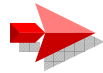


This is the tutorial for IBM's Fault Analyzer for z/OS®, one of the IBM zSeries® problem determination tools.



■ Introduction

- Fault Analyzer overview

■ Fault Analyzer files

- Fault history files
- Program side files and compiler listings

■ Real-time abend processing

- Real-time fault analysis

■ Using the on-line interface

- Opening a fault history file and using a view
- Getting help
- Finding and matching fault entries
- Getting information about a fault entry
- Customizing the columns displayed

This course will show you the features of Fault Analyzer and how you can use it to understand why a program running on a z/OS system has abnormally terminated.

This course is broken down into sections. If you have not already used Fault Analyzer, it is best to take each section in order. If you have already been using it, and want to learn more about a particular topic, you can go directly to that section.

This section is an introduction to fault analyzer. The next section describes files that it uses to store abend information, and files it reads to get program source information. The "real time abend processing" section describes what happens automatically when an abend occurs, and introduces the analysis report that is produced. Then take the "Using the on-line interface" section to understand the TSO and CICS® interfaces to fault analyzer.

- **Viewing a real-time fault analysis report**

- **Interactive reanalysis**
 - Interactive reanalysis tour
 - How to use the File Manager interface

- **Program source mapping during reanalysis**
 - Applying side files and compiler listings
 - Automating the search for side files and listings with options
 - Requesting prompts for file names during reanalysis
 - Re-creating a compiler listing for an existing module

The next section, "viewing a real-time fault analysis report" shows an example of how you can view a report using the on-line interface, and goes into detail about the information available in the report.

A feature called "reanalysis" is typically the best and fastest way to research an abend. Take the "interactive reanalysis" section to learn about this feature and to see an example of how it can be used to perform a root-cause analysis of an abend.

The next section describes how Fault Analyzer can read special side files and compiler listings to enable source mapping to show program statements and variables. There are topics that cover how you can apply these files, and how to automate the search for them.

- **CICS, DB2® and IMS™ support**
 - CICS support
 - Using the CICS on-line interface
 - DB2 support
 - IMS support

- **Working with fault entries**
 - Creating and using a fault history file
 - Moving or copying fault entries
 - Transmitting fault entries to another system
 - Writing to your own history file

If you work with CICS, DB2, or IMS applications, take the sections that describe the additional information that is reported for applications running in those environments.

The "Working with fault entries" section describes how you can move or copy fault entries to your own fault history file.

Fault Analyzer tutorial



- **Fault Analyzer options in JCL for batch jobs**
- **Batch reanalysis**
 - Example of batch reanalysis
- **Using the web browser interface**
- **Fault Analyzer tips**

The "batch reanalysis section" describes how to perform a batch reanalysis to reproduce an analysis report. There is a section that describes how to access real-time reports from a web browser. And finally, take the "Fault Analyzer tips" section for a few extra pointers.

What is Fault Analyzer ?



- Fault Analyzer is a tool that helps you determine the cause of an application abend
 - Enabling you to more quickly identify and resolve the problem

- Delivers 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?

Fault analyzer is software that helps you understand why a program has abnormally terminated or abended. It helps you to perform root cause analysis, so you can fix the problem. As you are doing your research, fault analyzer helps answer questions such as what happened, what program was running, what program statement ran that cause the abend, and what were the values of variables. And it will help you understand more in depth questions, such as "what were the programs on the call chain?", and "what processing was occurring against files and databases?".

Environments and languages supported



Fault Analyzer can capture abends in these environments:

- z/OS
- LE (Language Environment)
- CICS
- IMS
- DB2
- MQSeries®
- UNIX System Services

Side files and compiler listings can be mapped for these IBM compilers:

- COBOL
- PL/I
- Assembler
- C/C++

Fault Analyzer can map program source information to show source statements and variables. This is a big time saver since it eliminates the need to perform abend analysis the old-fashioned way, where you read a dump and calculate offsets into your program to find your variables and statements. It can perform source mapping for programs compiled using the IBM COBOL, PLI, and C and C++ compilers, and the IBM assembler. It uses a side file, such as something called a Sysdebug file, or a compiler listing created by a compiler.

