MainView for DB2®
Getting Started

Supporting

Version 10.1 of MainView for DB2®
Version 10.1 of BMC System Performance for DB2®

April 2011
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  - system hardware configuration
  - serial numbers
  - related software (database, application, and communication) including type, version, and service pack or maintenance level
- sequence of events leading to the issue
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- messages received (and the time and date that you received them)
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About this book

This tutorial is intended for first-time users of the MainView for DB2® product. It takes you step-by-step through practice sessions with several fundamental product applications.

--- WARNING ---
You will need appropriate IBM® DB2 authorization to execute certain steps.

Conventions

The following syntax notation is used in this tutorial:

- Items you type and keys you press are highlighted with **bold** letters.
- An item in CAPITAL LETTERS must be entered exactly as shown.
- Items in lowercase letters are values you supply.
- A vertical line | separates alternative options; one must be chosen.

The term pop-up refers to an ISPF pop-up display that replaces the original screen image.

--- NOTE ---
Throughout this document, MVDB2 refers to MainView for DB2 and MVDB2/DC refers to MainView for DB2 - Data Collector. These abbreviations do not indicate a legal product, solution, or service name of BMC Software.
Related documentation

This book is included as part of the MainView library, which documents all your MainView products and the tasks associated with using these products.

Several books from the DB2 Performance products and DB2 Administration products libraries are also included to help you install the MainView for DB2 components. These components are also used by other DB2 Performance products that are provided by BMC Software.

See the “About this book” section of the MainView for DB2 User Guide for more information on

- MainView library
- DB2 Performance products and DB2 Administration products libraries
- MainView for DB2 library
- other recommended reading

A glossary of terms is included in the MainView User Guide.

Like most BMC documentation, this book is available in printed and online formats. To request printed books or to view online books and notices (such as release notes and technical bulletins), see the Customer Support website at http://www.bmc.com/support. Most product shipments also include the books on a documentation CD.

**NOTE**

Online books are formatted as PDF or HTML files. To view, print, or copy PDF books, use the free Adobe Reader from Adobe Systems. If your product installation does not install the reader, you can obtain the reader at http://www.adobe.com.

The software also offers online Help. To access Help, press F1 within any product or click the Help button in graphical user interfaces (GUIs).
Quick reference card

This chapter presents the following topics:

Where to start ................................................................. 15
How to activate requests .................................................... 16

This chapter contains a quick reference card for your use. You can tear it out and keep it by your terminal if you want.

It contains

- a brief list of where you should start looking when you want information about a certain topic
- examples for defining requests

WARNING

Important: If you are a new user, be sure to go through each of the practice sessions in the rest of this book before using the quick reference card.
## Where to start

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How to activate requests

To define requests for automatic startup (BLKDMRW member in BBPARM):

— Summary Trace example

REQ=ATRAC THRDHIST TYPE=SUMMARY TITLE='THREAD HISTORY' STORAGE=4000K LOGTRAC=Y TRNUMDS=3 TRSWTIME=24:00 TRDSN='Mypfx.Trace.Dsn.V01'

— Detail Trace example

REQ=ATRAC DETLABC DB2PLAN=ABC TYPE=SQL,SCAN,IO STORAGE=4000K WRAP=Y TITLE='I/O TRACE OF ABC' GROUPSQL=Y TRBUFF=0, TRSIZE=400K

— Monitor example

REQ=BPUTL BP0 WMAX=85 I=00:01:00 WLIM=99 LOG=ATWARN

See sample member BLKDMRKY in BBPARM for a description of all the keywords you can use.

To define requests to check active thread exceptions (“runaway queries”) or other background exception conditions (DMRBEX00 member in BBPARM):

— TSO Exception example

MSG=DZ0630W,CPUTOT=1000,GPTOT=100000

For a complete list of all the background monitors, see sample member DMRBEXBB in BBPARM or “Chapter 8 - Monitors and Exception Detection” in the MainView for DB2 User Guide.

To display the active background samplers, type **BG ON** from the Active Timer Requests full-screen application (Option 3).

To activate, modify, or purge individual traces, use the Current Traces (CT) view **Start Trace** (ST) command.

To activate, modify, or purge individual monitors, use the Monitors Active (AT) view **Start Monitors** (SM) command.

To activate or purge a block request that contains a set of additional monitors or traces, use the full-screen Start Monitors (SM) panel BLK option and enter the block member name.

To purge all existing requests from BLKDMRW manually, type on any full-screen display:

```
SERV ===> SET
PARM ===> PRG=BLKDMRW
```
Isolating DB2 performance problems

This chapter presents the following topics:

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View all DB2 commands ............................... 75
These scenarios teach you how to navigate easily through the MainView for DB2 views and displays and use the available facilities. They do not show you every area covered by the product or all of the displays.

In this practice session, you

1. check status and activity of all DB2s to detect potential problem areas
2. analyze a single DB2 to study problem areas in more detail
3. use monitors to isolate specific resource- or workload-related problems
4. review critical problems, including those just identified by workload monitors

See the MainView User Guide for a complete description of how to work in both windows mode and full-screen mode.

**NOTE**

This practice session takes approximately one hour to complete.
Enter MainView

If you are new to MainView, you should get a copy of the MainView User Guide before starting. This document covers the basic things you need to know to use any MainView product.

1 Enter MainView by one of the following methods:

- Execute the MAINVIEW CLIST.
- Select an ISPF panel option.
- Log on to an IBM VTAM® session.

2 Go to Option 0.1.1 to specify your CASID, and then return to the MAINVIEW Selection Menu, as shown in Figure 1.

Figure 1 MAINVIEW Selection Menu

Accessing MainView for DB2

From this menu and its related set of submenus, you can access any installed MainView product. Products that work together to provide similar solutions are grouped together in submenus. You also have access to a full set of MainView functions that work with all of your MainView products to help you solve your performance problems. (See the MainView User Guide for a description of these functions.)

3 To access the DB2 Solutions submenu, shown in Figure 2, select option D from the MAINVIEW Selection Menu.
To access MainView for DB2, select option 1 from the DB2 Solutions submenu.

The Parameter Confirmation panel is displayed, as shown in Figure 3.

This panel prompts you to confirm the parameters for your MainView for DB2 session. The first time you sign on, the default parameters are:

- a context of all active DB2 subsystems
- an initial screen of MVDB2, which displays an Easy Menu called EZDSSI
- a primary display mode of MainView windows mode

NOTE

If you have the full System Performance for DB2 solution installed, you can use option 2 to access its capabilities.
You can change the parameters for a session by changing the values on this confirmation panel. You can also change the default parameters for future sessions of MainView for DB2 by selecting option 0.1.D, Parameters–Windows Mode, on the MAINVIEW Selection Menu.

5 To continue with this exercise, access the MainView for DB2 Primary Option Menu; change the Mode setting to FullScreen and press Enter.

Full-screen mode is generally recommended only to view detail traces for application analysis, as described in Chapter 4, “Tuning an application with trace.”

Windows mode provides trace and monitor administration dialogs, enhanced functionality, and more extensive DB2 data for both single DB2 and SSI (multiple DB2) analysis.

Figure 4 MainView for DB2 Primary Option Menu
Check DB2 status and activity

Begin by investigating the capabilities of the windows-mode views, because they are specially designed to provide an overview of multiple DB2 subsystems at one time. You can also drill down to details about any single DB2.

Point-and-shoot hyperlinks take you from one view to other displays with related information. Sometimes these displays are further windows-mode views; sometimes they are full-screen displays normally accessed through these menu options.

Check status of all DB2s

To access windows mode and get acquainted with the views available for monitoring multiple DB2s at a time:

1 Press PF3 to return to the DB2 Solutions Menu and choose option 1 again. This time, select Window mode. This mode of entry is preferred because you have quick access to all DB2s.

Or, from the Fullscreen Primary Option Menu, select the VIEWS option.

OPTION ===> V

The DB2 SSI Easy Menu (EZDSSI) is displayed, as shown in Figure 5.
2 Look at the fourth line from the top.

This line is the *window information line*. It shows the number of this window (later you might have several windows open at once), the name of this view (EZDSSI), the current target context (ALL), date, time, and product (MVDB2).

This view is an example of an Easy Menu that provides hyperlinks to various other views.

**NOTE**

Options prefixed with a period take you directly to data, while options prefixed with a “>” take you to another menu.

---

This EZDSSI Easy Menu is designed to be used in Single System Image (SSI) mode to look at multiple target DB2s at one time.

3 Several hyperlinks to other Easy Menus can be used to check out DB2 status, for example:

- **Stats Menu** provides options to select the many views that show complete DB2 statistics (EZDSTAT). EZDSTAT hyperlinks generally go to tabular views that show one row per DB2 with detail views accessible from there.

- **Buffer Pool Menu** provides options to show status and statistics for individual buffer pools (and group buffer pools).
Check status of all DB2s

- **EZBA Menu / Tgt & SSI** provides options to analyze one DB2 or multiple DB2s in SSI mode.

Look at these menus but do not go further now. You can come back here later.

4 To check the status of all DB2s, put your cursor on the **SSI Status - List DB2s** hyperlink and press Enter.

This link takes you to the STDB2 view, as shown in Figure 6, maintaining the default context of ALL, which includes all defined DB2s.

**Figure 6  DB2 activity overview (STDB2)**

You can quickly gauge how well each of your DB2 subsystems are performing by reviewing and comparing the number of active threads, key activity rates, a total exception count, and the most critical warning condition that exists right now (if any). Notice the “>” sign before the W1 in the window information line. This symbol indicates that you can scroll right for more data.

Later you will see how you can move the view fields around and set thresholds to customize the view to meet your monitoring needs exactly (or even create different views for different conditions).

A hidden header beneath the window information line provides direct navigation to related views and identifies the row hyperlinks in the view.

5 Put the cursor on the **Show Header** field and press Enter to display and review the header options. The top of the header provides hyperlinks to all the related statistics views. The bottom of the header provides a description of the row hyperlinks within the STDB2 view.

Select **Hide Header** and press Enter when you are finished.
6 Several of the column headers are highlighted, indicating that you can choose a row in that column. From each row, you can hyperlink to a view with more detail (related to that column) for the selected DB2.

If you see a warning message for one DB2, place the cursor on that message and press Enter to see a list of all the warning conditions that are tracked per DB2. If multiple conditions exist at the same time, only the most important is shown in STDB2, and the others are set to YES in this view. Press PF3 to return to STDB2.

**NOTE**
You can use this hyperlink to see the list even if the warning message field is blank (all the conditions will be set to NO). The view also shows the versions of the DB2 subsystem and MainView for DB2.

7 Hyperlink on the DB2 Target field for an active DB2 to see a detail status view.

8 Press PF3 to return to STDB2.

You will return to a detail status view later.

9 Hyperlink on the Comm Rate field for an active DB2 to see counts and rates of activity in that DB2, both for the current interval (1 to 15 minutes) and for the total session data since DB2 startup.
Figure 7  Activity rates (STRATE)

<table>
<thead>
<tr>
<th>Interval and session counts</th>
</tr>
</thead>
<tbody>
<tr>
<td>10MAR2011 16:37:54 ---------- INFORMATION DISPLAY -----------------------------</td>
</tr>
<tr>
<td>COMMAND ===&gt; SCROLL ===&gt; CSR</td>
</tr>
<tr>
<td>CURR WIN ===&gt; 1 ALT WIN ===&gt;</td>
</tr>
<tr>
<td>&gt;W1</td>
</tr>
<tr>
<td>=STDB2===STRATE==(ALL======DB2HC===)10MAR2011==16:37:52==MVDB2====D====1</td>
</tr>
</tbody>
</table>

<p>| Interval | Session | Interval | Session | Interval | Session | I |
|---------|---------|----------|---------|----------|---------|</p>
<table>
<thead>
<tr>
<th>Qty</th>
<th>Qty</th>
<th>Rate</th>
<th>Rate</th>
<th>/Thread</th>
<th>/Thread</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commits ..</td>
<td>16</td>
<td>52</td>
<td>0.0</td>
<td>0.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Thd Creates.</td>
<td>8</td>
<td>46</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Getpages ....</td>
<td>18431</td>
<td>30434</td>
<td>38.8</td>
<td>1.2</td>
<td>2303.9</td>
</tr>
<tr>
<td>Page Updates</td>
<td>209</td>
<td>211</td>
<td>0.4</td>
<td>0.0</td>
<td>26.1</td>
</tr>
<tr>
<td>Sync I/O....</td>
<td>259</td>
<td>560</td>
<td>0.5</td>
<td>0.0</td>
<td>32.4</td>
</tr>
<tr>
<td>Prefetch I/O</td>
<td>2153</td>
<td>3502</td>
<td>4.5</td>
<td>0.1</td>
<td>269.1</td>
</tr>
<tr>
<td>Write I/O...</td>
<td>4</td>
<td>5</td>
<td>0.0</td>
<td>0.0</td>
<td>0.5</td>
</tr>
<tr>
<td>DatasetOpens</td>
<td>16</td>
<td>45</td>
<td>0.0</td>
<td>0.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Lockouts....</td>
<td>2</td>
<td>2</td>
<td>0.0</td>
<td>0.0</td>
<td>0.2</td>
</tr>
<tr>
<td>LockSuspends</td>
<td>21</td>
<td>51</td>
<td>0.0</td>
<td>0.0</td>
<td>2.6</td>
</tr>
<tr>
<td>GBLLockCont.</td>
<td>36</td>
<td>924</td>
<td>0.1</td>
<td>0.0</td>
<td>4.5</td>
</tr>
<tr>
<td>Clm/Drn Fls.</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>DML SQL.....</td>
<td>1196</td>
<td>1700</td>
<td>2.5</td>
<td>0.1</td>
<td>149.5</td>
</tr>
<tr>
<td>StProcCalls.</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>StProcFails.</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>RID Fails...</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>EDM Loads...</td>
<td>5</td>
<td>10</td>
<td>0.0</td>
<td>0.0</td>
<td>0.6</td>
</tr>
<tr>
<td>EDM Fails...</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Checkpoints.</td>
<td>0</td>
<td>1</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Prll Groups.</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>PrllFallback</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Some of these fields are highlighted, indicating that hyperlinks will take you to even more detail.

10 Press PF3 as needed to return to EZDSSI.

11 Hyperlink on the DB2 Dashboard field to see critical, current interval measurements for all of the DB2 subsystems in the current SSI context, as shown in Figure 8 on page 27.

This view can help you quickly gauge the status of all the DB2 subsystems.
The first ten columns in the view are highlighted in reverse video. Green highlighting indicates acceptable values. Red highlighting indicates values that should be analyzed for potential problems.

12 Scroll right to see several other key indicators of system health, such as hit ratios and failure counts.

13 Press PF3 to return to EZDSSI.
Current thread activity

From the DB2 status overview (STDB2), you can access current thread information:

1 Hyperlink on Act Thrd to view a list of all active threads in the selected DB2, as shown in Figure 9.

The DB2 CANCEL THREAD command can be issued by using the C line command if you have the proper DB2 authorization.

Figure 9   All active threads for one DB2 (THDACTV)

A hidden header beneath the window information line provides direct navigation to related views and identifies the row hyperlinks in the view.

2 Put the cursor on the Show Header field and press Enter to display and review the header options. Select Hide Header and press Enter when you are finished.

3 Hyperlink on one thread by placing your cursor in the Correlation ID column to see a detail display for that thread, as shown in Figure 10 on page 29.
The DUSER view is a hybrid free-form view. The data in the scrollable section of the view is provided by the full-screen service DUSER. The view cannot be customized or sorted.

You can scroll down to see more data, or put the cursor on a field in the Section Locates area and press Enter to display that section at the top of the view. To display Help for a section, put the cursor on a field in the Section Locates area press PF1.
The view shows all available accounting detail information about that thread. The most critical data is summarized in the base section, including key indicators of failures or potential problems.

4 Notice that the SQL Statement Analysis section contains the full text of the current SQL statement that is being executed, the current package/DBRM name, the amount of time this SQL statement has been active, and the last page accessed.

If the SQL is dynamic, the decimal value of the current SQL Cache Token is also shown. If the statement has been executing for a long time, you might want to use the decimal value to issue an EXPLAIN STMTCACHE :stmt-token to see information about the access path in use for the cached SQL statement. In contrast, the EXPLAIN hyperlink in the DUSER header (and the Explain function described in step 7) performs a dynamic Explain based on the SQL text. If the text has been used multiple times from the cache, the access paths might be different.

5 Put the cursor on the SQLCNTS field in the Section Locates area press Enter to view a breakdown of all SQL executed by this thread.

There are many other sections of detail data with which you will get acquainted over time. For example, if you are concerned about locking, you can use the # Locks hyperlink in DUSER header to see all of the locks held or waited on by this thread and any threads that are in contention with it. Alternatively, you could use the LOCKS field in the Section Locates area to see the counts of all lock activity for this thread.

6 Press PF3 as needed to return to THDACTV.

There are several other hyperlinks that can be useful in analyzing a thread. Scroll right and hyperlink on User Status to see a subset of the DUSER information in THDDETL. Staying in windows mode may be valuable if you need to “freeze” the threads to look at several at the same point in time.

7 Hyperlink on Current Activity if it shows a currently active SQL statement.
You can also access the Explain application from the MVDB2/DC Admin/Archive hyperlink on the EZDB2 Easy Menu (shown in Figure 21 on page 39) to Explain a plan or package, or view existing Plan_Table Explain data. See the MainView for DB2 User Guide for more information about the Explain application.

8 Press PF3 several times to return to EZDSSI.

Exceptions overview

Another way to check for exception conditions in any of your DB2s quickly is to choose the Exceptions hyperlink on EZDSSI to display the view STEXC, as shown in Figure 12.

For more information about this view, see “Exceptions” on page 67.
Thread activity for multiple DB2s

From EZDSSI, you can choose hyperlinks to view thread activity across multiple DB2s.

1 Hyperlink on Current Threads (Elap) to see all active threads, identified by the DB2 in which they are running.

2 Press PF3 to return to EZDSSI.

3 Hyperlink on Summary by DB2 to see a summary of threads for each DB2; then hyperlink on one row to view a list of threads for just that DB2.

4 When finished, press PF3 to return to EZDSSI.
DB2 DBM1 storage usage

You can also access views to see the various components of virtual storage (both above and below the 2 GB bar) in the Database Services address space (DBM1). You can use this information for troubleshooting DB2 virtual storage constraints or storage usage analysis.

1 From EZDSSI, hyperlink on DB2 Storage Use to see the DB2 Storage Entries view (DB2STOR), as shown in Figure 13.

Figure 13   DB2 storage entries (DB2STOR)

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Information</th>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>10MAR2011</td>
<td>08:01:32</td>
<td>INFORMATION DISPLAY</td>
<td></td>
</tr>
<tr>
<td>COMMAND</td>
<td>===&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CURR WIN</td>
<td>===&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALT WIN</td>
<td>===&gt;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| >W1=DB2STOR=(ALL=**********)=10MAR2011=08:01:32=MVDB2====D==2
| DB2        | Available | Total DBM1 | In Use | Storage | Fixed | Getmain |
| Target     | < 2GB     | In Use      | By MVS | Cushion | > 2GB | >2       |
| DB2K       | 1509.32   | 56.09       | 1565.41| 127.76  | 0.02  | 33       |
| DECE       | 1538.60   | 38.25       | 1576.86| 103.25  | 0.02  | 33       |

Set an alarm

From this view, you can set an alarm to give you a warning if the amount of available storage below the 2 GB bar falls below the specified threshold. A sample alarm is provided. You can change the defined thresholds and assigned colors by customizing the view. See the MainView User Guide for instructions.

You might want to set this alarm either for one critical DB2 or for several production DB2s.

2 Hyperlink on a DB2 Target to access the DB2 Storage Details view (DB2STORD).

This view provides a complete picture of storage usage for the selected DB2. You can see information about storage usage below the 2 GB bar (Figure 14 on page 34), and above the bar (Figure 15 on page 35). For DB2 10, this view shows storage information for both the DBM1 and DIST address spaces.

NOTE

You can also access this view for a single DB2 from the EZDB2 or EZDBA Easy Menus.

You will learn more about analyzing a single DB2 in the next section.
(See “Analyze one DB2” on page 39.)
The first section of this view provides a summary of storage usage below the 2 GB bar, with pointers to subsequent sections that provide further details, as shown in Figure 14.

**Figure 14  DB2 storage details (DB2STORD)—below the bar (part 1 of 2)**

<table>
<thead>
<tr>
<th>Storage Summary Below 2 GB</th>
<th>Quantity in MB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address Space</td>
<td>DBM1</td>
</tr>
<tr>
<td>Storage Available</td>
<td>1187.60</td>
</tr>
<tr>
<td>Total DB2 Storage In Use</td>
<td>3.94</td>
</tr>
<tr>
<td>Total MVS Storage In Use</td>
<td>90.40</td>
</tr>
<tr>
<td>Storage Cushion</td>
<td>267.96</td>
</tr>
<tr>
<td>Average Thread Footprint</td>
<td>0.27</td>
</tr>
<tr>
<td>Average Thread Footprint Type II</td>
<td>0.27</td>
</tr>
<tr>
<td>Maximum Number of Possible Threads</td>
<td>3958</td>
</tr>
<tr>
<td>Max Number of Possible Threads Type II</td>
<td>735</td>
</tr>
</tbody>
</table>

1) Total DB2 Storage In Use.............. 3.94 1.18
Total Getmained Storage (2)............. 0.28 0.00
Total Variable Storage (3).............. 0.58 0.26
Total Fixed Storage.......................... 0.08 0.08
Total Getmained Stack Storage........... 3.00 0.83
Total Stack Storage in Use.............. 2.87 0.73

2) Total Getmained Storage Below 2GB..... 0.28 0.00
EDM Pool.................................. n/a
Total Buffer Manager control blocks..... 0.13

3) Total Variable Storage................ 0.58 0.26
Total Agent Local Storage............... 0.06
Total Agent System Storage.......... 0.04
Number of Prefetch Engines........ 1
Number of Deferred Write Engines.... 0
Number of Castout Engines.......... 1
Number of GBP Write Engines........ 0
Number of P-Lock/Notify Exit engines 1
Total Agent Non-System Storage........ 0.02
Total Number Of Active User Threads.. 2
Total Number Of Active DBATs......... 0
Thread High Water Mark........ 2
DBAT High Water Mark............. 0
RDS OP Pool................................ n/a
RID Pool.................................. n/a
Pipe Manager Sub Pool................ 0.00
Local Dynamic Stmt Cache Cntl Blks.... n/a
Thread Copies Of Cached SQL Statements. 0.00
In Use Storage.......................... 0.00
Statement Count........................ 0
HWM For Allocated Statements....... 0.00
Statement Count At HWM............... 0
Date At HWM................................ 2011-MAR08
Time At HWM............................ 12:10:36.0
Buffer & Data Manager Trace Table..... 0.00
When finished, press PF3 as needed to return to EZDSSI.
DDF connections and activity

You can analyze active and inactive Distributed Data Facility (DDF) connections, threads, and conversations by using the DDF views.

1. From EZDSSI, hyperlink on **DDF Menu** to display the EZDDF Easy Menu.

**Figure 16  DDF Easy Menu (EZDDF)**

EZDDF provides access to information about DDF connections, DBAT threads, statistics, exception monitors, ZPARM installation parameters, and if MainView for z/OS® is installed, zIIP usage for active DBAT threads.

2. Hyperlink on **All Locations** to display a summary of the DDF connections by DB2 subsystem and remote location.

**Figure 17  Connection location summary (DDFLOCZ)**

The PING and TRACERT commands are available on this view and several other DDF views to check the state of a TCP/IP connection and to trace the route to a destination. Network security might limit your ability to execute these commands.
3 In the C line command field, enter P next to a connection to issue an ICMP echo request to a remote IP host.

If an echo reply is received within ten seconds, the host is considered accessible and the elapsed response time is shown:

BBMXV335I Message(s) received from targets on BMCE ---
BBPF1015I Ping: 'mwitkows-BMC-04.bprod.bmc.com' is alive; time = 43ms
BBMXV336I --- End of message(s) from targets on BMCE ---

Otherwise, the PING command times out and a message is issued.

4 Press PF3 as needed to return to EZDDF.

5 Hyperlink on Client Products – SSI to display DDF connections summarized by client product ID.

In SSI mode, the DDFPRODZ view summarizes connections for all monitored DB2 subsystems.

Figure 18  Client product summary (DDFPRODZ)

6 Press PF3 as needed to return to EZDDF.

7 Hyperlink on Connections Menu to display the EZDDF2 Easy Menu.

Use this menu to check the status of threads, connections, and conversations by server or requester.
8 In the **All Threads** section, hyperlink on **Server** to display the DDFTHDZ view.

**Figure 20  Thread summary (DDFTHDZ)**

<table>
<thead>
<tr>
<th>Command</th>
<th>Scroll</th>
<th>Curr Win</th>
<th>Alt Win</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

>W1

<table>
<thead>
<tr>
<th>C</th>
<th>DB2</th>
<th>Agnt</th>
<th>Agt</th>
<th>Cnv</th>
<th>Network</th>
<th>Thread</th>
<th>Connect</th>
<th>Correlation</th>
<th>Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEDM</td>
<td>Acti</td>
<td>Srv</td>
<td>1 02:05:20</td>
<td>115 TSO</td>
<td>BOLDJW1</td>
<td>BOLDJW1</td>
<td>DSNESPCS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

On this view and other DDF views, the **Thread Token** and **AuthID** fields hyperlink to the THDDETL view and DUSER display for additional information about active DBATs or distributed threads.

9 Press **PF3** as needed to return to EZDSSI.
Analyze one DB2

To drill down to data about a specific DB2, use one of the following two methods:

- Select any view from the DB2 SSI Easy Menu (EZDSSI). From the list of available DB2 targets, you can hyperlink to another view with more information about the selected DB2.

- From EZDSSI, choose the Easy Menu (EZDB2) hyperlink to access an Easy Menu designed to analyze one DB2 at a time, EZDB2, as shown in Figure 21. This method selects one DB2 from the context of ALL. (If you choose the SSI Status - List DB2s hyperlink, the STDB2 view provides a drill down on the target to STDB2D, and from there to EZDB2.)

For the purposes of this exercise, use the second method.

Figure 21  DB2 Easy Menu (EZDB2)

To select the target DB2 that you want to analyze, use one of the following methods:

- Hyperlink on Set Target Context to see a list of targets; then place your cursor in the Target column and press Enter to hyperlink to a different target.

- Type CON target on the COMMAND line, where CON target is the name of the DB2 target that you want.
Notice in the **Tools And Menus** section, there are hyperlinks to several other Easy Menus.

---

**Check DB2 status**

To check the status of the target DB2:

1. **Hyperlink on DB2 Status Summary.**

   This link takes you to the STDB2 view, as shown in Figure 6 on page 24, but only one DB2 is displayed.

2. **Now you may want to review recent history.**

   Type `TIME ** 2H` to see the last 2 hours by 15-minute intervals.
   Type `INCLUDE TIME` to see the times (the **Intvl Time** column is added to the view), as shown in Figure 22.

3. **Reset to current time by typing `TIME ** 1I` and then `EXCLUDE TIME`.**

4. **Hyperlink on DB2 Target to see a detail status view, as shown in Figure 23 on page 41.**

   **NOTE**
   You can also access the STDB2D view by selecting one DB2 from STDB2 in SSI mode.

---
Check DB2 status

Figure 23  DB2 status detail—interval (STDB2D)

This view shows an overview of current thread activity per attach type as well as key indicators of recent performance. There are several hyperlinks at the top of the view, in addition to hyperlinks to threads of different connect types in the middle of the view, and others in the key indicators shown at the bottom of the view.

5 Use the STDB2DS hyperlink at the top of the view to see totals since DB2 startup instead of current interval values in the key indicator fields.

6 Use the >EZDSTATD option at the top of STDB2D to see the DB2 Stats Detail Easy Menu.

This Easy Menu is very similar to the DB2 Status Easy Menu, EZDSTAT, that you saw earlier, but the hyperlinks here take you directly to all the detailed statistics views for this DB2.
7 Hyperlink on SQL Counts to see STSQLD as an example of these detailed statistics views, as shown in Figure 24 on page 42.

