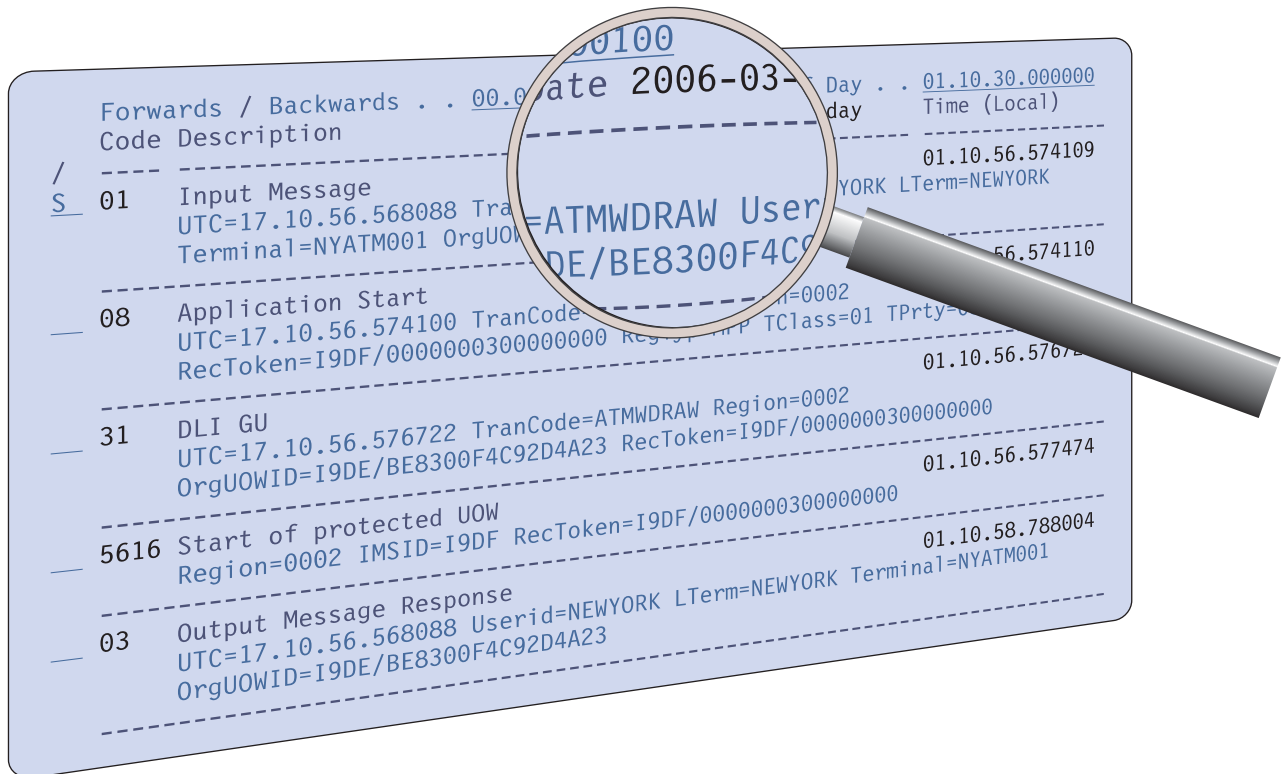




Introduction

Version 2 Release 1

<http://www.ibm.com/software/data/db2imstools/imstools/imsprobleminvest.html>



An introduction to IMS Problem Investigator for z/OS (September 2006)

This introduction is extracted from the *IBM IMS Problem Investigator for z/OS Version 2 Release 1 User's Guide*.

| A vertical bar in the left margin indicates a technical change since the previous product release.

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Overview

IBM IMS Problem Investigator for z/OS (also referred to as IMS Problem Investigator) is a problem analysis tool for Information Management System Database (IMS DB) and Transaction Manager (IMS TM) version 8 and 9 systems. It enables IMS administrators and programmers to interactively explore formatted, interpreted, and easily customizable views of log records; identifying and analyzing problems quickly, without requiring an expert understanding of log data structures and the relationships between log records.

For example, through the IMS Problem Investigator ISPF dialog, you can:

- View formatted logs with detailed field descriptions.
- Navigate to an exact point in time within a log file.
- Investigate specific problem areas. For example, transaction, database, security, or checkpoint processing.
- Merge log files to combine different aspects of IMS processing into a single view.
- Track the flow of a transaction in a single system or across a sysplex.
- Determine response times and latencies.

The IMS logs are a rich source of information about your IMS environment, providing essential data for many business functions. While the logs supply data for business functions, they were not primarily designed for such purposes. Without IMS Problem Investigator, much of the valuable information in the logs is hard to access and understand.

Utility programs such as DFSERA10 can assist in the examination and display of log records. However, such utilities require an intimate knowledge of IMS logs and the relationship between the records in them. Even expert users find the process of log analysis with such utilities difficult and time consuming.

In contrast, through its emphasis on interactive analysis and easy customization, IMS Problem Investigator speeds and simplifies log analysis, allowing you to efficiently use IMS and related logs for tasks such as debugging, performance tuning, tracing, and creating audit trails.

IMS Problem Investigator supports IMS log and monitor records, Common Queue Server (CQS) records, and IMS Connect event data collected by IMS Connect Extensions. You can analyze these records through an ISPF dialog, batch reports, and REXX programming services.

Benefits

IMS Problem Investigator exposes and interprets the valuable information contained in IMS and IMS related logs, making them easier to understand and analyze. This produces the following benefits:

Faster problem determination

Efficiently identify and resolve problems with terminals, applications, transactions, and IMS systems. You no longer need to look at dumps or

calculate hexadecimal offsets. Instead, you select the system or group of systems on which the problem occurred, enter the approximate time of the problem, and view log records from that period. Information in the records is easy to access and understand, and you can use advanced features to analyze the logs and understand the cause of the problem.

Reduced time-to-market for new IMS applications and transactions

IMS Problem Investigator makes debugging new applications and transactions quicker and easier. You can execute a new application and quickly view and understand its effect.

Combined with IMS Connect Extensions, IMS Problem Investigator also makes it quicker and easier to implement TCP/IP connectivity for existing applications.

Improved transaction response times

Pinpoint exactly where and why a transaction was delayed by viewing all events for that transaction and the time it took each event to occur.

Streamlined system audits; assistance with regulatory compliance

Create filters, extracts, and reports of security violations, database updates, and irregular transactions.

A better understanding of your IMS environment

Explore IMS, and the transactions and applications running in your IMS environment. IMS Problem Investigator provides helpful information on most log record types as well as allow you to track complex transactions.