Fault Analyzer works with programs running under the z/OS operating system, and provides detailed information about the environment where an application runs. Details are reported for language environment, CICS and IMS transaction managers, and UNIX System Services. It reports DB2 and IMS data base, and MQ Series queue activity.

What features does Fault Analyzer have?



- **Real-Time Analysis**
 - Detailed information is captured automatically when an application abends
 - An analysis report is generated
- **Interactive Reanalysis** ← Easiest way to research an abend
 - Quick point-and-shoot navigation of abend information
 - Apply files for program source mapping
- **Batch Reanalysis**
 - Run a utility to generate a new analysis report
 - Apply files for program source mapping
- **Online Interface**
 - Use the online interface to:
 - View a real-time analysis report
 - View a fault using interactive reanalysis
 - Generate JCL to perform batch reanalysis

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Fault analyzer has several features. When a program abends, it automatically captures information and generates an analysis report. That is called real time analysis. The on-line interface is available in TSO and CICS. You can use the on-line interface to manage your abend information, view analysis reports, and to perform a function called reanalysis.

Interactive reanalysis is the easiest way to research an abend. It provides point-and-shoot navigation of abend information, which makes it easier and faster than just viewing a report. When you do a reanalysis, you also have the option of mapping program source information.

A feature called batch reanalysis is a utility that lets you produce a fresh copy of an analysis report.

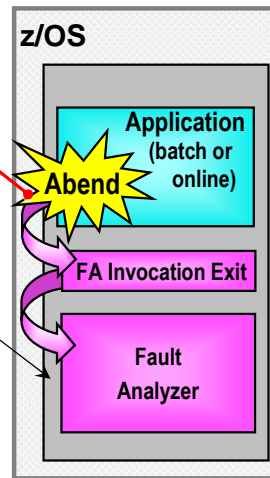
Real-Time analysis ... how it works



1. An application abends. The system intercepts the abend and calls a Fault Analyzer exit. The exit invokes FA.

2. FA reads options that control whether it will analyze the abend, how to process, and which Fault History file to use
 - Installation options are specified for the system
 - Options can be overridden for a job step or online region

Real-Time Analysis



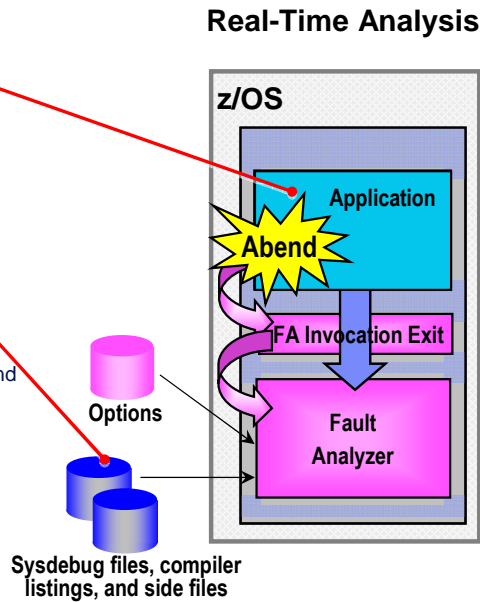
Here is how it works. First an application abends. This could be, for example, a batch job or a CICS transaction. The system intercepts the abend, and invokes fault analyzer. Notice that fault analyzer does not get involved, meaning that it does not have any system overhead, if the program does not abend. After it is invoked, it reads options customized for your system to determine, among other things, whether it should process the abend.

Real-Time analysis ... how it works



3. Fault Analyzer examines programs and the environment in the application address space

4. Files for source mapping are read
 - It searches for matching Sysdebug files, side files, and compiler listings
 - Multiple libraries can be searched



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Next, fault analyzer examines the application address space and performs its' data collection and analysis.

