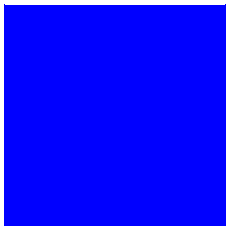

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CIMS Chargeback

OpenVMS Reference Guide

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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	**www.cimslab.com**

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About This Guide

The *CIMS Chargeback OpenVMS Reference Guide* provides information about features and capabilities of CIMS for OpenVMS. CIMS for OpenVMS was formerly known as ARSAP for OpenVMS.

There are therefore references to ARSAP thoughout this guide. Users of this guide are assumed to be experienced with CIMS for OpenVMS. Less experienced users should begin with the *CIMS Chargeback OpenVMS User Guide*.

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

Ch. No.	Chapter Name	Content Description
1	*CIMS System-wide Options*	Explains the various CIMS options and how to enable and disable them.
2	*CIMS System-wide Parameters*	Presents the system-wide CIMS parameters and how they can be used.
3	*Project Accounting*	Describes how to set up project accounting.
4	*User Accounting*	Describes how to set up user accounting.
5	*Chargeback*	Discusses various aspects of Chargeback, including the different kinds of invoices and how rates are determined.
6	*Resource Management*	Describes the accounting data and generating resource utilization reports.
7	*Terminal Accounting*	Describes how to set up terminal accounting.
8	*Disk Reporting*	Describes how to set up and generate disk reports.
9	*Capacity Planning*	Describes how to set up and generate capacity planning reports.
10	*Software Package / Image Accounting*	Describes how to set up and generate image reports.
11	*Session Accounting*	Describes how to produce a session level report.

Ch. No.	Chapter Name	Content Description
12	*Object Accounting*	Describes how to generate resource reports.
13	*All-in-1 Accounting*	Describes how to set up and generate All-in-1 reports.
14	*CIMS Customizations*	Describes how to write FORTRAN programs that use the CIMS data.
15	*Accounting Operational Hints*	Describes ways to manage the VMS Accounting files.
16	*CIMS Performance Considerations*	Lists hints for improving the performance of the CIMS utilities on your system.
17	*The CIMS Utilities*	Summarizes the various CIMS utilities.
	Index	Helps you locate information in this manual.

Conventions

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

Symbol or Type Style	Represents	Example
Bold	a new term	...called a **source object**.
Alternate color	(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 *Chapter 3, Data Migration*.
Italic	words that are emphasized	...the entry *after* the current entry...
	the titles of other documents	*CIMS Chargeback OpenVMS User Guide*
	syntax variables	`COPY filename`
`Monospace`	directories, file names, command names, computer code	`&HIGHLVL.SRCLIB`
	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 Chargeback OpenVMS Installation and Getting Started Guide*
- *CIMS Chargeback OpenVMS User Guide*
- *CIMS Chargeback OpenVMS Messages Guide*

1

CIMS System-wide Options

This chapter explains the various CIMS options and how to enable and disable them. It also discusses performance and special usage considerations.

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Overview

You can accomplish system accounting in many ways. Different environments have different requirements. The business needs and structure of each organization determine how system accounting should be implemented.

To meet the needs of multiple organizations and to let you specify how CIMS should be installed and used on your system, we provide a variety of features that you can implement with parameters and options.

You can easily enable or disable both parameters and options, many on a system-wide or on an account-by-account basis. You can enable or disable them when CIMS is first installed or later on.

Recovering Accounting Data After a System Crash

The Accounting Crash Recovery option lets you recover data on computer usage if your system crashes. This is particularly desirable when users have been active for a long period when a system crash occurs.

Under OpenVMS, if the system crashes, there is no accounting record of users who were on the system at that time. For example, if user SMITH has been logged in for ten hours when the system crashes, OpenVMS has no information in the accounting file for this user. Thus, as far as OpenVMS is concerned, SMITH was not on the system. When you are charging users for accessing the system, SMITH receives ten free hours of computer usage. When you are not charging users, your resource management, software package, and capacity planning reports are inaccurate.

When you enable Accounting Crash Recovery, the CIMS SNAPSHOT Utility periodically examines the existing processes on the system and records their current accounting statistics in the CIMS Recovery File.

With the CIMS Crash Recovery feature enabled, during a normal shut down the STOP_ARSAP command procedure deletes the CIMS Recovery File, and you create a new one when you use the START_ARSAP command

procedure. These procedures are located in the ARSAP$COM directory. Because of this and other considerations, a call to START_ARSAP should be included in your System STARTUP command procedure and a call to STOP_ARSAP in your System SHUTDOWN procedure.

Should a system crash occur, the CIMS Recovery File is present when the system is re-booted. CIMS restarts, and the recovery file is read by the CIMS RECOVER Utility. This utility saves statistical information in the OpenVMS Accounting File for those users that were on the system when it crashed. Thus, data for user SMITH is saved so that SMITH can be charged for the time he was on the system, and your management reports are accurate.

To use crash recovery, the Accounting Checkpoint Period field and the Crash Recovery flag must be initialized and enabled.

The Accounting Checkpoint Period Field

The checkpoint period field determines how frequently you want to update the data in the CIMS Recovery File for existing processes. The CIMS SNAPSHOT Utility does this updating. The minimum recommended value for the checkpoint period is 15 minutes. If you request a shorter period, SNAPSHOT might become a significant load on system resources. The maximum value that you can specify is 23 hours and 59 seconds.

The Crash Recovery Flag

The Crash Recovery Flag controls whether the Accounting Crash Recovery option is enabled.

Enable or disable the feature with the CIMS SETUP Utility. This option takes effect the next time you start CIMS.

To set the Accounting Checkpoint Period field

1. Use the CIMS SETUP Utility and the /ACCOUNTING_CHECKPOINT_PERIOD qualifier. Executing the following commands ensures that no more than 15 minutes of accounting data is lost if the system crashes:

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> DEFAULT/ACCOUNTING_CHECKPOINT_PERIOD=0:15
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP>
```

2. Next, execute these commands to enable the Crash Recovery feature and return to OpenVMS:

```
SETUP> DEFAULT/ENABLE=CRASH_RECOVERY
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP> EXIT
```

You must stop and restart CIMS for these changes to take effect. The following example stops and restarts CIMS:

```
$
$ SET DEFAULT ARSAP$COM
$ @STOP_ARSAP
$ @START_ARSAP
$
```

Absolute Daily Accounting

The CIMS Absolute Daily Accounting feature improves the accuracy of dividing the statistics of a long-running job among reporting periods. A long-running job runs across a reporting period boundary.

With this feature enabled, CIMS sends an absolute daily accounting record to the OpenVMS Accounting File just prior to midnight for each process on the system. The CIMS VMS_SELECT Utility then uses the last absolute daily accounting record it sees for a process within the reporting period in lieu of a process termination record.

For example, say that your reporting period is monthly and there is a job on your system that started on 31-MAY-1999. This job did not finish until 1-JUN-1999. When you process your data with VMS_SELECT using a /SINCE date of 1-MAY-1999 and a /BEFORE date of 1-JUN-1999, the process termination record for this job falls outside this date range. VMS_SELECT then uses the absolute daily accounting record for this job as the ending point of the job for the reporting period 1-MAY-1999 through 31-MAY-1999.

To enable or disable the Absolute Daily Accounting feature

- Use the CIMS SETUP Utility. The following commands enable the feature:

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> DEFAULT -
_SETUP> /ENABLE=ABSOLUTE_DAILY_ACCOUNTING
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP>EXIT
```

- Since this is a real time features of CIMS, you must also enable REAL_TIME_ACCOUNTING with the following command

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> DEFAULT -
_SETUP> /ENABLE=REAL_TIME_ACCOUNTING
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP>EXIT
```

You must stop and restart CIMS for these changes to take effect. The following example stops and restarts CIMS:

```
$
$ SET DEFAULT ARSAP$COM
$ @STOP_ARSAP
$ @START_ARSAP
$
```

All-in-1 Accounting

The CIMS All-in-1 Accounting option allows system resource and chargeback reporting on the specific software function of All-in-1. This lets you generate resource management and chargeback reports on the individual elements of the All-in-1 software package, as well as the package as a whole.

With CIMS you can:

- Set rates for the All-in-1 statistics
- Process these records with the CIMS VMS_SELECT Utility
- Report on these statistics using CIMS reporting utilities

CIMS measures All-in-1 resource utilization by user, by project, by groups of users, and by groups of projects.

Like the Software Package/Image Accounting feature, the All-in-1 feature lets you logically associate one or more software functions into one logical group. You can also charge different rates for different individual software functions.

To enable or disable the All-in-1 Accounting option

- Use the CIMS SETUP Utility. The following commands enable the feature.

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> DEFAULT/ENABLE=A1_ACCOUNTING
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP> EXIT
$
```

You must stop and restart CIMS for these changes to take effect.

Cluster Accounting

The CIMS Cluster Accounting option allows system resource and chargeback reporting by separate CPU node as well as for a combination of CPU nodes. This lets you generate resource management and chargeback reports by individual machine or by the entire cluster.

The reports are generated from a single, centralized database of system accounting information maintained on a node-by-node basis. Using this approach, you can assign rates and other items by node as well as by user or project account. For example, it is usually desirable to have different rates for a 6410 CPU and a 3100 processor.

Since portions of CIMS must operate on each node in the cluster for CIMS to function properly, all CPU nodes in the cluster must be licensed.

To enable or disable the Cluster Accounting option

- Use the CIMS SETUP Utility. The following commands enable the feature:

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> DEFAULT/ENABLE=CLUSTER_SUPPORT
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP> EXIT
$
```

Console Audit Trails

You can use the Console Audit Trail option to monitor certain activities on your system. CIMS can detect these activities and log them to a terminal where they can be monitored interactively or to a file for later examination.

This option is extremely useful in environments where security is an issue, but monitoring OpenVMS access activities can also be very useful regardless of security considerations.

CIMS can log five classes of OpenVMS access activity:

- Interactive LOGINs, LOGOUTs, and project switches
- Batch job LOGINs and LOGOUTs
- OpenVMS authorization failures (LOGIN failures)
- CIMS authorization failures (LOGIN failures)
- Idle processes that were warned as well as terminated.

To perform console auditing other than idle processes, you must enable CIMS Real-Time Accounting. The CIMS LOGGER Utility implements this part of the Console Audit Trail option.

You do not need to enable CIMS Real-Time Accounting when you just want to perform idle process termination since the CIMS SNAPSHOT Utility performs this task.

To use the Console Audit Trail option, you must set the following three fields to specify exactly how the feature is to perform:

- The Audit Terminal field
- The Console Audit Trail field
- The Operator field

Then, enable the Console Audit Trail flag to turn on the feature.

The Audit Terminal Field

If the console audit trail is to be logged to a terminal, the CIMS LOGGER Utility uses this field to determine the terminal name. The terminal name can be up to 26 characters long.

The Console Audit Trail Field

LOGGER uses this field to determine the items that are logged and where the audit trail messages are logged.

The following table shows the four logging choices. A NO prefix disables the logging choice.

Keyword	Function
[NO]BATCH	OpenVMS batch logins and logouts are logged.
[NO]IDLE_ MESSAGES	ARSAP idle process messages are logged.
[NO]INTERACTIV E	OpenVMS interactive login, logout, and project switches are logged.
[NO]LOGINFAIL	OpenVMS and ARSAP login failures are logged.

The following table shows the three logging destination choices. A NO prefix disables the logging location.

Keyword	Function
[NO]FILE	Items are logged to the CIMS Console Audit File in the ARSAP$PRIVATE directory.
[NO]OPCOM	Items are logged to the specific operator terminal class(es) enabled to receive the audit trail as specified by the OPERATOR field described in the following section.
[NO]TERMINAL	Items are logged to the terminal specified in the AUDIT_TERMINAL field.

The Operator Field

To use this field, you must enable OPCOM in the Console Audit Trail field. LOGGER uses the Operator field to determine which operator terminals receive the CIMS audit trail.

The choices controlled by this field follow. A NO prefix disables the choice.

Keyword	Function
[NO]CARDS	Items are logged to a card device operator terminal.
[NO]CENTRAL	Items are logged to a central operator terminal.
[NO]CLUSTER	Items are logged to a cluster operator terminal.
[NO]DEVICE	Items are logged to a device status information operator terminal.
[NO]DISKS	Items are logged to a disk operator terminal.
[NO]NETWORK	Items are logged to a network operator terminal.

Keyword	Function
[NO]OPER1 through [NO]OPER12	Items are logged to a terminal defined by the CIMS Administrator as an operator terminal.
[NO]PRINT	Items are logged to a printer operator terminal.
[NO]SECURITY	Items are logged to a security operator terminal.
[NO]TAPES	Items are logged to a tape operator terminal.

To set the Audit Terminal field

- Use the CIMS SETUP Utility and the /AUDIT_TERMINAL qualifier. To display the console audit trail information on the terminal named TXB4:, issue the following commands:

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> DEFAULT/AUDIT_TERMINAL=TXB4:
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP> EXIT
$
```

To set the Console Audit Trail field

- Use the CIMS SETUP Utility and the /CONSOLE_AUDIT_TRAIL qualifier. To display the console audit trail information on the terminal specified in the AUDIT_TERMINAL field and to log only login failures, execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> DEFAULT/CONSOLE_AUDIT_TRAIL=(TERMINAL,LOGINFAIL-
-_SETUP> ,NOINTERACTIVE,NOBATCH,NOIDLE_MESSAGES)
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP> EXIT
$
```

To set the OPERATOR field

- Use the CIMS SETUP Utility and the /OPERATOR qualifier. To display the console audit trail information (login failures) on the central operator terminal(s), execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> DEFAULT/CONSOLE_AUDIT_TRAIL=-
_SETUP> (OPCOM,LOGINFAIL,NOTERMINAL,NOINTERACTIVE-
_SETUP>,NOBATCH,NOIDLE_MESSAGES)/OPERATOR=CENTRAL
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP> EXIT
```

  Enable the Console Audit Trail feature by executing the following commands:

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> DEFAULT/ENABLE=CONSOLE_AUDIT_TRAIL
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP> EXIT
$
```

You must stop and restart CIMS for these changes to take effect.

Ingres Accounting

The Ingres database server can place records into the OpenVMS Accounting File that contains statistical information about the services the database server has performed for the user. CIMS now processes and reports on these records.

With CIMS you can:

- Process these records with the CIMS VMS_SELECT Utility
- Set rates for the Ingres statistics
- Report on these statistics in the AUDIT, INVOICES, and RESOURCE_REPORT reporting utilities.

To enable Ingres accounting, refer to the *Ingres Installation and Operations Guide* (part of the Ingres documentation set). You must make changes in the IIRUNDBMS.COM command procedure that starts the DBMS server. By

default, this file is located in the IISYSTEM:[INGRES.UTILITY] directory. You must add the /CPU_STATISTICS DBMS option to keep OpenVMS Accounting data, and the /SESSION_ACCOUNTING DBMS option to turn on individual session (thread) accounting.

If there are Ingres records in the OpenVMS Accounting File, VMS_SELECT processes them automatically.

Intact Accounting

The Intact transaction processing system from Advanced System Concepts, Inc. can place user records into the OpenVMS Accounting File. These records contain information about the resources consumed by the server on behalf of each user.

With CIMS you can now:

- Process these records with the CIMS VMS_SELECT Utility
- Set rates for the Intact statistics
- Report on these statistics in the AUDIT, INVOICES, and RESOURCE_REPORT reporting utilities.

If there are Intact records in the OpenVMS Accounting File, VMS_SELECT processes them automatically.

Project Accounting

The Project Accounting option lets you charge computer resource usage to a special kind of account that multiple users can access. It also lets you control access to that account independently while also maintaining separate user accounts on the computer system.

Chapter 3, Project Accounting in this manual discusses the Project Accounting option power and flexibility in detail.

Real-Time Accounting

CIMS Real-Time Accounting performs accounting data collection and user control functions in real-time; that is, as it happens. The CIMS INTERCEPT and LOGGER utilities implement the Real-Time features. The Real-Time Accounting option is a prerequisite for the following CIMS options and features. (The particular CIMS Utility that implements the feature is indicated.):

- Absolute Daily Accounting (INTERCEPT)
- Absolute Shift Accounting (INTERCEPT)
- Accurate Budget Limit Enforcements (LOGGER)
- Console Audit Trail (LOGGER)
- Forms Tracking (INTERCEPT)
- Intergraph Plot Tracking (INTERCEPT)
- Real-Time Data Logging (LOGGER)
- Selective Image Accounting (INTERCEPT)

To enable real-time accounting

- Execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> DEFAULT/ENABLE=REAL_TIME_ACCOUNTING
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP> EXIT
$
```

Real-Time Data Logging

CIMS Real-Time Data Logging keeps the intermediate CIMS Statistics File up-to-date in real-time (that is, the file is updated immediately as accounting records are logged by the job controller).

When this option is enabled, the CIMS INTERCEPT Utility sends accounting records to the CIMS LOGGER Utility as well as to the OpenVMS Accounting File. The CIMS LOGGER Utility processes the information and logs it to the Intermediate CIMS Statistics File.

The Real-Time Data Logging option is a prerequisite for CIMS Budget Limit Enforcements.

To enable real-time data logging

- Execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> DEFAULT/ENABLE=REAL_TIME_DATA_LOGGING
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP> EXIT
$
```

Forms Tracking

The Forms Tracking option lets you collect printer forms information from a print job and save that information in the OpenVMS Accounting File. The information collected includes the form name, the form number, and the stock name.

This option is useful when you want to charge users different rates for different types of printer forms. For example, you might have standard line printer paper, one-up label stock, three-up label stock, and pre-printed forms. Since all these printer forms (called stock in OpenVMS) cost varying amounts of money, you want to pass those differing expenses on to the users as well as know who is using what printer forms. You can do this using the Forms Tracking option.

Once the forms tracking option is enabled, the VMS_SELECT or LOGGER Utilities adds print queue names with their associated stock names to the CIMS Queue Mapping File automatically.

To enable forms tracking

- Execute the following commands, which take effect the next time you start CIMS. You can find commands to stop and restart CIMS on page 1-5. Note that enabling this option has no effect unless you also enable Real-Time Accounting.

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> DEFAULT/ENABLE=REAL_TIME_ACCOUNTING
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP> DEFAULT/ENABLE=FORMS_TRACKING
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP> EXIT
$
```

The following example adds a print queue name and its associated stock name to the CIMS Queue Mapping File manually:

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> ADD/QUEUE/PRINT/STOCK=BOND LN03$PRINT
%SETUP-S-ADDED, QUEUE record successfully added
SETUP> EXIT
$
```

Note • The DCL command SHOW QUEUE/FORMS displays stock information. What is referred to as FORMS in CIMS is referred to as STOCK from this DCL command.

Printer Use by Node

The Printer Use by Node feature allows for the accounting of printer usage broken down by node.

All print statistics records in the merged CIMS Statistics File contain a non-blank node name when you enable Cluster Support. This allows the RESOURCE_REPORT and INVOICES utilities to display print statistics by node. When you disable Cluster Support, all print statistics appear together under a blank node name.

This feature is turned on automatically when you enable Cluster Support.

Print Project Fallback UIC

The Print Project Fallback UIC feature adds another method to the CIMS VMS_SELECT Utility for finding a project for print jobs based on the UIC of the print job. To turn on this feature you must enable the PRINT_PROJECT_FALLBACK_UIC flag in SETUP. By default this feature is disabled.

With this feature disabled, VMS_SELECT and LOGGER use the default method for assigning a project to a print job. That method is detailed below.

- Use the project from the LOGIN or SWITCH record when there is one.
- Use the user's default project when default project is enabled and the default project is valid.
- Use the project in the user's PRIP field.
- Use the project PRINTJOBS.

With this new feature enabled, VMS_SELECT and LOGGER uses the following method for assigning a project to a print job.

- Use the project from the LOGIN or SWITCH record when there is one.

- Take the UIC of the print job and see whether there is a project in the CIMS Authorization File with that UIC. When a project is found with the UIC, it is used as the project for that print job.
- Use the user's default project when default project is enabled and the default project is valid.
- Use the project in the user's PRIP field.
- Use the project PRINTJOBS.

Selective Image Accounting

To understand the CIMS Selective Image Accounting option, you should first understand how OpenVMS image accounting works.

OpenVMS Image Accounting

With OpenVMS image accounting enabled, image records are put into the OpenVMS Accounting File every time an image (program) finishes executing. The OpenVMS job controller performs this function. OpenVMS provides two different ways to log images to the accounting file. Both these standard methods provided by OpenVMS can have a significant impact on your system.

Full OpenVMS Image Accounting

The first method is *all or nothing*; either OpenVMS Image Accounting is enabled for all images or disabled with none of the images being tracked. To enable it for all images, use the DCL command SET ACCOUNTING/ENABLE=IMAGE.

The major drawback with having OpenVMS Image Accounting enabled for all images involves system overhead and disk space. In order to have image accounting enabled, each image's accounting data is logged to the OpenVMS Accounting File. This increases the accounting file size significantly. Although, you might not care how many times the

DIRECTORY.EXE image is executed, you get an image accounting data record written in the Accounting File each time a user issues a DIRECTORY command.

Another problem with this method is the number of I/Os in logging data to the OpenVMS Accounting File. This file is usually on the system disk, which directly impacts system performance. The programs or utilities that process the accounting file must now perform considerable additional work.

OpenVMS Image Accounting with Installed Images

The other image accounting method involves using the OpenVMS INSTALL Utility to install the image. You must install the image with the /ACCOUNTING qualifier.

This does allow you to monitor images selectively. However, since installing an image causes system memory usage, this method is impractical also, particularly when you want to monitor usage of several images.

CIMS Selective Image Accounting

The Selective Image Accounting option gives you the best of both these methods:

- You can track any number of selected images, so you get the specific and important information you need without 90% of the overhead.
- CIMS also allows you to group individual images together into software packages for reporting.

For example, you have a software product that consists of ten images. Using Selective Image Accounting, you can group these images into one *package* and report on the package as a whole, or you can report on each individual image in the software package.

Selective Image Accounting allows enabling image accounting on exact image names or patterned image names that are user-definable using wildcards.

Using CIMS' Selective Image Accounting Option

To track images selectively

1. Enable the CIMS Real-Time Accounting option and the Selective Image Accounting option using the CIMS SETUP Utility.
2. Add the images you want to track to the CIMS Image Mapping File using the CIMS IMAGE_MAP Utility. The CIMS Image Mapping File contains mapping information about what images belong to what software packages and what images are to be logged to the OpenVMS Accounting File.
3. Stop and restart CIMS.

Note • Any time you change the mappings or add new mappings in the CIMS Image Mapping File, you must stop and restart CIMS in order for the changes to take effect.

Tracking Image Accounting Records

With OpenVMS IMAGE accounting enabled, the OpenVMS job controller sends out an image accounting record each time an image finishes executing on the system. This image record is intercepted by the CIMS INTERCEPT Utility.

When the CIMS INTERCEPT Utility is started by the Start CIMS Command procedure, it reads the image names in the CIMS Image Mapping File. It stores in an internal table the names of the images that you have selected to be put into the accounting file.

When INTERCEPT gets an image record from the job controller, it checks to see whether that image is in this internal table of image names. When the image name is in the table, INTERCEPT writes the image record to the OpenVMS Accounting File. When the image name is not in the table, INTERCEPT discards that image record, and it is not logged to the OpenVMS Accounting File.

When the records for the selected images are in the OpenVMS Accounting files, you can process them with the CIMS VMS_SELECT Utility and report on them using the CIMS IMAGE_REPORT or RESOURCE_REPORT utilities. Note that the image records are not processed and stored in the CIMS Image Statistics File in real-time. You must use the IMAGE command from within the CIMS VMS_SELECT Utility to process the OpenVMS Accounting Files to report on images and software packages.

To set up the CIMS Image Mapping File

- Use the following commands to track all images that have the image name pattern of *CIMS* and assign these images to the software package called CIMS:

```
$ RUN ARSAP$EXE:ARSAP_IMAGE_MAP
IMAGE_MAP> ADD  *CIMS*  CIMS/INCLUDE
%IMGMP-I-ADDED, image pattern/software package combination added
IMAGE_MAP> EXIT
$
```

To enable or disable the Selective Image Accounting option

1. Use the CIMS SETUP Utility.
2. Make sure Real-Time Accounting is enabled.
3. Execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> DEFAULT/ENABLE=SELECTIVE_IMAGE_ACCOUNTING
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP> DEFAULT/ENABLE=REAL_TIME_ACCOUNTING
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP> EXIT
$
```

This takes effect the next time you start CIMS.

Proprietary Software Chargeback

The Proprietary Software Chargeback option lets you gather resource statistics for users and projects that use software packages. You can produce reports showing what resources were used by the users and projects while running the software. You can also charge users at discount or increased rates while using the software.

To enable Proprietary Software Chargeback

- Execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> DEFAULT/ENABLE=PROPRIETARY_SOFTWARE
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP> EXIT
$
```

Supplemental Charges

The Supplemental Charges option lets you charge for miscellaneous items such as programmer time and computer supplies, and maintain payment histories, balance forwards, and adjustments.

Chapter 5, Chargeback, discusses the Supplemental Charges option in detail.

Terminal Accounting

With the Terminal Accounting option, you can produce resource utilization reports by terminal name using the CIMS TERMINAL_REPORT Utility. This is particularly useful when a limited number of terminal ports or terminals are available on the computer system and you need to know whether they are used appropriately.

One important feature of Terminal Accounting is the ability to produce reports on virtual terminals, LATs (DEC Servers), and Intergraph Workstations. The CIMS TERMINAL_REPORT Utility reports on the actual physical ports instead of the virtual terminal name (for example, TXA3: instead of VTA365:), the LAT node name and port name instead of the LAT terminal name (LAT1 - PORT_7 instead of LTA123:), and the Intergraph workstation id (which identifies the actual workstation).

When terminal reports are unnecessary in your environment, disable this option to reduce the amount of processing that the CIMS VMS_SELECT Utility must perform.

To enable the feature

- Execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> DEFAULT/ENABLE=TERMINAL_ACCOUNTING
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP> EXIT
$
```

Enablement or disablement of the option takes effect the next time you start CIMS.

Terminal Connect Time Surcharges

The CIMS Terminal Connect Time Surcharge option lets you charge different rates for connect time based upon the user's terminal speed or terminal name.

Terminal Speed Surcharging

With terminal speed surcharging, you can balance the costs of high speed terminals, which can bog down communications interfaces, against the slow response time of lower speed devices, such as dial-up modems.

A typical terminal speed grouping might have category speeds defined as:

- Category 1: 0-1200 baud
- Category 2: greater than 1200 baud to 2400 baud
- Category 3: greater than 2400 baud to 9600 baud
- Category 4: all speeds greater than 9600 baud.

Low-speed dial-up lines fall into category 1, medium-speed dial-up lines in category 2, low-speed, hard-wired local terminals and high-speed dial-up lines in category 3, and high-speed local devices in category 4.

To encourage the use of more plentiful lower speed devices and discourage the use of high speed terminal lines because of their scarcity or impact on the system, you could set the terminal surcharge factors for these categories as shown below:

- Category 1: .50
- Category 2: .75
- Category 3: 1.00
- Category 4: 4.00

Users of low speed devices would be billed for only half their actual connect time while users of high speed local devices would be billed at four times their actual connect time.

Terminal Name Surcharging

With terminal name surcharging, you can surcharge the use of terminals based on the name of the terminal port. For example, if `TTA1:` on your system is an expensive graphics terminal, you might want to charge users more for using that terminal than when they used *dumb* terminals.

You can enter terminal names manually to the `CIMS` Terminal Parameter File using the `CIMS SETUP` Utility or the `CIMS VMS_SELECT` or `CIMS LOGGER` Utility can enter them automatically.

Data Collection for Terminal Surcharging

The CIMS LOGIN Utility implements the data collection portion of this feature. When a user logs onto the system, the CIMS LOGIN Utility executes. It examines the user's terminal characteristics and obtains the terminal speed, terminal type, and the actual terminal name. This information is stored in the CIMS login record that is written to the OpenVMS Accounting File.

When the statistics for that session are processed by either the CIMS LOGGER or CIMS VMS_SELECT utilities, the surcharge factor is computed based on the method of surcharging you selected. The actual connect time is multiplied by the surcharge factor to arrive at the chargeable connect time for the session.

For example, assume you select surcharging by terminal name. If the TTA1: terminal has a factor of 4.0, and if user SMITH is logged onto the terminal for three hours, then SMITH is charged for twelve connect hours (3 hours multiplied by a factor of 4.0).

To enable the Terminal Connect Time Surcharge option

1. Initialize the following three fields to suit your needs: Connect Time Method, Speed Cutover, and Speed Factor.
2. Enable the Connect Time flag. Review the following material to decide whether to use the CIMS Terminal Connect Time Surcharge option at your site.

Terminal Connect Time Surcharge Option Flag

The Terminal Connect Time Surcharge Option flag controls the CIMS Terminal Connect Time Surcharge option. When the option is enabled, the fields associated with this option determine how the feature performs at your site.

To enable or disable Terminal Connect Time Surcharge option using the CIMS SETUP Utility

1. Set the fields to the desired values.
2. Use the following commands:

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> DEFAULT/ENABLE=CONNECT_TIME
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP> EXIT
$
```

This takes effect the next time CIMS is started.

The Connect Time Method Field

The CIMS LOGIN Utility uses this field to determine the connect time surcharge method to use. You can use both methods if you want.

The connect time methods controlled by this field are:

Method	Action
NAME	Calculates chargeable connect time by terminal name.
SPEED	Calculates chargeable connect time by terminal speed.

You can determine the connect time surcharge method using the CIMS SETUP Utility and the /CONNECT_TIME_METHOD qualifier.

To calculate chargeable connect time using the SPEED method

- Execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> DEFAULT/CONNECT_TIME_METHOD=SPEED
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP> EXIT
$
```

The Speed Cutover Field

When you select the SPEED method of calculating the chargeable connect time, the CIMS LOGIN Utility uses this field to determine the terminal speed category.

To set this field

- Use the CIMS SETUP Utility and the /SPDCUTOVER qualifiers follows:

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> DEFAULT/SPDCUTOVER=(1200,2400,9600)
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP> EXIT
$
```

The example sets the terminal speed categories as follows:

- Category 1: 0-1200 baud
- Category 2: greater than 1200 baud to 2400 baud
- Category 3: greater than 2400 baud to 9600 baud
- Category 4: all speeds greater than 9600 baud.

The Speed Factor Field

When you select the SPEED method of calculating the chargeable connect time, the CIMS LOGIN Utility uses this field to determine what factor (multiplier) to use in calculating the chargeable connect time.

To set this field

- Use the CIMS SETUP Utility and the /SPDFACTOR qualifier.

Suppose you want to discount terminal connect time by 50% for terminal speed category 1, by 25% for category 2, provide no discount for category 3, and surcharge by 300% for category 4. Execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> DEFAULT/SPDFACTOR=(.5,.75,1.,3.)
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP> EXIT
$
```

Adding Terminal Names

When you select the NAME method of calculating the chargeable connect time, the CIMS LOGIN Utility accesses the CIMS Terminal Parameter File to determine the factor (multiplier) to use in calculating the chargeable connect time.

To enter terminal names and factors into the terminal parameter file

- Use the CIMS SETUP Utility.

  To modify the TTA1: terminal name with a factor of 4.0, execute the following commands.

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> MODIFY/TERM TTA1:/FACTOR=4.0
%SETUP-S-TRMMODIFIED, 1 TERMINAL record successfully modified
SETUP> EXIT
$
```

Terminating Idle Processes

The Terminate Idle Processes option terminates interactive processes that have been idle for a specified time interval. This is particularly useful when a limited number of ports are available on the computer system and users have either forgotten to log off or are intentionally monopolizing the terminal line. When your organization charges for connect time, this feature ensures that users are logged off automatically and avoid inadvertent charges.

When the feature is enabled, the CIMS SNAPSHOT Utility periodically examines the current active processes and, for interactive processes, checks to see whether they are idle. The first time SNAPSHOT identifies an idle interactive process, it sends a warning message to the interactive process terminal. When SNAPSHOT detects that an interactive process is idle for two consecutive periods, it issues a system service ($DELPRC) to the system for that interactive process and the process is logged off the system.

An interactive process is idle when it meets all the following criteria:

- It owns no subprocesses.
- It has not consumed any CPU time since the last check.
- It has not performed any I/O, either buffered or direct, since the last check.
- It is at DCL level (that is, at the DCL prompt).

The CIMS$IDLE_PROCESS routine

The CIMS$IDLE_PROCESS routine is included in source form to let customers make their own decisions about what constitutes an idle process. This source routine is in a OpenVMS text library in the CIMS Source directory.

To enable the Terminate Idle Processes option

1. Initialize and enable the following:
   - The Idle Process flag
   - The Idle Process Method field
   - The Idle Scan field.

Review the following factors to determine whether the option is useful at your site.

The Idle Process Flag

The Idle Process flag controls whether the CIMS Terminate Idle Process option is enabled. When it is, the previously mentioned fields determine how the feature performs at your site.

To enable the feature

- Use the following commands:

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> DEFAULT/ENABLE=IDLE_PROCESS
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP> EXIT
$
```

Enablement or disablement of this option takes effect the next time you start CIMS.

The Idle Process Method Field

The /IDLMETHOD qualifier specifies the idle process method in the default node record of the CIMS Parameter File.

The CIMS Lab provides two idle process methods and the source code of the CIMS$IDLE_PROCESS routine for additional user-definable methods.

The methods provided are:

- /IDLMETHOD=0

  A process is idle when the following criteria are met:

  - Process has used less than three hundredths of a second of CPU time
  - No I/O performed since the last time we checked
  - Is not running an image
  - Has no subprocesses

- /IDLMETHOD=1

  A process is idle when the following criteria are met:

  - Process has used less than three hundredths of a second of CPU time
  - No I/O performed since the last time we checked
  - Has no subprocesses.

Methods 0-99 are reserved for use by the CIMS Lab. When you add additional methods, begin numbering with 100.

Other values can be permissible when you have customized the CIMS$IDLE_PROCESS routine in the CIMS Run Time Library.

To set the idle process method for the default record to 1

- Use the following commands:

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> DEFAULT/IDLMETHOD=1
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP> EXIT
$
```

The Idle Scan Field

The Idle Scan field controls how often the CIMS SNAPSHOT Utility scans the system looking for idle interactive processes. The smaller the value in this field, the more often the utility performs this activity and the shorter the time period after which you can terminate inactive processes. Generally, a value less than 15 minutes is undesirable because you might terminate users while they are performing another brief task (like answering the telephone). Since it takes two full inactive periods (the first with a warning), a 15 minute value would give the user up to 30 minutes to do something before being logged off.

To set this field

- Use the CIMS SETUP Utility and the /IDLSCAN qualifier. The following commands stop any interactive process that has been idle for more than 30 minutes:

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> DEFAULT/IDLSCAN=0:15
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP> EXIT
$
```

SNAPSHOT Idle Terminal Messages

When you enable the CIMS Terminate Idle Process Feature, the CIMS SNAPSHOT Utility periodically scans all processes on the system to determine whether they are eligible for termination. The CIMS Administrator can set the idle scan period, using the CIMS SETUP Utility. This idle scan period is normally 15 minutes.

When a user has been idle for the entire idle scan period, SNAPSHOT sends an IDLEWARN message to the user's terminal. If the user is still idle at the next scan period, SNAPSHOT sends an IDLELOGOFF message to the user's terminal and then deletes the user's process.

