

Z Abend Investigator- Real-Time Analysis



Real-time analysis is triggered when an application abends and Z Abend Investigator is invoked, either through one of the supplied invocations exits (refer to *Exits for invoking Z Abend Investigator*) or via a call to the program SNAP interface, as long as the job is not excluded from the analysis. This real-time analysis usually results in two possible outcomes:

1. A report, which is by default written to JES (Job Entry Subsystem): This report offers a detailed analysis of the fault, which is essential for diagnosing the cause of the abend.
2. A fault entry in a history file, allowing for reanalysis of the fault, if necessary. This history file contains a copy of the report written to JES, which users can view through the ISPF (Interactive System Productivity Facility) interface.

It's important to note, the report generated and written to JES cannot be modified by adjusting options while viewing it. To see more or less detail, you need to reanalyze the fault with different settings or consult a provided listing or side file. Generally, the initial step of real-time analysis is sufficient, making reanalysis unnecessary in most cases. However, you can customize specific job options to fine-tune the analysis before running them.

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During real-time analysis, all virtual storage pages accessed within the abending task's address space are captured as a "minidump" in the history file or as an XDUMP, depending on their content of the storage. If the number of storage pages surpasses the *Max-Mini-dump Pages* setting, neither a minidump nor an XDUMP is written.

Additionally, it's essential to recognize that Z Abend Investigator may not operate correctly when the LOADER (IEWBLDGO) is used. This method of link-editing modules doesn't write them to a dataset. A dataset copy of the load module is necessary for Z Abend Investigator to identify CSECT names, lengths, and starting offsets accurately.

In summary, real-time analysis with Z Abend Investigator delivers detailed reports and fault entries, facilitating quick diagnosis and resolution of application abends. It's a vital tool for mainframe developers and operators to ensure system reliability.

Real-time analysis report

The real-time analysis report is generated whenever Z Abend Investigator analyzes an abend, is invoked by HFZSNAP, or through the equivalent `com.hcl.zai.Snap.dump Java™` class, unless the Deferred Report option is used or the report is suppressed. By default, the report is written to the **HFZREPRT** DDname, which is dynamically allocated to **SYSOUT=class** if not previously allocated, making it part of the job's output in the JES spool.

The **SYSOUT** class used (referred to as **class**) is the default job output class (**SYSOUT=***). If a **SYSUDUMP** DD statement in the abending job step specifies a JES SYSOUT class, then the Z Abend Investigator real-time report uses the same output class and form name.

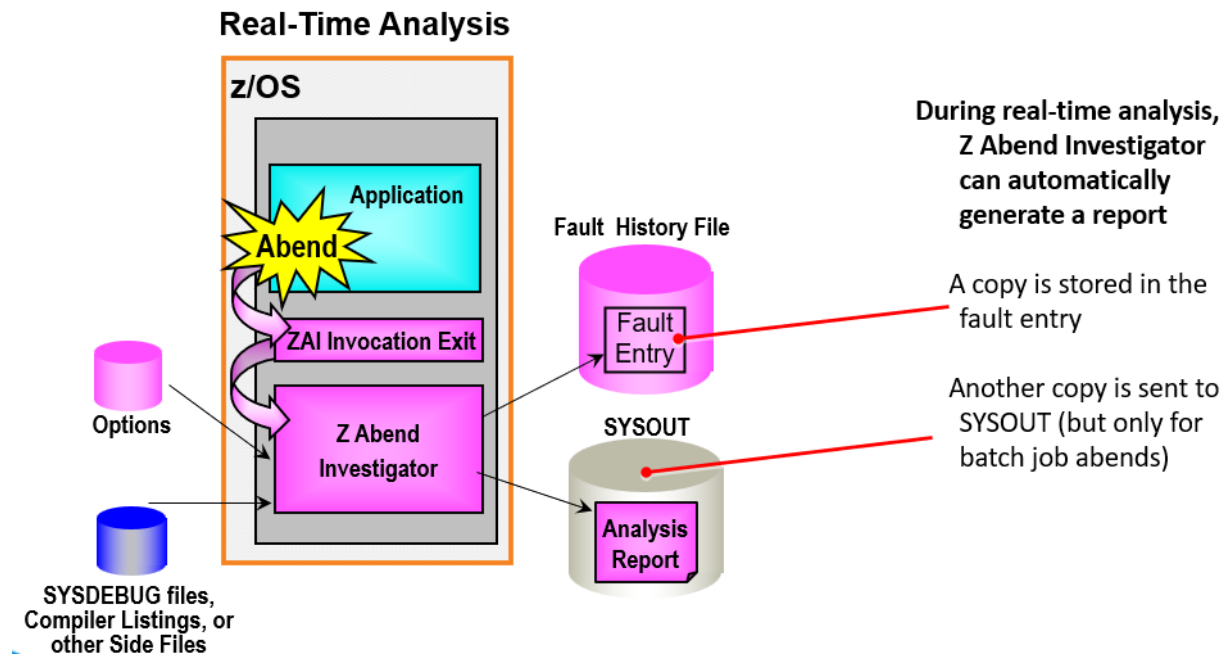
To redirect the real-time analysis report to another file, you can modify the **DD** card as needed. For example:

```
//HFZREPRT DD DISP=(,CATLG),DSN=MY.REPORT.DS,  
//      DCB=(RECFM=VB,LRECL=137),SPACE=(CYL,(1,1))
```