Part of that analysis is the mapping of program source data. Fault Analyzer system options can be customized so that it automatically locates side files or compiler listings created your compiler. Source mapping is described in more detail in later sections.

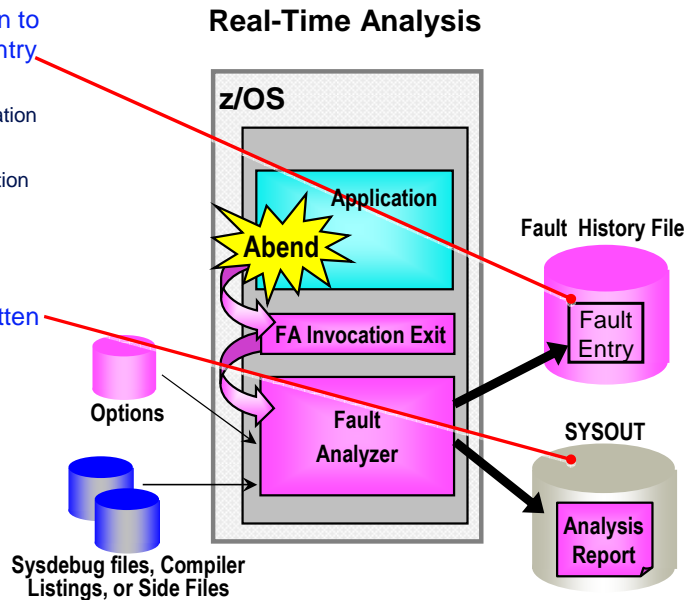
Real-Time analysis ... how it works



5. A new Fault Entry is written to a Fault History File. The entry contains:

- Information about the application
- The Analysis Report
- A "mini-dump" of the application (this enables reanalysis)

6. The Analysis Report is written to SYSOUT (batch jobs only)



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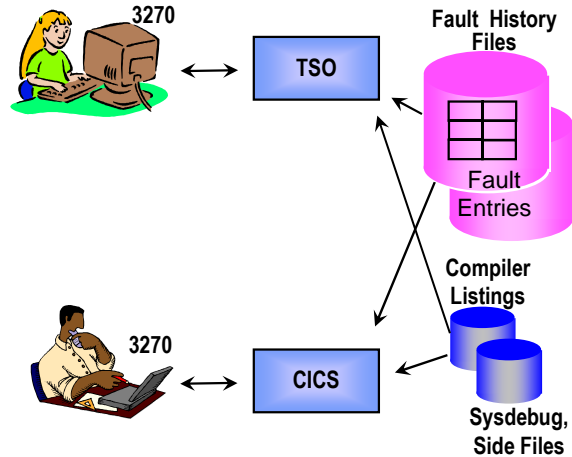
Next, fault analyzer writes an entry into a fault history file. A fault history file is a repository where abend information is stored. The fault entry contains a full copy of the real time analysis report, and something called a mini dump. But do not let the word "mini" fool you, because extensive information is collected.

Finally, but only for batch jobs, fault analyzer automatically writes a copy of the real time analysis report to sysout.

The online 3270 interface



- The online 3270 interface is available from TSO and CICS
- Use it to:
 - Display a list of abends
 - View real-time reports
 - Perform reanalysis and apply program source
 - Delete fault entries
- The CICS interface is the same as the TSO interface, with minor restrictions
- Any abend can be viewed from either interface



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Use the 3270 on-line interface to see a list of abends, view real time reports, perform a reanalysis, and manage fault entries. The same on-line interface is available in TSO and CICS. You can view any abend from either interface.