Increased automation

You can reduce the time and resources needed to maintain your IMS environment by automating analysis tasks.

Features

Log file selection and extraction

You can either manually select the log files you want to browse or automatically select and extract data from multiple IMS and IMS Connect systems.

- Type the name of the log file and start browsing it.
- Select logs from specific IMS and IMS Connect systems.
- Request log data for a time period.
- Request log data matching filtering criteria.
- Get log data from a group of systems in a single extract.

Log file navigation

To make navigating within a log file easier, you can:

- Process records from multiple files, merged in time sequence.
- Go to an exact point of time in a log file with microsecond precision.
- Navigate forwards and backwards in the record using time increments.
- Set labels to remember positions within a file.

Log record presentation

To access and interpret the information in the log files, you can:

- List records with or without a brief summary of their contents.
- View extensive details of log records, with descriptions of every field.
- View the description and state of individual bits in flag fields.
- Show time in GMT, local, or fixed offsets.
- Apply a leap second offset to synchronize time with the MVS system log.
- View dump fields with both hexadecimal and EBCDIC character translation.
- View additional information relating to APPC, OTMA, WebSphere MQ, and IMS Connect.
- Customize which fields are shown by using forms.
- Toggle between formatted presentation and ISPF-browse presentation.

Log analysis

To streamline log analysis, you can:

- Show those records that are in the same transaction, spanning IMS log and monitor, IMS Connect, and CQS.
- Display event latencies between each record.
- Use advanced filters to find records matching selection criteria. Criteria can include:
 - Global field names. For example, transaction code, user ID, or database name.
 - Field names from the IMS macros. For example, MSGODSTN.
 - Masking and character offsets. For example, show records where the string "UNAUTHORIZED" appears within the message text field MSGTXT.
- Perform advanced analysis and customization using REXX.

REXX

The REXX application programming interface (API) allows you to develop REXX execs to automate common investigative tasks. You can:

- Read log records.
- Fetch fields in the records.
- Customize how IMS Problem Investigator displays information in the dialog.
- Save information to an external data set.
- Extend batch capabilities by writing and then running REXX execs that perform analysis in batch.

Batch

You can use the batch interface to create reports and extracts. For example, produce daily reports of security violations, database updates, and irregular transactions.

Concepts

When using IMS Problem Investigator you will frequently encounter these concepts:

- “Log file processing”
- “Log file formatting”
- “Log file merging” on page 6
- “Filters” on page 6
- “Forms” on page 7
- “Transaction tracking” on page 7
- “REXX programming services” on page 9

Log file processing

Refers to the processing of log files by IMS Problem Investigator. IMS Problem Investigator can process log files to display them in the ISPF dialog, produce batch reports, or generate an extract.

Log file formatting

IMS Problem Investigator formats the contents of IMS log and monitor files, CQS log files, and IMS Connect events recorded in an IMS Connect Extensions journal. It displays the contents of these records in an ISPF session, or in a report, using information from the IMS mapping DSECTs as well as additional information built into IMS Problem Investigator. This additional information:

- Identifies the relationship between similar fields in different record types and presents them as global fields.
- Gives enhanced descriptions for many fields.
- Interprets values in some fields. For example, converts the hexadecimal CPU timer-unit field DLRTIME to the transaction CPU time in seconds (with micro-second precision).
- Formats segments not described in the IMS DSECTs, such as APPC, OTMA, WebSphere MQ, and IMS Connect segments.

Figure 1 on page 5 shows that you navigate formatted files, records, and fields in an interactive ISPF session.

1 Select a record to view all of its fields

```

Forwards / Backwards . . 00.00.00.000100   Time of Day . . 01.10.30.000000
Code Description          Date 2006-03-17 Friday   Time (Local)
-----
S 01  Input Message                               01.10.56.574109
      UTC=17.10.56.568088 TranCode=ATMWDRAW Userid=NEWYORK LTerm=NEWYORK
      Terminal=NYATM001 OrgUOWID=I9DE/BE8300F4C92D4A23
-----
 08  Application Start                             01.10.56.574110
      UTC=17.10.56.574100 TranCode=ATMWDRAW Region=0002
      RecToken=I9DF/0000000300000000 RegTyp=MPP TClass=01 TPpty=08
-----
 31  DLI Form ==> _____ +                               Format ==> FORM
      UTC= ***** Top of data *****
      OrgU +0004 Code... 01   Input Message
      -----+0166 STCK... BE8300EDBF897D01   LSN...
      5616 Star Date... 2006-03-17 Friday   Time...
      Regi
-----
 03  Outp +0000 MSGLRLL... 0176   MSGLRZZ... 0000   MSGLCODE... 01
      UTC= +0005 MSGFLAGS... C1   MSGDFLG2... 81   MSGFPADL... 94
      OrgU +0008 MSGMDRRN... 08000009   MSGRDRRN... 08000009   MSGPRFL... 0166
      -----+0012 MSGCSW          MSGDFLG3... 02
      Field Zoom
+0007 MSGFPADL... 94 Prefix Additional Info Flag
On MSGFPRSP... 80 Response Mode
Off MSGSACMD... 40 Scheduled APPL issued 'CMD'
Off MSGAOIUE... 20 Message generated by AOI user exit
On MSGSYSEG... 10 System Segment exists
Off MSGSSPND... 08 Message is on SMB Suspend queue
On MSGFPINR... 04 Input message is non-recoverable
      A754C703
      A754C703
      MSGDRBN... 00000000
      Item ID = 81
      MSGCFLG1... 00
      MSGCQSF1... 00
  
```

Figure 1. View formatted files, records, and fields

Global fields

Global fields are information fields that mean the same thing in different types of records. They help identify the resources used in transaction processing. For example, TRANCODE identifies the transaction code in all applicable log record types, recognizing that in an IMS type 01 record this information is stored in the MSGODSTN field and in an IMS type 07 record this information is stored in the DLRTRNCD field.

You can use global fields to view a brief summary of the contents of records and in filtering conditions. In filtering conditions, you can use global fields to display records matching global conditions. For example, show all records where:

- Transaction code is “ATMWDRAW”
- User ID is “John”

IMS Problem Investigator provides global fields that include:

- Program specification block (PSB) name
- Logical terminal (LTERM)
- VTAM Node, APPC NetID, or OTMA TPIPE

- Originating tracking unit-of-work identifier
- Recovery token
- TCP/IP port
- Monitor ITASK number

Time stamps and UTC

IMS Problem Investigator lists the records in a file with the time at which the log record was created. The time is in a human readable (*hh:mm:ss...*) format and is microsecond accurate. IMS Problem Investigator derives the time from the store clock (STCK) value of the log record suffix or the contents of the records. You can adjust this time to GMT, local time, or a fixed offset. To synchronize time with the MVS system log, you can also apply a leap second offset to the time display.

