IBM Problem Determination Tools:
New Versions Promise Productivity Increases

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Session: 12094

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Agenda

- Introduction to IBM Problem Determination (PD) Tools

- IBM PD Tools Integration
  - Eclipse plug-ins in CICS Explorer, IMS Explorer
  - Rational Developer for System z
  - IMS Explorer, IMS BTS plug-in
  - Single sign-on for PD Tools

- PD Tools – Host interface & GUI

- PD Tools GUI Demo

IBM PD Tools for z/OS

- **Reduces** the time programmers need to perform common development tasks such as debugging, test data creation/management, testing, and performance analysis
- **Shortens** application development cycles

- Provides **diagnostic tools** that provide detailed information about **production problems,** and tools for rapidly correcting **data problems**
- Results in **reduced** production down time**, shortened** problem resolution time**,** and fewer problem re-works

- Provides an extensive collection of **features** and **utilities** to **automate** file and data management, copying and reformatting, data scrambling, comparison, etc.
- **Reduces** loss of time and productivity spent writing in-house utilities
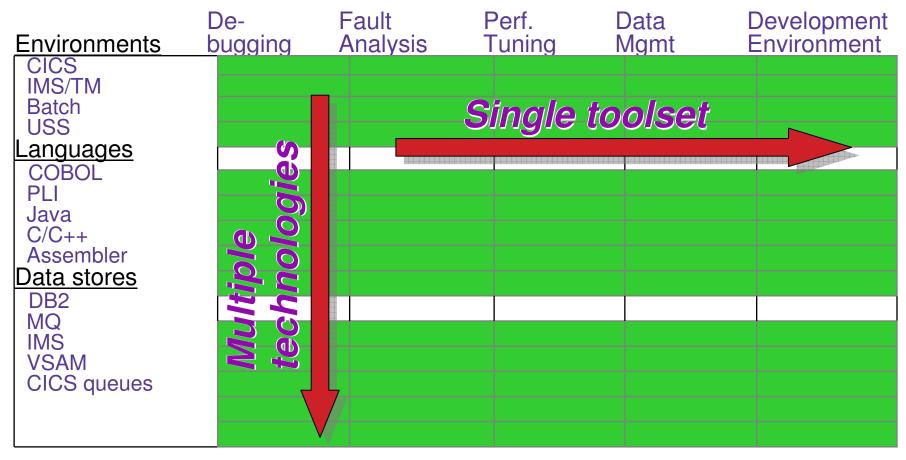
- **Simplifies** programming tasks during the entire development process
- Lets you spend more development time **creating value,** instead of struggling through mundane tasks without the right tools

- Increases productivity

The IBM zOS development toolset approach

- A single integrated toolset with support across a broad zOS technology spectrum

Environments	De-bugging	Fault Analysis	Perf. Tuning	Data Mgmt	Development Environment
CICS					
IMS/TM					
Batch					
USS					
Languages			**Single toolset**		
COBOL					
PLI					
Java					
C/C++					
Assembler					
Data stores					
DB2					
MQ					
IMS					
VSAM					
CICS queues					

Multiple technologies

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The IBM Problem Determination Tools Suite for z/OS

IBM Problem Determination Tools

IBM 2012 Offerings

Debug Tool for z/OS

Fault Analyzer for z/OS

Workload Simulator for z/OS & OS/390
Rational Functional Tester Ext
Rational Performance Tester z/OS

Hourglass

File Manager for z/OS

Application Performance Analyzer for z/OS

ISPF Productivity Tool

www.ibm.com/software/awdtools/deployment

Debug Tool for zOS

- Interactive program debugging
- Multiple languages and zOS environments
- Code coverage reporting
- COBOL modernization

Fault Analyzer for zOS

- Automatic program abend capture and reporting
- Program source-level reporting
- Multiple languages and zOS environments

The IBM Problem Determination Tools Suite for z/OS

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IBM Problem Determination Tools

IBM 2012 Offerings

Debug Tool for z/OS	**File Manager for z/OS**
Fault Analyzer for z/OS	**Application Performance Analyzer for z/OS**
Workload Simulator for z/OS & OS/390 Rational Functional Tester Ext Rational Performance Tester z/OS	**ISPF Productivity Tool**
Hourglass	

www.ibm.com/software/awdtools/deployment

File Manager for zOS

- Edit and view files and databases of any size
- VSAM, sequential, and PDS(e) files, DB2 and IMS databases
- Extensive file and data utilities

Application Performance Analyzer for zOS

- Monitor and report application performance
- Source level reporting
- Multiple languages and zOS environments

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The IBM Problem Determination Tools Suite for z/OS

IBM Problem Determination Tools

IBM 2012 Offerings

Debug Tool for z/OS

File Manager for z/OS

Fault Analyzer for z/OS

Application Performance Analyzer for z/OS

Workload Simulator for z/OS & OS/390
Rational Functional Tester Ext
Rational Performance Tester z/OS

ISPF Productivity Tool

Hourglass

www.ibm.com/software/awdtools/deployment

Workload Simulator for zOS and OS/390

- Drive regression, performance, stress, function, and capacity testing
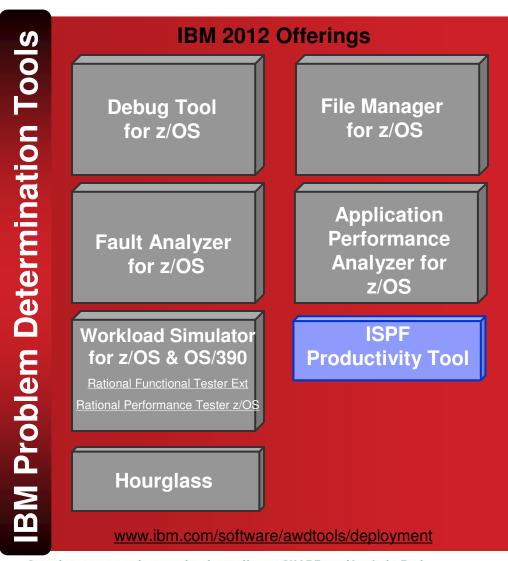- Simulate on-line users with smart scripts

Hourglass

- Alter the date and time returned to an application when a time request is made

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The IBM Problem Determination Tools Suite for z/OS

IBM Problem Determination Tools

IBM 2012 Offerings

Debug Tool
for z/OS

File Manager
for z/OS

Fault Analyzer
for z/OS

Application
Performance
Analyzer for
z/OS

Workload Simulator
for z/OS & OS/390
Rational Functional Tester Ext
Rational Performance Tester z/OS

ISPF
Productivity Tool

Hourglass

www.ibm.com/software/awdtools/deployment

ISPF Productivity Tool

- Turbo-charge the productivity of your ISPF users
- Turn IBM ISPF into a centralized, object-oriented development center

Support a variety of application developer skills

- Reusing mainframe application assets requires expertise in both traditional and new zOS technologies
- To maximize productivity:
  - Some developers may do best with traditional interfaces
  - Others may be more productive with GUI interfaces
- IBM Problem Determination Tools provide the **best of both worlds**:
  - Proven traditional 3270-based interfaces
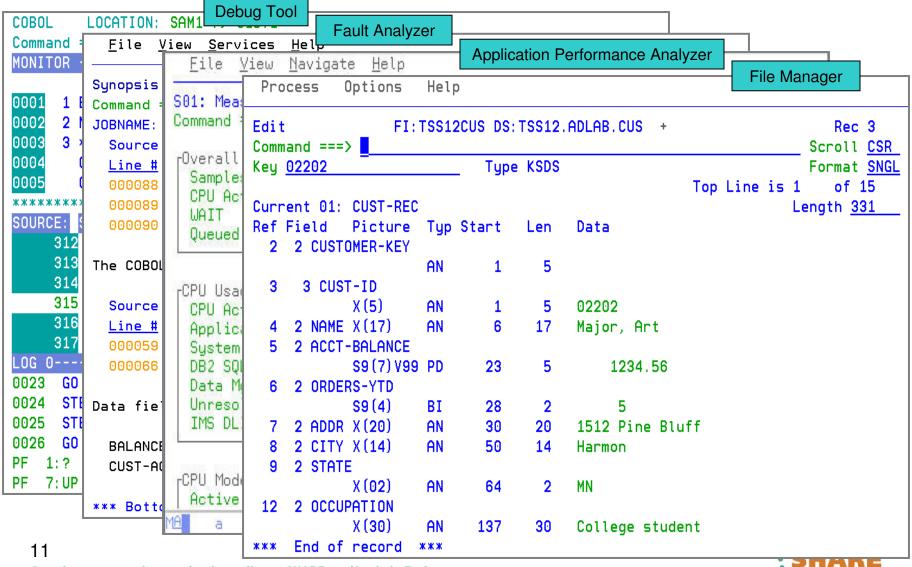 - Eclipse-based GUI interfaces for many products

Positioned to take advantage of the latest technologies

- The changing z development landscape requires modern, more productive and more affordable development tools
- The IBM approach to zSeries tools is an up-to-date toolset that provides:
  - a single set of tools across a broad spectrum of zSeries technologies to support the new generation of complex, composite applications
  - new GUIs and conventional 3270 interfaces
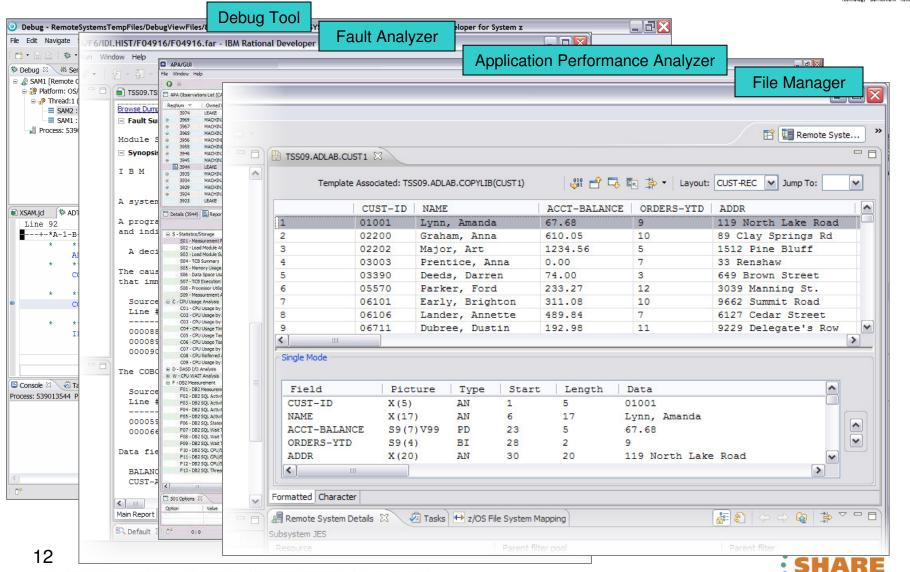 - immediate support for new versions of critical software such as DB2, CICS, MQ Series, and IMS

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Excellent, traditional 3270-based interfaces

Debug Tool

Fault Analyzer

Application Performance Analyzer

File Manager

```
COBOL     LOCATION: SAM1
Command
MONITOR
         File  View  Services  Help

0001    1      Synopsis           S01: Meas
0002    2 N    Command =          Command =
0003    3 *    JOBNAME:
0004    0      Source            Overall
0005    0      Line #            Samples
********       000088            CPU Ac
SOURCE:        000089            WAIT
    312        000090            Queued
    313
    314        The COBOL
    315                          CPU Usa
    316        Source            CPU Ac
    317        Line #            Applica
LOG 0---       000059            System
0023   GO      000066            DB2 SQ
0024   STE                       Data M
0025   STE     Data fiel         Unreso
0026   GO                        IMS DL
PF  1:?        BALANCE
PF  7:UP       CUST-A            CPU Mod
                                 Active
*** Bott                      MA    a
```

```
Process   Options   Help

Edit              FI:TSS12CUS DS:TSS12.ADLAB.CUS  +              Rec 3
Command ===> █                                               Scroll CSR
Key 02202                      Type KSDS                     Format SNGL
                                              Top Line is 1    of 15
Current 01: CUST-REC                               Length 331
Ref Field     Picture   Typ Start   Len   Data
  2  2 CUSTOMER-KEY
                          AN      1     5
  3    3 CUST-ID
              X(5)        AN      1     5   02202
  4  2 NAME X(17)         AN      6    17   Major, Art
  5  2 ACCT-BALANCE
              S9(7)V99 PD        23     5        1234.56
  6  2 ORDERS-YTD
              S9(4)       BI     28     2        5
  7  2 ADDR X(20)         AN     30    20   1512 Pine Bluff
  8  2 CITY X(14)         AN     50    14   Harmon
  9  2 STATE
              X(02)       AN     64     2   MN
 12  2 OCCUPATION
              X(30)       AN    137    30   College student
***  End of record ***
```

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Most of the tools provide GUI interfaces
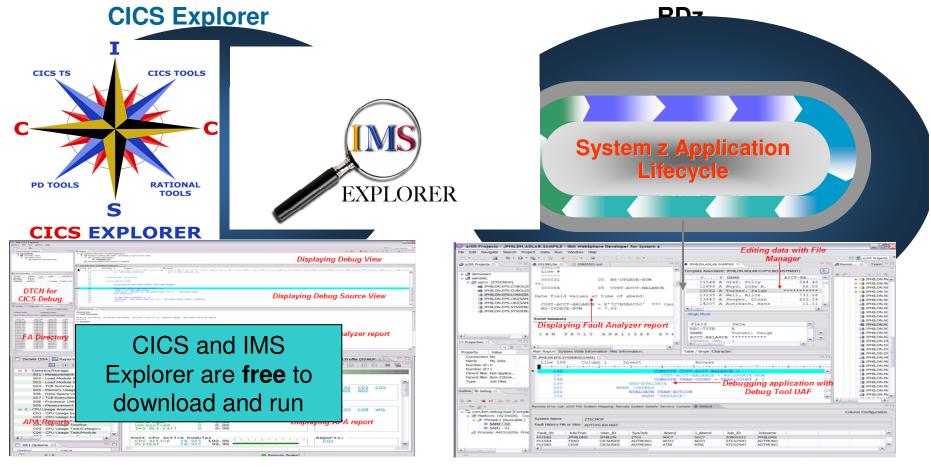
Eclipse plug-ins for the IBM Problem Determination Tools

- Graphical interfaces are provided as plug-ins for Eclipse platforms, such as Rational Developer for System z, CICS Explorer, and IMS Explorer

CICS Explorer

RDz

IMS EXPLORER

System z Application Lifecycle

CICS and IMS Explorer are **free** to download and run

Debug Tool, Fault Analyzer, Application Performance Analyzer, and File Manager plug-ins

Problem Determination Tools plug-ins in CICS Explorer

PD Tools single sign-on

Load connections from file or URL

Connections

Credentials

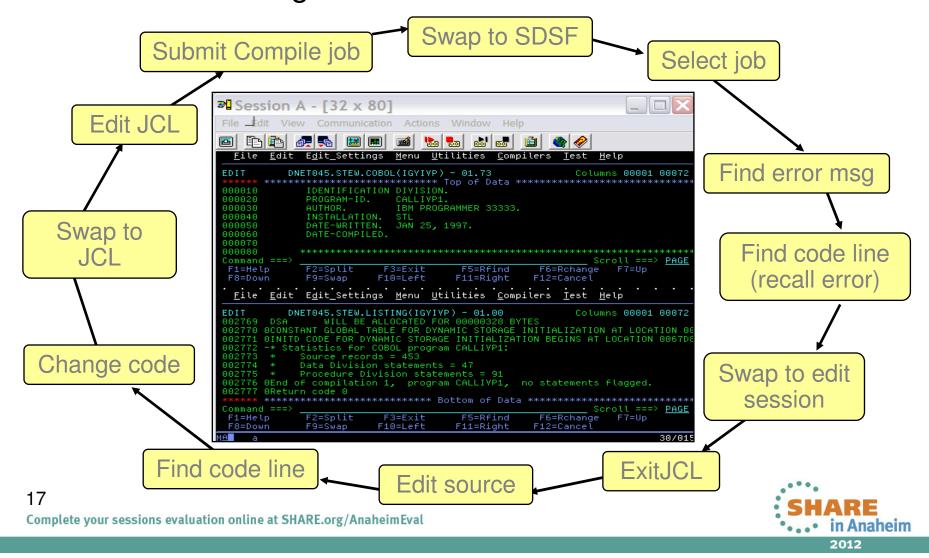# Rational Developer for System z (RDz)

- **An eclipse-based Integrated Development Environment (IDE) for System z applications**
  - Common IDE for COBOL, PL/I, C, C++, HLASM, Java, EGL and web services
- **Supports Enterprise Modernization and SOA**
  - Interactive access to z/OS for development, job generation, submission, monitoring, debugging
  - Enables CICS and IMS applications for web services and SOA
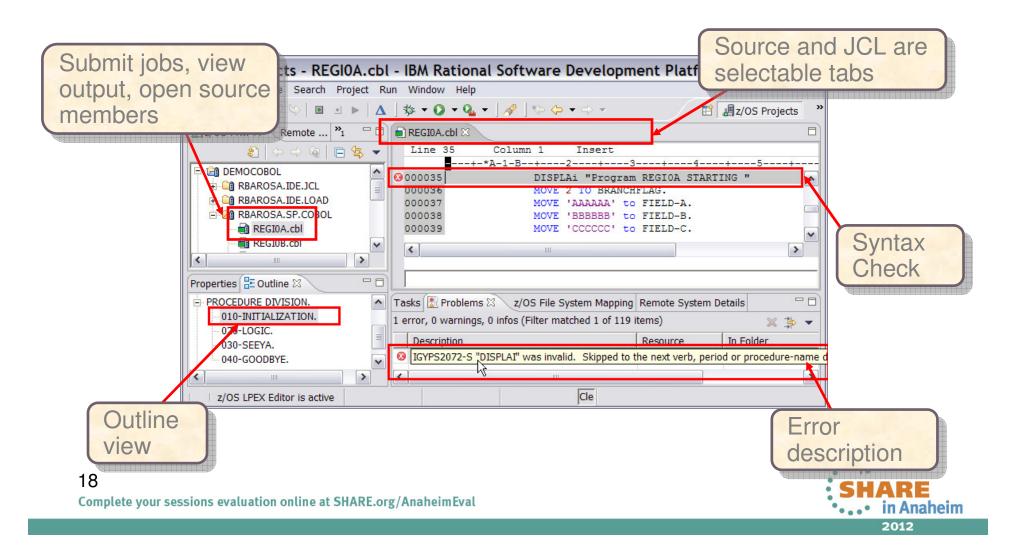 - Support for J2EE, JCA, XML, web services

ISPF-based development

- Multiple screens / sessions and varied tools
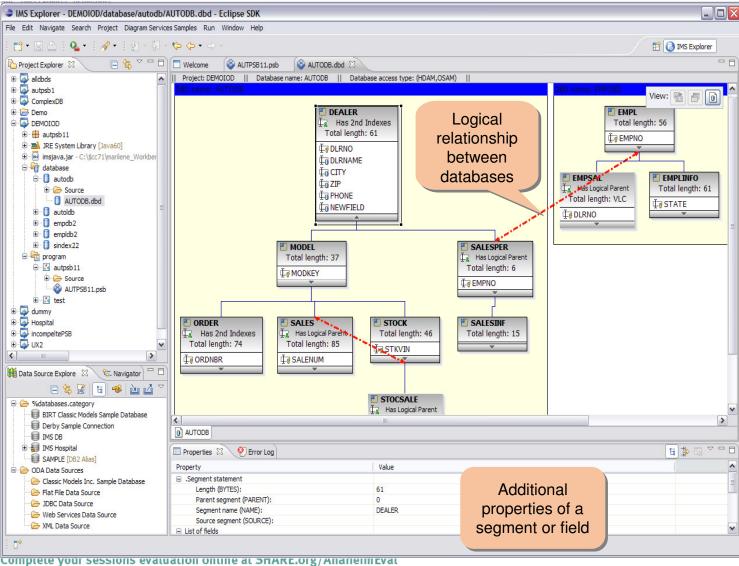- Limited screen height and width