When SNAPSHOT sends an IDLEWARN message to a user's terminal, it also sends a WARNEDIDLE message to the Console Audit Trail, the operator's console, or both. Likewise, when it sends an IDLELOGOFF message to the user's terminal, it sends a DELETEDIDLE message to the Console Audit Trail, the operator's console, or both.

Previously, when you did not want to see the WARNEDIDLE or DELETEDIDLE messages, there was no way you could turn them off completely; they were either sent to the Console Audit Trail or the operator's console.

You can now tell SNAPSHOT not to send these two messages (WARNEDIDLE and DELETEDIDLE) to the operator's console using the new LOG_IDLE_MESSAGES flag in the SETUP Utility. When you enable this flag, SNAPSHOT sends these messages to the console using OPCOM. When you disable the flag, SNAPSHOT does not display the messages on the console.

Also, if you do not want these messages to appear in the Console Audit Trail, you can now disable this using the IDLE_MESSAGES keyword on the /CONSOLE_AUDIT_TRAIL qualifier.

- When it is enabled (/CONSOLE_AUDIT_TRAIL=IDLE_MESSAGES), the two messages appear in the Console Audit Trail.
- When it is disabled (/CONSOLE_AUDIT_TRAIL=NOIDLE_MESSAGES), the messages do not appear in the Console Audit Trail.

Note that if your Console Audit Trail is set to OPCOM and IDLE_MESSAGES, the two messages appear on the specific operator terminal classes set up to receive the Console Audit Trail enabled by the /OPERATOR qualifier in SETUP. This could mean the messages are displayed on the console.

User Accounting

The User Accounting option lets you charge computer resource usage to user accounts.

See *Chapter 4, User Accounting*, for a detailed discussion of this topic.

Vector Processor Support

CIMS can collect Vector CPU Time statistics on the VAX 6000 and 9000 series machines when equipped with the vector processor and running OpenVMS V5.4 or higher.

When you are running OpenVMS V5.4 or higher and are using a vector processor, CIMS collects and processes this information automatically.

The following reporting utilities have been updated to display the vector CPU time:

- AUDIT: displays the vector CPU time on a /FULL report and includes a new /VECTOR_CPUTIME qualifier for use with the /BRIEF qualifier.
- CAPACITY_REPORT: the BARCHART command now has a /VECTOR_CPUTIME qualifier.
- IMAGE_REPORT: the BARCHART command now has a /VECTOR_CPUTIME qualifier.
- INVOICES: now shows the vector CPU time used and the charges for it in a /FULL invoice.
- RESOURCE_REPORT: shows the vector CPU time used with the new VECTOR_CPUTIME keyword on the /FORMAT qualifier.
- TERMINAL_REPORT: you can now sort on the vector CPU time statistic using the /SORT=VECTOR_CPUTIME qualifier.

The vector CPU time is displayed in units of minutes.

```
RESOURCE_REPORT> REPORT/TITLE=( -
_RESOURCE_REPORT> "!/!12* C I M S L A B, I N C." -
_RESOURCE_REPORT> ,"!/" -
_RESOURCE_REPORT> ,"!/!6* Vector CPU Report for Batch Jobs" -
_RESOURCE_REPORT> ,"!/!6* From !11%D Thru !11%D" -
_RESOURCE_REPORT> ,"!/" -
_RESOURCE_REPORT> ,"!/               Connect Time   Vector CPU Time" -
_RESOURCE_REPORT> ,"!/  Username        (Hours)        (Minutes)   " -
_RESOURCE_REPORT> ,"!/------------   ------------   ---------------") -
_RESOURCE_REPORT> /FAO_ARGS=(FROM,THRU) -
_RESOURCE_REPORT> /NOBARS -
_RESOURCE_REPORT> /FORMAT=(USER=12,DELIMIT=" ",SPACE=1,CONNECT=10,SPACE=3 -
_RESOURCE_REPORT> ,VECTOR_CPU=10) -
_RESOURCE_REPORT> /USER=(BDUNN,HJONES,IMARTIN,QTHOMAS,WDOE) -
_RESOURCE_REPORT> /JOBTYPE=BATCH -
_RESOURCE_REPORT> /NOTOTAL
```

This example uses the RESOURCE_REPORT /FORMAT qualifier to generate a user report of vector CPU time used for batch jobs.

The report shown below displays the username, total connect time of the batch jobs that the user executed, and the total vector CPU time used for each user.

```
                        CIMS LAB, INC.


                  Vector CPU Report for Batch Jobs
                  From  1-JUN-1999 Thru 31-AUG-1999


                     Connect Time   Vector CPU Time
 Username              (Hours)         (Minutes)
------------        ------------    ---------------
BDUNN                     4.55              79
HJONES                    6.47             190
IMARTIN                1491.08            8625
QTHOMAS                   0.34               1
WDOE                     18.84             255
```

```
INVOICES> REPORT/USER=JKING/FULL=BATCH-
_INVOICES> /OUTPUT=CHARGES.LIS
```

This example uses the INVOICES /FULL qualifier to show the detail pages for batch jobs executed by a specific user. The invoice is output to a file called CHARGES.LIS. One page from this invoice is shown on the next page.

7-JAN-1999

Invoice 0000000001

Batch Charges

Queue=VECTOR$BATCH

Shift 1 (07:00 to 17:00)

Description	Quantity	Unit Price	Amount
Logins	33.000	$0.0000	$0.00
Chargeable Connect Hours	111.326	$0.0000	$0.00
Buffered I/O's (1000's)	77.476	$0.0000	$0.00
Direct I/O's (1000's)	4,222.548	$0.0000	$0.00
CPU Minutes	2,185.310	$2.0000	$4,370.62
Memory Demand	649,136.688	$0.0000	$0.00
Volume Mounts	0.000	$0.0000	$0.00
Vector CPU Minutes	813.298	$10.0000	$8,132.98

Subtotal			$12,503.60

Shift 2 (17:00 to 00:00)

Description	Quantity	Unit Price	Amount
Logins	0.000	$0.0000	$0.00
Chargeable Connect Hours	71.937	$0.0000	$0.00
Buffered I/O's (1000's)	29.094	$0.0000	$0.00
Direct I/O's (1000's)	2,448.549	$0.0000	$0.00
CPU Minutes	1,290.982	$1.5000	$1,936.47
Memory Demand	396,037.281	$0.0000	$0.00
Volume Mounts	0.000	$0.0000	$0.00
Vector CPU Minutes	512.165	$10.0000	$5,121.65

Subtotal			$7,058.12

Shift 3 (00:00 to 07:00)

Description	Quantity	Unit Price	Amount
Logins	0.000	$0.0000	$0.00
Chargeable Connect Hours	38.440	$0.0000	$0.00
Buffered I/O's (1000's)	10.766	$0.0000	$0.00
Direct I/O's (1000's)	1,097.307	$0.0000	$0.00
CPU Minutes	759.812	$1.0000	$759.81
Memory Demand	243,711.359	$0.0000	$0.00
Volume Mounts	0.000	$0.0000	$0.00
Vector CPU Minutes	347.270	$10.0000	$3,472.70

Subtotal			$4,232.51

Shift 4 (Weekends and Holidays)

Description	Quantity	Unit Price	Amount
Logins	0.000	$0.0000	$0.00
Chargeable Connect Hours	2.653	$0.0000	$0.00
Buffered I/O's (1000's)	3.000	$0.0000	$0.00
Direct I/O's (1000's)	227.084	$0.0000	$0.00
CPU Minutes	20.045	$1.0000	$20.04
Memory Demand	8,125.674	$0.0000	$0.00
Volume Mounts	0.000	$0.0000	$0.00
Vector CPU Minutes	0.638	$10.0000	$6.38

Subtotal			$26.42

2

CIMS System-wide Parameters

This chapter presents the system-wide CIMS parameters and how they can be used.

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Batch Accounting

The term *batch accounting* is different from and not to be confused with the term *Batch Mode Accounting*. *Batch Mode Accounting* refers to a specific mode of CIMS operation defined earlier.

The term *batch accounting* refers to accounting for jobs that run as batch, rather than as interactive, jobs. You can accumulate the statistics from these batch jobs with interactive statistics or maintained separately. When you decide to maintain them separately, you have several options.

- First, you can break down batch statistics by shift. When you use this method, all batch queues are treated the same. You can report on or charge varying rates depending on the shift the statistics are accumulated in, regardless of the batch queue they ran on.
- Secondly, you can break down batch statistics by batch queue name. Using this method, you can report on or charge different rates for each batch queue name, regardless of what time it ran.
- Finally, you can accumulate batch statistics by both shift and batch queue name. This method provides a means of reporting on and charging different rates for each batch queue name for each shift.

Batch Accounting is always enabled, so no parameters or flags enable or disable it. However, the Batch Processing Method field must be initialized to suit your needs, and the batch queue names must be in the CIMS Parameter File. Review the following sections to decide how you want batch accounting statistics handled at your site.

Batch Processing Methods

As mentioned, CIMS can handle batch process accounting statistics in four ways:

Method	Action
BOTH	This method accumulates all batch accounting statistics by both batch queue name and the shift in which a job executed. Select this method when you want to charge different rates for different queues, as well as different rates depending on which shift a job was executed in.
BYQUEUE	This method accumulates all batch accounting statistics by batch queue name. Choose this option to charge a batch job by the queue it executed in or to track resource utilization. In chargeback environments, higher priority batch queues are more expensive than lower priority queues. Also use `BYQUEUE` when you do not care about the time the batch job runs.
BYSHIFT	This method accumulates all batch accounting statistics according to the shift a batch job executed in. Select this option to charge batch jobs by when they execute rather than by the queue they execute in, or to track resource utilization by shift.
COMBINED	This method combines all batch accounting statistics with interactive accounting statistics. Use this method to track resource utilization or when you do not care about differentiating between batch and interactive usage.

To set this field

- Use the CIMS SETUP Utility and the BATCH_PROCESSING qualifier to specify the appropriate method. To track usage of batch by queue name, execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> DEFAULT/BATCH_PROCESSING=BYQUEUE
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP> EXIT
$
```

Batch Queue Names

Batch queues must be known to CIMS in order for CIMS to know the correct rates to apply to specific batch queues, as well as where to place batch accounting statistics in the CIMS data files. The CIMS Queue Mapping File contains entries for batch queue names.

To add the batch queue names

Use the CIMS SETUP Utility. The following commands add the batch queue HIGH_PRIORITY to the CIMS Queue Mapping File:

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> ADD/QUEUE/BATCH HIGH_PRIORITY
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP> EXIT
$
```

Note that the CIMS LOGGER and VMS_SELECT utilities automatically add batch queue names to the CIMS Queue Mapping File.

Calculating Memory Use

Memory utilization in a virtual memory system is difficult to measure. Usually several parameters are involved. Their relationship varies dramatically from one site to the next, depending upon the system configuration. CIMS calculates a memory measurement referred to within CIMS as memory demand, but the CIMS Administrator defines how it calculates this measurement.

CIMS always calculates memory demand using a routine in the CIMS Run Time Library, ARSAP$CALCULATE_MEMORY_DEMAND.

The CIMS Lab provides six methods for calculating memory demand within this routine and also provides the source code in the CIMS source directory for any additional methods that you program. A CIMS utility knows which method of calculating memory demand is in use by retrieving the memory demand algorithm number from the CIMS Parameter File.

To set the memory demand algorithm field

- Use the CIMS SETUP Utility and the /MEMORY_DEMAND_ALGORITHM qualifier. This selects the method of calculating memory demand at your site. Execute the following commands to use algorithm number 4 instead of the default algorithm (number 6).

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> DEFAULT/MEMORY_DEMAND_ALGORITHM=4
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP> EXIT
$
```

To print the six pre-defined algorithms

- Execute the following commands:

```
$ LIBRARY/EXTRACT=ARSAP$CALCULATE_MEMORY_DEMAND -
ARSAP$SOURCE:ARSAPRTL.TLB-
/OUTPUT=CALCULATE_MEMORY_DEMAND.FOR
$ PRINT CALCULATE_MEMORY_DEMAND.FOR
```

Defining Shifts

CIMS supports up to four shifts, three during each weekday (Monday through Friday) and a fourth shift for weekends (Saturday and Sunday) and holidays. Shifts are defined in the CIMS SETUP Utility. Use the HOLIDAY qualifier to define holidays that are stored in the CIMS Holiday File.

To specify the shift boundaries for your site

- Use the `CIMS SETUP` Utility and the `/SHIFT_START_TIME` qualifier. The following commands define shift boundaries at 09:00, 18:00, and midnight.

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> DEFAULT/SHIFT_START_TIME-
_SETUP> =(SHIFT1=09:00,SHIFT2=18:00-
_SETUP> ,SHIFT3=00:00)
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP> EXIT
$
```

  This defines the first shift to start at 09:00:00 and end at 17:59:59, the second shift to start at 18:00:00 and end at 23:59:59, and the third shift to start at 00:00:00 (midnight) and end at 08:59:59.

  The following commands define New Years Day as a holiday. You can use the `/START_TIME` and `/END_TIME` qualifiers to specify exact days and hours to be charged at the holiday rate.

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> ADD/HOLIDAY 1-JAN-1999/DESC="New Year's Holiday" -
_SETUP> /START_TIME="31-DEC-1998 18:30:00"/ -
_SETUP> /END_TIME="1-JAN-1999:23:59:59"
%SETUP-S-ADDED, HOLIDAY record successfully added
SETUP> EXIT
$
```

Prorating Shifts

Interactive and batch sessions that cross shift boundaries accumulate accounting statistics in two or more shifts.

CIMS provides four proration methods for allocating accounting data to the shifts:

Method	Action
ABSOLUTE	Writes accounting data for all processes to the accounting file at the shift boundary.
CONNECT	Prorates the accounting information between shifts based on the time spent in each shift.
LOGIN	Accumulates all the accounting information to the shift where the process started.
LOGOUT	Accumulates all the accounting information to the shift where the process terminates.

The ABSOLUTE Shift Proration Method

The ABSOLUTE Shift Proration Method writes out accounting statistics to the OpenVMS Accounting File for every process that is active when a shift boundary is crossed.

This method is as close to a *perfect* solution as possible. Regardless of when a process is active, the accounting data for that process is allocated to the correct shift. Its only disadvantage is in the overhead incurred to provide this solution. Additional overhead considerations include:

- First, you must enable the Real-Time Accounting option. The CIMS INTERCEPT Utility implements the absolute proration method. Since this utility must be run as a OpenVMS *detached* process, it occupies a certain amount of memory and a job process slot.

- Whenever a shift boundary is reached, INTERCEPT (which normally *hibernates*, or *sleeps*), must *wake up*. INTERCEPT saves the accounting information for every process currently on the system. It does this at a relatively high priority to ensure that the information gathered does not contain information from the next shift that would reduce the accuracy of the accounting information in both shifts.
- Once information has been gathered for each process on the system at the shift boundary, the information must be saved for later processing. The only correct place to save this information is in the OpenVMS Accounting File.
- Once the information is logged to the OpenVMS Accounting File, it is processed by any utility that processes the accounting information, again adding overhead. The OpenVMS Accounting File grows to hold the absolute shift information. This can become a problem in environments where disk space is at a premium. Also, more time and storage space are consumed when the files are backed up.

The added overhead to implement the ABSOLUTE Shift Proration Method is minimal. In most environments, it is not noticeable, and the benefits of this method outweigh any disadvantages.

The CONNECT Proration Method

The CONNECT Proration Method allocates portions of the accounting statistics to the various shifts in which the process was active by using the connect (or elapsed) time spent in each shift as a spread factor. For example, if 25% of the connect time was in shift 1, then 25% of all the accounting statistics gathered for the process are allocated to shift 1.

This method incurs slightly more overhead than the first since the percentage of time spent in each shift must be calculated and then applied to the accounting statistics. In many environments, it is a better solution than the first since users are less able to manipulate shift rates to their benefit.

The LOGIN Proration Method

The LOGIN Proration Method allocates all accounting statistics to the shift in which the process initially started. This method is also referred to as the *telephone* method since it was used for many years in the United States when a telephone call crossed a time-of-day rate boundary.

This method is one of the simplest and most efficient as far as any additional work for the CIMS VMS_SELECT and LOGGER utilities are concerned. Since all accounting information goes into the shift in which the process started, no additional processing must be performed for crossing shift boundaries. The obvious disadvantage to this method is when different rates are applied to different shifts. A user could log on to the system during a cheaper shift and stay on through more expensive shifts, yet be charged at the cheaper shift rate.

The LOGOUT Proration Method

The LOGOUT Proration Method allocates all accounting statistics to the shift in which the process terminates.

This method is one of the simplest and most efficient as far as any additional work for the CIMS VMS_SELECT and LOGGER utilities are concerned. Because all accounting information goes into the shift in which the process terminated, no additional processing must be performed for crossing shift boundaries. The obvious disadvantage to this method is when different rates are applied to different shifts. A user could log off the system during a cheaper shift, having stayed on through more expensive shifts, yet be charged at the cheaper shift rate.

To set the proration method field

- Use the CIMS SETUP Utility and the /PRORATION_METHOD qualifier to specify which method to use. The following commands use the CONNECT method as described previously:

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> DEFAULT/PRORATION_METHOD=CONNECT
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP> EXIT
$
```

If you set the proration method to ABSOLUTE, you must stop and restart CIMS for it to take effect.

Factors for Multi-node Environments

This section is relevant when you are running CIMS in a multi-CPU environment and you want to compare resource usage on different CPUs.

You can use the following keywords to weight statistics for different CPUs and reflect each machines relative processing capabilities. CIMS reports the resources used and automatically normalizes the amounts based on your machine power ratings.

For example, you might have a VAX 8530 and a VAX 4300 in a cluster. Because of the differences in processing speed of the two CPUs, you want to weight the statistics for the 8350 to reflect its relative processing capabilities to the 4300, and therefore, the resources reported by the CIMS RESOURCE_REPORT Utility.

Since the 4300 is usually rated at 8 MIPS (millions of instructions per second) and the 8350 is rated at 4.0 MIPS, you could set the CPU factor for the 8350 to 2.0, and the CPU factor for the 4300 to 1.0. This would cause the statistics for CPU time for the 8350 to be multiplied by 2.0 in your resource report.

Note that these factors are applied to the various statistics for resource utilization reporting and are not applied for chargeback. Weighing rates charged for nodes of varying power is discussed in *Chapter 5, Chargeback*.

You can use the following keywords and their associated statistic with the /FACTOR qualifier.

Keyword	Statistic
BIO	Buffered I/Os
CONNECT	Connect time
COUNT	Process count
CPU	CPU time
DIO	Direct I/Os
FAULTIO	Page fault I/Os
GETS	RMS $GETS
IMAGES	Image activations
MEMORY	Memory utilization
PAGES	Pages printed
PGFLTS	Page faults
QACTIVE	Queue active time
QIOS	Queue I/Os
QWAIT	Queue wait time
SYMCPU	Symbiont CPU time
VOLUMES	Volumes mounted

To weight statistics for different CPUs

- The following commands weight two CPUs, with node names ALPHA (the 8350) and DELTA (the 4300), as described above. Note that only the CPU statistics are normalized in this example.

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> MODIFY ALPHA/FACTOR=CPU=2.0
SETUP> MODIFY DELTA/FACTOR=CPU=1.0
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP> EXIT
$
```

International Monetary Symbols

Different countries have different conventions and locations for their monetary symbols. In the United States, the $ (dollar sign) is the monetary symbol and it appears as a prefix to the amount. Other countries use different symbols, and it sometime appears as a suffix to the amount.

CIMS has two user definable parameters called the Monetary Prefix Symbol and the Monetary Suffix Symbol. Each symbol can be up to three characters long since some countries use multiple character symbols. All CIMS utilities use these parameters when displaying monetary amounts.

To set the monetary prefix symbol

- Use the CIMS SETUP Utility and the /MONPREFIX qualifier to conform to the conventions in the specific country. In the United Kingdom the monetary suffix symbol is pound sterling (£). The following commands cause the £ symbol to be displayed at the beginning of any monetary amounts generated by the CIMS utilities.

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> DEFAULT/MONPREFIX="£"
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP> EXIT
$
```

To set the monetary suffix symbol

- Use the CIMS SETUP Utility and the /MONSUFFIX qualifier to conform to the conventions in the specific country. In the United States there is no monetary suffix. In this case, you would enter all blanks into the monetary suffix symbol field.

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> DEFAULT/MONSUFFIX="  "
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP> EXIT
$
```

If you are creating reports solely for resource management purposes (that is, you are not charging users for resources utilized), you might want to use the monetary suffix field to show Computer Resource Units (CRU). In this case, you would enter CRU into the monetary suffix field.

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> DEFAULT/MONSUFFIX="CRU"
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP> EXIT
$
```

Login Failures

If a user attempts to log in to OpenVMS and does not provide a correct username or password, OpenVMS does not allow that user to log in. OpenVMS treats this as a login failure and writes a special record to the OpenVMS Accounting File.

If, on the other hand, while logging in, a user (with project accounting enabled) correctly types in his username and password, but he gives a project name to which he is not authorized access, CIMS logs that user out. CIMS treats this as a CIMS authorization failure and writes a CIMS record to the OpenVMS Accounting File.

There is a certain amount of CPU time and connect time associated with logging in. CIMS lets you track these statistics for OpenVMS login failures and CIMS authorization failures. For login failures, you can assign a username to which the statistics are charged. This is called the Login Failure Username.

For CIMS authorization failures, you can designate a project to which those statistics are assigned. This is called the Login Failure Project Name.

To set the Login Failure Username

- Use the CIMS SETUP Utility and the /LFUSERNAME qualifier. The following commands set the Login Failure Username to SYSTEM, so that the SYSTEM account is charged for all OpenVMS login failures.

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> DEFAULT/LFUSERNAME=SYSTEM
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP> EXIT
$
```

To set the Login Failure Project Name

- Use the CIMS SETUP Utility and the /LFPROJNAME qualifier. The following commands set the Login Failure Project Name to LOGIN_FAILURES, so that the LOGIN_FAILURES project account is charged for all CIMS authorization failures.

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> DEFAULT/LFPROJNAME=LOGIN_FAILURES
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP> EXIT
$
```

Output Queues

You must make output queues known to CIMS for the following reasons:

- For CIMS to know which rates apply to specific output queues (usually this means print queues)
- For CIMS to know where to place output queue accounting statistics in the CIMS data files

The CIMS Queue Mapping File contains entries for output queue names and paper stock names; the file is maintained by the CIMS SETUP Utility.

To set the output queue name fields

- Use the CIMS SETUP Utility. The following commands specify SYS$PRINT as an output print queue:

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> ADD/QUEUE/PRINT SYS$PRINT
%SETUP-S-ADDED, QUEUE record successfully added
SETUP> EXIT
$
```

Note • The CIMS VMS_SELECT and LOGGER Utilities automatically add queues to the CIMS Queue Mapping File.

Report Headers

Most reports produced by CIMS reporting utilities display a user-defined report header. Usually, this report header contains your company name or department. This report header is stored in the CIMS Parameter File.

To set the report header field

- Use the CIMS SETUP Utility and the /HEADER qualifier. The following commands set The X Y Z Data Processing Company as the header displayed at the top of your reports.

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> DEFAULT/HEADER="The X Y Z Data Processing Company"
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP> EXIT
$
```

RMS Parameters

CIMS lets you set the RMS Multiblock count and RMS Multibuffer count parameters to be used when accessing files. Proper usage of the RMS parameters can significantly improve the performance of several CIMS utilities. The best values for your system can vary depending on the size of the files processed, computer hardware, and other OpenVMS parameters.

For example, the optimal values for a VAX 3400 with 4.10.1 Mb of memory and all files on one DSSI RF-30 drive are provided below. These values resulted from experimenting with many different block and buffer counts for the files accessed by the CIMS VMS_MERGE Utility.

File	Block_Count	Buffer_Count
ARSAP_AUTHORIZATION	8	32
ARSAP_STORAGE	8	16
ARSAP_STORAGE_TEMP	16	255

File	Block_Count	Buffer_Count
ARSAP_STORAGE_MAPPING	16	0
INTERMEDIATE_ARSAP_STATISTICS	16	255
MERGED_ARSAP_STATISTICS	32	255
VMS_AUTHORIZATION	8	32

To set RMS parameters

- To set the RMS block count and RMS buffer count parameters to be used when accessing a particular CIMS file, use the CIMS SETUP Utility. The following commands specify the RMS block and buffer count parameters to be used when accessing the CIMS Storage File.

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> DEFAULT/BUFFER_COUNT=ARSAP_STORAGE=16-
_SETUP> /BLOCK_COUNT=ARSAP_STORAGE=8
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP> EXIT
$
```

- To show the current block and buffer counts, execute the following commands.

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP>REPORT/RMS_PARAMETERS
SETUP> EXIT
```

3

Project Accounting

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How CIMS Implements Project Accounting

CIMS implements the data collection portion of Project Accounting using the LOGIN, SWITCH, and STORAGE_UPDATE utilities.

CIMS implements the data processing portion of Project Accounting using the CIMS LOGGER, VMS_MERGE, and VMS_SELECT utilities.

CIMS implements the data reporting portion of Project Accounting using the CIMS INVOICES, MYCOST, and RESOURCE_REPORT utilities.

These utilities access two files: the CIMS Parameter File to determine whether Project Accounting is enabled, and the CIMS Authorization File to determine whether Project Accounting is enabled for a particular user account and to retrieve any individual Project Accounting options.

Additional information is available by using the HELP qualifier within these CIMS utilities.

Enabling Project Accounting

You enable Project Accounting using the CIMS SETUP and AUTHORIZE utilities. The CIMS SETUP Utility enables or disables Project Accounting system-wide. The CIMS AUTHORIZE Utility enables or disables Project Accounting and sets its options and parameters for individual accounts.

To enable Project Accounting system-wide

- Use the CIMS SETUP Utility as follows:

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> DEFAULT/ENABLE=PROJECT_ACCOUNTING
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP> EXIT
$
```

You must also enable or disable it for individual user accounts. You should always consider the PROJECT DEFAULT account. You use this account when you add a new project account (either automatically through the CIMS LOGIN Utility or manually through the CIMS AUTHORIZE Utility).

Usually, the DEFAULT accounts reflect the settings appropriate for the majority of accounts. For example, when most USER accounts do not use project accounting (or you want to enable Project Accounting when establishing individual user accounts), then you should disable Project Accounting for the DEFAULT USER account.

To disable Project Accounting

- Use following commands:

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> DEFAULT/USER-
_ARSAP_UAF> /DISABLE=PROJECT_ACCOUNTING
%AUTHORIZE-S-MODIFIED, 1 USER record successfully modified
ARSAP_UAF> EXIT
$
```

The PROJECT DEFAULT account should reflect the needs of most PROJECT accounts. For example, when most PROJECT accounts do not have an expiration date, then you should set the DEFAULT PROJECT account to specify no expiration date, as follows:

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> DEFAULT/PROJECT/NOEXPIRATION_DATE
%AUTHORIZE-S-MODIFIED, 1 PROJECT record successfully modified
ARSAP_UAF> EXIT
$
```

Project Accounting Method

The /PROJECT_ACCOUNTING_METHOD qualifier specifies the way that CIMS assigns a project to batch jobs. CIMS is delivered with the NORMAL method selected.

The valid methods and their associated meanings are:

Type	Function
NORMAL	The project assigned to the batch job is the project that was in effect at the time the job was submitted. CIMS looks up this project in the CIMS Activity File.
P8	The project assigned to the batch job is passed into the job as the eighth (P8) parameter in the SUBMIT command.

To assign a project to batch jobs

- Use the following commands:

```
SETUP> DEFAULT/PROJECT_ACCOUNTING_METHOD=P8
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP> EXIT
$
```

This example sets the project accounting method to P8. You must pass in a project to batch job in the P8 parameter when submitting the job. For example, to assign project CS230 with the resources utilized by the command procedure TEST.COM, you would issue the following command from DCL:

```
$ SUBMIT/LOG/PARAMETER=(,,,,,,,CS230) TEST.COM
```

Adding Project Accounts

The CIMS Administrator adds PROJECT accounts to the CIMS Authorization File either automatically or manually.

Adding PROJECT accounts automatically to the CIMS Authorization File is usually undesirable and we do not discuss it here. For more information about this, read *Controlling User Access—Validating Projects* on page 3-7.

Adding a CIMS PROJECT account manually is similar to adding a new USERNAME account to OpenVMS. Merely add the new PROJECT with the parameters set to the appropriate values.

To add a new project

- To add a new project called SALES, with password protection and an initial password of XYZ, and budget limit checking with an initial budget of 2,000 currency units, execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> ADD/PROJECT SALES/ENABLE-
_ARSAP_UAF> =(PROJECT_VALIDATION,-
_ARSAP_UAF> BUDGET_LIMIT)/PASSWORD-
_ARSAP_UAF> ="XYZ"/BUDGET_LIMIT=2000.-
_ARSAP_UAF> /VALIDATION_METHOD=PASSWORD
%AUTHORIZE-S-ADDED, PROJECT record successfully modified
ARSAP_UAF> EXIT
$
```

Remember that when you add a project, any unspecified parameters are copied from the Project DEFAULT account.

Controlling User Access–Validating Projects

With project validation, you can control user access to projects. CIMS has five project validation levels (presented in ascending order of security control):

- No validation
- Validation by project name existence
- Validation by password
- Validation by previously authorized access for a username
- Validation by password and previously authorized access

No Validation

With no validation checking, anything you provide to CIMS is accepted as a valid project as long as the PROJECT name meets naming requirements. When the project is not already in the CIMS Authorization File, it is added with the flag and parameter values of the PROJECT DEFAULT record.

This choice is generally not recommended since CIMS accepts input such as typographical errors or random input in response to the project prompt as a valid project.

The most common use of this option is inside a command file that creates a special user environment. For example, suppose you had a command procedure that presents a menu to the user and performs some actions based on the option picked by the user. You want to be able to track how many and which users use each option.

To do this, you could retrieve the user's USERNAME and append it to the menu option that the user selected, creating a project name. Once you have this, you could create a new project by switching to it. (This requires that you disable both the Project Validation for the PROJECT DEFAULT account and the CIMS SWITCH Utility.)

To add projects automatically

- The following commands enable adding projects automatically to CIMS by disabling the PROJECT_VALIDATION flag for the PROJECT DEFAULT record.

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> DEFAULT/PROJECT-
_ARSAP_UAF> /DISABLE=PROJECT_VALIDATION
%AUTHORIZE-S-MODIFIED, 1 PROJECT record successfully modified
ARSAP_UAF> EXIT
$
```

Validation by Project Name Existence

The project must exist in the CIMS Authorization File. This ensures that you can access only existing projects, but it does not perform any password protection or verify your authority to access this project. This method assumes that knowing a valid project name is sufficient authorization to access the project.

To access projects without passwords

- Execute the following commands to have a project called SALES that any user can access without a password.

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> ADD/PROJECT SALES-
_ARSAP_UAF> /ENABLE=PROJECT_VALIDATION-
_ARSAP_UAF> /VALIDATION_METHOD=-
_ARSAP_UAF> (NOPASSWORD,NOUSERPROJ)
%AUTHORIZE-S-ADDED, PROJECT record successfully modified
ARSAP_UAF> EXIT
$
```

With this method of project validation, a user entering a project that does not already exist in the CIMS Authorization File is denied access. When you attempt to access a non-existent project at login time, you are unable to log in under that project. When you attempt an online switch to a non-existent project, you are unsuccessful.

Validation by Password

With validation by password, the project is password protected. The project must exist in the CIMS Authorization File, and the user must provide a valid password for that project. This is the most common project security protection method. One disadvantage of this method is that when the user should no longer access a particular project (the user leaves the organization or moves on to another task), you must change the password to disable that user's access to the project. This can be an operational problem when several other accounts use this same project since you must notify them all of the password change.

To validate users by password

- Suppose you have a project called SALES. You want it to be accessible to all users who know its password. Execute the following commands.

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY/PROJECT SALES-
_ARSAP_UAF> /ENABLE=PROJECT_VALIDATION-
_ARSAP_UAF> /VALIDATION_METHOD=-
_ARSAP_UAF> (PASSWORD,NOUSERPROJ)-
_ARSAP_UAF> /PASSWORD="LOMAN"
%AUTHORIZE-S-MODIFIED, 1 PROJECT record successfully modified
ARSAP_UAF> EXIT
$
```

With this project validation method, when the user enters a project and does not know that project's password, access is denied. A process trying to access the project at login time is terminated. A user attempting an online switch to the project is unsuccessful.

Validation by Preauthorized Access for a Username

With this method, only pre-authorized user accounts can access the project.

Before a user is granted access to a project, CIMS validates that the USERNAME and PROJECT combination are authorized (similar to the Access Control List protection of OpenVMS). The CIMS Administrator typically grants this authorization. The authorization exists in the CIMS Validation File, which is maintained by the CIMS AUTHORIZE Utility.

With this feature, you can disable project password protection and still control which users can charge against project accounts.

To restrict user access to a project

- Suppose you have a project called SALES that you want accessed only by certain users. Execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY/PROJECT SALES-
_ARSAP_UAF> /ENABLE=PROJECT_VALIDATION-
_ARSAP_UAF> /VALIDATION_METHOD=(NOPASSWORD-
_ARSAP_UAF> ,USERPROJ)
%AUTHORIZE-S-MODIFIED, 1 PROJECT record successfully modified
ARSAP_UAF> EXIT
$
```

  You also must enable a list of user accounts that are permitted to access the SALES project. To add the user accounts BDUNN and YSMITH to the project SALES access list, execute the following commands.

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> ADD /VALIDATESALES BDUNN
%VALID-I-ADDED, user/project combination successfully added
ARSAP_UAF> ADD /VALIDATE SALES YSMITH
%AUTHORIZE-I-ADDED, user/project combination successfully added
ARSAP_UAF> EXIT
$
```

Validation by Password and Preauthorized Access

For maximum project protection, set the Project Validation Method for the particular project to both PASSWORD and USERPROJ. This requires the user to be pre-authorized for the project and know the password for the project.

To restrict user access to a project

- Suppose you have a project called SALES that you want accessed only by authorized users who have been given a password, XYZ, for accessing the project. Execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY/PROJECT SALES-
_ARSAP_UAF> /ENABLE=PROJECT_VALIDATION-
_ARSAP_UAF> /VALIDATION_METHOD=-
_ARSAP_UAF> (PASSWORD,USERPORJ)/PASSWORD="XYZ"
%AUTHORIZE-S-MODIFIED, 1 PROJECT record successfully modified
ARSAP_UAF> EXIT
$
```

  In addition to informing authorized users of the password needed to access this project, you must also validate them for the project. Do this using the CIMS AUTHORIZE Utility as follows:

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> ADD/VALIDATE SALES BDUNN
%AUTHORIZE-I-ADDED, user/project combination successfully added
ARSAP_UAF> EXIT
$
```

Customizing Projects

Assigning User Default Projects

When you have project accounting enabled and access the system, a project must be associated with the computer session. When you access the system interactively, the project association can be formed automatically through a User Default Project.

When you access the system interactively and the user account has the Default Project flag enabled, the `CIMS LOGIN` Utility retrieves the project specified in your Default Project field from the `CIMS` Authorization File. This is useful when you always want the same project assigned initially when you log onto the system. (You can use the `CIMS SWITCH` Utility to change to a different project later).

To assign a project to a user

- To assign a project automatically to a user logging in interactively, you must enable default project assignments and a assign a default project to the user. To assign the project `SALES` automatically when the user account `IMARTIN` logs into the computer system, execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY/USER IMARTIN/ENABLE-
_ARSAP_UAF> =(PROJECT_ACCOUNTING,DEFAULT_PROJECT)-
_ARSAP_UAF> /DEFPROJECT=SALES
%AUTHORIZE-S-MODIFIED, 1 USER record successfully modified
ARSAP_UAF> EXIT
$
```

Project Budget Limits

Many projects have budget limits. Consider the following factors to determine whether to enable project budget limits and what optional portions of project budget limits to use in your environment.