In addition to formatting and displaying the STCK value for when the log record was created, IMS Problem Investigator also shows the time at which the event occurred (if it is stored in the record). This information is usually a coordinated universal timestamp (UTC). The UTC appears as one of the global fields.

Log file merging

Merging log files refers to the ability to process files from multiple systems and sources. You can do this by extracting records from multiple systems into a single file, or by selecting multiple files and viewing their records *as if* they are merged in a single logical file.

For example, you can view:

- System-wide activity, by merging log files from all IMS systems in a sysplex; optionally, including the CQS logs.
- The monitor events for a transaction, by merging IMS log and monitor files.
- End-to-end activity for TCP/IP transactions, by merging IMS log files with IMS Connect events recorded in IMS Connect Extensions journals.

Filters

A filter selects which records to display in the ISPF dialog, output to an extract file, or write to a report. Filters can be simple, for example:

- Select only IMS type 01 records.
- Select only records related to security violations (IMS type 10 records).
- Select only records with the transaction code ATMWDRAW.

You can make filters gradually more complex by modelling on an existing filter. For example, "select only records related to security violations with the ATMWDRAW transaction code".

Potentially, you can define powerful and advanced filters with conditions including:

- Field names from the IMS mapping DSECTs
- Offsets
- Bit flag values
- Masking characters
- Position-dependent strings

You can also use filters to automatically apply a form or run a REXX exec when a user selects a matching record. For example, automatically apply a REXX exec that derives and displays TRANSACT macro parameters when a user browses an SMB segment in an IMS type 4004 checkpoint record (see Figure 4 on page 10 for an example).

Forms

A form selects which fields from a given record type to display. You can use forms to customize the display for certain problem scenarios. For example, in an IMS type 01 record, show only the User ID, terminal, transaction code, and message text.

Transaction tracking

Tracking means highlighting events in the life of an individual transaction by skipping records not associated with that transaction.

Because IMS serially processes large workloads, records from the same transaction can be separated by thousands of records from other transactions, making it difficult to trace the flow of only one of those transactions. Moreover, different record types will have different fields that relate them to a transaction, making conventional filtering and searching impossible.

With IMS Problem Investigator you can find a record from the relevant transaction, and then, as shown in Figure 2 on page 8, use a single line action to display just the records from that transaction. IMS Problem Investigator tracks all transaction records, finding the related IMS log and monitor, CQS, and IMS Connect records. All other log records are hidden.

1 Enter TX line action next to a log record

Code	Description	Time (Local)
/	-----	-----
<u>TX</u> 01	Input Message TranCode=ATMWDDR Source=Connect	01.31.09.598962
___ 35	Input Message Enqueue TranCode=ATMWDDR	01.31.09.598970
___ 01	Input Message TranCode=EFTWDDRSource=Connect	01.31.09.598989
___ 35	Input Message Enqueue TranCode=EFTWDDR	01.31.09.598994
___ 03	Output Message Response LTerm=ATMT Source=Connect	01.31.09.599008
___ 07	Application Terminate TranCode=EFTWDDR Region=005E	01.31.09.599015
___ 08	Application Start TranCode=EFTWDDR Region=005E	01.31.09.599017
___ 5607	Start of UOR Program=EFPROGA Region=005E	01.31.09.599017
___ 31	DLI GU TranCode=DSFFPS2B Region=007E	01.31.09.599022
___ 31	DLI GU TranCode=EFTWDDR Region=005E	01.31.09.599026
___ 33	Free	
___ 5610	Start	
___ 37	Syncp	
___ 33	Free	
___ 5612	End of	
___ 5612	End of	
___ 07	Appli	
___ 08	Appli	
___ 5607	Start	
___ 31	DLI G	
___ 01	Input	
___ 35	Input	
___ 01	Input	
___ 35	Input	

Code	Description	Time (Local)
/	-----	-----
___ 01	Input Message TranCode=ATMWDDR Source=Connect	01.31.09.598962
___ 35	Input Message Enqueue TranCode=ATMWDDR	01.31.09.598970
___ 08	Application Start TranCode=ATMWDDR Region=0012	01.31.09.599221
___ 5607	Start of UOR Program=ATMPROG Region=0012	01.31.09.599221
___ 31	DLI GU TranCode=ATMWDDR Region=0012	01.31.09.599227
___ 50	Database Update Database=ATMDBASE Region=0012	01.31.09.599982
___ 50	Database Update Database=ATMDBASE Region=0012	01.31.09.600041
___ 03	Output Message Response LTerm=ATMT Source=Connect	01.31.09.600109
___ 31	DLI GU TranCode=ATMWDDR Region=0012	01.31.09.600116
___ 33	Free Message	01.31.09.600156
___ 5610	Start Phase 1 Syncpoint Region=0012	01.31.09.600164
___ 37	Syncpoint Region=0012	01.31.09.606148
___ 33	Free Message	01.31.09.606179
___ 5612	End of Phase 2 Syncpoint Program=ATMPROG	01.31.09.611863
___ 07	Application Terminate TranCode=ATMWDDR Region=0012	01.31.10.003503
***** Bottom of Data *****		

2 View records from the same transaction

Figure 2. View records from a transaction

IMS Problem Investigator finds records in the same transaction by matching any global field that identifies the transaction; such as:

- Originating tracking unit-of-work identifier
- Recovery token (RecToken)
- Monitor record ITASK number
- Dependent region partition specification table (PST) number
- IMS Connect assigned logon token

Figure 3 on page 9 shows how IMS Problem Investigator links records that have different identifying fields to the same transaction. In this simple example, linking an IMS type 01 record (which does not have a recovery token) with a database update (which does not have a tracking unit-of-work identifier) by using an IMS type 31 record, which contains global fields from both record types.

Log Code	Description	OrgUOWID	RecToken
01	Incoming transaction	IMSA/B783071E1C865102	<u>No RecToken</u>
31	Transaction processed by region	IMSA/B783071E1C865102	IMSA/0000000600000000
50	Database update	<u>No OrgUOWID</u>	IMSA/0000000600000000

Figure 3. How tracking selects records that are part of the same transaction

REXX programming services

You can use the REXX programming services to customize IMS Problem Investigator and automate log analysis. You can write REXX execs to read log files, fetch fields in records, and then display output in IMS Problem Investigator or save output to a data set.

