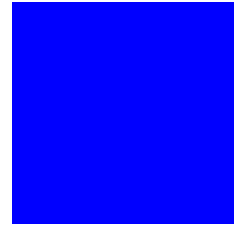


# **CIMS LAB, Inc.**

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## **CIMS Chargeback OpenVMS User Guide**

Version 8.0.9

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# Preface

As companies continue to integrate computer technology into their business operations, it becomes increasingly important to properly administer the IT function, particularly with respect to performance and cost. And the best way to control costs is to plan for them.

CIMS Chargeback is a comprehensive, flexible software solution that consolidates a wide variety of accounting data for multiple operating systems into a single file that may be accessed from either the mainframe or a workstation. Simply put, CIMS Chargeback is an essential component of an effective financial management system.

## Philosophy

Originally developed in 1974, CIMS has focused on meeting the financial and resource reporting requirements of Information Services Departments. CIMS has evolved with corporate IT management requirements. Focused commitment to client service and support sets CIMS apart from competing products. Our goal is to provide the best chargeback and resource reporting software in the world at the lowest possible cost to our customers.

The CIMS Lab strongly believes in and executes the concept of continuous product improvement. Customers have access to CIMS product development personnel to ensure that customer feedback and other critical issues are incorporated into the next release of the product.

## **Contacting the CIMS Lab**

You can contact us with any questions or problems you have. Please use one of the methods below to contact us.

### **For product assistance or information, contact:**

USA & Canada, toll free	(800) 283-4267
International	(916) 783-8525
FAX	(916) 783-2090
World Wide Web	<a href="http://www.cimslab.com">www.cimslab.com</a>

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## About This Guide

The *CIMS for OpenVMS User Guide* describes the various components of CIMS and those OpenVMS components used by CIMS. It also discusses how to set up your CIMS environment, collect accounting data, and generate reports for your system.

This guide assumes that the appropriate CIMS Chargeback components have been installed at your site. The instructions for installing the product are in the *CIMS Chargeback OpenVMS Installation and Getting Started Guide*.

Ch. No.	Chapter Name	Content Description
1	<i>Introduction</i>	Discusses OpenVMS and CIMS system accounting.
2	<i>Setting Up</i>	Discusses some of the basic concepts of setting up CIMS.
3	<i>Reporting</i>	Discusses the various reports CIMS produces.
4	<i>Consolidation</i>	Discusses how to process the OpenVMS accounting data.
	<i>Index</i>	Helps you locate information within this manual.

## Conventions

Some or all of the following conventions appear in this guide:

Symbol or Type Style	Represents	Example
<b>Bold</b>	a new term	...called a <b>source object</b> .
<i>Alternate color</i>	(online only) hotlinked cross-references to other sections in this guide; if you are viewing this guide online in PDF format, you can click the cross-reference to jump directly to its location	...see <i>Chapter 3, Data Migration</i> .
<i>Italic</i>	words that are emphasized	...the entry <i>after</i> the current entry...
	the titles of other documents	<i>CIMS for OpenVMS Installation and Getting Started Guide</i>
	syntax variables	<code>COPY filename</code>
Monospace	directories, file names, command names, computer code	<code>&amp;HIGHLVL.SRCLIB</code>
	computer screen text, system responses, command line commands	Copy file? Y/N
Monospace bold	what a user types	...enter RUN APP.EXE in the Application field

Symbol or Type Style	Represents	Example
▶	choosing a command from a cascading menu	File ▶ Import ▶ Object
Highlighted Screen Text	used to callout screen text on character- based screen captures. (When viewed online, the screen text will be blue.)	Dataset.... Product.... Parmlib...

## Related Publications

As you use this guide, you might find it helpful to have these additional books available for reference:

- *CIMS for OpenVMS Installation and Getting Started Guide*
- *CIMS for OpenVMS Reference Guide*
- *CIMS Chargeback OpenVMS Messages Guide*

## ■ Preface

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*Related Publications*

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# Introduction

This chapter gives an overview of system accounting and discusses the relationship of OpenVMS to CIMS. It defines system accounting data and explains how it is collected, saved, and used to produce the CIMS reports and displays. Understanding the flow of this data should help you use CIMS for OpenVMS.

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## What is System Accounting?

System accounting starts with collecting information about your computer system's usage.

System accounting information includes a detailed data record logged for each system activity. These records log specific resources, time of day, and other information for:

- Interactive process terminations
- Batch job terminations
- Print job completions
- System reboots
- Project logins
- Project switches
- Login failures
- Print forms used
- Images run

You can use CIMS for OpenVMS to collect, categorize, and interpret this detailed accounting data to find out and report on your system. This reporting ability has two broad applications:

- **Chargeback**—Billing users for system use
- **Resource management**—Finding out how to get the most out of your system and how your system is being used or justifying system upgrades.

CIMS is a group of software programs, or utilities, that perform these tasks for you. CIMS collects OpenVMS system accounting data and its own data. It processes the data and then presents it in concise management reports.

## OpenVMS Accounting Data

### Where Does OpenVMS Data Come From?

The OpenVMS job controller manages jobs on the computer system. These jobs can be interactive processes, batch jobs, or printouts requested by anyone using the system. All these activities consume system resources. OpenVMS keeps track of this consumption; the job controller logs this cumulative information and stores it in a disk file.

You must enable OpenVMS accounting to run CIMS. Use the DCL `SET ACCOUNTING` command to enable or disable OpenVMS accounting, select the kind of information to log to the accounting file, or start a new accounting file. For more information about this command, refer to the *OpenVMS DCL Dictionary* and the `SET ACCOUNTING` command.

### Processes Started with No Accounting

You can start a process on OpenVMS for which no accounting information is maintained, even when you have enabled Accounting with the `SET ACCOUNTING` Command.

There are some processes that DEC routinely starts with no accounting, most notably some of the DECnet detached processes.

Since CIMS relies on the data collected by OpenVMS, and OpenVMS does not maintain any accounting information for these processes, CIMS does not attempt to track processes started with no accounting.



## Where is OpenVMS Data Stored?

OpenVMS accounting data is stored in the OpenVMS accounting file. This file is usually stored in the SYS\$MANAGER directory with the file name ACCOUNTNG.DAT. The OpenVMS job controller updates it whenever:

- The system is initialized
- A user logs off
- A batch job finishes executing
- A print job completes
- An image finishes executing
- Other types of processes finish executing

The OpenVMS accounting files are complex because of their numerous and variable record formats. The file may be large and bulky due to continuous logging of system activity. In addition, the data is incomplete for most system accounting and reporting needs. CIMS adds flexibility to accounting data collection, automatically condenses information for chargeback and reporting, and achieves a hands-off system accounting operation.

OpenVMS users can send messages to the job controller that are inserted in the OpenVMS Accounting file. CIMS uses this feature to filter and store additional data in the file. For information about accounting file records and their formats, see the *OpenVMS Accounting Utility Reference Manual*.

## **CIMS Accounting Data**

The sections below discuss CIMS accounting data—what data is collected, where it is stored, where it comes from, and how it is used.

### **What Data Does CIMS Collect?**

CIMS collects data from the OpenVMS system accounting file, from its own data files, and from the OpenVMS job controller. In producing reports, CIMS uses the resource information from the OpenVMS accounting files and additional information from its own files. The CIMS Administrator for your system provides this information when setting up CIMS.

CIMS also collects dynamic information from the job controller that is normally not stored in the OpenVMS Accounting File.

The OpenVMS Accounting Utility does not collect any disk space accounting information suitable for resource management or chargeback. Therefore, CIMS collects disk space utilization information and stores it in the CIMS files.

### **Where is CIMS Data Stored?**

CIMS stores its data in files contained in the CIMS data directory.

In addition to the data CIMS collects itself, CIMS also processes OpenVMS accounting data. After CIMS processes and condenses the OpenVMS accounting files, it stores the information in its own statistical files.

## The CIMS Statistical Files

These statistical files contain information for your reporting period. Unlike the OpenVMS accounting files, which are bulky and difficult to handle, most CIMS files are RMS (Prolog 3) indexed files for maximum storage efficiency, access speed, and ease of accessibility. The statistical files that CIMS maintains are:

- ARSAP\_AUDIT.SYS—session statistics
- ARSAP\_CAPACITY.SYS—capacity planning statistics
- ARSAP\_IMAGE.SYS—image and software package statistics
- ARSAP\_STATISTICS.SYS—user and project statistics
- ARSAP\_TERMINAL.SYS—terminal statistics
- ARSAP\_STORAGE.SYS—disk space storage statistics

Depending on your specific accounting and resource management requirements, you might not need all of these files at your site. The files ARSAP\_TERMINAL.SYS (the CIMS Terminal file), ARSAP\_IMAGE.SYS (the CIMS Image file), and ARSAP\_CAPACITY.SYS (the CIMS Capacity file) do not need further processing before they are used in generating reports. However, the ARSAP\_STATISTICS.SYS (the CIMS Intermediate Statistics file) needs further processing.

## The CIMS DATA Files

While the CIMS statistical files contain condensed accounting information from the OpenVMS accounting files, additional data from other sources must be merged with the intermediate CIMS Statistics File for reporting on users, projects, or groups of users or projects.

The information merged with the OpenVMS accounting information in this file includes disk space information and various other *tags* the CIMS reporting utilities use to group accounts into departments, classes, and so forth.

The CIMS VMS\_MERGE Utility performs this merging operation:

- VMS\_MERGE first copies the intermediate CIMS Statistics File to the merged CIMS Statistics File (ARSAP\_STATISTICS.DAT).
- It then merges storage information collected by CIMS and stored in the CIMS Storage Files (ARSAP\_STORAGE.SYS;\*).
- The last step involves merging tag information from the OpenVMS Authorization File (SYSUAF.DAT) and the CIMS Authorization File (ARSAP\_UAF.SYS).

The file created by this merging contains the complete, condensed, and correlated information used by the CIMS Resource and Chargeback Reporting Utilities. The file includes information such as usage data for a wide variety of computer resources, organizational entities, software usage data, interactive and batch job resources, and disk space usage.

## **How does CIMS Process OpenVMS Accounting Data?**

CIMS can process the OpenVMS accounting data in two ways:

- Batch mode
- Real-time mode

## Batch Mode Data Processing

OpenVMS continuously collects accounting data for different processes which the OpenVMS job controller periodically writes to accounting files. These OpenVMS accounting files contain process and session specific accounting statistics such as time started, time stopped, CPU time, and number of I/Os. This information is stored as a series of variable length binary records composed of various packets of information. You can also put user-defined records into the OpenVMS accounting files, using a OpenVMS system service (`$SNDJBC`).

However, the accounting files OpenVMS creates are unsuitable for reporting, so CIMS processes them into the statistical files described previously.

The CIMS `VMS_SELECT` Utility reads the OpenVMS accounting files, selects all data that falls within the dates you request, and stores the information in the CIMS statistical files for producing reports or further processing.

This method of data reduction of the OpenVMS-collected accounting data is often called *batch* mode since this procedure condenses accounting files at periodic intervals usually by a batch job.

## Real-Time Mode Data Processing

The other method of processing or collecting the accounting data is to receive the information directly from the OpenVMS job controller. The information is stored directly into the intermediate CIMS Statistics File. This process stores the information in the same files as in batch-mode, but the data collection is accomplished dynamically as the job controller outputs the information.

