Evaluating ″EXPLORE for VSE″ In a VM/VSE Environment

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First Edition (September 1994)

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Abstract

This document evaluates the usage of EXPLORE for VSE** and EXPLORE for CICS** in a VM/VSE environment. Its main purpose is to explain which values provided by EXPLORE for VSE are usable if VSE/ESA* is running under VM/ESA* and not native on the hardware. VMPRF was used to look at the VSE/ESA virtual machine from the VM/ESA side and to compare EXPLORE for VSE and related VMPRF values if applicable. In addition it provides information about the installation of EXPLORE for VSE and EXPLORE for CICS in a VM/VSE environment.

This document was written for technical professionals who are evaluating VM/ESA and VSE/ESA performance. A good knowledge of VM/ESA and VSE/ESA is assumed.

(89 pages)

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Preface

This document is intended to give guidance to implement and use VM/ESA* and VSE/ESA* performance measurement tools in a VM/VSE environment. It will explain which values of EXPLORE for VSE are usable, if the VSE/ESA system is running under VM/ESA compared to a native VSE/ESA environment.

This evaluation was done for VSE/ESA guest systems running in V=R, V=F and V=V virtual machines.

We did not investigate the measured figures to see if they are ″good″ or ″bad″ figures. We checked their validity when they were measured under VM/ESA in V=R, V=F or V=V virtual machines with and without other loads (other virtual machines) executing under the same VM/ESA.

Assumption

The assumption is made that the VMPRF and the EXPLORE (native) values are correct.

How This Document is Organized

The document is organized as follows:

- Chapter 1, “Introduction”

  This chapter describes the hardware and software environment which was used during this project.

- Chapter 2, “EXPLORE for VSE”

  This chapter describes what EXPLORE for VSE is and how to install and configure it.

- Chapter 3, “EXPLORE for CICS”

  This chapter describes what EXPLORE for CICS is and how to install it.

- Chapter 4, “VMPRF Measurements for Comparisons”

  This chapter describes how VM/ESA monitor data was collected and how reports were produced to create comparable values.

- Chapter 5, “Looking into VSE”

  This chapter summarizes the experiences with EXPLORE for VSE to create performance measurement data for looking inside the VSE/ESA system.

- Chapter 6, “Summary”

  This chapter summarizes the experiences of VSE/ESA native runs compared to the several runs under VM (V=R, V=F, V=V) with and without other users running at the same time on the system.

Related Publications

The publications listed in this section are considered particularly suitable for a more detailed discussion of the topics covered in this document.

- *Virtual Machine/Enterprise Systems Architecture CP Commands and Utility Reference*, SC24-5519
- *VM Performance Reporting Facility Users's Guide and Reference*, SC23-0460
- *TPNS Teleprocessing Network Simulator Planning and Installation*, SH20-2488
- *Resource Optimization for VSE/ESA Installation Guide*, 31-0240-M401-01
- *Resource Optimization EXPLORE for VSE Trial Guide*, 31-0610-M332-01
- *Resource Optimization EXPLORE for VSE Online User's Guide*, 31-0610-M633-0
- *Resource Optimization EXPLORE for VSE History Reporting Guide*, 31-0610-M635-0
- *EXPLORE for CICS Online User's Guide*, 31-0610-M613-01
- *EXPLORE for CICS History Reporting Guide*, 31-0610-M615-01
- *EXPLORE for CICS Messages Guide*, 31-0610-M217-01

International Technical Support Organization Publications

- *VM/ESA Performance Tools*, GG24-4152

A complete list of International Technical Support Organization publications, with a brief description of each, may be found in:

Bibliography of International Technical Support Organization Technical Bulletins, GG24-3070.

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Chapter 1. Introduction

There are many tools available to measure the system behavior of VM/ESA and VSE/ESA systems. All these tools provide a lot of information, depending on the individual setup of the measurement environments. This manual will give some guidance regarding the figures of the tools to concentrate on in a VM/VSE environment. It will also point out which figures of VSE/ESA measurements are still valid, if running VSE/ESA under VM/ESA, which could be used because they can be relevant and which are unpredictable. In this manual we concentrate on EXPLORE for VSE for our measurements in VSE/ESA and on VMPRF for our VM/ESA measurements.

1.1 Test Environment

1.1.1 Hardware

All tests were done on an ES/9000* model 9121-260 with 128MB of storage in combination with an ES/9000 model 9221-150 with also 128MB of storage.

For comparison reasons, and to generate VSE/ESA paging, the Central Storage of the ES/9000 model 9121-260 for VSE/ESA native runs was brought back to 16MB. Because there is a storage requirement for the hardware storage area (HSA) this results in a remaining storage size of 14MB for the VSE/ESA system. The storage requirement for the HSA is hardware dependent. You are not free to select any storage size you like. Hardware storage allocations must be done in multiples of 16 MB.

Mainly 3390 model 2 DASD is used, but also one 3380 K. The 3390 DASD was connected by a 3990-3 control unit and the 3380 DASD was connected by a 3880-3 control unit. The 3990-3 was equipped with a 64 MB cache. To benefit from the I/O assist function, and to be able to run VSE/ESA native, we mainly used dedicated devices. See Figure 1 on page 2 for an overview of the hardware environment.

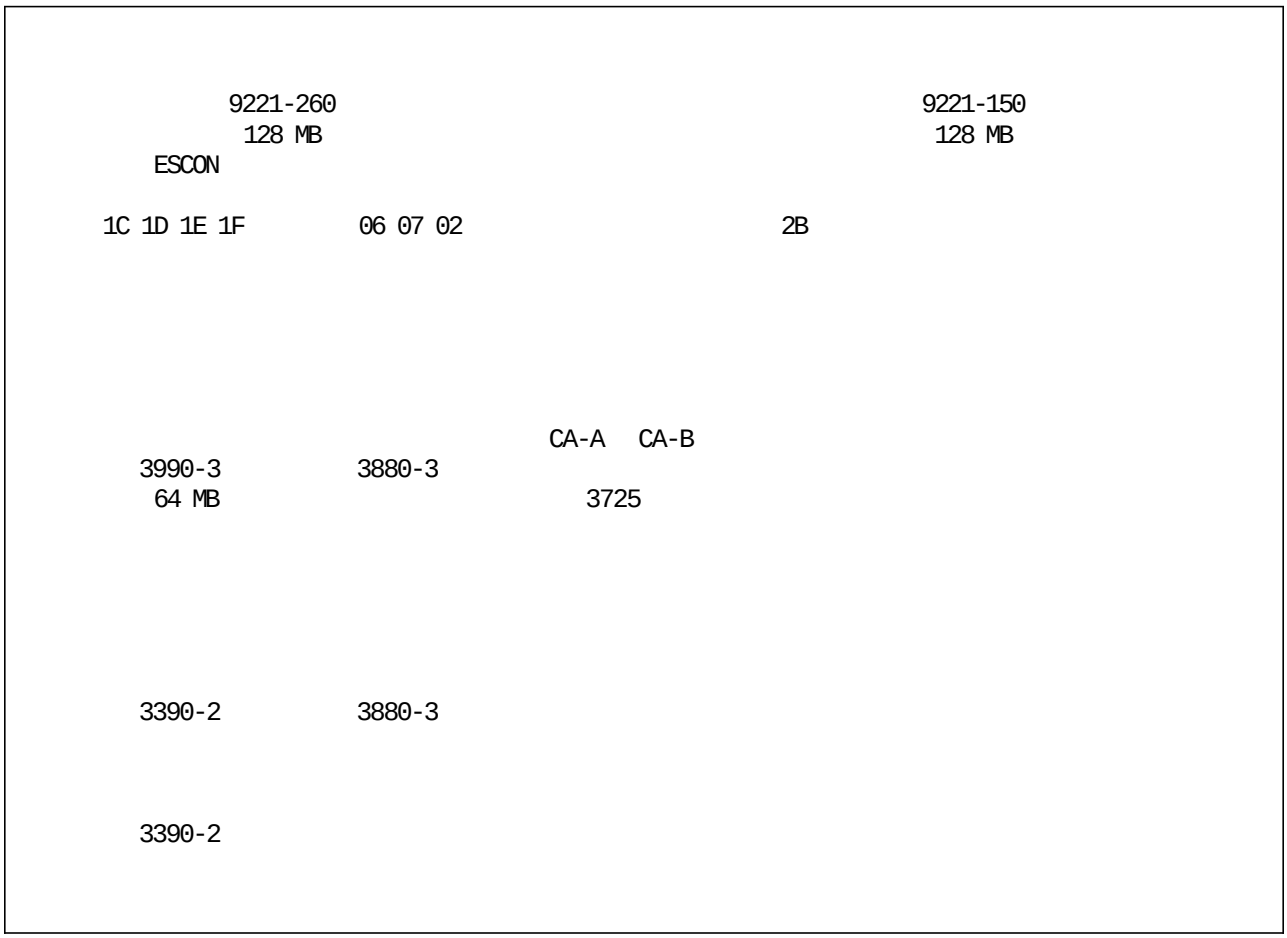


Figure 1. Hardware Configuration. Only parts relevant to the test environment are shown.

In our environment we only used basic caching functions, because it was not our target to optimize the system throughput. Our intention was rather to produce comparable figures for VSE native and VM/VSE runs. The IBM 9221 was only used for TPNS. Because both ES/9000 systems are connected to the 3990 control unit we have to set up the cache in such a way that we have the guarantee that we have the same cache available for each test run. This is done by executing the following EXEC.

```
/* REXX */
trace off
/*********************************/
/*      Nonvolatile Storage      */
/*********************************/
¢cp set nvs subsystem off 440¢
/*********************************/
/*        Dasd Fast Write        */
/*********************************/
¢cp set dasdfw off 440¢
/*********************************/
/*        Cache Subsystem        */
/*********************************/
¢cp set cache subsystem on  440¢
/*********************************/
/*          Cache Device         */
/*********************************/
¢cp set cache device    off 440-447¢
¢cp set cache device    on  460¢
¢cp set cache device    off 461-462¢
¢cp set cache device    on  463¢
¢cp set cache device    off 464¢
¢cp set cache device    on  465-466¢
¢cp set cache device    off 467¢
Return
```

Figure 2. IS13990 EXEC to Set Up the 3990

1.1.2 Software

On the ES/9000 model 9121-260 VSE/ESA Version 1 Release 3 Modification level 4 was running.

We ran VSE/ESA native and VSE/ESA as a V=R, V=F and V=V guest under VM/ESA Version 1 Release 2 Modification level 1.

On the ES/9000 model 9221-150 VM/ESA Version 1 Release 2 Modification level 1 was used.

VSE/ESA stand alone runs were done to find out the base figures for the product EXPLORE for VSE.

```
USER VSESA134  XXXXXXXX 14M 14M G
 ACCOUNT 234 7030-75
 MACHINE ESA
 SHARE RELATIVE 8000
 OPTION CPUID 055111 QUICKDSP VIRT=REAL
 IPL 460
* ========================
* =====> 3390 DASD <=======
* ========================
 DEDICATE 460 460
 DASDOPT SYSCTL
 DEDICATE 463 463
 DASDOPT SYSCTL
 DEDICATE 465 465
 DASDOPT SYSCTL
 DEDICATE 466 466
 DASDOPT SYSCTL
* ========================
* =====> 3380 DASD <=======
* ========================
 DEDICATE 647 647
* ========================
* =====> Printer   <=======
* ========================
 DEDICATE 00E 00E
* ========================
* =====> 3725      <=======
* ========================
 DEDICATE 260 260
* ========================
* =====> 3480      <=======
* ========================
 DEDICATE 870 870
* ========================
 CONSOLE 920 3270 T
 SPECIAL 921 3270
 SPECIAL 922 3270
 SPECIAL 923 3270
 SPECIAL 924 3270
 SPECIAL 925 3270
 SPECIAL 926 3270
 SPECIAL 927 3270
 SPECIAL 928 3270
 SPOOL   00C 2540 R A
 SPOOL   00D 3525 A
 SPOOL   02C 2540 R A
 SPOOL   02D 3525 A
 SPOOL   02E 3211 A
```

Figure 3. VSESA134 DIRECT. VM/ESA directory entry for our VSE/ESA test system.

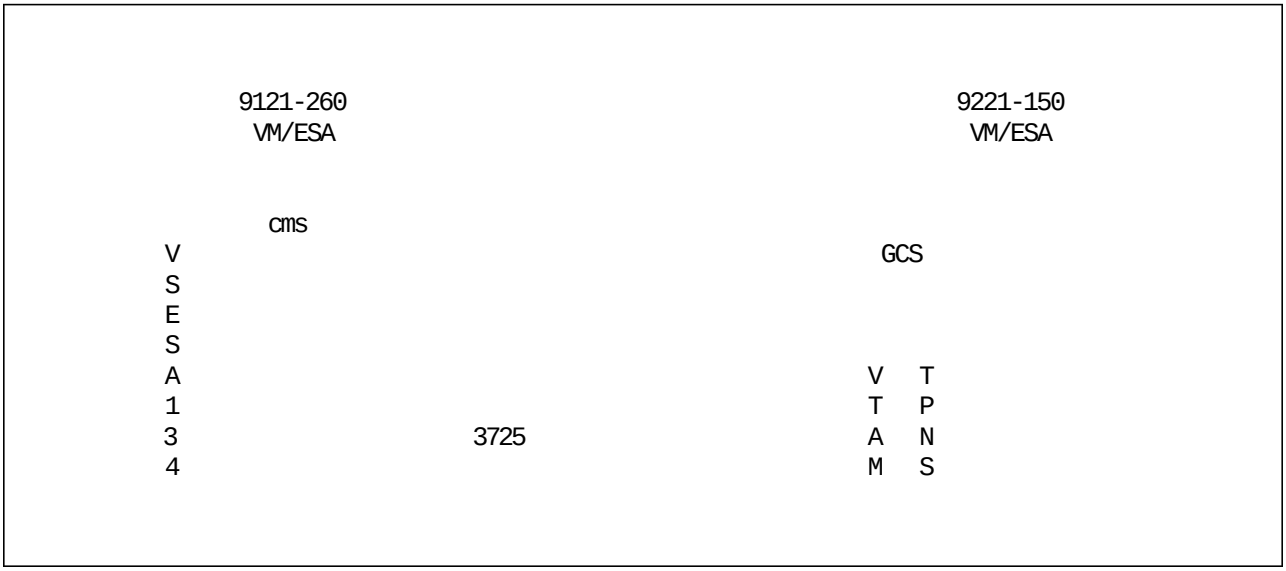


Figure 4. Software Configuration VSE/ESA as Guest System Under VM/ESA. This figure shows VSE/ESA as it ran V=R, V=F or as V=V guest under VM/ESA. Only relevant parts of the test environment are shown.

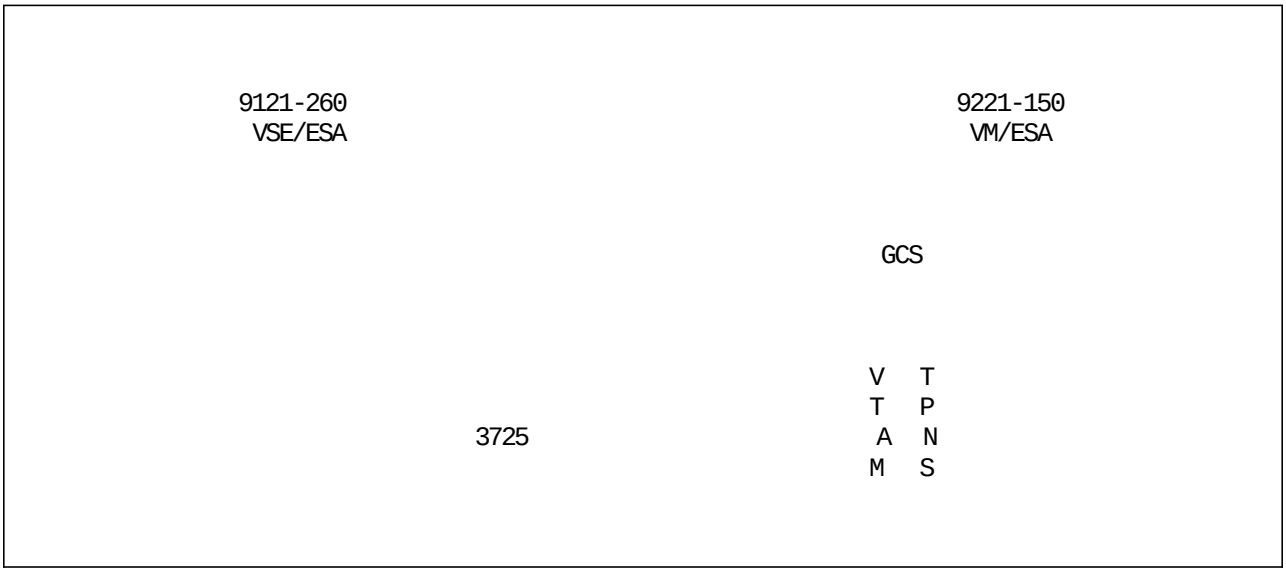


Figure 5. Software Configuration VSE/ESA Native. VSE/ESA native on the ES/9000 model 9121-260. Only relevant parts for the test environment are shown.

1.1.3 Workload

For our test we need a constant load which should be the same each run and should act as an on-line transaction environment. To achieve this we used Teleprocessing Network Simulator (see 1.2, “Teleprocessing Network Simulator” on page 6) and Requirements Approach to Measuring Performance in COBOL (RAMP-C), see 1.3, “RAMP-C” on page 7. These provide us meaningful values for performance measurements in our VSE/ESA and VM/ESA environments.

1.2 Teleprocessing Network Simulator

Teleprocessing Network Simulator (TPNS), Program number 5688-121, is a terminal and network simulation tool. You can use TPNS to determine system performance and response time, to evaluate network design, to perform functional testing, and to automate regression testing. Used as a basic tool in a comprehensive test plan, TPNS increases the effectiveness of system testing by providing a structured and systematic approach to all phases of system testing.

TPNS Version 3 Release 3 runs on any host processor that supports:

- MVS/370 (MVS/SP* Version 1 or later)
- MVS/XA* (MVS/SP Version 2 or later)
- MVS/ESA* (MVS/SP Version 3 or later)
- Any VM system that supports Group Control System (GCS)

TPNS enables you to test and evaluate teleprocessing systems without needing to have terminals and terminal operators present. You can use TPNS to simulate the actions of a number of different applications, terminals, terminal operators, and network subareas. These simulated resources communicate with the real teleprocessing system (referred to as the system under test) as if they were physically present. No modification to the system under test is required.

1.2.1 How to Use TPNS

To use TPNS, you write network definition statements that describe the network configuration to be simulated. You also create message generation decks that send and receive messages and enable your simulated terminals to take action based on message content and network status. The network definition statements and one or more message generation decks form a TPNS script that TPNS uses to send messages to the system under test. TPNS then collects the information returned from the system under test, records that information for further analysis, and uses the information received to determine what to send to the system under test.

You can use TPNS to perform tests that evaluate the reliability and approximate performance characteristics of a teleprocessing system under expected or projected operation conditions. That is, you use TPNS to simulate a specified network of resources that generates a specified number and type of messages. TPNS reduces the time and resources needed for testing and improves testing accuracy.

TPNS enables the system under test to operate as it would under actual conditions. You can evaluate your teleprocessing system with a low volume of message traffic and proceed on an orderly basis to a high volume of traffic. Because your programs and associated hardware are integral parts of the simulation process, TPNS closely approximates a true operating environment.

1.2.2 TPNS Driver Methods

TPNS can be used on two different driver methods:

- As an internal driver
- As an external driver

Used as an internal driver TPNS runs on the same CPU as the system under test.

Used as an external driver TPNS runs on a different CPU as the system under test.

Because we also measured VSE/ESA native, and TPNS could not run in a VSE/ESA environment, we must use TPNS as an external driver.

A 3725 connects VSE/ESA VTAM* on the ES/9000 model 9121-260 and VM/ESA VTAM on the ES/9000 model 9221-150. (See Figure 4 on page 5 and Figure 5 on page 5.)

This is necessary to let VM/ESA on the ES/9000 model 9221-150 “drive” the VSE/ESA system on the ES/9000 model 9121-260. With this driver implementation we are able to use TPNS in the VSE/ESA native and the VSE/ESA under VM/ESA environment.

The TPNS software is installed on the ES/9000 model 9221-150. It runs under Group Control System (GCS).

We used TPNS to simulate 100 terminals, all using the RAMP-C application.

1.3 RAMP-C

RAMP-C is a synthetic interactive benchmark workload. It is designed to exercise the components of a computer system as a typical on-line application might, but it is not patterned after a specific business application.

1.3.1 Applications

The workload has four classes of applications with different degrees of complexity: applications in class 1, for example, issue only two logical file I/Os, whereas class 4 programs issue 41 logical file I/Os. Class 3 and 4 programs call subroutines, class 1 and 2 programs don′t.

1.3.2 Data Files

All RAMP-C files are VSAM files.

There are five different types of files, identified as A, B, C, D, E files. C files are ESDS files. All the other files are KSDS files.

The A files have a record length of 209 bytes, the C files have a record length of 15 bytes, all other files have records which are 244 bytes long.

C files are used as transaction log files. Their record numbers increase during the benchmark. All the other files have 30,000 records each which results in a file size of approximately 7.5MB for each file.

The following table summarizes how the files are used by the various application classes.

Table 1. RAMP-C File Usage				
	Appl. Class 1	**Appl. Class 2**	**Appl. Class 3**	**Appl. Class 4**
File A	-	1 locate by key 2 seq. reads	1 locate by key 5 seq. reads	1 locate by key 5 seq. reads
File B	-	3 full key reads 1 update	11 full key reads 6 updates	19 full key reads 10 updates
File C	1 add	1 add	1 add	1 add
File D	1 full key read	-	-	3 full key reads
File E	-	-	-	3 full key reads

1.3.3 Simulated Users and Transaction Mix

The benchmark is driven by TPNS. Each group of five simulated users executes one class 1 program, one class 2 program, two class 3 programs, and one class 4 program.

Keying/think time for each class of transactions is fixed. This results in an average transaction mix of about 35% of class 1, 25% of class 2, 30% of class 3 and 10 % of class 4 programs.

1.3.4 Scaling

Scaling rules define the number of files used dependent on the number of simulated users.

For 100 users four copies of the C file are used, one copy for each class of program.

Each group of five users uses a new copy of A, B, D and E files, that is, for 100 users there are 20 copies of each of these files.

This means that for 100 users a total of 84 files are used.

For more than 100 users the existing files can be re-used. Therefore, for 200 or 300 users still only a total of 84 files is required.

Chapter 2. EXPLORE for VSE

EXPLORE for VSE is a performance monitor for the VSE operating system. It is usable for native VSE systems and for VSE systems running under VM.

There are three main functions of EXPLORE for VSE:

- Online Monitoring
- Archiving and Batch Reporting
- Threshold Setting

We concentrated mainly on batch reporting and some online monitoring, but we did not investigate the threshold function.