The online 3270 interface display

IBM

Specify the history file Available line commands are shown

```

File  Options  View  Services  Help
-----
IBM Fault Analyzer - Fault Entry List
Command ==> _____ Line 1 Col 1 80
                          Scroll ==> CSR

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

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

Fault_ID Job/Tran User_ID Sys/Job Abend Date Time
-----
F00869 DNET845X DNET845 DEMOMVS S0C7 2010/02/22 19:14:42
F00868 DDS00013 DDS0001 DEMOMVS U0001 2010/02/22 18:58:29
F00866 DNET4243 DNET424 DEMOMVS U0001 2010/02/22 14:03:32
F00865 DDS12513 DDS1251 DEMOMVS U0001 2010/02/22 12:06:16
F00864 DDS12511 DDS1251 DEMOMVS S0CB 2010/02/22 12:06:04
F00863 DDS12511 DDS1251 DEMOMVS S0CB 2010/02/22 12:01:38
F00862 DDS12513 DDS1251 DEMOMVS U0001 2010/02/22 10:08:00
F00861 DDS12511 DDS1251 DEMOMVS S0CB 2010/02/22 10:06:49
F00860 DNET0179 DNET017 DEMOMVS U0001 2010/02/22 09:49:51

F1=Help      F3=Exit      F4=MatchCSR  F5=RptFind  F6=Actions  F7=Up
F8=Down      F10=Left     F11=Right   F12=MatchALL

```

Fault entries

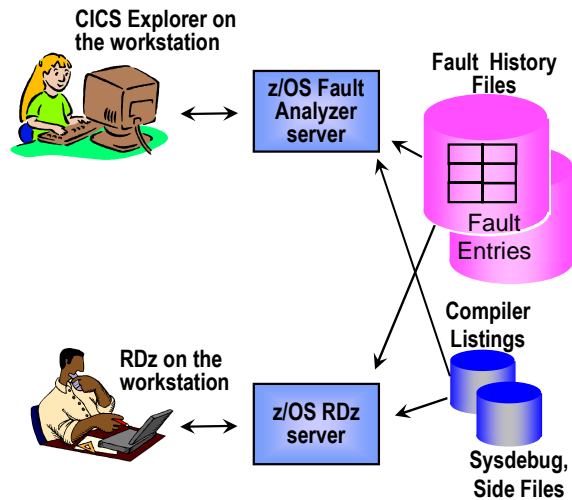
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Here is an example of the on-line interface. It looks the same in both TSO and CICS. Near the top, you see the name of the fault history file that is displayed. Below that is a list of all of the available line commands, and below that is the list of fault entries in the file. You can enter a line command next to any of the entries in the list. For example, typing "I" next to one will start an interactive reanalysis.

The GUI Eclipse plug-in for Fault Analyzer



- The plug-in runs on Eclipse workstation environments such as CICS Explorer® or Rational® Developer for System z®
- Use it to:
 - Display a list of abends
 - View real-time reports
 - Apply program source
 - Delete fault entries
- The plug-in and CICS Explorer are both free, and can be downloaded from the IBM web site



There is also a graphical user interface available as a plug-in for workstation-based Eclipse software such as CICS Explorer and Rational Developer for System z. The plug-in and CICS Explorer are both free, and can be downloaded from the IBM web site. Use the graphical user interface to see a list of abends, view real time reports, apply source, and manage fault entries.

The Fault Analyzer Eclipse plug-in



Specify the history file

Fault Analyzer Artifacts

- FA Artifacts
- 9_30.128.24:8000
- DEMOMVS.DEMOPKG.IBM.COM
- History Files
 - FAULTANL.V11R1.HIST

F00047.far

Browse Dump

Fault Summary

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

Synopsis

IBM FAULT ANALYZER SYNOPSIS

A system abend 0C7 occurred in module SAM2 program SAM2 at offset X'368'.

