# System z  COBOL Application Development and CICS Update

## IBM Problem Determination Tools:
### Fault, Edit, Debug, Test, and Tuning

**Dan Brown**
**IBM z Systems  AD/CICS Tools**
**browndan@us.ibm.com**

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# Agenda

## IBM File Manager for z/OS™

- Data management tool supporting key file structures like VSAM, DB2™, and IMS™

## IBM Fault Analyzer for z/OS™

- Helps you rapidly pinpoint cause of failed application (abends)

## IBM Debug Tool Utilities & Advanced Functions for z/OS™

- Source code debugging to improve development productivity

## IBM Workload Simulator for z/OS and OS/390™

- Regression and Load testing of interactive z/OS™ applications

## IBM Application Performance Analyzer™

- Monitor performance at the application level

# Agenda

## IBM File Export for z/OS™

- Export and import related sets of DB2, IMS, VSAM and sequential data

## Application Time Facility (aka TicToc)

- Enables date/time simulation in the mainframe environment

## IBM ISPF Productivity Tool™Version 5.8 (Spiffy)

- Turbo charge ISPF users

## Rational Function Tester Extension™

- Workstation-based regression testing of interactive z/OS applications

## Rational Performance Tester for z/OS™

- Harnesses the power of z/OS to validate web application scalability *before* deployment

# PD Tools

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**IMS V9**
**DB2 V8**
**CICS™ TSV3.1**

**WASz**

**Fault Analyzer V6**

**File Manager V6**

**WDDz**

**File Export**

**Debug Tool Utilities AF V6**

**COBOL™ Modernization**

**Application Time Facility**

**ISPF Productivity Tool**

**WASz**

**Workload Simulator**
**Rational Functional Tester Ext**
**Rational Performance Tester z/OS**

**E2E Performance**

**Application Performance Analyzer (APA)**

# *IBM File Manager for z/OS*

## Use it to:

- Work with data in files, DB2 tables, and IMS databases
- Browse and edit data directly
- Easily copy, modify, reformat, and compare data

## Key Features:

- Advanced data Edit and Browse      **No limit to file size!**
  - Uses familiar ISPF edit commands
  - Powerful data formatting and selection capabilities
- A robust set of utilities to create, copy, find, compare, and modify data
- Work with data in friendly formats
  - Use a copybook or user-defined "template" to format records

# *IBM Fault Analyzer for z/OS*

## Use it to:

- Understand why an application abended
- Get information you need to diagnose and fix a problem

## Key Features:

- Automatic real-time capture of diagnostic information
- Automatic analysis and reporting of application abends
  - FA can pinpoint an abend to the program and source statement
- Interactive, point-and-shoot navigation of abend information
  - Quickly navigate to information you need, even in large, complex applications

# *IBM Debug Tool and Advanced Functions for z/OS*

## Use it to:

- Interactively debug an application program while it runs
  - Step through source statements, set "breakpoints" and run, monitor and change program variables
- Modernize COBOL programs written for older compilers

## Key Features:

- Debug COBOL, PLI, C, C++, and Assembler programs
- Support for batch, CICS, IMS, DB2, and DB2 stored procedure programs
- Set simple or conditional breakpoints; or run a script at a breakpoint
- Gives you the ability to trap and repair abends
- Intuitive GUI interface using WDDZ
- COBOL Conversion Utility

# *IBM Workload Simulator for z/OS*

## Use it to:

- Automatically simulate online user(s) on the system
- Perform automated functional testing
- Perform regression testing of online applications
- Perform Load and Performance testing
- Automated large volume data entry script

## Key Features:

- Automatically capture test scripts from a live session
- Powerful scripting language
- Easy-to-use ISPF interface
- Organizes your testing scripts, projects, and results

# *IBM Rational Function Tester Extension for z/OS*

## Use it to:

- Automatically simulate online user(s) on the system
- Drive simulations from a workstation
- Perform regression testing of online applications

## Key Features:

- An extension to Rational Functional Tester
- Automatically capture test scripts from a live session
- Powerful scripting language
- GUI interface
- Organizes your testing scripts and results

# *IBM Rational Performance Tester for z/OS*

## Use it to:

– To validate system performance

–  To determine maximum system capacity

–  To identify and resolve performance problems

**WASz**

## Key Features:

– A highly scalable architecture, allowing larger tests to be run with less hardware

– A graphical schedule editor for workload and user population modeling

– Automated test creation via recording

– Test-time reporting on response time and throughput

– A graphical test editor, easily usable by novices and experts alike

# *File Export for z/OS*

## Use it to:

- Copy selected data from a related collection of data stores
- Migrate data to new environments
- Define application relationships between data in multiple files and databases

## Key Features:

- flexible data selection and transformation rules
- Support for DB2, IMS, and MVS™ data in one product
- SQL-like definition of application relationships

# *Application Performance Analyzer*

## <u>Use it to:</u>

- Monitor an application while it is running
- Pinpoint the cause(s) of bad application performance, right down to the line of source code
- Capture and report application system resource consumption, (ie. file access, DB2 SQL, CPU cycles, etc.)

## <u>Key Features:</u>

- Intuitive online ISPF interface
- Monitor application programs at the source level
- Support for batch, CICS, DB2, IMS, MQ

# *Application Time Facility (aka TicToc)*

## Use it to:

- Shift the time zone for an online region so users will see their local time

- Re-execute a failed job at the "right" time

- Test applications at end-of-period or sensitive times

## Key Features:

- a simple ISPF interface where you can easily specify jobs or groups to receive simulated dates

- Support for batch, CICS, LE, IMS, IDMS, IDEAL, DB2, and NATURAL

- handles a complete set of date formats and services

# IBM File Manager

# *What is File Manager?*

- **A comprehensive set of tools for working with z/OS data**

- **These tools allow you to:**

  - Manage QSAM, VSAM, IAM, OAM, DB2 and IMS data

  - Display and report data in friendly formats

  - Create, Copy, Modify, and Reformat data

  - Find and fix data in a file or database

# *File Manager Functional Overview*
# *File Manager is delivered as one product with three components ---- MVS, DB2 and IMS*

DB2  VSAM  QSAM  PDS  Tape  IMS

**File and Data Management**

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

**File Manager DB2**

**File Manager MVS**

**File Manager IMS**

**ISPF**

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

- **File Manager Features:**
  - Work with data in files, DB2 tables and IMS databases
  - ISPF-like Panels
  - Full Function Browse And Edit
  - Multiple Modes Of Edit And Browse
    - Table
    - Single
  - Flexible Selection Criteria
  - Copy
  - File Reformatting
  - Global Search And Updated Capability
  - Print
  - Compare
  - No file limit size!

# *The most-used functions in File Manager*

## ■ EDIT and BROWSE

- – Directly and interactively work with data in a file or database

## ■ COPY

- – Easily select records / rows to be copied

- – *Automatically* reformat record layouts during copy

- – Powerful capabilities to modify data during copy

## ■ COPYBOOK MAP

# *The most-used functions*

- **Global FIND / CHANGE**

  - Search for / change data across members in a PDS(E) or in a file

- **COMPARE**

  - Compare records/fields between files

  - Select fields to be compared

  - Map fields between files with different layouts

# *The most-used functions*

- **PRINT**
    - Select records and fields
    - format a report

- **SQL Prototyping (DB2)**
    - Powerful facilities to help code and test SQL statements

- **EXPORT / IMPORT (DB2)**

- **UNLOAD / LOAD (IMS)**

# *File Manager EDIT and BROWSE:*

- **Uses familiar ISPF-edit commands**

  - If you know how to use ISPF Edit, then FM Edit will be familiar

- **Edit a single record to an entire file/database**

  - Edit files or IMS databases of <u>unlimited</u> size

  - Customers tell us that FM lets them edit larger files than competing software!

Process    Options    Help

```
File Manager                    Primary Option Menu
Command ===> 2

0    Settings         Set processing options           User ID . : DBA022
1    Browse           Browse data                      System ID : DEMOMVS
2    Edit             Edit data                        Appl ID . : FMN
3    Utilities        Perform utility functions        Version . : 6.1.0
4    Tapes            Tape specific functions          Terminal. : 3278
5    Disk/VSAM        Disk track and VSAM CI functions Screen. . : 1
6    OAM              Work with OAM objects            Date. . . : 2005/12/09
7    Templates        Create, edit, or update templates Time. . . : 06:40
8    HFS              Access Hierarchical File System
X    Exit             Terminate File Manager
```

**Enter**

IBM

# Edit – with a copybook

Process     Options     Help

File Manager                    Edit Entry Panel
Command ===> _____

Input Partitioned, Sequential or VSAM Data Set, or HFS file:
    Data set/path name  'DBA022.FMDEMO.VSAM'                          +
    Member . . . . . .  _____        Blank or pattern for member list
    Volume serial  . .  _____           If not cataloged
    Start position . .  _____ +
    Record limit . . .  _____        Record sampling  [ / ]
    Inplace edit . . .  _                Prevent inserts and deletes
Copybook or Template:
    Data set name  .  'DBA022.FMDEMO.TEMPLATE'
    Member . . . . . .  DEMODATA        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 _____
       4. Create dynamic                      _   Create audit trail

Enter

# Edit – with a copybook

```
 Process    Options    Help

 File Manager Edit DNET074.GEO2004.COUNTRY
 Command ===> █_____  Scroll CSR
                                                                Format TABL
         GEO-KEY           REC-TYPE CTRY-CODE INTERNET          POPULATION LATITUD
         #2                #3       #4        #5                        #6 #7
         AN 1:14           AN 15:1  AN 16:3   AN 19:4              BI 23:8 AN 31:6
         <---+----1---> -           <->       <-->        <---+----1---+----> <---+>
 000000 ****  Top of data  ****
 000001 AFGHANISTAN    A         AFG       .AF               28513677 33:00N
 000002 ALBANIA        A         ALB       .AL                3544808 41:00N
 000003 ALGERIA        A         DZA       .DZ               32129324 28:00N
 000004 AMERICAN SAMOA A         ASM       .AS                  57902 14:20S
 000005 ANDORRA        A         AND       .AD                  69865 42:30N
 0                               AGO       .AO               10978552 12:30S
 0                               AIA       .AI                  13008 18:15N
 0                               ATA       .AQ                      0 90:00S
 000009 ANTIGUA AND BA A         ATG       .AG                  68320 17:03N
 000010 ARGENTINA      A                                                  :00S
 000011 ARMENIA        A                                                  :00N
 000012 ARUBA          A                                                  :30N
 000013 ASHMORE AND CA A                                              0 12:14S
 000014 AUSTRALIA      A         AUS       .AU               19913144 27:00S
```

**Use familiar ISPF editor commands**

**And FM provides powerful new commands to work with and format data**

# *Edit – Find command example*

File Manager Edit DNET[                    Enter            ]RY

Command ===> F PAL #2 ▮                                    Chars PAL found

                                                                    Scroll CSR
                                                                    Format TABL

```
          GEO-KEY          REC-TYPE CTRY-CODE INTERNET        POPULATION LATITUD
          #2               #3       #4        #5                      #6 #7
          AN 1:14          AN 15:1  AN 16:3   AN 19:4         BI 23:8 AN 31:6
          <---+----1--->   -        <->       <-->            <---+----1---+----> <---+>
000170 NEPAL              A         NPL       .NP              27070666 28:00N
000171 NETHERLANDS        A         NLD       .NL              16318199 52:30N
000172 NETHERLANDS AN A             ANT       .AN               218126 12:15N
000173 NEW CALEDONIA  A             NCL       .NC               213679 21:30S
000174 NEW ZEALAND    A             NZL       .NZ              3993817 41:00S
000175 NICARAGUA      A             NIC       .NI              5359759 13:00N
000176 NIGER          A             NER       .NE             11360538 16:00N
000177 NIGERIA        A             NGA       .NG            137253133 10:00N
000178 NIUE           A             NIU       .NU                 2156 19:02S
000179 NORFOLK ISLAND A             NFK       .NF                 1841 29:02S
000180 NORTHERN MARIA A             MNP       .MP                78252 15:12N
000181 NORWAY         A             NOR       .NO              4574560 62:00N
000182 OMAN           A             OMN       .OM              2903165 21:00N
000183 PAKISTAN       A             PAK       .PK            159196336 30:00N
000184 PALAU          A             PLW       .PW                20016 07:30N
```

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# Edit – Single Record Format

```
File Manager Edit DNE
Command ===> FS ▮            00001 COUNTRY

                                                    Scroll  CSR
                                                    Format  SNGL
Current type is COUNTRY

                            Top Line is 3    of 137    in Record 170

Ref Field      Picture     Typ Start   Len    Data
 2   2 GEO-KEY
              X(14)         AN     1    14     NEPAL
 3   2 REC-TYPE
              X             AN    15     1     A
 4   2 CTRY-CODE
              X(3)          AN    16     3     NPL
 5   2 INTERNET
              X(4)          AN    19     4     .NP
 6   2 POPULATION
              9(11)         BI    23     8     27070666
 7   2 LATITUDE
              X(6)          AN    31     6     28:00N
 8   2 LONGITUDE
              X(7)          AN    37     7     084:00E
 9   2 REGION
 F1=Help       F2=Zoom        F3=Exit      F4=CRetriev  F5=RFind     F6=RChange
 F7=Up         F8=Down        F9=Swap      F10=Previous F11=Next     F12=Cancel
```

**Enter**

**IBM**

# Edit – Find Fields in Error Command

```
File Manager Edit DNET074.              Enter
Command ===> fe (#11 #12)                        RY
                                                          1 errors found
                                                          Scroll CSR
                                                          Format TABL
        LATITUDE LONGITUDE REGION          TOTAL-AREA-SQ-KM LAND-AREA-SQ-KM
        #7       #8        #9                          #11             #12
        AN 31:6  AN 37:7   AN 44:16              PD 60:6         PD 66:6
        <---+>   <---+->   <---+----1----+>   <---+----1->   <---+----1->
000212 04:35S   055:40E   AFRICA            ************           455
000213 08:30N   011:30W   AFRICA                   71740         71620
000214 01:22N   103:48E   SOUTHEAST ASIA             693           683
000215 48:40N   019:30E   EUROPE                   48845         48800
000216 46:07N   014:49E   EUROPE                   20273         20151
000217 08:00S   159:00E   OCEANIA                  28450         27540
000218 10:00N   049:00E   AFRICA                  637657        627337
000219 29:00S   024:00E   AFRICA                 1219912       1219912
                                                    3903          3903
000221 40:00N   004:00W   EUROPE                  504782        499542
000222 08:38N   111:55E   SOUTHEAST ASIA               5             5
000223 07:00N   081:00E   ASIA                     65610         64740
000224 15:00N   030:00E   AFRICA                 2505810       2376000
 F1=Help       F2=Zoom      F3=Exit     F4=CRetriev  F5=RFind    F6=RChange
 F7=Up         F8=Down      F9=Swap     F10=Left     F11=Right   F12=Cancel
```