This method is referred to as *Real-Time* mode. In some environments, the CIMS Real-Time accounting feature significantly improves control of OpenVMS users while providing valuable feedback immediately to users about their computer system usage.

For more information about real-time accounting, see [Chapter 1, CIMS System-wide Options](#) in the [CIMS for OpenVMS Reference Guide](#).

## How is the CIMS Data Used?

Data is used by the various CIMS Reporting Utilities to produce reports:

Utility	Reports
ACTIVITY	User activity reports.
AUDIT	Audit trail session reports.
CAPACITY_REPORT	Capacity planning reports.
DISK_REPORT	Disk utilization reports.
IMAGE_REPORT	Image and package utilization reports.
INVOICES	Project or user invoices for chargeback.
MYCOST	Charges and statistics displayed for the current session as well as period-to-date information.
RESOURCE_REPORT	Various resource utilization reports.
TERMINAL_REPORT	Terminal usage reports.

---

## System Examples and Accounting Data Flow

This section contains figures of single and clustered CPU systems with batch mode and real-time accounting.

### Single CPU System with Batch Mode Accounting

The following illustration shows how system accounting data flows through OpenVMS and CIMS in a single, standalone CPU system with batch mode accounting.

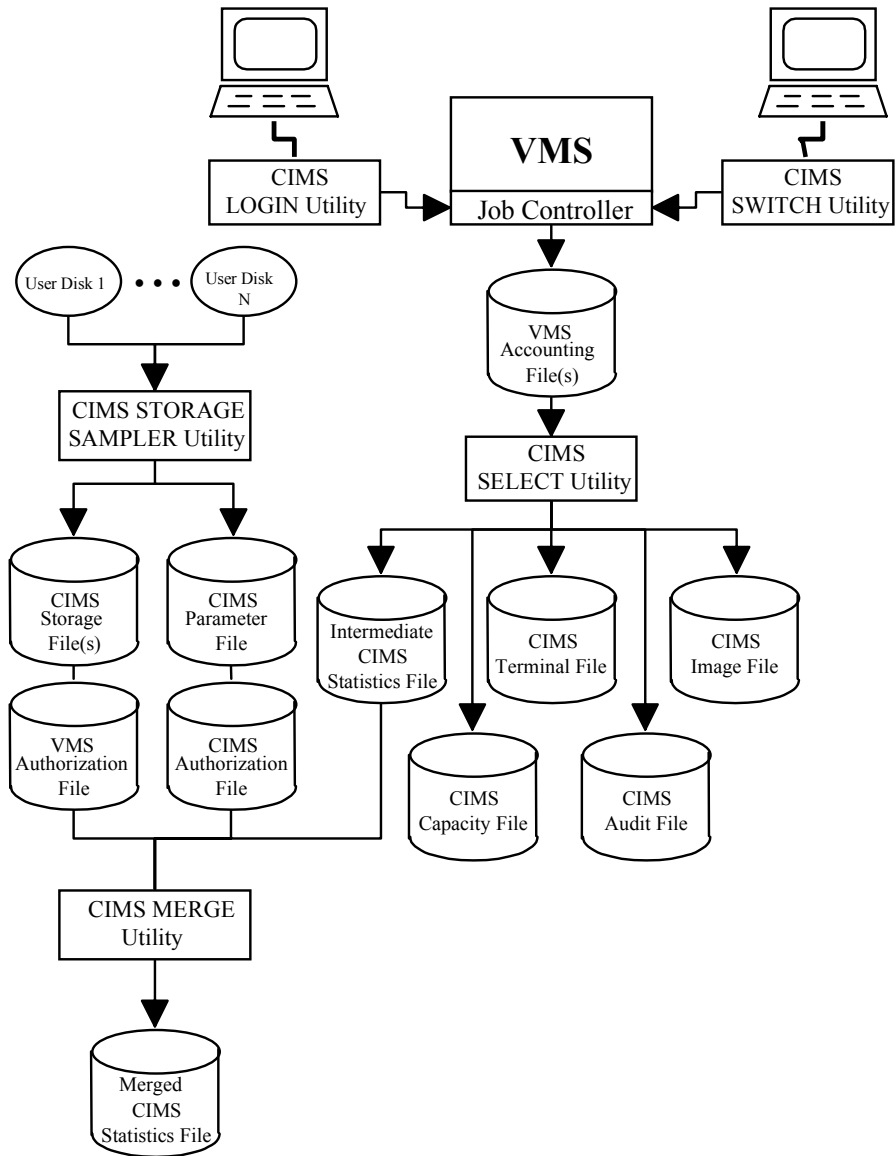
Note that four components in this figure are most important.

- OpenVMS and the Job Controller. The Job Controller sends accounting data to the OpenVMS Accounting File.

- **The OpenVMS Accounting File(s).** All OpenVMS accounting data is stored in this file.
- **The CIMS VMS\_SELECT Utility.** This utility is used to process the OpenVMS accounting files and store the information in the various CIMS files.
- **The CIMS VMS\_MERGE Utility.** This utility merges the intermediate CIMS Statistics File with disk utilization statistics and other information into the merged CIMS Statistics File.

## ■ Introduction

### System Examples and Accounting Data Flow





## Single CPU System with Real-Time Accounting

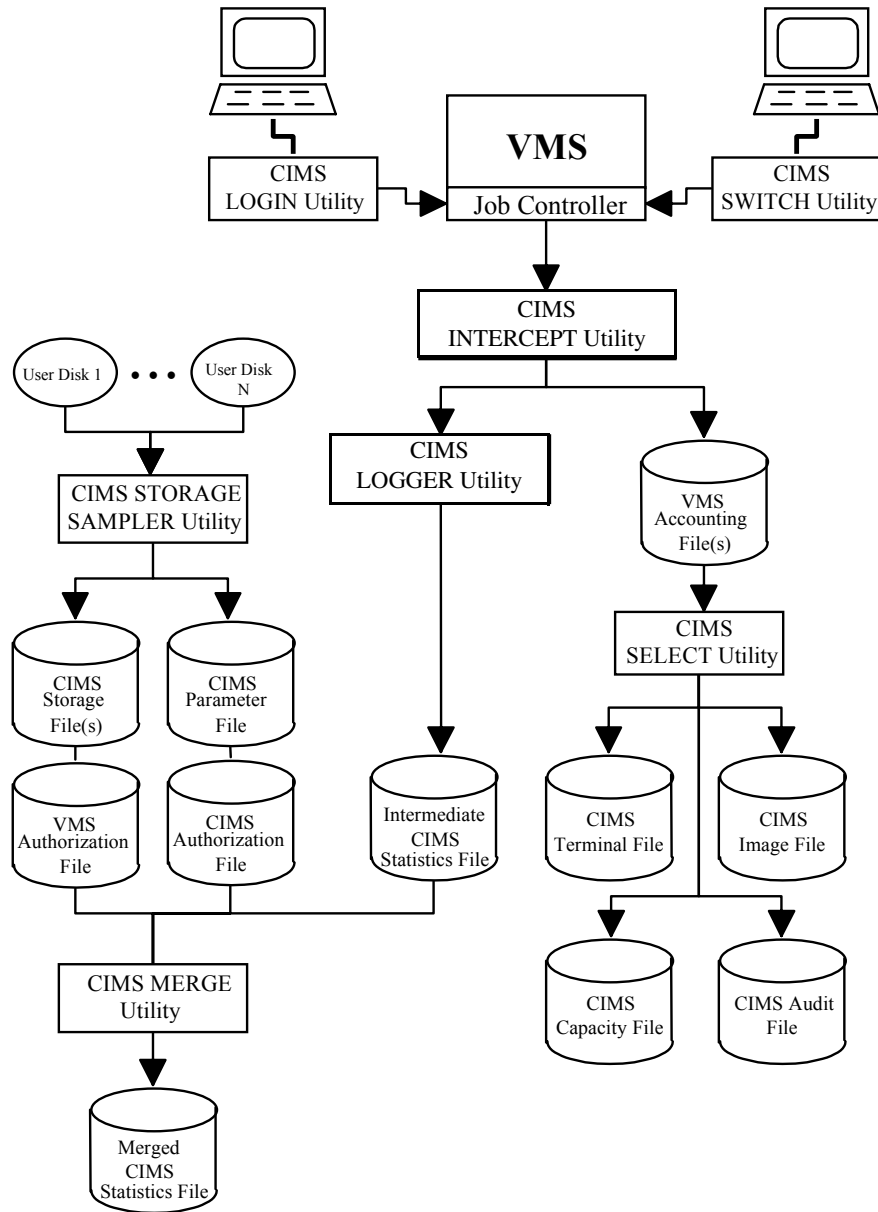
The following illustration shows how system accounting data flows through OpenVMS and CIMS in a single, standalone CPU system with the CIMS real-time accounting feature enabled. The shading indicates the components in the flow that are different from a single CPU system with batch mode accounting.

Note that six components in this figure are most important.

- **OpenVMS and the Job Controller**—The Job Controller sends accounting data to the CIMS INTERCEPT Utility.
- **CIMS INTERCEPT Utility**—This utility takes the accounting data from the OpenVMS Job Controller, sends it to the CIMS LOGGER Utility, and writes it to the OpenVMS Accounting File.
- **CIMS LOGGER Utility**—This utility takes the OpenVMS accounting data from the CIMS INTERCEPT Utility, processes it, and stores the resulting statistics in the intermediate CIMS Statistics File.
- **OpenVMS Accounting Files**—The CIMS INTERCEPT Utility writes all OpenVMS accounting data this file.
- **CIMS VMS\_SELECT Utility**—This utility processes the OpenVMS accounting files and stores the information in the various CIMS files.
- **CIMS VMS\_MERGE Utility**—This utility merges the intermediate CIMS Statistics File with disk utilization statistics and other information into the merged CIMS Statistics File.

## ■ Introduction

### System Examples and Accounting Data Flow



## Clustered CPU's with Batch Mode Accounting

CPU's (or nodes) in a cluster are single standalone CPU's sharing one disk farm for system accounting. Each CPU has its own private OpenVMS Accounting Files, and OpenVMS logs no information to these files to indicate on which CPU the information originated.

CIMS pulls together the information from the various CPU's and tags it with the CPU's nodename in the CIMS intermediate files.