2.1 EXPLORE for VSE Usage and Implementation

EXPLORE for VSE provides the following facilities:

- Logging of performance information
- Logging of job accounting information
- Panel-driven 3270 interface for online analysis
- Batch report writer
- PC-graphics interface in DOS** or Windows**

2.1.1 EXPLORE for VSE′s Functions and Facilities

The following table shows the primary functions of EXPLORE′s online interface:

This EXPLORE Function	**Allows You to**
Status	Monitor current system performance
GETVIS	Monitor GETVIS storage usage
System Options	Create the monitoring environment
Terminal Monitor Options	Specify the options for the online monitor
Flashback	Analyze past job step performance
Online Reports	Analyze past system performance online, and create history reporting job streams
Display	Display storage, formatted control blocks, flashback data, and technical support information
Threshold	Monitor performance thresholds
Access Other Legent Products	Access other Legent products. This option is displayed on the Main Menu if you are running a Legent product that interfaces with EXPLORE.

The EXPLORE batch reporting facilities include predefined *Canned Reports* and User-created Reports with many commands and variables.

2.1.2 Storage Requirement for EXPLORE for VSE

EXPLORE for VSE must run in a dedicated partition. The partition can be either static or dynamic. To save static partitions, we recommend to a use dynamic partition.

The partition in which EXPLORE for VSE runs must be at least 1.5 megabytes. In our measurement, we used partition Z1 which had a default of 5 megabytes to make sure that the storage would still be enough if we added some monitoring options.

The storage that EXPLORE for VSE uses can come from the System GETVIS storage, the SDAID storage area and private partition storage. Which storage is to be used can be determined during EXPLORE for VSE configuration. An option called SDAREA, set to YES, means that the SDAID storage area should be used. If there is not enough storage available, the 24-bit and 31-bit system GETVIS storage will be used. If the SDAREA option is set to NO, EXPLORE for VSE will only use the System GETVIS area.

Note: We recommend to use the GETVIS area, to exploit the storage above 16 MB. In our case we used the defaults (SDAID).

Using the default monitoring options, EXPLORE for VSE requires the following approximate amounts of shared system storage:

- 32K of 24-bit storage below the line, which could be the SDAID area and/or the 24-bit System GETVIS area.
- 96K of 31-bit storage above the line. If the available amount of 31-bit System GETVIS is insufficient, 24-bit System GETVIS is used.

The disadvantage of using the SDAID area is that you cannot run the SDAID trace because the storage area to run it is used by EXPLORE for VSE. Therefore if you think you might need to run the SDAID trace some time later, you had better not use the SDAID area for EXPLORE and set the SDAREA option to NO. The use of the SDAID area is meant to save some System GETVIS area.

If you choose additional monitoring options, more storage will be required. This storage generally comes from private partition storage, but a small amount could come from shared system storage. For example if you want to monitor the disks, you have to set the MONDISK option to YES (default is NO), which requires additional storage.

2.1.3 EXPLORE for VSE Logging Files

EXPLORE for VSE records performance data in two VSAM disk files, as shown in the following table:

Table 2. EXPLORE for VSE Logging Files

File	File ID	Description
Archive	EVSEARC	• Used to back up to tape or disk for long-term analysis. • Performance data is appended to the end of this file.
Flashback	EVSEFBK	• Used for batch reports, online reports, and online analysis of the recent past. • This file is a wrap-around file.

Data is written to the logging files every SYSTIMEI interval, which is a time interval that we can set when we configure EXPLORE for VSE. The default is 15 minutes, but we used 5 minute intervals instead to get more figures in a shorter period of time.

Logging of data to either or both of these files is optional. You can use configuration options LOGFBK and LOGARC to activate logging to these files.

Since the flashback file is a wrap-around file, you might lose performance data if this file begins to wrap-around, therefore if you do not want to lose any performance data, you have to use both the archive file and the flashback file. You use the data in the archive file as the input to the report writer to create reports instead of using the flashback file as the input.

To use the archive file data as the input to the report writer, use the BACKUP utility to create a log file. With report writer version 6.5, EXPLORE version 6.3 (available) you can report directly from the archive file.

Use of the BACKUP utility is explained in the *EXPLORE for VSE Utilities Guide* manual. Then you use the log file as the input for the report writer to create reports.

You can back up the archive file while EXPLORE is either still active or not active. While you are backing up the archive file, performance data cannot be written to it, instead it is only written to the flashback file, but after you finish backing up the archive file, the performance data written to the flashback file will be written to the archive file, therefore you will not lose any data.

In our measurements, we only used the flashback file as input for our reports since we only needed a few days' data.

2.1.4 Using EXPLORE for VSE

After installation, before you can use EXPLORE for VSE, you have to activate/initialize it in a dedicated partition. In our case, we used partition Z1.

2.1.4.1 Activating EXPLORE for VSE

The member EVSEINIT.Z of the EXPLORE for VSE residence library contains a copy of the initialization job stream.

Following is the initialization job stream that we used:

```
// JOB EXPLORE
// ASSGN SYS000,UA        Optional dedicated local 3270 terminal
// ASSGN SYS001,UA        Unused local 3270 terminal
// ASSGN SYS002,UA        Unused local 3270 terminal
// ASSGN SYS003,UA        Unused local 3270 terminal
// ASSGN SYS004,UA        Unused local 3270 terminal
// DLBL EVSEARC,'EVSE.ARCHIVE',,VSAM,CAT=VSESPUC
// DLBL EVSEFBK,'EVSE.FLSHBACK',,VSAM,CAT=VSESPUC
// LIBDEF PHASE,SEARCH=(PRD2.LEGENT)
// EXEC EVSEIBAT,SIZE=EVSEIBAT,PARM='31xxxxxxxxxxxxxxxxxx'
/*
/&
```

Item	Description
SYS000 - SYS004	Channel and unit address of a dedicated local bisynchronous 3270 terminal (optional). Since we did not use it, we put UAs.
EVSE.ARCHIVE	Name of the VSAM archive file.
VSESPUC	Name of the VSAM catalog where the archive and flashback file reside.
EVSE.FLSHBACK	Name of the VSAM flashback file
PRD2.LEGENT	Name of the EXPLORE for VSE residence library.sublibrary
'31xxxxxxxxxxxxxxxxx'	The 20-character product code supplied by Legent.

2.1.4.2 Accessing EXPLORE for VSE

There are a few ways to access EXPLORE for VSE explained in the *RO EXPLORE for VSE Trial Guide* manual.

One way could be to define EXPLORE for VSE in the USSTAB which allows a direct logon to EXPLORE for VSE. The following sample shows how it could be defined. By entering "F" you will have access to EXPLORE in this sample.

```
VTMUSSTB              VTAM APPLICATION SELECTION MENU

  Enter the character of your selection and press the ENTER key:

        A  A0009CI1
        B  A0009CI2
        C  A0009XRF
        D  A0009
        E  A0007XRF
        F  A0009EXP
        G  A0009VTE



==>
```

Figure 6. Sample for Calling EXPLORE by the USSTAB

In our measurements, we accessed EXPLORE for VSE through a CICS-controlled terminal by entering the CICS* transaction **EVSE**.

2.1.4.3 Exiting EXPLORE for VSE

To exit from EXPLORE for VSE, do one of the following:

- Press PF10
- Enter **EXIT** on the command line

2.1.4.4 Deactivating EXPLORE for VSE

To shutdown EXPLORE for VSE in the Z1 partition, do the following at the console:

- **MSG Z1**
- Reply **PURGE** at the required reply id.

2.1.4.5 EXPLORE for VSE′s Main Menu

When you access EXPLORE for VSE, the first panel displayed is the Main Menu as shown below:

```
EVSEMAIN VSESA134        MAIN MENU          A0010023     EXPLORE 6.14 10:55:00
==>                                                                      RATE

      Current Activity                  Configuration
       _ Status                          _ System Options
       _ GETVIS                          _ Terminal Monitor Options

      Past Activity                     System Programmer Aids
       _ Flashback                       _ Display
       _ Online Reports

      Excessive Resource Usage          Access Other Legent Products
       _ Thresholds                      _ EXPLORE for CICS
                                         _ EXPLORE for VTAM
                                         _ EXPLORE for SQL
                                         _ FAQS/ASO
                                         _ Other Legent Products

       Data Center Management - EXPLORE for VSE - Resource Optimization
                   (c) Legent Software, Inc., 1985, 1993


F1=HELP      F2=STATUS    F3=END       F4=FLSHBACK  F5=REFRESH   F6=REPORTS
F7=UP        F8=DOWN      F9=AUTO      F10=EXIT     F11=DISPLAY  F12=ALTPFKEY
```

EXPLORE for VSE′s Main Menu is the initial point of entry to the EXPLORE hierarchy of panels.

The options on the Main Menu correspond to the primary functions of EXPLORE. To access a function, you can do one of the following:

- Use the RETURN or TAB key to position the cursor to the left of the option you want to access, and press ENTER.

- Press the F-key corresponding to the function, as shown in the following table:

Press This F Key	To Access This Function
F2 (STATUS)	Current Activity: Status
F4 (FLSHBACK)	Past Activity: Flashback
F6 (REPORTS)	Past Activity: Online Reports
F11 (DISPLAY)	System Programmer Aids: Display
F16 (CONFIG)	Configuration: System Options
F24 (THRESHLD)	Excessive Resource Usage: Thresholds

2.1.4.6 EXPLORE for VSE′s Online Help

EXPLORE for VSE provides a useful online help for every panel, and it also provides online help for almost all fields within a panel. What you have to do is just move the cursor to a specific field and press F1 to get the help for that field. By doing this, you don′t have to browse the entire help panel to find the information you need. (An EXPLORE Windows/OS/2* help system is also available.)

The online help always gives the explanations which are of interest for the specific version and level of EXPLORE for VSE. Therefore you should prefer the online help rather than the manuals.

The online help contains a lot of information such as:

- Description of the panel
- How the figures are calculated

To display help about an entire EXPLORE panel, do one of the following:

- Put the cursor in the command line, and press F1
- Enter **HELP** at the command line

To display help on a specific field:

- Move the cursor to the specific field, and press F1

The following is a sample of some online help screens for the Status CPU Activity panel:

```
EVSEHELP VSESA134  EXPLORE ONLINE HELP       A0010023     EXPLORE 6.14 10:51:37
==>                                                                    RATE
Description of the Status CPU Activity Panel
     The Status CPU Activity Panel displays two types of CPU
     statistics:

      * The  upper half  of the  panel  displays the  actual
        percentage  of time  the  CPU  was busy  during  the
        monitored time interval.

      * The lower half of the  panel displays the percentage
        of time the CPU was busy  based on a sampling of the
        PSW.  Also displayed are the proportions of time the
        CPU was in supervisor state,   in problem state,  or
        active in the LTA.

             CPU Activity as a Percentage of Actual Time
Purpose
     This section  of the  CPU Activity  Panel displays  the
     actual percentage of  time the CPU was  busy during the
     monitored time interval.                                   MORE +

F1=HELP      F2=STATUS    F3=END       F4=FLSHBACK  F5=REFRESH   F6=REPORTS
F7=UP        F8=DOWN      F9=AUTO      F10=EXIT     F11=DISPLAY  F12=ALTPFKEY
```

```
EVSEHELP VSESA134  EXPLORE ONLINE HELP       A0010023     EXPLORE 6.14 10:52:07
==>                                                                    RATE
How the CPU Real-Time Percent Busy Statistics Are Calculated

      The real-time CPU statistics are collected when
      the CPU enters or exits the allbound wait state.
      EXPLORE records the time the CPU enters allbound and
      subtracts the time of the next interrupt to determine
      how long the CPU spent waiting (CPU wait).  The wait
      time subtracted from the total time the machine was
      given to run gives the amount of time the CPU was
      executing instructions, as follows:

      *   For VM and PR/SM* users, CPU busy = Virtual Duration
          minus CPU wait
      *   For other users, CPU busy = Native Duration minus
          CPU wait




F1=HELP      F2=STATUS    F3=END       F4=FLSHBACK  F5=REFRESH   F6=REPORTS
F7=UP        F8=DOWN      F9=AUTO      F10=EXIT     F11=DISPLAY  F12=ALTPFKEY
```

To exit from the help facility, do one of the following:

- Press F3
- Enter **END** at the command line

2.1.5 Online Monitoring

Since we only concentrated on batch reporting and some online monitoring, we only used the following panels:

- Status

  Status panel contains the information about the current activity of your system.

- Online Reports

  From the Online Reports panel, you can create both online reports and batch reports which are the past activity of your system.

2.1.5.1 Status Panel

The EXPLORE Status function gives you information about the current activity of your system. The data displayed on the Status panels is for the current time interval as defined by the SYSTIMEI configuration option.

SYSTIMEI interval is the time interval, in minutes, at which EXPLORE is to collect system statistics. SYSTIMEI can be changed through the Configure System Options panel. The default is 15 minutes, but in our measurements we used five minute time intervals, so that we could get the system statistics data we needed within a shorter period of time.

Although it is not mentioned in the maual we found a SYSTIMEI value of **1 minute** can be used. The manual states that the value of SYSTIMEI is between 5 and 480 minutes, and it must be a multiple of five minutes.

From the Status panel, you can monitor:

- CPU activity
- Paging activity
- Channel activity and utilization
- I/O activity
- Partition and task activity
- Job accounting information
- Supervisor calls
- External interrupts
- Task wait activity
- Cache activity (via Disk I/O panel)

To access the menu, do one of the following:

- From the Main Menu, select **Current Activity: Status**
- Press F2 (STATUS)
- Enter **STAT** on the command line

Following is the Status panel:

```
EVSESTAT VSESA134  STATUS MENU              A0010023     EXPLORE 6.14 16:45:00
==>                                                                   RATE
System Status
 _ Overview             _ Overview Plot   _ Comparison Plots
 _ CPU Activity         _ Paging Activity _ Channel Utilization
 _ VM CPU Activity

System I/O Activity
 _ Channel I/O
 _ Disk I/O             _ Device I/O
 _ XA Disk Measurement  _ XA I/O Plot

Partition Status
 _ Partition Activity   _ Graphic Overview
 _ Storage Allocations  _ Job Accounting

System Analysis
 _ Task Wait Analysis   _ System Wait Codes
 _ Event Analysis
 _ SVC Usage            _ External Interrupts


F1=HELP      F2=STATUS    F3=END       F4=FLSHBACK  F5=REFRESH   F6=REPORTS
F7=UP        F8=DOWN      F9=AUTO      F10=EXIT     F11=DISPLAY  F12=ALTPFKEY
```

Following are a few panels that we can get from the Status Menu:

- **STATUS SYSTEM OVERVIEW** panel

```
EVSESSYS VSESA134  STATUS SYSTEM OVERVIEW    A0020023     EXPLORE 6.14 09:46:28
==>                                                                    RATE
System activity between  09:45:01 and 09:46:28
_  0.4% busy time         **********************  _  0.6% busy samples
  Z1  .122 seconds       *   CPU UTILIZATION   *   Z1 EVSESBAT   0.6%
  F2  .033               **********************   F2 DFHSIP
  F4  .027                                        F4 DFHSIP

_   1.3 I/O              **********************   Z1 EVSESBAT   0.9 I/O
Channel _ 04     1.2     *    I/O ACTIVITY     *   F2 DFHSIP     0.0
        _ 09     0.1     **********************   F3 ISTINCVT   0.0


_   0.0 page faults       **********************   Z1 EVSESBAT   0.0 paging
    0.0 pageins          *   PAGING ACTIVITY   *   F2 DFHSIP     0.0
    0.0 pageouts         **********************   F3 ISTINCVT   0.0

        SVC Calls        **********************   Z1 EVSESBAT   0.0 monSVC
Code                     *   SUPERVISOR CALLS  *   F2 DFHSIP     0.0
                         **********************   F3 ISTINCVT   0.0


F1=HELP      F2=STATUS    F3=END       F4=FLSHBACK  F5=REFRESH   F6=REPORTS
F7=UP        F8=DOWN      F9=AUTO      F10=EXIT     F11=DISPLAY  F12=ALTPFKEY
```

- **STATUS CPU ACTIVITY** panel

```
EVSESCPU VSESA134  STATUS CPU ACTIVITY       A0020023     EXPLORE 6.14 09:52:34
==>                                                                    RATE
             CPU activity in seconds between 09:50:01 and 09:52:34

   0.2% use of real CPU      0.2% virtual machine busy

                 Seconds  %...10...20...30...40...50...60...70...80...90..100
Virtual Duration   152.6    DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD
       CPU busy      .3
       CPU wait   152.2    WWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWW
  CPU contention      .1
  Clock Duration   152.7

   0.3% sampling percent CPU busy based on a sample every  .500 seconds.

                 Samples  %...10...20...30...40...50...60...70...80...90..100
       CPU busy        1
       CPU wait      304    WWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWW
   Problem state       1
Supervisor state       0
      LTA active       0

F1=HELP      F2=STATUS    F3=END       F4=FLSHBACK  F5=REFRESH   F6=REPORTS
F7=UP        F8=DOWN      F9=AUTO      F10=EXIT     F11=DISPLAY  F12=ALTPFKEY
```

- **STATUS DASD** panel

```
EVSESDSK VSESA134  STATUS DASD              A0020023     EXPLORE 6.14 09:58:49
==>                                                                   RATE
SUMMARY    Disk monitoring between 09:55:01 and 09:58:49
             %Zero Avg.  I/O  Avg.        Service
  Device      Seeks Seek Qued Q-Len    I/O   Time  Total Service Time (seconds)
_  463 SYSWK1 60.1%  11    1%  .013    2.4  .00908  4*************************
_  460 DOSRES 53.6%  11   24%  .236    2.1  .00464  2**********




X=Device dsply(default),D=DSN rpt,G=Graphic DSN rpt,P=Seek plot,S=Seeksby cyl

F1=HELP      F2=STATUS    F3=END       F4=FLSHBACK  F5=REFRESH   F6=REPORTS
F7=UP        F8=DOWN      F9=AUTO      F10=EXIT     F11=DISPLAY  F12=RIGHT
```

- **STATUS DASD DSN** panel

  If we enter a **D** in a margin input field, we get a Status DASD panel.

```
EVSESDSN VSESA134  STATUS DASD DSN          A0020023     EXPLORE 6.14 10:04:46
==>                                                                   RATE
Cylinder    Relative         Service
 Low High    Trk/Blk     I/O   Time  Area Names on SYSWK1
  65  152    975,01320   0.0  .00603 VSE.PRD2.LIBRARY
 257  268   3855,00180   0.0  .00244 EVSE.FLSHBACK









SIO  Z1 51 0463 CC0 CCW=63 RW=86 READ

F1=HELP      F2=STATUS    F3=END       F4=FLSHBACK  F5=REFRESH   F6=REPORTS
F7=UP        F8=DOWN      F9=AUTO      F10=EXIT     F11=DISPLAY  F12=ALTPFKEY
```

2.1.5.2 Online Reports Panel

The Online Reports function uses data from the flashback file to produce online reports about the following activities:

- System Utilization
- System Summary
- CPU Utilization
- Page Faults
- I/O Activity

The Online Reports function also provides a way for you to create a report jobstream online and submit it for batch processing.

To access the menu, do one of the following:

- From the Main Menu, select **Past Activity: Online Reports**
- Press F6 (REPORTS)
- Enter **REPorts** or **RPTS** on the command line

Following is the ONLINE REPORTS panel:

```
EVSERPTS VSESA134  ONLINE REPORTS            A0020023     EXPLORE 6.14 10:11:21
==>                                                                      RATE

Flashback data available between 04/21/94 03:51:00 and 04/28/94 10:10:01
Start reporting on THURSDAY  04 / 28 / 94 at 10 : 10


      SYSTIMEI Reporting                 One Minute Sample Reporting
       _ System Summary                   _ System Utilization
       _ CPU Utilization
       _ Page Faults
       _ I/O Activity


      Online Report Generation
       _ Create Report




F1=HELP      F2=STATUS    F3=END       F4=FLSHBACK  F5=REFRESH   F6=REPORTS
F7=UP        F8=DOWN      F9=AUTO      F10=EXIT     F11=DISPLAY  F12=ALTPFKEY
```

The first line on the panel displays the range of time from when the flashback data is available. To select the starting time for the online reports, enter the date on the second line.

