



Advanced Technical Support

# Problem Determination Tools

Fault, Edit, Debug, Test, and Tuning

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# Agenda

## Overview

### **File Manager for z/OS**

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

### **Fault Analyzer for z/OS**

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

### **Debug Tool Utilities & Advanced Functions for z/OS**

- Source code debugging to improve development productivity

### **Workload Simulator for z/OS and OS/390**

- Regression and Load testing of interactive z/OS applications

### **Rational Function Tester Extension**

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

### **File Export for z/OS**

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

### **Application Monitor for z/OS**

- Monitor performance at the application level

### **TIC TOC**

- Enables date/time simulation in the mainframe environment

## Summary

# IBM 2005 OFFERINGS

**DB2 V8**

- Fault Analyzer V5
- File Manager V5
- File Export
- Debug Tool Utilities AF V5
- TicToc
- Workload Simulator  
Rational Functional Tester Ext
- Application Monitor

## 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 when used with products such as WSED
- COBOL Conversion Utility

# IBM Workload Simulator for z/OS

## Use it to:

- Automatically simulate online user(s) on the system
- Perform regression testing of online applications
- Perform Load and Performance testing

## 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



# 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 Monitor for z/OS

## Use it to:

- Monitor an application while it is running
- Pinpoint the cause(s) of bad application performance, right down to the line of source code

## Key Features:

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

## ISOGON TIC TOC

### 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

## 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

## What is File Manager?



- **File Manager has three features**

- **File Manager / Base**

- Utilities for VSAM, QSAM, OAM, IAM, PDS, PDSE, and Tape datasets

- **File Manager / DB2**

- Utilities for DB2 data

- **File Manager / IMS**

- Utilities for IMS data

- **File Manager is a single product**

- All three features are included with File Manager

## 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 (2)

- **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 (3)

- **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)**



## EDIT and BROWSE: FM's Most-Used Functions

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

# File Manager Edit

```
Process  Options  Help
-----
File Manager                Primary Option Menu
Command ===) 2 █

0  Settings      Set processing options
1  Browse        Browse data
2  Edit          Edit data
3  Utilities     Perform utility functions
4  Tapes        Tape specific functions
5  Disk/VSAM    Disk track and VSAM CI functions
6  OAM          Work with OAM objects
7  Templates    Create, edit, or update templates
X  Exit         Terminate File Manager

User ID . : DNET074
System ID : DEMOMVS
Appl ID . : FMN
Version . : 5.1.0
Terminal. : 3278
Screen. . : 1
Date. . . : 2004/12/20
Time. . . : 07:50
```

**Enter**

## Edit – *with* a copybook

```

Process  Options  Help
-----
File Manager                      Edit Entry Panel
Command ==> _____

Input Partitioned, Sequential or VSAM Data Set:
  Data set name . 'DNET074.GEO2004.COUNTRY'
  Member . . . . . _____ Blank or pattern for member list
  Volume serial . _____ If not cataloged
  Start position . _____ +
  Record limit . . _____

Copybook or Template:
  Data set name . geo.cntl
  Member . . . . . geo Blank or pattern for member list

Processing Options:
Copybook/template  Start position type  Enter "/" to select option
1 1. Above          █ 1. Key                _ Edit template
  2. Previous        █ 2. RBA                / Set top to Start position
  3. None            █ 3. Slot               _ Create audit trail
  4. Create dynamic  █ 4. Record number

```


 Enter

## Edit – *with* a copybook

```

Process  Options  Help
-----
File Manager Edit DNET074.GE02004.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          A          AGO      .AO          10978552 12:30S
0          A          AIA      .AI          13008 18:15N
0          A          ATA      .AQ          0 90:00S
000009 ANTIGUA AND BA A          ATG      .AG          68320 17:03N
000010 ARGENTINA         A          A          .A          1:00S
000011 ARMENIA         A          A          .A          0:00N
000012 ARUBA           A          A          .A          0:30N
000013 ASHMORE AND CA A          A          .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 DNETC  
 Command ==> F PAL #2

Enter

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

# Edit – *Cool!*: FX and CX commands

Enter

File Manager Edit D  
 Command ==> FX GEO2004.COUNTRY

Scroll CSR

Extended Command Entry

Complete typing the FIND command and press Enter.

```

FIND  ==>
0     ==>
0     ==>
0     ==>
0     ==>
0
0
0     F1=Help   F2=Split   F3=Exit   F9=Swap   F12=Cancel
0
000178 NIUE           A           NIU           .NU           2156 19:02S
000179 NORFOLK ISLAND A           NFK           .NF           1841 29:02S
000180 NORTHERN MARIA A           MNP           15:12N
000181 NORWAY         A           NOR           62:00N
000182 OMAN           A           OMN           21:00N
        F1=Help   F2=Zoom    F3=Exit    F4=CRetriev F5=RFind    F6=RChange
        F7=Up     F8=Down    F9=Swap    F10=Left    F11=Right   F12=Cancel
        
```

**FX: "Find Extended"**  
**CX: "Change Extended"**

## Edit – TABL format

```

Process  Options  Help
-----
File Manager Edit DNET074.GE02004.COUNTRY
Command ==> _____ Scroll CSR
                               Format TABL

      HIGH-POINT-NAME          HIGH-POINT-M  COASTLINE-KM  TOTAL-LAND-BNDRY-KM
      #16                      #17          #18          #19
      AN 109:25                PD 134:6    PD 140:6    PD 146:6
      <----+-----1-----+-----2-----> <----+-----1-> <----+-----1->      <----+-----1->
000170 MOUNT EVEREST          8850        0            2926
000171 VAALSERBERG           322         451          1027
000172 MOUNT SCENERY         862         364           10
000173 MONT PANIE            1628        2254          0
000174 AORAKI-MOUNT COOK     3754        15134         0
000175 MOGOTON               2438        910           1231
000176 MONT BAGZANE          2022         0            5697
000177 CHAPPAL WADDI         2419        853           4047
000178 UNNAMED (NEAR MUTALAU) 68           64            0
000179 MOUNT BATES           319         32            0
000180 UNNAMED (ON AGRIHAN)  965         1482          0
000181 GALDHOPIGGEN          2469        21925         2551
000182 JABAL SHAMS           2980        2092          1374
000183 K2 (MT. GODWIN-AUSTEN) 8611        1046          6774
000184 MOUNT NGERCHELCHUUS   242         1519          0

```



# Edit –SNGL format

File Manager Edit DNE

Command ==> FS Enter 00001 COUNTRY

Scroll CSR  
Format SNGL

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



# Edit – CHAR format

File Manager Edit Enter

Command ==> FC

Current type is COU

---

Scroll CSR  
Format CHAR

Col 109 Insert length 1496

-1-----2-----3-----4-----5-----6-----7-----

000170	MOUNT EVEREST	.....e.....	k%..INDIA	.....CHINA
000171	VAALSERBERG	.....	@..GERMANY	.....@BELGIUM
000172	MOUNT SCENERY	....f.....	<.....	GUADELOUPE (SA.....
000173	MONT PANIE	.....	<.....	.....
000174	AORAKI-MOUNT COOK	.....	<.....	.....
000175	MOGOTON	.....	j.....	HONDURAS
000176	MONT BAGZANE	.....	@.@NIGERIA	.....@CHAD
000177	CHAPPAL WADDI	.....	e.....@.<	CAMEROON
000178	UNNAMED (NEAR MUTALAU)	.....	<.....	.....
000179	MOUNT BATES	.....	.....	.....
000180	UNNAMED (ON AGRIHAN)	.....	o*.....	.....
000181	GALDHOPIGGEN	.....	k*.....	SWEDEN
000182	JABAL SHAMS	.....	q.....	.....
000183	K2 (MT. GODWIN-AUSTEN)	.....	/.....	HANI
000184	MOUNT NGERCHELCHUUS	.....	.....	.....
000185	UNNAMED	.....	*.....	.....
000186	VOLCAN DE CHIRIQUI	.....	*.....*	COSTA RICA
000187	MOUNT WILHELM	.....	&.....b..	INDONESIA

**And you can turn "HEX ON" in any format to see hex values**

## Edit – FE command: Find Fields in Error

File Manager Edit DNET074.  
 Command ==> fe (#11 #12)

Enter

1 errors found  
 Scroll CSR  
 Format TABL

	LATITUDE #7	LONGITUDE #8	REGION #9	TOTAL-AREA-SQ-KM #11	LAND-AREA-SQ-KM #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	*XXXXXXXXXX	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

Scan for invalid data in numeric fields

F1=Help      F2=Zoom      F3=Exit      F4=CRetriev    F5=RFind      F6=RChange  
 F7=Up        F8=Down      F9=Swap      F10=Left      F11=Right     F12=Cancel

## How do I format my data and select records?

- **You can use a “Template” to:**
  - Define (lay out) fields in a record
  - Select records or rows
  - Select fields / columns to be displayed
  - Differentiate between record types
  - Control the format of displayed / printed data

## Without a template: No formatting or selection