For example, Figure 4 on page 10 shows the supplied sample REXX exec ALZTRANS. The exec derives and displays SYSGEN TRANSACT macro parameters from fields in SMB segments. Defining the exec in a filter means the exec automatically runs when a user selects a matching log record or zooms on its fields.

1 This filter runs a REXX exec when you select an IMS type 4004 record or zoom on its fields

```

Filter . . . . . ALZSAMP +
Description . . . Display SYSGEN macros from segments _ Activate Tracking

/ Log Code + Exc Description
  IMS 4004      Checkpoint SMB
                Level 1_ Conditions No_ Form _____ + REXX ALZTRANS
  
```

```

Form ==> _____ + _ Use Form in Filter          Format ==> FORM
***** Top of data *****
+0004 Code... 4004 Checkpoint SMB
+0F40 STCK... BE82FF4641C70020      LSN... 0000000000000031
      Date... 2006-03-17 Friday      Time... 01.03.25.125744.007

+0000 CHKRLNG... 0F50      CHKZZ..... 0000      CHKLC
+0005 CHKTYPE... 04      CHKNO..... 0001      CHKBL
+000A CHKLL..... 0090      CHKNN..... 00000057

+0010 SMB. .... SMB
+0010 SMBQEBP... 00000000
+001 2 Zoom on the SMB segment field
+002
+002 SMBNAME... 'ADDINV '
+0034 SMBFLAGA... SMB Flags
+0034 SMBSTATS... 45
+0037 SMBFLAG3... 00
+0038 SMBQCBPR... 07
+003C SMBCTMP... FFFF
+0042 SMBLMTCT... +2
+0048 SMBSAVPR... 00
+004C SMBPDIR... 07572780
+0054 SMBRGNS... +0
+0058 SMBFLAGB... SMB Flag wo
+0058 SMBAOIFL... 00
+005C SMBSSPND... 00000000      SMBSMBPT... 07567FA0      SMBFNDCT... +0
  
```

3 The exec analyzes the SMB segment, and then displays it as SYSGEN TRANSACT macro parameters

```

APPLCTN PSB=DFSSAM04,
TRANSACT CODE=(ADDINV),
DCLWA=YES,
EDIT=UC,
FPATH=NO,
INQUIRY=(YES,RECOVER),
MODE=SNGL,
MSGTYPE=(MULTSEG,NONRESPONSE,1),
PARLIM=65535,
PROCLIM=(65535,65535),
PRTY=(7,10,2),
ROUTING=NO,
SCHD=4,
SEGNO=0,
SEGSIZE=0,
SERIAL=NO
  
```

Figure 4. Displaying SYSGEN macros using a REXX exec

Components

Figure 5 on page 12 shows the components of IMS Problem Investigator. These include:

Systems and groups

These are definitions of IMS and IMS Connect systems, which can be shared with IMS Performance Analyzer. The main purpose of defining systems is to register their DBRC information so that you can use DBRC log selection to select required log files for extracts and batch reports.

Your systems and groups store the RECON or DFSMDA specifications for DBRC log selection. Because you can group IMS and IMS Connect systems, you can easily extract records for a specific time range from multiple IMS and IMS Connect systems into a single file.

DBRC log selection

Provides automated log file selection for batch reports and extracts, bypassing the labor-intensive process of determining which SLDS or OLDS data sets contain the relevant log data. Simply specify a date and time, and then DBRC log selection will use the DBRC utility or RECON API (IMS V9) to extract the SLDS and OLDS data set information for the required time period.

IMS log files

You can analyze your IMS logs by entering their data set name. If the data is on tape, you must extract records first or analyze the data in batch reports.

User log records

You can process your own user log records by first defining them in IMS Problem Investigator.

IMS monitor files

You can analyze your IMS monitor files by just entering their data set name.

CQS log files

You can analyze your CQS log streams by first extracting them to a file or in batch reports.

IMS Connect

You can analyze IMS Connect events by processing the data collected in IMS Connect Extensions archive journals. You can automatically select and extract from IMS Connect Extensions journals using DBRC like archive file selection, or you can list the journals in the IMS Connect Extensions definitions data set and analyze them directly.

Control data set (CDS)

IMS Problem Investigator saves filters, forms, user log specifications, and object lists (lists of items that you can use in filters) in a control data set, so that you can share them with other users.

Knowledge modules

These are internal to IMS Problem Investigator. They contain the information IMS Problem Investigator needs to format and interpret log records. If you are defining user log records, you need to create a Knowledge Module.