- **SYSTEM SUMMARY REPORT Panel**

  The System Summary Report panel displays data from the flashback file about CPU utilization, I/O activity, SVC usage, phase loads, and the number of jobs run during each SYSTIMEI interval.

```
EVSERSUM VSESA134   SYSTEM SUMMARY REPORT    A0020023     EXPLORE 6.14 11:29:16
==>                                                                    RATE
                 Page                    Pgm LTA Job  Real  Virtual CPU
  Date      Time   In  Out Flts  I/O  SVC Lds Lds Cnt   CPU  Utilization
_ 04/28/94 10:05  0.0  0.0  0.0  0.0  0.0 0.0 0.0   0   0.2% 0.2%
_ 04/28/94 10:00  0.0  0.0  0.0  0.0  0.0 0.0 0.0   0   0.4% 0.4%
_ 04/28/94 09:55  0.0  0.0  0.7  1.3  0.0 0.0 0.1   0   2.0% 2.0%
_ 04/28/94 09:50  0.0  0.0  0.0  4.6  0.0 0.0 0.0   1   0.3% 0.3%
_ 04/28/94 09:45  0.0  0.0  0.0  0.4  0.0 0.0 0.0   0   0.2% 0.2%
_ 04/28/94 09:40  0.0  0.0  2.6  0.4  0.0 0.0 0.5   0  20.9% 21.1%
_ 04/28/94 09:35  0.2  0.6  0.1  9.8  0.0 0.0 0.0   4   0.4% 0.4%
_ 04/28/94 09:30  0.0  0.0  1.3  1.5  0.0 0.0 0.3   0  10.7% 10.7%
_ 04/28/94 09:25  0.0  0.0  1.1  5.7  0.0 0.0 0.3   2  10.6% 10.7%
_ 04/28/94 09:20  0.0  0.0  0.0  5.0  0.0 0.0 0.0   2   0.2% 0.2%
_ 04/28/94 09:15  0.0  0.0  0.3  0.0  0.0 0.0 0.0   0   4.2% 4.2%
_ 04/28/94 09:10  0.0  0.0  1.0  3.6  0.0 0.0 0.2   0   7.1% 7.1%
_ 04/28/94 09:05  0.0  0.0  0.4  5.5  0.0 0.0 0.1   2   2.5% 2.5%
_ 04/28/94 09:00  0.0  0.0  0.0  3.5  0.0 0.0 0.0   1   0.2% 0.2%
_ 04/28/94 08:55  0.0  0.0  0.5  0.0  0.0 0.0 0.1   0   1.3% 1.3%
_ 04/28/94 08:50  0.0  0.0  0.6  2.7  0.0 0.0 0.1   1   0.6% 0.6%
P=Paging, C=CPU Utilization
                                                                      MORE +
F1=HELP      F2=STATUS    F3=END       F4=FLSHBACK  F5=REFRESH   F6=REPORTS
F7=UP        F8=DOWN      F9=AUTO      F10=EXIT     F11=DISPLAY  F12=ALTPFKEY
```

- **CPU UTILIZATION REPORT Panel**

  The CPU Utilization Report panel displays in graph form the CPU usage from the EXPLORE flashback file. CPU usage is displayed for each SYSTIMEI interval, as set in the SYSTIMEI configuration option.

```
EVSERCPU VSESA134   CPU UTILIZATION REPORT   A0020023     EXPLORE 6.14 11:45:01
==>                                                                    RATE
   Date   Time    Virtual CPU Busy.....50.....75.....99
_ 04/28 10:05:01  0.2%
_ 04/28 10:00:02  0.4%
_ 04/28 09:55:01  2.0%
_ 04/28 09:50:01  0.3%
_ 04/28 09:45:01  0.2%
_ 04/28 09:40:02  21.1%*******
_ 04/28 09:35:01  0.4%
_ 04/28 09:30:01  10.7%*
_ 04/28 09:25:02  10.7%*
_ 04/28 09:20:01  0.2%
_ 04/28 09:15:01  4.2%
_ 04/28 09:10:01  7.1%
_ 04/28 09:05:02  2.5%
_ 04/28 09:00:01  0.2%
_ 04/28 08:55:01  1.3%
_ 04/28 08:50:02  0.6%
_ 04/28 08:45:01  0.4%
_ 04/28 08:30:01  0.2%
                                                                      MORE +
F1=HELP      F2=STATUS    F3=END       F4=FLSHBACK  F5=REFRESH   F6=REPORTS
F7=UP        F8=DOWN      F9=AUTO      F10=EXIT     F11=DISPLAY  F12=ALTPFKEY
```

- **SYSTEM I/O REPORT Panel**

  The System I/O Report panel displays in graph the total system I/O activity from the EXPLORE flashback file during each SYSTIMEI interval.

```
EVSERSIO VSESA134      SYSTEM I/O REPORT       A0020023      EXPLORE 6.14 11:50:21
==>                                                                        RATE
                           Service
   Date   Time        I/O   Time  Total Service Time (seconds)
_ 04/28 10:00:02      0.0  .01756  0
_ 04/28 09:55:01      1.3  .01510  6
_ 04/28 09:50:01      4.6  .02699 38*
_ 04/28 09:45:01      0.4  .02956  4
_ 04/28 09:40:02      0.4  .01673  2
_ 04/28 09:35:01      9.8  .01937 57***
_ 04/28 09:30:01      1.5  .03984 18
_ 04/28 09:25:02      5.7  .03078 52**
_ 04/28 09:20:01      5.0  .03352 51**
_ 04/28 09:15:01      0.0  .01027  0
_ 04/28 09:10:01      3.6  .02369 26
_ 04/28 09:05:02      5.5  .03843 63***
_ 04/28 09:00:01      3.5  .03937 41*
_ 04/28 08:55:01      0.0  .04275  1
_ 04/28 08:50:02      2.7  .04211 34*
_ 04/28 08:45:01      2.9  .02936 26
_ 04/28 08:30:01      0.6  .02235 12
                                                                      MORE +
F1=HELP       F2=STATUS     F3=END        F4=FLSHBACK   F5=REFRESH    F6=REPORTS
F7=UP         F8=DOWN       F9=AUTO       F10=EXIT      F11=DISPLAY   F12=ALTPFKEY
```

- **DEVICE I/O REPORT Panel**

  If you select one time interval from the System I/O Report Panel, you can get the Device I/O Report Panel which will display all accessed devices and their respective service times for a selected time interval.

```
EVSERDIO VSESA134      DEVICE I/O REPORT       A0020023      EXPLORE 6.14 11:55:45
==>                                                                        RATE
                 I/O  Avg.            Device activity between 09:35:01 and 09:40:02
Device Write Qued Q-Len     I/O Avg Time Total Service Time (seconds)
_ 922  50%                  0.1  .17065   3**********************************
_ 921  50%                  0.0  .18801   0
_ 920  79%                  0.2  .31398  17************************
_ 463  24%    16%  .233     5.6  .01520  25************************************
_ 460  24%    17%  .176     3.9  .00828   9************
_ 260   0%                  0.0  .00043   0









F1=HELP       F2=STATUS     F3=END        F4=FLSHBACK   F5=REFRESH    F6=REPORTS
F7=UP         F8=DOWN       F9=AUTO       F10=EXIT      F11=DISPLAY   F12=ALTPFKEY
```

- **DISK DSN REPORT Panel**

  If you select a device from the Device I/O Report panel, you can get the Disk DSN Report panel which displays I/O statistics by data set name for a selected disk device.

```
EVSERDSN VSESA134      DISK DSN REPORT       A0020023     EXPLORE 6.14 11:59:59
==>                                                                    RATE
Cylinder    Relative        Service Volume ID SYSWK1
Low  High    Trk/Blk    I/O   Time  Area Name
  0    0    00,00001   0.1  .02003 SYSWK1.VOL1.LABEL
 65  152   975,01320   1.0  .01230 VSE.PRD2.LIBRARY
235  243  3525,00135   0.3  .00432 VSESP.USER.CATALOG
244  244  3660,00003   0.1  .00476 VSESP.USER.CATALOG.INDX
244  244  3663,00012   0.1  .00667 VSESP.USER.CATALOG
257  268  3855,00180   1.4  .03844 EVSE.FLSHBACK
301  301  4515,00015   0.1  .01105 SYSWK1.VTOC
302  421  4530,01800   1.2  .00404 ICCF.LIBRARY
422  433  6330,00180   0.0  .02619 DOS.PAGING.FILE.FF0551119121
434  549  6510,01740   1.2  .00795 VSE.POWER.DATA.FILE
550  555  8250,00090   0.0  .01366 VSE.POWER.ACCOUNT.FILE
557  560  8355,00060   0.0  .02011 VSE.HARDCOPY.FILE



F1=HELP      F2=STATUS    F3=END       F4=FLSHBACK  F5=REFRESH   F6=REPORTS
F7=UP        F8=DOWN      F9=AUTO      F10=EXIT     F11=DISPLAY  F12=ALTPFKEY
```

- **REPORT WRITER MENU**

  The Report Writer Menu allows you to create a report job stream online and submit it for batch processing.

  To create a report job stream online with the Report Writer Menu, you must have GSS** (General Sub System) for VSE installed.

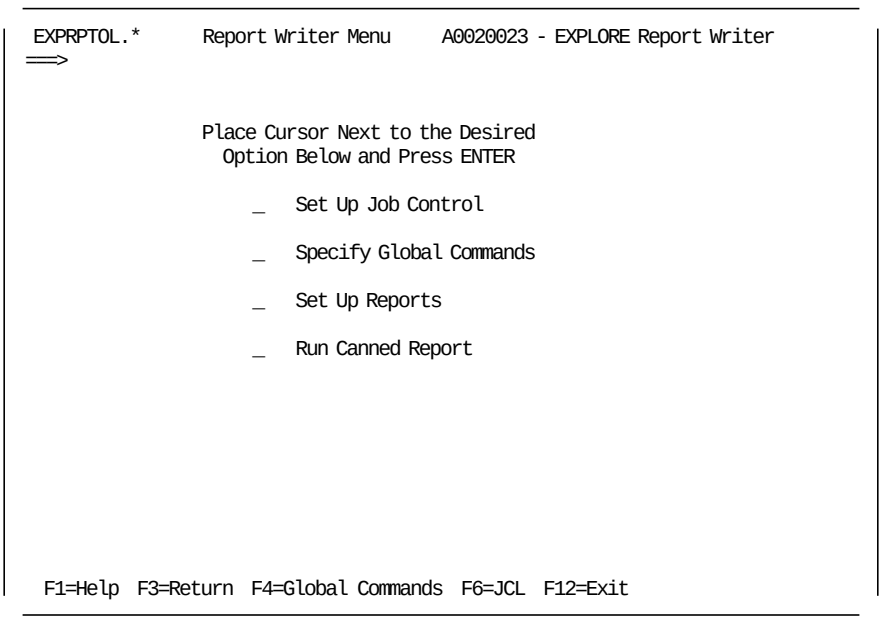
  GSS for VSE is another Legent product which, if installed, enables you to:

  – Create a report job stream online and submit it for batch processing

  – Access MSHP online

  GSS for VSE can run in a separate partition or in the same partition as EXPLORE for VSE.

  If you do not want to run GSS for VSE in a separate partition, go to the Terminal Monitor Option in the Configuration Option, and change the GSSUBSYS option from DCMTDRIV to EVSESVTM, but this will require an additional 256-512 K of storage in the EXPLORE for VSE partition.



The Report Writer menu allows you to run a predefined *Canned Report*. A *canned report* is a report for which the commands are already written for you, therefore you don't have to choose your own commands.

There are a few standard *canned reports* and each of them contains different kinds of reports. If one or a few of them satisfy your needs, you can just choose those instead of having to choose your own commands. But if you think they are not enough, you can choose your own commands which can be found in the *EXPLORE for VSE History Reporting Guide* manual.

Some examples of the standard *canned report* are:

- VSE.SYSTEM.STAT
- VSE.CHANNEL.STAT
- VSE.DISK.STAT

Before you select **Run Canned Report**, don't forget to select **Set Up Job Control** first to make sure your EXPLORE for VSE residence library is in the search chain.

```
EXPRPTJC.A      Report Writer JCL      A0020023 - EXPLORE Report Writer
===>


   VSE/POWER JOB CARD:                  VSE/POWER LST CARD:
   JNM   ===>  EXPRPT                   CLASS  ===>  R
   CLASS ===>  Y                        COPY   ===>
   DISP  ===>  D                        DEST   ===>
   LDEST ===>                           DISP   ===>
   PRI   ===>  6                        DIST   ===>
   SYSID ===>                           FCB    ===>
   USER  ===>                           FNO    ===>
                                        JSEP   ===>
                                        PRI    ===>
   DOS JOB CARD:                        REMOTE ===>
   JOB   ===>  EXPRPT                   SYSID  ===>
                                        USER   ===>


   LIBRARY SEARCH:
   Lib.Sublib  ===> PRD2.LEGENT      Lib.Sublib  ===>


 ENTER=SynChk  F1=Help  F3=Return  F4=Label Information  F12=Main Menu
```

After you fill in the necessary set up, select the **Run Canned Report** option, then choose which report you would like to get and press **F5** to submit.

```
EXPRPTCR.D      Canned Reports         A0020023 - EXPLORE Report Writer
===>
                                                      Product:  EVSE
                    Place Your Cursor Next to the
                 Desired Canned Report and Press ENTER

                   _   VSE.SVC.STAT
                   _   VSE.DEVICE.STAT
                   _   VSE.DISK.STAT
                   _   VSE.XA.DEVICE.STAT
                   _   VSE.CHANNEL.STAT
                   _   VSE.SYSTEM.STAT
                   _   VSE.PAGE.STAT
                   _   VSE.DSN.STAT
                   _   VSE.DISK.DSN.STAT
                   _   VSE.JOB.STAT
                   _   VSE.SEEK.STAT
                   _   VSE.GETVIS.STAT
                   _   VSE.PRINT.FORMS.STAT

            Selected Report ===>

  F1=Help      F3=Return     F4=Global Cmds       F5=Submit   F6=JCL Gen
  F7=Backward  F8=Forward    F9=Secondary Cmds    F12=Main Menu
```

2.1.6 Archiving and Batch Reporting

We can create reports either by using the short-term flashback file (EVSEFBK) or the long-term archive file (EVSEARC).

In our project, we only used the flashback file since it could contain a few days' data which was enough for our measurement. Therefore we set the LOGARC option to OFF, which means we did not want to log data to the archive file.

Please refer to the *RO EXPLORE for VSE Trial Guide* manual for more information about managing the archive file.

You can create a batch report in two ways:

1. Using predefined *Canned Reports*
2. Using your own customized reports

2.1.6.1 Canned Report

A *canned report* is a report for which the commands are already written for you. There are a few standard canned reports which contain usually the most commonly needed reporting information.

Some of the standard canned reports are:

- VSE.SVC.STAT
- VSE.DEVICE.STAT
- VSE.DISK.STAT
- VSE.XA.DEVICE.STAT
- VSE.CHANNEL.STAT
- VSE.SYSTEM.STAT
- VSE.PAGE.STAT
- VSE.DSN.STAT
- VSE.JOB.STAT
- VSE.SEEK.STAT
- VSE.GETVIS.STAT
- VSE.PRINT.FORMS.STAT

You can choose which canned reports you would like to create, but the most useful canned reports to get a view of your system are:

- VSE.SYSTEM.STAT
- VSE.DEVICE.STAT
- VSE.DISK.STAT
- VSE.DSN.STAT

Following is the sample of a canned report we created on our project:

```
* $$ JOB JNM=EXPLORE,CLASS=0,DISP=D
* $$ LST DISP=L,CLASS=R,FCB=$$BFCBIT
// JOB EXPLORE
// LIBDEF *,SEARCH=PRD2.LEGENT
// EXEC EXPRPT,SIZE=EXPRPT,PARM='BANNER=NO'
LINECOUNT 36
INPUT (EVSEFBK)
TITLE1 TESTRUN V=R
FROM 05/03/94 15:30:00
TO   05/03/94 16:00:00
EACH 05 MINUTES
CANRPT VSE.SYSTEM.STAT
END
RUN
/*
/&
* $$ EOJ
```

Figure 7. Sample Job Stream to Create a Canned Report

From the list queue we could see the expansion of the canned report job stream as follows:

```
 ERPT200I EXPRPT  6.37 INITIATED 05/03/94 16.11.00
LINECOUNT 36
INPUT (EVSEFBK)
TITLE1 TESTRUN V=R
FROM 05/03/94 15:30:00
TO   05/03/94 16:00:00
EACH 05 MINUTES
CANRPT VSE.SYSTEM.STAT
 ERPT237I CANNED REPORT EXPANSION
+*----------------------------------------*
+*  DISPLAY IN TABULAR FORMAT VARIOUS      *
+*  SYSTEM VARIABLES                       *
+*----------------------------------------*
+TITLE2 VSE SYSTEM STATISTICS
+TAB DATETIME VSE CPU BUSYVIRT XTIME            AND,
+             VSE CPU %BUSYVIRT                 AND,
+             VSE CPU %PROBLEM                  AND,
+             VSE CPU %SUPERVISOR               AND,
+             VSE PAGE FAULTS RATE,
+             HDR1(P-FAULT) HDR2(RATE)          AND,
+             VSE PAGE IN RATE,
+             HDR1(PAGE IN) HDR2(RATE)          AND,
+             VSE PAGE OUT RATE,
+             HDR1(PAGE OUT) HDR2(RATE)         AND,
+             VSE DEVICE SIO,
+             HDR1(TOTAL) HDR2(IO)              AND,
+             VSE DEVICE SIO RATE,
+             HDR1(TOT-IO) HDR2(RATE)           AND,
+             VSE DISK SIO HDR1(DISK) HDR2(IO)  AND,
+             VSE DISK SIO RATE,
+             HDR1(DISK-IO) HDR2(RATE)          AND,
+             VSE DISK SERVTIME,
+             HDR1(DISK) HDR2(SERVTIME)
+ERPT237I END OF UNCAN EXPANSION
```

Figure 8. VSE.SYSTEM.STAT Canned Report Expansion

From the above job streams, we got the following report:

DATE	TIME	VIRTUAL CPU	VIRTUAL %CPU	%PROBLEM STATE	%SUPVSOR STATE	P-FAULT RATE	PAGE IN RATE	PAGE OUT RATE	TOTAL IO	TOT-IO RATE	DISK IO	DISK-IO RATE	DISK SERVTIME
05/03/94	15.30	000:00:31	10.5	7.2	4.2	25.07	56.53	28.11	38,648	129.2	36,886	123.3	0.013
05/03/94	15.35	000:00:30	10.2	6.5	5.7	25.39	56.12	28.06	38,115	127.4	36,390	121.7	0.013
05/03/94	15.40	000:00:31	10.6	7.4	3.4	22.52	55.98	28.36	38,771	130.1	36,980	124.0	0.013
05/03/94	15.45	000:00:31	10.4	5.2	4.2	23.88	55.84	28.02	38,317	128.1	36,552	122.2	0.013
05/03/94	15.50	000:00:31	10.5	6.5	5.7	23.37	55.57	28.17	38,502	128.7	36,674	122.6	0.013
05/03/94	15.55	000:00:30	10.2	6.4	4.9	23.46	55.34	27.68	37,845	126.5	36,089	120.7	0.013
PERIOD		000:03:05	10.4	6.5	4.7	23.88	55.74	27.99	230,198	128.0	219,571	122.1	0.013

Figure 9. A Sample of Canned Report

2.1.6.2 Customized Report

In a customized report, you have to choose the commands which best suit your needs. You can find a complete list of commands and their use in the EXPLORE for VSE History Reporting Guide.

Following is a sample of a job stream we used in our measurements to produce a customized report:

```
* $$ JOB JNM=EXP1151S,CLASS=0,DISP=D
* $$ LST DISP=L,CLASS=S,FCB=$$BFCBIT
// JOB EXP1151S
// LIBDEF *,SEARCH=PRD2.LEGENT
// EXEC EXPRPT,SIZE=EXPRPT,PARM=¢BANNER=NO¢
LINECOUNT 36
INPUT (EVSEFBK)
TITLE1 TESTRUN V=R
FROM 05/11/94 08:15:00
TO   05/11/94 08:47:00
EACH 05 MINUTES
TAB DATETIME VSE VM VTIME                          AND,
             VSE VM %VTIME                         AND,
             VSE VM TTIME                          AND,
             VSE VM %TTIME                         AND,
             VSE CPU BUSYVIRT                      AND,
             VSE CPU %BUSYVIRT                     AND,
             VSE CPU %BUSYR                        AND,
             VSE CPU %BUSYS                        AND,
             VSE CPU %WAITSAMPLE                   AND,
             VSE CPU %SUPERVISOR                   AND,
             VSE CPU %PROBLEM
END
TITLE1 TESTRUN V=R
FROM 05/11/94 08:15:00
TO   05/11/94 08:47:00
EACH 05 MINUTES
TAB DATETIME VSE REAL %AVAILABLE                   AND,
             VSE REAL %USED                        AND,
             VSE REAL USED                         AND,
             VSE REAL SIZE                         AND,
             VSE PAGE IO                           AND,
             VSE PAGE IO RATE HDR2(RATE)
END
TITLE1 TESTRUN V=R
FROM 05/11/94 08:15:00
TO   05/11/94 08:47:00
EACH 05 MINUTES
TAB VOLSER   VSE DISK SIO                          AND,
             VSE DISK SIO RATE HDR2(RATE)          AND,
             VSE DISK BUSY                         AND,
             VSE DISK SERVTIME                     AND,
             VSE CACHE READ-NORM-REQS              AND,
             VSE CACHE READ-NORM-HITS              AND,
             VSE CACHE READ-NORM-%HITS
END
RUN
/*
/&
* $$ EOJ
```

Figure 10. Sample Job Stream to Create a Customized Report

From the above job stream, we got the following report:

```
                    VM       VM       VM       VM    VIRTUAL   VIRTUAL   REAL   CPU SAMP CPU SAMP %SUPVSOR %PROBLEM
  DATE     TIME    VTIME   %VTIME    TTIME   %TTIME     CPU       %CPU    %CPU   %ACTIVE   %WAIT     STATE    STATE
-------- -----  -------- -------- -------- -------- -------- -------- -------- -------- -------- -------- --------
05/11/94 08.15  00:01:41   16.8   00:01:53   18.8    47.83     16.2     15.9     17.2     82.8      4.8      12.4
05/11/94 08.20  00:01:26   14.4   00:01:38   16.4    40.34     13.7     13.5     17.3     82.7      6.4      10.9
05/11/94 08.25  00:01:12   11.9   00:01:23   13.8    33.27     11.2     11.1     11.9     88.1      5.2       6.7
05/11/94 08.30  00:01:10   11.6   00:01:21   13.5    32.41     10.9     10.8     11.2     88.8      5.0       6.2
05/11/94 08.35  00:01:09   11.5   00:01:20   13.4    32.08     10.8     10.7     12.2     87.8      5.7       6.5
05/11/94 08.40  00:01:08   11.4   00:01:20   13.2    31.71     10.7     10.6     10.9     89.1      4.0       6.9
05/11/94 08.45  00:00:29    4.8   00:00:33    5.6    13.48      4.5      4.5      7.9     92.1      1.1       6.8
-------- -----  -------- -------- -------- -------- -------- -------- -------- -------- -------- -------- --------
PERIOD          00:08:15   11.8   00:09:29   13.5    231.1     11.1     11.0     12.7     87.3      4.6       8.1
-------- -----  -------- -------- -------- -------- -------- -------- -------- -------- -------- -------- --------

                   RSTOR    RSTOR    RSTOR    RSTOR    PAGE     PAGE
  DATE     TIME   %AVAIL    %USED    USED     SIZE      IO      RATE
-------- -----  -------- -------- -------- -------- -------- --------
05/11/94 08.15            100.0    14336k   14336k   23621    79.00
05/11/94 08.20            100.0    14336k   14336k   25246    84.72
05/11/94 08.25            100.0    14336k   14336k   24778    82.87
05/11/94 08.30            100.0    14336k   14336k   24511    81.98
05/11/94 08.35            100.0    14336k   14336k   24549    82.10
05/11/94 08.40            100.0    14336k   14336k   24540    82.07
05/11/94 08.45     0.5     99.5    14268k   14336k    3260    10.94
-------- -----  -------- -------- -------- -------- -------- --------
PERIOD             0.1     99.9    14326k   14336k    151K    71.77
-------- -----  -------- -------- -------- -------- -------- --------

PERIOD NONE
 VOLSER     SIO        SIO     DEVICE    SERVICE NORMREAD NORMREAD NORMREAD
   ID      COUNT      RATE     %BUSY      TIME   REQUESTS   HITS     %HITS
-------- ---------- -------- -------- -------- -------- -------- --------
DOSRES    150,155    71.60     77.8    0.011     101K     69547     68.8
RAMP02     31,192    14.87     24.0    0.016    16481      2507     15.2
RAMP01     25,381    12.10     21.4    0.018
RAMPCF      9,666     4.61      6.3    0.014      574       515     89.7
SYSWK1      1,580     0.75      0.8    0.011     1048       689     65.7
-------- ---------- -------- -------- -------- -------- -------- --------
SUMMARY   217,974    103.9     26.1    0.013     119K     73258     61.5
-------- ---------- -------- -------- -------- -------- -------- --------
```

Figure 11. Sample of Customized Report

2.2 EXPLORE for VSE Installation

In some countries, we can now install EXPLORE for VSE as an IBM Optional Product using the Interactive Interface. But for the other countries, we still have to use the original way as described in the *RO (Resource Optimization) for VSE/ESA Installation Guide*.

2.2.1 Preparing for Installation

Before we began the installation, we had prepared the following things:

1. Obtained the Product Code

   You need a product code to install EXPLORE for VSE

   The format of the product code is usually '31xxxxxxxxxxxxxxxxxx'.