```

Process  Options  Help
-----
File Manager Edit DNET074.GE02004.COUNTRY
Command ==> █
          Col 1          Insert length 1496
          -----1-----2-----3-----4-----5-----6-----7-
000000 **** Top of data ****
000001 AFGHANISTAN  AAFG.AF .....33:00N065:00EASIA      ....&.....&..
000002 ALBANIA      AALB.AL .....Y41:00N020:00EEUROPE      .....
000003 ALGERIA      ADZA.DZ .....28:00N003:00EAFRICA      ...a.....a...
000004 AMERICAN SAMOA AASM.AS .....S.14:20S170:00WOCEANIA      .....
000005 ANDORRA      AAND.AD .....Z42:30N001:30EEUROPE      .....
000006 ANGOLA      AAGO.AO .....xd812:30S018:30EAFRICA      .....
000007 ANGUILLA     AAIA.AI .....}18:15N063:10WCARIBBEAN      .....
000008 ANTARCTICA    AATA.AQ .....90:00S000:00EANTARCTIC REGION..
000009 ANTIGUA AND BAA AATG.AG .....\17:03N061:48WCARIBBEAN      .....
000010 ARGENTINA    AARG.AR .....(.34:00S064:00WSOUTH AMERICA    ....i.....
000011 ARMENIA     AARM.AM .....v.40:00N045:00EASIA      .....
000012 ARUBA      AABW.AW .....12:30N069:58WCARIBBEAN      .....
000013 ASHMORE AND CAA .....12:14S123:05ESOUTHEAST ASIA    ....*.....*.
000014 AUSTRALIA   AAUS.AU .....R.27:00S013:00EOCEANIA      ...fe.....l..
000015 AUSTRIA     AAUT.AT .....@..47:20N133:20EEUROPE      ...cg....b.<.
000016 AZERBAIJAN  AAZE.AZ .....40:30N047:30EASIA      ...f-....f...
000017 BAHAMAS     ABHS.BS .....k.24:15N076:00WCARIBBEAN      ....m.....

```

## With a template: Select records and format fields

```

Process  Options  Help
-----
File Manager Browse DNET074.GE02004.COUNTRY
Command ==> █
-----
                                Record 0          Scroll CSR
                                Format          TABL
Country      Region      High Point      Height(meters)
#2           #3           #4           #5
AN 1:14     AN 44:16     AN 109:25     PD 134:6
<---+---1---> <---+---1---+> <---+---1---+---2--->  <---+---1--->
**** Top of data ****
- - - - - 169 Line(s) not selected
NEPAL      ASIA      MOUNT EVEREST      8850
NETHERLANDS  EUROPE    VAALSERBERG        322
- - - - - 9 Line(s) not selected
NORWAY     EUROPE    GALDHOPIGGEN      2469
- - - - - 82 Line(s) not selected
**** End of data ****

```

**Template selection and formatting:  
Selected records  
Selected fields**

```

F1=Help      F2=Zoom      F3=Exit      F4=CRetriev  F5=RFind      F7=Up
F8=Down      F9=Swap      F10=Left     F11=Right    F12=Cancel

```

## How do I make a Template?

- **There are 2 types of templates:**
  - Copybook template
    - Use a COBOL or PLI copybook
  - Dynamic template
    - Define your own fields interactively

# Using a Copybook Template

```

Process  Options  Help
-----
File Manager                      Edit Entry Panel
Command ==> _____

Input Partitioned, Sequential or VSAM Data Set:
  Data set name . 'DNET074.GEO2004.COUNTRY'
  Member . . . . . _____ Blank or pattern for member list
  Volume serial . _____ If not c
  Start position . _____
  Record limit . . _____

Copybook or Template:
  Data set name . geo.cntl
  Member . . . . . geo Blank or pattern for member list

Processing Options:
Copybook/template  Start position type  Enter "/" to select option
1 1. Above          █ 1. Key                _ Edit template
  2. Previous        █ 2. RBA                / Set top to Start position
  3. None            █ 3. Slot               _ Create audit trail
  4. Create dynamic  █ 4. Record number
  
```

**To use a copybook Template, just specify a copybook ...**

**Enter**



## Using a Copybook Template

```

Process  Options  Help
-----
File Manager Edit DNET074.GE02004.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
000006 ANGOLA            A          AGO      .AO          10978552 12:30S
000007 ANGUILLA         A          AIA      .AI          13008 18:15N
000008 ANTARCTICA        A          ATA
000009 ANTIGUA AND BA    A          ATG
000010 ARGENTINA         A          ARG
000011 ARMENIA          A          ARM
000012 ARUBA            A          ABW
000013 ASHMORE AND CA  A
000014 AUSTRALIA       A          AUS      .AU          19913144 27:00S

```

**... and FM automatically compiles it and creates a template.**



## OR... use a Dynamic Template

- **A Dynamic Template provides similar function to a copybook template**
- **Use a dynamic template if:**
  - You don't have a copybook
  - You want to quickly define selection criteria based on fixed positions
  - Or if you just don't want to use a copybook

# Using a Dynamic Template

```

Process  Options  Help
-----
File Manager                Browse Entry Panel
Command ==> █

Input Partitioned, Sequential or VSAM Data Set:
  Data set name . 'DNET074.GEO2004.COUNTRY'
  Member . . . . . _____ Blank or pattern for member list
  Volume serial . _____ If not cataloged
  Start position . _____ +
  Record limit . . _____

Copybook or Template:
  Data set name . GEO.CNTL
  Member . . . . . GEO Blank or pattern for member list

Processing Options:
Copybook/template  Start position type  Enter "/" to select option
  4 1. Above      - 1. Key          - Edit template
  2 2. Previous   - 2. RBA         / Set top to Start position
  3 3. None       - 3. Slot
  4 4. Create dynamic 4. Record number

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







# Using a Dynamic Template

```

Process  Options  Help
-----
File Manager                Dynamic Template                Line 1 of 15
Command ==> _____ Scroll CSR

1 Edit template field attributes and selection

Cmd Con ( Field Name                               Op Value )
<-> - <---+---1---+---2---+---3---> <-> <---+---1---+---2---+---
*** **** Top of data ****
--- Country                                         RG 'N', 'NZ'
--- AND Region                                     CO 'ASIA', 'EUROPE'
--- AND High Point
--- AND Height(meters)
--- AND
--- AND
--- AND
--- AND
--- AND
--- AND
--- AND
--- AND
--- AND
--- AND
--- AND
F1=Help      F2=Split    F3=Exit     F4=CRetriev  F5=...  F6=RunTemp
F7=Up        F8=Down    F9=Swap     F10=Left     F11=...  F12=Cancel
    
```

**Field Names and Selection  
Criteria are optional**

**PF6**

# Using a Dynamic Template

```

Process  Options  Help
-----
File Manager Browse DNET074.GE02004.COUNTRY
Command ==> █
                                         Record 0      Scroll CSR
                                         Format TABL
Country      Region      High Point      Height(meters)
#2           #3           #4           #5
AN 1:14     AN 44:16     AN 109:25     PD 134:6
<---+---1---> <---+---1---+> <---+---1---+---2---> <---+---1--->
**** Top of data ****
- - - - - 169 Line(s) not selected
NEPAL      ASIA      MOUNT EVEREST      8850
NETHERLANDS  EUROPE  VAALSERBERG      322
- - - - - 9 Line(s) not selected
NORWAY     EUROPE    GALDHOPIGGEN      2469
- - - - - 82 Line(s) not selected
**** End of data ****

```

**Template formatting:  
Selected countries starting with 'N' in Asia or Europe  
Selected fields**

```

F1=Help      F2=Zoom      F3=Exit      F4=CRetriev  F5=RFind      F7=Up
F8=Down      F9=Swap      F10=Left     F11=Right    F12=Cancel

```

## What happens if I select records / rows?

- **In BROWSE and EDIT:**
  - View / modify only selected records or rows
  
- **In COPY, PRINT, COMPARE, CREATE, DB2 IMPORT, DB2 EXPORT**
  - Process only selected records or rows

## How do I specify which records (or rows) will be selected?

- **There are 2 ways to specify selection criteria**

- “By Field”