- **Budget Limits**—If a project has budget limits and these limits are enforced, you cannot access the project when the limit has been exceeded. When you attempt access at login, the interactive or batch session terminates. When you attempt access by an online switch, access is denied, but the current session does not terminate.

  If the budget limit is not enforced, you are granted access even though the budget limit has been exceeded.

- **Budget Limit Warning Zones**—A project can have a budget limit warning zone. When the current charges against the project have reached a pre-established percentage, each subsequent access to the project results in a budget limit warning message before access is granted.

- **Budget Limit Exceeded Action**—If this flag is set and the project is over its budget limit, you are denied access to the project. When this flag is not set, you are allowed access even when the project is over its budget.

To enable project budget limits

- You must enable several flags and parameters in the `CIMS` Authorization File and set them for the target account. The following example enables both project budget limits and enforcement of the set budget limit for the project `SALES`.

  When the project `SALES` reaches 75% of its budget limit of 25,000 currency units, any user accessing that project receives a warning. When charges against the project reach 25,000 currency units or more, no user is allowed access to the project.

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY/PROJECT SALES-
_ARSAP_UAF> /ENABLE=(BUDGET_LIMIT,-
_ARSAP_UAF> BUDLIMIT_WARNING-
_ARSAP_UAF> ,BUDGET_EXCEEDED_ACTION)-
_ARSAP_UAF> /BUD_WARNING_ZONE=75/BUDGET_LIMIT=25000
%AUTHORIZE-S-MODIFIED, 1 PROJECT record successfully modified
ARSAP_UAF> EXIT
$
```

Project Storage Limits

Projects can have storage limits. Consider the following factors to determine whether to enable project storage limits and what optional portions of project storage limits would be useful in your environment.

- **Storage Limits**—If a project storage limit is enforced, and the limit has been exceeded, access to the project is not allowed. When you attempt access at login, the interactive or batch session terminates. When you attempt access by an online switch, access is denied but the current session does not terminate. When the storage limit is not enforced, you are granted access even though the storage limit has been exceeded.

- **Storage Limit Warning Zone**—A project can have a storage limit warning zone. When the current storage used by the project has reached a pre-established percentage, each subsequent access to the project results in a storage limit warning message before access is granted.

- **Storage Limit Exceeded Action**—If this flag is set and the project is over its storage limit, you are denied access to the project. When this flag is not set, you are allowed access even when the project has used more than its storage limit.

To enable project storage limits

- You must enable several flags and parameters in the CIMS Authorization File and set them for the target account. The following commands enable project storage limits for the project SALES and enforcement of the set storage limit. This allows the project's disk storage to get to within 90% of the storage limit of 10,000 block weeks; then any user accessing that project receives a warning. When that project's disk usage reaches 10,000 or more, no user can access the project:

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY/PROJECT SALES-
_ARSAP_UAF> /ENABLE=(STORAGE_LIMIT,-
_ARSAP_UAF> STOLIMIT_WARNING-
_ARSAP_UAF> ,STORAGE_EXCEEDED_ACTION)-
_ARSAP_UAF> /STO_WARNING_ZONE=90/STORAGE_LIMIT=10000
%AUTHORIZE-S-MODIFIED, 1 PROJECT record successfully modified
ARSAP_UAF> EXIT
$
```

Changing Projects Online

The CIMS SWITCH Utility is an extremely powerful and useful function. SWITCH eliminates the need for the time consuming process of logging off the OpenVMS system and logging on again to change projects.

SWITCH saves the time and resources associated with logging off and back on the system by allowing you to associate your computer session to a particular project and to then change to another project without terminating your session.

You can use SWITCH online or in a batch job to allocate portions of the job to different projects. In addition, with the SWITCH command you can also simultaneously change the project environment. When a new project is assigned to the current session, SWITCH can also:

- Change the current process' UIC
- Change the current process' default directory
- Change the current process' privileges

- Start a Project Command File.

To enable project switching

- The following commands enable project switching for the user account QTHOMAS, disable the changing of the process UIC to the project UIC, and disable the changing of the default directory.

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY/USER QTHOMAS-
_ARSAP_UAF> /ENABLE=SWITCH_PROJECT-
_ARSAP_UAF> /DISABLE=(SWITCH_UIC,SWITCH_DIRECTORY)
%AUTHORIZE-S-MODIFIED, 1 USER record successfully modified
ARSAP_UAF> EXIT
$
```

Project UICs

A project can have a UIC associated with it. The PROJECT UIC tracks disk space allocation for the project, and you can also use it to grant access to the project files.

- If on-line project switching is enabled as well as switching UICs for the user and the project, SWITCH resets the current process' UIC to the project's UIC.
- When the project has UIC switching disabled and revert UIC enabled, the current process' UIC is set to the user's default UIC.

While this is a powerful way to grant access to project files, exercise care in designating user accounts to have their UICs changed to a project UIC, as well as assigning appropriate UICs to a project. You should avoid assigning a project UIC within the range of valid system UICs.

To create a project account with a UIC

- The following commands create a project account called SALES with the UIC [100,1]. In addition, the UIC switching flag is enabled so that users accessing this project (SALES) with UIC switching enabled for them, have their process' UIC switched to that of the project SALES ([100,1]).

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> ADD/PROJECT SALES/UIC=[100,1]-
_ARSAP_UAF> /ENABLE=SWITCH_UIC
%AUTHORIZE-S-ADDED, PROJECT record successfully added
ARSAP_UAF> EXIT
$
```

Project Default Directories

A project can have a default directory associated with it. When online project switching is enabled as well as switching the default directory for the user and the project, SWITCH resets the current process' default directory to the project's default directory.

If directory switching is disabled and revert directory is enabled for a particular project, users switching to this project have their default directories reset to their login default directories.

To create a project account with an associated directory

- The following commands create a project account called SALES with the UIC [100,1] assigned to it as well as the default directory of DRB0:[SALES]. Users switching to this project with directory switching enabled for their user accounts have his process' default directory reset to DRB0:[SALES].

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> ADD/PROJECT SALES/UIC=[100,1]-
_ARSAP_UAF> /DIRECTORY=DRB0:[SALES]-
_ARSAP_UAF> /ENABLE=SWITCH_DIRECTORY
%AUTHORIZE-S-ADDED, 1 PROJECT record successfully added
ARSAP_UAF> EXIT
$
```

Project Default Privileges

A project can have default privileges associated with it. When online project switching is enabled as well as switching privileges for the user and the project, SWITCH resets the current process' default privileges to the project's default privileges.

If privilege switching is disabled and revert privilege enabled for a particular project, users switching to this project have their process default privileges reset to their login default privileges.

While this is a powerful way to grant privileges while working in a particular project, exercise care in assigning user accounts that can have their default privileges changed.

To create a project account with associated privileges

- The following commands create a project called CS203-1 with privilege switching enabled. The command also indicates the privileges the project are allowed to utilize. Users switching to this project (with privilege switching enabled for the user account) have their process' default privileges set to those of the project.

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> ADD/PROJECT CS203-1-
_ARSAP_UAF> /ENABLE=SWITCH_PRIVILEGE-
_ARSAP_UAF> /DPRIVILEGES=(SYSPRV,TMPMBX,GRPPRV)
%AUTHORIZE-S-ADDED, PROJECT record successfully added
ARSAP_UAF> EXIT
$
```

Project Command Files

A project can have a Project Command File associated with it. This is useful for setting up an environment for all users of that project. For example, you might want to define some DCL symbols and logicals for the users to use while they are working on that project. Or, you could design it as a captive command procedure. This procedure could be a simple menu system for your operators.

If a user has project switching enabled and the invoke login command file is enabled for both the project and the user, SWITCH executes the project command file when the user switches to a new project.

If the invoke login command file flag is disabled for the user and the revert login command file flag is enabled for the project, then users switching to this project have their login command procedures executed.

There is little danger (by itself) in enabling this option since you can start the project command file like any other command file. The advantage of starting a project command file automatically is user convenience.

To create a project account with an associated command file

- Suppose you want to create a project account called SALES with the UIC [100,1]. When user WDOE switches to the project SALES, his UIC changes to the SALES UIC, his default directory resets to the project SALES directory, and the SALES project command file executes, setting up an initial SALES project environment. The following commands accomplish this.

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY/USER WDOE/ENABLE-
_ARSAP_UAF> =(PROJECT_ACCOUNTING,SWITCH_DIRECTORY-
_ARSAP_UAF> ,SWITCH_PROJECT,SWITCH_UIC-
_ARSAP_UAF> ,INVOKE_LGICMD)
%AUTHORIZE-S-MODIFIED, 1 USER record successfully modified


ARSAP_UAF> ADD/PROJECT SALES/UIC=[100,1]-
_ARSAP_UAF> /DIRECTORY=DRB0:[SALES]-
_ARSAP_UAF> /LGICMD=SALES_LOGIN.COM/ENABLE=-
_ARSAP_UAF> (SWITCH_DIRECTORY,SWITCH_UIC,-
_ARSAP_UAF> INVOKE_LGIMD)
%AUTHORIZE-S-MODIFIED, 1 PROJECT record successfully modified
ARSAP_UAF> EXIT
$
```

Project Lifetimes

A project can have a project lifetime. This is particularly useful when a project has a known life span and you want to make sure that users cannot access the project after a particular date. You can also assign a project start time.

To assign a project lifetime

- Suppose you want to assign a project lifetime to the project account called SALES so that after 31-DEC-1995, no user accounts can charge computer resources to that project account. The following commands accomplish this:

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY/PROJECT SALES-
_ARSAP_UAF> /EXPIRATION_DATE=31-DEC-1995
%AUTHORIZE-S-MODIFIED, 1 PROJECT record successfully modified
ARSAP_UAF> EXIT
```

  Suppose you want to assign a project start time to the project SALES so that users cannot charge computer resources to it until 1-JAN-2000. The following commands accomplish this:

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY/PROJECT SALES-
_ARSAP_UAF> /START_DATE=1-JAN-2000
%AUTHORIZE-S-MODIFIED, 1 PROJECT record successfully modified
ARSAP_UAF> EXIT
```

  You can also define a project lifetime to *forever* for the project SALES by issuing the following commands:

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY/PROJECT SALES/NOEXPIRATION_DATE
%AUTHORIZE-S-MODIFIED, 1 PROJECT record successfully modified
ARSAP_UAF> EXIT
$
```

Project Synonyms

A project can have a synonym associated with it. The CIMS SYNONYM Utility maintains a database of project synonyms that you can use instead of project names. This can be useful when project names are long or cryptic (for example, numeric account codes). Note that there can be only one synonym per project.

Entering Synonyms For Project Names

You can use synonyms when you log into a project or change projects. The USE_SYNONYM option must be enabled for the user in the CIMS Authorization File. When this option is enabled, CIMS reads the CIMS Synonym File to see whether the project name that the user entered is defined as either a synonym or as a project. When the name that was entered is a synonym, the real project name associated with that synonym (taken from the file) is used instead of what the user entered.

For example, suppose there is an entry in the CIMS Synonym File for project 4512-111-PSKD-000000 with a synonym of CONTRACTS. The user enters CONTRACTS as a project name when logging into the system. LOGIN reads the Synonym File, and sees that CONTRACTS is really a synonym for the real project name of 4512-111-PSKD-000000. The 4512-111-PSKD-000000 project name is then used as the project name for that session.

Note that when the user has USE_SYNONYM enabled, then the project name that is used must already be in the CIMS Authorization File. When it is not, the project name is considered invalid.

Suppose now that what the user enters for the project name is not in the CIMS Synonym File (as a project or a synonym). When the ADD_SYNONYM option is enabled for that user, CIMS automatically creates a new synonym. This new synonym and the project name that the user enters are added to the CIMS Synonym File. In addition, when the ADD_PROJECT option is enabled for the user and the project name is not in the CIMS Authorization File, then the project is added to the CIMS Authorization File. When the PROMPT_SYNONYM_DESC option is enabled for the user, the user is prompted for a description of the new project. This description is then used for the Project Description in the CIMS Authorization File.

To permit synonym usage

1 First, enter the project (4516-111-PSKD-000000) / synonym (CONTRACTS) combination into the CIMS Synonym File as follows:

```
$ RUN ARSAP$EXE:ARSAP_SYNONYM
SYNONYM> ADD 4516-111-PSKD-000000 CONTRACTS
%SYNON-I-ADDED, project/synonym combination added
SYNONYM> EXIT
$
```

2 Next, issue the following commands to enable synonyms for that user:

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY/USER YSMITH/ENABLE=USE_SYNONYM
%AUTHORIZE-S-MODIFIED, 1 USER record successfully modified
ARSAP_UAF> EXIT
$
```

Now, when logging in, the user can enter the synonym CONTRACTS instead of the longer project name. Also, when allowed to switch projects, the user can specify CONTRACTS for the project name.

Project Descriptions

A project can have a project description. This is useful for cryptic project names that need a more descriptive phrase to accompany the project's name. A description can have up to 30 characters.

To assign a project description

- The following commands assign a project description to the project account called SALES of Sales and Marketing Account.

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY/PROJECT SALES/DESCRIPTION-
_ARSAP_UAF> ="Sales and Marketing Account"
%AUTHORIZE-S-MODIFIED, 1 PROJECT record successfully modified
ARSAP_UAF> EXIT
$
```

Project Cost Centers

A project can have a cost center associated with it. A cost center is a grouping of projects. This grouping is strictly by project name and can be totally arbitrary. A cost center has from 1 to 32 characters.

To assign a cost center

- The following commands assign the cost center R_AND_D to the project account called T8523-07946.

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY/PROJECT T8523-07946-
_ARSAP_UAF> /COST_CENTER="R_AND_D"
%AUTHORIZE-S-MODIFIED, 1 PROJECT record successfully modified
ARSAP_UAF> EXIT
$
```

Project Groups

A project can have up to five groups associated with it. A group is a grouping of projects; this grouping is strictly by project name and can be totally arbitrary. A group has from 1 to 32 characters.

To assign a project to a group

- The following commands assign Information Systems to the first project group in the project account called PUBLICATIONS.

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY/PROJECT PUBLICATIONS-
_ARSAP_UAF> /GRP1="Information Systems"
%AUTHORIZE-S-MODIFIED, 1 PROJECT record successfully modified
ARSAP_UAF> EXIT
$
```

Project Rates

Each project has an associated rates table. The name of the default rates table is DEFAULT_RATES. When you create a new CIMS Authorization File, the default project is created and specifies the default rates table.

The CIMS Administrator creates and assigns rates tables. A rates table name can have from 1 to 32 characters. Alphanumerics, dollar signs ($), and underscores (_) are permitted in the rates table name specification. Rates tables are stored in the CIMS Rates File and created or modified by the CIMS RATES Utility.

To assign a rate table to a project

- The following commands assign the rates table CAD_RATES to the project account called CS203-1.

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY/PROJECT CS203-1-
_ARSAP_UAF> /RATES_NAME=CAD_RATES
%AUTHORIZE-S-MODIFIED, 1 PROJECT record successfully modified
ARSAP_UAF> EXIT
$
```

  The following commands assign the rates table ALPHA_RATES to the project account called CONTRACTS on the node ALPHA in a cluster.

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY/PROJECT CONTRACTS-
_ARSAP_UAF> /RATES_NAME=ALPHA_RATES/NODE=ALPHA-
%AUTHORIZE-S-MODIFIED, 1 PROJECT record successfully modified
ARSAP_UAF> EXIT
$
```

Project Sold-to Addresses

Each project account can have a sold-to address assigned to it.

Sold-to addresses usually reflect the name and address where the invoice is to be sent. The sold-to address fields allow seven lines for the address, with each line up to forty characters long. The CIMS INVOICES Utility inserts the project's sold-to address fields on the project's invoice.

To assign a sold-to address

- Execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY CS203-1/PROJECT/SOLDTO=(-
_ARSAP_UAF> LINE1="Accounts Payable",-
_ARSAP_UAF> LINE2="XYZ Corporation",-
_ARSAP_UAF> LINE3="PO Box 1796",-
_ARSAP_UAF> LINE4="Laurel, MD 20707")
%AUTHORIZE-S-MODIFIED, 1 PROJECT record successfully modified
ARSAP_UAF> EXIT
$
```

Project Ship-to Addresses

Each project account can have an assigned ship-to address.

Ship-to addresses usually reflect the name and address to which the goods were shipped or where services were performed. The ship-to address fields allow seven lines for the address, with each line up to forty characters long. The CIMS INVOICES Utility inserts the project's ship-to address fields on the project's invoice.

To assign a ship-to address

- Execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY CS203-1/PROJECT/SHIPTO=(-
_ARSAP_UAF> LINE1="Bob Squires",-
_ARSAP_UAF> LINE2="VAX System Manager",-
_ARSAP_UAF> LINE3="Mail Code 120-COM",-
_ARSAP_UAF> LINE4="LAB Corporation",-
_ARSAP_UAF> LINE5="33 Alden Place",-
_ARSAP_UAF> LINE6="West Newton, MA  02165")
%AUTHORIZE-S-MODIFIED, 1 PROJECT record successfully modified
ARSAP_UAF> EXIT
$
```

Project Remit-to Addresses

Each project account can have an assigned remit-to address.

Remit-to addresses usually reflect the name and address where the invoice payment is to be sent. The remit-to address fields allow seven lines for the address, with each line up to forty characters long. The `CIMS INVOICES` Utility inserts the project's remit-to address fields on the project's invoice.

To assign a remit-to address

- Execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY CS203-1/PROJECT/REMIT=(-
_ARSAP_UAF> LINE1="Accounts Receivables",-
_ARSAP_UAF> LINE2="CIMS Lab, Inc.",-
_ARSAP_UAF> LINE3="3013 Douglas Blvd., Suite 120",-
_ARSAP_UAF> LINE4="Roseville, CA 95661")
%AUTHORIZE-S-MODIFIED, 1 PROJECT record successfully modified
ARSAP_UAF> EXIT
$
```

Project Minimum and Maximum Charges

A project can have minimum and maximum charge levels. You can specify either one or both.

To assign minimum and maximum charge levels

- The following command limits the charge for the project account called CONTRACTS to 100.00 currency units. This means that this project is never charged more than 100.00 in an accounting period.

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY/PROJECT CONTRACTS-
_ARSAP_UAF> /MAXIMUM_CHARGE=100.00-
_ARSAP_UAF> /ENABLE=MAXIMUM_CHARGE
%AUTHORIZE-S-MODIFIED, 1 PROJECT record successfully modified
ARSAP_UAF> EXIT
$
```

  Suppose you want the project account called SALES to always be charged at least 25.00 currency units. The following command accomplishes this.

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY/PROJECT SALES-
_ARSAP_UAF> /MINIMUM_CHARGE=25.00-
_ARSAP_UAF> /ENABLE=MINIMUM_CHARGE
%AUTHORIZE-S-MODIFIED, 1 PROJECT record successfully modified
ARSAP_UAF> EXIT
$
```

Project Resource Utilization and Charge Displays

You can display the project's computer resources consumed and associated charges using the CIMS MYCOST Utility. Also, when you use the CIMS LOGOUT Command Procedure and you log out of an interactive session, the terminal can display a Project Logout Display showing computer resources consumed and associated charges.

The following table shows the choices controlled by this field. A NO prefix disables the choice.

Option	Display
[NO]PERTOTAL	Displays the period-to-date total expenditure as a single monetary figure.
[NO]SESCHARG	Displays charges for each resource item (you must also select SESSTATS).
[NO]SESSHIFT	Displays resource utilization by shift (you must also select SESSTATS).
[NO]SESSTATS	Itemizes the session resources consumed by resource.
[NO]SESTOTAL	Displays the total cost of the session.

Select all items to display the most information. You can display more than one screen of information. Note that SESSHIFT and SESCHARG display options are meaningless unless you also select SESSTATS.

To display usage costs

- Suppose that whenever a user logs off from the project account called CONTRACTS you want him to see the session total cost and the period-to-date total expenditure. The following commands accomplish this:

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY/PROJECT CONTRACTS-
_ARSAP_UAF> /ENABLE=LOGOUT_DISPLAY-
_ARSAP_UAF> /LOGOUT_DISPLAY=(SESTOTAL,PERTOTAL)
%AUTHORIZE-S-MODIFIED, 1 PROJECT record successfully modified
ARSAP_UAF> EXIT
$
```

Suppose you do not want the project account called SALES to see the resource utilization itemized by shift. The following commands suppress the display of this information.

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY/PROJECT SALES-
_ARSAP_UAF> /LOGOUT_DISPLAY=NOSESSHIFT
%AUTHORIZE-S-MODIFIED, 1 PROJECT record successfully modified
ARSAP_UAF> EXIT
$
```

Project Accounting and Batch Jobs

CIMS automatically and transparently assigns a project to a batch job when the batch job starts execution when the user who submitted the batch job has project accounting enabled. The CIMS LOGIN Utility retrieves the project name and assigns the project name to the batch job.

However, due to restrictions in how the OpenVMS LOGINOUT Utility works, the CIMS LOGIN Utility cannot do the following:

- Set the user's UIC to the project's UIC
- Set the user's default directory to the project's default directory
- Set the user's default privileges to the project's default privileges
- Start the project's command file.

When you want to have one or more of these things done for project batch jobs, you must invoke the CIMS SWITCH Utility in the batch job's command procedure. When you do not need these things done, you don't need to use the CIMS SWITCH Utility in the batch command file.

If the CIMS SWITCH Utility has been installed in the manner supplied and suggested by the CIMS Lab, you should insert the following command into every batch command file that requires one of the items in the above list.

```
$ SWITCH
```

Do not supply any additional information such as project name and password. This method allows the batch job to change its directory, UIC, default privileges, and authorized privileges to that of the project that the batch job was submitted under. Note that this method does not change the project for which the session is charged. It performs environmental setup only as specified by the environment flags in the project's account record in the CIMS Authorization File.

Alternatively, you can call the CIMS SWITCH Utility from within the batch job as a foreign command and provide it with a project and optional password (depending on the validation method assigned to the project) as command line arguments or as data lines following the SWITCH command.

This method changes the project of the batch job to the project specified in the SWITCH command. The directory, UIC, default privileges, and authorized privileges are changed as indicated by the environment flags in the project's account record in the CIMS Authorization File.

Note that the project the batch job is charged to, up to the point in the batch job when the project in switched, is the project the batch job was submitted under. This method provides an ability to charge different segments of a single batch job to different projects.

There is one other restriction of the OpenVMS LOGINOUT Utility. Unless explicitly specified otherwise, the .LOG File created by the batch command procedure is always created in the user's default directory, not the project's default directory. This happens because the .LOG File is created before the CIMS LOGIN Utility is invoked, so the CIMS LOGIN Utility can not change where the .LOG File is created.

As a workaround, you can use the /LOG_FILE qualifier on the OpenVMS SUBMIT command to specify where the .LOG File is created provided you have read and write access to the location specified. Note also that the .LOG File is created with the username UIC, not the project UIC.

Project Reporting

Refer to *Chapter 5, Chargeback* for project invoices for chargeback.

Refer to *Chapter 6, Resource Management* for a discussion of project resource utilization reports.

Refer to *Chapter 10, Software Package / Image Accounting* for producing software package utilization reports for projects.

Refer to *Chapter 13, All-in-1 Accounting* for producing All-in-1 utilization reports for projects.

4

User Accounting

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How CIMS Implements User Accounting

CIMS uses the data gathered by the OpenVMS job controller and logged to the OpenVMS Accounting files. CIMS also collects disk storage information and handles the recovery of accounting data that would otherwise be lost as a result of a system crash (implemented by the RECOVER and STORAGE_SAMPLER utilities).

CIMS implements the data collection portion of User Accounting using the LOGIN, SWITCH, and STORAGE_UPDATE utilities.

CIMS implements the data processing portion of User Accounting using the CIMS LOGGER, VMS_MERGE, and VMS_SELECT utilities.

CIMS implements the data reporting portion of User Accounting using the CIMS INVOICES, MYCOST, and RESOURCE_REPORT Utility.

All of these utilities access the CIMS Parameter File to determine whether User Accounting is enabled. For more information, refer to the HELP command within each of these CIMS utilities.

Enabling User Accounting

You enable User Accounting system-wide with the CIMS SETUP Utility. The CIMS AUTHORIZE Utility sets user accounting options and parameters for individual accounts.

To enable User Accounting

1 Enable it first on a system-wide basis. To do this, use the CIMS SETUP Utility as follows:

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> DEFAULT/ENABLE=USER_ACCOUNTING
%SETUP-S-MODIFIED, NODE successfully modified
SETUP> EXIT
$
```

If you enable User Accounting on your system, you should always be concerned about the USER DEFAULT account. This account is referenced when a new user account is added to the CIMS Authorization File (either automatically by CIMS through the CIMS LOGIN Utility or manually through the use of the CIMS AUTHORIZE Utility).

Usually, the USER DEFAULT account reflects the settings appropriate for the majority of user accounts. For example, when you know that most accounts do not use Project Accounting (or you want to initialize each USER account for Project Accounting when the USER account is established), then the DEFAULT USER account should have Project Accounting disabled.

2 Do this as follows:

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> DEFAULT/USER-
_ARSAP_UAF> /DISABLE=PROJECT_ACCOUNTING
%AUTHORIZE-S-MODIFIED, 1 USER record successfully modified
ARSAP_UAF> EXIT
$
```

Adding USER Accounts

User accounts are added to the CIMS accounting system either automatically or by the CIMS Administrator.

Adding the user accounts automatically to the CIMS USERNAME account list is the simplest and most common method.

ARSAP_LOGIN (called from the system login command procedure) automatically adds user accounts (records) to the CIMS Authorization File. The new user account has the same setting as the DEFAULT user record's settings.

To add a user record automatically

- Use the LOAD command within the CIMS AUTHORIZE Utility to add USER records to the CIMS Authorization File. The /SYSUAF or /FILE qualifier is required.

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> LOAD/USER/SYSUAF
ARSAP_UAF> EXIT
$
```

  The /SYSUAF qualifier specifies that all the username accounts in the OpenVMS Authorization File should be added to the CIMS Authorization File.

To add a USER account manually

Use the CIMS AUTHORIZE Utility as follows:

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> ADD/USER WDOE
%AUTHORIZE-S-ADDED, USER record successfully added
ARSAP_UAF> EXIT
$
```

Manually adding an CIMS user account is similar to adding a new USERNAME account to OpenVMS. Add the new USERNAME with the parameters set to the appropriate values.

To set USERACCOUNT parameters

- Suppose you want to add a new user account called BDUNN with budget limit checking with an initial budget of 2,000 currency units (United States currency units are dollars). Execute the following command:

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> ADD BDUNN/ENABLE=(BUDGET_LIMIT)-
_ARSAP_UAF> /BUDGET_LIMIT=2000
%AUTHORIZE-S-ADDED, USER record successfully added
ARSAP_UAF> EXIT
$
```

Note • Any USER parameters you do not specify when adding a user account are copied from the USER DEFAULT account.

Customizing User Accounts

Default Projects

You can assign a project to a user's session automatically and transparently. With this method of project assignment, 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.

To set a default project

- The following command sets the default project for user IMARTIN to be project SALES, and enables the DEFAULT_PROJECT and PROJECT_ACCOUNTING flags.

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY IMARTIN-
_ARSAP_UAF> /DEFPROJECT=SALES-
_ARSAP_UAF> /ENABLE=(DEFAULT_PROJECT-
_ARSAP_UAF> ,PROJECT_ACCOUNTING)
%AUTHORIZE-S-MODIFIED, 1 USER record successfully modified
ARSAP_UAF> EXIT
$
```

Project Prompting

If a user has Project Accounting enabled but does not have Default Project enabled, CIMS prompts the user for a project name when the user logs in. Also, when a user has project switching enabled, the CIMS SWITCH Utility can prompt the user for a project name.

To enable PROJECT_ACCOUNTING

- The following command enables `PROJECT_ACCOUNTING` for user `IMARTIN`.

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY IMARTIN-
_ARSAP_UAF> /ENABLE=PROJECT_ACCOUNTING
%AUTHORIZE-S-MODIFIED, 1 USER record successfully modified
ARSAP_UAF> EXIT
$
```

User Budget Limits

User accounts can have associated budget limits. You can enable these limits and the various settings and options for particular users. Review this section to determine whether to enable user budget limits and which optional portions of user budget limits to use in your environment.

- **Budget Limits**—You can enforce or ignore user a budget limit on an individual account basis. When the limit is enforced, access to the user account is not allowed. When access is attempted at login, the interactive or batch session terminates.
- **Budget Limit Warning Zones**—A user can have a budget limit warning zone. When the current charges against the user account have reached a predetermined percentage, each subsequent access to the user account results in a budget limit warning message before access is granted.
- **Budget Limit Exceeded Action**—If this flag is set and the user account is over its budget limit, the user is denied access to the system during login. When this flag is not set, the user is allowed access even if the user account is over its budget.

To enable user budget limits

- You must enable several flags and parameters in the CIMS Authorization File and set them for the target account. The following example enables user budget limits and limit enforcement for the user account WDOE:

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY WDOE/ENABLE=(BUDGET_LIMIT,-
_ARSAP_UAF> BUDLIMIT_WARNING-
_ARSAP_UAF> ,BUDGET_EXCEEDED_ACTION)-
_ARSAP_UAF> /BUD_WARNING_ZONE=75/BUDGET_LIMIT=25000
%AUTHORIZE-S-MODIFIED, 1 USER record successfully modified
ARSAP_UAF> EXIT
$
```

User Storage Limits

User accounts can have associated storage limits. You can enable these limits and their various settings and options for selected user accounts. Review the following factors to decide whether to enable user storage limits and what optional portions to use in your environment.

- **Storage Limits**—You can enforce or ignore a user storage limit on an individual account basis. When the limit is enforced, access to the user account is not allowed. When access is attempted at login, the interactive or batch session terminates. When access is attempted by an on-line switch, access is denied but the current session does not terminate. When the storage limit is not to be enforced, the user is granted access even though the storage limit has been exceeded.
- **Storage Limit Warning Zones**—A user account can have a storage limit warning zone. When the current storage used by the user account has reached a certain percentage, each subsequent access to the user account results in a storage limit warning message before access is granted.
- **Storage Limit Exceeded Action**—If this flag is set and the user has exceeded the storage limit, the user is denied access to the project. When this flag is not set, the user is allowed access even if the user has used more than the allotted amount of storage.

To enable user account storage limits

- You must enable several flags and parameters in the CIMS Authorization File and set them for the target account. The following example enables user account storage limits for the user PJONES and enforcement of the set storage limit.

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY PJONES/ENABLE=(STORAGE_LIMIT-
_ARSAP_UAF> ,STOLIMIT_WARNING-
_ARSAP_UAF> ,STORAGE_EXCEEDED_ACTION)-
_ARSAP_UAF> /STO_WARNING_ZONE=75/STORAGE_LIMIT=20000
%AUTHORIZE-S-MODIFIED, 1 USER record successfully modified
ARSAP_UAF> EXIT
```

Inactive Terminal Logouts

A user account can be logged off the computer system when the process has 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.

To enable Inactive Terminal Logout

1. You must enable it first on a system-wide basis. To do this, you use the CIMS SETUP Utility as follows:

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> DEFAULT/ENABLE=IDLE_PROCESS
%SETUP-S-MODIFIED, NODE record successfully modified
SETUP> EXIT
$
```

2. Now that you have enabled Inactive Terminal Logout system-wide, you must also enable or disable it for individual user accounts. You should set up the DEFAULT USER account to reflect how you want to treat new users added to the system in relation to Inactive Terminal Logout. In addition, you must update any existing user accounts already in CIMS's Authorization File to reflect how you want these accounts to be treated in relation to Inactive Terminal Logout.

Suppose you want to enable Inactive Terminal Logout for all new user accounts, but disable it for all existing accounts starting with CHOP as part of their usernames. Use the following commands.

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> DEFAULT/ENABLE=KILL_IDLE_PROCESS
%AUTHORIZE-S-MODIFIED, 1 USER record successfully modified
ARSAP_UAF> MODIFY */ENABLE=KILL_IDLE_PROCESS-
_ARSAP_UAF> /NOCONFIRM
%AUTHORIZE-S-MODIFIED, 147 USER records successfully modified
ARSAP_UAF> MODIFY CHOP*/DISABLE=KILL_IDLE_PROCESS-
_ARSAP_UAF> /NOCONFIRM
%AUTHORIZE-S-MODIFIED, 15 USER records successfully modified
ARSAP_UAF> EXIT
$
```

User Descriptions

A user account can have a user description associated with it. A user description is a 30-character *tag* that is passed to the merged CIMS Statistics File. It is usually a more descriptive phrase to accompany the username.

To ensure retention of lowercase characters, embedded spaces, or both, you must enclose descriptions containing these specific characters in quotes.

To assign a user description

- The following commands assign the user description Sales and Marketing Account to the user account called SALES.

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY SALES/DESCRIPTION-
_ARSAP_UAF> ="Sales and Marketing Account"
%AUTHORIZE-S-MODIFIED, 1 USER record successfully modified
ARSAP_UAF> EXIT
$
```

User Cost Centers

A user can have a cost center associated with it. A cost center is a grouping of usernames and can be totally arbitrary. It can be from 1 to 32 characters long.

To ensure retention of lowercase characters, embedded spaces, or both, you must enclose descriptions containing these specific characters in quotes.

To assign a cost center

- To assign the cost center `Highway Mapping` to the user account called `QTHOMAS`, execute the following commands.

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY QTHOMAS/COST_CENTER=-
_ARSAP_UAF> "Highway Mapping"
%AUTHORIZE-S-MODIFIED, 1 USER record successfully modified
ARSAP_UAF> EXIT
$
```

User Groups

A user can have up to five groups associated with it. A group is a grouping of users. This grouping is strictly by username and can be totally arbitrary. A group has from 1 to 32 characters.

To ensure retention of lowercase characters, embedded spaces, or both, you must enclose descriptions containing these specific characters in quotes.

The `CIMS RESOURCE_REPORT` Utility can produce reports that show the total resources used by each group. That is, it adds all the statistics together for users that are in the same group and shows the total resource statistics for that group. In the example below, you could see the total resource statistics for all the users whose group 1 field is `Publications`.

To assign a user group

- The following commands assign Publications to the first user group in the user account called IMARTIN:

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY IMARTIN-
_ARSAP_UAF> /GRP1="Publications"
%AUTHORIZE-S-MODIFIED, 1 USER record successfully modified
ARSAP_UAF> EXIT
$
```

User Rates

Each user account has an associated rates table. The name of the default rates table is DEFAULT_RATES. When you create a new CIMS Authorization File, the default user account is created specifying that rates table.

The CIMS Administrator creates rates tables. A rates table name can have from 1 to 32 characters. You can use alphanumerics, dollar signs ($) and underscores (_) in the rates table name specification. Rates tables are created or modified by the CIMS RATES Utility and stored in the CIMS Rates File.

To assign a rates table

- If you want to assign the rates table SALES_RATES to the user account called YSMITH, execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY YSMITH-
_ARSAP_UAF> /RATES_NAME=SALES_RATES
%AUTHORIZE-S-MODIFIED, 1 USER record successfully modified
ARSAP_UAF> EXIT
$
```

User Addresses

User Sold-to Addresses

Each user account can have a sold-to address. Initially, the address fields are blank.