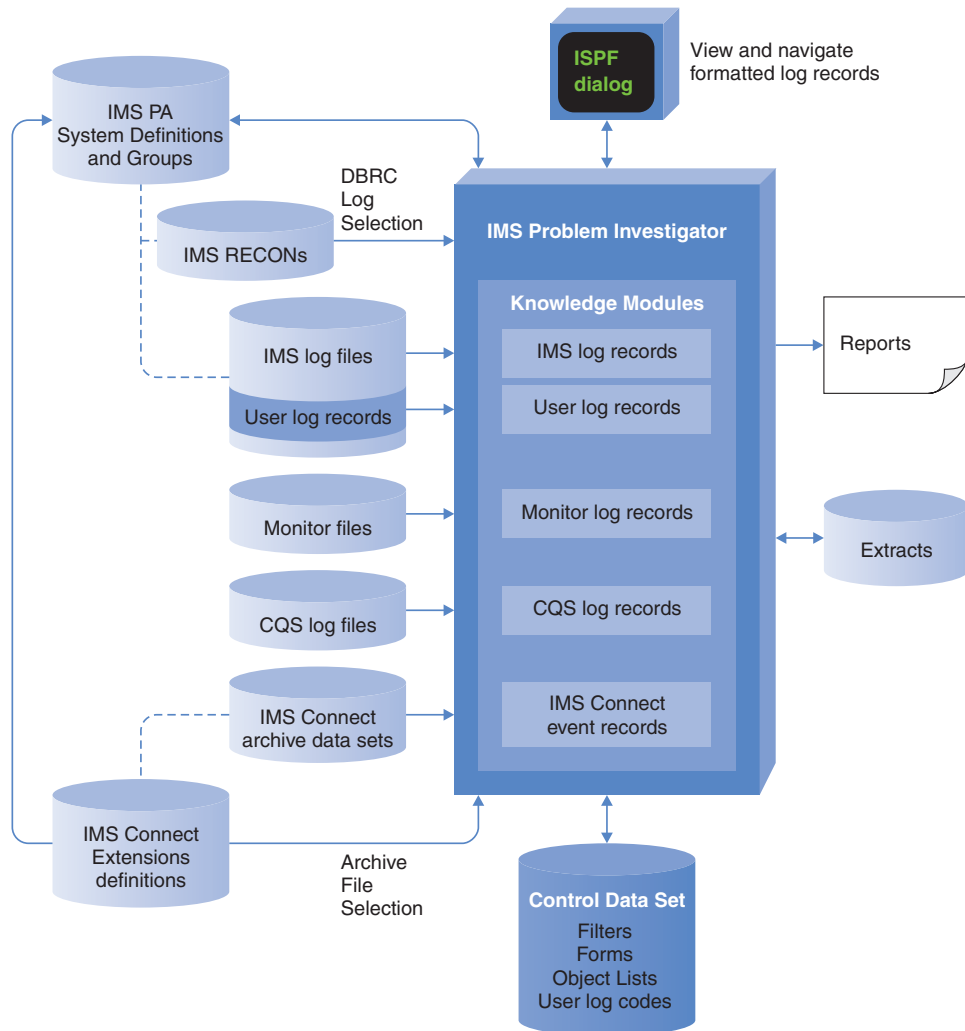


Figure 5. IMS Problem Investigator components

Related IBM tools

The following IBM IMS tools integrate with IMS Problem Investigator:

IBM IMS Performance Analyzer for z/OS

IMS Performance Analyzer gives you an overall picture of transactional throughput and performance. The product highlights performance problems, which you can then solve with IMS Problem Investigator. To make the products easier to use together, they share definitions for systems and groups: you only need to maintain the definitions in one of the tools.

IBM IMS Connect Extensions for z/OS

IMS Connect Extensions provides instrumentation for IMS Connect V2.2 and the IMS Connect component of IMS V9. The tool continuously records IMS Connect events, which you can analyze with IMS Problem Investigator. IMS Problem Investigator automatically selects IMS Connect Extensions archive journals for processing, and then formats and interprets the IMS Connect event data contained in the journals.

Tour of product features

These topics provide examples of core IMS Problem Investigator analytical features:

“View an IMS log file”

Shows how IMS Problem Investigator formats a log file.

“Select and view an IMS type 01 log record” on page 14

Shows how IMS Problem Investigator formats an IMS type 01 log record within the log file.

“Apply a form to the record” on page 16

Shows the IMS type 01 log record with a form applied to it.

“Navigate to a point in time and then find a string from a record” on page 17

Shows how you can navigate and search within a log file.

“Track records from a single transaction” on page 18

Shows records from a single transaction, selected with the TX line action.

“Dissect IMS transaction response times” on page 19

Shows the transaction response times for a single transaction.

“Merge IMS and IMS Connect log files” on page 19

Shows merged IMS log and IMS Connect records for a single transactions with the elapsed time relative to when the IMS type 01 record was created.

“Merge IMS log and monitor files” on page 20

Shows merged IMS log and monitor records for a single transactions with the elapsed time between each record.

“Define a filter to examine Full Function Database processing” on page 21

Shows an example filter that customizes IMS Problem Investigator for analyzing Full Function Database processing.

View an IMS log file

As shown in Figure 6 on page 14, when you select log files, IMS Problem Investigator formats and displays the records contained in them:

- The log records appear with their code and description.
- You can choose between a brief description or detailed description (shown).
- The detailed description contains information from global fields. Such as, transaction code, LTERM, program name, database, tracking unit of work ID, recovery token, as well as performance and status information.

```

File Menu Edit Mode Navigate Filter Time Labels Options Help
BROWSE IMSPI.I9DF.SLDS Record 00000203 More: < >
Command ==> Scroll ==> CSR
Forwards / Backwards . . 00.00.00.000100 Time of Day . . 01.10.59.143497
Code Description Date 2006-03-17 Friday Time (Local)
/ -----
07 Application Terminate 01.10.59.143497
UTC=17.10.59.143494 TranCode=ATMWDRAW Program=ATMPROG Region=0002
RecToken=I9DF/0000000300000001
RegTyp=MPP MCNT=1 DBDLI=5 DCDLI=3 CPU=29.634429
-----
5E SB Handler requests Image Capture 01.10.59.143531
UTC=17.10.56.573952 Region=0002
-----
08 Application Start 01.11.22.024555
UTC=17.11.22.024548 TranCode=ATMWDRAW Region=0001
RecToken=I9DF/0000000500000000 RegTyp=MPP TClass=01 TPrty=08
-----
5607 Start of UOR 01.11.22.024557
Program=ATMPROG Region=0001 IMSID=I9DF RecToken=I9DF/0000000500000000
-----
01 Input Message 01.11.22.028553
UTC=17.11.22.018766 TranCode=ATMWDRAW Userid=FUNTRM46 LTerm=FUNTRM46
Terminal=SC0TCP46 OrgUOWID=I9DE/BE83010D0EB91341
-----
31 DLI GU 01.11.22.028563
UTC=17.11.22.028559 TranCode=ATMWDRAW Region=0001
OrgUOWID=I9DE/BE83010D0EB91341 RecToken=I9DF/0000000500000000
-----
5616 Start of protected UOW 01.11.22.028826
Region=0001 IMSID=I9DF RecToken=I9DF/0000000500000000