**More Intuitive**

- *Easy!*: intuitive interface
- Quick and Intuitive

- Freeform

**More Powerful**

- Uses extended program syntax
- *Flexible!*: Can use any REXX function



# Specifying selection criteria

```

Process  Options  Help
-----
File Manager                               Edit Entry Panel
Command ==> █
-----
Input Partitioned, Sequential or VSAM Data Set:
  Data set name . GEO2004.COUNTRY
  Member . . . . . _____ Blank or pattern for member list
  Volume serial . _____ If not cataloged
  Start position . _____ +
  Record limit . . _____

Copybook or Template:
  Data set name . GEO.CNTL
  Member . . . . . GEO Blank or pattern for member list

Processing Options:
Copybook/template  Start position type  Enter "/" to select option
1 1. Above         - 1. Key          / Edit template
  2. Previous       - 2. RBA         / Set top to Start position
  3. None           - 3. Slot        - Create audit trail
  4. Create dynamic 4. Record number
    
```



# Specifying selection criteria

```

Process  Options  Help
-----
File Manager                               Field Selection/Edit                               Line 1 of 37
Command ===> 2                               Scroll CSR
-----
Criteria - Enter 1 or 2 to specify expression by field -----
1 Id : _____ +
2 Sel: _____ +
Offset 0
Cmd Seq SHC Ref Field Name                Picture    Type Start Length
-----
          **** Top of data ****
          1 1 COUNTRY-RECORD                  AN         1   1157
          2 2 GEO-KEY                        X(14)      AN         1    14
          3 2 REC-TYPE                        X          AN        15     1
          4 2 CTRY-CODE                       X(3)       AN        16     3
          5 2 INTERNET                       X(4)       AN        19     4
          6 2 POPULATION                      9(11)      BI         23     8
          7 2 LATITUDE                        X(6)       AN        31     6
          8 2 LONGITUDE                       X(7)       AN        37     7
          9 2 REGION                          X(16)      AN        44    16
         10 2 GEOGRAPHICAL-DATA              AN         60    374
         11 3 TOTAL-AREA-SQ-KM              S9(11)     PD         60     6
         12 3 LAND-AREA-SQ-KM              S9(11)     PD         60     6
         13 3 WATER-AREA-SQ-KM              S9(11)     PD         60     6
    
```



# Specifying selection criteria

```

Process  Options  Help
-----
File Manager                               Record Selection Criteria           Line 1 of 33
Command ==>> _____ Scroll CSR

Cmd Con ( Field Name                               Op Value                               )
  <-> - <---+-----1-----+-----2-----+-----3-----> <-> <---+-----1-----+-----2-----+-----
*** **** Top of data ****
____ AND  _ COUNTRY-RECORD
____ AND  _ GEO-KEY
____ AND  _ REC-TYPE
____ AND  _ CTRY-CODE
____ AND  _ INTERNET
____ AND  _ POPULATION
____ AND  _ LATITUDE
____ AND  _ LONGITUDE
____ AND  _ REGION
____ AND  _ GEOGRAPHICAL-DATA
____ AND  _ TOTAL-AREA-SQ-KM
____ AND  _ LAND-AREA-SQ-KM
____ AND  _ WATER-AREA-SQ-KM
____ AND  _ LOW-POINT-NAME
____ AND  _ LOW-POINT-M
____ AND  _ HIGH-POINT-NAME
    
```

# Specifying selection criteria

```

Process  Options  Help
-----
File Manager                Record Selection Criteria                REXX required
Command ==> _____ Scroll CSR
-----
Cmd Con ( Field Name                Op Value                )
  <-> - <----+-----1-----+-----2-----+-----3-----> <-> <----+-----1-----+-----2-----+-----
*** **** Top of data ****
____ AND  _ COUNTRY-RECORD
____ AND  _ GEO-KEY
____ AND  _ REC-TYPE
____ AND  _ CTRY-CODE
____ AND  _ CTRY-CODE
____ AND  _ INTERNET
____ AND  _ POPULATION
____ AND  _ LATITUDE
____ AND  _ LONGITUDE
____ AND  _ REGION
____ AND  _ GEOGRAPHICAL-DATA
____ AND  _ TOTAL-AREA-SQ-KM
____ AND  _ LAND-AREA-SQ-KM
____ AND  _ WATER-AREA-SQ-KM
____ AND  _ LOW-POINT-NAME
____ AND  _ LOW-POINT-M
____ AND  _ CO 'EUROPE', 'ASIA'
    
```



# Specifying selection criteria

```

Process  Options  Help
-----
File Manager                Field Selection/Edit                Line 1 of 37
Command ==> _____                Scroll CSR

----- Criteria - Enter 1 or 2 to specify expression by field -----
1 Id : █
2 Sel: #4 >= 'N' & #4 < 'O' & CO(#9, 'EUROPE', 'ASIA')
Offset _____ 0
Cmd Seq SHC Ref Field Name                Picture  Type Start Length
-----
          **** Top of data ****
          1 1 COUNTRY-RECORD                AN      1    1157
          2 2 GEO-KEY                      X(14)   AN      1     14
          3 2 REC-TYPE
          4 2 CTRY-CODE
          5 2 INTERNET
          6 2 POPULATION
          7 2 LATITUDE
          8 2 LONGITUDE
          9 2 REGION                      X(16)   AN     44    16
         10 2 GEOGRAPHICAL-DATA            AN     60    374
         11 3 TOTAL-AREA-SQ-KM            S9(11)  PD     60     6
         12 3 LAND-AREA-SQ-KM            S9(11)  PD     60     6
         13 3 WATER-AREA-SQ-KM            S9(11)  PD     60     6
    
```

**OR... if you prefer you can just type freeform selection criteria here.**

**With freeform criteria, you can use powerful REXX functions.**

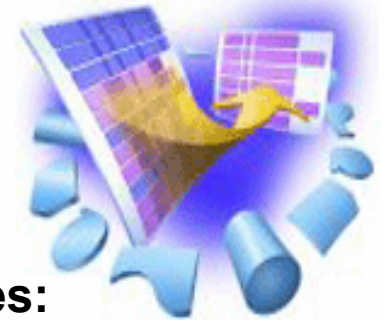
**PF6**



## Can I save and reuse my template settings?

- **A template can be saved as a PDS member, and reused by other utilities. For example:**
  - Use it in EDIT
    - To view only the selected records and fields
  - Use it in COPY
    - To copy only the selected records
  - Use it in PRINT
    - To print only the selected records and fields
  - Use it in COMPARE
    - To compare only the selected records and fields

## File Manager Overview



- **One product, 3 environments:  
base, 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



## What is Fault Analyzer ?

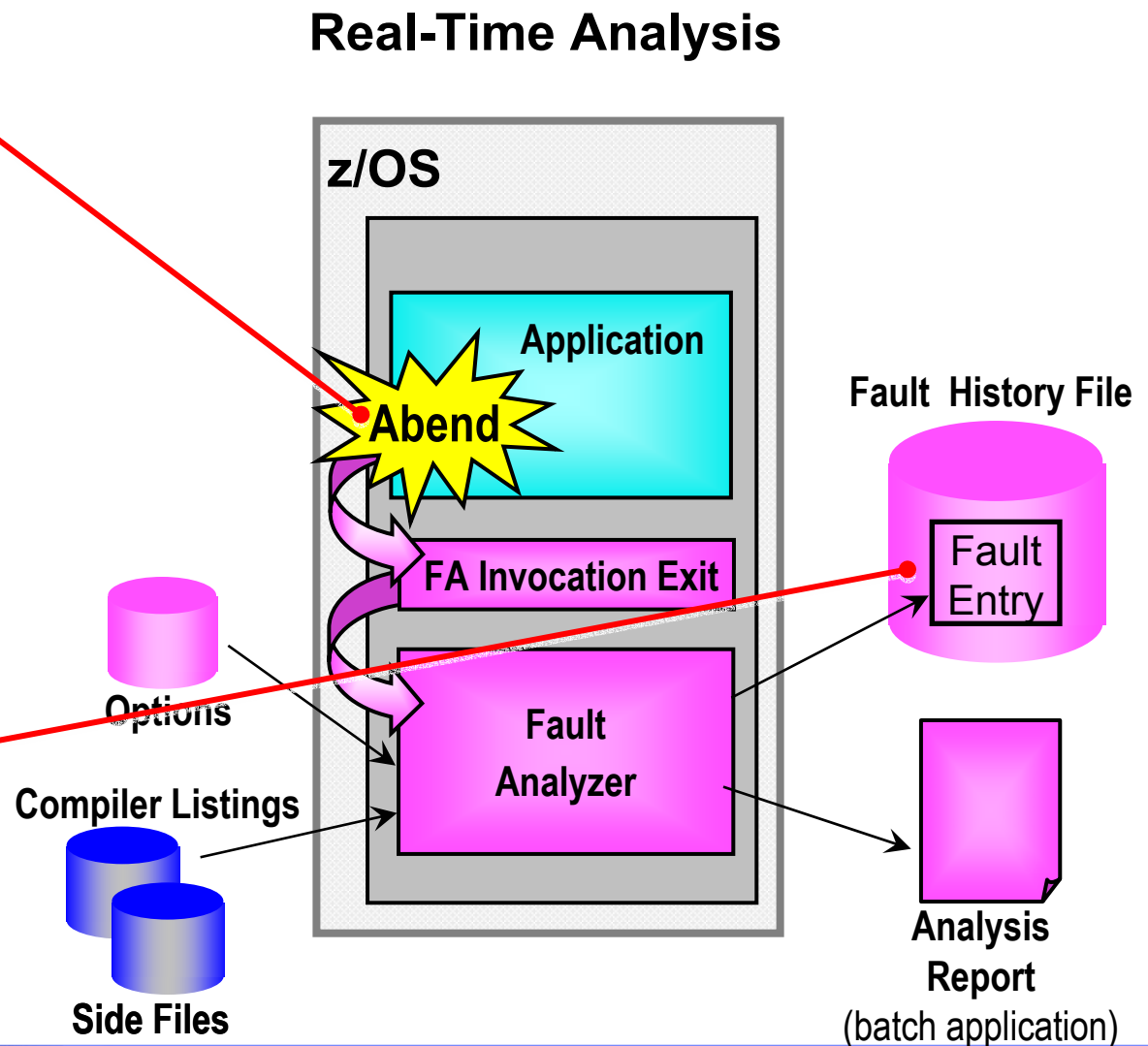
- **A tool that helps you determine the cause of an application abend**
  - so you can more quickly identify and resolve the problem
  