Figure 24  SQL counts detail (STSQLD)

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Information Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>10MAR2011</td>
<td>17:01:51</td>
<td>-------------------</td>
</tr>
</tbody>
</table>

**Detailed view**

<table>
<thead>
<tr>
<th>Command</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>SELECT.......</td>
<td>0</td>
</tr>
<tr>
<td>INSERT........</td>
<td>0</td>
</tr>
<tr>
<td>UPDATE........</td>
<td>2</td>
</tr>
<tr>
<td>DELETE.........</td>
<td>0</td>
</tr>
<tr>
<td>DESCRIBE......</td>
<td>0</td>
</tr>
<tr>
<td>PREPARE.......</td>
<td>12</td>
</tr>
<tr>
<td>OPEN...........</td>
<td>10</td>
</tr>
<tr>
<td>FETCH..........</td>
<td>150</td>
</tr>
<tr>
<td>CLOSE..........</td>
<td>9</td>
</tr>
</tbody>
</table>

**Data Definition Language**

<table>
<thead>
<tr>
<th>Command</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CREATE TABLE.</td>
<td>0</td>
</tr>
<tr>
<td>INDEX.........</td>
<td>0</td>
</tr>
</tbody>
</table>

8 Press PF3 to return to EZDSTATD.

You may want to browse a few other detail views.

9 Press PF3 to return to STDB2D.

10 Hyperlink on TSO to see a tabular view of current TSO users.

11 You have stepped through several status views now. However, some information is not available in windows mode. Examples are information about CICS connections, DB2 logging, DSNZPARM values, and so forth.

To access these displays, press PF3 to return to the Primary Option Menu, or you can use one of the following quick paths:

- From EZDB2, choose FullScreen Menu to hyperlink into full-screen mode.

- Use the transfer command at any point to access the full-screen DB2 Status display DB2ST. This view is similar to STDB2D, but it provides point-and-shoot access to most full-screen displays, such as CICSC (to see CICS connections), ZPARM, and so forth.

  TRANSFER target DB2;EX DB2ST

  You can also use the transfer command to access other MainView products.
12 Return to EZDB2 and choose Exception Menu.

Besides access to the exception displays that you have seen before, the Exception Menu also has a hyperlink to the MainView ALERTS view. This view consolidates monitor exceptions and those produced by alarms defined in MV ALARM. There are also hyperlinks to the Alerts Menu and to MV ALARM.

13 Press PF3 to return to EZDB2 again.

**DB2 topic index access**

Instead of always using the menu navigation, you can quickly find the views that you want through topic index views.

1 In EZDB2, hyperlink on *DB2 Topic Index* to access the DB2 Topic Index menu, which provides alphabetic access to the defined topics.

2 Press PF3 to return to EZDB2.

3 Think of a DB2 performance issue you might want to investigate. For this walkthrough, choose “data set open/close activity.” For the quickest access, you can now type **TOPICD** on the COMMAND line to access a list of DB2 topics starting with the letter D, as shown in Figure 25. (This action can be done in any MVDB2 view.)
Now browse through the list of topics starting with the letter, D, until you find Data Sets. There are several entries under this topic, including several for open/close activity.

The first hyperlink column is usually the one you want to take when looking at a single DB2, but you can also access similar SSI views, related monitors and ZPARMs, and identify relevant trace data.

Hyperlink on STDSAD to see the view of that name. It will show you the statistics you want to see.
Buffer pools

To analyze buffer pools for the target DB2:

1. From EZDB2, hyperlink on **Buffer Pools** to see a list of all defined pools with allocated space, utilization, and getpage rates, as shown in Figure 26.

**Figure 26  Buffer pool statistics (BFRPL)**

<table>
<thead>
<tr>
<th>Pool Name</th>
<th>DB2 Target</th>
<th>Vpool Size</th>
<th>Alloc</th>
<th>Getpg /sec</th>
<th>Get- pages</th>
<th>% Actv</th>
<th>0 to 50%</th>
<th>50 to 100%</th>
<th>Type</th>
<th>ID to</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP0</td>
<td>DEDM</td>
<td>2000</td>
<td>2000</td>
<td>0.0</td>
<td>9</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>BP1</td>
<td>DEDM</td>
<td>1001</td>
<td>1001</td>
<td>0.0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>BP2</td>
<td>DEDM</td>
<td>1002</td>
<td></td>
<td>0.0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>BP3</td>
<td>DEDM</td>
<td>1003</td>
<td></td>
<td>0.0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>BP4</td>
<td>DEDM</td>
<td>1004</td>
<td></td>
<td>0.0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>BP5</td>
<td>DEDM</td>
<td>1005</td>
<td></td>
<td>0.0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>BP6</td>
<td>DEDM</td>
<td>1006</td>
<td></td>
<td>0.0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>BP7</td>
<td>DEDM</td>
<td>1007</td>
<td></td>
<td>0.0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>BP25</td>
<td>DEDM</td>
<td>1250</td>
<td></td>
<td>0.0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>25</td>
<td>25</td>
</tr>
</tbody>
</table>

2. Hyperlink on **Pool Name** to see all status and statistics for one pool.

Chapter 2  Isolating DB2 performance problems  45
Both interval and session counts are shown (Figure 27).

**Figure 27 Local buffer pool statistics detail (BFRPLD)**

3 Scroll down with **PF8** to see all the data.

4 Press **PF3** to return to BFRPL.
5 Hyperlink on \texttt{Getpg/sec} to see current hit ratios per pool (BFRPLH); then hyperlink on \textbf{Pool Name} to see both current and session ratios (BFRPLHD) for one pool, as shown in \textbf{Figure 28}.

\textbf{Figure 28}  \textit{Buffer pool rates detail (BFRPLHD)}

<table>
<thead>
<tr>
<th>Date/Time</th>
<th>Command</th>
<th>Scroll</th>
<th>Current Window</th>
<th>Alt Window</th>
</tr>
</thead>
<tbody>
<tr>
<td>03MAR2011</td>
<td>W1</td>
<td>CSR</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

\textbf{Hit ratios}

<table>
<thead>
<tr>
<th>Interval</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pool Name</td>
<td>BP0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hit Ratios</th>
<th>Interval</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>VPOOL Hit Ratio % with P/F</td>
<td>17.51</td>
<td>18.55</td>
</tr>
<tr>
<td>VPOOL Hit Ratio % without P/F</td>
<td>92.64</td>
<td>81.70</td>
</tr>
<tr>
<td>GBP Hit Ratio %</td>
<td>0.00</td>
<td>18.92</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activity per Second</th>
<th>Interval</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>Getpages</td>
<td>143.20</td>
<td>4.87</td>
</tr>
<tr>
<td>Page Updates</td>
<td>29.70</td>
<td>0.61</td>
</tr>
<tr>
<td>Sync I/O</td>
<td>0.40</td>
<td>0.06</td>
</tr>
<tr>
<td>Prefetch I/O</td>
<td>15.51</td>
<td>0.51</td>
</tr>
<tr>
<td>Write I/O</td>
<td>0.80</td>
<td>0.02</td>
</tr>
</tbody>
</table>

6 Press \textbf{PF3} to return to EZDB2.

Group buffer pools are discussed later in the data sharing section (see “Tune group buffer pools” on page 95).
Catalog access

MVDB2 also provides a catalog browse facility with hyperlinks to the CATALOG MANAGER product. If you are licensed for the full product, all of its functions are available directly from MVDB2.

1 From EZDB2, hyperlink on CATALOG BROWSE—Local (for a DB2 that is in the same LPAR as your UAS) or CATALOG BROWSE—Remote (for a DB2 that is in a different LPAR) to access the Catalog Browser Primary Menu, as shown in Figure 29.

Figure 29 Catalog Browser primary menu

This menu allows you to browse most catalog objects.

2 Press PF1 for help to see a complete list of objects.

3 Use the Tab key to move to the Object type selections and type DB to see a list of databases.

You now see the object list display of all databases.

4 Enter a line command of either S or D next to one database to see the complete catalog row data for that database.

5 Press PF3 to return to the database list.

6 Now enter the TS line command to see a list of all the table spaces in the selected database.

7 For help on available actions, type COMMAND. For help on a message you received, type TSO BMCMSGmsgid.

Look at catalog objects

DB2K 09.01.01 Primary Menu

Enter object type and qualifier for an object list

Object type . . .

DB Database  TS Tablespace  PL Plan  ST Strings
SG Stogroup  SU SysPrivUser  AL Alias  LO Locations
TB Table  SY Synonym  US User  CK CheckConst
VW View  PG Package  CO Column  PR Procedures
IX Index  CI Collection  DM DBRM  XT Aux Table

Qualifier . . .

Initial attach to DB2K
Lock contention analysis

Although locking problems must usually be resolved at the application level, the first indication of problems—and the simplest identification of the applications and resources involved—can best be seen at the system level.

To look at locking problems in one DB2 (without data sharing):

1 Return to EZDB2.

2 If you are not sure whether you are having much lock contention, you might want to review the lockout and suspension counts and rates first in the STRATE view (hyperlink on Activity Rates).

A certain number of lock suspensions (and even an occasional timeout or deadlock) is to be expected in an active DB2 system. More frequent lockout conditions (either timeouts or deadlocks) may be a cause for concern, because the SQL statements involved are terminated.

3 Press PF3 to return to EZDB2.

4 Select Locking Menu to access the DB2 Locking Easy Menu, EZDLOCK, as shown in Figure 30.

Figure 30  DB2 locking menu (EZDLOCK)

Although you might have analyzed lockout conditions one at a time before, the windows-mode views provide additional analysis capabilities. They are available through all the hyperlinks in EZDLOCK.
Current locks

To see current contention, next look at the options on the DB2 Locking Menu (Figure 30 on page 49) under Currently Held Locks.

1. Hyperlink on Suspended Threads to see a list of active threads that are currently suspended for locks (LSTSUSPZ), as shown in Figure 31. Holding and waiting threads in current conflicts are identified.

### Figure 31  Suspended threads (LSTSUSPZ)

<table>
<thead>
<tr>
<th>User Id</th>
<th>Target</th>
<th>Wait</th>
<th>Total Exclusive</th>
<th>Total Shared</th>
<th>Connect</th>
<th>Lock Type</th>
<th>Wait Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOLDJW1</td>
<td>DECE</td>
<td>YES</td>
<td>7</td>
<td>0</td>
<td>6</td>
<td>BATCH</td>
<td>00:00:54.82</td>
</tr>
<tr>
<td>BOLDJW1</td>
<td>DECE</td>
<td>YES</td>
<td>7</td>
<td>1</td>
<td>6</td>
<td>BATCH</td>
<td>00:00:31.13</td>
</tr>
<tr>
<td>BOLDJW1</td>
<td>DECE</td>
<td>YES</td>
<td>129</td>
<td>0</td>
<td>129</td>
<td>BATCH</td>
<td>00:00:00.72</td>
</tr>
</tbody>
</table>

### NOTE

LSTSUSPZ is also accessible through hyperlinks in several thread views (THD:xxx).

Views with thread data include all the thread identifiers, as well as the current SQL statement. You might want to customize the views to see the identifiers most important for your workloads.
2 Return to EZDLOCK and hyperlink on Locks Held / Threads to see all threads with lock counts (LSTLOCKZ), as shown in Figure 32.

Figure 32  Locks held / threads (LSTLOCKZ)

From both LSTSUSPZ and LSTLOCKZ, you can hyperlink on one thread to see all its locked resources (or one it is waiting on), and then drill down on a conflict to see the holder and waiter threads. The current elapsed time of each lock is also available.

3 Return to EZDLOCK and hyperlink on Resources with Waiters to see a list of resources in contention (LSRWAITZ), as shown in Figure 33.

Figure 33  Resources with waiters (LSRWAITZ)

4 Hyperlink on a resource in LSRWAITZ to see the lock holder and all waiters (LSRCONT), as shown in Figure 34.

Figure 34  Lock resource contention (LSRCONT)
Lock contention analysis

5 Return to EZDLOCK and hyperlink on Locks Held / Resources to see all resources with locks (LSRHELDZ), as shown in Figure 35.

Figure 35  Locks held / resources (LSRHELDZ)

![Figure 35](image)

6 Press PF3 to return to EZDLOCK.
Timeouts and deadlocks

1 Hyperlink from Lockout Events by Time (for one DB2) on the EZDLOCK Easy Menu to see a list of timeouts and deadlocks in the LKEVENT view, as shown in Figure 36.

Figure 36  Lockout events (LKEVENT)

This view shows a chronological list of lockout events that have occurred since DB2 startup, sorted with the most current at the top of the screen. The most recent events are retrieved from an online buffer that holds a default of 100 events.

2 Type SORT and press the Tab key to move to the Victim Plan column to sort these lockout events by plan name to identify the applications for which SQL requests were terminated.

3 Hyperlink on the Date/Time field for an event (preferably a deadlock that involves multiple resources).

The first view shows the resources involved and holder (blocker) and waiter plans.

4 Scroll right to see additional details for both resources at once, or hyperlink on the Res Seq field to see all the available details for this conflict.

5 Press PF3 to return to EZDLOCK.

6 Hyperlink on Resource Cont. Summary to do an analysis of the resources involved in timeouts or deadlocks, as shown in Figure 37.

Figure 37  Lockout resource summary (LKRESZ)
Lock contention analysis

The first view, LKRESZ, summarizes all conflicts by resource name, usually database and table space. Note that a deadlock with three resources and participants will result in three conflicts, not one, for the purposes of this analysis. With this view, you can easily identify those table spaces involved in the most contention.

7  Hyperlink on a resource name that shows one or more conflicts to see a breakdown of these conflicts by specific resource, down to a page or row level (LKRESNRZ).

With this view, hot spots in your tables are immediately visible, as shown in Figure 38.

Figure 38  Lockout resource number summary (LKRESNRZ)

8  Hyperlink on either the resource name or the resource number to view a list of each lockout event that involved this resource (LKRESD), as shown in Figure 39.

The events are initially sorted in descending sequence by time, but the SORT command can be used to sort by any column. (If you have forgotten how, type HELP SORT on the COMMAND line.) Controlling the sort order allows you to identify quickly the applications (blocker planname, waiter planname) and users (blocker/waiter Corr ID, Connection, Victim Auth ID) who are involved.

Figure 39  Lockout resource conflict detail (LKRESD)

Although the solution to locking problems may involve application or table redesign, at least you now know where the problems lie.
9 Press PF3 until you return to EZDLOCK and hyperlink on Conntype Cont. Summary if you suspect that the problem might lie in application scheduling, where applications with incompatible lock usage are running concurrently, as shown in Figure 40.

**Figure 40  Lockout connection summary (LKCONZ)**

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Command</th>
<th>SCROLL</th>
<th>Win</th>
<th>ALT Win</th>
</tr>
</thead>
<tbody>
<tr>
<td>10MAR2011</td>
<td>17:38:41</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The view LKCONZ summarizes the conflict data to identify, for example, whether batch jobs or utilities are blocking critical CICS or IMS transactions. As in the resource summaries, hyperlinks lead to lists of the exact events with time stamps, so that the critical time periods can be seen at a glance.

10 Press PF3 until you return to EZDLOCK and hyperlink on Blocker/Waiter Summary in order to identify incompatible applications that are frequently blocking each other, as shown in Figure 41.

**Figure 41  Lockout blocker/waiter summary (LKBWZ)**

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Command</th>
<th>SCROLL</th>
<th>Win</th>
</tr>
</thead>
<tbody>
<tr>
<td>10MAR2011</td>
<td>17:40:24</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The view LKBWZ summarizes the conflict data by blocker and waiter plans, so that you can quickly see which applications are causing the most conflicts. The hyperlinks again show all of the lockout events where the selected plan was involved.

11 Press PF3 several times until you return to EZDB2.
The tuning of physical I/O and page set usage in the buffer pools is a critical success factor in DB2. DB2 itself uses many techniques to reduce or defer I/O, but the setup, from DASD volumes to buffer pool allocation and thresholds, all plays a part.

1 To look at data object issues with the focus still on a single DB2, begin by selecting the Page Set Menu option from EZDB2 to access the DB2 Object Menu, EZDPS, as shown in Figure 42.

MVDB2 collects these page set statistics with low overhead from DB2 control blocks.

For DB2 version 9 and later, the I/O counts for low activity page sets are retained as interval counts until they reach the threshold of one I/O per second for a STATTIME interval.
The first thing to review is simply the status of all open page sets. Hyperlink on Status to see a list sorted by object name (database, table space, partition), as shown in Figure 43.

**Figure 43  Page set status (PSSTAT)**

<table>
<thead>
<tr>
<th>Page Set</th>
<th>Bfrpl</th>
<th>%</th>
<th>First</th>
<th>Defr</th>
<th>GBP</th>
</tr>
</thead>
<tbody>
<tr>
<td>DB2HWORK</td>
<td>0</td>
<td>7440</td>
<td>99.4</td>
<td>3</td>
<td>BAB310</td>
</tr>
<tr>
<td>DSNDB01</td>
<td>BP00</td>
<td>1440</td>
<td>100.0</td>
<td>1</td>
<td>BAB310</td>
</tr>
<tr>
<td>DSNDB01</td>
<td>IX</td>
<td>288</td>
<td>66.7</td>
<td>1</td>
<td>BAB310</td>
</tr>
<tr>
<td>DSNDB01</td>
<td>IX</td>
<td>240</td>
<td>80.0</td>
<td>1</td>
<td>BAB312</td>
</tr>
<tr>
<td>DSNDB01</td>
<td>IX</td>
<td>48</td>
<td>33.3</td>
<td>1</td>
<td>BAB320</td>
</tr>
<tr>
<td>DSNDB01</td>
<td>IX</td>
<td>144</td>
<td>11.1</td>
<td>1</td>
<td>BAB310</td>
</tr>
<tr>
<td>DSNDB01</td>
<td>IX</td>
<td>432</td>
<td>44.4</td>
<td>1</td>
<td>BAB325</td>
</tr>
<tr>
<td>DSNDB01</td>
<td>IX</td>
<td>10080</td>
<td>14.3</td>
<td>1</td>
<td>BAB310</td>
</tr>
<tr>
<td>DSNDB01</td>
<td>IX</td>
<td>5760</td>
<td>25.0</td>
<td>1</td>
<td>BAB312</td>
</tr>
<tr>
<td>DSNDB01</td>
<td>IX</td>
<td>1440</td>
<td>100.0</td>
<td>1</td>
<td>BAB310</td>
</tr>
<tr>
<td>DSNDB01</td>
<td>IX</td>
<td>480</td>
<td>20.0</td>
<td>1</td>
<td>BAB312</td>
</tr>
<tr>
<td>DSNDB01</td>
<td>IX</td>
<td>432</td>
<td>22.2</td>
<td>1</td>
<td>BAB312</td>
</tr>
<tr>
<td>DSNDB01</td>
<td>IX</td>
<td>96</td>
<td>16.7</td>
<td>1</td>
<td>BAB310</td>
</tr>
<tr>
<td>DSNDB01</td>
<td>IX</td>
<td>144</td>
<td>11.1</td>
<td>1</td>
<td>BAB312</td>
</tr>
<tr>
<td>DSNDB01</td>
<td>IX</td>
<td>2160</td>
<td>66.7</td>
<td>1</td>
<td>BAB312</td>
</tr>
<tr>
<td>DSNDB01</td>
<td>IX</td>
<td>48</td>
<td>33.3</td>
<td>1</td>
<td>BAB310</td>
</tr>
<tr>
<td>DSNDB01</td>
<td>IX</td>
<td>480</td>
<td>33.3</td>
<td>1</td>
<td>BAB310</td>
</tr>
<tr>
<td>DSNDB01</td>
<td>IX</td>
<td>192</td>
<td>50.0</td>
<td>1</td>
<td>BAB318</td>
</tr>
<tr>
<td>DSNDB01</td>
<td>IX</td>
<td>48</td>
<td>33.3</td>
<td>1</td>
<td>BAB312</td>
</tr>
</tbody>
</table>

Sort on the EXT column to identify the data sets with the highest number of extents (a potential performance impact). Type SORT D and move to the EXT column by pressing the Tab key.
If you want to limit the view by selecting only certain page sets, use the WHERE command. It works very much like the SQL WHERE clause. First choose one (or more) column on which you want to filter the view. Place the cursor in that column header and press PF1 to view the field Help. Within the Help, the element name is identified.

A Now type WHERE on the COMMAND line. Under Where Condition, type the filters that you want in effect.

For example, to show only those data sets with several extents, type

\[ \text{IO_EXT} > 5 \]

B Press PF3 to return to PSSTAT with the WHERE clause in effect. You can check the filters in effect in any view with the SHOWFILT command.

---

**NOTE**

Help for any command is available by typing `HELP commandname` on the COMMAND line.

---

As another example of filtering, to see only catalog tables, type

\[ \text{IO_DBTSP} = \text{DSNDB06*} \]

Hyperlink on the Page Set field to see complete details about the selected page set, including size, volume, buffer pool cache data, and detailed I/O counts and elapsed wait times. You might need to scroll down with PF8 to see all the data.

Press PF3 to return to PSSTAT.

Hyperlink on the Users column to see the threads currently accessing this page set.

Or hyperlink on the Err column, which not only shows possible I/O errors, but also identifies page sets that are currently in restricted or advisory status. The hyperlink displays the OBJDETL view to show more details about that object and its status.

Press PF3 to return to EZDB2.

One of the most important issues to check periodically is data set placement and volume I/O response times.

Hyperlink on Volume I/O Summary to see the volumes in use for DB2 databases, as shown in Figure 44.
Type **SORT D** and move to **Sync Avg I/O Wait** to sort the volumes with the highest average delays to the top.

These values are based on activity since DB2 startup.

To see a 2-hour summary of activity for one volume broken down into 15-minute intervals, hyperlink on **Sync I/Os**.

Press **PF3** to return.

Hyperlink on a volume to see a list of all page sets on that volume.

You might want to scroll to the right to see the asynchronous I/Os made for prefetch, since these I/Os have different access characteristics and delay times than do synchronous I/Os.

Press **PF3** until you return to EZDB2 and hyperlink on the **Page Set Menu** option to go to EZDPS.

Hyperlink on any of the **I/O by Page Set** options to look at I/O counts and wait times per page set.

- Sort on the **Avg I/O Wait** column to identify the highest average delays that can point out DASD response time problems.

- Sort on **Max I/O Wait** to help identify occasional contention problems that are masked in the averages.
Page set status and I/O analysis

**NOTE**

However, be aware that the maximum is since DB2 startup, not per interval. This limitation does reduce its usefulness.

14 Press PF3 until you return to EZDPS and hyperlink on Cache Statistics to analyze page usage in the buffer pools by page set, as shown in Figure 45.

**Figure 45** Page Set cache (PSCACHE)

You might want to sort on the VP Current column (descending) to sort those with the highest current storage usage to the top. The VP Changed and VP Max Chng columns identify those page sets with update activity.

15 Press PF3 until you return to EZDPS and hyperlink on Summary by Buffer Pool for assistance in balancing table space allocations to the proper buffer pools, as shown in Figure 46.
The view PSBPSZ gives you a quick overview of how all the buffer pools are being used.

16 Hyperlink on Bfrpl ID to see a list of all page sets allocated to that pool (PSBPS). Sort on the VP Current column (descending) to sort those with the highest current storage usage to the top.

The VP Changed and VP Max Chng columns identify those page sets with update activity.

17 Press PF3 until you return to PSBPSZ. Hyperlink on VP Current for a 2-hour history.

18 Press PF3 until you return to EZDB2.

19 Hyperlink on Object Status Summary to see if any objects are in restricted or advisory status, or are being accessed by a utility.

If Util Thds is set to Y, you can hyperlink to the THDUTIL view to display the utility threads associated with the restricted objects.

20 Press PF3 until you return to EZDB2.
Use monitors to isolate problems

Monitors sample key measurements over time and save short-term history. When thresholds are specified, the measured values are compared and automatic warnings generated.

A default set of monitors defined in BBPARM member BLKDMRW is started automatically. This set can be tailored for each DB2 system with different monitors or different thresholds.

To view the active monitors:

1. Type AT in the COMMAND line, or select the monitor administration hyperlinks in the EZDBA or EZDB2 Easy Menus.

Figure 48  Active monitors (AT)

All active monitors are listed here. The current measurement values are shown and plotted compared to the thresholds. The W in the middle of the graph marks the warning threshold values. All monitors with acceptable values remain on the left side of the W. Those in warning status extend to the right and are highlighted.

2. To start a monitor, hyperlink on the SM option to issue the SM command and display the Monitor Services view.
Use monitors to isolate problems

Chapter 2 Isolating DB2 performance problems

Figure 49 Start Monitors view (SM)

The view lists of all available monitor services.

Monitors look at either resources/system activity (resource monitors) or at workload activity (workload monitors). All workload monitor names start with # (for a count) or with an @ (for an average). One workload monitor can be started multiple times to look at different workloads to help isolate specific workload-related problems. Some resource monitors also have parameters to support multiple requests—for example, buffer pool number.

You can scroll through the list with PF7/8, sort on any of the columns, or select only those monitors for the area in which you are interested.

3 Type S next to the #SQLM service to select a workload monitor and display the Start Workload Monitor panel.

By selecting #SQLM, you can view some immediate activity because this service measures the number of DML statements issued.
Figure 50  Start Workload Monitor panel

<table>
<thead>
<tr>
<th>COMMAND ====&gt;</th>
<th>SCROLL ===&gt; CSR</th>
</tr>
</thead>
<tbody>
<tr>
<td>#SQLM - DATA MANIPULATIVE SQL</td>
<td></td>
</tr>
<tr>
<td>Monitor Attributes:</td>
<td></td>
</tr>
<tr>
<td>PARM (Identifier)</td>
<td>START (hh:mm:ss)</td>
</tr>
<tr>
<td>INTERVAL 00:01:00 (hh:mm:ss)</td>
<td>STOP (hh:mm:ss/mins)</td>
</tr>
<tr>
<td>WVAL (Warning value)</td>
<td>WIF 1 (Intvls to lst msg)</td>
</tr>
<tr>
<td>WMSG (Log warnings to)</td>
<td>WIN 1 (Message Intervals)</td>
</tr>
<tr>
<td>WLIM 10 (Warnings limit)</td>
<td>RST HOT (HOT,PUR,QIS)</td>
</tr>
<tr>
<td>QIS YES (YES/NO)</td>
<td></td>
</tr>
<tr>
<td>TITLE DATA MANIPULATIVE SQL</td>
<td></td>
</tr>
<tr>
<td>PLOTMAX (Maximum PLOT X-Axis value)</td>
<td></td>
</tr>
<tr>
<td>RANGES (1-4 Range Distr. Upper Limits)</td>
<td></td>
</tr>
<tr>
<td>LOG (NO,ATSTOP,ATPD,ATINTVL,ATWARN)</td>
<td></td>
</tr>
</tbody>
</table>

Specify Workload Selections:

ICHECK (Check Elapsed versus Interval time)
CONNTYPE (TSO, IMS, CICS, BATCH, etc.)
DB2PLAN
DB2AUTH
DB2CONN
DB2CORR
DB2LOC
DB2PKG
DB2RTN

ENTER to process the request
END to cancel the request
HELP to display related help

4 Define optional workload monitor data collection parameters on the panel by using mostly defaults.

A  PARM  id

You can specify any name as an ID if you want several requests for this monitor to look at different workloads.

B  INTERVAL

Use the default (00:01:00) of one minute data collection intervals.

C  START

Use the default to start at the next even minute, or type a future time in the format of hh:mm:ss.

NOTE

The monitors are synchronized to the even minute to make it easier for you to compare the history values they collect.
D STOP

Use the default of no stop time, or type a time at which you want the monitor to stop in the format of hh:mm:ss, or the number of intervals (minutes).

E WVAL

A warning message is issued automatically when a sampling exceeds the monitor threshold. Type a low value so you can see a warning. For example, if you expect 100 statements in a minute, type 50. It can be changed to a more appropriate value later.

F WMSG

If left blank, a warning message is sent to the Journal log when sampling exceeds the monitor threshold (also triggers MainView AutoOPERATOR EXECs). Current warnings are shown on DB2EX. Specify WTO to also send a message to the MVS console, or a TSO ID to send a message to that user.

