Third/Fourth Quarter, 1998

IBM

VSE/ESA
Software Newsletter

News and information for VSE/ESA customers and vendors

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Contents

Editor's Note

News That's "Fit to Print"

Welcome to Issue 17 of the *VSE/ESA Newsletter*! As always, I want to express my personal thanks to all contributors. Our readers benefit from the time you took – the work you did – to provide us with this information.

In this issue, we've again addressed topics that go beyond VSE stand-alone environments. Thus it also contains articles about "webifying" VSE applications in a VM and VSE environment, VSE performance as a VM guest, and the new Auto UNIX System that was announced in September. I believe the *Newsletter* must inform you about solutions like these, too, in order to help you make the right kind of IT and business decisions for your business and its goals.

If you are an IBM customer, a provider of applications for VSE, or an IBM employee and you want to publish an article, then we welcome you with "open arms"! The rules for publishing it in the *Newsletter* are simple:

- Contact me using my e-mail address, and describe the topic that you'd like to address.

- The Editorial Board will consider the article's benefit to our readers and then either accept or reject it for the *Newsletter*.

- What should articles cover? I think the answer is: "That's up to you." We're going to be as open and unbiased as possible.

- Naturally, the accuracy of articles you submit is your responsibility, not IBM's. But that's business as usual.

If you are interested in contributing an article for the next issue, please contact me no later than **February 1, 1999**. Thanks!

Joel Hermann (jhermann@de.ibm.com)

New Issue of the S/390 Bulletin

The November 1998 issue of the *S/390 Bulletin* has a large number of articles of interest to VM and VSE users. In the "Product News" section, these include:

- "S/390 Integrated Server – Small And *Powerful!*"
  Klaus Bergmann, IBM Böblingen Laboratory

- "Serve Up CICS Data With IpServer For CICS!"
  David Kennedy, Data 21

- "News Bits for VM/ESA"
  Denny Refsnider and Tom Mayer, IBM Endicott

- "News Bits for VSE/ESA"
  Jerry Johnston, IBM Böblingen

In the "Customer Success" section, I'm especially proud to have these articles:

- "From Hours To Seconds – Success With SnapShot At HOMAG AG And BG Chemie"
  Anette Stolvoort, "Ms. IBM Worldwide"

- "e-business Day And Night At Häfele GmbH & Co"
  Hans-Jürgen Rehm, IBM Stuttgart

- "Columbia Enery Group Turns Up The Heat With VM:DB"
  Stacey Tompkins, Sterling Software, Inc.

- "Multiprise 2000 Helps Coleman College Interconnect Multiple Platforms"
  Jill Schafer and Julie Wade, Coleman College

- "Fusion, Not Fission, At West Valley"
  John Brown, IBM Salt Lake City

- "Leveraging Existing Resources – The Story Of An Australian Intranet"
  Neale Ferguson, TAB Ltd.

- "HBG Sees The Forest – Not The Trees!"
  Friedrich Hahn, IBM Munich

- "Insuring Business Goals With State-Of-The-Art IBM Technology"
  Friedrich Hahn

- "VSE/ESA And Wilken Financials At Kolb Wellpappe"
  Anette Stolvoort

If you would like a printed copy of the November issue, please send me an e-mail that contains your complete postal ("snail-mail") address. It and other issues also are available at:

   http://www.s390.ibm.com/bulletin/

VM and VSE on the Web

VSE/ESA Home Page

Besides the *VSE/ESA Newsletter*, S/390 and VSE Development also support a VSE/ESA home page. The site is not "fancy," but it does have a wide range of information about VSE and VSE-related products from IBM and other vendors. Check out: **http://www.s390.ibm.com/vse/**

VM/ESA Home Page

VM Development has an excellent home page that is maintained by Pam Christina and Brian Wade of IBM Endicott. There's a wealth of information and is a *must* for VM users: **http://www.vm.ibm.com/**

VM and VSE Business Unit Home Page

Earlier this year, IBM formed a new VM and VSE "business unit" in order to provide additional support to its customers with one or both of these S/390 operating systems. To learn more, access: **http://www.s390.ibm.com/vmvse/**

Main Technical Articles

VSE/ESA Version 2 Release 4 Announced

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└──────────────────────────────────────┘

Thousands of companies all over the world rely on VSE's sturdy batch and industrial-strength online transaction processing capabilities for near 24-hours-a-day, 365-days-a-year availability. VSE/ESA Version 2 Release 4 – announced on September 29 – continues the tradition of proven, thrifty solutions by offering **CICS Transaction Server for VSE/ESA**, new **security options**, and **IXFP/ShapShot for VSE/ESA**.

Meeting Today's Challenges

VSE/ESA Version 2 Release 4 (VSE/ESA V2.4) is Year 2000 ready and supports the euro currency symbol.[1] VSE/ESA V2.4 also offers VisualAge 2000 tools such as IBM Opti-Audit, VisualAge COBOL Millennium Language Extensions (MLE)[2], and more.

Your investment acquiring and learning these tools will pay off many times over. In addition to easing your Year 2000 efforts, they can be useful for adapting to the euro, preparing for a possible future migration to OS/390, or simply improving the productivity of your VSE system. They are *not* tools and skills to be "thrown away" once Year 2000 has come and gone.

Meeting Tomorrow's Challenges

CICS Transaction Server for VSE/ESA is new with VSE/ESA V2.4. Chris Smith's article (starting on page 12) reviews this advanced CICS product, which is based on OS/390 technology.

You also have new security options with VSE/ESA V2.4. For CICS signon and transaction ID protection, a new Basic Security Manager is delivered at no extra charge. If you used CICS resource level security or if you have growing, more-demanding security needs, VSE/ESA V2.4 offers CA-Top Secret for VSE/ESA – a full-function security manager. CA-Top Secret is an optional, priced product shipped with V2.4.[3]

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[1] Euro support is described in Gerhard Schneidt's article, which starts on page 37.

[2] For more information about MLE, see Graham Hannington's article, "COBOL and PL/I Millennium Language Extensions" on page 46.

[3] Security in VSE/ESA V2.4 is discussed in the articles by Klaus-Dieter Wacker ("VSE/ESA 2.4.0 Security – Overview" on page 23) and Helmut Hellner and Jörg Schmidbauer ("VSE/ESA 2.4.0 Security – Implementation Details" on page 28).

Doing e-business with VSE/ESA V2.4

Maybe you want to use your VSE system as a server for browser-based Internet/intranet solutions. Using VSE this way in a "two-tier" implementation leverages your investment in S/390 data, applications, skills, and hardware.

- IBM TCP/IP for VSE/ESA enables open connectivity and supports interoperability via the "socket" programming interfaces. It offers common TCP/IP applications such as file transfer (FTP client and server), terminal emulation (Telnet client and TN3270 server), print distribution and serving (LPR/LPD), basic Web serving, and VSE file serving (NFS).

- CICS Transaction Server for VSE/ESA will contain the CICS Web Interface and 3270 Bridge. They allow easy Web access to your CICS applications, services, and data.

You have additional options for "three-tier" solutions. For example, your Web server already may be an OS/2, AIX, or Windows NT system. Here your VSE system can function as an application, data, or print server. IBM has flexible middleware such as CICS Universal Clients V3, CICS Transaction Gateways V3, MQSeries V2, and Net.Data to help you implement such solutions. If you run VM/ESA, you also can exploit VM-based e-business solutions.

Other Enhancements

VSE/ESA V2.4 includes new releases of High Level Assembler, the HLASM Toolkit, and DITTO/ESA. New VSE optional products include DL/I VSE V1.11 and MQSeries V2.[4] Also note that BTAM/ES now is an optional product, instead of being in the base system.

VSE/ESA V2.4 supports the complete range of robust, scalable, and cost-effective S/390 servers. At the entry level is the new S/390 Integrated Server. In the middle is the S/390 Multiprise 2000 with its reliable internal disk and modern connectivity via Open Systems Adapter 2. At the high-end is the S/390 Parallel Enterprise Server - G5, simply the best mainframe on the market today.

IXFP/SnapShot for VSE/ESA

If you have requirements for high performance, large-capacity, available DASD, take a look at IBM RAMAC Virtual Array Storage (RVA). VSE/ESA V2.4 supports the unique SnapShot capability of RVA to make high speed copies of data in seconds. If you have a batch window constraint, RVA can help make your online systems available nearly around-the-clock. IXFP/SnapShot for VSE/ESA also will be available for VSE/ESA V2.3.1 starting this December.

Additional Information

The IBM Announcement Letter for VSE/ESA V2.4 is **298-372**. For IXFP/SnapShot for VSE/ESA, it is **298-296**. Availability of VSE/ESA Version 2 Release 4 is planned for June 25, 1999.

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4 See the article by Simon Davitt and David Pugh, "MQSeries for VSE/ESA V2.1 – What's New?" on page 41.

VSE/ESA 2.4.0 – A Technical Introduction

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A New CICS for VSE/ESA

VSE/ESA 2.4.0 is a major VSE/ESA release that provides a new CICS/VSE code base (new version) with new functionality (such as shared data tables) and improved integrity by exploiting ESA/390 architecture. The new **CICS Transaction Server for VSE/ESA 1.1** (**CICS TS VSE/ESA 1.1**) has the same code base as CICS/ESA 4.1 (in OS/390).

Some highlights of CICS TS VSE/ESA's functionality are:

- Extensive Virtual Storage Constraint Relief (VSCR)

- 24 and 31-bit CICS, Read-only, Shared and User Dynamic Storage Areas (DSAs)

- Extended CICS/VSE Application and System Programming Interfaces (API and SPI)

- A Front End Programming Interface (FEPI)

- An external call interface for batch calls to CICS applications

- CICS Web Interface (CWI), which provides direct access to CICS applications from the World Wide Web (available after GA).

- System management enhancements, including Resource Definition Online (RDO) for files

- ESA/390 Subsystem Storage Protection (SSP)

- Shared data tables

The articles by Chris Smith, Klaus-Dieter Wacker, Helmut Hellner, and Jörg Schmidbauer (pages 12 through 36) describe CICS TS VSE/ESA and the security environment which it uses. This article has some overview information about these and other topics.

VSE/ESA 2.4.0 – Supported Environments

All VSE/ESA 2.4.0 interfaces provided for CICS TS VSE/ESA are only available with the Turbo Dispatcher. Therefore, the Standard Dispatcher ("old Dispatcher") can no longer be IPLed.

The Turbo Dispatcher runs on any S/390 uni- or multiprocessor. VSE/ESA 2.4.0 can be used on S/390 processors only.

VSE/ESA 2.4.0 – CICS Coexistence Environment

Besides new functionality, the major difference to CICS/VSE 2.3 is that CICS TS VSE/ESA no longer provides macro level CICS interfaces. Thus users have to adapt old macro level-based applications to command level. For that purpose, both CICS TS VSE/ESA and CICS/VSE 2.3 may run within one VSE/ESA 2.4.0 system. Such an environment is called a "CICS coexistence environment."

Figure 1 illustrates the CICS coexistence environment. In it, you can:

- Run CICS/VSE 2.3 and CICS TS VSE/ESA 1.1 independently,
- Connect CICS/VSE 2.3 and CICS TS VSE/ESA 1.1 via MRO, and
- Migrate CICS/VSE 2.3 applications to CICS TS VSE/ESA 1.1.

The coexistence environment also may be an option for you because:

- CICS TS VSE/ESA does not support BTAM/ES, RPG II, DOS PL/I, and C/370.
- The Interactive Interface only runs on CICS TS VSE/ESA.

Two DL/I releases may be concurrently active in the coexistence environment – DL/I for CICS/ESA 2.3 and DL/I 1.11. The latter has been adapted for CICS TS VSE/ESA.
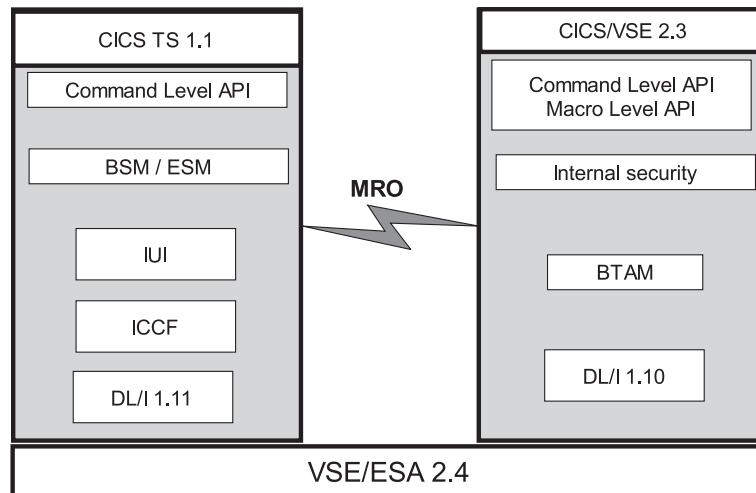
Figure 1. CICS Coexistence Environment

VSE/ESA 2.4.0 – Security

CICS TS VSE/ESA no longer provides (CICS) internal security. To allow signon and transaction security, VSE/ESA 2.4.0 thus offers a **Basic Security Manager** (**BSM**). If you want to have more security functions than BSM provides, then you can install an **External Security Manager** (**ESM**) from another software vendor.

CICS TS VSE/ESA uses RACROUTE calls ported from OS/390 (part of the MVS System Authorization Facility) to communicate with the BSM. The SAF calls a Security Manager, which can be VSE/ESA's BSM or an ESM.

During IPL, you can select the BSM or an ESM via new IPL SYS parameters (ESM=). After IPL, the selected Security Manager is activated (BSM as default),

and the **Security Server** is started. VSE/POWER is started after the Security Server, since it does not control the Security Server.

The VSAM Control File is the central security user profile repository for batch (IPL SYS SEC=YES) and online. Security user profiles can be maintained by the Interactive Interface's *Maintain User Profiles* dialog or a batch utility. Resource definitions for batch security (SEC=YES) are kept in the DTSECTAB (security table, as known in VSE/ESA 2.3). VSE/ESA introduces a new security table, **DTSECTXN**, which holds transaction-related security information. Access to the VSAM Control File is done by the Security Server.

Note: Improved security for VSE/POWER spool entries also has been enabled in VSE/ESA 2.4 via a new VSE/POWER SET parameter.

Figure 2 shows how the Security Manager gets control. Figure 3 on page 8 illustrates Basic Security Manager interaction for batch and online.
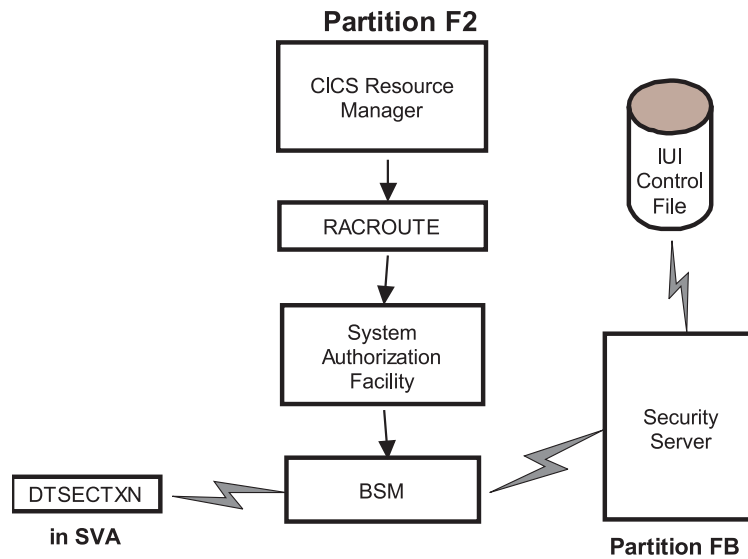
Figure 2. How the Security Manager Gets Control

Batch

CICS TS
1.1

BSM

BSM

XPCC

MRO

Security
Server

CICS TS
1.1

BSM

XPCC

VSE/ICCF
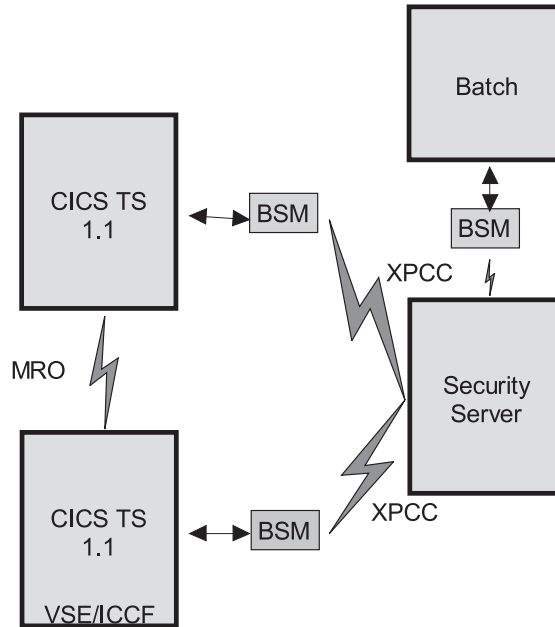
Figure 3. BSM Interaction for Batch and Online

VSE/ESA 2.4.0 – OS/390 Emulation

The VSE/ESA 2.4.0 Supervisor provides new interfaces for CICS TS for VSE/ESA:

1. OS/390 control blocks,

2. OS/390 system services, such as:

   a. Cross-memory services
   b. Locking services
   c. Program retrieval services
   d. ESTAEX recovery services
   e. Security services
   f. Storage management services (GETMAIN, FREEMAIN, STORAGE)
   g. Tasking services
   h. Timer services

3. Interfaces to exploit new hardware features.

OS/390 control blocks have to be allocated for every partition in which CICS TS VSE/ESA runs. To avoid wasting storage for non-CICS TS VSE/ESA partitions, VSE/ESA 2.4.0 introduces an **OS/390 Emulation Environment**. It can be started with the job control EXEC card:

```
// EXEC <program name>,OS390
```

where **OS390** indicates that the emulation environment has to be initialized before the application is started. For example, OS/390 control blocks like OS/390 ASCB, TCB or RB are allocated, initialized, and maintained. From then on, the application runs in "OS/390 Emulation Mode". In emulation mode, OS/390 services like `ATTACHX`, `WAIT`, `POST`, `ENQ`, and `DEQ` can be used. The OS/390 `ECB` format also is supported. These services are implemented as requested by CICS TS VSE/ESA and are *not* available for general use.

CICS TS VSE/ESA may execute `CICS SVC 150` to process supervisor-like functions. A few OS/390 services like GETMAIN, FREEMAIN, STORAGE, and RACROUTE are available in non-OS/390 emulation mode, too. During end-of-maintask processing, OS/390 Emulation Mode is deactivated and OS/390 control blocks released. These services are available for use by CICS TS VSE/ESA and vendor products.

ESA/390 Exploitation

To access servers (resources) located in an address space different from the CICS TS VSE/ESA address space (partition), CICS TS VSE/ESA uses **space switching Program Call (PC-ss)**. Such servers include the **CICS Data Management Facility (DMF) server** and the **CICS TS VSE/ESA shared data table server**.

A CICS TS VSE/ESA task (partition) calls a Program Call routine via PC-ss, which is located in a different address space (for example, the DMF server address space). As long as a PC routine is executed in a different address space, that task is running in **cross-memory mode** (**x-mem**). The PC routine is executed under the caller's task. Cross-memory mode has some restrictions, (for example, SVCs are not allowed).

ESA/390 architecture provides PC-ss. VSE/ESA 2.4.0 offers the services to establish the cross-memory environment (which were ported from OS/390). Figure 4 shows a cross-memory environment. Figure 5 on page 10 is an example of how such an environment can be exploited.
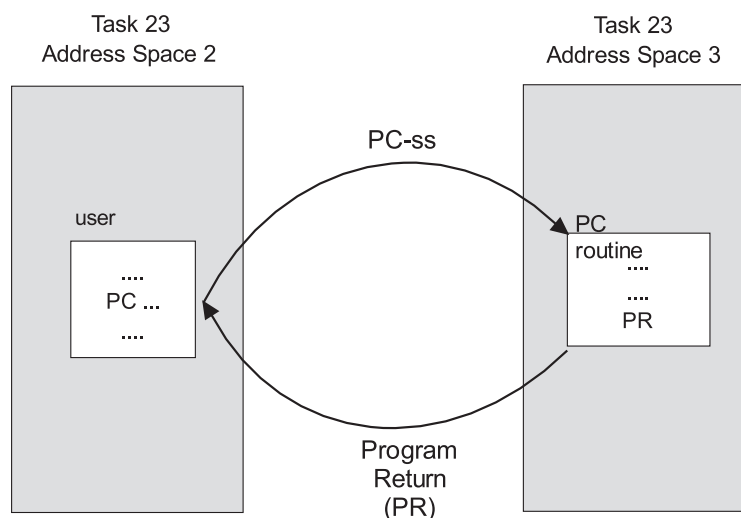
Figure 4. Cross-Memory Environment
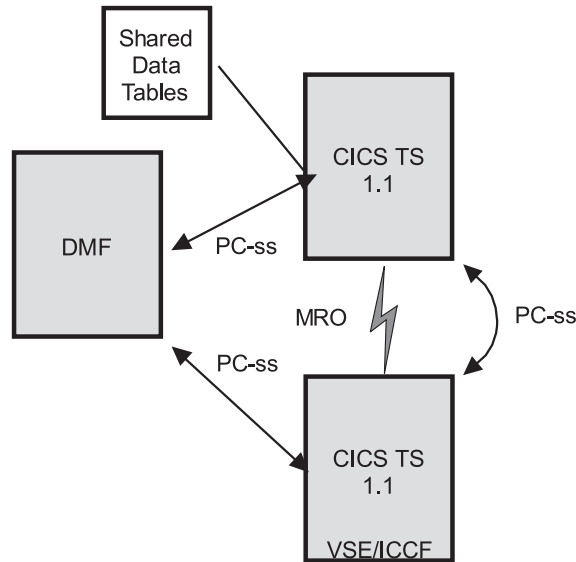
Figure 5. Exploiting a Cross-Memory Environment

For improved integrity, CICS TS VSE/ESA exploits **ESA/390 Subsystem Storage Protection** (**SSP**), where a task with any key may store into key 9 storage. CICS TS VSE/ESA allows CICS application programs to be defined to run in PSW key 9.

CICS TS VSE/ESA system code runs in its partition key. Thus the CICS TS VSE/ESA nucleus and data areas are protected and cannot be destroyed by programs defined to run in PSW key 9. If storage protection is requested when running in F4, startup for CICS TS VSE/ESA will be canceled.

VSE/ESA 2.4.0 – Planning and Installation

As stated earlier, the Turbo Dispatcher (which runs on uni- and multiprocessors) is the only supported VSE/ESA 2.4.0 dispatcher. Only S/390 processors are supported. Fast Service Upgrade (FSU) to VSE/ESA 2.4 from prior releases is *not* possible.

When you do *not* exploit new capabilities, you may see the additional CPU time requirements for VSE/ESA 2.4.0, as shown in Figure 6 on page 11.

5 - 10 %

VSE/ESA 2.3
Standard
Dispatcher
CICS/VSE 2.3

VSE/ESA 2.3
Turbo Dispatcher
CICS/VSE 2.3

up to 5 %

VSE/ESA 2.4
(Turbo Dispatcher)
CICS TS 1.1

VSE/ESA 2.4
(Turbo Dispatcher)
CICS/VSE 2.3

5 - 10 %
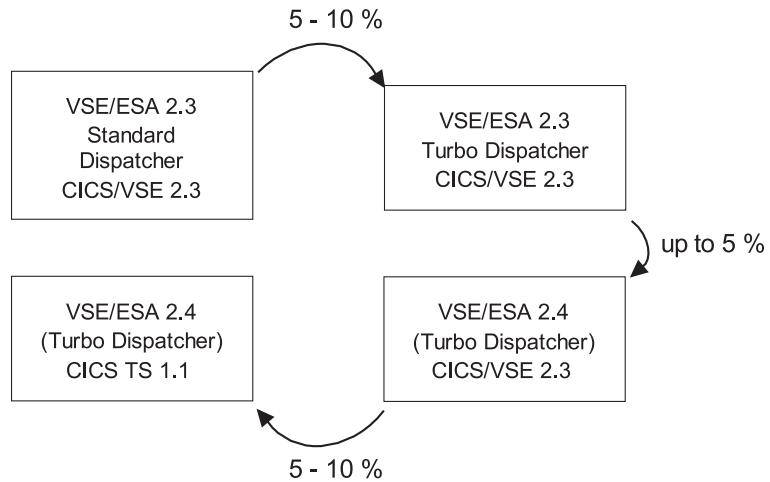
Figure 6. Additional CPU Requirements for VSE/ESA 2.4.0

You also will need additional disk space and VSIZE for the predefined environments:

- Environment A = small environment
- Environment B = large environment (has allocations for 2 CICS TS VSE/ESA systems and one CICS/VSE 2.3 system)
- Environment C = unattended node

Automatic installation only is available for CICS TS VSE/ESA. CICS/VSE 2.3 may be installed from the extended base tape, if needed. A shared CICS CSD file for CICS TS VSE/ESA and CICS/VSE 2.3 can be implemented. BTAM/ES now is on the optional product tape.

Additional Information

VSE/ESA 2.4.0 is a major new release with a new CICS code base. This release improves OS/390 affinity, application portability, CICS application/system programming interfaces, system management, and the reliability and integrity of the CICS system. For more information, read:

- "Introducing CICS Transaction Server for VSE/ESA" on page 12,

- "VSE/ESA 2.4.0 Security – Overview" on page 23, and

- "VSE/ESA 2.4.0 Security – Implementation Details" on page 28.

Introducing CICS Transaction Server for VSE/ESA

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└──┘

CICS Transaction Server for VSE/ESA Announced

On 29 September 1998, IBM formally announced CICS Transaction Server for VSE/ESA (CICS TS VSE/ESA). This is a significant milestone in the continuing evolution of CICS on the VSE/ESA platform, providing major enhancements, increased affinity with CICS on OS/390, and a foundation for the future. The details of the announcement are in IBM Announcement Letter number **298-373**.

CICS Transaction Server for VSE/ESA Version 1 Release 1 is planned for General Availability[5] with VSE/ESA Version 2 Release 4 in June 1999.

CICS Transaction Server for VSE/ESA is a significant product for a number of reasons:

- It delivers a brand new version of CICS/VSE, which is based on the proven strengths of CICS for MVS/ESA Version 4.1. These include:

    – Increased reliability and availability,
    – Enhanced and new application support,
    – Enhanced system management, and
    – New network computing and e-business support.

- It provides increased affinity and compatibility with CICS on OS/390.

- It includes CICS Server, CICS Client and CICS Gateway function in one product package.

- It offers the CICS "coexistence" environment, whereby CICS/VSE Version 2 Release 3 and the new CICS version can run concurrently in the *same* VSE/ESA system.

CICS Transaction Server for VSE/ESA Product Package

As depicted in Figure 7 on page 13, CICS Transaction Server for VSE/ESA Release 1 contains the following major components delivered as a single product package, with a single price, and with single Terms and Conditions:

- **CICS Transaction Server for VSE/ESA Base** – the new version of CICS, which is based on CICS for MVS/ESA V4.1 and also includes some code from CICS Transaction Server for OS/390.

- **CICS/VSE V2.3** – the current release, which also is designated as the coexistence release. It will continue to be supported by IBM and will run concurrently in the same VSE/ESA Version 2 Release 4 system as the new CICS version.

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5 General Availability excludes the CICS Web Interface and the 3270 Bridge. The availability of these two functions will be announced at a later date.

- **Report Controller** – a previously priced feature of VSE/ESA, which now will be supplied in two versions (one to work with CICS TS VSE/ESA and one to work with CICS/VSE V2.3).

