IBM Library Server

Title: *LE/VSE V1R4 Concepts Guide*
Document Number: *GC33-6680-00*
Build Date: *09/18/96 12:53:21* ***Build Version:*** *1.2*
Book Path: *C:\IBMZLIB\BOOK\fl2cge00.boo*

CONTENTS Table of Contents

CONTENTS Table of Contents

Title: *LE/VSE V1R4 Concepts Guide*
Document Number: *GC33-6680-00*
Build Date: *09/18/96 12:53:21* ***Build Version:*** *1.2*
Book Path: *C:\IBMZLIB\BOOK\fl2cge00.boo*

COVER Book Cover

IBM Language Environment for VSE/ESA

Concepts Guide

Release 4

Document Number GC33-6680-00

Program Number
5686-094

Notices

> **Note!**
>
> Before using this information and the product it supports, be sure to read the general information under "Notices" in topic FRONT 1.

 *© Copyright IBM Corp. 1991, 1996*

EDITION Edition Notice

First Edition (December 1996)

This edition applies to Version 1 Release 4 of IBM Language Environment for VSE/ESA, 5686-094, and to any subsequent releases until otherwise indicated in new editions or technical newsletters. Make sure you are using the correct edition for the level of the product.

Order publications through your IBM representative or the IBM branch office serving your locality. Publications are not stocked at the address given below.

A form for reader's comments is provided at the back of this publication. If the form has been removed, address your comments to:

IBM Corporation Attn: Dept. ECJ - BP/003D 6300 Diagonal Highway Boulder, CO 80301, U.S.A.	or to:	IBM Deutschland Entwicklung GmbH Department 3248 Schoenaicher Strasse 220 D-71032 Boeblingen Federal Republic of Germany

When you send information to IBM, you grant IBM a non-exclusive right to use or distribute the information in any way it believes appropriate without incurring any obligation to you.

 *© Copyright IBM Corp. 1991, 1996*

CONTENTS Table of Contents

IBM Library Server

Figures

IBM Library Server

Tables

FRONT_1 Notices

References in this publication to IBM products, programs, or services do not imply that IBM intends to make these available in all countries in which IBM operates. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Subject to IBM's valid intellectual property or other legally protectable rights, any functionally equivalent product, program, or service may be used instead of the IBM product, program, or service. The evaluation and verification of operation in conjunction with other products, except those expressly designated by IBM, are the responsibility of the user.

IBM may have patents or pending patent applications covering subject matter in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to:

IBM Director of Licensing
IBM Corporation
500 Columbus Avenue
Thornwood, NY 10594
U.S.A.

Subtopics:

FRONT_1.1 Programming Interface Information

This book is intended to help with application programming. This book documents General-Use Programming Interface and Associated Guidance Information provided by IBM Language Environment for VSE/ESA.

General-Use programming interfaces allow the customer to write programs that obtain the services of IBM Language Environment for VSE/ESA.

FRONT_1.2 Trademarks

The following terms are trademarks of the IBM Corporation in the United States or other countries or both:

AD/Cycle	DFSORT	SAA
BookManager	IBM	SQL/DS
C/370	Integrated Language Environment	System/370
COBOL/370	Language Environment	VM/ESA
CICS	MVS/ESA	VSE/ESA
CICS/VSE	Operating System/400	

PREFACE About This Book

This book introduces you to the Language Environment architecture as implemented on the VSE platform by IBM Language Environment for VSE/ESA (LE/VSE).

The book contains an overview of LE/VSE, descriptions of LE/VSE's full program model, callable services, run-time options, software and hardware requirements, and a glossary of LE/VSE terms. This is not a programming manual, but rather a conceptual introduction to LE/VSE.

LE/VSE Concepts Guide should be read by those who design systems installations and develop application programs. This high-level guide will show how best to plan for systems to support your enterprise.

Terms that may be new to you are *italicized* on their first use. Definitions of these terms can be found in "Language Environment Glossary" in topic GLOSSARY.

Subtopics:

PREFACE.1 What Is LE/VSE?

LE/VSE is a set of common services and language-specific routines that provide a single run-time environment for applications written in *LE/VSE-conforming* versions of the C, COBOL, and PL/I high level languages (HLLs), and for many applications written in previous versions of COBOL. (For a list of LE/VSE-conforming languages, and a description of compatibility with previous versions of COBOL, see "LE/VSE-Conforming Languages" in topic PREFACE.2.) LE/VSE also supports applications written in assembler language using LE/VSE-provided macros and assembled using High Level Assembler (HLASM).

Prior to LE/VSE, each programming language provided its own separate run-time environment. LE/VSE combines essential and commonly-used run-time services--such as message handling, condition handling, storage management, date and time services, and math functions--and makes them available through a set of interfaces that are consistent across programming languages. With LE/VSE, you can use one run-time environment for your applications, regardless of the application's programming language or system resource needs, because most system dependencies have been removed.

Services that work with only one language are available within language-specific portions of LE/VSE.

LE/VSE consists of:

- Basic routines for starting and stopping programs, allocating storage, communicating with programs written in different languages, and indicating and handling error conditions.

- Common library services, such as math services and date and time services, that are commonly needed by programs running on the system. These functions are supported through a library of callable services.

- Language-specific portions of the common run-time library.

LE/VSE is the implementation of Language Environment on the VSE platform. Language Environment is offered on two other platforms: on MVS and VM as IBM Language Environment for MVS & VM, and on OS/400 as Integrated Language Environment.

PREFACE.2 LE/VSE-Conforming Languages

An LE/VSE-conforming language is any HLL that adheres to the LE/VSE common interface. Table 1 lists the LE/VSE-conforming language compiler products you can use to generate applications that run with LE/VSE Release 4.

Table 1. LE/VSE-Conforming Languages

Language	LE/VSE-Conforming Language	Minimum Release
C	IBM C for VSE/ESA	Release 1
COBOL	IBM COBOL for VSE/ESA	Release 1
PL/I	IBM PL/I for VSE/ESA	Release 1

Any HLL not listed in Table 1 is known as a *non-LE/VSE-conforming* or, alternatively, a *pre-LE/VSE-conforming* language. Some examples of non-LE/VSE-conforming languages are: C/370, DOS/VS COBOL, VS COBOL II, and DOS PL/I.

Only the following products can generate applications that run with LE/VSE:

- LE/VSE-conforming languages
- HLASM using LE/VSE-provided macros (for details, see *LE/VSE Programming Guide*)
- DOS/VS COBOL and VS COBOL II, with some restrictions (see "LE/VSE Compatibility with Previous Versions of COBOL" below)

Subtopics:

- PREFACE.2.1 LE/VSE Compatibility with Previous Versions of COBOL

PREFACE.3 Using Your Documentation

The publications provided with LE/VSE are designed to help you:

- Manage the run-time environment for applications written in LE/VSE-conforming languages.
- Write applications that use the LE/VSE callable services.
- Develop interlanguage communication (ILC) applications.
- Plan for, install, customize, and maintain LE/VSE.
- Debug problems in your LE/VSE-conforming applications.
- Migrate your high-level language applications to LE/VSE.

Language programming information is provided in the high-level language programming manuals that provide language definition, library function syntax and semantics, and programming guidance information.

Each publication helps you perform a different task. For a complete list of publications you might need, see "Bibliography" in topic BIBLIOGRAPHY.

Table 2. How to Use LE/VSE and Language Publications

To...	Use...	
Evaluate LE/VSE	LE/VSE Fact Sheet	GC33-6679
	LE/VSE Concepts Guide	GC33-6680
Plan for, install, customize, and maintain LE/VSE	LE/VSE Installation and Customization Guide	SC33-6682
Understand the LE/VSE program models and concepts	*LE/VSE Concepts Guide*	GC33-6680
	LE/VSE Programming Guide	SC33-6684

Find syntax for LE/VSE run-time options and callable services	LE/VSE Programming Reference	SC33-6685
Develop your LE/VSE-conforming applications	LE/VSE Programming Guide *Your language programming guide* LE/VSE C Run-Time Programming Guide LE/VSE C Run-Time Library Reference	SC33-6684 SC33-6688 SC33-6689
Develop interlanguage communication (ILC) applications	LE/VSE Writing Interlanguage Communication Applications	SC33-6686
Debug your LE/VSE-conforming application and get details on run-time messages	LE/VSE Debugging Guide and Run-Time Messages	SC33-6681
Migrate applications to LE/VSE	LE/VSE Run-Time Migration Guide *Your language migration guide*	SC33-6687
Diagnose problems that occur in your LE/VSE-conforming application	LE/VSE Debugging Guide and Run-Time Messages	SC33-6681
Understand warranty information	*LE/VSE Licensed Program Specifications*	GC33-6683

PREFACE.4 Terms Used in This Book

Unless otherwise stated, the following terms are used in this book to refer to the specified languages:

Term...	*Refers to the language supported by...*
C	The IBM C for VSE/ESA compiler
COBOL	The IBM COBOL for VSE/ESA and VS COBOL II compilers
PL/I	The IBM PL/I for VSE/ESA compilers

For a list of LE/VSE-conforming language compilers, see "LE/VSE-Conforming Languages" in topic PREFACE.2.

| CHANGES Summary of Changes

```
| This section lists the major changes that have been made to LE/VSE since
| Release 1.  Technical changes since Release 1 are marked in the text by a
| vertical change bar in the left margin.
```

Subtopics:

- CHANGES.1 Major Changes to the Product

| CHANGES.1 Major Changes to the Product

Subtopics:

1.0 Chapter 1. Overview

Today, enterprises need efficient, consistent, and less complex ways to develop quality applications and to maintain their existing inventory of applications. The trend in application development is to modularize and share code, and to develop applications on a workstation-based front end. LE/VSE gives you a common environment for LE/VSE-conforming high-level language (HLL) products. An HLL is a programming language above the level of assembler language and below that of program generators and query languages.