G Optional fields: (For this exercise, accept the defaults)

- WLIM Limit number of warnings sent.
- WIF Wait n intervals before issuing a warning.
- WIN Wait n intervals before sending nth warning.
- RST Monitor reaction if DB2 stops and is restarted.
- PLOTMAX Specify maximum value of X Axis on monitor plot display.
- RANGES Set limits for range distribution statistics on plot display.
- LOG Record a hardcopy plot in the BBI-SS PAS Image log.

5 Specify workload selection criteria.

DB2CONN name,name,name

(Optional) Type one or more names, where name can be TSO, BATCH, DB2CALL, an IMSID, or a CICS jobname. Leave blank for total workload.

For an explanation of the other workload selection criteria, see the online Help.

6 Press Enter to start the monitor and return to the list of monitors.

7 Press PF3 to return to the Active Monitors view (AT).

8 Press Enter repeatedly until the new monitor shows an ACTIVE status and current measurement values. (Remember, they were synchronized to start at an even minute.) You might need to scroll right to see the status field.
9 Check that at least one monitor is in warning status (highlighted).

10 Use the M (modify) line command to view the monitor options in effect and to modify any that are preceded by an arrow.

Choose an active monitor and change its threshold value.

\[ \texttt{WVAL} \rightarrow n \quad \text{(Maximum)} \]
\[ \texttt{WVAL} \rightarrow <n \quad \text{(Minimum)} \]

If you did not start this monitor, you need special authorization to modify or purge it.

11 Press \texttt{PF3} to return to the AT panel.

Look at how the graph of the current value compared to the new threshold has changed.

---

**NOTE**

To stop a monitor, use the \texttt{Z} line command.

You now know how to start and modify monitors. The next dialog shows you how to look at the data.
Review critical problems

The following sections explain how to use exceptions, warnings, workload objectives, and audit trails to investigate critical problems.

Exceptions

1 Display the STEXC view to see an overview of background sampler system exceptions, thread exceptions, and outstanding messages for monitors in warning status.

**Figure 51 DB2 exceptions (STEXC)**

This view identifies immediately whether or not any exceptions have been detected, and shows what kind they are. Hyperlinks lead to additional details.

**Warning Monitors** indicates the number of conditions that have been detected by timer-driven sampling monitors defined with warning thresholds. Typically, a predefined group of monitors is started automatically and it is always active. A later section provides more information on monitors.

**System Exceptions** are conditions that are detected by a background sampler and are not governed by a threshold; for example, a problem with log archiving.

**Thread Exceptions** are thread-related conditions detected by a background sampler. Threshold conditions can be defined per attach type; for example, IBM IMS™, CICS®, or batch.

The first three types generate warning messages that can be viewed while active, tracked historically in the journal log, or fed into an automated operator product like MainView AutoOPERATOR.
**Exception**

**Warning Msg** shows the most important of several conditions that are checked per interval, and on request, as part of the total DB2 status and statistics data collection for windows-mode views. These conditions may also be identified by one of the other exception samplers.

2. Hyperlink on either the **Thread Exceptions** or **System Exceptions** column to see exception conditions that have been detected by background samplers.

**Figure 52 Monitor exceptions (STMONEX)**

Scroll right to see more of the message text. For an explanation of the message, you can hyperlink on the **Message ID** column.

For exceptions related to specific threads (DZ06nnn messages), the **Mon Name** column hyperlinks to the active thread view THDACTV. For most other exceptions, the **Mon Name** column hyperlinks to a plot view.
The MONWARN view provides a summary of monitors that are in a warning status.

### Figure 53  Monitors in warning status (MONWARN)

The view shows the number of active, completed or invalid, and quiesced monitors. The row data shows the request, its parameter, the observed monitor value, the warning threshold and a plotted graph of the observed value against the warning threshold.

3 Hyperlink on the Requests column to display additional information in a plot view.

### Figure 54  Sample plot view
The standard plot view shows the latest 10 values measured by the monitor. For further trending information, the values for the total monitoring period and the last 2 periods (10 samples each) are also shown. The threshold value is indicated with a W in the graph. Count type monitors show Avg/Sec rate calculations on the right side of the screen. Average type monitors (like the one shown in Figure 54), show the number of events (threads).

Workload objective views

Special workload monitors are started automatically for you to provide service-level monitoring of response time per workload.

Several default workloads have been predefined for transaction and query connections to DB2, based on connection type. Refer to the MainView for DB2 User Guide if you want to add workloads or modify the response time objectives of the existing workloads.

To see if you are meeting your response time goals for the defined workloads:

1. From EZDSSI, hyperlink on Monitors—Workload Objectives to review workload objectives, as shown in Figure 55.

Figure 55  Objectives review (DOBJ)

Are you meeting your goals?

The graph shows what percentage of all threads in that workload have met the response time goal.

You can access additional DOBJ* views by using the hyperlinks on the DOBJ view or EZDTHD Easy Menu.
Objectives monitor data, which includes the average response time, thread rate, and the percentage of goal attained, is also available in MainView Explorer charts. The charts provide an easy to use, historical perspective of the previous four hours. For more information about charts, see “Analyze workload history with MainView Explorer charts” on page 156.

Audit trail

To view an audit trail of problems throughout the day:

1. When in fullscreen mode, transfer to the Log Display general service (Option L).

   COMMAND ==> LOG

   or press PF5.

   When in windows mode, use the EZDBA Easy Menu hyperlink Journal (Messages), or enter

   COMMAND ==> TRAN db2target DB2;LOG

   All MainView for DB2 messages are shown chronologically, as shown in Figure 56.

Figure 56  Sample log display
You also can request an online audit trail of all DB2 system messages by specifying LOG=YES per target DB2 in the DMRBEX00 member of the BBPARM data set.

2 Check for exceptions that occurred in a specific period (Locate Time).

COMMAND ==› T 1130

3 FIND a specific problem (and press PF5 for RFIND). For example:

COMMAND ==› FIND DW0200W (SQLM monitor warning)
COMMAND ==› FIND DSNT375 (DB2 deadlock messages)
COMMAND ==› FIND DZ0630W (runaway TSO query)
COMMAND ==› FIND RUNAWAY (runaway thread from any connection)
COMMAND ==› FIND DW0 (all workload monitor warnings)

4 Scroll to the left with PF10 to see the origin of the messages.

This value can be used to select a subset of the messages in the Journal log.

5 Type PROFILE on the COMMAND line to access the Enhanced Journal Facility, as shown in Figure 57.

Figure 57 Enhanced journal facility

Select messages from one target

<table>
<thead>
<tr>
<th>BMC Software</th>
<th>Log Display</th>
<th>General services</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMMAND ==›</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Included Origins | Excluded Origins
--- | ---
DB2G |
----- | ------
----- | ------
----- | ------
----- | ------

Date --- 11/03/10
Time --- 12:41:32

Press END to SAVE Profile and return to application
CANCEL to discard changes

6 Type your DB2 target name (see the TGT field) in the Included Origins column. Return to the Log Display to view the messages only from that DB2.
To also include DB2 messages, specify the target name followed by a plus sign (+), such as \texttt{DB2G+}. This specification selects messages from the DB2 address spaces, such as DB2GMSTR.

7 Issue the \texttt{PROFILE} command again and specify \texttt{&TARGET} in the \texttt{Included Origins} column to automatically select the messages from the current target DB2 subsystem. Also specify the \texttt{BBI-SS PAS id} to include MainView for DB2 messages.

## Issue DB2 commands

If you have the proper authorization in MainView for DB2 (different from DB2 authorization), you also can issue DB2 commands from the fullscreen COMMAND line (usually from the Log Display so you can see the response):

1 Submit a \texttt{DISPLAY THREAD} command.

\begin{verbatim}
COMMAND ==> -DIS THD(*)
\end{verbatim}

The command is routed automatically to the DB2 system shown in the target field. You do not need to know the subsystem recognition character (SSRC) for each DB2.

The command response is shown in Figure 58.
Figure 58  Log display

```
BMC Software -------------------- Log Display ----------------- General services
COMMAND ===>                                                 TGT ===> DB2G
LINE=      30,270  LOG= #1   STATUS= INPUT    TIME= 16:01:28 INTV==> 3
16:00:20 -DIS THD(*)
16:00:20 DSNV401I - DISPLAY THREAD REPORT FOLLOWS -
16:00:20 DSNV402I - ACTIVE THREADS -
16:00:20 NAME     ST  A   REQ ID           AUTHID   PLAN     ASID
16:00:20 DB2CALL  T *   143 DB231        D31X              0068
16:00:20 DB2CALL  T       30 OLTF         OLTF              00CF
16:00:20 X18H     N      300 0001DSN8ICO  PDRIVER           010D
16:00:20 X18H     N        2              BABUSER           00FC
16:00:20 CICSCN3  N        3              BABUSER           0117
16:00:20 CICSCN3  N        0                                0117
16:00:20 CICSCN3  N        0                                0117
16:00:20 CICSCN3  N        0                                0117
16:00:20 CICSCN3  N        0                                0117
16:00:20 CICSCN3  N        0                                0117
16:00:20 CICSCN3  N        0                                0117
16:00:20 CICSCN3  N        0                                0117
16:00:20 CICSCN3  N        0                                0117
16:00:20 CICSCN3  N        0                                0117
16:00:20 CICSCN3  N        0                                0117
16:00:20 CICSCN3  N        0                                0117
16:00:20 CICSCN3  N        0                                0117
16:00:20 CICSCN3  N        0                                0117
16:00:20 CICSCN3  N        0                                0117
16:00:20 CICSCN3  N        0                                0117
16:00:20 CICSCN3  N        0                                0117
16:00:20 CICSCN3  N        0                                0117
16:00:20 CICSCN3  N        0                                0117
16:00:20 DISPLAY ACTIVE REPORT COMPLETE
16:00:20 DSN9022I - DSNVDT '-DIS THD' NORMAL COMPLETION
```
The MainView for DB2 - Data Collector provides a chronological log of DB2 commands. To view all the DB2 commands that have been issued since DB2 started:

1. From the EZDB2 Easy Menu, select the DB2 Event Traces option to access the System Event Traces Easy Menu (EZDEVENT), as shown in Figure 59.

2. From the EZDEVENT Easy Menu, hyperlink on Commands Executed to access the DB2 Command History view, CMDLIST.

From the CMDLIST view, you can identify who has issued commands and hyperlink to the CMDTEXT view to see the complete text.
Monitoring a DB2 data sharing group

This chapter presents the following topics:

Define the group context .................................................. 79
Check current group activity ........................................... 83
Look at page set considerations (I/O/GBP-DEP) .................. 86
Analyze global lock contention ....................................... 90
Tune group buffer pools ................................................. 95

Monitoring DB2 data sharing increases the complexity of both the environment and the number of tuning *knobs* that needs to be analyzed and optimized.

The first key requirement is to be able to focus on the level of data that is required to understand how the data sharing group is performing, or to solve a particular problem. Since a data sharing group consists of multiple DB2 members, and these members work together and share resources, viewing each DB2 individually is no longer adequate.

These scenarios show you how to look at all the members concurrently so you can easily compare activity and resource usage across the group, as well as access summarized data for the whole group, such as group buffer pool activity, total database I/O to the shared tables, or global lock contention. Of course, you will still drill down to an individual DB2 member for details as needed.
In this practice session, you

1. define a Single System Image (SSI) context for the data sharing groups
2. check on current group activity
3. look at page set considerations
4. analyze global lock contention
5. tune group buffer pools

**NOTE**

This practice session takes approximately one hour to complete.
Start this scenario at the EZDSSI menu, described in Figure 5 on page 23.

First make sure you have a Single System Image (SSI) context defined for the data sharing groups at which you want to look:

1. Select the Set SSI Context hyperlink (first option under Tools And Menus).

   This action presents a view of all the defined SSI contexts for MVDB2, as shown in Figure 60.

   ![Figure 60 - SSI context selection list (CONASEL)]

2. If you do have a context defined for the data sharing group you want to monitor, all you need to do is hyperlink on the context name, which returns you to EZDSSI with the new context in effect.

   If you do not have a context defined, you should define one now. (Even if you have a context defined, you may want to browse a little.) On the COMMAND line, type CONACTZ

   This view lists all SSI contexts (as known by your CAS and any connected CASs). Your CASID is shown on the window information line.

   If you have multiple MainView products installed, here you see one of the most powerful features of SSI—that the same context can be defined for several different MainView products. Obviously, since each product may look at different target types, the selection criteria can vary.
3 Select the default context of ALL for MVDB2 to hyperlink to the CONACT view.

Now you see each of the defined DB2 target subsystems, as shown in Figure 61.

**Figure 61  SSI context activity manager (CONACT)**

<table>
<thead>
<tr>
<th>Context</th>
<th>Target</th>
<th>Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALL</td>
<td>MVDB2</td>
<td>ACTIVE</td>
<td>MAINVIEW for DB2</td>
</tr>
<tr>
<td>ALL</td>
<td>DB0HC</td>
<td>ACTIVE</td>
<td>MAINVIEW for DB2</td>
</tr>
<tr>
<td>ALL</td>
<td>DB1HC</td>
<td>ACTIVE</td>
<td>MAINVIEW for DB2</td>
</tr>
</tbody>
</table>

4 Type `CONDEF` on the COMMAND line to access the context definition dialog.

5 Browse an example of a context definition.

If a data sharing group context already exists, hyperlink on the SSI context name to see how the target filters were defined. If you do not see the group, select any other context. (You will at least see the default context of ALL.)

6 Press PF3 to return to CONDEF.

7 Type `EDIT` on the COMMAND line to obtain an edit lock.
Define the group context

Chapter 3 Monitoring a DB2 data sharing group 81

8 Type **ADD** on the COMMAND line to display the Add SSI Context Definition panel, as shown in **Figure 62**.

**Figure 62  Add SSI Context Definition panel**

In this panel, you define the context name and description and the selection filters for the targets that will be part of this context. Help is available on each of the fields.

You can define several filter conditions, but, in this case, all you will need is to filter by **TGTNAME** (the shorthand for this is `%1`). Since most sites use some kind of naming convention for the members, you probably only need one filter condition; for example:

%1 = DB?P

would include DB2s named DB1P, DB2P, and so forth.

If you prefer, you can define an IN list; for example:

**TGTNAME IN (DB1P,DB2P)**

would include only the DB2s named DB1P and DB2P.
9 Type the following commands to activate this definition:

END (to return to the CONDEF view and complete the ADD)
SAVE (to save the information)
INSTALL to dynamically activate this SSI context in this CAS)

10 If there are multiple CASs involved, you need to complete this definition in each CAS. (CASACT will show you a list of CASs and you can type CON casid to switch to another CAS.)

11 If they all share the same BBPARM (you still see the new definition after you switch to another CAS), you only need to type

CONDEF
EDIT
INSTALL

Otherwise, you must repeat the whole set of steps.
Check current group activity

Often you just want to check the health of each member of your data sharing group, and check on the activity levels. The previous dialogs covered how to check on multiple DB2s subsystems and their active threads. For data sharing, all you need to do is focus on just a data sharing group, instead of the default SSI context of ALL used earlier.

To view activity for a data sharing group:

1. You should have already set the context in the previous step. As a shortcut in the future, you can also simply type

   `CON context` (example: `CON DBGHC`)

2. Now you can select options from the EZDSSI menu to look at just this group.

   Try the SSI Status - List DB2s option again for a list of the DB2s in the data sharing group. This version of the STDB2 view is a good place to see how each DB2 member is performing. You can also drill down into details about a member.

   Another useful option is Current Threads (Elap), which will now show all threads in the data sharing group, sorted by elapsed time.
3 Return to EZDSSI.

You now have the choice of a Data Sharing Menu or the Data Sharing Wizard.

4 Take a quick look at the menu, just so you know what is available.

5 Now choose the Data Sharing Wizard option to access the Data Sharing Wizard (WZDSHAR) menu, as shown in Figure 63.

**Figure 63 Data sharing wizard (WZDSHAR)**

<table>
<thead>
<tr>
<th>Access data sharing options</th>
</tr>
</thead>
<tbody>
<tr>
<td>10MAR2011 15:52:00 ------- MAINVIEW WINDOW INTERFACE (V6.0.00) ---------------</td>
</tr>
<tr>
<td>COMMAND ===&gt; SCROLL ===&gt; CSR</td>
</tr>
<tr>
<td>CURR WIN ===&gt; 1 ALT WIN ===&gt;</td>
</tr>
<tr>
<td>W1 =WZDSHAR=ALL====DB2K====)10MAR2011==15:52:00====MVDB2====D====1</td>
</tr>
<tr>
<td><strong>DATA SHARING WIZARD</strong> Group Name....... DBGK</td>
</tr>
<tr>
<td>#DB2s.............. 2</td>
</tr>
<tr>
<td>. &gt;&gt; Set Context to Group</td>
</tr>
<tr>
<td>Interval Session</td>
</tr>
<tr>
<td>Look at all Members? Changed Page Writes 0 0</td>
</tr>
<tr>
<td>. Review Group (Session) Read Hits......... 0 0</td>
</tr>
<tr>
<td>Narrow Focus from Session/Now?</td>
</tr>
<tr>
<td>. Review History and Set TIME</td>
</tr>
<tr>
<td>Global Locking (Tgt) Lockouts..... 0 0</td>
</tr>
<tr>
<td>. Lock Contention Wizard (Tgt) % Global Cont 0.0 0.0</td>
</tr>
<tr>
<td>. CF Structures (MVMVS)</td>
</tr>
<tr>
<td>GBPs Right Size/Ratio? Read Hit Ratio..... 0.0 0.0</td>
</tr>
<tr>
<td>. Check GBPs XIs-Dir. Reclaims.. 0 0</td>
</tr>
<tr>
<td>. Check GBP-DEP by GBP/PS Write Failures..... 0 0</td>
</tr>
<tr>
<td>. Check GBP-DEP by Member</td>
</tr>
<tr>
<td>. Check I/O per Volume (SSI)</td>
</tr>
<tr>
<td>Page Set Considerations? (Tgt) GBP-Dep..... 0</td>
</tr>
<tr>
<td>. Check GBP-DEP by Volume</td>
</tr>
<tr>
<td>Castout/Checkpoints Effective? Pages Castout...... 0 0</td>
</tr>
<tr>
<td>. Check Thresholds &amp; Activity</td>
</tr>
<tr>
<td>All OK? Congratulations! (PF3 to Exit Wizard)</td>
</tr>
</tbody>
</table>

This wizard collects the most used options for data sharing in one place, including access to group buffer pool activity and status, global lock contention, and page set analysis that summarizes activity from all members. You will return here later.

The rest of this exercise will cover use of the wizards, but you also have direct access to some detailed data views here.
Another tip to find information quickly on specific data sharing topics is to use the Topic Index to look up the DB2 term that you are interested in, such as “Group Buffer Pools” and “GBP-Dependent” in the TOPICG view or “Locks–Global” in the TOPICL view, as shown in Figure 64.

At any point when looking at another view, you can enter a view name TOPICx to directly access topics starting with that letter; for example, type TOPICL for lock information.

Figure 64  Topic index view (TOPICL) for topics beginning with the letter L

7 Press PF3 until you return to EZDSSI.

8 Now, select the Data Sharing Menu option to access the DB2 Data Sharing Easy Menu, EZDSHAR.
Look at page set considerations (I/O/GBP-DEP)

Data sharing means that some or all of the DB2 tables can be accessed concurrently from all members of the group. But the tools provided by DB2 to understand the impact of this are limited. This section shows the power of what SSI can do to make this easier.

To look at page set considerations:

1. One of the key tuning areas in DB2 is I/O analysis. But looking at I/O for shared page sets or volumes from one DB2 member at a time does not give a complete picture.

Select Volume I/Os (SSI) from the Data Sharing Menu, EZDSHAR, to see a view of total I/O per volume from all members (PSVOLSSI), as shown in Figure 65.

**Figure 65  Volume I/O SSI summary—session (PSVOLSSI)**

![Volume I/O for the group](image-url)
2 Select one of the volumes to see how many page sets are being accessed on that volume from each DB2 (PSVOLSZ), as shown in Figure 66.

Figure 66  Volume I/O summary—session (PSVOLSZ)

<table>
<thead>
<tr>
<th>Volume I/O per member</th>
</tr>
</thead>
<tbody>
<tr>
<td>10MAR2011 15:50:40</td>
</tr>
<tr>
<td>COMMAND ===&gt;</td>
</tr>
<tr>
<td>SCROLL ===&gt; CSR</td>
</tr>
<tr>
<td>Curr WIN ===&gt; 1</td>
</tr>
<tr>
<td>Alt WIN ===&gt;</td>
</tr>
<tr>
<td>&gt;W1 =PSVOLSZ=---------(DBGHC=*==)10MAR2011==15:50:39==MVDB2==D==2</td>
</tr>
<tr>
<td>DB2       Nr.     Sync I/O Sync Max Sync Avg Async</td>
</tr>
<tr>
<td>Volume Target PSs I/Os % I/O Wait I/O Wait 0...20...40 I/Os</td>
</tr>
<tr>
<td>BAB312 DB1HC 13     69  4.1  10322  188 **********+ 0</td>
</tr>
<tr>
<td>BAB312 DB2HC 17     1102 66.1 1796  22 ******          5732</td>
</tr>
</tbody>
</table>

3 Select Nr. PsSs for one of the members to see a list of each page set (PSVOLPS) with I/O data for just that member.

4 Press PF3 to return to PSVOLSZ and select the volume instead.

Now you see a list of all page sets on that volume (PSVOLPSZ) and can see how many members access each. The I/O data here shows totals for the group.

5 Select the volume once again.

Now the list shows each page set with the I/O data broken down per member (PSVOLPS), as shown in Figure 67.

Figure 67  Volume page sets (PSVOLPS)

<table>
<thead>
<tr>
<th>I/O per page set and member</th>
</tr>
</thead>
<tbody>
<tr>
<td>10MAR2011 15:53:44</td>
</tr>
<tr>
<td>COMMAND ===&gt;</td>
</tr>
<tr>
<td>SCROLL ===&gt; CSR</td>
</tr>
<tr>
<td>Curr WIN ===&gt; 1</td>
</tr>
<tr>
<td>Alt WIN ===&gt;</td>
</tr>
<tr>
<td>&gt;W1 =PSVOLPS=---------------(DBGHC=*==)10MAR2011==15:53:33==MVDB2==D==30</td>
</tr>
<tr>
<td>------Page Set------ DB2</td>
</tr>
<tr>
<td>Volume Database Object Prt Target I/Os I/O Wait I/O Wait 0...20...40</td>
</tr>
<tr>
<td>BAB312 DSNDB01 DSNLLX02 001 DB1HC 4 29 12 *</td>
</tr>
<tr>
<td>BAB312 DSNDB01 DSNLLX02 001 DB2HC 11 28 24 **</td>
</tr>
<tr>
<td>BAB312 DSNDB01 DSNSTP01 001 DB1HC 5 28 17 **</td>
</tr>
<tr>
<td>BAB312 DSNDB01 DSNSTP01 001 DB2HC 8 29 15 **</td>
</tr>
<tr>
<td>BAB312 DSNDB01 SPT01 001 DB1HC 3 36 27 ***</td>
</tr>
<tr>
<td>BAB312 DSNDB01 SPT01 001 DB2HC 21 40 13 *</td>
</tr>
<tr>
<td>BAB312 DSNDB06 DSNADH01 001 DB1HC 3 43 17 **</td>
</tr>
<tr>
<td>BAB312 DSNDB06 DSNADH01 001 DB2HC 23 221 37 ****</td>
</tr>
<tr>
<td>BAB312 DSNDB06 DSNATX01 001 DB2HC 13 145 30 ***</td>
</tr>
<tr>
<td>BAB312 DSNDB06 DSNATX02 001 DB1HC 12 155 40 ****</td>
</tr>
<tr>
<td>BAB312 DSNDB06 DSNATX02 001 DB2HC 139 98 17 **</td>
</tr>
</tbody>
</table>

6 Press PF3 to return to EZDSHAR; then select the Data Sharing Wizard.
7 There are several paths you could take on this panel, but first look down at the Page Set Considerations section. This section provides another way to get to the Volume I/O data you just looked at, but you are now going to select the option to Check GBP-DEP per Member to see the level of sharing, as shown in Figure 68.

Figure 68  Data sharing wizard GBP-DEP/member (WZDSDEP)

This view shows a summary of how many GBP-dependent page sets there are in the group per DB2 member, and includes the key ZPARM values that affect how long a page set remains in this status.

8 Move the cursor to the column header, Mins to PCLOSE(T), and press PF1 to get field Help on this value, as shown in Figure 69.

Many field Help panels, like this one, contain tuning tips in addition to the field definition.

Figure 69  Field Help

This value lists the amount of time, in minutes, that must elapse before a data set can be a candidate for pseudo-close (QWP1TMR).

ZPARM name: PCLOSET in DSN6SPRM

Tuning Tip: The PCLOSEN and PCLOSET parameters are associated with pseudo-close. PCLOSEN defaults to 5 system checkpoints and PCLOSET defaults to 10 minutes. There is a trade off in setting these parameters. If these values are set too high, data sets may remain GBP-dependent for longer than necessary and incur unnecessary performance overhead. If these values
9 Press PF3 to return to the Data Sharing Wizard (WZDSHAR) and select the option to Check GBP-DEP by GBP/PS.

**Figure 70  Buffer pool page set GBP-DEP summary (PSBPGBPZ)**

This view summarizes the same data, also for the whole group, but now organizes it per group buffer pool and member.

10 Select one pool (Bfrpl ID) to see a list of all the open page sets in that pool for all targets.

11 Press PF3 to return to PSBPGBPZ and then hyperlink on the GBP Dependent column to list only the GBP-dependent page sets in that pool (PSGBP), as shown in Figure 71.

**Figure 71  Page set GBP-DEP status (PSGBP)**

You cannot only see which members are GBP-dependent, but also which members have Read/Write Interest and how many pages from that page set are cached in each member’s local buffer pool.
Analyze global lock contention

One of the most important issues in data sharing is to control global lock contention, since it not only causes the usual problems of application availability that you deal with in one DB2, but can significantly degrade performance in a data sharing group as well.

To analyze global lock contention:

1. Press PF3 to return to the Data Sharing Wizard (WZDSHAR) and select Lock Contention Wizard.

The Global Lock Wizard (WZLKG OPT) is displayed, as shown in Figure 72.

Figure 72   Global lock wizard (WZLKG OPT)

The Global Lock Wizard helps you step through the analysis of lock contention in DB2 for a data sharing group. It allows you to look at current status or choose an earlier time interval, perhaps one that a user of your system has complained about.

A history of the most important symptoms of lock problems—timeouts and deadlocks—is available, as well as information on system considerations and statistics that can point out potential causes of problems.
2 Select Check Member Contention?

This view, shown in Figure 73, enables you to see the key indicators for all of the members together, allowing you to identify quickly any global contention issues that need analyzing. The counts shown are for the time since DB2 started.

**Figure 73  Lock wizard global members (WZLKGMEM)**

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Command</th>
<th>SCROLL</th>
<th>CURR WIN</th>
<th>ALT WIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>10MAR2011</td>
<td>16:21:53</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>DB2</td>
<td>MVS</td>
<td>Total</td>
<td>Local</td>
<td>Global</td>
<td>% of Group</td>
</tr>
<tr>
<td>Target</td>
<td>System</td>
<td>Lockouts</td>
<td>Suspends</td>
<td>Suspends</td>
<td></td>
</tr>
<tr>
<td>DHH1</td>
<td>SJSE</td>
<td>0</td>
<td>134</td>
<td>848</td>
<td>49.0</td>
</tr>
<tr>
<td>DHH2</td>
<td>SJSE</td>
<td>1</td>
<td>154</td>
<td>848</td>
<td>51.0</td>
</tr>
</tbody>
</table>

3 From here, you can hyperlink on any one DB2 to analyze its contribution to (or victimization by) global lock contention, as shown in Figure 74.