Submit Compile job → Swap to SDSF → Select job

Edit JCL

Swap to JCL

Change code

Find code line → Edit source → ExitJCL → Swap to edit session

Find error msg → Find code line (recall error)

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RDz-based development

- Simplified development with more information at your fingertips

Submit jobs, view output, open source members

Source and JCL are selectable tabs

Syntax Check

Outline view

Error description

Complete your sessions evaluation online at SHARE.org/AnaheimEval

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IMS Explorer for Development
View physical IMS database structure
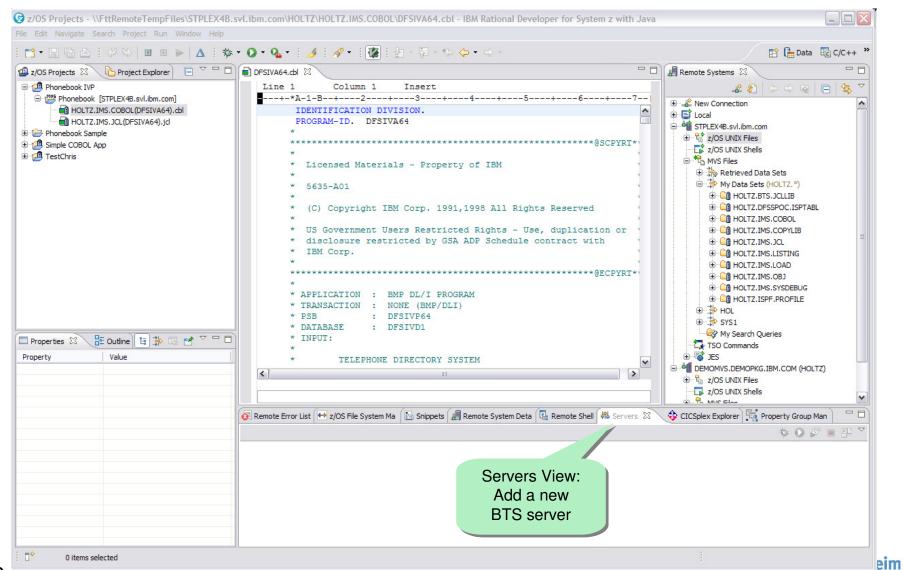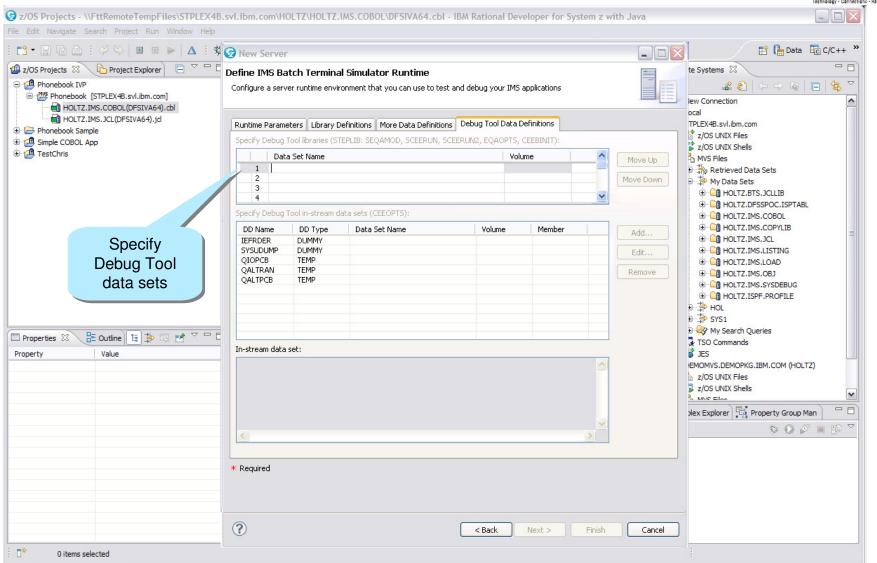
IMS Batch Terminal Simulator
Add BTS server

Servers View:
Add a new
BTS server

Debug Tool for z/OS
Debug runtime configuration
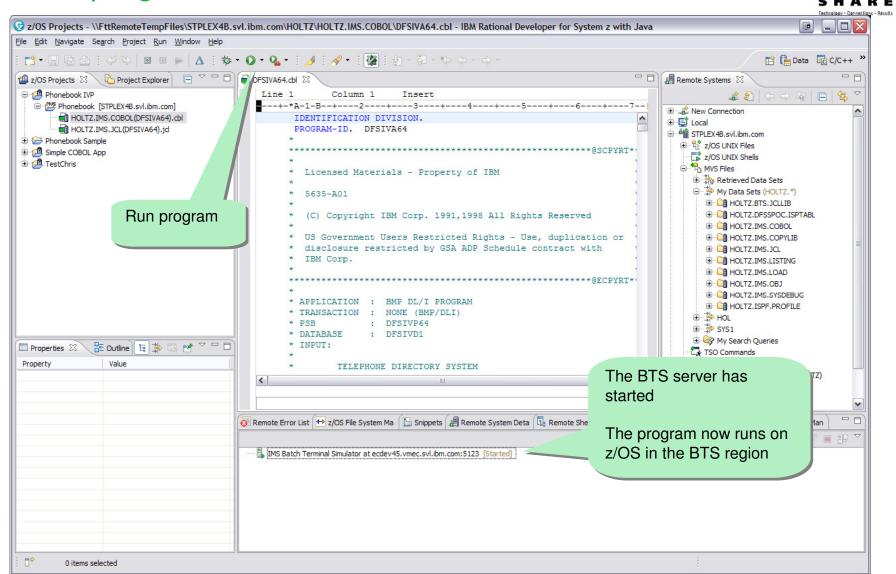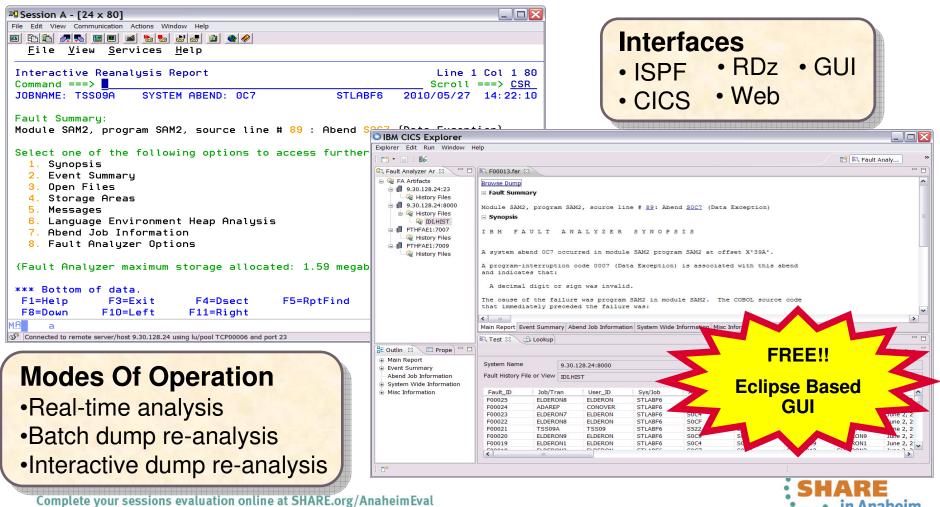
Complete your sessions evaluation online at SHARE.org/AnaheimEval

Run program

PD Tools – Host interface & GUI

- Fault Analyzer
- Debug Tool
- Application Performance Analyzer
- File Manager

Complete your sessions evaluation online at SHARE.org/AnaheimEval
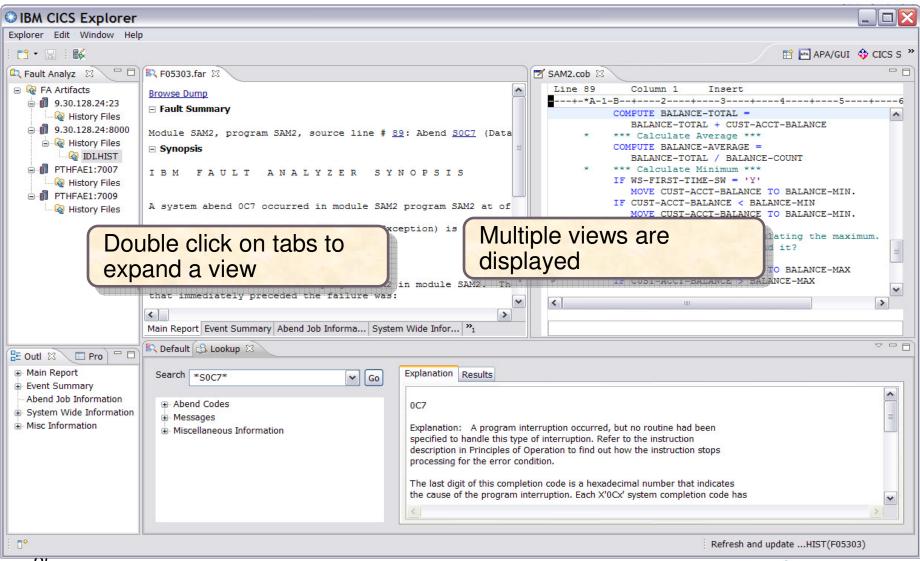
IBM Fault Analyzer
Multiple interfaces and modes of operation

Interfaces
- ISPF
- CICS
- RDz
- Web
- GUI

Modes Of Operation
- Real-time analysis
- Batch dump re-analysis
- Interactive dump re-analysis

FREE!!
Eclipse Based GUI

Fault Analyzer Interface inside CICS Explorer

Complete your sessions evaluation online at SHARE.org/AnaheimEval

Fault Analyzer Main Report

Fault Analyzer Synopsis

Source code that preceded the ABEND

Data Field Information

```
/F6/IDI.HIST/F04916/F04916.far - IBM Rational Developer for System z

Run  Window  Help

                                                              Fault Analyze...  »

  TSS09.TSS09A.JOB02382.D0000002.JESMSGLG.spool      F04916.far  ⊠

Browse Dump

⊟ Fault Summary

Module SAM2, program SAM2, source line # 89: Abend S0C7 (Data Exception)

⊟ Synopsis

I B M    F A U L T    A N A L Y Z E R    S Y N O P S I S


A system abend 0C7 occurred in module SAM2 program SAM2 at offset X'39A'.

A program-interruption code 0007 (Data Exception) is associated with this abend
and indicates that:

  A decimal digit or sign was invalid.

The cause of the failure was program SAM2 in module SAM2.  The COBOL source code
that immediately preceded the failure was:

  Source
  Line #
  ------
  000088      *    *** Add this customer's BALANCE to the grand total ***
  000089           COMPUTE BALANCE-TOTAL =
  000090              BALANCE-TOTAL + CUST-ACCT-BALANCE

The COBOL source code for data fields involved in the failure:

  Source
  Line #
  ------
  000059           05  CUST-ACCT-BALANCE      PIC S9(7)V99  COMP-3.
  000066           05  BALANCE-TOTAL          PIC S9(7)V99  COMP-3.

Data field values at time of abend:

  BALANCE-TOTAL     = 10948.44
  CUST-ACCT-BALANCE = X'7C7B5B6C50' *** Invalid numeric data ***

Main Report  Event Summary  Abend Job Information  System Wide Information  Misc Information

  Default ⊠    Lookup                                      Column Configuration

                                                        No CICS SM connection
```
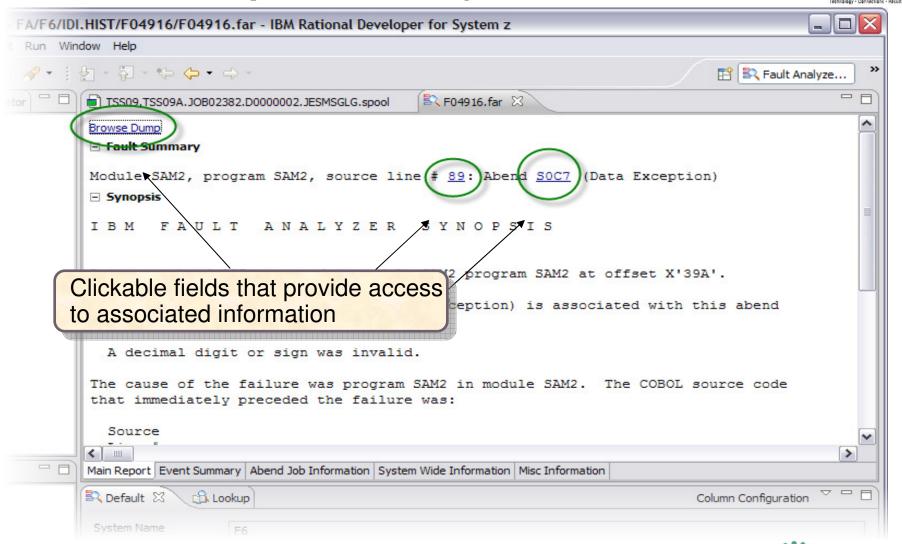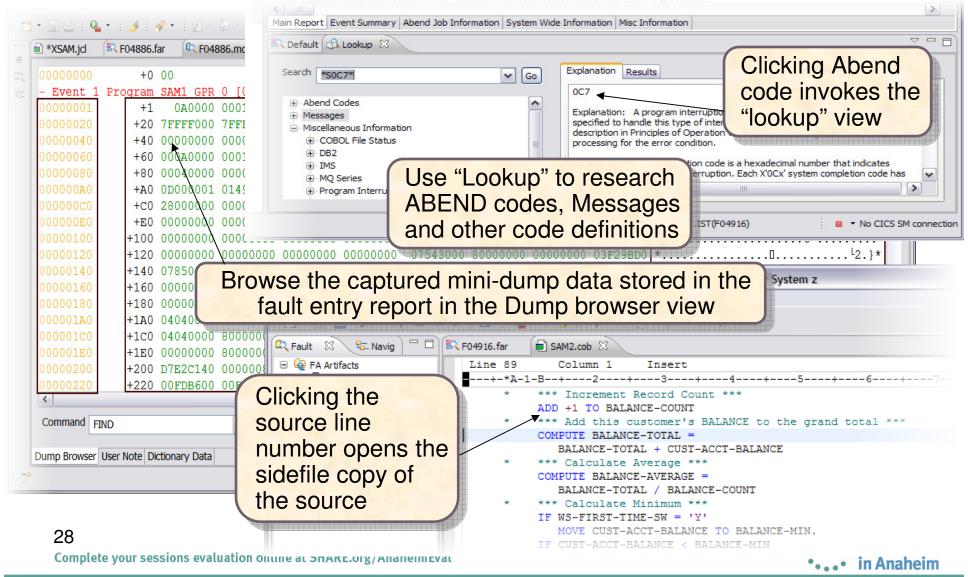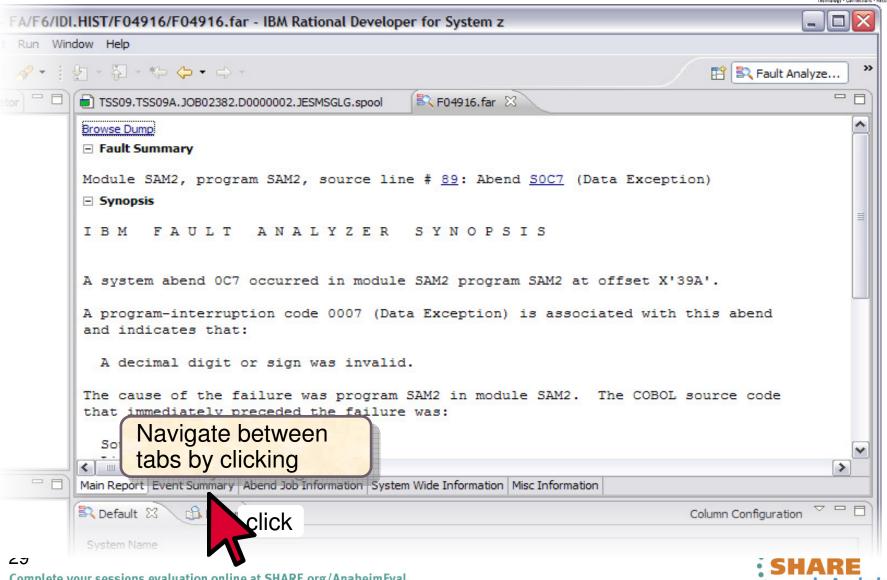
The Main Report "Hotkeys"

FA/F6/IDI.HIST/F04916/F04916.far - IBM Rational Developer for System z

Run   Window   Help

Fault Analyze...

TSS09.TSS09A.JOB02382.D0000002.JESMSGLG.spool   F04916.far

Browse Dump

Fault Summary

Module SAM2, program SAM2, source line # 89: Abend S0C7 (Data Exception)

Synopsis

I B M   F A U L T   A N A L Y Z E R   S Y N O P S I S

2 program SAM2 at offset X'39A'.

ception) is associated with this abend

> Clickable fields that provide access to associated information

A decimal digit or sign was invalid.

The cause of the failure was program SAM2 in module SAM2. The COBOL source code
that immediately preceded the failure was:

Source

Main Report | Event Summary | Abend Job Information | System Wide Information | Misc Information

Default   Lookup   Column Configuration

System Name   F6

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Results of clicking Hotkeys

Clicking Abend code invokes the "lookup" view

Use "Lookup" to research ABEND codes, Messages and other code definitions

Browse the captured mini-dump data stored in the fault entry report in the Dump browser view

Clicking the source line number opens the sidefile copy of the source

Complete your sessions evaluation online at SHARE.org/AnaheimEval

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Navigating the Report

Screenshot of IBM Rational Developer for System z showing the fault analyzer report. The title bar reads "FA/F6/IDI.HIST/F04916/F04916.far - IBM Rational Developer for System z". Menu items: Run, Window, Help. Tabs show "TSS09.TSS09A.JOB02382.D0000002.JESMSGLG.spool" and "F04916.far".

Report content:
- Browse Dump
- Fault Summary
  - Module SAM2, program SAM2, source line # 89: Abend SOC7 (Data Exception)
- Synopsis
  - IBM FAULT ANALYZER SYNOPSIS
  - A system abend 0C7 occurred in module SAM2 program SAM2 at offset X'39A'.
  - A program-interruption code 0007 (Data Exception) is associated with this abend and indicates that:
    - A decimal digit or sign was invalid.
  - The cause of the failure was program SAM2 in module SAM2. The COBOL source code that immediately preceded the failure was:

Callout: "Navigate between tabs by clicking"

Bottom tabs: Main Report | Event Summary | Abend Job Information | System Wide Information | Misc Information

"click" with cursor pointing to Event Summary tab.

Lower panel: Default tab, Column Configuration, System Name.