**Scan for invalid data in numeric fields**

System z Application Development Tools

# Specifying selection criteria

```
 Process    Options    Help
_____

File Manager Edit DNET074.GEO2004.COUNTRY
Command ===> _____  Scroll CSR
                                                        Format TABL
          GEO-KEY          REC-TYPE CTRY-CODE INTERNET        POPULATION LATITUD
          #2               #3       #4        #5                     #6 #7
          AN 1:14          AN 15:1  AN 16:3   AN 19:4             BI 23:8 AN 31:6
          <---+----1--->   -        <->       <-->      <---+----1---+---->  <---+>
000000 ****  Top of data  ****
- - -  - - - - - - - - - - - - - - - - - - - - - - - - - 169 Line(s) not selected
000170 NEPAL            A        NPL       .NP             27070666 28:00N
000171 NETHERLANDS      A        NLD       .NL             16318199 52:30N
- - -  - - - - - - - - - - - - - - - - - - - - - - - - - 9 Line(s) not selected
000181 NORWAY           A        NOR       .NO              4574560 62:00N
- - -  - - - - - - - - - - - - - - - - - - - - - - - - - 82 Line(s) not selected
000264 ****  End of data  ****
```

**Selected records are displayed**

IBM

# *File Manager MVS Utilities*

```
 Process    Options    Help

File Manager                  Utility Functions
Command ===> 11█

0    DBCS          Set DBCS data format for print
1    Create        Create data
2    Print         Print data
3    Copy          Copy data
4    Dslist        Catalog services
5    VTOC          Work with VTOC
6    Find/Change   Search for and change data
7    AFP           Browse AFP data
8    Storage       Browse user storage
9    Printdsn      Browse File Manager print data set
10   Loadlib       View load module information
11   Compare       Compare data
12   Audit trail   Print audit trail report
13   Copybook      View and Print




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

System z Application Development Tools

# FM / DB2 Primary Option Menu

Process     Options     Utilities     Help

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

0    Settings        Set processing options          User ID . : DBA022
1    Browse          Browse DB2 table or view        System ID : DEMOMVS
2    Edit            Edit DB2 table                  Appl ID . : FMN2
3    Utilities       Perform utility functions       Version . : 6.1.0
4    SQL             Prototype, execute and analyze SQL   Terminal  : 3278
5    DB2I            Start DB2 Interactive           Screen  . : 1
X    Exit            Terminate FM/DB2                Date  . . : 2005/12/09
                                                     Time  . . : 11:52

                                                     DB2 SSID  . DSNA
                                                     SQL ID  . . DBA022
```

# File Manager for DB2 Edit/Browse

```
 Process    Options   Utilities   Help
─────────────────────────────────────────────────────────────────
FM/DB2 (DF52)                        DB2 Edit
Command ===> _____

Specify the DB2 Object:
   Location  . . . . .  _____    Database . . _____  (optional)
   Owner . . . . . . .  ALLANT_____      Table space _____  (optional)
   Name  . . . . . . .  *_____

   Row count . . . . .  100_____    Number of rows to edit

Template:
   Data set name . . .  'ALLANT.TEMPLATE'_____
   Member  . . . . . .  EMP_____

Processing Options:
   Template usage              Enter "/", "A"lways to select option
   1   1. Above                   _   Edit options
       2. Previous                /   Edit template
       3. Generate from table     _   Re-edit template
       4. Generate/Replace
```

# *File Manager for DB2 Edit/Browse*

Process     Options     Utilities     Help

```
FM/DB2 (DF52)                  Table Edit           5 string(s) changed
Command ===> _____   Scroll  CSR
TABLE ALLANT.EMP                                         Format  TABL
       EMPNO   LASTNAME          FIRSTNME       JOB       HIREDATE    WORKDEPT PHONEN
       #1      #4                #2             #8        #7          #5       #6
       CH(6)   VARCHAR(15)       VARCHAR(12)    CH(8)     DATE        CH(3)    CH(4)
       <---+>  <---+----1---->   <---+----1->   <---+-->  <---+--->   <->      <-->
000000 ****  Top of data  ****
000001 000010 HAAS<            CHRISTINE<     PRES      01.01.1965 C11█        3978
000002 000060 STERN<           IRVING<        MANAGER   14.09.1973 A00        6423
000003 000110 LUCCHESI<        VINCENZO<      SALESREP  16.05.1958 A00        3490
000004 000120 O'CONNELL<       SEAN<          CLERK     05.12.1963 A00        2167
000005 000130 QUINTANA<        DOLORES<       ANALYST   28.07.1971 C11        4578
000006 000140 NICHOLLS<        HEATHER<       ANALYST   15.12.1976 C11        1793
000007 000160 PIANKA<          ELIZABETH<     DESIGNER  11.10.1977 C11        3782
000008 000170 YOSHIMURA<       MASATOSHI<     DESIGNER  15.09.1978 A00        2890
000009 000200 BROWN<           DAVID<         DESIGNER  03.03.1966 A00        4501
000010 000210 JONES<           WILLIAM<       DESIGNER  11.04.1979 C11        0942
000011 000220 LUTZ<            JENNIFER<      DESIGNER  29.08.1968 A00        0672
000012 200010 HEMMINGER<       DIAN<          SALESREP  01.01.1965 A00        3978
000013 200120 ORLANDO<         GREG<          CLERK     05.05.1972 A00        2167
000014 ****  End of data  ****
```

File Manager for DB2 Utilities
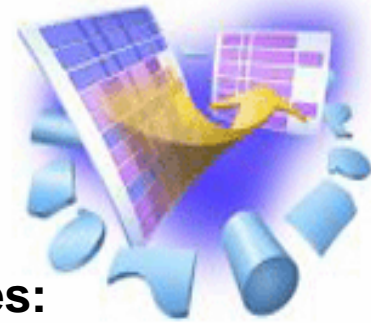
```
 Process    Options    Utilities    Help
─────────────────────────────────────────────────────────────────
FM/DB2 (DF52)                    Utility Functions
Command ===> 3

 1  Print         Print DB2 table or view
 2  Objects       Create and drop DB2 objects
 3  Copy          Copy data within DB2
 4  Object List   Display and process DB2 object lists
 5  Privileges    Manage DB2 privileges
 6  Import        Import sequential or VSAM data into DB2
 7  Export        Export DB2 data to sequential or VSAM data set
 8  Create        Create DB2 test data
 9  Utilities     DB2 utility job generation
10  Audit trail   Print audit trail report
11  Print browse  Browse FM/DB2 print data set
```

# File Manager Summary

- **One product, 3 environments: MVS, DB2, IMS**

- **Modes Of Operation**

  - Interactive

  - Batch

- **Supported Data Types**

  - QSAM / PDS(E)

  - VSAM / IAM

  - DB2

  - IMS

  - Physical Disk / Tape Records

- **File Manager Features:**

  - Familiar ISPF-like Panels

  - Powerful Browse And Edit

  - Customizable Data Display and Formatting

  - Flexible Record and Field Selection Criteria

  - Copy

  - File / Database Update

  - File / Database Reformatting

  - Global Search And Updated Capability

  - Print

  - Compare

  - Export / Import

# IBM Fault Analyzer

# *What is Fault Analyzer ?*

- **A tool that helps you determine the cause of an application abend**

  - so you can more quickly identify and resolve the problem

- **It provides information about an application when it has abended, to help you assess:**

  - What happened, and why?

  - What program?

  - What line of source code?
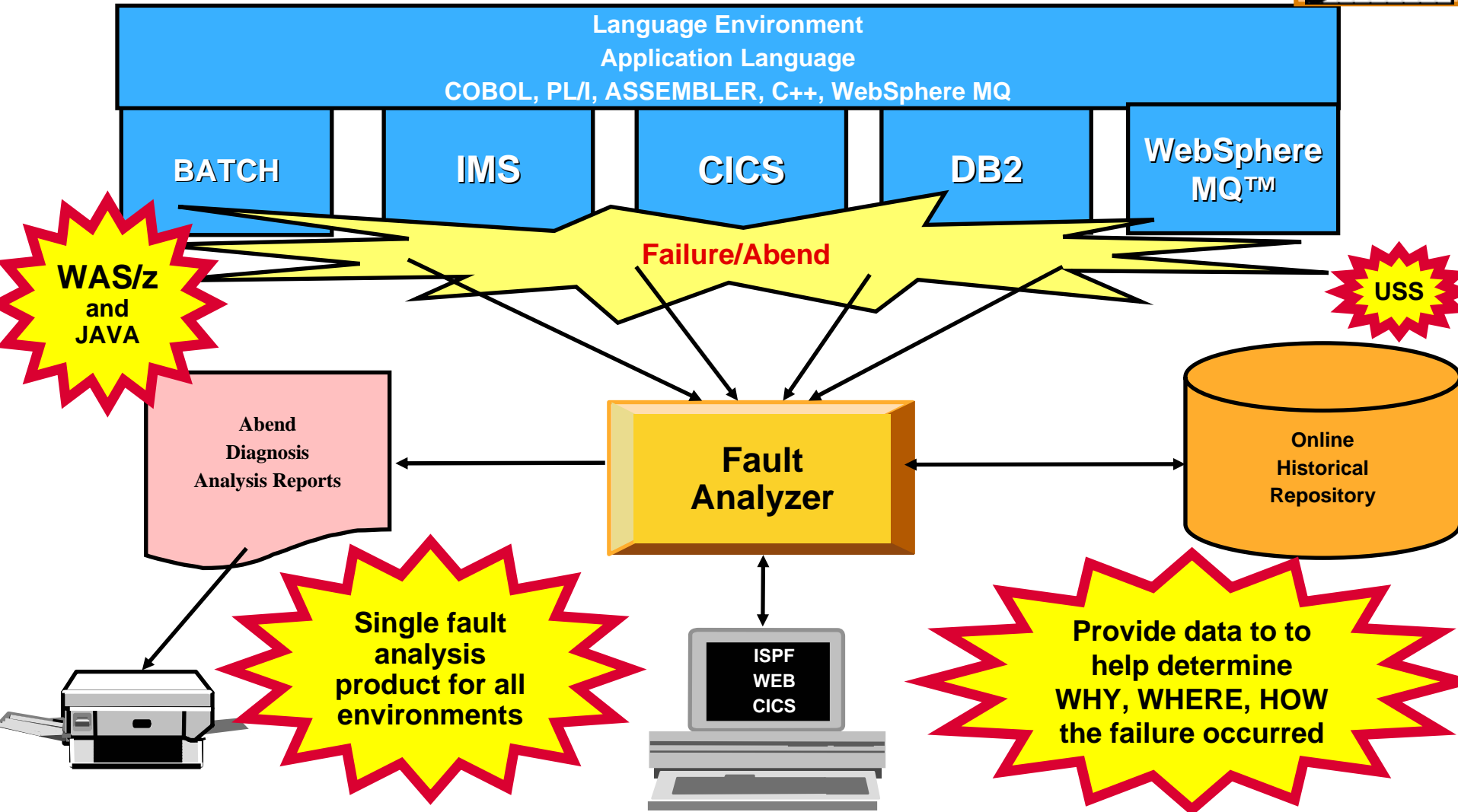
  - What source variables were involved?

# *What Functions does Fault Analyzer have ?*

- **Real-Time Analysis**

  - Automatic analysis and report generation

  - Automatic captures of detailed application data for later interactive analysis

- **Reanalysis**

  - Point-and-shoot navigation of an abend

  - Apply program source data after an abend *without re-creating the abend*

# Fault Analyzer - *Helps you rapidly pinpoint why and where an enterprise application failed - and offers suggestions on how to resolve*

Improve

**Language Environment**
**Application Language**
**COBOL, PL/I, ASSEMBLER, C++, WebSphere MQ**

| BATCH | IMS | CICS | DB2 | WebSphere MQ™ |
|---|---|---|---|---|

**Failure/Abend**

**WAS/z and JAVA**

**USS**

**Abend Diagnosis Analysis Reports**

**Fault Analyzer**

**Online Historical Repository**

**Single fault analysis product for all environments**

**ISPF WEB CICS**

**Provide data to to help determine WHY, WHERE, HOW the failure occurred**

# *A familiar occurrence…*

**Oooops!  The application abended.**

```
   Display  Filter  View  Print  Options
---------------------------------------------------
 SDSF OUTPUT DISPLAY DNET074R JOB06769  DSID     2 LINE 0      COLUMNS 02  81
 COMMAND INPUT ===> █                                         SCROLL ===> CSR
********************************* TOP OF DATA *********************************
                     J E S 2   J O B   L O G  --  S Y S T E M   M V S A  --  N O D E

11.32.09 JOB06769 ---- SATURDAY,  30 APR 2005 ----
11.32.09 JOB06769  IRR010I  USERID DNET074  IS ASSIGNED TO THIS JOB.
11.32.09 JOB06769  ICH70001I DNET074  LAST ACCESS AT 11:31:57 ON SATURDAY, APRIL
11.32.09 JOB06769  $HASP373 DNET074R STARTED - INIT 2   - CLASS A - SYS MVSA
11.32.09 JOB06769  IEF403I DNET074R - STARTED - TIME=11.32.09
11.32.11 JOB06769  +IDI0001I Fault Analyzer V5R1M0 (UK00798 2005/02/23) invoked
11.32.13 JOB06769  +IDI0002I Module SAM2, program SAM2, source line # 157: Abend
11.32.14 JOB06769  +IDI0003I Fault ID F00053 assigned in history file FAULTANL.V
11.32.14 JOB06769  IEF450I DNET074R RUNSAM1 - ABEND=S0C7 U0000 REASON=00000007
    638                       TIME=11.32.14
11.32.14 JOB06769  -                                          --TIMINGS (MINS.)--
11.32.14 JOB06769  -JOBNAME  STEPNAME PROCSTEP    RC   EXCP     CPU     SRB   CLOCK
11.32.14 JOB06769  -DNET074R          RUNSAM1   *S0C7  1666     .01     .00     .08
11.32.14 JOB06769  IEF404I DNET074R - ENDED - TIME=11.32.14
11.32.14 JOB06769  -DNET074R ENDED.  NAME-                     TOTAL CPU TIME=
11.32.14 JOB06769  $HASP395 DNET074R ENDED
------ JES2 JOB STATISTICS ------
 30 APR 2005 JOB EXECUTION DATE
         26 CARDS READ
      2,100 SYSOUT PRINT RECORDS
          0 SYSOUT PUNCH RECORDS
        138 SYSOUT SPOOL KBYTES
       0.08 MINUTES EXECUTION TIME
          1 //DNET074R JOB REGION=4M,
         // TIME=(1),MSGCLASS=H,NOTIFY=DNET074,MSGLEVEL=(1,1)
```

Fault Analyzer captured information and produced a Real-Time Analysis report.