2. Since EXPLORE for VSE needs at least 1.5 megabytes to run, we decided to use dynamic partition Z1 which has a default of 5 megabytes.
3. Created the EVSEARC and EVSEFBK logging files with the following job streams:

```
* $$ JOB JNM=EVSEARC,CLASS=0,DISP=D
// JOB EVSEARC DEFINE THE EXPLORE/VSE ARCHIVE FILE
// DLBL IJSYSUC,¢VSESP.USER.CATALOG¢,,VSAM
// DLBL EVSEARC,¢EVSE.ARCHIVE¢,,VSAM
// LIBDEF *,SEARCH=PRD2.LEGENT
// EXEC EXPUTIL,SIZE=EXPUTIL
INSTALL                         -
  FILE(EVSEARC)                 -
  NAME(EVSE.ARCHIVE)            -
  INPUT(NONE)                   -
  CYL(12 0)                     -
  USCL(0 0)                     -
  VOL(SYSWK1)
/*
/&
* $$ EOJ
```

Figure 12. EVSEARC Logging File Creation Job Stream

```
* $$ JOB JNM=EVSEFBK,CLASS=0,DISP=D
// JOB EVSEFBK DEFINE AND INITIALIZE THE EXPLORE/VSE FLASHBACK FILE
// DLBL IJSYSUC,¢VSESP.USER.CATALOG¢,,VSAM
// DLBL EVSEFBK,¢EVSE.FLSHBACK¢,,VSAM
// LIBDEF *,SEARCH=PRD2.LEGENT
// EXEC EXPUTIL,SIZE=EXPUTIL
INSTALL                         -
  FILE(EVSEFBK)                 -
  NAME(EVSE.FLSHBACK)           -
  INPUT(NONE)                   -
  CYL(12 0)                     -
  USCL(0 0)                     -
  VOL(SYSWK1)
/*
/&
* $$ EOJ
```

Figure 13. EVSEFBK Logging File Creation Job Stream

4. Added the labels for SYSVIO, SYSMON and SYS$EXP files in the STDLABEL.PROC in the IJSYSRS.SYSLIB sublibrary.

Following are the labels we used:

```
// DLBL SYS$VIO,'LEGENT.SYS$VIO.PDS',99/365
// EXTENT ,SYSWK1,1,0,8670,600
// DLBL SYS$MON,'LEGENT.SYS$MON.PDS',99/365
// EXTENT ,SYSWK1,1,0,9270,300
// DLBL SYS$EXP,'LEGENT.SYS$EXP.PDS',99/365
// EXTENT ,SYSWK1,1,0,9570,75
```

Figure 14. SYSVIO, SYSMON and SYS$EXP Labels

2.2.2 Installing EXPLORE for VSE

Below are the steps we used to install EXPLORE products from the IBM Optional Product Tape:

1. Log on to the Interactive Interface (II)
2. Select Installation (1)
3. Select Install Programs - Stacked V2 Format (1)
4. Select Prepare for Installation (1)
   - Answer the questions regarding the tape address and other information on the following panels.

```
INS$PRI2        PREPARE FOR INSTALLATION (STACKED TAPES ONLY)

Enter the required data and press ENTER.



TAPE ADDRESS..... 870          Address of input tape unit (cuu)
                               valid addresses enter a †?†.









              PF2=REDISPLAY  3=END
```

```
SUB$PRO5                          JOB DISPOSITION

Enter the required data and press ENTER.


JOB DESTINATION.............. 3          Enter 1 to submit the job to batch.
                                        Enter 2 to file in library.
                                        Enter 3 to do both.
JOB NAME..................... INSPRE     The name under which the job will be
                                        saved in VSE/ICCF.
PRIORITY..................... 8          Priority 0-9 for this job.
CLASS........................ 0          Changing * has no effect.
DISPOSITION.................. D          D,H,K or L. Changing * has no effect.
JOB ACCOUNTING.............. ________       ________
HOLD LIST IN QUEUE........... 2          Enter 1 to hold output in list queue.
                                        Enter 2 to print output immediately
TIME EVENT SCHEDULING........ 2          Enter 1 if TIME EVENT SCHEDULING
                                        required, otherwise enter 2.
OTHER PARAMETERS............. 2          Enter 1 to change any other POWER JOB
                                        parameters, otherwise enter 2.
 PF1=HELP       2=REDISPLAY  3=END
```

The job stream created was as follows:

```
* $$ JOB JNM=INSPRE,DISP=D,PRI=8,                                    C
* $$ NTFY=YES,                                                       C
* $$ LDEST=*,                                                        C
* $$ CLASS=0
// JOB INSPRE  SCAN OPTIONAL PRODUCT TAPE
// LIBDEF PHASE,SEARCH=(PRD1.BASE,IJSYSRS.SYSLIB)
* *
* *     PREPARE ADDITIONAL PROGRAM INSTALLATION
* *     -  SCAN PROGRAM TAPE
* *
// ASSGN SYS006,870
// EXEC DTRIPRE,PARM=¢ADDR=870¢
/*
/&
* $$ EOJ
```

Figure 15. Installation Preparation Job Stream

- Mount the product tape on the tape address specified and respond to the console messages.

```
F1 001 1Q47I   BG INSPRE 00115 FROM (SYSA) , TIME= 9:35:15
BG 000 // JOB INSPRE  SCAN OPTIONAL PRODUCT TAPE
   DATE 04/19/94,CLOCK 09/35/15
BG 000 * *
BG 000 * *     PREPARE ADDITIONAL PROGRAM INSTALLATION
BG 000 * *     -  SCAN PROGRAM TAPE
BG 000 * *
BG 000 IESI0091I PLEASE MOUNT TAPE LABELLED †VSE OPTIONAL TAPE NUMBER 1
BG 000 IESI0092A MOUNT ON TAPE DRIVE 870 . WHEN READY, REPLY †END/ENTER†
BG-000
0
BG 000 IESI0090A ARE THERE ANY MORE OPTIONAL PROGRAM TAPES? YES/NO
BG-000
0 NO
BG 000 EOJ INSPRE    MAX.RETURN CODE=0000
   DATE 04/19/94,CLOCK 09/37/12,DURATION   00/01/57
```

5. When job INSPRE completes, select Install Product(s) from Tape (2)
6. Set INSTALL (1) and enter the LIBRARY and SUBLIBRARY names next to EXPLORE.COMM.

   The default sublibrary is PRD2.LEGENT, and it will be created if it is not yet available.

```
INS$OPI1              INSTALL PRODUCT(S) FROM TAPE

LIST OF PROGRAMS TO BE INSTALLED

OPTIONS:  1 = INSTALL    2 = SKIP INSTALLATION

                              LIBRARY   SUBLIBR.
    OPT       IDENTIFIER      NAME      NAME      SEQ.NO.  TAPE NO.

     1        EXPLORE.COMM.6.3 PRD2     LEGENT      1        1
     2        EXPLORE.VSE.6.1  PRD2     LEGENT      2        1
     2        EXPLORE.CICS.6.1 PRD2     LEGENT      3        1
     2        EXPLORE.VTAM.6.1 PRD2     LEGENT      4        1
     2        EXPLORE.SQL.6.1  PRD2     LEGENT      5        1
     2        EXTEND/VSE.3.4   PRD2     LEGENT      6        1
     2        ALERT.COMM.4.83  PRD2     LEGENT      7        1
     2        ALERT/CICS.4.83  PRD2     LEGENT      8        1
     2        ALERT/VSE.4.83   PRD2     LEGENT      9        1


PF1=HELP      2=REDISPLAY  3=END                    5=PROCESS
              8=FORWARD
```

```
INS$OPI1              INSTALL PRODUCT(S) FROM TAPE

LIST OF PROGRAMS TO BE INSTALLED

OPTIONS:  1 = INSTALL    2 = SKIP INSTALLATION

                              LIBRARY   SUBLIBR.
    OPT       IDENTIFIER      NAME      NAME      SEQ.NO.  TAPE NO.

     1        GSS/VSE.3.9.3    PRD2     LEGENT      10       2
     _                         _______  ________
     _                         _______  ________
     _                         _______  ________
     _                         _______  ________
     _                         _______  ________
     _                         _______  ________
     _                         _______  ________
     _                         _______  ________


PF1=HELP      2=REDISPLAY  3=END                    5=PROCESS
PF7=BACKWARD
```

WARNING : Do NOT set INSTALL (1) next to Legent products other than EXPLORE.COMM A (2) should be indicated for the installation of GSS. GSS should not be installed with II. The EXPINST.Z will install it if needed. (During our installation we set INSTALL (1) to GSS. This was wrong. Because we had GSS already on disk, we received the message ″Reinstalling Version 3.9.3 Do you wish to continue with the GSS installation ″ and had to answer ″YES″. This message does not appear during the first installation.)

EXPLORE.COMM contains all common modules that are shared by all EXPLORE products.

We did not choose any other EXPLORE products because it would be installed later in the following job stream.

7. Build and submit the following job to run in BG specifying **PRD2.LEGENT** as the residence sublibrary where EXPLORE Common was installed:

Installation job stream

```
* $$ JOB JNM=EXPINST,CLASS=0
// JOB EXPINST
* $$ SLI MEM=EXPINST.Z,S=(PRD2.LEGENT)
/&
* $$ EOJ
```

If EXPLORE for VSE is being installed, the installation job will prompt you to determine whether you wish to install GSS for VSE.

We decided to install GSS for VSE because it could enable us to:

- Use Online Report Writer
- Access MSHP online

Since we were going to install GSS for VSE, we had inserted the labels of the SYSVIO, SYSMON and SYS$EXP files in the standard labels.

8. The EXPINST job will prompt you for the products you wish to install. It will then build and execute a procedure to install them. This procedure could end with a return code of 8. If there are no other messages, this return code can be ignored. If the installation should fail, all the desired products should be reinstalled to ensure that their installation is complete.

   When we were doing the installation, we decided to answer YES to most of the questions on which EXPLORE products to install except EXPLORE for SQL. This means that we restored those EXPLORE products (EXPLORE for VSE, EXPLORE for CICS, EXPLORE for VTAM) plus GSS for VSE, but we only continued with the next installation step of EXPLORE for VSE until it was ready to use. We did this so that if we then needed to install the other EXPLORE products, we just had to continue with the next steps after the installation tape.

9. Specify the common product expiration code at the SYS$EXP PDS file so that it can be used for all EXPLORE products. To do that we submitted the following job stream:

```
* $$ JOB JNM=EXPCODE,DISP=D,CLASS=0
* $$ LST CLASS=A
// JOB EXPCODE
// LIBDEF PHASE,SEARCH=PRD2.LEGENT
// EXEC GSPDSU
PDS=EXP,CAT=EXPLPROD.EPC
 31xxxxxxxxxxxxxxxxxx
./ END
/*
/&
* $$ EOJ
```

The 31xxxxxxxxxxxxxxxxxx is the product expiration code which you can get from Legent. It must start in column 2.

10. The last step is defining the access to EXPLORE for VSE. Since we decided to access EXPLORE for VSE through a CICS-controlled terminal, we had to define EXPLORE for VSE to CICS, in our case we used RDO (Resource Definition Online). Therefore we issued the following CICS transaction ids:

- **CEDA DEFINE TRANS(EVSE) GROUP(EXPLORE) PROGRAM(CICSEVSE) XTRANID(85A5A285)**

  This created a new group with the name of EXPLORE, and defined the transaction id EVSE within the group.

- **CEDA DEFINE PROGRAM(CICSEVSE) GROUP(EXPLORE) LANGUAGE(ASSEMBLER)**

  This defined the CICSEVSE program within the EXPLORE group.

- **CEDA INSTALL GROUP(EXPLORE)**

  This installed the EXPLORE group so that it could be used.

- **CEDA ADD GROUP(EXPLORE) LIST(VSELIST)**

  By adding EXPLORE group to the VSELIST, EXPLORE for VSE was available everytime CICS was up using the VSELIST list.

After this step, EXPLORE for VSE was then ready to use.

Following is the listing of our installation job stream:

```
 F1 001 1Q47I   BG EXPINST 00245 FROM (SYSA) , TIME=13:31:00
 BG 000 // JOB EXPINST
    DATE 04/19/94,CLOCK 13/31/00
 BG 000 // OPTION LOG,PARTDUMP,LOGSRC
 BG 000 * ------------------------------------------------------+
 BG 000 *              RO FOR VSE/ESA INSTALLATION              |
 BG 000 * ------------------------------------------------------+
 BG 000 * ------------------------------------------------------+
 BG 000 *        Q.  WHAT LIBRARY.SUBLIBRARY WILL BE USED?      |
 BG 000 *            AT THE PAUSE, ENTER A SETPARM FOR THE      |
 BG 000 *            TARGET OR RESIDENCE LIBRARY.SUBLIB WHERE   |
 BG 000 *            THE EXPLORE COMMON LIBRARY WAS INSTALLED.  |
 BG 000 *                                                       |
 BG 000 *        A.  0 SETPARM LIB=¢LIB.SUBLIB¢                 |
 BG 000 * ------------------------------------------------------+
 BG 000 // SETPARM LIB=¢LIBNAME.SUBLIB¢
 BG 000 // PAUSE ENTER ==> 0 SETPARM LIB=¢LIB.SUBLIB¢
*BG-000
 0 SETPARM LIB=¢PRD2.LEGENT¢
*BG-000 0D16D READY
 0
 BG 000 // LIBDEF PHASE,SEARCH=&LIB
 BG 000 // LIBDEF PHASE,SEARCH=PRD2.LEGENT
 BG 000 // EXEC DCMINST,SIZE=DCMINST,PARM=¢&LIB¢
 BG 000 // EXEC DCMINST,SIZE=DCMINST,PARM=¢PRD2.LEGENT¢
 BG 000 +------------------------------------------------------+
 BG 000 |             RO FOR VSE/ESA 1.3 INSTALLATION          |
 BG 000 |                                                      |
 BG 000 | YOU ARE NOW IN THE RO INSTALL GENERATION PROGRAM.     |
 BG 000 | THIS PROGRAM WILL PROMPT YOU FOR INFORMATION ABOUT    |
 BG 000 | WHAT EXPLORE PRODUCTS YOU WANT TO INSTALL. IT WILL THEN |
 BG 000 | BUILD AN INSTALL PROC IN THE RESIDENCE LIBRARY AND THIS |
 BG 000 | PROCEDURE WILL THEN BE EXECUTED.                     |
 BG 000 +------------------------------------------------------+
 BG 000 +------------------------------------------------------+
 BG 000 | ENTER TAPE DRIVE CUU FOR INSTALL.  (E.G. 280)        |
```

```
 BG 000 +-----------------------------------------------------+
*BG-000
 0 870
 BG 000 +-----------------------------------------------------+
 BG 000 | DO YOU WISH TO INSTALL                              |
 BG 000 | TO   PRD2.LEGENT
 BG 000 | FROM 870
 BG 000 | ENTER YES OR CANCEL.                                |
 BG 000 +-----------------------------------------------------+
*BG-000
 0 YES
 BG 000 +-----------------------------------------------------+
 BG 000 | DO YOU WISH TO INSTALL EXPLORE FOR VSE/ESA?         |
 BG 000 | ENTER YES OR NO.                                    |
 BG 000 +-----------------------------------------------------+
*BG-000
 0 YES
 BG 000 +-----------------------------------------------------+
 BG 000 | DO YOU WISH TO INSTALL EXPLORE FOR CICS?            |
 BG 000 | ENTER YES OR NO.                                    |
 BG 000 +-----------------------------------------------------+
*BG-000
 0 YES
 BG 000 +-----------------------------------------------------+
 BG 000 | DO YOU WISH TO INSTALL EXPLORE FOR VTAM?            |
 BG 000 | ENTER YES OR NO.                                    |
 BG 000 +-----------------------------------------------------+
*BG-000
 0 YES
 BG 000 +-----------------------------------------------------+
 BG 000 | DO YOU WISH TO INSTALL EXPLORE FOR SQL/DS?          |
 BG 000 | ENTER YES OR NO.                                    |
 BG 000 +-----------------------------------------------------+
*BG-000
 0 NO
 BG 000 +-----------------------------------------------------+
 BG 000 | DO YOU WISH TO INSTALL GSS 3.9.3 FOR VSE?           |
 BG 000 | ENTER YES OR NO                                     |
 BG 000 +-----------------------------------------------------+
*BG-000
 0 YES
 BG 000 +-----------------------------------------------------+
 BG 000 |               GSS VERSION 3.9.3                     |
 BG 000 +-----------------------------------------------------+
 BG 000 GSPDSVAM LOAD VERSION=3.9.3                 *
 BG 000 +-----------------------------------------------------+
 BG 000 | REINSTALLING VERSION 3.9.3. DO YOU WISH TO CONTINUE
 BG 000 | WITH THE GSS INSTALLATION?                          |
 BG 000 |  ENTER YES OR NO                                    |
 BG 000 +-----------------------------------------------------+
*BG-000
 0 YES
 BG 000 +-----------------------------------------------------+
 BG 000 | DO YOU WISH TO RESTORE THE PDS FILE SYS$EXP?        |
 BG 000 | ENTER YES OR NO.                                    |
 BG 000 +-----------------------------------------------------+
*BG-000
 0 YES
 BG 000 +-----------------------------------------------------+
```

```
BG 000 | INSTALL PROC GENERATED....                                  |
BG 000 +-----------------------------------------------------------+
BG 000 // LIBDEF PROC,SEARCH=&LIB,TEMP
BG 000 // LIBDEF PROC,SEARCH=PRD2.LEGENT,TEMP
BG 000 // EXEC PROC=DCMINST
BG 000 // OPTION LOG,PARTDUMP
BG 000 // SETPARM GSS=NO
BG 000 // SETPARM TAPE=870
BG 000 // PAUSE PRODUCT TAPE CONTAINING EXPLORE PRODUCTS READY ON 870 ?
*BG-000
0
BG 000 // LIBDEF PHASE,SEARCH=(PRD2.LEGENT)
BG 000 // ASSGN SYS006,870
BG 000 // ASSGN SYS005,SYS006
BG 000 1T20I  SYS005 HAS BEEN ASSIGNED TO X¢870¢ (TEMP)
BG 000 // MTC REW,SYS006
BG 000 // EXEC EVSEACHK,SIZE=EVSEACHK,PARM=¢PRD2.LEGENT¢
BG 000 /*
BG 000 // IF $RC  = 0 THEN
BG 000 1S46I  ONE STATEMENT SKIPPED DUE TO IF CONDITION
BG 000 // IF EVSEACT = NO THEN
BG 000 // GOTO SKIPTERM
BG 000 /. SKIPTERM
BG 000 *  RESTORE EXPLORE FOR VSE/ESA
BG 000 // ASSGN SYS006,870
BG 000 // EXEC MSHP,SIZE=920K,PARM=¢PIDSTACKED¢
BG 000 *  RESTORE EXPLORE FOR CICS
BG 000 // ASSGN SYS006,870
BG 000 // EXEC MSHP,SIZE=920K,PARM=¢PIDSTACKED¢
BG 000 *  RESTORE EXPLORE FOR VTAM
BG 000 // ASSGN SYS006,870
BG 000 // EXEC MSHP,SIZE=920K,PARM=¢PIDSTACKED¢
BG 000 // SETPARM INSTRC=$MRC
BG 000 // SETPARM ESQL=NO
BG 000 // SETPARM VIO=¢NONE¢
BG 000 // SETPARM VIO=¢GOOD¢
BG 000 // SETPARM MON=¢NONE¢
BG 000 // SETPARM MON=¢GOOD¢
BG 000 // SETPARM ARC=¢NONE¢
BG 000 // SETPARM ARC=¢NONE¢
BG 000 // SETPARM LOG=¢NONE¢
BG 000 // SETPARM LOG=¢NONE¢
BG 000 // SETPARM CPR=¢NONE¢
BG 000 // SETPARM CPR=¢NONE¢
BG 000 // SETPARM EXP=¢NONE¢
BG 000 // SETPARM EXP=¢GOOD¢
BG 000 // SETPARM ISM=¢NONE¢
BG 000 // SETPARM ISM=¢NONE¢
BG 000 // SETPARM VAM=¢SDL¢
BG 000 // SETPARM VAM=¢SAME¢
BG 000 // ON $RC<16 CONTINUE
BG 000 // ASSGN SYS006,870
BG 000 *  RESTORE GSS
BG 000 // EXEC MSHP,SIZE=920K,PARM=¢PIDSTACKED¢
BG 000 // ON $RC<16 CONTINUE
BG 000 // IF $RC = 0 THEN
BG 000 // GOTO GOODRC
BG 000 /. GOODRC
BG 000 // SETPARM GSS=YES
```

```
BG 000 * ------------------------------------------------------+
BG 000 *      MSHP PORTION OF INSTALLATION COMPLETE.           |
BG 000 * ------------------------------------------------------+
BG 000 // ON $ABEND GOTO CANCJOB
BG 000 // IF VAM EQ SAME THEN
BG 000 // GOTO NEXT
BG 000 /. NEXT
BG 000 // IF VIO EQ MISMATCH THEN
BG 000 1S46I  ONE STATEMENT SKIPPED DUE TO IF CONDITION
BG 000 // EXEC GSPDSU,SIZE=GSPDSU
BG 000 /*
BG 000 // IF $RC EQ 0 THEN
BG 000 1S46I  ONE STATEMENT SKIPPED DUE TO IF CONDITION
BG 000 // IF $RC NE 12 THEN
BG 000 // GOTO FORMAT
BG 000 /. FORMAT
BG 000 * ------------------------------------------------------+
BG 000 *                  GSS VERSION 3.9.3                   |
BG 000 *                                                      |
BG 000 *              FORMAT THE PDS FILE SYS$VIO             |
BG 000 *                                                      |
BG 000 *   IF THE PDS IS ALREADY FORMATTED, THIS JOB STEP WILL |
BG 000 *   SKIP AUTOMATICALLY                                 |
BG 000 *                                                      |
BG 000 * ------------------------------------------------------+
BG 000 // EXEC GSPDSU,SIZE=GSPDSU
BG 000 GPP205A FORMAT PDS=VIO,NDIR=030 ISSUED - RESPOND PROCEED TO CONTINUE
*BG-000
0 PROCEED
BG 000 /. NEXT
BG 000 // IF MON EQ MISMATCH THEN
BG 000 1S46I  ONE STATEMENT SKIPPED DUE TO IF CONDITION
BG 000 // EXEC GSPDSU,SIZE=GSPDSU
BG 000 /*
BG 000 // IF $RC EQ 0 THEN
BG 000 1S46I  ONE STATEMENT SKIPPED DUE TO IF CONDITION
BG 000 // IF $RC NE 12 THEN
BG 000 // GOTO FORMAT
BG 000 /. FORMAT
BG 000 * ------------------------------------------------------+
BG 000 *                  GSS VERSION 3.9.3                   |
BG 000 *                                                      |
BG 000 *              FORMAT THE PDS FILE SYS$MON             |
BG 000 *                                                      |
BG 000 *   IF THE PDS IS ALREADY FORMATTED, THIS JOB STEP WILL |
BG 000 *   SKIP AUTOMATICALLY                                 |
BG 000 *                                                      |
BG 000 * ------------------------------------------------------+
BG 000 // EXEC GSPDSU,SIZE=GSPDSU
BG 000 GPP205A FORMAT PDS=MON,NDIR=020 ISSUED - RESPOND PROCEED TO CONT
*BG-000
0 PROCEED
BG 000 /. NEXT
BG 000 // IF ARC EQ MISMATCH THEN
BG 000 1S46I  ONE STATEMENT SKIPPED DUE TO IF CONDITION
BG 000 // IF ARC EQ NONE THEN
BG 000 // GOTO NEXT
BG 000 /. NEXT
BG 000 // IF LOG EQ MISMATCH THEN
```

```
BG 000 1S46I  ONE STATEMENT SKIPPED DUE TO IF CONDITION
BG 000 // IF LOG EQ NONE THEN
BG 000 // GOTO NEXT
BG 000 /. NEXT
BG 000 // IF CPR EQ MISMATCH THEN
BG 000 1S46I  ONE STATEMENT SKIPPED DUE TO IF CONDITION
BG 000 // IF CPR EQ NONE THEN
BG 000 // GOTO NEXT
BG 000 /. NEXT
BG 000 // IF ISM EQ MISMATCH THEN
BG 000 1S46I  ONE STATEMENT SKIPPED DUE TO IF CONDITION
BG 000 // IF ISM EQ NONE THEN
BG 000 // GOTO NEXT
BG 000 /. NEXT
BG 000 // IF EXP EQ MISMATCH THEN
BG 000 1S46I  ONE STATEMENT SKIPPED DUE TO IF CONDITION
BG 000 // IF EXP EQ NONE THEN
BG 000 1S46I  ONE STATEMENT SKIPPED DUE TO IF CONDITION
BG 000 // EXEC GSPDSU,SIZE=GSPDSU
BG 000 /*
BG 000 // IF $RC EQ 0 THEN
BG 000 1S46I  ONE STATEMENT SKIPPED DUE TO IF CONDITION
BG 000 // IF $RC NE 12 THEN
BG 000 // GOTO FORMAT
BG 000 /. FORMAT
BG 000 * ------------------------------------------------------+
BG 000 *                    GSS VERSION 3.9.3                  |
BG 000 *                                                       |
BG 000 *              FORMAT THE PDS FILE SYS$EXP              |
BG 000 *                                                       |
BG 000 *   IF THE PDS IS ALREADY FORMATTED, THIS JOB STEP WILL  |
BG 000 *   SKIP AUTOMATICALLY                                  |
BG 000 *                                                       |
BG 000 * ------------------------------------------------------+
BG 000 // EXEC GSPDSU,SIZE=GSPDSU
BG 000 GPP205A FORMAT PDS=EXP,NDIR=010 ISSUED - RESPOND PROCEED TO CONTINUE
*BG-000
0 PROCEED
BG 000 /. NEXT
BG 000 * ------------------------------------------------------+
BG 000 *                    GSS VERSION 3.9.3                  |
BG 000 *                                                       |
BG 000 *           RESTORE THE COMMON ONLINE PDS FILES.        |
BG 000 * ------------------------------------------------------+
BG 000 // EXEC PROC=DUMMY
BG 000 /*
BG 000 EOP DUMMY
BG 000 // EXEC PROC=DCMSCRN
BG 000 * UPDATE DCM COMMON ONLINE DIALOGUE PANELS
BG 000 // EXEC GSPDSU,SIZE=GSPDSU,PARM=¢INSTALL¢
BG 000 EOP DCMSCRN
BG 000 // EXEC PROC=DCMSCRN2
BG 000 * CATALOG COMMON SCREENS
BG 000 // EXEC GSPDSU,SIZE=GSPDSU,PARM=¢INSTALL¢
BG 000 EOP DCMSCRN2
BG 000 /*
BG 000 /. ENDIT
BG 000 * ------------------------------------------------------+
BG 000 *        GSS VERSION 3.9.3 INSTALLATION COMPLETE       |
```

```
BG 000 * ------------------------------------------------------+
BG 000 /*
BG 000 /. ENDGSS
BG 000 // SETPARM EPDS=YES
BG 000 // SETPARM GSSLIB=NONE
BG 000 // SETPARM EXP=¢NONE¢
BG 000 // SETPARM EXP=¢GOOD¢
BG 000 // IF INSTRC < 8 THEN
BG 000 // GOTO RCOKAY
BG 000 /. RCOKAY
BG 000 // SETPARM PDSRC=0
BG 000 // IF EPDS EQ NO THEN
BG 000 1S46I  ONE STATEMENT SKIPPED DUE TO IF CONDITION
BG 000 * ------------------------------------------------------+
BG 000 *                      RO FOR VSE/ESA                   |
BG 000 *                                                       |
BG 000 *              FORMAT THE SYS$EXP PDS FILE              |
BG 000 *                                                       |
BG 000 *                                                       |
BG 000 *   IF THE PDS FILE IS ALREADY FORMATTED, THIS STEP      |
BG 000 *           WILL BE AUTOMATICALLY SKIPPED.              |
BG 000 *                                                       |
BG 000 * ------------------------------------------------------+
BG 000 // IF GSSLIB EQ NONE THEN
BG 000 // GOTO NOGSS
BG 000 /. NOGSS
BG 000 // IF EXP EQ MISMATCH THEN
BG 000 1S46I  ONE STATEMENT SKIPPED DUE TO IF CONDITION
BG 000 // ON $ABEND GOTO FORMAT
BG 000 // EXEC GSPDSU,SIZE=GSPDSU
BG 000 /*
BG 000 // IF $RC EQ 0 THEN
BG 000 // GOTO NEXT
BG 000 /. NEXT
BG 000 // EXEC PROC=DUMMY
BG 000 /*
BG 000 EOP DUMMY
BG 000 * ------------------------------------------------------+
BG 000 *   RESTORING THE EXPLORE REPORT WRITER ONLINE FILES.    |
BG 000 * ------------------------------------------------------+
BG 000 // EXEC PROC=ERPTSCRN
BG 000 // EXEC GSPDSU,SIZE=GSPDSU,PARM=¢INSTALL¢
BG 000 EOP ERPTSCRN
BG 000 /*
BG 000 * ------------------------------------------------------+
BG 000 *   RESTORING THE EXPLORE REPORT WRITER HELP FILES.      |
BG 000 * ------------------------------------------------------+
BG 000 // EXEC PROC=ERPTHELP
BG 000 // EXEC GSPDSU,SIZE=GSPDSU,PARM=¢INSTALL¢
BG 000 EOP ERPTHELP
BG 000 /*
BG 000 * ------------------------------------------------------+
BG 000 *    RESTORING THE EXPLORE REPORT WRITER OAL FILES.      |
BG 000 * ------------------------------------------------------+
BG 000 // EXEC PROC=ERPTOAL
BG 000 // EXEC GSPDSU,SIZE=GSPDSU,PARM=¢INSTALL¢
BG 000 EOP ERPTOAL
BG 000 /*
BG 000 /. ENDIT
```

```
BG 000 *
BG 000 * ------------------------------------------------------------+
BG 000 *                          RO FOR VSE/ESA                    |
BG 000 *                                                            |
BG 000 *                      END OF INSTALL PROCESS                |
BG 000 * ------------------------------------------------------------+
BG 000 /*
BG 000 // IF $MRC < 8 THEN
BG 000 1S46I  ONE STATEMENT SKIPPED DUE TO IF CONDITION
BG 000 // IF PDSRC = 8 THEN
BG 000 1S46I  ONE STATEMENT SKIPPED DUE TO IF CONDITION
BG 000 // IF GSS = NO THEN
BG 000 1S46I  ONE STATEMENT SKIPPED DUE TO IF CONDITION
BG 000 // IF INSTRC < 8 THEN
BG 000 // GOTO EOJ
BG 000 /. EOJ
BG 000 EOP DCMINST
BG 000 /*
BG 000 /*
BG 000 EOJ EXPINST   MAX.RETURN CODE=0008
   DATE 04/19/94,CLOCK 13/50/04,DURATION   00/19/03
```