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

Default | Lookup

System Name: DEMOMVS.DEMOPKG.IBM.COM:5124

Fault History File or View: FAULTANL.V11R1.HIST

Fault_ID	Job/Tran	User_ID	Sys/Job	Abend	I_Abend	Job
F00047	DNET047A	DNET047	DEMOMVS	S0C7	S0C7	JOB00
F00046	DNET422	DNET422	DEMOMVS	S522	S522	STC00
F00045	DTCN	DDS0001	CICSAOR1	ATNI	ATNI	STC00
F00044	DDS0001A	DDS0001	DEMOMVS	S0C7	S0C7	JOB00
F00043	CICSCMJ	DDS2006	DEMOMVS	S047	S047	JOB00
F00042	DDS0485	DDS0485	DEMOMVS	S0C7	S0C7	TSU00
F00041	RUNDB2C	DDS1986	DEMOMVS	S0C1	S0C1	JOB00
F00040	DDS0001A	DDS0001	DEMOMVS	S0C7	S0C7	JOB00
F00039	RUNDB2C	DDS1986	DEMOMVS	S0C1	S0C1	JOB00
F00038	TESTING	DDS0280	DEMOMVS	S378	S378	JOB00
F00037	TESTING	DDS0280	DEMOMVS	S378	S378	JOB00
F00036	TESTING	DDS0280	DEMOMVS	S378	S378	JOB00

Fault entries

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Here is an example of the graphical user interface. It has several views that you can see at the same time, and you can resize and reposition the views on the screen. In this example, the view in the upper left is where the name and location of a history file was specified. The view at the bottom shows a list of faults in the selected history file. One of the faults was selected by clicking it, and the view at the top is displaying the selected real-time analysis report.

The real-time analysis report



- Synopsis and the suspected cause of a failure
 - abending program
 - active line of source code
 - active variables
- Explanation of error messages / codes
- File and Database detail
- Program details:
 - Variables / storage
 - Compile, link, load, and entry point information
- System information:
 - z/OS, CICS, DB2, IMS

```
*****  
x IBM Fault Analyzer for z/OS V10R1M0 (HADQ0A10 2009/10/22) x  
x  
x Copyright IBM Corp. 2000, 2009. All rights reserved. x  
*****  
  
JOBNAME: DNET845X SYSTEM ABEND: 0C7 DEMONV5 2010/02/22 19:14:42  
  
<H1> IBM FAULT ANALYZER SYNOPSIS  
  
A system abend 0C7 occurred in module SAM2 program SAM2 at offset X'39A'.  
  
A program-interruption code 0007 (Data Exception) is associated with this abend  
and indicates that:  
  
A decimal digit or sign was invalid.
```

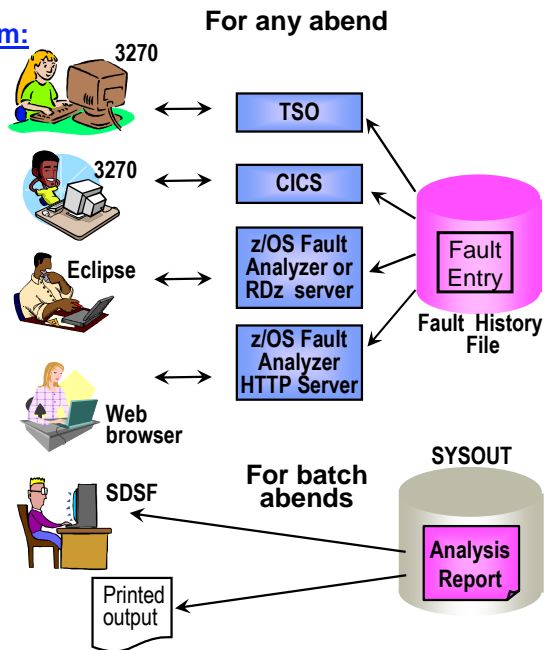
A real time report is produced automatically when an abend occurs. The first section of a real time report is the synopsis, which contains the most critical information, such as the name of the program that abended and, if available, the program statement that abended and the values of variables referenced. Sometimes the synopsis is all you need, if you are familiar with an application. But often you need more information, and the rest of the report contains details about the application and the environment, such as an explanation of the abend code and messages, details about files and databases, the values of program variables, subsystem information, and much more.