# *How do I view the Real-Time Analysis report?*

- **The real time report can be viewed from SYSOUT (for a batch job)**

- **Or, for any abend, the report can be viewed from the Online Interface**

# An example of a Fault Analyzer Report

```
   Display   Filter   View   Print   Options   Help
 -----------------------------------------------------------------------
 SDSF OUTPUT DISPLAY DNET074R JOB06769   DSID    106 LINE 1        COLUMNS 02- 81
 COMMAND INPUT ===> █                                              SCROLL ===> HALF
 ***********************************************************************************
 * IBM Fault Analyzer for z/OS V5R1M0 (UK00798 2005/02/23)                        *
 *                                                                                *
 * (C) Copyright IBM Corp. 2000, 2005.  All rights reserved.                      *
 ***********************************************************************************

 JOBNAME: DNET074R   SYSTEM ABEND: 0C7                  DEMOMVS    2005/04/30  11:32:11


 <H1> 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'640'.

 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 #
   ------
   000157                            COMPUTE CUST-ACCT-BALANCE =
   000158                                CUST-ACCT-BALANCE + WS-UPDATE-NUM
```

# An example of a Fault Analyzer Report

```
   Display  Filter  View  Print  Options  Help
 ------------------------------------------------------------------------
 SDSF OUTPUT DISPLAY DNET074R JOB06769   DSID    106 LINE 20      COLUMNS 02- 81
 COMMAND INPUT ===> █                                          SCROLL ===> HALF
The cause of the failure was program SAM2 in module SAM2.   The COBOL source code
that immediately preceded the failure was:

  Source
  Line #
  ------
  000157                              COMPUTE CUST-ACCT-BALANCE =
  000158                                  CUST-ACCT-BALANCE + WS-UPDATE-NUM

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

  Source
  Line #
  ------
  000031             05   WS-UPDATE-NUM      PIC S9(9)V99  COMP-3  VALUE +0.
  000050             05   CUST-ACCT-BALANCE  PIC S9(7)V99  COMP-3.

Data field values at time of abend:

  CUST-ACCT-BALANCE   = X'7B7C5C505A'  *** Cause of error ***
  WS-UPDATE-NUM       = 1.23


<H1> I B M   F A U L T   A N A L Y Z E R   E V E N T   S U M M A R Y


Th...                                        ...ogical order.
```

You can use the Real-Time report, but there is an even better way to research an abend…

# *The Fault Analyzer Online Interface*

```
   File   Options   View   Services   Help
   _____

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

   Fault History File or View  : 'FAULTANL.V5R1.HIST'_____

   {The following line commands are available: ? (Query), V (View real-time
   report), I (Interactive reanalysis), B (Batch reanalysis), D (Delete).}

       Fault_ID Job/Tran User_ID   Module    Sys/Job   Abend   Date        Tran_ID   Tim
   __    F00054 WEBSRV7  WEBSRV    /usr/lpp  DEMOMVS   S0C4    2005/04/30  n/a       19:
   i     F00053 DNET074R DNET074   SAM2      DEMOMVS   S0C7    2005/04/30  n/a       11:
         F00047 DNET152  DNET152   STARTAPP  DEMOMVS   U4038   2005/04/29  n/a       13:
   __    F00045 DNET311C DNET311   SAM2      DEMOMVS   S0C7    2005/04/28  n/a       11:
   __    F00044 DNET3111 DNET311   SAM1      DEMOMVS   S0CB    2005/04/28  n/a       06:
   __    F00043 GEN001   ETPOT51   REGI0A    DEMOMVS   S0CB    2005/04/27  n/a       21:
   __    F00042 G        ETPOT51             DEMOMVS   S0CB    2005/04/27  n/a       21:
   __    F00041 G        ETPOT51   REGI0A    DEMOMVS   S0CB    2005/04/27  n/a       21:
   __    F00040 W        WEBSRV    /usr/lpp  DEMOMVS   S0C4    2005/04/27  n/a       19:
   __    F00039 D        DNET187   EQHOOEVH  DEMOMVS   U4038   2005/04/27  n/a       09:
   __    F00038 GEN001   ETPOT59   REGI0A    DEMOMVS   S0CB    2005/04/27  n/a       04:
   __    F00037 GEN51    ETPOT51   REGI0A    DEMOMVS   S0CB    2005/04/27  n
   __    F00036 GEN001   ETPOT62   REGI0A    DEMOMVS   S0CB    2005/04/27  n
```

**I** for interactive reanalysis.

Or **V** to **v**iew the real-time report.

**Enter**

# Fault Analyzer Interactive Reanalysis

```
 File   View   Services   Help

Interactive Reanalysis Report                          Line 1 Col 1 80
Command ===> _____    Scroll ===> CSR
JOBNAME: DNET074R   SYSTEM ABEND: 0C7         DEMOMVS   2005/04/30   11:32:11

Fault Summary:
Module SAM2, program SAM2, source line # 157 : Abend S0C7 (Data Exception).

Select one of the following options and press Enter to access further fault
information:
 _    1.   Synopsis
      2.   Event Summary
      3.   System-Wide Information
      4.   Abend Job Information
      5.   Options in Effect

{Fault Analyzer maximum storage allocated: 1.54 megabytes.}

*** Bottom of data.
```

The app abended in **THIS** program…

…on **THIS** statement.

Use Point-and-Shoot navigation in Interactive Reanalysis.
Just TAB to any yellow-highlighted field and Enter.

**Enter**

# Fault Analyzer Interactive Reanalysis

```
 File   View   Services   Help                                              Line 154 Col 1 80
Program SAM2 Compiler Listing                                               Line 154 Col 1 80
Command ===> █                                                              Scroll ===> CSR
JOBNAME: DNET074R   SYSTEM ABEND: 0C7              DEMOMVS    2005/04/30   11:32:11
000148                      WHEN 'NAME    '
000149                          MOVE TRAN-UPDATE-DATA TO CUST-NAME
000150                          COMPUTE TRAN-COUNT = TRAN-COUNT + 1
000151                      WHEN 'BALANCE '
000152                          EVALUATE TRAN-ACTION
000153                              WHEN 'REPLACE'
000154                                  MOVE WS-UPDATE-NUM TO CUST-ACCT-BALANCE
000155                                  COMPUTE TRAN-COUNT = TRAN-COUNT + 1
000156                              WHEN 'ADD    '
000157                                  COMPUTE CUST-ACCT-BALANCE =
000158                                  CUST-ACCT-BALANCE + WS-UPDATE-NUM
000159                                  COMPUTE TRAN-COUNT = TRAN-COUNT + 1
000160                          END-EVALUATE
000161                      WHEN 'ORDERS  '
000162                          EVALUATE TRAN-ACTION
000163                              WHEN 'REPLACE'
000164                                  MOVE WS-UPDATE-NUM TO CUST-ORDERS-YTD
000165                                  COMPUTE TRAN-COUNT = TRAN-COUNT
000166                              WHEN 'ADD    '
```

Browse the program listing for reference

abending statement

PF3

# *Fault Analyzer Interactive Reanalysis*

```
 File   View   Services   Help
 _____

 Interactive Reanalysis Report                         Line 1 Col 1 80
 Command ===> _____      Scroll ===> CSR
 JOBNAME: DNET074R   SYSTEM ABEND: 0C7           DEMOMVS   2005/04/30   11:32:11

 Fault Summary:
 Module SAM2, program SAM2, source line # 157 : Abend S0C7 (Data Exception).

 Select one of the following options and press Enter to access further fault
 information:
 _   1.   Synopsis
     2.   Event Summary
     3.   System-Wide Information
     4.   Abend Job Information
     5.   Options in Effect

 {Fault Analyzer maximum storage allocated: 1.54 megabytes.}

 *** Bottom of data.
```

**Synopsis** will show high-level information the abend.

Enter

# *Fault Analyzer Interactive Reanalysis - Synopsis*

```
 File   View   Services   Help
─────────────────────────────────────────────────────────────────────
Synopsis                                             Line 1 Col 1 80
Command ===> █_____       Scroll ===> CSR
JOBNAME: DNET074R   SYSTEM ABEND: 0C7          DEMOMVS   2005/04/30   11:32:11


A system abend 0C7 occurred in module SAM2 program SAM2 at offset X'640'.


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

                                            reason       abending
                                                         program
  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 #            abending
  000157            statement       COMPUTE CUST-ACCT-BALANCE =
  000158                                    CUST-ACCT-BALANCE + WS-UPDATE-NUM


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


  Source
```

**PF8**

# *Fault Analyzer Interactive Reanalysis - Synopsis*

```
 File   View   Services   Help
_____

Synopsis                                          Line 11 Col 1 80
Command ===> █_____    Scroll ===> CSR
JOBNAME: DNET074R   SYSTEM ABEND: 0C7              DEMOMVS   2005/04/30   11:32:11


   Source
   Line #
   000157                          COMPUTE CUST-ACCT-BALANCE =
   000158                              CUST-ACCT-BALANCE + WS-UPDATE-NUM

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

   Source
   Line #
   000031            05   WS-UPDATE-NUM      PIC S9(9)V99   COMP-3   VALUE +0.
   000050            05   CUST-ACCT-BALANCE  PIC S9(7)V99   COMP-3.

Data field values at time of abend:

   CUST-ACCT-BALANCE    = X'7B7C5C505A'   *** Cause of error ***
   WS-UPDATE-NUM        = 1.23

*** Bottom of data.
```

Variable that had the bad data

PF3

# Fault Analyzer Interactive Reanalysis

```
  File   View   Services   Help
_____
Interactive Reanalysis Report                    Line 1 Col 1 80
Command ===> _____    Scroll ===> CSR
JOBNAME: DNET074R  SYSTEM ABEND: 0C7          DEMOMVS   2005/04/30  11:32:11

Fault Summary:
Module SAM2, program SAM2, source line # 157 : Abend S0C7 (Data Exception).

Select one of the following options and press Enter to access further fault
information:
  _   1.   Synopsis
      2.   Event Summary
      3.   System-Wide Information
      4.   Abend Job Information
      5.   Options in Effect

{Fault Analyzer maximum storage allocated: 1.54 megabytes.}

*** Bottom of data.
```

Event Summary will show the call chain and program events

**Enter**

# *Fault Analyzer Interactive Reanalysis – Event Summary*

SAM1 was the main program.
SAM2 was a subroutine.

```
   File   View   Services   Help

Event Summary                                          Line 1 Col 1 80
Command ===> _____         Scroll ===> CSR
JOBNAME: DNET074R   SYSTEM ABEND: 0C7          DEMOMVS   2005/04/30   11:32:11

{The following events are presented in chronological order.}


Event           Fail   Module   Program   EP
 #   Type       Point  Name     Name      Name    Event Location (*)      Loaded
 1 Call                SAM1     SAM1      SAM1    L#311 P+AD4             DNET07
 2 Call                IGZCPAC  n/a       IGZCFCC E+2CA                  CEE.SC
 3 Abend S0C7  *****  SAM2     SAM2      SAM2    L#157 P+640            DNET07

(*) One or more of the following abbreviations might appear in the "Event
    Location" column:

    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 information
          for file identification)
    M+x   Offset from start of load module
```

Get details about program SAM2

**Enter**

# *Fault Analyzer Interactive Reanalysis – program detail*

```
 File   View   Services   Help

Event 3 of 3: Abend S0C7 *** Point of Failure ***          Line 1 Col 1 80
Command ===> bottom                                        Scroll ===> CSR
JOBNAME: DNET074R   SYSTEM ABEND: 0C7            DEMOMVS   2005/04/30   11:32:11


Previous Event Details
                                        ┌──────────────────────────────┐
                                        │ Detailed info about program  │
                                        │ SAM2 is shown here.          │
                                        └──────────────────────────────┘
Abend Code. . . . . . . . . . : S0C7
Program Interruption Code . . : 0007 (Data Exception)
  A decimal digit or sign was invalid.


COBOL Source Code:
  Source
  Line #
  000157                          COMPUTE CUST-ACCT-BALANCE =
  000158                            CUST-ACCT-BALANCE + WS-UPDATE-NUM

Data Field Declarations:
  Source
  Line #
  000031              05   WS-UPDATE-NUM        PIC S9(9)V99  COMP-3
  000050              05   CUST-ACCT-BALANCE    PIC S9(7)V99  COMP-3
```

**Enter**

## *Fault Analyzer Interactive Reanalysis – program detail*

```
 File   View   Services   Help
─────────────────────────────────────────────────────────────────────
Event 3 of 3: Abend SOC7 *** Point of Failure ***        Line 68 Col 1 80
Command ===> _____   Scroll ===> CSR
JOBNAME: DNET074R  SYSTEM ABEND: OC7         DEMOMVS   2005/04/30  11:32:11
  R7:   000203A0 (Module SAM2 program SAM2 WORKING-STORAGE SECTION BLW=0000 +
                 X'0', symbol WS-FIELDS, source line # 30 )
  R8:   00016060 (Module SAM2 program SAM2 LINKAGE SECTION BLL=0002 + X'0',
                 symbol TRANSACTION-RECORD, source line # 63 )
  R9:   000201A0 (Module SAM2 program SAM2 + X'7F0', source line # 173 )
  R10: 0001FAE0 (Module SAM2 program SAM2 + X'130')
  R11: 0001FDBC (Module SAM2 program SAM2 + X'40C')
  R12: 0001FAAC (Module SAM2 program SAM2 + X'FC')
  R13: 19087478 (592776 bytes of storage addressable)
  R14: 0001FD14 (Module SAM2 program SAM2 + X'364')
  R15: 8001FD20 (Module SAM2 program SAM2 + X'370')


Associated Messages


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


Associated Storage Areas


*** Bottom of data.
```

Point-and-shoot lookup of error messages.

**Enter**

System z Application Development Tools

# Fault Analyzer Interactive Reanalysis – message lookup

```
 File   View   Services   Help
_____
Message CEE3207S Explanation                        Line 1 Col 1 80
Command ===> █_____   Scroll ===> CSR
JOBNAME: DNET074R   SYSTEM ABEND: 0C7         DEMOMVS   2005/04/30   11:32:11

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

   Explanation:  Your program attempted to use a decimal instruction
   incorrectly. See a Principles of Operation manual for a full list of data
   exceptions.

   Programmer Response:  Check the variables associated with the failing
   statement to make sure that they have been initialized correctly.

   System Action:  The thread is terminated.

   Symbolic Feedback Code:   CEE347

*** Bottom of data.
```

Error message look-up.