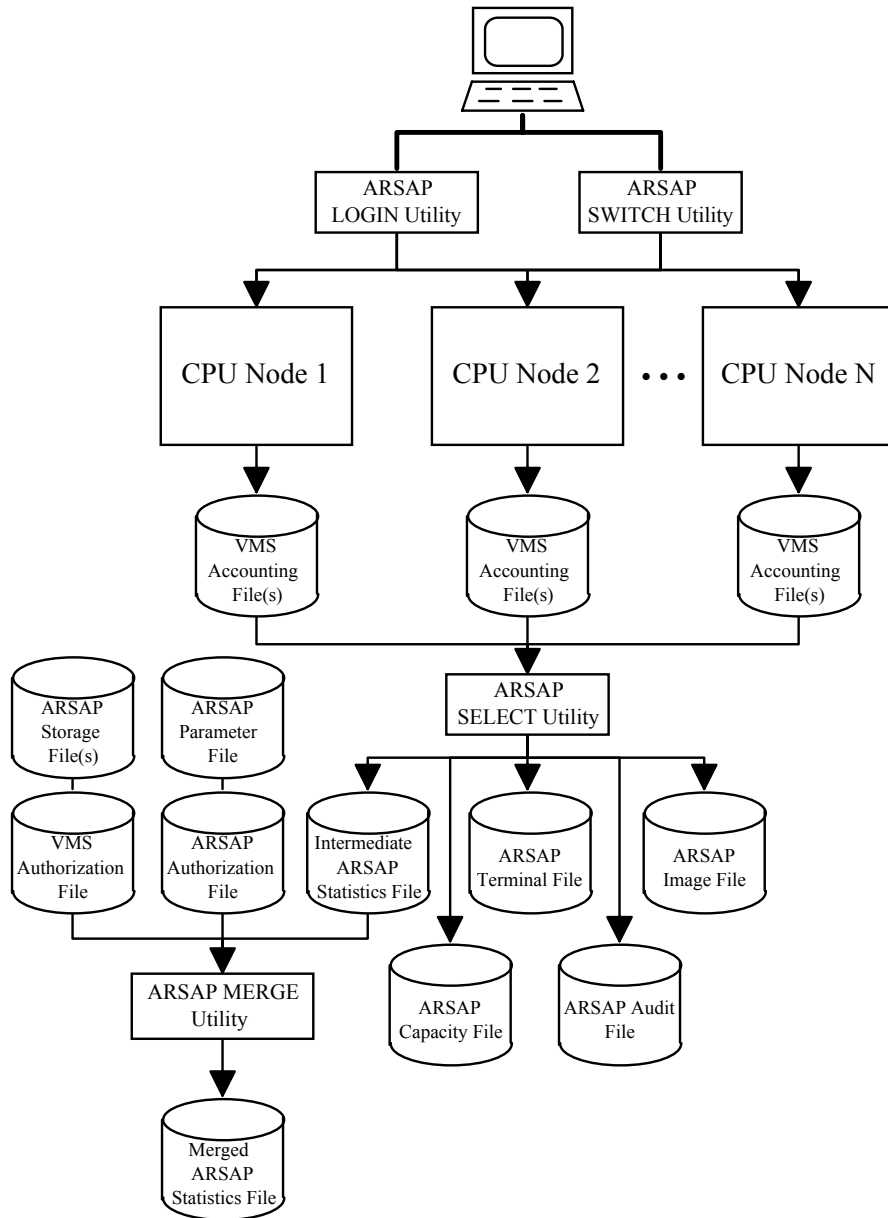
The following illustration shows how system accounting data flows through OpenVMS and CIMS in a clustered, multi-CPU system with batch mode accounting.

Note that four components in this figure are most important.

- **CPU nodes in the cluster, on which OpenVMS and the Job Controller execute**—The Job Controller sends accounting data to the OpenVMS Accounting File.
- **OpenVMS Accounting Files**—All OpenVMS accounting data is stored in this file.
- **CIMS VMS\_SELECT Utility**—This utility processes the OpenVMS accounting files and stores the information in the various CIMS files.
- **CIMS VMS\_MERGE Utility**—This utility merges the intermediate CIMS Statistics File with disk utilization statistics and other information into the merged CIMS Statistics File.

## ■ Introduction

### System Examples and Accounting Data Flow



## Clustered CPU's with Real-Time Accounting

If the CIMS real-time accounting option is enabled, accounting data is processed and put directly into the CIMS intermediate files as the it is generated. The CIMS utilities INTERCEPT and LOGGER receive and process this accounting information.

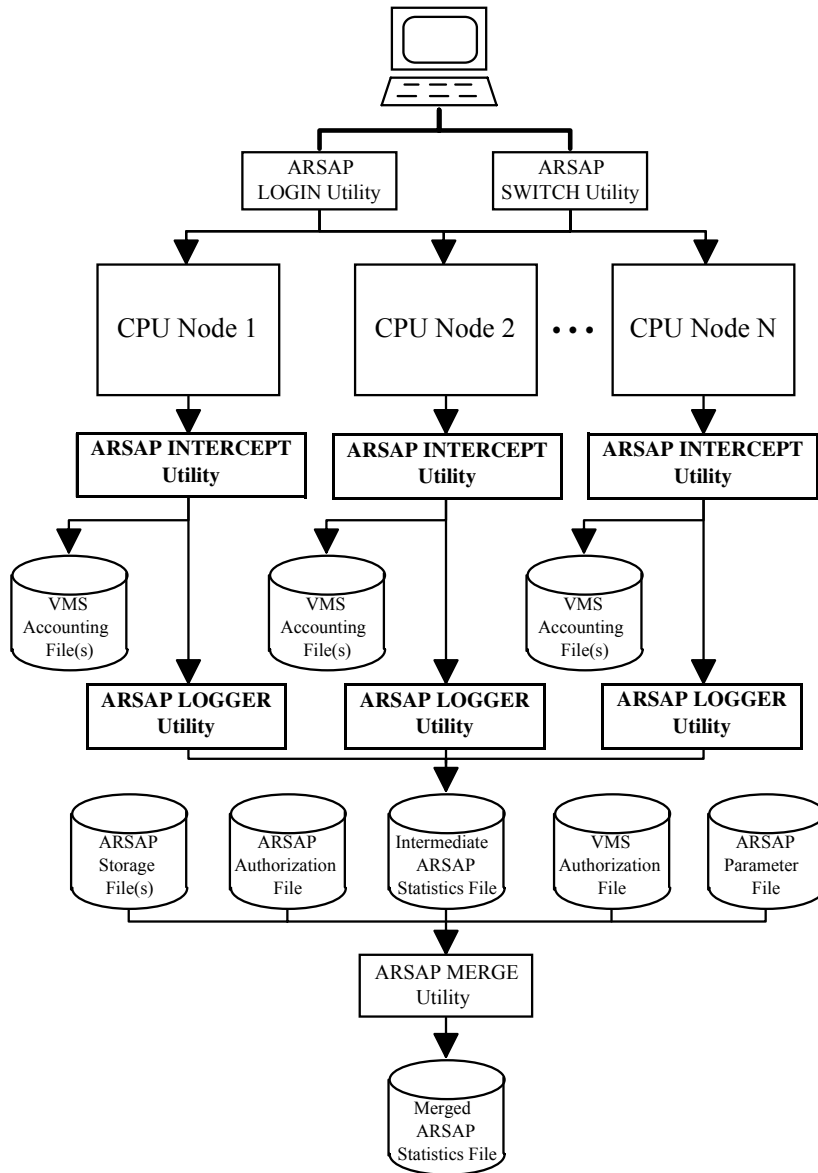
The following illustration shows this system accounting data flow in a clustered, multi-CPU system with the CIMS real-time accounting feature enabled. Shading indicates the differences between this illustration and the illustration for clustered CPUs with batch mode accounting.

Note that six components in this figure are most important.

- **CPU nodes in the cluster, on which OpenVMS and the Job Controller execute**—The Job Controller sends accounting data to the OpenVMS Accounting File.
- **CIMS INTERCEPT Utility**—This utility runs on each node in the cluster. It takes the accounting data from the OpenVMS Job Controller, sends it to the CIMS LOGGER Utility, and writes it to the OpenVMS Accounting File on that node.
- **CIMS LOGGER Utility**—This utility runs on each node in the cluster. It takes the OpenVMS accounting data from the CIMS INTERCEPT Utility, processes it, and stores the resulting statistics in the intermediate CIMS Statistics File.
- **OpenVMS accounting files**—One current accounting file exists on each node in the cluster. The CIMS INTERCEPT Utility writes all OpenVMS accounting data to this file.
- **CIMS VMS\_MERGE Utility**—This utility merges the intermediate CIMS Statistics File with disk utilization statistics and other information into the merged CIMS Statistics File.

## ■ Introduction

### System Examples and Accounting Data Flow



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# Setting Up

You can accomplish system accounting in many ways. Different environments have different system accounting requirements. To meet the needs of multiple organizations flexibly and to allow you to specify how CIMS should be installed and used on your system, we provide a variety of features, which are implemented with parameters and options.

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Features of User Accounting .....	2-12

## Selecting CIMS Features

After you install CIMS on your system, you can select the features that you need. Some CIMS features are not needed at some user sites. Some features might not be useful now but can become useful later. Most importantly, CIMS features are provided to give your organization room to grow within the CIMS product.

You select the CIMS features to implement by either enabling or disabling options and parameters. You can enable or disable features either system-wide or on an account-by-account basis either when CIMS is first installed or at any later date.

The CIMS Parameter File contains information about how accounting is implemented at your site; this includes your system-wide option and parameter selections. You use the CIMS SETUP Utility to make changes to this file; the file contains flags that determine whether the option is enabled and parameters that determine how the option operates on your system.

When you start up CIMS on your system, CIMS reads this setup file to determine how to implement your accounting system. If you change an option or parameter in the CIMS Parameter File, that change takes effect the next time CIMS is started on your system when the various CIMS utilities read the CIMS Parameter File. Generally when making a change, you should stop and restart CIMS to ensure that all CIMS utilities know of the change at the same time.



The need for some options or parameters are obvious, while others might seem relatively unimportant to you at this point. As you read through each description in the options and parameters chapters, you learn of different issues to help you weigh the importance of the feature for your particular accounting needs. Do not be concerned if the implications for all of these options and parameters are not apparent initially. You can change any of them later on.

You can also enable and disable some system-wide options for individual username or project accounts. For individual account settings, use the `CIMS AUTHORIZE` Utility. This utility sets the option or parameter flag to the proper value for a username or project account in the `CIMS Authorization File`.

## Default Accounts

The `CIMS Authorization File` contains user and project records. Every user on your system has a user record. When you use Project Accounting, every project on your system has a project record. Each user and project record in this file contains a number of flags and parameters for that user or project. These flags and parameters determine the system accounting environment for the user or project.

As new users and projects are added to this Authorization File, a new record is added. The initial (or default) values for the parameters and flags for this new record are taken from the user or project `DEFAULT` record. When you explicitly add a new user or project, you can specify settings of particular flags and parameters different from the default. However, if you do not explicitly specify flags and parameters, they are taken from the user or project `DEFAULT` record.

Note that if you already have users, projects, or both in the `CIMS Authorization File` when you make a change to the user or project default record, you must also change, normally with one command, all the existing records so that all users or projects have the same settings.

The sections on *Features of User Accounting* on page 2-12 and *Features of Project Accounting* on page 2-6 discuss these default accounts in more detail.

## Enabling Options and Parameters

### *To enable an option or parameter*

- 1** Enable the option or parameter system-wide using the CIMS SETUP utility and set any associated fields.
- 2** If you can enable the option for an individual username or project account, set the USERNAME or PROJECT DEFAULT account according to how you want to treat any user or project account that has not yet been added to the CIMS Authorization File. Also set associated USERNAME or PROJECT DEFAULT parameters in the CIMS Authorization File.
- 3** Enable or disable the option for all USERNAME or PROJECT accounts already established in the CIMS Authorization File and set any associated USERNAME or PROJECT account parameters.

## Project Accounting Setup

Often, you cannot manage computer resources or charge for system use by assigning an invoicing or reporting scheme to individual user accounts. Frequently, it is appropriate to track computer resource usage and charge information by activity as well as by user.