In the past, programming languages have had limited ability to call each other. Typically, when a routine calls another routine written in a different language, the called routine's environment must be initialized at the time of the call and terminated after the call--a very costly process. This has constrained those who want to use several languages in an application. Programming languages also have had different rules for implementing data structures and condition handling, and for interfacing with system services and library routines.

With LE/VSE, routines call one another within one common run-time environment, regardless of the LE/VSE-conforming HLL they are written in. Routines follow common calling conventions that standardize the way routines call one another and make interlanguage communication (ILC) in mixed-language applications easier, more efficient, and more consistent.

LE/VSE also combines essential run-time services, such as routines for run-time message handling, condition handling, and storage management. All of these services are available through a set of interfaces that are consistent across programming languages. You may either call these interfaces yourself, or use language-specific services that call the interfaces. With LE/VSE, you can use one run-time environment for your applications, regardless of the application's programming language or system resource needs.

LE/VSE consists of:

- Basic routines that support starting and stopping programs, allocating storage, communicating with programs written in different languages, and indicating and handling conditions.

- Common library services, such as math services and date and time services, that are commonly needed by programs running on the system. These functions are supported through a library of callable services.

- Language-specific portions of the run-time library. Because many language-specific routines call LE/VSE services, behavior is consistent across languages.

Figure 1 shows the separate components that make up LE/VSE.

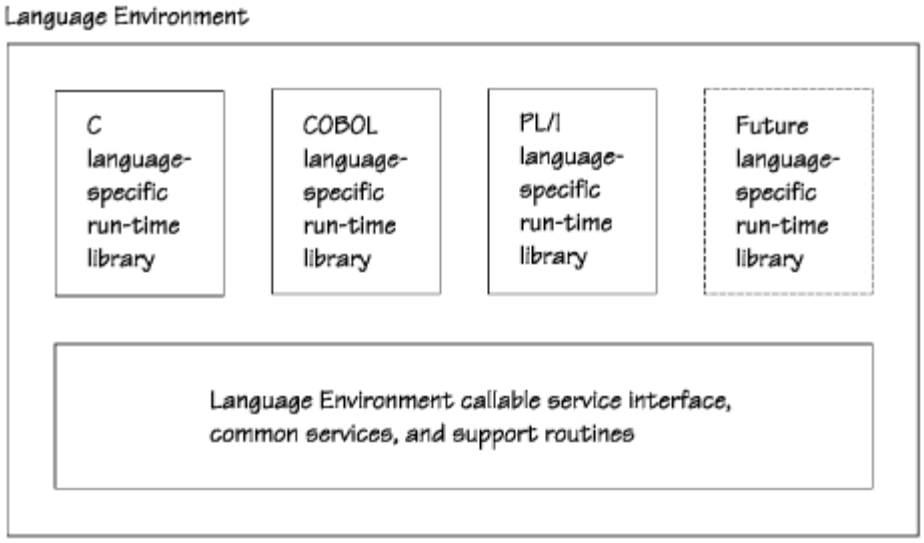


Figure 1. Components of LE/VSE

LE/VSE provides a single run-time environment for applications written in LE/VSE-conforming versions of the C, COBOL, and PL/I HLLs, and for many applications written in previous versions of COBOL. (For a list of LE/VSE-conforming languages, and a description of compatibility with previous versions of COBOL, see "LE/VSE-Conforming Languages" in topic PREFACE.2.) LE/VSE also supports applications written in assembler language using LE/VSE-provided macros and assembled using HLASM.

For a complete list of operating systems and subsystems supported by LE/VSE, see Chapter 6, "Product Requirements" in topic 6.0.

Figure 2 illustrates the common environment that LE/VSE creates.

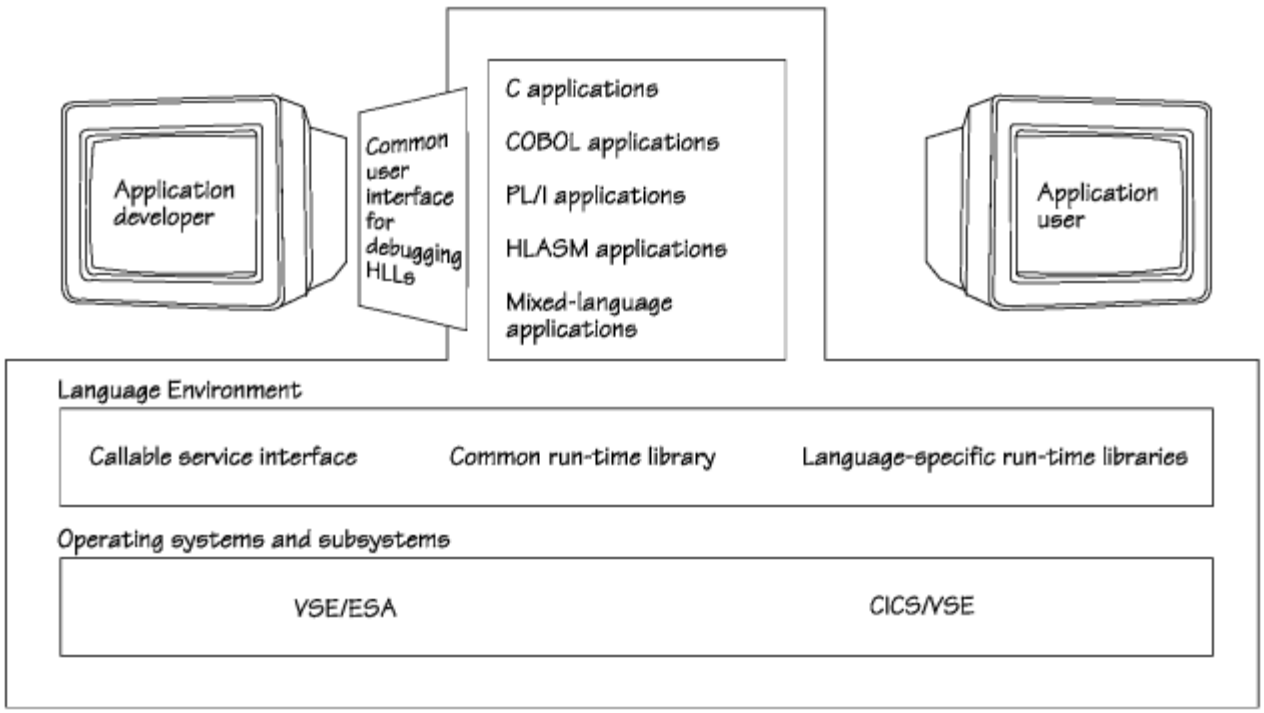


Figure 2. LE/VSE's Common Run-Time Environment

Subtopics:

- 1.1 What You Can Do with LE/VSE

1.1 What You Can Do with LE/VSE

LE/VSE helps you create mixed-language applications and gives you a consistent method of accessing common, frequently used services (for example, date and time conversions). Building mixed-language applications is easier with LE/VSE-conforming routines because LE/VSE establishes a consistent environment for all languages in the application.

Subtopics:

2.0 Chapter 2. The Model for Language Environment

This chapter describes the Language Environment architecture, a system of user conventions, product conventions, and processing models that, when followed by HLL application programmers, provides a common, consistent run-time environment. Models for program management, storage management, condition handling, and message services are outlined.

LE/VSE Implementation Information

This release of LE/VSE implements a subset of the Language Environment model. Features not supported in LE/VSE Version 1 Release 4 are clearly indicated in this chapter.

Subtopics:

2.1 Language Environment Program Management Model

The Language Environment program management model provides a framework within which an application runs. It is the foundation of all of the component models--condition handling, run-time message handling, and storage management--that comprise the Language Environment architecture. The program management model defines the effects of programming language semantics in mixed-language applications and integrates transaction processing and multithreading.

LE/VSE Implementation Information

Multithreading: Although the Language Environment model supports multithreading, LE/VSE Version 1 Release 4 supports only single threading.

Subtopics:

IBM Library Server

2.2 Language Environment Storage Management Model

Common storage management services are provided for all Language Environment-conforming programming languages; Language Environment controls stack and heap storage used at run time. It allows single- and mixed-language applications to access a central set of storage management facilities, and offers a multiple-heap storage model to languages that do not now provide one. The common storage model removes the need for each language to maintain a unique storage manager, and avoids the incompatibilities between different storage mechanisms.

Storage Management Terminology:

Stack	An area of storage in which stack frames are allocated (see "Language Environment Condition Handling Model" in topic 2.3 for an explanation of stack frames).
Heap	An area of storage used for allocation of storage whose lifetimes are not related to the execution of the current routine. The heap consists of the initial heap segment and zero or more increments. Heap storage contains storage acquired by the ALLOCATE statement in PL/I, and storage acquired by malloc() and calloc() in C.
Heap element	A contiguous area of storage allocated by a call to the CEEGTST service. Heap elements are always allocated within a single heap segment.
Heap increment	Additional heap segments allocated when the initial heap segment does not have enough free storage to satisfy a request for heap storage.
Heap segment	A contiguous area of storage obtained directly from the operating system.

Subtopics:

2.3 Language Environment Condition Handling Model

For single- and mixed-language applications, the Language Environment run-time library provides a consistent and predictable condition handling facility. It does not replace current HLL condition handling, but instead allows each language to respond to its own unique environment as well as to a mixed-language environment.