View a real-time analysis report



You can view an analysis report from:

- The Fault Analyzer TSO interface
 - OR -
- The Fault Analyzer CICS interface
 - OR -
- The Fault Analyzer Eclipse GUI plug-in
 - OR -
- A web browser
 - OR -
- Your batch job's SYSOUT
 - Default is `SYSOUT=*`
 - DD name is IDIREPRT



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There are several ways to view a real time report. A copy of the report is stored in the fault entry in a fault history file, and it can be viewed from the TSO or CICS 3270 on-line interface. Or it can be viewed using the Fault Analyzer Eclipse plug-in graphical user interface. Or optionally, the real-time report can be viewed from a web browser. For batch jobs, a copy of the real time report is written to sysout, and you can view it with a sysout viewer such as SDSF.

Interactive reanalysis



- The easiest way to research an abend
- A function of the 3270 online interface
- Quickly navigate to:
 - Synopsis
 - Any program in the call chain
 - Program variables and their values
 - File and database detail
 - CICS, DB2, and IMS information
 - Program source listings
 - Storage areas

```
File View Services Help
Interactive Reanalysis Report                               Line 1 Col 1 80
Command ==>                                             Scroll ==> CSR
JOBNAME: DNET845Y  SYSTEM ABEND: 0C7                     DEMOMVS   2010/02/22  20:01:51

Fault Summary:
Module PSAM1, program PSAM2, source line # 94 : Abend SOC7 (Data Exception).

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

F1=Help   F3=Exit   F4=Dsect   F5=RptFind  F6=Actions  F7=Up
F8=Down   F10=Left  F11=Right
```

Point and Shoot navigation

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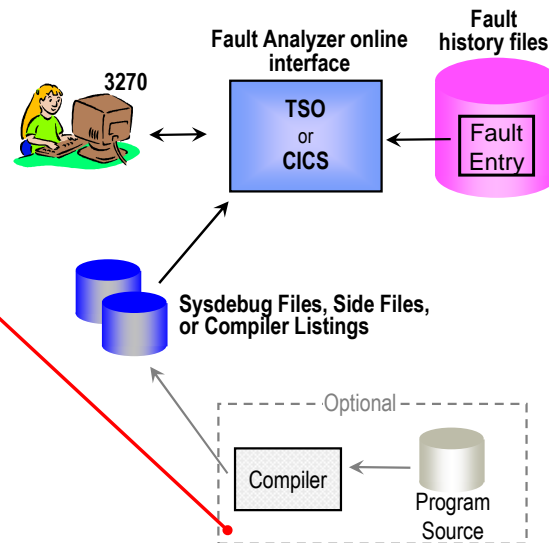
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The real time report provides detailed information about an abend. However, there is an easier way to research a problem: interactive reanalysis. This is a feature of the 3270 on-line interface, so you can do a reanalysis from either TSO or CICS. You can see all the same information that is available in the real time report, and even a little more. Your research is much easier because of point and shoot navigation, which lets you very quickly get to the information that you are looking for. Point and shoot navigation works by putting your cursor on any of the yellow highlighted fields, and pressing enter.

Interactive reanalysis



- Online panels to research abend information
- You can apply side files or listings, *even if they were not available when the program abended*
- A side file or listing file can be created *after* the abend
- You do not have to reproduce the abend