For example, a company has a contract or task to develop a product or perform a service that involves computer usage. The OpenVMS accounting system does not provide an efficient or convenient means of tracking the computer usage costs associated with such activities. OpenVMS tracks usage only to individual users, not by task, project, or activities.

One method for determining these figures, using the OpenVMS accounting system alone, is to hand-tabulate the statistics and charges incurred by each user involved in a particular task. Then, implement some sort of tracking system that, at best, is manual, time consuming, and potentially inaccurate.

Generally, this method is inadequate since it cannot ensure that every computer session has been allocated to a task or to the correct task. This method also eliminates any possibility of automatically generating various usage, financial, or managerial reports. It also lacks auditing and accounting capabilities or controls that might be required by the customer being billed or your upper management.

Another method assigns a different OpenVMS username account to each task and requires all users to log onto OpenVMS by task. This method is certainly better than the first, but also has limitations. For example, a user working on multiple tasks must now maintain several OpenVMS accounts and passwords. If the same password is used on several accounts and by several people, serious security problems can result. It is also impossible to produce accounting or resource management reports for each person. Furthermore, a user cannot work on several tasks during a single computing session since there is no way to determine accurately what proportion of the charges and statistics are associated with each task.

CIMS provides a solution to these problems through the Project Accounting option. Project accounting is implemented in a manner similar to user accounting except that it is not OpenVMS-initiated. CIMS supplies its functionality.

## Features of Project Accounting

The following section discusses the CIMS implementation of Project Accounting to help you decide the features to implement at your site and the reporting structures you need.

You can enable Project Accounting for all users or just for selected users. If you track Project Accounting statistics only for selected users and also track user accounting statistics (which must be collected for all users or none), then the total statistics for all users on your system does not equal the total statistics for all projects.

### **Project Names**

A PROJECTNAME can be from 1 to 96 characters and must be composed of the uppercase alphanumeric characters, the dollar sign (\$), the underscore (\_), the dash (-), and the period(.).

### **Project Access Control**

You can validate a project by password (verifying that the user is authorized to access the project), by checking that the user account has been authorized to access the project, or by a combination of the two. You can also disable project validation to omit authorization checking.

### **Assigning Default Projects for Users**

You can assign a project to a user's session automatically and transparently, or you can have the user prompted interactively to enter the project when logging on to the system. With the transparent method, the CIMS Administrator can conceal from a user the fact that the user is using Project Accounting. This method is also useful when a user always begins with the same project. The project is often referred to as a user default project.

If a user is prompted for a project when logging on, that user must enter a valid project name before the logon process can complete.

## **Project Budget Limits**

You can assign a budget limit to a project. For those projects with budget limits, you can also establish a warning zone. Then users of the project are informed when they approach the project budget limit. When the budget limit is reached, the CIMS Administrator can deny access to the project or allow access even when the project is over budget.

## **Project Storage Limits**

You can assign a storage limit (number of disk blocks used) to a project. A warning zone can inform users of the project when they are approaching the project storage limit. When the storage limit is reached, the CIMS Administrator can deny access to the project or allow access even when the project has exceeded its storage limit.

## **Switching Projects**

Users can change projects without having to log out and log back in with a new project.

## **Project User Identification Codes (UICs)**

You can assign a User Identification Code (UIC) to a project so that when a user performs an on-line switch to the project, the user's default UIC is set to the project's UIC. Changing a UIC can have security implications.

This enables all users working on a project to access the project files and allows CIMS to assign storage information to a project.

## **Project Default Directories**

A project can have a default directory associated with it so that when a user switches to the project, the user's default directory is set to the project's directory. This enables all users working on the project to store their files in the same directory.

### **Project Privileges**

You can assign OpenVMS privileges to a project so that when a user switches to the project, process privileges are changed to those associated with the project. When the user switches out of the project, process privileges can revert to the user's default privileges at login.

### **Project Command Files**

You can assign a command file to a project so that when a user switches to the project, the command file is executed (conceptually a project LOGIN.COM file).

This enables the users on the project to share, for example, DCL symbol definitions and logical names.

### **Project Lifetimes**

You can assign a *lifetime* to a project, expressed as an OpenVMS date. When this date is reached, the project expires and access to the project is denied.

### **Project Start Date**

You can assign a start date to a project, expressed as a OpenVMS date. If a project start date is assigned, the project cannot be used until the specified date.

### **Project Descriptions**

You can assign a description to a project. A project description is a 30-character tag that is passed to the merged CIMS Statistics File, providing a narrative or comment that describes the project on the project report. This can be useful with cryptic project names.

### **Project Cost Centers**

You can assign a cost center associated with it. A project cost center is a grouping of projects; this grouping can be arbitrary. A cost center name can have up to 32 characters.

The CIMS reporting utilities lets you produce reports based on cost centers. For example, when you group your projects into the particular company department the project is in, you can use the CIMS RESOURCE\_REPORT Utility to produce a report showing the total resources used by each department.

## Project Groups

You can assign up to five groups to a project. A project group, like a project cost center, is an arbitrary grouping of projects. A project group name can have up to 32 characters.

The CIMS reporting utilities let you produce reports based on each of the five groups. For example, you can use the CIMS RESOURCE\_REPORT Utility to produce a report showing the total resources used by each of the five groups.

## Project Rates Tables

A project has a specific rates table associated with it. This is used for charge rates when generating invoices or displaying the project's charges. The CIMS INVOICES Utility allows you to override the project's specified charge rate with another rate table. See the *CIMS for OpenVMS Reference Guide* for more information.

In a cluster, projects can have different rate tables for each node.

## Sold-to Addresses

A typical invoice contains sold-to, ship-to, and remit-to addresses. The sold-to address indicates the name and address to which the goods and services were sold and where the project's bill is sent.

The sold-to address fields allow seven lines for the name and address, with each line being up to forty characters long.

## **Ship-to Addresses**

The ship-to address indicates the name and address to which the project's goods were sent or services were performed. The ship-to address fields allow seven lines for the name and address, with each line being up to forty characters long.

## **Remit-to Addresses**

The remit-to address indicates the name and address to which the paid invoice is to be sent. The remit-to address fields allow seven lines for the name and address, with each line being up to forty characters long.

## **Minimum and Maximum Charges**

A project can have a minimum or maximum charge associated with it. This can be useful for establishing a minimum charge per accounting period to maintain the project account on the system or to assign a charge cap regardless of the computer resources consumed.

## **Logout Displays**

If the CIMS real-time data logging option is enabled, a terminal can display a project logout display of computer resources consumed and associated charges when its user logs out.

## **Project Accounting and Batch Jobs**

If Project Accounting is enabled for a user, batch jobs submitted by that user are assigned to a project. For example, if a user is currently assigned to project 3700120CX and submits a batch job, that batch job is assigned to the same project when it starts executing. In addition, you can switch projects from within the batch job. In this manner, different portions of a batch job can be charged to different projects.

CIMS does not require the user to specify the project name as a parameter to the batch job, nor does it require users to change their batch command procedures.



## Project Accounting and Print Jobs

If Project Accounting is enabled for a user, print jobs submitted by that user are charged to the project that was current when the print job was submitted. For example, if a user is currently assigned to project CS203-1, and prints a program listing, that print job is charged to the same project when it finishes executing.

## User Accounting Setup

Most data processing environments need computer resource management, chargeback for individual user accounts, or both. OpenVMS collects resource utilization information by process, primarily through user account usage logged into the OpenVMS Accounting File. However, OpenVMS does not provide a way to report this information in a form suitable for making management decisions, tracking other useful information, or equitably allocating charges to users.

CIMS solves this with its user accounting option. CIMS provides extensive and flexible user accounting features that are based on the standard OpenVMS usernames entered at login time. The CIMS implementation extends OpenVMS's user accounting by collecting information about additional resources including disks, terminals, nodes, print forms, software, and more.

Control and reporting features for individual users are essential to professional resource management and financial control within an organization. When computer users are located in different departments, divisions, and cost centers; it is necessary to keep track of computer charges so each separate area and level of management can be invoiced correctly. Also, the various department managers, division chiefs, and cost center heads need resource and cost information on the personnel, projects, and budgets for which they are responsible.

CIMS's unique and comprehensive accounting features automatically keep track of up to nine different organizational structures or levels. Therefore, you can get accounting information that is appropriate for your organizational structure quickly and easily. Management saves valuable time and everyone gets exactly the reports they need.

The extensive reporting capabilities retrieve and correlate the information using CIMS centralized database for reporting on software usage, disk space allocations, projects, and nodes related to individual users. User reports show how many CPU minutes, disk space units, I/Os, connect units, logons, and other resources that individual users consumed.

You can run user reports for any time period and break days into time-of-day shifts for reporting and charging purposes. Reports available include both brief summaries and detailed reports, depending on your needs.

## Features of User Accounting

Examine CIMS user accounting's full range of flexibility to decide which features to implement at your site and what, if any, hierarchical reporting structures to use. This chapter discusses various factors to aid you in deciding whether or not to use user accounting at your site.

You enable user accounting for all or none of your users. You enable specific user accounting options for all users or for individual users, allowing you to tailor CIMS to specific needs.

### Grouping by Username

An OpenVMS username currently can be from 1 to 32 characters. If more than 12 characters are entered, OpenVMS truncates the entry to the first 12 characters. OpenVMS controls its composition. Since the CIMS Statistics File is keyed by OpenVMS username, it can also impose groupings and hierarchical structures.

Most sites that manage a large number of OpenVMS user accounts follow some sort of hierarchical structure in defining them. Using the reporting features of CIMS, you can easily generate usage and billing reports for these accounts.

## **Assigning Default Projects for Users**

You can assign a project to a user's session automatically and transparently, or you can have the user prompted interactively to enter the project when logging on to the system. With the transparent method, the CIMS Administrator can hide the fact that the user is using Project Accounting. This method is also useful when a user always begins with the same project; this project is often referred to as a user default project.

If a user is prompted for a project when logging on, that user must enter a valid project name before the logon process can complete. CIMS supports up to five prompts for the project name.

## **User Budget Limits**

You can assign a budget limit to a user account. In addition, you can enable a warning zone to tell a user about an approaching budget limit. When the budget limit is reached, the CIMS Administrator can deny access to the user or allow access even when the user account is over budget.

## **User Storage Limits**

You can assign a storage limit to a user. Then, you can also enable a warning zone to inform a user that the storage limit is approaching. When the storage limit is reached, the CIMS Administrator can deny access to the user or allow access even when the account exceeds its storage limit.

## **Inactive Terminal Logout**

You can log users off the computer system when their processes have been idle for a defined period of time. This is particularly useful when the number of dial-up lines are limited or when users have a tendency to walk away from their terminals for long periods of time.

### **User Report Descriptions**

You can assign a description to a username. A user description usually provides a narrative or comment describing the user account. The description can contain up to 30 characters.

### **User Cost Centers**

You can assign a user to a cost center. A user cost center is an arbitrary grouping of users. A cost center name can be up to 32 characters long.

You can produce reports based on user cost centers. For example, if you grouped your users into cost centers corresponding to particular departments in your company, you could use the `CIMS RESOURCE_REPORT` Utility to show the total resources used by each department.

### **User Groups**

You can assign a user to up to five groups. A user group, like a user cost center, is an arbitrary grouping. A user group name can have up to 32 characters.