- **CICS Universal Clients V3** – a new product, which runs on all popular desktops to provide client access to CICS servers. It offers a number of enhancements over the existing CICS Clients V2 product, which it replaces.[6]

- **CICS Transaction Gateway V3** – a new product, which is designed to run on Web servers to provide access to CICS servers from a Web browser or a Network Computer. It enhances and replaces[7] both the existing CICS Internet Gateway and the CICS Gateway for Java.

The new product packaging structure for CICS on the VSE/ESA platform follows the structure used for CICS Transaction Server for OS/390, providing increased consistency across the CICS family.
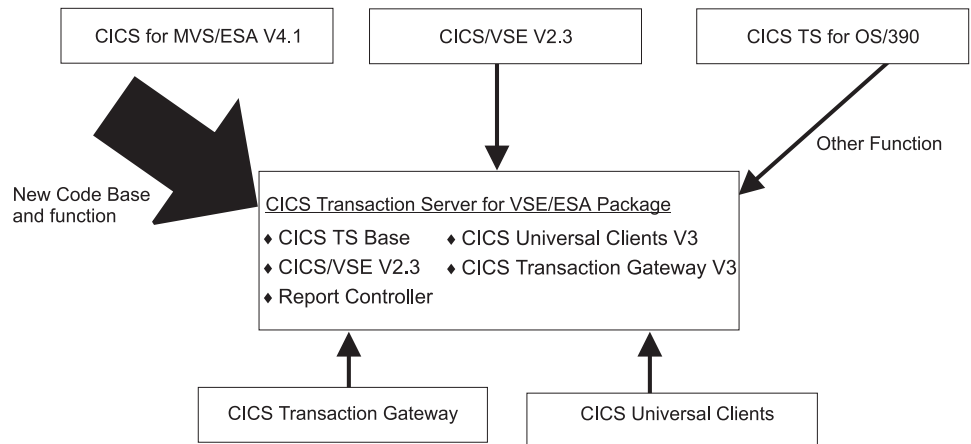
Figure 7. The CICS Transaction Server for VSE/ESA Product

CICS Transaction Server for VSE/ESA – Base Product Overview

Summary
This major new version of CICS for VSE/ESA provides key enhancements and new function across a broad range of areas, as summarized in Figure 8 on page 14. Significant value and benefits are offered with CICS Transaction Server for VSE/ESA. The overall CICS TS VSE/ESA environment, including the coexistence environment, is illustrated in Figure 10 on page 18.

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6 The CICS Clients Version 2 will remain available.

7 The CICS Internet Gateway and CICS Gateway for Java also will remain available.

```
Connectivity, Network Computing and e-business
 ◆  MRO enhancements                            ◆  CICS Transaction Gateway
 ◆  CICS Universal Clients                      ◆  CICS Web Interface (CWI)
```

```
Application Support                             System Management
 ◆  Shared Data Tables                           ◆  RDO enhancements, including support for files
 ◆  API enhancements                             ◆  Auto install for programs, mapsets, partitionsets
 ◆  Global User Exit enhancements                ◆  Data Management Facility
 ◆  Exit Programming Interface (XPI)             ◆  Monitoring and Statistic enhancements
 ◆  External CICS Interface (EXCI)               ◆  Dump and Trace enhancements
 ◆  Front End Programming Interface (FEPI)       ◆  Automatic journal archiving
 ◆  Common Programming Interface (CPI-C)         ◆  Dynamic Transaction Routing enhancements
 ◆  3270 Bridge                                  ◆  In-Doubt Window Resolution Utility
 ◆  Report Controller enhancements               ◆  External Security Manager support
 ◆  SPI enhancements                             ◆  Sysgen removal
```

```
Availability
 ◆  Storage Protection           ◆  APPC (LU6.2) Persistent Verification        ◆  DTB Failure
 ◆  VTAM Persistent Sessions     ◆  Intersystem Session Queue Management           Recovery
```

```
New Restructured CICS Code Base from CICS for MVS/ESA V4.1
 ◆  Improved code quality, reliability
 ◆  Extensive Virtual Storage Constraint Relief   ◆  31-bit support
                                                  ◆  Dynamic DSA management
```

Figure 8. CICS Transaction Server for VSE/ESA – Enhancements and New Function

New Code Base

CICS TS VSE/ESA has a new internal architecture that is designed to help
VSE/ESA customers meet ever-increasing business demands and workload growth.
This is achieved by using the proven restructured code base from CICS for
MVS/ESA Version 4.1.

The new code base was produced using modern software engineering techniques,
and the restructured CICS code improves quality, reliability, serviceability and takes
advantage of the extended addressing capabilities of S/390 and VSE/ESA for full
31-bit support – as well as protecting and extending customer investment in CICS

With the restructure, the CICS internal architecture now consists of a number of
domains, as illustrated in Figure 9 on page 15. Domains are functionally isolated
parts of CICS that communicate with the rest of the system – and with external
applications – by means of strictly-defined, standard internal interfaces. This
improves the reliability of CICS, makes problem determination easier, and limits the
effects of program failures.
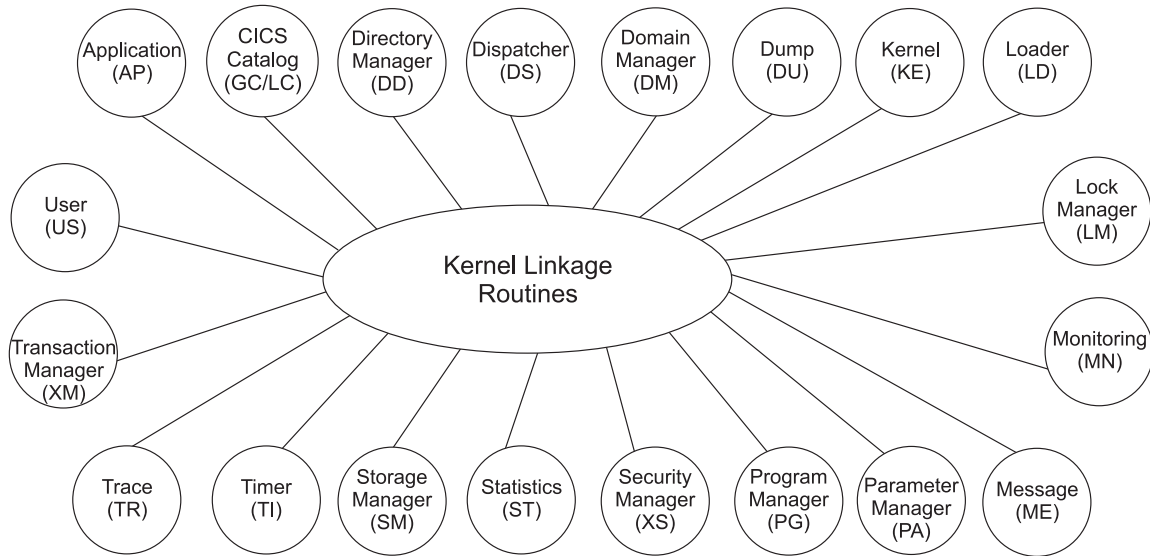
Figure 9. CICS Transaction Server for VSE/ESA – Internal Domain Architecture

An important benefit of the re-engineering of the CICS code is **extensive Virtual Storage Constraint Relief**, which enables application and workload growth. Most of the CICS nucleus and control blocks are now moved above the 16MB line, as well as a large number of VTAM control blocks.

As part of the restructure, there are also **major enhancements to Dynamic Storage Area (DSA) management**. First of all, the number of DSAs has been increased from one to eight. There are now four below the 16MB line and four equivalent DSAs above it (the **Extended DSAs**).

DSAs are used for CICS programs and data (the CSDA and ECSDA), user programs and data (the UDSA and EUDSA), shared data (the SDSA and ESDSA), and read-only reentrant programs (the RDSA and ERDSA). The new DSA structure provides increased flexibility in allocating storage areas for CICS and user programs and data and is used in storage protection.

Secondly, there is now dynamic management of DSAs. The size of the DSAs is managed within limits defined via System Initialization parameters, thus removing the need to restart CICS to change DSA sizes. Improved storage management algorithms are employed to handle storage stress conditions – the objective of which is to reduce the likelihood of a lack of storage (causing CICS to stall) and to avoid the major disturbances previously caused by program compressions.

Availability

As well as the inherent increase in reliability that is part of the new restructured code base, several other enhancements have been made which improve system availability. These are:

- The **ESA/390 Subsystem Storage Protection** feature is exploited to prevent CICS code or control blocks from being accidentally overwritten by application errors. In addition, Read-Only protection for applications is provided via a new Dynamic Storage Area where reentrant programs can be loaded and protected. A third storage protection option prevents CICS API commands receiving data into storage areas which the application does not have access to.

- **VTAM Persistent Sessions** support improves usability for end users in the event of a CICS failure in that they get an indication of the failure and do not have to re-establish sessions. This support also enables faster restart of Terminal Owning Regions (TORs) and is an alternative to XRF.

- **Intersystem Session Queue Management** provides new mechanisms for handling queuing bottlenecks on ISC and MRO links between CICS regions. This is achieved via specification of limits to CICS and via a new global user exit that allows early detection of problems by a user-written program.

- **APPC LU6.2 Persistent Verification** enables a single signon to a remote host to remain valid over multiple conversations, which reduces overheads and improves performance.

- **Dynamic Transaction Backout Failure Recovery** enables recovery from Dynamic Transaction Backout (DTB) failures and removes the need to restart CICS.

These enhancements result in increased system availability with less unplanned downtime, providing an even more dependable system and better service to end users.

Application Support

Many enhancements and exciting new capabilities have been provided in the area of application support:

- **Shared Data Tables** extends CICS file control and is an enhanced replacement for the data tables facility in CICS/VSE V2.3. This new support exploits S/390 data spaces and cross-memory services, offering improved performance for VSAM file browse and read-only operations. It supports both browse and imprecise key read operations and allows files to be shared between multiple CICS regions in the same VSE/ESA system with good performance, full integrity, recovery, and availability.

- **Application Programming Interface (API) enhancements** include new security commands, the ability to write journal records, a file control option for multiple concurrent READ-UPDATE operations, and the ability to determine MRO or APPC conversation state information.

- **Global User Exits enhancements** give increased flexibility for customization. This includes several new exit points (such as those for Interval Control, Journal Control, Temporary Storage, and Statistics) and the introduction of a standardized calling interface.

- The **Exit Programming Interface (XPI)** is introduced for use in Global User Exits so that the functions of CICS can be extended in new ways. The XPI uses the services of the new CICS domains and consists of a set of calls to servicing domains, which requires that the exit program be fully reentrant. There are over 30 calls, including Suspend, Resume, Wait, Change Priority, Take System or Transaction Dump, and Load and Delete programs.

- The **External CICS Interface (EXCI)** provides a new interface which allows a CICS application to be called from a non-CICS program, such as a VSE/ESA batch program. This could be used, for example, to update files with integrity while online to CICS, to open and close files, or to disable and enable transactions.

- The **Front-End Programming Interface (FEPI)** provides a new interface to allow a CICS program to simulate a 3270 terminal to access back-end systems. The back-end system may be a CICS system running on VSE/ESA or OS/390, or an IMS system. The back-end application remains unchanged. This supports, therefore, a flexible way of extending or integrating such back-end applications without requiring them to be modified.

- The **Common Programming Interfaces - Communications (CPI-C)** is an IBM SAA programming interface which is introduced to provide an alternative to the existing CICS APPC support. Through it, APPC networks that include multiple different system platforms could benefit from the consistency of a common platform-independent API.

- The **3270 Bridge** provides an interface to run 3270-based CICS transactions from other than a 3270 terminal. For example, an end-user application executing outside of the CICS environment could use the Internet or MQSeries to access a CICS 3270 application, which remains unchanged. When used with the CICS Web Interface (CWI), the 3270 Bridge can provide access from a Web browser to existing CICS applications.

- **Report Controller enhancements** include Forms Control Buffer (FCB) specification at the terminal definition level, report SKIP command processing is aligned with VSE/POWER, and the Browse panel is now enabled for national language translation. Also, Double Byte Character Set (DBCS) data can be viewed in the Browse display panel.

- **Significant System Programming Interface (SPI) enhancements** mean that the SPI now provides a command-level equivalent of all CEMT master terminal function. This has been achieved via new INQUIRE, SET and PERFORM commands, plus new options on existing commands. There are also new CREATE and DISCARD commands for dynamic resource definition.

These significant enhancements and new capabilities open up new opportunities for extending existing applications and developing new ones to meet today's ever-increasing business demands.
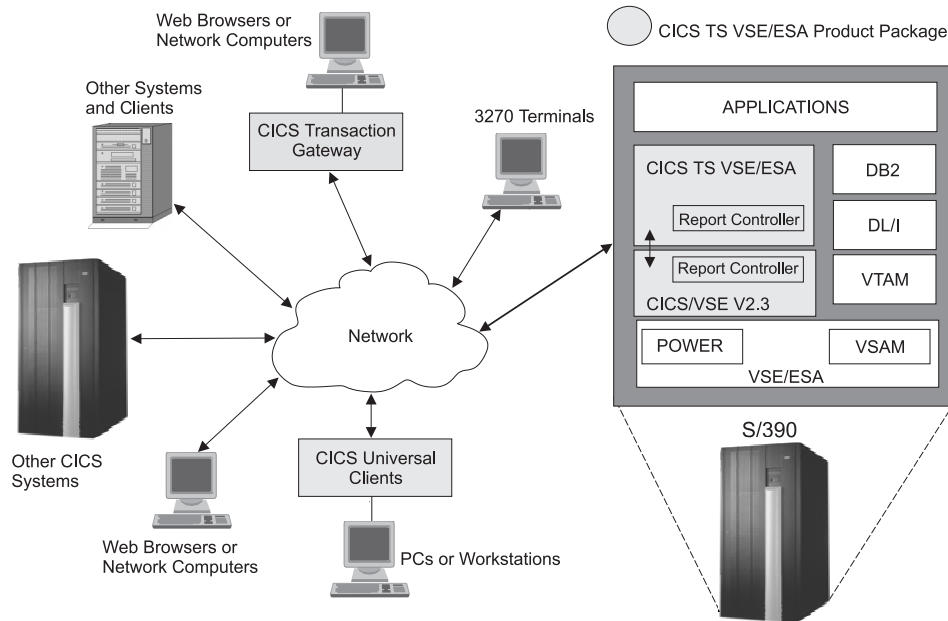
Figure 10. The CICS Transaction Server for VSE/ESA Environment

Network Computing and e-business

CICS continues to move with the times, and new support for network computing and e-business is provided by CICS TS VSE/ESA in three main areas:

1. The **CICS Universal Clients V3** product is included as part of the CICS TS VSE/ESA product package. This runs on popular desktop workstations to provide access to CICS applications via the External Call Interface (ECI) or the External Presentation Interface (EPI). It allows exploitation of modern tools and user interfaces to "reface" existing CICS applications with modern front-ends, such as Graphical User Interfaces. Existing CICS applications can remain unchanged via use of the EPI.

   CICS Universal Clients V3 enhances and replaces the CICS Clients V2 product. It is supported on Windows NT, Windows 95/98, AIX, OS/2, and SUN Solaris.

2. The **CICS Transaction Gateway V3** product is also included in the CICS TS VSE/ESA product package. This runs on a Web server and provides access to CICS applications from a Web browser or Network Computer. CICS Transaction Gateway V3 enhances and replaces both the CICS Internet Gateway and the CICS Gateway for Java. It provides automatic rendering of 3270 applications into HTML, so that existing CICS applications can run unchanged. Java support is also provided, which enables user-written Java applets to access CICS applications via Java classes and Java beans that implement the ECI and EPI.

   The CICS Transaction Gateway V3 is supported on Windows NT, AIX, OS/2, and SUN Solaris. It also runs on Windows 95/98, but for development purposes only.

3. The **CICS Web Interface (CWI)** is a new function within CICS TS VSE/ESA which enables direct access to CICS applications from a Web browser or a Network Computer within a TCP/IP network, without the need for an intermediate Web server. New or extended applications can be written to handle the manipulation of HTML pages, and support is provided to create HTML pages from existing BMS maps. In addition, in conjunction with the new 3270 Bridge function, the CWI can be used to provide Web browser access to existing 3270 based transactions without requiring any application changes.

System Management

System management is another area with significant enhancements:

- **Resource Definition Online (RDO) is extended** to include files, VSE consoles, and APPC Partners. RDO can now be used to manage the following resources associated with files – local VSAM files, remote VSAM files, remote DAM files, VSAM local shared resource (LSR) pools, and shared data tables. The PARTNER definition enables CICS application programs to communicate via APPC protocols to a partner application program running on a remote logical unit.

  Also, it is now possible to share the CICS System Definition file (CSD) used by RDO between multiple CICS regions. This includes CICS/VSE V2.3 and will aid in migration.

- **Autoinstall is extended** to include programs, mapsets, partitionsets and APPC connections. This means that these resources do not have to be defined prior to use by CICS. This reduces system administration costs, saves virtual storage and can improve CICS restart times.

- **Automatic journal archiving** is introduced, which enables timely submission of archive jobs, eliminates operator intervention for journals archived to disk, and removes the need for users to have their own archiving facility. It also provides greater security in that CICS will not re-use a journal until archiving is complete.

- **Dynamic Transaction Routing enhancements** enable a dynamic transaction routing program to make more intelligent routing decisions and to make it possible to detect transaction affinities as they are created. This is achieved via the invocation of the user-replaceable DTR program at several new points.

- **Data Management Facility (DMF)** provides a new mechanism for collecting and logging CICS monitoring and statistics data. DMF runs in its own partition outside of CICS, and data is passed via cross-memory services. DMF provides improved performance for both CICS monitoring and statistics. It also provides the ability to have a central repository for logging and managing monitoring and statistics data, as it can be used outside of CICS (for example, by user batch programs or vendor products).

- **Monitoring and Statistics enhancements.** Monitoring is easier to install and customize. The statistics utility program (DFHSTUP) provides better analysis, and new sample programs provide VSE and CICS storage analysis. CEMT and the SPI can now be used to control monitoring and statistics dynamically. In addition, it is now easier to relate resource usage information with transaction monitoring information, since the records are now in comparable formats.

- **Dump and Trace enhancements.** All CICS dumps – other than transaction dumps – are now created via the VSE SDUMP macro and written to a SYSDUMP library which can be processed by Info/Analysis, together with a CICS supplied dump-exit routine. There is also more control over dumps (for

example, the types of dump to be taken and the maximum number of dumps to be taken by CICS). Also, there is additional information in formatted dumps. Trace enhancements include more trace points, more information traced, and a new supplied transaction (CETR) for controlling what is traced.

- **The In-Doubt Window Resolution Utility (DFH$IWUP)** is a new program which helps resolve in-doubt resources such as database synchronization error messages, units of work whose outcome is unknown, and operator actions which have prevented CICS from resolving certain situations. It runs as an exit program from the DFHJUP journal utility program.

- **External Security Manager (ESM) support**. This is provided for an ESM that conforms to the RACROUTE interface, and support for CICS internal security is discontinued. As described in the two following articles, a Basic Security Manager (BSM) is provided as part of VSE/ESA V2.4. It supports signon and transaction attach security. For more comprehensive security needs, a product from another vendor (such as CA-Top Secret for VSE/ESA) must be used.

  The use of external security can provide the user with a more flexible and comprehensive approach to total system security needs (for example, centralized security including batch programs and other subsystems, as well as CICS).

- **SYSGEN removal.** The need for a SYSGEN step has now been removed, thus simplifying installation. Full-function versions of the CICS modules that were previously customized are now provided.

The benefits that result from these enhancements include improved productivity and usability for system administration staff and also improved system availability (for example, less planned downtime with the ability to define more resources online).

Other Enhancements

- Transaction Management improvements that offer increased flexibility and control include a new transaction manager with Global User Exits, transaction runaway limit defined at transaction level which overrides the system initialization defined limit, and support for unlimited number of transaction classes which are represented by a new TRANCLASS resource definition.

- MRO enhancements include an improved queuing algorithm (giving better performance) and support for new function (such as the EXCI and External Security for links).

- There are new options for logging of journal records which may be used by forward recovery utilities and which provide increased control and integrity.

Migration Considerations

IBM has previously announced that several CICS functions were non-strategic and would not be supported in future versions of CICS. Specifically, CICS/VSE V2.3 is the last release to support:

- Macro-level API
- Direct access to CICS Control Blocks
- RPG, DOS PL/I, and C/370 compiled programs
- BTAM terminals and devices
- CICS Internal Security

A number of tools to help with migration are delivered with CICS/VSE V2.3, such as the DFHMSCAN Utility, the Application Migration Aid, and the Security Migration Aid. To further aid migration, CICS/VSE V2.3 is designated as the "coexistence" release. It will run under VSE/ESA V2.4, alongside the new CICS Transaction Server version in the CICS coexistence environment.

The migration path to the new CICS Transaction Server version is via CICS/VSE V2.3. Customers need to get there first. It supports Year 2000, is the only CICS release that is supported for coexistence with the new CICS version, and will provide a stable environment to start preparation for migration.

This is the first time that two different levels of CICS will be supported on the same VSE/ESA system. CICS/VSE V2.3 can run in one partition and be connected via MRO to CICS Transaction Server for VSE/ESA running in another partition, with all the normal functions being supported (such as Transaction Routing and Function Shipping). In addition, the CICS System Definition File (CSD) used by the RDO facility can be shared between CICS/VSE V2.3 and the new version of CICS.

This gives flexibility in timing for migration to the new version and taking advantage of the benefits it offers. For example, old macro level applications can continue to run alongside new or extended applications, or ongoing support for BTAM terminals can be provided by a CICS/VSE V2.3 Terminal Owning Region with Transaction Routing to an Application Owning Region running under the new CICS version. Migration and coexistence is illustrated below in Figure 11.
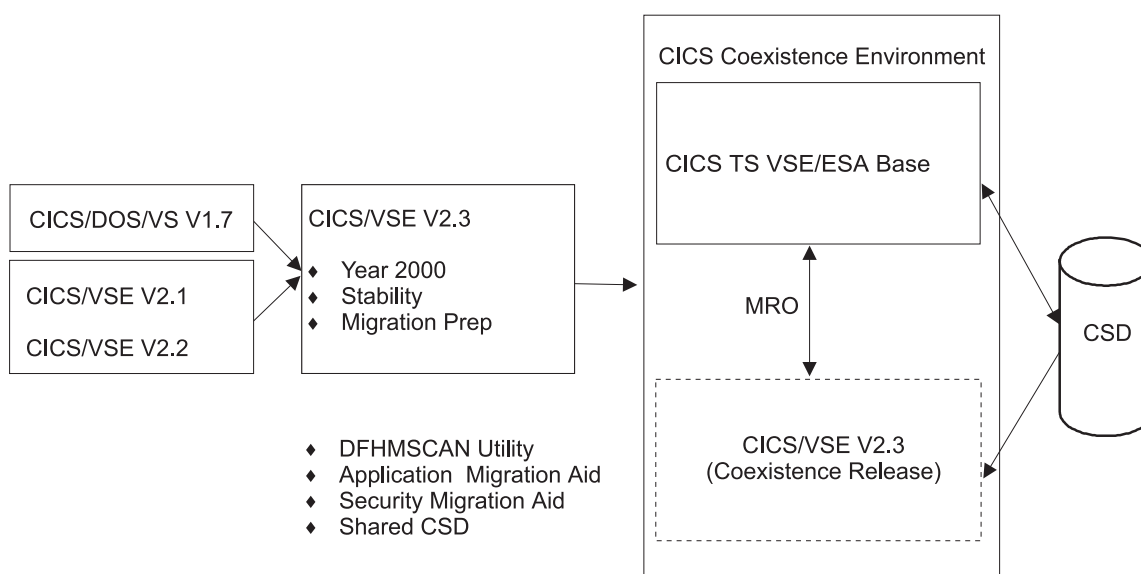
Figure 11. Migration and Coexistence

Additional Information

Further information can be obtained from the following sources:

- Web Sites

  - CICS, **http://www.software.ibm.com/ts/cics**
  - CICS Year 2000, **http://www.software.ibm.com/ts/CICS/year2000/**
  - VSE, **http://www.s390.ibm.com/vse/**
  - ITSO Red Books, **http://www.redbooks.ibm.com/**
  - IBM Global Services, **http://www.ibm.com/services/**

- CICS Product Publications

  - *CICS Transaction Server for VSE/ESA Release Guide*, GC33-1645-00
    Early version, subject to change, downloadable from the CICS Web site
  - *CICS Transaction Server for VSE/ESA Migration Guide*, GC33-1646-00
    Early version, subject to change, downloadable from the CICS Web site
  - *CICS Transaction Gateway V3 Administration*, SC34-5448-00
  - *CICS Universal Clients V3*
    - for Windows, SC34-5449-00
    - for OS/2, SC34-5450-00
    - for AIX, SC34-5348-00
    - for Solaris, SC34-5451-00
  - *CICS Family Cleint/Server Programming*, SC33-1435-00
  - *CICS/VSE V2.3 Release Guide*, GC33-0700-02
  - *CICS/VSE V2.3 Server Support for CICS Clients*, SC33-1712
  - All CICS, DB2, IMS publications on CDROM, SK2T-0730

- CICS ITSO Red Books

  - *CICS/VSE in a Networking World*, SG24-2047
  - *CICS Clients Unmasked*, SG24-2534
  - *New VSE/ESA support for CICS Clients (EPI)*, SG24-2038
  - *The CICS Internet Gateway for VSE/ESA*, SG24-4799

VSE/ESA 2.4.0 Security – Overview

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Basic Security Requirements and Concepts

Computer security addresses the controlled access of resources in a computer system.[8] Controlling resource access means an administration effort, and this effort must be balanced against the benefits of providing security.

User Identification and Verification

Normally, users have to identify themselves to a computer system before using it. For each user, a *profile* has to be created which registers the user in the system and defines various settings for that person. The identity of a user is verified by a *password*, which is a string of characters known only to the computer system and the specific user. In the *signon* process, users have to present their unique user ID and password to the system.

Authorization Checking

Even when a user has successfully passed the signon, access to all resources is usually not allowed. In a VSE system, a typical resource is a CICS transaction, a program or a file. Such resources can be individually protected, and access is allowed only to those persons who have a need for it.

Logging and Reporting

The system has not only to deal with granting access to resources, it has also to prevent deliberate misuse. Invalid signon attempts and prohibited resource access have to be logged so that a security auditor can recognize such events.

Easy Administration

User identification and authorization checking result in a planning and administration effort. For VSE, its **Security Manager** (**SM**) component is the focal point for security definitions. Dialogs of the Interactive Interface make the administration easy and simple. But definitions also can be done using batch utilities, if that's the method you prefer.

Status Prior to VSE/ESA 2.4

In systems prior to VSE/ESA 2.4, security checking is delegated to single products integrated in the VSE package. Let's look at these definitions in a little more detail.

---

[8] Resources include programs, information stored in data bases, or flat files.

CICS/VSE Internal Security

CICS/VSE requires you to register a user in the Sign-on Table (SNT). Resource access is controlled with parameters in the usual CICS resource tables – Processing Control Table (PCT) or File Control Table (FCT), for example.

Batch Security

"Batch security" means the controlled access to files, libraries and sublibraries, etc. This requires user registration and resource access specification in a so-called DTSECTAB table. The definitions are done in an Assembler source file via DTSECTAB macros.

VSE/ICCF

VSE/ICCF requires you to register a user in the DTSFILE. Registration is done via the DTSUTIL utility.

VSE Interactive Interface

Interactive Interface users are defined in the VSE Control File. Access to specific functions is controlled by providing tailored selection menus for each (type of) user. Special administration functions are protected by additional authority flags.

The Interactive Interface helps a great deal in doing the above mentioned administration effort. However, it is not a perfect solution. Changing passwords during signon leads to problems, for example, because passwords in the SNT and DTSECTAB only can be changed in the original source member.