2.3 Configuring EXPLORE for VSE

There are two panels where you can configure EXPLORE for VSE:

- Configure System Options Panel

  In this panel, we can determine how EXPLORE runs and collects data.

- Configure Online Options Panel

  In this panel, we can determine the features of EXPLORE's online monitor.

The detail explanation on how to choose the values for those configuration panels can be found in the *EXPLORE for VSE Online User's Guide* manual.

2.3.1 Configure System Option Panel

This panel determines how EXPLORE runs and collects data.

To access this panel, do one of the following:

- From the Main Menu, select Configuration: System Options
- Enter **CINT** from the command line

If we want to change any of the options, we just have to change the values in the panel and press PF3 (UPDATE), then the updates are stored permanently in the EXPLORE residence library.

The following is the Configure System Options panel with all the values we chose for our measurements:

```
EVSECINT VSESA134  CONFIGURE SYSTEM OPTIONS  A0020023     EXPLORE 6.14 13:10:49
==>                                                                   RATE
PRODCODE 31XXXXXXXXXXXXXXXXX Product expiration code
OLDPSWD           PASSWORD REQUIRED FOR CHANGE OF OPTIONS (IF DEFINED)
NEWPSWD           NEW PASSWORD
EVNTBUFF 16K      USE THIS FOR THE EVENT BUFFER SIZE
LOGFBK   YES      LOG PERFORMANCE DATA TO THE EVSEFBK FILE
LOGARC   NO       LOG PERFORMANCE DATA TO THE EVSEARC FILE
SYSTIMEI 5        MINUTE TIME INTERVAL FOR SYSTEM STATISTIC ACCUMULATION
SAMPSECS .500    SECOND TIME INTERVAL FOR SYSTEM SAMPLING
MONDISK  YES      MONITOR DISK DEVICES
MONOTHER NO       MONITOR OTHER NON-DISK DEVICES
MONSVC   NO       MONITOR SUPERVISOR CALLS
THRSHOLD NO       PERFORM THRESHOLD MONITORING
THSHMINS 05       MINUTE TIME INTERVAL FOR THRESHOLD CHECKING
POWRACCT NO       COLLECT POWER ACCOUNTING DATA
LOOPSIZE 128      BYTE RANGE FOR PSW SAMPLING LOOP DETECTION
MONRSTOR YES      MONITOR REAL STORAGE UTILIZATION
MONLTA   YES      MONITOR LOGICAL TRANSIENT AREA
SDAREA   YES       YES OR MIN USE OF THE SDAID AT THE END OF THE SUPERVISOR
SBATGVS  384K     AMOUNT OF PARTITION GETVIS TO USE INSTEAD OF SYSTEM GETVIS
                                                                     MORE +
F1=HELP                  F3=UPDATE              F5=REFRESH   F6=NOUPDATE
F7=UP       F8=DOWN                  F10=EXIT                 F12=ALTPFKEY
```

```
EVSECINT VSESA134  CONFIGURE SYSTEM OPTIONS  A0020023     EXPLORE 6.14 13:12:28
==>                                                                   RATE
PRODCODE 31XXXXXXXXXXXXXXXXX Product expiration code
OLDPSWD           PASSWORD REQUIRED FOR CHANGE OF OPTIONS (IF DEFINED)
NEWPSWD           NEW PASSWORD
MINGETVS 384      MIN K OF PARTITION GETVIS TO LEAVE FREE FOR SBATGVS OPTION
MONCCW   NO       MONITOR DEVICE CCW COMMAND USAGE
VCATCONF YES      VSAM CATALOG CONFIGURATION FOR DISK MAPPING
MONDELAY YES      MONITOR TASK DELAYS DUE TO RESOURCE CONTENTION
MONPGMLD YES      MONITOR PROGRAM LOADS
MONGETVS YES      MONITOR GETVIS USAGE









                                                                     MORE-
F1=HELP                  F3=UPDATE              F5=REFRESH   F6=NOUPDATE
F7=UP       F8=DOWN                  F10=EXIT                 F12=ALTPFKEY
```

The meaning of each option is on the panel.

We did not put in the product code since it was already included in the initialization job stream.

We set the LOGFBK option to YES and the LOGARC option to NO because we only needed the data in the flashback file for our measurements.

We set the SYSTIMEI option to five minutes instead of the default value of 15 minutes so that we could get sufficient data within a shorter period of time, a multiple of 5 minutes. Of course by making the SYSTIMEI value smaller, we increased EXPLORE′s overhead, but in our case we did that to have a more accurate value within a shorter time.

The value of SYSTIMEI is between 5 minutes and 480 minutes, and it should be a multiple of 5 minutes.

Undocumented information

The value of SYSTIMEI can be set to 1 minute.

SAMPSECS option was set to 0.500 second because we thought the default value of one second was too long to get a sample of data, we might lose some data within that one second period. But if you want to make a measurement within a long period of time, you can set the SAMPSECS value to a higher value, so that you can reduce EXPLORE′s overhead.

We set the MONDISK, MONRSTOR, MONLTA, MONPGMLD, MONGETVS, MONDELAY options to YES since we wanted to monitor disk, real storage, logical transient area, program load, GETVIS usage, and task delays respectively.

We left the rest as the default since we did not need to change them.

In some of the options, such as the MONDISK, there were more detail panels. For example after we set the MONDISK option to YES, there was another panel that had to be filled in as shown below:

```
EVSECDSK VSESA134  CONFIGURE DASD I/O        A0020023     EXPLORE 6.14 16:03:09
==>                                                                    RATE
Device   Volume   Monitor VTOC-Names VSAM-Names User-Names Seeks-by-Cyl Cache
  460    DOSRES       Y         Y          Y          N           Y        Y
  463    SYSWK1       Y         Y          Y          N           Y        Y
  465    RAMP02       Y         Y          Y          N           Y        Y
  466    RAMPCF       Y         Y          Y          N           Y        Y
  647    RAMP01       Y         Y          Y          N           Y        N
F1=HELP                    F3=UPDATE                  F5=REFRESH   F6=NOUPDATE
F7=UP        F8=DOWN                    F10=EXIT                   F12=ALTPFKEY
```

In this panel we have to put ′Y′ in the corresponding column to describe what kind of monitoring we want to activate for the specified disk. For the RAMP01 disk, we set Cache monitoring to ′N′ since it resided on a 3380 DASD.

To initialize the data collection for disk monitoring, we had to issue the **SBAT MAPDISK** command on the command line. We only had to issue this command when we changed the disk monitoring options. This is automatically done with EXPLORE for VSE version 6.3.

2.3.2 Configure Online Option Panel

This panel determines the features of EXPLORE's online monitor.

To access this panel, do one of the following:

- From the Main Menu, select Configuration: Terminal Monitor Options
- Enter **CTMO** from the command line

The following panel contains the values we chose for our measurements:

```
EVSECTMO VSESA134  CONFIGURE ONLINE OPTIONS  A0020023     EXPLORE 6.14 16:21:47
==>                                                                    RATE
VTAMAPPL EVSEAPPL VTAM APPLICATION ID
BTAMTERM YES      USE DEDICATED LOCAL TERMINALS
SECURITY NO       SECURITY IN TERMINAL MONITOR
SCRLSTOR 64K      MAXIMUM GETVIS ALLOWED FOR ONLINE SCROLLING
MAXSESSN 16       MAXIMUM NUMBER OF TERMINAL MONITOR SESSIONS ALLOWED
TIMEOUT  30       NUMBER OF SECONDS BEFORE A SCREEN TIME OUT WILL OCCUR
AUTOTIME 10       DEFAULT TIME RE-DISPLAY INTERVAL IN SECONDS
AUTOIDLE 60       MAXIMUM IDLE TIME FOR RE-DISPLAY IN MINUTES
AUTOMINM 5        MINIMUM ALLOWED TIME FOR RE-DISPLAY IN SECONDS
UPPRCASE NO       TRANSLATE ALL SCREENS TO UPPER CASE
GSSUBSYS EVSESVTM GOAL SUBSYSTEM TERMINAL MONITOR TASK









F1=HELP                  F3=UPDATE                F5=REFRESH   F6=NOUPDATE
F7=UP       F8=DOWN                   F10=EXIT                  F12=ALTPFKEY
```

On this panel, we only changed the GSSUBSYS option from DCMTDRIV to EVSESVTM. We did this so that we could use the Online Report Writer to produce the report job stream online, without having to run GSS for VSE in a separate partition. Instead we ran GSS for VSE in the same partition as the EXPLORE for VSE.

The other default values were appropriate for our measurements.

Chapter 3. EXPLORE for CICS

We also ran some CICS applications in VSE/ESA native and under VM/ESA within V=R and V=V virtual machines. In all cases the values EXPLORE for CICS where predictable and repeatable.

3.1 What is EXPLORE for CICS?

EXPLORE for CICS is a performance monitor for CICS which, as EXPLORE for VSE, provides the online monitoring function and batch reporting facilities. Batch reporting facilities include the *canned report* and user-created report.

EXPLORE for CICS records data in three VSAM files:

- The Archive File (EXPCARC)

  This file is used to log transaction data and the new data is appended to the end of this file. The default size is 100 cylinders.

- The Flashback File (EXPCFBK)

  This file is used for online reports and also to make a batch report. This file is a wrap-around file. The default size is 100 cylinders.

  EXPLORE for CICS compresses transaction data into 4096-byte records prior to writing the data to disk.

- The Online Work File (EXPCFIL)

  This is a small file, only one cylinder, with a secondary allocation of one cylinder, which is used to store information, including review data, plot lists, command lists, and replay screens.

The function of EXPCARC and EXPCFBK files is similar to the EVSEARC and EVSEFBK files in EXPLORE for VSE, but EXPLORE for VSE does not have a file which is similar to the EXPCFIL file.

You initialize EXPLORE for CICS in a dedicated partition which is called a Master Logging Region. It can be either a static or dynamic partition. In our measurement we chose dynamic partition Y1.

The CICS partition which we want to monitor is called the CICS Region or Slave Region.

EXPLORE for CICS uses a table called the Monitor Initialization Table to identify the master logging region and the CICS regions that are to be monitored. The table is in the EXPLORE for CICS residence sub library, in our case it is in PRD2.LEGENT, as a member called $MIT.P as shown below.

```
*-------------------------------------------------------------------*
*                                                                   *
*                        EXPLORE FOR CICS                           *
*                                                                   *
*                    Monitor Initialization Table                   *
*                                                                   *
*   The Monitor Initialization Table member MUST be named $MIT.     *
*                                                                   *
*   Parameter 01 - Jobname   - Jobname associated to a partition    *
*                              EXPLORE for CICS Master Logging jobname *
*                              CICS jobname                         *
*                                                                   *
*   Parameter 02 - Regionid  - Unique 2 character region id         *
*                                                                   *
*   Parameter 03 - Master    - Jobname of Master Logging entry      *
*                              This entry is responsible for logging *
*                              all data collection for this entry.  *
*                              If this entry is a Master Logging    *
*                              entry, enter the same jobname as in  *
*                              parameter 1.                         *
*                                                                   *
*   Parameter 04 - Applid    - VTAM applid.                         *
*                              Only code this parameter if the job is *
*                              to start the VTAM application driver *
*                              EXPDVTAM as a subtask.  If VTAM is not *
*                              used code the parameter BTAM.        *
*                              We suggest that this parameter is coded *
*                              on the Master Logging entry.         *
*                                                                   *
*   Parameters 1, 2, and 3 are required.                            *
*   Parameter 4 is required on one entry.                           *
*                                                                   *
*-------------------------------------------------------------------*
EXPDCICS   M1    EXPDCICS
PRODCICS   F4    EXPDCICS
CICSICCF   F2    EXPDCICS
```

Item	Description
EXPDCICS	This is the Master Logging Region's jobname
PRODCICS and CICSICCF	These are the CICS Regions jobname that are to be monitored
M1, F4, and F2	These are called the Region ID which must be unique

EXPLORE for CICS also needs a product expiration code which can be put in the member $CNFIG.P, which is called a configuration override member, in the EXPLORE for CICS residence sublibrary. Since we already put it in the SYS$EXP PDS file when we installed EXPLORE for VSE, we did not need to put it in the $CNFIG.P file.

3.1.1 Activating EXPLORE for CICS

To activate EXPLORE for CICS, you have to:

- Initialize EXPLORE for CICS in the master logging region
- Activate EXPLORE for CICS in the CICS region

3.1.1.1 Initializing EXPLORE for CICS in the Master Logging Region

To initialize EXPLORE for CICS, we ran the following job stream:

```
* $$ JOB JNM=EXPDCICS,CLASS=Y,DISP=L
* $$ LST CLASS=A
// JOB EXPDCICS
// OPTION PARTDUMP
// DLBL IJSYSUC,'VSESP.USER.CATALOG',,VSAM
// DLBL EXPCFIL,'EXPLORE.CICS.EXPCFIL',,VSAM
// DLBL EXPCARC,'EXPLORE.CICS.EXPCARC',,VSAM
// DLBL EXPCFBK,'EXPLORE.CICS.EXPCFBK',,VSAM
// ASSGN SYS005,UA          OPTIONAL DEDICATED TERMINAL
// ASSGN SYS006,UA          OPTIONAL DEDICATED TERMINAL
// ASSGN SYS007,UA          OPTIONAL DEDICATED TERMINAL
// ASSGN SYS008,UA          OPTIONAL DEDICATED TERMINAL
// ASSGN SYS009,UA          OPTIONAL DEDICATED TERMINAL
// LIBDEF *,SEARCH=(PRD2.LEGENT)
// EXEC ECDIGEN,SIZE=ECDIGEN
/*
/&
* $$ EOJ
```

This job stream would initialize EXPLORE for CICS in the dynamic partition Y1.

3.1.1.2 Activating EXPLORE for CICS in the CICS Region

We chose to use the manual way to activate EXPLORE for CICS in a CICS region by entering a CICS transaction called **EXPS**.

We could have had EXPLORE for CICS activated automatically if we had succeeded with the I9 option for the SIMODS SIT parameter when we installed EXPLORE for CICS. But since we had some problems with the SIMODS when installing EXPLORE for CICS and it didn't work when we tried to use that, we chose the manual way and did not use the SIMODS SIT parameter.

3.1.2 Deactivating EXPLORE for CICS

To shutdown EXPLORE for CICS in the master logging region, you can do one of the following:

- From the console, enter **MSG Y1**.

  Y1 is the partition of the master logging region.
- From CICS, enter transaction **EXPT**.
- From the EXPLORE for CICS online interface for that CICS region, enter **SHUTDOWN** on the command line.

3.1.3 Accessing EXPLORE for CICS

In our measurements, we accessed EXPLORE for CICS from CICS which we thought was the easiest way to do it.

To do this, we used the transaction **EXPC**, then we got the main menu of the online interface, shown below.

```
EXPLORE for CICS  6.14   D921EXPC PRODCICS CICS              94/05/11 15:27:36
==>
                                  Main Menu

              Current Activity                System Configuration
              _  /PROBLEMS                    _  /CONFIG
              _  /STATUS                      _  /EXPLORE
              _  /STORAGE                     _  /HELP
              _  /TABLES

              File Activity                   Historical Data
              _  /FILES                       _  /HISTORY
              _  /DBASE

              System Facilities               Product Interfaces
              _  /DISPLAY                     _  /LEGENT
              _  /VSE
              _  /UTILITY

      Data Center Management - EXPLORE for CICS - Resource Optimization
                  (c) Legent Software, Inc., 1985, 1993

 F1=Help      F2=          F3=Return    F4=Flshback  F5=Top       F6=Bottom
 F7=Backward  F8=Forward   F9=Auto      F10=         F11=         F12=System
```

From the main menu, you can do an online monitoring to the CICS region to look at information, such as:

- DSA Usage
- Transaction rate per second
- Program checks

Since we are not using the online monitoring feature in our measurements, it is not described in detail.