The `CIMS` reporting utilities let you produce reports based on any of the five groups. For example, you can produce a report showing the total resources used by each of the five user groups.

### **User Rates Tables**

A user has a specific rates table associated with it. This table is used for the set of charge rates when generating invoices or displaying the user's charges. Some `CIMS` utilities allow you to override the user's specified charge rate with another rate table.

In a cluster, users can have different rate tables for each node.

## **Sold-to Addresses**

The sold-to address represents the name and address to which the goods and services were sold and where the user's bill is sent. The sold-to address fields allow seven lines for the billing name and address, with each line up to forty characters long.

## **Ship-to Addresses**

The ship-to address represents the name and address to which the user's goods were sent or where services were performed. The ship-to address fields allow seven lines for the name and address, with each line up to forty characters long.

## **Remit-to Addresses**

The remit-to address represents the name and address to which the paid invoice is to be sent. The remit-to address fields allow seven lines for the name and address with each line up to forty characters long.

## **Maximum and Minimum Charges**

You can assign a minimum or maximum charge to a user account. You can use this to establish a minimum charge per accounting period for maintaining the user account on the system or assign a charge limit regardless of the computer resources used.

## **Logout Displays**

If you enable the CIMS real-time data logging option, a terminal can display a user logout display when a user logs out of an interactive session. The display can show the computer resources consumed and associated charges.

## ■ **Setting Up**

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### *User Accounting Setup*

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# Reporting

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## Why Use Chargeback?

There are various reasons for doing chargeback on your system. These include, but are certainly not limited to the following:

- You want to recover the costs associated with running your computer center from the users.
- You want to make a specific profit each accounting period.
- You do government contract work and are required to charge certain rates for certain resources.
- You use chargeback to limit the resources consumed by your users.
- You administer a system in an academic environment, and allocate internal money to student users. You want to limit these users to this set amount.

## Types of Invoices

The CIMS INVOICES Utility produces user and project invoices to use for chargeback. To generate user invoices, you must enable user accounting. To generate project invoices, you must enable Project Accounting.

Both user and project invoices can be grouped in different ways. For example, you can generate an invoice for each project that used the computer in the last accounting period. You can generate user invoices but at the cost center level, so that cost centers are charged for the resources consumed by their users.

## Charging for Resources

Chargeback involves assigning set rates for various resources on your system.

If your rates are determined by the government or by tradition in your company, setting the rates can be an easy task. However, if the rates are not dictated by someone or something else, determining the appropriate rates for your system might be more difficult.

If you must determine the rates yourself, here are a few guidelines to help you. CIMS comes with a default set of rates. If you are unsure of how to set your rates, you might want to process these default rates using past accounting data to see if the charges suit your needs.

## Limiting Resource Consumption

Are you trying to conserve resources on your system by charging for resources that are limited? For example:

- If memory is limited on your system, you can charge more for memory demand.
- If terminal ports are limited, you can charge more for interactive connect time than for batch connect time.
- If printers are limited, you can charge more for the number of pages that are printed.
- If you have a slow CPU, you can charge more for CPU time.

## Recovering Costs

Suppose your use for chargeback is simply to pass the costs associated with running your system on to your users. At the end of each month, you know the costs for that month.

When you generate your invoices, the CIMS INVOICES Utility can compute the charges for all users on your system, based on your user's normal rates, and then adjust the charges for all users so that the total comes out to equal your computer center costs. That way, users are charged equitably for what they used during the month, and the total of all the invoices equals your costs.

## Supplemental Charges

The CIMS SUPPLEMENTAL\_CHARGES Utility lets you charge for miscellaneous items such as programmer time or computer supplies, maintain a payment history of computer timesharing bills, maintain a balance forward from one reporting period to the next, and apply any adjustments. If you disable this option, CIMS generates invoices from the OpenVMS accounting statistics.

We also provide a facility for maintaining recurring charges. For example, suppose you rent a terminal by the month to one of your users. CIMS maintains this recurring charge and posts it as one of the miscellaneous charges for your reporting period.

A **balance amount** is the current computer charges plus any miscellaneous charges, minus any payments, plus any adjustments, plus the balance brought forward from the previous reporting period.

This balance usually shows how much money the account currently *owes*. If you enable budget limits, they can be used to establish a *credit limit*. If the outstanding amount is over the budget limit, then the account user would have to ask for a higher budget limit (get a credit extension) or pay the bill.

Another application using balance amounts establishes a user or project budget limit. When the limit is reached, regardless of the reporting period, the user must ask for a higher budget limit. To do this, merely never post any payments. This method is common in project-oriented environments.

If supplemental charges are not necessary in your environment, disabling this option reduces the processing that various CIMS utilities require.

To decide whether to use the CIMS Supplemental Charges option at your site, review the following list of requirements and benefits.

- You must enable Supplemental Charges for all user or project accounts or for none of them.
- You can post payments of charges to user or project accounts.
- You can post adjustments of charges to user or project accounts.
- You can post miscellaneous charges to user or project accounts.
- You can maintain a balance forward to the next reporting period.

## Resource Management Reporting

Resource management reporting provides a tool to help you answer questions like:

- Which users are using the systems the most?
- Which types of jobs are slowing the CPU down?
- Which batch queues are used, and by what projects?
- Which printer forms are used, and how many pages are being printed on each one?
- Which projects are using the different nodes on the cluster?
- What would happen if a certain project moved off the cluster onto a stand-alone system?

- Which users are mounting the most tapes, and during what shift?
- Which users are accessing this project?
- Which projects use the computer during the weekend?
- Which node on the cluster is being used the most?

Resource reports can show totals for any statistic in the OpenVMS accounting file, such as:

- CPU time
- Buffered I/Os
- Connect time
- Direct I/Os
- Process count
- Fault I/Os
- Print job queue active time
- Number of images executed
- Volumes mounted
- Pages printed
- Memory utilization
- Print job QIOs

You can generate reports for single and multi-CPU systems (clusters). Cluster resource reports can be for one node, for selected sets, or for all nodes.

You can organize users and projects in several ways, including by cost center, group, OpenVMS account, description, or UIC. For example, to see the resources used by all members of each department in your company, set up your users to have their department name in the user's `COST_CENTER` field in the CIMS Authorization File. You can then generate a user resource report grouped by cost center.

With the `CIMS RESOURCE_REPORT` Utility, you can specify completely what is printed on each page of the report: titles, headings, data, and column widths.

## Terminal Accounting Reporting

This chapter deals with a subset of resource management and capacity planning called terminal accounting. You can generate terminal reports using the CIMS TERMINAL\_REPORT Utility.

CIMS terminal reporting provides a tool to help you answer questions like:

- At what time of day are the terminals being used?
- What usage trends are occurring for the terminals on my system?
- When will I need additional terminals?
- Are all terminals being used, or could some terminals be better used by someone else in my organization?
- Which LAT ports are used the most and which are not used?
- Which groups of terminals are used the least?
- Which terminal ports are not in use and therefore available for new users?
- Are the users on the terminals located at another site printing enough print jobs to justify a new printer at that site?
- Are the dial-in lines used enough to justify their cost? At what time of the day are they being used?
- How do the resources used by each terminal type compare? Do the users on the new terminals consume more resources than those using older terminals?
- Does the terminal speed have any effect on the number of resources used? Do people accomplish more on higher-speed terminals?

You can generate terminal reports for any statistic in the OpenVMS Accounting File, such as:

- CPU time
- Buffered I/Os
- Connect time
- Memory utilization
- Pages printed
- Number of images executed
- Volumes mounted

In the case of print jobs, the statistics reflect the jobs submitted to print queues by the users on a particular terminal.

You can generate reports for single nodes and for clusters. Cluster reports can be for one node, for selected sets of nodes, or for all nodes.

You can request terminal reports for any time period from one day to many years worth of data. You can then compare the resources used during each hour of the day. You can also group the terminals by terminal group, description, node, terminal speed, or terminal type.

## Disk Reporting

With disk reporting, you can see how your disks are being used. You can generate disk reports using the CIMS DISK\_REPORT Utility.

Disk reporting provides a tool to help you answer questions like:

- How many disk blocks is a user using on the cluster?
- How has this user's disk space changed over the last month? How about over the last year?
- What percentage of each disk is being used?
- At the current rate, when will I need a new disk?
- What effect did adding that new application have on my total disk space?

- Which users should I move off my overloaded disk to my new disk?
- On what disks does a particular user have files?

You can generate disk reports in two forms: a daily report or a trend report. The daily report shows the disk usage for a specified day. This report can display usage for all or selected projects or usernames. In addition, the report can encompass all disks or only those indicated by the /DISK or /VOLUME qualifiers.

The trend report shows how disk usage changes over a specified time period. The report is broken down by user or project, and you can specify selected users or projects. The report shows the total disk usage for all or selected users or projects on certain days within the time period. You can request trend reports for any time period for which storage data exists in the CIMS storage files.

## Capacity Planning Reporting

You can generate system capacity reports for resource management and capacity planning using the CIMS CAPACITY\_REPORT Utility.

Capacity management reporting provides a tool to help you answer questions like:

- At what time of day is CPU usage the highest and lowest?
- What usage trends are occurring on my system?
- How has the CPU usage changed this year compared to last year?
- When will I need to add system resources?
- What effect did a new application have on my system?
- What effect did adding the new node to the cluster have on my system?
- What should I do to optimize system response time?
- Should I reschedule some batch jobs to another time period?



- Should I reschedule some jobs to another node in the cluster?
- What size should my new CPU or printer be?

You can generate capacity reports for any statistic in the OpenVMS Accounting File, such as:

- CPU time
- direct I/Os
- connect time
- number of images executed
- pages printed
- print job queue active time
- volumes mounted

You can generate reports for single and multi-CPU systems (clusters). Cluster capacity reports can be for one node, for selected sets, or for all nodes.

You can request reports for any time period from one day to several years worth of data. You can then compare the capacity used during each hour of the day, for each day of the week, day of the month, and month of the year.

In addition to displaying the actual amount used, you can also display the percentage used; for example, to show the actual I/O percentage used relative to a specified maximum I/O rate. You can differentiate the information by node or process type (interactive, batch, network, subprocess, detached, print) in any combination including all types for any date range.

With the `CIMS CAPACITY_REPORT` Utility, you can specify headings, scale factors, and display width. The utility performs auto-scaling when no scale factors are given.

You can display reports in barchart form on a terminal or send them to a data file to be printed on a line printer. You can produce them in *screen* mode on terminals supported by the OpenVMS SMG routines or in color using ReGIS™ graphics on VT-241 or VT-340 terminals.

## Software Package and Image Accounting Reporting

You can use CIMS to produce reports for images or groups of images for software package monitoring, productivity measurement, performance tuning, and application analysis. CIMS can also collect accounting information on user-selected images.

This image reporting tool can help you answer questions like:

- What images should we install for faster image activations?
- How much CPU time is being used for editing? For compiling?
- Does anyone actually use a particular software package?
- At what time of day is the package used?
- Is this package used enough to justify its costs?
- Would it be a better business decision to use a different method to perform that function since the package gets little use?

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**Note** • The CIMS RESOURCE\_REPORT Utility, not CIMS IMAGE\_REPORT, shows the users or projects that use the packages.