**Figure 74  Lock wizard global/local contention (WZLKGCON)**

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Command</th>
<th>SCROLL</th>
<th>CURR WIN</th>
<th>ALT WIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>10MAR2011</td>
<td>16:23:49</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Global / Local Contention</td>
<td>Interval</td>
<td>Session</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lockouts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Timeouts</td>
<td>0</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deadlocks</td>
<td>0</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indicators</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Global Contention</td>
<td>5.6</td>
<td>1.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% False Contention</td>
<td>23.3</td>
<td>39.7</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Global Lock Activity
- Sync XES Lock Req: 641, 83846
- Sync XES Change Req: 0, 54
- Sync XES Unlock Req: 0, 84707
- IRLM Suspensions: 23, 513
- XES Suspensions: 0, 16
- False Suspensions: 7, 348

Local Lock Activity
- Lock Requests: 21959, 121627
- Lock Suspensions: 0, 4
- Latch Suspensions: 10, 57
This view provides the information to analyze both global and local lock contention for a selected member. Besides the most critical statistics, both for the current interval and since DB2 startup, the two key indicators of % global contention and % false contention are calculated for you. Thresholds are defined to highlight any value that exceeds the recommended value. Place the cursor on the % Global Contention header or fields to see an explanation of the calculation and what it means.

4 Press PF3 to return to the Lock Wizard - Group panel (WZLKG0PT) and select List Group Lockouts? to see a list of the latest timeouts and deadlocks that have occurred in all the members of the group.

The Global Contention flag on the right is set to YES when the conflict occurred between threads running on different members, as shown in Figure 75.

Figure 75  Global lockout events (LKEVSSI)

<table>
<thead>
<tr>
<th>Date / Time</th>
<th>Lockout Type</th>
<th>Victim Member</th>
<th>Victim Plan</th>
<th>Victim AuthID</th>
<th>Victim Connect</th>
<th>Victim CorrName</th>
<th>Global Contention</th>
</tr>
</thead>
<tbody>
<tr>
<td>17SEP-16:12:37</td>
<td>DEADLOCK</td>
<td>DB2H RXDB2</td>
<td>BOLLAA2 DB2CALL</td>
<td>DMRDLK1</td>
<td>YES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17SEP-16:10:18</td>
<td>TIMEOUT</td>
<td>DB1H RXDB2</td>
<td>BOLLAA2 DB2CALL</td>
<td>DMRTMO2</td>
<td>YES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17SEP-16:10:15</td>
<td>TIMEOUT</td>
<td>DB2H RXDB2</td>
<td>BOLLAA2 DB2CALL</td>
<td>DMRDLK3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17SEP-16:06:43</td>
<td>TIMEOUT</td>
<td>DB2H RXDB2</td>
<td>BOLLAA2 DB2CALL</td>
<td>DMRDLK1</td>
<td>YES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17SEP-15:45:46</td>
<td>DEADLOCK</td>
<td>DB2H RXDB2</td>
<td>BOLLAA2 DB2CALL</td>
<td>DMRDLK1</td>
<td>YES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17SEP-15:45:26</td>
<td>TIMEOUT</td>
<td>DB2H RXDB2</td>
<td>BOLLAA2 DB2CALL</td>
<td>DMRDLK3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

From here, you can drill down for more information on the resources involved in a specific event, and then to a detail view of each lock holder or waiter.

**TIP**

If you are looking at a distributed thread, scroll right to see the additonal workstation identifiers, as well as some that are specially formatted for SAP.
5 Press PF3 to return to the Lock Wizard - Group panel (WZLKGOPT) and select Which Resources Involved? to analyze resource conflicts in the group, as shown in Figure 76.

Figure 76  Lockout resource summary (LKRESZ)

<table>
<thead>
<tr>
<th>Database Object</th>
<th>Conflicts</th>
<th>% Total</th>
<th>Global</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSN8D51A DSN8S51E</td>
<td>8</td>
<td>72.7</td>
<td></td>
</tr>
<tr>
<td>DSN8D51A DSN8S51P</td>
<td>3</td>
<td>27.3</td>
<td></td>
</tr>
</tbody>
</table>

The first view summarizes all conflicts by table space / index space, so that you can quickly identify the objects with the most contention. The count on the right shows how many conflicts exist between members (global).

6 Hyperlink on a resource name showing several conflicts to see a breakdown of these conflicts by specific resource, down to a page or row level (LKRESNRZ).

With this view, hot spots in your tables are immediately visible, as shown in Figure 77.

Figure 77  Lockout resource number summary (LKRESNRZ)

<table>
<thead>
<tr>
<th>Database Object</th>
<th>Resource</th>
<th>Type</th>
<th>Conflicts</th>
<th>% Total</th>
<th>Global</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSN8D51A DSN8S51E</td>
<td>0000001200 DATAPAGE</td>
<td></td>
<td>8</td>
<td>72.7</td>
<td></td>
</tr>
</tbody>
</table>
Analyze global lock contention

7 Hyperlink on either the resource name or the resource number to view a list of each lockout event that involved this resource (LKRESD), as shown in Figure 78.

**Figure 78  Lockout resource conflict detail (LKRESD)**

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Database Object</th>
<th>Resource</th>
<th>Resource Type</th>
<th>Time Lockout</th>
<th>Blocker</th>
<th>Waiter</th>
<th>Gbl</th>
</tr>
</thead>
<tbody>
<tr>
<td>10MAR2011</td>
<td>16:30:21</td>
<td>DSN8D51A</td>
<td>DSN8S51E</td>
<td>DATAPAGE</td>
<td>16:12:37</td>
<td>DEADLOCK</td>
<td>RXDB2</td>
<td>Yes</td>
</tr>
<tr>
<td>10MAR2011</td>
<td>16:10:18</td>
<td>DSN8D51A</td>
<td>DSN8S51E</td>
<td>DATAPAGE</td>
<td>16:10:18</td>
<td>TIMEOUT</td>
<td>RXDB2</td>
<td>Yes</td>
</tr>
<tr>
<td>10MAR2011</td>
<td>16:10:15</td>
<td>DSN8D51A</td>
<td>DSN8S51E</td>
<td>DATAPAGE</td>
<td>16:10:15</td>
<td>TIMEOUT</td>
<td>RXDB2</td>
<td>Yes</td>
</tr>
<tr>
<td>10MAR2011</td>
<td>16:06:43</td>
<td>DSN8D51A</td>
<td>DSN8S51E</td>
<td>DATAPAGE</td>
<td>16:06:43</td>
<td>TIMEOUT</td>
<td>RXDB2</td>
<td>Yes</td>
</tr>
<tr>
<td>10MAR2011</td>
<td>15:45:46</td>
<td>DSN8D51A</td>
<td>DSN8S51E</td>
<td>DATAPAGE</td>
<td>15:45:46</td>
<td>DEADLOCK</td>
<td>RXDB2</td>
<td>Yes</td>
</tr>
<tr>
<td>10MAR2011</td>
<td>15:45:26</td>
<td>DSN8D51A</td>
<td>DSN8S51E</td>
<td>DATAPAGE</td>
<td>15:45:26</td>
<td>TIMEOUT</td>
<td>RXDB2</td>
<td>Yes</td>
</tr>
</tbody>
</table>

This view helps you quickly determine which plans are involved in the contention and whether the problem was occurring only at a particular time, perhaps because of an application affinity problem.

8 Press PF3 to return to the Lock Wizard - Group panel (WZLKGOPT) and select Global Blockers/Waiters? to see which plans are involved in the lockouts, as shown in Figure 79.

**Figure 79  Lockout global blocker waiter summary (LKBWZSSI)**

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>PlanName</th>
<th>Member</th>
<th>PlanName</th>
<th>Member</th>
<th>% Conflicts</th>
<th>Gbl</th>
</tr>
</thead>
<tbody>
<tr>
<td>10MAR2011</td>
<td>16:31:40</td>
<td>RXDB2</td>
<td>DB1H</td>
<td>RXDB2</td>
<td>DB2H</td>
<td>36.4</td>
<td>4</td>
</tr>
<tr>
<td>10MAR2011</td>
<td>16:31:40</td>
<td>RXDB2</td>
<td>DB2H</td>
<td>RXDB2</td>
<td>DB1H</td>
<td>36.4</td>
<td>4</td>
</tr>
<tr>
<td>10MAR2011</td>
<td>16:31:40</td>
<td>RXDB2</td>
<td>DB2H</td>
<td>RXDB2</td>
<td>DB2H</td>
<td>27.3</td>
<td>0</td>
</tr>
</tbody>
</table>

This view lists a summary of blocker/waiter plans and systems. You can identify conflicting plans across multiple data sharing DB2 members. Again, the list of events for a particular combination is available with a hyperlink, so you can quickly check to see if any application scheduling problems exist.

9 Return to EZDSSI; then select Locking Menu to access the DB2 Locking Easy Menu, EZDLOCK (shown in Figure 30 on page 49), to see current lock contention in SSI mode for the data sharing group.

The steps in “Current locks” that you followed to analyze current lock contention for a single DB2 work the same in SSI mode for a data sharing group (see page 50).
After global locking, the next most important area of data sharing tuning is to determine whether the group buffer pools are the right size and have the correct ratio of directory to data entries to support your workload, based on the amount of inter-DB2 sharing that is occurring.

If any of these resources is lacking, overhead increases in the group buffer pools, the coupling facility, and the local pools. It can also cause unnecessary I/O.

To tune the group buffer pools:

1. Press PF3 to return to the Data Sharing Wizard (WZDSHAR) and select Review Group (Session) to see an overview of key statistics about
   - global contention
   - group buffer pool performance
   - GBP-dependent page sets
   - coupling facility activity (castouts, failures)

This view shows you some of the key indicators per member and allows you to identify quickly whether you have any performance issues to analyze. The counts shown are for the time since DB2 was started.

From here, you can hyperlink on any one DB2 to see all group buffer pool statistics for both the current interval and the session data since DB2 startup. Or you can return to the first panel to follow some of the analysis paths.
2 Press PF3 to return to the Data Sharing Wizard (WZDSHAR) and select Check GBPs to access the GBP analysis section of the Data Sharing Wizard.

This decision panel provides options to analyze GBP size and the ratio of directory to data entries, as shown in Figure 81.

**Figure 81  Data sharing wizard GBP options (WZDSBOPT)**

<table>
<thead>
<tr>
<th>GBP analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>10MAR2011 16:35:20 --------MAINVIEW WINDOW INTERFACE (V6.0.00) ---------------</td>
</tr>
<tr>
<td>COMMAND ===&gt; SCROLL ===&gt; CSR</td>
</tr>
<tr>
<td>CURR WIN ===&gt; 1 ALT WIN ===&gt;</td>
</tr>
<tr>
<td>W1=WZDSBOPT=-----------------DBGHC=-----DB******10MAR2011==16:35:19-----MVDB2=-----D==1</td>
</tr>
<tr>
<td>** DATA SHARING WIZARD - GBPs Group GBP Values DBGK **</td>
</tr>
<tr>
<td>Check Totals per GBP (Select GBP for Detail) Interval Session</td>
</tr>
<tr>
<td>. GBP Size Too Small? Read Hit %...... 0.0 6.2</td>
</tr>
<tr>
<td>(Low Hit% / Cache Full) Miss-Cache Full. 0 0</td>
</tr>
<tr>
<td>Curr. Chngd Pgs. 0</td>
</tr>
<tr>
<td>. Too Few Directory Entries? Dir.Reclaims.... 0 0</td>
</tr>
<tr>
<td>(Reclaims Cause XI/DASD Reads) XIs/Dir.Recl.... 0 0</td>
</tr>
<tr>
<td>. Too Few Data Entries? Castouts....... 6 95</td>
</tr>
<tr>
<td>(Castouts More Frequent) Castout........ 0</td>
</tr>
<tr>
<td>(Castout Too Slow) Write Fail-Stor. 0 0</td>
</tr>
</tbody>
</table>

Three diagnostic paths are here, but, as an example, you are going to follow the path to analyze directory entries. Even if the pools are large enough, a lack of directory entries (used to register each page) can cause problems.

The key indicators on the right help you decide whether you need to do additional analysis by following one or more paths. On this panel, all of these values are for the whole group, summarized for all GBPs.

Possible symptoms of too few directory entries are

- the occurrence of directory reclaims so that new pages can be registered
- the even worse consequence—that cross-invalidations of pages in the members’ local buffer pools are occurring because of these directory reclaims

If one of these indicators is greater than 0, the field is highlighted in red.
Tune group buffer pools

Chapter 3 Monitoring a DB2 data sharing group 97

3 Hyperlink on Too Few Directory Entries? to see a tabular list of all defined group buffer pools, as shown in Figure 82.

Figure 82 Data sharing wizard GBP directory entries (WZDSGBR)

GBP group overview

<table>
<thead>
<tr>
<th>Name</th>
<th>Curr Ratio</th>
<th>Pend Ratio</th>
<th>Dir Entries</th>
<th>Data Entries</th>
<th>Reclaims</th>
<th>XI from Dir.Recl.</th>
<th>Miss</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP0</td>
<td>5</td>
<td>5</td>
<td>942</td>
<td>187</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>6.2</td>
</tr>
<tr>
<td>BP1</td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>BP2</td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>BP4</td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>BP5</td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>BP9</td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>BP11</td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>BP32K</td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>BP32K9</td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Now you can see each group buffer pool with the current definitions, the two key indicators that you saw before for all pools (Directory Reclaims and XI from Dir. Recl. columns), and some additional related statistics.

4 From here you can select a single GBP for further analysis, as shown in Figure 83.

Figure 83 Data sharing wizard GBP directory detail (WZDSGBRD)
This analysis panel provides details to help you determine whether a group buffer pool might have too few directory entries to support its part of the data sharing workload. It addresses the main issue—whether directory reclaims are causing cross-invalidations (XI) and probably increasing I/O.

In this panel, you now see the two key indicators again, but both as interval (current activity) and session (total since DB2 startup) counts.

The answer to the additional question of whether this situation is increasing DASD reads can only be seen by looking at statistics per member instead of at the group level.

5 Hyperlink on Check Members for XI Miss to see data sharing session activity counts per member for this group buffer pool, as shown in Figure 84.

Figure 84 Data sharing wizard GBP size activity (WZDSGBSA)

The XI Read Miss column now shows whether any members had to do additional I/O to read in pages lost through reclaims and cross-invalidation. Non-zero counts are highlighted. From here, you can also hyperlink on a GBP to see interval and session counts for that GBP.

You have seen a few of the most important areas for data sharing monitoring. You have used a Single System Image context to enable you to monitor all members of a group, both individually and summarized, and to pull all the relevant data together. Now you have the tools to master the new and complex data sharing performance issues.
Chapter 4 Tuning an application with trace

This chapter presents the following topics:

Start an application trace .................................................. 100
Specify trace options ....................................................... 101
Activate the trace .............................................................. 108
Review tips on tracing tests ................................................ 108
Look for application problems ............................................ 110
  All trace entries (DB2 accounting records) ......................... 113
  Data for one thread ....................................................... 115
  Another thread ............................................................ 126
  Detail events ............................................................... 127
  Summarized data for all threads ....................................... 130
  Viewing detail trace data for active threads ........................ 131
Print a trace report .......................................................... 132
  All data per traced thread ............................................... 133
  Other examples .......................................................... 136

These scenarios teach you how to navigate easily through the MainView for DB2 trace setup panels and the displays of trace data, and acquaint you with the trace print utility.

In this practice session, you

1. start an application trace and review the available options
2. review tips on running your tests with trace
3. look for application problems by using the various trace displays
4. print a trace report for offline review
Start an application trace

To start an application trace, begin by checking the current traces:

1. From the EZDB2 Easy Menu, select the Current Traces option in the Thread Activity section.

The CT view lists all the current traces, as shown in Figure 85. The Status column indicates whether the trace is active and collecting data from DB2, or already completed but not yet purged. You will return here later to view your own trace.

**Figure 85  Current traces (CT)**

<table>
<thead>
<tr>
<th>CM Trace ID</th>
<th>Typ</th>
<th>User ID</th>
<th>Trace Title</th>
<th>Start Date</th>
<th>Start Status</th>
<th>Log Stat</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIGELAP</td>
<td>Sum</td>
<td>BOLDJWI</td>
<td>LARGE ELAPSED TIMES</td>
<td>23FEB2011</td>
<td>11:00</td>
<td>Active</td>
</tr>
<tr>
<td>THRDHIST</td>
<td>Sum</td>
<td>BOLDJWI</td>
<td>THREAD HISTORY</td>
<td>23FEB2011</td>
<td>11:00</td>
<td>Active</td>
</tr>
</tbody>
</table>

2. Type the ST command to display the Start DB2 Trace Request panel.

You must be authorized to start a trace and to specify certain options. See your system administrator for the trace privileges you have. If you cannot start a trace, just browse these instructions and then go to “Look for application problems” on page 110 to view an already active trace.

---

**NOTE**

To complete the first exercise, you must have authorization to start detail traces. Contact your system administrator if you do not have authorization. If SAF security is in use, the resource name is “prefix.ssid.BBI.target.TRACE.D” or “prefix.ssid.BBI.target.TRACE.ALL”. If USERID security in BBPARM is in use, the parameter to be specified is DB2TRACE=D or ALL.

This practice session takes approximately two hours to complete.
Specify trace options

On the Start DB2 Trace Request panel, shown in Figure 86, you can specify various options for your trace. Many traces can be started by using just this first panel. If you want to review other options, they are available on additional panels that are accessed much like DB2I SPUFI options.

**Figure 86  Start DB2 Trace Request panel**

<table>
<thead>
<tr>
<th>COMMAND</th>
<th>SCROLL =&gt; CSR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trace Attributes:</td>
<td></td>
</tr>
<tr>
<td>PARM</td>
<td>(Trace Identifier)</td>
</tr>
<tr>
<td>TYPE</td>
<td>(S-Summary, D-Detail)</td>
</tr>
<tr>
<td>Storage</td>
<td>(Display Buffer Size)</td>
</tr>
<tr>
<td>LOGTRAC</td>
<td>(Y/N log trace)</td>
</tr>
<tr>
<td>TITLE</td>
<td>DB2 APPLICATION TRACE</td>
</tr>
<tr>
<td>Specify additional trace options: (*-processed)</td>
<td></td>
</tr>
<tr>
<td>Selection Criteria</td>
<td>N (Y/N)</td>
</tr>
<tr>
<td>Exception Filters</td>
<td>N (Y/N)</td>
</tr>
<tr>
<td>Detail Trace Options</td>
<td>N (Y/N)</td>
</tr>
<tr>
<td>Trace Log Data Set Options</td>
<td>N (Y/N)</td>
</tr>
</tbody>
</table>

**1** Define a trace by using mostly defaults.

**A**  PARM => id

You can specify any name as an ID, but try to make it descriptive. For example, use your initials or an acronym for the application being tested, plus a number to identify the test: JNL003, ABCTEST1, ABC2IO.

**B**  START =>

Leave blank to start the trace immediately.

**C**  TYPE => D

A Detail trace collects the DB2 accounting record and additional events (DB2 performance trace IFCIDs) per thread. The default includes the basic start and end events, plan allocation data, exceptions (like timeouts), sorts, and all the SQL statements. This choice can be modified on a later panel.

**D**  STOP => 10
The trace runs for 10 minutes and then stops collecting data. Even if you decide not to log a trace, the data is available for display until the trace is purged.

**E** STORAGE ==> 1000K

Use the site default size for the storage buffer (used for online display).

**F** WRAP ==> Y

Use the default to wrap the data in the STORAGE buffer if it fills up.

**G** LOGTRAC ==> Y

Use the default to request trace logging, which allocates a VSAM log for this trace. You can recall the data for online display or print reports until you decide to delete the data set.

**H** RST ==> HOT

Use the default to restart the trace automatically without loss of data if DB2 goes down while you are tracing.

**I** TITLE ==> *user-specified title*

This field is populated with the default, but you should specify a title that will help you later to identify the contents of this trace.

2 Request the additional trace options to review the other panels.

Additional Selection ==> Y
Exception Filters ==> Y
Detail Trace Options ==> Y
Trace Log Data Set Options ==> Y

3 Press Enter to view the next panel.
Specify your user ID to trace your own tests. Add SYSOPR to trace prefetch reads. You can also specify other selection criteria. For a detail trace, you must specify DB2PLAN or DB2AUTH to limit DB2 tracing, subject to DB2 restrictions (1 plan / 8 authids, or vice versa).

\[
\text{DB2AUTH} \rightarrow \text{userid}, \text{SYSOPR}
\]

**NOTE**

If you qualify by plan, prefetch read I/O events cannot be captured.

5 Press Enter to view the next panel.
Specify trace options

You can specify filters to discard thread accounting records that do not meet the qualification. The value can be a maximum (n) or a minimum (<n). For example, specifying ELAP => 10 only keeps threads with an elapsed time greater than 10 seconds. This filter is very useful when you are looking for poorly performing applications in an existing DB2 workload.

**NOTE**

If you specify several filters, they are ORed. A trace record is retained if any one of the comparisons is valid.

6 Review the Exception Filters panel, shown in Figure 88, but leave it empty.

7 Press Enter to view the next panel.

8 Review the Detail Trace Options panel, shown in Figure 89.

**NOTE**

You should review the recommendations in MainView for DB2 User Guide before executing detail traces of long-running threads.
Specify trace options

Figure 89  DB2 Detail Trace Options panel

<table>
<thead>
<tr>
<th>COMMAND</th>
<th>DB2 Detail Trace Options</th>
<th>SCROLL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specify additional events:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SQL</td>
<td>Y (Y/N)</td>
<td></td>
</tr>
<tr>
<td>SCANS</td>
<td>N (Y/N)</td>
<td></td>
</tr>
<tr>
<td>I/O</td>
<td>N (Y/N)</td>
<td></td>
</tr>
<tr>
<td>LOCKS</td>
<td>N (Y/N)</td>
<td></td>
</tr>
<tr>
<td>DDF</td>
<td>N (Y/N)</td>
<td></td>
</tr>
<tr>
<td>DDFVTAM</td>
<td>N (Y/N)</td>
<td></td>
</tr>
<tr>
<td>Specify event compression:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GROUP SQL</td>
<td>Y (Y/N)</td>
<td></td>
</tr>
<tr>
<td>Specify data collection buffer options:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRSIZE</td>
<td>1600K (Trace buffer size)</td>
<td></td>
</tr>
<tr>
<td>TRBUFF</td>
<td>10 (# of trace buffers)</td>
<td></td>
</tr>
</tbody>
</table>

ENTER to accept the exception filters
HELP to view related help

**TRSIZE** (value shown is the default for your site)

This value is the size of a data collection buffer. Without logging, the data collected for one thread is limited to two buffers. If you are tracing long-running applications, you might need to increase the size. With logging, multiple buffers can be written per thread and combined automatically when recalled online or printed.

**TRBUFF**

You might need to increase this value to trace more concurrent threads or to provide multiple buffers for the logging of long-running applications. The recommended number is three or more times the number of concurrent threads to be traced.

**NOTE**

*MainView for DB2 User Guide* has additional recommendations that can help you trace special situations like capturing part of a long-running thread.

**GROUP SQL  Y**

Y compresses many consecutive identical SQL statements together to save space and make the event trace easier to read; for example, combine many FETCHes.

Specify the additional DB2 events that you want to trace.
Specify trace options

<table>
<thead>
<tr>
<th>Event Type</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SQL</td>
<td>Y</td>
<td>Default is Y for standard application tuning.</td>
</tr>
<tr>
<td>SCANS</td>
<td>Y</td>
<td>Default is N; specify Y this time.</td>
</tr>
<tr>
<td>I/O</td>
<td>Y</td>
<td>Default is N; specify Y this time.</td>
</tr>
<tr>
<td>LOCKS</td>
<td>N</td>
<td>Default is N; leave as is - very expensive.</td>
</tr>
<tr>
<td>DDF</td>
<td>N</td>
<td>Default is N. These events are needed only for distributed work.</td>
</tr>
<tr>
<td>DDFVTAM</td>
<td>N</td>
<td>Default is N. These events are needed only for DDF VTAM analysis.</td>
</tr>
</tbody>
</table>

Each of the other groups of events adds additional overhead. You can specify any combination; for example, SQL and I/O but no SCANS.

10 Press Enter to view the next panel.

11 Review the Trace Log Data Set Options panel, shown in Figure 90, but leave the defaults.

**Figure 90 Trace Log Data Set Options panel**

```
Logging the trace

Specify trace log data set options:
Number of logs 1
First log DSN
Low level qualifier of DSN must be V01
Blank for default: BCVJXF3.DIT2.BLANK.mmmdd.Thhmm.V01
Names without quotes will be prefixed with BCVJXF3
Overwrite logs Y (Y/N) Action when all logs used
Archive PROC (Blank for none or PROCLIB member name)
Log switch time (HH:MM that a log switch is requested)
Disposition NEW (OLD/NEW) If NEW, specify options below
Volumes
Primary CYLS 10 SMS Storage class
Data DSN Suffix D SMS Data class
SMS Management class

ENTER to accept the log dataset options
```

A Number of Logs ==> 1

Multiple logs are usually needed only for continuous system traces for workload history.

B First Log DSN ==>
Specify trace options

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Leave this blank to take the generated default. You must be authorized for
dynamic allocation of a trace log. See your system administrator. If you are not
authorized, there is a batch job (JXT011) to preallocate a log data set. Then type
the name here and change Disposition to OLD.

C  Overwrite Logs ==> Y

Y allows the latest trace data to be kept if it does not all fit in the log. N keeps the
earliest trace data by quiescing the trace when full.

D  Archive PROC ==> 

Leave blank. This option is not needed for simple single-log traces.

E  Log Switch Time ==> 

Leave blank. This option is not needed for simple single-log traces.

F  Disposition ==> NEW

Leave NEW unless you had to preallocate a log.

G  Volumes ==> 

This field should be filled in with the default volumes for your site. If not,
specify a volume the MainView for DB2 product address space (BBI-SS PAS) is
allowed to use.

H  Primary Cyls ==> 

Use the default.

12  If your site requires them and the defaults are not set, specify SMS values.

SMS Storage Class ==> 
SMS Data Class ==> 
SMS Management Class ==> 

13  Press Enter to process the options and return to the first panel.
Activate the trace

All options are now specified for your trace. The trace options are set to *. If you want to drop the related options you specified, change the * to N. To view them again, change the * to Y.

When all options are * or N:

1. Press Enter to submit the trace request.

2. Press PF3 to return to the CT view.

3. Press Enter until the status of your trace changes to Active.

Data can now be collected. Enter some activity to be traced.

- If the status changes to Invalid, there was an error in your request that was not found in the preliminary syntax checking. An example of this kind of error would be a trace log data set allocation error because no space was available on the specified volume. You can see the detailed error messages on the Journal Log (hyperlink on Journal in the upper right corner of the CT view).

- If the status changes to Quiesced, the target DB2 is not up.

Review tips on tracing tests

There are many different scenarios for testing. Here are some hints on tracing a few of the most common tests.

- Testing your new application during development

1. Qualify the trace by your own AUTHID. DB2 trace overhead is only incurred for the tests of your application. Depending on the number of users of the MainView for DB2 trace in your test DB2 system, you may be able to keep your trace request active through several test iterations, consolidating them on one trace log. (Only four detail traces can be active at one time.)

2. BIND your program after the trace is started. The text and EXPLAIN data of all static SQL statements is captured in your trace output for reference when analyzing performance. EXPLAIN=YES is not required.
3. If you do not set an automatic stop time when requesting your trace, don’t forget to stop it when you have completed testing (use the Z line command in the CURRENT TRACES option). If you have logged the trace data, you should also purge the trace when complete. You can still browse and print the data from the log (HISTORY TRACES option). Otherwise, analyze the data from the online buffers and purge the trace when you are done.

- Analyzing the performance of an existing application

1. If you have SQL Explorer, RxD2/FlexTools, or a similar tool, you can qualify the trace by PLAN.

2. Set automatic start and stop times to cover a time span in which you expect sufficient activity.

3. If the application usually runs well with only a few occurrences of poor performance, specify exception filters to save just those that you need to analyze. For example, select only those with high elapsed or CPU times, or with many GETPAGE requests or I/Os.

- Improving the performance of a bad SQL statement

1. You may have identified a poorly performing SQL statement and now want to try out several different variations in the syntax to determine which is best. If you have RxD2/FlexTools or a similar tool, you can modify and execute the statement directly from the source while in ISPF edit. Otherwise, make the statement executable from SPUFI.