Event Summary View

Chronological order of events

Expandable event details

Highlighted "POINT OF FAILURE" event details

System Wide Information View

Open Files

LE Heap Analysis

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Misc Information View

Options in effect

Exits

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The Fault Analyzer TSO Interface

Using Interactive reanalysis to analyze an abend

```
 File  Options  View  Services  Help

 IBM Fault Analyzer - Fault Entry List                    Col 1 80
 Command ===>                                              ===> PAGE

 Fault History File or View  : 'FAULTANL.V10R1.HIST'

 {The following line commands are available: ? (Query), V or S (View saved
 report), I (Interactive reanalysis), B (Batch reanalysis), D (Delete), H
 (Duplicate history), C (Copy fault entry), M (Move fault entry), X (XMIT fault
 entry).}

     Fault_ID Job/Tran Job_ID    Program  Offset  Dups  User_ID  Sys/Job  Abend
 i   F00905   DNET845X JOB15885  SAM2        39A         DNET845  DEMOMVS  S0C7
 __  F00882   DNET845X JOB15573  SAM2        39A      4  DNET845  DEMOMVS  S0C7
 __  F00881   DNET845X JOB15572  SAM2        39A         DNET845  DEMOMVS  S0C7
 __  F00880   DNET845X JOB15571  SAM2        39A         DNET845  DEMOMVS  S0C7
 __  F00878   DNET845X JOB15535  SAM2        39A         DNET845  DEMOMVS  S0C7
 __  F00872   DNET845Y JOB15410  PSAM2       3DA         DNET845  DEMOMVS  S0C7
 __  F00871   DNET845P JOB15408  PSAMM2      27A         DNET845  DEMOMVS  S0C7
 __  F00869   DNET845X JOB15387  SAM2        39A         DNET845  DEMOMVS  S0C7

 **  Bottom of data.
```

The I line command starts an interactive reanalysis session

Enter

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Analyze an abend

```
 File  View  Services  Help
_____

Interactive Reanalysis Report                              Li
Command ===>  _____        Scr
JOBNAME: DNET845X  SYSTEM ABEND:                            0/02

Fault Summary:
Module SAM2, program SAM2, source line # 89 : Abend S0C7 (Data Ex

Select one of the following options to access further fault infor
  1. Synopsis
  2. Event Summary
  3. Open Files
  4. Storage Areas
  5. Messages
  6. Language Environment Heap Analysis
  7. Abend Job Information
  8. Fault Analyzer Options

{Fault Analyzer maximum storage allocated: 1.68 megabytes.}

*** Bottom of data.
```

"Point and shoot" fields are highlighted.

Use **tab** and **Enter** to navigate.

select Synopsis

Enter

Debug Clues:

✓Abended in program SAM2 because of a data exception

What is information is in the Synopsis?

```
 File   Options   View   Services   Help

IBM Fault Analyzer - Fault Entry List                    Line 1 Col 1 80
Command ===> _____            ===> PAGE

Fault History File or View  : 'FAULTANL.

{The following line commands are available: ? (Query), V or S (View saved
report), I (Interactive reanalysis), B (Batch reanalysis), D (Delete), H
(Duplicate history), C (Copy fault entry), M (Move fault entry), X (XMIT fault
entry).}

    Fault_ID Job/Tran Job_ID   Program Offset   Dups  User_ID  Sys/Job  Abend
 i  F00905   DNET845X JOB15885 SAM2     39A           DNET845  DEMOMVS  S0C7
 __ F00882   DNET845X JOB15573 SAM2     39A        4  DNET845  DEMOMVS  S0C7
 __ F00881   DNET845X JOB15572 SAM2     39A           DNET845  DEMOMVS  S0C7
 __ F00880   DNET845X JOB15571 SAM2     39A           DNET845  DEMOMVS  S0C7
 __ F00878   DNET845X JOB15535 SAM2     39A           DNET845  DEMOMVS  S0C7
 __ F00872   DNET845Y JOB15410 PSAM2    3DA           DNET845  DEMOMVS  S0C7
 __ F00871   DNET845P JOB15408 PSAMM2   27A           DNET845  DEMOMVS  S0C7
 __ F00869   DNET845X JOB15387 SAM2     39A           DNET845  DEMOMVS  S0C7

** Bottom of data.
```

The **I** line command starts an interactive reanalysis session

Enter

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```
 File  View  Services  Help

Interactive Reanalysis Report                              Col 1 8
Command ===> _____                  ===> HAL
JOBNAME: DNET845X  SYSTEM ABEND: OC7                         15:45:0

Fault Summary:
Module SAM2, program SAM2, source line # 89 : Abend S0C7 (Data Exception).

Select one of the following options to access further fault information:
 1. Synopsis
 2. Event Summary
 3. Open Files
 4. Storage Areas
 5. Messages
 6. Language Environment Heap Analysis
 7. Abend Job Information
 8. Fault Analyzer Options

{Fault Analyzer maximum storage allocated: 1.68 megabytes.}

*** Bottom of data.
```

"Point and shoot" fields are highlighted.

Use **tab** and **Enter** to navigate.

select Synopsis

Enter

Debug Clues:

✓ Abended in program SAM2 because of a data exception

What is information is in the Synopsis?

37

File View Services Help

Synopsis   Line 1 Col 1 8
Command ===> _____   Scroll ===> PAG
JOBNAME: DNET845X SYSTEM ABEND: 0C7   DEMOMVS 2010/02/23 15:45:0

A system abend 0C7 occurred in module SAM2 program SAM2 at offset X'39A'.

A program-interruption code 0007 (Data Exception) is associated with this
abend and indicates that:

    A decimal digit or sign was invalid.

The cause of the failure was program SAM2 in module SAM2. The COBOL source
code that immediately preceded the failure was:

Source
Line #
000088   *   *** Add this customer's BALANCE to the grand total ***
000089   COMPUTE BALANCE-TOTAL =
000090   BALANCE-TOTAL + CUST-ACCT-BALANCE

The COBOL source code for data fields involved in the failure:

Here is a clue. What can cause a data exception?

F8

Debug Clues:

✓ Abended in program SAM2 while running a COMPUTE statement because of a data exception

Page forward to see active variables

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File   View   Services   Help

Synopsis   2 Col 1 8
Command ===>   Scroll ===> PAG
JOBNAME: DNET845X   SYSTEM ABEND: 0C7   DEMOMVS   2010/02/23   15:45:0
    Source
    Line #
    000088   *   *** Add this customer's BALANCE to the grand total ***
    000089   COMPUTE BALANCE-TOTAL =
    000090   BALANCE-TOTAL + CUST-ACCT-BALANCE

The COBOL source code for data fields involved in the failure:

    Source
    Line #
    000059   05 CUST-ACCT-BALANCE   PIC S9(7)V99 COMP-3.
    000066   05 BALANCE-TOTAL   PIC S9(7)V99 COMP-3.

Data field values at time of abend:

    BALANCE-TOTAL   = 10948.44
    CUST-ACCT-BALANCE = X'7C7B5B6C50' *** Invalid numeric data ***

*** Bottom of data.

What variable contained the bad data?

Debug Clues:

✓ Abended in program SAM2 while running a COMPUTE statement because of a data exception

Go look at the bad variable

Return to menu

F3

File   View   Services   Help

Interactive Reanalysis Report   Line 1 Col 1 8
Command ===> 2   Scroll ===> PAG
JOBNAME: DNET645X   SYSTEM ABEND: 0C7   DEMOMVS   2010/02/23   15:45:0

Fault Summary:
Module SAM2, program SAM2, source line # 89 : Abend S0C7 (Data Exception).

Select one of the following options to access further fault information:
    1. Synopsis
    2. Event Summary
    3. Open Files
    4. Storage Areas
    5. Messages
    6. Language Environment Heap Analysis
    7. Abend Job Information
    8. Fault Analyzer Options

{Fault Analyzer maximum storage allocated: 1.68 megabytes.}

*** Bottom of data.

Select 2 (event summary) or cursor-select the option

Enter

Debug Clues:

✓ Abended in program SAM2 because:

✓ CUST-ACCT-BALANCE had bad numeric data

Go look at the bad variable, CUST-ACCT-BALANCE

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```
 File  View  Services  Help
 ───────────────────────────────────────────────────────────────
 Event Summary                              Line 1 Col 1 8
 Command ===> _____  Scroll ===> PAG
 JOBNAME: DNET845X  SYSTEM ABEND: 0C7          DEMOMVS   2010/02/23   15:45:0

 {The following events are presented in chronological order.}

 Event         Fail   Module  Program  EP
 #  Type       Point  Name    Name     Name     Event Location (*)           Loade
 1 Call               SAM1    SAM1     SAM1     L#312 P+D30 E+D30            DNET8
 2 Call               IGZCPAC n/a      IGZCFCC  E+2BE                       CEE.S
 3 Abend S0C7 *****   SAM2    SAM2     SAM2     L#89 P+39A E+39A            DNET8

 (*) One or more of the following abbrevia            "Event
     Location" column:

     F#n   Source file number (refer to det                file
           identification)
     L#n   Source file line number
     S#n   Listing file statement number (refer to detailed event in
           for file identification)
     M+x   Offset from start of load module
```

What is the relationship between programs SAM1 and SAM2?

Enter

Debug Clues:

✓ Abended in program SAM2 because:

✓ CUST-ACCT-BALANCE had bad numeric data

Go look at the bad variable, CUST-ACCT-BALANCE

Select detail for program SAM2

41

```
 File  View  Services  Help

Event 3 of 3: Abend S0C7 *** Point of Failure ***              Line 1 Col 1 8
Command ===> bottom                                   Scroll ===> HAL
JOBNAME: DNET845X  SYSTEM ABEND: 0C7          DEMOMVS  2010/02/23  15:45:0


Previous Event Details



Abend Code. . . . . . . . . : S0C7
Program-Interruption Code . : 0007 (Data Exception)
  A decimal digit or sign was invalid.


The source code below was executed via the following sequence of PERFORM
statements:
  Source
  Line #
  000079              PERFORM 100-CALC-BALANCE-STATISTICS.


COBOL Source Code:
  Source
  Line #
  000088        *     *** Add this customer's BALANCE to the grand t
  000089              COMPUTE BALANCE-TOTAL =
```

Enter

Debug Clues:

✓ Abended in program SAM2 because:

✓ CUST-ACCT-BALANCE had bad numeric data

Go look at the bad variable, CUST-ACCT-BALANCE

Go to the bottom of the program detail display

File   View   Services   Help

Event 3 of 3: Abend SOC7 *** Point of Failure ***   Line 83 Col 1 8
Command ===> _____   Scroll ===> PA
JOBNAME: DNET845X   SYSTEM ABEND: 0C7   DEMOMVS   2010/02/23   15:45:0
   R6: 205910C0 (606016 bytes of storage addressable)
   R7: 2050DA20 (1144288 bytes of storage addressable)
   R8: 0003F7C8 (Module SAM2 program SAM2 WORKING-STORAGE SECTION BLW=0000 +
                   X'0', symbol WS-FIELDS, source line # 36)
   R9: 0003F5D0 (Module SAM2 program SAM2 + X'5D0', source line # 116)
   R10: 0003F11C (Module SAM2 program SAM2 + X'11C')
   R11: 0003F29C (Module SAM2 program SAM2 + X'29C')
   R12: 0003F0FC (Module SAM2 program SAM2 + X'FC')
   R13: 20594458 (592808 bytes of storage addressable)
   R14: 8003F392 (Module SAM2 program SAM2 + X'392', source line # 89)
   R15: 8003F224 (Module SAM2 program SAM2 + X'224')

Associated Messages

CEE3207S The system detected a data exception (System Completion Code=0C7).

Associated Storage Areas

*** Bottom of data.

What is shown here?

Enter

Debug Clues:

✓Abended in program SAM2 because:

✓CUST-ACCT-BALANCE had bad numeric data

Go look at the bad variable, CUST-ACCT-BALANCE

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Analyze an abend (9 of 20)

```
 File  View  Services  Help
─────────────────────────────────────────────────────────────────────
Associated Storage Areas                              Line 1 Col 1 8
Command ===> f cust-acct-balance                      Scroll ===> PAG
JOBNAME: DNET845X  SYSTEM ABEND: 0C7        DEMOMVS  2010/02/23  15:45:0


Task Global Table (TGT) at address 0003F5D0 for length 376


WORKING-STORAGE SECTION
    - Collapse hex
 Off Hex Value                               Data Value        Source (Starting
BLW=0000 at address 0003F7C8

                                                           01  WS-FIELDS.
   0 C3C1D3C3 E4D3C1E3 C9D5C740 C2C1D3C1  *CALCULATING BALA*     05  WS-PROGR
  10 D5C3C540 E2E3C1E3 E2404040 4040     *NCE STATS       *
  1E D5                                  *N               *     05  WS-FIRST
  1F 0000000C                           0                       05  WS-WORK-
  23 0000000C                           0                       05  WS-WORK-
  27 0000000C                           0                       05  WS-WORK-
  2B 0000000C                           0                       05  WS-WORK-
  2F 0000000C                           0                       05  WS-WORK-

LINKAGE SECTION
```

Enter

Debug Clues:

✓Abended in program SAM2 because:

✓CUST-ACCT-BALANCE had bad numeric data

Go look at the bad variable, CUST-ACCT-BALANCE

44

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File View Services Help

Associated Storage Areas   Line 18 Col 40 11
Command ===> _____   Scroll ===> HAL
JOBNAME: DNET845X   SYSTEM ABEND: 0C7   DEMOMVS   2010/02/23   15:45:0

> Here is CUST-ACCT-BALANCE, it is a packed decimal field (COMP-3).

ss
_ Data Value   Source (Starting at Line # 000053)

                    01   CUST-REC.
                         05   CUST-KEY.
   *54321   *   10   CUST-ID   PIC X(5).
   *C   *   10   CUST-RECORD-TYPE   PIC X.
   *   *   10   FILLER   PIC X(7).
 0 *Aster, Dez *   05   CUST-NAME   PIC X(17).
   *   *
   *@#$%&   *   05   CUST-ACCT-BALANCE   PIC S9(7)V99   COMP-3.
   2   05   CUST-ORDERS-YTD   PIC S9(4)   COMP.
   *Stormy Falls *   05   CUST-CITY   PIC X(15).
 1 *Data Entry Opera*   05   CUST-OCCUPATION   PIC X(28).
   *tor   *

F11

Debug Clues:

✓ Abended in program SAM2 because:

✓ CUST-ACCT-BALANCE had bad numeric data (it is part of CUST-REC)

Here is the bad variable, CUST-ACCT-BALANCE

Scroll right

45

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File   View   Services   Help

Associated Storage Areas   Col 55 13
Command ===> _____   ===> PAC
JOBNAME: DNET845X   SYSTEM ABEND: 0C7   DEMOMVS   2010/02/23   15:45:0

        Source (Starting at Line # 000053)

        01   CUST-REC.
             05   CUST-KEY.
    *   10   CUST-ID   PIC X(5).
    *   10   CUST-RECORD-TYPE PIC X.
    *   10   FILLER   PIC X(7).
    *   05   CUST-NAME   PIC X(17).
    *
    *   05   CUST-ACCT-BALANCE   PIC S9(7)V99 COMP-3.
             05   CUST-ORDERS-YTD   PIC S9(4)   COMP.
    *   05   CUST-CITY   PIC X(15).
pera*   05   CUST-OCCUPATION   PIC X(28).
    *

        Source (Starting at Line # 000064)

It is part of CUST-REC

Debug Clues:

✓Abended in program SAM2 because:

✓CUST-ACCT-BALANCE had bad numeric data (it is part of CUST-REC)

Here is the the bad variable, CUST-ACCT-BALANCE

Scroll left

F10

46

Analyze an abend (12 of 20)

File   View   Services   Help

It is in Linkage Section.
What does that indicate?

Associated Storage Areas   Line 18 Col 1 80
Command ===>   Scroll ===> HALF
JOBNAME: DNET845X   SYSTEM ABEND: 0C7   DEMOMVS   2010/02/23   15:45:02

LINKAGE SECTION
BLL=0000 has not been assigned an address
 Off Hex Value   Data Value   Source (Starting a
BLL=0001 at address 00023F88

                                                                01   CUST-REC.
                                                                05   CUST-KEY.
   0 F5F4F3F2 F1   *54321   *   10   CUST-
   5 C3   *C   *   10   CUST-
   6 40404040 404040   *   *   10   FILLE
   D C1A2A385 996B40C4 85A94040 40404040 *Aster, Dez *   05   CUST-NAME
  1D 40   *   *
  1E 7C7B5B6C 50   *@#$%&   *   05   CUST-ACCT
  23 0002   2   05   CUST-ORDE
  25 E2A39699 94A840C6 819393A2 404040 *Stormy Falls *   05   CUST-CITY
  34 C481A381 40C595A3 99A840D6 97859981 *Data Entry Opera* 05   CUST-OCCU
  44 A3969940 40404040 40404040   *tor   *

F3

47

Debug Clues:

✓Abended in
program SAM2
because:

✓CUST-ACCT-
BALANCE had
bad numeric data
(it is part of
CUST-REC)

Here is the
the bad
variable,
CUST-ACCT-
BALANCE

Return to
program detail

Analyze an abend (13 of 20)

```
 File  View  Services  Help
 _____

 Event 3 of 3: Abend S0C7 *** Point of Failure ***          Line 83 Col 1 8
 Command ===> _____     Scroll ===> HAL
 JOBNAME: DNET845X  SYSTEM ABEND: 0C7               DEMOMVS  2010/02/23  15:45:0
    R6:  205910C0  (606016 bytes of storage addressable)
    R7:  2050DA20  (1144288 bytes of storage addressable)
    R8:  0003F7C8  (Module SAM2 program SAM2 WORKING-STORAGE SECTION BLW=0000 +
                    X'0', symbol WS-FIELDS, source line # 36 )
    R9:  0003F5D0  (Module SAM2 program SAM2 + X'5D0', source line # 116 )
    R10:  0003F11C  (Module SAM2 program SAM2 + X'11C')
    R11:  0003F29C  (Module SAM2 program SAM2 + X'29C')
    R12:  0003F0FC  (Module SAM2 program SAM2 + X'FC')
    R13:  20594458  (592808 bytes of storage addressable)
    R14:  8003F392  (Module SAM2 program SAM2 + X'392', source line # 89 )
    R15:  8003F224  (Module SAM2 program SAM2 + X'224')

 Associated Messages

 CEE3207S The system detected a data exception (System Completion Code=0C7).

 Associated Storage Areas

 *** Bottom of data.
```

Debug Clues:

✓Abended in program SAM2 because:

✓CUST-ACCT-BALANCE has bad numeric data (it is part of CUST-REC), which was passed from a calling program

Go look at the passed data

Return to the events list

F3

```
 File  View  Services  Help

Event Summary                                          Line 1 Col 1 8
Command ===> _____  Scroll ===> HAL
JOBNAME: DNET845X  SYSTEM ABEND: 0C7           DEMOMVS    2010/02/23   15:45:0

{The following events are presented in chronological order.}

Event              Fail  Module   Program  EP
#  Type            Point Name     Name     Name     Event Location (*)     Loade
1  Call                  SAM1     SAM1     SAM1     L#312 P+D30 E+D30      DNET8
2  Call                  IGZCPAC  n/a      IGZCFCC  E+2BE                  CEE.S
3  Abend  SOC7   *****  SAM2     SAM2     SAM2     L#89 P+39A E+39A       DNET8

(*) One                                                         "Event
    Loc

    F#n  Source file number (refer to detailed event information for file
         identification)
    L#n  Source file line number
    S#n  Listing file statement number (refer to detailed event info
         for file identification)
    M+x  Offset from start of load module
```

> The bad data was passed from a calling program. SAM1 called SAM2. Next look at details for SAM1.

Enter

Debug Clues:

✓ Abended in program SAM2 because:

✓ CUST-ACCT-BALANCE has bad numeric data (it is part of CUST-REC), which was passed from a calling program

Go look at the passed data

.

File   View   Services   Help

Event 1 of 3: Call (DSA Address 2059...   e 1 Col 1 8
Command ===> bottom   ll ===> HAL
JOBNAME: DNET845X   SYSTEM ABEND: 0C7

What passed variable contained the bad data?