Alternatively, you can use a user exit to allocate **HFZREPRT** to a different output class. The **HFZREPRT** DDname is opened with **LRECL=137**, and any pre-existing dataset attributes must be compatible with this logical record length.

For CICS® transaction abends, the **HFZREPRT** allocation functions the same as it does for any other type of abend.

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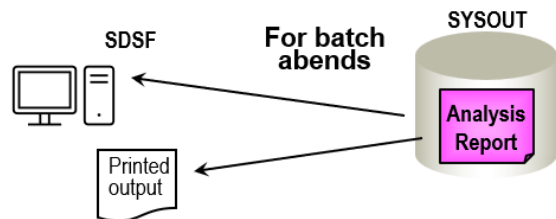
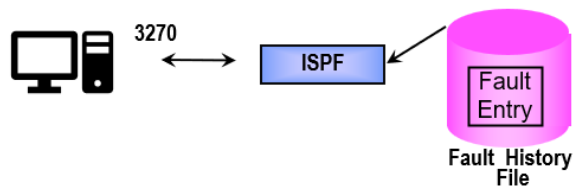


View a real-time analysis report

You can view an analysis report from:

- The ZAI ISPF interface
- OR -
- A batch job's SYSOUT
 - Default is SYSOUT=*
 - DD name is HFZREPT

For any abend



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Batch job abends

The screenshot below displays a batch job executed and subsequently abended.

```
EDIT      NSAH00.EMPNW.JCL(XSAMFA) - 01.00      Columns 00001 00072
Command ===> sub                               Scroll ===> CSR
***** Top of Data *****
000001 //NSAH00ID JOB (ACCTG), 'HCLSOFT WORKSHOP', REGION=0M, CLASS=A,
000002 //          NOTIFY=&SYSUID, MSGLEVEL=(1,1)
000003 //*          - - - ADD A JOB CARD ABOVE THIS LINE - - -
000004 //*****
000005 //*          RUN SAMPLE PROGRAM SAM1
000006 //*          THIS VERSION OF THE XSAM JCL EXECUTES A VERSION OF THE SAMX
000007 //*          PROGRAMS THAT ARE COMPILED BUT THE SYSDEBUG FILE WAS NOT SAVED
000008 //*          TO PREVENT FAULT ANALYZER FROM AUTOMATICALLY FINDING SOURCE INFO
000009 //*****
000010 //RUNSAM1 EXEC PGM=SAM1, REGION=4M
000011 //STEPLIB DD DSN=NSAH00.EMPNW.LOAD2, DISP=SHR
000012 //CUSTFILE DD DSN=NSAH00.CUSTOMER.FILES(CUST2FA), DISP=SHR
000013 //SYSPRINT DD SYSOUT=*
000014 //SYSOUT DD SYSOUT=*
JOB NSAH00ID(JOB38441) SUBMITTED
***
04.13.19 JOB38441 $HASP165 NSAH00ID ENDED AT PTHAPA0 - ABENDED S0C7 U0000 - CNCTN
(TERNAL)
***
```