Security in VSE/ESA 2.4

In VSE/ESA 2.4, all security-related definitions and decisions are concentrated in the Security Manager component. Each signon to the system requires the "okay" from the Security Manager. When resource checking is enabled, it allows/denies access to specific resources. The interface from resource managers (for example, CICS Transaction Server) to the Security Manager is the so-called **RACROUTE** interface. It was originally developed for Resource Access Control Facility (RACF).

VSE/ESA 2.4 supplies a **Basic Security Manager** (**BSM**), which implements signon verification and batch/transaction security analogous to the previous VSE releases. If your security requirements go beyond these methods, you can replace the BSM by an **External Security Manager** (**ESM**) from another software vendor.

Basic Security Manager (BSM)

The BSM keeps a user profile for each registered user in the VSE Control File. Protected resources have to be listed in tables. The mechanism used for protection is that a resource gets an access class assigned to it, and a user needs the matching key. This concept is maintained from the batch and transaction security in past releases.

Note: It is a good practice to group resources into security classes. That is, all transactions related to a payroll application should have a specific security class assigned; let's say 31. All users who need access to the payroll transactions must have the transaction security key of 31 assigned to them.

The BSM is integral part of VSE/ESA 2.4 and ready to use after initial installation. Part of the BSM – the **Security Server** – runs in static partition FB (ALLOC=512KB) and is started before any other VSE partition.

User Identification

Each VSE user has to be registered in the VSE Control File. A user profile is comprised of basic user settings, Interactive Interface settings, CICS TS VSE/ESA settings, Resource Access classes, and VSE/ICCF parameters. Regardless if signon is done via the Interactive Interface screen, the CICS CESN signon trans-action or via a batch signon (`// ID` card), the *same* user profile is checked for the correct password.

With the *User Profile Maintenance* (*UPM*) dialog, you have a structured means of defining these different attributes (Figure 12).

```
 IESADMUPBA                 ADD OR CHANGE USER PROFILE
 Base      II      CICS      ResClass ICCF

 To CHANGE, alter any of the entries except the user ID.

    USERID............. HUGO        4 - 8 characters (4 characters for ICCF users)

    INITIAL PASSWORD... _____     3 - 8 characters

    DAYS............... 030         0-365 Number of days before password expires
    REVOKE DATE........ _____     Date when Userid will be revoked (mm/dd/yy)

    USER TYPE.......... 1           1=Administrator, 2=Programmer, 3=General
    INITIAL NAME....... IESEADM     Initial function performed at signon
    NAME TYPE.......... 2           1=Application, 2=Selection Panel
    SYNONYM MODEL...... _____     Userid to be used as model for synonyms




 PF1=HELP                 3=END                        5=UPDATE
              8=FORWARD


```

Figure 12. UPM Dialog – User Profile Editor (Base Panel)

During the signon process, the Security Manager is consulted to check the given password. In addition, the Interactive Interface and CICS TS VSE/ESA extract the user settings from the SM. This makes the use of a Signon Table (SNT) obsolete in CICS TS VSE/ESA.

The Interactive Interface Signon program uses the standard security interface. Because of this, seamless cooperation with an ESM is guaranteed.

Note that VSE/ICCF still requires user registration in the DTSFILE. This is accomplished by the UPM, as in previous releases.

Improvements in User Identification and Verification

PASSWORD   Passwords are now strings of 3 to 8 characters. The admin-
                      istrator only needs enter data in the field when defining a
                      new user or when it is necessary to reset a user's password.

                      When the administrator assigns an initial password, a user is
                      forced to change it at the next signon. Any user is allowed to
                      change his password during signon in order to keep it secret.

REVOKE DATE   When you have users with limited access to the system, you can specify a date with REVOKE DATE. Any signon attempt after that date is rejected. The user ID and data created by the user is still available after that date, however.

The REVOKE DATE can be set by the system itself, when the user ID is used with a number of invalid signon attempts that exceed a certain limit (REVOKE COUNT specified in IESELOGO).

Resource Classes   User settings are extended to contain batch access control classes. This allows access control to batch resources like files and VSE library members. The middle part of the UPM screen in Figure 13 shows this support.

```
 IESADMUPR1              ADD OR CHANGE RESOURCE ACCESS RIGHTS
 Base     II       CICS     ResClass ICCF

     Place an 'X' next to the transaction security keys for user HUGO
   01 X    02 X    03 X    04 X    05 X    06 X    07 X    08 X    09 X    10 X    11 X
   12 X    13 X    14 X    15 X    16 X    17 X    18 X    19 X    20 X    21 X    22 X
   23 X    24 X    25 X    26 X    27 X    28 X    29 X    30 X    31 X    32 X    33 X
   34 X    35 X    36 X    37 X    38 X    39 X    40 X    41 X    42 X    43 X    44 X
   45 X    46 X    47 X    48 X    49 X    50 X    51 X    52 X    53 X    54 X    55 X
   56 X    57 X    58 X    59 X    60 X    61 X    62 X    63 X    64 X

     Specify the access rights for 1-32 DTSECTAB access control classes
    ( _=No access, 1=Connect, 2=Read, 3=Update, 4=Alter )
   01 _    02 _    03 _    04 _    05 _    06 _    07 _    08 _    09 _    10 _    11 _
   12 _    13 _    14 _    15 _    16 _    17 _    18 _    19 _    20 _    21 _    22 _
   23 _    24 _    25 _    26 _    27 _    28 _    29 _    30 _    31 _    32 _

     READ DIRECTORY..... 1   User can read directory with Connect (1=yes, 2=no)
     B-TRANSIENTS....... 1   User can manipulate B-Transients     (1=yes, 2=no)

  PF1=HELP                      3=END                       5=UPDATE
  PF7=BACKWARD    8=FORWARD
```

Figure 13. UPM Dialog – User Profile Editor (Resource Class I Panel)

VSE user definition can be done either via the:

- *User Profile Maintenance* (*UPM*) dialog (fastpath 2-1-1). The UPM dialog is a new implementation in VSE/ESA 2.4, overcoming certain limitations and with better performance than in the past.

- Utility *IESUPDCF*. A sample IESUPDCF is in ICCF library 59.

Resource Protection
VSE treats transactions and batch resources differently.

- Transactions can be protected with the dialog *Define Transaction Security* (fastpath 2-8).

- Batch resources have to be maintained in an Assembler source file, coding the *DTSECTAB* macro for each protected resource.

Define Transaction Security: Each transaction has a security class (1-64) assigned. As shown in Figure 14, transactions which have to be available for all users ("public") should have a security class 1 assigned. The preferred security class for Interactive Interface transactions is 61.

```
 ┌────────────────────────────────────────────────────────────────────┐
 │                                                                      │
 │    TAS$SEC1                 DEFINE TRANSACTION SECURITY              │
 │                                                                      │
 │   Enter the required data and press ENTER.                           │
 │                                                                      │
 │   OPTIONS: 1 = ADD   2 = ALTER    5 = DELETE                         │
 │                                                                      │
 │    OPT        TRANSACTION NAME  CICS REGION   SECURITY CLASS         │
 │                                                                      │
 │    _              IECX                        1                      │
 │    _              IEDA                        61                     │
 │    _              IEDD                        61                     │
 │    _              IEDM                        61                     │
 │    _              IEDS                        61                     │
 │    _              IEEP                        61                     │
 │    _              IEFX                        1                      │
 │    _              IEGM                        1                      │
 │    _              IEGT                        1                      │
 │    _              IELA                        61                     │
 │                                                                      │
 │    LOCATE TRANSACTION NAME == >  ____                                │
 │   PF1=HELP       2=REDISPLAY  3=END                   5=PROCESS      │
 │   PF7=BACKWARD   8=FORWARD                                           │
 │                                                                      │
 └────────────────────────────────────────────────────────────────────┘
```

Figure 14. Define Transaction Security Dialog

The PROCESS (PF5) function creates a job to assemble and catalog a DTSECTXN phase which is used by the SM for authorization checking.

Define Batch Security: Batch security is controlled by DTSECTAB table. VSE/ESA provides a pregenerated version of DTSECTAB, which has security information about protected VSE/ESA system resources. It does not use any access control classes. See ICCF library 59 member DTSECTRC for the macro source file.

Logging and Reporting

Invalid signon attempts and unauthorized usage of transactions is logged in the *VSE Message log* (fastpath 4-2). These messages also are available in a job listing after CICS TS VSE/ESA shutdown.

Logging of access to batch resources requires the VSE/ESA optional program *Access Control-Logging and Reporting*. It supports the logging of attempts to use protected resources without authorization and, optionally, of any authorized access to, or use of, protected data and programs. It provides formatted reports of the information logged.

Additional Information

The next article has further information about security in VSE/ESA 2.4. Also refer to the manual *VSE/ESA Administration* for VSE/ESA 2.4.0.

VSE/ESA 2.4.0 Security – Implementation Details

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As described in "Introducing CICS Transaction Server for VSE/ESA" on page 12, VSE 2.4.0 includes the CICS Transaction Server for VSE/ESA. For security that formerly was provided by CICS ("CICS internal security"), CICS TS VSE/ESA relies on an external Security Manager, using OS/390-like **RACROUTE** interfaces. To support these RACROUTE interfaces, VSE/ESA 2.4.0 security support introduces the MVS (OS/390) **System Authorization Facility** (**SAF**).

This article discusses the new security structure in VSE/ESA and special aspects of the **Basic Security Manager** (**BSM**).

A New Security Structure

The new security structure in VSE/ESA 2.4.0 consists of three parts:

1. VSE/ESA SAF as a centralized system security component,
2. New security startup to handle the different setups, and
3. BSM as a new Security Manager belonging to VSE Central Functions.

The BSM is a Security Manager that provides the *minimum* security required by CICS. If more security is required, the BSM can be replaced by an External Security Manager (ESM) provided by another software vendor.

System Authorization Facility (SAF)

The System Authorization Facility (SAF) in VSE/ESA is ported from OS/390. It provides a VSE installation with centralized control over system security processing through a system service named the **SAF router**. The resource manager components and subsystems call the SAF router as part of security decision-making functions in their processing, such as access control checking and authorization-related checking.

To use the SAF router, a resource manager component or subsystem issues the RACROUTE macro. The RACROUTE macro of VSE/ESA accepts most of the parameters from OS/390 in order to make them available to various Security Managers.

The RACROUTE macro invokes the SAF router. When it is invoked, the SAF router first calls an optional installation exit routine and then calls the BSM or an External Security Manager, if one is installed and active on the system. This is shown in Figure 15 on page 29.

```
Resource                 VSE/ESA                    SAF Router Exit
Manager                  SAF ROUTER                 (ICHRTX00)
            RACROUTE
 (CICS)                                             
            Macro
                                                    Security Manager
                                                    BSM or ESM
```
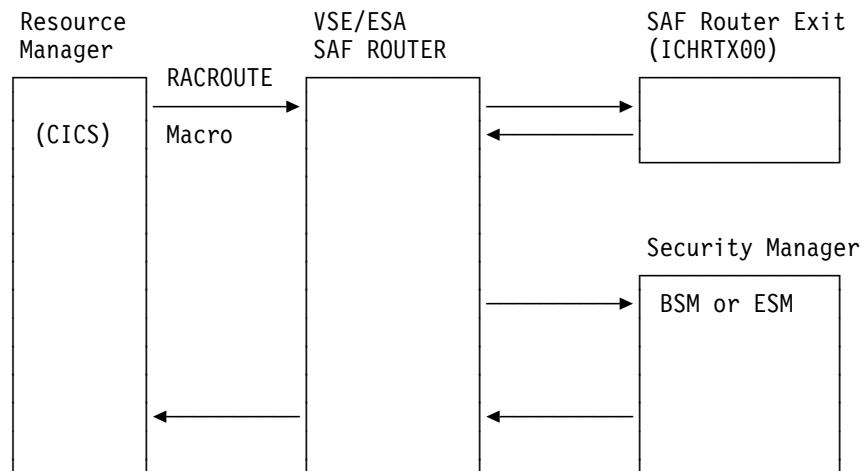
Figure 15. SAF Router in VSE/ESA

Startup

Together with the changes in the VSE/ESA security, the related startup parameters
have been extended.

- **SYS SEC=YES|NO** – With this command, the DTSECTAB security can be acti-
  vated or deactivated (as in previous releases).

  If you decide with SYS SEC=YES to protect your resources like VSE files,
  libraries, sublibraries, and members, a DTSECTAB is required. This
  DTSECTAB protects your resources during IPL and up to the point where an
  ESM is established and takes control. If instead of an ESM the BSM is used,
  the DTSECTAB stays active.

- **SYS ESM=<ESM_initialization_phase_name>** – This command specifies two
  things. First, it says that an ESM should be used. Second, it provides the
  name of the phase to initialize the ESM. It is not required that this phase be
  copied from the ESM product library into IJSYSRS.SYSLIB. But the ESM
  product library has to be made available in the $0JCL procedure before
  BSSINIT is started.

- **SYS SERVPART={F1|F2|...|FB}** – The BSM and certain ESMs need their own
  partition for processing. This command provides an installation with the ability
  to select a static partition for the Security Server function. The default is FB. If
  you chose an other partition, ensure that the start procedure is similar to
  $BJCL.

  A static partition has to be used to have security ready as early as possible
  during system startup, especially before VSE/POWER starts with all its dynamic
  partitions.

These commands determine the flow of the security startup. In $0JCL, the specifi-
cation of SYS ESM= is used by the initialization routine BSSINIT to decide whether
an ESM or the BSM should be started.

If an ESM is requested, BSSINIT gives control to the ESM initialization routine.
From the return information of the ESM initialization phase, BSSINIT will recognize

whether a Security Server is required or not. In case the ESM requires a Security Server partition, BSSINIT also will start the partition specified in SYS SERVPART= and wait for the completion of the Security Server partition initialization. After successful initialization of the ESM, BSSINIT does the final switch to ESM security and stops the DTSECTAB processing.

If no ESM was requested, the BSM initialization phase gets control and initializes its Security Server.

After the successful initialization of the requested Security Manager, BSSINIT terminates, and the $0JCL procedure continues processing. Figure 16 shows the startup of an ESM with a Security Server partition for an environment where SYS SEC=YES was specified.

```
        Partition                          Server Partiton
           BG                                   (FB)

           │
 IPL       │
           │
           │    Start
           │      DTSECTAB
           │      processing
           │
           ▼


 $0JCL  │  . . .
        │
        │  BSSINIT
        │    Start ESM
        │      initialization
        │      routine
        │    Start security
        │      server partition ──────▶ $BJCL │ BSSINIT
        │      and wait                       │   Indicate server partition
        │                                     │
        │                                     │ ESM server routine
        │        ◀──────────────────         │   Initialize server
        │                                     │   Post BSSINIT in BG
        │      Stop DTSECTAB                  │   Ready for requests
        │        processing                   │
        │                                     │
        │  Start POWER                        │
        │                                     │
        │  . . .                              │
        │                                     │
        ▼                                     ▼
```
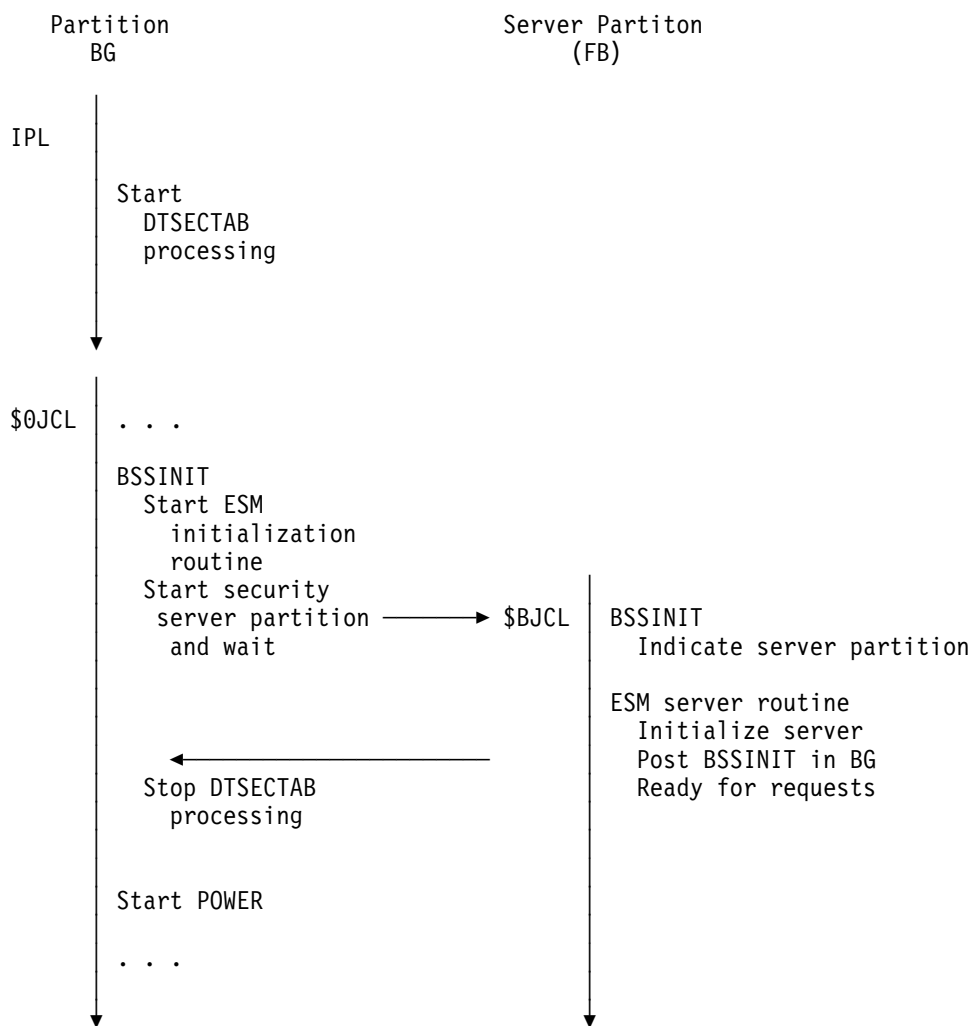
Figure 16. Security Startup Using an ESM with SYS SEC=YES.

The BSSINIT routine is not only used in the job BGINIT of the $0JCL procedure. It also is called in the procedure of the Security Server partition (like $BJCL) to indicate via return code that this is the partition requested for the Security Server by the SYS SERVPART= command. For other partitions, BSSINIT can be used to get the information which partition was requested for the Security Server.

Basic Security Manager (BSM)

The BSM, delivered as part of the VSE/ESA Central Functions, provides CICS signon security and CICS transaction protection as the minimum security required by CICS. It also integrates the existing DTSECTAB security to protect VSE files, libraries, sublibraries, and sublibrary members. For user IDs, the VSE Control File from the Interactive Interface is used as the central repository. More about this is documented in the IBM manual, *VSE/ESA Administration*.

Supported Classes

In accordance with the SAF, the BSM uses the term "class" for the things it protects (like user IDs, files, etc.). The class name is part of most RACROUTE requests. The BSM supports the following classes:

Class	Meaning
USER	VSE users
DATASET	VSE files
VSELIB	VSE libraries
VSESLIB	VSE sublibraries
VSEMEM	VSE sublibrary members
TCICSTRN	CICS transactions

Depending on the class specified in the RACROUTE request, the BSM will access the appropriate repository, as shown in figure Figure 17.
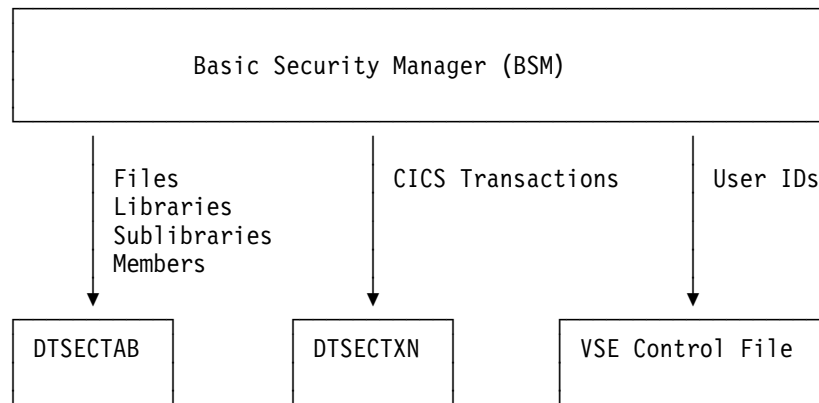
Figure 17. BSM Classes and Related Repositories.

For I/O to the VSE Control File or DTSECTXN, the Security Server is used. See "Security Server" on page 33.

As described in "VSE/ESA 2.4.0 Security – Overview" on page 23, the security administrator can use special Interactive Interface dialogs to update the repositories of the BSM security information.

Task User IDs

Together with the BSM, a new kind of user ID is introduced, the special **task user ID**.

If you don't yet have VSE/ESA 2.4.0 installed and are using the protection of VSE files and libraries by specifying SYS SEC=YES at IPL time, you usually have to provide a user ID with a password in your VSE/POWER jobs of system components like CICS. If you specify user ID and password in the jobs, the password is exposed to all users who have access to the VSE/POWER Reader (RDR) queue.

To avoid this, you could logon with the user ID of this job, remove the user ID and password in the job, and submit this job from this user ID. The job will now have the access authority of the submitting user ID. Neither password nor user ID is shown when the job stays in the RDR queue.

If you have a requirement to provide different user IDs to a number of such jobs because of different access authorities, you have to logon with each of these user IDs to submit the single job. Due to an VSE/ICCF restriction, the user IDs can have only 4 characters, which may not allow the use of meaningful words for a user ID. Furthermore, in the RDR queue, you will not be able to see under which user ID this job was submitted.

All of these problems are solved by using the task user ID. The task user ID should be specified in the `// ID` statement *without a password*. It can have up to 8 characters in length.

This user ID can only be used for batch jobs. No logon to the Interactive Interface is possible with it. To activate this user ID in a job, the job must be submitted from an administrator (type 1) user ID, like SYSA.

With the BSM, two task user IDs are shipped, `DBDCCICS` and `PRODCICS`. They are used for the CICS startup jobs. (See skeletons SKCICS and SKCICS2 in library 59.)

CICS Prefixing

CICS provides a system initialization parameter to specify whether you want CICS to prefix the resource names that it passes to the Security Manager for authorization. The prefix that CICS uses is the user ID under which the CICS region is running. The BSM supports the CICS prefixing of transaction names.

Prefixing is useful mainly when you have more than one CICS region. It enables you to prevent users on one CICS region from accessing the resources of a different CICS region that has a different prefix. For example, VSE/ESA 2.4.0 ships the skeleton SKCICS (which contains the special task user ID, DBDCCICS) and the skeleton SKCICS2 (which contains the special task user ID, PRODCICS). If you have transactions that should only be used by users of the second CICS system, you have to define these transactions with the prefix `PRODCICS` to BSM and activate the prefixing in CICS via its system initialization parameter. Users of both systems will be able to access transactions that have *no* prefix specified in their BSM profile.

In an environment with SYS SEC=NO, the BSM takes the user ID from the //ID statement in the CICS startup job. No password is required. If no //ID statement is found, the user ID `FORSEC` is used as default.

Security Server

This section discusses one aspect of the Basic Security Manager, the **Security Server**. As indicated in Figure 18, it is a separate application which runs in the FB partition by default.

Overview
The Security Server is that part of BSM which receives and processes security requests. It is implemented through phase `BSTPSTS`, which is started in the selected server partition (default is FB) during IPL. The phase consists of a main task that handles incoming requests and two subtasks to process the various requests.

The server is started automatically during IPL through procedure SECSERV. This procedure gets control again when the server is stopped.

The **Database Services Subtask** (**DB**) handles requests that result in an access to the VSE.CONTROL.FILE. The **Profile Services Subtask** (**PS**) currently handles one request to build a list of profiles of CICS transactions.
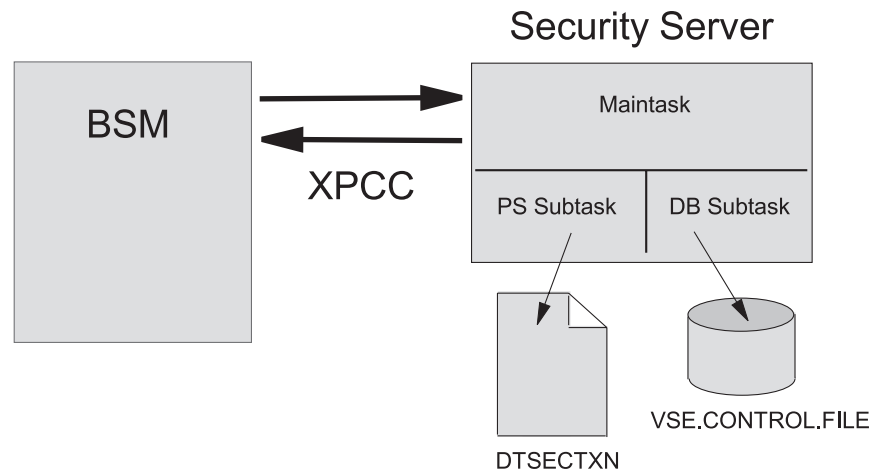
Figure 18. Overall Security Server Structure

Database Caching
The server database caching function provides fast retrieval of recently accessed control file records loaded into a dataspace. Subsequent requests to previously read records are retrieved directly from the cache, thereby avoiding the overhead of XPCC and VSAM processes. Database caching is turned OFF by default. It can be turned ON using the `DBSTARTCACHE` command.

Database Logging
The database logging function facilitates propagation of control file updates. The UXLOGENTRY record of the control file contains a list of keys to records that have been changed (or added) by other applications, such as the Interactive Interface dialogs.

Since the control file may be shared across systems, the UXLOGENTRY record is used to make changes to the control file available to each server. Entries in the log

list are then used to fetch updated control file records and write them into the server's cache.

User Interface

The Security Server provides a set of commands to control its operation and display server status information. These commands are implemented using the **OCXIT** (**Operator Communication Exit**) macro and can be entered from the system console through:

    MSG **xx**,DATA=**command**

where **xx** indicates the selected server partition (default FB) and **command** can be one of the following.

HELP, ?, or blank	obtains a list of possible commands
STATUS	displays some information about the server's internal status.
DBSTARTCACHE	starts caching records read from the VSE.CONTROL.FILE
DBSTOPCACHE	stops caching
LOGTIME=n	sets the logtime interval time
RESET	resets the server to its initial state
STOP	stops the server
OPENCNTL	opens the VSE.CONTROL.FILE

Getting Help

The Help command displays a list of available server commands. For example:

```
msg fb,data=help
AR 0015 1I40I  READY
FB 0011 BST221I POSSIBLE SECURITY SERVER COMMANDS ARE:
FB 0011   DBSTARTCACHE........: STARTS DATABASE CACHING
FB 0011   DBSTOPCACHE.........: STOPS DATABASE CACHING
FB 0011   STATUS[=ALL]........: SHOWS TOTAL SERVER STATUS
FB 0011   STATUS=[MAIN|PS|DB].: SHOWS SELECTED STATUS
FB 0011   LOGTIME=N...........: SETS LOGTIME TO N MINUTES (1..9)
FB 0011   RESET...............: CLEANUP EVERYTHING
FB 0011   STOP................: STOPS THE SERVER (USE WITH CAUTION!)
FB 0011   OPENCNTL............: OPENS THE II CONTROL FILE
```

Displaying the Server's Status

The server maintains a set of internal queues for buffering incoming security requests and outgoing replies. These queues are used to transfer blocks of data from the server's main task to its two subtasks. The main task is responsible for receiving requests and sending replies.

The database service subtask (DB) handles all accesses to the VSE.CONTROL.FILE. The Profile Service subtask (PS) can build a list of CICS profiles.