3.1.4 Reporting

You can create a batch report by either using the flashback file (EXPCFBK) or the backup of the archive file (EXPCARC).

In our measurements, we only used the flashback file (EXPCFBK) as the input file since we only needed a few days' data.

The detail description of the History Reporting feature of EXPLORE for CICS can be found in the *EXPLORE for CICS History Reporting Guide*.

Just as EXPLORE for VSE, with EXPLORE for CICS you can also create the batch reports in two ways:

1. Using a predefined *canned report*
2. Create your own commands (customized report)

3.1.4.1 Canned Report

EXPLORE for CICS provides a canned report which is a report for which the commands are already written for you so that you don't have to write your own commands if they are already enough for you. There are a few standard canned reports which contain the most commonly needed reporting information.

In our measurements, we only used EXPLORE for CICS to get the value of File I/O, therefore the CICS.FILESTAT canned report is sufficient for us.

Some of the standard canned reports are:

- TRANWAIT
- FILEWAIT
- FILESTAT
- TERMSTAT
- TRANSTAT
- CICSSTAT
- TRANFILE
- CICS.TRAN.ACCOUNTING
- CICS.TERM.ACCOUNTING
- CICS.OPER.ACCOUNTING
- CICS.USER.ACCOUNTING
- CICS.SYSTEM.STAT

Following is the sample of a canned report we created in our project:

```
* $$ JOB JNM=EXPC-CAN,CLASS=0,DISP=D
* $$ LST DISP=L,CLASS=S,FCB=$$BFCBIT
// JOB EXPC-CAN
// DLBL   EXPCFBK,'EXPLORE.CICS.EXPCFBK',,VSAM,CAT=VSESPUC
// LIBDEF *,SEARCH=PRD2.LEGENT
// EXEC EXPRPT,SIZE=EXPRPT,PARM='BANNER=NO'
LINECOUNT 120
INPUT (EXPCFBK)
TITLE1 TESTRUN V=R + LOAD
CANRPT CICS.FILESTAT
FROM 05/11/94 10:50:00
TO   05/11/94 11:24:00
EACH 5 MINUTES
END
RUN
/*
/&
* $$ EOJ
```

Figure 16. Sample Job Stream to Create a Canned Report

From the above job stream, we got the following expansion of the canned report:

```
 ERPT200I EXPRPT  6.37 INITIATED 05/18/94 13.13.18
LINECOUNT 120
INPUT (EXPCFBK)
TITLE1 TESTRUN V=R + LOAD
CANRPT CICS.FILESTAT
 ERPT237I CANNED REPORT EXPANSION
+  *********************************
+  ***                           ***
+  **  SHOW IN TABULAR FORMAT WHAT **
+  **  FILES WERE USED AND HOW     **
+  **  EACH FILE PERFORMED.        **
+  ***                           ***
+  *********************************
+  TAB FILEIDS,
+      DATASET USE,
+      AND DATASET UPDATES,
+      AND DATASET READNU,
+      AND DATASET READU,
+      AND DATASET DELETES,
+      AND DATASET ADDS,
+      AND DATASET BROWSES,
+      AND DATASET WAITS,
+      AND DATASET SOS,
+      AND DATASET PSOS,
+      AND DATASET XCL,
+      AND DATASET WBUF,
+      AND DATASET SPLITS
+
+ERPT237I END OF UNCAN EXPANSION
```

Figure 17. CICS.FILESTAT Canned Report Expansion

From the job stream, we got the following report:

FILE ID	FILE USE	FILE UPDATE	FILE READNUPD	FILE READUPDT	FILE DELETES	FILE ADDS	FILE BROWSE	FILE WAITS	SOS WAITS	PSOS WAITS	EXCL WAITS	WBUF WAITS	CI/CA WAITS
FILEB44	9462	3258	2946	3258				878			878		
FILEB11	7209	2482	2245	2482				1286			1286		
FILEB22	6431	2204	2023	2204				98			98		
FILEB55	5433	1862	1709	1862				159			159		
FILEB33	5356	1833	1690	1833				143			143		
LILEB11	3025	1020	985	1020				72			72		
LILEB22	2971	1000	971	1000				142			142		
LILEB33	2966	998	970	998				91			91		
LILEB55	2932	986	960	986				49			49		
LILEB44	2910	977	956	977				86			86		
GILEB22	2865	964	937	964				47			47		
GILEB44	2838	952	934	952				94			94		
GILEB33	2823	948	927	948				46			46		
GILEB11	2789	935	919	935				55			55		
MILEB11	2775	930	915	930				138			138		
GILEB55	2773	931	911	931				87			87		
MILEB22	2750	921	908	921				114			114		
MILEB55	2745	919	907	919				121			121		
MILEB33	2726	914	898	914				32			32		
MILEB44	2716	909	898	909				66			66		
FILEC3	2536					2536		76			76		
FILEA44	2366						2366						
FILEC1	2209					2209		475			475		
FILEA11	1941						1941						
FILEA22	1691						1691						
FILEC2	1669					1669		196			196		
FILEA55	1501						1501						
FILEA33	1426						1426						
FILEC4	935					935		174			174		
LILEA11	841						841						
LILEA22	831						831						
LILEA33	826						826						
LILEA55	816						816						
LILEA44	816						816						
GILEA22	801						801						
GILEA44	794						794						
GILEA33	791						791						
GILEA11	791						791						
GILEA55	779						779						
MILEA11	779						779						
MILEA22	776						776						
MILEA55	771						771						
MILEA33	766						766						
MILEA44	766						766						
FILED44	541		541										
FILEE44	435		435										
FILED22	355		355										
FILED11	335		335										
FILED33	304		304										
FILED55	262		262										
FILEE22	249		249										
FILEE11	228		228										
LILED33	214		214										
LILED11	214		214										
LILED55	214		214										
GILED44	211		211										
LILED22	211		211										
LILED44	211		211										
GILED33	208		208										
GILED22	208		208										
MILED11	208		208										
MILED55	208		208										
GILED55	205		205										
MILED22	205		205										
MILED33	205		205										
MILED44	205		205										
GILEE11	96		96										
SUMMARY	110K	23944	32340	25943		7349	20869	4725			4725		

Figure 18. A Sample Canned Report

3.1.4.2 Customized Report

You can create a customized report to satisfy your specific needs if you think the canned report is not enough for you.

You can find the complete list of the commands in the *EXPLORE for CICS History Reporting Guide*.

3.2 EXPLORE for CICS Installation

From the listing of the EXPLORE for VSE Installation you can see that we answered 'YES' to the question whether we wanted to install EXPLORE for CICS or not. That meant that all EXPLORE for CICS modules have already been restored in the residence sublibrary (PRD2.LEGENT). Therefore we only have to continue from there to install EXPLORE for CICS. These steps will be described below.

1. Create the EXPCARC, EXPCFBK, and EXPCFIL files which are VSAM files within which EXPLORE for CICS records data.

   We copied the sample job stream, named EXPDINST.Z from sublibrary PRD2.LEGENT and made the necessary modifications.

   The job stream is as follows:

```
* $$ JOB  JNM=EXPDINST,CLASS=0
// JOB    EXPUTIL
// OPTION LOG,PARTDUMP
// DLBL   IJSYSUC,¢VSESP.USER.CATALOG¢,,VSAM
// DLBL   EXPCFIL,¢EXPLORE.CICS.EXPCFIL¢,,VSAM
// DLBL   EXPCARC,¢EXPLORE.CICS.EXPCARC¢,,VSAM
// DLBL   EXPCFBK,¢EXPLORE.CICS.EXPCFBK¢,,VSAM
// LIBDEF *,SEARCH=PRD2.LEGENT
// EXEC   EXPUTIL,SIZE=EXPUTIL
INSTALL                        -
  FILE(EXPCFIL)                -
  NAME(EXPLORE.CICS.EXPCFIL)   -
  INPUT(NONE)                  -
  USCL(0 0)                    -
  CYL(1 1)                     -
  VOL(SYSWK1)
INSTALL                        -
  FILE(EXPCARC)                -
  NAME(EXPLORE.CICS.EXPCARC)   -
  INPUT(NONE)                  -
  USCL(0 0)                    -
  CYL(100 0)                   -
  VOL(SYSWK1)
INSTALL                        -
  FILE(EXPCFBK)                -
  NAME(EXPLORE.CICS.EXPCFBK)   -
  INPUT(NONE)                  -
  USCL(0 0)                    -
  CYL(100 0)                   -
  VOL(SYSWK1)
/*
/&
* $$ EOJ
```

Figure 19. The EXPCARC, EXPCFBK, and EXPCFIL Files Creation Job Stream

Item	Description
VSESP.USER.CATALOG	Name of our VSAM user catalog
EXPLORE.CICS.EXPCFIL	Name of the online workfile
EXPLORE.CICS.EXPCARC	Name of the archive file
EXPLORE.CICS.EXPCFBK	Name of the flashback file
PRD2.LEGENT	Name of the EXPLORE residence library.sublibrary
CYL(100 0)	Number of cylinders for the file's allocation

2. Create a Monitor Initialization Table (MIT).

   The Monitor Initialization Table is a library member called $MIT.P and it resides in the sublibrary PRD2.LEGENT.

   We modified the $MIT.P to the following:

```
*-------------------------------------------------------------------*
*                                                                   *
*                        EXPLORE FOR CICS                           *
*                                                                   *
*                    Monitor Initialization Table                   *
*                                                                   *
*   The Monitor Initialization Table member MUST be named $MIT.     *
*                                                                   *
*   Parameter 01 - Jobname   - Jobname associated to a partition    *
*                              EXPLORE for CICS Master Logging jobname *
*                              CICS jobname                         *
*                                                                   *
*   Parameter 02 - Regionid  - Unique 2 character region id         *
*                                                                   *
*   Parameter 03 - Master    - Jobname of Master Logging entry      *
*                              This entry is responsible for logging *
*                              all data collection for this entry.  *
*                              If this entry is a Master Logging    *
*                              entry, enter the same jobname as in  *
*                              parameter 1.                         *
*                                                                   *
*   Parameter 04 - Applid    - VTAM applid.                         *
*                              Only code this parameter if the job is *
*                              to start the VTAM application driver *
*                              EXPDVTAM as a subtask.  If VTAM is not *
*                              used code the parameter BTAM.        *
*                              We suggest that this parameter is coded *
*                              on the Master Logging entry.         *
*                                                                   *
*   Parameters 1, 2, and 3 are required.                            *
*   Parameter 4 is required on one entry.                           *
*                                                                   *
*-------------------------------------------------------------------*
EXPDCICS   M1    EXPDCICS
PRODCICS   F4    EXPDCICS
CICSICCF   F2    EXPDCICS
```

Item	Description
EXPDCICS	Parameter 1 - The Master Jobname
M1, F4 and F2	Parameter 2 - The Region ID
PRODCICS and CICSICCF	Parameter 3 - The CICS regions that we want to monitor

We did not use parameter 4 since we did not want to access the online interface from VTAM, instead we would do that from CICS.

3. In the normal case, we should put the product expiration code in the $CNFIG.P member in sublibrary PRD2.LEGENT, but since we already put the product expiration code in the SYS$EXP PDS file when we installed EXPLORE for VSE, we did not have to put it in $CNFIG.P. Therefore we did not change anything in the $CNFIG.P.

4. Define the transactions and programs to CICS.

   We would have been able to skip this step if we had succeeded using the I9 option for the SIMODS SIT parameter, but since we ran into some problems

when we used the SIMODS parameter, we had to define all the transactions and programs manually through RDO. The I9 option of the SIMODS SIT parameter should have added the PCT and PPT entries directly to the CICS nucleus, but failed to do so.

The following was how we defined all the transactions and programs:

- CEDA DEFINE TRAN(EXPC) PROGRAM(ECDIEXPC) GROUP(EXPCICS)
- CEDA DEFINE TRAN(EXPS) PROGRAM(ECDIEXPS) GROUP(EXPCICS)
- CEDA DEFINE TRAN(EXPW) PROGRAM(ECDIEXPW) GROUP(EXPCICS)
- CEDA DEFINE TRAN(EXPT) PROGRAM(ECDIEXPT) GROUP(EXPCICS)
- CEDA DEFINE TRAN(EXPI) PROGRAM(ECDIINIT) GROUP(EXPCICS)
- CEDA DEFINE PROGRAM(ECDEXITS) LANGUAGE(ASSEMBLER) GROUP(EXPCICS)
- CEDA DEFINE PROGRAM(ECDIEXPC) LANGUAGE(ASSEMBLER) GROUP(EXPCICS)
- CEDA DEFINE PROGRAM(ECDIEXPS) LANGUAGE(ASSEMBLER) GROUP(EXPCICS)
- CEDA DEFINE PROGRAM(ECDIEXPW) LANGUAGE(ASSEMBLER) GROUP(EXPCICS)
- CEDA DEFINE PROGRAM(ECDIEXPT) LANGUAGE(ASSEMBLER) GROUP(EXPCICS)
- CEDA DEFINE PROGRAM(ECDIINIT) LANGUAGE(ASSEMBLER) GROUP(EXPCICS)
- CEDA INSTALL GROUP(EXPCICS)
- CEDA ADD GROUP(EXPCICS) LIST(RAMPLIST)

These will create a new group called EXPCICS, install it, and add it to the list, in our case the list name is RAMPLIST.

The functions of these transactions are shown in the following table:

Transaction	Function
EXPS	To start EXPLORE for CICS in a CICS partition
EXPC	To access the EXPLORE for CICS online interface
EXPW	Internally used by EXPLORE for CICS to activate time-out limit
EXPT	To terminate EXPLORE for CICS in a CICS partition
EXPI	Internally used by EXPLORE for CICS to start the initialization program. This transaction stays in CICS until CICS is terminated.

5. Insert the following labels and search chain in our CICS startup JCL:

```
// DLBL EXPCARC,'EXPLORE.CICS.EXPCARC',,VSAM
// DLBL EXPCFBK,'EXPLORE.CICS.EXPCFBK',,VSAM
// DLBL EXPCFIL,'EXPLORE.CICS.EXPCFIL',,VSAM

// LIBDEF *,SEARCH=(PRD2.LEGENT)
```

Chapter 4. VMPRF Measurements for Comparisons

This chapter gives a short description of the usage of the CP Monitor Facility and VMPRF. The only purpose of using the VM/ESA performance measurement facilities was to be able to verify the EXPLORE for VSE figures in the different runs under VM/ESA 2.1, to compare VMPRF and EXPLORE for VSE figures, if possible and to look at the CPU utilization of EXPLORE for VSE itself.

4.1 Collecting Monitor Data

The usage of VMPRF requires the collection of monitor data in advance. Explore for VSE collects the data and provides the results online while the system is running and/or gives the possibility to create reports (as VMPRF does it for virtual machines) about the VSE/ESA system behavior. Monitor data collection in VM/ESA is done by the CP Monitor Facility. This data can be collected during VM/ESA operations and stored in a saved segment in the form of monitor records. To achieve this a saved segment must be created and a monitor writer service machine has to be set up. Monitor records are the data source for VMPRF.

CP monitor collects and reports two types of data:

- event data
- sample data

The same type of data is collected by EXPLORE for VSE. Event data is collected and reported each time a designated system event occurs. The data reported represents the status of the system at the time the event occurred. Sample data is collected and reported at the end of each designated time interval. To avoid overhead by collecting too much data the CP Monitor Facility uses two different types of sample data. This allows different time settings for each type. Such separation is not made by EXPLORE for VSE data collections. The CP Monitor Facility handles:

- Single-sample data, which is collected once at the end of each time interval. This time interval is set by the CP MONITOR SAMPLE INTERVAL command.
- High-frequency sample data, which is collected at a rate higher than it is reported. This rate is set by the CP MONITOR SAMPLE RATE command.

The system defaults for sample interval and sample rate are one minute and two seconds, respectively. To obtain a good statistical sample with higher precision, at least 50 high frequency samples per sample interval are recommended. A sample interval of one minute and a sample rate of one second should be sufficient.

All data will be written to a saved segment. Depending on which monitor domains are enabled, sample, event, or both, monitor records commence.

To start the collection of CP monitor sample records, the relevant CP MONITOR domains have to be enabled by issuing the MONITOR SAMPLE and/or MONITOR EVENT commands.

Selecting which event and sample data should be enabled depends on the VMPRF report selection and the degree of computational precision of some of the calculations. Each VMPRF report requires certain monitor data as input.

To avoid overhead (CPU load and DASD space) select as few domains as possible to collect. For the same reason set the sample interval and the sample rate settings at high values or keep the collecting time frame short and concentrate on the most important hours.

When setting the sample interval time keep in mind that VMPRF “loses” any resource usage between LOGON and the first sample after LOGON and between LOGOFF and the last sample before LOGOFF. On average, it loses data from one monitor sample interval per logon session.

VMPRF requires the user to appear in two consecutive samples before the user is reported as existing and ANY resource utilization is reported. Users with short logon sessions disappear from VMPRF′s reports. This normally will not happen to VSE/ESA guest systems.

But be aware switching off monitor domains to avoid overhead could mean that you are not able to produce all VMPRF reports you like. This is because VMPRF is a post-processing tool. You can only produce those VMPRF reports for which monitor records are available.

Guidance to select which event and sample domains should be enabled can be found in table 3 of the *VM Performance Reporting Facility User′s Guide and Reference*.

For our runs we needed only those records which are required to produce VMPRF reports which we used to compare with EXPLORE for VSE figures. The following figure shows our settings.

```
/*********************************************************************/
/*   M O N I T O R    E V E N T   S E T T I N G S   **************/
/*********************************************************************/
¢CP MONITOR EVENT DISABLE ALL¢
¢CP MONITOR EVENT ENABLE  APPLDATA ALL¢
¢CP MONITOR EVENT ENABLE  I/O CLASS DASD¢
¢CP MONITOR EVENT ENABLE  PROCESSOR¢
¢CP MONITOR EVENT DISABLE SCHEDULER ALL¢
¢CP MONITOR EVENT DISABLE SEEKS ALL¢
¢CP MONITOR EVENT ENABLE  STORAGE¢
¢CP MONITOR EVENT ENABLE  USER ALL¢
¢CP MONITOR EVENT CONFIG LIMIT 1 MINUTES¢
¢CP MONITOR EVENT CONFIG SIZE 25¢
¢CP MONITOR EVENT BLOCK 4¢
¢CP MONITOR EVENT START PARTITION 384¢
/*********************************************************************/
/*   M O N I T O R    S A M P L E   S E T T I N G S   *************/
/*********************************************************************/
¢CP MONITOR SAMPLE DISABLE ALL¢
¢CP MONITOR SAMPLE ENABLE  APPLDATA ALL¢
¢CP MONITOR SAMPLE ENABLE  I/O CLASS DASD¢
¢CP MONITOR SAMPLE ENABLE  USER ALL¢
¢CP MONITOR SAMPLE ENABLE  PROCESSOR¢
¢CP MONITOR SAMPLE ENABLE  STORAGE¢
¢CP MONITOR SAMPLE CONFIG SIZE 25¢
¢CP MONITOR SAMPLE CONFIG LIMIT 1 MINUTES¢
¢CP MONITOR SAMPLE INTERVAL 1 MINUTES¢
¢CP MONITOR SAMPLE RATE     1 SECONDS¢
¢CP MONITOR SAMPLE START¢
/*********************************************************************/
return
```

Figure 20. MONSET EXEC. This EXEC can be run by the AUTOLOG1 virtual machine.

4.2 Creating Comparable Figures

VMPRF is an IBM licensed program that provides performance management capabilities for VM/ESA (ESA Feature based) systems. It is a post-processing only tool and generates performance reports of key performance indicators. The information derived from the performance reports may be used to analyze system performance, assist in the detection and diagnosis of system performance problems and create the base for capacity planning.

The reports produced by VMPRF can be categorized as follows:

Global Monitor setup, system configuration, LPAR, and key system performance indicators.

Processor Consolidated and individual processor activities, including vector activities (not supported by VSE/ESA).

Storage Paging, expanded storage, shared segments, and data-space activities. Of interest for VM/VSE installations, if VSE/ESA is a) running as V=V and expanded storage is used for VM paging or track caching of VSE/ESA minidisks (VM/ESA 1.2.2 required) or b) VSE SQL/DS guest sharing take advantages from the SQL/DS data space feature.

Response	System response times, throughputs, and transactions.
User	Individual and user class activities.
Device	System devices and channel configurations.
I/O	Channel (physical and logical), DASD, and I/O assist, including seek and extended functions of the DASD storage controls.
VM communication	System and users IUCV and VMCF activities.
CP Service	CP system services activities.
SFS	Not useful in a VM/VSE environment without intensive CMS usage.

VMPRF requires CP monitor data to produce reports. VMPRF accesses the data and processes it to produce readable performance reports and history files that you can examine to tune your VM/ESA system.

Other user written applications may also use monitor data; the layout of monitor records is described in *VMPRF User's Guide and Reference*.

4.2.1 How it Works

The primary executable code of VMPRF comes in the form of a REXX EXEC, a TXTLIB containing various subroutines, and several files that should be tailored according to the installation requirements. VMPRF is a PL/I application and uses the PL/I Library for its execution. It runs from a virtual machine and is command driven to post-process CP monitor data from VM/ESA systems.

VMPRF provides various input parameter files which can be easily tailored to help control the following tasks:

- Types of report to generate
- Boundary conditions governing VMPRF's execution
- User or workload classifications
- User bench markings

Besides generating actual performance reports, VMPRF also produces history files. These history files, in the form of SUMMARY and TREND reports, can be used by Performance Analysis Facility/VM (5684-130), the MVS Service Level Report (5665-397), Enterprise Performance Data Manager/MVS (5695-101), or any other user-written applications, for graphical, trend, or other further analysis.

VMPRF does not require any modification to CP code for its operations.

4.3 Customization

Customization mainly means the tailoring of the following files:

- MASTER
- SETTINGS
- REPORTS
- UCLASS
- INCLUSER

- MDISKS see note
- MDISKVOL see note

Note: required only for seek analysis For a comprehensive discussion, refer to *VM Performance Reporting Facility User's Guide and Reference.*

4.4 Reports Used

There are many reports available which may give a lot of information about the behavior of the VSE/ESA systems under VM/ESA. We selected those VMPRF reports which have figures that are comparable with EXPLORE.

They were generated for a VM/ESA Version 1 Release 2 Modification level 1 system using VMPRF Version 1 Release 2 Modification level 1, with PTF UM25906 applied.

Table 3. Reports Used

Report ID	Report Name
PRF008	USER_RESOURCE_UTIL
PRF012	DASD_BY_ACTIVITY
PRF013	CHANNEL_BUSY

VMPRF is a program that provides performance management capabilities for VM/ESA systems. It has the ability to generate performance reports of key performance indicators for that environment. VMPRF is not able to produce VSE/ESA specific items such as: partition data, GETVIS usage, CICS and so on. For these VSE/ESA specific items you need a VSE/ESA performance management tool such as EXPLORE for VSE.