An application batch job abends

ENTER

Display the job with a SYSOUT viewer

To review the job's abend, navigate to SDSF and use the "S" command before the **JOBID** to access the full JOBLOG.

```
SDSF STATUS DISPLAY ALL CLASSES      LINE 1-16 (16)
COMMAND INPUT ===>                   SCROLL ===> CSR
NP  JOBNAME  JobID   Owner   Prty Queue      C   Pos SAff  ASys Status
NSAH00  TSU38349 NSAH00   15 EXECUTION  A   118 PPA2 PPA2
NSAH00KA JOB37749 NSAH00   1 PRINT      A   180
NSAH00  TSU37651 NSAH00   1 PRINT      A   360
NSAH00ID JOB38350 NSAH00   1 PRINT      A   361
NSAH00ID JOB38352 NSAH00   1 PRINT      A   362
NSAH00ID JOB38425 NSAH00   1 PRINT      A   408
NSAH00ID JOB38430 NSAH00   1 PRINT      A   413
NSAH00ID JOB38431 NSAH00   1 PRINT      A   414
NSAH00ID JOB38433 NSAH00   1 PRINT      A   415
NSAH00ID JOB38434 NSAH00   1 PRINT      A   416
NSAH00ID JOB38435 NSAH00   1 PRINT      A   419
NSAH00ID JOB38436 NSAH00   1 PRINT      A   420
NSAH00ID JOB38439 NSAH00   1 PRINT      A   422
NSAH00ID JOB38440 NSAH00   1 PRINT      A   423
S_ NSAH00ID JOB38441 NSAH00   1 PRINT      A   424
```

View the job's output using SDSF (like this example) or any SYSOUT viewer

ENTER

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ZAI messages are displayed in the job's log

When viewing the JOBLLOG of an abandoned job, ZAI messages appear, including the ID of the fault entry recorded in the history file. This fault entry can be further analyzed using the ZAI online interface. The JOBLLOG also indicates that the cause of the abend is related to line #89 of the program SAM2.

```
SDSF OUTPUT DISPLAY NSAH00ID JOB38441 DSID      2 LINE 0          COLUMNS 02- 81
COMMAND INPUT ===> _                               SCROLL ===> CSR
***** TOP OF DATA *****
      J E S 2  J O B  L O G  -- S
04.13.17 JOB38441 ---- MONDAY,    20 MAY 2024 ----
04.13.17 JOB38441 IRR010I  USERID NSAH00  IS ASSIGNED TO THIS JOB.
04.13.17 JOB38441 ICH70001I NSAH00  LAST ACCESS AT 03:25:23 ON MONDAY, MAY 20.
04.13.17 JOB38441 $HASP373 NSAH00ID STARTED - INIT 2  - CLASS A  - SYS
04.13.17 JOB38441 IEF403I  NSAH00ID - STARTED - TIME=04.13.17
04.13.17 JOB38441 +HFZ0001I Z Abend Investigator V01R1M2 (TFA0020 2023/08/24)
      SYS1.PARMLIB.PPA2.USER(HFZCNF00)
04.13.18 JOB38441 +HFZ0002I Module SAM2, program SAM2, source line # 89: Abend
04.13.18 JOB38441 +HFZ0003I Fault ID F00041 assigned in history file HFZ.PPA2.H
04.13.18 JOB38441 IEF450I  NSAH00ID RUNSAM1 - ABEND=S0C7 U0000 REASON=00000007
      115
      TIME=04.13.18
04.13.18 JOB38441 -
      --TIMINGS (MINS.)--
04.13.18 JOB38441 -JOBNAME  STEPNAME  PROCSTEP  RC  EXCP  CPU  SRB  CLOCK
04.13.18 JOB38441 -NSAH00ID          RUNSAM1  *S0C7   5919  .00  .00  .01
04.13.18 JOB38441 IEF404I  NSAH00ID - ENDED - TIME=04.13.18
04.13.18 JOB38441 -NSAH00ID ENDED.  NAME=HCLSOFT WORKSHOP  TOTAL CPU  F3
```

View dd names of the batch job

Use the “?” command against the **JOBID** to view the Job output in detail segregated by DD name.

```
SDSF STATUS DISPLAY ALL CLASSES                               LINE 1-16 (16)
COMMAND INPUT ===> _                               SCROLL ===> CSR
NP  JOBNAME  JobID  Owner  Prty Queue  C  Pos SAff ASys Status
NSAH00  TSU38349 NSAH00  15 EXECUTION  A  118
NSAH00KA JOB37749 NSAH00  1 PRINT  A  180
NSAH00  TSU37651 NSAH00  1 PRINT  A  360
NSAH00ID JOB38350 NSAH00  1 PRINT  A  361
NSAH00ID JOB38351 NSAH00  1 PRINT  A  362
NSAH00ID JOB38425 NSAH00  1 PRINT  A  408
NSAH00ID JOB38430 NSAH00  1 PRINT  A  413
NSAH00ID JOB38431 NSAH00  1 PRINT  A  414
NSAH00ID JOB38432 NSAH00  1 PRINT  A  415
NSAH00ID JOB38433 NSAH00  1 PRINT  A  416
NSAH00ID JOB38436 NSAH00  1 PRINT  A  419
NSAH00ID JOB38437 NSAH00  1 PRINT  A  420
NSAH00ID JOB38439 NSAH00  1 PRINT  A  422
NSAH00ID JOB38440 NSAH00  1 PRINT  A  423
? _ NSAH00ID JOB38441 NSAH00  1 PRINT  A  424  ENTER
```