The status of these queues is reflected in the output of the STATUS command. The status of each task can be displayed separately. For example:

```
msg fb,data=status
AR 0015 1I40I  READY
FB 0011 BST223I CURRENT STATUS OF THE SECURITY TRANSACTION SERVER:
FB 0011 SERVER GENERAL STATUS:      (06/16/1998)
FB 0011   SERVER WAS STARTED AT .............. : 09/22/1998 10:49:38
FB 0011   TIME ELAPSED (DDDD::HH:MM:SS) ...... : 0013::05:44:47
FB 0011   NO. OF REQUESTS IN XPCC QUEUE ...... : 0
FB 0011   NO. OF REQ. IN INTERNAL REPLY QUEUE  : 0
FB 0011   NO. OF FREE (REUSABLE) REQ. BLOCKS . : 9
FB 0011   NO. OF CURRENTLY ALLOCATED BLOCKS .. : 10
FB 0011   SIZE OF ONE REQUEST BLOCK (BYTES) .. : 740
FB 0011   TOTAL NUMBER OF REQUESTS SO FAR .... : 197
FB 0011   HIGHEST NO. OF PARALLEL REQUESTS ... : 2
FB 0011   SERVER TRACE ....................... : OFF
FB 0011   NUMBER OF SERVER RESETTINGS ........ : 0
FB 0011 PROFILE SERVICE SUBTASK STATUS:
FB 0011   PS SUBTASK STARTED ................. : YES
FB 0011   NO. OF ITEMS IN PS REQUEST QUEUE ... : 0
FB 0011 DATABASE SUBTASK STATUS:
FB 0011   DB SUBTASK STARTED ................. : YES
FB 0011   II CONTROL FILE OPEN ............... : YES
FB 0011   DATABASE CACHE INITIALIZED OK ...... : YES
FB 0011   DATABASE CACHING ................... : ON
FB 0011    DATABASE CACHE FULL .............. : NO
FB 0011    DATABASE CACHE INDEX FULL ........ : NO
FB 0011   LOGTIME INTERVAL IN MINUTES ........ : 5
FB 0011   NO. OF ITEMS IN DB REQUEST QUEUE ... : 0
```

The SERVER GENERAL STATUS line above shows the server's build date. The next two lines show the server's startup date and time and the elapsed time since the server has been started. If there was no STOP or abnormal end, the time interval is equal to the time elapsed since the last IPL.

The XPCC queue holds all incoming security requests and outgoing replies. If the number of requests in the XPCC queue is not zero, this either indicates that the server currently cannot keep up with processing new requests as fast as they come in or that replies are not sent back to requesting clients.

The internal reply queue holds data blocks that have been sent from the server's subtasks to the main task. They are now waiting to be sent back to the requesting client.

The number of free request blocks is the number of storage blocks that can be reused for further requests. 10 data blocks are allocated by default. If the server is idle, 9 blocks are free; and one block is used to receive the next security request. The server allocates more storage if these 10 data blocks are all occupied by active requests. Issuing the RESET command from the system console will deallocate superfluous data blocks if possible.

The next three lines above show the size of one request block, the total number of requests since the last server startup, and the highest number of parallel processed requests. This number is a measurement for the server's peak load. It shows the maximum number of requests that were accumulated in the server's internal queues.

The next two lines show whether the server's internal trace facility is started and the number of server resets. The server trace function is intended as a debug

facility for IBM technical support (Level 2 support), and should *not* be used by customers.

The DB subtask status shows whether the control file is open and whether database caching is initialized and started. The file is normally opened during server startup but can also be opened manually later using the OPENCNTL command.

The logtime interval also is shown. The logtime interval is the time interval in minutes, where the UXLOGENTRY record of the VSE.CONTROL.FILE is read to update the server's cache. This time interval can be adjusted between one and nine minutes using the LOGTIME command.

Termination and Recovery

The Security Server registers itself as a VSE subsystem, like VSE/POWER or CICS. This is necessary to get control when the server partition is cancelled via the operator console – which could happen by mistake. In this case, the user would be asked whether the server should really be cancelled.

There are two reasons why the Security Server could be terminated:

1. A STOP request was received, or
2. A severe error occurred.

If the server received a STOP request, a confirmation message is displayed on the console also.

Restarting of the server depends on:

- Whether the system was IPLed with SEC=YES or SEC=NO, and
- Whether the SECSERV procedure still has control or not.

If there was a severe error, or the partition has been cancelled by the operator, the SECSERV procedure may be terminated.

	SECSERV procedure has control (A message `// PAUSE TO RESTART THE SECURITY SERVER` **is issued.)**	**SECSERV procedure is not running (No message is issued.)**
System was IPLed with SEC=NO	Restart the job with `// EXEC PROC=RESTASEC`	Restart the job with `// EXEC PROC=$BJCL`
System was IPLed with SEC=YES		Re-IPL the system

Additional Information

The manual *VSE/ESA Administration* for VSE/ESA 2.4.0 has more information about the topics introduced here.

Euro Support in VSE/ESA

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On January 1, 1999, the **European Monetary Union** (**EMU**) will come into effect in the following European countries: Austria, Belgium, Germany, Finland, France, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain. From this day on, the **euro** will become legal currency in these countries; and the exchange rates between the participating national currencies and the euro will be irrevocably fixed.

Until December 31, 2001, the euro currency will exist in parallel to the old national currencies for all non-cash transactions. Companies thus have time to conform to euro system compliance anytime in this three-year transition period. From January to July, 2002, euro banknotes and coins will be introduced in the participating countries. By July, 2002, the national banknotes and coins will be withdrawn.

This article describes the technical changes VSE/ESA will implement to assist you in dealing with the IT implications which derive from the decisions surrounding the EMU.

The Challenge

The EMU will impact businesses and IT systems primarily in participating nations. However, non-participating European countries also will be effected, as their enterprises will compete with euro denominated goods and services offered by competitors from participating countries. Eventually, *all* companies which conduct business in Europe will be impacted.

Leaving aside all the business aspects to be considered in adapting to the EMU, there is the unique situation that during the transition period, two different currency units will be used within each participating country. Enterprises will be faced with circumstances where they receive (or are required to produce) financial information either in the euro or the national currency unit or in both.

During the transition period, IT systems will have to be prepared to cope with a number of issues like:

- Rounding of converted values according to the prescribed rules,
- Displaying two currencies either alternatingly or concurrently,
- Use of decimals in countries where the national currency didn't need them,
- Interfaces between systems with and without the euro, and
- Converting historical data.

Preparing financial information systems for this unique situation is a major effort and is coincident with solving the Year 2000 problem.

What to Expect from VSE/ESA

Whereas VSE/ESA supports Year 2000 efforts with Year 2000-ready system components and compilers, there is limited help VSE/ESA can provide you to solve the euro issues. (Most of these problems have to be solved by your financial applications, however.) VSE/ESA will assist you in two areas:

1. Ensure that you are able to use the euro currency symbol within text files, that you can display and print it, and that it will be preserved during the ASCII/EBCDIC conversion of file transfers.

2. Provide you with the programming tools to help you change your financial applications.

Euro Code Pages

ISO/IEC 8859 part 15 defines a new code page, **Latin 9**, for support of the euro symbol. It also adds 7 more new characters. This standard is reflected in IBM code page **923** for ISO-8 (ASCII) and **924** for EBCDIC. To support the euro currency symbol with minimum impact on existing data, additional new code pages have been defined, as described below.

Host Code Pages

The following table shows the EBCDIC code pages where a single character, the international currency symbol (SC01), was replaced by the euro symbol (SC20).

Table 1. Euro Country Extended Code Pages (ECECPs)

Current CP	New CP	Code Position	Countries
37	1140	9F	USA, Canada, Netherlands, Brazil, Portugal, Australia, New Zealand
273	1141	9F	Austria, Germany
277	1142	5A	Denmark, Norway
278	1143	5A	Finland, Sweden
280	1144	9F	Italy
284	1145	9F	Spain, Latin America (Spanish)
285	1146	9F	UK
297	1147	9F	France
500	1148	9F	Belgium, Canada, Switzerland
871	1149	9F	Iceland

PC Code Pages

The euro symbol (SC20) was added to ASCII code page 850 at code point D5, where it replaced LI61 (the i dotless, ı). The resulting code page was registered as code page **858**. Microsoft added the euro symbol to the **125x** series of code pages at 0x80, except for code page **1251** (where it was added at 0x88).

Since for PCs the old code page numbers also will be used if the euro symbol is supported, emulator programs assume that the new PC code pages are used when a host code page 114x is defined.

Locales

Language Environment for VSE/ESA 1.4 will support the euro by adding the appropriate locale information and by introducing the **@euro** modifier to switch between the euro and the national currency. The euro will be reflected in LC_MONETARY, LC_TYPE, LC_COLLATE, and in the character maps of the affected locales. For example:

```
Load Fr_FR.IBM-1147 (French):         LC_MONETARY contains 'F'

Set LC_MONETARY=Fr_FR.IBM-1147@euro:  LC_MONETARY contains '€'

Load Fr_FR.IBM-1147 (French):         LC_MONETARY contains 'F'
```

Keyboards

Most keyboards will allow to enter the euro symbol with a key combination of **AltGr+e** (sometimes **AltGr+5** in addition). For a few exceptions, only **AltGr+5** or **AltGr+4** are used.

VSE/ESA Support Implementation

On March 17, 1998, IBM announced:

"Those products which need to process currency symbols available from IBM after 1st January 1999 will support the euro symbol from that date and will be described as EuroReady products...."

"IBM considers a product to be euro-ready if the product, when used in accordance with its associated documentation, is capable of correctly processing monetary data in the euro denomination, respecting the euro currency formatting conventions (including the euro symbol). This assumes that all other products (i.e. hardware, software, firmware, etc.) that are used with this product are also euro-ready..."

VSE/ESA base and optional products for VSE/ESA 1.4.x, VSE/ESA 2.2.x, VSE/ESA 2.3.x, and VSE/ESA 2.4.x follow this announcement and will provide euro support by the end of 1998 either via PTF or with a new release. IBM products which don't handle currencies or currency symbols are also considered EuroReady.

VSE/ESA euro support implementation depends on the individual product and its character and currency handling functions. For example, VSE/ESA Central Functions normally operates code page independent and relies on the hardware code page definitions for character entry and display. However, for file transfer functions (IND$FILE, LANRES, and TCP/IP), ASCII/EBCDIC conversion tables are provided which reflect code pages. Therefore the new 114x code pages will be supported by adding the appropriate ASCII/EBCDIC conversion tables. To enable euro support on VSE/ESA, please select the proper table.

In addition to the euro locales described above, the Language Environment for VSE/ESA 1.4 provides euro conversion tables to enable euro support for the **iconv()** function. PL/I for VSE/ESA and COBOL for VSE/ESA also will deliver euro-enabling service, as will many other VSE/ESA products.

Additional Information

To get the latest information on the euro readiness status of IBM products, please use the IBM's EuroReady Product Database at:

http://wwweuro.raleigh.ibm.com/

There is comprehensive help available to assist you in using this database.

You also might want to access these Web sites:

- IBM euro home page:
  http://www.europe.ibm.com/euro/index.html

- European Commission:
  http://europa.eu.int/euro/html/entry.html

- IT impact of the euro:
  http://www.ispo.cec.be/y2keuro/euroit.htm

MQSeries for VSE/ESA V2.1 – What's New?

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Introduction

In October 1998, Version 2 Release 1 of MQSeries for VSE/ESA (MQ/VSE) was made available. This new release of MQ/VSE implements many of the features of IBM's V2 family of products for the first time for the VSE user. When selecting features to incorporate with this release, IBM focused on customers' requirements. The MQ requirements database was searched for all customer requests for the VSE platform, and V2.1 is a direct result of those requests.

New Features

TCP/IP Protocol Support: In addition to the existing support for the SNA LU6.2 protocol, the MQ/VSE Message Channel Agents now allow messages to be sent and received using the TCP/IP protocol. The user may specify a single TCP/IP port number for inbound MQ requests and associate a TCP/IP IP address and port number for sender channel definitions.

Client Support: MQ/VSE can now act as server to an MQSeries client. Any remote client with a TCP/IP connection to the VSE platform can make MQ requests directly to the MQ/VSE server. *All* of the MQ family of clients (VM, OS/2, NT, AIX, Windows, etc.) are supported. The standard MQ/VSE listener which handles all TCP/IP requests will recognize an MQ Client request and create a task to server process the client's requests. The server process will terminate when the client disconnects.

Messages which are placed on a queue from a client using the `MQPUT` or `MQPUT1` API are written within a CICS logical unit of work (LUW). These messages are available for another application to retrieve using the `MQGET`, when the original application sync points to the messages. This can be via an explicit `MQCMIT` within the client or by normal transaction termination when the client issues `MQDISC`.

Large Message Support: To provide compatibility with other MQ platforms, MQ/VSE now provides support for messages up to 4MB in size. This far exceeds the previous limit of 30000 bytes. The maximum queue size is 4GB.

These large messages are achieved by segmenting the application data into multiple records before storing into the queue file. As part of this change, both the sender and receiver MCAs support split messages to allow messages larger in size than the transmission buffer to be sent and received.

Definable Code Page (CCSID) Support: MQ/VSE now supports a user definable local code page. From the *MQMT System Administration* panel, the user can define which code page (`MQMD_CODEDCHARSET`) is to be used for all messages written on the local system.

MQSET API Support: The MQ/VSE API has been enhanced with the addition of the `MQSET` call. Applications now can invoke this API to enable and disable queues and open and close channels.

Non-persistent Message Support: Transparent flagging of messages is supported. This allows messages to be sent from an MQ/VSE platform to another MQ platform and flagged as non-persistent. This has no direct effect on messages held locally on the VSE platform, as they are under control of the CICS subsystem. It will, however, effect the handling of messages on the remote platform.

Confirm on Arrival/Confirm on Delivery Reports: MQ/VSE now supports variations of the COA and COD messages options.

```
MQRO_COA                    MQRO_COD

MQRO_COA_WITH_DATA          MQRO_COD_WITH_DATA

MQRO_COA_WITH_FULL_DATA     MQRO_COD_WITH_FULL_DATA
```

This will allow both local and remote applications confirmation of message receipt.

Message Priority Support: Under previous releases of MQ/VSE, only the default message priority of zero was supported. MQ/VSE now supports message priority in the range 0 to 9 on MQPUT, allowing an MQ/VSE sending application to assign a priority. This can then affect the order in which the message is received from a queue on a remote platform.

Reusable File Storage System: MQ/VSE now supports an automated procedure for queue file reorganization. On previous releases of MQ/VSE, the operator was obliged to close MQ queues and VSAM files and run JCL to recover VSAM files space and later reopen the files and queues. With V2.1 of MQ/VSE, this procedure has been automated to allow selected queues to be scheduled closed and automatically reorganized according to user-selected parameters. For example, queues can be selected to close, reorganize and reopen at 03:00 AM, when queue activity is reduced.

Batch Size Greater Than One: One major limitation of MQ Version 1 platforms is the sending and receiving of messages in batches of only 1. MQ/VSE now allows messages to be sent and received in batches of a user-specified size. This can have a significant performance benefit, as messages are acknowledged and sync pointed in batches rather than individually.

PL/I and C/VSE Support: In addition to the existing support for COBOL for VSE/ESA, MQ/VSE now supports both PL/I for VSE/ESA and C for VSE. Appropriate copybooks, macros and include files for each language are provided.

Get by MSGID/CORRELID: To further enhance the API and conform with MQ V2 requirements, MQ/VSE now supports access to particular messages on a queue identified by the message's MSGID or CORRELID field.

Improved Communication Error Handling: Both the sender and receiver channel agents (MCAs) for MQ/VSE have improved error handling. Wherever possible, the MCA outputs additional diagnostic information to the SYSTEM.LOG to identify the cause of a communications failure.

> **APAR Fixes Migrated from V1.4 of MQSeries for VSE:** All existing closed
> APARs for the previous release of the MQ/VSE product have been incorporated
> into this new release of the product.

Design and Implementation of the TCP/IP Layer

When preparing for this new release, we had several targets which we set for ourselves. One of these was that any new code should be as non-intrusive as possible. The schematic diagram in Figure 19 gives gives a representation of how the previous MQ/VSE (V1.4) implemented the SNA protocol within the CICS/VSE partition. Both the sender and receiver Message Channel Agents (MCA) utilized this by means of Distributed Transaction Programming (DTP) calls. The MCAs were, in effect, front-end or back-end DTP programs.

SNA / APPC request

VTAM

CICS/VSE

Partition

Starts CICS task

APPC Calls

APPC Calls

MQ/VSE Receiver MCA (MQ01)

MQ/VSE Sender MCA (MQ02)

MQ API

MQ API

*Triggered after MQPUT from Application.

MQ/VSE Queue Manager

VSAM/VSE

File System

KSDS

KSDS
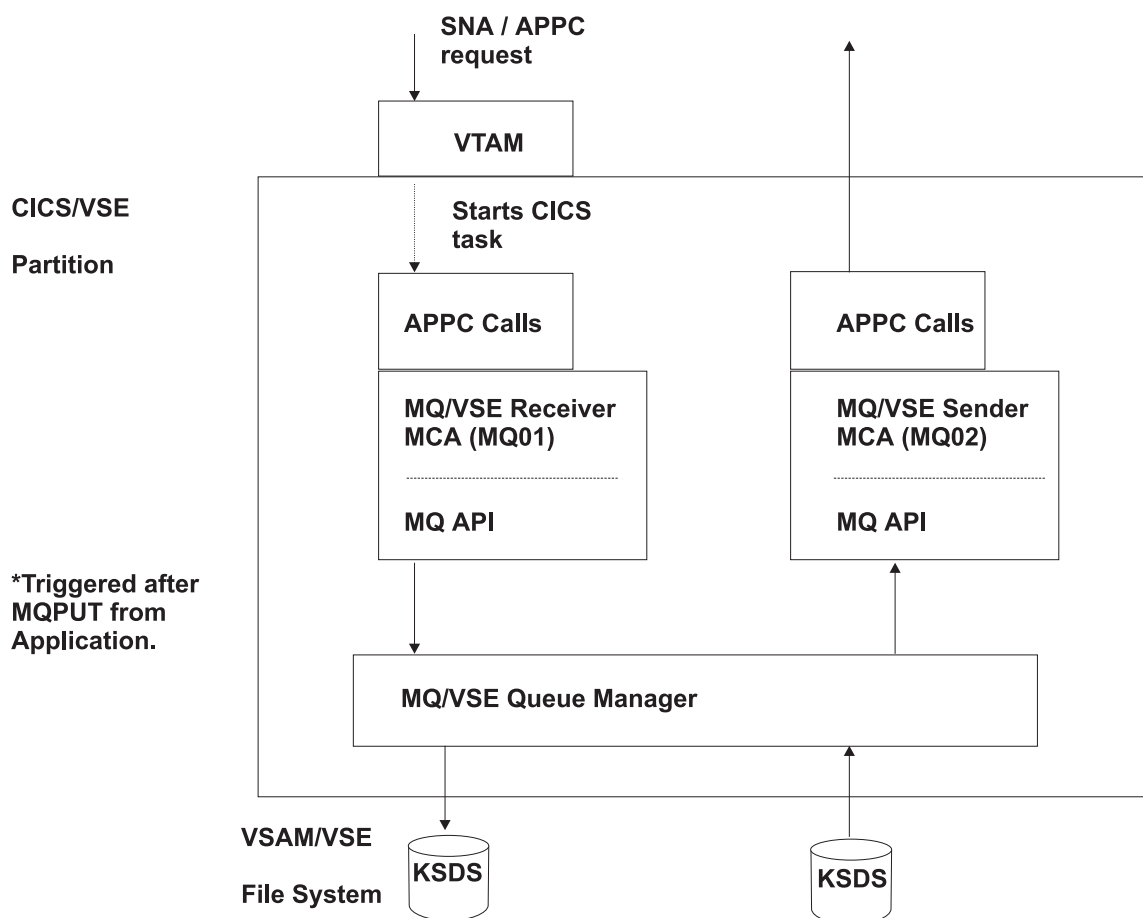
Figure 19. MQSeries for VSE/ESA 1.4 Protocol Implementation (SNA Only)

Using the LE interfaces, the TCP/IP layer was added at the same level as the existing SNA protocol (Figure 20 on page 44). This allowed the existing code to be relatively unchanged.

Port #
(1414)

SNA / APPC
request

read ()
socket #
from MQTL

Port # from
Channel
Definition

VTAM

CICS/VSE

Partition

Starts CICS
task

APPC Calls | TCP/IP
API Calls

MQ/VSE
TCP/IP Server

(MQPTCPSV)

APPC Calls | TCP/IP
API Calls

MQ/VSE
Listener
(MQTL)

MQ/VSE Receiver
MCA (MQ01)

MQ/VSE Sender
MCA (MQ02)

MQ API

MQ API

MQ API

*Triggered after
MQPUT from
Application.

MQ/VSE Queue Manager

VSAM/VSE

File System

KSDS

KSDS

KSDS

Figure 20. MQSeries for VSE/ESA 2.1 Protocol Implementation (Plus TCP/IP)

In Figure 20, it can be seen that the MCAs have the new protocol available to them. Two new facilities also may be seen:

1. **MQTL – The MQ/VSE Listener Transaction**

   When MQ/VSE is initialized, the Global System Definitions are checked for a new field, the "Port Number". If this field is available, then MQ attempts to start the MQTL listener transaction using the supplied port number. This transaction stays active until MQ/VSE is shut down. It "listens" for inbound TCP/IP requests and will start an appropriate MQ01 receiver MCA.

   If the request is from a partner MCA, then the request is serviced directly. If the request is an initial connect request from an MQ client, then the receiver passes control to another new facility, the MQ/VSE TCP/IP Server.

2. **MQ/VSE TCP/IP Server**

   This task remains active for the duration of the client request. That is. it starts when the client requests a connection and terminates when the client issues a disconnect.

   All the put and get requests to the server are issued within the CICS LUW for this task. This LUW can be controlled from the client by means of the `MQCMIT` and `MQBACK` API. Because these are not supported from within the normal MQ/VSE API when received as client requests, they are translated into appro-priate `CICS SYNCPOINT` and `CICS SYNCPOINT ROLLBACK` commands.

The Future

IBM is fully committed to the future of MQ/VSE and intends to extend the existing API and support into new areas. Planned for implementation in the near future are:

- **Data Conversion** – Both the API and the sender and receiver MCAs will be upgraded to allow data conversion.

- **Programmable Command Format (PCF) support** – A Command Server process will be provided to allow user applications to use the MQ systems management API. This function enables remote management of the MQ/VSE system using a command queue to make PCF requests and a reply queue to receive responses from the Command Server.

Additional Information

The IBM Announcement Letter for MQSeries for VSE/ESA Version 2 Release 1 is **298-374**. The MQSeries home page is:

http://www.software.ibm.com/ts/mqseries/

COBOL and PL/I Millennium Language Extensions

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└──────────────────────────────────────┘

If you're responsible for maintaining COBOL or PL/I applications that still use 2-digit year fields in dates, then IBM's patent-pending VisualAge Millennium Language Extensions (MLE) might be the only solution that can save you in time for the Year 2000!

What Is MLE?

MLE introduces new syntax and compiler options to IBM COBOL for VSE/ESA and IBM PL/I for VSE/ESA to allow applications that use 2-digit years to continue performing correctly in the Year 2000 and beyond, with minimal modification to existing code. MLE uses a technique known as *windowing*, which removes the assumption that all 2-digit year fields represent years from 1900 to 1999. Instead, windowing enables 2-digit year fields to represent years within any 100-year range, known as a *century window*.

For example, if a 2-digit year field contains the value 15, many applications would interpret the year as 1915. However, with a century window of 1960–2059, the year is interpreted as 2015.

MLE offers two approaches for handling dates:

Inferring the correct century
> Programs use the century window to infer the century in which 2-digit years lie. For example, given a century window of 1950–2049:
> - For 2-digit years less than 50, the century is inferred to be 20.
> - For 2-digit years equal to or greater than 50, the century window is inferred to be 19.

Expanding year fields to hold century digits
> If you copy the contents of a 2-digit year date field to another, larger, 4-digit year date field, the larger date field will be assigned the correct two leading century digits, based on the century window. Two common uses for this approach are:
> - In a one-time program that reads 2-digit years from a database, then writes expanded 4-digit years to a new database.
> - Reading 2-digit years from a database, expanding them to 4-digits for use inside the program, then writing them back to the database as 2-digits. This technique is called *internal bridging*.

The century window can be either *fixed* (with a set starting year, as shown in the example below) or *sliding* (relative to the system date at the time the program runs).

COBOL MLE Example

Table 2, Table 3 on page 48, and Table 4 on page 48 show a simplified program that demonstrates the Year 2000 challenge, an example fix without MLE, and an example fix with MLE.

Before: The Year 2000 challenge

If the current date is later than the due date, the following program should display the message "Bill is overdue." However, the program stores dates in the (widely-used) format *yymmdd*. Thus it incorrectly interprets a current date of 1 January 2000 as falling before the due date of 31 December 1999.

Table 2. Sample Program – Incorrect Date Interpretation

COBOL	PL/I
| ```
WORKING-STORAGE SECTION

01  CURR-DATE.
  05  CURR-YEAR     PIC 99.
  05  CURR-MONTH    PIC 99.
  05  CURR-DAY      PIC 99.
77  DUE-DATE        PIC 9(6).

PROCEDURE DIVISION.

  MOVE 000101 TO CURR-DATE.
  MOVE 991231 TO DUE-DATE.

  IF CURR-DATE > DUE-DATE
     DISPLAY "Bill is overdue".
``` | ```
dcl 1 curr_date_struct,
      2 curr_year  pic '99',
      2 curr_month pic '99',
      2 curr_day   pic '99';
dcl 1 curr_date    pic '(6)9'
                   defined curr_date_struct;
dcl 1 due_date     pic '(6)9';



curr_date = 000101;
due_date  = 991231;

if curr_date > due_date then
   display('Bill is overdue');
``` |

After: Example fix without MLE

The fix in Table 3 on page 48 assumes an implicit century window start date of 1950. Underlining indicates changes to the original program.

After: Example fix with MLE

The changed program shown in Table 4 on page 48 works correctly for all dates in the century window. Note that in the example fix with MLE, the program logic is untouched, yet Year 2000 ready!

Table 3. Sample Program – Fix without MLE

COBOL	PL/I

<pre>WORKING-STORAGE SECTION
 	
01 CURR-DATE.
  05 CURR-YEAR   PIC 99.
  05 CURR-MONTH   PIC 99.
  05 CURR-DAY   PIC 99.
77 DUE-DATE   PIC 9(6).
 	
77 CURR-TEMP   PIC 9(8).
77 DUE-TEMP   PIC 9(8).
 	
PROCEDURE DIVISION.
 	
  MOVE 000101 TO CURR-DATE.
  MOVE 991231 TO DUE-DATE.
 	