4.4.1 USER_RESOURCE_UTIL - PRF008

The USER_RESOURCE_UTIL, or the PRF008 report, (shown in Figure 21 on page 66) provides information about the resource utilization by individual users. User IDs are ordered by the amount of CPU consumed (but user IDs defined by the INCLUSER input parameter file are listed first). Information for each user is averaged across the period of reporting.

The field CPU Pct shows the percentage of total CPU utilization by the virtual machines. It helps to identify VSE/ESA guests that have caused momentary surges in CPU consumption resulting in a sudden slow-down in user responses.

The fields CPU Total and CPU Virtual give you the amount of CPU seconds expended by the individual users. CPU Total is the amount of CPU time the user spent doing productive work plus the time CP spent doing work on behalf of the user; for example, instruction simulation. CPU Virtual is a subset of CPU Total that gives the emulation time of the user; that is, the time when the user is doing productive work. This time can be calculated directly by Explore for VSE. EXPLORE for VSE uses the CP DIAGNOSE instruction to collect data about CP CPU cycle usage for the VSE/ESA guest and about the CPU utilization of the total system environment. We compared these values (see Chapter 6, “Summary” on page 81).

The field CPU T/V Ratio is calculated by dividing the CPU Total by the CPU Virtual values. A T/V ratio equal to one indicates that all the CPU cycles are used by the guest and no CPU cycles are needed for CP tasks. Normally, the T/V ratios for VSE guests will be between 1.05 and 1.6 depending on the virtual machine (V=R, V=F or V=V) and the availability and usage of the involved hardware and the load on the total system (especially SIE assist). An extraordinarily high T/V ratio may indicate that the VSE guest is looping on some resources causing CP to generate a large amount of overhead.

The field Storage Est WSS gives the estimated working set size of the user. This is the amount of storage that the scheduler thinks the user needs to sustain its operations. Storage Resid gives the actual amount of real storage used by the user. High values in any one these fields mean that the user has a large virtual storage defined and is executing work that may require more real storage. This could be a VSE/ESA guest system. But be aware that VM does not provide such a value for a V=R or V=F guest system. For a V=R or V=F guest these values are 0. This value helps to tune the total VM/VSE system environment, but is meaningless for tuning a VSE/ESA system under VM. It helps to define an optimal virtual machine size for the V=V guest. This size is not an absolute number for a given VSE/ESA production system. The size depends on the available real storage for paging, the storage requirements of other virtual machines and the speed of CPU and paging devices.

The following is a sample report which was used for our verification.

```
PRF008  Run 05/05/1994 10:55:24          USER_RESOURCE_UTIL                                                    Page   10
                                         Resource Utilization by User
From 05/04/1994 11:34:38                                                                          BOEVMIS1
To   05/04/1994 12:04:38                                                                          CPU 9121      SN  30477
For   1800 Secs 00:30:00                 14Mb V=V 3990 Cache with other load                      VM/ESA   21.01 SLU 9403
_____________________________________________________________________________________________________________________

        <---------CPU---------> <Vec> <-User Time-> <-DASD-> <----Storage----> <-----------Paging----------> <---Spool--->
              <-Seconds->              <--Minutes-->          <-----Pages-----> <--Slots--> <Rate wh/ Logged>
                                                                                                XSTORE     DASD          Rate   Data
                                                    Rate                                        PGIN+     Read+         While Spaces
                              T/V                  While   Est                                    PGOUT     Write Pages Logged  Owned
Userid    Pct  Total  Virt Ratio  Secs Logged Active  Logged   WSS Resid Lockd XSTOR  DASD

VSESA134 20.7   372   230   1.6     0     30     30  117.47  3435  3437     3     0   186        0      0.36     0      0      0
BIGWSS5  15.2   273    97   2.8     0     30     30    8.50  2546  1925     1     0     0        0         0     0      0      0
BIGWSS3  14.3   258    92   2.8     0     30     30    7.97  2480  1930     1     0     0        0         0     0      0      0
BIGWSS1  12.9   232    83   2.8     0     30     30    8.34  2350  1890     1     0     0        0         0     0      0      0
BIGWSS2  12.7   229    82   2.8     0     30     30    7.19  2217  1810     1     0     0        0         0     0      0      0
BIGWSS4  12.4   223    80   2.8     0     30     30    7.85  2380  1915     1     0     0        0         0     0      0      0
MAINT     1.6    28    15   1.8     0     30     19    0.10   930   932     0     0     0        0         0     0      0      0
RTMESA    0.2     3     1   3.1     0     30     30       0   900   900     0     0     0        0         0     0      0      0
VTAM      0.1     2     1   1.5     0     30     30       0   956  1025     1     0     0        0         0     0      0      0
VMSERVS   0.1     1     1   2.0     0     30     30    0.17   896   902     0     0     0        0         0     0      0      0
MONWRITE  0.0     0     0   2.0     0     30     30    0.22    91    91     0     0     0        0         0     0      0      0
DIRMAINT  0.0     0     0   1.8     0     30      4    0.05   232   232     0     0     0        0         0     0   0.00      0
DATAMOVE  0.0     0     0   1.3     0     30      2    0.01   134   141     0     0     0        0         0     0      0      0
EREP      0.0     0     0   2.4     0     30      1    0.01   661   661     0     0     0        0         0     0      0      0
OPERATOR  0.0     0     0     0     0     30      0       0   122   122     0     0     0        0         0     0      0      0
PVM       0.0     0     0   2.1     0     30      1       0   276   276     0     0     0        0         0     0      0      0
GCS         0     0     0     0     0     30      0       0    46     1     1     0    46        0         0     0      0      0
VMSERVU     0     0     0     0     0     30      0       0   914   881     0     0    34        0      0.06     0      0      0
RSCS        0     0     0     0     0     30      0       0  1161   404     1     0   758        0      0.42     0      0      0
OPERSYMP    0     0     0     0     0     30      0       0   678     0     0     0   678        0         0     0      0      0
DISKACNT    0     0     0     0     0     30      0       0   671   426     0     0   245        0      0.37     0      0      0
VMSERVR     0     0     0     0     0     30      0       0   898   898     0     0     0        0         0     0      0      0
The table above contains the top    22 of    22 items.
Sum/Mean  90.1  1622   683   2.4     0    660    327    7.18  1135   945     0     0    88        0      0.06     0   0.00      0
```

Figure 21. USER_RESOURCE_UTIL Report

4.4.2 DASD_BY_ACTIVITY - PRF012

The DASD_BY_ACTIVITY, or PRF012, report, (shown in Figure 22 on page 68) provides information on the activities of the DASD. DASD are sorted by the values in the SSCH+RSCH Plus Avoided field. The DASD with the highest SSCH+RSCH Plus Avoided value is reported first. This was in our case the VSE/ESA system residency. Be aware that VM/ESA 1.2.1 does not provide minidisk or track caching for VSE disks. Therefore there are no avoided I/Os caused by minidisk caching. The Plus Avoided values are the same as the base values in our case.

In our runs we used dedicated disks, which were SIE assisted in the V=R and V=F tests. SIE assist is not active in V=V virtual machines. Information about the number of SSCH to dedicated disks was provided if VSE/ESA was running V=V. If running V=R or V=F we did not receive this information as long as EXPLORE for VSE was also active during the CP monitor collection time. When EXPLORE for VSE was not started during this time, all I/Os, including those to the dedicated SIE assisted disks, were reported correctly by VMPRF.

The Pct Busy field tells you how heavily used your DASD volumes are.

Time Pend gives the amount of time an I/O operation waits for some busy component of the path to free. This is the channel subsystem queueing time and is generally caused by shared DASD delays, storage control busy, or channel busy conditions.

Time Disc gives the amount of time the volume is logically disconnected from the path. This value, for example, may be attributed to the time spent seeking for data or waiting for a path to free up for reconnection to the channel subsystem. For DASD connected to cache storage controls, Time Disc may be due to cache misses, resulting in data being read directly from the volumes.

Time Conn is the amount of time the DASD volume is logically connected to the path. This time is mainly search and data transfer between the DASD and storage.

Time Serv is the actual amount of time required to do an I/O operation. More precisely, it is the time from the issuing of the SSCH until the device end is received. It is the sum of Time Pend, Time Disc, and Time Conn.

The Time Resp is the estimated internal response time of the DASD. For FBA devices, Time Pend, Time Disc, Time Conn, and Time Serv would always be reported with zero values.

The same information, sorted by the device numbers, is provided in the DASD_BY_CONFIG report.

If it becomes necessary for further investigation on the performance of the DASD, you can generate seek reports for seek analysis.

Note

The SSCH+RSCH Count values for the I/O Assisted DASD, with or without Cache, were gone when EXPLORE for VSE was running and the VSE/ESA system runs as a preferred guest (V=R or V=F).

The figures were present when EXPLORE for VSE was not running.

```
PRF012  Run 05/05/1994 10:55:24          DASD_BY_ACTIVITY                                                    Page   14
                                         DASD Activity Ordered by Activity
From 05/04/1994 11:34:38                                                                          BOEVMIS1
To   05/04/1994 12:04:38                                                                          CPU 9121      SN  30477
For   1800 Secs 00:30:00                 14Mb V=V 3990 Cache with other load                      VM/ESA   21.01 SLU 9403
```

Num- ber	Volume Serial	Device Type	Control Unit	Owner	Mini-disk Links	On-line Secs	SSCH+RSCH Count	SSCH+RSCH Rate	Plus Avoided	Plus Avoid Rate	Pct Busy	Time Pend	Time Disc	Time Conn	Time Serv	Time Resp	<-SSCHs in Queue--> Mean	Queue Max	Queue Err
0460	DOSRES	3390-2	3990-3	VSESA134	0	1800	143869	79.9	143869	79.9	81.9	0.3	7.7	2.3	10.2	10.2	0	0	0
0330	IS1RES	3380-K	3880-03		182	1800	73227	40.7	73227	40.7	64.4	0.2	11.6	4.0	15.8	41.5	1.0	2.8	0
0465	RAMP02	3390-2	3990-3	VSESA134	0	1800	33664	18.7	33664	18.7	34.5	0.3	14.5	3.7	18.4	18.4	0	0	0
0647	RAMP01	3380-E	3880-03	VSESA134	0	1800	26137	14.5	26137	14.5	29.4	0.2	16.8	3.3	20.3	20.3	0	0	0
0466	RAMPCF	3390-2	3990-3	VSESA134	0	1800	7506	4.2	7506	4.2	5.6	0.3	10.8	2.5	13.5	13.5	0	0	0
0464	IS1PP1	3390-2	3990-3		28	1800	592	0.3	592	0.3	0.8	0.3	16.6	7.0	23.9	23.9	0	0	0
0463	SYSWK1	3390-2	3990-3	VSESA134	0	1800	512	0.3	512	0.3	0.3	0.3	6.6	2.2	9.0	9.0	0	0	0
0334	I21W01	3380-K	3880-03		39	1800	179	0.1	179	0.1	0.3	0.4	14.1	13.8	28.4	28.4	0	0	0
0440	DOSRES	3390-2	3990-3		0	1800	60	0.0	60	0.0	0.0	0.3	0.0	0.7	1.0	1.0	0	0	0
0441	SYSWK1	3390-2	3990-3		0	1800	60	0.0	60	0.0	0.0	0.3	0.0	0.7	1.0	1.0	0	0	0
0442	DSWWRK	3390-2	3990-3		0	1800	60	0.0	60	0.0	0.0	0.3	0.0	0.7	1.0	1.0	0	0	0
0443	IS1SPL	3390-2	3990-3		0	1800	60	0.0	60	0.0	0.0	0.2	0.0	0.7	1.0	1.0	0	0	0
0444	DOSRES	3390-2	3990-3		0	1800	60	0.0	60	0.0	0.0	0.2	0.0	0.7	1.0	1.0	0	0	0
0445	SYSWK1	3390-2	3990-3		0	1800	60	0.0	60	0.0	0.0	0.2	0.0	0.7	1.0	1.0	0	0	0
0446	DSWWRK	3390-2	3990-3		0	1800	60	0.0	60	0.0	0.0	0.3	0.0	0.7	1.0	1.0	0	0	0
0447	IS1LEN	3390-2	3990-3		0	1800	60	0.0	60	0.0	0.0	0.3	0.0	0.7	1.0	1.0	0	0	0
0461	SYSWK1	3390-2	3990-3		0	1800	60	0.0	60	0.0	0.0	0.2	0.0	0.7	1.0	1.0	0	0	0
0462	IS2PP2	3390-2	3990-3		0	1800	60	0.0	60	0.0	0.0	0.2	0.0	0.7	1.0	1.0	0	0	0
0467	IS1PPN	3390-2	3990-3		0	1800	60	0.0	60	0.0	0.0	0.3	0.0	0.7	1.0	1.0	0	0	0
0324	IS1LS1	3380-K	3880-03		0	1800	0	0	0	0	0	0	0	0	0	0	0	0	0
0325	IS1LS2	3380-K	3880-03		0	1800	0	0	0	0	0	0	0	0	0	0	0	0	0
0331	IE13EE	3380-K	3880-03		0	1800	0	0	0	0	0	0	0	0	0	0	0	0	0
0332	RAMP05	3380-K	3880-03		0	1800	0	0	0	0	0	0	0	0	0	0	0	0	0
0336	TCPIP1	3380-K	3880-03		0	1800	0	0	0	0	0	0	0	0	0	0	0	0	0
0337	TCPIP2	3380-K	3880-03		0	1800	0	0	0	0	0	0	0	0	0	0	0	0	0
0640	LSRES1	3380-E	3880-03		0	1800	0	0	0	0	0	0	0	0	0	0	0	0	0
0641	IS2VMB	3380-E	3880-03		0	1800	0	0	0	0	0	0	0	0	0	0	0	0	0
0642	LSRES2	3380-E	3880-03		0	1800	0	0	0	0	0	0	0	0	0	0	0	0	0
0643	LSRES3	3380-E	3880-03		0	1800	0	0	0	0	0	0	0	0	0	0	0	0	0
0644	IS2VMA	3380-E	3880-03		0	1800	0	0	0	0	0	0	0	0	0	0	0	0	0
0650	IS1LS3	3380-E	3880-03		0	1800	0	0	0	0	0	0	0	0	0	0	0	0	0
0655	IS1LS4	3380-E	3880-03		0	1800	0	0	0	0	0	0	0	0	0	0	0	0	0
0657	IS1LS5	3380-E	3880-03		0	1800	0	0	0	0	0	0	0	0	0	0	0	0	0
The table above contains the top 33 of 33 items.																			
Sum/Mean					8	59400	286346	159.1	286346	159.1	6.6	0.2	10.4	3.0	13.7	20.2	0.0	2.8	0

Figure 22. DASD_BY_ACTIVITY Report

4.4.3 CHANNEL_BUSY - PRF013

The CHANNEL_BUSY, or PRF013, report (shown in Figure 23 on page 70) describes the utilization of your I/O channels. From this report, you can assess whether the utilization of your I/O channels is well balanced.

The channel utilization information is presented as the percentage of time the channel is found busy. This information is presented in the Pct Chan Busy field. The relative times that the channel is found busy in various percent-busy ranges are also presented.

EXPLORE for VSE uses different parameters to collect channel busy data. On ESA hardware the EXPLORE for VSE XA channel parameter has to be used. Without ′XA′ no data is collected for XA or ESA channels.

VMPRF does not offer an option to select the number of active channels that you want included in the reports. This option helps to shorten the CHANNEL_BUSY report, often saturated with zero values, resulting from channels that physically do not exist.

To analyze the I/O subsystem, you will very often have to examine all the I/O related performance reports discussed. At times you may find that the information in these I/O reports does not give you all you want to know about your I/O subsystem. For example, information on the usage of cached storage controls by individual minidisks is not available.

For VM systems running in logical partitions (LPAR) and using ESCON* Multiple Image Facility (EMIF), VMPRF reports the utilization of the logical channels in the LPAR_CHANNEL_BUSY, or PRF100, report. This report is similar to the CHANNEL_BUSY report described above, which reports on the utilization of the physical channels.

```
PRF013  Run 05/05/1994 10:55:24          CHANNEL_BUSY                                                    Page   20
                                         Channel Busy Relative Distribution
From 05/04/1994 11:34:38                                                                  BOEVMIS1
To   05/04/1994 12:04:38                                                                  CPU 9121      SN  30477
For   1800 Secs 00:29:59                 14Mb V=V 3990 Cache with other load              VM/ESA   21.01 SLU 9403
```

Chan in Dec	Chan in Hex	Pct Chan Busy	Channel Busy Percent: 0< Busy =0	10< Busy <=10	20< Busy <=20	30< Busy <=30	40< Busy <=40	50< Busy <=50	60< Busy <=60	70< Busy <=70	80< Busy <=80	90< Busy <=90	Busy <=100
31	(1F)	13.3	0	40	50	10	0	0	0	0	0	0	0
28	(1C)	12.3	0	27	70	3	0	0	0	0	0	0	0
3	(03)	9.2	0	67	30	3	0	0	0	0	0	0	0
4	(04)	8.6	7	53	37	3	0	0	0	0	0	0	0
30	(1E)	4.6	3	97	0	0	0	0	0	0	0	0	0
29	(1D)	4.1	7	93	0	0	0	0	0	0	0	0	0
6	(06)	2.4	20	80	0	0	0	0	0	0	0	0	0
7	(07)	2.3	23	77	0	0	0	0	0	0	0	0	0
2	(02)	0.8	60	40	0	0	0	0	0	0	0	0	0
0	(00)	0	100	0	0	0	0	0	0	0	0	0	0
1	(01)	0	100	0	0	0	0	0	0	0	0	0	0
5	(05)	0	100	0	0	0	0	0	0	0	0	0	0
8	(08)	0	100	0	0	0	0	0	0	0	0	0	0
9	(09)	0	100	0	0	0	0	0	0	0	0	0	0
10	(0A)	0	100	0	0	0	0	0	0	0	0	0	0
11	(0B)	0	100	0	0	0	0	0	0	0	0	0	0
12	(0C)	0	100	0	0	0	0	0	0	0	0	0	0
13	(0D)	0	100	0	0	0	0	0	0	0	0	0	0
14	(0E)	0	100	0	0	0	0	0	0	0	0	0	0
15	(0F)	0	100	0	0	0	0	0	0	0	0	0	0
16	(10)	0	100	0	0	0	0	0	0	0	0	0	0
17	(11)	0	100	0	0	0	0	0	0	0	0	0	0
18	(12)	0	100	0	0	0	0	0	0	0	0	0	0
19	(13)	0	100	0	0	0	0	0	0	0	0	0	0
20	(14)	0	100	0	0	0	0	0	0	0	0	0	0
21	(15)	0	100	0	0	0	0	0	0	0	0	0	0
22	(16)	0	100	0	0	0	0	0	0	0	0	0	0
23	(17)	0	100	0	0	0	0	0	0	0	0	0	0
24	(18)	0	100	0	0	0	0	0	0	0	0	0	0
25	(19)	0	100	0	0	0	0	0	0	0	0	0	0
26	(1A)	0	100	0	0	0	0	0	0	0	0	0	0
27	(1B)	0	100	0	0	0	0	0	0	0	0	0	0
32	(20)	0	100	0	0	0	0	0	0	0	0	0	0
33	(21)	0	100	0	0	0	0	0	0	0	0	0	0
34	(22)	0	100	0	0	0	0	0	0	0	0	0	0
35	(23)	0	100	0	0	0	0	0	0	0	0	0	0
36	(24)	0	100	0	0	0	0	0	0	0	0	0	0
37	(25)	0	100	0	0	0	0	0	0	0	0	0	0
38	(26)	0	100	0	0	0	0	0	0	0	0	0	0
39	(27)	0	100	0	0	0	0	0	0	0	0	0	0
The table above contains the top 40 of 256 items.													
Sum/Mean		0.2	97	2	1	0	0	0	0	0	0	0	0

Figure 23. CHANNEL_BUSY Report

4.5 Evaluation of CPU Usage by EXPLORE for VSE

To find out the CPU usage by EXPLORE for VSE we made runs with and without EXPLORE for VSE. The VSE/ESA figures in Table 4 are from VMPRF during V=R runs.

Table 4. CPU Overhead EXPLORE for VSE

	With EXPLORE for VSE	**Without EXPLORE for VSE**
CPU Pct	11.4	10.4
Total CPU seconds	205	188
Virt CPU seconds	183	166

In our test we needed 1% of the CPU for EXPLORE for VSE. This brought in our case about 9% more load to the system. EXPLORE for VSE has a set amount of overhead regardless of the CPU activity. With lower CPU utilization the total CPU used by EXPLORE for VSE could be large, but as the CPU activity increases, the percentage of the EXPLORE for VSE overhead decreases. (We were informed by Legent about tests at customer sites with the total CPU% of 75% and an EXPLORE for VSE overhead in the range of 3% - 4% with extensive monitoring options active. Release 6.3 of EXPLORE for VSE will provide an option which allows to request information about the EXPLORE for VSE resource usage.)

Chapter 5. Looking into VSE

In a VM/VSE environment there are two different ways to check the behavior of the VSE guest. One way gives the view from outside, from CP, which is done by the CP Monitor Facility and the programs based on it, such as VMPRF or other tools. The other way checks the behavior from inside the VSE guest as it is done by EXPLORE for VSE. Both methods are valid, have their advantages and disadvantages, and whether both or one of them should be used depends on the individual requirements. In most cases both methods will be required, because the VM/ESA view is only able to describe the behavior of the whole virtual machine and its appearance to VM including its resource usage, but it can not monitor what is going on inside the virtual machine. On the other side it is not possible to control the behavior of other virtual machines from a VSE/ESA or other guest running under the same VM/ESA.

Depending on the methods used to sample figures, especially if there are no event figures, the values could be misleading if they are not sampled in a native VSE/ESA but in a VM/VSE environment. Therefore we ran the same VSE load native, in V=R, V=F and V=V environments under VM with and without additional users.

The following discussion tries to explain how CPU utilization, storage usage, and I/Os are seen from the outside of VSE (by VMPRF) and from the inside (by EXPLORE for VSE).

5.1 A View into VSE/ESA

During our tests with EXPLORE for VSE we also tried to verify some of the figures provided by EXPLORE for VSE which give information about what is going on inside VSE/ESA. These figures cannot be provided by VM/ESA performance tools. This means a comparison was not possible. To find out, whether the figures are influenced by other virtual machines running under the same VM/ESA, we made different runs with and without additional virtual machines.

The figures cover the following areas within VSE:

- partition activity
- storage allocations
- GETVIS
- task wait analysis
- supervisor calls

5.1.1 Partition Activity

EXPLORE for VSE provides online panels which allow to view directly the partition's activities.

History reports are not available due to the nature of that kind of actual information. However for some of the detail views history reports can be produced by specifying various variables and variable options in the reports (that is, PAGE variable class, GETVIS variable class and so on).

The Status Partition Panel displays partition performance data for jobs currently running.