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You can produce image reports for a specific image or for all images that are part of a particular software product. For example, CIMS itself is made up of more than 35 images. If you want to track CIMS usage, you can enter each separate CIMS image into the CIMS image mapping file and make the package name for each image the same as the image name. This way, you can track usage of each separate image in CIMS.

Otherwise, you can enter CIMS\* as the image name (so it matches all CIMS image names) and CIMS as the package name. This way, you can track the usage of all CIMS images as a whole.

You can produce image-level performance reports for individual images or for an entire software product/package, for any statistic in the OpenVMS Accounting File, such as:

- CPU time
- elapsed time
- volumes mounted
- memory utilization
- buffered I/Os
- direct I/Os
- fault I/Os

You can generate reports for single and multi-CPU systems (clusters). Cluster image-level performance reports can be for one node, for selected sets of nodes, or for all nodes. Image-level performance reports can also reflect the different processing power of each machine in a cluster environment. You can achieve this by establishing factors within the CIMS parameter file for each node in the cluster. You can find the setting of these factors in *Chapter 2, CIMS System-wide Parameters* of the *CIMS for OpenVMS Reference Guide*.

You can request reports for any time period, from one day to several years worth of data. You can compare the images or packages used during each hour of the day, for each day of the week, day of the month, month of the year, and for each year.

In addition to producing graphs showing the actual amount used, you can show the percentage used; for example, the I/O percentage used relative to a specified maximum I/O rate. You can separate the information by node or process type (interactive, batch, network, subprocess, detached) in any combination including all for any date range.

With the CIMS IMAGE\_REPORT Utility, you can specify headings, scale factors, and display width. The utility performs auto-scaling when you provide no scale factors.

## ■ Reporting

### Session Accounting Reporting

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You can generate reports in barchart form and display them on a terminal or send them to a data file to be printed on a line printer. You can also generate the reports in *video* mode on terminals supported by the OpenVMS SMG routines.

In the past, most OpenVMS sites could not collect image accounting information because of the significant amount of disk space required for image accounting. We have solved this problem through the CIMS Selective Image Accounting Feature.

Selective Image Accounting is unique to CIMS. Using this feature, you do not need to install images to be tracked, thus avoiding system overhead. You enter the names of images to track into an image name database. Specifications of these tracked images can contain wildcards to form patterns that CIMS uses as a filter to determine images to be tracked. The image name database also lets you associate groups of images with a software product. This allows reporting by software product as well as by image.

Significant amounts of CPU time and disk space are reclaimed while retaining the ability to track certain images, groups of images, and software products without being forced to enable full-blown OpenVMS Image Accounting.

## Session Accounting Reporting

You can generate session-level reports for auditing using the CIMS AUDIT Utility.

Session-level reporting provides a tool to help you answer such questions as:

- A user claims his charges for last month are excessive because he never logged in. How can I justify his charges?
- I know some users accessed this project. Who were they and when did they access the project?

You can generate session-level reports for any specific user and for all users, or for any specific project or for all projects.

If you have enabled Project Accounting and your users switch projects, the reports show each interactive session broken down into the time spent accessing each project. You can generate the reports for any specific time period, from one day to many years.

The reports show each session (interactive session or batch job) broken down by shift, with the total charges for that session. You can also show the statistics and charges for each print job, plot job (in an Intergraph environment), software package execution, and resource tracking record.

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**Note** • This utility can generate a lot of output because of the level of detail.

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## Object Accounting Reporting

Some resources are not suited for statistical tracking using the standard accounting features provided by CIMS. These resources include home-grown routines and in-house environments that are difficult to track using CIMS Project Accounting or Selective Image Accounting. Still, a system manager might need to determine who is using a particular resource, how much system time is being devoted to operating the resource, or how much to charge for the resource usage.

CIMS' Object Accounting provides the tools you need to accomplish these tasks and many more. The CIMS Object Accounting Feature lets the CIMS Administrator track and generate reports on any user-defined resource for which source code is available.

You can implement this tracking two ways. First, you can track the resource for the customary usage statistics such as CPU time, connect time, buffered I/Os, and so forth. Secondly, you can track a resource by frequency, counting the number of times the resource is used.

This feature can help you answer such questions as:

- What does a particular resource cost the system?
- Is this resource used enough to justify its costs?
- Does anyone actually use a particular resource?
- At what time of day is the resource used?

Consider the last question. Suppose, for example, at a particular site the system manager has created a menu-driven environment (executable image) for use by secretaries in order to simplify their interface with OpenVMS. At the top menu, they are offered a choice of working with a word processor, the client database, customer correspondence, and a report generator. Now suppose when selecting the word processor option, they have the choice of two different word processors.

The question might arise as to which of these is being used more often and the time of day they are being used. In the client database, it might be important to know how many screens of information are generated. For the report generator, you should know which reports are generated and how often. For customer correspondence, it could be important to see how much connect time is spent to determine whether you need more staff. You can address these questions effectively using the CIMS Object Accounting Feature.

## **Pathworks Accounting**

CIMS provides an optional feature (a separately licensed option) specifically designed to provide accurate system accounting information for Digital Equipment Corporation's Pathworks package. With CIMS, data center managers are now able to identify Pathworks usage by user or department.

To report on user and project accounting, CIMS gathers information from Pathworks and combines this information with statistics from the VMS accounting file to produce reports depicting when and how long each user accessed software functions with Pathworks.

The following standard CIMS features apply to organizations with Pathworks environments. Reference the corresponding chapters in this User Guide for details on these features:

- *Features of Project Accounting* on page 2-6
- *Features of User Accounting* on page 2-12
- *Why Use Chargeback?* on page 3-3
- *Resource Management Reporting* on page 3-6
- *Terminal Accounting Reporting* on page 3-8
- *Disk Reporting* on page 3-9
- *Capacity Planning Reporting* on page 3-10
- *Software Package and Image Accounting Reporting* on page 3-12
- *Session Accounting Reporting* on page 3-14

Flexible charging options permit you to set rates by software functions of Pathworks. For example, one rate could be set for each Pathworks database. The powerful report generator permits you to customize the format and contents of reports and invoices for you specific needs.

Reports may be generated in graphic or chart form for easy reading by staff and management.

CIMS allows you to associate groups of Pathworks database's with a "package name". This allows you the flexibility to report on a logical group of functions as well as by individually.

## Processing Pathworks Data

CIMS implements the data processing portion of Pathworks Accounting using the CIMS LOGGER, VMS\_MERGE, and VMS\_SELECT Utilities.

CIMS implements the data reporting portion of Pathworks Accounting using the CIMS INVOICES, MYCOST, RESOURCE\_REPORT and AUDIT Utilities.

## ■ Reporting

---

### *Oracle Accounting*

These utilities access the CIMS Parameter File to determine if Pathworks Accounting is enabled.

If Logical Grouping will be implemented, make the necessary modifications within ARSAP\_SETUP.

If Chargeback is going to be implemented, add the desired rates for the software functions to the CIMS Rates File.

## Producing Pathworks Reports

The CIMS RESOURCE\_REPORT Utility produces Pathworks accounting reports from the data file created by the CIMS VMS\_SELECT and VMS\_MERGE Utilities.

## Oracle Accounting

CIMS provides an optional feature (a separately licensed option) specifically designed to provide accurate system accounting information for the Oracle database. With CIMS, data center managers are now able to identify Oracle Instance usage by user or group.

The Oracle Relational Database Management System (RDBMS) records resource statistics in internal tables when the timed statistics variable is set in the initialization file of an Oracle instance. The Oracle RDBMS has several processes that perform the work on behalf of users connecting to an Oracle instance; therefore, the only resource usage OpenVMS can gather is the work done by these processes and cannot assign this work to individual users. Users access an Oracle server locally or remotely.

CIMS for OpenVMS periodically samples the internal tables of an Oracle instance to attribute the resource usage to Oracle users. The CIMS for OpenVMS Oracle Accounting Process collects and stores the following information in the VMS Accounting File.

- UIC of the user
- the Oracle username used to access the database
- the Oracle database name



- statistics reflecting the resources used

To report on user and project accounting, CIMS gathers information from Oracle and combines this information with statistics from the VMS accounting file to produce reports depicting when and how long each user accessed software functions with Oracle.

The following standard CIMS features apply to organizations with an Oracle environment. Reference the corresponding chapters in this User Guide for details on these features:

- *Features of Project Accounting* on page 2-6
- *Features of User Accounting* on page 2-12
- *Why Use Chargeback?* on page 3-3
- *Resource Management Reporting* on page 3-6
- *Terminal Accounting Reporting* on page 3-8
- *Disk Reporting* on page 3-9
- *Software Package and Image Accounting Reporting* on page 3-12
- *Session Accounting Reporting* on page 3-14

Flexible charging options permit you to set rates by database instance. The powerful report generator permits you to customize the format and contents of reports and invoices for you specific needs.

## All-in-1 Accounting

CIMS provides an optional feature (a separately licensed option) specifically designed to provide accurate system accounting information for Digital Equipment Corporation's All-in-1™ office automation package. With CIMS, data center managers are now able to identify the specific software functions (mail, word processing, calendar, and so forth) that are actually used in each All-in-1 session.

## ■ Reporting

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### *All-in-1 Accounting*

To report on user and Project Accounting, CIMS gathers information from All-in-1 and combines this information with statistics from the VMS accounting file to produce reports depicting when and how long each user accessed software functions within All-in-1.

The following standard CIMS features apply to organizations with All-in-1 environments. See the corresponding chapters in the *CIMS for OpenVMS Reference Guide* for details on these features:

- *Features of Project Accounting* on page 2-6
- *Features of User Accounting* on page 2-12
- *Why Use Chargeback?* on page 3-3
- *Resource Management Reporting* on page 3-6
- *Terminal Accounting Reporting* on page 3-8
- *Disk Reporting* on page 3-9
- *Capacity Planning Reporting* on page 3-10
- *Software Package and Image Accounting Reporting* on page 3-12
- *Session Accounting Reporting* on page 3-14

Flexible charging options let you set rates by software functions of All-in-1. For example, you can set one rate for sending electronic mail, and another for receiving electronic mail. The powerful report generator lets you customize the format and contents of reports and invoices for your specific needs. You can generate reports in graphic or chart form for easy reading by staff and management.

CIMS lets you associate groups of All-in-1 software functions with a package name. This allows you the flexibility to report on a logical group of functions as well as individually. For example, you can map all the electronic mail functions into one logical electronic mail group. Specifically, you could consider the EM Answer Mail, the EM Attach Doc, the EM Create Mail, and the EM Send Mail as the logical group Electronic Mail. Logical groupings of All-in-1 software functions are handled much the same as the CIMS Software Package Feature.

## CIMS Customization Reporting

### Writing Reports in FORTRAN

You can write FORTRAN reporting programs that use the CIMS data. The standard RMS files processed and used by CIMS utilities contain the data for such programs.

The file most commonly used for this is the merged CIMS Statistics File (ARSAP\_STATISTICS.DAT).

Your CIMS examples directory has several sample FORTRAN programs that access the merged CIMS statistics file. We suggest you use one of these as a starting point, observing how the CIMS Lab writes code using the routines in the CIMS library. These routines follow the same standards and conventions used in the CIMS product.

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**Note** • Failure to follow the suggested conventions and guidelines in the CIMS documentation can cause significant compatibility problems with your routines in future releases of CIMS.