```

Figure 6. Formatted log file

Select and view an IMS type 01 log record

As shown in Figure 7 on page 15, when you select any record in the file you get formatted details of that record:

```

File Menu Format Help
-----
BROWSE      IMSPI.I9DF.SLDS                      Record 00000680 Line 00000000
Command ==> _____ Scroll ==> CSR
Form ==> _____ + _ Use Form in Filter      Format ==> FORM
***** Top of data *****
+0004 Code... 01      Input Message
+0198 STCK... BE8300F4C9322443      LSN.... 0000000000000203
      Date... 2006-03-17 Friday      Time... 01.10.56.568098.266

+0000 MSGLRLL.... 01A8      MSGLRZZ.... 0000      MSGLCODE... 01
+0005 MSGFLAGS... C1      MSGDFLG2... 81      MSGFPADL... 94
+0008 MSGMDRRN... 0800000D      MSGRDRRN... 0800000D      MSGPRFLL... 0166
+0012 MSGCSW.... 90      MSGDFLG3... 00
+0014 MSGUOW.... Unit of Work (UOW) - Tracking
+0014 MSGORGID... 'I9DE '      MSGORGTK... BE8300F4C92D4A23
+0024 MSGPROID... 'I9DE '      MSGPROTK... BE8300F4C92D4A23
+0034 MSGUFLG1... 80      MSGUFLG2... 00
+0036 MSGRSQTY... 01      MSGDOFS.... 0000      MSGDRBN.... 00000000

+0040 MSGSSEGM... Message Prefix System Segment; Item ID = 81
+0040 MSGSILL.... 0040      MSGSIID.... 81      MSGCFLG1... 00
+0044 MSGCFLG2... 88      MSGCFLG3... 00      MSGCQSF1... 00
+0047 MSGCQSF2... 00
+0048 MSGPTERM... Full Physical Input Terminal ID
+0048 MSGINODE... 'NYATM001'
+0050 MSGTISEQ... 000A      MSGPREFO... +0      MSGPREFI... +0
+0056 MSGSETS.... 00      MSGRES01... 00      MSGRECCT... +1
+0060 MSGIDSTN... 'NEWYORK '      MSGODSTN... 'ATMWDRAW'
+0070 MSGIHSQN... 0000000000000000
+0078 MSGFMTNM... 'DFSM02 '

```

Figure 7. Formatted log record

All fields in the record are point-and-shoot: you can zoom on any field in the log record by placing your cursor on that field and pressing Enter. When you zoom on a field, you get a detailed description of its contents:

- Character, numeric, and hexadecimal fields appear with descriptions:

```

+0068 MSGODSTN... 'ATMWDRAW'

Destination CNT Name or SMB Name.
For APPC transaction, Dest field consists
of 2 parts: Dest Type and Dest address
- valid only if MSGC2APP flag on.
1. MSGOD62I APPC (LU6.2) Dest Type QAB/TIB
2. MSGOD62A APPC (LU6.2) Dest Addr QAB/TIB

```

- Flag fields appear with the status and description of each flag bit:

```

+0005 MSGFLAGS... C1 Message Flags

On MSGFFRST... 80 First record of message, full prefix
On MSGFLAST... 40 Last DRRN (record) of message prefix
Off MSGFCANC... 20 Message cancelled
Off MSGFNRQU... 10 Non-recoverable Query message
Off MSGFQNR.... 0F L/O nibble has Logical Queue Number

```

- Store clocks and UTC appear in a human readable format:

```

+001C MSGORGTK... BE8300F4C92D4A23

Time (LOCAL)... 2006-03-17 01.10.56.568020.633 Friday

Originating Token (STCK value)

```

- Dump fields appear in hexadecimal and EBCDIC:

```

+016A MSGXSTXT...

Message Text

+0000 C1E3D4E6 C4D9C1E6 40C1C3C3 D6E4D5E3 *ATMWDRAW ACCOUNT*
+0010 7EF4F6F5 60F3F7F3 60F9F2F2 40C1D4D6 *=465-373-922 AMO*
+0020 E4D5E37E 5BF1F0F0 F04BF0F0 4040 *UNT=$1000.00 *

```

Apply a form to the record

A form tailors the display for specific problem scenarios by selecting what fields to display. For example, in Figure 7 on page 15 all the fields from the IMS type 01 records are shown so key fields for certain problem areas are hard to identify (some of the key fields do not even fit on the one screen). In contrast, Figure 8 shows the same record with a form applied. The form shows only the VTAM node, transaction code, RACF user ID, and content of the message.

```

File Menu Format Help
-----
BROWSE      IMSPI.I9DF.SLDS                      Record 00000680 Line 00000000
Command ==>                                     Scroll ==> CSR
Form ==> BRIEF + _ Use Form in Filter           Format ==> FORM
***** Top of data *****
+0004 Code... 01 Input Message
+0198 STCK... BE8300F4C9322443 LSN.... 0000000000000203
      Date... 2006-03-17 Friday Time... 01.10.56.568098.266

+0048 MSGINODE... 'NYATM001' MSGODSTN... 'ATMWDRAW'
+0094 MSGRACUS... 'NEWYORK '
+016A MSGXSTXT... Message Text
      +0000 C1E3D4E6 C4D9C1E6 40C1C3C3 D6E4D5E3 *ATMWDRAW ACCOUNT*
      +0010 7EF4F6F5 60F3F7F3 60F9F2F2 40C1D4D6 *=465-373-922 AMO*
      +0020 E4D5E37E 5BF1F0F0 F04BF0F0 4040 *UNT=$1000.00 *
***** End of data *****

```

Figure 8. A formatted record with a form applied to it

Note: To apply forms, you must first change the Format option from STD to FORM.

Navigate to a point in time and then find a string from a record

As shown in Figure 9, you can easily navigate to a point-in-time within the log file, find a formatted string in the file, and set labels to return to specific positions.

```

File Menu Edit Mode Navigate Filter Time Labels Options Help
-----
BROWSE      IMSPI.I9DE.SLDS                      Record 00000 String found
Command ==> F NEWYORK word 1                      Scroll ==> CSR
Forwards / Backwards . . 00.00.00.000100 2 Time of Day . . 17.10.00.000000 3
Code Description                      Date 2006-03-16 Thursday Time (Local)
/ -----
01  Input Message                      17.10.56.568098
    UTC=17.10.56.568088 TranCode=ATMWDRAW Userid=NEWYORK LTerm=NEWYORK
    Terminal=NYATM001 OrgUOWID=I9DE/BE8300F4C92D4A23
-----
35  Input Message Enqueue              17.10.56.568114
    UTC=17.10.56.568088 TranCode=ATMWDRAW OrgUOWID=I9DE/BE8300F4C92D4A23
-----
0702 CQSPUT COMMIT request completed  17.10.56.568200
    UTC=17.10.56.568088 TranCode=ATMWDRAW Userid=NEWYORK LTerm=NEWYORK
    Terminal=NYATM001 OrgUOWID=I9DE/BE8300F4C92D4A23
-----
33  Free Message                      17.10.56.572620
    OrgUOWID=I9DE/BE8300F4C92D4A23
-----
4E15 Scheduling IWAIT end             17.10.56.573688
    Region=0002 ITASK=0000009E
-----
08  Application Start                 17.10.56.574109
    UTC=17.10.56.574100 TranCode=ATMWDRAW Region=0002
    RecToken=I9DF/0000000300000000 RegTyp=MPP TClass=01 TPrty=08
-----
5607 Start of a Unit-of-Recovery      17.10.56.574110
    UTC=17.03.25.116264 Program=ATMPROG Region=0002 IMSID=I9DF
    RecToken=I9DF/0000000300000000
-----

```

Figure 9. Navigating a log record

1

You can use primary commands such as:

FIND

Finds the characters you specify. For example:

```
FIND NEWYORK
```

Finds the string 'NEWYORK'.

```
FIND 03 WORD
```

Searches whole words only; '03' in this case.