The source code below was executed via the following sequence of PERFORM
statements:

Source
Line #
000261   PERFORM 100-PROCESS-TRANSACTIONS
000278   PERFORM 200-PROCESS-PRINT-TRAN
000299   PERFORM 210-PROCESS-CUSTFILE-RECORD

COBOL Source Code:
Source
Line #

This is the CALL statement

000311   *   SUBROUTINE SAM2 WILL COLLECT CUSTOMER STATISTICS
000312   CALL 'SAM2' USING CUST-REC,
000313   CUSTOMER-BALANCE-STATS

Data Field Declarations:
Source
50

Enter

Debug Clues:

✓Abended in program SAM2 because:

✓CUST-ACCT-BALANCE has bad numeric data (it is part of CUST-REC), which was passed from a calling program

✓SAM1 called SAM2

Go look at the passed data

```
 File  View  Services  Help
 _____

 Event 1 of 3: Call (DSA Address 20594030)              Line 68 Col 1
 Command ===> _____        Scroll ===> P
 JOBNAME: DNET845X  SYSTEM ABEND: 0C7          DEMOMVS   2010/02/23  15:45
    R10: 00007124 (Module SAM1 program SAM1 + X'124')
    R11: 00007798 (Module SAM1 program SAM1 + X'798')
    R12: 000070FC (Module SAM1 program SAM1 + X'FC')
    R13: 20594030 (593872 bytes of storage addressable)
    R14: 80007D32 (Module SAM1 program SAM1 + X'D32', source line # 312 )
    R15: A05142B0 (Module IGZCPAC + X'2B0')


 Associated Open Files


 File Name . . . . . . . . . . : CUSTFILE
 File Name . . . . . . . . . . : CUSTRPT
 File Name . . . . . . . . . . : TRANFILE



 Associated Storage Areas



 Next Event Details


 *** Bottom of data.
```

Debug Clues:

✓ Abended in program SAM2 because:

✓ CUST-ACCT-BALANCE has bad numeric data, which was passed from a calling program

✓ SAM1 called SAM2

✓ SAM1 passed bad data in CUST-REC

Look at CUST-REC

Go to variables and storage for this program

Enter

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Analyze an abend (17 of 20)

```
 File  View  Services  Help

Associated Storage Areas                                    Line 1 Col 1 8
Command ===> _____              _____=> PAG
JOBNAME: DNET845X  SYSTEM ABEND: 0C7                              45:0

Task Global Table (TGT) at address 000088

FILE SECTION (File CUSTFILE)
     - Collapse hex
 Off Hex Value                                    Data Value      Source (Starting
BLF=0000 at address 00023F88

                                                                01  CUST-REC.
                                                                 05  CUST-KEY
   0 F5F4F3F2 F1                                 *54321      *      10  CUST
   5 C3                                          *C          *      10  CUST
   6 40404040 404040                             *           *      10  FILL
   D C1A2A385 996B40C4 85A94040 40404040        *Aster, Dez  *  05  CUST-NAM
  1D 40                                          *           *
  1E 7C7B5B6C 50                                *@#$%&       *  05  CUST-ACC
  23 0002                                       2               05  CUST-ORD
  25 E2A39699 94A840C6 819393A2 404040          *Stormy Falls*  0
  34 C481A381 40C595A3 99A840D6 97859981        *Data Entry Opera*  0
  44 A3969940 40404040 40404040                 *tor         *
52
```

It is in File Section. What does that indicate?

What is the file DD name?

The bad data

F3

Debug Clues:

✓Abended in program SAM2 because:

✓CUST-ACCT-BALANCE has bad numeric data, which was passed from a calling program

✓SAM1 called SAM2

✓SAM1 passed bad data in CUST-REC

Here is CUST-REC

Analyze an abend (18 of 20)

```
 File  View  Services  Help
_____

Event 1 of 3: Call (DSA Address 20594030)              Line 68 Col 1 8
Command ===> _____  Scroll ===> PAG
JOBNAME: DNET845X  SYSTEM ABEND: 0C7          DEMOMVS   2010/02/23   15:45:0
   R10: 00007124 (Module SAM1 program SAM1 + X'124')
   R11: 00007798 (Module SAM1 program SAM1 + X'798')
   R12: 000070FC (Module SAM1 program SAM1 + X'FC')
   R13: 20594030 (593872 bytes of storage addressable)
   R14: 80007D32 (Module SAM1 program SAM1 + X'D32', source line # 312 )
   R15: A05142B0 (Module IGZCPAC + X'2B0')

Associated Open Files


File Name . . . . . . . . .   CUSTFILE
                              _
File Name . . . . . . . . . : CUSTRPT
File Name . . . . . . . . . : TRANFILE


Associated Storage Areas



Next Event Details


*** Bottom of data.
```

Cursor select the file name

Enter

Debug Clues:

✓ Abended in program SAM2 because:

✓ CUST-ACCT-BALANCE has bad numeric data, which was passed from a calling program

✓ SAM1 called SAM2

✓ SAM1 passed bad data in CUST-REC

✓ The bad data was read from file CUSTFILE

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```
 File   View   Services   Help

 File Information                                              Line 1 Col 1 8
 Command ===>  _____                                Scroll ===> PAG
 JOBNAME: DNET845X  SYSTEM ABEND: 0C7          DEMOMVS   2010/02/23  15:45:0

 File Name . . . . . . . . . . . :  CUSTFILE
   Data Set Name . . . . . . :  DNET845.ADLAB.FILES(CUST2FA)
   File Attributes . . . . . :  ORGANIZATION=SEQUENTIAL, ACCESS MODE=SEQUENTIAL
                                RECFM=FIXED
   Last I/O Function . . . . :  READ
   Open Status . . . . . . . :  INPUT
   File Status Code. . . . . :  0

 Previous Record . . . . . :  Record data length 80
 Address   Offset    Hex                                       EBCDIC
 00023F38            F2F4F0F9 F0D7D7D6 F0F0F9F4 F5D78981  *24090PP000945Pia*
 00023F48     +10    95964040 40404040 40404040 40404040  *no              *
 00023F58     +20    40404040 4040F2F0 F0F560F0 F760F0F5  *       2005-07-05*
 00023F68     +30    0001F2F0 F0F660F1 F260F2F7 40404040  *..2006-12-27    *
 00023F78     +40    40404040 40404040 40404040 40404040  *                *

 Current Record. . . . . . :  Record data length 80
 Address   Offset    Hex                                       EBCDIC
```

What is the full name of the CUSTFILE file?

CUSTFILE is an input file

Debug Clues:

✓ Abended in program SAM2 because:

✓ CUST-ACCT-BALANCE has bad numeric data, which was passed from a calling program

✓ SAM1 called SAM2

✓ SAM1 passed bad data in CUST-REC

✓ The bad data was read from file CUSTFILE

F8

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File   View   Services   Help

File Information   Line 18 Col 1
Command ===>   Scroll ===> HAL
JOBNAME: DNET845X   SYSTEM ABEND: 0C7   DEMOMVS   2010/02/23 15:45:
   Current Record. . . . . . . : Record data length 80
   Address   Offset   Hex   EBCDIC
   00023F88   F5F4F3F2 F1C34040 40404040 40C1A2A3 *54321C   Ast*
   00023F98   +10   85996B40 C485A940 40404040 40407C7B *er, Dez   @#*
   00023FA8   +20   5B6C50D0 02E2A396 9994A840 C6819393 *$%& .Stormy Fall*
   00023FB8   +30   A2404040 C481A381 40C595A3 99A840D6 *s   Data Entry O*
   00023FC8   +40   97859981 A3969940 40404040 40404040 *perator   *

   Next Record . . . . : Record data length 80
   Address   Offset   Hex   EBCDIC
   00023FD8   F5F5F5F5 F5C34040 40404040 40C485D4 *55555C   DeM*
   00023FE8   +10   8195956B 40C8A487 88404040 40400001 *ann, Hugh   ..*
   00023FF8   +20   23400C00 03C68189 99A58985 A6404040 *. ...Fairview *
   00024008   +30   40404040 D496A389 A581A389 96958193 *   Motivational*
   00024018   +40   40E29785 81928599 40404040 40404040 * Speaker   *

   Associated File Control Blocks

*** Bottom of data.

Here is the bad data in the record

Debug Clues:

✓ Abended in program SAM2 because:

✓ CUST-ACCT-BALANCE has bad numeric data, which was passed from a calling program

✓ SAM1 called SAM2

✓ SAM1 passed bad data in CUST-REC

✓ The bad data was read from file CUSTFILE

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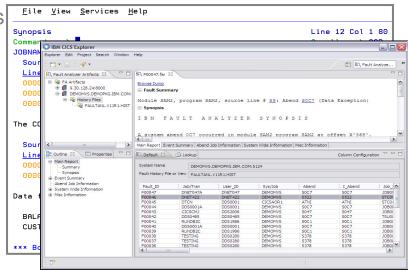
Fault Analyzer: What's new in version 12?

- **IBM Fault Analyzer** improves developer productivity and decreases deployment costs by helping to analyze and correct application failures quickly (CICS/DB2/IMS/MQ/COBOL/PLI/ASM/C/C++/ASM/JAVA).

- Develop and test new and existing applications more productively, helping to reduce costs along the way.

- Proven 3270-based interface and free graphical user interface.

What was released on May 11th?:

- Enhanced Java support

- Support for CICS TS V4.2

- Functional, usability, and security enhancements to the GUI plug-in that include improved integration with CICS Explorer, IMS Explorer, and the other Problem Determination Tools family of plug-ins

- A range of other enhancements to address key customer requirements

Announcement: April 24,12 GA: May 11, 12

Helps to identify the cause, analyze the failure, and fix the problem

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Fault Analyzer for z/OS V12.1

- **Improvements to Eclipse plug-in**:
  - Subsystem $$INDEX cache access
  - RACF® passphrase support added

- **Java enhancements**:
  - Java information displays instance variable data.
  - Java information is displayed from SVC or SDUMP analysis.

- **Usability enhancements**:
  - Point-and-shoot-enabled abend codes are added to Fault Entry list display.
  - Improved options display from Fault Analyzer-supplied CICS transaction.
  - Consistency changes are made to UFM data structure.
  - Expand/collapse function is added to COBOL level 88 items.

- **General enhancements**:
  - Display of C variables is added when using DWARF files.
  - GenerateSavedReport option is added, enabling the creation and saving of a saved report in a fault entry.
  - IDIRLOAD DDname support is added, allowing for extended CSECT mapping.
  - Options specification is added to the environment variables _IDI_OPTS and _IDI_OPTSFILE.
  - 64-bit registers and machine instruction operands are shown with report event details.

Agenda
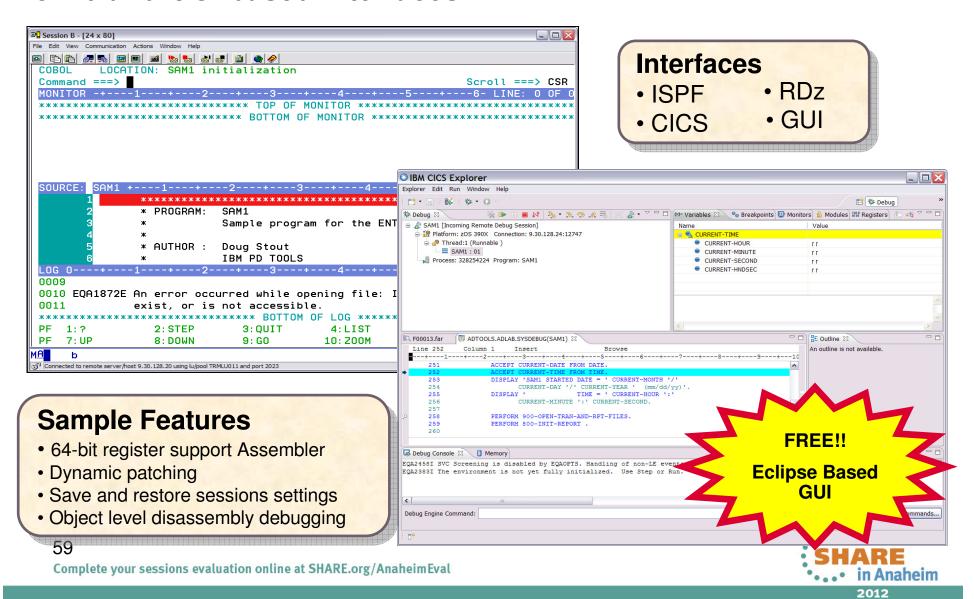
- Fault Analyzer
- Debug Tool
- Application Performance Analyzer
- File Manager

IBM Debug Tool
3270 and GUI based interfaces

Interfaces
- ISPF
- CICS
- RDz
- GUI

Sample Features
- 64-bit register support Assembler
- Dynamic patching
- Save and restore sessions settings
- Object level disassembly debugging

FREE!!
Eclipse Based GUI

The Debug Tool Perspective

The screenshot shows the IBM CICS Explorer Debug Tool Perspective with the following labeled areas:

- **Program Stack** — pointing to the Debug view showing SAM1 [Incoming Remote Debug Session], Platform: zOS 390X Connection: 9.30.128.24:7328, Thread:1 (Runnable), SAM2 : 02, SAM1 : 01, Process: 328254224
- **Monitors and Listings** — pointing to the Monitors view showing CUST-RECORD-TYPE = 'C', CUST-REC, CUSTOMER-BALANCE-STATS, CUST-ID = '01001', CUST-NAME = 'Lynn, Amanda', WS-PROGRAM-STATUS = 'CALCULATING BALANCE STATS', BALANCE-COUNT = +0000000.00
- **Active Source Code** — pointing to ADTOOLS.ADLAB.SYSDEBUG(SAM2) source showing lines 82–88
- **Variables Display** — pointing to the Outline/Variables view showing BALANCE-COUNT, WS-FIELDS, WS-PROGRAM-STATUS, WS-FIRST-TIME-SW, WS-WORK-NUM-1
- **The Debug perspective when a program is being debugged** — pointing to the Debug Console

The Debug view

See your currently running programs in the Debug view

Program call chain (bottom to top)

• Click a program to see it in the source view
• Right-click a program to run or see program properties

Complete your sessions evaluation online at SHARE.org/AnaheimEval

Action bar buttons perform program actions....

Resume: Run the program to the next breakpoint or to the end

Terminate: End the program

Disconnect: from the debug engine

Animated Step: Steps into the program automatically at a rate you specify

Step: run one statement

Step Over: run one statement, but step over a CALL

Step Return: run until return from subprogram

The Program Source view

The highlighted line is the current statement

```
ADTOOLS.ADLAB.SYSDEBUG(SAM1)
Line 318     Column 1     Insert              Browse
----+----1----+----2----+----3----+----4----+----5----+----6----+----7----+----8----+----9----+----10----+----
     314              MOVE CUST-ID          TO RPT-CUST-ID
     315              MOVE CUST-NAME        TO RPT-CUST-NAME
     316              MOVE CUST-OCCUPATION  TO RPT-CUST-OCCUPATION
     317              MOVE CUST-ACCT-BALANCE TO RPT-CUST-ACCT-BALANCE
     318              MOVE CUST-ORDERS-YTD  TO RPT-CUST-ORDERS-YTD
     319              WRITE REPORT-RECORD FROM RPT-DETAIL AFTER 1
     320              ADD +1 TO NUM-DETAIL-LINES
     321          END-IF
     322          IF CUST-RECORD-TYPE = 'P'
     323      *       SUBROUTINE SAM3 WILL COLLECT PRODUCT STATISTICS
     324              CALL 'SAM3' USING CUST-REC,
     325                   PRODUCT-STATS
                                     CT-RECS
                                     QUESTS .
     332              ADD +1 TO NUM-TRANSACTIONS.
     333              WRITE REPORT-RECORD FROM RPT-SPACES      AFTER 1.
     334              WRITE REPORT-RECORD FROM RPT-TOTALS-HDR1.
     335              WRITE REPORT-RECORD FROM RPT-TOTALS-HDR2.
     336              IF NUM-PRINT-COMPLETED > 0
     337                  MOVE SPACES           TO RPT-TOTALS-DETAIL
     338                  MOVE 'Acct Balance:  ' TO RPT-TOTALS-TYPE
```

Debug Console   Memory

Outline   (x)= Va
Name
SYSTEM-D
WS-FIELD
WORK-VA
TOTALS-V
CUSTOME
PRODUCT
RPT-HEAD

Set a statement breakpoint by double-clicking in the gray area next to a statement

Right click a statement to:
• find text
• create a stmt breakpoint
• jump or run to a stmt
• see other options

Right click a variable to:
• add it to the monitor view
• create a watch breakpoint
• see other options

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The Variables View

View and change variables for the program displayed in the source view.

Right click a variable to:
- display in hex
- add to the memory view
- change the value
- see other options

Expand and collapse group level data elements

Overtype a value to change it

Click on a variable to display it in the expanded area

Look at all working storage (show, change screen)

Name	Value
RPT-DETAIL	
RPT-CUST-ID	'01001'
FILLER	' '
RPT-CUST-NAME	'Lynn, Amanda '
FILLER	' '
RPT-CUST-OCCUPATIO	'Musician '
FILLER	' '
RPT-CUST-ACCT-BALAN	' 67.68'
FILLER	' '
RPT-CUST-ORDERS-YTD	'ΓΓΓΓΓΓΓΓΓΓ'
FILLER	' ...
RPT-TRAN-DETAIL	
ERR-MSG-BAD-TRAN	

' 67.68'

☒ Outline   (x)= Varia

SHARE Technology · Connections · Results

SHARE in Anaheim 2012

The Monitors View

Monitor variables and their value in the Monitors View

Overtype a value to change it

The Breakpoints View

Use the Breakpoints View to add and display breakpoints

Right click in the view to create different types of breakpoints

Complete your sessions evaluation online at SHARE.org/AnaheimEval

Traditional memory view

Complete your sessions evaluation online at SHARE.org/AnaheimEval

The registers view

The Debug Tool MFI Interface

Three windows in initial display

```
COBOL      LOCATION: SAM1 :> 251.1                          oll ===> PAGE
Command ===> step 15                                        LINE: 1 OF 7
MONITOR -+----1----+----2----+----3
*********************************** TOP OF MONITOR ************************************
                                   ----+----1----+----
0001   ***** AUTOMONITOR SAM1 ::> SAM1 :> 251.1 ****
0002   02 CURRENT-DATE
0003   03 CURRENT-YEAR                          . .
0004   03 CURRENT-MONTH                         . .
0005   03 CURRENT-DAY                           . .
0006   ********** AUTOMONITOR - PREVIOUS **********
0007   There are no variables in the statement to display.
SOURCE: SAM1 +----1----+----2----+----3----+----4----+----5--- LINE: 249 OF 467
    249
    250        000-MAIN.
    251              ACCEPT CURRENT-DATE FROM DATE.
    252              ACCEPT CURRENT-TIME FROM TIME.
    253              DISPLAY 'SAM1 STARTED DATE = ' CURRE
    254                  CURRENT-DAY '/' CURRENT-YEAR
    255              DISPLAY '            TIME = ' CURRENT-HOUR ':'
    256                  CURRENT-MINUTE ':' CURRENT-SECOND.
    257
LOG 0----+----1----+----2----+----3----+----4----+----5----+---- LINE: 18 OF 24
0018   There are no breakpoints set.
0019   PLAYBACK ENABLE ;
0020   SET FREQUENCY ON ;
0021   SET AUTOMONITOR ON BOTH ;
0022   *** User preferences file commands end ***
0023   STEP ;
0024   STEP ;
PF    1:?           2:STEP        3:QUIT        4:LIST        5:FIND        6:AT/CLEAR
PF    7:UP          8:DOWN        9:GO         10:ZOOM       11:ZOOM LOG   12:RETRIEVE
```

Header: Shows:
- the name of program
- current statement number

Monitor Window: Add and watch variables here

Source Window: Program source statements are displayed here

Log Window: Commands and messages are logged

in Anaheim

2012

TRACE LOAD command

- **TRACE LOAD START**
  - Debug Tool begins to start tracing the loading of load modules.
  - Load module(s) already known to Debug Tool are added to the TRACE table.

- **TRACE LOAD STOP**
  - Not only does Debug Tool stop tracing but the TRACE table is deleted.

- **LIST TRACE LOAD**
  - Displays the load module names along with the load module libraries.

LIST TRACE command output

Complete your sessions evaluation online at SHARE.org/AnaheimEval

Terminal Interface Manager SessionTimeOut

The following EQAXOPT SESSIONTIMEOUT parameters control the behavior of the
Terminal Interface Manager debug session when users leave the session unattended
for long periods of time increasing the chances of holding on a database or IMS MPP.

- **NEVER**
  - Default behavior.
  - No timeout is enforced.

- **QUITDEBUG,hhmmssnn**
  - Debug session will proceed as though QUIT DEBUG command was entered after specified time
    interval.
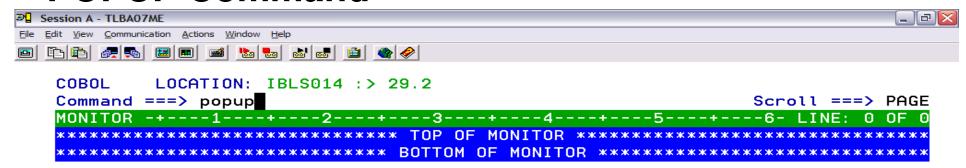
- **QUIT,hhmmssnn**
  - Debug session cancelled, the process being debugged will be terminated with U4038 abend
    after specified time interval.

POPUP Command

Complete your sessions evaluation online at SHARE.org/AnaheimEval

Popup window

Session A - TLBA07ME

File Edit View Communication Actions Window Help