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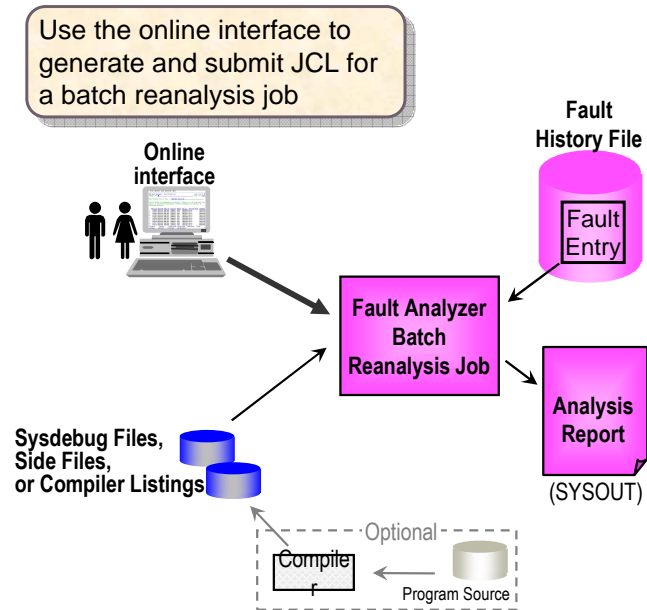
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When you do an interactive reanalysis, you can enable source mapping by specifying a side file or compiler listing. Even if these files were not available when an abend occurred, you can name the right file at this point, without having to re-create the abend. Even if you do not have a side file or listing, sometimes you can recompile your program after the abend, to create, for example a new compiler listing. Then the new listing can be used for source mapping during interactive reanalysis. That is a good way to expedite your research, but just be sure to use the exact same source code and compiler when you recompile.

Batch reanalysis



- A batch utility to generate a new analysis report
- Apply side files or listings, even if they were not available when the program abended
- Fault Analyzer generates JCL
- JCL can be edited, submitted, and saved



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The last feature covered in this introduction is batch reanalysis. It is not used as often as interactive reanalysis, but it can be useful. It is a batch utility program that you can run to produce a fresh copy of a fault analysis report. You might use it if a side file or listing was not available when the abend occurred and the original real time report was produced. You specify the names of these files in your options, and the utility produces a new analysis report with source mapping. The TSO on-line interface will automatically generate JCL for it. Then just submit the JCL to run the utility.

IBM PD tools (including Fault Analyzer) information and manuals are on the web



<http://www.ibm.com/software/awdtools/deployment/>

The screenshot shows the IBM website for z/OS Problem Determination Tools. The page is titled "z/OS Problem Determination Tools" and features a navigation menu on the left with options like "Library", "News", "How to buy", "Training and certification", "Services", and "Support". The main content area is divided into sections: "Retooling System z for SOA Workloads Growth", "Webcast", "Why IBM", "What we offer", and "Products". The "Products" section lists several tools, including "Application Performance Analyzer for z/OS", "Debug Tool for z/OS", "Fault Analyzer for z/OS", and "Optim Move for DB2". A red arrow points to the "Fault Analyzer for z/OS" link. A yellow callout box with the text "Select Fault Analyzer from the list" is overlaid on the page. The footer of the page contains the number "21", the text "IBM Fault Analyzer for z/OS - V12 Tutorial", and the copyright notice "© 2012 IBM Corporation".

Manuals for the IBM problem determination tools, including Fault Analyzer, are available on the IBM web site. Direct a browser to this URL (www.ibm.com/software/awdtools/deployment) and click the link to Fault Analyzer.

You can get the Fault Analyzer manuals from the IBM website



<http://www.ibm.com/software/awdtools/faultanalyzer>

Home Solutions Services Products Support & downloads My IBM Welcome Douglas Stout [Not you?] [IBM Sign in]

Software > Software Development >

Fault Analyzer for z/OS

Library

Overview

IBM® Fault Analyzer for z/OS® assists developers in analyzing and fixing application and system failures.

When one of your applications ends abnormally, it helps you identify the cause, analyze the failure and fix the problem.