- **It provides information about an application when it has abended, to help you assess:**
  - What happened, and why?
  - What program?
  - What line of source code?
  - 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*

## What does Fault Analyzer do when a program abends?

1. An application abends. The system intercepts it and invokes FA.
2. FA analyzes the abend,
3. gets program source information,
4. generates an analysis report,
5. and stores the report and detailed abend info into the "Fault History File".



## A familiar occurrence...

Oooops! The application abended.

```

Display Filter View Print Options
-----
SDSF OUTPUT DISPLAY DNET074R JOB06769 DSD 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 -
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-
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
logical order.

```

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





## Fault Analyzer Interactive Reanalysis

```

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

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
Program SAM2 Compiler Listing
Command ==>
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 '

```

Line 154 Col 1 80  
Scroll ==> CSR

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:

    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
000158
COMPUTE CUST-ACCT-BALANCE =
CUST-ACCT-BALANCE + WS-UPDATE-NUM

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

Source
  
```

Diagram annotations:

- A blue box labeled "reason" has an arrow pointing to the text "A decimal digit or sign was invalid."
- A blue box labeled "abending program" has an arrow pointing to the text "The cause of the failure was program SAM2 in module SAM2."
- A blue box labeled "abending statement" has an arrow pointing to the COBOL code line "COMPUTE CUST-ACCT-BALANCE = CUST-ACCT-BALANCE + WS-UPDATE-NUM".

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



# Fault Analyzer Interactive Reanalysis – Event Summary

File View Services Help

SAM1 was the main program.  
 SAM2 was a subroutine.

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 #	Type	Fail Point	Module Name	Program Name	EP 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 program SAM2

(\*) 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 3 of 8: 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

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

COBOL Source Code:
Source
Line #
000157
000158
                                COMPUTE CUST-ACCT-BALANCE =
                                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
    
```

Detailed info about program SAM2 is shown here.





## Fault Analyzer Interactive Reanalysis – program detail

```

File View Services Help
-----
Event 3 of 3: Abend S0C7 *** Point of Failure ***                Line 68 Col 1 80
Command ==> _____ Scroll ==> CSR
JOBNAME: DNET074R  SYSTEM ABEND: 0C7                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



## Fault Analyzer Interactive Reanalysis – program detail

```

File View Services Help
-----
Event 3 of 3: Abend S0C7 *** Point of Failure ***                Line 68 Col 1 80
Command ==> _____ Scroll ==> CSR
JOBNAME: DNET074R  SYSTEM ABEND: 0C7                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.

```

**Associated Storage Areas** contains all variables and storage for the program.

Enter

# Fault Analyzer Interactive Reanalysis - storage

Finding the variable with the bad data...

```

File View Services Help
Associated Storage Areas                               Line 1 Col 1 80
Command ==> f cust-acct-balance █                     Scroll ==> CSR
JOBNAME: DNET074R  SYSTEM ABEND: 0C7                 DEMOMVS  2005/04/30  11:32:11

Task Global Table (TGT) at address 000201A0 for length 384

WORKING-STORAGE SECTION
Off Hex Value                                         EBCDIC Value     Source (Starting a
BLW=0000 at address 000203A0

    0 00000000 123C                                     1.23              01  WS-FIELDS.
    6 D5                                                *N                *   05  WS-UPDATE
    7 00000F                                           0                 05  TRAN-COUN

LINKAGE SECTION
BLL=0000 has not been assigned an address
Off Hex Value                                         EBCDIC Value     Source (Starting a
BLL=0001 at address 00009978

    01 CU
    05
  
```



# Fault Analyzer Interactive Reanalysis - storage

```

File View Services Help
Associated Storage Areas                                     Line 14 Col 2 81
Command ==> _____ Scroll ==> CSR
JOBNAME: DNET074R  SYSTEM ABEND: 0C7                      DEMOMVS  2005/04/30  11:32:11
INKAGE SECTION
LL=0000 has not been assigned an address
Off Hex Value      EBCDIC Value      Source (Starting at
LL=0001 at address 00009978

                                01  CUSTOMER-REC.
                                05  CUST-KEY.
                                10  CUST-I
                                10  CUST-R
0  F1F1F1F1 F2              *11112              *
5  C1                      *A                  *
6  D585A2A2 6B40D3A4 92854040 40404040 *Ness, Luke        *
16 40                      *                  *
17 7B7C5C50 5A              *#*!*&!            *
1C 000003E9                1001                *
20 F5F1F6F6 40D68192 40C79996 A58540D9 *5166 Oak Grove R*
30 96818440                *oad                *
34 D79699A3 81878540 40404040 4040    *Portage            *
42 D4C9                    *MI                 *
44 E4E2C140 40              *                  *
4F 00000000 00              *                  *
54 00000048 40              *                  *
                                05  CUST-ACCT-
                                05  CUST-ORDER
                                05  CUST-ADDR
                                05  CUST-CITY
                                05  CUST-STATE
                                05  CUST-COUNT
                                05

```

The bad data

\*#\*!\*&! (circled in red)

Lots of good info here. The bad variable is part of "CUSTOMER-REC". And it's in LINKAGE section.

PF3

## Fault Analyzer Interactive Reanalysis – program detail

```

File View Services Help
-----
Event 3 of 3: Abend S0C7 *** Point of Failure ***                               Line 68 Col 1 80
Command ==> _____ Scroll ==> CSR
JOBNAME: DNET074R  SYSTEM ABEND: 0C7          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.
```

Returning back to the  
Event Summary

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.



# 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-0
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. Edit
2. Browse

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 *
    
```

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

Enter

## Fault Analyzer Interactive Reanalysis – link to File Manager

```

Process  Options  Help
-----
File Manager Edit DNET074.ADLAB.CUSTOMER.FILE
Command ==> █
Type KSDS      Refresh on save N
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 15511  A          A.                    244.42          1 1551 S. Was
- - - - - CONTACT-REC - - - - - 2 Line(s) suppressed
000020 0221  A          A.                    86.88           0 221 Yale Rd
- - - - - CONTACT-REC - - - - - 1 Line(s) suppressed
    
```

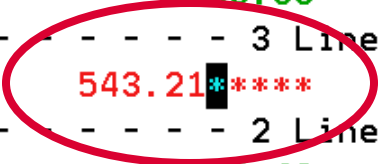
The bad data in the file...  
(the cause of this abend).

