Chargeback

As I write this methodology the majority of data centers are undergoing the biggest overhaul in 25 years. Organizations are reducing physical servers by an order of magnitude or more. While organizations will experience long term savings in the process, in the near term even small companies will spend hundreds of thousands of dollars on new hardware and software. For large organizations the data center investment will run into many millions of dollars.

In many organizations the IT department has always been and will continue to be a cost center and an ongoing expense on the income statement. Most IT organizations simply can't make this massive investment in a new virtualized data center without charging and recovering costs from its business users. Thus the Chargeback process is a must do.

The idea of Chargeback is not new. It was pioneered in the "old" mainframe data center forty plus years ago where analogous organizations were spending millions of dollars to acquire mainframes, the use of which was shared by multiple departments

Even if your organization does not formally have a Chargeback process at a minimum you will want to use this process to show your users what it costs to support them. Without this type of cost visibility it is impossible to put in place the financial controls necessary to contain the virtual machine sprawl that has been identified by Gartner as the #1 challenge to managing virtual server environments.

Most organizations recognize the need for Chargeback, but simply do not know how to do it or where to start. The goal of this methodology is to provide an easy to understand approach to Chargeback. When used in conjunction with software such the VKernel Virtual Appliance or analogous software Chargeback does not have to be difficult nor time consuming

### Let's Get Started

Before you begin please download the companion Excel spreadsheet called "How to Calculate Chargeback Rates" available from [www.vkernel.com](http://www.vkernel.com).

The proposed methodology enables organizations to recover data center expenses by allocating costs to end user departments based on their actual use of hardware resources, software and other expenses in the Datacenter. This process is analogous to how a power company supplies electricity or a gas company delivers natural gas. Customers are charged for resources they actually

"As virtualization becomes more broadly implemented over the next few years, we expect forward-thinking IT leaders will change their IT chargeback processes now to get ready for it."

– Joseph Pucciarelli,  
ITMS Principal Analyst,  
Technology Financing



use. When electric and gas companies calculate the rates they must charge to recover their costs and make a profit. Similarly, IT departments must come up with rates for CPU, memory, storage and network that will recover the costs of buying hardware, software and operating the datacenter. If profit is desired it must be figured into the rates as well.

The proposed methodology has several advantages:

*Easy to understand*

Experience has shown that if Chargeback is too complex people resist it.

*Quick to implement*

Simply add a new host and recovery date to the spreadsheet and the rates you need to charge are automatically updated.

*Flexible*

You decide what the cost recovery timeframe is. You can even take existing hardware that was already purchased and accelerate its recovery.

*Fair*

Cost centers get used only for the resources they use.

*Extensible*

Similar ideas can be applied to chargeback for other expenses such as software licenses, admin cost, electricity, etc.

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## The Big Picture

The overall idea is to recover Datacenter expenses over a period of time, spread the cost among multiple cost centers, charge users for the resources they actually use and quantify resource usage based on specific rates to fully recover the expenses.

The methodology is designed to deal with additions and removals of server hardware and storage – a real world scenario.

The old fixed model per server simply does not work anymore. In a dynamic ESX environment where VMs are automatically VMotioned from one host to another, a physical server is no longer a relevant boundary. Resource Pools and Clusters determine where and how resources will be used. Thus the only methodology that makes sense is one based on resource consumption, regardless from which host resources are drawn.

We now outline a step by step process you can use to calculate



daily chargeback rates for CPU, Memory and Storage. Be sure to download the spreadsheet called “How to Compute Chargeback Rates” from [www.vkernel.com](http://www.vkernel.com).

## The VKernel Methodology

### ***Step 1 – List all purchased hosts and the amount spent on hardware.***

Here you want to list all server hardware that is used in your environment to support ESX. Be sure to exclude software expenses. You can also optionally exclude the cost of local storage to more accurately calculate CPU and memory costs. Storage chargeback can be calculated separately under “Storage” tab. Define each host by its vendor name, model or any other naming convention used in your organization.

### ***Step 2 – For each host specify the number months in which the cost needs to be fully recovered.***

The usual number here is 36 or 48 months. However, there is nothing wrong with a shorter period of time. Experiment with different time frames to see how it impacts your rates. Existing hardware may be good candidates for a shorter recovery period.

### ***Step 3 – For each host specify how many departments, clients, or cost centers will use the hardware and therefore be charged.***

The idea here is that since the host will be a shared resource, in order to correctly allocate costs we must know how many cost centers will be using it. If you have organized your environment into clusters and resource pools you have a good idea in which resource pool the new host will participate. Keep in mind the less “shared” the server will be, the higher the chargeback rates.

The spreadsheet now calculates exactly how much money you need to recover for this host on a monthly basis for CPU and memory. The next steps will show you how to tie the recovery rates to CPU and memory usage to calculate daily rates.

“Experiment with different time frames to see how it impacts your rates. Existing hardware may be good candidates for a shorter recovery period.”



**Step 4 – For each host use Virtual Center, VKernel or other software to tell you how many GHz of CPU is used on the host on average in a given month.**

In this step we are tying CPU usage to dollars. If for instance, we know that we need to recover \$4 per month for CPU, the idea here is to figure out the total CPU cycles per month and determine the rate we need to charge when all or some of the CPU cycles are used. For existing hosts you should capture information about cycles used by looking at past 3 to 6 months. Keep in mind if the usage increases you will have to update this cell to make sure that the rates are being calculated correctly.

For a new host use the CPU specification to figure the maximum CPU monthly cycles. Remember that you can always adjust this number over time once the host is in production and you see how it is really being used.

**Step 5 – For each host use Virtual Center, VKernel or other software to tell you how much memory in Gigabytes is being consumed on average in a given month.**

This step is similar to step #4 except that we are dealing with memory here. Once we know how much memory is being utilized on this host in a given month, we can figure out how to relate it to the amount of money we need to recover per month to pay for memory.

In both steps 4 and 5 you will notice that we use calculated rates based on allocation of 60% of hardware cost to memory and 40% to CPU. At first this may seem confusing, but it actually makes sense. In general memory is slightly more expensive than CPU. I am sure you have noticed that the cost per Gigabyte of memory actually increases as you get more memory (no volume discounts here). For example you can buy 1 Gigabyte of memory for about \$50. If you wanted to buy 16 Gigabytes you will spend about \$2100.

CPUs in general make up a smaller percentage of cost. For the most part adding CPUs to a host is less expensive than adding more memory. This is not surprising since before virtualization CPU was underutilized, which by the way sparked the idea that the underutilized CPUs could run more “virtual servers”. Memory, however, is a different story. Applications are not using less

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memory when virtualized, thus we allocate more cost to memory over CPU

Now the spreadsheet calculates exactly how much you should charge daily. If you need to make a profit enter the percentage there and use the adjusted rates.

***Step 6 – Repeat the process for the Storage calculation.***

Click on the “Storage” tab and go through the same calculation to calculate the storage rates.

I hope this approach helped you determine your rates. Please send your feedback and suggestions to me at [abakman@vkernel.com](mailto:abakman@vkernel.com).

For more information or to learn more,  
call 866-370-2733 or  
visit [www.vkernel.com](http://www.vkernel.com).