Provides support for analyzing CICS® application and system failures, WebSphere® Application Server for z/OS system failures, WebSphere MQ application failures, IMS™ application failures and DB2® application failures

- Helps you analyze failures when they occur or reanalyze them after the fact
- Expands error messages and codes that apply to your failure with interactive reanalysis and includes a feature for using application-specific messages and codes to supplement those supplied by IBM
- Creates a fault history file with an interactive display that helps you track and manage application failures
- Starts automatically when an application fails, eliminating the need to recompile programs or change the job control language (JCL)
- Integration with Rational Developer for System z enables developers to diagnose application problems without changing user interface

Learn more

- Features & benefits
- System requirements
- Product library
- Announcement letter
- Data sheet (PDF, 566KB)

Downloads

- GUI plug-ins

Use and maintain

- Product support
- Information center

Contact IBM

Considering a purchase?

Request a quote

Email IBM

Or call us at: 877-426-3774
Priority code: 109HE03W

Highlights

- Announcement Letter: IBM Problem Determination Tools V12
- Analyst Summary Report: IBM PD Tools lead again
- Analyst Full Report: IBM PD Tools lead again (596KB)
- Monthly Podcast Series

Product framework

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The Fault Analyzer page is displayed. Click on the "library" link.

You can get the Fault Analyzer manuals from the IBM website



<http://www.ibm.com/software/awdtools/faultanalyzer>

Right-click to download User's Guide and Reference

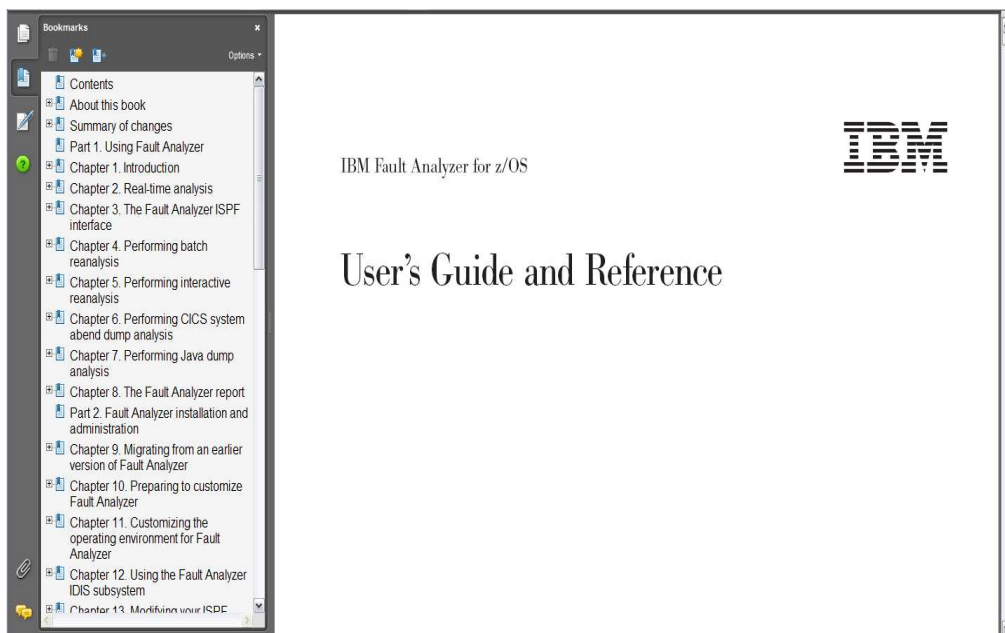
Title	View/download PDF	Order number	Download	Last update
Program Directory		GI10-8917-01	Download (PDF, 165KB)	05/2012
User's Guide and Reference		SC19-3671-00	Download (PDF, 3.0MB)	05/2012
Problem Determination Tools for z/OS Common Component Customization Guide and User Guide		SC19-3690-00	Download (PDF, 2.2MB)	05/2012
PDF Extended Shelf		GC19-3130-04	Download (XKS, 1.69KB)	05/2012

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The Fault Analyzer page is displayed. Click on the "library" link.



Then the User's Guide is available in case you have any questions.

That is the end of this section, an introduction to IBM Fault Analyzer for z/OS.

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