  IF CURR-DATE < 500000 THEN
     COMPUTE CURR-TEMP = CURR-DATE + 20000000
  ELSE
     COMPUTE CURR-TEMP = CURR-DATE + 19000000
  END-IF
  IF DUE-DATE < 500000 THEN
     COMPUTE DUE-TEMP = DUE-DATE + 20000000
  ELSE
     COMPUTE DUE-TEMP = CURR-DATE + 19000000
  END-IF
 	
  IF CURR-TEMP > DUE-TEMP
     DISPLAY "Bill is overdue".</pre>
	<pre>dcl 1 curr_date_struct,
	    2 curr_year pic '99',
	    2 curr_month pic '99',
	    2 curr_day pic '99';
	dcl 1 curr_date pic '(6)9'
	                   defined curr_date_struct;
	dcl 1 due_date pic '(6)9';
	
	dcl 1 curr_temp pic '(8)9';
	dcl 1 due_temp pic '(8)9';
	
	curr_date = 000101;
	due_date = 991231;
	
	if curr_date < 500000 then
	   curr_temp = curr_date + 20000000;
	else
	   curr_temp = curr_date + 19000000;
	
	if due_date < 500000 then
	   due_temp = due_date + 20000000;
	else
	   due_temp = due_date + 19000000;
	
	if curr_temp > due_temp then
	   display ('Bill is overdue');</pre>

Table 4. Sample Program – Fix with MLE

COBOL	PL/I

1. Use the new DATE FORMAT clause to identify date fields and their formats:
<pre> WORKING-STORAGE SECTION
 	
  01 CURR-DATE   DATE FORMAT YYXXXX.
    05 CURR-YEAR   PIC 99 DATE FORMAT YY.
    05 CURR-MONTH PIC 99.
    05 CURR-DAY   PIC 99.
  77 DUE-DATE   PIC 9(6) DATE FORMAT YYXXXX.
 	
  PROCEDURE DIVISION.
 	
    MOVE 000101 TO CURR-DATE.
    MOVE 991231 TO DUE-DATE.
 	
    IF CURR-DATE > DUE-DATE
       DISPLAY "Bill is overdue".</pre>
	1. Use the new DATE clause to identify date fields and their formats:
	<pre> dcl 1 curr_date_struct,
	      2 curr_year pic '99',
	      2 curr_month pic '99',
	      2 curr_day pic '99';
	  dcl 1 curr_date pic '(6)9'
	                    defined curr_date_struct
	                             date('YYMMDD');
	  dcl 1 due_date pic '(6)9' date('YYMMDD');
	
	  curr_date = 000101;
	  due_date = 991231;
	
	  if curr_date > due_date then
	     display('Bill is overdue');</pre>

2. Compile the program using two new options: • DATEPROC to enable MLE processing. • YEARWINDOW(*base-year*) to set the first year of the century window. For example, a *base-year* of 1950 defines a century window of 1950–2049.	2. Compile the program using two new options: • RESPECT(DATE) to enable MLE processing. • WINDOW(*base-year*) to set the first year of the century window. For example, a *base-year* of 1950 defines a century window of 1950–2049.

Benefits of MLE

COBOL for VSE/ESA and PL/I for VSE/ESA already provide full Year 2000 support, and you can use Language Environment for VSE/ESA callable services to set and query a century window at run-time. You can read about these existing features for COBOL in an earlier article by Alice Crema at:

> **http://www.s390.ibm.com/products/vse/vsehtmls/vn13cob.htm**

So why use MLE?

- MLE offers even more assistance, providing the underlying logic that you would otherwise have to code yourself.

- MLE gives you the ability to fix programs with few, if any, logic changes. MLE syntax includes new functions to simplify such changes where they are necessary (for example, new COBOL intrinsic functions for date field conversion).

- COBOL compiler messages indicate where date fields are used in a statement, and highlight uses of date fields that might require manual logic changes. These messages also are useful when planning for the long-term migration of an application to use fully-expanded date fields.

- COBOL users can automate the addition of the DATE FORMAT clause with COBOL and CICS Command Level Conversion Aid for VSE (CCCA) or the MLE Wizard (Windows NT only). For details, see "Automating Conversion to COBOL MLE" on page 50.

- MLE is implemented by compiler-generated machine code, making it the best-performing windowing solution.

- COBOL MLE support is identical in COBOL for OS/390 & VM, COBOL for MVS & VM, COBOL for VSE/ESA, COBOL Set for AIX, and VisualAge COBOL (OS/2 and Windows). PL/I MLE support is identical on PL/I for MVS & VM, PL/I for VSE/ESA, PL/I Set for AIX, and VisualAge PL/I.

- Not all programs within an application must be recompiled – only those programs with date logic. You can mix MLE programs with unchanged older modules.

- MLE allows you to use windowed dates and expanded dates in combination.

- The YEARWINDOW (COBOL) or WINDOW (PL/I) compiler option makes it easy to move the century window.

Limitations of MLE

MLE is intended for Year 2000 repairs only, not for long-term use. MLE cannot be used in applications where dates span more than a hundred years or where dates fall outside the range 1900–2099.

While MLE can relieve you of many of the logic changes where you choose windowing as your solution, it does not relieve you of the assessment, planning, analysis, implementation, and testing activities. In some cases, MLE might require you to make manual logic changes.

MLE does not provide true date data types. The only date-sensitive semantics provided involve automatically expanding (and contracting) the 2-digit year part of dates with respect to the century window. For example, adding 1 to a COBOL windowed date field containing the value 991231 (that might be used in an application to represent 31 December 1999) results in the value 991232, not 000101.

Automating Conversion to COBOL MLE

COBOL and CICS Command Level Conversion Aid for VSE (CCCA) offer a new conversion option that adds the DATE FORMAT clause to COBOL source code and copy books. To do this, CCCA requires a date identification file (DIF), which is a plain-text file of data item names and their date formats. You can create the DIF using a Year 2000 tool such as IBM OPTI-AUDIT for VSE.

If you have VisualAge COBOL Enterprise Edition Version 2.2 with FixPak 1, you can download your COBOL source to a PC and use the MLE Wizard (on Windows NT only), which provides a fully-integrated solution for implementing MLE.

MLE and Sorting

DFSORT/VSE windowed date sorting is fully compatible with MLE. For example, if you define a COBOL data item as a windowed date field and then use it as a SORT or MERGE key, DFSORT/VSE correctly sorts the 2-digit year dates according to the century window defined by the YEARWINDOW compile-time option.

Debugging COBOL MLE Applications

For debugging COBOL MLE applications, Debug Tool for VSE/ESA has a new type of breakpoint, AT DATE, which stops at each statement that uses a date field. This offers you direct support for Year 2000 verification testing.

If you use the TEST(*,SYM) option to produce a Language Environment for VSE/ESA formatted dump, DATE FORMAT clauses appear alongside values and descriptions.

What You Need to Use MLE

In addition to a COBOL or PL/I for VSE/ESA compiler, you need a separate enabling product and some PTFs.

The separate products that enable MLE for COBOL or PL/I are:

- VisualAge COBOL Millennium Language Extensions for VSE/ESA (program number 5686-MLE)
- VisualAge PL/I Millennium Language Extensions for VSE/ESA (program number 5686-MLX)

To use MLE with COBOL, you need the following PTFs:

Product	Component	PTF	APARs
COBOL for VSE/ESA	Base	UQ18840	PQ13830 PQ15549
	English	UQ19043	PQ13832
	Japanese	UQ19044	PQ13834
Language Environment for VSE/ESA	COBOL-Specific Base	UQ18836	PQ15106
	Japanese	UQ18664	PQ15112
	COBOL-Specific CICS	UQ18665	PQ15114

To use MLE with PL/I, you need the following PTFs:

Product	Component	PTF	APARs
PL/I for VSE/ESA	Base	UQ18898	PQ14394
Language Environment for VSE/ESA	PL/I-Specific Base	UQ18913	PQ15749
	Japanese	UQ18792	PQ15750

To debug COBOL MLE applications using Debug Tool for VSE/ESA, you need the following PTFs:

Product	Component	PTF	APARs
Debug Tool for VSE/ESA	Base	UQ18678	PQ15548 PQ15549
	Japanese	UQ18737	PQ15550

Additional Information

For more information about MLE, see:

- IBM COBOL Family Web site
  http://www.software.ibm.com/ad/cobol/

  Contains the *IBM COBOL Millennium Language Extensions Guide*, GC26-9266, in various formats (including PDF) and an online demonstration of working MLE code.

- IBM PL/I Family Web site
  http://www.software.ibm.com/ad/pli/

  Contains the *IBM PL/I Millennium Language Extensions Guide*, GC26-9324, as an Acrobat PDF file, and an online demonstration of working MLE code.

- IBM VisualAge 2000 Web site
  http://www.software.ibm/com/ad/va2000/

  Contains many MLE-related links.

- IBM OPTI-AUDIT for VSE Web site
  http://www.software.ibm.com/ad/va2000/va2koa.htm

- *CCCA for VSE User's Guide*, SC26-9401

  Acrobat PDF available from:
  http://www.software.ibm.com/ad/cobol/cccavug.pdf

- DFSORT/VSE Web site
  http://www.ibm.com/storage/dfsortvse/

- IBM Debug Tool Web site
  http://www.s390.ibm.com/dt/

DFSORT/VSE: Sorting and Creating Reports for Different Countries

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Do you have data from different countries and need a way to process that data quickly and easily? If so, DFSORT/VSE's **locale** support may be just what you're looking for! This article shows you how easy it is to sort your data and produce reports using DFSORT/VSE and the locales provided with VSE/ESA. We'll use three different locales:

1. The `DE_DE.IBM-273` locale for the German language from Germany,

2. The `FR_FR.IBM-297` locale for the French language from France, and

3. The `EN_US.IBM-037` locale for the English language from the United States,

and produce a Population Summary Report for each of the three languages. One input file will be used, so you'll be able to see for yourself that the output listings were sorted differently for each language.

The language-dependent sort sequence is defined by the different locales. If you don't specify a locale, DFSORT uses the English sort sequence (EBCDIC), which will produce incorrect results for the other languages due to the special characters used in these languages.

ICETOOL is the perfect tool when you want to sort your data using the cultural rules defined in a locale. You can then use ICETOOL to create reports and display the date, numerical data, and statistical information in the format that's most appropriate for the language. We'll go over examples on how to do all of these things.

⎡ **A Note About ICETOOL** ⎤

ICETOOL is a very versatile utility that is part of DFSORT/VSE. It's a batch front-end utility that uses the capabilities of DFSORT/VSE to perform many different operations in a single job step.

ICETOOL has its own syntax and is very easy to use. It has 13 operators that perform sort, copy, statistical, and report operations. ICETOOL automatically calls DFSORT/VSE with the control statements and options required to perform each operation. So, even though you're calling ICETOOL, ICETOOL is calling DFSORT/VSE under the covers.

Sample Input File

Figure 21 on page 53 shows the input file we'll be using. It contains the names of countries in three different languages, German (columns 1-20), French (columns 21-40) and English (columns 41-60). In addition, it contains the population for each country (columns 61-70) in zoned decimal.

```
Ägypten            Égypte          Egypt           0054800000
Afghanistan        Afghanistan     Afghanistan     0016900000
Österreich         Autriche        Austria         0010000000
Brasilien          Brésil          Brazil          0147400000
Nepal              Népal           Nepal           0018700000
Namibia            Namibie         Namibia         0012800000
Nigeria            Nigeria         Nigeria         0115300000
Peru               Pérou           Peru            0021400000
Panama             Panama          Panama          0002500000
Portugal           Portugal        Portugal        0010000000
Senegal            Sénégal         Senegal         0007200000
San Marino         Saint-Marin     San Marino      0000170000
```

Figure 21. Input File for the Reports

We are going to create three reports:

1. One German report which includes the German names of the countries and the population for each country in the file, displayed using the notation commonly used with German.

2. One French report which includes the French names of the countries and the population for each country in the file, displayed using the notation commonly used with French.

3. One English report which includes the English names of the countries and the population for each country in the file, displayed using the notation commonly used with English.

German Report

Let's start with the German report. We'll create the ICETOOL statements necessary to:

- Sort the German names of the countries using the DE_DE.IBM-273 locale.

- Produce a report that lists the country name and the population for each country and includes the average and total population of all of the listed countries in the format commonly used with German.

```
SORT FROM(COUNTRY) TO(TEMP1) USE LOCALE(DE_DE.IBM-273)
  USTART
    SORT FIELDS=(1,20,CH,A)
  UEND
DISPLAY FROM(TEMP1) LIST(012) -
  TITLE('Bevölkerungsübersicht') DATE(DM4.) -
  HEADER('Land')  HEADER('Bevölkerung') -
  ON(1,20,CH)     ON(61,10,ZD,A2) -
  AVERAGE('Durchschnittliche Bevölkerung:') -
  TOTAL('Gesamtbevölkerung:')
```

Figure 22. ICETOOL Statements for a Population Summary in German

Let me explain each of the ICETOOL statements in Figure 22.

The SORT operator sorts the COUNTRY file to the TEMP1 file using the SORT
control statement in the DFSORT/VSE section (the control statement between the
USTART and UEND).

The SORT control statement tells DFSORT/VSE to sort the country names (in
German) in ascending order. The LOCALE operand tells DFSORT/VSE to use the
collation sequence defined by the DE_DE.IBM-273 locale.

The ICETOOL DISPLAY operator uses the sorted records in the TEMP1 file to
create the report on the SYS012 printer containing:

- The title line with 'Bevölkerungsübersicht' and the date format commonly used
  with German (DD.MM.YYYY)

- A heading line with 'Land' and 'Bevölkerung', both underlined

- Data lines which include:

  – The country name, in German, from positions 1-20 of the input file

  – The population from positions 61-70 of the input file. The A2 mask tells
    ICETOOL to print the numbers using the decimal point separators com-
    monly used with German. You can choose from 33 predefined edit mask
    patterns, making it easy for you to pick the one you want.

- An AVERAGE line containing "Durchschnittliche Bevölkerung:" and the
  average population of all the countries.

- A TOTAL line containing "Gesamtbevölkerung:" and the total population of all
  the countries.

The SYS012 output starts on a new page and looks like the report in Figure 23.

```
Bevölkerungsübersicht      22.10.1998

Land                       Bevölkerung
--------------------       --------------------
Ägypten                        54.800.000
Afghanistan                    16.900.000
Brasilien                     147.400.000
Namibia                        12.800.000
Nepal                          18.700.000
Nigeria                       115.300.000
Österreich                     10.000.000
Panama                          2.500.000
Peru                           21.400.000
Portugal                       10.400.000
San Marino                        170.000
Senegal                         7.200.000

Durchschnittliche Bevölkerung:  34.797.500

Gesamtbevölkerung:             417.570.000
```

Figure 23. German Report

French and English Reports

To create the same report in French and in English, you have to make some changes. I'll point them out to you:

1. SORT operator changes:

   a. Change the LOCALE operand from (DE_DE.IBM-273) to:

      - (FR_FR.IBM-297) for French or
      - (EN_US.IBM-037) for English.

   b. Change the SORT control statement in the DFSORT/VSE section to a different sort key, either:

      - (21,20,CH,A) for the country names in French or
      - (41,20,CH,A) for the country names in English.

2. DISPLAY operator changes:

   a. Change the TITLE of the report to:

      - 'Sommaire de Population' in French or
      - 'Population Summary' in English.

   b. Change the DATE to the format used with

      - French (DM4/) or
      - English (MD4/)

   c. Change the HEADER of the report to:

      - 'Pays' and 'Population' in French or
      - 'Country' and 'Population' in English.

   d. Change the ON statement for Population to make the numeric data print in the notation that is common for the language:

      - ON(61,10,ZD,A3) for French or
      - ON(61,10,ZD,A1) for English.

   e. Change the AVERAGE of the report to:

      - 'Population moyenne:' for French or
      - 'Average population:' for English.

   f. Change the TOTAL of the report to:

      - 'Population totale:' for French or
      - 'Total population:' for English.

If you make these changes for French, the ICETOOL statements would look like this:

```
SORT FROM(COUNTRY) TO(TEMP1) USE LOCALE(FR_FR.IBM-297)
  USTART
    SORT FIELDS=(21,20,CH,A)
  UEND
DISPLAY FROM(TEMP1) LIST(012) -
  TITLE('Sommaire de Population') DATE(DM4/) -
  HEADER('Pays')  HEADER('Population') -
  ON(21,20,CH)    ON(61,10,ZD,A3) -
  AVERAGE('Population moyenne:') -
  TOTAL('Population totale:')
```

Figure 24. ICETOOL Statements for a Population Summary in French

The SYS012 output would look like this for French:

```
Sommaire de Population        22/10/1998

Pays                       Population
-------------------   --------------------
Afghanistan                16 900 000
Autriche                   10 000 000
Brésil                    147 400 000
Égypte                     54 800 000
Namibie                    12 800 000
Népal                      18 700 000
Nigeria                   115 300 000
Panama                      2 500 000
Pérou                      21 400 000
Portugal                   10 400 000
Saint-Marin                   170 000
Sénégal                     7 200 000

Population moyenne:        34 797 500

Population totale:        417 570 000
```

Figure 25. French Report

If you make these changes for English, the ICETOOL statements would look like this:

```
SORT FROM(COUNTRY) TO(TEMP1) USE LOCALE(EN_US.IBM-037)
  USTART
    SORT FIELDS=(41,20,CH,A)
  UEND
DISPLAY FROM(TEMP1) LIST(012) -
  TITLE('Population Summary') DATE(MD4/) -
  HEADER('Country')  HEADER('Population') -
  ON(41,20,CH)       ON(61,10,ZD,A1) -
  AVERAGE('Average Population:') -
  TOTAL('Total Population:')
```

Figure 26. ICETOOL Statements for a Population Summary in English

If you make these changes for English, the SYS012 output would look like this:

```
Population Summary          10/22/1998

Country Name                    Population
--------------------    --------------------
Afghanistan                  16,900,000
Austria                      10,000,000
Brazil                      147,400,000
Egypt                        54,800,000
Namibia                      12,800,000
Nepal                        18,700,000
Nigeria                     115,300,000
Panama                        2,500,000
Peru                         21,400,000
Portugal                     10,400,000
San Marino                      170,000
Senegal                       7,200,000

Average Population:          34,797,500

Total Population:           417,570,000
```

Figure 27. English Report

Summary

Thus you can see how easy it is to use DFSORT/VSE's ICETOOL locale support to sort the data in different languages! Then in the same step, you can use ICETOOL to produce reports that display the numeric values and date formats that are common for that country and display summary information such as averages and totals. I hope you can make use of this important feature of DFSORT/VSE!

Note: If you want to use DFSORT/VSE's locale processing, you must use DFSORT/VSE V3R3 or a subsequent release and have one of the following installed:

- VSE/ESA 1.4 through 2.1 and the Language Environment for VSE/ESA 1.4.0 (with the C language run-time support installed), or

- VSE/ESA 2.2 (with the C language run-time support installed from the VSE/ESA Extended Base Products tape), or

- VSE/ESA 2.3 or subsequent release

Additional Information

See *DFSORT/VSE Application Programming Guide*, Appendix E, for the list of locales supplied with the C Run-Time Library.

For more information on DFSORT/VSE, visit our home page at:
    http://www.ibm.com/storage/dfsortvse/

Bringing VSE Applications to the Web

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└───────────────────────────────────┘

Overview

VSE is a solid, reliable repository for your organization's vital business information. However, are you still providing users with access to VSE data only through the antiquated 3270 interfaces of VSE applications? Now more than ever, users demand graphical, intuitive interfaces and access to information not just from the office, but from home and the road as well. How can you satisfy their needs while still retaining the mainframe strengths of reliability, availability, and scalability (RAS)?

Many organizations consider system migration their best option. The presumption is that in order to connect your legacy applications to the Internet, you must move them to a platform that was designed for Internet applications. However, "legacy systems" can, in fact, connect directly into the Internet via the desktop. Many of the alternative platforms are also still evolving, and unlike the mainframe, deliver only minimal levels of RAS.

Even those platforms that have achieved acceptable levels of RAS still lack robust systems management tools, creating high levels of Total Cost of Ownership (TCO). According to the International Technology Group in Mountain View, CA, not only does the mainframe have the ability to support a high number of hits per minute, but it also has the lowest Web server cost compared to the NT and UNIX alternative servers.

Every mainframe application represents a significant investment that should not be casually discarded. One alternative to migration is putting a new front-end on your application. This allows you to easily extend its life, freeing you to focus your resources on developing new applications for your organization.

The good news is that there are several VM and VSE products that allow you to provide access to legacy applications directly from a desktop system, while those applications are stored on a platform that delivers high levels of RAS. Thus migrating to NT or UNIX servers is *not* necessary. This article focuses on one of your options – using the IBM VM/ESA operating system as the platform for the Web server – and discusses the basics of how to "webify" your VSE applications.

VM/ESA – A Platform for the Internet

VM/ESA offers extraordinary flexibility in RAS and is still considerably ahead of alternative platforms such as UNIX and NT. Frequently implemented on VSE as a hypervisor, or master operating system, VM/ESA has local access to multiple guest operating systems and their applications. As a Web server, VM/ESA can act as a gateway to all the established legacy systems in your environment without creating new connections between systems and without the addition of a new platform.

Providing Web browser access to an application (*Web-enabling*) is only the first step. More importantly, you need to exploit browser capabilities (*Web-enhancing*) to improve your VSE application's user interface. Web-enhancing your VSE applications is the best and most cost-effective way to bring VSE data to the desktop. You can hold down development time and costs, and protect your investment in existing systems.

Key requirements for a solution that Web-enhances VSE applications are that it:

- **Addresses all your VSE applications, including 3270 (full-screen) applications,**

- **Does not just Web-enable your applications, but also Web-enhances them,**

- **Delivers scalability for any number of users, and**

- **Protects transmitted data by combining mainframe-class authentication and access control with Secure Sockets Layer (SSL) technology.**

Getting Started

You need to start thinking about the processes required to bring your mainframe applications to the Web browser. Since you've decided to stay with the VM and VSE platforms, you shouldn't have to modify the applications just to bring them to the Web browser. You should be able to define a new browser interface for your VSE applications without having to make any changes to the underlying programs.

The task of creating a new Web browser interface for an application can be accomplished by using a VM-based Web server, Common Gateway Interface (CGI) programs, and Hypertext Markup Language (HTML) documents.

CGI programs are the means of creating dynamic, interactive Web pages. The CGI program defines how information gathered from your users using an HTML document (called a "form") is passed through the Web server to a program that will process that information and return the results to the user in another HTML document. Practically all Web servers support CGI programs. On VM, you write CGI programs using REXX and CMS Pipelines in conjunction with standard CGI commands.

Using CGI programs in conjunction with your intranet data can provide your users with real-time, up-to-date information rather than having stale HTML documents that must be manually updated as the information changes. For example, you could write a Web-based expense report form driven by a CGI program. This form would allow users to submit their expense reports directly through your intranet, thus removing the need for paper documents. In addition, the CGI program could perform error checking that can save your accounting department from performing manual checks later on. The program could verify that the user entered proper department codes, filled in all required fields, and did not go over his personal or department expense limits.

Add to your intranet the ability to execute your mainframe VSE applications, and you have a complete Web-based solution.

Steps Necessary to Bring the Application to the Browser

When bringing your VSE applications to the browser, there are several processes that you follow. The remainder of this article will address each of these processes and demonstrate how to write a CGI program to Web-enhance a simple application.

Before you can begin writing a single line of code for the CGI program, you must first make several decisions:

1. **Should the application be Web-enhanced or merely Web-enabled?**

   A Web-enhanced application uses the strengths of HTML, the Web browser interface, and graphic elements such as images and icons to bring a new and more modern user interface to the application. A Web-enabled application merely presents the existing 3270 application screens to the Web browser, while maintaining the existing and often outdated user interface.

   Which method you employ can depend on several factors, including how much time you have and how often the application is used. If your goal is to quickly bring the existing applications to the Web browser, then use the Web-enable method. Likewise, if the application is not heavily used and users would not benefit greatly from a new interface, then you should use the Web-enable method. However, if the application is heavily used or you want to add functionality to it (using existing application functions), then use the Web-enhance method.

   Just remember that it is not an all or none situation. You can decide to use the Web-enhance method for the most heavily-used application functions and use the Web-enable method for seldom-used screens. This approach allows you to bring a new look to your application without having to create HTML for every application screen.

2. **How will the CGI program validate the requestor?**

   Your system has some means of validating application users. You will carry forth a similar means of validation with your CGI program. If all your VSE users also have VM user IDs, then you can simply have the browser challenge the user for a user ID and password and have the Web server validate the users. If the user provides the correct user ID/password combination, he is allowed to invoke the CGI program. If the user does not specify the correct user ID/password combination, he is denied access to that CGI program (or any other Web resource if you so choose).

   But what if your VSE users do not have a VM user ID and password? What if the application validated the users based on their social security number and a PIN number? Because your CGI program is interfacing with your VSE application, you can prompt requestors for their social security number and PIN number (in the same manner as you would have obtained their VM user ID and password) and then have the application validate the information for you. Should the social security number/PIN number combination be incorrect, the CGI program will terminate. If a user enters a valid combination, then the CGI program will proceed.

3. **How will the CGI program obtain the VSE session for the transaction request?**

   In addition to validating the requestor for the CGI program request, you must also determine how the user will access the VSE application. Will the requestor always connect to a specific terminal address? Or will the CGI

program pick a free terminal address for the execution of the application? Either way, your CGI program must determine the correct terminal address for this session.

In the discussion above on user validation, we were able to validate the users based on social security number and PIN number. We could add logic to the CGI program to determine a valid application ID and terminal address based on the information the requestor provides at validation.

The method you choose (and there are other means of determining how to access the application) depends largely on your system and application requirements.

Once you have the answers to these questions, you are ready to begin creating the CGI program. Each CGI program will follow these basic steps:

1. Begin standard CGI program setup and validation.
2. Convert the application's main page to an HTML document.
3. Validate the requestor and invoke the application.
4. Present the Web-enhanced main menu to the browser.
5. Respond to the requestor's next request.
6. Advance the application to respond to the request.
7. Present the Web-enhanced browser response to the request.
8. Wait for the next request.

The remainder of this article discusses these steps in more detail.

Step 1: Begin Standard CGI Setup and Validation

The CGI program itself resides on the VM Web server or on a user's virtual machine. Unlike a Java program, which runs in the client browser, a CGI program runs on the VM Web server service virtual machine or in worker machines assigned to that Web server. A CGI program can be called from an HTML document (called a "form") or directly from the requested URL. With either method, once the client browser makes a request, the CGI program begins executing on the VM Web server. Processing begins and the CGI program builds an HTML document that presents the results to the requestor on the browser. At that point, the user can begin the process again by filling out the appropriate information on the HTML form that was built dynamically by the initial CGI program. Or the user can invoke another CGI program by entering a URL on the browser.

As you begin developing your own CGI programs, you will find that constructing a common CGI template file will reduce the time it takes to produce a working CGI program. You will only need to make changes in parameters passed, the specific processing that is done, and in the HTML document used to present the results of the CGI program.

With some CGI command knowledge, coding CGI programs is no more difficult than coding REXX programs, and it opens up an entire new means of presenting information to your users.

To expedite the creation of CGI programs, you will find it useful to have a template CGI program on hand to use as a framework for all your CGI projects. At a minimum, the template CGI program should:

- Determine the CGI program request method.

  The CGI program should regard a `GET` request method as the original invocation of the CGI program and trigger the appropriate routines to log on to the user ID (or access the appropriate operating system), invoke the application, and present the initial Web page to the browser. Your program should regard a `POST` request as a subsequent invocation of the CGI. This is how you will determine what function the user selected from the main menu.

- Obtain any data from the request and make it available to the CGI program.

  The request method will determine how you obtain the data the requestor passed to the CGI program. A `GET` request places the data in the environmental variable `QUERY_STRING`. A `POST` request places the data in the program stack. After you obtain the data, you must decode and parse it into the program variables.

- Include the necessary CGI `WRITE` commands to pass the information to the browser.

  You will find it useful to create a common subroutine in your sample CGI program that contains the required CGI WRITE commands. You can then call this subroutine any time you need to pass an HTML document to the browser.

Step 2: Convert the Application's Main Page to an HTML Document

At this time, you should be familiar with the application and its various screens. You have probably given some thought to how you would like to modify the application's menus to give them a Web page "look and feel." We now need to transfer those thoughts and ideas to an HTML document. Let's assume that this main menu screen (Figure 28 on page 63) of the sample `RECIPES` application provided with Sterling Software's **VM:Webgateway CGI Extension** is representative of your application's main menu. We will make the following changes as we construct the corresponding HTML document:

- Exchange the "enter a selection number" interface with a "click on the button" interface for each selection.