The following views are available:

SUMMARY	Displays an overview of current CPU, I/O, paging, and storage statistics
PAGING	Displays detailed I/O and paging statistics
24GETVIS	Displays detailed statistics for 24-bit GETVIS storage
31GETVIS	Displays detailed statistics for 31-bit GETVIS storage
DYNGVS	Displays detailed storage statistics for dynamic GETVIS
SYSGVS	Displays detailed storage statistics for system GETVIS
OTHER	Dislays other I/O, LTA, phase load, threshold, and supervisor call (SVC) statistics
JOBACCT	Displays detailed job accounting statistics
WAIT	Displays detailed information on wait states for the job

The values provided by these displays are predictable, if VSE/ESA is running under VM/ESA.

5.1.2 Storage Allocations

As for the partition activity reports, there are online reports but no history reports available for this kind of information. Selecting storage allocations from the Status Menu will display the following screens:

```
EVSESMAP VSESA134  DISPLAY STORAGE MAP  A0010023  EXPLORE 6.14 12:55:45
==>                                                              RATE
Space  Virtual--------  Total      Pfix     Area
  Id   Begin      End   V-Size  Limit--Used Description
_ S  00000000 00070FFF    452k     0k    0k $$A$SUPX
_ S  00071000 00080FFF     64k     0k    0k SDAID AREA
_ S  00081000 00088FFF     32k     0k    0k SVA-SDL
_ S  00089000 00258FFF   1856k     0k    0k 24-BIT VIRTUAL LIBRARY
_ S  00259000 00514FFF   2800k 11168k  692k 24-BIT SYSTEM GETVIS AREA
_ S  00515000 0052FFFF    108k     0k    0k LABEL WORK AREA
_ S  00530000 0054FFFF    128k     0k    0k VPOOL FOR VIO
_ S  00550000 006FFFFF   1728k     0k    0k UNALLOCATED
_ 0  00700000 0087FFFF   1536k     0k    0k BG-NO NAME
_ 0  00880000 02EFFFFF  39424k     0k    0k UNALLOCATED
_ 1  00700000 0088FFFF   1600k   152k   52k F1-POWSTART
_ 1  00890000 02EFFFFF  39360k     0k    0k UNALLOCATED
_ 2  00700000 024FFFFF  30720k   144k   40k F2-CICSICCF
_ 2  02500000 02EFFFFF  10240k     0k    0k UNALLOCATED
_ 3  00700000 00CFFFFF   6144k  1024k  792k F3-VTAM600
_ 3  00D00000 02EFFFFF  34816k     0k    0k UNALLOCATED
_ 4  00700000 02EFFFFF  40960k  1024k   16k F4-PRODCICS
_ 5  00700000 007FFFFF   1024k     0k    0k F5-NO NAME
_ 5  00800000 02EFFFFF  39936k     0k    0k UNALLOCATED
_ 6  00700000 0077FFFF    512k     0k    0k F6-NO NAME
```

```
_ 6  00780000 02EFFFFF  40448k     0k    0k UNALLOCATED
_ 7  00700000 0077FFFF    512k     0k    0k F7-NO NAME
_ 7  00780000 02EFFFFF  40448k     0k    0k UNALLOCATED
_ 8  00700000 012FFFFF  12288k     0k    0k F8-NO NAME
_ 8  01300000 02EFFFFF  28672k     0k    0k UNALLOCATED
_ 9  00700000 0077FFFF    512k     0k    0k F9-NO NAME
_ 9  00780000 02EFFFFF  40448k     0k    0k UNALLOCATED
_ A  00700000 0077FFFF    512k     0k    0k FA-NO NAME
_ A  00780000 02EFFFFF  40448k     0k    0k UNALLOCATED
_ B  00700000 0077FFFF    512k     0k    0k FB-NO NAME
_ B  00780000 02EFFFFF  40448k     0k    0k UNALLOCATED
_ Z1 00700000 0071FFFF    128k     0k    0k Z1-DYNAMIC-GETVIS
_ Z1 00720000 00BFFFFF   4992k     0k    0k Z1-EVSEINIT
_ S  02F00000 02F0AFFF     44k     0k    0k 31-BIT VIRTUAL LIBRARY
_ S  02F0B000 02F18FFF     56k     0k    0k SYSTEM GETVIS CONTROL AREA
_ S  02F19000 02FFFFFF    924k    16k   16k 31-BIT SYSTEM GETVIS AREA
```

By selecting the individual storage area with the cursor and pressing the enter key the contents of the virtual storage will be displayed. Here again there were no differences between the various environments.

5.1.3 Monitoring GETVIS

The GETVIS function of EXPLORE for VSE is used to analyze both the system and the partition GETVIS storage usage and to determine the GETVIS consumption for each task.

5.1.3.1 GETVIS Data

To be able to display the system GETVIS, the following configuration options must be set.

- On the Configure System Options panel, MONGETVS must be set to YES.

- On the Configure GETVIS panel, SMONTYPE must be set to FULL or MINIMUM.

To be able to display partition GETVIS data, the following configuration options must be set.

- On the Configure System Options panel, MONGETVS must be set to YES.

- On the Configure GETVIS panel
  - PMONTYPE must be set to FULL or MINIMUM.
  - PARTID must specify the ID of the partition to be monitored. Only one partition can be monitored at a time.

Depending on the RATE/COUNT setting on the GETVIS panels the storage amounts displayed on the panels in the GETVIS function are displayed in kilobytes (RATE) or in Bytes (COUNT).

5.1.3.2 GETVIS Events

GETVIS events are collected and stored in the event buffers. When these buffers are filled, the events are processed and the control blocks and panel displays are updated. The time required to fill the buffers, depends on the activity of the system. If the system has a low activity, recent GETVIS events may not be displayed immediately, as the event buffer must be filled before the panels are refreshed.

5.1.3.3 Orphaned Storage

Orphaned storage is storage that remains allocated even after a task goes to end-of-step. Some programs, by design, for example some VSE/ESA subpools (their names start with ″I″), do not free their storage but keep the storage address for future reference and use. EXPLORE for VSE has a subtask, that starts, maps out the data set names on the disk and terminates. This subtask does some LOCK requests, therefore some storage entries are allocated for subpool ILCKSP. Since the subtask terminated, it meets the definition and is called orphan. Do NOT free this storage, it will be freed, if the storage is no longer needed.

In other cases storage is not freed because of an error in a program. Unintentionally orphaned storage wastes GETVIS and causes a fragmentation of the GETVIS area.

Storage that is currently orphaned can be displayed online by partition, job, step, or task name. The storage address, length, time allocated, subpool name, location, and job, step, and task name are logged and can be reported using the history report writer or viewed online with the flashback facility. If you know for sure that a piece of system GETVIS storage was left in error the GETVIS monitor allows you to free it.

5.1.3.4 Freeing System GETVIS Storage

WARNING! Normally you should not try to free orphaned storage at least not in a production system.

Be extremely careful when freeing storage. Some programs use orphaned storage by design, and freeing this orphaned storage can have unpredictable results - even hard waits.

From any GETVIS Storage Detail panel, take the following steps to free system GETVIS storage:

1. Enter F in a margin input field next to the storage you want to free. The following prompt is displayed at the bottom of the panel: VERIFY FREE STORAGE REQUEST AND PRESS <ENTER>

2. Ensure that you have selected the correct storage to free and press ENTER. To cancel the request, press CLEAR.

5.1.3.5 The GETVIS Status Panel

The GETVIS Status panel displays current and total statistics on 24-bit and 31-bit GETVIS storage usage, and is the gate to the other GETVIS panels.

To display data on the GETVIS Status panel, SMONTYPE must be set to FULL or MINIMUM or PMONTYPE must be set to FULL or MINIMUM on the Configure GETVIS panel.

The Status GETVIS panel has the following views:

- 24CURRENT, which displays data about 24-bit GETVIS storage from the last SYSTIMEI interval up to the current time
- 31CURRENT, which displays data about 31-bit GETVIS storage from the last SYSTIMEI interval up to the current time
- 24TOTAL, which displays data about 24-bit GETVIS storage from the time that GETVIS monitoring was activated to the present time
- 31TOTAL, which displays data about 31-bit GETVIS storage from the time that GETVIS monitoring was activated to the present time

Pressing PF12 or PF13 allows toggling between the above views.

Information Fields

The first line on the GETVIS Status panel displays the name of the active panel view and the time interval for the system GETVIS data displayed.

The following information is displayed about system GETVIS usage:

Requests The number of successful requests for GETVIS storage

Used The amount and percentage of GETVIS storage used

Subpool The amount and percentage of GETVIS storage in the subpool

Reserved The subpool that is reserved for additional requests

Total Size The total size of the GETVIS storage area

Max Used The maximum amount and percentage of GETVIS storage used

The same information is displayed for partition GETVIS usage if partition GETVIS monitoring is active.

5.1.4 GETVIS Function - History Reports

For the monitored GETVIS usage both a canned report as well as a customized report can be produced using the history report writer - which is supplied with EXPLORE for VSE.

The following variables are printed, using the supplied canned report called VSE.GETVIS.STAT, by partition and job:

- VSE GETVIS MAXUSED
- VSE GETVIS MAX%USED
- VSE GETVIS USED
- VSE GETVIS %USED

A sample output can be found in the *RO EXPLORE for VSE Version 6.1 History Reporting Guide*, chapter 5.

More variables both for partition and system GETVIS can be selected for customized reports. They are well described in chapter 7 of the *RO EXPLORE for VSE Version 6.1 History Reporting Guide* manual and can be found under:

- GETVIS Variable Class for partition GETVIS
- SGETVIS Variable Class for system GETVIS

We compared all the figures of the native runs with runs (same jobstream) under VM and could not find differences. This means all those figures give also valid values, if the VSE/ESA system runs V=V, V=R or V=F as a guest under VM/ESA 2.1.

5.1.5 Task Wait Analysis

The Status Task Wait Analysis panel displays the current status of all tasks in the system and the last SVC issued for all tasks. Therefore no history reports are available.

Following is a sample output screen from task wait analysis:

```
EVSESTWA VSESA134  STATUS TASK WAIT ANALYSIS A0040023     EXPLORE 6.14 1
==>                                                                   R
  Task ID/Name   Wait Code   Last SVC issued
_ AR-20 AR-TASK  80 NOTACTIV 033 FORCE TASK SELECTION
_ BG-21 ASSEMBLY 82 WAITBND  007 WAIT FOR THE POSTING OF CCB OR TECB
_ F1-22 IPWPOWER 82 WAITBND  007 WAIT FOR THE POSTING OF CCB OR TECB
_ F2-23 DFHSIP   82 WAITBND  029 WAIT ON MULTIPLE EVENTS
_ F3-24 ISTINCVT 82 WAITBND  007 WAIT FOR THE POSTING OF CCB OR TECB
_ F4-25 DFHSIP   82 WAITBND  029 WAIT ON MULTIPLE EVENTS
_ F5-26 NO NAME  82 WAITBND  NO SVC EVER ISSUED
_ F6-27 ASSEMBLY 54 SV3BND   014 END A JOB
_ F7-28 ASSEMBLY 82 WAITBND  007 WAIT FOR THE POSTING OF CCB OR TECB
_ F8-29 $JOBACCT 82 WAITBND  007 WAIT FOR THE POSTING OF CCB OR TECB
_ F9-2A NO NAME  82 WAITBND  NO SVC EVER ISSUED
_ FA-2B NO NAME  82 WAITBND  NO SVC EVER ISSUED
_ FB-2C NO NAME  82 WAITBND  NO SVC EVER ISSUED
_ Z1-2D EVSESBAT 82 WAITBND  029 WAIT ON MULTIPLE EVENTS
_ F1-4D IPW$$LS  82 WAITBND  NO SVC EVER ISSUED
_ F3-4E VTAMRP   82 WAITBND  029 WAIT ON MULTIPLE EVENTS
_ F3-4F ISTPDCLU 82 WAITBND  NO SVC EVER ISSUED
_ F3-50 ISTINMLS 82 WAITBND  NO SVC EVER ISSUED
```

Any of the displayed tasks can be selected with the cursor. When the enter key is hit, the status task wait events panel is displayed showing more detailed information.

The following information is displayed for a selected task:

- The last monitored supervisor call issued and the location in storage where it was executed
- The current PSW and registers from the task save area

- The storage around the currently active PSW

- The last channel queue request, start I/O or SSCH, and I/O interrupt issued

Although the information provided can be used to identify bottlenecks in the systems dispatching mechanism, in our opinion it is rather more useful to debug an application program or to analyze a hardware problem.

In both the native as well as the various VM/VSE environments the information displayed is valid. There was no impact of VM/ESA on the mentioned figures in the various runs.

5.1.6 Supervisor Calls (SVC Usage)

With EXPLORE for VSE you can monitor all valid SVCs to determine if an SVC is causing a performance problem. To reduce the overhead of monitoring and to keep the data to inspect to a manageable size we suggest the following steps.

Action	Menu
1. Switch MONSVC to YES	CONFIGURE SYSTEM OPTIONS Menu
2. Turn on the monitoring for all SVCs by typing Y next to the SVC code	CONFIGURE SVC Menu
3. Run your system and application	
4. During your test runs select Status	MAIN Menu
5. Select SVC Usage	STATUS Menu
6. From the List displayed select the SVCs you really want to monitor.	STATUS SUPERVISOR CALLS Menu
7. Go back to the CONFIGURE SVC menu and select the respective SVCs	

With this it is possible to concentrate on those SVCs which may cause the performance problem. With the help of either the online panels or the supplied canned report ″VSE.SVC.STAT″ a determination of the problem originator should be possible.

5.1.6.1 Supervisor Calls (SVC Usage) - History Reports

For the monitored SVC usage both a canned report as well as a customized report can be produced using the history report writer - which is supplied with EXPLORE for VSE.

The following variables are printed, using the supplied canned report called VSE.SVC.STAT

- VSE SVC HEXCODE
- VSE SVC NAME
- VSE SVC DESCRIPTION
- VSE SVC COUNT
- VSE SVC COUNT PCT
- VSE SVC COUNT RATE

A sample output can be found in the *RO EXPLORE for VSE Version 6.1 History Reporting Guide*, chapter 5.

There is also a Variable Class (SVC Variable Class) available for customized reports. This is described in chapter 7 of the *RO EXPLORE for VSE Version 6.1 History Reporting Guide* manual and can be found under *"*SVC Variable Class*"*.

There was no difference in the monitoring or reporting of SVCs in our test runs for the various VM/VSE and VSE environments.

Chapter 6. Summary

The following summarizes the results of our tests, regarding the evaluation of comparable EXPLORE for VSE and VMPRF values. (All EXPLORE for CICS values were usable independent of whether we measured them in a native VSE/ESA or VM/VSE environment. Therefore they are not listed in the following table).

Table 5. Selected Explore for VSE Values Seen Under VM/ESA

Value	**if VSE/ESA 1.3 is running under VM/ESA 2.1**
I/O	usable
I/O count	usable
I/O rate	usable
Service Time	usable
Device busy	usable
Channel busy	usable
CPU	
CPU virt.	usable
CPU real	see note 1.
CPU %active	usable
CPU % Supervisor	usable
CPU % problem	see note 2.
CPU seconds	usable
VM %TTIME	see note 3.
SVC's	usable
Partition activity	usable
Task wait analys.	usable
Storage	
RSTOR %used	reports size of the virtual machine
Storage Alloc	all values always usable
GETVIS	usable
Page I/o	usable
Page rate	usable

Note 1. Values not consistent. Legent recommends to use virt. CPU values.

Note 2. Problem state values were consistent when running in V=R or V=F virtual machines. With V=V and additional load on the VM system the values became unpredictable. A fix will be available from Legent.

Note 3. These values changed, if other virtual machines were executing at the same time. The problem was reported to Legent.

6.1.1 Storage Utilization

If VSE is run as a V=R or V=F guest, then VSE has its own storage and VMPRF does not have to make additional storage calculations. The storage area specified in the directory is for the guest usage only. How this storage is used can only be seen from the inside. Explore for VSE provides the real storage size ″**RSTOR SIZE**″, which is the same as the size of the virtual machine for the VSE/ESA system, and it also provides a figure about the used storage ″**RSTOR %USED**″. In most of the cases this value will be 100%, because all allocated storage is seen as used by EXPLORE for VSE. Only when there is no load which can make use of the available storage will this value be smaller. Under VM/ESA this would indicate, that the size of the virtual machine is too large. Detailed information about the storage usage by partitions or jobs can be seen on the online panels provided by EXPLORE for VSE.

The real storage used for a V=V guest is normally not as high as the virtual machine size (depending on the available total storage and the storage requirements of other guest systems). VMPRF calculates the used storage by checking the allocated frames in real storage. Seen from EXPLORE for VSE there is no difference between a V=R, V=F or V=V guest. The storage size defined in the directory is always seen as the VSE real storage size. As for a V=R or V=F system, the EXPLORE for VSE online panels provide detailed information about the storage usage by partitions.

6.1.2 CPU Utilization

VMPRF provides figures about the virtual CPU time for a VSE guest and the total CPU time. The virtual CPU time is time used by VSE for its own work. The total CPU time adds all directly related CP overhead to the virtual CPU time.

EXPLORE for VSE provides the CPU time for the VSE system. This includes the CPU time used by EXPLORE for VSE itself. The new EXPLORE for VSE Release 6.3 will provide a new command which allows to present figures about the resource usage of EXPLORE for VSE. If running under VM or in an LPAR Legent recommends not to use the ″**CPU REAL**″ but the ″**CPU VIRTUAL**″ values. In our tests under VM/ESA we compared the ″**CPU VIRTUAL**″ values with the VMPRF virtual CPU value for the VSE/ESA virtual machine. The results of our tests confirm the recommendation.

The sample CPU values for ″% **active**″ (the sum of ″% **supervisor**″ and ″% **problem state**″) were consistent in all V=R and V=F runs. Running V=V with other virtual machines running at the same time, the %problem state value grew and became meaningless. The same problem would occur, if VSE runs in an LPAR. The reason the problem state grows in an active VM/LPAR environment is that the variable uses sampling to determine CPU activity. When the sampling (SAMPSECS) interval expires, the PSW is sampled to see if it was active and if so whether problem or supervisor state is active. In a native environment a sample would occur every SAMPSECS. In a VM/LPAR environment, VM or PRSM may not dispatch every SAMPSECS thus producing less samples. After VM/PRSM interrupts an active VSE machine and when it redispatches it, a SAMPSECS interval is likely to occur thus showing the CPU as busy when in fact it has been in a VM/PRSM ready to run state.

The ″**VM %TTIME**″ or ″**LPAR %TTIME**″ values show the total CPU time. If there was additional load on the system, produced by other virtual machines, we could

not find a match with the VMPRF figures concerning the virtual guest or the total CPU.

6.1.3 Channel and DASD I/Os

EXPLORE for VSE allows a counting or sampling of all I/Os produced by VSE/ESA activities. Running VSE/ESA under VM/ESA does not influence the sampling or counting. Running with or without dedicated and SIE assisted disks, in V=R, V=F or V=V virtual machines, EXPLORE for VSE will always provide the correct number of I/Os. (Number of I/Os, I/O rate, device busy, service time, and channel busy figures were evaluated in our runs.) EXPLORE for VSE can be used in VSE/ESA systems running on /370 and XA or ESA hardware.

Note: Do not forget to provide the XA parameter, if your system uses XA or ESA channels. Otherwise, there is no channel information provided, if the system is running on XA or ESA hardware.

The equivalent numbers measured with VMPRF were nearly identical, even with sample values. This means, in all runs with or without other virtual machines running under VM/ESA we could rely on the EXPLORE for VSE figures.

6.1.4 Native VSE/ESA System Performance Figures

EXPLORE for VSE is a performance measurement tool for VSE/ESA. This means it provides information which can be used for tuning a VSE/ESA system, for capacity planning, for evaluation of system problems and for controlling the VSE/ESA system behavior during execution time. All our runs show that the values of the following measurements are reliable independent of whether VSE/ESA was running native or under VM/ESA:

- partition activity
- storage allocation
- GETVIS
- Task wait analysis
- Supervisor calls

Neither the virtual machine type (V=R, F or V) nor the execution of other virtual machines influenced these values.

6.1.5 Required Information from VM/ESA

All information regarding the VSE/ESA system itself can be taken from EXPLORE for VSE. The figures provided by EXPLORE for VSE should be sufficient for the tuning and control of a VSE/ESA system running native on the hardware, in an LPAR or under VM/ESA. But there is more information needed to tune a whole VM/ESA system with multiple guest and CMS virtual machines. Such information cannot be provided by a performance measurement tool running in one guest under VM. To receive these kind of figures a VM/ESA performance measurement tool is required. These tools provide information about the behavior of all virtual machines related to their system resource usage. They also provide information about the CP effort needed to let the virtual machines execute and to schedule or dispatch them. (As for example: SIE assist usage, CP interception and interrupts, CCW translation, relation to other virtual machines, CP work done for the guest ...).

List of Abbreviations

GCS	Group Control System
HSA	Hardware Storage Area
RAMP-C	Requirements Approach to Measuring Performance in COBOL
TPNS	Teleprocessing Network Simulator
VM/ESA	Virtual Machine/Enterprise Systems Architecture
VMPRF	VM Performance Reporting Facility
VSE/ESA	Virtual Storage Extended/Enterprice Systems Architecture

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Special Characters

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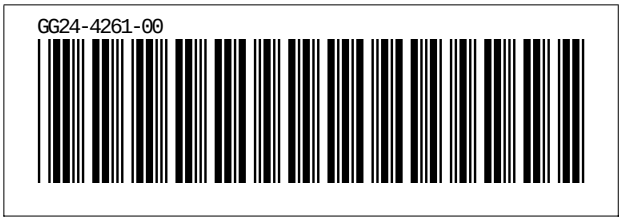

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Processing Options

Runtime values:

Document fileid	GG244261 SCRIPT
Document type	USERDOC
Document style	IBMXAGD
Profile	EDFPRF30
Service Level	0029
SCRIPT/VS Release	4.0.0
Date	94.09.16
Time	04:24:26
Device	3820A
Number of Passes	3
Index	YES
SYSVAR D	YES
SYSVAR G	INLINE
SYSVAR V	ITSCEVAL

Formatting values used:

Annotation	NO
Cross reference listing	YES
Cross reference head prefix only	NO
Dialog	LABEL
Duplex	YES
DVCF conditions file	(none)
DVCF value 1	(none)
DVCF value 2	(none)
DVCF value 3	(none)
DVCF value 4	(none)
DVCF value 5	(none)
DVCF value 6	(none)
DVCF value 7	(none)
DVCF value 8	(none)
DVCF value 9	(none)
Explode	NO
Figure list on new page	YES
Figure/table number separation	YES
Folio-by-chapter	NO
Head 0 body text	Part
Head 1 body text	Chapter
Head 1 appendix text	Appendix
Hyphenation	NO
Justification	NO
Language	ENGL
Layout	OFF
Leader dots	YES
Master index	(none)
Partial TOC (maximum level)	4
Partial TOC (new page after)	INLINE
Print example id's	NO
Print cross reference page numbers	YES
Process value	(none)
Punctuation move characters	.,
Read cross-reference file	(none)
Running heading/footing rule	NONE
Show index entries	NO
Table of Contents (maximum level)	3
Table list on new page	YES
Title page (draft) alignment	RIGHT
Write cross-reference file	(none)

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