Tip: To search values inside global fields, press the Right key (F11) until you can see these fields, and only then use the FIND command. The find command searches in any string that is displayed.

Labels (LOCATE and .label)

Set labels to remember positions within the file by entering `.label_name` (a period followed by the label name), and then return to that position with the command:

```
LOCATE label_name
```

- 2** You can navigate forwards in time by specifying a time intervals and using the Forwards and Backwards point-and-shoot fields.
- 3** You can navigate to a time-of-day by specifying the required time and using the Time of Day point-and-shoot field. The display scrolls to the first record on or after the time you specified.

Track records from a single transaction

Figure 10 shows an example of extended tracking (TX line action). Extended tracking only shows records associated with the same transaction as the selected record. In Figure 10 you can clearly identify when message processing began, the unit of recovery (UOR), database updates, and when the application finished processing the transaction. IMS Problem Investigator will track all the records from that transaction, finding the related IMS log and monitor, CQS, and IMS Connect records from across the sysplex.

```
File Menu Edit Mode Navigate Filter Time Labels Options Help
-----
BROWSE IALZ. IMS910.OLDS Extended Tracking active
Command ==>> Scroll ==>> CSR
Forwards / Backwards . . 00.00.00.000100 Time of Day . . 01.31.09.598989
Code Description Date 2005-10-05 Wednesday Time (Local)
/ ---- Search limit reached (+5000) -----
TX 01 Input Message TranCode=EFTWDRAW Source=Connect 01.31.09.598962
__ 35 Input Message Enqueue TranCode=EFTWDRAW 01.31.09.598970
__ 08 Application Start TranCode=EFTWDRAW Region=0012 01.31.09.599221
__ 5607 Start of UOR Program=EFTSPROG Region=0012 01.31.09.599221
__ 31 DLI GU TranCode=EFTWDRAW Region=0012 01.31.09.599227
__ 50 Database Update Database=EFTDBASE Region=0012 01.31.09.599982
__ 50 Database Update Database=EFTDBASE Region=0012 01.31.09.600000
__ 50 Database Update Database=EFTDBASE Region=0012 01.31.09.600032
__ 50 Database Update Database=EFTDBASE Region=0012 01.31.09.600036
__ 50 Database Update Database=EFTDBASE Region=0012 01.31.09.600041
__ 03 Output Message Response LTerm=EFT1 Source=Connect 01.31.09.600109
__ 31 DLI GU TranCode=EFTWDRAW Region=0012 01.31.09.600116
__ 33 Free Message 01.31.09.600156
__ 5610 Start Phase 1 Syncpoint Region=0012 01.31.09.600164
__ 37 Syncpoint Region=0012 01.31.09.606148
__ 33 Free Message 01.31.09.606179
__ 5612 End of Phase 2 Syncpoint Program=EFTSPROG 01.31.09.611863
__ 07 Application Terminate TranCode=EFTWDRAW Region=0012 01.31.10.003503
***** Bottom of Data *****
```

Figure 10. Tracking: only those records from the same transaction appear

Dissect IMS transaction response times

You can toggle the time display to show the elapsed time between each record (line action E) or elapsed time relative to a base record (line action R).

Though you can use these line actions at any time, they are particularly useful when combined with tracking: by using TX, and then the E or R line actions, you can dissect transactional performance and identify exactly where and why transactional delays occurred.

For example, Figure 11 shows that 0.404541 seconds elapsed from the time the input message was received to when the application terminated.

By merging files from other sources, such as IMS monitor and IMS Connect, you can gain an end-to-end view of transactional performance.

```
File Menu Edit Mode Navigate Filter Time Labels Options Help
ALZPRBRF IMS910.OLDS Record 00000012 More: < >
Command ==> Scroll ==> CSR
Forwards / Backwards . . 00.00.00.000100 Time of Day . . 01.31.09.598962
Code Description Date 2005-10-05 Wednesday Time (Relative)
/ ---- Search limit reached (+10000) -----
R_01 Input Message TranCode=DSFFSC6C Source=Connect 01.31.09.598962
__35 Input Message Enqueue TranCode=DSFFSC6C +0.000008
__08 Application Start TranCode=DSFFSC6C Region=0012 +0.000258
__5607 Start of UOR Program=PDSFSC6C Region=0012 +0.000259
__31 DLI GU TranCode=DSFFSC6C Region=0012 +0.000265
__50 Database Update Database=INVENTRC Region=0012 +0.001020
__50 Database Update Database=INVENTRC Region=0012 +0.001038
__50 Database Update Database=INVENTRC Region=0012 +0.001070
__50 Database Update Database=INVENTRC Region=0012 +0.001074
__50 Database Update Database=INVENTRC Region=0012 +0.001079
__03 Output Message Response LTerm=9993 Source=Connect +0.001147
__31 DLI GU TranCode=DSFFSC6C Region=0012 +0.001154
__33 Free Message +0.001193
__5610 Start Phase 1 Syncpoint Region=0012 +0.001202
__37 Syncpoint Region=0012 +0.007186
__33 Free Message +0.007217
__5612 End of Phase 2 Syncpoint Program=PDSFSC6C +0.012901
__07 Application Terminate TranCode=DSFFSC6C Region=0012 +0.404541
***** Bottom of Data *****
```

Figure 11. By showing relative and elapsed times you can pinpoint transactional delays