PF3

# *Fault Analyzer Interactive Reanalysis – Event Summary*

```
  File   View   Services   Help
  _____

  Event Summary                                Line 1 Col 1 80
  Command ===> _____  Scroll ===> CSR
  JOBNAME: DNET074R  SYSTEM ABEND: 0C7        DEMOMVS   2005/04/30  11:32:11

  {The following events are presented in chronological order.}


  Event           Fail  Module   Program   EP
  #  Type         Point Name     Name      Name    Event Location (*)      Loaded
  1  Call               SAM1     SAM1      SAM1    L#311 P+AD4             DNET07
  2  Call               IGZCPAC  n/a       IGZCFCC E+2CA                  CEE.SC
  3  Abend S0C7   ***** SAM2     SAM2      SAM2    L#157 P+640            DNET07
```

Get details about SAM1 (the main program)

```
(*) One or more of the following abbreviations might appear in the "Event
    Location" column:

    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 information
          for file identification)
    M+x   Offset from start of load module
```

**Enter**

# *Fault Analyzer Interactive Reanalysis – program detail*

```
 File   View   Services   Help

Event 1 of 3: Call (DSA Address 19087030)              Line 1 Col 1 80
Command ===> bottom                                    Scroll ===> CSR
JOBNAME: DNET074R   SYSTEM ABEND: 0C7        DEMOMVS   2005/04/30  11:32:11


COBOL Source Code:
   Source
   Line #
   000308        *
   000309        *           Subroutine SAM2 will apply an update to a customer re
   000310        *
   000311                    CALL 'SAM2' USING CUSTOMER-REC, TRANSACTION-RECORD,
   000312                                         WS-TRAN-OK, WS-TRAN-MSG

Data Field Declarations:
   Source
   Line #
   000060        01  CUSTOMER-REC.
   000082        01  TRANSACTION-RECORD.
   000137            05  WS-TRAN-OK           PIC X     VALUE 'N'.
   000139            05  WS-TRAN-MSG          PIC X(50) VALUE SP
```

**Enter**

# *Fault Analyzer Interactive Reanalysis – program detail*

```
 File   View   Services   Help
 ────────────────────────────────────────────────────────────────

 Event 1 of 3: Call (DSA Address 19087030)              Line 62 Col 1 80
 Command ===> _____  Scroll ===> CSR
 JOBNAME: DNET074R  SYSTEM ABEND: 0C7          DEMOMVS   2005/04/30  11:32:11
   R10: 00007EFC (Module SAM1 program SAM1 + X'12C')
   R11: 00008588 (Module SAM1 program SAM1 + X'7B8')
   R12: 00007ECC (Module SAM1 program SAM1 + X'FC')
   R13: 19087030 (593872 bytes of storage addressable)
   R14: 800088A6 (Module SAM1 program SAM1 + X'AD6', source line # 311 )
   R15: 99051CC0 (Module IGZCPAC + X'406E8')


 Associated Open Files

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


 Associated Storage Areas



 Next Event Details


 *** Bottom of data.
```

You can get information about files that were open when the program abended.

**Enter**

# Fault Analyzer Interactive Reanalysis – file detail

```
 File   View   Services   Help
─────────────────────────────────────────────────────────────────

 File Information                                      Line 2 Col 1 80
 Command ===> _____  Scroll ===> CSR
 JOBNAME: DNET074R  SYSTEM ABEND: 0C7      DEMOMVS   2005/04/30  11:32:11
 File Name . . . . . . . . . :  CUSTFILE
   Data Set Name . . . . . . :  DNET074.ADLAB.CUSTOMER.FILE
   File Attributes . . . . . :  ORGANIZATION=INDEXED VSAM, ACCESS MODE=DYNAMIC,
                                RECFM=VARIABLE
   Last I/O Function . . . . :  READ
   Open Status . . . . . . . :  I-O
   File Status Code. . . . . :  0
   Return Code . . . . . . . :  X'0'
   Function Code . . . . . . :  X'0'
   Feedback Code . . . . . . :  X'0'

   Record Key. . . . . . . . :  Key position 0, length 6
   Address   Offset      Hex                              EBCDIC
   00009978              F1F1F1F1 F2C1                    *11112A            *

   Current Record. . . . . . :  Record data length 334
   Address   Offset      Hex                              EBCDIC
   00009978              F1F1F1F1 F2C1D585 A2A26B40 D3A49285 *11112ANess, Luke*
   00009988       +10    40404040 4040407B 7C5C505A 000003E9 *       #@*&!...Z*
```

**Enter**

The record key

The bad data

# *Fault Analyzer Interactive Reanalysis – link to File Manager*

```
 File   View   Services   Help
                          ──── Data Set Actions ────

 Data Set . . . . : DNET074.ADLAB.CUSTOMER.FILE


 Select one of the following options and press Enter:
 1█   1.   Edit
      2.   Browse
```

Fault Analyzer interfaces with File Manager to Edit or Browse the file.

```
 File Status Code. . . . . : 0
 Return Code . . . . . . . . : X'0'
 Function Code . . . . . . . : X'0'
 Feedback Code . . . . . . . : X'0'

 Record Key. . . . . . . . . : Key position 0, length 6
 Address  Offset     Hex                              EBCDIC
 00009978            F1F1F1F1 F2C1                     *11112A           *

 Current Record. . . . . . . : Record data length 334
 Address  Offset     Hex                              EBCDIC
 00009978            F1F1F1F1 F2C1D585 A2A26B40 D3A49285 *11112AN
 00009988     +10    40404040 4040407B 7C5C505A 000003E9 *
```

**Enter**

# *Fault Analyzer Interactive Reanalysis – link to File Manager*

```
 Process    Options    Help

File Manager Edit DNET074.ADLAB.CUSTOMER.FILE
Command ===>                                              Scroll CSR
        Type KSDS      Refresh on save N                  Format TABL
        CUST-ID REC-TYPE NAME             ACCT-BALANCE  ORDERS-YTD ADDR
        #3      #4       #5                        #6          #7 #8        +
        AN 1:5  AN 6:1   AN 7:17              PD 24:5    BI 29:4 AN 33:20
        <--->   -        <---+----1----+->  <---+----1> <---+----1> <---+----1-
000000 ****  Top of data  ****
000001 03115   A         Graham, Holly          254.53          1 3100 Oaktre
- - - - - - - - - - CONTACT-REC - - - - - - - - - - - 2 Line(s) suppressed
000004 05580   A         Moore, Adeline         498.95          3 4700 S. Syr
- - - - - - - - - - CONTACT-REC - - - - - - - - - - - 3 Line(s) suppressed
000008 06075   A         Dubree, Dustin         192.98          1 9229 Delega
000009 06927   A         Buchs, Jillian          99.99          0 41 Avendale
000010 07025   A         Marx, Audrey           100.08          1 90 South Ca
- - - - - - - - - - CONTACT-REC - - - - - - - - - - - 3 Line(s) suppressed
000014 11112   A         Ness, Luke       ***********       1001 5166 Oak Gr
- - - - - - - - - - CONTACT-REC - - - - - - - - - - - 2 Line(s) suppressed
000017                                          244.42          1 1551 S. Was
- - - - - - - - - - - - - - - - - - - - - - - - - - - 2 Line(s) suppressed
00002                                            86.88          0 221 Yale Rd
- - - - - - - - - - CONTACT-REC - - - - - - - - - - - 1 Line(s) suppressed
```

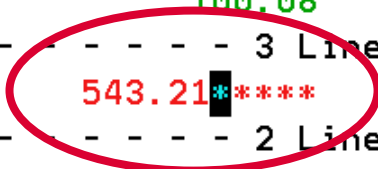The bad data in the file…
(the cause of this abend).

# *Fault Analyzer Interactive Reanalysis – link to File Manager*

```
 Process    Options    Help

 File Manager Edit DNET074.ADLAB.CUSTOMER.FILE
 Command ===> _____  Scroll CSR
       Type KSDS     Refresh on save N                  Format TABL
       CUST-ID REC-TYPE NAME            ACCT-BALANCE  ORDERS-YTD ADDR
       #3      #4       #5                        #6         #7 #8        +
       AN 1:5  AN 6:1   AN 7:17              PD 24:5    BI 29:4 AN 33:20
       <--->   -        <---+----1----+->  <---+----1> <---+----1> <---+----1-
 000000 ****  Top of data  ****
 000001 03115   A        Graham, Holly          254.53          1 3100 Oaktre
 - - - - - - - - - - CONTACT-REC - - - - - - - - - - 2 Line(s) suppressed
 000004 05580   A        Moore, Adeline         498.95          3 4700 S. Syr
 - - - - - - - - - - CONTACT-REC - - - - - - - - - - 3 Line(s) suppressed
 000008 06075   A        Dubree, Dustin         192.98          1 9229 Delega
 000009 06927   A        Buchs, Jillian          99.99          0 41 Avendale
 000010 07025   A        Marx, Audrey           100.08          1 90 South Ca
 - - - - - - - - - - CONTACT-REC - - - - - - - - - - 3 Line(s) suppressed
 000014 11112   A        Ness, Luke             543.21*****  1001 5166 Oak Gr
 - - - - - - - - - - CONTACT-REC - - - - - - - - - - 2 Line(s) suppressed
 000017 11344   A        Graf, Polly            244.42          1 1551 S. Was
 - - - - - - - - - - CONTACT-REC - - - - - - - - - - 2 Line(s) suppressed
 000020 12689   A        Boyd, Luke A.           86.88          0 221 Yale Rd
 - - - - - - - - - - CONTACT-REC - - - - - - - - - - 1 Line(s) suppressed
```

Repairing the data in the file.

# *Fault Analyzer Interactive Reanalysis – System Wide Information*

```
   File   View   Services   Help
  _____

  Interactive Reanalysis Report                    Line 1 Col 1 80
  Command ===> _____  Scroll ===> CSR
  TRANID: CD08        CICS ABEND: ASRA         MVS2      2003/10/28   18:24:21

  Fault Summary:
  Module CDCB0080, program CDCB0080, source line # 677 : CICS abend ASRA.

  Select one of the following options and press Enter to access further fault
  information:
  _    1.   Synopsis
       2.   Event Summary
       3.   System-Wide Information
       4.   Abend Job Information
       5.   Options in Effect

  {Fault Analyzer maximum storage allocated: 2.48 megabytes.}


  *** Bottom of data.



  MA      a                                                        14/005
```

# *Fault Analyzer Interactive Reanalysis – System Wide Information*

```
 File   View   Services   Help
 _____

System-Wide Information                         Line 1 Col 1 80
Command ===> _____      Scroll ===> CSR
TRANID: CD08      CICS ABEND: ASRA          MVS2      2003/10/28   18:24:21


Open Files

CICS Information

DB2 Information

IMS Information

Storage Areas

Messages

Language Environment Heap Analysis

*** Bottom of data.
```

MA    a

09/002

# Select Last CICS 3270 Screen Buffer

```
 File   View   Services   Help
_____

CICS Information                              Line 1 Col 1 80
Command ===> _____   Scroll ===> CSR
TRANID: CD08      CICS ABEND: ASRA          MVS2    2003/10/28  18:24:21

CICS Control Blocks

CICS Transaction Storage

Last CICS 3270 Screen Buffer

Last CICS 3270 Screen Buffer Hex

Summarized CICS Trace

CICS Trace Formatting

CICS Recovery Manager

*** Bottom of data.
```

**Enter**

```
MA    a                                                   11/002
```

# WebSphere Browser

**Directory of fault history file 'dnet070.idi.history' - Microsoft Internet Explorer**

File   Edit   View   Favorites   Tools   Help

Back | Search | Favorites | Media

Address | http://demomvs.demopkg.ibm.com/FAULTANAL/dnet070.idi.history | Go

Links | Search the Web with Lycos | IBM Business Transformation Homepage | IBM Internal Help Homepage | IBM Standard Software Installer | Media

## Fault entries for history file 'dnet070.idi.history'

| FAULT_ID | PROGRAM | MD_PAGES | DUP_COUNT | TRAN_ID | JOBNAME | JOB/TRAN | JOB_TYPE | ABEND | MODULE | USER_TITLE |
|---|---|---|---|---|---|---|---|---|---|---|
| F00531 | IDISCBLF | 0 | 0 | n/a | DNET070A | DNET070A | Batch | S0C7 | IDISCBLF | n/a |
| F00530 | IDISCBLF | 0 | 3 | n/a | DNET070A | DNET070A | Batch | S0C7 | IDISCBLF | n/a |
| F00498 | IDISCBLF | 0 | 0 | n/a | DNET070A | DNET070A | Batch | S0C7 | IDISCBLF | n/a |
| F00107 | CDCB0080 | 0 | 0 | CD08 | CD08DA | CD08 | CICS | ASRA | CDCB0080 | n/a |
| F00100 | ICCB0030 | 0 | 0 | n/a | ICCB0030 | ICCB0030 | Batch | U0476 | ICCB0030 | n/a |
| F00098 | ICCB0060 | 0 | 0 | n/a | ICCB0060 | ICCB0060 | Batch | S0CB | ICCB0060 | n/a |
| F00087 | DACBDH01 | 0 | 0 | n/a | DACBDH03 | DACBDH03 | Batch | U0100 | DACBDH01 | n/a |
| F00083 | CSCB0040 | 0 | 0 | CS04 | CSCB0040 | CS04 | CICS | ASRA | CSCB0040 | n/a |
| F00534 | IDISCBLF | 0 | 0 | n/a | DNET070A | DNET070A | Batch | S0C7 | IDISCBLF | n/a |

Shortcut to dnet070.idi.history(F00531)

Local intranet

System z Application Development Tools

IBM

# *Fault Analyzer Summary*

- **Single Fault Analysis Product For All Environments**

- **Consistent Across Languages**
  - COBOL, C, C++, PL/I, Assembler

- **Environments Supported**
  - CICS, TSO, JES/Batch, IMS, DB2, Unix System Services, WebSphere MQ, WebSphere Application Server™ and Java

- **Modes Of Operation**
  - Real Time Analysis
  - Batch Dump Re-analysis
  - Interactive Dump Re-analysis

- **Fault Analyzer Features:**
  - Analysis At Application Level, translation of low-level "Dump" information
  - Interactive Point-and-Shoot Navigation
  - Real-Time Information Capture
  - Expands Abend Code And Message Descriptions
  - No Recompile Of Applications
  - No JCL Changes
  - Interface to File Manager
  - Integrated 64-bit DB2 version 8 support

- **Interfaces**
  - ISPF
  - Web browser
  - CICS

# *IBM Debug Tool Utilities and Advanced Functions*

IBM

# *What is Debug Tool Utilities and Advanced Functions ?*

- **A tool that helps you test programs, and monitor and control the execution of programs**

- **An interactive, source level debugger**

- **A set of utilities:**
  - *Load Module Analyzer*
  - *COBOL Modernization Utility*
  - *Code Coverage Utility*

# *Debug Tool UAF Functional Overview*
## Provides debugging of enterprise applications

| BATCH | IMS | TSO | CICS | DB2 | USS | Web Sphere |
|---|---|---|---|---|---|---|

**Application Languages**
**COBOL, PL/I, ASSEMBLER, C++, High Performance Java**

Debug application in supported environments

**Debug Tool UAF**

3270    GUI

- **Features:**
  - Playback support
  - Automonitor support for COBOL and PL/I programs
  - An interface to the Fault Analyzer tool
  - A code coverage tool
  - Support for identifying and converting OS/VS COBOL source programs to ANSI 85 standard COBOL
  - Preparation and compile facilities for programs
  - Commands to query, allocate, and free files

- **Consistent Across Languages**
  - COBOL, C, C++, PL/I, Assembler, HP Java

- **Environments Supported**
  - CICS, TSO, JES/Batch, IMS Including IMS/TM, DB2 Including Stored Procedures
  - Uses the GUI debug interface built into products such as:
    - *Websphere Developer for zSeries (WDz)*
    - *Websphere Dev. Debugger for zSeries (WDDz)*

# How do I interface with Debug Tool Utilities and Advanced Functions ?

```
Session A - STLMVS1.WS - [24 x 80]                                    _ □ X
COBOL    LOCATION: CBLATP2 :> 543.1
Command ===>                                          Scroll ===> PAGE
MONITOR --+----1----+----2----+----3----+----4----+----5----+----6 LINE: 1 OF 4
********************************** TOP OF MONITOR ********************************
0001  1 OUTPUT-FLAG    'D'
0002  2 H1-CURR-DATE   '01/05/03'
0003  3 GM-MSG-ID      '01I'
0004  4 ACTION         '      '
******************************** BOTTOM OF MONITOR ******************************
SOURCE: CBLATP2 --1----+----2----+----3----+----4----+----5--- LINE: 541 OF 939
   541
   542              DISPLAY 'ENTER Action:'.
   543              ACCEPT SCREEN-INPUT.
   544              MOVE FUNCTION UPPER-CASE (SCREEN-INPUT) to ACTION.
   545
   546          ** End program when EXIT is entered and
LOG 0----+----1----+----2----+----3----+----4----+----5----+---- LINE: 36 OF 39
0036  GO ;
0037  You were prompted because the IGZ00H  condition was raised in your program
0038  IGZ00H is a severity or class 3 condition.
0039  The current location is CBLATP2 ::> CBLATP2 :> 543.1.
PF  1:MON       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                              A                          03/002
```

Debug Tool ◄► Application

Batch, CICS, DB2, or IMS application

- **Full-screen mode**
  - 3270 interface
  - Common interface for all z/OS runtimes, CICS, JES, IMS TM, DB2 Stored Procedures, etc.