Sold-to addresses usually specify the name and address to which to send the invoice. The sold-to address fields allow seven lines for the name and address, with each line up to forty characters long. The `CIMS INVOICES` Utility inserts the user's sold-to address fields on the user's invoice.

To assign a sold-to address to a user account

- Execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY BDUNN/SOLDTO=(-
_ARSAP_UAF> LINE1="Purchasing Department",-
_ARSAP_UAF> LINE2="West Virginia Wesleyan College",-
_ARSAP_UAF> LINE3="College Avenue",-
_ARSAP_UAF> LINE4="Buckhannon, WV 26201")
%AUTHORIZE-S-MODIFIED, 1 USER record successfully modified
ARSAP_UAF> EXIT
$
```

User Ship-to Addresses

Each user account can have a ship-to address.

Ship-to addresses usually specify the name and address where the goods or services are to be sent. The ship-to address fields allow seven lines for the name and address, with each line up to forty characters long. The `CIMS INVOICES` Utility inserts the user's ship-to address fields on the user's invoice.

To assign a ship-to address to a user account

- Execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY BDUNN/SHIPTO=(-
_ARSAP_UAF> LINE1="Bill T. Elmore",-
_ARSAP_UAF> LINE2="1200 West Dayton Street",-
_ARSAP_UAF> LINE3="Madison, WI 55771")
%AUTHORIZE-S-MODIFIED, 1 USER record successfully modified
ARSAP_UAF> EXIT
$
```

User Remit-to Addresses

Each user account can have a remit-to address.

Remit-to addresses usually specify the name and address where the invoice payment 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. The `CIMS INVOICES` Utility inserts the user's remit-to address fields on the user's invoice.

To assign a remit-to address to a user account

- Execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY BDUNN/REMIT=(-
_ARSAP_UAF> LINE1="Accounts Receivable",-
_ARSAP_UAF> LINE2="Computer Services, Inc.",-
_ARSAP_UAF> LINE3="1200 West Dayton Street",-
_ARSAP_UAF> LINE4="Madison, WI 55771")
%AUTHORIZE-S-MODIFIED, 1 USER record successfully modified
ARSAP_UAF> EXIT
$
```

User Minimum and Maximum Charges

The CIMS Administrator can assign minimum and maximum charge levels to a user account. You can specify either one or both. You specify an amount in dollars or another monetary unit. These figures control the *bottom line* figure on invoices where the user account is referenced.

To assign a maximum charge level

- Suppose you want the charges for the user account called YSMITH to never exceed 100.00 currency units. Use the following commands:

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY YSMITH-
_ARSAP_UAF> /MAXIMUM_CHARGE=100.00-
_ARSAP_UAF> /ENABLE=MAXIMUM_CHARGE
%AUTHORIZE-S-MODIFIED, 1 USER record successfully modified
ARSAP_UAF> EXIT
$
```

To assign a minimum charge level

- Suppose you want the user account called HJONES to always be charged at least 25.00 currency units. Use the following commands:

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY HJONES/MINIMUM_CHARGE=25.00-
_ARSAP_UAF> /ENABLE=MINIMUM_CHARGE
%AUTHORIZE-S-MODIFIED, 1 USER record successfully modified
ARSAP_UAF> EXIT
$
```

User Logout Displays

You can display computer resources consumed and associated charges using the CIMS MYCOST Utility. Also, when you use the CIMS LOGOUT command procedure and log out of an interactive session, the terminal can display a logout display showing computer resources consumed and associated charges. The CIMS Administrator controls this display, enabling or disabling it for a particular account, or tailoring the information displayed.

The following table shows the choices controlled by this field. A NO prefix disables the choice.

Option	Display
[NO]PERTOTAL	Displays the period-to-date total expenditure as a single monetary figure.
[NO]SESCHARG	Displays charges for each resource item (you must also select SESSTATS).
[NO]SESSHIFT	Displays resource utilization by shift (you must also select SESSTATS).
[NO]SESSTATS	Itemizes the session resources consumed by resource.
[NO]SESTOTAL	Displays the total cost of the session.

To display the most information, select all items. You can display more than one screen of information. Note that SESSHIFT and SESCHARG display options are meaningless unless you also select SESSTATS.

To display resources consumed and charges

- Suppose that whenever a user logs off from the HJONES account, you want to have the session total cost and the total expenditure to date displayed. Execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY HJONES-
_ARSAP_UAF> /ENABLE=LOGOUT_DISPLAY-
_ARSAP_UAF> /LOGOUT_DISPLAY=(SESTOTAL,PERTOTAL)
%AUTHORIZE-S-MODIFIED, 1 USER record successfully modified
ARSAP_UAF> EXIT
$
```

To hide resources consumed and charges

- Suppose you do not want the user account called IMARTIN to see the resource utilization itemized by shift. Execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_AUTHORIZE
ARSAP_UAF> MODIFY IMARTIN/LOGOUT_DISPLAY=NOSESSHIFT
%AUTHORIZE-S-MODIFIED, 1 USER record successfully modified
ARSAP_UAF> EXIT
$
```

User Reporting

Refer to *Chapter 5, Chargeback* for a discussion of user invoices for chargeback.

Refer to *Chapter 6, Resource Management* for user resource reports.

Refer to *Chapter 10, Software Package / Image Accounting* for producing software package reports for users.

Refer to *Chapter 13, All-in-1 Accounting* for producing All-in-1 utilization reports for users.

5

Chargeback

This chapter introduces chargeback and generating invoices. It discusses various aspects of chargeback, including the different kinds of invoices, how rates are determined, and supplemental charges.

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Processing OpenVMS Accounting Data **5-5**

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Implementing Chargeback

CIMS implements the Supplemental Charges option with the CIMS INVOICES, LOGGER, LOGIN, MYCOST, RECURRING_CHARGES, and SUPPLEMENTAL_CHARGES utilities.

All these utilities access the CIMS Parameter File to determine whether the Supplemental Charges option is enabled.

Enabling Supplemental Charges

To enable Supplemental Charges

- Use the CIMS SETUP Utility as follows:

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> DEFAULT/ENABLE=SUPPLEMENTAL_CHARGES
SETUP> EXIT
$
```

Posting Adjustments

Often, you need to make some sort of adjustment to an account's bill or invoice. For example, suppose you accidentally charged the user account BDUNN 185.00 currency units for a terminal rental during the current reporting period and you have caught the error and want to adjust his account.

You need to subtract 185.00 currency units from the BDUNN account and make a note of why the adjustment was made.

To adjust the invoice

- Use the following commands:

```
$ RUN ARSAP$EXE:ARSAP_SUPPLEMENTAL_CHARGES
SUPPLEMENTAL_CHARGES> ADD BDUNN-
_SUPPLEMENTAL_CHARGES> ADJUSTMENT -185.00 -
_SUPPLEMENTAL_CHARGES> "Billed in error"
SUPPLEMENTAL_CHARGES> EXIT
$
```

Posting One-Time Charges

You might need to post some miscellaneous charge to an account and include it on that account's invoice when you use the CIMS INVOICES Utility.

For example, suppose you are renting a VT-241 color terminal to the user account HJONES for 160.00 currency units. You need to charge 160.00 currency units to the HJONES account and indicate why the charge was made.

To post a miscellaneous charge

- Use the following commands:

```
$ RUN ARSAP$EXE:ARSAP_SUPPLEMENTAL_CHARGES
SUPPLEMENTAL_CHARGES> ADD HJONES CHARGE 160.00 -
_SUPPLEMENTAL_CHARGES> "VT-241 Terminal Rental"
SUPPLEMENTAL_CHARGES> EXIT
$
```

Posting Recurring Charges

You might need to post miscellaneous charges periodically to some accounts and include them on those account's invoices when you use the CIMS INVOICES Utility.

Suppose you are renting a laser printer to the user account IMARTIN for 200.00 currency units per month. You need to charge 200.00 currency units to the IMARTIN account, indicate why the charge was made, and repeat this process each month. CIMS helps you automate this task by maintaining a set of recurring charges that are posted to the account each month.

To post recurring charges

1 The following commands add the item, amount, and description to the CIMS Recurring Charges File:

```
$ RUN ARSAP$EXE:ARSAP_RECURRING_CHARGES
RECURRING_CHARGES> ADD IMARTIN 200.00 -
_RECURRING_CHARGES> "Laser Printer Rental"
RECURRING_CHARGES> EXIT
$
```

2 On a monthly basis, you need to post these recurring charges to the various accounts. The following commands post the items, amounts, and descriptions to the CIMS Supplemental Charges File.

```
$ RUN ARSAP$EXE:ARSAP_RECURRING_CHARGES
RECURRING_CHARGES> POST
RECURRING_CHARGES> EXIT
$
```

Posting Payments

Eventually, the invoices you send out for the charges accumulated by the accounts on your computer system should result in payments. You need to post the payment and credit the proper account.

Suppose that you received 185.00 currency units for the account QTHOMAS and you need to credit that account with this amount.

To post payments

Use the following commands:

```
$ RUN ARSAP$EXE:ARSAP_SUPPLEMENTAL_CHARGES
SUPPLEMENTAL_CHARGES> ADD QTHOMAS PAYMENT 185.00 -
_SUPPLEMENTAL_CHARGES> "Terminal Rental Payment"
SUPPLEMENTAL_CHARGES> EXIT
$
```

Processing OpenVMS Accounting Data

The CIMS INVOICES Utility produces invoices from the merged CIMS Statistics File generated by the CIMS VMS_SELECT Utility.

To process accounting data

1. The following commands process the accounting data for the month of July, 1994. The data for the month of July has been stored previously in one accounting file called 1994_07_ACCOUNTNG.DAT. The CIMS VMS_SELECT Utility zeroes the statistics file before processing the accounting data so that the intermediate CIMS Statistics File contains only the accounting data for July.

```
$ RUN ARSAP$EXE:ARSAP_VMS_SELECT
VMS_SELECT> SELECT/SINCE=1-JUL-1994/BEFORE=1-AUG-1994-
_VMS_SELECT> /ZERO 1994_07_ACCOUNTNG.DAT
VMS_SELECT> EXIT
$
```

2. Next, process the intermediate CIMS Statistics File with the CIMS VMS_MERGE Utility to create the merged CIMS Statistics File.

```
$ RUN ARSAP$EXE:ARSAP_VMS_MERGE
VMS_MERGE> MERGE
VMS_MERGE> EXIT
$
```

Generating Invoices

The CIMS INVOICES Utility generates invoices from the merged CIMS Statistics File generated by the CIMS VMS_MERGE Utility. The rate information is obtained from the CIMS Rates File. The following four examples generate some of the different types of invoices.

To generate invoices

- To generate an invoice for all user accounts and save these invoices in a file called USER_CHARGES.LIS, execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_INVOICES
INVOICES> REPORT/OUTPUT=USER_CHARGES.LIS
INVOICES> EXIT
$ PRINT USER_CHARGES.LIS
$
```

  One page of the output from this command is shown on the next page.

1-AUG-1994 Invoice 0000000020

Sold to	Shipped to (if different)
West Virginia College College Avenue Buckhannon, WV 26201 USA	

User: IMARTIN UIC: [IMARTIN]

VAX charges from 1-JAN-1994 thru 31-JUL-1994

Description	Amount
Interactive Charges	$227.75
Batch Charges	$42.94
Print Charges	$22.62
Plot Charges	$20.00
Software Package Surcharges	$84.85
Resource Charges (user defined)	$21.02
Disk Space Charges	$1,669.97
Miscellaneous Charges	$13.50
Total charges this billing period	$2,102.65
Previous balance	$0.00
Balance due	$2,102.65

Please remit to

Accounts Receivable
CIMS Lab, Inc.
3013 Douglas Blvd., Suite 120
Roseville, CA 95661
USA

- To generate invoices for all projects with the first invoice number being 1196, execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_INVOICES
INVOICES> REPORT/PROJECT-
_INVOICES> /FIRST_INVOICE_NUMBER=1196-
_INVOICES> /OUTPUT=INVOICES.LIS
INVOICES> EXIT
$ PRINT INVOICES.LIS
$
```

The first page of the output from this command is shown below:

```
1-AUG-1994                                        Invoice 0000001196


     Sold to                              Shipped to (if different)
     -------------------------------      -------------------------------
     West Virginia College
     College Avenue
     Buckhannon, WV   26201
     USA




     Project:CS-230    UIC: [100,2]

     VAX charges from  1-JAN-1994 thru 31-JUL-1994

          Description                                              Amount
          ------------------------------------------------------------------


          Interactive Charges                                       $31.56

          Print Charges                                             $13.89

          Software Package Surcharges                               $56.93
                                                                   ----------

          Total charges this billing period                        $102.38

                    Please remit to

                              Accounts Receivable
                              CIMS Lab, Inc.
                              3013 Douglas Blvd., Suite 120
                              Roseville, CA 95661
                              USA
```

- To generate a summary listing of all user charges on your terminal, with the users grouped by their SYSUAF account (one line per SYSUAF account), execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_INVOICES
INVOICES> REPORT/ACCOUNT_SUMMARY-
_INVOICES> /GROUP=SYSUAF_ACCOUNT
INVOICES> EXIT
$
```

A sample output of this command is shown below:

```
Invoice                SYSUAF Account        Charge
Number
-----------------------------------------------------
    1                 <login>                  $3.31
    2                 ASREM                   $68.99
    3                 BDUNN                  $739.20
    4                 CLOPEN                  $97.73
    5                 HJONES                 $718.05
    6                 IMARTIN                  $0.04
    7                 JFELDMAN             $2,256.69
    8                 KLIMELT              $9,952.33
    9                 MJACKSON                $22.00
   10                 SWILSON                 $55.26
   11                 SYSTEM              $26,810.57
   12                 WDOE                    $89.36
   13                 YSMITH                 $621.67

                                           -----------

                                           $41,435.20
```

- To generate invoices for projects, showing detailed pages for batch, interactive, print, and software charges, with the projects grouped according to their first grouping field, execute the following commands.

```
$ RUN ARSAP$EXE:ARSAP_INVOICES
INVOICES> REPORT/PROJECT=*/GROUP=PROJECT_GROUP1 -
_INVOICES> /FULL=(BATCH,INTERACTIVE,PRINT,SWDETAIL)-
_INVOICES> /OUTPUT=PROJECT_INVOICES.LIS
INVOICES> EXIT
$ PRINT PROJECT_INVOICES.LIS
$
```

  Two pages of the output from this command are shown on the next two pages.

1-AUG-1994 Invoice 0000000001

Sold to	Shipped to (if different)
West Virginia College College Avenue Buckhannon, WV 26201 USA	

Group 1: SUPPORT

VAX charges from 1-JAN-1994 thru 31-JUL-1994

Description	Amount
Interactive Charges	$227.75
Batch Charges	$42.94
Print Charges	$22.62
Plot Charges	$0.00
Software Package Surcharges	$84.85
Resource Charges (user defined)	$21.02
Disk Space Charges	$8,615.85
Miscellaneous Charges	$170.00
Total charges this billing period	$9,185.03
Previous balance	$0.00
Balance due	$9,185.03

Please remit to

Accounts Receivable
CIMS Lab, Inc.
3013 Douglas Blvd., Suite 120
Roseville, CA 95661
USA

```
 1-AUG-1994                                          Invoice 0000000001
                          Interactive Charges

Shift 1  (09:00 to 18:00)

     Description                    Quantity  Unit Price        Amount
     ------------------------------------------------------------------
     Logins                           14.000   $0.5000          $7.00
     Chargeable Connect Hrs            4.079   $4.0000         $16.31
     Buffered I/O's (1000's)          32.683   $0.6000         $19.61
     Direct I/O's (1000's)            14.527   $0.2000          $2.91
     CPU Minutes                      16.662   $2.0000         $33.32
     Memory Demand                   742.987   $0.2000        $148.60
     Volume Mounts                     0.000   $1.5000          $0.00
                                                               ----------
    Subtotal                                                   $227.75

Shift 2  (18:00 to 00:00)

     No Chargeable Activity


Shift 3  (00:00 to 09:00)

     No Chargeable Activity


Shift 4  (Weekends and Holidays)

     No Chargeable Activity

                                                               ----------
Total Interactive Charges                                      $227.75
```

6

Resource Management

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Processing OpenVMS Accounting Data

The following sections describe the accounting data processing and generating resource utilization reports.

How you process the OpenVMS accounting data depends on the mode you use: batch or real-time.

Processes Started with No Accounting

We have added support to CIMS to check for processes that are started with no accounting. (There are several that DEC starts that way; most notably, any process involved with DECnet). CIMS does not attempt to track processes that have been started with no accounting.

This makes CIMS conform more closely to the DEC standards.

Batch Mode

The CIMS VMS_SELECT Utility reads the OpenVMS Accounting files, selects all data that falls within the dates you request (your accounting period), and stores the information in the intermediate CIMS Statistics files.

For example, suppose that CIMS has been started, Real-Time Accounting is not enabled, CIMS is not running on a cluster, and the reporting period is the month of January, 1994. The following example shows the commands that generate the intermediate CIMS Statistics File. You must process this file further before you can generate reports.

To generate the intermediate CIMS Statistics File

- Use the following commands:

```
$ RUN ARSAP$EXE:ARSAP_VMS_SELECT
VMS_SELECT> SELECT/ZERO/SINCE=1-JAN-1994/BEFORE=1-FEB-1994
VMS_SELECT> EXIT
$
```

The following three examples assume CIMS Real-Time Accounting is not enabled, CIMS is running on a cluster, and the reporting period is the six- month period from July, 1997 through December, 1998. The cluster has three nodes: ALPHA, BETA, and DELTA. The following examples show different ways you can process the accounting data for the three nodes. This example runs VMS_SELECT on each of the three nodes in this order.

- Commands to be entered from node ALPHA:

```
$ RUN ARSAP$EXE:ARSAP_VMS_SELECT
VMS_SELECT> SELECT/SINCE=1-JUL-1997/BEFORE=1-JAN-1998-
_VMS_SELECT> /ZERO/NODE=ALPHA
VMS_SELECT> EXIT
$
```

- Commands to be entered from node BETA:

```
$ RUN ARSAP$EXE:ARSAP_VMS_SELECT
VMS_SELECT> SELECT/SINCE=1-JUL-1997/BEFORE=1-JAN-1998-
_VMS_SELECT> /NODE=BETA
VMS_SELECT> EXIT
$
```

- Commands to be entered from node DELTA:

```
$ RUN ARSAP$EXE:ARSAP_VMS_SELECT
VMS_SELECT> SELECT/SINCE=1-JUL-1997/BEFORE=1-JAN-1998-
_VMS_SELECT> /NODE=DELTA
VMS_SELECT> EXIT
$
```

You could run these three jobs simultaneously simply by adding the /SHARE qualifier to each command. The /SHARE qualifier opens the necessary files shared, thereby allowing multiple processes to access the same data simultaneously.

The following example assumes that:

- The cluster has a common (shared) system disk
- You can access the accounting files in the SYS$MANAGER directory on each node from any one node.

You can do this because the ALPHA node is on the SYS0 tree on the system disk, the BETA node is on the SYS1 tree, and the DELTA node is on the SYS2 tree.

- From the ALPHA node, this example runs VMS_SELECT on the accounting files in each node, first for ALPHA, then for BETA, and finally for DELTA.

```
$ RUN ARSAP$EXE:ARSAP_VMS_SELECT
VMS_SELECT> SELECT/SINCE=1-JUL-1997/BEFORE=1-JAN-1998-
_VMS_SELECT> /ZERO/NODE=ALPHA
VMS_SELECT> SELECT/SIN=1-JUL-1997/BEF=1-JAN-1998/NODE=BETA-
_VMS_SELECT> SYS$SYSDEVICE:[SYS1.SYSMGR]ACCOUNTNG.DAT;*
VMS_SELECT> SELECT/SIN=1-JUL-1997/BEF=1-JAN-1998/NODE=DELTA-
_VMS_SELECT> SYS$SYSDEVICE:[SYS2.SYSMGR]ACCOUNTNG.DAT;*/
VMS_SELECT> EXIT
$
```

- This example uses the network to access the files on the other nodes in cluster from the ALPHA node.

```
$ RUN ARSAP$EXE:ARSAP_VMS_SELECT
VMS_SELECT> SELECT/SINCE=1-JUL-1997/BEFORE=1-JAN-1998-
_VMS_SELECT> /ZERO/NODE=ALPHA
VMS_SELECT> SELECT/SIN=1-JUL-1997/BEF=1-JAN-1998/NODE=BETA
_VMS_SELECT> BETA::SYS$MANAGER:ACCOUNTNG.DAT;*-
VMS_SELECT> SELECT/SIN=1-JUL-1997/BEF=1-JAN-1998/NODE=DELTA
_VMS_SELECT> DELTA::SYS$MANAGER:ACCOUNTNG.DAT;*-
VMS_SELECT> EXIT
$
```

Real-Time Mode

Suppose you have enabled CIMS Real-Time Accounting and you want to produce resource reports from the time the intermediate CIMS Statistics File was last zeroed to the current time. In this case, you have two options:

- Use the data in the intermediate CIMS Statistics File
- Use the data in the OpenVMS Accounting files

If you want to use the data in the intermediate CIMS Statistics File, you can proceed directly to the VMS_MERGE phase, as discussed in the next section.

To use the data in the OpenVMS Accounting files, you need to process the accounting files with the CIMS VMS_SELECT Utility first. Since you have CIMS Real-Time Data Logging enabled, you can either turn off CIMS and manually define the CIMS logicals ARSAP$DATA and ARSAP$EXE, which are necessary to access the CIMS files, or you can create a CIMS work directory and assign the ARSAP$DATA logical to point to it.

To create a work directory

- The best approach is to create a CIMS work directory and then process the data. A typical set of commands to do this follows. (Select different disks or directories to meet your needs.)

```
$ SET DEF ARSAP$DATA
$ SET DEF [-]
$ CREATE/DIR [.WORK]
$ SET DEF [.WORK]
$ @ARSAP$COM:STOP_ARSAP
$ DEFINE ARSAP$DATA DIA1:[ARSAP.DATA]
$ BACKUP ARSAP$DATA:*.SYS []
$ @DIA1:[ARSAP.COM]:START_ARSAP
$ DEFINE ARSAP$DATA []
$ RUN ARSAP$EXE:ARSAP_VMS_SELECT
VMS_SELECT> SELECT/ZERO/SINCE=1-JAN-1994/BEFORE=1-FEB-1994
VMS_SELECT> EXIT
$
```

You might also want to process the OpenVMS accounting data for a previous time period. Suppose you want to produce reports for a previous fiscal quarter, for example, October 1, 1993 through December 31, 1994. In this case, your only option is to process the OpenVMS accounting data for that time period.

To process the OpenVMS accounting data

- In this case, create a work directory as shown previously and use the CIMS VMS_SELECT Utility as follows:

```
$ RUN ARSAP$EXE:ARSAP_VMS_SELECT
VMS_SELECT> SELECT/ZERO/SINCE=1-OCT-1993/BEFORE=1-JAN-1994
VMS_SELECT> EXIT
$
```

Merging CIMS and OpenVMS Data

After processing the OpenVMS Accounting files into the intermediate CIMS Statistics File, ARSAP_STATISTICS.SYS, you must still add information to this file so that the CIMS reporting utilities can produce the different user and project reports. The information you should add includes disk storage statistics and data from the OpenVMS and CIMS Authorization files.

To avoid any confusion about whether the file already contains this information, you should generate a new file, referred to as the merged CIMS Statistics File, ARSAP_STATISTICS.DAT, using the CIMS VMS_MERGE Utility.

Any CIMS reporting program that produces user- or project-based reports uses the merged CIMS Statistics File. Any other programs or reporting utilities that you have written using the CIMS Run-Time Library also use this file.

To generate the merged CIMS Statistics File

- Use the VMS_MERGE Utility as shown in the following example.

```
$ RUN ARSAP$EXE:ARSAP_VMS_MERGE
VMS_MERGE> MERGE
VMS_MERGE> EXIT
$
```

Generating Reports

Generating Resource Reports

You can generate resource reports that show the following information:

- Username or project name
- UIC
- Logons
- Volume mounts
- Connect hours
- Number of images run
- Block weeks allocated
- CPU minutes
- I/O requests (including buffered I/O, direct I/O, and page fault I/O)
- Memory demand

These reports can show:

- Total statistics for each user or project
- Total statistics for one of a number of grouping specifiers (such as cost center, group1 through group5, or UIC)
- Total statistics for each group, with each group broken down into users or projects

To produce resource reports

- Use the following commands:
  - To produce a resource report for all usernames that begin with the character B and save this report in a file called B_USER.LIS, execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_RESOURCE_REPORT
RESOURCE_REPORT> REPORT/USERNAME-
_RESOURCE_REPORT> =B*/OUTPUT=B_USER.LIS
RESOURCE_REPORT> EXIT
$ PRINT B_USERS.LIS
$
```

    A sample of the output from these commands is shown on the next page.

Resource Management & Chargeback CIMS LAB, Inc. Run Date: 14-MAR-2000
CIMS/VMS Version V08.0 Page 1

User Account Utilization
From 1-JAN-2000 Thru 31-JAN-2000
All Job Types
All Shifts

Username	UIC	Logons	Volume Mounts	Connect Minutes	Number Of Image Run	Block Weeks Allocated	I/O Requests (1000's)	CPU Minutes	Memory Demand
ADUNN	000054,000000	991	2	192.41	20509	318709.	2087.294	462.43	18480.52
ELOLPEN	000056,000000	1935	161	606.00	107283	243075.	14448.444	2666.24	115466.30
BJONES	000051,000000	0	0	0.00	0	375.	0.000	0.00	0.00
YSMITH	000053,000000	502	0	217.55	3133	24293.	389.805	48.19	1226.18
Total		3428	163	1015.97	130925	586423.	16925.543	3176.87	135172.98

- To produce a resource report that shows the total statistics for all users in the `Sales and Publications` cost centers, execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_RESOURCE_REPORT
RESOURCE_REPORT> REPORT/GROUP=-
_RESOURCE_REPORT> USER_COST_CENTER=-
_RESOURCE_REPORT> (PUBLICATIONS,SALES)
_RESOURCE_REPORT> /OUTPUT=COST_CENTER.LIS
RESOURCE_REPORT> EXIT
$ PRINT COST_CENTER.LIS
$
```

  A sample of the output from these commands is shown on the next page.

```
Resource Management & Chargeback                  CIMS LAB, Inc.                          Run Date: 14-MAR-2000
CIMS/VMS Version V08.0                                                                                Page 1
                                        User Cost Center Account Utilization
                                         From 1-JAN-2000 Thru 31-JAN-2000
                                                  All Job Types
                                                    ALL Shifts
```

User Cost Center	Logons	Volume Mounts	Connect Minutes	Number Of Image Run	Block Weeks Allocated	I/O Requests (1000's)	CPU Minutes	Memory Demand
PUBLICATIONS	0	0	0.00	0	356145.	0.000	0.00	0.00
SALES	1170	0	635.31	7702	317712.	2952.250	341.92	10336.51
Total	1170	0	635.31	7702	673857.	2952.250	341.92	10336.51

- To produce a resource report that shows the total statistics for all users in the MIS group, and show the totals for each user in the group, execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_RESOURCE_REPORT
RESOURCE_REPORT> REPORT/GROUP-
_RESOURCE_REPORT> =USER_GROUP1=MIS-
_RESOURCE_REPORT> /INDIVIDUAL/OUTPUT=MIS.LIS
RESOURCE_REPORT> EXIT
$ PRINT MIS.LIS
$
```

  A sample of the output from these commands is shown on the next page.

```
Resource Management & Chargeback                  CIMS LAB, Inc.                          Run Date: 14-MAR-2000
CIMS/VMS Version V08.0                                                                                Page 1
                                        User Cost Center Account Utilization
                                         From 1-JAN-2000 Thru 31-JAN-2000
                                                  All Job Types
                                                    ALL Shifts


User Cost Center = "MIS"

Username            UIC      Logons     Volume   Connect    Number Of     Block        I/O        CPU     Memory
                                        Mounts   Minutes    Image Run     Weeks      Requests   Minutes   Demand
                                                                        Allocated   (1000's)
-------------------------------------------------------------------------------------------------------------------
ADUNN        000054,000000     502          0    217.55         3133     24293.     389.805     48.19   1226.18
-------------------------------------------------------------------------------------------------------------------
ELOLPEN      000075,000000     352          0    234.33         2834    276210.    1874.814      4.20   7912.73
-------------------------------------------------------------------------------------------------------------------
YSMITH       000053,000000     316          0    183.42         1735     17209.     687.630      1.80   1197.60
-------------------------------------------------------------------------------------------------------------------
Total                          1170          0    635.31         7702    317712.    2952.249    341.92  10336.51
```

Generating Print Queue Reports

A print queue utilization report shows the following statistics for each print queue.

- Pages printed
- Queue active time (how long it took the job to print)
- RMS $GETS (reading the file(s) being printed)
- Printer I/O requests (I/Os to the printer)
- Queue wait time (how long the job waited in the print queue)
- Symbiont CPU time.

The print queue report can also show what users or projects accessed each print queue.

Note • While the symbiont CPU time is stored in the OpenVMS Accounting File, the field has not been filled in by OpenVMS for at least two (2) major versions (4 and 5). Thus, this field is zero on the reports.

To generate print queue reports

- Use the following commands:
  - To produce a print queue utilization report for all print queues, execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_RESOURCE_REPORT
RESOURCE_REPORT> REPORT/PRINT/OUTPUT=PRINT.LIS
RESOURCE_REPORT> EXIT
$ PRINT PRINT.LIS
$
```

    A sample of the output from these commands is shown on the next page.

Resource Management & Chargeback CIMS LAB, Inc. Run Date: 14-MAR-2000
CIMS/VMS Version V08.0 Page 1

Print Queue Utilization
From 1-JAN-2000 Thru 31-JAN-2000
ALL Shifts

Print Queue	Queue Activations	Pages Printed	Elapsed Minutes	RMS $GET's (1000's)	Printer I/O Requests (1000's)	Wait Minutes	Symbiont CPU Minutes
LPA0	626	7667	1700.099	287.685	10.697	686.60	0.00
LTA5	235	2285	541.010	103.522	56.924	324.84	0.00
SYS$PRINT	1	0	0.000	0.000	0.000	0.18	0.00
Total	862	9952	2241.109	391.207	67.621	1011.62	0.00

- To produce a print queue utilization report that shows what projects used each print queue, execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_RESOURCE_REPORT
RESOURCE_REPORT> REPORT/PRINT/GROUP=PROJECT_NAME-
_RESOURCE_REPORT> /REVERSE_GROUPING-
_RESOURCE_REPORT> /OUTPUT=PRINT_PROJECT.LIS
RESOURCE_REPORT> EXIT
$ PRINT PRINT_PROJECT.LIS
$
```

  A sample of the output from these commands is shown on the next page.

```
Resource Management & Chargeback                  CIMS LAB, Inc.                          Run Date: 14-MAR-2000
CIMS/VMS Version V08.0                                                                                Page 1
                                          Print Queue Utilization
                                     From 1-JAN-2000 Thru 31-JAN-2000
                                                 ALL Shifts

Print Queue = "LPA0"
```

Project	Queue Activations	Pages Printed	Elapsed Minutes	RMS $GET's (1000's)	Printer I/O Requests (1000's)	Wait Minutes	Symbiont CPU Minutes
CONTRACTS	39	493	93.111	24.109	0.823	0.62	0.00
CS203-1	1	2	0.268	0.081	0.005	0.01	0.00
CUSTOMER_LETTERS	7	14	2.156	0.788	0.028	0.41	0.00
CUSTOMER_UPDATE_LETTERS	1	2	0.393	0.114	0.005	0.00	0.00
DISTRIBUTOR_LETTERS	2	4	0.577	0.218	0.008	0.00	0.00
GTM	8	24	4.403	1.267	0.054	0.25	0.00
HOME	365	5926	916.845	198.071	6.643	590.22	0.00
MARKETING	37	245	56.685	13.351	0.672	94.78	0.00
OPERATOR	86	410	100.164	22.968	1.236	0.08	0.00
SALES	73	530	520.549	25.985	1.171	0.11	0.00
SECRETARY	7	17	4.948	0.743	0.052	0.12	0.00
Total	626	7667	1700.099	287.685	10.697	686.60	0.00

Generating Stock Reports

If you have enabled the Forms Tracking option, you can generate stock utilization (printer form) reports. A stock utilization report shows the following statistics for each printer stock.

- Pages printed
- Queue active time (how long it took the job to print)
- RMS $GETS (reading the file(s) being printed)
- Printer I/O requests (I/Os to the printer)
- Queue wait time (how long the job waited in the print queue)
- Symbiont CPU time.

The stock report can also show what users or projects accessed each stock.

To generate stock reports

- Use the following commands:
  - To produce a stock utilization report, execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_RESOURCE_REPORT
RESOURCE_REPORT> REPORT/STOCK/OUTPUT=STOCK.LIS
RESOURCE_REPORT> EXIT
$ PRINT STOCK.LIS
$
```

    A sample of the output from these commands is shown on the next page.

Resource Management & Chargeback CIMS LAB, Inc. Run Date: 14-MAR-2000
CIMS/VMS Version V08.0 Page 1

Print Queue Utilization
From 1-JAN-2000 Thru 31-JAN-2000
ALL Shifts

Paper Stock	Queue Activations	Pages Printed	Elapsed Minutes	RMS $GET's (1000's)	Printer I/O Requests (1000's)	Wait Minutes	Symbiont CPU Minutes
1UP_LABELS	27	3041	264.997	56.649	1.502	284.72	0.00
DEFAULT	833	6899	1975.301	333.989	66.087	726.87	0.00
SALES_FORMS	2	12	0.811	0.569	0.032	0.03	0.00
Total	862	9952	2241.109	391.207	67.621	1011.62	0.00

- To produce a stock utilization report for all projects grouped by the project UIC, and show the statistics for each individual project, execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_RESOURCE_REPORT
RESOURCE_REPORT> REPORT/PROJECT/STOCK-
_RESOURCE_REPORT> /GROUP=PROJECT_UIC/INDIVIDUAL-
_RESOURCE_REPORT> /REVERSE_GROUPING-
_RESOURCE_REPORT> /OUTPUT=STOCK_PROJECT_UIC.LIS
RESOURCE_REPORT> EXIT
$ PRINT STOCK_PROJECT_UIC.LIS
$
```

A sample of the output from these commands is shown on the next page.

```
Resource Management & Chargeback                  CIMS LAB, Inc.                          Run Date: 14-MAR-2000
CIMS/VMS Version V08.0                       Print Queue Utilization                                  Page 1
                                          From 1-JAN-2000 Thru 31-JAN-2000
                                                     ALL Shifts

Paper Stock = "1UP_LABELS"

Project UIC              Queue         Pages     Elapsed       RMS         Printer       Wait           Symbiont
                      Activations     Printed    Minutes      $GET's     I/O Requests   Minutes            CPU
                                                              (1000's)      (1000's)                      Minutes
-------------------------------------------------------------------------------------------------------------------
[56,0]                      4          2978      143.106      53.618         0.863       284.28             0.00
-------------------------------------------------------------------------------------------------------------------
[66,0]                      9            21       76.442       0.927         0.148         0.13             0.00
-------------------------------------------------------------------------------------------------------------------
[200,0]                    14            42       45.449       2.104         0.491         0.31             0.00

Total                      27          3041      264.997      56.649         1.502       284.72             0.00
```

Generating Batch Queue Reports

A batch queue report shows the following statistics for each batch queue.