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Select HFZREPRT, the real-time analysis report

Use the **"S"** command against the **HFZREPRT** DDname to view the ZAI real-time analysis report.

```
SDSF JOB DATA SET DISPLAY - JOB NSAH00ID (JOB38441) LINE 1-7 (7)
COMMAND INPUT ==>
SCROLL ==> CSR
NP DDNAME StepName ProcStep DSID Owner C Dest Rec-Cnt Pa
JESMSG LG JES2 2 NSAH00 A LOCAL 26
JESJCL JES2 3 NSAH00 A LOCAL 34
JESYSMSG JES2 4 NSAH00 A LOCAL 128
SYSOUT RUNSAM1 104 NSAH00 A LOCAL 5
CUSTRPT RUNSAM1 105 NSAH00 A LOCAL 36
CEEDUMP RUNSAM1 108 NSAH00 A LOCAL 817
S HFZREPRT RUNSAM1 109 NSAH00 A LOCAL 1,898
```

View the ZAI Real-Time Analysis Report

For a batch job, the report is generated automatically to DD name HFZREPRT

ENTER

Real-time analysis report

The real-time analysis report indicates the JOB failed with a **SOC7 abend code** due to a **COMPUTE statement** at line #89 in the program **SAM2** caused by Invalid packed-decimal DATA in the data item CUST-ACCT-BALANCE caused the failure.

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```
SDSF OUTPUT DISPLAY NSAH00ID JOB38441 DSID 109 LINE 0 COLUMNS 02- 81
COMMAND INPUT ==> _ SCROLL ==> CSR
***** TOP OF DATA *****
* HCL Z Abend Investigator V01R1M2 (TFA0020 2023/08/24) *
*
* Copyright IBM Corp. 2000, 2017. All rights reserved. *
* Copyright HCL Technologies Ltd 2017, 2023. All rights reserved. *
*****
JOBNAME: NSAH00ID SYSTEM ABEND: 0C7 PPA2 2024/05/20 04:13:17

<H1> S Y N O P S I S

A system abend 0C7 reason code X'0' occurred in module SAM2 program SAM2 at
offset X'27E'.

A program-interruption code 0007 (Data Exception) is associated with this
and indicates that:
F8
-----
SDSF OUTPUT DISPLAY NSAH00ID JOB38441 DSID 109 LINE 19 COLUMNS 02- 81
COMMAND INPUT ==> _ SCROLL ==> CSR

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 #
-----
000089 COMPUTE BALANCE-TOTAL =
000090 BALANCE-TOTAL + CUST-ACCT-BALANCE
000091 * *** Calculate Average ***

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

Source
Line #
-----
000059 05 CUST-ACCT-BALANCE PIC S9(7)V99 COMP-3.
F8
```

```

SDSF OUTPUT DISPLAY NSAH00ID JOB38441 DSID 109 LINE 38
COMMAND INPUT ==>
000066      05 BALANCE-T 9(7)V99 COMP-

```

variable contained the bad data

Data field values at time of abend:

```

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

```

Debug Clues:

- ✓ Abended in Program SAM2 at COMPUTE Statement, due to Data exception.

Check the bad variable.

F3

Result of the abend analysis in ZAI

The screen below displays the **BAD DATA** causing the job to fail. We can update the BAD Data with the correct value and then run the JOB again to resolve the error.

```

Associated Storage Areas
Command ==>
JOBNAME: NSAH00ID  SYSTEM ABEND: 0C7      PPA2      2024/0

```

Data Value	Source (Starting at Line # 000053)
	01 CUST-REC.
	05 CUST-KEY.
*54321	10 CUST-ID PIC X(5).
*C	10 CUST-RECORD-TYPE PIC X.
*	10 FILLER PIC X(7).
*Aster, Dez	CUST-NAME PIC X(17).
*@#\$\$%&	05 CUST-ACCT-BALANCE PIC S9(7)V99
2	05 CUST-ORDERS-YTD PIC S9(4)
*Stormy Falls	05 CUST-CITY PIC X(15).
Data Entry Opera	
*tor	

Bad Data

Debug Clues:

- ✓ Abended in Program SAM2.
- ✓ CUST-ACCT-BALANCE had bad numeric data(it is part of CUST-REC)

Here is the bad variable, CUST-ACCT-BALANCE

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

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