Language Environment condition management gives you the flexibility to respond directly to conditions by providing callable services to signal conditions and to interrogate information about those conditions. It also provides functions for error diagnosis, reporting, and recovery.

Language Environment condition handling is based on the *stack frame*, an area of storage that is allocated when a routine runs and that represents the history of execution of that routine. It can contain automatic variables, information on program linkage and condition handling, and other information. Using the stack frame as the model for condition handling allows conditions to be handled in the stack frame in which they occur. This allows you to tailor condition handling according to a specific routine, rather than handle every possible condition that could occur within one global condition handler.

A unique feature of Language Environment condition handling is the condition token. The token is a 12-byte data type that contains information about each condition. The information can be returned to the user as a feedback code when calling Language Environment callable services. It can also be used as a communication vehicle within the run-time environment.

Subtopics:

2.4 Language Environment Message Handling Model and National Language Support

A set of common message handling services that create and send run-time informational and diagnostic messages is provided by Language Environment.

With the message handling services, you can use the condition token that is returned from a callable service or from some other signaled condition, format it into a message, and deliver it to a defined output device or to a buffer.

Subtopics:

3.0 Chapter 3. LE/VSE Callable Services

This chapter gives an overview of LE/VSE callable services and the common calling procedure required to invoke them from C, COBOL, PL/I, and assembler.

This common set of callable services is designed to supplement your programming language's intrinsic capability. For example, COBOL application developers will find LE/VSE's consistent condition handling services especially useful. All languages can benefit from the rich set of LE/VSE common math services, as well as the date and time services.

LE/VSE callable services are divided into the following groups:

- Condition Handling Services
- Date and Time Services
- Dynamic Storage Services
- General Callable Services
- Initialization/Termination Services
- Locale Callable Services
- Math Services
- Message Handling Services
- National Language Support Services

Language-specific services, including those that call LE/VSE callable services, are documented in the language manuals.

Subtopics:

3.1 LE/VSE Calling Conventions

LE/VSE services can be invoked by HLL library routines, other LE/VSE services, and user-written HLL calls. In many cases, services will be invoked by HLL library routines, as a result of a user-specified function, such as a COBOL intrinsic function.

LE/VSE-conforming languages exhibit consistent behavior because language functions call LE/VSE services. For example, C malloc() and PL/I ALLOCATE each directly or indirectly call CEEGTST to obtain storage.

The sections below show examples of the syntax used to invoke LE/VSE callable services.

Subtopics:

3.2 LE/VSE Callable Services

Table 3 lists LE/VSE callable services. Naming conventions of the callable services are as follows:

- Those services starting with CEE*x*, where *x* is not 5, are intended to be cross-system consistent; they operate on all platform-specific implementations of Language Environment.

- Those services starting with CEE5 are services that exploit unique System/390 or VSE characteristics.

Condition Handling Services

CEE5CIB--Return Pointer to Condition Information Block
Given a condition token passed to a user-written condition handler, CEE5CIB returns a pointer to the condition information block associated with a condition. Allows access to detailed information about the subject condition during condition handling.

CEE5GRN--Get Name of Routine that Incurred Condition
Obtains the name of the routine that is currently running when a condition is raised. If there are nested conditions, the most recently signaled condition is used.

CEE5SPM--Query and Modify LE/VSE Hardware Condition Enablement
Allows the user to manipulate the program mask by enabling or masking hardware interrupts.

CEEDCOD--Decompose a Condition Token
Decomposes or changes an existing condition token.

CEEGPID--Retrieve the LE/VSE Version and Platform ID
Retrieves the LE/VSE version ID and platform ID currently in use.

CEEGQDT--Retrieve q_data_Token
Retrieves the q_data token from the ISI to be used by user condition handlers.

CEEHDLR--Register a User Condition Handler
Registers a user condition handler for the current stack frame. Currently, PL/I users can not call CEEHDLR.

CEEHDLU--Unregister a User Condition Handler
Unregisters a user condition handler for the current stack frame.

CEEITOK--Return Initial Condition Token
Returns the initial condition token for the current condition.

CEEMRCR--Move Resume Cursor Relative to Handle Cursor
Moves the resume cursor. You can either move the resume cursor to the call return point of the routine that registered the executing condition handler, or move the resume cursor to the caller of the routine that registered the executing condition handler.

CEENCOD--Construct a Condition Token
Dynamically constructs a condition token. The condition token communicates with message services, condition management, LE/VSE callable services, and user applications.

CEESGL--Signal a Condition
Signals a condition to the LE/VSE condition manager. It also may be used to provide qualifying data and create an instance specific information (ISI) field. The ISI contains information that is used by the LE/VSE condition manager to identify and react to conditions.

Date and Time Services

CEECBLDY--Convert Date to COBOL Integer Format
Converts a string representing a date into a COBOL Integer format that is compatible with ANSI COBOL intrinsic functions.

CEEDATE--Convert Lilian Date to Character Format
Converts a number representing a Lilian date to a date written in character format. The output is a character string such as

"1996/05/14."
CEEDATM--Convert Seconds to Character Timestamp
Converts a number representing the number of seconds since 00:00:00 14 October 1582 to a character format. The format of the output is a character string, such as "1996/05/14 20:37:00."
CEEDAYS--Convert Date to Lilian Format
Converts a string representing a date into a Lilian format. The Lilian format represents a date as the number of days since 14 October 1582, the beginning of the Gregorian calendar.
CEEDYWK--Calculate Day of Week from Lilian Date
Calculates the day of the week on which a Lilian date falls. The day of the week is returned to the calling routine as a number between 1 and 7.
CEEGMT--Get Current Greenwich Mean Time
Returns the current Greenwich Mean Time (GMT) as both a Lilian date and as the number of seconds since 00:00:00 14 October 1582. These values are compatible with those generated and used by the other LE/VSE date and time services.
CEEGMTO--Get Offset from Greenwich Mean Time to Local Time
Returns values to the calling routine which represent the difference between the local system time and Greenwich Mean Time.
CEEISEC--Convert Integers to Seconds
Converts separate binary integers representing year, month, day, hour, minute, second, and millisecond to a number representing the number of seconds since 00:00:00 14 October 1582. Use CEEISEC instead of CEESECS when the input is in numeric format rather than character format.
CEELOCT--Get Current Local Time
Returns the current local time in three formats:

- Lilian date (the number of days since 14 October 1582)
- Lilian timestamp (the number of seconds since 00:00:00 14 October 1582)
- Gregorian character string (in the form YYYYMMDDHHMISS999)

CEEQCEN--Query the Century Window
Queries the century within which LE/VSE assumes 2-digit year values lie. Use it in conjunction with CEESCEN when it is necessary to save and restore the current setting.
CEESCEN--Set the Century Window
Sets the century where LE/VSE assumes 2-digit year values lie. Use it in conjunction with CEEDAYS or CEESECS when you process date values that contain 2-digit years (for example, in the YYMMDD format), or when the LE/VSE default century interval doesn't meet the requirements of a particular application.
CEESECI--Convert Seconds to Integers
Converts a number representing the number of seconds since 00:00:00 14 October 1582 to seven separate binary integers representing year, month, day, hour, minute, second, and millisecond. Use CEESECI instead of CEEDATM when the output is needed in numeric format rather than character format.
CEESECS--Convert Timestamp to Number of Seconds
Converts a string representing a timestamp into a number representing the number of seconds since 00:00:00 14 October 1582. This service makes it easier to do time arithmetic, such as calculating the elapsed time between two timestamps.
CEEUTC--Get Coordinated Universal Time
CEEUTC is an alias of CEEGMT.

Dynamic Storage Services

CEECRHP--Create New Additional Heap
Defines additional heaps. The heaps defined by CEECRHP can be used just like the LE/VSE initial heap (heap id of 0). However, the entire heap created by CEECRHP may be quickly freed with a single call to the CEEDSHP (discard heap) service.
CEECZST--Reallocate (Change Size of) Storage
Changes the size of a previously allocated storage element while preserving its contents. Reallocation of a storage element is accomplished by allocating a new storage element of a new size and copying the contents of the old element to the new element.
CEEDSHP--Discard Heap
Discards an entire heap previously created with a call to CEECRHP.
CEEFRST--Free Heap Storage
Frees storage previously allocated by CEEGTST. It can be used to free both large and small blocks of storage efficiently because freed storage is retained on a free chain instead of being returned to the operating system.
CEEGTST--Get Heap Storage
Allocates storage from a heap whose ID you specify. It can be used to efficiently acquire both large and small blocks of storage.

General Services

CEE5DMP--Generate Dump
Generates a dump of the run-time environment of LE/VSE and of the member language libraries. The dump can be modified to selectively include such information as number and contents of enclaves and threads, traceback of all routines on a call chain, file attributes, and variable, register, and storage contents.

CEE5PRM--Query Parameter String
Returns to the calling routine the parameter string that was specified at invocation of the program. The returned parameter string contains only user parameters. If no user parameters are available, a blank string is returned.

CEE5RPH--Set Report Heading
Sets the heading displayed at the top of the storage or run-time options report. LE/VSE generates the storage report when the RPTSTG(ON) run-time option is specified, and the options report when the RPTOPTS(ON) run-time option is specified.

CEE5USR--Set or Query User Area Fields
Sets or queries one of two 4-byte fields in the enclave data block known as the user area fields. The user area fields are associated with an enclave and are maintained on an enclave basis. A user area might be used by vendor or applications to store a pointer to a global data area or keep a recursion counter.

CEERAN0--Calculate Uniform Random Numbers
Generates a sequence of uniform pseudo-random numbers between 0 and 1 using the multiplicative congruential method with a user-specified seed.

CEETDLI--Invoke DL/I
Provides an interface to DL/I DOS/VS.