## Fault Analyzer Interactive Reanalysis – link to File Manager

```

Process  Options  Help
-----
File Manager Edit DNET074.ADLAB.CUSTOMER.FILE
Command ==> _____ Scroll CSR
                          Format TABL
Type KSDS      Refresh on save N
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
000018 11551  A          S. Was                  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.

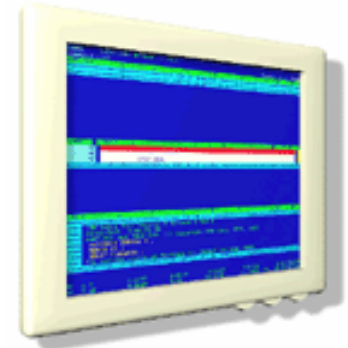


# Fault Analyzer Overview



- **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, MQSeries, WAS/z 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
  - ISPF Interface for all applications
  - Integrated 64-bit DB2 version 8 support

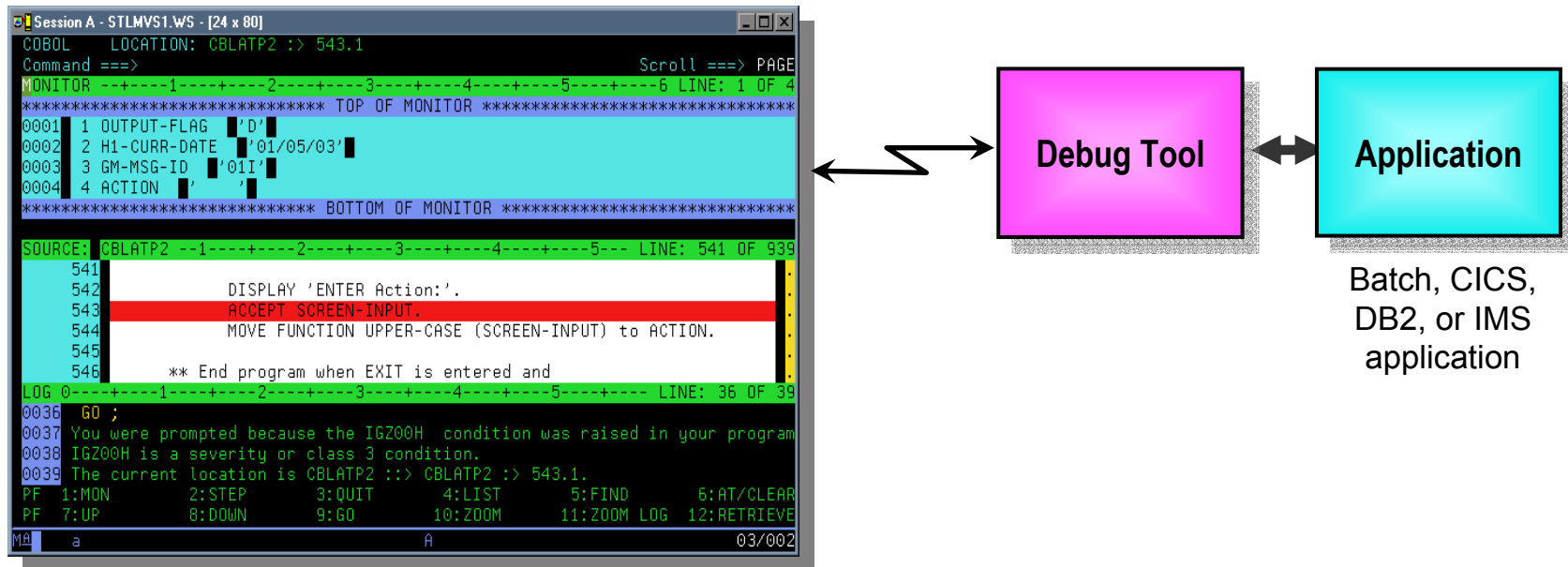
## What is Debug Tool?



- A tool that helps you test programs, and monitor and control the execution of programs
- An interactive, source level debugger
- A set of utilities to help you
  - Modernize (convert) older COBOL programs (i.e. OS/VS COBOL)
  - Perform coverage testing
  - Automate regression testing



## How do I interface with Debug Tool?

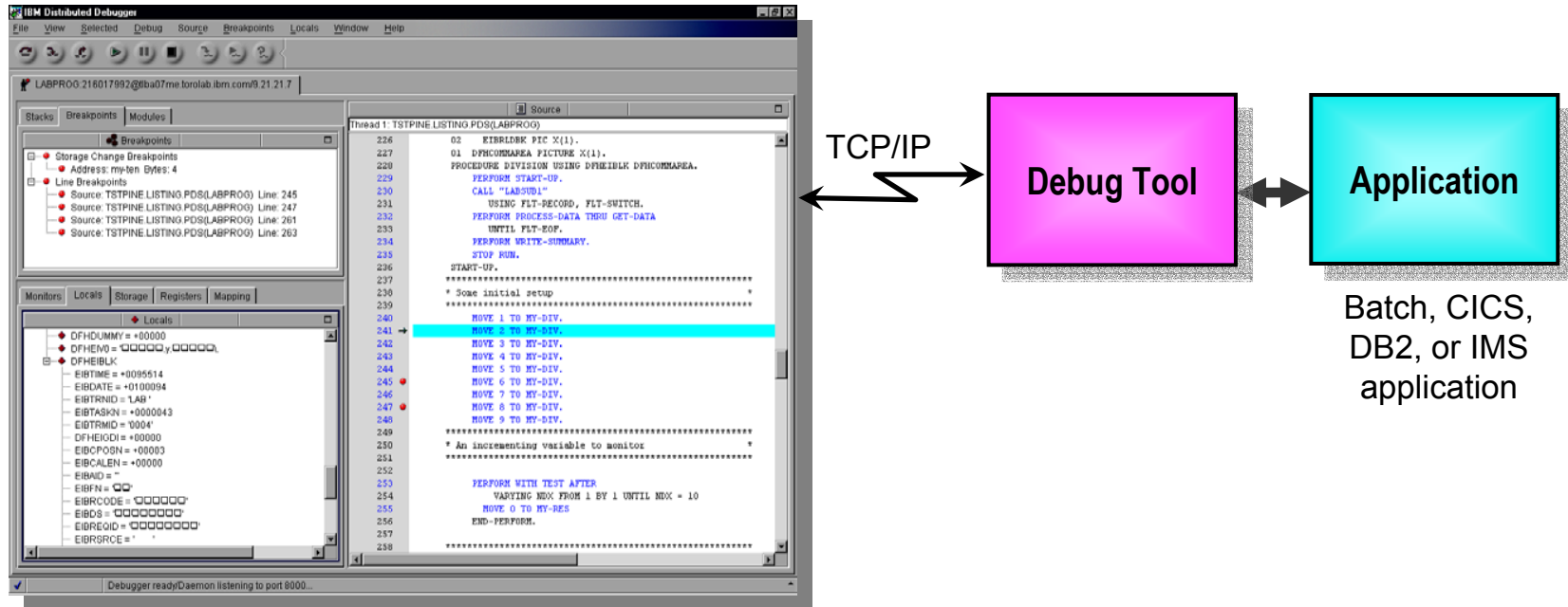


### ■ Full-screen mode

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



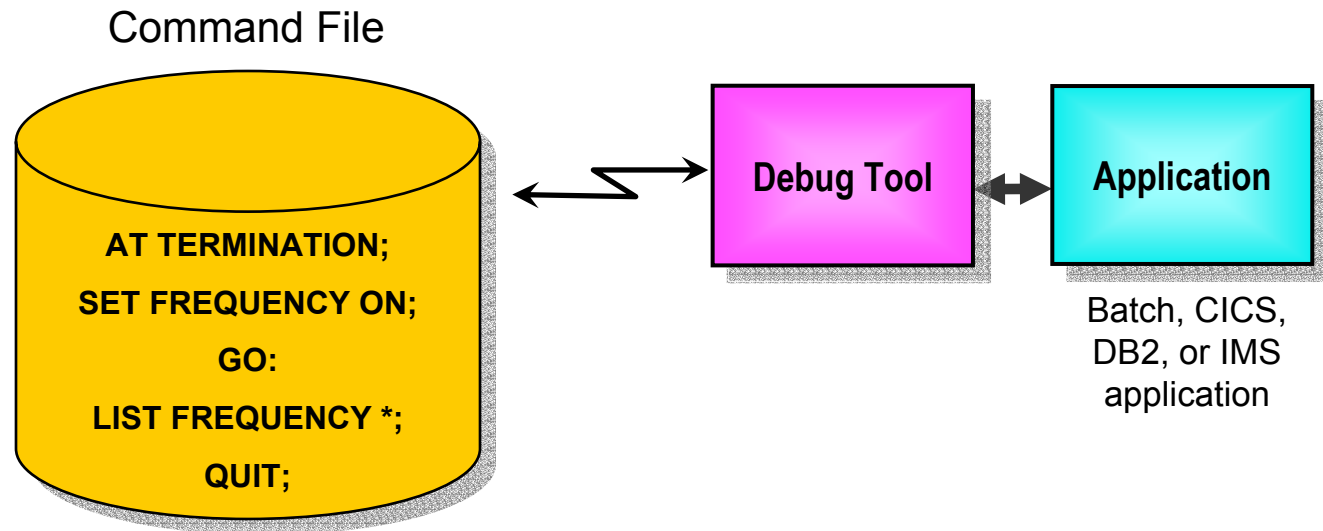
# How do I interface with Debug Tool?



## Remote debug mode

- the host application starts Debug Tool, which connects to a remote debugger on your workstation
- Uses the GUI debuggers built into products such as:
  - WSED
  - C/C++ Productivity Tools for OS/390
  - VisualAge COBOL for Windows
  - VisualAge for Java, Enterprise Edition for OS/390
  - VisualAge PL/I for Windows

## How do I interface with Debug Tool?



### ■ 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

## Starting a Debug Tool session