```
COBOL      LOCATION: IBLS014 :> 29.2
Command ===>                                              Scroll ===> PAGE
>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>





>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
0016                NOCMPR2
0017                DATA(31)
0018                DBCS
PF   1:?            2:STEP       3:QUIT        4:LIST       5:FIND        6:AT/CLEAR
PF   7:UP           8:DOWN       9:GO         10:ZOOM      11:ZOOM LOG   12:RETRIEVE
```

MA   a   04/002

Connected to remote server/host tlba07me.torolab.ibm.com using lu/pool S0700063 and port 23   HP DeskJet 820Cse on LPT1:

75

SHARE
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2012

Press the Enter key after continuation character…
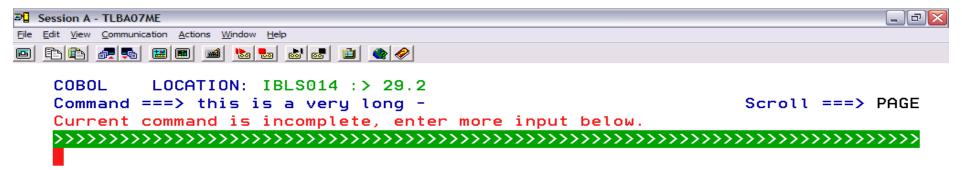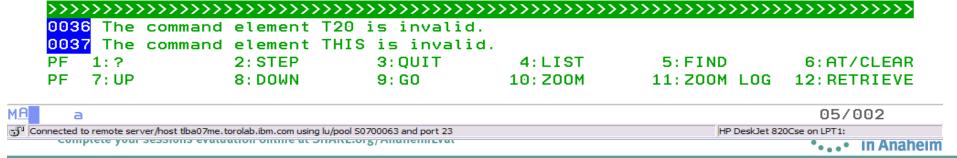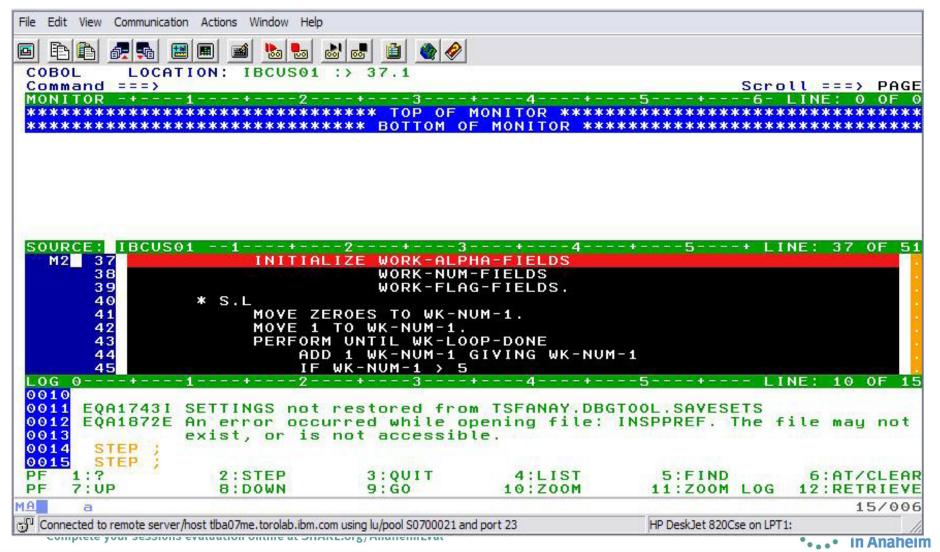
The popup window appears

File   Edit   View   Communication   Actions   Window   Help

COBOL   LOCATION: IBLS014 :> 29.2
Command ===> this is a very long -   Scroll ===> PAGE
Current command is incomplete, enter more input below.
>>>

>>>
0036 The command element T20 is invalid.
0037 The command element THIS is invalid.
PF   1:?   2:STEP   3:QUIT   4:LIST   5:FIND   6:AT/CLEAR
PF   7:UP   8:DOWN   9:GO   10:ZOOM   11:ZOOM LOG   12:RETRIEVE

MA   a   05/002
Connected to remote server/host tlba07me.torolab.ibm.com using lu/pool S0700063 and port 23   HP DeskJet 820Cse on LPT1:

Using the monitor prefix command - Mn
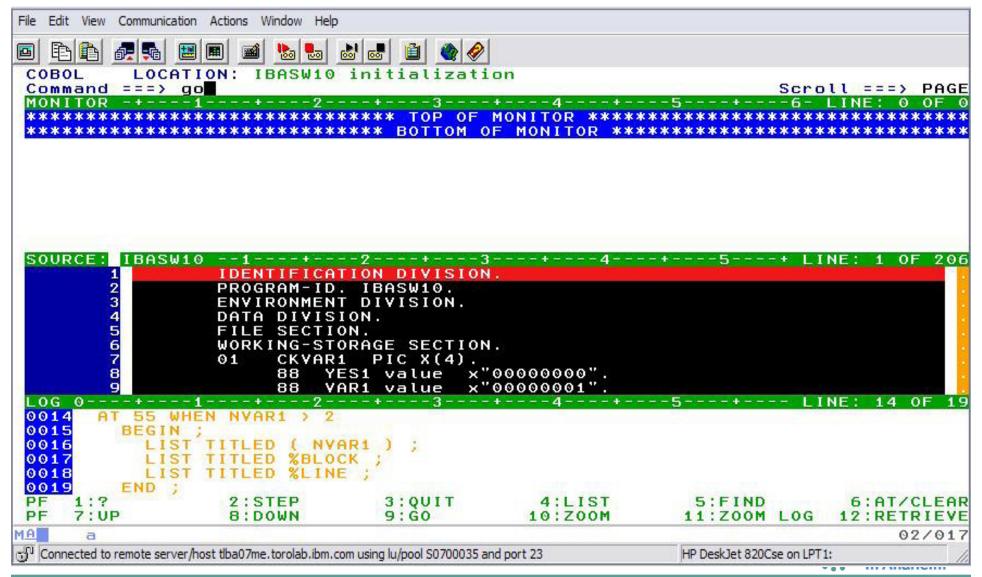
Second variable is now being monitored

AT Statement...

```
File  Edit  View  Communication  Actions  Window  Help

COBOL        LOCATION:  IBASW10  initialization
Command ===>  go
                                                              Scroll ===> PAGE
MONITOR -+---+----1---+----2---+----3---+----4---+----5---+----6-  LINE:  0  OF  0
******************************** TOP OF MONITOR ********************************
******************************** BOTTOM OF MONITOR ****************************




SOURCE:  IBASW10 --1----+----2---+----3---+----4---+----5----+  LINE:  1  OF  206
        1            IDENTIFICATION DIVISION.
        2            PROGRAM-ID. IBASW10.
        3            ENVIRONMENT DIVISION.
        4            DATA DIVISION.
        5            FILE SECTION.
        6            WORKING-STORAGE SECTION.
        7            01    CKVAR1  PIC X(4).
        8                  88   YES1 value  x"00000000".
        9                  88   VAR1 value  x"00000001".
LOG  0---+----1----+----2---+----3---+----4---+----5---  LINE:  14  OF  19
0014    AT 55 WHEN NVAR1 > 2
0015      BEGIN ;
0016        LIST TITLED ( NVAR1 ) ;
0017        LIST TITLED %BLOCK ;
0018        LIST TITLED %LINE ;
0019      END ;
PF   1:?              2:STEP         3:QUIT         4:LIST         5:FIND         6:AT/CLEAR
PF   7:UP             8:DOWN         9:GO          10:ZOOM        11:ZOOM LOG    12:RETRIEVE
MA      a                                                                        02/017
```

Connected to remote server/host tlba07me.torolab.ibm.com using lu/pool S0700035 and port 23   HP DeskJet 820Cse on LPT1:

AT Statement WHEN and Grouping commands using BEGIN/END.
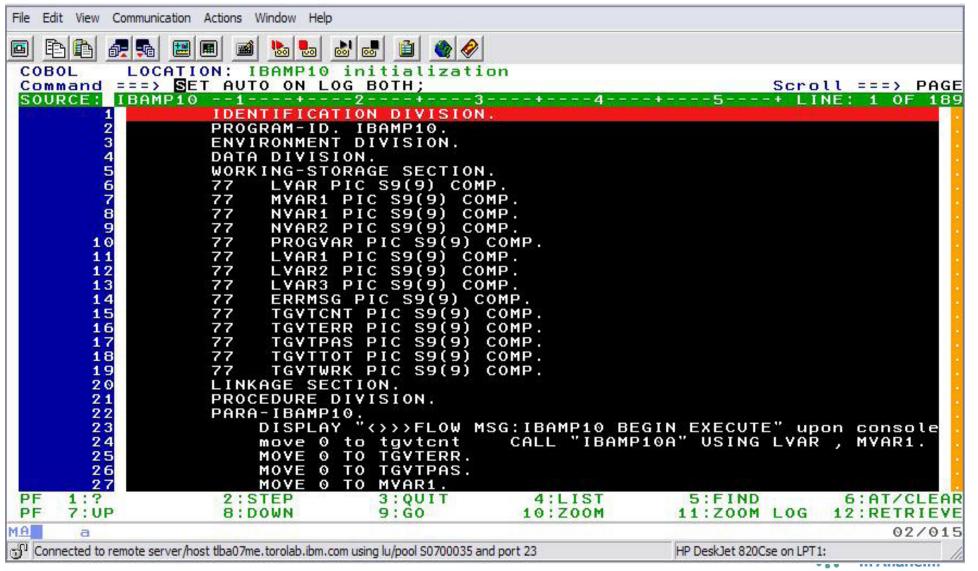
AT Statement...

SET AUTO (BOTH, PREVIOUS)

SET AUTO...


```
File  Edit  View  Communication  Actions  Window  Help
```

```
COBOL       LOCATION:  IBAMP10A :> 42.1
Command ===>                                                          Scroll ===> PAGE
MONITOR -+---1---+---2---+---3---+---4---+---5---+---6- LINE: 1 OF 6
************************************* TOP OF MONITOR *****************************
                                    ---+---1---+---2---+---3---+---4---
0001      ***** AUTOMONITOR IBAMP10 ::> IBAMP10A :> 42.1 *****
0002      77 LVAR2A                 +0000000021
0003      77 MVAR12A                +0000000000
0004         ***** Previous Statement IBAMP10 ::> IBAMP10 :> 24.2 *****
0005      77 LVAR                   +0000000000
0006      77 MVAR1                  +0000000000
************************************* BOTTOM OF MONITOR *************************

SOURCE: IBAMP10A -1---+---2---+---3---+---4---+---5---+ LINE: 42 OF 86
     42              CALL "IBAMP102" USING LVAR2A , MVAR12A.
     43              COMPUTE BVAR2 = BVAR2 + 1.
     44              COMPUTE BVAR2 = BVAR2 + 1.
     45              COMPUTE BVAR2 = BVAR2 + 1.
     46              COMPUTE BVAR2 = BVAR2 + 1.
     47              COMPUTE BVAR2 = BVAR2 + 1.
     48              DISPLAY "<>>>FLOW MSG: IBAMP10A END EXECUTION" upon conso
     49              GOBACK.
     50          IDENTIFICATION DIVISION.
LOG 0---+---1---+---2---+---3---+---4---+---5---+--- LINE: 24 OF 29
0024   The current location is IBAMP10 ::> IBAMP10A :> 42.1.
0025   77 IBAMP10A:>LVAR2A  = +0000000021
0026   77 IBAMP10A:>MVAR12A = +0000000000
0027   The previous location is IBAMP10 ::> IBAMP10:> 24.2.
0028   77 IBAMP10:>LVAR  = +0000000000
0029   77 IBAMP10:>MVAR1 = +0000000000
PF  1:?            2:STEP        3:QUIT        4:LIST       5:FIND       6:AT/CLEAR
PF  7:UP           8:DOWN        9:GO         10:ZOOM      11:ZOOM LOG  12:RETRIEVE
MA      a                                                                    02/015
Connected to remote server/host tlba07me.torolab.ibm.com using lu/pool S0700035 and port 23        HP DeskJet 820Cse on LPT1:
```

XML formatting

XML… (The monitor area zoomed)
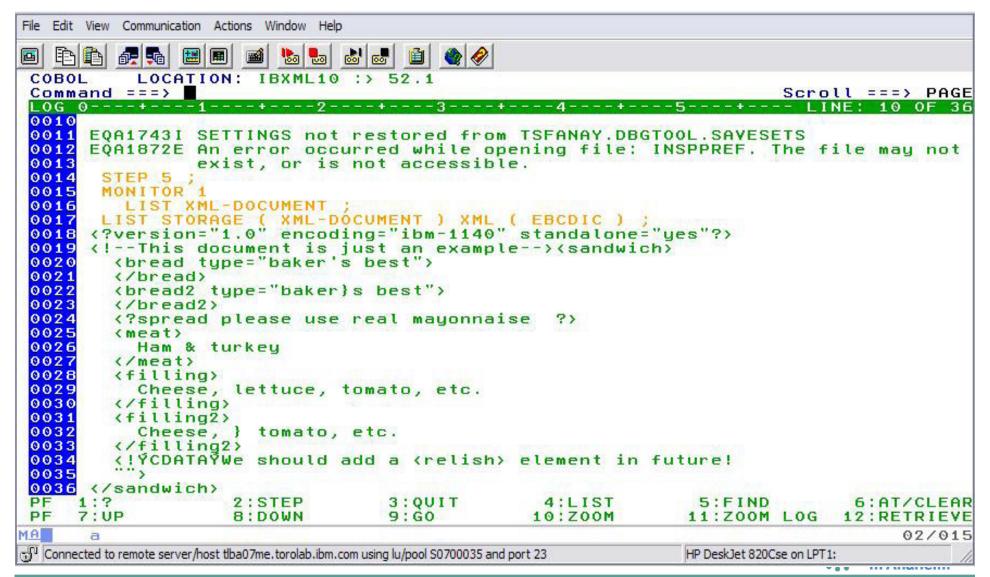
XML…(before entering LIST STORAGE)