2. Start the trace qualified by your AUTHID.

3. Modify and execute each variation as dynamic SQL. You want to force the thread to terminate so an accounting record will be produced. This termination is done automatically with RxD2. With SPUFI, you must exit each time to terminate the thread.

4. The trace automatically captures the SQL text, EXPLAIN data (with cost factor), and the accounting record and SQL performance statistics.

   You now have all variations captured together in one trace for easy comparison.

- Comparing test to production

Save the detail trace log from the last test run. Run a short detail trace in production after cutover to compare performance. You can either print batch reports or browse both trace logs in split screen mode.
Look for application problems

This section describes how to use the trace displays for application tuning. Although all of the trace data at the thread accounting level is available in windows mode, detail trace event data is available only in full-screen mode. From the list of traces in the HTLOGS view, you can display detail trace data in full-screen mode, or you can enter full-screen mode now to review your traces.

Choose the FullScreen Menu option on the EZDBA Easy Menu.

Two options on the full-screen Primary Option Menu display trace data:

- Option 4, TRACES

This option lists all currently active or complete trace requests. You have already viewed this data in windows mode when you started your trace and checked that it started correctly. From this option you can see the trace data as it is being collected. And even after the trace is complete, it stays available here until you purge the trace.

Trace data is posted to the display buffer only when the accounting record is written. If you are tracing a longer running thread (detail), you can view the detail events as they occur with the UTRAC display. (Select the current USERS analyzer display, line select the detail display (DUSER) for your thread, and expand to UTRAC.)

When you trace long-running threads, logging is recommended so that data is not lost because of buffer shortages. The data should also be viewed from the logs instead of the buffers (see next option).

Press PF3 to return to the Primary Option Menu.

- Option 5, HISTORY TRACES

Traces that are logged are also always accessible through this option that lists all known trace log data sets. You can view your trace when it is running, after it is complete, and even after you have purged the original trace request—as long as it is worthwhile to keep the data set. This list makes it easy to compare different tests, even a month or two apart, without keeping stacks of paper.
From the log you can recall the data online or print selected reports. The trace log data sets are displayed in descending order by date and time, as shown in Figure 91, so you can easily find a newly created log. If you are looking for an older log, you can sort the display by any of the columns.

**Figure 91  History Traces application**

<table>
<thead>
<tr>
<th>BMC Software</th>
<th>HISTORY TRACES</th>
<th>PERFORMANCE MGMT</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMMAND ====&gt;</td>
<td>TGT ===&gt; DB2G</td>
<td></td>
</tr>
<tr>
<td>TIME -- 09:36:34</td>
<td>SCROLL ===&gt; CSR</td>
<td></td>
</tr>
<tr>
<td>COMMANDS: SORT, LOCATE, NEW, STOP, START, TYPE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LC CMDs: S (SELECT), W (SHOW), P (PRINT), D (DELETE), E (RESET)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V (VERIFY), N (NEW), A (ARCHIVE), F (FREE)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DIRECTORY: CIR4.LL1X.TRACEDIR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENTRIES USED: 1,209 FREE: 201</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Logged traces**

<table>
<thead>
<tr>
<th>LC DATE------TIME</th>
<th>TRACEID</th>
<th>TITLE</th>
<th>USERID</th>
<th>TGT</th>
<th>STAT</th>
<th>ACTV</th>
</tr>
</thead>
<tbody>
<tr>
<td>02/09/29 22:00</td>
<td>LEOTST01</td>
<td>LEOS DETAIL TRACE</td>
<td>CIR4</td>
<td>DB2G</td>
<td>INV</td>
<td></td>
</tr>
<tr>
<td>02/09/11 21:00</td>
<td>DET1</td>
<td>WORKLOAD DETAIL 1</td>
<td>CIR2</td>
<td>DB2G</td>
<td>USED</td>
<td>READ</td>
</tr>
<tr>
<td>02/09/01 00:00</td>
<td>THRDHIST</td>
<td>THREAD HISTORY</td>
<td>BABUSERS</td>
<td>DB2G</td>
<td>UPDAT</td>
<td>WRIT</td>
</tr>
</tbody>
</table>

**NOTE**

The same summary trace thread accounting data that is shown in the full-screen LTRAC and STRAC displays is also available in windows-mode views, as described in “Analyze recent workload history” on page 139. However, when analyzing applications with a detail trace, it is simpler to stay in full-screen mode.

**Figure 92** summarizes many of the ways you can navigate among the trace displays that are accessed from either Current Traces, Option 4, or History Traces, Option 5. It is included here for your reference.
Figure 92 Trace display service access

- **Primary Option Menu**
  - Option 4: Current Traces
  - Option 5: History Traces

- **S Line Command**
  - LTRAC: List of Traced Transactions (Accounting Records)
  - TSUMx: Trace Summaries by:
    - AUTHID
    - CONNECTION
    - LOCATION
    - PLAN
    - CORRELATION ID
    - TIME

- **Detail Traces ONLY**
  - STRAC: Summary Data for One Transaction
  - STRAC: Accounting Data Sections:
    - ENV
    - ELAPSED
    - SQLCOUNTS
    - BPOOL
    - LOCKS
    - PRL10
    - DDF
    - PKG
    - SPAS
  - STRAC: Detailed Event Summaries:
    - ENV
    - ELAPSED
    - SQLCOUNTS
    - BPOOL

- **Cursor Select**
  - TSTAT: Trace Totals
  - DTRAC: Chronological List of Detail Trace Events (Level=1,2,3)
  - DTRAC: Event Pop-ups
All trace entries (DB2 accounting records)

Whether selected from Option 4 or 5, all the trace displays are the same, except for a few minor differences. So you will continue here with Option 5.

To view all trace entries in a trace log data set:

1 Sort by USERID.

   COMMAND ===> SORT US

2 Locate your user ID (like ISPF LOCATE).

   COMMAND ===> L userid

3 Select the trace log data set that you just created.

   LC (Line Command)
   S (Select)

The first panel of trace data is displayed, as shown in Figure 93.

Figure 93   DB2 Trace Entries display (LTRAC)
LTRAC lists all threads (trace entries) in chronological sequence, with the newest at the bottom. Each entry corresponds to a completed transaction, query, or batch job. There is one entry for each DB2 accounting record. In addition to the thread identifiers (plan, authid, connection), some of the most important performance indicators are shown.

4 Use the scroll keys PF7 and PF8 to scroll back and forth in the list.

ENTRIES IN DATASET on line 4 tells you how many threads were traced. (This line says ENTRIES IN BUFFER from a current trace.) Compare the values for ELAPSED, CPU, #STMTS, and GETPAGE and look for high activity.

NOTE
Use the HISTORY option to see all the data from the current TLDS. You must use this option to see data for a long-running thread that has not yet terminated.

5 Move to any entry and press Enter to see more detailed information.
Data for one thread

The Summary Trace Entry display, STRAC, shows summary data for this thread. There are complete activity statistics from the DB2 accounting record. For a detail trace, there also are summaries of the captured detail events, such as SQL statements.

The most critical information is summarized in the base section, shown in Figure 94. It includes:

- Identifiers
- Completion status
- Commits and rollbacks
- Runtime graphic analysis of elapsed and CPU times
- Most important activity counts
- Key indicators of failures or possible problems

![Figure 94 Summary Trace Entry display (STRAC)—base section](image-url)
View DB2 accounting data

You can scroll down or expand to sections showing complete details on SQL statements by type, lock counts, buffer activity, and parallel I/O and package accounting:

1. Select **ELAPSED** in the ACCOUNTING EXPAND line.

If you run DB2 with Accounting Trace 2 or 3 active, an Elapsed Time Analysis section is displayed, as shown in Figure 95.

Figure 95  STRAC Elapsed Time Analysis (ELAPSED) section

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>#EVENTS</th>
<th>AVG/EVENT</th>
<th>ELAPSED</th>
<th>%TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ELAPSED TIME</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IN DB2</td>
<td>10</td>
<td>s</td>
<td>99.00</td>
<td></td>
</tr>
<tr>
<td>IN APPLICATION</td>
<td>103</td>
<td>ms</td>
<td>0.99</td>
<td>&lt;</td>
</tr>
<tr>
<td><strong>--TOTALS--</strong></td>
<td>10</td>
<td>s</td>
<td>100.00</td>
<td></td>
</tr>
<tr>
<td><strong>Waits in DB2 (local)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOCK/LATCH</td>
<td>4</td>
<td>ms</td>
<td>23 us</td>
<td>0.00</td>
</tr>
<tr>
<td>I/O WAIT</td>
<td>887</td>
<td>ms 5.543</td>
<td>4.917 ms</td>
<td>47.22</td>
</tr>
<tr>
<td>LOG WRITE I/O</td>
<td>0</td>
<td>us 0</td>
<td>0 us</td>
<td>0.00</td>
</tr>
<tr>
<td>OTHER READ I/O</td>
<td>218</td>
<td>ms 24</td>
<td>5.181 ms</td>
<td>49.76</td>
</tr>
<tr>
<td>OTHER WRITE I/O</td>
<td>0</td>
<td>ms 0</td>
<td>0 us</td>
<td>0.00</td>
</tr>
<tr>
<td><strong>Unit Switch Events</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>..COMMIT/ROLLBK</td>
<td>0</td>
<td>us 0</td>
<td>0 us</td>
<td>0.00</td>
</tr>
<tr>
<td>..OPEN/CLOSE</td>
<td>0</td>
<td>us 0</td>
<td>0 us</td>
<td>0.00</td>
</tr>
<tr>
<td>..SYSLGRNG</td>
<td>0</td>
<td>us 0</td>
<td>0 us</td>
<td>0.00</td>
</tr>
<tr>
<td>..DATASPACE MGR</td>
<td>0</td>
<td>us 0</td>
<td>0 us</td>
<td>0.00</td>
</tr>
<tr>
<td>..OTHER</td>
<td>0</td>
<td>us 0</td>
<td>0 us</td>
<td>0.00</td>
</tr>
<tr>
<td>ARCH. LOG(QIS)</td>
<td>0</td>
<td>us 0</td>
<td>0 us</td>
<td>0.00</td>
</tr>
<tr>
<td>ARCH.READ(TAPE)</td>
<td>0</td>
<td>ms 0</td>
<td>0 us</td>
<td>0.00</td>
</tr>
<tr>
<td>DRAIN LOCK</td>
<td>0</td>
<td>us 0</td>
<td>0 us</td>
<td>0.00</td>
</tr>
<tr>
<td>CLAIM RELEASE</td>
<td>0</td>
<td>ms 0</td>
<td>0 us</td>
<td>0.00</td>
</tr>
<tr>
<td>PAGELATCH CONT.</td>
<td>0</td>
<td>ms 0</td>
<td>0 us</td>
<td>0.00</td>
</tr>
<tr>
<td>SPAS SERVER TCB</td>
<td>0</td>
<td>ms 0</td>
<td>0 us</td>
<td>0.00</td>
</tr>
<tr>
<td>Force-at-commit</td>
<td>0</td>
<td>ms 0</td>
<td>0 us</td>
<td>0.00</td>
</tr>
<tr>
<td><strong>---TOTAL WAITS---</strong></td>
<td>1,109</td>
<td>9.106 us</td>
<td>10 s</td>
<td>96.98</td>
</tr>
<tr>
<td>*NOT ACCOUNTED</td>
<td>38 ms</td>
<td>0.36</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The graph tells you at a glance where the most time is being spent—and what you should concentrate on in tuning: more time in the application or in DB2; if in DB2, are the times for I/O, prefetch reads, or lock waits unusually high?
2 Select **BPOOL** in the **ACCOUNTING EXPAND** line.

This section provides a complete summary of activity for each buffer pool accessed plus totals, as shown in **Figure 96**.

**Figure 96  STRAC Buffer Pool (BPOOL) section**

```
<table>
<thead>
<tr>
<th>Activity</th>
<th>TOTAL</th>
<th>BP0</th>
<th>BP1</th>
<th>BP2</th>
</tr>
</thead>
<tbody>
<tr>
<td>GETPAGES</td>
<td>4,112</td>
<td>80</td>
<td>2,032</td>
<td>2,000</td>
</tr>
<tr>
<td>SYNC READS</td>
<td>887</td>
<td>0</td>
<td>887</td>
<td>0</td>
</tr>
<tr>
<td>GETPAGES/READIO</td>
<td>4.6</td>
<td>0.0</td>
<td>2.3</td>
<td>0.0</td>
</tr>
<tr>
<td>COND. GP FAILURES</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>SEQ. PREFETCH QREQS</td>
<td>10</td>
<td>10</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>LIST PREFETCH QREQS</td>
<td>200</td>
<td>0</td>
<td>0</td>
<td>200</td>
</tr>
<tr>
<td>DYNAMIC PREFETCHES</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ASYNC PAGES READ</td>
<td>919</td>
<td>0</td>
<td>0</td>
<td>919</td>
</tr>
<tr>
<td>PAGES/PREFETCH QREQS</td>
<td>4.4</td>
<td>0.0</td>
<td>0.0</td>
<td>4.6</td>
</tr>
<tr>
<td>PAGE UPDATES</td>
<td>40</td>
<td>40</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>IMMEDIATE WRITES</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>HP SYNC READS</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>HP SYNC READ FAILS</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>HP ASYNC PAGES READ</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>HP SYNC WRITES</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>HP WRITE FAILURES</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

- - - GROUP BUFFER POOL (DATA SHARING ONLY) - - -

CF READS (BUFFER CROSS INVALIDATION)
- DATA RETURNED       | 2     | -    | 2    |
- R/W INTEREST       | 1     | -    | 1    |
CF READS (DATA NOT IN BUFFER POOL)
- DATA RETURNED       | 2     | -    | 2    |
- R/W INTEREST       | 1     | -    | 1    |
- NO R/W INTEREST   | 1     | -    | 1    |
CF WRITE (CHANGED)
- WAR REQUESTS      | 0     | -    | 0    |
- WARM REQUESTS     | 0     | -    | 0    |
CF WRITE (CLEAN)
- UNREGISTER QPAGE  | 0     | -    | 0    |
EXPLICIT XI          | 0     | -    | 0    |
SECONDARY BP WRITES | 0     | -    | 0    |
COMPLETION CHECKS   | 0     | -    | 0    |
ILXCACHE PRI GBP    | 0     | -    | 0    |
ILXCACHE SEC GBP    | 0     | -    | 0    |
PAGE P-LOCK REQUESTS
- SPACE MAP PAGE | 0     | -    | 0    |
- DATA PAGE         | 0     | -    | 0    |
- INDEX PAGE        | 0     | -    | 0    |
PAGE P-LOCK UNLOCK  | 0     | -    | 0    |
PAGE P-LOCK SUSPENDS
- SPACE MAP PAGE | 0     | -    | 0    |
- DATA PAGE         | 0     | -    | 0    |
- INDEX PAGE        | 0     | -    | 0    |
```
The GETPAGE/READ I/O ratio can give you a good indication of synchronous READ efficiency, which directly affects thread elapsed time. However, you should also check the prefetch requests, because some I/O may be occurring asynchronously.

3 Select each of the expand options shown in the ACCOUNTING line.

This data is all that you would see with a low-overhead summary trace.

4 The package accounting section is available only if DB2 accounting class 7 is active, and shows a breakdown of elapsed, CPU, and wait times (class 8) per package/DBRM, as shown in Figure 97.

Figure 97  STRAC Package/DBRM Overview (PKG) section

<table>
<thead>
<tr>
<th>PACKAGE/DBRM</th>
<th>NO. SQL</th>
<th>CPU TIME</th>
<th>WAIT TIM</th>
<th>ELAPSED</th>
<th>ELAP.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RXSEL1M</td>
<td>5</td>
<td>23 ms</td>
<td>611 ms</td>
<td>860 ms</td>
<td>9.78</td>
</tr>
<tr>
<td>RXSEL2M</td>
<td>6</td>
<td>21 ms</td>
<td>514 ms</td>
<td>538 ms</td>
<td>6.12</td>
</tr>
<tr>
<td>RXSEL3M</td>
<td>24</td>
<td>38 ms</td>
<td>193 ms</td>
<td>250 ms</td>
<td>2.84</td>
</tr>
<tr>
<td>RXSEL4M</td>
<td>8</td>
<td>22 ms</td>
<td>765 ms</td>
<td>828 ms</td>
<td>9.43</td>
</tr>
<tr>
<td>RXSEL5M</td>
<td>9</td>
<td>24 ms</td>
<td>298 ms</td>
<td>337 ms</td>
<td>3.83</td>
</tr>
<tr>
<td>RXSEL6M</td>
<td>10</td>
<td>25 ms</td>
<td>363 ms</td>
<td>408 ms</td>
<td>4.64</td>
</tr>
<tr>
<td>RXSEL7M</td>
<td>11</td>
<td>26 ms</td>
<td>179 ms</td>
<td>211 ms</td>
<td>2.40</td>
</tr>
<tr>
<td>RXSEL8M</td>
<td>12</td>
<td>28 ms</td>
<td>270 ms</td>
<td>299 ms</td>
<td>3.40</td>
</tr>
<tr>
<td>RXSEL9M</td>
<td>13</td>
<td>27 ms</td>
<td>286 ms</td>
<td>351 ms</td>
<td>3.99</td>
</tr>
<tr>
<td>RXSELAM</td>
<td>14</td>
<td>28 ms</td>
<td>256 ms</td>
<td>286 ms</td>
<td>3.25</td>
</tr>
</tbody>
</table>

Select one package to see further details in a pop-up display.

5 Press PF3 to return to STRAC.

View detail event summaries (detail trace only)

Because you started a detail trace, several more sections with data summarized from detail event records are available. You do not have to collect and analyze each type of data separately, the MainView for DB2 trace does it all for you. You can keep scrolling to see all the data, but there is a quicker way to select just the data that you want.
SQL statement summary

To view summary data for each SQL statement:

1. Move through the SUMMARIES EXPAND line to the SQL option and press Enter.

The SQL Summary is displayed, as shown in Figure 98, with important statistics for each SQL statement, showing totals and averages across all executions. If the plan contains multiple DBRMs, the statements are sorted by package/DBRM (program).

Figure 98 STRAC SQL Summary section

<table>
<thead>
<tr>
<th>Statement Type</th>
<th>Statement</th>
<th>Count</th>
<th>Elapsed Time</th>
<th>% Elapsed</th>
<th>Avg. CPU Time</th>
<th>% CPU</th>
<th>Recs</th>
<th>Index</th>
<th>Work</th>
<th>Refs</th>
<th>Pages Scanned</th>
</tr>
</thead>
<tbody>
<tr>
<td>SELECT</td>
<td>3228</td>
<td>1</td>
<td>25 ms</td>
<td>2.7</td>
<td>1,930 us</td>
<td>0.3</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>SELECT</td>
<td>3347</td>
<td>2</td>
<td>11 ms</td>
<td>2.4</td>
<td>4,047 us</td>
<td>1.5</td>
<td>0</td>
<td>11</td>
<td>4</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>OPEN</td>
<td>3565</td>
<td>6</td>
<td>172 us</td>
<td>0.1</td>
<td>170 us</td>
<td>0.2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>FETCH</td>
<td>3578</td>
<td>11</td>
<td>1,986 us</td>
<td>2.3</td>
<td>782 us</td>
<td>1.6</td>
<td>0</td>
<td>19</td>
<td>3</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>CLOSE</td>
<td>3664</td>
<td>6</td>
<td>192 us</td>
<td>0.1</td>
<td>149 us</td>
<td>0.2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>SELECT</td>
<td>3671</td>
<td>6</td>
<td>1,776 us</td>
<td>1.1</td>
<td>1,091 us</td>
<td>0.1</td>
<td>12</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>SELECT</td>
<td>3283</td>
<td>1</td>
<td>2,643 us</td>
<td>0.3</td>
<td>1,888 us</td>
<td>0.3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>OPEN</td>
<td>3299</td>
<td>1</td>
<td>109 us</td>
<td>0.0</td>
<td>107 us</td>
<td>0.0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>FETCH</td>
<td>3313</td>
<td>2</td>
<td>907 us</td>
<td>0.2</td>
<td>855 us</td>
<td>0.6</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>CLOSE</td>
<td>3334</td>
<td>1</td>
<td>142 us</td>
<td>0.0</td>
<td>141 us</td>
<td>0.0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>OPEN</td>
<td>3456</td>
<td>1</td>
<td>693 ms</td>
<td>74.1</td>
<td>414 ms</td>
<td>74.9</td>
<td>8</td>
<td>71</td>
<td>13</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>FETCH</td>
<td>3468</td>
<td>5</td>
<td>440 us</td>
<td>0.2</td>
<td>322 us</td>
<td>0.3</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>SELECT</td>
<td>4803</td>
<td>1</td>
<td>1,269 us</td>
<td>0.1</td>
<td>1,121 us</td>
<td>0.2</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>PGM: P025D100</td>
<td>44</td>
<td></td>
<td>83.9</td>
<td></td>
<td>81.0</td>
<td>8</td>
<td>71</td>
<td>1195</td>
<td>8</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>SELECT</td>
<td>1239</td>
<td>1</td>
<td>1,040 us</td>
<td>0.1</td>
<td>1,040 us</td>
<td>0.2</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>OPEN</td>
<td>1263</td>
<td>1</td>
<td>66 ms</td>
<td>7.1</td>
<td>47 ms</td>
<td>8.6</td>
<td>172</td>
<td>13</td>
<td>6</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>FETCH</td>
<td>1273</td>
<td>87</td>
<td>201 us</td>
<td>1.9</td>
<td>177 us</td>
<td>2.8</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>CLOSE</td>
<td>1234</td>
<td>1</td>
<td>250 us</td>
<td>0.0</td>
<td>250 us</td>
<td>0.0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>OPEN</td>
<td>1333</td>
<td>1</td>
<td>15 ms</td>
<td>1.6</td>
<td>14 ms</td>
<td>2.6</td>
<td>7</td>
<td>6</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>FETCH</td>
<td>1343</td>
<td>5</td>
<td>254 us</td>
<td>0.1</td>
<td>254 us</td>
<td>0.2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>SELECT</td>
<td>1375</td>
<td>3</td>
<td>1,746 us</td>
<td>0.6</td>
<td>1,165 us</td>
<td>0.6</td>
<td>0</td>
<td>12</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>CLOSE</td>
<td>1393</td>
<td>1</td>
<td>126 us</td>
<td>0.0</td>
<td>126 us</td>
<td>0.0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>PGM: P025D200</td>
<td>100</td>
<td></td>
<td>11.4</td>
<td></td>
<td>15.0</td>
<td>179</td>
<td>21</td>
<td>23</td>
<td>18</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>SELECT</td>
<td>389</td>
<td>1</td>
<td>38 ms</td>
<td>4.2</td>
<td>18 ms</td>
<td>3.4</td>
<td>0</td>
<td>10</td>
<td>3</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>OPEN</td>
<td>482</td>
<td>1</td>
<td>135 us</td>
<td>0.0</td>
<td>134 us</td>
<td>0.0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>FETCH</td>
<td>489</td>
<td>10</td>
<td>459 us</td>
<td>0.5</td>
<td>302 us</td>
<td>0.5</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>PGM: P025D300</td>
<td>12</td>
<td></td>
<td>4.7</td>
<td></td>
<td>3.9</td>
<td>0</td>
<td>11</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

**TOTALS**      | 156      |      | 187          |           | 103           | 1221  | 26   | 0     |
2 Scan the **PERCENT ELAPSED** (% ELAP) column.

The percent tells you how much this statement is contributing to the total thread elapsed time. If an average is high, but the statement is only executed a few times, it might not be worth tuning it.

3 Scan the **SORT RECS** column to see which statements invoked a sort.

Although EXPLAIN tells you a sort will be used, it cannot tell you whether many rows will be selected and sorted, or just a few. This column does. (Of course, as always, you must adjust the value by any differences between your test and production tables.)

4 Scan the **PAGES SCANNED - INDX** column.

This column tells you whether an index was accessed and how many pages were scanned. If this value does not meet your expectations, there is more information on index accesses a little further along.

5 Check for referential integrity processing. See the **PAGES SCANNED - REF** column.

6 Sort the display by **PAGES SCANNED - DATA**.

   `PARM ==> traceid, SEQ=nn, SQL, SORT=PD`

7 Now sort the display by **PAGES SCANNED - DATA** within Program.

   `PARM ==> traceid, SEQ=nn, SQL, SORT=PDP`

The first characters of the column header are used to request a sort. Adding P as the third character keeps all the statements for each DBRM together. All options are defined in the HELP panels (PF1). (The sort is supported only when you expand to the section, not when you scroll to it.)
Place the cursor on one of the SQL statement lines and press **Enter**.

This pop-up display, shown in **Figure 99**, shows the complete statistics for that statement, displayed as averages per execution. Where the single line shows total counts of pages scanned, the pop-up display shows averages not only for pages but also rows accessed.

**Figure 99**  STRAC SQL statement pop-up display

<table>
<thead>
<tr>
<th>BMC Software</th>
<th>DETAIL TRACE ENTRY</th>
<th>RX AVAILABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SERV ==&gt; STRAC</td>
<td>INPUT 10:22:51</td>
<td>LOG=&gt; N</td>
</tr>
<tr>
<td>PARM ==&gt; TEST3,SEQ=000017,SQ</td>
<td>ROW 1</td>
<td>18 SCROLL =&gt; CSR</td>
</tr>
<tr>
<td>EXPAND: SQLTEXT(EXPLAIN)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STATEMENT</th>
<th>NUMBER OF EXECUTIONS: 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLAN: DSNESPRR</td>
<td>ELAPSED: AVERAGE 2,794 us TOTAL 5,588 us</td>
</tr>
<tr>
<td>PROGRAM: DSNTIAUL</td>
<td>CPU: AVERAGE 1,271 us TOTAL 2,543 us</td>
</tr>
<tr>
<td>LOCATION: DB1D</td>
<td></td>
</tr>
<tr>
<td>PACKAGE: SAJUYH2I</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>INDEX</th>
<th>SEQ-DATA</th>
<th>SEQ-WORK</th>
</tr>
</thead>
<tbody>
<tr>
<td>--------</td>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td>ROWS PROCESSED ALL TYPES</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>ROWS PROCESSED CORRECT TYPE</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>ROWS QUALIFIED BY DM (STAGE 1)</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>ROWS QUALIFIED BY RDS (STAGE 2)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ROWS INSERTED</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ROWS UPDATED</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ROWS DELETED</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>PAGES SCANNED</td>
<td>8</td>
<td>2</td>
</tr>
</tbody>
</table>

These are the statistics that allow you to evaluate the SQL predicates. For example, ROWS QUALIFIED BY RDS are caused by Stage 2 predicates and are more expensive than rows qualified in the first stage by the Data Manager (ROWS QUALIFIED BY DM). Of course, there may be variations per execution depending on host variable values. You will see how to find the statistics per single statement execution later.

If RxD2 is installed and this SQL statement is static, the **SQLTEXT(EXPLAIN)** expand option is highlighted. You can select this option to view the SQL text from the catalog and access available EXPLAIN data from a PLAN_TABLE or do a dynamic EXPLAIN.

If the MainView for DB2 - Data Collector component is available, you can access more thorough EXPLAIN information by using the EXPLAIN button on the DUSER display, or by hyperlinking on the MVDB2/DC Admin/Archive option on the EZDB2 Menu and then selecting option **E (EXPLAIN Interface)**. You can view static SQL EXPLAIN data from the plan or package SQL data, or from PLAN_TABLE data that has been previously populated.
Press **PF3** to return to STRAC.

**Table space / index space scans**

To view table space and index space scans:

Move through the EXPAND line to the **SCANS** option and press **Enter**.

Here you can see a summary of all scans by table space and index space, as shown in **Figure 100**.