CEETEST--Invoke Debug Tool
Invokes a debug tool, such as Debug Tool for VSE/ESA.

Initialization/Termination Services

CEE5ABD--Terminate Enclave with an Abend
Requests LE/VSE to terminate the enclave via an abend. The abend can be issued either with or without cleanup.

CEE5GRC--Get the Enclave Return Code
Retrieves the current value of the user enclave return code.

CEE5SRC--Set the Enclave Return Code
Modifies the user enclave return code. The value set will be used in the calculation of the final enclave return code at enclave termination.

Locale Services

CEEFMON--Format Monetary String
Converts numeric values to monetary strings.

CEEFTDS--Format Time and Date into Character String
Converts time and date specifications into a character string.

CEELCNV--Query Locale Numeric Conventions
Returns information about the LC_NUMERIC and LC_MONETARY categories of the locale.

CEEQDTC--Query Locale Date and Time Conventions
Queries the locale's date and time conventions.

CEEQRYL--Query Active Locale Environment
Allows the calling routine to query the current locale.

CEESCOL--Compare Collation Weight of Two Strings
Compares two character strings based on the collating sequence specified in the LC_COLLATE category of the locale.

CEESETL--Set Locale Operating Environment
Allows an enclave to establish a locale operating environment, which determines the behavior of character collation, character classification, date and time formatting, numeric punctuation, and message responses.

CEESTXF--Transform String Characters into Collation Weights
Transforms each character in a character string into its collation weight and returns the length of the transformed string.

Mathematical Services

LE/VSE math services are scalar routines. *x* is a data type variable.

CEESxABS
Absolute value

CEESxACS
Arccosine

CEESxASN
Arcsine

CEESxATH
Hyperbolic arctangent

CEESxATN
Arctangent

CEESxAT2
Arctangent x/y

CEESxCJG
Conjugate of complex
CEESxCOS
Cosine
CEESxCSH
Hyperbolic cosine
CEESxCTN
Cotangent
CEESxDIM
Positive difference
CEESxDVD
Floating complex divide
CEESxERF
Error function
CEESxEXP
Exponential (base e)
CEESxGMA
Gamma function
CEESxIMG
Imaginary part of complex
CEESxINT
Truncation
CEESxLGM
Log gamma function
CEESxLG1
Logarithm base 10
CEESxLG2
Logarithm base 2
CEESxLOG
Logarithm base e
CEESxMLT
Floating complex multiply
CEESxMOD
Modular arithmetic
CEESxNIN
Nearest integer
CEESxNWN
Nearest whole number
CEESxSGN
Transfer of sign
CEESxSIN
Sine
CEESxSNH
Hyperbolic sine
CEESxSQT
Square root
CEESxTAN
Tangent
CEESxTNH
Hyperbolic tangent
CEESxXPx
Exponentiation

Message Handling Services

CEECMI--Store and Load Message Insert Data
Stores the message insert data and loads the address of that data into the instance specific information (ISI) field associated with the condition being processed, after optionally creating an ISI.
CEEMGET--Get a Message
Retrieves, formats, and stores a message in a buffer for manipulation or output by the caller.
CEEMOUT--Dispatch a Message
Dispatches a message to a destination which you specify.
CEEMSG--Get, Format, and Dispatch a Message
Obtains/formats/dispatches a message corresponding to an input condition token received from a callable service. You can use this service to print a message after a call to any LE/VSE service that returns a condition token.

National Language Support Services

CEE5CTY--Set Default Country
Allows the calling routine to change or query the current national country setting. The country setting affects the date format, the time format, the currency symbol, the decimal separator character, and the thousands separator.
CEE5LNG--Set National Language
Allows the calling routine to change or query the current national language. The national languages may be recorded on a LIFO national language stack. Changing the national language changes the languages of error messages, the names of the days of the week, and the names of the months.
CEE5MCS--Obtain Default Currency Symbol

```
Returns the default currency symbol for the specified country.
CEE5MDS--Obtain Default Decimal Separator
Returns the default decimal separator for the specified country.
CEE5MTS--Obtain Default Thousands Separator
Returns the default thousands separator for the specified country.
CEEFMDA--Obtain Default Date Format
Returns the default date picture string for the specified country.
CEEFMDT--Obtain Default Date and Time Format
Returns the default date and time picture strings for the specified
country.
CEEFMTM--Obtain Default Time Format
Returns the default time picture string for the specified country.
```

 *© Copyright IBM Corp. 1991, 1996*

4.0 Chapter 4. LE/VSE Run-Time Options

This chapter lists the run-time options available with LE/VSE. Although most LE/VSE options apply to all LE/VSE-conforming languages, some are specific only to a single language. LE/VSE helps migration by mapping run-time options to C, COBOL, and PL/I options. Specific mapping information is found in *LE/VSE Programming Reference*.

Table 3. LE/VSE Run-Time Options

Run-Time Option	Description
ABPERC	Exempts a specified VSE cancel code, program-interruption code, or user abend code from LE/VSE condition handling.
ABTERMENC	Determines how an enclave ending with an unhandled condition of severity 2 or greater terminates: with a return code and reason code, or with an abend.
AIXBLD	Dynamic invocation of access method services for COBOL programs.
ALL31	Indicates the entire application is running AMODE 31.
ANYHEAP	Controls allocation of LE/VSE and HLL heap storage not restricted to below the 16MB line.
ARGPARSE	Specifies whether arguments on the command line are to be parsed in the usual C format.
BELOWHEAP	Controls allocation of LE/VSE and HLL heap storage below the 16MB line.
CBLOPTS	Indicates the order of run-time options. This option is honored only when the main routine is written in COBOL.
CBLPSHPOP	Controls whether CICS PUSH HANDLE and CICS POP HANDLE are issued when a COBOL subroutine is called.
CHECK	Checking of index, subscript, reference modification, and variable length group ranges in COBOL programs.
COUNTRY	Specifies the default formats for date, time, currency symbol, decimal separator, and the thousands separator based upon a country.
DEBUG	Activates the COBOL batch debugging features.
DEPTHCONDLMT	Limits the extent to which conditions can be nested.
ENV	Specifies the operating system environment for a C application.

ENVAR	Sets the initial values for the environment variables specified. With ENVAR, you can pass into an application switches or tagged information that can then be accessed during application execution using the C functions getenv(), setenv(), and clearenv().
ERRCOUNT	Specifies how many non-fatal errors are allowed before the program is abnormally terminated.
EXECOPS	Specifies whether run-time options can be specified on the command line.
HEAP	Controls the allocation of the user heap.
LIBSTACK	Controls the allocation of the enclave's library stack storage.
MSGFILE	Specifies the *filename* of the run-time diagnostics file.
MSGQ	Specifies the maximum number of message inserts allocated on a per thread basis during execution.
NATLANG	Specifies the national language to be used for the run-time environment.
PLIST	Specifies the format of the invocation parameters received by your C application when it is invoked.
REDIR	Specifies whether redirections for stdin, stderr, and stdout are allowed from the command line.
RPTOPTS	Specifies that a report of the run-time options in use by the program will be generated.
RPTSTG	Specifies that a report of the storage used by the program be generated at the end of execution.
RTEREUS	Specifies a reusable run-time environment for COBOL programs.
STACK	Controls the allocation of the enclave's stack storage.
STORAGE	Used for debugging. Specifies initial values to which all heap and stack storage is set when first allocated or freed.
TERMTHDACT	Sets the level of information produced due to an error of severity 2 or greater.
TEST	Specifies the conditions under which a debug tool (such as Debug Tool for VSE/ESA) assumes control of the application.
TRACE	Determines whether LE/VSE run-time library tracing is active.
TRAP	Specifies how LE/VSE routines should handle error conditions and program interrupts.
UPSI	Sets UPSI switches (affects only COBOL programs).
XUFLOW	Specifies whether an exponent underflow causes a program interrupt.

5.0 Chapter 5. Sample Routines

This chapter includes sample routines that demonstrate several aspects of LE/VSE.

- Assembler routine, Figure 15 in topic 5.1
- C routine, Figure 16 in topic 5.2
- COBOL routine, Figure 17 in topic 5.3
- PL/I routine, Figure 18 in topic 5.4

Subtopics:

IBM Library Server

5.1 Sample Assembler Routine

```
*COMPILATION UNIT: LEASMMN
* ===================================================================
*
*        A simple main assembler routine that brings up the
*        LE/VSE environment, prints a message in the main routine,
*        and returns with a return code of 0, modifier of 0.
*
* ===================================================================
MAIN     CEEENTRY PPA=MAINPPA
*
*        Invoke CEEMOUT to issue a message for us
*
         CALL  CEEMOUT,(STRING,DEST,0)      Omitted feedback code
*
*   Terminate the LE/VSE environment and return to the caller
*
         CEETERM  RC=0,MODIFIER=0
* ===================================================================
*              CONSTANTS AND WORKAREAS
* ===================================================================
*
DEST     DC    F'2'
STRING   DC    Y(STRLEN)
STRBEGIN DC    C'In the main routine'
STRLEN   EQU   *-STRBEGIN
MAINPPA  CEEPPA  ,               Constants describing the code block
         CEEDSA  ,               Mapping of the dynamic save area
         CEECAA  ,               Mapping of the common anchor area
         END   MAIN              Nominate MAIN as the entry point
```

Figure 15. A Simple Main Assembler Routine

5.2 Sample C Routine

This routine demonstrates the following LE/VSE callable services:

- CEEMOUT--Dispatch a message
- CEELOCT--Get current time
- CEEDATE--Convert Lilian date to character format

```
#include <leawi.h>
#include <string.h>
main ()
{
  _FEEDBACK   fbcode;           /* fbcode for all callable services */

/*******************************************************************/
/* Parameters passed to CEEMOUT.  Typedefs found in leawi.h.       */
/*******************************************************************/
  _VSTRING    msg;
  _INT4       destination;
/*******************************************************************/
/* Parameters passed to CEELOCT.  Typedefs found in leawi.h.       */
/*******************************************************************/
  _INT4       lildate;
  _FLOAT8     lilsecs;
  _CHAR17     greg;
/*******************************************************************/
/* Parameters passed to CEEDATE.  Typedefs found in leawi.h.       */
/*******************************************************************/
  _CHAR80  str_date;
  _VSTRING pattern;
/*******************************************************************/
/* Starting and ending messages                                    */
/*******************************************************************/
  _CHAR80  startmsg  = "Callable service example starting (C).";
  _CHAR80  endingmsg = "Callable service example ending (C).";

/*******************************************************************/
/* Start execution. Print the first message.                       */
/*******************************************************************/
  destination = 2;
  strcpy( msg.string, startmsg );
  msg.length  = strlen( msg.string );
  CEEMOUT ( &msg, &destination, &fbcode );

/*******************************************************************/
/* Get the local date and time, format it, and print it out.       */
/*******************************************************************/
  CEELOCT ( &lildate, &lilsecs, greg, &fbcode );
  strcpy  ( pattern.string,\
          "Today is Wwwwwwwwwwwz, Mmmmmmmmmz ZD, YYYY." );
  pattern.length = strlen( pattern.string );
  memset ( msg.string , ' ' , 80 );
```

```
|     CEEDATE ( &lildate, &pattern, msg.string, &fbcode );
|     msg.length = 80;
|     CEEMOUT ( &msg, &destination, &fbcode );
|   /*****************************************************************/
|   /* Say goodbye.                                                  */
|   /*****************************************************************/
|     strcpy  ( msg.string, endingmsg );
|     msg.length = strlen( msg.string );
|     CEEMOUT ( &msg, &destination, &fbcode );
|   }
```

| Figure 16. Sample C Routine

5.3 Sample COBOL Routine

This routine demonstrates the following LE/VSE callable services:

- CEEMOUT--Dispatch a message
- CEELOCT--Get current time
- CEEDATE--Convert Lilian date to character format

```
 CBL C,RENT,APOST,OPTIMIZE,LIST,DATA(31),NODYNAM,LIB
    ***************************************************************
    *  This routine demonstrates the following LE/VSE callable     *
    *  services : CEEMOUT, CEELOCT, CEEDATE                        *
    ***************************************************************


    ***************************************************************
    **           I D          D I V I S I O N                     ***
    ***************************************************************
     Identification Division.
     Program-Id.    AWIXMP.
    ***************************************************************
    **           D A T A      D I V I S I O N                     ***
    ***************************************************************
     Data Division.
     Working-Storage Section.
    ***************************************************************
    **  Declarations for the local date/time service.
    ***************************************************************
     01   Feedback.
     COPY CEEIGZCT.
      02   Fb-severity      PIC 9(4) Binary.
      02   Fb-detail        PIC X(10).
     77   Dest-output       PIC S9(9) Binary.
     77   Lildate           PIC S9(9) Binary.
     77   Lilsecs           COMP-2.
     77   Greg              PIC X(17).
    ***************************************************************
    **  Declarations for messages and pattern for date formatting.
    ***************************************************************
     01   Pattern.
      02                    PIC 9(4) Binary Value 45.
      02                    PIC X(45) Value
          'Today is Wwwwwwwwwwwwz, Mmmmmmmmmmz ZD, YYYY.'.


     77   Start-Msg         PIC X(80) Value
          'Callable Service example starting.'.


     77   Ending-Msg        PIC X(80) Value
          'Callable Service example ending.'.


     01 Msg.
       02 Stringlen         PIC S9(4) Binary.
```

```
   02 Str                .
    03                  PIC X Occurs 1 to 80 times
                             Depending on Stringlen.
*****************************************************************
**           P R O C      D I V I S I O N                     ***
*****************************************************************
 Procedure Division.
 000-Main-Logic.
     Perform 100-Say-Hello.
     Perform 200-Get-Date.
     Perform 300-Say-Goodbye.
     Stop Run.
**
** Setup initial values and say we are starting.
**
 100-Say-Hello.
     Move 80 to Stringlen.
     Move 02 to Dest-output.
     Move Start-Msg to Str.
     CALL 'CEEMOUT' Using Msg     Dest-output Feedback.
     Move Spaces to Str.
     CALL 'CEEMOUT' Using Msg     Dest-output Feedback.
**
** Get the local date and time and display it.
**
 200-Get-Date.
     CALL 'CEELOCT' Using Lildate Lilsecs     Greg      Feedback.
     CALL 'CEEDATE' Using Lildate Pattern     Str       Feedback.
     CALL 'CEEMOUT' Using Msg     Dest-output Feedback.
     Move Spaces to Str.
     CALL 'CEEMOUT' Using Msg     Dest-output Feedback.
**
** Say Goodbye.
**
 300-Say-Goodbye.
     Move Ending-Msg to Str.
     CALL 'CEEMOUT' Using Msg     Dest-output Feedback.
 End Program AWIXMP.
```

Figure 17. Sample COBOL Routine

5.4 Sample PL/I Routine

This sample demonstrates the following LE/VSE callable services:

- CEEMOUT--Dispatch a message
- CEELOCT--Get current time
- CEEDATE--Convert Lilian date to character format

```
*PROCESS MACRO;
 /*compilation unit: cecgxmp                                    */
 /***************************************************************/
 /* This routine demonstrates the following LE/VSE callable **/
 /* services:  CEEMOUT, CEELOCT, and CEEDATE.                **/
 /*                                                          **/
 /***************************************************************/
 cecgxmp: proc options(main);


 /* Declarations for callable services */
    %INCLUDE  CEEIBMAW;
    %INCLUDE  CEEIBMCT;


 /* feedback code for all callable services*/
    dcl 01 fc FEEDBACK;


 /***************************************************************/
 /** Parameters passed to CEEMOUT.                             **/
 /**                                                           **/
 /***************************************************************/


    dcl startmsg VSTRING
          init('Callable service example starting (PL/I)');
    dcl endmsg VSTRING
          init('Callable service example ending (PL/I)');
    dcl strmsg VSTRING;
    dcl destination real fixed binary ( 31,0 );
 /***************************************************************/
 /** Parameters passed to CEELOCT.                             **/
 /**                                                           **/
 /***************************************************************/
    dcl lildate real fixed binary ( 31,0 );
    dcl lilsecs real float decimal ( 16 );
    dcl greg character ( 17 );
 /***************************************************************/
 /** Parameters for CEEDATE.                                   **/
 /**                                                           **/
 /***************************************************************/
    dcl pattern VSTRING;
    dcl chrdate CHAR80 init ((80)' ');
 /***************************************************************/
 /** Start execution.  Print the first message.                **/
 /**                                                           **/
 /***************************************************************/
    destination = 2;
```

```
      call CEEMOUT ( startmsg , destination , fc );
      IF  ¬ FBCHECK( fc, CEE000)  THEN  DO;
         DISPLAY( 'CEEMOUT failed with msg ' || fc.MsgNo );
         STOP;
         END;


   /*************************************************************/
   /** Get the local date and time. Format it, and print it    **/
   /** out.                                                    **/
   /*************************************************************/
      call CEELOCT ( lildate , lilsecs , greg , fc );
      IF  ¬ FBCHECK( fc, CEE000)  THEN  DO;
         DISPLAY( 'CEELOCT failed with msg ' || fc.MsgNo );
         STOP;
         END;


      pattern = 'Today is Wwwwwwwwwwwz, Mmmmmmmmmz, ZD, YYYY.';
      call CEEDATE ( lildate , pattern , chrdate , fc );
      IF  ¬ FBCHECK( fc, CEE000)  THEN  DO;
         DISPLAY( 'CEEDATE failed with msg ' || fc.MsgNo );
         STOP;
         END;


      strmsg = chrdate;
      call CEEMOUT ( strmsg , destination , fc );
      IF  ¬ FBCHECK( fc, CEE000)  THEN  DO;
         DISPLAY( 'CEEMOUT failed with msg ' || fc.MsgNo );
         STOP;
         END;


   /*************************************************************/
   /** Say good bye.                                           **/
   /**                                                         **/
   /*************************************************************/
      call CEEMOUT ( endmsg , destination , fc );
      IF  ¬ FBCHECK( fc, CEE000)  THEN  DO;
         DISPLAY( 'CEEMOUT failed with msg ' || fc.MsgNo );
         STOP;
         END;


   end;
```

Figure 18. Sample PL/I Routine

IBM Library Server

6.0 Chapter 6. Product Requirements

Subtopics:

6.1 Machine Requirements

```
LE/VSE-conforming compiler-generated object code runs on any hardware
configuration supported by the licensed programs specified below.  LE/VSE
supports the DBCS character sets on the IBM Personal System/55 (as 3270)
and IBM 5550 Family (as 3270).
```

6.2 Programming Requirements

LE/VSE runs under the control of, or in conjunction with, the following IBM licensed programs and their subsequent releases unless otherwise announced by IBM.

Subtopics:

 *© Copyright IBM Corp. 1991, 1996*

6.3 Compatibility Considerations

LE/VSE's open architecture ensures that there will be minimal disruption of your resources as you migrate to LE/VSE; it provides COBOL and PL/I source code compatibility, and, with certain exceptions, COBOL object code and executable phase compatibility with your existing applications. Many of your existing VS COBOL II applications can run with LE/VSE without relink-editing or recompiling. Routines compiled with LE/VSE-conforming compilers can be mixed with old VS COBOL II routines in an application, so applications can be enhanced and maintained selectively. However, routines that depend on dump formats, condition handling routines, or assembler routines may have to be changed.