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## **Writing Your Own Memory Demand Algorithm**

The CIMS source directory contains a OpenVMS text library, ARSAPRTL.TLB. This text library contains FORTRAN source modules for some of the CIMS Run-Time Library (RTL) routines. The ARSAP\$CALCULATE\_MEMORY-\_DEMAND routine is one of these. You might want to add your own memory demand algorithm.

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# Consolidation

Resource management relates to optimizing the resources and use of your computer facility. CIMS provides a significant amount of information about your system that would not otherwise be available from OpenVMS. You can use this information to better manage your system(s).

This chapter discusses how to process the OpenVMS accounting data.

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## Overview

The data consolidation phase processes the VMS accounting file(s) into a centralized statistics file. The data collection phase centers on each node because OpenVMS does not provide cluster wide accounting. Once the data is consolidated into the statistics files, you can generate reports.

The frequency of data consolidation and reporting depends on the needs of your site. You can set up periodic reporting (for example, daily, weekly, monthly). You can also process and generate a large variety of interim reports at any time.

The type of statistics file determines the type of report you may generate. Since the statistics file is the product of the data consolidation phase, you need to choose the correct processing options which determines the type of report(s) you can generate. If you wish to produce an Invoices or Resource Report you must generate a CIMS Merged Statistics File. If you wish to produce session audit reports, you must generate a CIMS Audit Statistics File. If you wish to produce capacity reports, you must generate a CIMS Capacity Statistics File. If you wish to produce image reports, you must generate a CIMS Image Statistics File.

You also must determine the reporting period that suits your needs. You define the data reporting period by determining the beginning (SINCE) and ending (BEFORE) date for which you wish to report (e.g., from 01-Jun-2000 until 01-Jul-2000).

When consolidating the data with project accounting enabled, there are times when a project login record cannot be associated with a session. You have several options for assigning a project to this session. These options range from using the users default project to using project name in the ALLP, BATP, DETP, INGP, INTP, ITCP, or NETP fields as the project.

Data consolidation can be automated by setting up a command procedure that will process the VMS Accounting File(s). The steps in the data consolidation procedure include running the CIMS SELECT Utility and then the CIMS MERGE Utility. These steps are repeated for each node for which you wish to generate a report.

A site with a very large number of machines can consolidate the data simultaneously on several machines, with a final consolidation on one node by using the CIMS SUPER\_MERGE Utility. This approach drastically reduces the amount of time necessary to consolidate large amounts of data.

Sites with any mix UNIX®, Windows NT®, and OpenVMS platforms may wish to consolidate all data on a centralized platform for enterprise-wide reporting.

## Setup

There are a number of things to consider before you process the accounting data. These include the following:

### Cluster Support

If you wish to track multiple nodes in your network, the CIMS SETUP Utility can be used to enable the Cluster Support Flag.

### Defining Holidays

You must define your holidays before processing the accounting and storage data. The CIMS SETUP Utility defines holidays.

### Grouping Users and Projects

The CIMS VMS\_MERGE Utility will combine the grouping information in the CIMS Authorization File in the MERGED CIMS Statistics File. This file is then used by the CIMS Reporting Utilities to generate reports.

For this reason, if you wish to do any kind of grouping of users and/or projects in your reports, you must have the grouping fields set up before you run the VMS\_MERGE Utility.

## **Project Accounting**

If you are doing project accounting, you should make sure that Project Accounting has been enabled system-wide as well as for all users that are doing project accounting. You can enable Project Accounting system-wide using the CIMS SETUP Utility. Project Accounting can be enabled for individual users using the CIMS AUTHORIZE Utility.

## **Proprietary Software**

If you wish to track the use of particular software packages on your system(s), you can enable this feature using the CIMS SETUP Utility.

## **Terminal by User**

If you wish to track the use of terminals on your system(s), you can enable this feature using the CIMS SETUP Utility.

## **CIMS VMS\_SELECT Utility**

The CIMS VMS\_SELECT Utility reads the accounting data that has been gathered for each day of the reporting period and writes it to the appropriate statistics file based on which types of reports for which you are processing the data. These indexed statistics files contain records for every combination of user, project, node, etc., plus the statistics accumulated for each record.

The CIMS VMS\_SELECT Utility also checks the date and time of each session against the information you previously entered in the CIMS Holiday Mapping File. If the date is a holiday which you defined, and you have defined a holiday shift, it assigns the holiday shift to that session. If it is not a holiday, then based on the time of the session this utility assigns the appropriate shift from your defined shifts to that session.

If you have mapped images to software packages, each time the CIMS VMS\_SELECT Utility encounters one of those images it adds the statistics from the image to those of the software package record as well as to those of the session (i.e., interactive, batch).



The CIMS VMS\_SELECT Utility can work in a cumulative fashion. You can have it add resource statistics from the accounting file to the Intermediate Statistics File from a previous run of VMS\_SELECT. As long as you do not use the /ZERO qualifier (see below), the new accounting data is added to what is already there. You also have the choice of removing the CIMS Intermediate Statistics so that the CIMS VMS\_SELECT Utility creates a new file as it begins consolidating the data for the reporting period.

The CIMS VMS\_SELECT Utility has four commands, plus several qualifiers that dictate how the data is processed. The main command in the utility is "SELECT". This command produces the CIMS Intermediate Statistics File for resource reporting. The AUDIT, TERMINAL and CAPACITY commands process the CIMS Accounting Files for audit, terminal and capacity planning reports, respectively. The AUDIT command produces the CIMS Audit Statistics File (ARSAP\_AUDIT.SYS); the CIMS Terminal Statistics File (ARSAP\_TERMINAL.SYS); the CAPACITY command produces the CIMS Capacity Statistics File (ARSAP\_CAPACITY.SYS).

Only one command can be used on the command line at one time (AUDIT, TERMINAL, SELECT, IMAGE, and CAPACITY). The command is followed by the qualifiers (all qualifiers start with a /) that set the reporting period. The reporting period is one of the most important things to decide before processing the data.

The reporting period you select may depend on any number of factors, such as company policies, government regulations, financial requirements, etc., and can range from daily to weekly, to monthly.

The reporting period is defined by a starting date and an ending date. The starting date is defined using the /SINCE qualifier. The ending date is defined using the /BEFORE qualifier. For instance, you may say the starting date is 1-MAR-1999 and the ending date is 1-APR-1999. Note that neither date includes a time. The time is always assumed to be 00:00. Thus, this reporting period goes from 00:00 on the first of March to 00:00 on the first of April, and includes all the time in March.

The /NODE qualifier is only used if "Cluster Support" is enabled in CIMS Setup.

The remaining qualifiers are optional, and you decide whether you need them based on your own requirements.

All VMS\_SELECT commands and qualifiers are explained in detail in the VMS\_SELECT HELP Utility. In order to view the VMS\_SELECT HELP Utility, run VMS\_SELECT with the HELP command.

### Example

```
$ RUN ARSAP$EXE:ARSAP_VMS_SELECT  
VMS_SELECT> HELP
```

---

**Note • Use of the VMS\_SELECT Utility requires execute access to the ARSAP\$EXE directory and read/write access to files in the ARSAP\$DATA directory. Access to these directories are normally restricted to users with the a system UIC, the SYSPRV privilege, or the BYPASS privilege.**

---

## CIMS VMS\_MERGE Utility

The CIMS MERGE Utility first copies all records from the CIMS Intermediate Statistics File to the CIMS Merged Statistics File. This utility then applies any grouping information that has been set up in the CIMS Authorization File (refer to the "User Accounting" section). Finally, this utility merges in data from the CIMS Storage Files.

The storage data that the CIMS MERGE Utility reads must be located in the ARSAP\$DATA Directory. If the data is not normally stored in this directory, it must be copied to the directory before running the CIMS MERGE Utility.

There is only one command in the CIMS MERGE Utility, "MERGE". There are several miscellaneous qualifiers available with the MERGE command. These qualifiers have no effect on the data itself, just on how the MERGE command runs.

All VMS\_MERGE qualifiers are optional and are explained in detail in the VMS\_MERGE HELP Utility. In order to view the VMS\_MERGE HELP Utility, run VMS\_MERGE with the HELP command.

## Example

```
$ RUN ARSAP$EXE:ARSAP_VMS_MERGE  
VMS_SELECT> HELP
```

You do not need to tell the CIMS MERGE Utility the reporting period dates since the CIMS SELECT Utility stores these dates in the CIMS Intermediate Statistics File and the CIMS MERGE Utility copies them to the Merged Statistics File.

The CIMS MERGE Utility does not act in a cumulative fashion. It runs on a given time period (the reporting period). During the phase in which the data is copied from the Intermediate Statistics File to the Merged Statistics File all the storage statistics records are zeroed. The utility then figures out the storage statistics for the given time period, and adds them to the Merged Statistics File.

Because of this, it is not possible to run the CIMS MERGE Utility on a nightly basis in order to accumulate storage statistics for the whole month. You must run the CIMS MERGE Utility once at the end of the month.

On the other hand, if you wish to generate reports on a daily basis, then you would need to run both the CIMS SELECT and MERGE Utilities on a daily basis.

Basically, a good rule of thumb is to run VMS\_MERGE as often as you want to generate your reports.

---

**Note • Use of the VMS\_MERGE Utility requires execute access to the ARSAP\$EXE directory and read/write access to files in the ARSAP\$DATA directory. Access to these directories are normally restricted to users with the a system UIC, the SYSPRV privilege, or the BYPASS privilege.**

---

## CIMS Super Merge Utility

CIMS SUPER MERGE Utility (ARSAP\_SUPER\_MERGE) merges two sets of CIMS reporting data which includes the Merged Statistics file (ARSAP\_STATISTICS.DAT) from two nodes into one set of CIMS reporting data that can be utilized by the reporting node(s).

## ■ Consolidation

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### Overview

SUPER\_MERGE reduces the time needed to process system wide accounting data by providing the means to process the statistics data for several nodes simultaneously. This method is recommended for very large sites.

SUPER\_MERGE combines the results of two different runs of VMS\_SELECT and VMS\_MERGE into one super data directory (ARSAP\_SUPER). Once the resulting data files have been moved to the final ARSAP\$DATA directory, reports can be generate by using the ARSAP\_INVOICES and ARSAP\_RESOURCE\_REPORT Utilities.

CIMS SUPER\_MERGE can be invoked by the "RUN ARSAP\$EXE:ARSAP\_SUPER\_MERGE" command. It can also be invoked as a foreign command, provided you have defined such a command.

If SUPER\_MERGE is invoked using the RUN command, the utility responds with the following prompt:

```
SUPER_MERGE>
```

In response to the prompt, enter any SUPER\_MERGE Utility command. If SUPER\_MERGE is invoked using a foreign command, you can enter the foreign command with the desired qualifiers and parameters. If you plan to issue multiple commands to SUPER\_MERGE, initiate requests in response to the SUPER\_MERGE> prompt to minimize system overhead.

---

**Note • Use of the SUPER\_MERGE Utility requires execute access to the ARSAP\$EXE directory and read/write access to files in the ARSAP\$DATA directory. Access to these directories are normally restricted to users with the a system UIC, the SYSPRV privilege, or the BYPASS privilege.**

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## Processing Unix data

The CIMS UNIX\_SELECT Utility is an executable used to process the ARSAP/UNIX Accounting File. UNIX\_SELECT will create or update the CIMS for OpenVMS data files for reporting by ARSAP\_INVOICES or ARSAP\_RESOURCE\_REPORT.