- Remove the need for PF keys and have only an EXIT button on this Web page.

```
   DA1MM1                       Recipe Manager 7.35g

What would you like to do with your recipes?

          Enter the number or letter of your selection and press ENTER

                  _ 1. View a recipe category

                    2. Search for a recipe

                    3. Create a new recipe

                    4. set Options

                    5. eXit
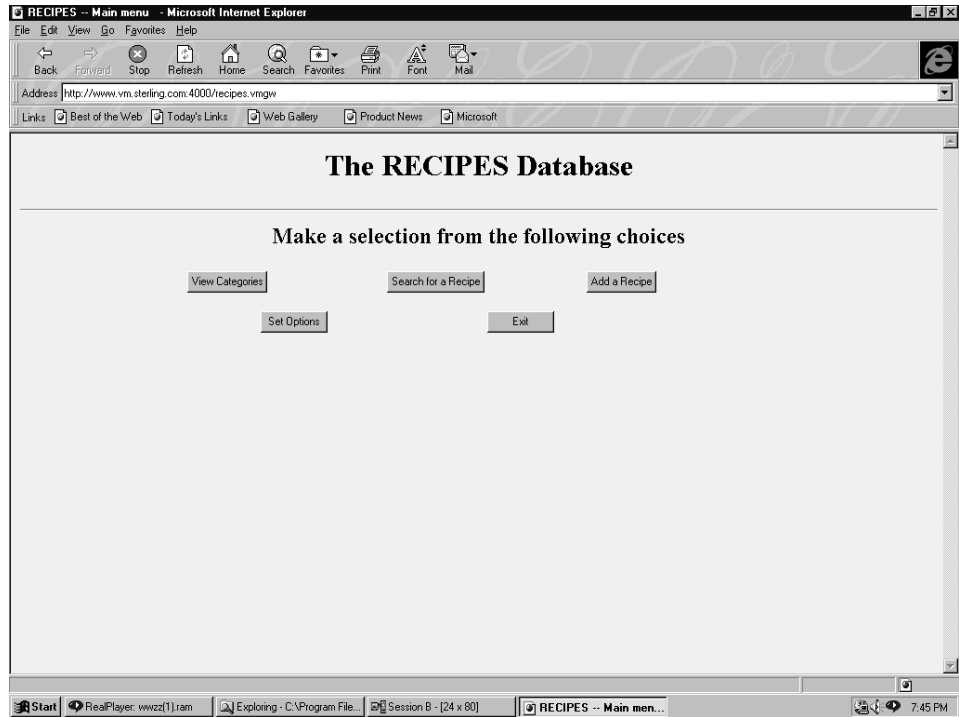


  ===>
 PF:   1- Help   2- Info   3- Quit   12- Return              Enter - Proc
```

Figure 28. Sample Main Menu from RECIPES Application

We will use SUBMIT buttons to replace the standard 3270 selection process with a Web-enhanced look. Why were SUBMIT buttons chosen over other types of FORM selectors such as radio buttons or a drop-down list? Although any type of selector would have worked, the others require two actions on the part of the user: 1) to choose the selection and 2) to submit the request. A SUBMIT button does both with one action. SUBMIT buttons are preferred when the number of selections is known in advance.

We also did not carry over the PF keys to the HTML document. These keys do not have the same meaning on a Web page, and you can replace their functionality by adding "Previous Page" and "Home" buttons.

The HTML document should also include a title for the page and any instructions to the requestor. You might also want to place the FORM buttons in a table to improve readability. The completed Web page could resemble Figure 29 on page 64.

Figure 29. Sample RECIPES CGI Main Menu

We are now ready to update the template CGI program to actually invoke the VSE application.

Step 3: Validate the Requestor and Invoke the Application

Now we will use the methods described earlier to validate the requestor and invoke the application:

1. Challenge requestors for validation information, such as their social security number and PIN number.

2. Create a logical device to use for this session.

3. Access the VSE application and display the application's main menu on the logical session.

You can accomplish these three steps by using two VM:Webgateway CGI Extension routines: **USERPASS** and **DIALVTAM**. These routines are available in **VIGRTNS** building block library in VM:Webgateway CGI Extension.

First, we need to obtain the validation information from the user. Using the USERPASS routine and access control records, you can cause the Web browser to challenge the user for specific information, such as a social security number and PIN. The CGI program can then obtain that information from the browser and validate the request. If the user provided correct validation information, the CGI will continue.

Once we have validated that a requestor is authorized to execute a particular CGI program, you can create the logical device and then use a series of commands to invoke the VSE application. These commands will obtain a valid application ID and terminal address and then actually issue the commands to bring up the application

on the logical device. Routines such as DIALVTAM assist in automating this process.

At the completion of these steps, the application will be active and displaying the main menu of the application on the logical session (as in Figure 28 on page 63). We now need to display the Web-enhanced version of this page, which we created in Step 2 above, to the user.

Step 4: Present the Web-Enhanced Main Menu to the Browser

Whenever you advance the VSE application to a new screen, such as the main menu above, you need to display the appropriate Web page to the user. This way both the VSE session and the browser will be in sync. Please note, however, that there does not have to be a one-to-one correspondence between application screens and browser screens. One of the benefits of Web-enabling an application is that you can combine several VSE screens together into a single Web page. When you have finished navigating through all the VSE screens for a particular selection (such as a display of classes and instructors), you can display the single Web page (representing all or parts of the class list screens) to the user.

In order to display the Web page you constructed in Step 2, you must use a series of CGI commands to write the HTML document out to the browser. At this time, you can use the subroutine discussed earlier to write the document. Here is an example of the commands required for this subroutine:

```
Write_Document:
    'CGI WRITE HEADER (STRING Status: 200 OK'
    'CGI WRITE HEADER (STRING Content-type: text/html'
    'CGI WRITE DOCUMENT (TRANSLATE USENGLISH CRLF STEM HTML.'
    return
```

At this point, the HTML document is presented to the user, who will see the Web page as shown in Figure 29 on page 64. The user is ready to make a selection and move on to the next function. You are ready to move on to the next steps of coding for each application function and the navigation keys for each page.

Step 5: Respond to the Requestor's Next Request

At this point, the requestor is ready to make a choice from the application's main menu. That request is then passed back on the second invocation of the CGI program. CGI programs must follow the Hypertext Transfer Protocol (HTTP) and exit after the CGI program has passed the HTML document to the browser. When the requestor makes a selection from this menu document, it is requesting that the CGI program be invoked for a second time. The CGI program must then recognize this request (as a POST request method) and continue processing.

Assuming that the requestor made a function request (such as View Categories), the CGI program must now reflect that choice to the application.

Step 6: Advance the Application to Respond to the Request

Because the CGI program invoked the VSE application from a logical session, it must simulate the keystrokes that an actual user would have keyed in to select that same function request on a 3270 device. To select the "View Categories" function, the CGI program has to simulate moving the cursor to the first input area on the screen, entering a "1" in the input field, and pressing the ENTER key. Once the CGI program has executed these three screen actions, the application displays a

new screen on the logical session. It is the CGI program's responsibility to again display a representation of this new screen to the Web browser.

Step 7: Present the Web-Enhanced Browser Response to the Request

In the same manner as the CGI program displayed the initial main menu screen as a Web page, it must now pass the results of the request to the Web browser. Typically, this requires building a second HTML form document that represents the current application screen. This form displays additional information and provides a means of gathering new information from the requestor.

Step 8: Wait for the Next Request and Repeat

At this point, the process becomes a loop between the browser display, execution of the CGI program, and advancing the VSE application in response to the user's requests. For each request that the CGI program obtains from the HTML form, the CGI program must continue to advance the application and then display a new browser page representing the application screen. This process continues until the user terminates the application. At that point, the CGI program should terminate the application gracefully, destroy the logical session, and present a final Web page to the requestor to signify that the application has indeed terminated.

Conclusion

It certainly *is* possible to revitalize your VSE applications by bringing them to the Web. You can meet your users' needs by delivering unparalleled access to all your existing VSE applications, enhancing data presentation, and capitalizing on the proven strengths of your mainframe environment. And you can do this quickly, easily, and cost-effectively.

The answer lies in retaining both data and applications on the mainframe, improving user interfaces to the data and applications, and ensuring you have a *complete* solution to Web-enable *and* Web-enhance your applications. Hosting your Web server on VM/ESA – in combination with a Web-enabling and Web-enhancing solution – can provide a rapid, reliable, and low-cost solution for e-commerce applications.

Don't reinvent the wheel by recreating your applications on alternative platforms simply to get them out on the Web. Extend and leverage your investments on the mainframe by connecting them to the Web and giving them the fresh look and feel of a graphical user interface.

Additional Information

Sterling Software's VM:Webgateway provides a cost-effective solution for delivering information worldwide to employees, business partners, and customers through popular Web browsers. With the VM:Webgateway CGI Extension, you can Web-enable and Web-enhance your existing mainframe – VM, VSE, and OS/390 (MVS) – applications, including full-screen applications. This cost-effective alternative to NT and UNIX Web-enablers requires no additional servers. Plus, it allows you to add a graphical interface to 3270 data streams to provide a modern appearance and functionality to your applications without significant re-engineering.

If you would like information about VM:Webgateway, please visit:
http://www.vse.sterling.com/

You also can send an e-mail to **vse@sterling.com**, or you can call **(703) 264-8102** or **(800) 533-5128**.

Editor's Note: Rob Amos, a Senior Consultant, has held numerous positions at Sterling Software since he started with the company in 1985. Most recently, he has been extensively involved with using VM:Webgateway to assist sites in Web-enhancing their mainframe applications.

Is VM Good for VSE Guest Performance?

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└

Introduction

Does VM help VSE guest performance? Anyone who has spent any time in performance knows the answer to a performance question is most often, "It depends." That performance rule applies here as well. The real performance enthusiast uses the follow-up question, "What does it depend on?".

This article will help you understand the performance dependencies when running VSE as a guest of VM. These dependencies include a number of factors and tradeoffs, such as hardware assists, preferred guest usage, enhanced minidisk cache, workload, and objectives.

If forced to respond to the original question, I would have to say, "*Yes, VM helps VSE guest performance!*" VM/ESA adds value to VSE systems in a number of ways from a performance perspective. VM/ESA traditionally extends the capacity of a single VSE by providing the ability to run multiple VSE images. While the VSE Turbo Dispatcher provides multiprocessing support, many customers will need VM/ESA to fully exploit the large n-ways in the IBM processor line. VM/ESA multi-processor support, used in conjunction with the extensive scheduling features, make it very powerful. VM/ESA allows for efficient sharing of storage for V=V guests and the virtualization of many resources. Providing the best of both worlds, VM/ESA paging allows high-speed demand paging with expanded storage and block paging with DASD. VM/ESA also allows for several performance features, including virtual disk in storage, enhanced minidisk cache, and VM data spaces. The latter is exploited by DB2 Server for VSE and VM (SQL/DS) for great performance improvements.

Besides performance, there are other reasons to use VM with VSE. CMS is a great application development and test platform. The virtual machine model of VM allows for easy migration, test, and isolation. VM/ESA can further complement VSE with additional products and applications, such as OV/VM or ADSM.

When using technical terms, we need to understand what is really meant by those terms. No definition is more critical than that of "performance." A discussion on whether performance will improve or degrade is a waste of time unless you have first reached an understanding on the meaning of performance.

There are two schools of thought about performance. One looks at processor utilization, and one that looks at response time. The **Internal Throughput Rate** (**ITR**) is a measure of commands per processor second. Another way of thinking of this is the number of commands that could complete if the processor was running at 100%. Many people use ITRs to compare processor performance. When done properly, there should be an implied response time limit as well. **External Transaction Rate** (**ETR**) is a measure of commands completed per wallclock or elapsed

second. When looking at performance comparisons, it is a good idea to be able to determine both the ITR and the ETR.

Another factor to consider is the relative importance of various components of the workload. Is batch performance more important than interactive users? Are all interactive users of equal priority? Are there different windows where batch becomes more or less important? These are all important questions to ask.

I have heard people criticize the performance of VSE with VM, only to find that their view of performance was based solely on processor utilization. However, the discussion changed when topics of response time and throughput were brought into the picture.

CPU Usage by VM/ESA

A common error is to use a trivial test case to determine the overhead of running VSE as a guest of VM. Base costs to run VM/ESA include infrastructure, scheduling, dispatching, accounting, and monitor. Many of these are constant costs. That is, the CPU required stays the same no matter how busy the system. So, if you run a trivial VSE workload as a test, you'll see VM/ESA being a larger percentage of the total CPU usage.

VM/ESA uses the **SIE** (**Start Interpreted Execution**) instruction to run virtual processors. The phrases "running under SIE" and "running under emulation" describe the state of a virtual processor that has been run by CP with the SIE instruction.

The cost of processing work in the VM CP is tied to how often we exit from SIE (via intercept or interrupt). This is a case where the hardware assists play a significant role. The four most common reasons for exiting SIE are: I/O processing, page fault resolution, instruction simulation, and minor time slice expiration.

I/O Processing tends to be the most significant and is obviously workload dependent. VM/ESA gets involved with all V=V I/O and some V=R and V=F I/O. Minimizing I/O in the guest, by using larger buffers or data-in-memory techniques, can lower VM/ESA overhead. The best I/O is the one not done. VM/ESA also gets involved for page fault processing for V=V guests. This can be minimized by adding storage or reserving pages as appropriate.

SIE is also exited for certain instruction simulation such as unassisted SIGPs and IUCV. VM/ESA will also get control when the minor time slice expires. This can be adjusted with the SET SRM DSPSLICE command. However, caution should be used when adjusting the minor time slice. While increasing it *may* lower the VM/ESA overhead, it also lowers the ability of VM/ESA scheduling to adjust to system changes.

In general, dispatching in VM/ESA is fairly efficient; and increasing the dispatch slice may only show marginal improvement in system overhead. We have seen scenarios where the ITR improves, but ETR gets worse when increasing the minor time slice. Note also that a virtual processor dedicated to a real processor gets a 500 millisecond dispatch time slice.

VM I/O Processing

From an ITR point of view, I/O Assist gives the best performance since it avoids VM processing. However, devices eligible for I/O Assist are not eligible for minidisk cache. In this case, we would need to choose between using I/O Assist to lower processor resource usage and minidisk cache for faster I/O.

I/O Assist (or I/O Passthru or SIE Assist) is the ability that under certain conditions, guest I/O operations and interrupts do not cause an exit from SIE and, therefore, avoid processing in the VM control program. On ES/9000 processors, I/O Assist is enabled by the microcode. Only dedicated devices of V=R or V=F guests are eligible for I/O passthrough. In Chapter 3 under the "I/O Interpretation Facilities" section, *VM/ESA Performance* (SC24-5782-02) contains requirements for I/O Assist, reasons for dropping out of I/O Assist, and information on available data.

CCW Translation Bypass can be done for V=R guests for dedicated devices and, in limited cases, full-pack minidisks. When I/O Assist is not available, CCW Translation Bypass provides some of the benefits that would be otherwise missed. CCW Translation Bypass can be controlled by the SET CCWTRAN command. For a V=R machine the default for CCWTRAN is set OFF. CCW Translation Bypass does not apply for a V=F machine as the real and virtual storage address are not equivalent. If you SET CCWTRAN ON for a V=R machine, then the benefit of I/O Assist is lost. In the past, CCW translation bypass was often referred to as I/O fast path.

Fast CCW Translation is related to a VM/ESA feature where CP will use a more efficient path in the translation of virtual to real addresses associated with CCWs and untranslation (real to virtual). It is only available for a subset of DASD I/O that are not satisfied through I/O Assist or CCW Translation Bypass. Fast CCW Translation should not be confused with the hardware feature called CCW Translation Bypass.

Remember that the VM overhead results from exiting SIE for processing. Therefore, features in VSE that can be used to avoid I/O that VM sees can be very helpful. VSE virtual disk in storage is a good example. Improving I/O performance often comes at a cost in some other resource. Both virtual disk in storage and minidisk cache require sufficient storage to provide good performance. With VM/ESA you can exploit expanded storage, if available. If you are only looking to improve read I/O, then minidisk cache is a better choice than a VM virtual disk in storage.

The various types of DASD can influence performance. To get the most from I/O Assist, dedicated devices are best, followed by full pack minidisks. Partial pack minidisks are very flexible, but ineligible for I/O Assist.

Remember: Dedicated devices are not eligible for minidisk cache. There are also a couple of special guidelines for using minidisk cache with FBA devices, such as the minidisk being even increments of 64 512-byte blocks.

Paging Considerations

VM/ESA paging is recognized to be more advanced than VSE/ESA paging, but there is room for discussion. One should try to avoid scenarios of double paging or paging in both VM and VSE which are described in the following steps.

1. A VSE job references storage which results in a page fault.

2. VSE pages this virtual page into a real frame. (The VSE real frame or guest real frame is really a virtual page to VM.)

3. VM then takes a page fault on the guest real frame (virtual page to VM) and must page into host real storage.

VM paging is avoided completely for V=R or V=F machines. The closer the VSE VSIZE to the size of the VSE virtual machine, the less VSE system should have to page.

If there is no need for paging in VSE, consider the NOPDS option. Use the PAGEX ON option where appropriate. The PAGEX feature of VM allows for page faults to be handled asynchronously to the guest.

Normally, when a there is a page fault for virtual storage in VM/ESA (what would be real storage to the guest), the processing of the page fault serializes the guest. However, with PAGEX, the page fault can be handled asynchronously. VM/ESA gives control back to the guest so it can run a different task while it waits for the page fault to complete. VM/ESA will present a special interrupt to signal the guest that the original page fault is complete.

A tradeoff can arise between ITR and ETR for paging. If you are not using PAGEX ON, a page fault handled by VM/ESA will serialize the virtual machine (VSE). If the paging configuration is very poor, it might be appropriate to move the paging up to the VSE level. While a page fault here would take more processor resources, it will not serialize the virtual machine. If the configuration includes expanded storage for paging, then let VM/ESA do the paging in order to exploit the expanded storage.

Preferred Guest Considerations

Preferred guests (V=R and V=F) are eligible for I/O Assist and avoid paging over-head. V=R and V=F performance is similar, but it can vary some. There is some extra processing required for the recoverability part of V=R support, especially if I/O Assist cannot be exploited. However, V=R also has the CCW Translation Bypass option. The total number of preferred guests is still six, even though LPAR can provide more partitions on some processors.

Speaking of LPAR, if you are running VM/ESA in an LPAR, you need to realize that it changes the characteristics. Both LPAR and VM/ESA use SIE. On older processors (3090E and older), the assists were not available to run SIE on top of SIE. Running this configuration would be very costly. All the current processors (ES/9000, 9672, 2003, etc.) have the required interpreted SIE assist for running VM/ESA on LPAR. However, with VM/ESA on an LPAR, only the V=R machine is possible and there is no I/O Assist. In this scenario, you are often better off just running the guest as a V=V machine with CP reserved pages.

Virtual Multiprocessor Considerations

Two approaches to creating a virtual multiprocessor (MP) machine are:

- Defining the virtual processors in the directory so they are available when the virtual machine logs on.

- Setting up the directory so that you can use the DEFINE CPU command to add virtual processors dynamically.

Detaching a virtual processor resets the virtual machine, which is rather disruptive. Extra virtual processors should not be defined unless they are going to be used. A defined, but unused, virtual processors can cause performance problems. A virtual processor in the stopped state makes the virtual machine ineligible for I/O Assist.

From a tuning perspective, it is important to note that the share value is distributed across the virtual machine. For example, if you have a virtual 4-way and a default share of relative 100, then each virtual processor would be scheduled as if it had a relative 25 share value. Therefore, defining more virtual processors than you will use lowers the effective share value. Real processors can be dedicated to virtual processors. Mixed environments, where a single virtual machine has both dedicated and undedicated virtual processors, is not recommended. A mixed environment can result in performance anomalies that will be difficult to detect and explain.

VM/ESA Data-in-Memory Techniques

The three main VM/ESA data-in-memory techniques available for use with VSE are VM data spaces, virtual disks in storage, and minidisk cache. Many products exploit VM data space. Of particular interest to VSE customers is DB2 Server for VSE and VM (SQL/DS).

The VM virtual disk in storage feature allows for volatile FBA minidisks that can be defined as shareable or private. These are backed by a VM system utility space. It is ideal for the VSE lock file.

Minidisk cache was enhanced in VM/ESA 1.2.2 to be more flexible, allow more types of data, and more types of I/O. The enhancements included a series of CP commands to enable/disable the cache; flush the cache; the ability to use real storage as the cache; the eligibility of almost any type of data; and eligibility of SSCH, SIO, and SIOF I/Os. One should not suppose that MDC will benefit read-once data, particularly if the reading application has been highly tuned.

Exploitation Examples

Figure 30 on page 73 and Figure 31 on page 74 show exploitation of the minidisk cache (MDC). The first also includes VM virtual disks in storage (VDSK).

Two important facts are brought to light with these illustrations. First, it is **possible**, but not **guaranteed**, to get better throughput with a guest running under VM/ESA than running native, by trading off processor and storage resources. Second, it is workload dependent, based on I/O characteristics.

Elapsed Time and Processor Usage

VSE/ESA PACEX8 Workload

Figure 30. Elapsed Time Benefits from Using Minidisk Caching – PACEX8 Workload. PACEX8 workload on a single VSE/ESA guest of VM/ESA 1.2.2 on the 9121-320 processor.

For the I/O intensive PACEX workload in Figure 30, the new MDC can be very beneficial, especially when combined with virtual disk in storage. Note that when VM/ESA gets more involved, processor utilization can increase. This is a trade-off for better elapsed time.

Minidisk Cache Benefits

VSE/ESA VSECICS Workload

Figure 31. Elapsed Time Benefits from Using Minidisk Caching – CICS Workload. CICS workload on a single VSE/ESA guest of VM/ESA 1.2.2 on the 9121-320 processor.

The VSE CICS workload did not show as significant an improvement as PACEX. The CICS workload is less I/O intensive and has a lower read to write ratio. While there was a significant reduction in the number of DASD I/Os, average response time reduction was not as large. Also, note the diminishing returns as more storage is provided for minidisk cache.

From the CICS graph, you can also see the law of diminishing returns. As more and more storage is given to MDC, the rate of improvement lessens.

Conclusion

VM/ESA continues to add value to many VSE environments by

1. Allowing multiple VSE images to run on a single processor complex.

2. Efficiently sharing storage and virtualizing other physical resources.

3. Expanding the rich function of VSE with additional products and applications such as ADSM.

Additional Information

This article has addressed some of the features and variables that go into determining guest performance. It is based on a presentation available on the web at:

http://www.vm.ibm.com/devpages/bitner/presentations/vmvseprf.html

Additional VM with VSE resources include:

- MDC information
  http://www.vm.ibm.com/perf/tips/prgmdcar.html

- VSE performance as a VM/ESA guest
  http://www.vm.ibm.com/perf/tips/prgvse.html

- CCW translation information
  http://www.vm.ibm.com/perf/tips/prgccw.html

- Dr. Wolfgang Krämer's paper on VM/VSE performance
  http://www.s390.ibm.com/ftp/vse/docs/vevmperf.pdf

- Various other VSE performance papers
  http://www.s390.ibm.com/products/vse/vsehtmls/s390ftp.htm

Auto UNIX System Provides VSE and VM Customer Value

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Overview

The **OS/390 Auto UNIX System Option for VM, VSE and OS/390** (**Auto UNIX System**) offers VSE and VM customers valuable solutions by providing access to modern applications not available on VSE or VM. These include key applications such as Lotus Domino for S/390, the Baan ERP application (in 1999), the ability to develop and run generalized UNIX interactive workloads on a UNIX 95 branded system that can utilize DB2, and the capability to consolidate alternate platform UNIX applications and data.

Auto UNIX System can be installed, maintained and managed with current VSE or VM S/390 and UNIX systems administrator skills. It requires **no** OS/390 or MVS skills.

Auto UNIX System – when combined with selected offerings – has very attractive terms and conditions. VSE/ESA affinity and VM/ESA synergy to OS/390 make Auto UNIX System a really viable business and technical option.

Auto UNIX System can be ordered today. It will be generally available the end of December 1998.

VSE/ESA Affinity to OS/390

Since the introduction of VSE/ESA in 1990, VSE has had an "OS/390 Affinity" technical strategy. This means that whenever VSE customer requirements are addressed, IBM tries to make the solutions consistent with OS/390 solutions. In many cases, actual OS/390 code has been reused and modified to work in a VSE environment. For example:

- VTAM for VSE V4.2 is based on the VTAM base element of OS/390, and Language Environment (LE) for VSE is a subset of the OS/390 LE base element.

- Year 2000 Ready programming languages of COBOL for VSE, PL/1 for VSE, and C for VSE are based on OS/390 language products.

- High Level Assembler (HLASM) is basically the same for VSE and OS/390.

- DFSORT/VSE is based on DFSORT for OS/390.

- IBM reused OS/390 code in the VSE operating system for dataspaces and the Open Systems Adapter Support Facility (OSA/SF).

In September 1998, IBM announced VSE/ESA V2.4 with a new CICS Transaction Server for VSE. Based on CICS/ESA for OS/390, it provides a more "common" CICS between VSE/ESA and OS/390.

For years now, VSE customers looking for new applications that were not available for VSE have practiced "coexistence." Some customers installed AS/400, AIX, Windows NT, or UNIX systems to supplement their VSE system. Some VSE customers ran applications under VM that otherwise aren't available for VSE. Thus, Auto UNIX System is simply the latest variation of a "coexistence option" that many VSE customers are already pursuing.

VM/ESA Synergy to OS/390

For years, S/390 customers have realized maximum value when running VSE and OS/390 as guests of VM. These customers recognize the unique strengths of each S/390 platform and that in combination they have the most flexible, powerful system possible. IBM has invested in this relationship over the years, ensuring that "guest only" functions in VM supported the latest hardware and software advances required by the guest systems.

At the same time, CMS-unique functions are exploited by customers to assist with application development, business intelligence, printing and general inter-system connectivity. Investments in these relationships continue through the latest release of VM/ESA – V2 R3 – which includes Parallel Sysplex testing support for OS/390 customers, a TCP/IP feature (that among other things can serve as a dynamic routing hub for several VSE and/or OS/390 guests), and Year 2000 support which allows multiple test guest systems to run with different clocks and calendars.

Customers who have historically looked to VM to address interactive computing requirements are beginning to take advantage of the network computing capabilities provided in VM products produced by IBM and other vendors. Web technology has turned out to be a key enabler in extending current VM applications to intranets or the Internet.

VM has a variety of new interfaces which complement its traditional environment and allow customers to develop systems to address many business challenges. In some cases, these solutions exploit the complementary nature of the traditional relationship between VM and OS/390 or VM and VSE through data sharing and other techniques.

VM customers want to take advantage of today's modern applications, most of which were originally written for other platforms and not available on VM. They are available on OS/390. Thus some customers now see additional new benefits in running both VM and OS/390.

Coexistence Option

IBM realizes that VSE and VM customers want access to many of the newest applications available on OS/390. Although we won't make many of these newest applications available natively for the VSE and VM systems, **we can make some of them available for VSE and VM customers**. That's what Auto UNIX System and the coexistence option is all about. The simple idea is that VSE and VM/VSE customers can install Auto UNIX System as a VM/ESA guest system or in an LPAR. We call this approach *coexistence*, running more than one environment and taking advantage of the unique benefits each brings to their business.

Several trends came together recently to make Auto UNIX System coexistence possible and valuable to existing VSE and VM customers. Many of the most attractive UNIX-based ERP and e-business applications now run on OS/390. Because of

the power of IBM's newest S/390 CMOS servers and disk technology, OS/390 runs effectively on all of those S/390 Servers.