```
File  Edit  View  Communication  Actions  Window  Help

COBOL        LOCATION: IBXML10 :> 52.1
Command ===> LIST STORAGE (xml-document) XML (EBCDIC);        Scroll ===> PAGE
MONITOR -+----1----+----2----+----3----+----4----+----5----+----6 LINE: 1  OF 17
                       ----+----1----+----2----+----3----+----4----
0001   1 01  XML-DOCUMENT
0002     02  FILLER                    '<?xml version="1.0" encoding="ibm-1140"'
0003     02  FILLER                    ' standalone="yes"?>'
0004     02  FILLER                    '<!--This document is just an example-->'
0005     02  FILLER                    '<sandwich>'
0006     02  FILLER                    '  <bread type="baker&apos;s best"/>'
0007     02  FILLER                    '  <bread2 type="baker&#125;s best"/>     '
0008     02  FILLER                    '  <?spread please use real mayonnaise   ?>'
0009     02  FILLER                    '  <meat>Ham &amp; turkey</meat>'
SOURCE:   IBXML10 --1----+----2----+----3----+----4----+----5--- LINE: 49 OF 107
       49
       50            xml-handler section.
       51              move XML-TEXT to x.
       52              evaluate XML-EVENT
       53                when 'START-OF-DOCUMENT'
       54                  compute xml-document-length = function length(XML-TEX
       55                  display 'Start of document: length=' xml-document-len
       56                    ' characters.'
       57                when 'END-OF-DOCUMENT'
LOG 0----+----1----+----2----+----3----+----4----+----5----+---- LINE: 31 OF 36
0031     <filling2>
0032       Cheese, } tomato, etc.
0033     </filling2>
0034     <!ÝCDATAÝWe should add a <relish> element in future!
0035     ¨¨>
0036   </sandwich>
PF  1:?          2:STEP      3:QUIT      4:LIST      5:FIND      6:AT/CLEAR
PF  7:UP         8:DOWN      9:GO        10:ZOOM     11:ZOOM LOG 12:RETRIEVE
MA      a                                                        02/015
Connected to remote server/host tlba07me.torolab.ibm.com using lu/pool S0700035 and port 23    HP DeskJet 820Cse on LPT1:
```

2012

XML… formatted document

XML doc in code page 1141 with XML(EBCDIC)

Complete your sessions evaluation online at SHARE.org/AnaheimEval

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Debug Tool: What's new in version 12? (Part 1)

- Startup at **subprogram boundary**. Delay debug mode is added, enabling Debug Tool to operate in a dormant state until a compile unit of interest to the user becomes active. Delay debug mode is valid for non-CICS programs written in Enterprise PL/I or Enterprise COBOL. When delay debug is on, Debug Tool delays starting the initialization for the debugging session until a compile unit matching the program naming pattern in the delay debug profile is found. That matched compile unit is started using the TEST runtime options in the delay debug profile.

- Dynamic debugging supports applications using **XPLINK** linkage. You can now debug non-CICS C and C++ applications that use XPLINK linkage without having to insert compiled-in hooks. Additional benefits include smaller load modules, enhanced performance, and improved interaction between Java-based applications and COBOL, PL/I, and Assembler.

- User exits are consolidating into one. The three Debug Tool Language Environment® user exits (EQADBCXT, EQADDCXT, and EQADICXT) are merged into a single one: **EQAD3CXT**. The existing user exit routines are still supported for upward compatibility and to help users transition to the consolidated user exit.

- Enhanced remote communication security. This enhancement enables encrypted communication between Debug Tool and remote debug mode for better privacy and integrity. The enablement uses the Secure Sockets Level (**SSL**) protocol and digital certificates.

- **DTCN** enhancement prevents a non-owner from deleting a profile. The 3270 BMS DTCN transaction checks to see if users are authorized to delete or modify other owners' profiles, and rejects unauthorized attempts.

- DTCN profile plug-in is integrated with CICS objects in the CICS Explorer. This provides a new mechanism to create or manage a DTCN profile when you want to debug a transaction or program. With the mouse you can right-click on either a transaction in the **Transactions** view or a program in the **Programs** view in the CICS Explorer and choose one of the actions: Update Profile or Manage Profile.

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2012

Debug Tool: What's new in version 12? (Part 2)

- **Code Coverage** enhancement to monitor sessions. The Coverage Utility increases the number of monitor sessions from 32 to 256.

- Set list by subscript for remote. You can specify a **SET LIST BY SUBSCRIPT** command to control the display format when you view a COBOL array. You can change it to display as it is stored in memory. This enhancement is for remote debug mode only.

- Prevent duplicate entries in Monitor table. Previously, Debug Tool allowed **duplicate monitor** commands to be entered. Now users can prevent duplicate monitor definitions. This enhancement potentially saves space in the monitor window and in the monitor commands list.

- Prevent display of local variables outside of a valid **scope**. Debug Tool does not establish a Monitor command for Monitor Local List expression if one or more variables are not defined in the specified compile unit. This enhancement reduces unnecessary information in the monitor window.

- Reduced storage overhead and **performance** for **automonitor**. Storage overhead is reduced, and performance of automonitor is improved when you debug a program with large structures.

- Handle PL/I generic ENDFILE conditions. PL/I conditions associated with file handling can now use a wildcard instead of users having to specify a file reference. Specifically, the AT OCCURENCE file_condition(file_reference) and ON file_condition(file_reference) commands are enhanced for Enterprise PL/I programs to support a wildcard for the file_reference. The wildcard indicates that the breakpoint is honored for all files that raise the ENDFILE condition.

- EQAOPTS DYNDEBUG command. The EQAOPTS DYNDEBUG command is added so that you can specify an initial default for the **SET DYNDEBUG** command.

- %CHAR built-in function. The **%CHAR** Debug Tool built-in function is added to enable you to display the result of an expression in EBCDIC format.

Debug Tool: What's new in version 12? (Part 3)

- NONLESP option for EQANMDBG. The **NONLESP** option is added to EQANMDBG to enable you to direct Debug Tool to use a different storage subpool for its storage in cases where the program being debugged does a FREEMAIN of subpool 1 (where Debug Tool places its data by default).

- COMPOPTS parameter for load module analyzer. A new parameter, **COMPOPTS**, is now supported by the load module analyzer. COMPOPTS lists the compiler options that are known at runtime to be listed for each CSECT in the load module.

- EQAOPTS QUIET keyword. The new EQAOPTS **QUIET** keyword for the SVCSCREEN,OFF command can be used to suppress the message "EQA2458I SVC Screening is disabled by EQAOPTS. Handling of non-LE events is not available. Debugging of non-LE programs will be restricted in this Debug Tool session."

- EQAOPTS STARTSTOPMSG command. The new EQAOPTS **STARTSTOPMSG** command tells Debug Tool whether to issue a message when each Debug Tool session starts and stops.

- Customization of site default data set names for new users. The Debug Tool Utilities enable you to customize the site default data set name for new users for the options Debug Tool User Exit Data Set and Delay Debug Profile.

- Customization of site default data set name in the Terminal Interface Manager. The Terminal Interface Manager now allows you to customize the site default data set name for the option "LE options data set".

- LOADDEBUGDATA command enhancement. The LOADDEBUGDATA command has been enhanced to support **%CU** and **%PROGRAM** substitution for the cu_name operand.

- UNIX System Services multi-process support. POSIX multi-process support is enhanced for remote debug mode.

Agenda
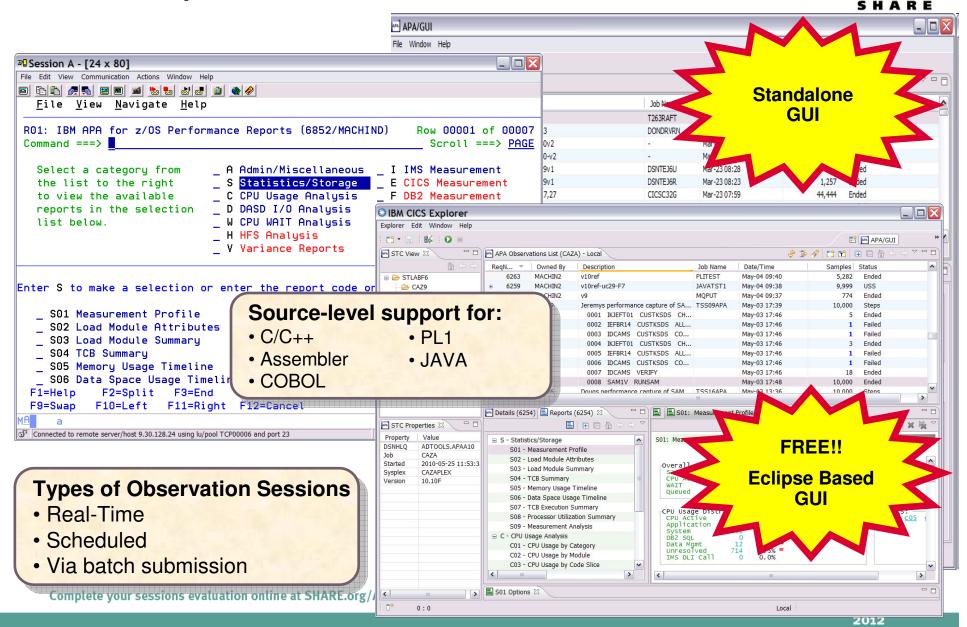
- Fault Analyzer
- Debug Tool
- Application Performance Analyzer
- File Manager

Application Performance Analyzer
3270 or multiple GUI interfaces

SHARE

Standalone GUI

FREE!! Eclipse Based GUI

Source-level support for:
- C/C++
- Assembler
- COBOL
- PL1
- JAVA

Types of Observation Sessions
- Real-Time
- Scheduled
- Via batch submission

The Observations List View

Indicates Local or Remote connection
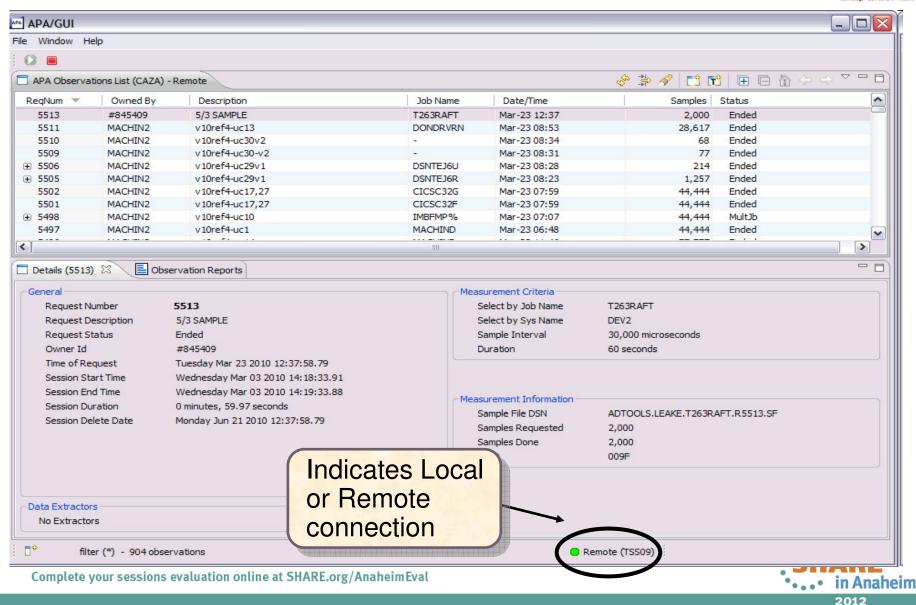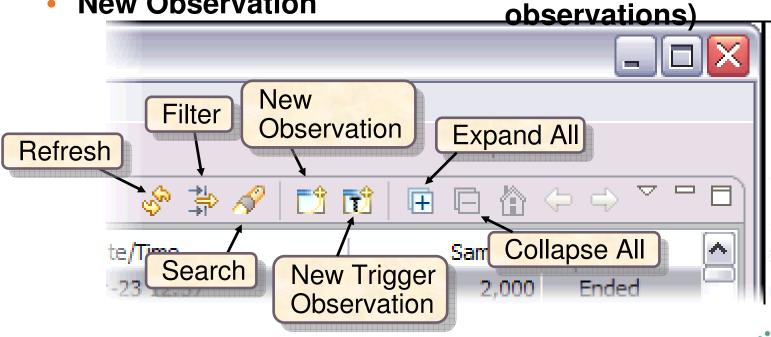
Observations List View Toolbar
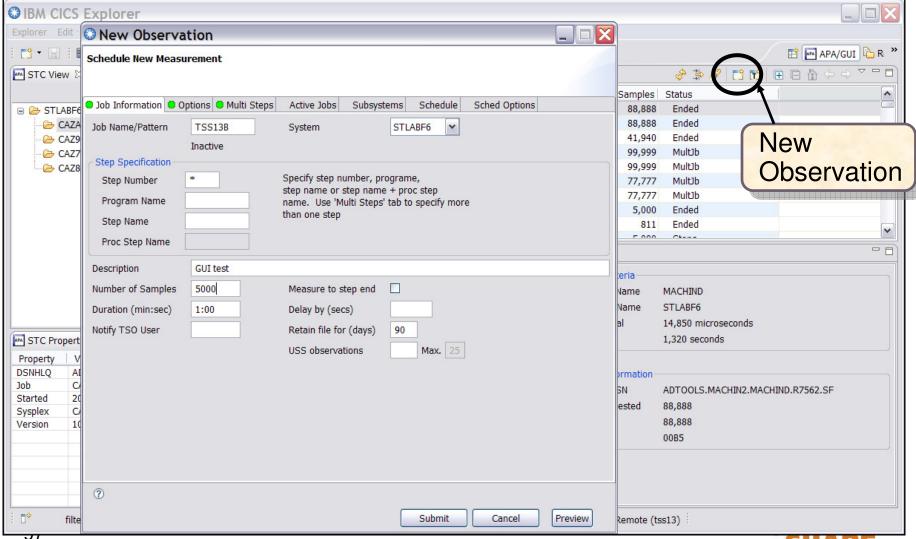
- **Observations List toolbar**
  - **Refresh Observations List**
  - **Filter Observations List**
  - **Search Observations**
  - **New Observation**

- **New Trigger Observation**
- **Expand All (expand all observations)**
- **Collapse All (collapse all observations)**

Complete your sessions evaluation online at SHARE.org/AnaheimEval

Click on new observation button
Create a new observation

Observation is scheduled

Req... ▼	Owned By	Description	Job Name	Date/Time	Samples	Status
7552	TSS13	GUI test job	TSS13B	Jul-27 10:33	**5,000**	Steps
7551	MACHIN2	v10H-uc26	DB2V9TEP	Jul-27 10:33	**22,222**	Sched
⊞ 7533	MACHIN2	v10H-cst6	CIC%	Jul-27 09:45	99,999	MultJb
⊞ 7532	MACHIN2	v10H-cst6	CIC%	Jul-27 09:45	99,999	MultJb
⊞ 7527	MACHIN2	v10H-cst6	CIC%	Jul-27 09:09	77,777	MultJb
⊞ 7522	MACHIN2	v10H-cst6	CIC%	Jul-27 08:47	77,777	MultJb
7521	VNDBKNT	Natural pause II	VNDBKNT1	Jul-27 07:50	5,000	Ended
7520	VNDBKNT	Natural pause	VNDBKNT1	Jul-27 07:33	811	Ended
⊞ 7511	TSS13	New measurement sampling	TSS13A	Jul-27 07:04	5,000	Steps

APA Details (7562) | Reports (7562) ✕

Right click on report and select Download Reports

APA Observations List (CAZA) - Remote

Req... ▼	Owned By	Description	Job Name	Date/Time	Samples	Status
⊟ 📄 7563	TSS13	GUI test	TSS13B	Jul-27 12:11	**5,000**	Steps
756		0001 IKJEFT01 CUSTKSDS ...		Jul-27 12:15	3	Ended
756		0002 IEFBR14 CUSTKSDS ...		Jul-27 12:15	2	Ended
756					15	Ended
756					7	Ended
756					1	Failed
756					1	Failed
757					30	Ended
📄 757					00	Ended

Downloading Reports

ⓘ Downloading 1 of 1. Reports for Observation #7564 ...

Step 3 of 3 : Extracting 28 of 28 G03: Coupling Facility Total Service Times

☐ Always run in background

[Run in Background] [Cancel] [Details >>]

📄 Details (7564)

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Report list is displayed
S01 Measurement Profile report shows high CPU activity

Associated reports are displayed and can be selected

APA Observations List (CAZA) - Remote

Req...	Owned By	Description	Job Name	Date/Time	Samples	Status
7563	TSS13	GUI test	TSS13B	Jul-27 12:11	5,000	Steps
756		0001 IKJEFT01 CUSTKSDS ...		Jul-27 12:15	3	Ended
756		0002 IEFBR14 CUSTKSDS ...		Jul-27 12:15	2	Ended
756		0003 IDCAMS CUSTKSDS ...		Jul-27 12:15	15	Ended
756		0004 IKJEFT01 CUSTKSDS ...		Jul-27 12:15	7	Ended
756		0005 IEFBR14 CUSTKSDS ...		Jul-27 12:15	1	Failed
756		0006 IDCAMS CUSTKSDS ...		Jul-27 12:15	1	Failed
757		0007 IDCAMS VERIFY		Jul-27 12:15	30	Ended
757		0008 SAM1V RUNSAM		Jul-27 12:16	5,000	Ended

Details (75   Reports (7

- S - Statistics/Storage
  - S01 - Measurement Profile
  - S02 - Load Module Attributes
  - S03 - Load Module Summary
  - S04 - TCB Summary
  - S05 - Memory Usage Timeline
  - S06 - Data Space Usage Timelin
  - S07 - TCB Execution Summary
  - S08 - Processor Utilization Sum
  - S09 - Measurement Analysis
- C - CPU Usage Analysis
  - C01 - CPU Usage by Category

S01: Measurement Profile (7571/TSS13B)

S01: Measurement Profile (7571/TSS13B)

```
Overall CPU Activity
Samples        5,000   100.0%
CPU Active     4,636    92.7%
WAIT             317     6.3%
Queued            47     0.9%
```

Reports:
C01 C02 C03 C05
C07 W01 W02

```
CPU Usage Distribution
CPU Active     4,636   100.0%
Application    2,255    48.6%
System         1,997    43.0%
DB2 SQL            0     0.0%
Data Mgmt         17     0.3%
Unresolved       367     7.9%
IMS DLI Call       0     0.0%
```

Reports:
C01 C05 C08 W01

Most CPU Active Modules

Reports:

S01 Options

Report View

- **Toolbar**
  - **Provides buttons for report-level actions which include:**
    - **Print**
    - **Save As**
    - **Find**
    - **Copy**
    - **Close Report**
    - **Close All Reports**
    - **Expand All**

Complete your sessions evaluation online at SHARE.org/AnaheimEval

S09 Measurement Analysis report displays possible performance improvement

SHARE in Anaheim 2012

Java Test Case (Java 5)

Java Test Case (Java 5)

Java Test Case (Java 5)

APA/GUI

File   Window   Help

APA Observations List (CAZA) - Remote

ReqNum ▼	Owned By	Description	Job Name	Date/Time	Samples	Status
⊕ 1310	MACHIN2	v10ref7-uc19	STEPS	Oct-07 09:50	9,999	Steps
1301	MACHIN2	v10ref7-uc27	CICSC32F	Oct-07 07:15	99,999	Ended
1299	MACHIN2	v10ref7-uc27	CICSC32F	Oct-07 07:03	99,999	Ended
1298	MACHIN2		CICSC32F	Oct-07 06:54	547	Cancel
⊟ 1292	MACHIN2	v10ref7-uc29	JAVATST1	Oct-07 06:29	9,999	USS
1293		BPXBATCH RUN		Oct-07 06:30	9	Ended
1294		BPXPRECP *OMVSEX		Oct-07 06:30	3	Ended
1295		BPXPRECP *OMVSEX *Java*		Oct-07 06:30	4,658	Ended
1296		n/a		Oct-07 06:30	1	Failed
1242	MACHIN2	v10ref7-uc15	DB2DATA	Oct-06 14:02	21,277	Ended
1231	MACHIN2	v10ref7-uc13v2	DONDRVRN	Oct-06 10:33	87,541	Ended

Reports (1295)   **Details (1295)**

- S08 - Processor Utilization Summary
- S09 - Measurement Analysis
- ⊟ C - CPU Usage Analysis
  - C01 - CPU Usage by Category
  - C02 - CPU Usage by Module
  - C03 - CPU Usage by Code Slice
  - C04 - CPU Usage Timeline
  - C05 - CPU Usage Task/Category
  - C06 - CPU Usage Task/Module
  - C07 - CPU Usage by Procedure
  - C08 - CPU Referred Attribution
  - C09 - CPU Usage by PSW/ObjCode
- ⊕ D - DASD I/O Analysis
- ⊕ W - CPU WAIT Analysis
- ⊕ H - HFS Analysis
- ⊕ G - Coupling Facility
- ⊟ J - Java Measurement
  - J01 - Java Summary/Attributes
  - J04 - Java CPU Usage by Package
  - J05 - Java CPU Usage by Class
  - J06 - Java CPU Usage by Method
  - J07 - Java CPU Usage by Call Path
  - J09 - Java Svc Time by Package
  - J10 - Java Svc Time by Class
  - J11 - Java Svc Time by Method
  - J12 - Java Svc Time by Call Path
  - J14 - Java Wait Time by Package
  - J15 - Java Wait Time by Class
  - J16 - Java Wait Time by Method
  - J17 - Java Wait Time by Call Path

J10 Options

Option	Value
Levels	2

Tabs: J01: Java Summary/Attribute | J04: Java CPU Usage by Pac | S01: Measurement Profile (12 | J15: Java Wait Time by Class | J10: Java Svc Time by Class

J10: Java Svc Time by Class (1295/JAVATST1)

```
JavaId    Class/Method              Percent of Time * 10.00%  ±2.2%
                                    *....1....2....3....4....5....6....7....8....9....*

00003     Runtime                   61.46   ████████████████████████
→ 00005     freeMemory              61.46   ████████████████████████

00002     Burner4                   29.99   ████████████
→ 00002     calc                    11.01   ████
→ 00006     next1                    7.50   ███
→ 00007     next2                    7.50   ███
→ 00003     exec                     3.95   █

00001     Burner4Test               8.25    ███
→ 00001     checkMem                 8.25    ███

00010     BigInteger                0.14
→ 00017     <clinit>                 0.09
→ 00016     <init>                   0.04

00004     BootstrapClassLoader      0.04
→ 00008     loadClass                0.04

00007     BigDecimal                0.04
→ 00012     <clinit>                 0.04

00009     AbstractClassLoader       0.04
→ 00015     getPackageName           0.04
```

0 : 0   ● Remote (leake)

Base User Interface

CICS Test Case Sample

The Application Performance Analyzer ISPF Interface

Each step generates reports, select the appropriate report

```
 File  View  Navigate  Help

R02: IBM APA for z/OS Observation List (CAZA)              Row 00001 of 00177
Command ===> _____         Scroll ===> PAGE


ReqNum  Owned By   Description     Job Name  Date/Time    Samples  Status

  7511 +  TSS13     New measurement TSS13A    Jul-27  7:04    5,000  STEPS
→  7512  0001 IKJEFT01 CUSTKSDS CHECKV        Jul-27  7:06       63  Ended
→  7513  0002 IEFBR14  CUSTKSDS ALLOCV        Jul-27  7:06        2  Ended
→  7514  0003 IDCAMS   CUSTKSDS COPYV         Jul-27  7:06       50  Ended
→  7515  0004 IKJEFT01 CUSTKSDS CHECKV        Jul-27  7:06        4  Ended
→  7516  0005 IEFBR14  CUSTKSDS ALLOCV        Jul-27  7:06        2  Ended
→  7517  0006 IDCAMS   CUSTKSDS COPYV         Jul-27  7:06       51  Ended
→  7518  0007 IDCAMS   VERIFY                 Jul-27  7:06       13  Ended
→  r519  0008 SAM1V    RUNSAM                 Jul-27  7:07    5,000  Ended