```

File Edit Edit_Settings Menu Utilities Compilers Test Help
EDIT      DNET074.ADWORK.DATA(SAMRUN) - 01.17      Columns 00001 00072
Command ==> sub
***** ***** 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  
in a batch job, just  
add a PARM to the  
EXEC statement

# Debug Tool

```

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 *****

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     PREEVE
    
```

STEP through the program statement by statement



# Debug Tool

```

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 *****

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         BELIEVE
    
```

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



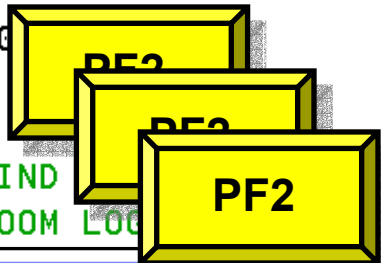
# Debug Tool

```

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          6:AR
PF  7:UP         8:DOWN          9:GO           10:ZOOM         11:ZOOM LOG    VE
    
```

The Red Line is the current statement.

STEP a few times...



# Debug Tool

```

COBOL    LOCATION: SAM1 :> 267.1
Command ==>
MONITOR  --+---1---+---2---+---3---
*****
0001 1 ***** AUTOMONITOR *****
0002   There are no variables in the s
*****
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

```

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----+----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: 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





# Debug Tool

```

COBOL      LOCATION: SAM1 1
Command ==> go
                                                    Scroll ==> CSR
-----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 - 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

```

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 *****

SOURCE: SAM1 +---1---+---2---+---3---+---4---+---5---+---6 LINE: 39 OF 42
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---+---6 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      CLEAR
PF 7:UP     8:DOWN     9:GO      10:ZOOM     11:ZOOM     PREEVE
    
```

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



# Debug Tool

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

```

COBOL   LOCATION: SAM1 :> 270.1
Command ==>                               Scroll ==> CSR
MONITOR  --+---1---+---2---+---3---+---4---+---5---+---6 LINE: 1 OF 3
***** TOP OF MONITOR *****
0001  1 CUST-ACCT-BALANCE  X'0000000000'
0002  2 ***** AUTOMONITOR *****
0003  02 SAM1:>WS-TRAN-EOF
***** BOTTOM OF MONITOR *****

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     PEEVE
    
```

The AUTOMONITOR displays all variables referenced by the current statement

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



# Debug Tool

```

COBOL      LOCATION: SAM1 :> 270.1
Command ==>
SOURCE: SAM1 +----1-----2-----3-----
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
    
```

Scroll ==> CSR  
- LINE: 60 OF 489

PF 1:?      2:STEP      3:QUIT      4:LIST      5:FIND      CLEAR  
PF 7:UP      8:DOWN      9:GO      10:ZOOM      11:ZOOM      BRIEF

ZOOMed in on the Source Window.

**PF10**

## Debug Tool

```

COBOL      LOCATION: SAM 157.1
Command ==> go █
Enter
-----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

```

COBOL   LOCATION: SAM2 :> 157.1
Command ==>
MONITOR  --+---1---+---2---+---3---+---4--- CSR 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      CLEAR
PF 7:UP     8:DOWN      9:GO       10:ZOOM     11:ZOOM     PRIEVE
    
```

You can fix the bad data and keep running...

...overtyp e a value to change it.

**Enter**



# Debug Tool

```

COBOL    LOCATION: SAM2 :> 157.1
Command ==> MOVE 123          TO SAM2:>CUST-ACCT-BALANCE;      Scroll ==> CSR
MONITOR  --+---1---+---2---+---3---+---4---+---5---+---6 LINE: 1 OF 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---+---6 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          CLEAR
PF  7:UP         8:DOWN          9:GO           10:ZOOM         11:ZOOM        PIEWE
    
```

DT formats a command to make the change.





# Debug Tool

```

COBOL   LOCATION: SAM2 :> 157.1
Command ==> go bypass
MONITOR  ---+---1---+---2---+---3---+---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     BRUEVE
    
```

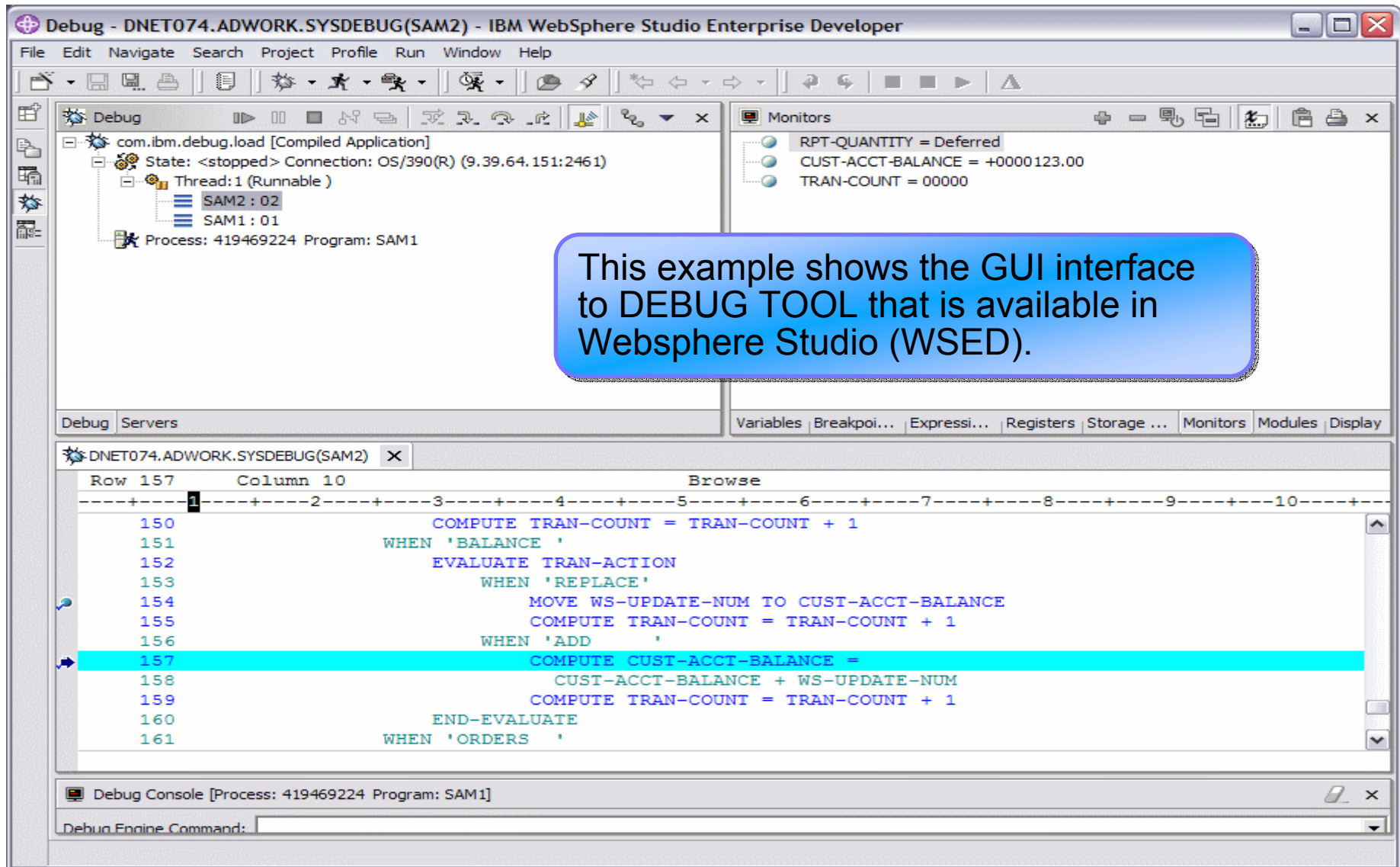
GO BYPASS skips the abending statement and the program keeps running !