**Figure 100  STRAC Database Summary section**

<table>
<thead>
<tr>
<th>DATABASE</th>
<th>PAGESSET</th>
<th>OBID</th>
<th>INDEX</th>
<th>DATA</th>
<th>WORK</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD028</td>
<td>S021FT10</td>
<td>8</td>
<td>16</td>
<td>9</td>
<td>185</td>
</tr>
<tr>
<td>DD028</td>
<td>S021FT20</td>
<td>13</td>
<td>94</td>
<td>2</td>
<td>16</td>
</tr>
<tr>
<td>DD028</td>
<td>S021FT30</td>
<td>18</td>
<td>0</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>DD028</td>
<td>S021FT40</td>
<td>23</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>DD028</td>
<td>S021PR10</td>
<td>28</td>
<td>6</td>
<td>6</td>
<td>1181</td>
</tr>
<tr>
<td>DD028</td>
<td>S021PR30</td>
<td>33</td>
<td>33</td>
<td>11</td>
<td>298</td>
</tr>
<tr>
<td>DD028</td>
<td>S021UI10</td>
<td>40</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>DSNDB07</td>
<td>DSN4K01</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>DSNDB07</td>
<td>DSN4K02</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>DSNDB07</td>
<td>DSN4K03</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**** TOTALS ***** 153 103 1486 35 1221 45105 6 12 0

This data is available only if you requested **SCANS** on the trace request. It allows you to review the number of rows and pages accessed per page set, and also see which indexes were used.
Lock and I/O events

To analyze lock and I/O problems:

Move through the EXPAND line to the IO/LOCK option and press Enter.

This display, shown in Figure 101, is a summary of all lock and I/O activity by this application, shown by table space and index space. The lock data is available with any detail trace. The I/O data is available only if you requested I/O events on the trace request, which can be expensive, depending on the application characteristics.

**Figure 101 STRAC Database Lock and I/O Summary section**

<table>
<thead>
<tr>
<th>DATABASE</th>
<th>PAGESET</th>
<th>MAX. SUSP. TM/OUT</th>
<th>READ WRITE</th>
<th>ELAPSED AVG. ELAP</th>
<th>READ PAGES</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1CODB</td>
<td>BB040A12</td>
<td>0 0 0 1 0</td>
<td>21 ms 21 ms</td>
<td>0 0</td>
<td></td>
</tr>
<tr>
<td>B2CODB</td>
<td>BB051012</td>
<td>2 0 0 1 0</td>
<td>18 ms 18 ms</td>
<td>0 0</td>
<td></td>
</tr>
<tr>
<td>B3CODB</td>
<td>BB09TS02</td>
<td>3 0 0 0 0</td>
<td>0 us 0 us</td>
<td>0 0</td>
<td></td>
</tr>
</tbody>
</table>

**** TOTALS ***** 5 0 0 2 0 39 ms 19 ms 0 0

For traces by AUTHID, where SYSOPR is included, you will also see counts for prefetch read requests and the number of pages read for this thread. The other counts are all for synchronous I/O within the application. In other words, the ELAPSED time shown here is part of the total thread elapsed time. Reducing the total number of synchronous I/Os has a direct effect on performance.
Avoiding expensive lock event traces

A lock trace is usually only requested to analyze a specific locking problem, since it causes a great deal of DB2 overhead and also generates many trace records for MainView for DB2 to store online or in a log. Therefore, before you decide to trace LOCK events, you should analyze the following detail trace events available in DTRAC:

<table>
<thead>
<tr>
<th>Lock event</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOCK-SUMMARY (LEVEL=2)</td>
<td>This event appears near the end of the thread processing. It shows the maximum number of page locks held and the highest lock state for each page set (table/index space) accessed.</td>
</tr>
<tr>
<td>DEADLOCK / TIMEOUT (LEVEL=1)</td>
<td>One of these events is shown for any thread that terminated due to a timeout or deadlock. It shows the page set involved in a timeout, or the number of resources involved in a deadlock. The complete details about the holder, waiters, and resource are in shown the event pop-up display.</td>
</tr>
<tr>
<td>LOCK-SUSP (LEVEL=2)</td>
<td>This event is shown for all lock suspensions. It shows the elapsed time suspended, the page set, the type of entity locked (for example, a data page, index tree, and so on), page number if applicable, and lock state.</td>
</tr>
</tbody>
</table>
Sort information

To evaluate the impact of sorting:

1. Move through the EXPAND line to the SORTS option and press Enter.

   A Sort Summary of all the sort activity for this plan execution is displayed, as shown in Figure 102.

Figure 102 STRAC Sort Summary section

When scrolling through STRAC, this section is at the end of the display. The SORT ELAPSED time allows you to evaluate the impact of sorting on the total thread elapsed time. Since there may be multiple sorts, the values are shown as averages, maximums, minimums, and totals.

Now you have seen all the summarized data for one thread by browsing through an STRAC (Summary Trace Entry) display. Even with a low-overhead summary trace, the complete accounting data, elapsed time analysis, buffer pool usage analysis, and DDF information is available. The other summarized data depends on the type of events you decide to trace: SQL, SCANS, IO, LOCKS.

2. Press PF3 several times until you return to the initial STRAC display.
Another thread

If you have traced several thread executions, you may now want to view another thread. Look at the **PARM** field. The **SEQ=nnnnnn** field shows you the sequence number of this trace entry (accounting record plus summarized details) and allows you to navigate between entries.

To view another thread:

1. Press **PF10** to scroll to the next chronological entry.
2. Press **PF11** to scroll back to the previous entry.
3. Select the **SQLCOUNTS** expand option to view the summary of all SQL statements; then press **PF10** several times.

The display shows the SQL counts for the following threads. This is an easy way to compare particular statistics (such as SQL, elapsed times, or GETPAGEs) for several threads.
Detail events

There is another level of trace data available for a detail trace. It shows all the traced events for a thread in chronological sequence. To see the detail event statistics:

1. Move through the EXPAND line to the DETAIL option and press Enter.

The DTRAC (Detail Trace Entry) display allows you to follow the sequence of events during thread processing, as shown in Figure 103.

Figure 103  Detail trace display for a thread (level 2)—DB2 requests

The number and type of events shown depend on how much you decided to trace (more events, more overhead). The simplest detail trace captures just the major events and exceptions in the life of the thread. This trace also has SQL, SCANS, and IO.

Subordinate events are indented in the display. Whenever possible, nesting at different levels is provided, although this nesting is somewhat dependent on the sequence in which the IFCIDs are received.

2. Look at the first event, CREATE-THD.

Events like this example, with start and end trace records, are matched and displayed on one line with relative start time, elapsed, and CPU times. Events that occur within another event (like I/O for a scan) are indented.
3 Look at the **PARM** field.

The SEQ number is the same as that shown on the Summary display (STRAC). But now there is a new parameter of **LEVEL=2**. This parameter allows you to widen or narrow your view of all the traced events. Level 2 shows you the major events (for example, the first event you see is probably PLAN-ALLOCation) and SQL.

4 Change the level to 1 to see just the SQL statements.

```plaintext
PARM ==> traceid, SEQ=nnnnnn, LEVEL=1
```

Browse through the SQL statements to find one you want to know more about.

5 Move to that statement and press **PF7** to scroll it to the top (**SCROLL => CSR**).

6 Change the level to 3 to see SCANS and I/O.

```plaintext
PARM ==> traceid, SEQ=nnnnnn, LEVEL=3
```

The events always remain in chronological sequence, and the event at the top of the screen remains there. Now you can see all of the events that occurred in processing the SQL statement—index scans, data scans, table space opens, sorts, dynamic SQL text and EXPLAIN data, I/O, and so on.
7 Move the cursor to an SQL statement and press Enter.

The statistics for the single SQL statement, shown in Figure 104, are available in a pop-up display whenever you need them, but are out of the way when browsing the events.

**Figure 104  DTRAC SQL statement pop-up display**

Any event that has an asterisk at the beginning of the DETAIL column has a pop-up display. The detail column shows the most important data, but many trace records have much more information available. This data varies by event type. For example, for an SQL statement, you see the return code, cursor, indicators about data access (Data/Index/Work = D/X/W), and pages scanned.

You have already seen the SQL pop-up display; the same row/page statistics are available per scan. Some other important pop-up displays are

- **BIND-TEXT** for DB2 7.1 and earlier, text of dynamic SQL (also static SQL if BIND traced)
- **EXPLAIN** EXPLAIN data for dynamic SQL (also from BIND)
- **LOCK-SUMMARY** summary of locks held per page set
- **TIMEOUT/DEADLOCK** lock contention events that cause a SQL statement or thread to fail
Summarized data for all threads

Now look at data that has been summarized for all the threads that have been traced:

1. In LTRAC, move to the **TOTALS** expand option and press **Enter** to access the TSTAT display, as shown in Figure 105.

**Figure 105  Summary statistics for all trace buffer entries (TSTAT)—base section**

<table>
<thead>
<tr>
<th>Trace totals</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SERV ==&gt; TSTAT</strong></td>
</tr>
<tr>
<td><strong>PARM ==&gt; BIGELAP</strong></td>
</tr>
<tr>
<td>EXPAND: <strong>MON(WKLD)</strong> HISTORY</td>
</tr>
<tr>
<td><strong>ACCOUNTING: ELAPSED, SQLCOUNTS, BPOOL, LOCKS, PRLL, RTN, DDF</strong></td>
</tr>
</tbody>
</table>

---

**- - - - - - - - - - SUMMARY STATISTICS - ALL TRACE ENTRIES- - - - - - - - - - -**

**-----TERMINATIONS ---------- TOTAL AVERAGE MAXIMUM MINIMUM -----**

**FIRST END...16OCT 09.34.27.28**

<table>
<thead>
<tr>
<th>NUMBER THREADS</th>
<th>ELAPSED</th>
<th>COMMIT/ROLLBK</th>
<th>NORMAL TERM</th>
<th>-- NEW USER</th>
<th>-- DEALLOC</th>
<th>-- APPL END</th>
<th>-- RESIGNON</th>
<th>-- DBAT INACT</th>
<th>-- DDF/RRSAF ROLLUP</th>
<th>-- ABNORMAL TERM</th>
<th>IN DOUBT TERM</th>
</tr>
</thead>
<tbody>
<tr>
<td>211</td>
<td>12:08:02</td>
<td>00:50:24</td>
<td>55 s</td>
<td>0 s</td>
<td>14 s</td>
<td>00:47:29</td>
<td>00:47:29</td>
<td>00:47:29</td>
<td>00:47:29</td>
<td>00:47:29</td>
<td>00:47:29</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**LAST END...16OCT 13.57.44.24**

<table>
<thead>
<tr>
<th>ELAPSED</th>
<th>CPU</th>
<th>CPU-DB2</th>
<th>WAITS</th>
<th>APPL END</th>
<th>SQL</th>
<th>GETPAGES</th>
<th>SYNC RDS</th>
<th>DDF/RRSAF ROLLUP</th>
<th>UPD/COMT</th>
<th>1/0 RSP</th>
<th>DDF/RRSAF ROLLUP, LIMIT</th>
<th>RID LIST PROCESSING USED</th>
</tr>
</thead>
<tbody>
<tr>
<td>00:03:27</td>
<td>55 s</td>
<td>00:50:24</td>
<td>00:47:29</td>
<td>55 s</td>
<td>13,050</td>
<td>852,770</td>
<td>184,661</td>
<td>188,995</td>
<td>0</td>
<td>7,110 us</td>
<td>0</td>
<td>2,070</td>
</tr>
</tbody>
</table>

**- - - - - - KEY INDICATORS - - - - - - - - - - - - - - - - - - - - - - - - - -**

**SQL: SELECT= 0, FETCH= 4,143**
**SQL: DYNAMIC(PREPARE)= 2,279**
**I/O RSP: SYNC= 7,110 us, ASYNC= 37 ms**
**DDF/RRSAF ROLLUP, LIMIT= 5, STG= 0, TIME= 0**
**RID LIST PROCESSING USED = 2,070**

The TSTAT (Trace Statistics) display provides a summary of all traced threads. Much of the data is similar to that shown for one thread in the STRAC display, so just browse through it by using the **PF8** key or select the desired accounting data sections from the EXPAND line.
TSTAT can be useful in application tuning when you trace just one plan. It gives you an overview of the performance of the plan to see if you even need to go into further detail analysis of single thread executions. If the average values meet expectations and the maximum and minimum don’t vary greatly, you may be able to stop here. Also, TSTAT summarizes the key indicator values to show whether any exceptional conditions, such as RID pool failures, have occurred. After all, the art of performance analysis and tuning is to spend your time where you get the biggest payback.

2. Press PF3 to return to LTRAC.

**Viewing detail trace data for active threads**

When you are running a detail trace, the events that you have just looked at in the DTRAC displays are available from the Detail User Status (DUSER) display for an active thread that is being traced.

1. Access the DUSER display by following the steps in “Current thread activity” on page 28.

2. Use the Tab key to move to the UTRAC option on the EXPAND line and press Enter to view this data from the buffers.

As the threads complete processing, the data becomes available from the Current Traces and History Traces options as described previously in this chapter.
Print a trace report

You have now run a trace and viewed it online. However, depending on the results, you may want to have a hardcopy for further analysis. Batch reports can also be valuable tools during an application review meeting.

**NOTE**

This section describes printing a trace, but you may also want to look at the accounting reports produced from SMF data, either from DB2 tables or directly from the extracted DB2 accounting records. See the *MainView for DB2 Performance Reporter User Guide* for more information.

To begin this exercise:

Press **PF3** several times until you return to the History Traces panel (Option 5).

This panel not only provides access to view the trace data online but also offers several line commands to simplify management of the trace log data sets:

- **W**: Show the options used for this trace.
- **P**: Generate the JCL to print a batch report.
- **D**: Delete this data set from the trace directory.
- **E**: Reset the log data set for reuse.
- **V**: Verify that the directory entry matches the data set contents.
- **N**: Add a new data set to the directory (moved from another system).
- **A**: Archive the data set (only if an archive started task was specified).
- **F**: Free a data set that is currently being read

Usually you will need only W(SHOW), D(DELETE), and P(PRINT). You are going to concentrate now on P. You can try the others when you need those functions.
All data per traced thread

To print a trace report showing all data per traced thread:

1 Select your trace log data set for print.

   LC (Line Command)
   P (PRINT)

The Batch Trace Print panel is displayed, as shown in Figure 106, where you can specify options to print a batch report.

Figure 106  Batch Trace Print panel

   BMC Software  ------------  BATCH TRACE PRINT  ------------  PERFORMANCE MGMT
   COMMAND ===>   TIME   --  15:00

   Update job ==> N (Y/N - update job statement)       (END to edit JCL)
   Title line 1 ==> 
   Title line 2 ==> 

   Data Selection:
   From date ==> 16SEP2003  Time ==> 1125
   To date ==> 17SEP2003  Time ==> 1412
   PLAN ==> 
   AUTHID ==> 
   CONNECT ==> 
   CORR ==> 
   LOC ==> 
   DB2PKG ==> 

   REPORT SELECTION:
   LTRAC ==> NO (YES/NO)
   STRAC ==> NO (NO,ALL,SUMMARY,section1,section2..)
   DTRAC ==> NO (YES/NO)
   POPUP ==> NO (NO/ALL/SQL/event1.event2.....)
   TSUM ==> (A/C/L/P/T)  SORT ==> (for any TSUMx)
   TSTAT ==> NO (SUMMARY/ALL/NO)  INTERVAL ==> 1H (for TSMT only)

2 If you are using this option for the first time, you must update your job statements.

   Update Job ==> Y

3 Press Enter to display a job statement data entry panel.

   Fill in the required information and return by using PF3.

4 Set the option to N.
5 Fill in the options for a report.

\[
\begin{align*}
\text{TITLE1} & \Rightarrow \text{any title} & \text{Optional. Centered in first report header.} \\
\text{TITLE2} & \Rightarrow \text{any title} & \text{Optional. Centered in second report header.}
\end{align*}
\]

Data Selection is optional. The selection fields can be used to reduce the amount printed from a long trace. The date and time fields are primed with the start and end date-time of the trace.

\[
\text{REPORT SELECTION:}
\begin{align*}
\text{LTRAC} & \Rightarrow \text{N} \\
\text{STRAC} & \Rightarrow \text{ALL} & \text{Print data per thread traced.} \\
\text{DTRAC} & \Rightarrow \text{N} \\
\text{POPUP} & \Rightarrow \text{N} \\
\text{TSUM} & \Rightarrow \text{ } \\
\text{TSTAT} & \Rightarrow \text{N}
\end{align*}
\]

There are many different reports that can be generated, either singly or in combination. Browse “Printing a Trace” in *MainView for DB2 User Guide* for a full explanation of the options and to see sample reports. There is also a sample JCL member DZTBPRNT you can use when you want to generate multiple reports or print reports from SMF data. The control statements for several sample reports are provided in BBSAMP member DZJPnnnn, with comments to point out some of the most useful variations.

The reports are based on printouts of the online displays, so the options are selected using the names of these displays, like LTRAC, STRAC, DTRAC. In this tutorial you have chosen STRAC=ALL as the most useful report for application tuning. It shows the following for each thread traced:

- Basic DB2 accounting record data
- Environmental Indicators section
- Elapsed Time Analysis section
- SQL Statement Execution Counts section
- Buffer Pool Usage Analysis section, including Global Buffer Pools
- Lock Activity section, including Global Locks
- I/O Parallelism section
- Routines section (stored procedures and user-defined functions)
- DDF Summary section (if distributed work was done)
- Package/DBRM Overview section (if accounting trace 7 is active)
These sections are included for detail traces:

- SQL Summary section with summary statistics per SQL statement
- Database Summary section with scans per page set
- Database Lock and I/O section with locks and/or I/O data per page set
- Sort Summary section (if any sorts were performed)

6 Press **Enter** to validate your specifications.

These options are saved in your profile and used to initialize the fields the next time this panel is requested.

7 Press **PF3** to review the generated JCL in edit mode.

The options that you specified are inserted into a pattern job DZJPTRAC in BBPROF. You may want to copy this JCL into your own UBBPROF profile data set and modify it.

8 Check the rest of the options.

There are many more print options than can be shown on the panel. The sample job contains a short description of these options. Scroll to the bottom to review them.

9 Submit the job.

   COMMAND ===> SUB

   Of course, if you prefer, you can **SAVE** the JCL for later execution, or even **CANCEL** it completely.

10 Press **PF3** to return to the Batch Trace Print panel. You can issue another request now if you want.
Other examples

When the job is completed, review the output. You might want to try other report combinations too. Here are a few examples:

- For an SQL statement summary per thread, sorted by Average CPU usage, followed by average SQL row processing statistics per statement:

  LTRAC ==> Y
  STRAC ==> SQL,SORTSQL=AC,SQLPOPUP

- For a detail event trace per thread, with pop-up displays per SQL statement:

  LTRAC ==> Y
  DTRAC ==> Y
  POPUP ==> SQL

- For SQL statement text and EXPLAIN data for all dynamic SQL executed or BINDs of static SQL:

  POPUP ==> (SQL-TEXT,EXPLAIN)

The following formatting options are available:

- NEWPAGE controls page breaks
- WIDTH specifies wide (133) or narrow (81) output
- LINECNT adjusts the number of lines printed per page
- HEADING suppresses headings
- MAXPAGES limits the amount of output to prevent an unexpectedly high prints volume
Chapter 5  Analyzing the DB2 workload

This chapter presents the following topics:

Understand thread history collection and data sources ........................................... 138
  Capturing the complete DB2 workload to analyze total DB2 activity .................. 138
  Capturing selected threads or applications to analyze specific issues .............. 139
Analyze recent workload history .............................................................................. 139
  Access thread history data .................................................................................... 140
  Thread history analysis .......................................................................................... 146
  Package analysis from MVDB2/DC active trace data sets ................................. 154
  Analyze workload history with MainView Explorer charts .............................. 156
Print workload reports ............................................................................................. 171

These scenarios teach you how to gain a quick overview of summary thread history data to identify problem areas and drill down to further detail if needed to pinpoint exception threads. You will also learn to use the trace displays and the sorting and selection features to pinpoint problem areas and exception threads.

In this practice session, you

1. analyze recent workload history through thread interval summary views
2. perform detailed analysis of the thread data in an MVDB2 TLDS
3. perform detailed analysis of the thread data in the MVDB2/DC trace data sets
4. perform detailed analysis of summary package data in the MVDB2/DC trace data sets
5. use MainView Explorer charts for graphical workload history analysis
6. print workload reports for offline review
Understand thread history collection and data sources

There are two methods of collecting thread history in MainView for DB2. Each method is used for a different purpose, as described in the following sections.

Capturing the complete DB2 workload to analyze total DB2 activity

The preferred method for capturing a complete DB2 workload, especially in a high-volume production system, is to use the MVDB2/DC trace facility, because it is optimized for both data storage and retrieval. The data is compressed so that a longer time period can be held for online viewing. Workload summary records per minute and connect type are also created, to simplify and speed up data access. (This data is also automatically archived for use as input to batch reporting and for populating the performance data into DB2 tables.)

This trace data is identified with a trace name of MVDB2DC. It provides consolidated online access to all the active data sets in use for thread collection. Check with your system administrator if the MVDB2/DC trace facility is not available at your site.

A default MVDB2 summary trace named THRDHIST is also started automatically in the MVDB2 Product Address Space (PAS) and runs continuously. The system administrator might choose to log the data to one more wraparound trace log data sets (TLDSs). Each TLDS is viewed separately, and does not hold as large a thread volume as MVDB2/DC. The windows mode view interface described in the following sections is only available for active or complete TLDSs, not from online buffer storage. When MVDB2/DC is set up to capture the total workload, THRDHIST is often customized to reduce overhead by just capturing short-term history, or only keeping exception threads.
Capturing selected threads or applications to analyze specific issues

Thread traces for a specific purpose can be defined in the MVDB2 Product Address Space (PAS) to either run continuously, or to cover only a specific time period. These summary exception traces are inexpensive to run and simplify later analysis by limiting data capture to threads that might need attention, reducing the time needed to find them afterward in the complete DB2 workload. A trace, called BIGELAP, that only captures threads that exceed 10 seconds of total elapsed time may already be available in your system.

Such traces are even more effective when tailored to your workload. For example, you might have a BIGCICS trace qualified to capture only CICS transactions that exceed a much smaller elapsed time, or a BIGBATCH trace with a much larger elapsed time. Other filters allow you to capture threads that encounter a particular exception condition. Workload qualifiers can be used to select only a particular application, or threads from a specific user.

For most effective use, these exception traces should also be written to a TLDS in addition to online buffers. TLDSs provides additional space for longer-term collection and also allow analysis through the windows mode thread history and thread query facility, and MainView Explorer charts. Traces kept only in online buffers can only be accessed through the full-screen trace displays.

Analyze recent workload history

Sometimes you might need to go back in time to analyze recent history of your DB2 workload; for example:

- to make a quick check of DB2 performance from an application perspective
- to identify system and application exceptions and relate the problems to the threads that caused them
- to analyze the performance of a specific application
- to develop an understanding of the workload profile and spot deviations

The following scenarios describe how to look at thread history data in 3270 mode, which provides the most detailed data. For information about using workload history charts, see “Analyze workload history with MainView Explorer charts” on page 156.
Access thread history data

Thread history overview data in both the MVDB2 TLDSs and MVDB2/DC active trace data sets is accessible from the thread interval history views. These views provide summary performance data and exception analysis of your DB2 workloads. They display summary data by 15-, 5-, and 1-minute time intervals and connection type, and they provide access to the detail thread accounting data.

To access the views for thread interval history analysis:

1 Select the Thrd Workload History hyperlink on the EZDB2 Easy Menu (or Thread History / Query on EZDBA) and press Enter to access the Thread History Trace Log List view (HTLOGS), as shown in Figure 107.

Figure 107 Thread history traces (HTLOGS)

This view displays information about all available sources of thread accounting history. It includes each trace log data set (TLDS), as well as data from the MainView for DB2 - Data Collector active trace data sets. The entries are sorted by end date and time, so typically the MVDB2/DC entry is at the top, followed by the most current THRDHIST TLDSs. TLDSs that are currently being updated are displayed in green.

NOTE

Only traces that are being logged and have a valid TLDS that contains records are accessible from the windows-mode views and thread query panel discussed in this section.

Active traces that are not being logged are shown in HTLOGS for informational purposes only; however, you can access the data from such traces by using the full-screen displays.
You can use this view to review the sources of thread history data and select one for workload summary analysis by hour, interval, or connection type, or drill down to detail thread accounting data. The **Number Records** column shows how many accounting records have been captured in this data source.

## Workload interval summaries

First, go through the summary views. ("Thread history analysis" on page 146 explains how to drill down through interval history views to detail threads; analyze detail thread records; and perform thread queries.)

1. Choose an entry with recent data from the HTLOGS views.

   You can choose any earlier TLDS if you want to see past history. In this case, first sort the view by TRACE ID so that you can easily find all the THRDLHIST entries. (Enter **SORT** in the command line and place the cursor in the **TRACE ID** column.)

2. Hyperlink from the **Number Records** column for your selected entry to begin your analysis of the selected data source.

   View HTIQZ provides a summary of the data in 15-minute intervals, and several navigation options in the header.

### Figure 108  Thread Analysis - Query / Drilldown (HTIQZ)

<table>
<thead>
<tr>
<th>Time</th>
<th>Connect Type</th>
<th>Thread Type</th>
<th>Record Count</th>
<th>Total Elapsed</th>
<th>Total CPU</th>
<th>Total zIIP</th>
<th>Total Elaps</th>
</tr>
</thead>
<tbody>
<tr>
<td>14:45</td>
<td>03-03 CICS</td>
<td>767</td>
<td>1690.189</td>
<td>3.172</td>
<td>0.000</td>
<td>33.9</td>
<td></td>
</tr>
<tr>
<td>14:30</td>
<td>03-03 CICS</td>
<td>835</td>
<td>1790.337</td>
<td>3.364</td>
<td>0.000</td>
<td>29.0</td>
<td></td>
</tr>
<tr>
<td>14:15</td>
<td>03-03 CICS</td>
<td>831</td>
<td>1800.814</td>
<td>3.347</td>
<td>0.000</td>
<td>32.1</td>
<td></td>
</tr>
<tr>
<td>14:00</td>
<td>03-03 CICS</td>
<td>832</td>
<td>1801.821</td>
<td>3.409</td>
<td>0.000</td>
<td>29.5</td>
<td></td>
</tr>
<tr>
<td>13:45</td>
<td>03-03 CICS</td>
<td>823</td>
<td>1798.185</td>
<td>3.431</td>
<td>0.000</td>
<td>37.0</td>
<td></td>
</tr>
<tr>
<td>13:30</td>
<td>03-03 CICS</td>
<td>821</td>
<td>1798.729</td>
<td>3.369</td>
<td>0.000</td>
<td>40.2</td>
<td></td>
</tr>
<tr>
<td>13:15</td>
<td>03-03 CICS</td>
<td>817</td>
<td>1800.306</td>
<td>3.161</td>
<td>0.000</td>
<td>42.6</td>
<td></td>
</tr>
<tr>
<td>13:00</td>
<td>03-03 CICS</td>
<td>808</td>
<td>1800.283</td>
<td>3.275</td>
<td>0.000</td>
<td>43.7</td>
<td></td>
</tr>
<tr>
<td>12:45</td>
<td>03-03 CICS</td>
<td>817</td>
<td>1806.015</td>
<td>3.402</td>
<td>0.000</td>
<td>37.4</td>
<td></td>
</tr>
<tr>
<td>12:30</td>
<td>03-03 CICS</td>
<td>817</td>
<td>1792.930</td>
<td>3.399</td>
<td>0.000</td>
<td>36.4</td>
<td></td>
</tr>
</tbody>
</table>

3. Hyperlink on the **Trace Details** to begin your analysis of the selected data source in a detailed summary view HTD TLZ of all the thread data, as shown in Figure 109 and Figure 110 on page 143.
You can use this detailed summary data to understand the characteristics of your DB2 workload for the time frame covered by that trace.

The top portion shows a thread summary with elapsed and CPU time analysis. You can immediately see the number of threads, any unusual number of exceptions, the impact on the system (CPU usage), and whether the percentage of class 3 wait time, as either an average or a maximum, is out of normal guidelines.

For more detail, scroll down to the bottom portion of the view, as shown in Figure 110.
Chapter 5  Analyzing the DB2 workload  143

Figure 110  Thread interval summary, bottom portion (HTD TLZ)

Here you can see key activity indicators (as totals, averages, and maximums) and a detailed breakdown of what kind of thread exceptions have occurred.