- Queue activations (number of batch jobs submitted)
- Connect hours
- CPU minutes
- Buffered I/O requests
- Direct I/O requests
- Page fault I/O requests
- Memory demand
- Volume mounts.

The batch queue report can also show what users or projects accessed each batch queue.

To generate batch queue reports

- The following commands produce a batch queue utilization report that shows the statistics for each batch queue:

```
$ RUN ARSAP$EXE:ARSAP_RESOURCE_REPORT
RESOURCE_REPORT> REPORT/BATCH/OUTPUT=BATCH.LIS
RESOURCE_REPORT> EXIT
$ PRINT BATCH.LIS
$
```

  A sample of the output from these commands is shown on the next page.

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CIMS/VMS Version V08.0 Page 1

Batch Queue Utilization
From 1-JAN-2000 Thru 31-JAN-2000
ALL Shifts

Batch Queue	Queue Activations	Connect Hours	CPU Minutes	Buffered I/O Requests (1000's)	Direct I/O Requests (1000's)	Fault I/O Requests (1000's)	Page Faults (1000's)	Memory Demand	Volume Mounts
FAST	51	156.16	2113.96	1014.186	4398.954	20.958	528.619	33790.90	37
GTM$BATCH	13492	1160.84	6958.45	10247.858	17570.342	2376.494	52712.891	271396.19	0
SYS$BATCH	565	74.91	1716.79	441.717	2928.072	110.528	2840.501	48266.19	6
VAXSIM_BATCH	1	0.01	0.05	0.103	0.087	0.112	0.654	0.50	0
VAXSIM_CIMS	86	0.60	8.90	23.299	15.746	7.416	142.239	107.93	0
Total	14195	1392.52	10798.14	11727.162	24913.201	2515.508	56224.898	353561.72	43

- The following commands produce a batch queue utilization report that shows, for each batch queue, the statistics for each user that used that queue:

```
$ RUN ARSAP$EXE:ARSAP_RESOURCE_REPORT
RESOURCE_REPORT> REPORT/BATCH/GROUP=USERNAME -
_RESOURCE_REPORT> /INDIVIDUAL/REVERSE_GROUPING-
_RESOURCE_REPORT> /OUTPUT=BATCH_GROUPED.LIS
RESOURCE_REPORT> EXIT
$ PRINT BATCH_GROUPED.LIS
$
```

  A sample of the output from these commands is shown on the next page.

Resource Management & Chargeback CIMS LAB, Inc. Run Date: 14-MAR-2000
CIMS/VMS Version V08.0 Page 1

Batch Queue Utilization
From 1-JAN-2000 Thru 31-JAN-2000
ALL Shifts

Batch Queue = "GTM$BATCH"

User	Queue Activations	Connect Hours	CPU Minutes	Buffered I/O Requests (1000's)	Direct I/O Requests (1000's)	Fault I/O Requests (1000's)	Page Faults (1000's)	Memory Demand	Volume Mounts
ADUNN	656	24.75	211.68	226.857	547.109	74.243	1633.078	5576.95	0
BJONES	1632	411.47	2221.67	4733.779	7803.997	536.815	13577.498	95141.39	0
CMARTIN	1144	33.51	298.31	410.850	682.796	150.789	3525.188	8911.16	0
LOGINFAIL	54	1.58	15.48	26.291	31.599	9.215	206.162	406.07	0
LTHOMAS	1387	283.75	2056.91	1964.526	4184.526	556.926	12077.487	94793.48	0
SYSTEM	1	0.00	0.03	0.069	0.120	0.025	0.579	0.33	0
TDOE	8597	404.68	2145.11	2869.357	4295.411	1041.947	21575.318	66401.40	0
YSMITH	21	1.09	9.25	16.130	24.781	6.534	117.569	165.37	0
Total	13492	1160.84	6958.45	10247.859	17570.340	2376.494	52712.883	271396.16	0

Generating Node Reports

A node utilization report shows the following statistics for each node.

- Logons
- Connect hours
- CPU minutes
- Buffered I/O requests
- Direct I/O requests
- Page fault I/O requests
- Memory demand
- Volume mounts

The node report can also show what users or projects accessed each node

To generate node reports

- Use the following commands:
  - To produce a node utilization report and output the report to the file NODE.LIS, execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_RESOURCE_REPORT
RESOURCE_REPORT> REPORT/NODE/OUTPUT=NODE.LIS
RESOURCE_REPORT> EXIT
$ PRINT NODE.LIS
$
```

    A sample of the output from these commands is shown on the next page.

Resource Management & Chargeback CIMS LAB, Inc. Run Date: 14-MAR-2000
CIMS/VMS Version V08.0 Page 1

Batch Queue Utilization
From 1-JAN-2000 Thru 31-JAN-2000
ALL Shifts

Batch Queue = "GTM$BATCH"

User	Queue Activations	Connect Hours	CPU Minutes	Buffered I/O Requests (1000's)	Direct I/O Requests (1000's)	Fault I/O Requests (1000's)	Page Faults (1000's)	Memory Demand	Volume Mounts
ADUNN	656	24.75	211.68	226.857	547.109	74.243	1633.078	5576.95	0
BJONES	1632	411.47	2221.67	4733.779	7803.997	536.815	13577.498	95141.39	0
CMARTIN	1144	33.51	298.31	410.850	682.796	150.789	3525.188	8911.16	0
LOGINFAIL	54	1.58	15.48	26.291	31.599	9.215	206.162	406.07	0
LTHOMAS	1387	283.75	2056.91	1964.526	4184.526	556.926	12077.487	94793.48	0
SYSTEM	1	0.00	0.03	0.069	0.120	0.025	0.579	0.33	0
TDOE	8597	404.68	2145.11	2869.357	4295.411	1041.947	21575.318	66401.40	0
YSMITH	21	1.09	9.25	16.130	24.781	6.534	117.569	165.37	0
Total	13492	1160.84	6958.45	10247.859	17570.340	2376.494	52712.883	271396.16	0

- To produce a node utilization report that shows a summary page, execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_RESOURCE_REPORT
RESOURCE_REPORT> REPORT/NODE/GROUP=USERNAME -
_RESOURCE_REPORT> /INDIVIDUAL/SUMMARY-
_RESOURCE_REPORT> /OUTPUT=NODE_SUMMARY.LIS
RESOURCE_REPORT> EXIT
$ PRINT NODE_SUMMARY.LIS
$
```

  A sample of the output from these commands is shown on the next page.

```
Resource Management & Chargeback                  CIMS LAB, Inc.                        Run Date: 14-MAR-2000
CIMS/VMS Version V08.0                                                                            Page 1
                                                Node Utilization
                                          From 1-JAN-2000 Thru 31-JAN-2000
                                                   ALL Shifts

Number of Active   Nodes:     2
Number of Inactive Nodes:     0
```

Resource	Units Consumed	Average Per Node	Average Per Logon	Percent Total Utilization
Logons	19372.000	9686.000	1.000	99.758
Connect Hours	4306.468	2153.234	0.222	99.995
CPU Minutes	13278.493	6639.247	0.685	99.984
Buffered I/O's (1000's)	20336.145	10168.072	1.050	99.979
Direct I/O's (1000's)	30346.334	15173.167	1.567	99.987
Fault I/O's (1000's)	3312.787	1656.394	0.171	99.999
Page Faults (1000's)	77141.648	38570.824	3.982	99.960
Memory Demand	459288.188	229644.094	23.709	99.996
Volumes Mounted	320.000	160.000	0.017	100.000

Generating Software Package Reports

A software package report shows the following statistics for each package.

- Image activations
- Connect hours
- CPU minutes
- Buffered I/O requests
- Direct I/O requests
- Page fault I/O requests
- Page faults
- Memory demand
- Volume mounts

The software package report can also show what users or projects accessed each package. Note that software packages are defined using the CIMS IMAGE_MAP Utility. You must enable the Proprietary Software option within CIMS SETUP to produce software package reports.

To produce a software package report

- Execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_RESOURCE_REPORT
RESOURCE_REPORT> REPORT/PACKAGE/OUTPUT=PACKAGE.LIS
RESOURCE_REPORT> EXIT
$ PRINT PACKAGE.LIS
$
```

A sample of the output from these commands is shown on the next page.

Resource Management & Chargeback CIMS LAB, Inc. Run Date: 14-MAR-2000
CIMS/VMS Version V08.0 Page 1

Software Package Utilization
From 1-JAN-2000 Thru 31-JAN-2000
ALL Shifts

Software Package	Queue Activations	Connect Hours	CPU Minutes	Buffered I/O Requests (1000's)	Direct I/O Requests (1000's)	Fault I/O Requests (1000's)	Page Faults (1000's)	Memory Demand	Volume Mounts
ASAP	153	5.41	131.61	3.898	86.314	1.767	42.367	3487.45	0
COMPILERS	18	0.08	3.11	0.929	1.161	0.276	13.474	63.08	0
LPS	21	12.68	27.68	14.843	24.150	0.208	5.555	524.22	0
LIBRARY	128	0.23	2.41	1.590	2.882	0.659	20.779	22.10	0
LINKER	4	0.05	1.12	1.187	0.915	0.047	2.277	20.47	0
ORACLE	30	1.26	3.22	7.684	5.692	0.247	14.045	41.60	0
SMS	711	0.60	6.45	10.947	4.126	1.221	60.249	29.02	0
Total	1065	20.31	175.60	40.078	125.240	4.425	158.746	4187.93	0

- To produce a software package report that shows for each of the selected packages what users accessed the package, execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_RESOURCE_REPORT
RESOURCE_REPORT> REPORT/PACKAGE=(CAD_SOFTWARE-
_RESOURCE_REPORT> ,COMPILERS,VMS_IMAGES)-
_RESOURCE_REPORT> /GROUP=USERNAME/INDIVIDUAL-
_RESOURCE_REPORT> /REVERSE_GROUPING-
_RESOURCE_REPORT> /OUTPUT=PACKAGE_GROUP.LIS
RESOURCE_REPORT> EXIT
$ PRINT PACKAGE_GROUP.LIS
$
```

A sample of the output from these commands is shown on the next three pages.

Resource Management & Chargeback CIMS LAB, Inc. Run Date: 14-MAR-2000
CIMS/VMS Version V08.0 Page 1

Software Package Utilization
From 1-JAN-2000 Thru 31-JAN-2000
ALL Shifts

Software Package = "CD_SOFTWARE"

User	Image Activations	Connect Hours	CPU Minutes	Buffered I/O Requests (1000's)	Direct I/O Requests (1000's)	Fault I/O Requests (1000's)	Page Faults (1000's)	Memory Demand	Volume Mounts
ADUNN	1	1.42	0.05	0.461	0.042	0.008	0.165	0.45	0
BJONES	2	2.96	0.12	1.045	0.078	0.026	0.471	0.81	0
CMARTIN	2	0.82	0.10	0.928	0.068	0.018	0.269	0.89	0
DDORMET	2	5.86	0.40	4.755	0.098	0.027	0.401	3.14	0
ELIMELT	3	0.72	18.88	0.723	14.970	0.038	2.298	453.70	0
THOMAS	4	0.43	0.30	2.311	0.316	0.039	0.881	1.96	0
SIMPSON	2	0.12	0.17	1.798	0.041	0.017	0.389	1.18	0
SYSTEM	2	0.18	0.39	2.802	0.403	0.016	0.397	2.46	0
YSMITH	3	0.16	7.27	0.011	8.134	0.019	0.284	59.64	0
Total	21	12.68	27.68	14.843	24.150	0.208	5.555	524.22	0

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Software Package Utilization
From 1-JAN-2000 Thru 31-JAN-2000
ALL Shifts

Software Package = "COMPILERS"

User	Image Activations	Connect Hours	CPU Minutes	Buffered I/O Requests (1000's)	Direct I/O Requests (1000's)	Fault I/O Requests (1000's)	Page Faults (1000's)	Memory Demand	Volume Mounts
ADUNN	17	1.09	2.40	6.773	4.378	0.135	8.455	31.92	0
BJONES	3	0.05	0.16	0.194	0.344	0.036	1.300	1.78	0
CMARTIN	10	0.11	0.66	0.717	0.970	0.076	4.290	7.89	0
Total	30	1.26	3.22	7.684	5.692	0.247	14.045	41.60	0

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CIMS/VMS Version V08.0 Page 1

Software Package Utilization
From 1-JAN-2000 Thru 31-JAN-2000
ALL Shifts

Software Package = "VMS_IMAGES"

User	Image Activations	Connect Hours	CPU Minutes	Buffered I/O Requests (1000's)	Direct I/O Requests (1000's)	Fault I/O Requests (1000's)	Page Faults (1000's)	Memory Demand	Volume Mounts
ADUNN	3	0.00	0.01	0.002	0.002	0.006	0.137	0.01	0
BJONES	480	0.20	3.49	4.853	1.384	0.721	42.173	16.95	0
CMARTIN	3	0.00	0.01	0.006	0.004	0.008	0.149	0.02	0
DDORMET	15	0.12	0.59	1.453	0.641	0.036	1.279	2.57	0
ELIMELT	8	0.05	0.49	1.220	0.557	0.018	0.578	1.81	0
HTHOMAS	30	0.02	0.23	0.347	0.126	0.057	2.537	0.97	0
SIMPSON	14	0.02	0.26	0.618	0.265	0.028	1.006	1.19	0
SYSTEM	116	0.17	1.17	2.135	0.995	0.251	9.690	4.64	0
TSCULLY	4	0.00	0.09	0.217	0.100	0.008	0.216	0.39	0
WDOE	32	0.00	0.10	0.079	0.045	0.076	0.225	0.36	0
YSMITH	6	0.00	0.02	0.017	0.007	0.012	0.259	0.10	0
Total	711	0.60	6.45	10.947	4.126	1.221	60.249	29.02	0
Grand Total	762	14.53	37.35	33.474	33.968	1.676	79.849	594.83	0

User/Project Resource Reports

Another useful feature of CIMS is the ability to see what resources users consumed when they worked on different projects. These reports can be produced in two ways: user by project, and project by user. This requires that both User Accounting and Project Accounting be enabled in the CIMS Parameter File, and that the Userproj Combination feature be enabled. These features may be enabled from within SETUP.

User by Project

This type of report lists all projects that consumed resources within the accounting period, and within each project, what users consumed resources for that project.

To produce a User by Project report

- Execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_RESOURCE_REPORT
RESOURCE_REPORT> REPORT/GROUP-
_RESOURCE_REPORT> =PROJECT_NAME/INDIVIDUAL-
_RESOURCE_REPORT> /OUTPUT=USER_BY_PROJECT.LIS
RESOURCE_REPORT> EXIT
$ PRINT USER_BY_PROJECT.LIS
$
```

  A sample of the output from these commands is shown on the next page.

Resource Management & Chargeback CIMS LAB, Inc. Run Date: 14-MAR-2000
CIMS/VMS Version V08.0 Page 1

Project Account Utilization
From 1-JAN-2000 Thru 31-JAN-2000
ALL Shifts

Project = "CONTRACTS"

Username	UIC	Logons	Volume Mounts	Connect Minutes	Number Of Image Run	Block Weeks Allocated	I/O Requests (1000's)	CPU Minutes	Memory Demand
ADUNN	000054,000000	71	0	23.58	575	0.0	181.449	13.60	404.88
ELOLPEN	000075,000000	19	0	10.30	175	0.0	65.534	4.20	110.11
BJONES	000056,000000	10	0	0.97	71	0.0	16.010	1.69	82.15
CMARTIN	000067,000000	113	0	93.95	713	0.0	108.225	11.74	350.40
DDORMET	000101,000000	57	0	29.01	543	0.0	116.340	10.69	282.71
DFELDMAN	000047,000000	54	0	14.18	646	0.0	156.209	12.15	402.97
ELIMELT	000072,000000	1	0	0.13	4	0.0	2.409	0.18	7.08
FCOLLINS	000050,000000	37	0	10.32	279	0.0	61.942	6.21	277.16
HJACKSON	000057,000000	9	0	2.32	45	0.0	7.603	0.77	37.99
HWILSON	000060,000000	30	0	27.80	168	0.0	33.407	4.06	145.01
JMARTIN	000100,000000	20	0	8.81	121	0.0	75.897	4.43	180.75
JTANNER	000104,000000	33	0	0.13	4	0.0	2.409	0.18	7.0
LTHOMAS	000056,000000	3	0	0.10	18	0.0	3.521	0.32	9.71
SIMPSON	000061,000000	10	0	2.84	78	0.0	47.989	3.25	141.61
PRALET	000074,000000	18	0	2.66	86	0.0	16.227	2.01	92.88
TSCULLY	000062,000000	2	0	0.71	22	0.0	3.117	0.32	6.43
WDOE	000051,000000	55	0	16.26	448	0.0	87.291	7.42	191.10
YSMITH	000053,000000	10	0	7.06	87	0.0	23.173	1.80	53.82
Total		552	0	261.83	4354	0.0	1106.900	92.96	3079.90
Grand Total	762	14.53	37.35	33.474	33.968	1.676	79.849	594.83	0

Project by User

This type of report lists all users that consumed resources within the accounting period, and for each user, the resources for the projects that the user accessed during that period.

To produce a Project by User report

- Execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_RESOURCE_REPORT
RESOURCE_REPORT> REPORT/PROJECT-
_RESOURCE_REPORT> /GROUP=USERNAME/INDIVIDUAL-
_RESOURCE_REPORT> /OUTPUT=PROJECT_BY_USER.LIS
RESOURCE_REPORT> EXIT
$ PRINT PROJECT_BY_USER.LIS
$
```

A sample of the output from these commands is shown on the next page.

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CIMS/VMS Version V08.0 — Page 1

User Account Utilization
From 1-JAN-2000 Thru 31-JAN-2000
All Job Types
All Shifts

User = "BDUNN"

Project	UIC	Logons	Volume Mounts	Connect Minutes	Number Of Image Run	Block Weeks Allocated	I/O Requests (1000's)	CPU Minutes	Memory Demand
CUSTOMER_LETTERS	000076,000000	23	0	6.97	265	0.0	69.042	13.60	135.00
CUSTEMER_NOTES	000076,000000	71	0	23.58	575	0.0	181.449	13.60	404.88
DISTRIBUTOR_LETTERS	000076,000000	2	0	1.34	29	0.0	13.094	0.70	19.93
DISTRIBUTOR_NOTES	000076,000000	2	0	0.11	5	0.0	1.267	0.14	3.98
HOME	037777,177777	112	0	61.50	460	0.0	83.741	13.52	282.63
MARKETING	000076,000000	51	0	25.63	330	0.0	52.633	5.98	149.85
OPERATOR	000002,000000	6	4	2.18	963	0.0	51.694	17.61	422.40
PROSPECT_NOTES	000076,000000	3	0	0.02	3	0.0	0.316	0.09	2.58
SALES	000070,000000	0	0	0.00	0	5743.0	0.000	0.00	0.00
SECRETARY	000066,000000	2	0	0.49	7	0.0	1.436	0.16	10.46
VENDOR_LETTER	000076,000000	1	0	0.00	1	0.0	0.117	0.02	0.34
VENDOR_NOTES	000076,000000	8	0	1.12	28	0.0	10.228	0.66	13.39
Total		281	4	122.94	2666	5743.0	465.017	57.12	1445.44

7

Terminal Accounting

Processing OpenVMS Accounting Data **7-2**

Producing Terminal Reports **7-3**

Processing OpenVMS Accounting Data

The CIMS TERMINAL_REPORT Utility produces terminal reports from the CIMS Terminal File generated by the CIMS VMS_SELECT Utility.

To create the CIMS Terminal File

- The following commands create the CIMS Terminal File (if one does not already exist) used by the CIMS TERMINAL_REPORT Utility. It processes the data in the accounting file for the month of May, 1994. This assumes the accounting data is in the SYS$MANAGER directory for the month of March.

```
$ RUN ARSAP$EXE:ARSAP_VMS_SELECT
VMS_SELECT> TERMINAL/SINCE=1-MAY-1994-
_VMS_SELECT> /BEFORE=1-JUN-1994/ZERO
VMS_SELECT> EXIT
$
```

Producing Terminal Reports

This section presents command examples and their output for four terminal reports.

To show resource statistics

- Suppose you noticed one day in May that your system was heavily loaded and response time was down. You want to know how much CPU time was used by each terminal on this day.

  You decide to generate a terminal report to show the resource statistics for each terminal port on your system on this day, May 2, 1994. To do this, execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_VMS_SELECT
VMS_SELECT> TERMINAL/SINCE=2-MAY-1994-
_VMS_SELECT> /BEFORE=3-MAY-1994/ZERO
VMS_SELECT> EXIT
$ RUN ARSAP$EXE:ARSAP_TERMINAL_REPORT
TERMINAL_REPORT> REPORT/OUTPUT=TERMINAL.LIS
TERMINAL_REPORT> EXIT
$ PRINT TERMINAL.LIS
$
```

  An example report generated by the above commands is on the next page.

Resource Management & Chargeback
CIMS/VMS Version V08.0

CIMS LAB, Inc.
Terminal Utilization
From 1-JAN-2000 Thru 31-JAN-2000
All Job Types
All Shifts

Run Date: 14-MAR-2000
Page 1

Terminal	Logons	Volume Mounts	Connect Minutes	Number Of Image Run	Buffered I/O's (1000's)	Direct Requests (1000's)	CPU Minutes	Memory Demand
BARNEY-PORT_1	2	0	8.36	431	21.028	14.561	8.72	253.33
BARNEY-PORT_12	1	0	7.78	59	2.996	1.317	0.69	11.06
BARNEY-PORT_13	1	0	8.55	239	23.193	23.385	10.09	610.99
BARNEY-PORT_18	7	0	2.21	141	7.731	2.304	1.43	21.91
FRED-PORT_2	2	0	7.91	121	21.361	6.291	1.71	34.65
FRED-PORT_20	3	0	10.80	98	17.965	6.827	1.76	39.87
FRED-PORT_21	2	0	7.71	201	18.000	5.268	2.29	54.45
FRED-PORT_31	1	0	0.08	11	0.496	0.166	0.10	1.36
FVA-PORT_4	1	0	4.85	122	9.627	6.302	1.74	51.23
FVA-PORT_7	3	1	12.80	508	53.674	34.761	16.54	813.87
FVA-PORT_8	1	0	8.56	186	37.971	12.710	3.71	106.33
LTA1	147	2	3.73	1778	23.544	170.872	122.20	2887.63
LTA2	2	0	143.96	1	6.114	2.607	1.28	8.19
SVA-PORT_1	1	0	0.92	13	0.177	0.082	0.06	0.60
SVA-PORT_2	2	0	1.36	67	3.354	2.758	1.26	26.08
SVA-PORT_5	1	1	7.43	323	14.733	13.211	5.52	153.90
TNA1	3	0	0.03	3	0.086	0.025	0.02	0.10
TNA2	1	0	0.03	8	0.165	0.067	0.05	0.44
TNA3	322	0	2.22	985	29.401	12.936	9.12	127.96
Total	503	4	239.29	5300	291.616	316.450	188.30	5203.96

To show terminal port usage

- You suspect that a number of remote terminals on your system are not being used enough to justify their expense. You decide to produce a terminal report for the month of May, 1994 to show remote terminal ports usage, in ascending order of the amount of CPU time used. This way, the terminals that are not being used appear at the top of the report.

  Since you have set up your CIMS Terminal Parameter File with the remote terminal ports having the same terminal group name (REMOTE), you can look at just these terminals in your report.

  To produce this report, execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_VMS_SELECT
VMS_SELECT> TERMINAL/SINCE=1-MAY-1994-
_VMS_SELECT> /BEFORE=1-JUN-1994/ZERO
VMS_SELECT> EXIT
$
$ RUN ARSAP$EXE:ARSAP_TERMINAL_REPORT
TERMINAL_REPORT> REPORT/GROUP=GROUP=REMOTE -
_TERMINAL_REPORT> /SORT=CPU_TIME=ASCENDING -
_TERMINAL_REPORT> /INDIVIDUAL/HEADING= -
_TERMINAL_REPORT> "Remote Terminals by CPU Time"-
_TERMINAL_REPORT> /OUTPUT=REMOTE.LIS
TERMINAL_REPORT> EXIT
$ PRINT REMOTE.LIS
$
```

  An example report generated by the above commands is on the next page.

```
Resource Management & Chargeback                  CIMS LAB, Inc.                        Run Date: 14-MAR-2000
CIMS/VMS Version V08.0                                                                                Page 1
                                          Remote Terminal by CPU Time
                                       From 1-MAY-2000 Thru 31-MAY-2000

Terminal Group = "REMOTE"
```

Terminal	Logons	Volume Mounts	Connect Minutes	Number Of Image Run	Buffered I/O's (1000's)	Direct Requests (1000's)	CPU Minutes	Memory Demand
BARNEY-PORT_1	2	0	0.09	18	0.281	0.156	0.11	0.78
BARNEY-PORT_12	2	0	0.15	32	1.018	0.491	0.28	6.23
BARNEY-PORT_13	19	0	23.18	1231	56.612	38.299	18.46	490.32
BARNEY-PORT_18	23	0	130.25	1559	213.254	60.267	20.70	441.97
FRED-PORT_2	28	1	153.11	2561	478.127	267.891	62.68	2162.91
FRED-PORT_20	29	1	229.51	5195	610.610	310.933	110.27	3957.83
FRED-PORT_21	31	0	174.97	4312	449.068	347.134	125.98	5127.24
FRED-PORT_31	17	3	66.93	7296	413.140	281.188	168.62	8254.78
FVA-PORT_4	60	1	199.19	13915	1022.616	694.319	294.85	20018.91
FVA-PORT_7	20	69	101.73	22007	1134.326	588.621	389.95	21181.63
Total	231	76	1079.12	58126	4379.053	2589.299	1191.90	61642.60

To show print statistics

- Suppose you want to see the number of pages being printed from each terminal port during the month of May, 1994. You decide to output a terminal report to a file to show the print statistics for each terminal. To do this, execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_VMS_SELECT
VMS_SELECT> TERMINAL/SINCE=1-MAY-1994-
_VMS_SELECT> /BEFORE=1-JUN-1994/ZERO
VMS_SELECT> EXIT
$
$ RUN ARSAP$EXE:ARSAP_TERMINAL_REPORT
TERMINAL_REPORT> REPORT/PRINT -
_TERMINAL_REPORT> /OUTPUT=TERMINAL-PRINT-REPORT.LIS
TERMINAL_REPORT> EXIT
$ PRINT TERMINAL_PRINT_REPORT.LIS
$
```

  An example report generated by the above commands is on the next page.

```
Resource Management & Chargeback                    CIMS LAB, Inc.                    Run Date: 14-MAR-2000
CIMS/VMS Version V08.0                                                                       Page 1

                                  Print Queue Utilization
                              From 1-MAY-2000 Thru 31-MAY-2000

Terminal                Print   Pages   Elapsed      RMS      Printer      Wait      Symbiont
                        Jobs    Printed Minutes   $GET's     I/O Requests Minutes       CPU
                                                  (1000's)   (1000's)                 Minutes
---------------------------------------------------------------------------------------------
BARNEY-PORT_1             3       61     9.535     3.019       0.926       0.03         0.00
---------------------------------------------------------------------------------------------
BARNEY-PORT_12           81     1226   283.389    57.958      14.593      12.45         0.00
---------------------------------------------------------------------------------------------
FRED-PORT_2               7       20     3.650     0.843       0.148      24.07         0.00
---------------------------------------------------------------------------------------------
FRED-PORT_20             44      321    65.385    15.962       5.518      51.17         0.00
---------------------------------------------------------------------------------------------
FRED-PORT_31             21      661   189.176    15.198       1.573     428.11         0.00
---------------------------------------------------------------------------------------------
FVA-PORT_4               23       98   197.020     4.392       0.772     375.23         0.00
---------------------------------------------------------------------------------------------
BARNEY-PORT_1            11      102    20.934     5.311       0.268       4.45         0.00
---------------------------------------------------------------------------------------------
BARNEY-PORT_12           21      245    50.660    12.077       5.489      14.67         0.00
---------------------------------------------------------------------------------------------
BARNEY-PORT_13           32      754   141.322    36.430       2.243      42.47         0.00
---------------------------------------------------------------------------------------------
FRED-PORT_2              34      986   189.946    50.005      15.417      16.44         0.00
---------------------------------------------------------------------------------------------
FRED-PORT_20             67      785    95.513    42.507       4.354      33.30         0.00
---------------------------------------------------------------------------------------------
FRED-PORT_21             68      665    94.820    32.668       3.997       7.39         0.00
---------------------------------------------------------------------------------------------
FRED-PORT_31              2      106    20.264     5.344       3.423       0.04         0.00
---------------------------------------------------------------------------------------------
FVA-PORT_4               39      425   124.717    18.472       6.522      25.73         0.00
---------------------------------------------------------------------------------------------
FVA-PORT_7              110      753  7499.392    35.735      10.494     576.22         0.00
---------------------------------------------------------------------------------------------
Total                   563     7208  8940.723   335.921      75.737    1611.80         0.00
```

To report on CPU time

- Finally, suppose you want to investigate your hypothesis that users logging in from home on the 2400 baud modem get more work done than the users accessing the 1200 baud modem. You want to look at the two terminal ports to which the modems are connected. Furthermore, you want to sort the output in terms of CPU time.

  If you can show your managers that users are getting more work done on 2400 baud modem (terminal port FRED - PORT_2), then perhaps you can upgrade your older 1200 baud modem (terminal port FRED - PORT_6). To output the report, execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_VMS_SELECT
VMS_SELECT> TERMINAL/SINCE=1-MAY-1994/BEFORE=1-JUN-1994-
_VMS_SELECT> /ZERO
VMS_SELECT> EXIT
$
$ RUN ARSAP$EXE:ARSAP_TERMINAL_REPORT
TERMINAL_REPORT> REPORT/TERMINAL -
_TERMINAL_REPORT> =("FRED - PORT_2","FRED - PORT_6") -
_TERMINAL_REPORT> /SORT=CPU_TIME=DESCENDING-
_TERMINAL_REPORT> /OUTPUT=DIALUP.LIS
TERMINAL_REPORT> EXIT
$ PRINT DIALUP.LIS
$
```

  An example report generated by the above commands is on the next page.

Note • Port names with embedded spaces must be enclosed in quotes.

```
Resource Management & Chargeback                  CIMS LAB, Inc.                          Run Date: 14-MAR-2000
CIMS/VMS Version V08.0                                                                                Page 1
                                                Terminal Utilization
                                            From 1-JAN-2000 Thru 31-JAN-2000

Terminal                 Logons    Volume   Connect   Number Of     Buffered    Direct         CPU         Memory
                                   Mounts   Minutes   Image Run      I/O's     Requests      Minutes       Demand
                                                                    (1000's)   (1000's)
-----------------------------------------------------------------------------------------------------------------
BARNEY-PORT_1             19          0      23.18       1231       56.612     38.299         18.46       490.32
-----------------------------------------------------------------------------------------------------------------
BARNEY-PORT_6              7          0       3.54        347       17.533     11.733          5.39       173.83
-----------------------------------------------------------------------------------------------------------------
Total                     26          0      26.72       1578       74.145     50.032         23.85       664.15
```

Terminal by User Support

The CIMS TERMINAL_REPORT Utility let you find out how much each terminal is being used, and at what times of day. However, the terminal reports show only the terminal names; they do not relate the terminal usage back to the user or the project. Thus, you use the CIMS TERMINAL_REPORT Utility for reporting on the usage of the terminal names (ports) themselves.

Terminal by User Support lets you:

- Charge more (or less) for certain terminals
- Report on which terminals are being used by what users and projects

The CIMS SETUP Utility includes a flag, TERMINAL_BY_USER, that you can enable or disable. When you disable the flag, Terminal by User support is turned off. The rest of this section assumes you have enabled this feature.

You use the CIMS RATES Utility to set charges for particular terminals. This applies to interactive rates only. For example, if you want to charge more for connect time for the terminal server port that is connected to the high-speed modem, you can set the interactive rate for that port to have a higher connect time rate than the other terminals. This means there can be different rates for different terminal names within the same rates table.

- In a cluster environment, you might want to charge more for a specific terminal connected to a specific node in the cluster. For example, if you want to charge, in the DEFAULT_RATES rates table, 10.00 per hour of connect time in shift 1 on the TXA5: terminal on node ALPHA, you would use the following commands:

```
$ RUN ARSAP$EXE:ARSAP_RATES
RATES> ADD DEFAULT_RATES/INTERACTIVE -
_RATES> /TERMINAL=TXA5:/NODE=ALPHA
%RATES-S-ADDED, 1 record successfully added
RATES> DEFAULT/INTERACTIVE/TERMINAL=TXA5: -
_RATES> /NODE=ALPHA/SHIFT=1/CONNECT=10.00
%RATES-S-MODIFIED, 1 record successfully modified
RATES> EXIT
$
```

The CIMS INVOICES Utility shows the rates being applied and the charges generated for specific terminal usage. This is shown on the /FULL=INTERACTIVE invoice pages. The INTSUMMARY page shows the total charge for each terminal. The INTDETAIL page shows the breakdown into shifts for each terminal used by the user or project (or whatever grouping you are using). Note that /FULL=INTERACTIVE is the same as /FULL=INTDETAIL.

```
INVOICES> REPORT/USER=CJONES/FULL=(INTSUMM,INTDET)-
_INVOICES> /OUTPUT=CJONES_CHARGES.LIS
```

This example uses the INVOICES /FULL qualifier to show the charges for a specific user, with a summary page showing all terminals used by CJONES, followed by detail pages of each terminal. The summary page is shown on the next page, followed by one of the detail pages. Please note that the pages shown are not in consecutive order

Note • All keywords of the /FULL qualifier are negatable to allow for customization of the /FULL report.

8-JAN-1994 Invoice 0000000001

Interactive Charges

Terminal	Amount
BARNEY - LC-5-1	$1.02
BARNEY - LC-5-2	$3.18
BARNEY - LC-5-3	$8.11
BARNEY - LC-5-4	$0.35
BARNEY - LC-5-6	$4.48
BARNEY - LC-5-7	$7.63
BARNEY - LC-5-8	$1.00
BARNEY - LC-6-1	$3.30
BARNEY - LC-6-2	$1.41
BARNEY - LC-6-3	$7.79
BARNEY - LC-6-4	$2.24
BARNEY - LC-6-5	$0.74
BARNEY - LC-6-6	$7.09
BARNEY - LC-6-7	$0.43
BARNEY - LC-6-8	$5.17
FRED - PORT_7	$15.77
WILMA - PORT_3	$166.85

Total Interactive Charges	$236.56

8-JAN-1994 Invoice 0000000001

Interactive Charges For

FRED - PORT_7

Shift 1 (07:00 to 17:00)

Description	Quantity	Unit Price	Amount
Logins	1.000	$0.5000	$0.50
Chargeable Connect Hours	0.214	$4.0000	$0.86
Buffered I/O's (1000's)	2.157	$0.6000	$1.29
Direct I/O's (1000's)	0.449	$0.2000	$0.09
CPU Minutes	0.052	$2.0000	$0.10
Memory Demand	0.890	$0.2000	$0.18
Volume Mounts	0.000	$1.5000	$0.00
Vector CPU Minutes	0.000	$10.0000	$0.00
Subtotal			$3.02

Shift 2 (17:00 to 00:00)

Description	Quantity	Unit Price	Amount
Logins	4.000	$0.3750	$1.50
Chargeable Connect Hours	0.168	$3.0000	$0.50
Buffered I/O's (1000's)	2.033	$0.4500	$0.91
Direct I/O's (1000's)	0.997	$0.1500	$0.15
CPU Minutes	0.088	$1.5000	$0.13
Memory Demand	4.086	$0.1500	$0.61
Volume Mounts	0.000	$1.5000	$0.00
Vector CPU Minutes	0.000	$10.0000	$0.00
Subtotal			$3.80

Shift 3 (00:00 to 07:00)

No Chargeable Activity

Shift 4 (Weekends and Holidays)

Description	Quantity	Unit Price	Amount
Logins	15.000	$0.2500	$3.75
Chargeable Connect Hours	0.910	$2.0000	$1.82
Buffered I/O's (1000's)	5.478	$0.3000	$1.64
Direct I/O's (1000's)	2.742	$0.1000	$0.27
CPU Minutes	0.259	$1.0000	$0.26
Memory Demand	12.062	$0.1000	$1.21
Volume Mounts	0.000	$1.5000	$0.00
Vector CPU Minutes	0.000	$10.0000	$0.00
Subtotal			$8.95

The CIMS AUDIT Utility also shows the terminal name used for each interactive session. It breaks down the statistics and charges for each session.