## Debug Tool 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

# Optionally, use one of the GUI Debugging Interfaces



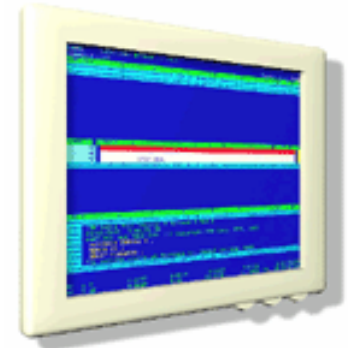
The screenshot displays the IBM WebSphere Studio Enterprise Developer interface for debugging. The main window is titled "Debug - DNET074.ADWORK.SYSDEBUG(SAM2) - IBM WebSphere Studio Enterprise Developer". The interface is divided into several panes:

- Debug Console:** Shows the state of the application. The state is "<stopped>" with a connection to OS/390(R) at IP 9.39.64.151:2461. A thread is running, and the process is 419469224, program SAM1.
- Monitors:** Displays monitored variables: RPT-QUANTITY = Deferred, CUST-ACCT-BALANCE = +0000123.00, and TRAN-COUNT = 00000.
- Code Editor:** Shows the source code for the application. The current line is 157, which is highlighted in blue. The code is as follows:

```
Row 157      Column 10      Browse
-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
150          COMPUTE TRAN-COUNT = TRAN-COUNT + 1
151          WHEN 'BALANCE '
152          EVALUATE TRAN-ACTION
153          WHEN 'REPLACE'
154          MOVE WS-UPDATE-NUM TO CUST-ACCT-BALANCE
155          COMPUTE TRAN-COUNT = TRAN-COUNT + 1
156          WHEN 'ADD '
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 '
```
- Debug Console:** Shows the process and program information: "Debug Console [Process: 419469224 Program: SAM1]".

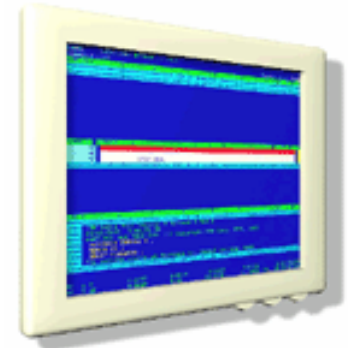
A blue callout box with a white border and a drop shadow is overlaid on the interface, containing the text: "This example shows the GUI interface to DEBUG TOOL that is available in Websphere Studio (WSED)."

## Debug Tool Overview:



- **Common User Interface Across Systems And Subsystems**
- **Consistent Across Languages**
  - COBOL, C/C++, PL/I, assembler
- **Environments Supported**
  - CICS
  - TSO
  - JES/Batch
  - IMS Including IMS/TM
  - DB2 Including Stored Procedures
  - Unix System Services (USS)
  - MQSeries
- **Debug Tool 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

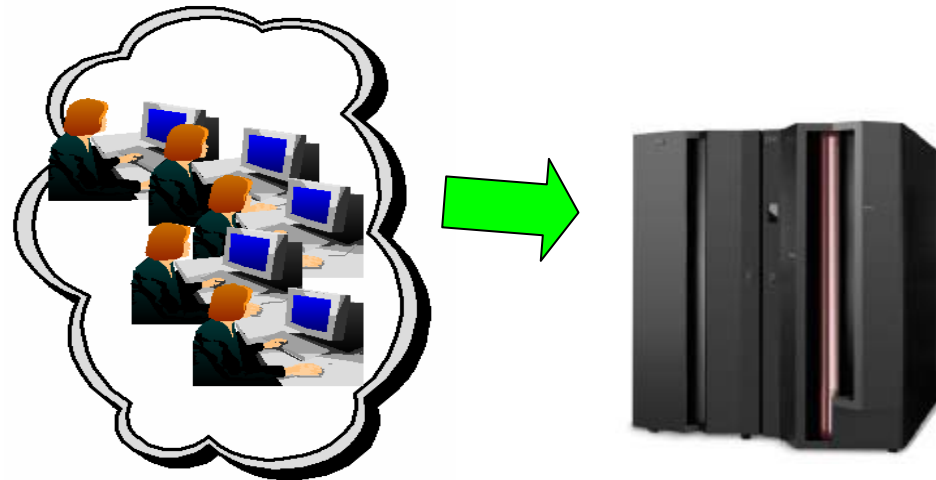
## Debug Tool Overview (part two):



- **Common User Interface Across Systems And Subsystems**
- **Consistent Across Languages**
  - COBOL, C/C++, PL/I, assembler
- **Environments Supported**
  - CICS, TSO, JES/Batch, IMS Including IMS/TM, DB2 Including Stored Procedures, Unix System Services (USS), MQSeries
- **Order Debug Tool Utilities and Advanced Functions PID**
  - 5655-L23
- **Debug Tool Utilities and Advanced Functions Features:**
  - 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

## What is Workload Simulator?

- **An automated performance and testing tool**
- **It simulates terminals or other network devices, and the associated message traffic**
- **It is used to perform**
  - Load testing
  - Stress testing
  - Performance testing
  - Regression testing





## 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?”**



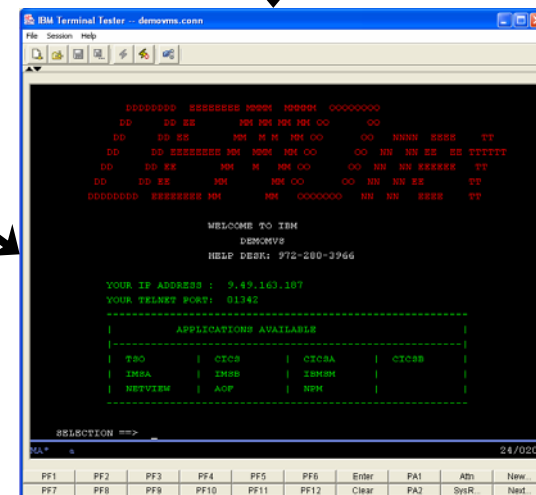
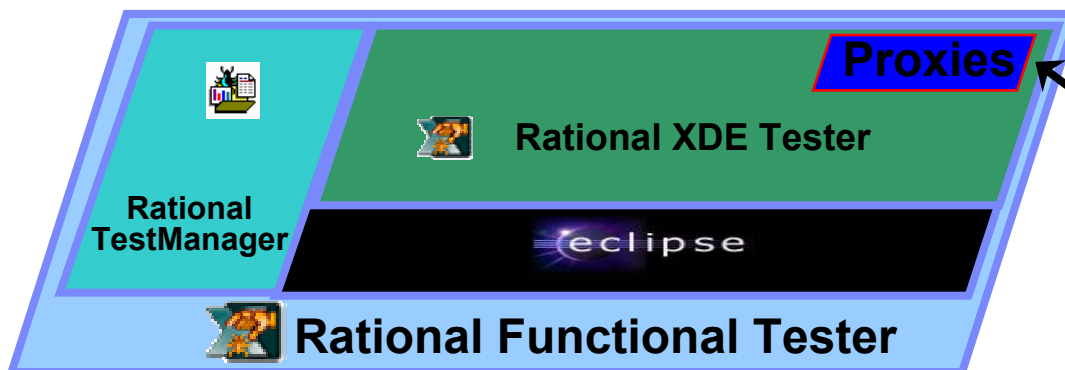
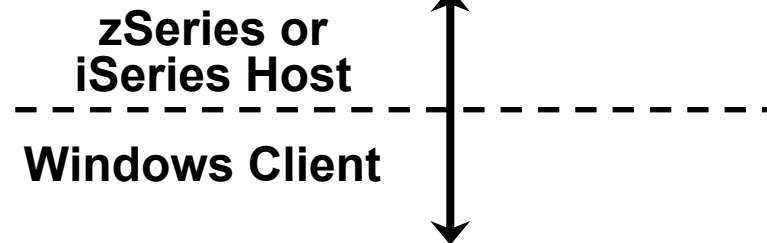
## What is the IBM Rational Functional Tester Extension for Terminal-based Applications ?