5 Scroll back to the top of the view to access hyperlinks for further analysis by hour, interval, or connection type. Hyperlink from the Date field to see a summary of thread processing by hour, as shown in Figure 111.
You can use this information to identify when workload processing problems or thread exceptions have occurred. You can sort it by any of the columns to look for particular problems like high class 3 wait times or too many exceptions. Type \texttt{SORT A} or \texttt{SORT D} on the \texttt{COMMAND} line and place the cursor in the column that you want to sort by.

6 Hyperlink from the \texttt{Hour} column to see thread data for the selected time period by interval and connection type, as shown in Figure 112.

You can use this information to determine which connection types were experiencing problems during a selected interval.
7 Hyperlink on the **End Time** field to see detailed information for the selected interval and connection type in 1-minute intervals in the HTINTVLC view.

8 Hyperlink on the **End Time** field to see detailed information for the selected connection type and 1-minute interval in the HTINTVLD view.

HTINTVLD looks the same as the HTDTLZ view that you saw earlier, except that HTINTVLD shows only the information of interest to help you analyze why the workload from this connection type was experiencing problems or an unusual pattern of activity.

9 Press **PF3** until you return to HTDTLZ to try out the other hyperlinks for alternative analysis paths.

Next, hyperlink from the **Start Time / End Time** field to see a summary of thread history data by interval in HTINTVLZ. This view is similar to HTHOURZ, but the data is summarized by 15-minute intervals.

You can drill down on **End Time** to see the data for an interval broken down by connect type, if needed.

10 Press **PF3** until you return to HTDTLZ and hyperlink from the **Connect Type** field to see a summary of thread processing by connection type in HTCTYPZ.

From here, you can drill down on one **Connect Type** to see the breakdown by interval.

11 Press **PF3** until you return to HTLOGS.
Thread history analysis

The HTLOGS view provides access to detailed thread accounting data in any of the trace data sources. Accessing and analyzing a large number of detail records can be very time consuming, but HTLOGS provides two methods for choosing only the threads you need to analyze. This feature is especially useful when working with a large MVBD2/DC active trace data set.

You can use either of the following methods, or a combination of them, based on what you need to analyze:

- A thread history drill down of interval summary data—from 15 to 5 to 1 minute intervals of data—can help you identify problem threads in a particular time period, or detect a time period with problems.

- A thread query with extensive filtering options can help you find specific conditions or workload qualifiers in threads that might be distributed throughout all of the records traced.

You will use both of these methods in the following sections.

**Analyze by thread history drill down**

1. Access the HTLOGS view in target mode (not SSI mode). Set the context to the desired DB2 subsystem.

2. In HTLOGS, find a history trace entry and hyperlink on the **Number Records** field to access the HTIQZ view, as shown in Figure 113 on page 147.

HTIQZ provides summarized thread history data by 15-minute intervals. The header section provides additional navigation options. Scroll right to examine all the data available for analysis, including totals, averages and exceptions. When you are done, scroll left.

The **Thread Count** field is the number of threads processed. The **Record Count** field indicates the number of accounting records. These counts differ for DDF/RRSAF rollup (multiple threads per accounting record) and parallelism rollup (one rollup record that does not represent a thread).
3 Review the hyperlinks on the left side of the header section. They provide options that pertain to the entire trace:

- **THREAD QUERY** hyperlinks to the Select threads to display panel, which is discussed later in this section.

- **Trace Details** hyperlinks to a detail summary view of the entire trace (the HTDTLTZ view shown in Figure 109 on page 142.)

- **BB12 LTRAC-MV** hyperlinks to the full-screen LTRAC display for a TLDS and is used primarily to analyze the events per thread in a detail trace.

- **TLDS All Recs** is valid only for TLDSs and hyperlinks to the TRLTRAC view to show all of the thread accounting records from the selected TLDS. This data is especially useful for exception traces, where only occasional threads are captured and may be in widely spaced, 15-minute intervals.

Review the **Row Hyperlinks** that are available for thread history drill down.

4 Find an interval with a fairly high record count, and hyperlink on the **End Time** field to drill down to a 5-minute summary in the HTISZ view.

5 Hyperlink again on **End Time** to display 1-minute intervals in the HTI1Z view.

6 Press PF3 until you return to HTIQZ.
7 Find an entry that has asterisks in the Connect Type field (indicating multiple connect types) and hyperlink on it.

A 15-minute summary by connect type within the interval is displayed.

In each of the 15-, 5-, and 1-minute interval views, the Date field hyperlinks to a detail summary of the selected row. The format is similar to HTDTTLZ, but the data is limited to a specific set of threads. You can easily determine whether the conditions you are looking for occurred during the selected time period. Alternatively, you can scroll right in the tabular views to compare multiple time periods more easily.

8 Press PF3 to return to HTIQZ.

**Analyze individual thread records**

1 In the HTIQZ view, find a row with a high record count (hundreds of records will provide a good set of threads to examine). Scroll right to see if that row also has any abnormal terminations, rollbacks, or other exceptions. Scroll left when you are done.

2 Hyperlink on the Record Count field to display a list of threads and a navigation header in the TRLTRAC view.

**Figure 114 Trace thread list (TRLTRAC)**

```plaintext
25JAN2011 14:12:33 ------ MAINVIEW WINDOW INTERFACE (V6.0.00) --------------
COMMAND ===> SCROLL ===> CSR
CURR WIN ===> 1 ALT WIN ===>
>W1 =TRLTRAC==========(ALL=======DEFG====)25JAN2011==14:12:33====MVDB2======D===27
   Trace Thread List S0000004,140
   - Hide Header
                      . Plan     . ConnType  . CorrName  . TOTALS
                      . EU ID    . EU WN     . EU TX     . Role
   Row Hyperlinks:      EndTim        >> TRSTRAC    Auth ID   >> TRLTRACD
   Stacked Filters:   Use Column Filter Masks (Help)
   ISPF Commands:   INC MASK        EXC MASK
   Time  Auth     Plan   Corr. Elapsed   CPU   SQL Getpage TRM
   End ID   Name   Name   Total   Total     Stmts  Count Typ
10:52:57.97 BOLDJW1 DSNTEP2 BOLDJW1G 1.043  0.063  64  4053 OK
10:52:44.31 BOLDJW1 DSNTEP2 BOLDJW1G 1.262  0.067  64  4051 OK
10:51:57.69 BOLDJW1 DSNTEP2 BOLDJW1G 1.219  0.066  64  4051 OK
10:51:27.71 BOLDJW1 DSNTEP2 BOLDJW1G 1.076  0.070  64  4051 OK
10:50:56.62 BOLDJW1 DSNTEP2 BOLDJW1G 1.106  0.069  64  4053 OK
10:50:03.85 BOLDJW1 DSNTEP2 BOLDJW1G 1.208  0.068  64  4051 OK
10:49:44.26 BOLDJW1 DSNTEP2 BOLDJW1G 1.926  0.080  64  4050 OK
10:48:55.48 BOLDJW1 DSNTEP2 BOLDJW1G 1.842  0.072  64  4050 OK
10:48:36.49 BOLDJW1 DSNTEP2 BOLDJW1G 1.248  0.068  64  4052 OK
10:48:10.14 BOLDJW1 DSNTEP2 BOLDJW1G 1.131  0.074  64  4052 OK
```
Scroll right to review the additional elements in the view. (The TRLTRAC view provides much more information than the full-screen LTRAC display).

Because DB2 workloads vary so much, many additional identifiers are available as hidden fields. You can customize the view to show the identifiers that are most important in your environment. For example, you might want to display any of the following data: the full correlation ID, connect name, connect type, or DDF requesting location. The distributed workstation end user identifiers are available for DBAT or RRSAF threads.

3 To find threads with high or exception values quickly, sort the rows in the view by time or a measurement column. To find exceptions, scroll right to display the Except Flag field. This flag identifies abnormal terminations, rollbacks, and processing exceptions such as a timeout, RID failure, or parallelism fallback. For more detail on exceptions, scroll further right, or hyperlink on the Auth ID field or Except Flag field.

4 You can also filter the data in the view by using a filter mask. Put the cursor on the INC MASK field and press Enter. Notice that the second row of the column header becomes blank for input. Type one or more filter values in the blank row. For example, you might type ABC in the Plan column. Press Enter to convert the filter values to a new WHERE filter. When you are done, remove your filter values and use the EXC MASK field to remove the blank row.

5 In the header, the Thread Summaries area lists the types of summary views available. Hyperlink on the Plan field to display a summary view of the thread list by plan name.

Figure 115  Plan summary (TRPLANZ)

The summary views provide both totals and averages in a row for each plan (scroll right to see more data). In this example, there was only one plan.

6 Hyperlink on the Plan Name field to return to TRLTRAC to display only the threads that used this plan.
Thread history analysis

7 Hyperlink on the Plan field in the Thread Summaries area again. You can also hyperlink on the Exct. Count field if it contains a value greater than zero, to redisplay TRLTRAC with just the exception threads for this plan. (These filters are in effect only for these hyperlinks. If you choose any other hyperlink, such as a different summary by Auth ID, the filter by plan is not retained. To retain one or more filters, use filter masks as described in step 4.)

8 Hyperlink on the End Time field to display the hybrid free-form view TRSTRAC, which displays DB2 accounting details provided by the full-screen service STRAC.

Figure 116 Summary trace view (TRSTRAC)

You can scroll this view vertically, or use the Section Locates fields to display a particular section at the top of the scrollable area of the view. Put the cursor on a section and press Enter.

To display Help for a section, put the cursor on the section and press PF1.

9 Press PF3 repeatedly to return to HTIQZ.
Analyze by thread query

The HTIQLZ view provides two ways to access the thread query panel:

- The THREAD QUERY hyperlink in the header section lets you specify any time period in the trace. The trace start time is filled in as the start time of the query. The default duration is set to 15 minutes.

- The 15M QRY hyperlink for a particular interval sets the start time of the query to the start time of that interval. The default duration is set to 15 minutes. (There is also a 5M QRY hyperlink in the view HTI5Z, which sets the default duration to 5 minutes.)

1 Choose a 15M QRY hyperlink on HTIQLZ to access the thread query panel, as shown in Figure 117 on page 151.

This panel is called a multiplatform dialog (MPD) because it can be used in both 3270 mode and in the MainView Explorer product.

Figure 117  Thread query panel - top portion (qualifiers, exceptions, and conditions)

2 Verify the time in the Required Query Criteria section. You can override both the Start Time and the Duration.

3 In the Optional Qualifiers section, specify one or more qualifiers, such as one or more plans, or a generic plan such as ABC*.
Multiple qualifiers of one type are ORed. Multiple qualifiers of different types are ANDed, so that all conditions must be met.

4 In the Exception and Condition Filters section, specify at least one exception or condition filter that you know exists in your trace data.

The Exception and Condition Filters include critical thread failures that are good indicators of potentially poor performance. Only threads that meet at least one of the filter criteria will be retrieved.

NOTE

Specifying additional filters and qualifiers is highly recommended. If too many records meet your search criteria, only a subset of those records might be returned, along with a message that suggests specifying additional filters.

5 Scroll down to display the next screen of the panel, as shown in Figure 118 on page 152.

Figure 118  Thread query panel - bottom portion (value filters)
For any of the value filters, you can specify the value of your choice and a logical operator, such as GT (greater than) or EQ (equal). For example, you might want to retrieve only the records that exceed 10 seconds of In-DB2 elapsed time.

The filters are different for TLDSs and MVDB2/DC trace data sets; these differences will be addressed in future releases of MVDB2.

For more information about the filters, see the online Help.

6 Specify a value filter in the In DB2 Elapsed field.

7 Review the values that you specified and then press PF3 to submit the query.

The thread records that meet your criteria are displayed in the TRLTRAC view. You can then use any of the thread analysis options discussed previously in this section.

8 After you complete your analysis of these threads, press PF3 repeatedly to return to the HTLOGS view.

---

**TIP**

The previous scenarios described methods to analyze even very large thread volumes and drill down to detail data. However, to simplify access to specific threads or applications of interest, you might want to consider running one or more summary exception traces with TLDSs. These trace requests are fairly inexpensive to run, and you can filter the threads and store only those threads needed for later analysis, which will save storage, processing time to retrieve the records, and analysis time. For more information, see “Understand thread history collection and data sources” on page 138.
Package analysis from MVDB2/DC active trace data sets

Summary and detail package reports are available online only from the MVDB2/DC active trace data sets.

1. Return to the HTLOGS view and find an entry with MVDB2DC as the Trace ID (if available).

2. Hyperlink on the Type column of an entry where the ID is MVDB2DC.

The qualification panel is displayed.

3. Select option 3 and specify one or more package names and a DB2 subsystem ID, as shown in Figure 119.

Because the report that will be accessed is THACPKGS, you can enter qualifiers at either the thread or the package level.

Figure 119 Qualifiers panel for package summary report

<table>
<thead>
<tr>
<th>SPECIFY A PACKAGE</th>
<th>LOCAL FILTERS/QUALIFIERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command ====&gt;</td>
<td>Scroll ====&gt; CSR_</td>
</tr>
</tbody>
</table>

Type the following information to include or exclude data. Then Exit.
- one or more exact values to include or exclude (wildcards are allowed)
- one or more qualifier lists to include or exclude -- lists begin with )
- ? to display existing qualifier lists
- ?xxxxxxx to view, modify, or create a qualifier list named )xxxxxxx
- Qualifiers marked with (t) are the only ones applicable to tracing.

**NOTE**

The DB2 subsystem that you selected from MVDB2 is no longer defined. After you select this panel, you must enter at least one DB2ID, which will usually be the one that you started analyzing. However, in data sharing systems you might want to broaden the analysis to the members in the group.
4 Press PF3 to return to the report qualification panel and press the Enter key to see the package summary report (THACPKGS) for the specified package, as shown in Figure 120.

**Figure 120** THACPKGS report for a specified package

![THACPKGS report](image)

5 Use the zoom commands (shown in Figure 120) to navigate the Data Collector report.

Enter the one-character zoom commands by overtyping any + (plus sign) on the left side of the report. Use the Tab key to move from one + to the next +. Use the D zoom command to see additional package identifiers and the S or R zoom commands to see all details for that package.
Analyze workload history with MainView Explorer charts

The previous sections described how to use the thread history views and thread query dialog to analyze a DB2 workload, detect problems, and investigate problem threads. Those views provide access to extensive performance data over time, which can be summarized, sorted, and filtered. That large volume of data is useful for analyzing a specific problem, such as

- an end user complaint about performance at a particular time in the past
- a specific application that was recently changed
- threads with high CPU usage

However, that volume of data can make more general analysis very time consuming. The MainView Explorer charts can greatly simplify general analysis tasks, such as gaining a historical perspective of the total workload; detecting problems that you were not aware of; and correlating different measurements and indicators over time. By using the charts, even less experienced users can easily spot anomalies in normal workload patterns and quickly drill down to additional information for that time period.

The charts that are described in the following sections focus on recent historical workload analysis.

For more detailed information about MainView Explorer, see the online Help or the MainView User Guide.

Using MainView Explorer for the first time

If you are already familiar with MainView Explorer, skip this section and see “Viewing chart configurations” on page 160.

MainView Explorer runs in your web browser, so it is simple to access, and any necessary software installation or updates are performed automatically.

To begin using MainView Explorer:

1. Ask your system administrator for the URL for MainView Explorer on the mainframe system that you would normally use to access MainView for DB2.

   The MainView Explorer data server must be active and connected to the CAS in that system.

   The URL format is: http://system:port/

2. Open a web browser and enter the URL.
3 After a security prompt, a logon dialog box is displayed.

4 Enter your TSO user ID and password. (Logging on to MainView Explorer does not log you in to a TSO session, and your TSO session can be active concurrently.)

5 Review the template for the user data sets and add a prefix if necessary. If you would like to customize charts and configurations, you will need a BBCDEF data set.

The MainView Explorer window opens.
The navigation frame on the left contains a context tree and a product tree. The frame on the right shows the systems that you can access.

6 Click on the **Product** tab at the top of the navigation frame.

7 Expand the **MVDB2** node and the system name (**SJSE** in this example) to see a list of individual DB2s per system and any defined SSI contexts.

8 Right-click on one DB2 and select **Set context**.

   The product tree for **MVDB2** opens, as shown below.

   ![Product tree for MVDB2](image)

   The view folders in the product tree provide view access by area, similar to the MAIN view in 3270 mode.

9 Expand the **BFRPOOL** node and double-click the **BFRPLD** view.

   The view opens in a tab.
Analyze workload history with MainView Explorer charts

10 Right-click the BFRPLD tab to see various options, and then select the Close this view option to close the tab.

11 Expand the EZExplorer node to access a navigation path that similar to Easy Menus in 3270 mode. This navigation path is recommended.

12 Expand the Views node, the Single DB2 (EZDB2) node, and the Threads node to see a list of thread views.

13 Double-click any view to open it in a tab and then close that tab and collapse the Views node.
Viewing chart configurations

Before you access the charts in the Configurations node, review the following MainView Explorer terminology:

*Charts* are graphic representations of the data in a view. There are multiple chart types, such as two dimensional (2D) line charts and three dimensional (3D) area charts.

*Containers* are a special type of view that can hold multiple views and charts, either tiled, cascaded, or free form. MainView for DB2 uses containers to chart multiple data items from one view together for easier comparison and reduced overhead (data is retrieved only once).

*Configurations* are used to save one or more views, charts or containers together, and preserve properties such as chosen items or sort order. They can also be used to distribute charts with a product release.

1. Expand the Configurations node, and then expand both the Single DB2 and Multiple DB2s nodes to access the charts.

These charts focus on historical DB2 workload analysis. There are two sources of information about workload history for charting:

- workload objectives monitor data for defined workloads
- thread history interval data

Workload objectives monitor 15-minute interval charts

These charts show monitor data for all defined workloads for the previous four hours. They show average response time, the percentage of threads that meet response goals per workload, and thread rate per second.

1. Under the Configurations node, expand the Single DB2 (Target Context) node, the Monitor Workloads by Interval node, the Values per Workload node, and then the Values per DB2 (ALLWORK) node, as shown below.

The available charts are displayed.
2 Under the Values per Workload node, double-click the All 3 Values chart.

The container of charts shows all three monitor values per workload together for easy comparison. These charts help you see the bigger picture, for example, whether a response time spike in one workload could be related to an increased thread rate, either for that workload or another workload.

The charts show data from the individual workload objectives monitors that are automatically activated per defined workload. MainView for DB2 distributes definitions based on DB2 connect types for workloads that are mostly likely to have consistent processing characteristics, including the transaction type workloads that typically must meet service level agreements, such as CICS, IMS MPPS, and distributed DBAT workloads. Response time targets are set based on the In-DB2 elapsed time.
Analyze workload history with MainView Explorer charts

To make this information even more valuable for your systems, you can easily modify the default response times to use total elapsed time, or set different response time goals for these general workloads. You can also add new workloads for your site’s critical applications, defined by various DB2 thread qualifiers. (For more information about workload setup, see the DWKLDEDF view.)

The three-chart layout is good for comparisons, but you might want to see one chart in a larger format.

3 To maximize a chart, do one of the following actions:

- Click the standard maximize or minimize icons in the upper right corner of each chart.
- Use the cycling icons at the top of the container tab. Click the forward or backward arrow icon to maximize a chart; click the circle icon to redisplay the three-chart layout.
- Open the individual chart in the navigation tree.

4 Right-click any data point in the chart and select the Hyperlink option to see the 90-second monitor samples within the selected 15-minute interval in the related plot view.
Analyze workload history with MainView Explorer charts

The view opens in a separate tab; close this tab after you have viewed it.

5 To show the same data across multiple DB2 subsystems, return to the context tree to set the context to a predefined SSI context.

6 Right-click on any defined SSI context and select Set context. In this example, the DJ context shown below includes two DB2 subsystems.

When you change the context, the product tree collapses.

7 Reopen EZExplorer, Configurations, and Multiple DB2s (SSI Context). Then select Thread Rate/Sec under Grand Totals per DB2, as shown below.

The resulting chart shows thread rate per second for each DB2 in the SSI context. You could also view total thread rate, summarized for all DB2s, under Grand Totals SSI. The ALLWORK monitor captures all thread activity.
Thread history 1-minute interval charts

Several charts show thread history data, summarized per 1-minute intervals and connect type— the same data that is shown in the thread history views and thread query results from MVDB2/DC data. The fields in those views are also available for charting. Thread processing times, CPU and zIIP usage, exceptions, or activity rates for SQL and I/O can be quickly compared in multiple charts that simplify analysis of workload activity over time. Thread history is available in target mode only, so first ensure that your context is set to a single DB2.

1 Under the Configurations node, expand the Single DB2 (Target Context) node, and the Thread History by Minute node.

To see all the types of views available, expand these nodes: Total Workload, CICS Workload, and Batch Workload, as shown below.

Transaction type workloads typically have a more consistent thread profile, with more measurements that are comparable when analyzing those workloads over time, so several charts are provided.

Other workloads, such as batch or utility jobs, often run only at specific time periods and vary more in their processing characteristics.
Under the **Total Workload** node, double-click **Thread Rate per Connect Type**.

This chart is similar to the objectives monitor thread rate chart, except:

- The monitor data is per 15 minute intervals over the last four hours and includes only threads from defined workloads.

- The thread history charts include data for all processed threads that are still in the MVDB2/DC data sets, and shows the threads by the connect types active at that time period. One minute intervals without any thread activity are not shown (such intervals might occur in a development system).

Use the scroll bar on the right to scroll back and forth in time; you might see different workloads appear and disappear as you scroll.

**3** DBAT processing can provide more details. Expand the **DBATDRDA Workload** node and double-click **Thread Processing Times**. (Use CICS or IMSMPP instead, if they might be more useful in your environment.)
This 9-chart container allows you to analyze elapsed times (class 1, In-DB2, and class 3 waits) in the top row; CPU times (class 1 and In-DB2) with thread rate in the middle row; and zIIP usage in the bottom row. (The charts shown here are for a DB2 10 system, so zIIP eligible in not applicable and always zero.)

4 As described earlier, you can maximize any chart, or cycle through all of them.
The maximized chart above (scrolled back in time) shows a spike in class 3 wait time.

Move your pointer over any data point in the chart to see a Tool Tip about the data point; for example, the exact value charted, the date and time, and the thread count.

**TIP**

If an outlier value skews the graph Y-axis, right-click in the chart, select **Properties**, then select the **Items** tab, and set the **Data Range for Y-Axis** options to modify the range.

You can hyperlink on any 1-minute interval data point. In this example, you can display information about the spike in wait time that occurred at 16:23.

5 Right-click on a point and select the **Hyperlink** option, which shows you exactly what text is used for the hyperlink.
Analyze workload history with MainView Explorer charts

This analysis capability is very powerful. Not only can you compare interval data over time in the charts, but you can drill down to see exactly the list of threads of this connection type that were completed in any selected 1-minute interval. In this sample test system, the list contains only 13 threads. The row count is displayed in the bottom right corner of the chart.

6 Look for anomalies in the threads. Use the scroll bar at the bottom of the chart to see additional fields and compare the values. Sort the list by clicking on one of the columns.

In this example, the last thread in the list shows a very large elapsed time, so that is the one to look at more closely.

7 In the TRLTRAC view, hyperlink on the first column, **End Time**, to display the detail thread view TRSTRAC, which shows all of the accounting information.
There is a very high wait time in this thread that obviously caused the spike shown in the chart. To see a breakdown of the class 3 waits, scroll down through the view, or hyperlink on **ELAPSED** in the upper right corner of the view.

The **Elapsed Time Analysis** section shows an unusual spike in latch waits. That spike could be investigated later by using the STLATCH and STLATCHD views.

8 Close the TRSTRAC tab and look again at the TRLTRAC view.

This example shows a short list of threads, but in a production system, you could easily retrieve a list of thousands of threads.

Use the many summarization options in the TRLTRAC view header to qualify the workload and select a subset for further analysis. You can also use the column filter masks or column sorting to further narrow your analysis. You might also want to look at the other sets of charts, **SQL and I/O Rates** and **Thread Exceptions**.

9 Now that you have seen the charts available for a transaction-type workload, you can look at the other workloads.
Expand the **Batch Workload** node and double-click **Thread Activity**.

The container provides six charts of data relevant to the chosen workload. For example, utility activity charts would also include zIIP measurements.

This container provides different chart types—a bar chart and 2D area charts—to better demonstrate the correlation between class 1 and class 2 times.

**Miscellaneous tips**

Before you close your MainView Explorer session, try some of the following tips:

- Review the icons that are available for the charts, including the nine chart type icons. To display a description of the icon, move the pointer over the icon.
- Click the question mark icon to display online Help.
- Click the refresh icon to update the data in a view or chart. You can also set up auto-refresh if desired. (For the 1-minute interval charts, do not choose a refresh interval less than 60 seconds.)
- Right-click in a tab and select **Properties** to review the available chart settings.
To save a customized individual chart, open it in a tab (close all other tabs except for the standard PLEX, PRODUCTS and SYSTEMS tabs) and change the chart properties as needed. Use the File menu Save Configuration option to save the chart in your BBCDEF data set (the distributed chart under the EZExplorer node will not be modified). Use the File menu Open Configuration option to access your customized chart.

Print workload reports

Printing workload reports is usually done from the DB2 tables of performance data supported by Performance Reporter. This method gives you long-term history and trending, as well as the full flexibility of SQL for defining your own reports in addition to the predefined set. See “Reports from DB2 Tables” in the MainView for DB2 Performance Reporter User Guide for more information.

Also, selective or total accounting reports, in either a short or a long format, can be printed from DB2 accounting records that are extracted from Data Collector archive files or one or more SMF files. For example, you can select from a specific time period or by plan, authorization ID, and so on. The reports also can be summarized by various criteria. See “Data Collector Reporting Facilities” in the MainView for DB2 Performance Reporter User Guide for more information. A summary of batch printing capabilities is in Chapter 6, “Printing views and reports.”

However, this data is often not available to answer questions about the workload until the next day. The batch trace print facility is designed to fill the need for quick reports. All the trace summary report formats are available, in any combination.

There are different types of input:

- one or more trace log data sets; for example, of the Thread History trace
- archived trace logs (TLDSs) (without reloading to VSAM); for example, thread history from two weeks ago
- Data Collector archive files of accounting data output groups
- SMF history file containing DB2 Accounting records
- live SMF data sets
- GTF trace data set

If you are writing accounting data to the Data Collector trace data sets, you can also run the Data Collector reports against any of the archived files, or against the active trace data sets. See “Data Collector Reporting Facilities” in the MainView for DB2 Performance Reporter User Guide for more information.
The examples in this dialog are made with THRDHIST.

To print a workload report:

1. From the Primary Option Menu, select the **HISTORY TRACES** option.

   
   
   **OPTION ====> 5**

2. Locate an entry with a TRACEID of THRDHIST and select it for print.

   
   
   **LC** (Line Command)

   **P** (PRINT)

   The Batch Trace Print panel where you can specify options to print one batch report is displayed, as shown in Figure 121.

   **Figure 121  Batch Trace Print panel**

   ![Batch Trace Print panel](image)

   You can also use the sample JCL **DZTBPRNT** to tailor and submit a set of reports. This JCL is set up so that it can invoke several sample report members that explain many of the available print options.

3. If you are using this option for the first time, you might want to update your job statements first (**Update Job ===> Y**).
4 Fill in the options for a report.

   REPORT  ==>  traceid  Specify any name. Used as the output DD.
   DDNAME  ==>  (Optional.)
   TITLE1  ==>  any title  (Optional.) Centered in first report header.
   TITLE2  ==>  any title  (Optional.) Centered in second report header.

Data Selection is optional, but can be used to reduce the amount printed. The date and time fields are primed from the trace log data set.

   REPORT SELECTION:
       LTRAC  ==>  N
       STRAC  ==>  N
       DTRAC  ==>  N
       POPUP  ==>  N
       TSUM   ==>  T
       TSTAT  ==>  SUMMARY
       SORT   ==>  
       INTERVAL ==>  30M

5 Press Enter to validate your specifications.

   These options are saved in your profile and used to initialize the fields the next time this panel is requested.

6 Press PF3 to review the generated JCL in edit mode.

   The options you specified are inserted into a pattern job DZJPTRAC in BBPROF. You may want to copy this JCL into your own UBBPROF data set and modify it.