# How do I interface with Debug Tool UAF?



TCP/IP

**Debug Tool UAF** ↔ **Application**

Batch, CICS, DB2, or IMS application

- **■** ***Websphere Developer Debugger for zSeries (WDDz):***
  - – the host application starts Debug Tool, which connects to a remote debugger on your workstation
  - – Point and Click ease of use
  - – Uses the GUI debug interface built into products such as:
    - **•** ***Websphere Developer for zSeries (WDz)***

# *How do I interface with Debug Tool Utilities and Advanced Functions ?*

Command File

AT TERMINATION;

SET FREQUENCY ON;

GO:

LIST FREQUENCY *;

QUIT;

Debug Tool
UAF

Application

Batch, CICS,
DB2, or IMS
application

- **Debug Tool "Batch" Command File mode**
  - Run an automatic script that controls program execution and message display
  - For creation of:
    - Automated condition checking and message display
    - Regression Test cases
    - Production Runtime problem diagnosis

IBM

# *Starting a Debug Tool UAF session*

```
   File   Edit   Edit_Settings   Menu   Utilities   Compilers   Test   Help

EDIT        DNET074.ADWORK.DATA(SAMRUN) - 01.17           Columns 00001 00072
Command ===> sub                                            Scroll ===> CSR
****** ************************** Top of Data ***************************
000001 //DNET074R JOB REGION=4M,
000002 // TIME=(1),MSGCLASS=H,NOTIFY=DNET074,MSGLEVEL=(1,1)
000003 //*****************************************************************
000004 //*****************************************************************
000005 //*    RUN SAMPLE PROGRAM SAM1
000006 //*
000007 //*    CAUSES ABEND IN SUBPROGRAM SAM2
000008 //*****************************************************************
000009 //RUNSAM1 EXEC PGM=SAM1,REGION=4M,
000010 //    PARM='/TEST(,,,MFI%TRMLU016:)'
000011 //STEPLIB  DD DSN=DNET074.ADWORK.LOAD,DISP=SHR
000012 //         DD DSN=DEBUG.V5R1.SEQAMOD,DISP=SHR
000013 //SYSPRINT DD SYSOUT=*
000014 //CUSTRPT  DD SYSOUT=*
000015 //CUSTFILE DD DSN=DNET074.ADLAB.CUSTOMER.FILE,DISP=SHR
000016 //TRANFILE DD *
000017 *TRAN  KEY          ACTION    FIELD NAME      VALUE
000018 *----- ----------   --------  ------------- +999999..
000019 *PDATE 07025A       ADD       BALANCE        +00000001
```

To start Debug Tool UAF in a batch job, just add a PARM to the EXEC statement

# Debug Tool Utilities and Advanced Functions

```
COBOL      LOCATION: SAM1 initialization
Command ===> step █                                    Scroll ===> CSR
MONITOR --+----1----+----2----+----3----+----4----+----5----+----6 LINE: 0 OF 0
*************************** TOP OF MONITOR ****************************
*************************** BOTTOM OF MONITOR ************************
```

STEP through the program statement by statement

```
SOURCE: SAM1 +----1----+----2----+----3----+----4----+----5----+ LINE: 1 OF 489
     1 ************************************************************** .
     2    * LICENSED MATERIALS - PROPERTY OF IBM                     .
     3    * ALL RIGHTS RESERVED                                      .
     4    *************************************************************
     5    * PROGRAM:   SAM1                                          .
     6    *
LOG 0----+----1----+----2----+----3----+----4----+----5----+---- LINE: 30 OF 32
0030 IBM Debug Tool Version 5 Release 1 Mod 0
0031 04/30/2005 11:24:15 PM
0032 5655-M18 and 5655-M19: (C) Copyright IBM Corp. 1992, 2004
*************************** BOTTOM OF LOG ****************************
PF  1:?           2:STEP        3:QUIT        4:LIST        5:FIND       CLEAR
PF  7:UP          8:DOWN        9:GO          10:ZOOM       11:ZOOM      RIEVE
```

Enter

# *Debug Tool Utilities and Advanced Functions*

```
COBOL     LOCATION: SAM1 ENTRY
Command ===>                                          Scroll ===> CSR
MONITOR --+----1----+----2----+----3----+----4----+----5----+----6 LINE: 1 OF 2
********************************* TOP OF MONITOR *********************************
0001   1 ********** AUTOMONITOR **********
0002     There are no variables in the state
********************************* BOTTOM OF MONITOR ***********************************
```

> PF2 will STEP by default.
>
> You can customize your PF key settings.

```
SOURCE: SAM1 +----1----+----2----+----3----+----4----+----5---- LINE: 29 OF 489
     29          PROGRAM-ID. SAM1.                                          .
     30          ENVIRONMENT DIVISION.                                      .
     31          INPUT-OUTPUT SECTION.                                      .
     32          FILE-CONTROL.                                              .
     33                                                                     .
     34          SELECT CUSTOMER-FILE ASSIGN TO CUSTFILE                    .
LOG 0----+----1----+----2----+----3----+----4----+----5---+---- LINE: 30 OF 33
0030 IBM Debug Tool Version 5 Release 1 Mod 0
0031 04/30/2005 11:24:15 PM
0032 5655-M18 and 5655-M19: (C) Copyright IBM Corp. 1992, 2004
0033  STEP ;
PF  1:?          2:STEP          3:QUIT          4:LIST          5:FIND      CLEAR
PF  7:UP         8:DOWN          9:GO           10:ZOOM         11:ZOOM      RIEVE
```

**PF2**

# Debug Tool Utilities and Advanced Functions

```
COBOL     LOCATION: SAM1 :> 260.1
Command ===>                                          Scroll ===> CSR
MONITOR --+----1----+----2----+----3----+----4----+----5----+----6 LINE: 1 OF 5
********************************* TOP OF MONITOR *******************************
0001   1 ********** AUTOMONITOR **********
0002      02 SAM1:>CURRENT-DATE
0003         03 SAM1:>CURRENT-YEAR     X'0000'
0004         03 SAM1:>CURRENT-MONTH     X'0000'
0005         03 SAM1:>CURRENT-DAY     X'0000'
******************************* BOTTOM OF MONITOR ******************************
SOURCE: SAM1 +----1----+----2----+----3----+----4----+----5--- LINE: 258 OF 489
   258                                                                         .
   259         000-MAIN.                                                       .
   260             ACCEPT CURRENT-DATE FROM DATE.                              .
   261             ACCEPT CURRENT-TIME FROM TIME.                              .
   262             DISPLAY 'SAM1 STARTED DATE = ' CURRENT-MONTH '/'            .
   263                 CURRENT-DAY '/' CURRENT-YEAR '  (mm/dd/yy)'.            .
LOG 0----+----1----+----2----+----3----+----4----+----5----+---- LINE: 31 OF 34
0031 04/30/2005 11:24:15 PM
0032 5655-M18 and 5655-M19: (C) Copyright IBM Corp. 1992, 20
0033  STEP ;
0034  STEP ;
PF  1:?              2:STEP         3:QUIT         4:LIST         5:FIND
PF  7:UP             8:DOWN         9:GO          10:ZOOM        11:ZOOM
```

The Red Line is the current statement.

STEP a few times…

PF2

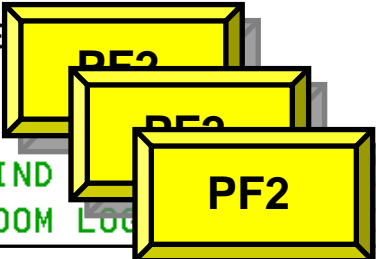PF2

PF2

# Debug Tool Utilities and Advanced Functions

```
COBOL     LOCATION: SAM1 :> 267.1
Command ===>                                          Scroll ===> CSR
MONITOR --+----1----+----2----+----3---   +----  6 LINE: 1 OF 2
************************************* TOP OF  
0001   1 ********** AUTOMONITOR *********        - a PF key,
0002     There are no variables in the s                    g.
************************************* BOTTOM OF  

SOURCE: SAM1 +----1----+----2----+----3----+----4----+----5--- LINE: 266 OF 489
    266                                                                          .
    267            PERFORM 700-OPEN-FILES .                                       .
    268            PERFORM 800-INIT-REPORT .                                      .
    269                                                                          .
    270            PERFORM 100-PROCESS-TRANSACTIONS                              .
    271                UNTIL WS-TRAN-EOF = 'Y' .                                 .
LOG 0----+----1----+----2----+----3----+----4----+----5----+---- LINE: 35 OF 38
0035   STEP ;
0036   STEP ;
0037   STEP ;
0038   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
```

You can set a statement breakpoint with:
- a PF key,
- a command, or
- a line command

Here a breakpoint is set by placing the cursor, and PF6.

PF6

# *Debug Tool Utilities and Advanced Functions*

```
COBOL     LOCATION: SAM1 :> 267.1
Command ===>                                          Scroll ===> CSR
MONITOR --+----1----+----2----+----3----+----4----+----5----+----6 LINE: 1 OF 2
************************** TOP OF MONITOR **********************************
0001   1 ********** AUTOMONITOR **********
0002     There are no variables in the statement to display.
************************** BOTTOM OF MONITOR ******************************




SOURCE: SAM1 +----1----+----2---        ----5--- LINE: 266 OF 489
     266                                                                   .
     267          PERFORM 700-OPEN-FILES .                                 .
     268          PERFORM 800-INIT-REPORT .                                .
     269                                                                   .
     270  ▌      PERFORM 100-PROCESS-TRANSACTIONS                          .
     271          UNTIL WS-TRAN-EOF = 'Y' .                                .
LOG 0----+----1----+----2----+----3----+----4----+----5----+---- LINE: 36 OF 39
0036  STEP ;
0037  STEP ;
0038  STEP ;
0039  AT 270 ;
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
```

A breakpoint is set at statement 270.

Commands are automatically logged

System z Application Development Tools

# *Debug Tool Utilities and Advanced Functions*

```
COBOL    LOCATION: SAM1.1
Command ===> go                                    Scroll ===> CSR
MONITOR                 Enter    ---+----4----+----5---+----6 LINE: 1 OF 2
*********************** TOP OF MONITOR *********************************
0001   1 ********** AUTOMONITOR **********
0002      02 SAM1:>WS-TRAN-EOF        '  '
********************************* BOTTOM OF MONITOR *******************
```

GO (or PF9) will run to the breakpoint

```
SOURCE: SAM1 +----1----+----2----+----3----+----4----+----5--- LINE: 266 OF 489
      266
      267              PERFORM 700-OPEN-FILES .
      268              PERFORM 800-INIT-REPORT .
      269
      270          PERFORM 100-PROCESS-TRANSACTIONS
      271              UNTIL WS-TRAN-EOF = 'Y' .
LOG 0----+----1----+----2----+----3----+----4----+----5---+---- LINE: 37 OF 40
0037  STEP ;
0038  STEP ;
0039  AT 270 ;
0040  GO ;
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
```

# Debug Tool Utilities and Advanced Functions - Breakpoints

- **Debug Tool provides many types of breakpoints.**

- **For example:**

  - At any statement

  - At the change of any variable or storage area

  - When variable(s) reach a value or range

  - When a specific subroutine is called

# Debug Tool Utilities and Advanced Functions

```
COBOL     LOCATION: SAM1 :> 270.1
Command ===> mon list                              Scroll ===> CSR
MONITOR --+----1----+----2----+----3----+----4----+----5----+----6 LINE: 1 OF 2
********************************** TOP OF MONITOR **********************************
0001   1 ********** AUTOMONITOR **********
0002     02 SAM1:>WS-TRAN-EOF          '  '
********************************** BOTTOM OF MONITOR **********************************
```

The MONITOR LIST command adds a variable to the Monitor Window.

```
SOURCE: SAM1 +----1----+----2----+----3----+----    4    5    LINE: 39 OF 489
      60          01   CUSTOMER-REC.                                      .
      61               05  CUST-KEY.                                      .
      62                   10  CUST-ID           PIC X(5).                .
      63                   10  CUST-REC-TYPE     PIC X.                   .
      64               05  CUST-NAME             PIC X(17).               .
      65               05  CUST-ACCT-BALANCE     PIC S9(7)V99  COMP-3.    .
LOG 0----+----1----+----2----+----3----+----4----+----5----+---- LINE: 39 OF 42
0039   AT 270 ;
0040   GO ;
0041   LIST ( CUST-ACCT-BALANCE ) ;
0042 CUST-ACCT-BALANCE = X'0000000000'
PF  1:?           2:STEP        3:QUIT        4:LIST        5:FIND      LEAR
PF  7:UP          8:DOWN        9:GO         10:ZOOM       11:ZOOM     IEVE
```

Enter

# Debug Tool Utilities and Advanced Functions

```
COBOL      LOCATION: SAM1 :> 270.1
Command ===>
MONITOR --+----1----+----2----+----3----        LINE: 1 OF
********************************* TOP OF MONITOR *****************************
0001    1 CUST-ACCT-BALANCE    X'0000000000'
0002    2 ********** AUTOMONITOR **********
0003     02 SAM1:>WS-TRAN-EOF        ' '
*************************** BOTTOM OF MONITOR **
```

A variable you add to the Monitor window stays there for your reference

The AUTOMONITOR displays all variables referenced by the current statement

```
SOURCE: SAM1 +----1----+----2----+----3----+----4----+----5---- LINE: 60 OF 489
      60          01   CUSTOMER-REC.                                          .
      61              05   CUST-KEY.                                          .
      62                  10  CUST-ID              PIC X(5).                  .
      63                  10  CUST-REC-TYPE        PIC X.                     .
      64              05   CUST-NAME           PIC X(17).                     .
      65              05   CUST-ACCT-BALANCE   PIC S9(7)V99  COMP-3.          .
LOG 0----+----1----+----2----+----3----+----4----+----5----+---- LINE: 41 OF 44
0041   LIST ( CUST-ACCT-BALANCE ) ;
0042 CUST-ACCT-BALANCE = X'0000000000'
0043   MONITOR
0044    LIST ( CUST-ACCT-BALANCE ) ;
PF  1:?           2:STEP        3:QUIT        4:LIST        5:FIND        CLEAR
PF  7:UP          8:DOWN        9:GO         10:ZOOM       11:ZOOM       RIEVE
```

You can ZOOM (or PF10) any window to make it full-screen

**PF10**

# Debug Tool Utilities and Advanced Functions

```
COBOL     LOCATION: SAM1 :> 270.1
Command ===>                                        Scroll ===> CSR
SOURCE: SAM1 +----1---+----2----+----3-        5    - LINE: 60 OF 489
      60           01   CUSTOMER-REC.
      61               05   CUST-KEY.
      62                    10   CUST-ID              PIC X(5).
      63                    10   CUST-REC-TYPE        PIC X.
      64               05   CUST-NAME                PIC X(17).
      65               05   CUST-ACCT-BALANCE        PIC S9(7)V99   COMP-3.
      66               05   CUST-ORDERS-YTD          PIC S9(5)      COMP.
      67               05   CUST-ADDR                PIC X(20).
      68               05   CUST-CITY                PIC X(14).
      69               05   CUST-STATE               PIC X(02).
      70               05   CUST-COUNTRY             PIC X(11).
      71               05   CUST-MONTH               PIC S9(7)V99    COMP-3   OCCURS 12
      72               05   CUST-OCCUPATION          PIC X(30).
      73               05   CUST-NOTES               PIC X(120).
      74               05   CUST-LAB-DATA-1          PIC X(05).
      75               05   CUST-LAB-DATA-2          PIC X(40).
      76
      77           FD   TRANSACTION-FILE
      78               RECORDING MODE IS F
PF   1:?           2:STEP        3:QUIT        4:LIST        5:FIND        LEAR
PF   7:UP          8:DOWN        9:GO          10:ZOOM       11:ZOOM       IEVE
```

ZOOMed in on the Source Window.