Additionally, OS/390 has provided UNIX services for several years. In fact, OS/390 was among the first operating systems to receive UNIX 95 branding. However, to install and maintain the OS/390 system that contains these UNIX services required OS/390 or MVS system programmer skills. With the Auto UNIX System, VSE and VM customers can exploit the strengths of UNIX and leverage their long-term investments on the S/390 platform without requiring additional investment in OS/390 skills.

Auto UNIX System provides a UNIX application platform that is easily installed, maintained and managed with current S/390 and UNIX skills, such as those provided by current VSE and VM system programmers and UNIX systems administrators. This new option requires no OS/390 or MVS system programming skills. It can provide a low total-cost-of-computing solution for customers looking for new UNIX-based applications, porting of existing and/or development of new UNIX-based applications.

Our goal is to make the Auto UNIX System coexistence option simple and cost-effective so that customers will choose to add the new and modern applications to their current S/390 platform. It's important for VSE and VM customers to understand Auto UNIX System is simply **one more choice or option for them to consider**. We're committed to improving this option and believe it offers some unique advantages. There's never been a better time to take advantage of OS/390.

What Is the Auto UNIX System?

Auto UNIX System is a new delivery option of OS/390. It consists of a pre-built, customized and automated base UNIX application server system built off OS/390 Version 2 Release 6. The base system contains the OS/390 UNIX System Services components of the standard OS/390 system, the WebSphere Application Server, eNetwork Communication Server which includes TCP/IP and VTAM, and so forth. Auto UNIX System can run unattended and, therefore, be used in remote as well as other environments where there are no OS/390 skills, only UNIX-based skills. A UNIX user will feel comfortable with the familiar UNIX shell user interface and the "rlogin" and "telnet" access to Auto UNIX System.

Besides the base system, there are three priced optional features of Auto UNIX System – **C/C++ Compiler with Debugger**, **DB2 for OS/390 V5**, and **MQSeries V1R2**.

Capabilities That Auto UNIX System Provides

Lotus Domino for S/390 e-business Applications

The Auto UNIX system is pre-built and configured so that Lotus Domino for S/390 server installs quickly and easily. Lotus Domino 4.61 is the premier groupware and e-mail server for the "Net." Lotus Domino is an application and messaging server with an integrated set of services that make possible a broad range of secure, interactive business solutions for the Internet and intranets. With Domino, developers can rapidly build, deploy and manage applications which engage colleagues, partners and customers in online collaboration and coordination of critical business activities.

Domino extends your Notes applications to anyone with a Web browser. Additionally, it includes a rich set of native calendaring and scheduling functionality that is powerful and intuitive for end users, flexible for application developers, and scalable to even the largest enterprise. Users gain secure and real-time lookups of their colleagues' free and busy times. The calendaring and scheduling feature leverages services such as replication, so that users can keep calendars synchronized while they are on the road.

Additional applications are available for Lotus Domino for S/390. Over 100 Lotus Domino applications are available from over 65 Lotus Domino for S/390 Solution Providers. Off-the-shelf cross industry applications are available for many industries. Many industry-specific applications also are available in such industries as distribution, finance and securities, government, manufacturing, travel, etc. Application development tools, services, and Lotus Domino based utilities also are available to help you fully exploit the power of Lotus Domino for S/390.

e-business Secure Web Server, Java and Network Station Manager

The WebSphere Application Server is part of the Auto UNIX System base. It's a high-performance Web server, includes security, site indexing and is highly scalable. For high-demand S/390 Web serving environments, the High Speed Web Access service can support over 3000 connections per second!

The OS/390 40 bit CDMF export software encryption feature is integrated in Auto UNIX System base. WebSphere Application Server supports Web content hosting, provides client authentication and can detect and utilize the crypto hardware, if it is installed.

Java Development Kit (JDK) 1.1.4 is integrated in Auto UNIX System. Java is a new object-orientated programming language that supports a "write it once and run it everywhere" model of computing. Java-based servlet and applet Web applications can be written, in addition to non-Web based applications. The WebSphere Application Server supports Java servlets.

Network Station Manager (2.5 PRPQ) is also integrated in Auto UNIX System. Its Boot Server support provides software download capability to the Network Station (NS), while the Target Server enables the NS to connect to a host server to run applications or obtain data.

Server Consolidation

Server consolidation of UNIX-based applications off non-S/390 platforms should be important to VSE and VM customers. Multiple simple systems are certainly more complex and difficult to mange. Customers who went to the decentralized model are seeing a *10%* to *30%* growth in the number of servers per year.

There's clearly lots of processing power lost in the data movement between these multiple servers. Additionally, multiple distributed systems also have more points of failure and also more points of access which increases security risks. The bottom line is that the distributed computing model and its inherent technology proliferation reduces IT efficiency and increases total cost of computing for S/390 customers.

International Technology Group (ITG) did a study that looked at the business value of S/390 server consolidation based on a survey of 52 companies that either completed S/390 server consolidation or were currently engaged in it. This study was

conducted in January 1998. Centralized UNIX to S/390 application consolidations resulted in an average 5-year total cost of computing savings of *21%*. Decentralized UNIX to S/390 application consolidations provided the largest average 5 year total cost of computing savings of *35%*.

Customers said the savings came from three areas – lower average centralized S/390 personnel costs of 28% versus 42% for UNIX server farms; economies of scale with S/390; and lower S/390 hardware prices. The smallest project in the study saved *$150K* (going from $850K to $700K), while the largest project saved *$15M*!

Although a UNIX application port is necessary from other non-S/390 platforms to Auto UNIX System, that's the last port your UNIX application will need because of S/390 compatibility support. If the application to be ported conforms to X/Open UNIX standards, it should be a minimal amount of effort to port the application. The provided C/C++ compiler with debugger can be used to port and develop UNIX based applications.

Baan ERP Application
Auto UNIX System preview announced for 2H1999 support for the Baan ERP application. That support includes making Baan very easy to install and easy to manage from the Auto UNIX command shell interface. Because the Baan ERP application can have a heavy print requirement, print support will be provided in 2H1999 to enable a new UNIX shell command to print UNIX files to any LAN-attached printers.

Easy to Install, Operate and Service
You install the Auto UNIX System from the **Control Center**. Auto UNIX provided configuration data is queried and can be changed by the install process. The Control Center initiates the restore process of the Auto UNIX System from a set of tapes. Total install time depends upon the speed of the tape drive, but this is usually 4 to 6 hours.

The DB2 or MQSeries Auto UNIX features – if ordered – are provided with the Auto UNIX System base tapes. You can install the features during the Auto UNIX System base system install or do it later.

The install process consists of six stages. After the completion of the last stage, the complete system is automatically IPLed. Once your new TCP/IP configuration is activated, your Auto UNIX System is ready to use.

The Control Center is used to operate the Auto UNIX System via an easy-to-use graphical user interface. Specific Auto UNIX System functions such as system start and shutdown, TCP/IP restart, system restore, service refresh, and so forth are available from Control Center pull-down menus.

The Control Center regularly monitors and displays the status of the system and subsystems automatically. It automatically can restart the system when it detects a hardware failure or disabled wait state. There is *no* OS/390 console visible.

The Control Center is the visible operational interface. Therefore, no OS/390 operational skills are required.

A special emphasis on service support is provided, since Auto UNIX is targeted to UNIX system administrators and VSE and VM customers who don't have OS/390 skills. Auto UNIX System can be maintained by a person with basic UNIX administration skills.

Just like VSE and/or VM, service is provided in the form of fixes. These fixes are delivered on preventive and corrective service tapes most of the time. In some exceptional cases, service is delivered on a system service refresh tape which totally refreshes the entire system. Auto UNIX has its own unique dedicated service streams, which is different from a native OS/390 system. What's unique is that all PTF hold data has been researched and resolved so that no OS/390 unique system programming skills are required. Easy-to-use service commands are provided through the command shell interface to install service. These commands remove the need for customers to understand OS/390 SMP/E command syntax, TSO/ISPF, and so forth.

Special IBM-supplied software service support – a Front End Support Team (FEST) – will be available to assist in Auto UNIX problem determination and problem source identification work as necessary to determine fixes a customer may require. The FEST can remotely access Auto UNIX System when required and agreed to by customers to perform this additional diagnostic and problem failure data capture. **This is a no charge entitled service for users of the Auto UNIX System**.

Auto UNIX System Connectivity to VSE and VM Systems

Auto UNIX Release 1 supports three types of connectivity – TCP/IP, APPC, and MQSeries connectivity. TCP/IP is targeted at communication with VSE and VM systems.

Making and maintaining a TCP/IP configuration is critical for UNIX application availability. This used to involve editing multiple files with little or no guidance for available options and their meanings. Auto UNIX System, however, provides an intuitive, Web-based, graphical user interface for TCP/IP configuration. This interface hides the complexity of configuring TCP/IP and helps avoid definition errors by value checking and cross checking. The Auto UNIX System provides sample TCP/IP socket programs to demonstrate communication between Auto UNIX System and VSE or VM.

Auto UNIX is pre-configured to easily establish communication with VSE and VM using APPC. The Auto UNIX eNetwork Communication Server contains VTAM which includes APPC. Connecting to VSE using APPC involves configuring VTAM and CICS. Auto UNIX System ships sample code and JCL jobs to help you do that and to verify the APPC connection.

For VM to communicate with Auto UNIX System, you need to establish either a physical or virtual connection via channels. The SNA connection between VM and Auto UNIX System is an APPN host-to-host connection. Auto UNIX System is pre-configured as an APPN node.

MQSeries provides assured message delivery in the form of asynchronous communication. Auto UNIX System has a pre-configured MQSeries setup to easily communicate with VSE MQSeries. In Release 1, MQSeries support for VM is not provided. The Auto UNIX MQSeries optional feature can be installed via a "mouse click" and starts with an optimized configuration for communications to VSE.

To take advantage of MQSeries, you also need to have MQSeries installed on VSE. Auto UNIX provides new UNIX shell commands for MQSeries administration and utilities. Samples are shipped with Auto UNIX System to set up the environment for VSE and Auto UNIX System MQSeries connectivity.

Why Is Auto UNIX System Valuable to VSE and VM Customers?

Auto UNIX System delivers value to VSE and VM customers in several areas:

- It's a ready to use UNIX Application Server that's fully UNIX 95 Branded, Year 2000 ready, scalable, available, and secure. Additionally, it's a reliable platform capable of running multiple mixed workloads on just one S/390 system.

- No OS/390 systems programmer or operator skills are required to install, use or maintain the Auto UNIX System.

- The Auto UNIX System can provide a low total cost of computing solution.

- More functions, applications and choices are available for VSE and VM customers, and Auto UNIX System helps protect VSE and VM customers investments in S/390.

- Auto UNIX System provides a significant opportunity to reduce the number of servers by consolidating UNIX applications and workloads. As a result, this can save significant systems and operational management costs.

- Auto UNIX System supports the industry trends of server consolidation, e-business, and application enablement. Auto UNIX System offers more choice, flexibility, power, and productivity. It's also the right choice for customers looking for new UNIX-based applications that make the most out of their existing resources, skills, applications and data.

Summary

IBM realizes that Auto UNIX System coexistence option may not be for everybody. However, we're committed to making it as attractive as possible to the widest number of VSE, VM and VM/VSE customers. "Attractive" includes application selection as well as considerations of function, ease-of-use, connectivity, price/performance, support, and terms and conditions. The list of applications available is significant and will continue to expand. Auto UNIX System is an easy-to-use OS/390 automated UNIX application server designed to eliminate the need for traditional OS/390 or MVS systems programmer and operator skills. Finally, coexistence offerings will continue to evolve and improve as we learn more about how VSE and VM customers are actually taking advantage of the coexistence option presented to them by Auto UNIX System.

Additional Information

For more information about Auto UNIX System, refer to the following Internet sites:

- Auto UNIX System home page:
  http:// www.s390.ibm.com/autounix/

- Lotus Domino for S/390 applications:
  http://www.s390.ibm.com/products/domino/

- ITG business value of consolidation:
  http://www.conntrade.com/s390order/

More Articles and News

1999 VM/ESA and VSE/ESA Technical Conferences

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Save These Dates!

In 1999, IBM has scheduled two VM and VSE Technical Conferences that are
meant for *you*!

May 24-27, 1999	**June 14-16, 1999**
Renaissance Orlando Resort	Mainz Hilton Hotel
6677 Sea Harbor Drive	Mainz, Germany
Orlando, Florida, USA	
4 Full Days	3 Full Days
Price: $1050 Early Bird by 4/1/99	Price: watch the Web sites
$1150 After 4/1/99	

These conferences are designed to help you extend your existing VM/ESA and
VSE/ESA resources and help you reach new heights in performance and produc-
tivity. Let your system resurgence begin May 24-27 in Orlando or June 14-16 in
Mainz with information-packed days that are intended to help you:

- **Cross the Year 2000 finish line** with tools, services, and solutions.

- **Exploit new e-business opportunities** as you learn the technical details of
  planning, installing, and tuning VSE/ESA Version 2.4 and the new CICS Trans-
  action Server for VSE/ESA.

- **Re-energize your VM/ESA system** by exploiting enhancements in recent and
  future releases of VM/ESA in areas such as Java, NetRexx, MQSeries, and
  TCP/IP.

- **Explore the latest VM/ESA and VSE/ESA solutions** at the Product EXPO
  and talk one-on-one with product vendors to get your specific questions
  answered.

Topics will focus on: Year 2000, business intelligence, e-business, network com-
puting, security, application development, performance, problem determination, and
S/390 servers and peripherals.

Some of the IBM organizations that will make presentations include:

- IBM VSE Development – Böblingen, Germany
- IBM CICS/VSE Development – Hursley, England
- IBM Advanced Technical Support – Endicott, New York; Gaithersburg, Maryland; San Jose, California
- IBM VM Development – Endicott
- IBM COBOL Development – San Jose

Additional Information

Topics, abstracts, and a preliminary agenda will be available on the following Web sites by February 15, 1999.

http://www.vm.ibm.com/
http://www.s390.ibm.com/vse/
http://www.training.ibm.com/ibmedu/conf/

In the USA, you also can call **1-800-IBM-TEACH** (**800-426-8322**) and ask for "Conferences".

For questions or more information about these conferences, please contact Julie Liesenfelt (for Orlando) or Anette Stoolvoort (for Mainz).

S/390 Integrated Server – Small and Powerful!

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With the **S/390 Integrated Server**, announced in September and generally available this month, IBM continues to deliver powerful and extremely cost-effective entry servers to the S/390 marketplace. Positioned between the P/390 (or R/390) and Multiprise 2000 offerings, the S/390 Integrated Server delivers enhanced functionality and a growth perspective for entry-level S/390 customers. It exploits the latest technologies to deliver a complete S/390 machine in a small, deskside-size box.

Brief Technical Overview

The heart of the S/390 Integrated Server is a full **S/390 CMOS microprocessor**, which executes the S/390 instruction set. OS/390, VM/ESA, VSE/ESA, and applications run unchanged. No recompile or modification is necessary.

The processor is on a single chip, mounted on a PCI (Peripheral Component Interconnect) adapter card with 256MB ECC (Error Correction Code) memory. It delivers performance comparable to an IBM 9221-170 (approximately 6 to 7 MIPS). The processor chip is a 0.6 micron CMOS gate array with 212,000 gates and 647 pins.

The large memory and the option to use expanded storage in the Pentium-OS/2 component of the system reduces paging activity and enables the machine to run workloads very efficiently.

The **I/O subsystem** (channels, control units, and devices) is provided either through emulation of selected IBM I/O devices using workstation resources or attachment of "real" S/390 control units to PCI-based Parallel Channel or ESCON Channel adapters.

The Parallel Channel adapter is the one already used in the P/390. It can attach many S/390 control units (like tapes, printers, terminal controllers, or communication controllers). DASD attachment is not supported. The ESCON Channel adapter does not have this restriction. It can attach traditional external disks like IBM 3390 and all other IBM ESCON devices or ESCON Directors.

A maximum of 4 channel adapters is supported. The maximum number of ESCON adapters is 2.

The S/390 Integrated Server has 16 PCI slots and 3 ISA (Industry Standard Architecture) slots available for industry standard LAN adapters[9], communication adapters, and SCSI-attached (Small Computer System Interface) tape drives.

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[9] Token Ring, Ehternet 10BASE-T, and Ethernet 100BASE-TX ("fast" Ethernet)

All these adapters and devices appear to the S/390 operating system as standard S/390 devices (IBM 317 2 control units or 3480 tape devices, for example). This is achieved through OS/2-based emulation programs running on a 333MHz Pentium processor with 128MB memory. This support allows for quick exploitation of new devices and technologies as they become available.

Physically, the S/390 Integrated Server is 520mm x 1100mm x 819 mm (WxDxH) and weighs 155kg maximum. Thus it is larger than the P/390 or R/390. But look at its **storage capacity**. The machine uses 18GB SSA[10] disk drives in a RAID-5 configuration. A maximum of 16 internal disks can be accommodated, resulting in 255GB of RAID-5 protected user disk space. Also note that SSA allows for multiple data paths and auto-reconfiguration. The internal disks can be used as FBA or CKD/ECKD disk devices.

The **power subsystem** of the S/390 Integrated Server is a combination of "N+1" dual-redundant power supplies and an optional internal battery backup. It uses standard power facilities; and with 1.32 kVA, it has excellent environmental values and does not require special cooling.

Figure 32. S/390 Integrated Server and IBM Multiprise 2000

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[10] Serial Storage Architecture

Great Value in Software Pricing

One of the attractive features of the S/390 Integrated Server is its software pricing structure. Although the machine has much more functions and capacities than the PC Server 330-based P/390 and delivers a CPU performance of approximately the IBM 9221-170 (Software Group 29), the software is priced at the ESL (Entry System License) model. This is the same pricing used for the P/390 and R/390 and means *OTC* (One Time Charge) only, *no MLC* (Monthly License Charge), and a price that is *significantly lower* than the lowest group prices (Group 18) available from IBM.

Who Can Benefit?

Because it can run S/390 applications unchanged, the S/390 Integrated Server is an attractive option for a wide range of customers and uses. These include:

- Enterprises that do not require the I/O bandwidth or performance of the S/390 Multiprise 2000 servers.

- Installations with older S/370[11] and S/390 processors. The S/390 Integrated Server is a potential replacement for the 9221-170 or below, all 9370 models, the 3083, and most 43xx models.

- Departments or small businesses with limited space. Due to the flexibility and capacity of its internal I/O attachments, the S/390 Integrated Server can eliminate the need for channel cards and external control units. And fewer devices also can have a positive impact on maintenance requirements.

- Application development groups who want to exploit the productivity of S/390 development tools and have immediate access to real S/390 architecture for testing and debugging applications.

- Teams who require a flexible base for Year 2000 conversion and testing projects. They also can start new, post-Year 2000 projects on the S/390 Integrated Server without impacting their enterprise's existing production infrastructure.

For all of these possibilities and more, the S/390 Integrated Server allows for easy upgrades and offers the classic S/390 strengths. Customers can continue to use their existing hardware; applications don't have to be moved to a new platform lacking the S/390 advantages; and with the ESCON channel, they can connect to new devices.

Additional Information

As indicated in the September announcement, S/390 intends to announce and deliver in 1999 an S/390 Integrated Server with twice the performance of the processor shipped in 1998. For customers who are considering upgrading to that capability in 1999, the software price will be at the then-prevailing terms for processors of similar capacity.

For more information, refer to the IBM Announcement Letter **198-211**. You also should access:

   http://www.s390.ibm.com/is/

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[11] Yes, the machine also can run in S/390 mode!

Vendors of Related Products

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The table below was contributed by Marc Smith, who is a member of Len Diegel's VM and VSE Technical Marketing Support Team. This is meant as a **start** at getting an accurate, current list of products. Please contact **both** Marc and the *Newsletter's* editor (jhermann@de.ibm.com) if you have additions, changes, or corrections. For more information or for products not contained in this table, see the *S/390 Application Solutions Directory* on the Web:
http://www.software.ibm.com/solutions/isv/

Vendor/Company Web Page	Product	Industry Category	Platform VM/VSE
Allen System Group www.allensysgroup.com	ASG-LDS	Cross Industry	VSE, MVS
Allen Systems Group www.allensysgroup.com	ASG-XPATH	Cross Industry	VM, VSE, MVS
Allen System Group www.allensysgroup.com	Outbound	Cross Industry	VM, VSE
ACCENT Solutions inc. (ASi) www.asizip.com	PKZIP VSE	Cross Industry	VSE
Beyond Software Inc. www.beyond-software.com	EnterpriseWeb/VM	Cross Industry	VM Support: World Wide
Beyond Software Inc. www.beyond-software.com	EnterpriseWeb/MVS	Cross Industry	MVS
Beyond Software Inc. www.beyond-software.com	Enterprise VIEW	Cross Industry	VM
Beyond Software Inc. www.beyond-software.com	EnterpriseWeb Calendar	Cross Industry	VM
Beyond Software Inc. www.beyond-software.com	EnterpriseWeb Secure	Cross Industry	VM
BMC Software www.bmc.com/	3270SuperOptimizationr/VM	Cross Industry	VM
Circle Computer Group NA	ROLF/BRF	Cross Industry	VSE
Circle Computer NA	REPRO	Cross Industry	VSE
Circle Computer Group NA	Xpress	Cross Industry	VSE
Circle Computer Group NA	Audit 2000	Cross Industry	VSE
Circle Computer Group NA	COMvert	Cross Industry	VSE

Vendor/Company Web Page	Product	Industry Category	Platform VM/VSE
cfSOFTWARE, Inc. www.cfsoftware.com	XAPI (Terminal & communications control interface)	Cross Industry	VM, VSE
cfSOFTWARE, Inc. www.cfsoftware.com	DIALOG (Advanced 3270 scripting facility)	Cross Industry	VM, VSE
cfSOFTWARE, Inc. www.cfsoftware.com	APPX (Peer-to-peer communications channel)	Cross Industry	VM, VSE
cfSOFTWARE, Inc. www.cfsoftware.com	pcMAINFRAME (Strategic tool to join PC, LAN, and mainframe worlds)	Cross Industry	VM, VSE
Computec www.computec.com.ar	MANTEC-WIN Computed Maintenance Management System	Cross Industry	VM, VSE Latin America
Computec www.computec.com.ar	Catalog WIN 2.0. Materials Cataloging	Cross Industry	VM, VSE Latin America
Computec www.computec.com.ar	SUMTEC-WIN Purchase, Materials, and contract management.	Cross Industry	VM, VSE Latin America
Computec www.computec.com.ar	ISOMANAGER Administration/Documentation for ISO9000 activities	Cross Industry	VM, VSE Latin America
Control Software Inc. www.csoft.com	Maintenance Control & Management System (MCMS)	Transportation, Public Sector, Construction Utilities Cross Industry	VSE Support in England, Saudi Arabia
Council EDV- und Managementberatung Gesellschaft mbH www.council-systems.com	Virtual Machine System Manager	Cross Industry	VM, VSE
Cross Access Corporation www.crossaccess.com	Data Mapper	Cross Industry	VSE
Cross Access Corporation www.crossaccess.com	Cross Access	Cross Industry	VSE
Janake K. Dabare NA	Job Scheduler	Cross Industry	VSE
Decision Technology Inc. www.dtiprinceton.com	Decision Analyzer	Cross Industry	VSE
DETEC(Decision Technology Software www.det.de	Lasersoft/VSE (Printing facility, Fax)	Cross Industry	VSE
Global Financial NA	ManTec	Finance	VSE

Vendor/Company Web Page	Product	Industry Category	Platform VM/VSE
GT Software, Inc. www.gtsoftware.com	Assist/GT	Cross Industry	VM, VSE
GT Software, Inc. www.gtsoftware.com	BMS/GT	Cross Industry	VM, VSE
GT Software, Inc. www.gtsoftware.com	READ/GT	Cross Industry	VM, VSE
GT Software, Inc. www.gtsoftware.com	Interactive Books and Screen Partner Mainframe (SPMF)	Cross Industry	VM, VSE
GT Software, Inc. www.gtsoftware.com	Screen Partner Mainframe	Cross Industry	VSE
IntelliWare Systems, Inc. www.intelliware.com	Data Center Management	Cross Industry	VSE
IntelliWare Systems, Inc. www.intelliware.com	OS Programmer Tools	Cross Industry	VSE
IntelliWare Systems Inc. www.intelliware.com	WIN/VSE (Application development)	Cross Industry	VSE
International Software Company NA	AOII (Console Automation)	Cross Industry	VM, VSE
Kuhn & Weyh Software GmbH www.kwsoft.freinet.de	MTEXT (text processing for German documents)	Cross Industry	VM, VSE Germany
Kuhn & Weyh Software GmbH www.kwsoft.freinet.de	M/MAIL (Electronic mail and workgroup component for mainframe)	Cross Industry	VM, VSE Germany
Kuhn & Weyh Software GmbH www.kwsoft.freinet.de	M/AFP (PostScript printing on the mainframe)	Cross Industry	VM, VSE Germany
Kuhn & Weyh Software GmbH www.kwsoft.freinet.de	M/Postscript (PostScript printing on the mainframe)	Cross Industry	VM, VSE Germany
Kuhn & Weyh Software GmbH www.kwsoft.freinet.de	M/ARCHIVE (Document management system for corporate solutions)	Cross Industry	VM, VSE Germany
Life Insurance Data Processing www.lidp.com	The Administrator	Finance, Insurance	VSE
Life Insurance Data Processing www.macro4.com	LIPD's Agency Management System	Finance, Insurance	VSE
Macro4 Inc. www.macro4.com	CICSPRINT and VTAMPRINT	Cross Industry	VM, VSE
Macro4 Inc. www.macro4.com	REFLECT	Cross Industry	VM, VSE
Macro4 Inc. www.macro4.com	CMAP	Cross Industry	VM

Vendor/Company Web Page	Product	Industry Category	Platform VM/VSE
Macro4 Inc. www.macro4.com	COMMAND VSE	Cross Industry	VSE
Macro4 Inc. www.macro4.com	DATABACK	Cross Industry	VSE
Macro4 Inc. www.macro4.com	DESKPAD	Cross Industry	VM, VSE
Macro4 Inc. www.macro4.com	DUMPMASTER	Cross Industry	VM
Macro4 Inc. www.macro4.com	EnterWEB	Cross Industry	VM, VSE
Macro4 Inc. www.macro4.com	FOREMAN	Cross Industry	VSE
Macro4 Inc. www.macro4.com	LIBRA	Cross Industry	VSE
Macro4 Inc. www.macro4.com	LOCKMASTER	Cross Industry	VM
Macro4 Inc. www.macro4.com	LOGOUT	Cross Industry	VSE
Macro4 Inc. www.macro4.com	Reflect	Cross Industry	VSE
Macro4 Inc. www.macro4.com	SYSTEM ACCOUNTING	Cross Industry	VSE
Macro4 Inc. www.macro4.	SYNCHRO	Cross Industry	VSE
Macro4 Inc. www.macro4.com	TUBES	Cross Industry	VM, VSE
Macro4 Inc. www.macro4.com	VPAC	Cross Industry	VM
Macro4 Inc. www.macro4.com	VSAMLITE	Cross Industry	VSE
Macro4 Inc. www.macro4.com	VSAMTUNE	Cross Industry	VSE
Manager Software Products Limited www.manager-software -products.co.uk	METHODMANAGER	Cross Industry	VM, VSE
Manager Software Products Limited www.mspusa.com	CONTROLLMANAGER	Cross Industry	VM, VSE
Manager Software Products Limited www.mspusa.com	DATAMANAGER	Cross Industry	VM, VSE
Manager Software Products Limited www.mspusa.com	DICTIONARYMANAGER	Cross Industry	VM, VSE
Manager Software Products Limited www.mspusa.com	DESIGNMANAGER	Cross Industry	VM, VSE