Merge IMS and IMS Connect log files

Figure 12 on page 20 shows a transaction that arrived from TCP/IP, routed by IMS Connect, and then processed by IMS. The figure shows the time it took from when IMS Connect received the transaction to when IMS began processing the transaction. The overall time it took the IMS application to process the transaction can be seen at the bottom of the figure.

```

File Menu Edit Mode Navigate Filter Time Labels Options Help
BROWSE CEX.ARCHIVE.JOURNAL Record 00000055 More: < >
Command ==> Scroll ==> CSR
Forwards / Backwards . . 00.00.00.000100 Time of Day . . 21.12.00.00000
Code Description Date 2006-01-09 Monday Time (Relative)
/ -----
A03C Prepare READ Socket -0.229771
A049 READ Socket -0.001539
A049 READ Socket -0.001486
A03D Message Exit called for READ -0.001468
A03E Message Exit returned from READ TranCode=PART -0.001423
A041 Message sent to OTMA Datastore=XCFMI9D1 -0.001297
01 Input Message TranCode=PART Source=Connect 21.13.21.255103
35 Input Message Enqueue TranCode=PART +0.000132
08 Application Start TranCode=PART Region=0002 +0.000503
5607 Start of UOR Program=DFSSAM02 Region=0002 +0.000503
31 DLI GU TranCode=PART Region=0002 +0.000534
5E SB Handler requests Image Capture Region=0002 +0.028829
5E SB Handler requests Image Capture Region=0002 +0.028833
03 Output Message Response LTerm=3101 Source=Connect +0.050422
31 DLI GU TranCode=PART Region=0002 +0.050442
33 Free Message +0.050652
5610 Start Phase 1 Syncpoint Region=0002 +0.050679
37 Syncpoint Region=0002 +0.050730
33 Free Message +0.050813
A042 Message received from OTMA Datastore=XCFMI9D1 +0.051215
A042 Message received from OTMA Datastore=XCFMI9D1 +0.051257
5612 End of Phase 2 Syncpoint Program=DFSSAM02 +0.051280
A03D Message Exit called for XMIT +0.051375
A03E Message Exit returned from XMIT +0.051409
07 Application Terminate TranCode=PART Region=0002 +0.051459

```

Figure 12. A TCP/IP transaction: entering from IMS Connect and processed by IMS

Merge IMS log and monitor files

This example shows the IMS log and monitor records associated with a single transaction. The time elapsed between each record is shown, highlighting where transactional delays are occurring:

```

| 4E12 Dependent Region start Region=0002          01.08.45.838201
| 4E14 Scheduling IWAIT start Region=0002          0.000509
| :
| 4E14 Scheduling IWAIT start Region=0002          0.000003
| 01  Input Message TranCode=ATMWDRAW              7.377191
| 35  Input Message Enqueue TranCode=ATMWDRAW      0.000016
| 33  Free Message                                  0.004505
| 4E15 Scheduling IWAIT end Region=0002            0.001067
| :
| 5616 Start of protected UOW Region=0002          0.000609
| 4E60 DLI Call start Region=0002                  0.004079
| 4E61 DLI Call end Region=0002                    0.000003
| 4E60 DLI Call start Region=0002                  0.000007
| 4E62 DLA00 start Database=ACCOUNTS Region=0002  0.000021
| 4E66 PI/IRLM ENQ IWAIT start Database=ACCOUNTS  0.000189
| 4E67 PI/IRLM ENQ IWAIT end Region=0002          0.000554
| 4E24 VSAM IWAIT start Database=ACCOUNTS Region=  0.062948
| :
| 20  Database Open Database=ACCOUNTS Region=0002  0.000030
| 5E  SB Handler requests Image Capture Region=0002 0.002982
| :
| 4E66 PI/IRLM ENQ IWAIT start Database=ACCOUNTS  0.000077
| 4E67 PI/IRLM ENQ IWAIT end Region=0002          0.001236
| 50  Database Update Database=ACCOUNTS Region=0002 0.000077
| 50  Database Update Database=ACCOUNTS Region=0002 0.000039
| 4E63 DLA00 end Region=0002 Seg=ACNTINFO SC=' '  0.000021
| 4E61 DLI Call end Region=0002                    0.000004
| :
| 03  Output Message Response LTerm=NEWYORK        0.004645
| 35  Output Message Enqueue LTerm=NEWYORK          0.000032
| 31  Communications GU LTerm=NEWYORK               0.000035
| 36  Output Message Dequeue LTerm=NEWYORK          0.003112
| 33  Free Message                                  0.000737
| 33  Free Message                                  0.324634
| 5612 End of Phase 2 Syncpoint Program=ATMPROG    0.001062
| 4E65 DLA30 end Region=0002 SC='QC'                0.002015
| 4E61 DLI Call end Region=0002                    0.000003
| 07  Application Terminate TranCode=CEXTNONC Region=0002 0.000673
| :

```

Define a filter to examine Full Function Database processing

The filter in Figure 13 on page 22 performs these functions:

- Selects records related to Full Function Database processing based on their log codes. You can use the filter to view all records with the relevant log code, extract those records, or generate a report about them.
- To display only the most relevant fields, the filter applies a different form to each log record type.
- Runs REXX execs to automate analysis of database errors and IO buffers. The execs run when a user selects an IMS type 24 record or an IMS type 26 record.

```

File Menu View Help
-----
VIEW                               Filter                               Row 1 of 9 More: < >
Command ==> _____           Scroll ==> CSR

Filter . . . . . FULLFUNC +
Description . . . Full function database processing _ Activate Tracking

/ Log Code + Exc Description
- IMS 20      Database Open
  Level 1 Conditions No Form FULLF20 + REXX _____
-----
- IMS 21      Database Close
  Level 1 Conditions No Form FULLF21 + REXX _____
-----
- IMS 24      Database Error
  Level 1 Conditions No Form FULLF24 + REXX DBERRSH
-----
- IMS 25      EEQE
  Level 1 Conditions No Form FULLF25 + REXX _____
-----
- IMS 26      I/O Toleration Buffer
  Level 1 Conditions No Form FULLF24 + REXX IOERTEST
-----
- IMS 27      Database Extension
  Level 1 Conditions No Form FULLF27 + REXX _____
-----
- IMS 49      RSR Tracker Control Structures; subtypes 11 and 12
  Level 1 Conditions No Form FULLF49 + REXX _____
-----

```

Figure 13. Filter for Full Function Database analysis

A filter can include conditions. Conditions specify what information the log record must contain to be included in selection. You can specify conditions that apply only to specific log codes or to global fields in all record types.

As show in Figure 14 on page 23, filter conditions can include:

- Specialized field names
- Field names from the IMS macros
- Offsets similar to DFSERA10
- Flag bits
- Masking and substring positional matching
- Lists of values (stored in object lists)

```

File Menu Edit Object Lists Help
-----
Command ==> _____ Conditions Row 1 to 7 of 7
Scroll ==> CSR
Code: ALL Global Criteria for all Log Record Codes

/ Field Name + Oper Value +
- TRANCODE EQ TRAN*
- USERID NE ADMIN
- LTERM EQ LT01
- MSGXSTXT(*) EQ 'UNAUTHORIZED'
- MSGXSTXT(40) EQ 'ERROR'
- QDF2SMB ON
- X'0A' GE 1

```

Figure 14. Filter conditions

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