**PF10**

# Debug Tool Utilities and Advanced Functions

```
COBOL      Loc LOCATION: SAM 157.1
Command ==> ==> go                          Enter
MONITOR                    ---+----4---
******************************** TOP OF MONITOR ***
0001    1 CUST-ACCT-BALANCE    X'7B7C5C505A'
0002    2 ********** AUTOMONITOR **********
0003    02 SAM2:>CUST-ACCT-BALANCE      X'7B7C5C505A'
0004    02 SAM2:>WS-UPDATE-NUM         +000000001.23
********************************** BOTTOM OF MONITOR *************

SOURCE: SAM2 +----1----+----2----+----3----+----4----+----5--- LINE: 157 OF 174
   157                          COMPUTE CUST-ACCT-BALANCE =          .
   158                          CUST-ACCT-BALANCE + WS-UPDATE-NUM    .
   159                          COMPUTE TRAN-COUNT = TRAN-COUNT + 1  .
   160                  END-EVALUATE                                 .
   161            WHEN 'ORDERS  '                                    .
   162                  EVALUATE TRAN-ACTION                         .
LOG 0----+----1----+----2----+----3----+----4----+----5----+---- LINE: 51 OF 54
0051 The operating system has generated the following message:
0052    CEE3207S The system detected a data exception (System Completion
0053 Code=0C7).
0054 The current location is SAM2 ::> SAM2 :> 157.1.
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
```

**GO runs the program.**

**This application abended in a subroutine. And DT intercepted the abend.**

**This bad data caused the abend**

**This statement abended**

# *Debug Tool Utilities and Advanced Functions*

```
COBOL     LOCATION: SAM2 :> 157.1
Command ===>                                            CSR
MONITOR --+----1----+----2----+----3----+----4--            OF 4
******************************** TOP OF MONITOR ***********************
0001   1 CUST-ACCT-BALANCE    X'7B7C5C505A'
0002   2 ********** AUTOMONITOR ********
0003     02 SAM2:>CUST-ACCT-BALANCE     123
0004     02 SAM2:>WS-UPDATE-NUM       +000000001.23
*********************************** BOTTOM OF MONITOR *****************

SOURCE: SAM2 +----1----+----2----+----3----+----4----+----5--- LINE: 157 OF 174
      157         COMPUTE CUST-ACCT-BALANCE =                      .
      158            CUST-ACCT-BALANCE + WS-UPDATE-NUM              .
      159            COMPUTE TRAN-COUNT = TRAN-COUNT + 1            .
      160         END-EVALUATE                                     .
      161      WHEN 'ORDERS  '                                     .
      162         EVALUATE TRAN-ACTION                             .
LOG 0----+----1----+----2----+----3----+----4----+----5----+---- LINE: 51 OF 54
0051 The operating system has generated the following message:
0052    CEE3207S The system detected a data exception (System Completion
0053 Code=0C7).
0054 The current location is SAM2 ::> SAM2 :> 157.1.
PF  1:?        2:STEP      3:QUIT      4:LIST      5:FIND       LEAR
PF  7:UP       8:DOWN      9:GO       10:ZOOM     11:ZOOM       IEVE
```

You can fix the bad data and keep running…

…overtype a value to change it.

Enter

# *Debug Tool Utilities and Advanced Functions*

```
COBOL     LOCATION: SAM2 :> 157.1
Command ==> go bypass
MONITOR --+----1----+----2----+----3----+----4----+----          LINE: 1 OF 4
******************************** TOP OF MONITOR ********************
0001   1 CUST-ACCT-BALANCE     +0000123.00
0002   2 ********* AUTOMONITOR **********
0003     02 SAM2:>CUST-ACCT-BALANCE     +0000123.00
0004     02 SAM2:>WS-UPDATE-NUM       +000000001.23
****************************** BOTTOM OF MONITOR *******************************

SOURCE: SAM2 +----1----+----2----+----3----+----4----+----5--- LINE: 157 OF 174
    157                              COMPUTE CUST-ACCT-BALANCE =            .
    158                              CUST-ACCT-BALANCE + WS-UPDATE-NUM       .
    159                              COMPUTE TRAN-COUNT = TRAN-COUNT + 1     .
    160                    END-EVALUATE                                      .
    161              WHEN 'ORDERS   '                                        .
    162                    EVALUATE TRAN-ACTION                              .
LOG 0----+----1----+----2----+----3----+----4----+----5----+--- LINE: 52 OF 55
0052    CEE3207S The system detected a data exception (System Completion
0053 Code=0C7).
0054 The current location is SAM2 ::> SAM2 :> 157.1.
0055  MOVE 123 TO SAM2:>CUST-ACCT-BALANCE ;
PF  1:?        2:STEP      3:QUIT     4:LIST     5:FIND     CLEAR
PF  7:UP       8:DOWN      9:GO       10:ZOOM    11:ZOOM    RIEVE
```

GO BYPASS skips the abending statement and the program keeps running !

**Enter**

# *Debug Tool Utilities and Advanced Functions provides powerful debugging features*

- **Step and run BACKWARD through recorded program statements**

  - See how a program executed
  - View variable values AS THEY WERE during execution

- **Make any breakpoint CONDITIONAL**

  - use COBOL, PLI, or C "IF" statements

- **Run a SCRIPT at any breakpoint**

  - Put programs statements and Debug Tool commands in the script

- **"Patch" your program – effectively add and remove statements on the fly**

- **Customize the user interface**

  - Define your own PF keys, window layouts, and commands

# *Websphere Developer Debugger for zSeries (WDDz):*

- **Desktop Client GUI Interface built on the Eclipse Technology**

- **Common interface for all z/OS runtimes**

- **Provides a "point-and-click" interface as opposed to commands**

- **An "ease-of-use" interface to simplify use for the first time users of Debug Tool**

- **Facilitate the view/update of z/OS storage for assembler and C/C++ programs**

# Websphere Developer Debugger for zSeries:

- **DTUAF with WDDz:**
  - A workstation client software application that is started in a listen mode
  - When the z/OS application is started, the workstation IP address is passed via the LE "TEST" parameter

# Present IBM COBOL Compliers and Support:

| Product Name | PID(S) | Market Withdraw | Service Withdraw |
|---|---|---|---|
| **MVS & VM** | | | |
| OS/VS COBOL V1.2.4 | 5740-CB1<br>5740-LM1 | Yes 06/30/1992<br>Yes 06/30/1992 | Yes 06/30/1994<br>Yes 06/30/1994 |
| VS COBOL II V1.4.0 | 5668-958<br>5688-022<br>5688-023 | Yes 06/30/1997<br>Yes 06/30/1997<br>Yes 06/30/1997 | Yes 03/31/2001<br>Yes 03/31/2001<br>Yes 03/31/2001 |
| COBOL/370 1.1 | 5688-197 | Yes 10/31/1995 | Yes 09/31/1997 |
| COBOL for MVS & VM Ver 1 Rel 2 | 5688-197 | Yes 09/06/2000 | Yes 12/31/2001 |
| COBOL for OS/390 & VM Ver 2 | 5648-A25 | Yes 12/31/2002<br>(MVS feature) | Yes 12/31/2004<br>(MVS only) |
| Enterprise COBOL for z/OS V3R1 | 5655-G53 | Yes, 09/27/2002 | Yes, 04/04/2004 |
| Enterprise COBOL for z/OS V3R2 | 5655-G53 | No | No |
| **VSE** | | | |
| DOS/VS COBOL V1.2.4 | 5746-CB1<br>5746-LM1 | Yes 03/24/1997<br>Yes 03/24/1997 | Yes 12/31/1999<br>Yes 12/31/1999 |
| VS COBOL II V1.4.0 | 5668-958, 5688-022 | Yes 06/30/1997 | Yes 04/28/1998 |
| COBOL for VSE/ESA | 5686-068 | No | No |
| LE for VSE/ESA V2R5 | 5690-VSE | Yes, 12/14/2001 | Yes, 12/31/2003 |
| LE for VSE/ESA V2R6 | 5690-VSE | No | No |

# COBOL Modernization Function:

- **Identifies COBOL language elements and CICS commands in the input COBOL source programs that are:**

  - Not supported by the target COBOL compiler release

  - Are supported with a different syntax by the target COBOL compiler release

- **Will do one of the following to the identified elements:**

  - Converts them to the equivalent in the target COBOL language release

  - Removes them if they are obsolete and not required in the target COBOL compiler release

  - Flags them for user manual conversion

# COBOL Modernization Outputs:

- **Reports**

  – Identification of source requiring conversion from the source COBOL compiler version to the target COBOL compiler version:

    - Source elements identified
    - Source elements converted
    - etc

- **Converted Source**

  – Converted COBOL program source

  – Converted COBOL copy files

# COBOL Modernization Converted COBOL Versions:

| Source language | Version | Release | Program number |
| --- | --- | --- | --- |
| DOS/VS COBOL | 1 | 3 | 5746-CB1 |
| OS/VS COBOL | 1 | 2 | 5740-CB1 |
| VS COBOL II | 1 | 1, 2, or 3 | 5668-958 |
| COBOL for VSE/ESA | 1 | 1 | 5686-068 |
| COBOL for MVS & VM | 1 | 2 | 5688-197 |
| COBOL for OS/390 & VM | 2 | 2 | 5648-A25 |

# COBOL Modernization COBOL Version to Convert To:

| Target COBOL Compiler | Version | Release | Program number |
|---|---|---|---|
| VS COBOL II | 1 | 4 | 5668-958 |
| COBOL for VSE/ESA | 1 | 1 | 5686-068 |
| COBOL for MVS & VM | 1 | 2 | 5688-197 |
| COBOL for OS/390 & VM | 2 | 1 | 5648-A25 |
| Enterprise COBOL for z/OS and OS/390 | 3 | 1 | 5655-G53 |

# *Debug Tool Utilities and Advanced Functions Summary:*

- **Common User Interface Across Systems And Subsystems**

- **Consistent Across Languages**
  - COBOL, C/C++, PL/I, Assembler, HP Java

- **Environments Supported**
  - CICS
  - TSO
  - JES/Batch
  - IMS Including IMS/TM
  - DB2 Including Stored Procedures
  - Unix System Services (USS)
  - WebSphere MQ

- **Debug Tool Utilities and Advanced Functions Features::**
  - **Source-level Debugging**
  - **Step mode debugging**
  - **Multiple Breakpoints**
    - **- at program statements**
    - **- at change of storage / variable**
    - **- at subroutine call / entry**
  - **Recovery of program ABENDS**
  - **Step Mode Debugging**
  - **Dynamic Program Patching**
  - **Statement Frequency Counter**
  - **Enhancements for Interactive Debugging**
  - **"disassembly" interactive debug support**
  - **An interface to the Fault Analyzer tool**
  - **Code coverage tool for unit and regression testing**
  - **COBOL modernization utilities**
  - **Support for OS/VS COBOL source programs**

- **For More Information:**
  **http://www-306.ibm.com/software/awdtools/debugtool/**

# IBM Workload Simulator

IBM

# *Workload Simulator Functional Overview*

**z/OS and OS/390**

| Applications under test |
|---|

| VTAM |
|---|

| Workload Simulator |
|---|

**Features:**

- – Auto Generation Of Scripts
- – Auto Generation Of Networks
- – Controls Resource During Runs
- – Simulates Different Terminals, Terminal Features And Terminal Operator Actions
- – Executes Independently Of The System Under Test
- – Provides utilities for post-test analysis

- ▪ **Capture your live 3270 session and automatically create test scripts**

- ▪ **A powerful scripting language for modifying and creating your own 3270 and TCP scripts**

- ▪ **Run test scripts to simulate network traffic against live systems and applications**

  - – Simulate a single user to test application functionality
  - – Simulate multiple users to generate a test load

- ▪ **Display and report Test Results**
- ▪ **Latest PTF allows Rational TestManager to run Workload Simulator**

# *What features does Workload Simulator provide?*

- **Capture your live 3270 session and automatically create test scripts**

- **A powerful scripting language for modifying and creating your own 3270 and TCP scripts**

- **Run test scripts to simulate network traffic against live systems and applications**

  – Simulate a single user to test application functionality

  – Simulate multiple users to generate a test load

- **Display and report Test Results**

# *What can I test using Workload Simulator?*

- **Regression Testing**
  - Verify correct application function after a change
  - **"Does it *still* work right?"**

- **Performance Testing**
  - **"How well can I make it perform?"**

- **Load or Capacity Testing**
  - Predict the impact of additional workload
  - **"What will happen with more users on the system?"**

- **Stress Testing**
  - Predict the impact of extremely high transaction rates
  - **"What will break first?"**

# TESTING

## Workload Simulator for z/OS

- **Stress, Regression (functional) and Load testing of interactive z/OS applications**

**"** **+** **"**

## Rational Functional Tester Extension for Terminal Apps

- **Workstation-based functional and regression testing of interactive z/OS applications**

- WAS Z
    - Rational Performance Tester for z/OS
        - Stress and Load testing of a web-based applications
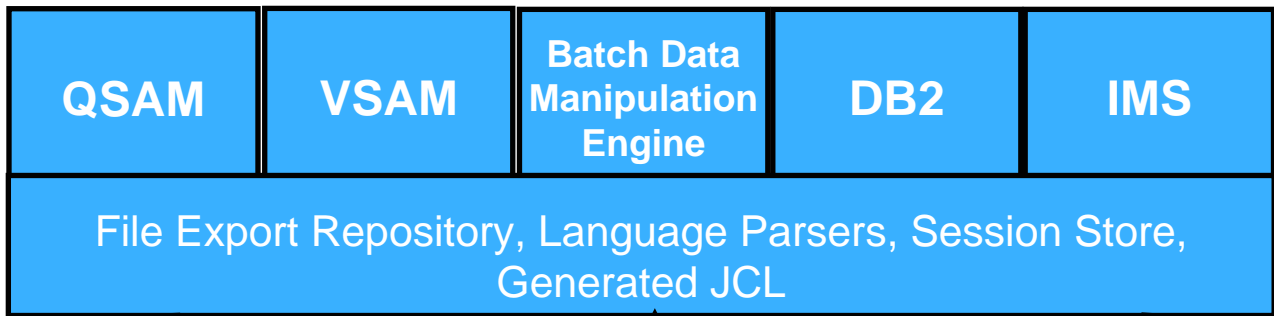        - WSWS taken out of marketing RPT is product of choice

# *IBM File Export*

# *File Export for z/OS*

- File Export for z/OS offers highly selective data copying capabilities to simplify the complex problems of populating test environments, or migrating applications to new or additional environments.