  7510    MACHIND   v10H- uc8       VSAMJOB   Jul-27  6:37   78,787  Sched
  7509    MACHIND   v10H-uc20       CICSC31G  Jul-27  6:36       11  Active
  7508    MACHIND   v10H- uc5       VSAMREAD  Jul-27  6:25   59,218  E
  7498    MACHIN2   v10H-uc10       PLITEST   Jul-26 16:58    2,088  E
  7496 +  MACHIN2   v10H-uc23v2     COBOLPLI  Jul-26 16:14   34,567  T
```

Enter

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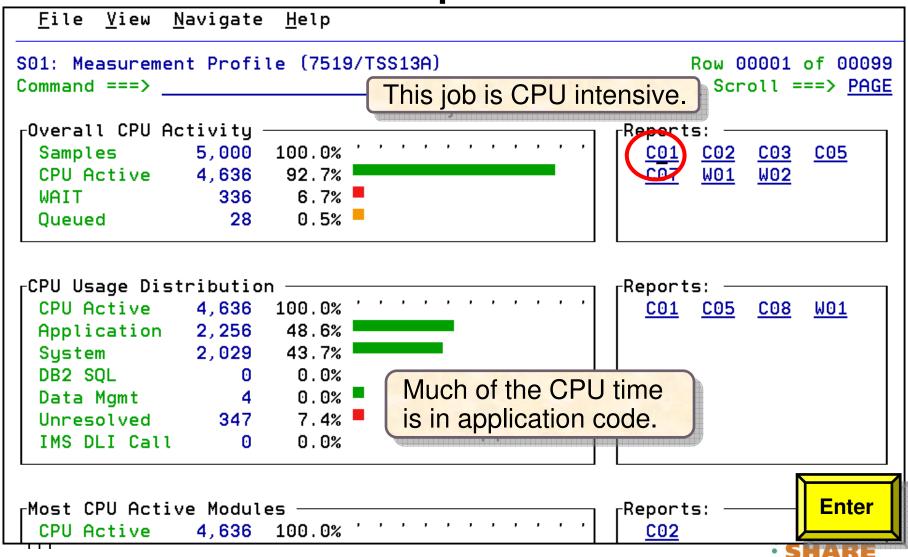
R01 Performance Report index is displayed Select S01 Measurement Report

File View Navigate Help

```
R01: IBM APA for z/OS Performance Reports (7519/TSS13A)   Row 00001 of 00007
Command ===> _____   Scroll ===> PAGE

   Select a category from    _ A Admin/Miscellaneous  _ I IMS Measurement
   the list to the right     _ S Statistics/Storage   _ E CICS Measurement
   to view the available     _ C CPU Usage Analysis   _ F DB2 Measurement
   reports in the selection  _ D DASD I/O Analysis     _ Q MQ Measurement
   list below.               _ W CPU WAIT Analysis     _ G Coupling Facility
                             _ H HFS Analysis          _ J Java Measurement
                             _ V Variance Reports      _ X Multi Address Space

                                                       More:         +
Enter S to make a selection or enter the report code on the command line

 s S01 Measurement Profile          _ S07 TCB Execution Summary
 _ S02 Load Module Attributes       _ S08 Processor Utilization Summary
 _ S03 Load Module Summary          _ S09 Measurement Analysis
 _ S04 TCB Summary
 _ S05 Memory Usage Timeline
 _ S06 Data Space Usage Timeline
```

Enter
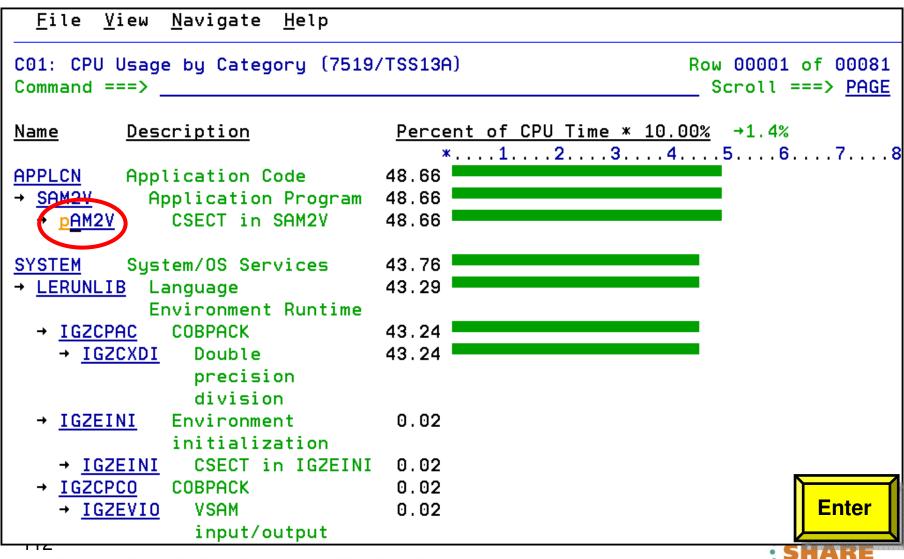
Measurement Profile report
Cursor select the C01 report

```
  File   View   Navigate   Help
 _____

 S01: Measurement Profile (7519/TSS13A)              Row 00001 of 00099
 Command ===> _____              Scroll ===> PAGE

 ┌Overall CPU Activity──────────────┐          ┌Reports:──────────────┐
 │ Samples      5,000  100.0% ' ' ' ' ' ' ' ' '│ │ C01  C02  C03  C05 │
 │ CPU Active   4,636   92.7% ▇▇▇▇▇▇▇▇▇▇▇▇▇      │ │ C07  W01  W02      │
 │ WAIT           336    6.7% ▇                 │ │                    │
 │ Queued          28    0.5% ▇                 │ │                    │
 └──────────────────────────────────┘          └────────────────────┘

 ┌CPU Usage Distribution────────────┐          ┌Reports:──────────────┐
 │ CPU Active   4,636  100.0% ' ' ' ' ' ' ' ' '│ │ C01  C05  C08  W01 │
 │ Application  2,256   48.6% ▇▇▇▇▇▇▇           │
 │ System       2,029   43.7% ▇▇▇▇▇▇            │
 │ DB2 SQL          0    0.0%                   │
 │ Data Mgmt        4    0.0% ▇                 │
 │ Unresolved     347    7.4% ▇                 │
 │ IMS DLI Call     0    0.0%                   │
 └──────────────────────────────────┘          └────────────────────┘

 ┌Most CPU Active Modules───────────┐          ┌Reports:──────────────┐
 │ CPU Active   4,636  100.0% ' ' ' ' ' ' ' ' '│ │ C02                │
```

This job is CPU intensive.

Much of the CPU time is in application code.

Enter

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Use the 'p' line command to display program source for the SAM2V csect

The program statements that used the most CPU time are displayed Bar charts indicate statements using the most resources

```
 File  View  Navigate  Help
 _____

 P01: Source Program Attribution (7519/TSS13A)          Row 00010 of 00039
 Command ===> _____  Scroll ===> HALF

 LineNo Offset Prcnt Source Statement
 000097
 000098                         100-CRUNCH-LOOP.
 000099 0003C2   .90 ▌              MOVE  'CALCULATING BALANCE STATS' TO WS-PROGRAM-
 000100                  *     *** Increment Record Count ***
 000101 0003D2  5.24 ▐▌             ADD +1 TO BALANCE-COUNT
 000102                  *     *** Add this customer's BALANCE to the grand tot
 000103 0003EA 11.32 ▐▐▌            COMPUTE BALANCE-TOTAL =
 000104                                BALANCE-TOTAL + CUST-ACCT-BALANCE
 000105                  *     *** Calculate Average ***
 000106 000412 13.97 ▐▐▐▌           COMPUTE BALANCE-AVERAGE =
                46.09 <- CPU time attributed to above statement
 000107                                BALANCE-TOTAL / BALANCE-COUNT
 000108                  *     *** Calculate Minimum ***
 000109 00045A  2.41 ▌              IF WS-FIRST-TIME-SW = 'Y'
 000110 00046A                         MOVE CUST-ACCT-BALANCE TO BALANCE-MIN.
 000111 000474  1.61 ▌              IF CUST-ACCT-BALANCE < BALANCE-MIN
 000112 000486                         MOVE CUST-ACCT-BALANCE TO BALANCE-M[
 000113                  *     *** Calculate Maximum ***
```

PF3

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Application Performance Analyzer: What's new in version 12? (Part 1)

- **Enhancements to sampling include**:
  - Improved accuracy of CICS and DASD reports.
  - In CICS, the DB2+ data extractor intercepts only those DB2 calls involved in the selected transaction or from the selected terminal, including those in collateral DB2 stored procedures.
  - In CICS, the IMS+ data extractor intercepts DLI calls involved only in the selected transaction or from the selected terminal.
  - In IMS, the DB2+ data extractor intercepts DB2 calls involved only in the selected transaction, program, or user, including those in collateral DB2 stored procedures.
  - Reduced memory requirement.
  - New SMF Record exit captures SMF type 120 subtype 9 records for WebSphere activity, and type 101 records for DB2 accounting data.
  - New messages for abnormal termination of APA and Listener started tasks.
  - Support added for CICS TS 4.2, including running a single JVM, Java 6.0.1, and IMS 12.
- **Enhancements to the ISPF observation list include**:
  - Indicate when sample files are about to be auto-deleted.
  - Support "+" and "-" commands on ReqNum heading to expand/collapse all observations in the list.
  - Support use of "%" when filtering the observation list.
- **Enhancements to the NEW command include**:
  - New DDF thread selection criterion based on corrid, authid, or workstation.
  - New WAS data extractor for measuring activity processed by a selected WebSphere controller address space.
  - New WebSphere selection criterion based on request, application, or origin
  - New WebSphere selection criterion to filter out image files and specific file extensions.

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Application Performance Analyzer:
What's new in version 12? (Part 2)

- **Enhancements to reporting include**:
  - Display formatted SQL in DB2 report detail windows.
  - Display SQL function for Remote SQL in DB2 reports.
  - Display IMS subsystem and trancode, program, or user in S01 report and R02 detail window.
  - Add DB2 Class 3 Wait report.
  - Add option in S03 to combine duplicate modules.
  - Disable expansion of very large wait reports.
  - Support new COBOL SYSDEBUG interface.
  - Add WebSphere activity reports.
  - Expand recommendations in S09 report to include:
    - Assess whether VSAM shareoption 4 is appropriate.
    - Consider a VSAM reorg and increase in CI/CA freespace because excessive CI/CA splits were found.
    - Consider additional VSAM buffers because excessive EXCPs were found.
    - Consider additional processors because zAAP on CP or zIIP on CP exists.*
    - Running a DB2 Explain when long-running SQL found.
- **Enhancements to the listener started task** to restrict TCP/IP stack monitoring to specific IP stacks based on a new configuration option.

Application Performance Analyzer: What's new in version 12? (Part 3)

- **Enhancements to the GUI plug-in include**:
    - Integration with z/OS Explorer credentials and connections.
    - Additional preferences to match those available in ISPF.
    - Support for mixed case password and password phrases.
    - Support for SSL.
    - Support for new logging level preferences of off and fatal.
    - Display warning/error message text along with the message number.
    - In the Observation List, separate the downloaded reports icon from the request number column into a new sortable column.
    - New Observation List column displays the number of days left to sample file deletion.
    - Sticky notes added in observations and individual reports.
    - Email a report.
    - Save/browse current view of report as HTML.
    - DB2 SQL extract (for input to DB2 or Visual Explain products).
    - Support for sample file import/export.
    - Produce PDF and XML reports on users' workstations.
    - Support for access to source stored in third-party repositories.

Agenda
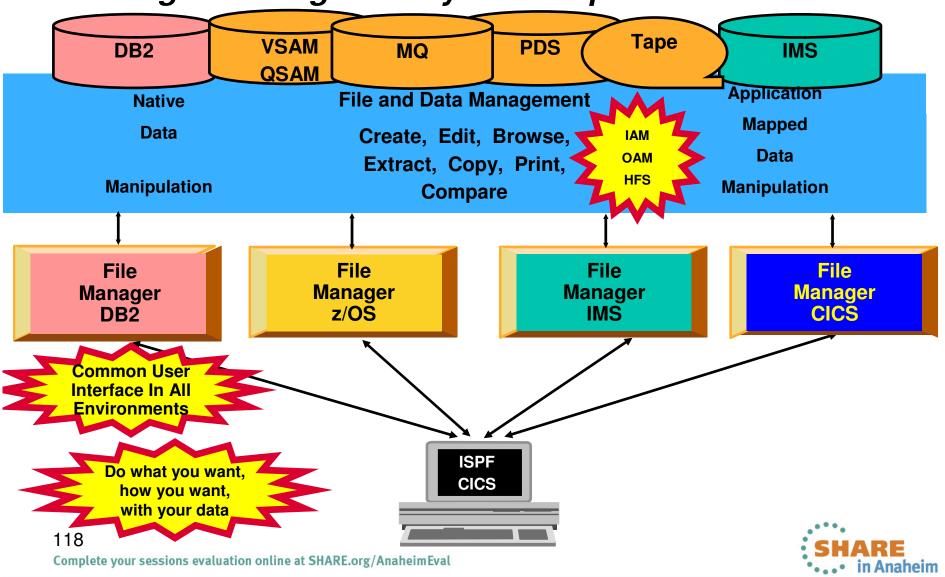
- Fault Analyzer
- Debug Tool
- Application Performance Analyzer
- File Manager
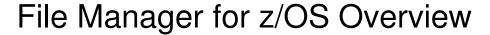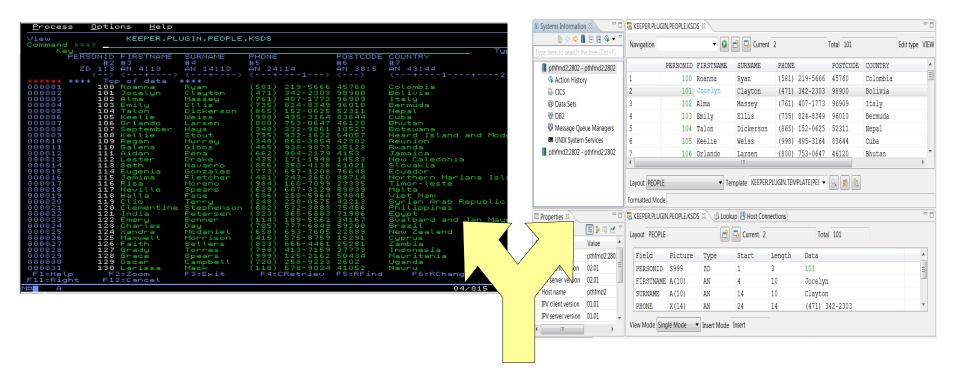
File Manager- Manage variety of Enterprise Data Structures

DB2	VSAM QSAM	MQ	PDS	Tape	IMS

Native Data Manipulation

File and Data Management

Create, Edit, Browse, Extract, Copy, Print, Compare

IAM OAM HFS

Application Mapped Data Manipulation

File Manager DB2	File Manager z/OS	File Manager IMS	File Manager CICS

Common User Interface In All Environments

Do what you want, how you want, with your data

ISPF CICS

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File Manager for z/OS Overview

- A toolset for working with z/OS, DB2, IMS, CICS and WebSphere MQ data.
- View, edit, update, create, copy, compare, and print data.
- Format data according to COBOL, PL/I and HLASM copybooks (template).
- ISPF interface since V1.1. Eclipse interface incrementally added since 2011.
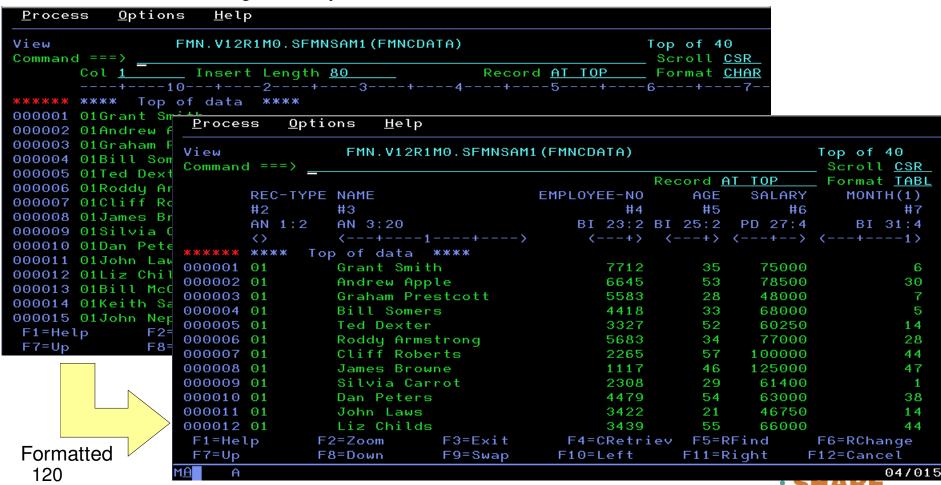
Your choice!

Why FM template? – Part 1

- Create a FM template using COBOL, PL/I or HLASM copybooks, or create interactively (dynamic templates).
- Formats data according to the layouts.