Vendor/Company Web Page	Product	Industry Category	Platform VM/VSE
NBS Systems, Inc. NA	TOSS Mainframe Office Automation for VM/VSE	Finance, Insurance, Banking, Medical, Manufacturing, Transport	VM, VSE
NBS Systems, Inc. NA	Total-FAX	Cross Industry	VM/VSE
NBS Systems, Inc. NA	Golden Mailbridge	Cross Industry	VM/VSE
OptiSystems NA	Energizer for CICS	Cross Industry	VSE
OptiSystems NA	Energizer for R/2-VSE	Cross Industry	VSE
Pacific Systems Group www.optisystems.com	Spectrum Writer VSE 4GL Report Writer	Cross Industry	VSE
Phoenix Software International NA	Auto/FT (Unattended file transfer across multiple platforms)	Cross Industry	VSE
Phoenix Software International NA	CONDOR (Online package of program development, library management and system maintenance tools)	Cross Industry	VSE
Praim www.praim.com www.docsuite.com	DocSuite	Cross Industry	VM, VSE
Safe Software Inc. www.vm.safesoftware.com	SafeSFS	Cross Industry	VM
Sapiens International Corporation, N.V. www.sapiens.com	SAPIENS ObjectPool	Cross Industry Client/Server development toolset	VM, VSE Worldwide support
Sapiens International Corporation, N.V. www.sapiens.com	SAPIENS Object Modeler (Client-based graphical modeling environment for visual application development)	Cross Industry	VM, VSE Worldwide support
Sapiens International Corporation, N.V. www.sapiens.com	SAPIENS WorkStation (Generates GUI clients for ObjectPool applications)	Cross Industry	VM, VSE Worldwide support
Sapiens International Corporation, N.V. www.sapiens.com	SAPIENS Year 2000 Toolkit	Cross Industry	VM, VSE Worldwide support
SEA Software Engineering of America www.seasoft.com	TRMS "Total Report Management Solution"	Cross Industry	VSE
SEA Software Engineering of America www.seasoft.com	CSAR "Computer Scheduling And Reporting system"	Cross Industry	VM
SEA Software Engineering of America www.seasoft.com	KEYS "Complete information database for data center management of MVS and VSE environments"	Cross Industry	VSE

Vendor/Company Web Page	Product	Industry Category	Platform VM/VSE
SEA Software Engineering of America www.seasoft.com	PRO-2 "Application generator enabling development of production ready CICS COBOL code"	Cross Industry	VSE
SEA Software Engineering of America www.seasoft.com	CODEC "Non-destructive compressing/ decompression and encryption/ deciphering of files"	Cross Industry	VM, VSE
SEA Software Engineering of America www.seasoft.com	TAPE2000 "Automated Tape Library Management System"	Cross Industry	VSE
Software Engineering GMBH NA	Pilot for Sessions-VM	Cross Industry	VSE
Software Engineering GMBH NA	Online Transmission Time Optimizers (OTTO) for CICS-VSE	Cross Industry	VSE
Software Engineering GMBH NA	Compress for SAP-VSE	Cross Industry	VSE
Software Engineering GMBH NA	Robot for Transactions	Cross Industry	VSE
SOPRA NA	Inter.Pel v.6.3	Cross Industry	VM, VSE
SOPRA NA	Peli.VM v.2.10	Cross Industry	VM
SOPRA NA	Peli.VSE v.5.20	Cross Industry	VSE
S + S SoftwarePartner GmbH NA	ISF - Financial Accounting (Version G1)	Cross Industry	VSE Czech Rep., Germany Netherlands, Spain
S + S SoftwarePartner GmbH NA	ISA - Fixed Asset Administration (Version G1)	Cross Industry	VSE Czech Rep., Germany Netherlands, Spain
S + S SoftwarePartner GmbH NA	GPR - Profit Planning (Version G1)	Cross Industry	VSE Czech Rep., Germany Netherlands, Spain
Sterling Software www.vm.sterling.com	VM:Account	Cross Industry	VM
Sterling Software www.vm.sterling.com	VM:Archiver	Cross Industry	VM
Sterling Software www.vm.sterling.com	VM:Backup	Cross Industry	VM
Sterling Software www.vm.sterling.com	VM:Batch	Cross Industry	VM
Sterling Software www.vm.sterling.com	VM:DBA	Cross Industry	VM
Sterling Software www.vm.sterling.com	VM:DB/Admin	Cross Industry	VM

Vendor/Company Web Page	Product	Industry Category	Platform VM/VSE
Sterling Software www.vm.sterling.com	VM:DB/Editor	Cross Industry	VM
Sterling Software www.vm.sterling.com	VM:DB/Monitor	Cross Industry	VM
Sterling Software www.vm.sterling.com	VM:DB/Reorganizer	Cross Industry	VM
Sterling Software www.vm.sterling.com	VM:DB/Reporter	Cross Industry	VM
Sterling Software www.vm.sterling.com	VM:DB/Restore	Cross Industry	VM
Sterling Software www.vm.sterling.com	VM:DB/REXX	Cross Industry	VM
Sterling Software www.vm.sterling.com	VM:Director	Cross Industry	VM
Sterling Software www.vm.sterling.com	VM:Manager	Cross Industry	VM
Sterling Software www.vm.sterling.com	VM:Migrate	Cross Industry	VM
Sterling Software www.vm.sterling.com	VM:Monitor	Cross Industry	VM
Sterling Software www.vm.sterling.com	VM:Notekeeper	Cross Industry	VM
Sterling Software www.vm.sterling.com	VM:Operator	Cross Industry	VM
Sterling Software www.vm.sterling.com	VM:Prorexx	Cross Industry	VM
Sterling Software www.vm.sterling.com	VM:Schedule	Cross Industry	VM
Sterling Software www.vm.sterling.com	VM:Secure	Cross Industry	VM
Sterling Software www.vm.sterling.com	VM:Sort	Cross Industry	VM
Sterling Software www.vm.sterling.com	VM:Spool	Cross Industry	VM
Sterling Software www.vm.sterling.com	VM:Tape	Cross Industry	VM
Sterling Software www.vm.sterling.com	VM:Vantage	Cross Industry	VM
Sterling Software www.vm.sterling.com	VM:Webserver	Cross Industry	VM
Sterling Software www.vm.sterling.com	VM:Webserver Gateway	Cross Industry	VM
Sterling Software www.vm.sterling.com	VM:Webserver for OfficeVision	Cross Industry	VM

Vendor/Company Web Page	Product	Industry Category	Platform VM/VSE
StoneHouse & Co. NA	MONIES Extended System	Finance	VM, VSE
SupplyTech NA	STX for the Mainframe	Cross Industry	VSE Worldwide support
SWAN www.DATACOOP.com	VISION$_{64}$ (formerly DATACOOP)	Cross Industry	VSE, VM USA, France UK, Belgium, Italy
Systema NA	CUBIS "Business engineering optimization of key customer oriented processes"	Cross Industry	VSE, VM
Systema NA	IRD "Customer information and billing system"	Cross Industry	VSE, VM
Systema NA	KARAT Energy "Integrated total business solution for local and regional utilities"	Cross Industry	VSE, VM
Systematic Software Solutions NA	ISRS "Trickle-Poll Software"	Retail	VSE
Systematic Software Solutions NA	STore Transmission System/1 (STS/1)	Retail	VSE
Systematic Software Solutions NA	Host Positive Credit System	Retail	VSE
Target Four Limited www.target4.com	PKZIP	Cross Industry	VSE
Teubner & Assoc. www.teubner.com	A-Net	Education, Finance, Health, Manufacturing Retail, Transportation, Wholesale	VM, VSE
TRAX Softworks, Inc. NA	Electronic Spreadsheet System (ESS)	Cross Industry	VM, VSE Worldwide support Languages: French, German, English
TRAX Softworks, Inc. NA	EdWord	Cross Industry	VM, VSE
Unicom Systems Int. NA	Automon/CICS	Cross Industry	VSE
Velocity Software www.velocity-software.com	ESAMAP	Cross Industry	VM
Velocity Software www.velocity-software.com	ESAMON	Cross Industry	VM

Vendor/Company Web Page	Product	Industry Category	Platform VM/VSE
Velocity Software www.velocity-software.com	ESATCP	Cross Industry	VM
VIASERV, Inc. www.viaserv.com	VIASQL for VSE - SQL/DS	Cross Industry	VSE Worldwide support
VIASERV, Inc. www.viaserv.com	VIASQL for VSE VSAM	Cross Industry	VSE Worldwide support
WINCAP, Inc. www.wincapsoftware.com	WINCAP	Education, Health, Manufacturing, Retail, Transportation Travel, Wholesale Distribution	VSE

Year 2000 Tool Matrix

┌─ **Author** ─────────────────────────────┐

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At WAVV 98 (Albany, New York), Phil Leicht presented the information shown in Table 5 on page 98. We'd like to thank him for letting us reprint it here!

Naturally, such information is dynamic, not static. Please contact **both** Phil and the *Newsletter's* editor (jhermann@de.ibm.com) if you have changes or corrections.

Table 5 (Page 1 of 11). Year 2000 Tool Matrix

Company	Suite/Tool Name	Compo-nents/ Capability	Data/ Program	Works On	Language	Runs On	Notes
ADPAC Corporation 425 Market Street San Francisco, CA 94105 (415) 777-5400 (phone) (415) 284-1125 (fax) www.adpac.com	YEAR 2000	Impact Anal. Conversion Reporting	Program	Mainframe	COBOL BAL PL/I	OS/390 VSE	Marketed through Platinum Technology, Inc.
Allegiant Legacy Solutions, Inc. 11025 Reed Hartman Hwy Cincinnati, OH 45242 513-984-1822 888-972-5257 http://www.allgnt.com	ADAPT/2000 Toolset	Impact Anal. Code and Data Conver-sion	Both	Mainframe Midrange Mini	COBOL	UNIX DOS Windows NT, 95 VMS	Workstation-based approach. Supports any COBOL dialect.
Alydaar Software Corp. 6701 Carmel Rd. Suite 302 Charlotte, NC 704-544-0092 http://www.year2000.com/ vendors/alydaar.html	SmartCode	Analysis, Conversion	Program	Platform Independent	COBOL PL/I BAL C, C++ SAS FORTRAN Natural Pascal	PC/LAN	Automated code and data conversion
Answer2000 Inc. 428 Center Street N. Vienna, VA 703-319-0819 amsheesley@aol.com	Answer2000 (Pisces)	Discovery Analysis Conversion Testing	Both	Contact Vendor	C, CICS COBOL FORTRAN PL/I ADS/O ASM Natural APS	Contact Vendor	
ArchiData Systems, Inc. 5308 E. Shoshone Avenue Orange, CA 92867 714-282-7833 Dataman911@aol.com	Archiman-Approach2000	Data Ware-housing File Conver-sions Year2K Methodology Analysis Reporting	Both	Platform Independent	COBOL C, C++, PB CICS DDL RPG, VB Most languages addressed	PC in DOS	

Table 5 (Page 2 of 11). Year 2000 Tool Matrix

Company	Suite/Tool Name	Compo-nents/ Capability	Data/ Program	Works On	Language	Runs On	Notes
Barnard Software, Inc. 645 Tomlinson Terrace Lake Mary, FL 32746 407-323-4773 (phone) 407-323-4775 (fax) bsisales@ix.netcom.com (email) http://www.bsiopti.com	OPTI-AUDIT	Inventory Assessment Reporting	Both	Mainframe	Independ.	VSE/SP thru VSE/ESA 2.3	Identifies only those programs and associated datasets that are active to optimize conversion effort
Blackhawk Information Services 2420 Camino Ramon Suite 212 Bishop Ranch 6 San Ramon, CA 94583 (925) 244-6701 (phone) (925) 830-4252 (fax) info@blackhawkis.com	BH2K Marty2k	Methodology Analysis Conversion	Program	Mainframe Mini	Independ.	Most operating systems	Comprehensive methodology for Year 2K Automated analysis and conversion toolset
BrainPower International, Inc. 110 Wall Street - 15th Floor New York, N.Y. 10005 212-701-8585 (phone) 212-701-8583 (fax) info@y2ktools.com (email)	BrainPower Toolset Remedy2k Tool Suite	Inventory Analysis Remediation Reporting	Data	Mainframe	Independ.	VSE OS/390	Robust Year2000 toolset that assists in finding real dates, aging files, expanding files, building bridges, creating test data and verifying your data
Computer Associates Intl, Inc. One Computer Associates Plaza Islandia, N.Y. 11788-7000 800-225-5224 or 516-342-5224 http://www.cai.com	CA-Impact/ 2000	Inventory Assessment Project Plan-ning	Program	Mainframe	COBOL PL/I BAL ADS Ideal Eztrieve CICS IMS/DC IDMS VSAM Datacom DB2 IMS/DB	VSE OS/390	Powerful analysis tool that helps determine impact and cost of converting applications to support Year2K * CA Year 2000 solutions are tied together as part of the CA Discovery 2000 suite.

Table 5 (Page 3 of 11). Year 2000 Tool Matrix

Company	Suite/Tool Name	Compo-nents/ Capability	Data/ Program	Works On	Language	Runs On	Notes
	CA-Datesolver/ 2000	Code/Data Remediation	Program	Mainframe	COBOL PL/I BAL ADS Ideal Eztrieve CICS IMS/DC IDMS VSAM Datacom DB2 IMS/DB	VSE OS/390 Windows	Callable date conversion and calculation routines for all common date formats
	CA-RealiaII Workbench for CICS	Code/Data Remediation	Both	PC	COBOL CICS VSAM	VSE OS/390	Analyzer, Life Cycle Mgr, Compiler, CICS emulator, GUI edit/debug
	CA-Panvalet	Code/Data Remediation	Program	Mainframe		VSE OS/390	Program source and version control
	CA-Librarian	Code/Data Remediation	Program	Mainframe		VSE OS/390 VM	Program source and version control
	CA-PanLCM & Config. Manager	Code/Data Remediation Reintegration	Program	Mainframe		VSE OS/390 DOS Windows OS/2	Complete change and configuration management system
	CA-Migrate/ COBOL	Code/Data Remediation	Program	Mainframe	COBOL CICS IMS/DC IDMS VSAM Datacom DB2 IMS/DB	VSE OS/390	A COBOL analysis, transformation and migration system designed to provide a smooth transition

Table 5 (Page 4 of 11). Year 2000 Tool Matrix

Company	Suite/Tool Name	Compo- nents/ Capability	Data/ Program	Works On	Language	Runs On	Notes
	CA-OptimizerII	Code/Data Remediation Testing	Program	Mainframe	COBOL PL/I BAL ADS Ideal Eztrieve CICS IMS/DC IDMS VSAM Datacom DB2 IMS/DB	VSE OS/390	Helps programmers to create, test, debug, tune, and maintain COBOL programs
	CA- Datamacs/II	Code/Data Remediation Testing	Data	Mainframe	COBOL PL/I BAL ADS Ideal Eztrieve CICS IMS/DC IDMS VSAM Datacom IMS/DB	VSE OS/390	Creates or ages test data from existing files or from scratch for system testing and regression analysis
	CA-Accuchek	Testing	Data	Mainframe	VSAM Seq. files	VSE OS/390	Comparison tool for PDS's, files, records, or fields within files
	CA-Verify	Testing Reintegration	Program	Mainframe	COBOL PL/I BAL ADS Ideal Eztrieve CICS VSAM Datacom DB2 IMS/DB	VSE OS/390	Makes all types of CICS application testing faster, more realistic and more cost effective

Table 5 (Page 5 of 11). Year 2000 Tool Matrix

Company	Suite/Tool Name	Compo-nents/ Capability	Data/ Program	Works On	Language	Runs On	Notes
Compuware 31440 Northwestern Highway P.O. Box 9080 Farmington Hills, MI 48333-2564 800-535-8707 or 248-737-7300 http://www.compuware.com	SIMON	Testing Debugging	Program	Mainframe	COBOL	VSE	Interactively test and debug applications. SIMON is used to test programs in the batch environment
	Abend-AID CICS Abend-AID	Fault Diag-nosis Reporting	Program	Mainframe	VSAM ISAM Seq. files	VSE	Abend-AID automatically intercepts the IBM dump routine and produces report explaining cause of abend
	XPEDITER/ CICS	Testing Debugging	Program	Mainframe	COBOL PL/I BAL	OS/390 VSE	Interactively test and debug applications. XPEDITER is used to debug CICS app.
	CA-FIX for Windows	Impact Anal. Code Remediation	Program	Windows NT 98, 95	COBOL	PC	Identify and change date related information utilizing Windows-based application
	PLAYBACK	Automated Testing	Program	Mainframe	CICS	VSE	Automated test tool that addresses entire testing spectrum (unit testing stress testing, and entire online system testing)
C'Quest International Ltd. Tel: +44(0) 1344 23069 Fax: +44(0) 1344 875106 http://www.cquest2000.com	Conversion Workbench (CWB)	Analysis Conversion	Both	Mainframe	COBOL	VSE	Sophisticated toolset that targets various phases of the Year 2000 life cycle
Cognizant Technology Solutions (CTS) http://webinfo@cognizantcorp. com	CTS Year 2000 Tool Suite	Assessment Analysis Conversion Testing	Data	Mainframe Client/ Server	COBOL PL/I SAS BAL C, C++ VB, PB Sybase Oracle	IBM oper-ating systems	Powerful Y2K diagnostic and code conversion tools. Converts problem code.

Table 5 (Page 6 of 11). Year 2000 Tool Matrix

Company	Suite/Tool Name	Compo-nents/ Capability	Data/ Program	Works On	Language	Runs On	Notes
DBA Software 1195 Park Avenue Emeryville, CA 94608 800-536-3221 or 510-658-9900 510-658-9927 (fax) info@dbasoft.com	Y2K!Tools: Y2K!Alert Y2K!Verify Tracer 2000	Impact Anal. Conversion Quality Assurance Proj. Mgmt.	Program	Independent	Most languages	VSE OS/390 Windows	Automated Solution to Year 2000 problem utilizing date windows
DGEN2000 P.O. Box 209 Route 14 East Randolph, VT 05041 info@dgen2000.com	DGENx Suite	Impact Anal. Conversion	Program	Mainframe Mini	COBOL FORTRAN Basic Pascal	OS/390 VSE Windows	PC-based demo program available. Shows the RID methodology in action.
DPE & Associates 904-246-4591 (phone) 904-273-8350 (fax) dpewen@ibm.net	SIM2000 (Batch and CICS) SIM2000/ VSAM	Date Simu-lation Data Aging	Both	Mainframe	Any prog. language supported by CICS	VSE OS/390	Allows testing of batch and CICS applications in normal environment without disrupting critical work. Can be activated or deactivated without IPL. SIM2000/VSAM allows VSAM datasets to function properly with Y2K dates.
H & W Computer Systems, Inc. 12438 W. Bridger Street Boise, ID 83713 (208) 377-0336 (phone) (208) 377-0069 (fax) www.hwcs.com	DataShare Y2K for VSE and MVS	Cross-system VSAM Data Sharing VSAM Catalog Replacement	Both	Mainframe	Any language supported by CICS	OS/390 VSE	Allows systems that normally shared non-Y2K supported VSAM catalogs to share ICF catalogs to resolve Y2K issues
	DataShare Y2K for VM and MVS	Cross system VSAM Data Sharing VSAM Catalog Replacement	Both	Mainframe	Any language supported by CICS	OS/390 VM	Allows systems that normally shared non-Y2K supported VSAM catalogs to share ICF catalogs to resolve Y2K issues
HAL Informatica (+39) 2 280151 (phone) (+39) 2 26140145 (fax) halinfo@halinfo.it	BYPASS2000	Impact Anal-ysis Conversion Testing	Both	Mainframe	VSAM DL/I COBOL CICS JCL PL/I, IMS	VSE VM	Specialized in the automatic reengineering operations of application software.

Table 5 (Page 7 of 11). Year 2000 Tool Matrix

Company	Suite/Tool Name	Compo- nents/ Capability	Data/ Program	Works On	Language	Runs On	Notes
IBM Corporation	VisualAge 2000 Suite	Assessment Planning Conversion Implement. Testing	Program	Mainframe	COBOL PL/I	VSE VM OS/390	Broad array of products, services, tools, and free resources to help customers with the major steps in the Year 2000 transition process
IBS Conversions, Inc. 800-5555-IBS or 630-990-1999 630-571-0723 (fax) http://www.ibs2000.com	IBS/ Solution 2000	Impact Anal. Conversion Project Methodology Training	Program	Mainframe Midrange Mini	COBOL RPG II RPG/400 BAL PL/I ADS/O Focus	OS/390 VSE OS/400	
IntelliWare Systems, Inc. 4025 Woodland Park Blvd. Arlington, TX 76013 (800) 4VSE-ESA (817) 277- 0899 (fax) http://www.intelliware.com	CA/ Dis- covery 2000	Code Factory Impact Analy. Code & Data Remediation Testing	Both	Mainframe	COBOL PL/I BAL ADS Ideal Eztrieve CICS IMS/DC IDMS VSAM Datacom DB2 IMS/DB	OS/390 VSE OS/400	Certified Reseller of Computer Associates Discovery 2000 product suite
	IBM Visual Age YR2K Suite	Impact Anal. Code & Data Remediation	Both	Mainframe		OS/390 VSE	Qualified Reseller of IBM Visual Age YR2K product suite

Table 5 (Page 8 of 11). Year 2000 Tool Matrix

Company	Suite/Tool Name	Compo-nents/ Capability	Data/ Program	Works On	Language	Runs On	Notes
MacKinney Systems 417-882-8012 (phone) 417-882-7569 (fax) http://www.mackinney.com	GSR	Global Search and Replace	Program	Mainframe	COBOL JCL	OS/390 VSE OS/390	Global search and replace
	GLO	Analysis Reporting	Program	Mainframe	COBOL	OS/390 VSE	COBOL glossary and on-line glossary cross reference
	Track	Analysis Testing (online)	Program	Mainframe	COBOL CICS	OS/390 VM VSE	Interactive source-level debugger for CICS
	Xray	Testing (batch) Analysis	Program	Mainframe	COBOL	OS/390 VM VSE	Interactive source-level debugger for batch
	SPC	Reporting	Program	Mainframe	Source code	OS/390 VSE	Source program compare utility
	JCLXref	Reporting	Program	Mainframe	JCL		JCL cross reference utility
	FIC	Reporting	Data	Mainframe	Files	OS/390 VSE	File compare utility
Micro Focus	SoftFactory/ 2000	Analysis Reporting Conversion Testing	Program	Mainframe Micro	COBOL	OS/390 VSE	Integrated family of Y2K products and services
SEEC Inc.	SEEC IV & V Workbench	Verification Validation Analysis Reeng. Testing Methodology	Program	Mainframe Mini	COBOL	OS/390 VSE VMS	Provides a methodology for identifying high-risk applications. Tools and processes for ensuring the quality of the reengineering process.
Millennium Dynamics 580 Walnut St. , 10th Floor P.O. Box 2575 Cincinnati, OH 45202 800-892-7431 or 513-369-3041 http://www.dynam.com	VANTAGE YR2000	Impact Anal. Planning Conversion Testing	Both	Mainframe	COBOL PL/I BAL	OS/390 VSE	Toolset, training, process modeling

Table 5 (Page 9 of 11). Year 2000 Tool Matrix

Company	Suite/Tool Name	Compo-nents/ Capability	Data/ Program	Works On	Language	Runs On	Notes
SICOR 116 Village Blvd, Suite 200 Princeton Forrestal Village Princeton, N.J. 08540-5799 (609) 951-2249 (phone) (609) 734-7405 (fax) info@sicor.com	SICOR Year 2000 Solution	Inventory Analysis Automated Conversion	Both	Mainframe S/X AS/400 HP SUN NT	COBOL C, C++ FORTRAN Natural PL/I RPG ADA	OS/390 VSE OS/400	Highly cost effective and expedient solution for bringing applications and data into YR2K compliance. Provides a full YR2K life cycle with an emphasis on automation.
Software Migrations Limited 44+ (0)1629 82 2242 (phone) 44+ (0)1629 82 2132 (fax) http://sml.u-net.com	FermaT 2000	Inventory Analysis Conversion	Program	Mainframe	BAL	OS/390 VSE	Specifically for legacy Assembler systems and applications
Software Pursuits 510-747-6900 (phone) info@spursuits.com	SIM2000 (Batch and CICS) SIM2000/ VSAM	Date Simu-lation Data Aging	Both	Mainframe	Any prog. language supported by CICS	VSE OS/390	Certified Reseller of DPE and Associates SIM2000 and SIM2000/VSAM products
Source Recovery Company 1080 Holcomb Bridge Rd. Bldg 200, Suite 200 Roswell, GA 30076 770-650-1090 (phone) 770-650-1093 (fax)		Recover lost COBOL or Assembler Source	Program	Mainframe	COBOL BAL	VMS VSE VM	Can recover source code from an executable version of the program
SQA, Inc. 10 State Street Woburn, MA 01801 800-228-9922 or 617-939-3000 http://www.sqa.com	SQA Team Test	Testing	Program	Independent	Independ.	PC UNIX	GUI and Client/Server test suite of products. Automated software quality assurance.
Sterling Software, Inc. 300 Crescent Court Suite 1200 Dallas, TX 75201 (214) 981-1000 (phone) (214) 981-1255 (fax) www.vmd.sterling.com	VM:Operator	Testing	Data	Mainframe		OS/390 VM VSE	A product used primarily to automate operations. Also includes facilities for automating testing for YR2K.

Table 5 (Page 10 of 11). Year 2000 Tool Matrix

Company	Suite/Tool Name	Compo-nents/ Capability	Data/ Program	Works On	Language	Runs On	Notes
Superior IS 435B-1 FM1092 Suite 168 Stafford, Texas 77477 (713) 524-8998 (phone) (713) 977-2320 (fax)	Beyond 2000	Inventory Assess Date Impact Assessment Code Reno-vation Auto Test Data Gener-ation Dynamic Bridge	Program	Mainframe Mini	COBOL PL/I IDMS FOCUS RPG	OS/390 VSE OS/400	State-of-the-art code conversion factory
Syllogy Corporation 201-343-8900 Ext. 36	IDMS Automated Tools And Methodol-ogies	Analysis Conversion Reporting	Data	Mainframe	BAL COBOL JCL ADS/O	OS/390 VSE	
Systemware Laboratories 503-977-0700 (phone)	Dossier Prove	Inventory Analysis	Program	Mainframe	COBOL CICS PL/I BAL RPG	VSE	Assists in performing complete online inventory analysis
Turnkey 2000 408-955-0244 (phone)	Unravel 2000	Impact Anal. Conversion	Program	Mainframe Client/ Server	COBOL DB2 IMS JCL SQL	OS/390 VSE UNIX	Has the ability to cross reference components for an entire system and provides support for Y2K projects using existing tools
Verilog SA, Inc. +33 61 29 39 (phone)	Logiscope	Analysis Reporting	Program	Mainframe Midrange	Ada C COBOL FORTRAN Modula Pascal PL/I	AIX OS/390 VM VSE Ultrix X Windows	Provides analysis and reporting by statements, paths and calls

Table 5 (Page 11 of 11). Year 2000 Tool Matrix

Company	Suite/Tool Name	Compo-nents/ Capability	Data/ Program	Works On	Language	Runs On	Notes
UCAN Company clu@seanet.com	CenturyVue	Impact Anal.	Both	Independent	Focus	Independent	Designed specifically for Focus applications. Will identify data files and FOCEXECs that are suspect for data manipulation.
Xpress Software, Inc. Dudley, MA 508-949-7661 (phone) http://www.xpsoft.com	Inventory2000	Impact Anal.	Program	Independent	Independ.	Independent	Language independence through use of syntax parsing tables
	Imp2000	Conversion/ Reporting	Data	Independent	Independ.	Independent	Repository scanning; online report viewer

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