Statement Execution Statistics Maintenance

This function is used to obtain statistical information on which statement lines of invoked Natural objects were executed. The function also provides information on how often an object was invoked and how often a statement line was executed.

Statement execution statistics can be used for the following purposes:

- To detect dead (never gets executed) programming code in an application;

- To estimate the coverage of an application test (how many statement lines have not been executed at least once for testing);

- To locate frequently executed code segments that could have an impact on the application's performance.

▶ **To invoke the statement execution statistics maintenance function**

- In the **Debug Main Menu**, enter function code X.

  Or:
  Enter the following direct command:

  ```
  xs
  ```

  The **Statement Execution Statistics Maintenance** menu is displayed.

The functions provided in the **Statement Execution Statistics Maintenance** menu are explained in the following section whereas all print functions are described in *Print Statements*.

- Set Test Mode ON/OFF

- Set Statement Execution Statistics ON/OFF/COUNT

- Delete Statement Execution Statistics

- Display Statement Execution Statistics

- Print Statements

Set Test Mode ON/OFF

See the section *Switch Test Mode On and Off*.

Set Statement Execution Statistics ON/OFF/COUNT

This function is used to activate statistics about executed statement lines of Natural objects.

This section covers the following topics:

- Setup Options

- Activate and deactivate Statistics

Setup Options

When executing a Natural object with **statement execution statistics** set to ON or COUNT, all statement lines executed within a specific object are listed in a statistical report.

With the option ON, the debugger only retains whether a specific statement line was executed or not; with the option COUNT, it counts how often a statement line was executed. You can specify a library and an object name to restrict statement execution statistics to the desired Natural objects. The default is to collect statistics for all objects of the current library. Asterisk (*) notation is possible.

If you switch statement execution statistics from ON to COUNT or vice versa, existing statistics are not affected, that is, their status of ON or COUNT remains.

The statistical data collected is stored in the debug buffer. The amount of storage that is required to store statistical information for a Natural object is approximately

(number of source lines) / 8 + 100 bytes with **statement execution statistics** set to ON and
(number of source lines) * 4 + 100 bytes with **statement execution statistics** set to COUNT.

If you modify a Natural object by inserting or deleting lines and you do not renumber the object lines before you STOW it, the amount of storage required for the object's statistics may increase. To avoid this, set **Auto Renumber** to Y (Yes) in your editor profile (see *Editor Profile* in the *Editors* documentation), or use the system command CATALL (see the *System Commands* documentation) with the **Renumber source-codes lines** option enabled (this is the default).

You can use the debugger command PROFILE (see *Navigation and Information Commands*) to limit the size of the debug buffer. With **statement execution statistics** set to COUNT, no statement execution statistics are collected for objects with more than 8000 statement lines.

Statement execution statistics are part of the debug environment; therefore, they are affected by the direct commands SAVE ENVIRONMENT and LOAD ENVIRONMENT (see also the section *Debug Environment Maintenance*).

Activate and deactivate Statistics

This section provides instructions for activating or deactivating statement execution statistics.

You can specify a library and/or an object name to restrict statement execution statistics to the desired Natural objects. The default is to collect statistics for all objects of the current library. Asterisk (*) notation is possible.

▶ **To activate statement execution statistics**

- In the **Statement Execution Statistics Maintenance** menu, enter function code S, the name of a library and/or the name of an object. In the **State** field, change the value to ON.

  Or:
  Enter one of the following direct commands:

  ```
  SET XSTATISTICS ON library (object)
  ```

  or

  ```
  SET XSTATISTICS COUNT library (object)
  ```

  See also the syntax of SET in *Command Summary and Syntax*.

If you do not specify a library and/or an object, the statistics data about all objects in your current library are activated.

▶ **To deactivate statement execution statistics**

- In the **Statement Execution Statistics Maintenance** menu, enter function code S, the name of a library and/or the name of an object. In the **State** field, change the value to OFF.

  Or:
  Enter the following direct command:

  ```
  SET XSTATISTICS OFF library (object)
  ```

  See also the syntax of SET in *Command Summary and Syntax*.

If you do not specify a library and/or an object, the statistics data about all objects in your current library are deactivated.

Delete Statement Execution Statistics

▶ **To delete statement execution statistics**

- In the **Statement Execution Statistics Maintenance** menu, enter function code C and the name of a library and/or the name of an object.

  Or:
  Enter the following direct command:

  ```
  DELETE XSTATISTICS library (object)
  ```

See also the syntax of DELETE in *Command Summary and Syntax*.

If you do not specify a library and/or an object, the statistics data about all objects in your current library are deleted.

Display Statement Execution Statistics

This function invokes a screen with a list of the specified statement execution statistics.