```
 Process    Options    Help

View                  FMN.V12R1M0.SFMNSAM1(FMNCDATA)              Top of 40
Command ===> _                                                   Scroll CSR
      Col 1       Insert Length 80              Record AT TOP    Format CHAR
      ----+----10---+----2----+----3----+----4----+----5----+----6----+----7--
****** **** Top of data ****
000001 01Grant Smith
000002 01Andrew A
000003 01Graham P      Process    Options    Help
000004 01Bill Som
000005 01Ted Dext     View              FMN.V12R1M0.SFMNSAM1(FMNCDATA)           Top of 40
000006 01Roddy Ar     Command ===> _                                           Scroll CSR
000007 01Cliff Ro                                       Record AT TOP     Format TABL
000008 01James Br        REC-TYPE NAME              EMPLOYEE-NO   AGE    SALARY   MONTH(1)
000009 01Silvia C        #2       #3                        #4    #5        #6         #7
000010 01Dan Pete        AN 1:2   AN 3:20           BI 23:2 BI 25:2 PD 27:4    BI 31:4
000011 01John Law        <>       <---+----1----+---->  <---+) <---+> <---+--> <---+----1>
000012 01Liz Chil   ****** **** Top of data ****
000013 01Bill McC   000001 01     Grant Smith          7712     35     75000          6
000014 01Keith Sa   000002 01     Andrew Apple         6645     53     78500         30
000015 01John Nep   000003 01     Graham Prestcott     5583     28     48000          7
 F1=Help      F2=   000004 01     Bill Somers          4418     33     68000          5
 F7=Up        F8=   000005 01     Ted Dexter           3327     52     60250         14
                    000006 01     Roddy Armstrong      5683     34     77000         28
                    000007 01     Cliff Roberts        2265     57    100000         44
                    000008 01     James Browne         1117     46    125000         47
                    000009 01     Silvia Carrot        2308     29     61400          1
                    000010 01     Dan Peters           4479     54     63000         38
                    000011 01     John Laws            3422     21     46750         14
                    000012 01     Liz Childs           3439     55     66000         44
 Formatted          F1=Help    F2=Zoom     F3=Exit    F4=CRetriev  F5=RFind     F6=RChange
 120                F7=Up      F8=Down     F9=Swap    F10=Left     F11=Right    F12=Cancel
                    MA    A                                                         04/015
```

Why FM template? – Part 2

- Create attributes – specify how data should be created.
- Scramble – specify how data should be scrambled during copy, import and export functions.
- Field mapping – specify which field corresponds to another in a different template.

Scrambled

The File Manager Plug-in Overview
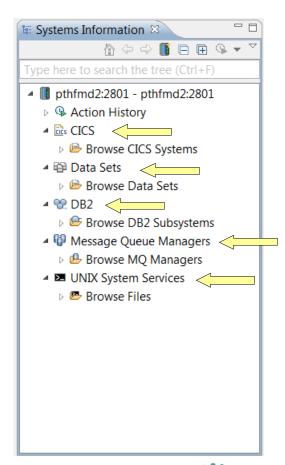
File Manager plug-in Overview

- It's all about making a variety of data easily accessible in a consistent way.

- Initial release: Base (data sets, USS files and MQ queues) in April 2011 (V11).

- CICS support added in October 2011 (V11).

- DB2 support in May 2012 (V12-only feature).

Base	DB2
Edit & Browse using templates	Edit & Browse using templates
Utility functions: •Allocate •Compare •Copy •Create •Print •View Load Module	Utility functions: •Copy •Create •Export •Import •Print
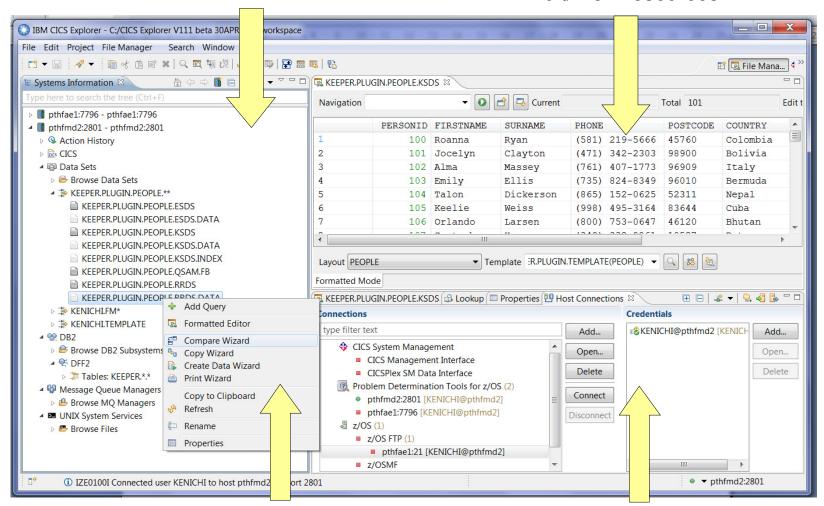
File Manager Perspective

Resource navigation

Edit/View resources
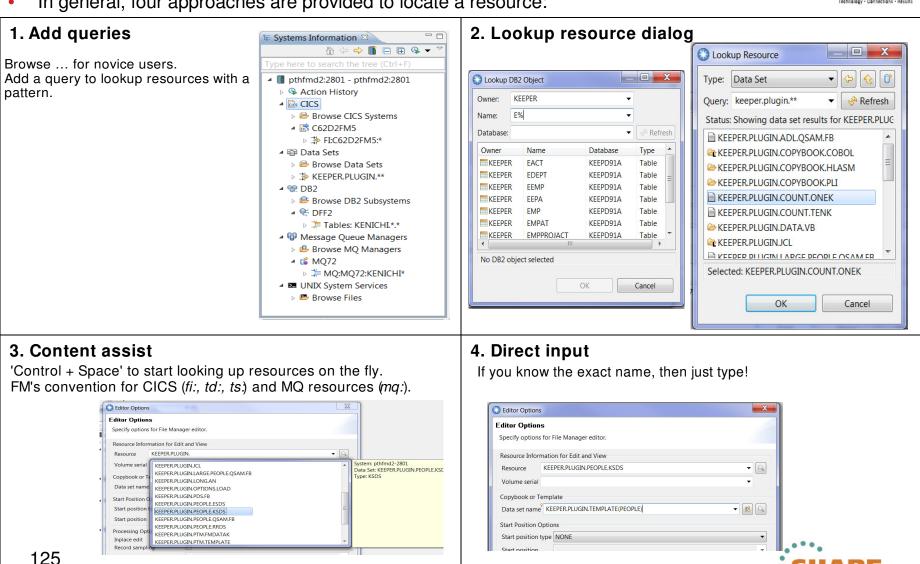
File Manager actions

Connections and credentials

Resource navigation

- In general, four approaches are provided to locate a resource:

1. Add queries Browse … for novice users. Add a query to lookup resources with a pattern. 	**2. Lookup resource dialog**
3. Content assist 'Control + Space' to start looking up resources on the fly. FM's convention for CICS (*fi:, td:, ts:*) and MQ resources (*mq:*). 	**4. Direct input** If you know the exact name, then just type!

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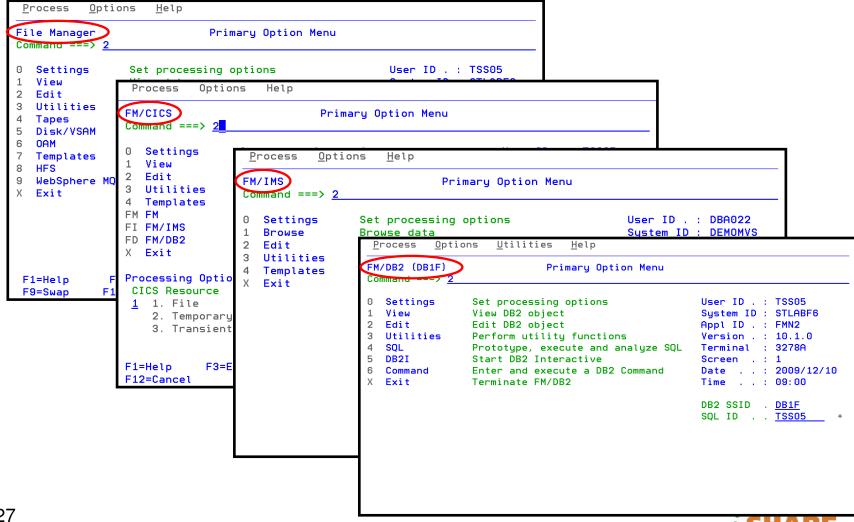
The File Manager ISPF Interface

File Manager
Inclusive of all environments

```
 Process    Options    Help

 File Manager                      Primary Option Menu
 Command ===> 2

 0   Settings         Set processing options          User ID . : TSS05
 1   View
 2   Edit
 3   Utilities
 4   Tapes
 5   Disk/VSAM
 6   OAM
 7   Templates
 8   HFS
 9   WebSphere MQ
 X   Exit


     F1=Help     F
     F9=Swap     F1
```

```
 Process    Options    Help

 FM/CICS                          Primary Option Menu
 Command ===> 2

 0   Settings
 1   View
 2   Edit
 3   Utilities
 4   Templates
 FM  FM
 FI  FM/IMS
 FD  FM/DB2
 X   Exit

 Processing Optio
   CICS Resource
   1  1. File
      2. Temporary
      3. Transient


 F1=Help     F3=E
 F12=Cancel
```

```
 Process    Options    Help

 FM/IMS                           Primary Option Menu
 Command ===> 2

 0   Settings         Set processing options          User ID . : DBA022
 1   Browse           Browse data                     System ID : DEMOMVS
 2   Edit
 3   Utilities
 4   Templates
 X   Exit
```

```
 Process    Options    Utilities    Help

 FM/DB2 (DB1F)                     Primary Option Menu
 Command ===> 2

 0   Settings     Set processing options         User ID . : TSS05
 1   View         View DB2 object                System ID : STLABF6
 2   Edit         Edit DB2 object                Appl ID . : FMN2
 3   Utilities    Perform utility functions      Version . : 10.1.0
 4   SQL          Prototype, execute and analyze SQL  Terminal  : 3278A
 5   DB2I         Start DB2 Interactive          Screen  . : 1
 6   Command      Enter and execute a DB2 Command  Date  . . : 2009/12/10
 X   Exit         Terminate FM/DB2               Time  . . : 09:00

                                                 DB2 SSID  . DB1F
                                                 SQL ID  . . TSS05      +
```

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- Use a copybook or template to format the display
- A COBOL or PL/I copybook, or an assembler DSECT can be used

```
EDIT        TSS12.ADLAB.COPYLIB(CUST1) - 01.00
Command ===> █
=COLS> ---1----+----2----+----3----+----4----+----5----+---
****** *********************************** Top of Data **********
000100 *    ------------------------------------------------
000200 *    Sample COBOL Copybook for IBM PD Tools Workshops
000300 *    Describes file <userid>.ADLAB.CUST1
000400 *    ------------------------------------------------
000500  01  CUST-REC.
000600     05  CUSTOMER-KEY.
000700        10  CUST-ID           PIC X(5).
000800     05  NAME                 PIC X(17).
000900     05  ACCT-BALANCE         PIC S9(7)V99  COMP-3.
001000     05  ORDERS-YTD           PIC S9(4)     COMP.
```

```
EDIT        TSS12.ADLAB.COPYLIB(PLCU1) - 01.00         Columns 000
Command ===> █                                          Scroll =
=COLS> ----+----1----+----2----+----3----+----4----+----5----+----6---
****** *************************** Top of Data ********************
000001  /*   ------------------------------------------------   */
000002  /*   SAMPLE PLI COPYBOOK FOR IBM PD TOOLS WORKSHOPS      */
000003  /*   DESCRIBES FILE <USERID>.ADLAB.CUST1                 */
000004  /*   ------------------------------------------------   */
000005  DCL 1 CUST_REC,
000006        2 CUSTOMER_KEY,
000007         3 CUST_ID         CHAR(5),
000008        2 NAME             CHAR(17),
000009        2 ACCT_BALANCE     FIXED DEC (9,2) UNALIGNED,
000010        2 ORDERS_YTD       FIXED BINARY(15,0) SIGNED UNALIGNED,
```

```
EDIT        TSS12.ADLAB.COPYLIB(ASCU1)
Command ===> █
=COLS> ----+----1----+----2----+----3
****** ***********************
000001 *------------------------------
000002 *    SAMPLE ASSEMBLER DSECT FOR
000003 *    DESCRIBES FILE <USERID>.AD
000004 *------------------------------
000005 CUST_REC    DSECT
000006 CUST_ID     DS CL5
000007 NAME        DS CL17
000008 ACCT_BAL    DS 5D
000009 ORDS_YTD    DS 4H
```

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Option 1 displays the view entry panel

```
 Process    Options    Help
 _____
 File Manager                    Primary Option Menu
 Command ===> 1

 0   Settings        Set processing options          User ID . : TSS12
 1   View            View data                       System ID : STLABF6
 2   Edit            Edit data                       Appl ID . : FMN
 3   Utilities       Perform utility functions       Version . : 10.1.0
 4   Tapes           Tape specific functions         Terminal. : 3278A
 5   Disk/VSAM       Disk track and VSAM CI functions  Screen. . : 1
 6   OAM             Work with OAM objects           Date. . . : 2010/05/19
 7   Templates       Template and copybook utilities Time. . . : 03:15
 8   HFS             Access Hierarchical File System
 9   WebSphere MQ    List, view and edit MQ data
 X   Exit            Terminate File Manager




 F1=Help        F2=Split      F3=Exit      F4=CRetriev  F7=Backward   F8
 F9=Swap       F10=Actions   F12=Cancel
```

Enter

Enter the name of the copybook, and specify the 1 (above) option
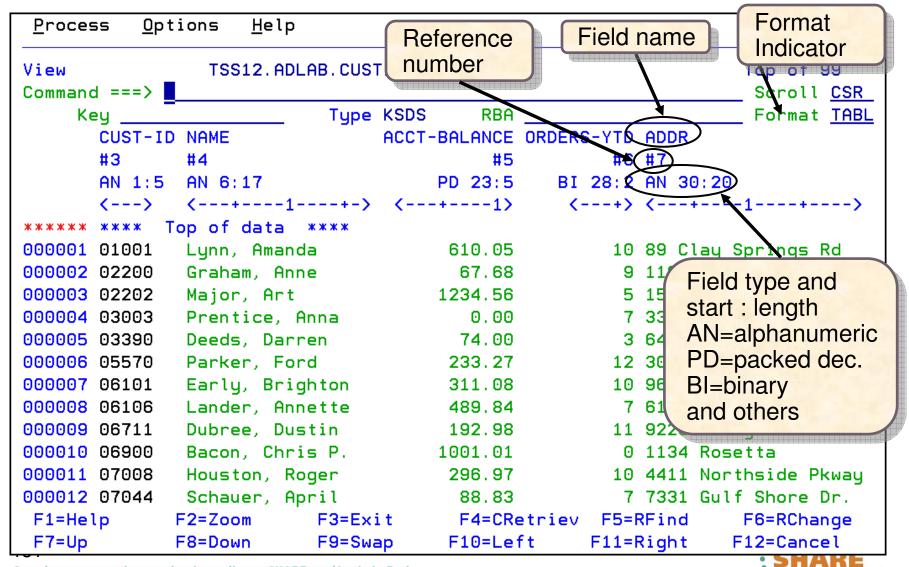
```
 Process    Options    Help
 _____
 File Manager                      View Entry Panel
 Command ===> _____

 Input Partitioned, Sequential or VSAM Data Set, or HFS file:
    Data set/path name ADLAB.CUST1.KSDS_____  +
    Member . . . . . . . _____    (Blank or pattern for member list)
    Volume serial  . .  _____      (If not cataloged)
    Start position . .  _____  +
    Record limit . . .  _____     Record sampling  _

 Copybook or Template:
    Data set name    . ADLAB.COPYLIB_____
    Member . . . . . . CUST1_____    (Blank or pattern for member list)
 Processing Options:
 Copybook/template    Start position type   Enter "/" to select option
 1  1. Above          _  1. Key             _   Edit template  _ Type (1,2,S)
    2. Previous           2. RBA             _   Include only selected records
    3. None               3. Record number   _   Binary mode, reclen 80___
    4. Create dynamic

  F1=Help      F2=Split     F3=Exit      F4=Expand    F7=Backward   F8
  F9=Swap      F10=Left     F11=Right    F12=Cancel              [ Enter ]
```

Records are formatted showing fields defined in the copybook

Reference number

Field name

Format Indicator

```
Process     Options    Help
─────────────────────────────────────────────────────────────────────
View                    TSS12.ADLAB.CUST              Top of 99
Command ===>                                          Scroll  CSR
     Key                     Type KSDS     RBA         Format  TABL
        CUST-ID NAME                  ACCT-BALANCE ORDERS-YTD ADDR
        #3      #4                         #5          #6 #7
        AN 1:5  AN 6:17                PD 23:5      BI 28:2 AN 30:20
        <--->   <---+----1----+->     <---+----1>   <---+> <---+----1----+---->
****** **** Top of data  ****
000001 01001  Lynn, Amanda          610.05     10 89 Clay Springs Rd
000002 02200  Graham, Anne           67.68      9 11
000003 02202  Major, Art           1234.56      5 15
000004 03003  Prentice, Anna          0.00      7 33
000005 03390  Deeds, Darren          74.00      3 64
000006 05570  Parker, Ford          233.27     12 30
000007 06101  Early, Brighton       311.08     10 96
000008 06106  Lander, Annette       489.84      7 61
000009 06711  Dubree, Dustin        192.98     11 922
000010 06900  Bacon, Chris P.      1001.01      0 1134 Rosetta
000011 07008  Houston, Roger        296.97     10 4411 Northside Pkway
000012 07044  Schauer, April         88.83      7 7331 Gulf Shore Dr.
 F1=Help      F2=Zoom      F3=Exit      F4=CRetriev  F5=RFind     F6=RChange
 F7=Up        F8=Down      F9=Swap      F10=Left     F11=Right    F12=Cancel
```

Field type and start : length
AN=alphanumeric
PD=packed dec.
BI=binary
and others

Some commands can use the field reference number

Command ===> f mann #4   [Enter]

This find command searches only field #4

```
View                 TSS12.ADLAB.CUST1.KSDS                        Chars  mann   found
Command ===> _____    Scroll  CSR
       Key 01001_____  Type KSDS      RBA 0_____    Format TABL
           CUST-ID NAME                  ACCT-BALANCE ORDERS-YTD ADDR
           #3      #4                            #5         #6 #7
           AN 1:5  AN 6:17                   PD 23:5    BI 28:2 AN 30:20
           <--->   <---+----1----+->        <---+----1>  <---+> <---+----1---+---->
000001 01001   Lynn, Amanda                   610.05        10 89 Clay Springs Rd
000002 02200   Graham, Anne                    67.68         9 119 North Lake Road
000003 02202   Major, Art                    1234.56         5 1512 Pine Bluff
000004 03003   Prentice, Anna                   0.00         7 33 Renshaw
000005 03390   Deeds, Darren                   74.00         3 649 Brown Street
000006 05570   Parker, Ford                   233.27        12 3039 Manning St.
000007 06101   Early, Brighton                311.08        10 9662 Summit Road
000008 06106   Lander, Annette                489.84         7 6127 Cedar Street
000009 06711   Dubree, Dustin                 192.98        11 9229 Delegate's Row
000010 06900   Bacon, Chris P.               1001.01         0 1134 Rosetta
000011 07008   Houston, Roger                 296.97        10 4411 Northside Pkway
000012 07044   Schauer, April                  88.83         7 7331 Gulf Shore Dr.
000013 07077   Mann, Mr. E.                   621.05         1 24 Valentine Rd
 F1=Help       F2=Zoom       F3=Exit         F4=CRetriev  F5=RFind     F6=RChange
 F7=Up         F8=Down       F9=Swap         F10=Left     F11=Right    F12=Cancel
```

match found

Out of scope

SHARE in Anaheim 2012

Utilities

- Search for/change Test data generation
  - Generate new data based on existing copybooks
- Copy data
  - Reformat and generate data while copying
  - Field values can be "**scrambled**" to protect sensitive data
  - Copy data into XML format
- Global Find/Change data across members in a PDS(E)
  - Perform a new search based on the results of a previous search
- Compare
  - Compare records/fields between files
  - Use field level mapping for comparison criteria
  - Special options for load module comparisons
- Websphere MQ support

File Manager for z/OS V12.1

- **File Manager plug-in enhancements include**:
  - Support for manipulating data stored in z/OS data sets and UNIX System Services files, WebSphere MQ queues, CICS files, Transient Data queues, Temporary Storage queues, and DB2 databases.
  - Template editor enhancements for field-mapping support and easier invocation from dialogs and wizards.
- **File Manager Base is enhanced with**:
  - Formatted KSDS key
  - Picture support for edit and find/change command
  - WebSphere MQ 7.1 toleration
- **File Manager DB2 enhancements include**:
  - The SQL SELECT Statement Advanced Prototyper now supports DB2 V10 syntax.
  - The Object List utility shows columns added in DB2 V10.
  - The SQL Reverse Engineering code works with DB2 V10 systems.
  - Support is added for TIMESTAMP(n) and TIMESTAMP(n) WITH TIME ZONE data types.
  - An installation option is added to disable the use of DB2 scrollable cursors by the FM/DB2 editor, and to set a maximum for the number of rows in editor sessions.
  - Documentation of error messages used by the DB2 component is improved.

- **File Manager IMS is enhanced to support IMS V12**.

Get more information about these tools at:

www.ibm.com/software/awdtools/deployment

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- Workload Simulator for z/OS and OS/390

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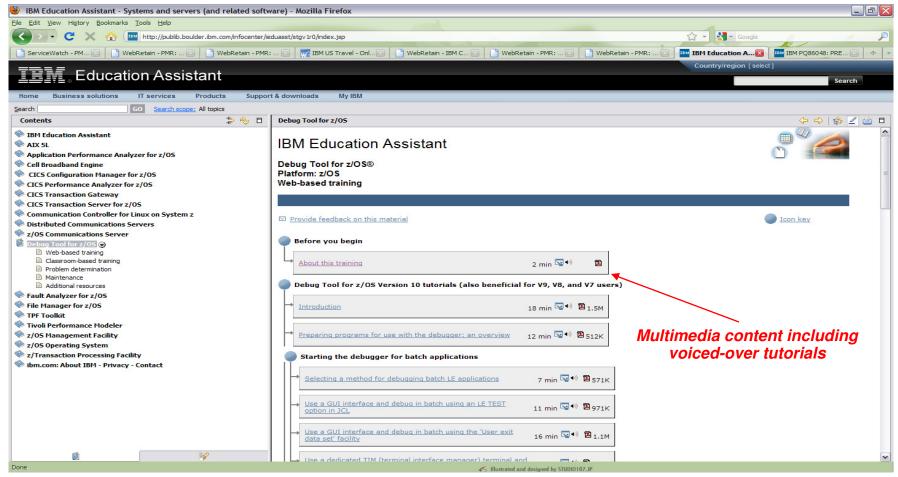
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