There are several things to consider before you run the CIMS UNIX\_SELECT Utility. These include the following:

## What Commands to Use

The CIMS UNIX\_SELECT Utility has six commands to process your UNIX accounting data: AUDIT, CAPACITY, IMAGE, SELECT, and TERMINAL. See the *CIMS Chargeback OpenVMS Reference Guide* for more information.

## Reporting Period

The reporting period is one of the most important things to decide before processing the data. The reporting period you select may depend on any number of factors, such as company polices, government regulations, financial requirements, etc.

Many customers have a reporting period of one month. For some of those, the month may start on the 1st, while for others it may start in the middle of the month. Some customers have to report on a daily basis, some on a weekly basis. Some want to process all the accounting data from the previous year.

The reporting period is defined by a starting date and an ending date. The starting date is defined using the /SINCE qualifier. The ending date is defined using the /BEFORE qualifier. For instance, you may say the starting date is 1-MAR-1999 and the ending date is 1-APR-1999. Note that neither date includes a time. The time is always assumed to be 00:00. Thus, this reporting period goes from 00:00 on the first of March to 00:00 on the first of April, and includes all the time in March.

## Miscellaneous Qualifiers

There are several miscellaneous qualifiers available with the commands in the UNIX\_SELECT Utility. These qualifiers have no effect on the accounting data itself, just on how the commands run. See the CIMS for OpenVMS UNIX\_SELECT on-line help for a detail description of the UNIX\_SELECT qualifiers.

The CIMS UNIX\_MERGE Utility is an executable used to process the ARSAP/UNIX Storage File. UNIX\_MERGE will create or update the CIMS for OpenVMS data files for reporting by ARSAP\_INVOICES or ARSAP\_RESOURCE\_REPORT.

There are several things to consider before you run the ARSAP/UNIX UNIX\_MERGE Utility. These include the following:

### **Performance**

The /BLOCK\_COUNT, /BUFFER\_COUNT, /EXTEND\_SIZE, /INITIAL\_SIZE qualifiers can be used to improve the performance of UNIX\_MERGE.

### **UIC Information**

If you do not wish UNIX\_MERGE to use UIC information from the ARSAP/OpenVMS Authorization File, you must specify the /NOUIC\_INFO qualifier. Normally, UNIX\_MERGE looks up all usernames in the OpenVMS Authorization File and all projects in the ARSAP/OpenVMS Authorization File for UIC information.

### **Grouping Data**

If you do not wish to include the grouping information from the ARSAP/OpenVMS Authorization File, you can specify the /NOGROUP\_INFO qualifier. Normally the grouping data is extracted from the Authorization File and included in the ARSAP/OpenVMS Merged Statistics File.

### **Miscellaneous Qualifiers**

There are several miscellaneous qualifiers available with the MERGE command in the UNIX\_MERGE Utility. These qualifiers have no effect on the storage data itself, just on how the MERGE command runs. See the CIMS for OpenVMS UNIX\_MERGE on-line help for a detail description of the UNIX\_MERGE qualifiers.



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# CIMS Rate Codes

Open Systems Rate Codes ..... A-2

## Open Systems Rate Codes

Following is a list of the Open Systems Rate Codes:

Rate Code	Resource	Description
<b>OPENVMS ALL-IN-ONE RATES</b>		
LLI101	VMS Executions	Executions Performed by the User
LLI102	VMS Charge Connect (hours)	Chargeable Connect Time
LLI103	VMS Connect (hours)	Connect Time per User
LLI104	VMS CPU (minutes)	CPU Time per User
LLI105	VMS BIO	Buffered I/O Operations
LLI106	VMS DIO	Direct I/O Operations
<b>OPENVMS BATCH RATES</b>		
LLJ101	VMS Batch Logins	Batch Logins
LLJ102	VMS Batch Charge Connect (hours)	Chargeable Connect Time
LLJ103	VMS Batch Connect (hours)	Total Connect Time
LLJ104	VMS Batch CPU (minutes)	Batch CPU Time
LLJ105	VMS Batch Vector CPU (minutes)	Vector CPU Time
LLJ106	VMS Batch Memory	Memory Used
LLJ107	VMS Batch BIO	Batch Buffered I/Os
LLJ108	VMS Batch DIO	Batch Direct I/O Operations
LLJ109	VMS Batch Image Activations	Batch Image Activations
LLJ110	VMS Batch Volume Mounts	Batch Volume Mounts



Rate Code	Resource	Description
LLJ111	VMS Batch IOS	All Batch I/O Operations
<b>OPENVMS INGRESS RATES</b>		
LLQ101	Ingress Sessions	Ingress Sessions Performed By The User
LLQ102	Ingress Charge Connect (hours)	Ingress Chargeable Connect Time
LLQ103	Ingress Connect (hours)	Ingress Connect Time
LLQ104	Ingress CPU (minutes)	Ingress CPU Time
LLQ105	Ingress Comm Count	Server Communication Count
LLQ106	Ingress DIO	Ingress Direct I/O Operations
<b>OPENVMS INTACT RATES</b>		
LLS101	Intact Sessions	Intact Sessions Performed By The User
LLS102	Intact Charge Connect (hours)	Intact Chargeable Connect Time
LLS103	Intact Connect (hours)	Intact Connect Hours
LLS105	Intact CPU (minutes)	Intact CPU Time
LLS105	Intact Memory	Memory Used By The Intact User
LLS106	Intact BIO	Intact Buffered I/O Operations
LLS107	Intact DIO	Intact Direct I/O Operations
LLS108	Intact Volume Mounts	Intact Volume Mounts
<b>OPENVMS INTERACTIVE RATES</b>		
LLK101	VMS Interactive Logins	Interactive Logins

## ■ CIMS Rate Codes

### *Open Systems Rate Codes*

Rate Code	Resource	Description
LLK102	VMS Interactive Volume Mounts	Interactive Volume Mounts
LLK103	VMS Interactive Charge Connect (hours)	Interactive Chargeable Connect Time
LLK104	VMS Interactive Connect (hours)	Interactive Connect Time
LLK105	VMS Interactive Image Activations	Interactive Image Activations
LLK106	VMS Interactive CPU (minutes)	Interactive CPU Time
LLK107	VMS Interactive Vector CPU (minutes)	Interactive Vector CPU Minutes
LLK108	VMS Interactive Memory	Interactive Memory Used
LLK109	VMS Interactive BIO	Interactive Buffered I/O Requests
LLK110	VMS Interactive DIO	Interactive Direct I/O Requests
LLK111	VMS Interactive Fault IOs	Interactive Fault I/O Requests
LLK112	VMS Interactive Faults	Interactive Fault Requests
LLK113	VMS Interactive I/Os	Interactive I/O Requests
<b>OPENVMS ORACLE RATES</b>		
LLE201	Oracle Logins	Number of Oracle sessions
LLE202	Oracle Session CPU (minutes)	CPU utilized in Oracle sessions
LLE203	Oracle Connect (hours)	Amount of time a user is connected to Oracle
LLE204	Oracle UGA Memory	Memory used in the User Global Area
LLE205	Oracle PGA Memory	Memory used in the Program Global Area

Rate Code	Resource	Description
LLE206	Oracle Rec CPU (minutes)	Oracle Recursive CPU - CPU used updating internal tables
LLE207	Oracle User Commits	Commits performed by the user
LLE208	Oracle Physical Reads	Reads from database files resulting in access to data files
LLE209	Oracle Physical Writes	Writes to database files resulting in access to data files on disk
LLE210	Oracle Write Requests	Multi-block writes performed
LLE211	Oracle Disk Sorts	Memory utilized to perform an external sort
LLE212	Oracle Messages Sent	Messages sent to perform database updates
LLE213	Oracle Messages Received	Messages received to update database
<b>OPENVMS PATHWORKS RATES</b>		
LLL101	PathWorks Logins	PathWorks Logins
LLL102	PathWorks Connect Time (hours)	PathWorks Connect Time (hours)
<b>OPENVMS PLOT RATES</b>		
LLP201	Plot Jobs	Plot Jobs Executed
LLP202	Plot Connect (hours)	Plot Connect Time
LLP203	Plot CPU (minutes)	CPU Time Utilized by Plot Jobs
LLP204	Plot Vector CPU (minutes)	Vector CPU Time Utilized by Plot Jobs
LLP205	Plot Memory	Memory Used

## ■ CIMS Rate Codes

### *Open Systems Rate Codes*

Rate Code	Resource	Description
LLP206	Plot BIO	Plot Buffered I/O Requests
LLP207	Plot DIO	Plot Direct I/O Request
LLP208	Plot Mounts	Volume Mounts (disk or tape) Mounted
LLP209	Plot X-size	Unit of X-dimension Plotted
LLP210	Plot Y-size	Unit of Y-dimension Plotted
LLP211	Plot Area	Square Unit Area
<b>OPENVMS PRINT RATES</b>		
LLM101	Print Jobs	Number of Printed Jobs
LLM102	Print Pages	Number of Pages Printed
LLM103	Print Queue Active	Time a Printer is Active on a Particular Queue
LLM104	Print Queue Wait	Time a Printer is Waiting on a Particular Queue
LLM105	Print Gets	Print symbiont RMS \$GETS
LLM106	Print QIOs	Output I/O Requests Performed
LLM107	Print SMBS	Print SMBS
LLM108	Print SMB Operations	Print SMB Operations
LLM109	Print SYMCPU (minutes)	Print SYMCPU (minutes)
<b>OPENVMS RESOURCE CODE RATES</b>		
LLN101	VMS Resource Frequency	Resource Frequency Count

Rate Code	Resource	Description
LLN102	VMS Resource Charge Connect (hours)	Resource Chargeable Connect Time
LLN103	VMS Resource Connect (hours)	Resource Connect Time
LLN104	VMS Resource CPU (minutes)	Resource CPU Time
LLN105	VMS Resource Vector CPU (minutes)	Resource Vector CPU Time
LLN106	VMS Resource Memory	Resource Memory Used
LLN107	VMS Resource BIO	Resource Buffered I/O Requests
LLN108	VMS Resource DIO	Resource Direct I/O Requests
LLN109	VMS Resource Volume Mounts	Resource Volume Mounts
<b>OPENVMS SOFTWARE PACKAGE RATES</b>		
LLP101	VMS Package Image Activations	VMS Package Image Activations
LLP102	VMS Package Charge Connect (hours)	VMS Package Charge Connect (hours)
LLP103	VMS Package Connect (hours)	VMS Package Connect (hours)
LLP104	VMS Package CPU (minutes)	VMS Package CPU (minutes)
LLP105	VMS Package Vector CPU (minutes)	VMS Package Vector CPU (minutes)
LLP106	VMS Package Memory	VMS Package Memory
LLP107	VMS Package BIO	VMS Package BIO
LLP108	VMS Package DIO	VMS Package DIO
LLP109	VMS Package volume mounts	VMS Package Volume Mounts
<b>OPENVMS STORAGE RATES</b>		

## ■ CIMS Rate Codes

### *Open Systems Rate Codes*

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<b>Rate Code</b>	<b>Resource</b>	<b>Description</b>
LLO101	VMS Storage Allocated	VMS Storage Allocated
LLO102	VMS Storage Used	VMS Storage Used



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