  - **Copies all data in a related set of objects or a slice of data across a related set of objects**

  - **Supports application-defined relationships**

  - **Provides for one-to-one, one-to-many and many-to-one data creation**

  - **Includes highly flexible data selection and transformation rules**

  - **Supports DB2, IMS, and MVS data in one product**

IBM

# File Export Utility - *Flexible solution for exporting and importing related sets of enterprise data*

**Improve**

| QSAM | VSAM | **Batch Data Manipulation Engine** | DB2 | IMS |

File Export Repository, Language Parsers, Session Store, Generated JCL

**File Export Utility**

**Extract related data from multiple sources**

**Reformat data, scramble sensitive data, create Nth selections of data, and. exploit application defined data relationships**

**ISPF**

# *How Test Data Generation is Performed Today*

- **QA Managers and non-programmers**

  - Need ability to easily create test data and extracts from data stores "on demand"

- **Developers**

  - Write custom programs to extract data from production data stores

  - Write throw-away programs, and use utilities not designed for the purpose

- **Expensive to keep up-to-date**

  - Needs change over time

  - Custom programs need to be modified and debugged

# *Why File Export for z/OS ?*

- **Tool designed specifically for:**

  – Quick generation of referential sets of test data from production data

  – Easy migration of data from one format to another to support application enhancements

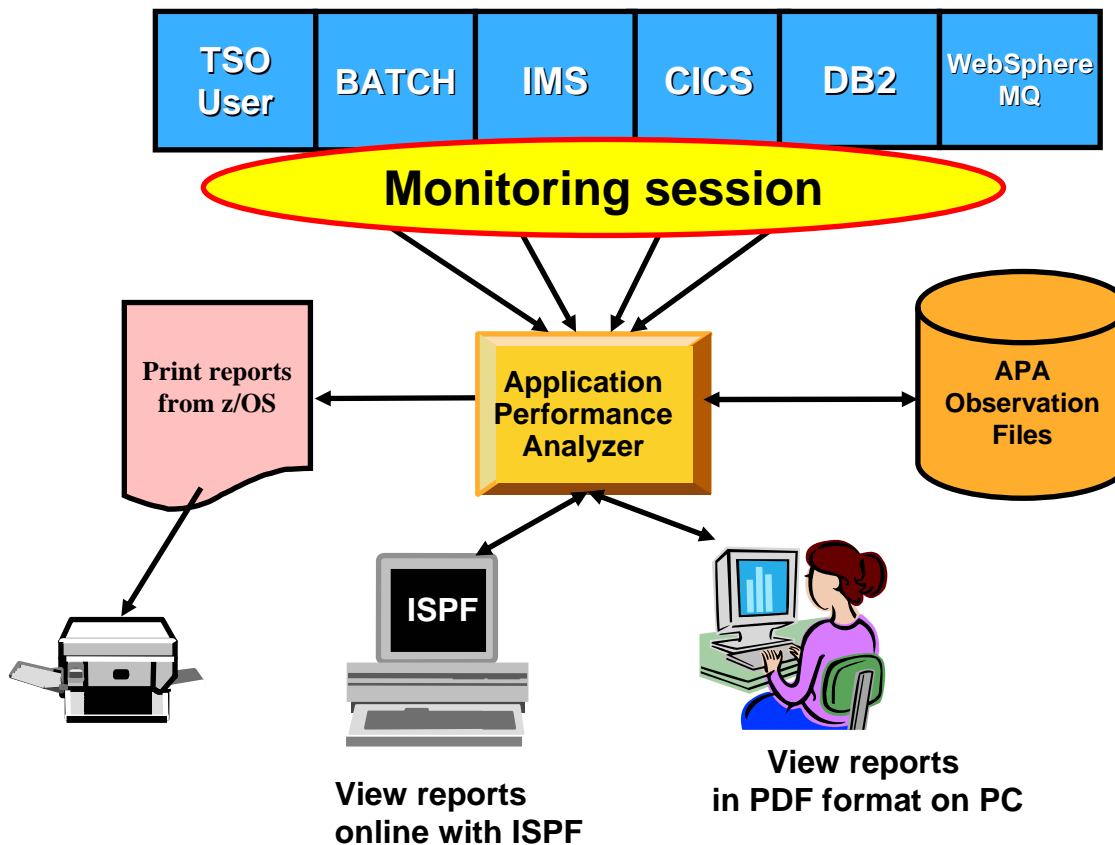- **Improved test data generation productivity**

# File Export Utility Features

- **Flexible solution for exporting and importing related sets of enterprise data**

- **Provides for one-to-one, one-to-many and many-to-one data creation**

- **Copies all data in a related set of objects or a slice of data across a related set of objects**

- **Supports application defined relationships**

- **Includes highly flexible data selection and transformation rules**

- **Gives the user the option to protect sensitive data on a field by field basis**

- **Supports altering data content while copying**

- **Includes a repository in which common persistent information about your data is stored**

- **Offers highly selective data copying capabilities that simplify the complex task of populating test environments, or migrating applications to new or additional environments**

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# *IBM Application Performance Analyzer*

# *Application Performance Analyzer Functional Overview*

## Application performance analysis tooling for application developers

- **Features:**

  - Summary/Profile Reports with drill down into detailed levels via an ISPF interface or PDF hardcopy

  - CPU, Load Module, and CSECT Analysis of all modules in the address space

  - Source Statement (COBOL or PL1) or Instruction utilization in each CSECT

  - Supports Fault Analyzer / Debug Tool Sidefiles

  - Wait Time Analysis by Category, Task/Module, or Attribution

  - DASD I/O Analysis by Device, DD Name, Dataset and Dataset Attributes, EXCP's, VSAM with Buffer Pool, I/O Wait, Over Time

  - Sysplex Coupling Facility Reports

  - DB2 SQL Analysis – Static and Dynamic – Service Times

  - DB2 Analysis by DBRM, Statement, and Plan

  - CICS Session Statistics, Transaction Analysis by CPU Usage, Mean and Total Service Time, and Waits by Transaction

  - IMS CPU and Service Time Analysis

  - MQ Series Analysis by Queue, Request, and Transaction

  - Interval Reporting

  - Adjustable Sampling Rate

  - Repeated Observation Sessions

  - Internal (APA) and External (RACF, etc) Security

| TSO User | BATCH | IMS | CICS | DB2 | WebSphere MQ |
|----------|-------|-----|------|-----|--------------|

**Monitoring session**

**Print reports from z/OS**

**Application Performance Analyzer**

**APA Observation Files**

**ISPF**

**View reports online with ISPF**

**View reports in PDF format on PC**

# *What is Application Performance Analyzer ?*

- A performance analyzer for application programs

  – **A tool that shows resources used by an application**

  – **so you can identify the cause of performance problems**

- Delivers information about an application, to help answer:

  – **What programs are running?**

  – **What percentage of time is spent in each program?**

  – **Which lines of code are using the most time?**

  – **What files and databases are being used?**

  – **Why is the application waiting?**

# *Application Performance Analyzer*

- **Get information about application performance:**

  – Interactively monitor a running application

  – Schedule monitoring for an application that will run later

- **Support for application running in:**

  – Batch jobs

  – CICS transactions

  – IMS transactions

  – TSO

# Select Job To Monitor from List

```
 File   View   Navigate   Help

R03: Schedule New Measurement                        Row 00001 of 00198
Command ===> _____  Scroll ===> CSR

● 1. Job Information    3. Multi Steps     5. CICS Txns    7. Schedule
  2. Options           4. Active Jobs     6. Sysplex      8. Sched Options

Panel 4. Active Jobs

  Enter S to select an active job step to be measured.    Prefix . . *_____

      JobName    Type   JobId      StepName   ASID   System     CPU%      SIO
  _   ALLOCAS    STC    N/A        ALLOCAS    0011   STLABF6    0.00      0.00
  _   ANTAS000   STC    N/A        ANTAS000   000C   STLABF6    0.00      0.00
  _   ANTMAIN    STC    N/A        ANTMAIN    000B   STLABF6    0.00      0
  _   APPC       STC    N/A        APPC       0027   STLABF6    0.00
  _   ASCH       STC    N/A        ASCH       0028   STLABF6    0.00
  _   ATRRRS     STC    N/A        ATRRRS     0020   STLABF6    0.00
  _   BBODMNB    STC    STC01847   BBODMNB    008A   STLABF6    0.00
  _   BBOS001    STC    STC01845   BBOS001    0088   STLABF6    0.00
  _   BBOS001S   STC    STC01858   BBOS001S   0095   STLABF6    0.12
  _   BPXOINIT   STC    N/A        BPXOINIT   012D   STLABF6    0.00      0.00
  _   CANSCN     STC    STC01739   CANSCN     002E   STLABF6    0.00      0.00
MA    a
```

Use the Prefix to Reduce Selection List.

Alphabetical order is default

Enter

# S01: Measurement Profile - Suggested Start for Navigation

```
 File   View   Navigate   Help
_____
R01: AP-Analyzer Performance Reports (0018)            Row 00001 of 00007
Command ===> _____ Scroll ===> CSR

    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
_____

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
    _ S04 TCB Summary
    _ S05 Memory Usage Timeline
    _ S06 Data Space Usage Timeline



MA█     a                              A
```

Enter

# S01: Measurement Profile - Summary

```
 File   View   Navigate   Help
─────────────────────────────────────────────────────────────────
S01: Measurement Profile (0018)                Row 00001 of 00078
Command ===> _____ Scroll ===> CSR

┌Overall CPU Activity ──────────────────────┐  ┌Reports: ──────────────────────┐
│ Samples        2,889   100.0% ' ' ' ' ' ' ' ' ' ' ' ' │  │ C01   C02   C03   C05 │
│ CPU Active     2,865    99.1% ████████████████████████│  │ C07   W01   W02       │
│ WAIT               1     0.0% ■                        │  │                       │
│ Queued            23     0.7% ■                        │  │                       │
└───────────────────────────────────────────┘  └───────────────────────────────┘

┌CPU Usage Distribution ────────────────────┐  ┌Reports: ──────────────────────┐
│ CPU Active     2,865   100.0% ' ' ' ' ' ' ' ' ' ' ' ' │  │ C01   C05   W01       │
│ Application      256     8.9% ██                       │  │                       │
│ System         2,609    91.0% ██████████████████████   │  │                       │
│ DB2 SQL            0     0.0%                           │  │                       │
│ Data Mgmt          0     0.0%                           │  │                       │
│ Unresolved         0     0.0%                           │  │                       │
└───────────────────────────────────────────┘  └───────────────────────────────┘

┌CPU Modes ─────────────────────────────────┐  ┌Reports: ──────────────────────┐
│ Active CPU     2,865   100.0% ' ' ' ' ' ' ' ' ' ' ' ' │  │ S08                   │
│ Supv Mode          1     0.0% ■                        │  │                       │
MA▮    a                                    A   └───────────────────────────────┘
```

**Enter**

Navigate to more detailed information by selecting the desired report with the cursor

# Enter P to view program source

```
   File   View   Navigate   Help
   _____
   C01: CPU Usage by Category (0018)              Row 00001 of 00005
   Command ===> _____  Scroll ===> CSR

   Name        Description            Percent of CPU Time * 10.00%  ±1.8%
                                      *....1....2....3....4....5....6....7....8
   SYSTEM      System/OS Services     91.06 ████████████████████████████████
   APPLCN      Application Code        8.93 ███
 → VSAMWRTE    Application Program     8.93 ███
   → PSAMWRTE    CSECT in VSAMWRTE      8.76 ███
   → CEELOCT     LE Runtime Module      0.17

   MA     a                          A
```

**Enter**

# P01: Source Program Attribution

```
 File    View    Navigate    Help

P01: Source Program Attribution (0018)              Row 00018 of 00047
Command ===> ▮_____        Scroll ===> CSR

LineNo  Offset  Count  Source Statement
000049  0006D6   17                PERFORM CAL-PARA UNTIL TIME-INTERVAL > TIME-DURA
000050  000710                     STOP RUN.
000051
000052                         CAL-PARA.
000053  000730   21                PERFORM STOP-PARA.
000054
000055                         START-PARA.
000056  00074E                     ACCEPT TIME-START FROM TIME.
000057
000058                         STOP-PARA.
000059  00078E   47                ACCEPT TIME-STOP FROM TIME.
                2546   <- CPU time attributed to above statement
000060  0007C8  129                COMPUTE TIME-INTERVAL = TIME-START - TIME-STOP.
000061
000062                         INITIALIZE-PARA.
000063
                                                   TO TABLE-VALUES(1).
                                                   TO TABLE-VALUES(2).
```

The Pink highlighted line indicates a System Module and is termed as

**Referred Attribution**

**PF3**

IBM

# *CICS Measurement "E" Reports*

```
 File   View   Navigate   Help

R01: AP-Analyzer Performance Reports (0104)          Row 00001 of 00007
Command ===> _____     Scroll ===> CSR

   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


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

   S E01 CICS Session Statistics
   ■ E03 CICS CPU Usage by Txn
   _ E04 CICS Mean Service Time by Txn
   _ E05 CICS Total Service Time by Txn
   _ E06 CICS Service Time by Task Id
   _ E07 CICS Wait by Txn




MA■     a                                    A                    16/004
```