▶ **To invoke the List Statement Execution Statistics screen**

1. In the **Statement Execution Statistics Maintenance** menu, enter function code D.

   Or:
   Enter the following direct command:

   ```
   DISPLAY XSTATISTICS
   ```

   The **List Statement Execution Statistics** screen is displayed:

   ```
   16:02:01                  ***** NATURAL TEST UTILITIES *****              2002-02-15
   Test Mode ON           - List Statement Execution Statistics -     Object
                                                                                   All
   Co Object   Library  Type        DBID    FNR Obj.Called Exec Exec   %  Total No.
      *_____  *_____ _____                 n Times able uted     Executions
   __ TEST      SAG      Program      10    32          4   20   17  85         95
   __ MAP01     SAG      Map          10    32          6    2    2 100         12
   __ SPGM02    SAG      Subprogram   10    32          2    6    2  33          4
   __ SAGTEST1  SAG      Program      10    32          2   20   10  50         17
   __ DEBPGM    SAG      Program      10    32          1    6    6 100         34
   ```

   For each object, the following information is displayed:

   - the call frequency;

   - the number of executable statements;

   - the number of executed statements;

   - the percentage of executed statements as related to the total number of executable statements;

   - the total number of executed statements.

   A list entry is highlighted if data is missing or possibly inconsistent.

2. On the statistics list, you can mark an item with a line command for further processing:

Line Command	Explanation
DE	Deletes statement execution statistics as described above.
DS	Displays all statement lines.
DX	Displays executed statement lines only.
DN	Displays non-executed statement lines only.
I	Displays information on the cataloged object and errors.
PS	Prints all statement lines.
PX	Prints executed statement lines only.
PN	Prints non-executed statement lines only.

For further information on print functions, see *Print Statements*.

The following section describes the screens, which can be invoked with the display commands:

- Display All Statement Lines

- Display Executed Statement Lines

- Display Non-Executed Statement Lines

Display All Statement Lines

The **Display Statement Lines** screen shows the object source and indicates whether or not a statement line has been executed.

▶ **To invoke the Display Statement Lines screen**

- On the **List Statement Execution Statistics** screen, mark an entry with the line command DS.

  Or:
  Enter the following direct command:

  ```
  DISPLAY STATEMENT library (object)
  ```

See also the syntax of DISPLAY in *Command Summary and Syntax*.

The **Display Statement Lines** screen appears. If **statement execution statistics** has been set to COUNT, the execution frequency of the statement line is displayed as shown in the example screen below:

```
16:04:01                ***** NATURAL TEST UTILITIES *****              2002-02-15
Test Mode ON               - Display Statement Lines -         Object SAGTEST

Line Source                                                               Count
0200   RD1. READ EMPLOYEES-VIEW BY NAME                                       2
0210       STARTING FROM #NAME-START THRU #NAME-END
0220 *
0230     IF LEAVE-DUE >= 20                                                   1
0240       PERFORM MARK-SPECIAL-EMPLOYEES                          not executed
0250     ELSE                                                      not executed
0260       RESET #MARK                                                        1
0270     END-IF
0280 *
0290     RESET #MAKE #MODEL                                                   1
0300     CALLNAT 'SPGM02' PERSONNEL-ID #MAKE #MODEL                           1
0310 *
0320     WRITE TITLE / '*** PERSONS WITH 20 OR MORE DAYS LEAVE DU             1
0330       / '***    ARE MARKED WITH AN ASTERISK        ***' //
0340     DISPLAY   '//N A M E' NAME                                           2
```

If no unique object has been specified, the **List Statement Execution Statistics** screen is displayed.

Display Executed Statement Lines

The **Display Executed Statement Lines** screen corresponds to the **Display Statement Lines** screen, but only the statement lines that have been executed are displayed.

▶ **To invoke the Display Executed Statement Lines screen**

- On the **List Statement Execution Statistics** screen, mark an entry with the line command DX.

    Or:
    Enter the following direct command:

    ```
    DISPLAY EXEC library (object)
    ```

    See also the syntax of DISPLAY in *Command Summary and Syntax*.

    If no unique object has been specified, the **List Statement Execution Statistics** screen is displayed.

Display Non-Executed Statement Lines

The **Non-Executed Statement Lines** screen corresponds to the **Display Statement Lines screen**, but only the statement lines that have not been executed are displayed.

▶ **To invoke the Display Non-Executed Statement Lines screen**

- On the **List Statement Execution Statistics** screen, mark an entry with the line command DN.

    Or:
    Enter the following direct command:

```
    DISPLAY NOEXEC library (object)
```

See also the syntax of DISPLAY in *Command Summary and Syntax*.

If no unique object has been specified, the **List Statement Execution Statistics** screen is displayed.

Print Statements

With the print functions, you can directly route a generated list of statement execution statistics to a printer or download the list to a PC. You define a printer as the output device on the **User Profile** screen of the debugger. Use the debugger command PROFILE (see the section *Navigation and Information Commands*) to invoke this screen.

If you do not specify a library name, the library where you are currently logged on is assumed by default.

As indicated under *Print Options* below, to invoke one of the print functions, you can either enter a function code in the **Statement Execution Statistics Maintenance** menu, enter a line command on the **Display Statement Lines** screen, or enter a direct command.

Print Options

Print Function	Function Code	Line Command	Direct Command
Print statement execution statistics	1		PRINT XSTATISTICS *library (object)*
Print all statements	2	PS	PRINT STATEMENT *library (object)*
Print executed statements	3	PX	PRINT EXEC *library (object)*
Print non-executed statements	4	PN	PRINT NOEXEC *library (object)*

See also the syntax of PRINT in the section *Command Summary and Syntax*.

Related Topics:

- *Example of a PC Download* in *Print Objects* in the section *Call Statistics Maintenance*

- *Example of Generating and Printing Statistics in Batch* in the section *Batch Processing*