The CIMS RESOURCE_REPORT Utility includes a REPORT /TERMINAL command that displays the statistics for each terminal used in the given reporting period. Likewise, the CHARGES /TERMINAL command displays the charges for each terminal used in the given reporting period. You can use the various grouping keywords and the /INDIVIDUAL qualifier to break down the usage for each terminal into the specific user, project, or grouping field.

Thus, in RESOURCE_REPORT, you can obtain reports of which users (or projects) used each specific terminal. Likewise, you can see reports of the terminals each user (or project) used.

```
_RESOURCE_REPORT> REPORT/TERMINAL/INDIVIDUAL-
_RESOURCE_REPORT> /GROUP=USERNAME=ABELJ -
_RESOURCE_REPORT> /OUTPUT=RESOURCE.LIS
```

This example uses the RESOURCE_REPORT/TERMINAL qualifier to show the resource statistics for each terminal that a particular user accessed. Only the terminals accessed by this user are shown. The output is directed to a file called RESOURCE.LIS. The output is shown on the next page.

```
Resource Management & Chargeback                  CIMS LAB, Inc.                        Run Date: 14-MAR-2000
CIMS/VMS Version V08.0                                                                                Page 1
                                                Terminal Utilization
                                          From 1-JAN-2000 Thru 31-JAN-2000
                                                    ALL Shifts

User = "ABELJ"
```

Terminal Name	Logins	Connect Hours	CPU Minutes	Buffered I/O Requests (1000's)	Direct I/O Requests (1000's)	Fault I/O Requests (1000's)	Page Faults (1000's)	Memory Demand	Volume Mounts
LTA - LC-5-1	2	0.06	0.03	0.673	0.329	0.255	7.940	1.45	0
LTA - LC-5-2	3	0.58	0.04	0.848	0.416	0.313	10.180	1.53	0
LTA - LC-5-3	7	0.61	0.19	5.499	3.191	1.070	23.633	9.83	0
LTA - LC-5-4	1	0.01	0.01	0.197	0.092	0.078	1.249	0.08	0
LTA - LC-5-6	2	0.37	0.11	4.071	2.638	0.262	4.139	1.51	0
LTA - LC-5-7	4	1.12	0.13	10.996	1.787	0.475	13.265	3.39	0
LTA - LC-5-8	2	0.08	0.03	0.512	0.215	0.217	8.815	1.33	0
LTA - LC-6-1	2	0.20	0.08	2.634	1.582	0.299	6.717	4.15	0
LTA - LC-6-2	2	0.10	0.03	0.652	0.306	0.182	5.956	0.93	0
LTA - LC-6-3	7	1.31	0.14	3.747	2.405	0.781	28.073	6.46	0
Total	32	4.44	0.79	98.829	12.961	3.932	109.967	30.66	0

8

Disk Reporting

Processing Disk Data **8-2**

Producing Disk Reports **8-2**

Processing Disk Data

The CIMS DISK_REPORT Utility produces disk reports from the CIMS Storage File generated by the CIMS STORAGE_SAMPLER Utility. No other processing is necessary to generate disk reports from this file.

Producing Disk Reports

This section presents command examples and their output for both types of disk reports.

To report on disk space

- Suppose you want to see how much disk space was being used on your system as of yesterday. To do this, execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_DISK_REPORT
DISK_REPORT> REPORT/DAILY/OUTPUT=DISK_REPORT
DISK_REPORT> EXIT
$ PRINT DISK_REPORT.001
```

  An example of the resulting output is on the next two pages.

Resource Management & Chargeback
ARSAP/VMS Version V08.0

CIMS Lab, Inc.

Run Date: 12-MAR-1994
Page 1

Disk Usage Report for 12-MAR-1994
Number of Blocks Allocated

Username	UIC	_GEJAC$DUA0: GEJACVOL0	_GEJAC$DUA1: GEJACVOL1	Total
"Unknown"	[100001,000023]	0	186	186
"Unknown"	[100001,000024]	9891	3177	13068
"Unknown"	[100001,000027]	0	46845	46845
"Unknown"	[100001,000037]	0	1953	1953
SYSTEM	[000001,000004]	99000	107421	206421
ARSAP	[000001,000210]	0	192000	192000
OPERATOR	[000002,000001]	0	183	183
COBREMSKI	[000047,000000]	23613	0	23613
GBONIFANT	[000050,000000]	29307	0	29307
BHICKOK	[000051,000000]	0	78	78
BKUSNADI	[000053,000000]	0	6021	6021
BCLAYTON	[000054,000000]	40710	0	40710
BFIELD	[000056,000000]	29826	19206	49032
GCHURCH	[000057,000000]	0	3192	3192
GMERCER	[000060,000000]	0	1593	1593
KHENLEY	[000061,000000]	0	69	69
MSCHEUERMAN	[000062,000000]	0	105	105
TBOLING	[000064,000000]	0	246	246
ARSAPGUEST	[000065,000000]	0	8508	8508
SECRETARY	[000066,000000]	0	3450	3450
THICKOK	[000067,000000]	27783	36	27819
KFAGERLUND	[000071,000000]	0	105	105

Resource Management & Chargeback
ARSAP/VMS Version V08.0

CIMS Lab, Inc.

Run Date: 12-MAR-1994
Page 2

Disk Usage Report for 12-MAR-1994
Number of Blocks Allocated

Username	UIC	_GEJAC$DUA0: GEJACVOL0	_GEJAC$DUA1: GEJACVOL1	Total
DTOWNSON	[000072,000000]	0	318	318
JSTANSBURY	[000073,000000]	41160	46776	87936
MCRAWLEY	[000074,000000]	0	63039	63039
AWILSON	[000075,000001]	0	1407	1407
MARKETING	[000076,000000]	0	74262	74262
GFS	[000077,000000]	0	2832	2832
HRICHARDSON	[000077,000001]	0	111	111
GNICOLET	[000100,000000]	0	153	153
CDOSTER	[000101,000000]	68139	0	68139
JCHURCH	[000104,000000]	0	4167	4167
DEFAULT	[000106,000000]	150	0	150
EBURKE	[000375,000001]	0	3	3
Total:		369579	587442	957021
Percent:		46.81%	74.40%	60.60%
Other Allocation:		0	0	0
Percent:		0.00%	0.00%	0.00%
Free Blocks:		420021	202158	622179
Percent:		53.19%	25.60%	39.40%
Available Blocks:		789600	789600	1579200

To compare disk space usage

- Suppose you want to see how disk space utilization has changed over the last two months (in January and February, 1994). Furthermore, you want to see the two month time period broken down into eight samples, representing approximately the eight weeks in the two months. To do this, execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_DISK_REPORT
DISK_REPORT> REPORT/TREND/SINCE=1-JAN-1994-
_DISK_REPORT> /BEFORE=1-MAR-1994/COLUMNS=8-
_DISK_REPORT> /OUTPUT=DISK
DISK_REPORT> EXIT
$ PRINT DISK.001
$ PRINT DISK.002
$
```

  Since you asked for eight columns of data in the resulting report and a maximum of five columns can be shown on a single print page of 132 columns, two files were generated (`DISK.001` and `DISK.002`). The resulting files are displayed on the following two pages.

Resource Management & Chargeback — CIMS Lab, Inc. — Run Date: 13-MAR-1994
ARSAP/VMS Version V08.0 — Page 1

Disk Trend Report (Part 1 of 2)
Number of Blocks Allocated

Username	UIC	1-JAN-1990	11-JAN-1994	19-JAN-1994	27-JAN-1994	4-FEB-1994
SYSTEM	[000001,000004]	789285	838038	843450	852378	893967
OPERATOR	[000002,000001]	201	186	186	186	189
COBREMSKI	[000047,000000]	16446	24303	119148	34299	15270
GBONIFANT	[000050,000000]	70482	70614	69729	65406	63672
BKUSNADI	[000053,000000]	2595	5832	5820	5826	5787
BCLAYTON	[000054,000000]	61509	96573	75186	44706	37566
BFIELD	[000056,000000]	49386	75726	54618	45195	70692
GMERCER	[000060,000000]	1542	1749	966	1071	1116
MSCHEUERMAN	[000062,000000]	111	105	105	105	105
TBOLING	[000064,000000]	228	210	246	249	252
SECRETARY	[000066,000000]	2922	2910	3132	3225	3378
THICKOK	[000067,000000]	27918	28005	27399	27555	26640
DTOWNSON	[000072,000000]	228	237	237	237	258
JSTANSBURY	[000073,000000]	247737	297873	321279	341469	329367
MCRAWLEY	[000074,000000]	110004	83343	105225	109803	137358
AWILSON	[000075,000001]	1290	1293	1305	1308	1326
CDOSTER	[000101,000000]	53967	66903	68808	63333	60903
A2276	[000377,000001]	42	42	42	42	72
A1894	[000377,000002]	243	243	243	243	243
Total:		1436136	1594185	1697124	1596636	1648161
Percent:		43.01%	47.75%	50.83%	47.82%	49.36%
Other Allocation:		749820	655827	710982	689700	706905
Percent:		22.46%	19.64%	21.29%	20.66%	21.17%
Free Blocks:		1152883	1088827	930733	1052503	983773
Percent:		34.53%	32.61%	27.88%	31.52%	29.46%
Available Blocks:		3338839	3338839	3338839	3338839	3338839

Resource Management & Chargeback
ARSAP/VMS Version V08.0

CIMS Lab, Inc.

Run Date: 13-MAR-1994
Page 1

Disk Trend Report (Part 2 of 2)
Number of Blocks Allocated

Username	UIC	12-FEB-1994	20-FEB-1994	28-FEB-1994
SYSTEM	[000001,000004]	872967	925596	902979
OPERATOR	[000002,000001]	189	189	222
COBREMSKI	[000047,000000]	14400	16668	30516
GBONIFANT	[000050,000000]	61437	27825	27564
BKUSNADI	[000053,000000]	5787	5799	6012
BCLAYTON	[000054,000000]	25314	26424	32622
BFIELD	[000056,000000]	37290	310368	312333
GMERCER	[000060,000000]	1158	1296	1440
MSCHEUERMAN	[000062,000000]	105	105	111
TBOLING	[000064,000000]	222	237	246
SECRETARY	[000066,000000]	3339	3435	3372
THICKOK	[000067,000000]	26832	28011	28134
DTOWNSON	[000072,000000]	276	321	327
JSTANSBURY	[000073,000000]	118977	121032	154404
MCRAWLEY	[000074,000000]	174837	185397	139182
AWILSON	[000075,000001]	1320	1590	1617
CDOSTER	[000101,000000]	61932	62799	68181
A2276	[000377,000001]	72	87	87
A1894	[000377,000002]	243	243	243
		1406697	1717422	1709592
Total:		42.13%	51.44%	51.20%
Percent:				
Other Allocation:		737619	743286	721167
Percent:		22.09%	22.26%	21.60%
Free Blocks:		1194523	878131	908080
Percent:		35.78%	26.30%	27.20%
Available Blocks:		3338839	3338839	3338839

9

Capacity Planning

Processing OpenVMS Accounting Data **9-2**

Producing Capacity Planning Reports **9-3**

Processing OpenVMS Accounting Data

The CIMS CAPACITY_REPORT Utility produces capacity planning reports from the capacity planning database file generated by the CIMS VMS_SELECT Utility.

To create the CIMS Capacity File

- The following commands create the CIMS Capacity File used by the CIMS CAPACITY_REPORT Utility (if it does not already exist). It processes the data in the OpenVMS Accounting File for the month of January, 1999.

```
$ RUN ARSAP$EXE:ARSAP_VMS_SELECT
VMS_SELECT> CAPACITY/SINCE=1-JAN-1999/BEFORE=1-FEB-1999-
_VMS_SELECT> 1999-01-ACCOUNTNG.DAT
VMS_SELECT> EXIT
$
```

To update the CIMS Capacity File

- The following commands add to the data in the current CIMS Capacity File. The command processes the data in the OpenVMS Accounting File for the month of February, 1999.

```
$ RUN ARSAP$EXE:ARSAP_VMS_SELECT
VMS_SELECT> CAPACITY/SINCE=1-FEB-1999/BEFORE=1-MAR-1999-
_VMS_SELECT> 1999-02-ACCOUNTNG.DAT
VMS_SELECT> EXIT
$
```

Producing Capacity Planning Reports

This section presents command examples and their output for four capacity planning reports.

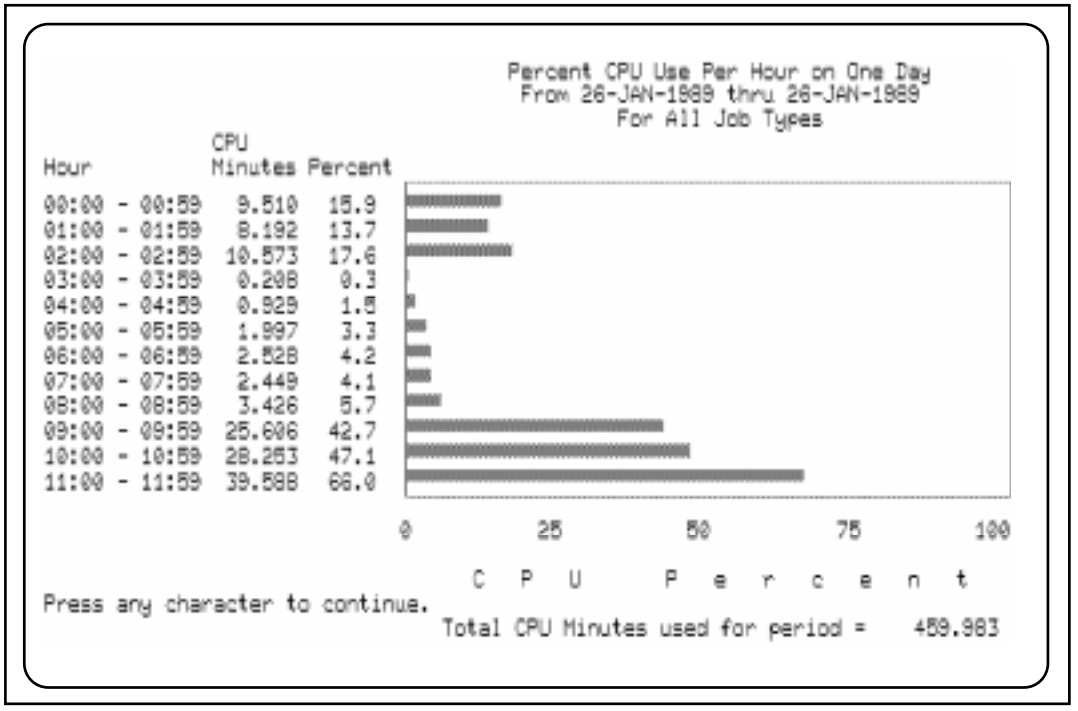
To produce capacity planning reports

- Suppose you noticed one day in January that your system was heavily loaded and that response time was down. You want to know how much of your CPU was being used on this certain day. Furthermore, you want to see how this usage differed for each hour of the day.

  You decide to display a capacity planning report on your VT-240 CRT to show what percentage of the total CPU time available on your system was in use on this day, January 26, 1999. To do this, execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_CAPACITY_REPORT
CAPACITY_REPORT> SET MODE REGIS
CAPACITY_REPORT> BARCHART/SINCE=26-JAN-1999-
_CAPACITY_REPORT> /BEFORE=27-JAN-1999-
_CAPACITY_REPORT> /CATEGORIZATION=HOURS/CPU-
_CAPACITY_REPORT> /PERCENT/USED-
_CAPACITY_REPORT> /SCALE=(0,100)/HEADING=-
_CAPACITY_REPORT> "Percent CPU Use Per Hour on One Day"
CAPACITY_REPORT> EXIT
$
```

  The first screen generated by the above commands is shown on the next page.

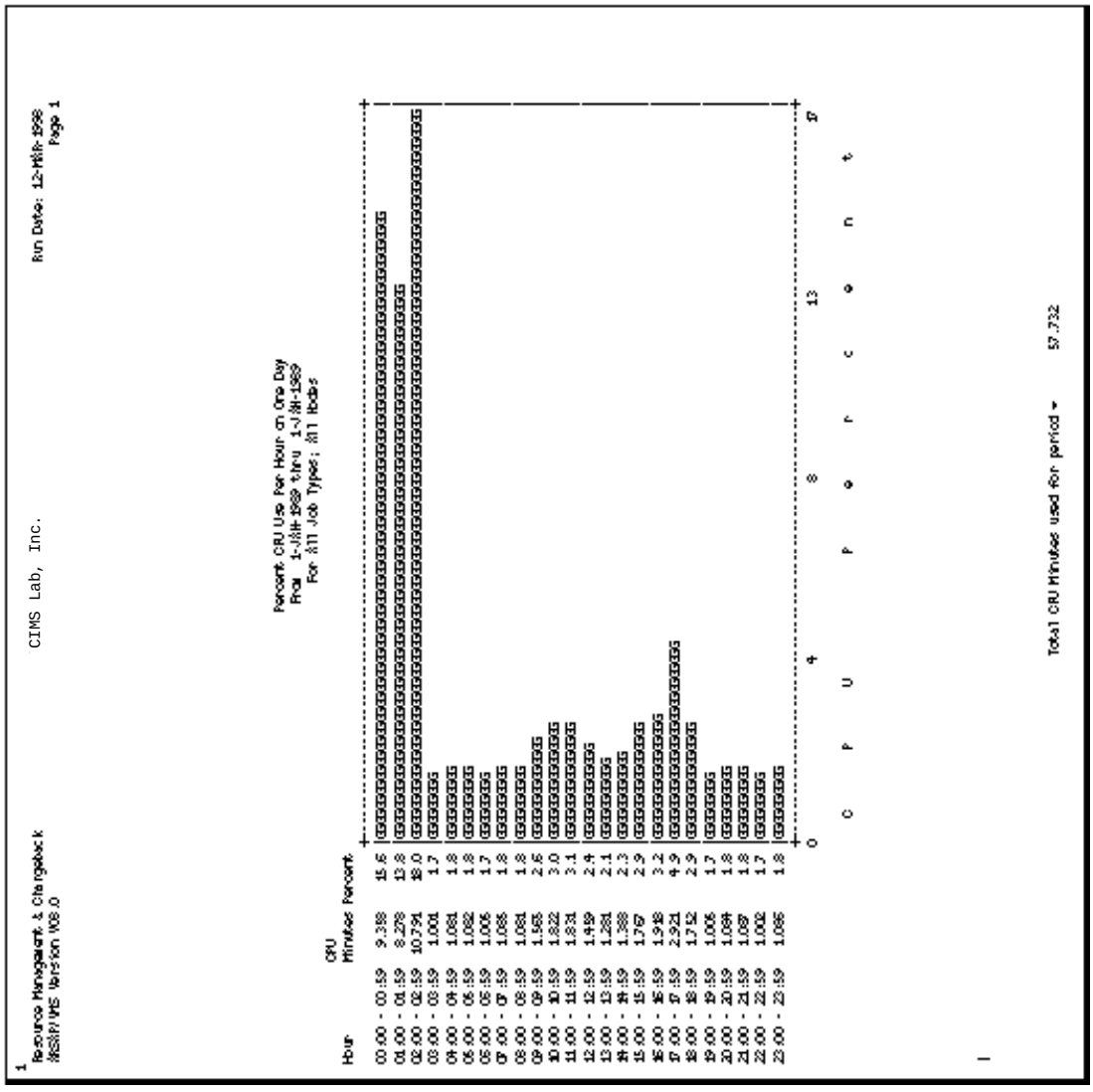


- You decide that you need a hardcopy of the report printed on the line printer. To do this, execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_CAPACITY_REPORT
CAPACITY_REPORT> BARCHART/SINCE=26-JAN-1992-
_CAPACITY_REPORT> /BEFORE=27-JAN-1992-
_CAPACITY_REPORT> /CATEGORIZATION=HOURS/CPU-
_CAPACITY_REPORT> /PERCENT/USED/OUT=CPU.LIS-
_CAPACITY_REPORT> /SCALE=(0,100)/HEADING=-
_CAPACITY_REPORT> "Percent CPU Use Per Hour on One Day"
CAPACITY_REPORT> EXIT
$ PRINT CPU.LIS
$
```

An example report generated by the above commands is on the next page.

```
1
Resource Management & Chargeback                    CIMS Lab, Inc.                    Run Date: 12-MAR-1998
ARSAP/VMS Version V08.0                                                                          Page 1

                                                Percent CPU Use Per Hour on One Day
                                                   From  1-JAN-1989 thru  1-JAN-1989
                                                   For All Job Types; All Nodes
                 CPU
Hour           Minutes Percent
                                 +-----------------------------------------------------------------------------------------+
00:00 - 00:59   9.358    15.6    |GGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGG|
01:00 - 01:59   8.278    13.8    |GGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGG|
02:00 - 02:59  10.791    18.0    |GGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGG|
03:00 - 03:59   1.001     1.7    |GGGGGGGG                                                                                 |
04:00 - 04:59   1.081     1.8    |GGGGGGGG                                                                                 |
05:00 - 05:59   1.082     1.8    |GGGGGGGG                                                                                 |
06:00 - 06:59   1.006     1.7    |GGGGGGGG                                                                                 |
07:00 - 07:59   1.085     1.8    |GGGGGGGG                                                                                 |
08:00 - 08:59   1.081     1.8    |GGGGGGGG                                                                                 |
09:00 - 09:59   1.565     2.6    |GGGGGGGGGGGG                                                                             |
10:00 - 10:59   1.822     3.0    |GGGGGGGGGGGGGG                                                                           |
11:00 - 11:59   1.831     3.1    |GGGGGGGGGGGGGG                                                                           |
12:00 - 12:59   1.459     2.4    |GGGGGGGGGGG                                                                              |
13:00 - 13:59   1.281     2.1    |GGGGGGGGGG                                                                               |
14:00 - 14:59   1.388     2.3    |GGGGGGGGGGG                                                                              |
15:00 - 15:59   1.767     2.9    |GGGGGGGGGGGGG                                                                            |
16:00 - 16:59   1.918     3.2    |GGGGGGGGGGGGGG                                                                           |
17:00 - 17:59   2.921     4.9    |GGGGGGGGGGGGGGGGGGGGGGGG                                                                 |
18:00 - 18:59   1.752     2.9    |GGGGGGGGGGGGG                                                                            |
19:00 - 19:59   1.006     1.7    |GGGGGGGG                                                                                 |
20:00 - 20:59   1.084     1.8    |GGGGGGGG                                                                                 |
21:00 - 21:59   1.087     1.8    |GGGGGGGG                                                                                 |
22:00 - 22:59   1.002     1.7    |GGGGGGGG                                                                                 |
23:00 - 23:59   1.086     1.8    |GGGGGGGG                                                                                 |
                                 +-----------------------------------------------------------------------------------------+
                                 0                   4                   8                  13                  17

                                   C     P     U           P     e     r     c     e     n     t

|

                                                Total CPU Minutes used for period =      57.732
```



- Suppose you want to compare how much connect time is being used each day of the week, and which day of the week you have the most and the least amount of connect time. Furthermore, you want to see how this connect time is distributed between interactive and batch jobs.

  If you find that your system is not used much on Saturday and Sunday, then you might want to change your rates to encourage more users to work on those two days and reduce the load on your system during the week. Or, you might want to reschedule some batch jobs to run on these two days.

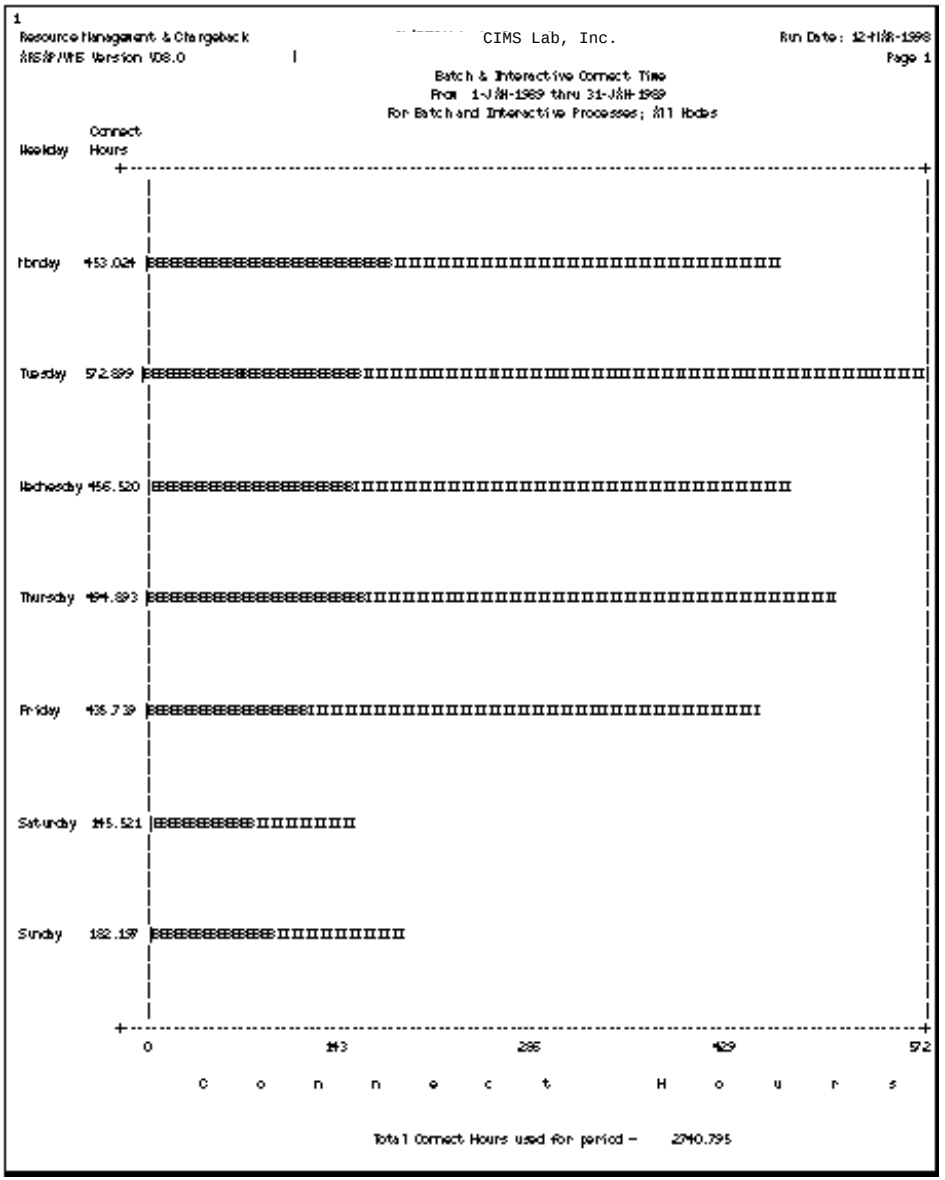
  You decide to display a capacity planning report on your VT-340 color CRT to show how much connect time is accumulated each day of the week (Sunday, Monday, Tuesday, etc.) for the month of January, 1999. The batch connect time should be in BLUE and the interactive connect time should be in RED. To do this, execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_CAPACITY_REPORT
CAPACITY_REPORT> SET MODE REGIS/DEVICE=VT340
CAPACITY_REPORT> BARCHART/SINCE=1-JAN-1999-
_CAPACITY_REPORT> /BEFORE=1-FEB-1999-
_CAPACITY_REPORT> /CATEGORIZATION=WEEKDAYS-
_CAPACITY_REPORT> /CONNECT_TIME/JOBTYPE-
_CAPACITY_REPORT> =(BATCH:BLUE,INTERACTIVE:RED)-
_CAPACITY_REPORT> /HEADING=-
_CAPACITY_REPORT> "Batch & Interactive Connect Time"
CAPACITY_REPORT> EXIT
$
```

- You decide to generate the same report as the previous example, except that it should be printed on the line printer (replacing colors with printing letters to distinguish interactive and batch connect time). To do this, execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_CAPACITY_REPORT
CAPACITY_REPORT> BARCHART/SINCE=1-JAN-1992-
_CAPACITY_REPORT> /BEFORE=1-FEB-1992/CATEGORIZATION-
_CAPACITY_REPORT> =WEEKDAYS/CONNECT_TIME-
_CAPACITY_REPORT> /JOBTYPE=(BATCH:B,INTERACTIVE:I)-
_CAPACITY_REPORT> /OUTPUT=CAPACITY.LIS/HEADING=-
_CAPACITY_REPORT> "Batch & Interactive Connect Time"
CAPACITY_REPORT> EXIT
$ PRINT CAPACITY.LIS
$
```

  An example report generated by the above commands is on the next page.

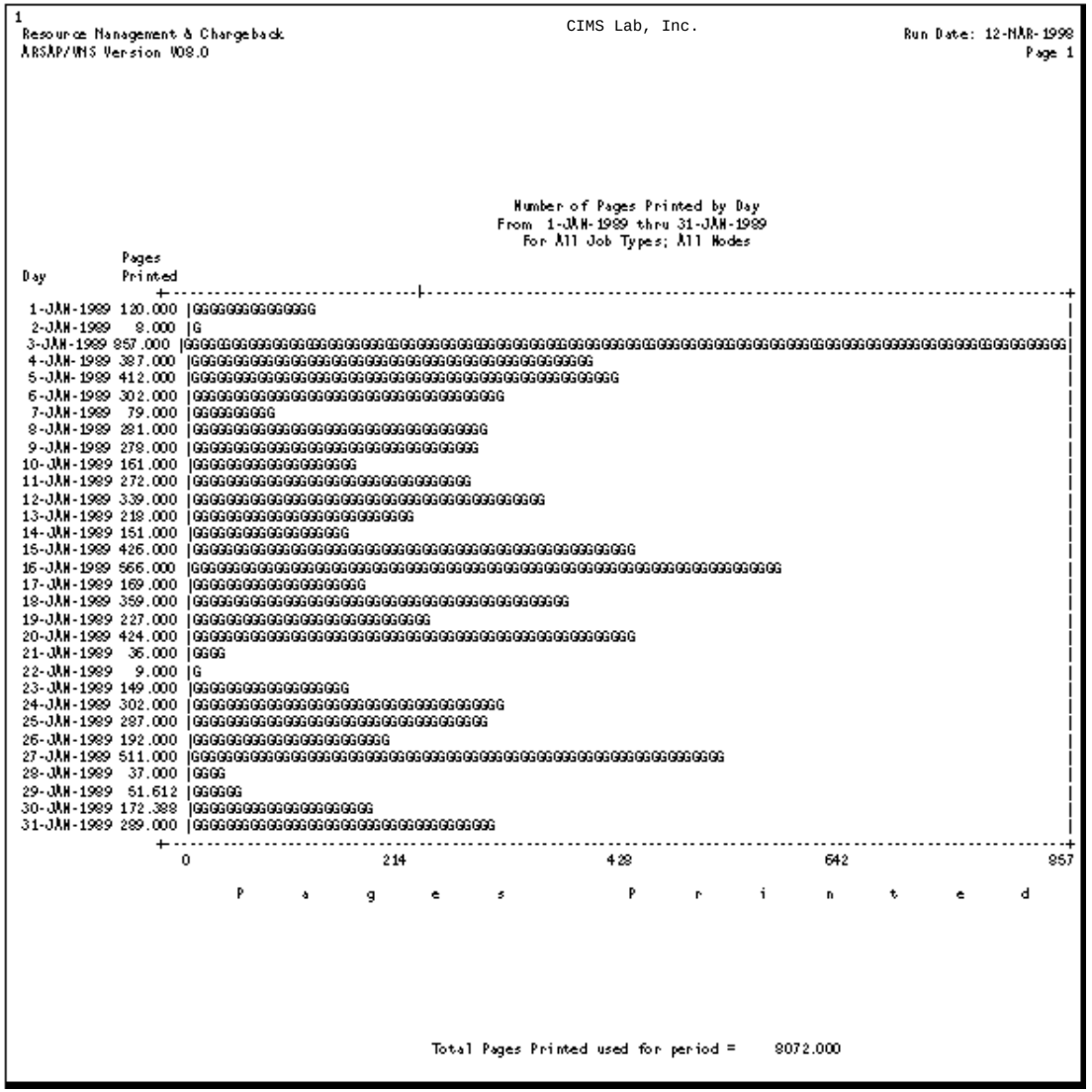

1
Resource Management & Chargeback
CIMS Lab, Inc.
Run Date: 12-MAR-1998
CA-CIMS/VMS Version 100.0
Page 1
Batch & Interactive Connect Time
From 1-JAN-1989 thru 31-JAN-1989
For Batch and Interactive Processes; All Modes
Weekday
Connect Hours
Monday 453.024
Tuesday 572.899
Wednesday 456.520
Thursday 494.893
Friday 438.739
Saturday 145.521
Sunday 182.197
0
143
286
429
572
Connect Hours
Total Connect Hours used for period - 2740.795

- Suppose you want to see the number of pages being printed on each day in the month of January, 1999. You installed a new printer in the middle of the month, and you want to see how it has impacted the number of pages being printed.