Compatibility and migration are fully documented in *LE/VSE Run-Time Migration Guide*, *IBM COBOL for VSE/ESA Migration Guide*, and *IBM PL/I for VSE/ESA Migration Guide*.

IBM Library Server

Bibliography

Subtopics:

BIBLIOGRAPHY.1 Language Environment Publications

IBM Language Environment for VSE/ESA

Fact Sheet, GC33-6679

Concepts Guide, GC33-6680

Debugging Guide and Run-Time Messages, SC33-6681

Installation and Customization Guide, SC33-6682

Licensed Program Specifications, GC33-6683

Programming Guide, SC33-6684

Programming Reference, SC33-6685

Run-Time Migration Guide, SC33-6687

Writing Interlanguage Communication Applications, SC33-6686

C Run-Time Programming Guide, SC33-6688

C Run-Time Library Reference, SC33-6689

BIBLIOGRAPHY.2 LE/VSE-Conforming Language Product Publications

IBM C for VSE/ESA

Licensed Program Specifications, GC09-2421

Installation and Customization Guide, GC09-2422

Migration Guide, SC09-2423

User's Guide, SC09-2424

Language Reference, SC09-2425

Diagnosis Guide, GC09-2426

IBM COBOL for VSE/ESA

General Information, GC26-8068

Licensed Program Specifications, GC26-8069

Migration Guide, GC26-8070

Installation and Customization Guide, SC26-8071

Programming Guide, SC26-8072

Language Reference, SC26-8073

Diagnosis Guide, SC26-8528

Reference Summary, SX26-3834

IBM PL/I for VSE/ESA

Fact Sheet, GC26-8052

Programming Guide, SC26-8053

Language Reference, SC26-8054

Licensed Program Specifications, GC26-8055

Migration Guide, SC26-8056

Installation and Customization Guide, SC26-8057

Diagnosis Guide, SC26-8058

Compile-Time Messages and Codes, SC26-8059

Reference Summary, SX26-3836

Debug Tool for VSE/ESA

User's Guide and Reference, SC26-8797

Installation and Customization Guide, SC26-8798

Fact Sheet, GC26-8925

IBM Library Server

BIBLIOGRAPHY.3 Softcopy Publications

The following collection kit contains the LE/VSE and LE/VSE-conforming language product publications:

VSE Collection, SK2T-0060

You can order these publications from Mechanicsburg through your IBM representative.

GLOSSARY Language Environment Glossary

A

abend. Abnormal end of application.

active routine. The currently executing routine.

additional heap. An LE/VSE heap created and controlled by a call to CEECRHP. See also *below heap, anywhere heap,* and *initial heap*.

American National Standard Code for Information Interchange (ASCII). The code developed by the American National Standards Institute (ANSI) for information interchange among data processing systems, data communications systems, and associated equipment. The ASCII character set consists of 7-bit control characters and symbolic characters.

anywhere heap. The LE/VSE heap controlled by the ANYHEAP run-time option. It contains library data, such as LE/VSE control blocks and data structures not normally accessible from user code. The anywhere heap may reside above 16MB. See also *below heap, additional heap,* and *initial heap*.

application development life cycle. The sequence of activities performed during application development, from enterprise modeling and validation, requirements analysis and application design, to system development, test, production, and maintenance.

application generator. An application development tool that creates applications, application components (panels, data, databases, logic, interfaces to system services), or complete application systems from design specifications.

application program. A collection of software components used to perform specific types of work on a computer, such as a program that does inventory control or payroll.

argument. An expression used at the point of a call to specify a data item or aggregate to be passed to the called routine.

ASCII. American National Standard Code for Information Interchange.

assembler. see *High Level Assembler*.

automatic data. Data that does not persist across calls to other routines. Automatic data may be automatically initialized to a certain value upon entry and reentry to a routine.

automatic storage. Storage that is allocated on entry to a routine or block and is freed on the subsequent return. Sometimes referred to as *stack storage* or *dynamic storage*.

B

below heap. The LE/VSE heap controlled by the BELOWHEAP run-time option, which contains library data, such as LE/VSE control block and data structures not normally accessible from user code. Below heap always resides below 16MB. See also *anywhere heap*, *initial heap*, and *additional heap*.

by reference. See *pass by reference*.

by value. See *pass by value*.

byte. The basic unit of storage addressability, usually with a length of 8 bits.

C

callable services. A set of services that can be invoked by an LE/VSE-conforming high level language using the conventional LE/VSE-defined call interface, and usable by all programs sharing the LE/VSE conventions.

Use of these services helps to decrease an application's dependence on the specific form and content of the services delivered by any single operating system.

CASE. Computer-aided software engineering.

CICS. Customer Information Control System.

COBOL. COmmon Business-Oriented Language. A high level language, based on English, that is primarily used for business applications.

COBOL run unit. A COBOL-specific term that defines the scope of language semantics. Equivalent to an LE/VSE *enclave*.

command line. The command used to invoke an application program, and the associated program arguments and LE/VSE run-time options. This can be the job control EXEC statement and the associated PARM parameter, or the parameter string passed to the C `system()` function.

compilation unit. An independently compilable sequence of HLL statements. Each HLL product has different rules for what makes up a compilation unit. Synonym for *program unit*.

computer-aided software engineering (CASE). A software engineering discipline for automating the application development process and thereby improving the quality of application and the productivity of application developers.

condition. An exception that has been enabled, or recognized, by LE/VSE and thus is eligible to activate user and language condition handlers. Any alteration to the normal programmed flow of an application. Conditions can be detected by the hardware/operating system and result in an interrupt. They can also be detected by language-specific generated code or language library code.

condition handler. A user-written condition handler or language-specific condition handler (such as a PL/I ON-unit) invoked by the LE/VSE *condition manager* to respond to conditions.

condition manager. Manages conditions in the common execution environment by invoking various user-written and language-specific *condition handlers*.

condition token. In LE/VSE, a data type consisting of 96 bits (12 bytes). The condition token contains structured fields that indicate various aspects of a condition including the severity, the associated message number, and information that is specific to a given instance of the condition.

cross-system consistency. Consistency of interfaces across different systems. Cross-system consistency relates to portability of applications to different platforms; that is, the application writer sees consistent support on all of the supported platforms relative to standard HLL source statements and a broad range of callable services.

Customer Information Control System (CICS). CICS is an OnLine Transaction Processing (OLTP) system that provides specialized interfaces to databases, files and terminals in support of business and commercial applications.

D

data type. The properties and internal representation that characterize data.

DBCS. Double-byte character set.

default. A value that is used when no alternative is specified.

DOS PL/I. See *PL/I*.

double-byte character set (DBCS). A collection of characters represented by a two-byte code.

DSA. Dynamic storage area.

dynamic call. A call that results in the resolution of the called routine at run time. Contrast with *static call*.

dynamic storage. Storage acquired as needed at run time. Contrast with *static storage*.

dynamic storage area (DSA). An area of storage obtained during the running of an application that consists of a register save area and an area for automatic data, such as program variables. DSAs are generally allocated within LE/VSE-managed stack segments. DSAs are added to the stack when a routine is entered and removed upon exit in a last in, first out (LIFO) manner. In LE/VSE, a DSA is known as a *stack frame*.

E

EBCDIC. Extended binary-coded decimal interchange code.

enablement. The determination by a language at run time that an exception should be processed as a condition. This is the capability to intercept an exception and to determine whether it should be ignored or not; unrecognized exceptions are always defined to be enabled. Normally, enablement is used to supplement the hardware for capabilities that it does not have and for language enforcement of the language's semantics. An example of supplementing the hardware is the specialized handling of floating-point overflow exceptions based on language specifications (on some machines this can be achieved through masking the exception).

enclave. In LE/VSE, an independent collection of routines, one of which is designated as the main routine. An enclave is roughly analogous to a program or run unit.

enterprise. The composite of all operational entities, functions, and resources that form the total business concern.

environment. A set of services and data available to a program during execution. In LE/VSE, environment is normally a reference to the run-time environment of HLLs at the enclave level.

ESDS. Entry sequenced data sets. See *VSAM*.

exception. The original event such as a hardware signal, software detected event, or user-signaled event which is a potential condition. This action may or may not include an alteration in a program's normal flow. See also *condition*.

execution time. Synonym for *run time*.

execution environment. Synonym for *run-time environment*.

extended binary-coded decimal interchange code (EBCDIC). A set of 256 eight-bit characters.

external data. Data that persists over the lifetime of an enclave and maintains last-used values whenever a routine within the enclave is reentered. Within an enclave consisting of a single phase, it is equivalent to COBOL external data.

external routine. A procedure or function that may be invoked from outside the program in which the routine is defined.

F

feedback code (fc). A condition token value. If you specify *fc* in a call to a callable service, a condition token indicating whether the service completed successfully is returned to the calling routine.

file. A named collection of related data records that is stored and retrieved by an assigned name.

filename. A 1- to 7-character name used within an application and in JCL to identify a file. The filename provides the means for the logical file to be connected to the physical file.

fix-up and resume. The correction of a condition by changing the argument or parameter and running the routine again.

Fortran. A high level language primarily designed for applications involving numeric computations.

function. A routine that is invoked by coding its name in an expression. The routine passes a result back to the invoker through the routine name.

