

## Enterprise COBOL Debugging and Maintenance

### Course Summary

#### Description

The student learns how to use the Language Environment (LE) and COBOL facilities for debugging as well as how to effectively do maintenance on a module that has been debugged. The Program Binder is also discussed extensively.

#### Objectives

After taking this course, students will be able to:

- Describe the general structure of the LE program management model
- Describe the outputs of the IBM Enterprise COBOL compiler, and use these outputs correctly in problem determination and dump debugging
- Approach debugging in an orderly, efficient fashion
- Locate data items from a COBOL program in an LE CEEDUMP
- Better understand subroutines and parameters in a COBOL environment
- Use the Program Binder to maintain load modules and program objects
- Understand LE debugging facilities such as condition handling and the CEE3DMP and CEE3ABD LE services
- Use the appropriate COBOL compiler debugging techniques to assist in tracking down and solving errors
- Use appropriate Binder options and control statements, including creating a program object with a segment below the line and a segment above the line.

#### Topics

- Overview of Language Environment
- COBOL compiler options, inputs, outputs, and cataloged procedures
- Sources of information
- Anatomy of a COBOL compile listing
- LE dump reading
- Subroutines and parameters
- Static and dynamic calls
- The Program Binder
- LE condition handling concepts
- The LE run-time environment
- Debugging features of the language
- LE debugging services (CEE3DMP, CEE3ABD, CEETEST)

#### Audience

This course is designed for COBOL programmers who need to know how to code calling and called programs (subroutines) and who need to know how to debug these programs in the LE environment; programmers who need to know how to use the Program Binder for maintenance will also find this course beneficial.

#### Prerequisites

Before taking this course, students should have a basic understanding of the COBOL language, and a working knowledge of how to code JCL statements. Students should also have a fundamental understanding of CALL statements and basic subroutine concepts.

#### Duration

Two days

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### Course Outline

- I. Language Environment - An Introduction**
  - A. What Is LE?
  - B. LE Conforming Programs
  - C. LE Services
  - D. Invoking LE Services
  - E. LE Program Management
- II. Introduction to Debugging and Dump Reading**
  - A. Computer Exercise : ONION Debugging Program
- III. Guidelines for Debugging**
  - A. The School of Footprints and Breadcrumbs
  - B. Program Termination
  - C. Sources of Information
    - 1. IBM Publications
    - 2. Quick Reference
  - D. Messages and Clues
    - 1. File Related Messages
    - 2. Common System Completion Codes
    - 3. Program Check error Codes
  - E. Common LE Completion Codes
  - F. Lab Time for ONION
- IV. Anatomy of a COBOL Compile Listing**
  - A. Machine Instructions
  - B. Executable Programs
  - C. Lab Time for ONION
- V. Dump Reading - Introduction**
  - A. LE Dump Reading
  - B. Locating Data Items in an LE Dump
  - C. Common Errors to Watch For
  - D. Locating Index Information in a Dump
  - E. Locating Data in a Program's Linkage Section
- VI. How the COBOL compiler works**
  - A. Data sets
  - B. CompilerParms
  - C. PROCESS Statement
- VII. Subroutines and parameters**
  - A. CALL Syntax
  - B. Enhancements to Parameter Passing
  - C. Returning Values
  - D. Multiple ENTRY points
- VIII. The Program Binder**
  - A. Object Modules and Load Modules
  - B. CSECTs
  - C. Binder Control Statements and PARMs
  - D. Binder Processing
  - E. The Program Binder and Maintenance
  - F. Application Programming to get PARM Data
  - G. Computer Exercise: Program Binder and Maintenance
- IX. More About the Program Binder**
  - A. Load Modules vs. Program Objects
  - B. BinderParms
  - C. Binder Inputs
- X. LE Condition Handling**
  - A. Condition Handling Concepts
  - B. Standard LE Processing for T\_I\_U and T\_I\_S
- XI. Dynamic CALL, CANCEL**
- XII. COBOL Source Debugging Techniques**
  - A. Subscriprange Checking
  - B. DISPLAY
  - C. DEBUGGING MODE (Compile Time Switch)
  - D. Declaratives
  - E. TEST and CEEDUMP
  - F. Runtime Options
  - G. Computer Exercise: Using TEST
- XIII. LE Debugging Services**
  - A. CEE3DMP, CEE3ABD, CEETEST
- XIV. LE: The Run-Time Environment**
  - A. Specifying run-time parameters
  - B. LE run-time parameters that apply to debugging or COBOL