  You decide to output a capacity planning report to a file to show how many pages are being printed on each day in the month. To do this, execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_CAPACITY_REPORT
CAPACITY_REPORT> BARCHART/SINCE=1-JAN-1999-
_CAPACITY_REPORT> /BEFORE=1-FEB-1999-
_CAPACITY_REPORT> /CATEGORIZATION=DAYS/PAGES-
_CAPACITY_REPORT> /OUTPUT=PAGES.LIS/HEADING=-
_CAPACITY_REPORT> "Number of Pages Printed by Day"
CAPACITY_REPORT> EXIT
$ PRINT PAGES.LIS
$
```

  An example report generated by the above commands is on the next page.



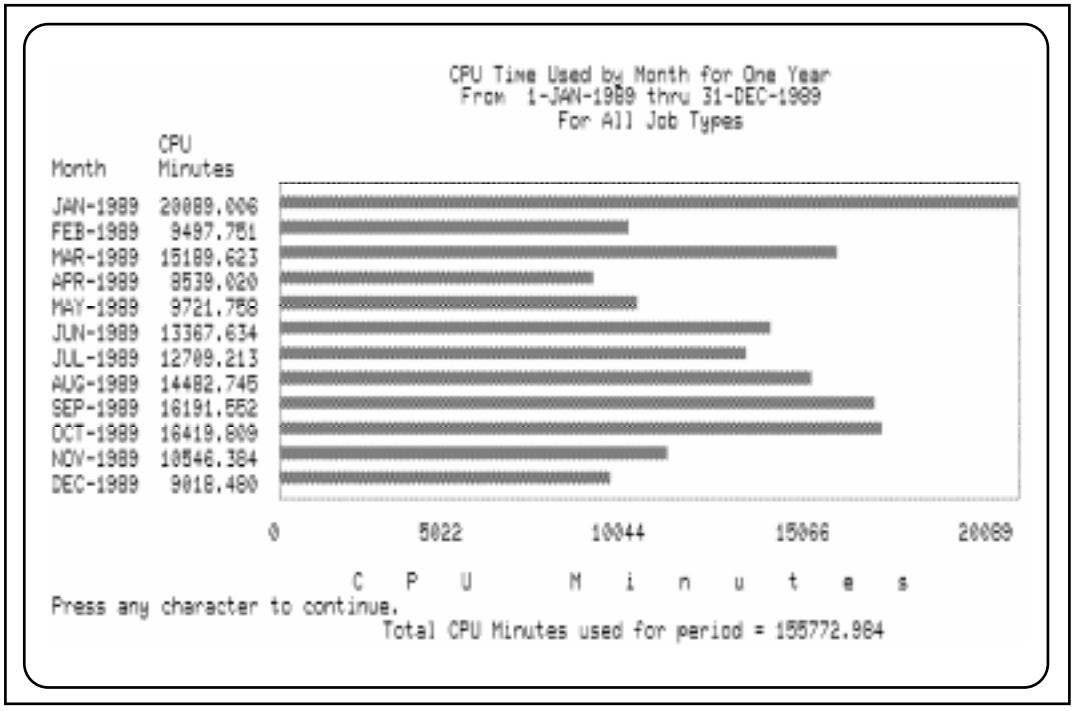
```
1
Resource Management & Chargeback                CIMS Lab, Inc.                  Run Date: 12-MAR-1998
ARSAP/VMS Version V09.0                                                         Page 1

                                  Number of Pages Printed by Day
                                  From  1-JAN-1989 thru 31-JAN-1989
                                    For All Job Types; All Nodes

                Pages
Day             Printed
                   +-------------------------+-------------------------------------------------------------------------------------+
 1-JAN-1989 120.000 |GGGGGGGGGGGGGG                                                                                                 |
 2-JAN-1989   8.000 |G                                                                                                              |
 3-JAN-1989 857.000 |GGGGGGGGGGGGG
```

- Finally, suppose you want to analyze the trend of how your CPU has been used in the past year. Is it being used more and more, as your users seem to think, based on reported diminishing response times, or has the usage been fairly constant? If it is being used more, how long will it be before your CPU is too overloaded to be useful to any users, and you have to start thinking about purchasing a new CPU?

  You decide to output a capacity planning report to your terminal that shows the CPU usage for each month in the past year. This assumes you have processed the last year's accounting data into the CIMS Capacity Planning file. To output the report, execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_CAPACITY_REPORT
CAPACITY_REPORT> SET MODE SCREEN
CAPACITY_REPORT> BARCHART/SINCE=1-JAN-1989-
_CAPACITY_REPORT> /BEFORE=1-JAN-1990-
_CAPACITY_REPORT> /CATEGORIZATION=MONTHS/CPU-
_CAPACITY_REPORT> /HEADING=-
_CAPACITY_REPORT> "CPU time used by Month for One Year"
CAPACITY_REPORT> EXIT
$
```

  The output generated by the above commands is shown on the next page.



- You decide to output the same report to a file for printing. To do this, execute the following commands:

```
$ RUN ARSAP$EXE:ARSAP_CAPACITY_REPORT
CAPACITY_REPORT> BARCHART/SINCE=1-JAN-1993-
_CAPACITY_REPORT> /BEFORE=1-JAN-1994-
_CAPACITY_REPORT> /CATEGORIZATION=MONTHS/CPU-
_CAPACITY_REPORT> /HEADING/OUTPUT=YEAR.LIS=-
_CAPACITY_REPORT> "CPU time used by Month for One Year"
CAPACITY_REPORT> EXIT
$ PRINT YEAR.LIS
$
```

An example report generated by the above commands is on the next page.

```
Resource Management & Chargeback                CIMS LAB, Inc.                        Run Date: 14-MAR-2000
CIMS/VMS Version V08.0                                                                          Page 1

                                        CPU Time Used by Month for One Year
                                        From 1-JAN-2000 Thru 31-JAN-2000
                                               For All Job Types

         CPU
Month    Minutes
               +-------------------------------------------------------------------------------------------------------
JAN-2000 20089.006 |GGGG
```

10

Software Package / Image Accounting

Processing OpenVMS Accounting Data 10-2

Producing Image Reports 10-2

Processing OpenVMS Accounting Data

To generate image accounting information

- The following commands generate or add image accounting information to the CIMS Image File that is used for image reporting.

```
$ RUN ARSAP$EXE:ARSAP_VMS_SELECT
VMS_SELECT> IMAGE/ZERO/SINCE=1-FEB-1994/BEFORE=2-FEB-1994
VMS_SELECT> EXIT
$
```

Producing Image Reports

The CIMS IMAGE_REPORT Utility produces image accounting reports from the CIMS Image File generated by the CIMS VMS_SELECT Utility.

This section presents command examples and output for four image reports.

To produce image reports

- This first example creates an image report for all images tracked, for all job types, by CPU minutes by image for a one-day period.

  Execute the following commands to produce this report for the day 1 February 1994 and save this report in a file called IMAGE1.LIS.

```
$ RUN ARSAP$EXE:ARSAP_IMAGE_REPORT
IMAGE_REPORT> BARCHART/SINCE=1-FEB-1994 -
_IMAGE_REPORT> /BEFORE=2-FEB-1994-
_IMAGE_REPORT> /OUTPUT=IMAGE1.LIS
IMAGE_REPORT> EXIT
$ PRINT IMAGE1.LIS
$
```

  The resulting report is shown on the next page.

```
Resource Management & Chargeback                    CIMS Lab, Inc.                    Run Date:  9-MAR-1994
ARSAP/VMS Version V08.0                                                                          Page 1

                                        Image Report For All Images Tracked, For All Job Types
                                                  By CPU Minutes by Image
                                              From  1-FEB-1994 thru  1-FEB-1994
                CPU
Image Name      Minutes
                        +-----------------------------------------------------------------------------------------------+
ACC               0.797 |*                                                                                              |
ASK               0.033 |                                                                                              |
BACKUP           69.646 |*********************************************************************************************|
CDU               0.291 |                                                                                              |
COPY              7.058 |**********                                                                                    |
CREATE            0.016 |                                                                                              |
DELETE            2.509 |***                                                                                           |
DIFF              0.785 |*                                                                                             |
DIRECTORY         3.607 |*****                                                                                         |
DISMOUNT          0.006 |                                                                                              |
EXCHANGE          0.197 |                                                                                              |
FORTRAN           3.105 |****                                                                                          |
FRAGMENT          0.142 |                                                                                              |
GLPS_REPORT      18.805 |***************************                                                                   |
GLPS_SALESFORM    7.263 |***********                                                                                   |
GLPS_SEARCH       1.608 |**                                                                                            |
GLPS_SELECT       0.003 |                                                                                              |
GWPS_MENU         2.949 |****                                                                                          |
INIT              0.017 |                                                                                              |
LIBRARIAN         2.406 |***                                                                                           |
LINK              1.122 |*                                                                                             |
LOGINOUT          1.076 |*                                                                                             |
MAIL              3.224 |****                                                                                          |
MONITOR           0.160 |                                                                                              |
PATCH_IMAGES      0.229 |                                                                                              |
PRTSMB            0.628 |                                                                                              |
QUEMAN            0.124 |                                                                                              |
RENAME            0.197 |                                                                                              |
RUNOFF            1.716 |**                                                                                            |
SAT               0.333 |                                                                                              |
SEARCH            2.354 |***                                                                                           |
SET               0.488 |                                                                                              |
SETP0             0.046 |                                                                                              |
SHOW              1.126 |*                                                                                             |
SORTMERGE         0.012 |                                                                                              |
STARTUP           0.028 |                                                                                              |
SUBMIT            0.184 |                                                                                              |
TPU              12.467 |*******************                                                                           |
TYPE              0.787 |*                                                                                             |
VAXSIM            0.038 |                                                                                              |
VMOUNT            0.025 |                                                                                              |
VMSHELP           0.455 |                                                                                              |
WEEKDAY           0.002 |                                                                                              |
WHO               0.082 |                                                                                              |
WORLD_SYMBOLS     0.023 |                                                                                              |
WPS               1.467 |**                                                                                            |
                        +-----------------------------------------------------------------------------------------------+
                        0                   17                   34                   52                   69

                                C       P       U               M       i       n       u       t       e       s
                                    Total CPU Minutes used for period =    149.636
```

- The next example creates an image report sorted by connect hours, for all images tracked, for all job types, by connect hours by image for the same one day period.

  Execute the following commands to produce this report for the day 1 February 1994 and save this report in a file called IMAGE2.LIS.

```
$ RUN ARSAP$EXE:ARSAP_IMAGE_REPORT
IMAGE_REPORT> BARCHART/SINCE=1-FEB-1994-
_IMAGE_REPORT> /BEFORE=2-FEB-1994-
_IMAGE_REPORT> /OUTPUT=IMAGE2.LIS/CONNECT-
_IMAGE_REPORT> /SORT=STATISTIC
IMAGE_REPORT> EXIT
$ PRINT IMAGE2.LIS
$
```

  The resulting report is shown on the next page.

```
Resource Management & Chargeback                    CIMS Lab, Inc.                    Run Date:  9-MAR-1994
ARSAP/VMS Version V08.0                                                                       Page 1

                    Image Report For All Images Tracked, For All Job Types
                                    By Connect Hours by Image
                                    From  1-FEB-1994 thru  1-FEB-1994

                                 Connect
Image Name                       Hours
                                 +----------+----------+----------+
```

- The third example creates an image report for an image *backup*, for all job types, by CPU minutes by hour for a one-day period.

  Execute the following commands to produce this report for 1 February 1994 and save this report in a file called IMAGE3.LIS.

```
$ RUN ARSAP$EXE:ARSAP_IMAGE_REPORT
IMAGE_REPORT> BARCHART/SINCE=1-FEB-1994-
_IMAGE_REPORT> /BEFORE=2-FEB-1994-
_IMAGE_REPORT> /OUTPUT=IMAGE3.LIS-
_IMAGE_REPORT> /IMAGE=BACKUP-
_IMAGE_REPORT> /CATEGORIZATION=HOURS
IMAGE_REPORT> EXIT
$ PRINT IMAGE3.LIS
$
```

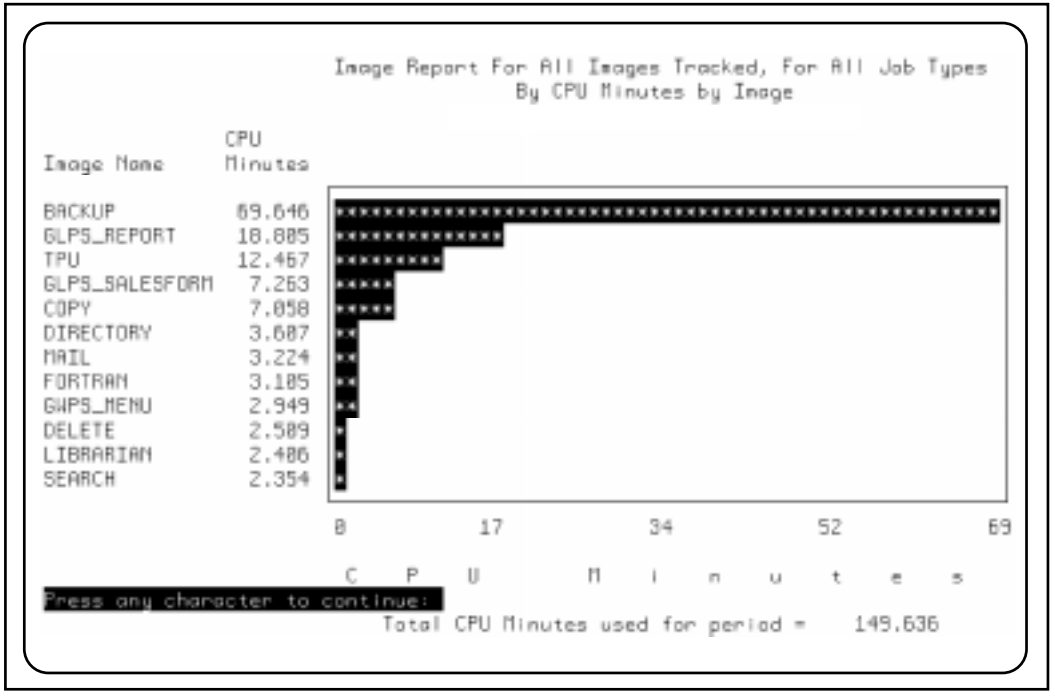
  The resulting report is shown on the next page.

```
Resource Management & Chargeback                    CIMS Lab, Inc.                                  Run Date:  9-MAR-1994
ARSAP/VMS Version V08.0                                                                                          Page 1


                                                Image Report for Image = "BACKUP", For All Job Types
                                                          By CPU Minutes by Hour
                                                     From  1-FEB-1994 thru  1-FEB-1994
                 CPU
Hour            Minutes
                        +-----------------------------------------------------------------------------------------------------+
00:00 - 00:59    0.000  |                                                                                                     |
01:00 - 01:59    0.000  |                                                                                                     |
02:00 - 02:59    0.000  |                                                                                                     |
03:00 - 03:59    0.000  |                                                                                                     |
04:00 - 04:59    0.000  |                                                                                                     |
05:00 - 05:59    0.000  |                                                                                                     |
06:00 - 06:59    0.000  |                                                                                                     |
07:00 - 07:59    0.000  |                                                                                                     |
08:00 - 08:59    0.000  |                                                                                                     |
09:00 - 09:59    9.488  |*************************************************************                                        |
10:00 - 10:59   16.142  |*************************************************************************************************|
11:00 - 11:59    8.057  |*****************************************************                                                |
12:00 - 12:59   15.037  |*************************************************************************************************   |
13:00 - 13:59   10.354  |*************************************************************************                           |
14:00 - 14:59    0.000  |                                                                                                     |
15:00 - 15:59    2.314  |***************                                                                                      |
16:00 - 16:59    2.144  |**************                                                                                       |
17:00 - 17:59    6.111  |****************************************                                                             |
18:00 - 18:59    0.000  |                                                                                                     |
19:00 - 19:59    0.000  |                                                                                                     |
20:00 - 20:59    0.000  |                                                                                                     |
21:00 - 21:59    0.000  |                                                                                                     |
22:00 - 22:59    0.000  |                                                                                                     |
23:00 - 23:59    0.000  |                                                                                                     |
                        +-----------------------------------------------------------------------------------------------------+
                        0                         4                         8                        12                        16
                                C         P         U                 M         i         n         u         t         e         s


                                                Total CPU Minutes used for period =     69.646
```

- Example 4 displays an image report on your CRT for all images tracked on 1 February 1994, sorted by CPU time.

```
$ RUN ARSAP$EXE:ARSAP_IMAGE_REPORT
IMAGE_REPORT> SET MODE SCREEN
IMAGE_REPORT> BARCHART/SINCE=1-FEB-1994-
_IMAGE_REPORT> /BEFORE=2-FEB-1994-
_IMAGE_REPORT> /CPU/SORT=STATISTIC
IMAGE_REPORT> EXIT
$
```

The first screen of the resulting report is shown below.



11

Session Accounting

Processing OpenVMS Accounting Data 11-2

Producing Session Level Audit Reports 11-3

Processing OpenVMS Accounting Data

The CIMS AUDIT Utility produces Session Level reports from the CIMS Audit File generated by the CIMS VMS_SELECT Utility.

To create the CIMS Audit File

- The following commands create the CIMS Audit File used by the CIMS AUDIT Utility. It processes the data in the OpenVMS Accounting File for the month of March, 1994. It saves auditing information for all users and projects.

```
$ RUN ARSAP$EXE:ARSAP_SELECT
SELECT> AUDIT/SINCE=1-MAR-1994/BEFORE=1-APR-1994 -
_SELECT> 1994-03-ACCOUNTNG.DAT
SELECT> EXIT
$
```

To process the Open VMS Accounting File

- The following commands process the OpenVMS Accounting File for a specific project. The month being processed is March, 1994.

```
$ RUN ARSAP$EXE:ARSAP_VMS_SELECT
VMS_SELECT> AUDIT/SINCE=1-MAR-1994/BEFORE=1-APR-1994-
_VMS_SELECT> /PROJECT=SALES -
_VMS_SELECT> 1994-03-ACCOUNTNG.DAT
VMS_SELECT> EXIT
$
```

Producing Session Level Audit Reports

This section presents command examples and their output for two Session Level reports.

To produce session level audit reports

- A user, BDUNN, has complained that he never logged in during February 1994, yet he still had interactive, batch, and print charges on his timesharing invoice. You now must *prove* to him that the invoice is correct. To verify his charges, execute the following commands:

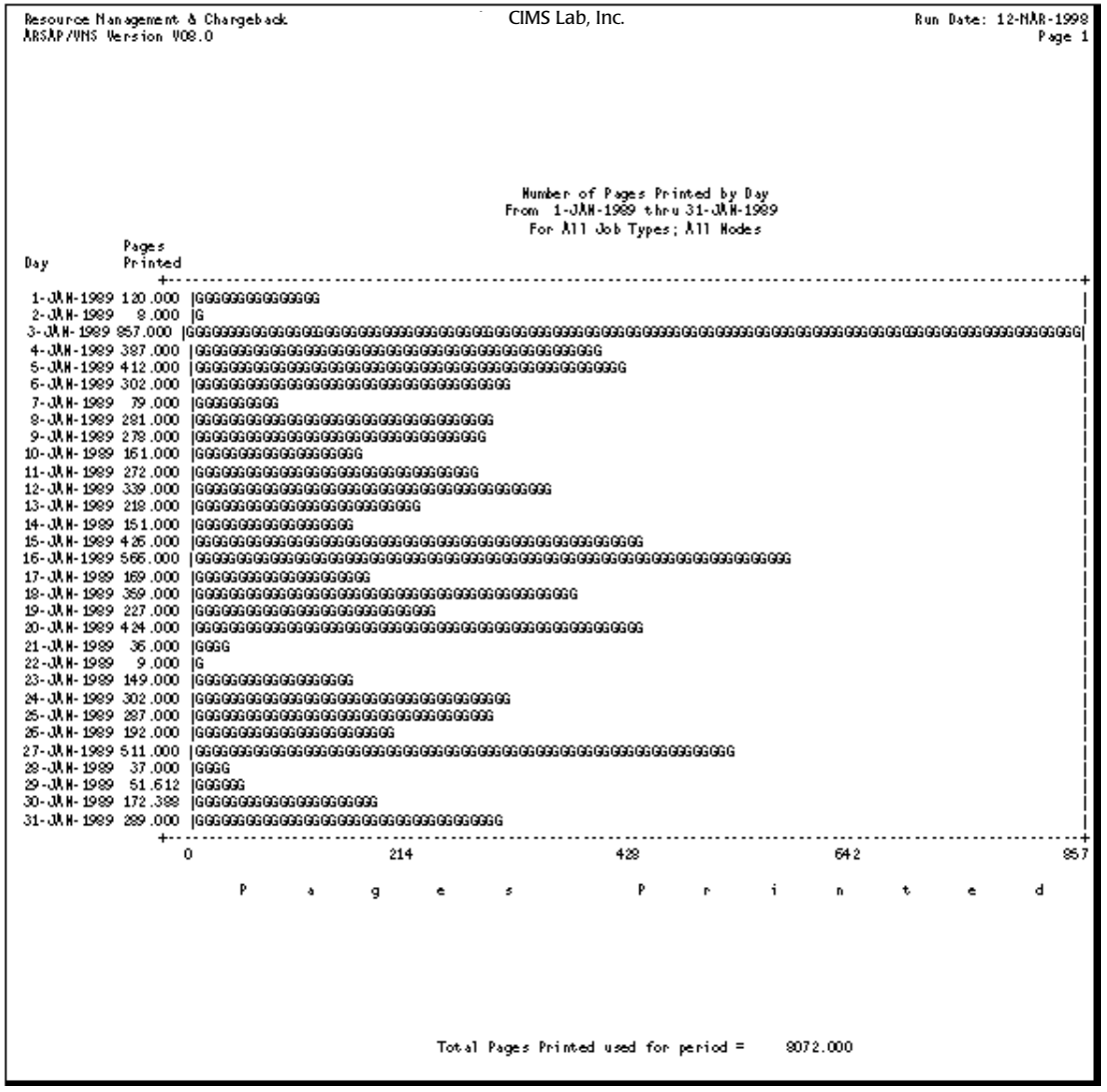
```
$ RUN ARSAP$EXE:ARSAP_VMS_SELECT
VMS_SELECT> AUDIT/SINCE=1-FEB-1994/BEFORE=1-MAR-1994 -
_VMS_SELECT> /USER=BDUNN 1994-02-ACCOUNTNG.DAT
VMS_SELECT> EXIT
$ RUN ARSAP$EXE:ARSAP_AUDIT
AUDIT> REPORT/FULL/USER/OUTPUT=ARSAP_AUDIT.LIS BDUNN-
AUDIT> EXIT
$ PRINT ARSAP_AUDIT.LIS
$
```

  The output from AUDIT, shown on the next page, shows that he did indeed have charges from work he did on February 9, 1994.

```
Resource Management & Chargeback                XYZ Company (Dallas Office)          Run Date: 13-MAR-1994
ARSAP/VMS Version V08.00                              User Charges Audit Trail                     Page 1

User = "BDUNN" Type = Batch

Start time           Stop time            Queue Name  ChgConnect Charge Total
-------------------- -------------------- ----------  ---------- ----- ------
 9-FEB-1994 00:00:00.00  9-FEB-1994 00:21:58.99 SYSSBATCH    0.366  4.26   4.26
 9-FEB-1994 08:54:57.34  9-FEB-1994 08:55:37.14 SYSSBATCH    0.011  4.04   4.04
 9-FEB-1994 15:53:04.37  9-FEB-1994 17:51:01.49 SYSSBATCH    1.966  227.65 227.65

User = "BDUNN" Type = Interactive

Start time           Stop time            Shift ChgConnect Charge Total
-------------------- -------------------- ----- ---------- ------ ------
 9-FEB-1994 08:49:01.31  9-FEB-1994 17:24:44.95     1     33.650 117.91
                                                3      0.732   4.10 122.01
 9-FEB-1994 09:23:02.08  9-FEB-1994 13:36:13.73     1     16.880 220.08 220.08

User = "BDUNN" Type = Print

Start time           Stop time            Queue Name  Stock Name Pages Charge
-------------------- -------------------- ----------  ---------- ----- ------
 9-FEB-1994 09:17:36.22  9-FEB-1994 09:22:27.83 SYSSPRINT DEFAULT     20   1.60
 9-FEB-1994 11:25:19.17  9-FEB-1994 11:25:57.16 SYSSPRINT DEFAULT      3   0.24
 9-FEB-1994 13:13:33.82  9-FEB-1994 13:14:21.39 SYSSPRINT DEFAULT      5   0.40
 9-FEB-1994 14:00:33.34  9-FEB-1994 14:01:23.69 SYSSPRINT DEFAULT      5   0.40
 9-FEB-1994 14:57:37.05  9-FEB-1994 14:58:29.66 SYSSPRINT DEFAULT      5   0.40
 9-FEB-1994 15:34:01.42  9-FEB-1994 15:34:54.11 SYSSPRINT DEFAULT      5   0.40
```

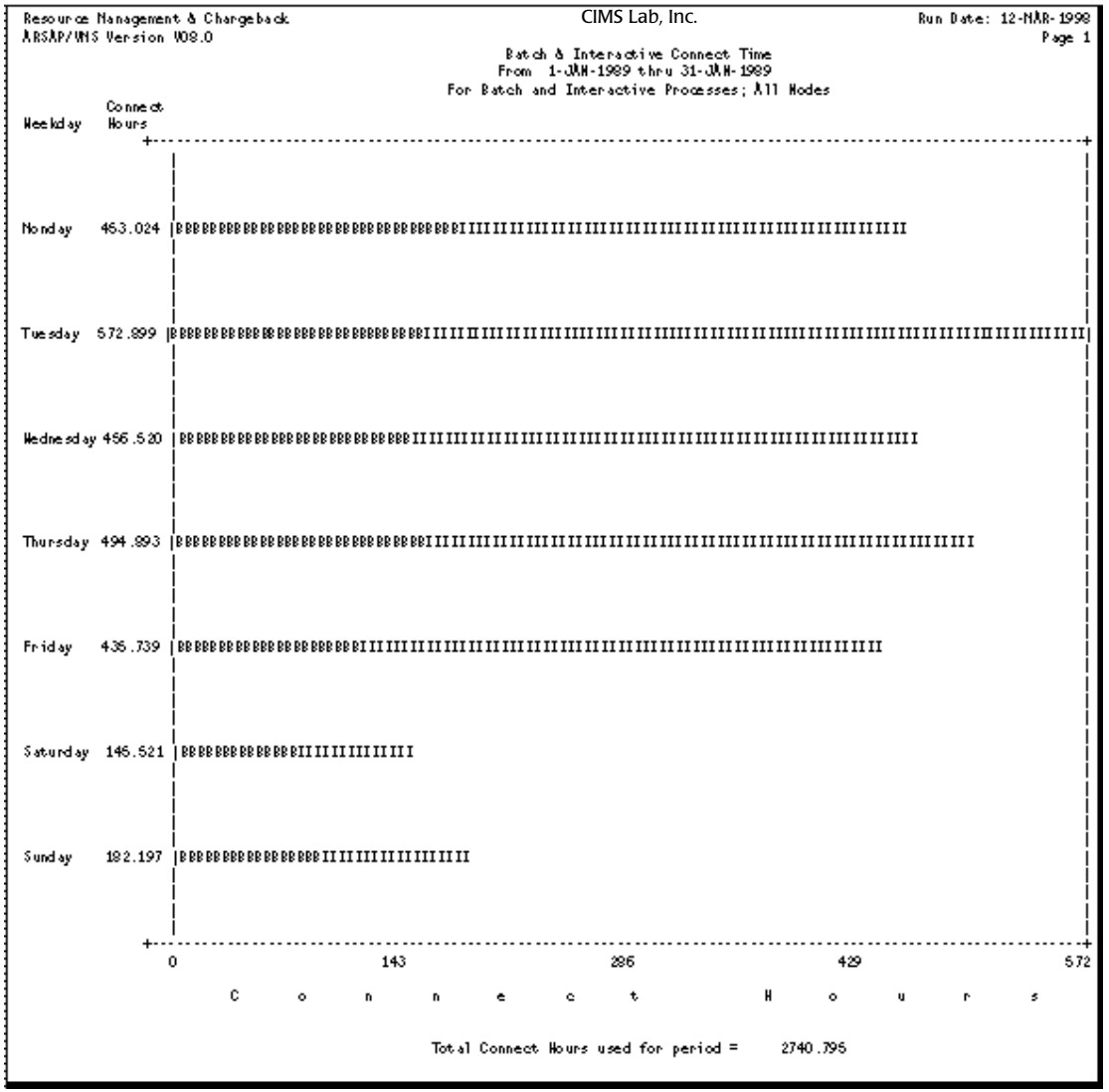
- This next example shows the output of each of the job types supported by `AUDIT`:
  - Plot Resource tracking by frequency
  - Resource tracking by statistic
  - Interactive Software package Batch (where the batch processing method is `BOTH`)
  - Print (with the Forms Tracking Option enabled)

  The output is shown on the next three pages.



```
Resource Management & Chargeback                CIMS Lab, Inc.                  Run Date: 12-MAR-1998
ARSAP/VMS Version V08.0                                                         Page 1

                                  Number of Pages Printed by Day
                                 From  1-JAN-1989 thru 31-JAN-1989
                                   For All Job Types; All Nodes

                 Pages
Day              Printed
                    +-------------------------------------------------------------------------------------------------+
 1-JAN-1989  120.000 |GGGGGGGGGGGGGG                                                                                   |
 2-JAN-1989    8.000 |G                                                                                                |
 3-JAN-1989  857.000 |GGGGGGGGGGGGG
```

```
Resource Management & Chargeback                CIMS Lab, Inc.                  Run Date: 12-MAR-1998
ARSAP/VMS Version V08.0                                                         Page 1

                                                Percent CPU Use Per Hour on One Day
                                                From  1-JAN-1989 thru  1-JAN-1989
                                                  For All Job Types; All Nodes

                CPU
Hour            Minutes Percent
                        +----------------------------------------------------------------------------------------------------------------+
00:00 - 00:59   9.359    15.6 |GGGG
```


Resource Management & Chargeback
ARSAP/VMS Version V08.0
CIMS Lab, Inc.
Run Date: 12-MAR-1998
Page 1
Batch & Interactive Connect Time
From 1-JAN-1989 thru 31-JAN-1989
For Batch and Interactive Processes; All Nodes
Weekday
Connect Hours
Monday 463.024
Tuesday 572.899
Wednesday 456.520
Thursday 494.893
Friday 436.739
Saturday 146.521
Sunday 182.197
0
143
286
429
572
Connect Hours
Total Connect Hours used for period = 2740.795

12

Object Accounting

Implementation 12-2

Loading the CIMS Resource Mapping File 12-2

Resource Tracking Routines 12-3

Chargeback and Resource Tracking 12-6

Implementation

When you decide to track a particular resource, you must take several steps to implement this feature in CIMS.

- Assign a codename to each of the resources to be tracked. A codename can be up to 12 alphanumeric characters.
- Load the codename of the resource into the CIMS Resource Mapping File.
- Insert calls to the CIMS Resource Tracking routines into the source code handling the resource.
- Re-compile and re-link as necessary. For more information on this step refer to Chapter 2 of the *CIMS Run-Time Library Manual*.
- If you plan to implement Chargeback, add the appropriate rates for the resource to the CIMS Rates File.

Loading the CIMS Resource Mapping File

You must assign a codename to each user-defined resource, and you must enter this codename into the CIMS Resource Mapping File. You can either add the codename manually, using the CIMS SETUP Utility; or the CIMS VMS_SELECT Utility can add it for you when you process the OpenVMS accounting data. You don't need to enter a description with the codename, but this field can be very useful for invoicing and keeping track of the resource the codename represents.

To implement object accounting

- The following example enters the codename CCORESP for a user defined resource described as a customer correspondence into the CIMS Resource Mapping File.

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> ADD /RESOURCE CCORESP/DESCRIPTION=-
_SETUP> "Customer Correspondence"
%SETUP-I-ADDED, resource code successfully added
SETUP> EXIT
$
```

- The next example uses the CIMS RESOURCE_MAP Utility to output all the codenames and their descriptions to a file named CODENAMES.LIS.

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP> REPORT */OUTPUT=CODENAMES.LIS
SETUP> EXIT
$
```

Resource Tracking Routines

The next step in implementing this feature is to insert the CIMS Resource Tracking routines in the appropriate location of the resource's source code. Implementation of the CIMS resource tracking routines is the key to the successful use of CIMS's Object Accounting feature. These routines are divided into two groups, frequency tracking routines and statistical tracking routines.

- ARSAP$INIT_RT_BY_FREQUENCY
- ARSAP$INC_RT_BY_FREQUENCY
- ARSAP$CLOSE_RT_BY_FREQUENCY
- ARSAP$INIT_RT_BY_STATISTICS
- ARSAP$START_RT_BY_STATISTICS
- ARSAP$STOP_RT_BY_STATISTICS
- ARSAP$CLOSE_RT_BY_STATISTICS

You can find documentation for these routines in the *CIMS Run-Time Library Manual*.

When you have inserted the routines into the source code of the resource and have completed all necessary compiling and linking, accounting records are generated and stored in the OpenVMS Accounting File for later processing as directed by the resource tracking routines.

For instance, the example environment previously mentioned could be entered from a program executed within the secretary's LOGIN.COM. Inserting calls to the CIMS Resource Tracking routines at the appropriate locations in this program generate the accounting records needed to track the desired items in the environment.

To use resource tracking routines

- Suppose you want to track the number of times one of the secretaries in the example uses the menu option for customer correspondence. In addition you want to know how much time is spent working in this area. The algorithm for the program that generates the menu and processes selections could have a form similar to the following:

  ```
  begin procedure
  loop
     generate menu
     evaluate selection
     process selection
     goto loop or endloop
  endloop
  ```

To implement tracking of this resource, we assign the codename CCORESP. This codename is then entered into the CIMS Resource Mapping File with the appropriate description. Now, insert the CIMS Resource Tracking routines into the menu program as follows:

```
            INCLUDE 'ARSAP$LIBRARY:ARSAPDEF
*               (ARSAP$ARSAPRTL_EXTERNAL_ERRORS)'
            INCLUDE 'ARSAP$LIBRARY:GEJACDEF
*               (GEJAC$GEJACRTL_EXTERNAL_ERRORS)'
begin procedure
```

```
loop
        ISTATUS=ARSAP$INIT_RT_BY_STATISTICS('CCORESP')
        IF(.NOT.ISTATUS)CALL LIB$STOP(%VAL(ISTATUS))
    generate menu
    evaluate selection
        if{selection = customer correspondence}
        ISTATUS=ARSAP$START_RT_BY_STATISTICS('CCORESP')
        IF(.NOT.ISTATUS)CALL LIB$STOP(%VAL(ISTATUS))
    process selection
        ISTATUS=ARSAP$STOP_RT_BY_STATISTICS('CCORESP')
        IF(.NOT.ISTATUS)CALL LIB$STOP(%VAL(ISTATUS))
    goto loop or endloop
endloop
        ISTATUS=ARSAP$CLOSE_RT_BY_STATISTICS('CCORESP')
        IF(.NOT.ISTATUS)CALL LIB$STOP(%VAL(ISTATUS))
```

To link the library to your program

- Add the following library references in the `LINK` command.

```
ARSAP$RTL/SHAREABLE
GEJAC$RTL/SHAREABLE
```

The previous example, implementing the `CIMS` resource tracking routines in an imaginary environment, should provide an indication of the care needed when you place the resource tracking routines within the code of the resource. An understanding of the algorithm that generates the resource is essential to placing these calls properly.

Chargeback and Resource Tracking

As with the other accounting features in CIMS, you implement chargeback by entering the appropriate rates into the necessary rates tables. You do this using the CIMS RATES Utility. Note that a charge for using a particular resource can vary from one rates table to another.

To implement chargeback

- The following example enters the resource represented by the codename CCORESP into the rates table ALPHA_RATES with a charge of .50 for connect time.

```
$ RUN ARSAP$EXE:ARSAP_RATES
RATES> ADD ALPHA_RATES /RESOURCE-
_RATES> /CODE=CCORESP
%RATES-I-ADDED, 1 record successfully added
RATES> MODIFY ALPHA_RATES/RESOURCE-
_RATES> /CODE=CCORESP/CONNECT=.50
%RATES-S-MODIFIED, 1 record successfully modified
RATES> EXIT
$
```

To set default rates

- A default resource rate in each rates tables is used to determine the charges for a particular resource if there is not a rate specified for that resource. This record is also used as a template for new resource records as they are added to a rates table. The following example sets 1.00 as the rate for CPU time of the default resource record in the DEFAULT_RATES table.

```
$ RUN ARSAP$EXE:ARSAP_RATES
RATES> DEFAULT/RESOURCE/CODE=%/CPU=1.00
%RATES-S-MODIFIED, 1 record successfully modified
RATES> EXIT
$
```

13

All-in-1 Accounting

Processing All-in-1 Data 13-2

Producing All-in-1 Reports 13-3

Processing All-in-1 Data

CIMS implements the data processing portion of All-in-1 Accounting using the CIMS LOGGER, VMS_MERGE, and VMS_SELECT utilities.