H

handle cursor. Points to the first condition handler within the stack frame that is to be invoked when a condition occurs. As condition handling progresses, the handle cursor moves to earlier handlers within the stack frame, or to the first handler in the calling stack frame.

handler. See *condition handler*.

heap. An area of storage used for allocation of storage whose lifetime is not related to the execution of the current routine. The heap consists of the initial heap segment and zero or more increments. See also *additional heap*, *anywhere heap*, *below heap*, *heap element*, and *initial heap*.

heap element. A contiguous area of storage allocated by a call to the CEEGTST service. Heap elements are always allocated within a single heap segment.

heap increment. See *increment*.

heap segment. A contiguous area of storage obtained directly from the operating system. The LE/VSE storage management scheme subdivides heap segments into individual heap elements. If the initial heap segment becomes full, LE/VSE obtains a second segment, or increment, from the operating system.

heap storage. See *heap*.

High Level Assembler. An IBM licensed program. Translates symbolic assembler language into binary machine language.

high level language (HLL). A programming language above the level of assembler language and below that of program generators and query languages.

HLL. High level language.

I

ILC. Interlanguage communication.

increment. The second and subsequent segments of storage allocated to the stack or heap.

indirect parameter passing. Placing an address in a parameter list. In other words, passing a pointer to a value instead of passing the value itself.

initial heap. The LE/VSE heap controlled by the HEAP run-time option and designated by a *heap_id* of 0. The initial heap contains dynamically allocated user data. See also *additional heap*.

initial heap segment. The first heap segment. A heap consists of the initial heap segment and zero or more additional segments or increments.

initial stack segment. The first stack segment. A stack consists of the initial stack segment and zero or more additional segments or increments.

instance specific information (ISI). Located within the LE/VSE condition token, the ISI contains information used by the condition manager to identify and react to a specific occurrence of a condition.

interlanguage communication (ILC). The ability of routines written in different programming languages to communicate. ILC support allows the application writer to readily build applications from component routines written in a variety of languages.

interrupt. A suspension of a process, such as the execution of a computer program, caused by an event external to that process, and performed in such a way that the process can be resumed.

ISI. Instance specific information.

K

KSDS. Key sequenced data sets. See *VSAM*.

L

Language Environment. A set of architectural constructs and interfaces that provides a common run-time environment and run-time services to applications compiled by Language Environment-conforming compilers.

Language Environment for VSE/ESA. An IBM software product that is the implementation of Language Environment on the VSE platform.

LE/VSE. Short form of Language Environment for VSE/ESA.

LE/VSE-conforming. Adhering to LE/VSE's common interface.

library. A collection of functions, subroutines, or other data.

LIFO. Last in, first out method of access. A queuing technique in which the next item to be retrieved is the item most recently placed in the queue.

local data. Data that is known only to the routine in which it is declared. Equivalent to local data in C and WORKING-STORAGE in COBOL.

locale. The definition of the subset of a user's environment that depends on language and cultural conventions.

M

main program. The first routine in an enclave to gain control from the invoker.

multitasking. See *multithreading*.

multithreading. Mode of operation that provides for the concurrent, or interleaved, execution of two or more tasks, or threads.

N

national language support. Translation requirements affecting parts of licensed programs; for example, translation of message text and conversion of symbols specific to countries.

non-LE/VSE conforming. Any HLL program that does not adhere to LE/VSE's common interface. For example, VS COBOL II, DOS/VS COBOL, and DOS/VS PL/I are all non-LE/VSE conforming HLLs. Synonym for *pre-LE/VSE conforming*.

O

object code. Output from a compiler or assembler which is itself executable machine code or is suitable for processing to produce executable machine code.

object deck. Synonym for *object module*.

object module. A portion of an object program suitable as input to a linkage editor. Synonym for *object deck.*

online. (1) Pertaining to a user's ability to interact with a computer. (2) Pertaining to a user's access to a computer via a terminal.

operating system. Software that controls the running of programs; in addition, an operating system may provide services such as resource allocation, scheduling, input/output control, and data management.

P

parameter. Data items that are received by a routine.

Pascal. A high level language for general purpose use. Programs written in Pascal are block structured, consisting of independent routines.

pass by reference. In programming languages, one of the basic argument passing semantics. The address of the object is passed. Any changes made by the callee to the argument value will be reflected in the calling routine at the time the change is made.

pass by value. In programming languages, one of the basic argument passing semantics. The value of the object is passed. Any changes made by the callee to the argument value will not be reflected in the calling routine.

percolate. The action taken by the condition manager when the returned value from a condition handler indicates that the handler could not handle the condition, and the condition will be transferred to the next handler.

phase. An application or routine in a form suitable for execution. The application or routine has been compiled and link-edited; that is, address constants have been resolved.

PL/I. A general purpose scientific/business high level language. It is a high-powered procedure-oriented language especially well suited for solving complex scientific problems or running lengthy and complicated business transactions and record-keeping applications.

pointer. A data element that indicates the location of another data element.

pre-LE/VSE conforming. Any HLL program that does not adhere to LE/VSE's common interface. For example, VS COBOL II, DOS/VS COBOL, and DOS/VS PL/I are all pre-LE/VSE conforming HLLs. Synonym for *non-LE/VSE conforming*.

procedure. A named block of code that can be invoked, usually via a call. In LE/VSE, the term *routine* is used as generic for a procedure or a function.

process. The highest level of the LE/VSE program management model. A process is a collection of resources, both program code and data, and consists of at least one enclave.

program. See *application program*.

program management. The functions within the system that provide for establishing the necessary activation and invocation for a program to run in the applicable run-time environment when it is called.

program unit. Synonym for *compilation unit*.

programmable workstation (PWS). A workstation that has some degree of processing capability and that allows a user to change its functions.

promote. To change a condition. A condition is promoted when a condition handling routine changes the condition to a different one. A condition handling routine promotes a condition because the error needs to be handled in a way other than that suggested by the original condition.

PWS. Programmable workstation.

R

register. To specify formally. In LE/VSE, to register a condition handler means to add a user-written condition handler onto a routine's stack frame.

resume. To begin execution in an application at the point immediately after which a condition occurred. A resume occurs when the condition manager determines that a condition has been handled and normal application execution should continue.

resume cursor. Designates the point in the application where a condition occurred when it is first reported to the condition manager. The resume cursor also designates the point where execution resumes after a condition is handled, usually at the instruction in the application immediately following the point at which the error occurred. The resume cursor can be moved with the CEEMRCR callable service.

return code. A code produced by a routine to indicate its success. It may be used to influence the execution of succeeding instructions.

routine. In LE/VSE, refers to a procedure, function, or subroutine.

RRDS. Relative record data sets. See *VSAM*.

run. To cause a program, utility, or other machine function to be performed.

run time. Any instant at which a program is being executed. Synonym for *execution time*.

run-time environment. A set of resources that are used to support the execution of a program. Synonym for *execution environment.*

run unit. One or more object programs that are executed together. In LE/VSE, a run unit is the equivalent of an *enclave*.

S

safe condition. Any condition having a severity of 0 or 1. Such conditions are ignored if no condition handler handles the condition.

SBCS. Single-byte character set.

scope. A term used to describe the effective range of the enablement of a condition and/or the establishment of a user-generated routine to handle a condition. Scope can be both statically and dynamically defined.

scope. The portion of an application within which the definition of a variable remains unchanged.

segment. See *stack segment*.

single-byte character set (SBCS). A collection of characters represented by a 1-byte code.

source code. The input to a compiler or assembler, written in a source language.

source program. A set of instructions written in a programming language that must be translated to machine language before the program can be run.

stack. An area of storage used for suballocation of stack frames. Such suballocations are allocated and freed on a LIFO (last in, first out) basis. A stack is a collection of one or more stack segments consisting of an initial stack segment and

zero or more increments.

stack frame. The physical representation of the activation of a routine. The stack frame is allocated on a LIFO stack and contains various pieces of information including a save area, condition handling routines, fields to assist the acquisition of a stack frame from the stack, and the local, automatic variables for the routine. In LE/VSE, a stack frame is synonymous with *DSA*.

stack increment. See *increment*.

stack segment. A contiguous area of storage obtained directly from the operating system. The LE/VSE storage management scheme subdivides stack segments into individual DSAs. If the initial stack segment becomes full, a second segment or increment is obtained from the operating system.

stack storage. See *stack* and *automatic storage*.

static call. A call that results in the resolution of the called program statically at link-edit time. Contrast with *dynamic call*.

static data. Data that retains its last-used state across calls.

static storage. Storage that persists and retains its value across calls. Contrast with *dynamic storage*.

subsystem. A secondary or subordinate system, or programming support, usually capable of operating independently of or asynchronously with a controlling system. Example: CICS.

syntax. The rules governing the structure of a programming language and the construction of a statement in a programming language.

T

thread. The basic run-time path within the LE/VSE program management model. It is dispatched by the system with its own instruction counter and registers. The thread is where actual code resides.

token. See *condition token*.

U

user-written condition handler. A routine established by the CEEHDLR callable service to handle a condition or conditions when they occur in the common run-time environment. A queue of user-written condition handlers established by CEEHDLR may be associated with each stack frame in which they are established.

V

vendor. A person or company that provides a service or product to another person or company.

VSAM. Virtual storage access method. A high-performance mass storage access method. Three types of data organization are available: entry sequenced data sets (ESDS), key sequenced data sets (KSDS), and relative record data sets (RRDS).

W

workstation. One or more programmable or nonprogrammable devices that allow a user to do work on a computer. See also *programmable workstation*.