*Software that will let you test your zSeries terminal-based applications with the same tool – IBM Rational Functional Tester – used to test Java and Web-based client server applications.*

- **Supports 3270 and 5250 based apps**
- **Implemented as terminal emulator plus Rational XDE Tester Proxies**
- **Installs “on top of” Rational XDE Tester**
- **A single point of control for testing z/OS and web front-end applications**

# Rational Functional Tester Extension Components

- **Consists of:**
  - Java-based terminal emulator
  - XDE Tester proxies
- **Windows-based**
- **Nothing installs on the host**



# Rational Functional Tester Extension

## Value of IBM Rational Function Tester

*Part of a bigger picture*

### Plan Test Cases



- ✓ Plan tests using a flexible test management framework to design each test case

### Create Tests



- ✓ Build automated tests to validate business functionality
- ✓ Create manual tests for test cases not suited to automation
- ✓ Extend script function with Java programs

### Schedule & Execute



- ✓ Execute test suites unattended
- ✓ Combine automated, manual and custom tests for complete coverage
- ✓ Execute tests across Windows and Linux workstations

## 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**

## 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 for z/OS Features

- **Workflow-oriented ISPF User Interface**
- **Allows Definition and Exploitation of Application Relationships**
- **Parsers**
  - Generate File Export Information by parsing source programs, copybooks and include files
- **Ability to reformat data and modify data while copying**
- **SQL-like control language for advanced users to allow generation of complex exports**
- **Support for DB2, IMS, QSAM, VSAM**



## What is Application Monitor for z/OS ?

- 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 Monitor for z/OS

- 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**

# Application Monitor for z/OS

```

----- IBM AM for z/OS - Statement Analysis -----
          2005/05/09 11:19:28.0 to 2005/05/09 11:19:55.5   Row 1 of 6

Jobname: DNET074C          Stepname: RUNPRIME          Duration: 00:00:27
Samples: 4,438            Module: ISPRIME             CPU Pct: 19.31

Stmtno Statement                                          < CPU% > Pct.
-----
 67 DIVIDE TEST-NUMBER BY CALC-NUMBER GIVING SOME-RES =====> 55.68
 74 COMPUTE CALC-NUMBER = CALC-NUMBER - 1.                => 16.95
 58 PERFORM 110-PRIME-TEST  UNTIL TEST-DONE-SW = SW-    > 12.17
 69 IF MOD = 0 THEN                                       . 8.23
 63 IF (CALC-NUMBER < 2)                                  . 6.90
 55 COMPUTE CALC-NUMBER = TEST-NUMBER - 1.                . 0.04
***** BOTTOM OF DATA *****

```

AM can pinpoint CPU usage down to individual lines of source code!

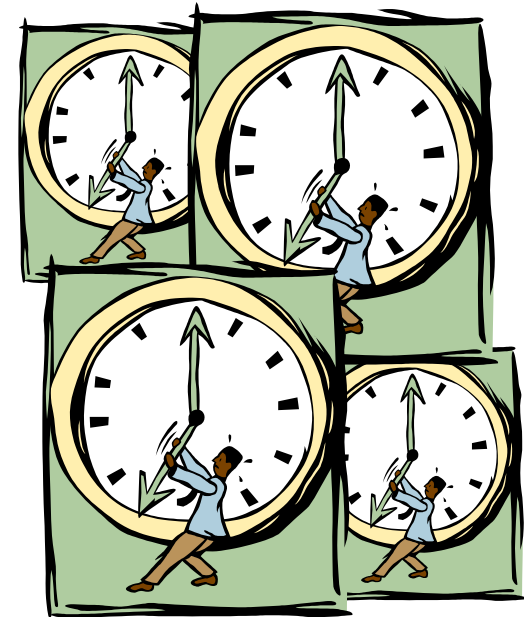
```

Command ==> | Scroll ==> CSR

```

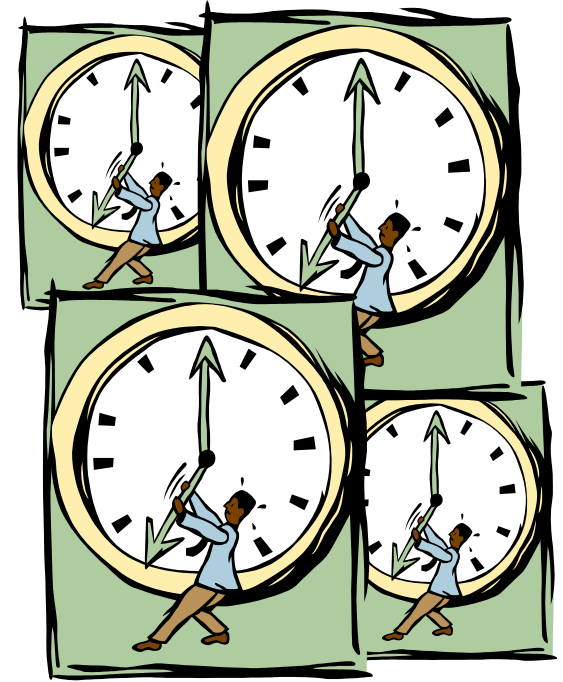
## What is ISOGON TIC TOC ?

- **A date and time simulation tool**
- **Use it to control dates and times used by your applications**
- **For example:**
  - Shift time zones for online regions so users will see their local time
  - Restart a failing job at the date/time it failed ensuring that updates / reports are not affected
  - Allow jobs that, due to unavoidable circumstances run over a deadline, to finish “on time”



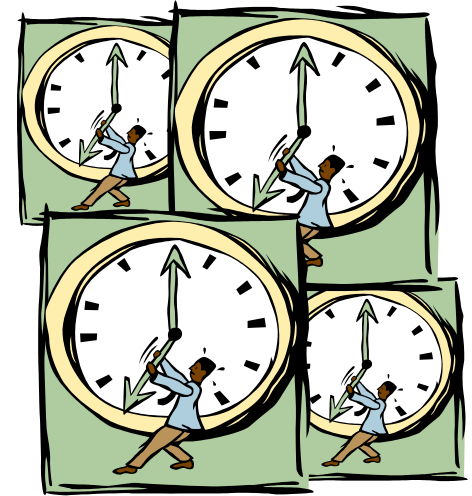
## **ISOGON** TIC TOC Date and Time Simulation

- TIC TOC is Proven technology. **It was the leading tool used for mainframe Y2K testing.**
- TIC TOC enables testing end-of-period as well as across midnight or other sensitive times.
- **Sets the standard for date / time simulation tools**
  - Recognized and recommended by industry analysts and leading companies around the world who rely on TIC TOC every day.



## ISOGON TIC TOC – Date and Time Simulation

- TICTOC supports common programming languages such as **COBOL, PL/1, Assembler, CLIST, REXX**, as well as support for CICS via the **EXEC-CICS ASKTIME** service, **LE, IMS, IDMS, IDEAL, DB2, and NATURAL**.
- TICTOC handles all clock formats including **decimal, binary, timer units, microseconds, and TOD** clock format. It supports requests for date via the **MVS TIME** and **STCKSYNC** macros and supports the **STCK** instruction.
- **Specifying virtual dates can be done in ISPF or via a JCL statement.**
- TICTOC has a simple ISPF interface **with online help for programmers to easily specify the jobs to receive simulated dates on an individual or generic group.**
- TICTOC offers stringent security and integrity features. **In addition to specific programmer and job group access, TICTOC can be restricted via your installation's standard security system.**
- **For more information:**  
[www.isogon.com/partners/tictoc/index.htm](http://www.isogon.com/partners/tictoc/index.htm)



Get more information about these tools at  
[www.ibm.com/software/awdtools/deployment](http://www.ibm.com/software/awdtools/deployment)

Software > Software Development >

## z/OS Problem Determination and Deployment Tools

z/OS® Problem Determination and Deployment Tools have powerful functions and features. Organizations that choose to use them improve the health of their application portfolios.

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**Related software**

- Application Monitor for z/OS
- DebugTool for z/OS
- Fault Analyzer for z/OS
- File Export for /OS
- File Manager for z/OS
- Workload Simulator for z/OS and OS/390

**Related hardware**

- zSeries servers
- Warranty info

Products	Solutions
<ul style="list-style-type: none"> <li>• <b>Application Monitor for z/OS</b> A non-intrusive performance analyzer for applications and systems programs that provides resource utilization information for your applications. This resource information can be the current system data (online analysis) or data collected over a certain time period (historical analysis).</li> <li>• <b>Debug Tool for z/OS</b> A program testing and analysis aid that helps you examine, monitor, and control the execution of programs written in C/C++, COBOL, or PL/I on OS/390, MVS™, VM, or VSE™, and compiled Java™ with the</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Problem Determination and Deployment Tools Information Center</b> This information center provides fast, online centralized access to Problem Determination and Deployment Tools product information.</li> <li>• <b>IBM COBOL family</b> IBM COBOL provides a complete offering of compatible, cross-platform, cross-product compilers that support z/OS, OS/390®, VM, VSE/ESA®, AS/400®, AIX®, and Microsoft® Windows NT®. IBM gives you the tools you need to amplify your program development and leverage your existing applications, enabling you</li> </ul>

**Highlights**

File Manager: Latest PTF information

Fault Analyzer: Latest PTF information

Debug Tool: Latest PTF information

WebSphere and zSeries AD tools help meet on demand