CIMS implements the data reporting portion of All-in-1 Accounting using the CIMS INVOICES, MYCOST, and RESOURCE_REPORT utilities.

These utilities access two files:

- The CIMS Parameter File to determine whether All-in-1 Accounting is enabled
- The CIMS Authorization File to determine whether All-in-1 Accounting is enabled for a particular user account and to retrieve any individual All-in-1 Accounting options

When you plan to implement Logical Grouping, make the necessary modifications within ARSAP_SETUP.

When you plan to implement Chargeback, add the appropriate rates for the software functions to the CIMS Rates File.

Producing All-in-1 Reports

The CIMS RESOURCE_REPORT Utility produces All-in-1 accounting reports from the data file created by the CIMS VMS_SELECT Utility.

This section provides examples for producing an All-in-1 usage report by users.

To produce an ALL-in-1 usage report

- Execute the following commands to produce a report on usage of All-in-1 functions by user.

```
$ RUN ARSAP$EXE:ARSAP_RESOURCE_REPORT
RESOURCE_REPORT> REPORT/A1/GROUP=USERNAME/REVERSE -
__RESOURCE_REPORT> /OUT=A1_WP_EDIT.LIS
RESOURCE_REPORT> EXIT
$
```

  The resulting report is shown on the next page.

  The report on the second page displays All-in-1 utilization over the period of a year, shown by logical groups.

```
Resource Management & Chargeback                  CIMS LAB, Inc.                        Run Date: 14-MAR-2000
CIMS/VMS Version V08.0                                                                                Page 1
                                                All-in-1 Utilization
                                          From 1-MAY-2000 Thru 31-MAY-2000
                                                    All Shifts

Group = "WP Edit DOC"
```

All-in-1 Meter Group	Executions	Connect Hours	CPU Minutes	BIO I/O Requests (1000's)	DIO I/O Requests (1000's)	Page Faults (1000's)
BCLAYTON	1	0.03	0.08	0.570	0.24	1.381
BJONES	6	0.02	0.05	1.395	0.19	0.684
CMARTIN	1	0.40	0.18	10.657	0.14	0.643
CTORMET	1	0.09	0.06	0.394	0.23	2.428
LIMELT	2	0.60	0.09	8.863	0.11	0.768
THOMAS	1	0.00	0.01	0.034	0.04	0.520
TIMPSON	2	0.41	0.11	9.763	0.09	0.030
SYSTEM	1	1.71	0.13	9.024	0.07	0.650
TSMITH	5	2.22	0.08	4.286	0.13	1.587
ZTEBBER	2	6.34	1.22	11.966	0.22	4.170
Total	22	11.82	2.00	56.952	1.47	12.861

```
Resource Management & Chargeback                CIMS LAB, Inc.                          Run Date: 14-MAR-2000
CIMS/VMS Version V08.0                                                                                Page 1
                                                All-in-1 Utilization
                                          From 1-MAY-2000 Thru 31-MAY-2000
                                                    All Shifts
```

All-in-1 Meter Group	Executions	Connect Hours	CPU Minutes	BIO I/O Requests (1000's)	DIO I/O Requests (1000's)	Page Faults (1000's)
M_GROUP	72	4.44	0.69	31.099	2.32	15.118
SYS_GROUP	27	7.36	0.20	1.264	1.06	2.286
TM_GROUP	49	83.36	6.94	219.073	13.77	130.944
TMS_GROUP	14	0.14	0.04	0.144	0.04	0.378
ZMS_GROUP	56	17.12	4.19	179.885	4.87	22.693
Total	218	112.43	12.07	431.465	22.06	172.419

14

CIMS Customizations

Writing Reports in FORTRAN **14-2**

Writing Your Own Memory Demand Algorithm **14-2**

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). The *CIMS Run Time Library Manual* documents a number of routines that make it easier to manipulate the data to form the desired report.

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.

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.

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. Suppose you want the memory utilization statistic to reflect page faults. Follow the steps outlined below to change this routine in the CIMS RTL.

To access the routine in the text library

- Use the OpenVMS Librarian (the LIBRARY command). For example, you can issue the following command to extract the module from the library.

```
$ LIBRARY/EXTRACT=ARSAP$CALCULATE_MEMORY-
_$ _DEMAND ARSAPRTL.TLB/OUTPUT=-
_$ ARSAP$CALCULATE_MEMORY_DEMAND.FOR
$
```

After you extract this module from the RTL library, you should read the comments in the beginning of the module that explain how to change the routine.

If you decide to add your own memory demand algorithm to the ARSAP$CALCULATE_MEMORY_DEMAND module, follow these general guidelines:

- Do not disturb the six algorithms in the source code module provided by the CIMS Lab. Instead, start your first custom memory demand algorithm at 7.
- Follow the conventions used in the six algorithms provided by the CIMS Lab.
- To enable the CIMS utilities that call this routine to use your new algorithm, you must change the Memory Demand Algorithm number in the CIMS Parameter File. Use the CIMS SETUP Utility to do this.
- After the module has been successfully modified and compiled, insert it into the ARSAPRTL.OLB library module in the CIMS library directory.
- Re-link the CIMS LOGGER, VMS_SELECT, and MYCOST utilities. Copy the new executables to the CIMS executable directory, then stop and restart CIMS.

Any time you install a CIMS distribution, you *must*:

1. Compile the source module (with the new algorithm)
2. Put the object module in the ARSAPRTL.OLB library
3. Rebuild the CIMS Run-Time Library executable
4. Re-link the three utilities mentioned above
5. Stop and restart CIMS

15

Accounting Operational Hints

Saving the Current Reporting Period Data 15-2

Preparing for the Next Reporting Period 15-3

Avoiding Common Problems 15-5

Saving the Current Reporting Period Data

You should save the CIMS data and parameter files in case you ever need to regenerate these reports. If you do not save the CIMS parameter files and later need to generate reports for a previous period, the CIMS parameter files might have changed.

This will make it difficult to reproduce the exact reports you are generating now. While you can always regenerate the data files, doing so would probably take considerable effort on your part as well as computer resources.

To illustrate this, the following example saves the current CIMS data and parameter files in a directory different from the default ARSAP$DATA directory. You must tailor this process to fit the needs of your site. The example below processes November 1993 accounting data, and saves it on disk DRB0.

To save CIMS data and parameter files

1. Create an CIMS historical file save area.
2. Save the current CIMS data and parameter files.
3. Save the OpenVMS Authorization File:

```
$ CREATE/DIR DRB0:[ARSAP_HISTORY.NOV93]
$ BACKUP/IGNORE=INTERLOCK -
_$ ARSAP$DATA:*.* DRB0:[ARSAP_HISTORY.NOV93
$ BACKUP/IGNORE=INTERLOCK SYS$SYSTEM:SYSUAF.DAT-
_$ DRB0:[ARSAP_HISTORY.NOV93]
$
```

Preparing for the Next Reporting Period

After you generate reports for the reporting period just processed, you need to prepare for the next reporting period.

If you enabled the CIMS Supplemental Charges Option, you need to *close out* the previous reporting period's File and *post* the current computer resource utilization charges to the next reporting period to maintain a correct balance forward amount. The following commands perform these functions.

To prepare for the next reporting period

1. Close out the previous period's CIMS Supplemental Charges File and create a new one for the current reporting period.

```
$ RUN ARSAP$EXE:ARSAP_SUPPLEMENTAL_CHARGES
SUPPLEMENTAL_CHARGES> NEW_FILE
SUPPLEMENTAL_CHARGES> EXIT
$
```

2. Post the previous period's computer utilization charges to the new CIMS Supplemental Charges File to maintain a current balance of posted charges, adjustments, and payments.

```
$ RUN ARSAP$EXE:ARSAP_SUPPLEMENTAL_CHARGES
SUPPLEMENTAL_CHARGES> POST/USERNAME=*-
_SUPPLEMENTAL_CHARGES> /DESC="T/S Charges for Nov 1993"
SUPPLEMENTAL_CHARGES> EXIT
$
```

3. Post any recurring charges that may exist (such as monthly terminal rentals) to the new CIMS Supplemental Charges File.

```
$ RUN ARSAP$EXE:ARSAP_RECURRING_CHARGES
RECURRING_CHARGES> POST
RECURRING_CHARGES> EXIT
$
```

Since you can either regenerate the merged CIMS Statistics File or retrieve it from your historical save area, you can delete it from the ARSAP$DATA directory to reclaim disk space.

```
$ DELETE ARSAP$DATA:ARSAP_STATISTICS.DAT;*
```

If you have Real-Time Accounting enabled, you need to zero the intermediate CIMS Statistics File, since it contains accounting data from the previous reporting period. It should contain only accounting data from the current (new) accounting period if you want to enforce correct budget limits or proper display of accounting data.

Also, since the intermediate file is rarely zeroed at exactly the beginning of the current reporting period, after zeroing it, you need to load the file with the accounting data from the first of the accounting period to now.

To set up for the current accounting period

1. Find a quiet time on your system (a time of little or no user activity) and turn off CIMS as follows:

```
$ SET DEFAULT ARSAP$COM
$ @STOP_ARSAP
$
```

2. Clear out the previous reporting period and perform a *period-to-date catchup* using the CIMS VMS_SELECT Utility. For example, suppose your new reporting period is August 1994; the commands to do this follow:

```
$ ASSIGN SYS$COMMON[ARSAP.DATA] ARSAP$DATA
$ ASSIGN SYS$COMMON[ARSAP.EXE] ARSAP$EXE
$ RUN ARSAP$EXE:ARSAP_VMS_SELECT
VMS_SELECT> SELECT/SINCE=1-AUG-1994-
_VMS_SELECT> /BEFORE=1-SEP-1994/ZERO
VMS_SELECT> EXIT
$
```

3. Now all you need to do is restart CIMS so that Real-Time Accounting keeps the intermediate CIMS Statistics File up-to-date as users log off the system and restarts disk data collection. The commands to do this follow:

```
$ DEASSIGN ARSAP$DATA
$ DEASSIGN ARSAP$EXE
$ @SYS$COMMON:[ARSAP.COM]START_ARSAP
$
```

Avoiding Common Problems

You can do a number of things to make your life easier and prevent, or at least minimize, loss of accounting data. Some suggestions on how to avoid some problems other users have encountered follow.

To prevent data loss

1. Generate a new accounting file every day. We have had our accounting file corrupted and also have had customers call us with corrupted accounting files. You will know that your accounting file is corrupted when `VMS_SELECT` and the `OpenVMS ACCOUNTING` Utility cannot process it. We are not sure what causes this, but it happens (even in environments where `CIMS` is not installed).

   Unfortunately, if you are billing users based on that data, this can create problems. To minimize the effect of such a problem, create a new accounting file every day. At the end of your reporting period, after you have verified that all of the accounting files are valid, you can keep them as individual files or concatenate them as if you had not created a new accounting file every day.

   To create an accounting file automatically every day, you can tailor the `GEJAC_NIGHTLY.COM` procedure in the `CIMS` Examples directory. This procedure creates a new `OpenVMS` Accounting File every night at midnight.

2. Create a single accounting file for each reporting period.

   After processing the accounting data (which also verifies that the accounting files are not corrupt), at the CIMS Lab we concatenate the accounting files into a single accounting file that contains accounting data for the period just processed.

   To do this, you can use the `APPEND_ACCOUNTING_FILES.COM` command procedure that is included in the `CIMS` Examples directory (`ARSAP$EXAMPLES`) as part of your `CIMS` distribution.

If you have been creating accounting files on a daily basis with the procedure outlined earlier, you can easily determine what versions of the accounting files to put into one file for a particular period.

3 Perform a directory operation on the accounting files to get the highest and lowest file version number for the reporting period for which you are trying to generate a single accounting file.

First, set your default directory to the SYS$MANAGER directory. Then execute the APPEND_ACCOUNTING_FILES command procedure as follows.

```
$ @ARSAP$EXAMPLES:APPEND_ACCOUNTING_FILES
```

You are prompted for the highest and lowest accounting file version numbers. Using those file version numbers, the command procedure creates a single accounting file.

4 Archive your previous reporting period accounting data. Archiving the data and then deleting the files saves disk space and speeds up the CIMS VMS_SELECT Utility.

VMS_SELECT processes all accounting files it finds unless you specify a particular accounting file. This means that it potentially scans accounting files that contain data outside your reporting period, which means more I/O and CPU utilization by VMS_SELECT.

16

CIMS Performance Considerations

This appendix contains a list of hints for improving the performance of the CIMS utilities on your system.

The CIMS Statistics File 16-2

The CIMS Storage File 16-2

The CIMS Activity File 16-3

The CIMS Authorization File 16-3

Enabling Setup Options 16-4

CIMS Selective Image Accounting 16-4

CIMS and RMS Parameters 16-4

RMS Multibuffer Count 16-5

VMS_MERGE Performance Improvements 16-5

Using the /METHOD Qualifier 16-6

Converting CIMS Authorization File During Installation 16-10

Optimizing the Files 16-10

The CIMS Statistics File

If you use the /ZERO qualifier with the SELECT command when running the CIMS VMS_SELECT Utility to process OpenVMS accounting files, you can delete the intermediate CIMS Statistics File from your ARSAP$DATA directory before you run VMS_SELECT.

Note • *Do not delete* the intermediate file unless you use the /ZERO qualifier.

If you do not find the intermediate CIMS Statistics File in the ARSAP$DATA directory when the SELECT command executes, the VMS_SELECT Utility creates it.

The difference between creating a new Statistics file and using an old one is that the old one probably contains records for users, projects, or both that did not access the system during the time period you are processing. These extra records will slow down the processing of the accounting data.

The CIMS Storage File

The CIMS Storage File is an OpenVMS relative file that contains disk storage information for every day that the CIMS Storage Sampling Command Procedure runs.

When it runs, it simply adds new disk information to the end of the existing file; no data is ever deleted. Thus, if you do nothing to the file, it grows every day. As this file gets bigger, it slows down the performance of the CIMS VMS_MERGE Utility.

Improve the performance of the CIMS VMS_MERGE Utility by ensuring that the CIMS Storage File that VMS_MERGE processes contains only the disk usage information for the current accounting period.

To do this, after you have processed the accounting data for the current accounting period, rename the CIMS Storage File or move it from the CIMS Data directory. When the Storage Sampling Command procedure runs the next time, it will see that there is no CIMS Storage File in the CIMS Data directory, and it will create a new one.

The CIMS Activity File

Records are written to the CIMS Activity File whenever someone logs in or switches to a project. You can create a new CIMS Activity File by renaming or deleting the current one and then logging in on that node. The CIMS LOGIN Utility creates the CIMS Activity File whenever it cannot find it.

The CIMS Activity File can grow to a large size. The CIMS Storage Sampling Command procedure keeps the file from growing forever by the use of the ACTIVITY Utility with the PURGE command. The largest number of records ever in the file determines the amount of disk space that the CIMS Activity File occupies. The CIMS ACTIVITY Utility deletes old records, but it also provides a way to reclaim unused disk space within the file using the COMPRESS command.

The CIMS Authorization File

As users and projects come and go on a computer system, the CIMS Authorization File has more and more deleted records in it. Because these deleted records consume some amount of disk space, it is a good idea to compress the file periodically.

Use the COMPRESS command in the CIMS AUTHORIZE Utility to do this. This command creates a new CIMS Authorization File and copies all the non-deleted records to the new file. If you have a high turnover of users, projects, or both, the new file should be smaller than the old file.

Enabling Setup Options

The CIMS SETUP Utility lets you enable a number of options, such as Project Accounting, Proprietary Software Chargeback, and Forms Tracking. As you enable more and more of these options, the time it takes the CIMS VMS_SELECT Utility to process the OpenVMS Accounting files increases.

Because of this, you should disable the options in the CIMS SETUP Utility that are not needed. These options can increase the processing time required in the CIMS VMS_SELECT Utility:

- Proprietary Software Chargeback
- Forms Tracking
- User/Project Combination

CIMS Selective Image Accounting

If you must enable OpenVMS Image Accounting, use the CIMS Selective Image Accounting feature to limit the number of image records that get stored in the OpenVMS Accounting File.

CIMS and RMS Parameters

CIMS provides a way to tune the RMS Multiblock count and Multibuffer count values for selected CIMS files. Using these values helps improve I/O performance by reducing the amount of direct I/Os. For example, when a utility reads a particular record in the file and the record is already in a buffer in memory, RMS does not need to perform an I/O to the disk. Tuning RMS parameters will help reduce elapsed time because you spend less time waiting for disk I/O. The best values for your system varies depending on the size of the files processed, computer hardware, and OpenVMS parameters.

RMS Multibuffer Count

Under OpenVMS V5.4, the maximum value for the RMS Multibuffer count has been increased from 127 to 255. The CIMS utilities have been updated to take advantage of the increased multibuffer count.

You can now specify a value up to 255 for all files accessed by CIMS when you are running OpenVMS V5.4 or higher. If you are using an OpenVMS version prior to V5.4, the maximum of 127 still exists.

VMS_MERGE Performance Improvements

The CIMS software development team has been working hard on enhancing CIMS performance. Although this effort has been concentrated on a few utilities, all CIMS utilities have benefited from these improvements.

The two utilities we concentrated on are VMS_SELECT and VMS_MERGE. To learn about some of the changes we made in these utilities, you can run the utility and use the HELP command to display help text on improving performance. For example, in VMS_SELECT, you can do this:

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

where *command* is one of these: AUDIT, CAPACITY, IMAGE, SELECT, or TERMINAL. Likewise, you can do this in VMS_MERGE:

```
$ RUN ARSAP$EXE:ARSAP_VMS_MERGE
VMS_MERGE> HELP  VMS_MERGE IMPROVING_PERFORMANCE
```

This section explains our latest efforts at improving the performance of the CIMS VMS_MERGE Utility. This work led to adding support for showing print statistics by node in a cluster.

The improvements in VMS_MERGE have different effects in different situations. You can realize the greatest improvements in VMS_MERGE at sites that have at least several of the following characteristics:

- Cluster Support is enabled.
- Project Accounting is enabled.
- The merged CIMS Statistics File contains a substantial number of print records.
- The CIMS Storage File either:
  - Is large (over 25,000 blocks)
  - Contains a substantial number of samples (over a year's worth)
  - Contains a lot of records in each sample (that is, you are either sampling a lot of disks or have a lot of unique UICs on each disk)
- A large number of records are in your merged CIMS Statistics File.
- A large number of records are in your CIMS and OpenVMS Authorization files.

Note, however, that all sites should benefit from these improvements. These next sections talk about the things you can do to help improve the performance of VMS_MERGE at your site. These suggestions apply to all sites, regardless of whether you have Cluster support enabled.

Using the /METHOD Qualifier

The /METHOD qualifier tells VMS_MERGE the optimum way to access certain files.

This qualifier specifies the method for processing the OpenVMS storage data. The two methods are STEP and NORMAL. The default method, if not specified, is NORMAL.

You specify the method on a file-by-file basis. The method you choose for a particular file can affect the performance of the VMS_MERGE phase that processes the OpenVMS storage data (phase 5). You can specify the method on the following files:

- ARSAP_AUTHORIZATION
- ARSAP_STORAGE_MAPPING
- PROJ_MERGED_ARSAP_STATISTICS
- USER_MERGED_ARSAP_STATISTICS
- OpenVMS_AUTHORIZATION

The method to choose for a particular file depends on several factors including the size of the file, the number of users and projects, and whether you have enabled CIMS Cluster support.

The next sections explain the theory behind these methods and how you can determine the best method for your site.

Theory of Methods

While processing the OpenVMS storage data, VMS_MERGE can access the CIMS Authorization File, OpenVMS Authorization File, merged CIMS Statistics File, CIMS Storage Temp File, and the CIMS Storage Mapping File.

Note • The CIMS Storage Temp File is a temporary file used only during the merging process. It is built during VMS_MERGE phase 2.

While performing phase 5, VMS_MERGE processes these OpenVMS Prolog 3 files in UIC order. It first reads a record from the CIMS Storage Temp File. The data in this record includes the UIC and the number of blocks used and allocated. VMS_MERGE then has to find a username and a project name (assuming you have enabled Project Accounting) to assign the blocks used and allocated.

For the username, VMS_MERGE first looks up the UIC in the CIMS Storage Mapping File, and, if it is not there, in the merged CIMS Statistics File, and, finally, in the OpenVMS Authorization File.

The theory is the same for the project name, but VMS_MERGE reads the CIMS Storage Mapping File, then the merged CIMS Statistics File, and finally the CIMS Authorization File.

In reading these files, VMS_MERGE has two options for finding the record with the UIC (from the CIMS Storage Temp File) in it:

- 19.9.1.1.1. VMS_MERGE can read sequentially all the records (in UIC order) in the file until it finds the record with the particular UIC it is looking for.
- 19.9.1.1.2. VMS_MERGE can look at the current record in the file to see if it has the UIC it is looking for (called a **Direct hit**), and if not, read directly the record with the UIC in it (called a **Read hit** if it finds it or a **No hit** if it does not find it).

Option 1 is called the STEP method because it steps through the files sequentially. When you specify the /STATISTICS qualifier, you get the average number of sequential reads per UIC, along with the number of times VMS_MERGE did not find the UIC in the file.

Option 2 is called the NORMAL method. When you specify the /STATISTICS qualifier, you see the number of Direct hits, Read hits, and No hits.

Which Method is Best For My Site?

You can determine the method that is best for your site by executing the MERGE command twice. Note that this is not something you do every time you need to run VMS_MERGE. You need to do this process only once to determine which method to use for your site, and then use that method from then on.

To determine the correct method for your site

1 First, execute the following command:

```
$ RUN ARSAP$EXE:ARSAP_VMS_MERGE
VMS_MERGE> MERGE/STATISTICS/METHOD= -
_VMS_MERGE> (ARSAP_STORAGE_MAPPING=STEP -
_VMS_MERGE> ,PROJ_MERGED_ARSAP_STATISTICS=STEP -
_VMS_MERGE> ,VMS_AUTHORIZATION=STEP -
_VMS_MERGE> ,ARSAP_AUTHORIZATION=STEP -
_VMS_MERGE> ,USER_MERGED_ARSAP_STATISTICS=STEP)
```

2 When the MERGE command finishes, check the VMS_MERGE statistics that are printed at the end. For each one of the files that has an Average reads value greater than 3, change the method for that file from STEP to NORMAL.

For example, suppose the OpenVMS_AUTHORIZATION File had an Average reads value of 10 and the ARSAP_AUTHORIZATION File had an Average reads value of 5. Change the above command to:

```
$ RUN ARSAP$EXE:ARSAP_VMS_MERGE
VMS_MERGE> MERGE/STATISTICS/METHOD= -
_VMS_MERGE> (ARSAP_STORAGE_MAPPING=STEP -
_VMS_MERGE> ,PROJ_MERGED_ARSAP_STATISTICS=STEP -
_VMS_MERGE> ,VMS_AUTHORIZATION=NORMAL -
_VMS_MERGE> ,ARSAP_AUTHORIZATION=NORMAL -
_VMS_MERGE> ,USER_MERGED_ARSAP_STATISTICS=STEP)
```

and the performance of VMS_MERGE should improve, as verified by the statistics printed at the end. In particular, the Direct I/O Count and the Elapsed CPU time should decrease. You can continue using this second command for all subsequent merges.

Converting CIMS Authorization File During Installation

As a performance enhancement in converting the CIMS Authorization File, we have increased the RMS multibuffer count inside the CIMS CONVERT Utility to 50. This dramatically reduces the time it takes to convert or update the CIMS Authorization File to the current level.

As a result of this change, when you run VMSINSTAL to install CIMS, your Enque Limit (ENQLM) must be at least 60. The CIMS installation kit checks to verify that it is at least 60, and if it is not, it will fail. Before you install CIMS, you should verify that the account you plan to use to install CIMS has an Enque Limit of at least 60.

Optimizing the Files

You should use the OPTIMIZE_ARSAP_FILES.COM command procedure located in the ARSAP$EXAMPLES directory to optimize the files that VMS_SELECT and VMS_MERGE access.

We use OpenVMS Prolog 3 Indexed file organization for most of our CIMS files. By default, OpenVMS RMS creates these files with both index and data key compression enabled. While these two compression options tend to decrease the size of the indexed files, they also tend to increase the access time. In fact, it can mean the difference between doing a linear search for a particular key and doing a binary search. With index compression enabled, RMS must do a linear search for a key in a bucket.

This command procedure also optimizes the file in other ways. For a more detailed discussion of indexed files and optimizations, see the *DEC Guide to OpenVMS File Applications* manual.

In testing the effects of executing this command procedure on files that VMS_SELECT and VMS_MERGE access, these changes were noted on files sent to us from a large site:

File	Size Before	Size After
CIMS Image Mapping File	19.11.1	19.11.2
CIMS Parameter File	19.11.3	19.11.4
CIMS Queue Mapping File	19.11.5	19.11.6
CIMS Rates File	19.11.7	19.11.8
Intermediate CIMS Statistics File	19.11.9	19.11.10
Merged CIMS Statistics File	19.11.11	19.11.12
OpenVMS Authorization File	19.11.13	19.11.14

The size is given in terms of the number of blocks. As you can see, the file size of three of the files was reduced substantially by the reorganization.

To optimize the intermediate CIMS Statistics File

- Use the following command:

```
$ @ARSAP$EXAMPLES:OPTIMIZE_ARSAP_FILES -
_$ ARSAP_STATISTICS.SYS

Optimizing $1$DIA1:[ARSAP.DATA]ARSAP_STATISTICS.SYS;
  Analyzing the file ...
  Removing index and data key compression ...
  Optimizing the file description ...
  Converting the file to its optimized form ...
$1$DIA1:[ARSAP.DATA]ARSAP_STATISTICS.SYS; has been optimized.
$
```

The file location defaults to ARSAP$DATA: and the file type defaults to .SYS.

17

The CIMS Utilities

The descriptions in this chapter summarize the various CIMS utilities.

Overview 17-2

Utilities Summary 17-3

Overview

This chapter presents summary information. Detailed information about each utility can be found online by using the HELP command within each CIMS utility.

For example, to obtain additional information about the CIMS SETUP Utility, and issue the HELP command.

```
$ RUN ARSAP$EXE:ARSAP_SETUP
SETUP>  HELP
```

The HELP file emulates DEC's VMS Help. Use the HELP command within each CIMS utility as you would within VMS.

Utilities Summary

Utility	Function
ARSAP_ACTIVITY	The CIMS ACTIVITY Utility maintains and reports on the contents of the CIMS Activity File.
ARSAP_ANALYZE	The CIMS ANALYZE Utility lets you view the contents of the CIMS Recovery File, the CIMS Switch File, and the OpenVMS Accounting File. Additionally, you can verify the contents of the CIMS Storage File with this utility.
ARSAP_AUDIT	The CIMS AUDIT Utility extracts records from the CIMS Audit File created by the VMS_SELECT Utility, based on date and account selection criteria, and formats the information into audit trail and session level reports.
ARSAP_AUTHORIZE	You can use the CIMS AUTHORIZE Utility is used to initialize, modify, and examine CIMS user and project account parameters and options that control the operation of CIMS for each particular account. This utility provides an extension to OpenVMS's AUTHORIZE Utility; you can use it to enable or disable resource management and chargeback features not provided by OpenVMS on an account-by-account basis. It also adds a new account type to OpenVMS called project.
ARSAP_CAPACITY_ REPORT	The CIMS CAPACITY_REPORT Utility extracts records from the CIMS Capacity File created and updated by the CIMS VMS_SELECT Utility, based on date and jobtype, and formats the information into resource and capacity planning reports.
ARSAP_DISK_ REPORT	The CIMS DISK_REPORT Utility generates disk space utilization information and trend reports for user and project accounts.
ARSAP_IMAGE_ REPORT	The CIMS IMAGE_REPORT Utility generates image reports from the CIMS Image File.

Utility	Function
ARSAP_INTERCEPT	The CIMS INTERCEPT Utility intercepts the accounting records from the OpenVMS job controller and sends them to the OpenVMS Accounting File and to the LOGGER Utility. This utility is optional; it automatically starts as a detached process when CIMS is started. INTERCEPT stays active if Real-Time Accounting is enabled, and if at least one of the following is enabled: Forms Tracking, Selective Image Accounting, Real-Time Data Logging, Absolute Daily Accounting, Absolute Shift Proration, or Intergraph Support with Plot Support. If none of these is enabled, INTERCEPT exits.
ARSAP_INVOICES	The CIMS INVOICES Utility generates invoice and financial reports for user and project accounts. You can prepare individual user or project invoices in either detailed or summary form. In addition, you can produce invoices for user-defined groups.
ARSAP_LOGGER	The CIMS LOGGER Utility receives accounting information from the CIMS INTERCEPT Utility to update the user and project account records as a real-time activity. It also performs the console logging of login and logout activity. This utility's use is optional; it automatically starts as a detached process when CIMS is started and stays active only when Real-Time Accounting and Real-Time Data Logging are enabled.

Utility	Function
ARSAP_LOGIN	The CIMS LOGIN Utility executes automatically each time a user logs onto the computer system. It is invoked by the system-wide login command procedure. Depending upon the CIMS options in effect when LOGIN is invoked, it retrieves project information, creates a project environment, performs budget and storage limit checking, and retrieves special terminal information (such as terminal speed) for use by other CIMS utilities. LOGIN sends the collected information to the system accounting file via a system service that formats the information and writes a user accounting record to the accounting file. While the use of LOGIN is optional, depending on your need for its features, we recommend its use. It is installed with sufficient privilege to allow it to access the CIMS files.
ARSAP_MYCOST	The CIMS MYCOST Utility lets you examine system resource usage statistics and charges on-line. Users often want to know how much money they have spent at a certain point in their session or determine the cost of various actions. The CIMS MYCOST Utility can also implement a logout display of this information.
ARSAP_PATCHACC	The CIMS PATCHACC Utility is useful when you are using resource accounting packages (other than CIMS) that rely on the Account code field in accounting data being accurate. This program reads the original account code from the OpenVMS Authorization File (SYSUAF.DAT) and replaces it in the accounting record.
ARSAP_RATES	The CIMS RATES Utility maintains the rate tables used by the other CIMS utilities that need rate information such as the INVOICES, MYCOST, and LOGIN utilities.

Utility	Function
ARSAP_RECOVER	The CIMS RECOVER Utility recovers the accounting data written at previously established intervals by the CIMS SNAPSHOT Utility for all sessions active at the interval time. The utility executes automatically during the CIMS Startup Command Procedure.
ARSAP_RECURRING_ CHARGES	The CIMS RECURRING_CHARGES Utility maintains the CIMS Recurring Charges File that posts recurring miscellaneous charges for each reporting period when the Supplemental Charges option is enabled.
ARSAP_RESOURCE_ REPORT	The CIMS RESOURCE_REPORT Utility provides the various resource management reports for users and projects.
ARSAP_SETUP	The CIMS SETUP Utility lets you initialize, modify, and examine CIMS system-wide parameters and options. These parameters control the overall operation of CIMS.
ARSAP_SNAPSHOT	The CIMS SNAPSHOT Utility handles inactive process logout (and the logging of that to the console) and saves accounting information for the system Crash Recovery feature of CIMS. This utility is optional; it starts automatically as a detached process when CIMS is started and stays active when either Crash Recovery or Idle Process is enabled.
ARSAP_STORAGE_ MAINT	The CIMS STORAGE_MAINT Utility maintains and reports on the contents of the CIMS Storage File.
ARSAP_STORAGE_ SAMPLER	The CIMS STORAGE_SAMPLER Utility collects disk storage information by UIC for each disk that the CIMS Administrator defines in the CIMS Storage Parameter File. The utility usually executes from a periodic batch job. As delivered by the CIMS Lab, the command file STORAGE_SAMPLER.COM is submitted to the batch queue and then resubmits itself for execution the next day.

Utility	Function
ARSAP_STORAGE_ UPDATE	The CIMS STORAGE_UPDATE Utility usually executes from the same batch job that collects disk storage information. Immediately after disk data collection, it reads the collected data and updates the account records in the intermediate CIMS Statistics File so that the most accurate disk storage information is available. It also updates the CIMS Authorization File to enforce storage limits if they have been enabled.
ARSAP_SUPER_MERGE	The CIMS SUPER_MERGE Utility merges the various CIMS data files from one standalone or cluster computer system with other standalone or cluster computer system's accounting data to produce combined system reports.
ARSAP_SUPPLEMENTAL_CHA RGES	The CIMS SUPPLEMENTAL_CHARGES Utility maintains the CIMS Supplemental Charges File used to implement the miscellaneous charges, balance forward, adjustments, and payments capabilities of CIMS when the Supplemental Charges option is enabled.
ARSAP_SWITCH	The CIMS SWITCH Utility enables project accounting users to change projects without logging out and then back in with a new project. Because this program accesses the CIMS files within the context of the user, it is normally installed with privilege and invoked with the symbol SWITCH.
ARSAP_TERMINAL_ REPORT	The CIMS TERMINAL_REPORT Utility produces utilization reports by terminal name.
ARSAP_UNIX_CONVERT	The CIMS UNIX_CONVERT Utility is designed to be used only after a version update to CIMS has been installed. This utility converts the CIMS for UNIX definition files that reside on the OpenVMS system.

Utility	Function
ARSAP_UNIX_MERGE	The CIMS UNIX_MERGE Utility merges the intermediate CIMS Statistics File with information from the OpenVMS Authorization File and the CIMS for UNIX Storage files into the merged CIMS Statistics File. Various CIMS reporting utilities use the merged CIMS Statistics File to produce reports. You invoke the CIMS UNIX_MERGE Utility after the intermediate CIMS Statistics File has been loaded by the UNIX_SELECT Utility using the SELECT or PROCESS command.
ARSAP_UNIX_SELECT	The CIMS UNIX_SELECT Utility extracts records from the formatted CIMS for UNIX Accounting files based on date criteria and puts the information into the appropriate CIMS data files for later use by the CIMS CAPACITY_REPORT, IMAGE_REPORT, VMS_MERGE, UNIX_MERGE, TERMINAL_REPORT, and AUDIT Utilities.
ARSAP_VERIFY	The CIMS VERIFY Utility is used to verify the integrity of CIMS files. This utility currently supports verifying the contents of the CIMS Storage File.
ARSAP_VMS_MERGE	The CIMS VMS_MERGE Utility merges the intermediate CIMS Statistics File with information from the OpenVMS Authorization File and the CIMS Storage File into the merged CIMS Statistics File. Various CIMS reporting utilities use the merged CIMS Statistics File to produce reports. The CIMS VMS_MERGE Utility is invoked after the intermediate CIMS Statistics File has been loaded by the CIMS VMS_SELECT Utility using the SELECT command (or the CIMS LOGGER Utility if Real-Time Accounting is enabled).
ARSAP_VMS_SELECT	The CIMS VMS_SELECT Utility extracts records from the OpenVMS Accounting files based on date criteria and puts the information into the appropriate CIMS data files for later use by the CIMS CAPACITY_REPORT, IMAGE_REPORT, VMS_MERGE, TERMINAL_REPORT and AUDIT utilities.

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