# E03:  CICS CPU Usage by Transaction - Services

```
  File   View   Navigate   Help

E03: CICS CPU Usage by Transaction (0104)            Row 00001 of 00018
Command ===> _____         Scroll ===> CSR

Name    NTxns/Description              Percent of CPU Time * 10.00%  ±7.4%
                                        *....1....2....3....4....5....6....7
SSP1        28                         38.04 ███████████████████████
→ DFHD2EX1    CICS Program             10.86 ██████
→ SSTESTP1    CICS Program              8.15 █████
→ LGIPOL01    EXEC SQL                  7.60 █████
→ CICS        System Services          4.34 ███
→ SSTESTP1    EXEC CICS                 3.26 ██
  →  +0892       RECEIVE MAP(SSMAPP1)   1.63 █
  →  +0EE4       SEND MAP(SSMAPP1)      1.08 █
  →  +0908       LINK PROGRAM(LGIPOL01) 0.54

→ LGIPOL01    EXEC CICS                 1.08 █
→ LGIPOL01    CICS Program              1.08 █
→ EQADCXXT    EXEC CICS                 1.08 █
→ EQADCCXR    EXEC CICS                 0.54
SSC1        22                         37.50 ███████████████████████
MQPT         1                          4.34 ██
FBII         1                          2.17 █

MA▊      a                                A
```

Enter

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# DB2 Measurement "F" Reports

```
 File  View  Navigate  Help

R01: AP-Analyzer Performance Reports (0087)           Row 00001 of 00008
Command ===> _____   Scroll ===> CSR

   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


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

 S F01 DB2 Measurement Profile         _ F08 DB2 SQL Wait Time by Statement
 ▌ F02 DB2 SQL Activity Timeline       _ F09 DB2 SQL Wait Time by Plan
 _ F03 DB2 SQL Activity by DBRM        _ F10 DB2 SQL CPU/Svc Time by DBRM
 _ F04 DB2 SQL Activity by Statement   _ F11 DB2 SQL CPU/Svc Time by Stmt
 _ F05 DB2 SQL Activity by Plan        _ F12 DB2 SQL CPU/Svc Time by Plan
 _ F06 DB2 SQL Statement Attributes    _ F13 DB2 SQL Threads Analysis
 _ F07 DB2 SQL Wait Time by DBRM       _ F14 DB2 CPU by Plan/Stored Proc

MA▌    a                                                       16/004
```

Reports organized by DBRM, Statement, and Plan

F02 – F04  SQL Activity

F07 – F09  Wait Time

F10 – F2 CPU/SVC Time

# F01: DB2 Measurement Profile - Summary

```
 File   View   Navigate   Help

F01: DB2 Measurement Profile (0087)                    Row 00001 of 00058
Command ===> ▮                                          Scroll ===> CSR

┌Most Active DB2 Plans ─────────────────────────────┐        ┌Reports:─┐
│  Samples                  7,230   100.0% , , , , , , , , , , , , ,│        │  F07    │
│  DB2JOB3                  2,087    28.8% ████████     │        └─────────┘
└───────────────────────────────────────────────────┘

┌Most Active Package/DBRMs ─────────────────────────┐        ┌Reports:─┐
│  Samples                  7,230   100.0% , , , , , , , , , , , , ,│        │  F03    │
│  DB2JOB3                  2,087    28.8% ████████     │        └─────────┘
└───────────────────────────────────────────────────┘

┌Most Active SQL Statements ────────────────────────┐        ┌Reports:─┐
│  Samples                  7,230   100.0% , , , , , , , , , , , , ,│        │  F04    │
│  DB2JOB3:00331 FETCH        875    12.1% ██          │        └─────────┘
│  DB2JOB3:00377 INSERT       613     8.4% ██          │
│  DB2JOB3:00467 FETCH        344     4.7% ██          │
│  DB2JOB3:00219 EXECUTE      113     1.5% ██          │
│  DB2JOB3:00260 FETCH        106     1.4% ██          │
└───────────────────────────────────────────────────┘

MA▮    a                                    A
```

**PF8**

Shows Most Active DB2 Plans, DBRM/Packages, and Statements

# Application Performance Analyzer Report Summary

## CICS
Session Statistics
CPU Usage by Txn
Mean Service Time by Txn
Total Service Time by Txn
Service Time by Task Id
Wait Time by Txn

## Storage & Statistics
Measurement Profile
Load Module Attributes
Load Module Summary
TCB Summary
Memory Usage Timeline
Data Space Usage Timeline
TCB Execution Summary
Processor Utilization Summary

## DB2
Measurement Profile
SQL Wait Time by Statement
SQL Activity Timeline
SQL Wait Time by Plan
SQL Activity by DBRM
SQL CPU/Svc Time by DBRM
SQL Activity by Statement
SQL CPU/Svc Time by Stmt
SQL Activity by Plan
SQL CPU/Svc Time by Plan
SQL Statement Attributes
SQL Threads Analysis
SQL Wait Time by DBRM
CPU by Plan/Stored Proc

## Wait
Time by Task/Category
Time by Task/Module
Time Referred Attribution

## CPU
Usage by Category
Usage by Procedure
Usage by Module
Referred Attribution
Usage by Code Slice
Usage Timeline
Usage Task/Category
Usage Task/Module

## WebSphere MQ
Activity Summary
Serv Time by Txn
CPU Usage by Queue
Wait Time by Queue
CPU Usage by Request
Wait Time by Reque
CPU Usage by Txn
Wait Time by Txn
Serv Time by Queue
Serv Time by Request

## DASD
Usage by Device
Activity Timeline
Usage by DDNAME
I/O Wait Time
Usage by Dataset
VSAM Buffer Pool Usag
Dataset Attributes
Summary
D06 DASD VSAM Statistics

## IMS
DL/I Call CPU Time
DL/I Call Service Time

## Coupling Facility
Summary
Mean Times
Facility Total Times

# *IBM Application Performance Analyzer Summary*

- **Non-intrusive Performance Analyzer for Applications and Systems Programs to**
  - Improve response time in online applications
  - Improve batch turn around time
  - Identify excessive I/O activity
  - Identify excessive CPU usage
  - Test the effects of increasing workload
  - Isolate performance problems in new and existing applications

- **Types of Observation Sessions**
  - Real-Time
  - Scheduled
  - Via Batch Submission

- **Environments Supported**
  - CICS, DB2, IMS, JES/Batch, Sysplex, WebSphere MQ

- **Application Performance Analyzer Features:**
  - Summary/Profile Repots with drill down into detailed levels via an ISPF interface or PDF hardcopy
  - CPU, Load Module, and CSECT Analysis of all modules in the address space
  - Source Statement (COBOL or PL1) or Instruction utilization in each CSECT
  - Supports Fault Analyzer / Debug Tool Sidefiles
  - Wait Time Analysis by Category, Task/Module, or Attribution
  - DASD I/O Analysis by Device, DD Name, Dataset and Dataset Attributes, EXCP's, VSAM with Buffer Pool, I/O Wait, Over Time
  - Sysplex Coupling Facility Reports
  - DB2 SQL Analysis – Static and Dynamic – Service Times
  - DB2 Analysis by DBRM, Statement, and Plan
  - CICS Session Statistics, Transaction Analysis by CPU Usage, Mean and Total Service Time, and Waits by Transaction
  - IMS CPU and Service Time Analysis
  - WebSphere MQ Analysis by Queue, Request, and Transaction
  - Adjustable Sampling Rate
  - Repeated Observation Sessions

- **Information Available At:**

  **www.ibm.com/software/awdtools/deployment**

# *IBM Application Time Facility*

IBM

# Application Time Facility – *Easy for programmers to specify the jobs to receive simulated dates*

**Improve**

| BATCH | IMS | TSO | CICS | DB2 |
|-------|-----|-----|------|-----|

COBOL, PL/I, Assembler, CLIST, REXX EXEC

IDMS
IDEAL
Natural

**Application Time Facility**

Helps software development teams ensure their software performs as intended

ISPF

# Application Time Facility Features

- **Shifts time zones for on-line regions so users will see their local time or, so dated application file updates will have the local time**

- **Restarts a failing job at the date/time it failed, ensuring that file update and reports are not affected**

- **Allows jobs that, due to unavoidable circumstances, run over a deadline to finish "on time"**

- **Handles all clock formats including decimal, binary, timer units, microseconds and TOD clock format**

- **On-line ISPF interface makes it easy for programmers to specify the jobs to receive simulated dates on an individual basis, or as generic groups by using a wild card**

- **Allows testing of applications that are reliant upon timing, time zones, or time and date formatting without changing z/Series system date / time settings**

# IBM ISPF Productivity Tool

# ISPF Productivity Tool – *Enhances TSO ISPF productivity*

**Improve**

| Edit | Browse | Point and Shoot | Object List | Fast Path |
|------|--------|-----------------|-------------|-----------|

**TSO**

**ISPF Productivity Tool**

**ISPF**

**Increases the productivity of ISPF users by packing various ISPF functions into the areas in which programmers most frequently work**

# ISPF Productivity Tool Features

- **Consolidates commands within a single panel**

- **Presents a comprehensive, object-oriented, project-related list of data sets**

- **Provides extensive point & shoot capabilities**

- **Extended TSO command execution**

- **Automatic PDS compression**

- **Reduces keystrokes and EXCP counts**

- **Enhanced print and clipboard capabilities**

- **Improves ISPF navigation**

- **SCLM, Librarian, Panvalet Library support**

- **IPT increases the productivity of ISPF users by packing various ISPF functions into the areas in which programmers most frequently work, such as browse, edit ,member lists, and dataset lists.**

- **New commands and functions reduce the need to navigate to additional panels to perform utility functions. This results in reduced keystrokes and increase productivity.**

# Get more information about these tools at:

## www.ibm.com/software/awdtools/deployment

# For more information

- z/OS Problem Determination and Deployment Tools
  - www.ibm.com/software/awdtools/deployment
  - www.ibm.com/software/awdtools/faultanalyzer
  - www.ibm.com/software/awdtools/filemanager
  - www.ibm.com/software/awdtools/debugtool
  - www.ibm.com/software/awdtools/apa
  - www.ibm.com/software/awdtools/migration
  - www.ibm.com/software/awdtools/tictoc/
  - www.ibm.com/software/awdtools/ispfproductivitytool
  - www.ibm.com/software/awdtools/fileexport

  - zSeries Application Development Tools information center
  - Introduction to the IBM Application Development Tools on z/OS Redbook

# IBM PD Tools Product Identification

- **Fault Analyzer for z/OS (5655-P16 )**

- **File Manager for z/OS (5655-P17)**

- **Debug Tool Utilities and Advanced Functions for z/OS (5655-P15)**

- **Application Performance Analyzer for z/OS (5697-N37)**

- **Workload Simulator for z/OS & OS/390 (5655-I39)**

- **Migration Utility (5697-I89)**

- **Application Time Facility (5697-N42)**

- **ISPF Productivity Tool (5698-A81)**

- **File Export Utility (5697-I12)**

# PIDS / Part #s for z Rational

| CURRENT AD TOOLS  Feb 1, 2006 | | | | | |
|---|---|---|---|---|---|
| **Rational Z Tools** | | | | | |
| **Wwide Prod Code Dscr** | **PID** | **Rev Stream** | **Part Dscr Long** | **non-zSeries Part Num** | **zSeries Part Num** |
| **Ratl Functional Tester** | 5724G25 | License + Maint | RATL FUNCTIONAL TESTER AUTHORIZED USER LIC+SW MAINT 12 MO | **D53NFLL** | **D54BSLL** |
| Ratl Functional Tester | | Maint Reinstatement | RATL FUNCTIONAL TESTER AUTHORIZED USER SW MAINT REINSTATE 12 MO | **D53NGLL** | **D54BTLL** |
| Ratl Functional Tester | | Maint Renewal | RATL FUNCTIONAL TESTER AUTHORIZED USER ANNUAL SW MAINT RNWL | **E0197LL** | **E01I4LL** |
| **Ratl Functional Tester** | 5724G25 | License + Maint | RATL FUNCTIONAL TESTER FLOATINGUSER LIC+SW MAINT 12 MO | **D530BLL** | **D54BULL** |
| Ratl Functional Tester | | Maint Reinstatement | RATL FUNCTIONAL TESTER FLOATINGUSER SW MAINT REINSTATE 12 MO | **D530CLL** | **D54BVLL** |
| Ratl Functional Tester | | Maint Renewal | RATL FUNCTIONAL TESTER FLOATINGUSER ANNUAL SW MAINT RNWL | **E012DLL** | **E01I5LL** |
| **Ratl Functional Tester Extension** | 5724J07 | License + Maint | RATL FUNCT TEST EXT TERMINAL BASED APS ATHUSR LIC+SW MAINT 12 MO | **D53ZXLL** | **D53ZTLL** |
| Ratl Functional Tester Extension | | Maint Reinstatement | RATL FUNCT TEST EXT TERMINAL BASED APS ATHUSR SW MAINT REINSTATE 12 MO | **D53ZYLL** | **D53ZULL** |
| Ratl Functional Tester Extension | | Maint Renewal | RATL FUNCT TEST EXT TERMINAL BASED APS ATHUSR ANNUAL SW MAINT RNWL | **E01CDLL** | **E01CBLL** |
| **Ratl Functional Tester Extension** | 5724J07 | License + Maint | RATL FUNCT TEST EXT TERMINAL BASED APS FLTUSR LIC+SW MAINT 12 MO | **D53ZVLL** | **D53ZZLL** |
| Ratl Functional Tester Extension | | Maint Reinstatement | RATL FUNCT TEST EXT TERMINAL BASED APS FLTUSR SW MAINT REINSTATE 12 MO | **D53ZWLL** | **E01CELL** |
| Ratl Functional Tester Extension | | Maint Renewal | RATL FUNCT TEST EXT TERMINAL BASED APS FLTUSR ANNUAL SW MAINT RNWL | **E01CCLL** | **D5400LL** |
| Ratl Performance Tester | 5724J96 | License + Maint | RATL PERFORMANCE TESTER AUTHORIZED USER LIC+SW MAINT 12 MO | **D54LRLL** | **NA** |
| Ratl Performance Tester | | Maint Reinstatement | RATL PERFORMANCE TESTER AUTHORIZED USER SW MAINT REINSTATE 12 MO | **D54LSLL** | **NA** |
| Ratl Performance Tester | | Maint Renewal | RATL PERFORMANCE TESTER AUTHORIZED USER ANNUAL SW MAINT RNWL | **E01M9LL** | **NA** |
| Ratl Performance Tester | 5724J96 | License + Maint | RATL PERFORMANCE TESTER FLOATING USER LIC+SW MAINT 12 MO | **D54LTLL** | **NA** |
| Ratl Performance Tester | | Maint Reinstatement | RATL PERFORMANCE TESTER FLOATING USER SW MAINT REINSTATE 12 MO | **D54LULL** | **NA** |
| Ratl Performance Tester | | Maint Renewal | RATL PERFORMANCE TESTER FLOATING USER ANNUAL SW MAINT RNWL | **E01MALL** | **NA** |
| **Ratl Performance Tester for z/OS** | 5724J96 | License + Maint | RATL PERFORMANCE TESTER FOR Z/OS PER VALUE UNIT LIC+SW MAINT 12 MO | **NA** | **D556ULL** |
| Ratl Performance Tester for z/OS | | Maint Reinstatement | RATL PERFORMANCE TESTER FOR Z/OS PER VALUE UNIT SW MAINT REINSTATE 12 MO | **NA** | **D556VLL** |
| Ratl Performance Tester for z/OS | | Maint Renewal | RATL PERFORMANCE TESTER FOR Z/OS PER VALUE UNIT ANNUAL SW MAINT RNWL | **NA** | **E01UCLL** |