7 Check the other options and add if desired; for example:

   TSUM=T, I=30M, GRAPH=TOT

   Add the option to graph the totals instead of printing values. There are many other options that cannot be shown on the panel. Refer to “Printing a Trace” in MainView for DB2 User Guide.

8 Submit the job.

   COMMAND  ===>  SUB

   If you prefer, you can SAVE or CANCEL the JCL.
9 Press **PF3** to return to the Batch Trace Print panel.

   You can make another request now if desired.

When the job is complete, review the output. This output gives you a graphic
summary of total DB2 activity for the selected time period in 30-minute intervals,
followed by a summary of the activity.

Here is another example:

```
LTRAC ==> Y
STRAC ==> SUMMARY (Add,DDF if DDF is active)
```

This command provides the complete DB2 Accounting information per thread. You
may want to use the data selection options to limit the output.

All the other summarization options of AUTHID, connect, buffer pool, location, and
time, are also available.
Printing views and reports

This chapter presents the following topics:

Print online views ................................................................. 176
Print online history traces (thread data) .................................... 177
Print offline reports ............................................................... 183
   Batch trace print ............................................................. 183
   Performance Reporter reports ............................................ 187

These scenarios teach you how to print both your online and offline reports.

In this practice session, you

1. export an online windows-mode view and print an online history trace for offline review

2. print offline traces from a trace log data set or SMF records

3. print offline Performance Reporter reports from SMF data, MVDB2/DC archive data sets, and DB2 tables

This practice session takes approximately one hour to complete.
There are several ways to export and print any windows mode view to a data set or file. The exported view can be used to supplement performance reports or can be downloaded to a workstation for use with a spreadsheet application.

- With any windows mode view displayed, use the `EXPort` command to access a panel that requests an existing data set name (or SYSOUT class) and formatting options, as shown in Figure 122.

**Figure 122  View export panel**

The output of the EXPort command includes all the rows of data associated with the view, even data that requires scrolling to be seen online. However, if the logical record length (LRECL) of the data set is less than the width of the view, the view data is truncated on the right.

You can change the **Output format** to CSV to write the data rows to a data set in comma-separated format to download for use in a spreadsheet program.

- In MainView Explorer, use the **Export** icon to write a data snapshot file directly to your computer. You can then print the file by using a spreadsheet or text processing program. The file is also accessible later from the MainView Explorer Viewer. See the MainView Explorer online Help for more information about exporting data.
Use the MVBATCH utility to print any view that can be invoked directly from the command line. See the *MainView User Guide* for more information about MVBATCH.

### Print online history traces (thread data)

You can both print online history traces and export online windows-mode views for offline review.

In previous exercises, you learned how to run a trace and view it online. However, depending on the results, you may want to have a hardcopy for further analysis. Batch reports can also be valuable tools during an application review meeting.

**NOTE**

This section describes printing a trace, but you might also want to look at the accounting reports produced from DB2 trace records written to SMF, from MVDB2/DC archive data sets, or from DB2 tables loaded from one of these sources. See “Performance Reporter reports” on page 187 and the *MainView for DB2 Performance Reporter User Guide* for more information.

To begin this exercise:

From the Primary Option Menu, select the **HISTORY TRACES** option.

**OPTION ====> 5**

This panel not only provides access to view the trace data online but also offers several line commands to simplify management of the trace log data sets:

- **W** Show the options used for this trace.
- **P** Generate the JCL to print a batch report.
- **D** Delete this data set from the trace directory.
- **E** Reset the log data set for reuse.
- **V** Verify that the directory entry matches the data set contents.
- **N** Add a new data set to the directory (moved from another system).
- **A** Archive the data set (only if an archive started task was specified).
- **F** Free a data set currently being read.

Usually you will need only **W(SHOW)**, **D(DELETE)**, and **P(PRINT)**. You are going to concentrate now on **P**. You can try the others when you need those functions.
All data per traced thread

To print a trace report showing all data per traced thread:

1. The history traces display shows the most recent traces at the top, but you can sort on any column and use the locate command to help you find other trace logs. For example, you can sort on USERID to group all your own trace logs together.

Now, select your trace log data set for print.

LC (Line Command)
P (PRINT)

The Batch Trace Print panel is displayed, as shown in Figure 123, where you can specify options to print a batch report.

Figure 123 Batch Trace Print panel

Printing a Trace

| BMC Software ------------ BATCH TRACE PRINT ---------------- PERFORMANCE MGMT |
|-------------------------|-----------------------------|
| COMMAND ===> | TIME --- 15:00 |

Update job ==> N (Y/N - update job statement) (END to edit JCL)

Title line 1 ==> 

Title line 2 ==> 

Data Selection:
From date ==> 16SEP2003 Time ==> 1125
To date ==> 17SEP2003 Time ==> 1412

PLAN ==>

AUTHID ==>

CONNECT ==>

CORR ==>

LOC ==>

DB2PKG ==>

REPORT SELECTION:
LTRAC ==> NO (YES/NO)
STRAC ==> NO (NO, ALL, SUMMARY, section1, section2...)
DTRAC ==> NO (YES/NO)
POPUP ==> NO (NO/ALL/SOQL/event1, event2.....)
TSUM ==> (A/C/L/P/T) SORT ==> (for any TSUMx)
TSTAT ==> NO (SUMMARY/ALL/NO) INTERVAL ==> 1H (for TSUMT only)

2. If you are using this option for the first time, you must update your job statements.

Update Job ==> Y
3 Press **Enter** to display a job statement data entry panel.

Fill in the required information and return by using **PF3**.

4 Set the Update Job option to **N**.

5 Fill in the options for a report.

   \[ \text{TILE1} \Rightarrow \text{any title} \quad \text{(Optional)} \quad \text{Centered in first report header.} \]
   \[ \text{TILE2} \Rightarrow \text{any title} \quad \text{(Optional)} \quad \text{Centered in second report header.} \]

Data Selection is optional. The selection fields can be used to reduce the amount printed from a long trace.

Data Selection:
- **From** date \( \Rightarrow \text{ddmmmyyyy} \) Time \( \Rightarrow \text{hhmmm} \)
- **To** date \( \Rightarrow \text{ddmmmyyyy} \) Time \( \Rightarrow \text{hhmmm} \)

The date and time fields are primed with the start and end date-time of the trace. You can modify them to select a shorter time period.

   \[ \text{PLAN} \Rightarrow \text{plan name} \]
   \[ \text{AUTHID} \Rightarrow \text{authorization id} \]
   \[ \text{CONNECT} \Rightarrow \text{connection name} \]
   \[ \text{CORR} \Rightarrow \text{correlation id} \]
   \[ \text{LOC} \Rightarrow \text{location name} \]
   \[ \text{DB2PKG} \Rightarrow \text{db2 package name} \]

The Data Selection identifiers allow you to select only a subset of threads that you need to analyze further, such as one particular plan from a Thread History (THRDHIST) trace.

REPORT SELECTION:
- **LTRAC** \( \Rightarrow \text{N} \) Print data per thread traced.
- **STRAC** \( \Rightarrow \text{ALL} \)
- **DTRAC** \( \Rightarrow \text{N} \)
- **POPPUP** \( \Rightarrow \text{N} \)
- **TSUM** \( \Rightarrow \text{N} \)
- **TSTAT** \( \Rightarrow \text{N} \)
Print online history traces (thread data)

There are many different reports that can be generated, either singly or combined. See “Batch trace print” on page 183 for some examples. Browse “Printing a Trace” in MainView for DB2 User Guide for a full explanation of the options and to see sample reports.

The reports are based on printouts of the online displays, so the options are selected by using the names of these displays, like LTRAC, STRAC, DTRAC. In this tutorial you have chosen STRAC=ALL as the most useful report for application tuning. It shows the following information for each thread traced:

- Basic DB2 accounting record data
- Environmental Indicators section
- Elapsed Time Analysis section
- SQL Statement Execution Counts section
- Buffer Pool Usage Analysis section, including Global Buffer Pools
- Lock Activity section, including Global Locks
- I/O Parallelism section
- Routines section (stored procedures and user-defined functions)
- DDF Summary section (if distributed work was done)
- Package/DBRM Overview section (if accounting trace 7 is active)

These sections are included for detail traces that captured the relevant events:

- SQL Summary section with summary statistics per SQL statement (SQL events)
- Database Summary section with scans per page set (SCAN events)
- Database Lock and I/O section with locks and I/O data per page set (I/O or lock events)
- Sort Summary section (if any sorts were performed) (any detail trace)

6 Press Enter to validate your specifications.

These options are saved in your profile and are used to initialize the fields the next time this panel is requested.

---

**WARNING**

Be careful! Select only the data that you want to print. This report is per thread execution (like an accounting trace report from DB2PM) and can generate a large amount of output.

---

7 Press PF3 to review the generated JCL in edit mode.

The options you specified are inserted into a pattern job DZJPTRAC in BBPROF. You may want to copy this JCL into your own UBBPROF profile data set and modify it.
8 Review the remaining options.

There are many more print options than can be shown on the panel, such as lines per page or maximum pages to print. The sample job contains a short description of these options. Scroll to the bottom to review them.

9 Submit the job.

```
COMMAND   ==> SUB
```

Of course, if you prefer, you can SAVE the JCL for later execution, or even CANCEL it completely.

10 When the job is complete, review the output.

11 Press PF3 to return to the Batch Trace Print panel. You can issue another request now if desired.

**Other accounting report examples**

Here are a few examples of workload-oriented reports based on the DB2 accounting record. For quick reports submitted online through the trace print panel, you will generally select one of the trace logs created by the Thread History (THRDHIST) trace for the time period you are interested in. However, these same accounting reports can be produced from any other summary or detail trace log. See “Print offline reports” on page 183 for more complete batch reporting options.

- For a summary of total DB2 activity for the selected time period, you can first select an overview summary by time (broken into 30 minute intervals in this example), followed by a summary of all accounting data with useful averages, totals, and maximums for the complete period.

```
TSUM ==> T
TSTAT ==> SUMMARY  INTERVAL ==> 30M
```

- To change the summary to a graphic format, edit the generated selection statements in the JCL before submitting the job:

```
TSUM=T, I=30M, GRAPH=TOT (or AVG)
```

- For a summary by plan (or other identifier), specify

```
TSUM=P  (or A for authorization ID, and so on)
```

All the other summarization options of AUTHID, connect, buffer pool, location, and time are also available.
Print online history traces (thread data)

- For a quick list of each thread, specify
  LTRAC ==> Y

- To generate a report of activity in each individual buffer pool per thread, specify
  STRAC ==> BPOOL

For a summary of this information per individual buffer pool for all selected threads, look at this same section in the TSTAT SUMMARY report mentioned above.

Other detail trace report examples

You might want to try other report combinations too. Here are a few examples from detail traces:

- For an SQL statement summary per thread, sorted by Average CPU usage, followed by average SQL row processing statistics per statement:

  LTRAC ==> Y
  STRAC ==> SQL,SORTSQL=AC,SQLPOPUP

- For a detail event trace per thread, with pop-up displays per SQL statement:

  LTRAC ==> Y
  DTRAC ==> Y
  POPUP ==> SQL

- For SQL statement text and EXPLAIN data for all dynamic SQL executed or BINDs of static SQL:

  POPUP ==> (SQL-TEXT,EXPLAIN)
Print offline reports

You can print

- offline traces from a trace log data set or SMF records
- offline Performance Reporter reports from both SMF data and DB2 tables

Batch trace print

Most scheduled batch reporting is done with the Performance Reporter reports either directly from SMF data or from that same data loaded (often summarized) in DB2 tables. However, this data is often not available to answer questions about the DB2 workload until the next day. The batch trace print facility is designed to fill the need for quick reports. All the trace summary accounting report formats are available, in any combination.

There are different types of input:

- one or more trace log data sets; for example, of the Thread History trace
- archived trace logs (without reloading to VSAM); for example, thread history from two weeks ago
- Data Collector archive files
- SMF history file containing DB2 Accounting records or I/O trace IFCIDs
- live SMF data sets
- GTF trace data set

A batch utility job, DZTBTRAC, is provided in your BBSAMP data set to print these reports. There is also a sample JCL member DZTBPRNT you can use when you want to generate multiple reports or print accounting reports from SMF data. The control statements for several sample reports are provided in BBSAMP member DZJPnnnnn, with comments to point out some of the most useful variations.

The trace data shown in the batch reports is in the same format and content as the online displays. This includes LTRAC, STRAC, DTRAC, DTRAC pop-ups, TSTAT, and the TSUMx series of displays. Many of these displays can also be combined into one report. For example, a report can consist of both LTRAC and DTRAC data. Selection options, such as plan, authorization ID, or date can be used to narrow the scope of a report. In addition, you can focus in on just one area of interest, such as buffer pool activity by individual pool.

All of the report options described in “Print offline reports” on page 183 are also available by directly editing and submitting the batch trace print job, first specifying the input file and the reports to be printed.
Trace print from a TLDS

To print a trace log data set, use the JCL provided in BBSAMP members DZTBTRAC, as shown in Figure 124. Specify the DSN of the log with the TLDS parameter. Multiple TLDSs can be concatenated.

Figure 124  JCL to print a trace (DZTBTRAC)

```
// JOB (ACCT),'NAME'
// DZTBPRNT PROC TLDS=NULLFILE, INPUT TRACE DATA SET
// TDIR=NULLFILE, INPUT TRACE DIRECTORY
// SMF=NULLFILE, INPUT UNLOADED SMF FILE
// GTF=NULLFILE, INPUT GTF FILE
// ARC=NULLFILE, INPUT ARCHIVED TRACE DATA SET
// PFx='HILVL.RUN.LIB' DSN PREFIX OF BBLINK
// PRINT EXEC PGM=DZTBPRNT,REGION=4M,PARM='GMWK=128K'
// INCREASE GMWK FOR LARGE TRACES
// STEPLIB DD DISP=SHR,DSN=&PFX..BBLINK
// SYSPRINT DD SYSOUT=* INPUT LIST AND DIAGNOSTICS
// SYSUDUMP DD SYSOUT=* ABEND DUMPS
// STD1 DD SYSOUT=* DEFAULT REPORT OUTPUT
//**
//** ONLY ONE OF THE FOLLOWING INPUT DD'S MAY BE SPECIFIED
//** IF NONE IS SPECIFIED, DEFAULT INPUT IS LIVE SMF DATASET
//**
// TRACIN01 DD DISP=SHR,DSN=&TLDS TLDS INPUT
// TRACEDIR DD DISP=SHR,DSN=&TDIR TLDS INPUT THRU TRACE DIR
// SMFIN DD DISP=SHR,DSN=&SMF SMF INPUT
// GTFIN DD DISP=SHR,DSN=&GTF GTF INPUT
// ARCIN DD DISP=SHR,DSN=&ARC ARCHIVED TLDS INPUT
// PEND
//**
//** SPECIFY INPUT FILE **
// PRINT EXEC DZTBPRNT,TLDS='SYS5.DB2P.THRDHIST.JUL01.T0001.V01'
// REPTDD1 DD SYSOUT=YES USER-DEFINED OUTPUT DD
// RPTSUM DD SYSOUT=YES SAMPLE REPORT OUTPUT DD
// RPTWKLD DD SYSOUT=YES SAMPLE REPORT OUTPUT DD
// RPTACCL DD SYSOUT=YES SAMPLE REPORT OUTPUT DD
// RPTACCS DD SYSOUT=YES SAMPLE REPORT OUTPUT DD
// RPTSQL DD SYSOUT=YES SAMPLE REPORT OUTPUT DD
// RPTEXPL DD SYSOUT=YES SAMPLE REPORT OUTPUT DD
// RPTFAIL DD SYSOUT=YES SAMPLE REPORT OUTPUT DD
// RPTDBIO DD SYSOUT=YES SAMPLE REPORT OUTPUT DD
// SYSSIN DD * FOR IN-STREAM REPORT STMTS
// SYSSIN DD DSN=&PFX.BBSAMP(DZJPSUM) DEFAULT SUMMARY RPT (SUM)
// SYSSIN DD DSN=&PFX.BBSAMP(DZJPWKLD) WORKLOAD SUMMARY-TIME(SUM)
// SYSSIN DD DSN=&PFX.BBSAMP(DZJPACCL) ACCTG DETAIL-LONG (SUM)
// SYSSIN DD DSN=&PFX.BBSAMP(DZJPACCS) ACCTG DETAIL-SHORT (SUM)
// SYSSIN DD DSN=&PFX.BBSAMP(DZJPSQL) SQL STATEMENT SUMMARY (D-SQL)
// SYSSIN DD DSN=&PFX.BBSAMP(DZJPVNT) THREAD DETAIL EVENTS (D-DAY)
// SYSSIN DD DSN=&PFX.BBSAMP(DZJPACSL) SQL TEXT/EXPLAIN (D-SQL)
// SYSSIN DD DSN=&PFX.BBSAMP(DZJPFAIL) LOCK/EDM FAILURES (D-BASE)
// SYSSIN DD DSN=&PFX.BBSAMP(DZJPDBIO) I/O SUMMARY BY DB/TS (D-I/O)
```

For detailed information about all the control statements in DZTBTRAC, see “Printing a Trace” in MainView for DB2 User Guide.

An example of the Accounting Summary Report that is produced when you submit this JCL is shown in Figure 125 on page 185. It shows accounting totals, followed by a trace summary by plan.
### Summary Statistics

- **Elapsed Time**: 7,554 ms 59.01
- **In Application**: 5,246 ms 40.98

### Buffer Pool Activity

<table>
<thead>
<tr>
<th>Activity</th>
<th>TOTAL</th>
<th>BP1</th>
<th>BP2</th>
<th>BP5</th>
<th>BP6</th>
<th>BP10</th>
</tr>
</thead>
<tbody>
<tr>
<td>GetPages</td>
<td>2,545</td>
<td>14</td>
<td>592</td>
<td>1</td>
<td>6</td>
<td>38</td>
</tr>
<tr>
<td>Sync Reads</td>
<td>320</td>
<td>11</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

### Normal Terminations

- **CPU (average) 1 21 s 5.302 ms 18 s 183 ms
- **CPU (total) 0 21 s 5.302 ms 18 s 183 ms
- **GetPages 27,541 6,885 27,203 56
- **DB at Inactive 0 Sync RDS 110 27 57 0
- **I/O Read 7,916 6,729 26,916 0
- **Abnormal Terminations 1 UPD/COMT 0 0 0

### Key Indicators

- **In Doubt Term** 0
- **BFR Hit Ratios** VP=2%, HP=100%

---

**Chapter 6 Printing views and reports**

Figure 125 Accounting Summary Report
All control of the input and formatting is done through a series of keywords in the input job stream (or in a PDS member) under ddname SYSIN. Keywords that apply to all requested reports can be specified following a label of GLOBAL. Keywords that apply to a specific report must be specified following the REPORT label. An example of two report requests is shown in Figure 126.

Figure 126  Sample report requests

<table>
<thead>
<tr>
<th>GLOBAL</th>
<th>TIME=1300-1500</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>SQL-TEXT and EXPLAIN FROM TSO</td>
</tr>
<tr>
<td>REPORT</td>
<td>REPORTID=DAILY1, LTRAC=YES, NEWPAGE=TRAN, POPUP=(SQL-TEXT, EXPLAIN, OPEN), CONNECT=TSO, TITLE1='DETAILS OF BIND AND EXPLAIN', TITLE2='WITH STATS FROM OPEN', DDN=OUTPUT1, WIDTH=WIDE</td>
</tr>
<tr>
<td></td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>FULL EXAMINATION OF CERTAIN SPECIAL TRANSACTIONS</td>
</tr>
<tr>
<td>REPORT</td>
<td>REPORTID=SPECIALS, LTRAC=YES, STRAC=SUMMARY, DTRAC=YES, POPUP=ALL, NEWPAGE=(TRAN, FIRSTEVENT), LEVEL=3, PLAN=(PAY+++++, ACCT1+++), CONNECT=IMSP, AUTHID=(USR1, USR5)</td>
</tr>
</tbody>
</table>

The GLOBAL keyword TIME limits the trace output to 1:00 P.M. to 3:00 P.M. for both reports.

The first report prints the one-line LTRAC entry on a new page for each transaction of the selected TSO threads and the pop-ups for SQL-TEXT, EXPLAIN, and OPEN after that one-line entry for each transaction. The report is written on ddname OUTPUT1.

The second report prints the one-line LTRAC entry, the STRAC accounting summary, and all DTRAC events and pop-ups for selected plans from two specific IMS users. The report is written on ddname SPECIALS.

For detailed information about each of the request keywords you can use, see “Printing a Trace” in MainView for DB2 User Guide.

Trace print from SMF records

This same batch utility (DZTBTRAC), shown in Figure 124 on page 184, can be used to print summary trace reports from DB2 accounting records written to GTF or SMF, either from an SMF history tape or from the live SMF data sets.

NOTE

No detail trace events are extracted from SMF or GTF. In addition, you cannot process SMF or GTF files in the same run with TLDs.
Performance Reporter reports

Performance Reporter is an offline analysis system that produces reports that can be used to evaluate DB2 system and application performance. These evaluations can be used for DB2 planning, forecasting, and performance management.

Several reports can be produced from Data Collector archive data sets or SMF extract files without loading the data into DB2 tables. For longer term storage and trend reporting, summarized data can be loaded to the performance data tables.

Also, the accounting data supports several levels of summarization. You can print any number of reports produced from the summary and detailed accounting tables, or statistics, buffer statistics per pool, and audit tables. Additional reports are available from the Data Collector, such as a storage report from IFCID 225.

When you want reports produced directly from the input data, and only the reports are needed, it is recommended that you use the Data Collector reports.

Data Collector reports

These reports can cover one day, several days, or just a short recent interval, depending on the number of archive files used as input. For immediate reporting, you can produce reports from the active Data Collector trace data sets.

You can review the available archive trace data sets from the Data Collector Administration panel (hyperlink from EZDB2), option D, Archive Directory.

Reports on accounting, statistics and audit data are available, as well as a DBM1 storage usage report (IFCID 225) and utility processing (IFCIDs 23-25).

The accounting reports can be defined with different summarization qualifiers.

Reports from DB2 tables

Printing workload reports is usually done from the DB2 tables of performance data that is supported by Performance Reporter. This data gives you long-term history and trending, as well as the full flexibility of SQL for defining your own reports in addition to the predefined set. See “Reports from DB2 Tables” in the MainView for DB2 Performance Reporter User Guide for more information.

Performance Reporter provides predefined reports using SQL statements, which can be run through a batch reporting facility (DPRREPT).
Predefined reports

The prepared reports included with Performance Reporter show DB2 system workload to help the DB2 performance analyst, capacity planner, or service manager solve specific DB2 problems. These reports are generated from accounting, statistics, and audit data.

With these reports, standard reporting can be run on a daily or weekly basis or both.

Daily run

The queries processed by the batch reporting program, DPRREPT, from the detail statistics (queries STxxx) and detail accounting (queries ACxxxx) tables are set up to produce a set of daily reports on the data loaded from the previous day (current date minus one). The sample JCL in BBSAMP named DPRREPT includes all distributed reports. Run these reports once, select those ACxxxx and STxxx reports you want to review daily, and create a job for this daily run.

Note: Generally, you will not want to load detail accounting records into table DMRACDTL, but only data summarized by hour or day into table DMRACSUM. In this case, delete the ACxxxx reports from the job and modify the date selection on the SAxxxx reports to produce your daily reports. The report results will be the same. Only the detailed exceptions report cannot be produced.

Weekly run

The queries processed by the batch reporting program, DPRREPT, from the summary accounting table (queries SAxxxx) are set up to produce a set of weekly reports on the data from the previous week (current date to current date minus seven). Select the SAxxxx reports you want to review weekly and create a job for this weekly run.

Note: You can also summarize the daily table to other tables at a higher level, such as weekly or monthly. The SAxxxx reports can also be used with these tables.

Any of the distributed SQL queries can be modified or used as a model to produce queries to satisfy ad hoc reporting needs.

Customizing your own reports

After you have used the Performance Reporter facilities to load data into DB2 tables, you may want to use your own reporting tools to create customized reports.

However, because Performance Reporter uses a generalized report generator to provide reporting and charting facilities, the entire report is defined by the SQL select statement used to read the data tables. Thus, it is very easy to create customized reports for a specific requirement. The SQL select statements used to produce the distributed reports and charts are available, within the DPRREPT environment, as models in tailoring new reports or charts.
The JXREPT program is designed to run any SQL SELECT statement against the Performance Reporter tables and report the results.

See “Customizing Reports” in the *MainView for DB2 Performance Reporter User Guide* for more information.

One example of a custom report you may want to create is to change the time interval for reporting statistics data.

The default statistics reports show statistics by the DATETIME stamp in each record. To provide a historical view, you may want to modify the distributed reports to show statistics grouped by a longer time interval. To simplify this type of reporting, the statistics tables include columns for several other date and time values, such as DATE, MONTH, DAY, TIME, and HOUR.

**NOTE**

Data is not spread across intervals.

An example of a report by DATE and HOUR is in BBPARM member STOVERH, as shown in Figure 127. See “Reporting Statistics Data by Time Interval” in the *MainView for DB2 Performance Reporter User Guide*.

**Figure 127  Statistics Overview Report by DATE and HOUR**

<table>
<thead>
<tr>
<th>DATE / HOUR</th>
<th>THREADS</th>
<th>COMMITS</th>
<th>SYNC</th>
<th>COMMIT</th>
<th>ABORTS</th>
<th>SQL</th>
<th>CONTROL</th>
<th>SQL</th>
<th>DEFINIT</th>
<th>GETPAGES</th>
<th>PAGE</th>
<th>READ</th>
<th>WRITE</th>
<th>LOADS</th>
<th>CALLS</th>
<th>LOCK</th>
<th>SUSPEND</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002-09-01 00</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2002-09-01 01</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2002-09-01 02</td>
<td>8</td>
<td>0.6</td>
<td>0.5</td>
<td>0.1</td>
<td>1.2</td>
<td>2.2</td>
<td>0.0</td>
<td>0.0</td>
<td>0</td>
<td>367.7</td>
<td>176.7</td>
<td>15.7</td>
<td>1.3</td>
<td>1.3</td>
<td>4.0</td>
<td>0.0</td>
<td>0</td>
</tr>
<tr>
<td>2002-09-01 03</td>
<td>3</td>
<td>0.3</td>
<td>1.0</td>
<td>0.0</td>
<td>0.6</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0</td>
<td>64.6</td>
<td>30.6</td>
<td>1.6</td>
<td>4.0</td>
<td>0.0</td>
<td>2.0</td>
<td>0.0</td>
<td>0</td>
</tr>
<tr>
<td>2002-09-01 04</td>
<td>1</td>
<td>0.0</td>
<td>1.0</td>
<td>0.0</td>
<td>253.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0</td>
<td>528.0</td>
<td>0.0</td>
<td>15.0</td>
<td>0.0</td>
<td>2.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0</td>
</tr>
<tr>
<td>2002-09-01 05</td>
<td>1</td>
<td>2.0</td>
<td>0.0</td>
<td>0.0</td>
<td>1.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0</td>
<td>17.3</td>
<td>0.0</td>
<td>4.8</td>
<td>0.0</td>
<td>0.2</td>
<td>0.0</td>
<td>0.0</td>
<td>0</td>
</tr>
<tr>
<td>2002-09-01 06</td>
<td>14</td>
<td>1.0</td>
<td>0.0</td>
<td>0.0</td>
<td>1.0</td>
<td>0.8</td>
<td>0.0</td>
<td>0.0</td>
<td>0</td>
<td>17.3</td>
<td>0.0</td>
<td>4.8</td>
<td>0.0</td>
<td>0.2</td>
<td>0.0</td>
<td>0.0</td>
<td>0</td>
</tr>
<tr>
<td>2002-09-01 07</td>
<td>10</td>
<td>0.6</td>
<td>0.7</td>
<td>0.0</td>
<td>1.4</td>
<td>1.5</td>
<td>0.0</td>
<td>304.6</td>
<td>168.1</td>
<td>4.7</td>
<td>2.4</td>
<td>0.0</td>
<td>3.4</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0</td>
</tr>
</tbody>
</table>
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