Index

A

B

C

D

E

F

H

I

J

L

M

N

O

P

R

S

T

U

V

BACK_1 Communicating Your Comments to IBM

IBM Language Environment for VSE/ESA
Concepts Guide
Release 4

Publication No. GC33-6680-00

If you especially like or dislike anything about this book, please use one of the methods listed below to send your comments to IBM. Whichever method you choose, make sure you send your name, address, and telephone number if you would like a reply.

Feel free to comment on specific errors or omissions, accuracy, organization, subject matter, or completeness of the book. However, the comments you send should pertain to only the information in this manual and the way in which the information is presented. To request additional publications, or to ask questions or make comments about the functions of IBM products or systems, you should talk to your IBM representative or to your IBM authorized remarketer.

When you send comments to IBM, you grant IBM a nonexclusive right to use or distribute your comments in any way it believes appropriate without incurring any obligation to you.

If you are mailing a readers' comment form (RCF) from a country other than the United States, you can give the RCF to the local IBM branch office or IBM representative for postage-paid mailing.

- If you prefer to send comments by mail, use the RCF form and either send it postage-paid in the United States, or directly to:

  IBM Deutschland Entwicklung GmbH
  Department 3248
  Schoenaicher Strasse 220
  D-71032 Boeblingen
  Federal Republic of Germany

- If you prefer to send comments by FAX, use this number:

  - (Germany): 07031+16-3456
  - (Other countries): (+49)+7031-16-3456

- If you prefer to send comments electronically, use this network ID:

  IBM Mail Exchange: DEIBMBM9 at IBMMAIL

  INTERNET: VSEPUBS at VNET.ibm.com

Make sure to include the following in your note:

- Title and publication number of this book
- Page number or topic to which your comment applies.

COMMENTS Readers' Comments -- We'd Like to Hear from You

IBM Language Environment for VSE/ESA
Concepts Guide
Release 4

Publication No. GC33-6680-00

Overall, how satisfied are you with the information in this book?

Legend:

1 Very satisfied
2 Satisfied
3 Neutral
4 Dissatisfied
5 Very dissatisfied

Table 7. Optional Licensed Programs for LE/VSE					
	1	2	3	4	5
Overall satisfaction					

How satisfied are you that the information in this book is:

	1	2	3	4	5
Accurate					
Complete					
Easy to find					
Easy to understand					
Well organized					
Applicable to your tasks					

Please tell us how we can improve this book:

International Business Machines Corporation
Attn: Dept ECJ - BP/003D
6300 Diagonal Highway
Boulder, CO 80301-9151

Name . . . . . _____
Company or Organization _____
Address . . . . . _____
_____
_____
Phone No. . . . . _____

EDITION Edition Notice

First Edition (December 1996)

This edition applies to Version 1 Release 4 of IBM Language Environment for VSE/ESA, 5686-094, and to any subsequent releases until otherwise indicated in new editions or technical newsletters. Make sure you are using the correct edition for the level of the product.

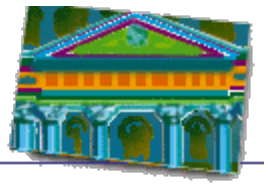
Order publications through your IBM representative or the IBM branch office serving your locality. Publications are not stocked at the address given below.

A form for reader's comments is provided at the back of this publication. If the form has been removed, address your comments to:

IBM Corporation Attn: Dept. ECJ - BP/003D 6300 Diagonal Highway Boulder, CO 80301, U.S.A.	or to:	IBM Deutschland Entwicklung GmbH Department 3248 Schoenaicher Strasse 220 D-71032 Boeblingen Federal Republic of Germany

When you send information to IBM, you grant IBM a non-exclusive right to use or distribute the information in any way it believes appropriate without incurring any obligation to you.

 *© Copyright IBM Corp. 1991, 1996*



IBM Library Server Library

Welcome to IBM's Library Server--your electronic library of books on the World Wide Web. Using Library Server, you can easily manage and display electronic books grouped into catalog collections, shelves and bookcases. Library Server's high-performance, morphological searching capabilities allow you to search books and entire shelves for the information you need.

Find books in the catalog with titles, names, or doc numbers containing:

Find

Browse Bookcases

Browse Shelves

Administration

Help

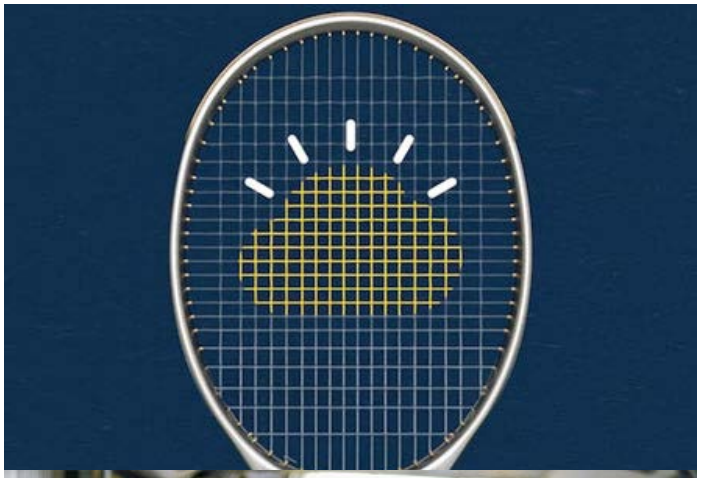
Getting Started | Product Information

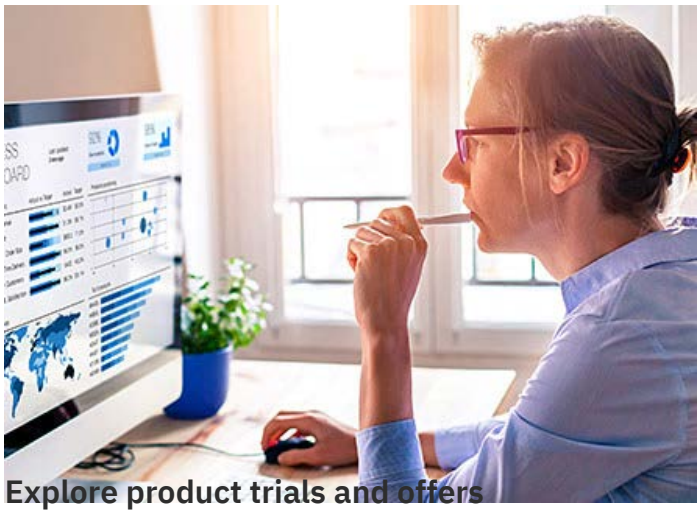
Clip the page

Let's put smart to work.

This public-private partnership prepares students

This week at IBM





Explore product trials and offers

Become a data scientist, no PhD required

See current deals →

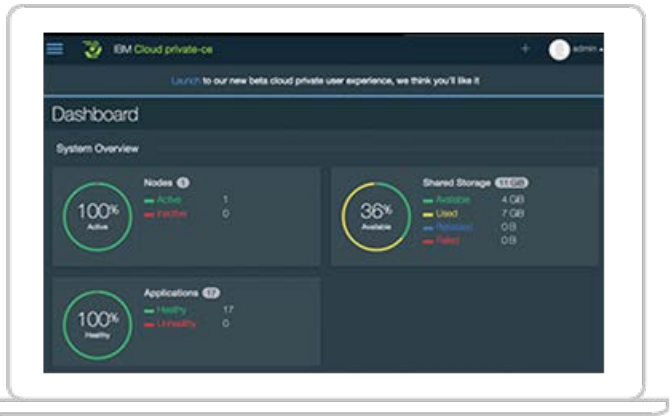
You bring basic computer skills and a passion for

Build a smarter supply chain with IBM Watson AI

See more products →

learning, we'll teach you the rest

Earn your IBM Data Science Professional Certificate →



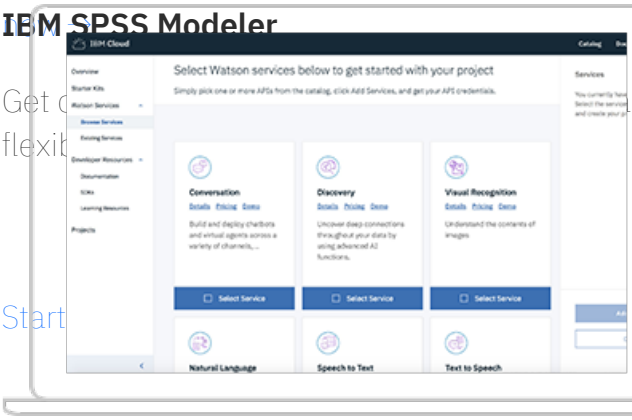
With and resol

Try the Supply Chain Business Network demo

IBM SPSS Modeler

Get flexib

Start



Inside IBM

Visit the IBM News Room →

Try a free edition now →

Get your first look at the Think 2019 conference

Find the upside to information overload

By 2020, Earth will be home to 2.5 billion

Let's put smart to work™

Technologies like AI, cloud and blockchain have to be more than smart

See how we're engaging new technologies to put smart to work →

For developers | For business

developerWorks →

Redbooks →

Support →

Marketplace →

Trending in tech

SPSS →

Careers →

Blockchain →

AI →

Open source →

Swift →

Cloud →

Serverless computing →

Commit to the cause

Your software can help save lives

Answer the Call for Code →

Case study: OpenSponsorship

What athlete should endorse your product? Ask AI.

Sponsors expect more than good game stats from the sports figures who promote their products. In this social media era, reach is also key: stats about followers, retweets and engagement also make up the metrics that help sponsors choose a

spokesperson.

OpenSponsorship wanted brands of all sizes to find the right influencers. They chose IBM Watson services to analyze relevant social data and help place athletes like 'fastest woman alive' Carmelita Jeter in some unexpected but successful deals.

Read the whole story →

Explore Watson products and services →