

NOCSTAT Command

For programs optimized with the Natural Optimizer Compiler, certain statements can be directly converted into machine code when cataloged. As a result, when executing the optimized objects with Natural at runtime, the performance can be improved considerably.

The NOCSTAT command analyses cataloged programming objects and provides statistical information to help decide whether program statements benefit from optimization with the Natural Optimizer Compiler and, if so, to what extent they can be optimized.

If a program is cataloged (STOW, CATALOG), the Natural compiler generates an internal (pseudo) object code based on the statements in the source program. In most cases, one source statement is transformed into one pseudo-code instruction. However, for complex statements, such as FOR and REPEAT, several pseudo-code instructions are generated. The NOCSTAT analyses are based on the generated pseudo-code instructions. Therefore, the number of statements indicated in the statistical reports may exceed the number of statements in the source program.

This chapter covers the following topics:

- Invoking NOCSTAT
 - Generating Reports
 - Report Formats
 - Batch Execution
-

Invoking NOCSTAT

To invoke the NOCSTAT command

- Enter the direct command NOCSTAT.

The main NOCSTAT screen is displayed:

```

14:02:01          ***** NATURAL NOCSTAT COMMAND *****          2000-09-04

Name ..... _____
Library ..... SAGTEST_

NOCable Objects only .. _

Output Report ..... X Statement Category
                   _ Statement Type
                   _ Code Profile

Output Destination .... X Screen
                   _ CSV to Work File 1
                   _ XML to Work File 1
                   with XSL _____

Progress Control ..... X

Command ==>
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      Help           Exit                                           Canc
    
```

To obtain field-specific help information, either enter a question mark in the relevant field and press ENTER, or place the cursor in the field and press PF1. Press PF3 to exit NOCSTAT.

Generating Reports

You can generate statistical reports for a single program or a set of programs. If you analyze more than one program at a time, the reports are produced in series. When you have finished looking at one report, press ENTER to view the next report.

The main NOCSTAT menu provides the following options:

Field	Explanation
Name	Enter a name or a range of names to specify the program(s) you want to examine:
	<i>value</i> is any combination of one or more characters.
	<i>value</i> Single program.
	* All programs.
	<i>value</i> * All programs whose names begin with <i>value</i> .
	<i>value</i> > All programs whose names are greater/equal <i>value</i> .
<i>value</i> < All programs whose names are less/equal <i>value</i> .	
Library	Enter the name of a library or specify a range; the same applies as described for the Name field above.
	The current library is the default.

Field	Explanation
NOCable Objects only	<p>Mark this option to exclude programs already compiled with the Natural Optimizer Compiler.</p> <p>Otherwise, the NOCSTAT command selects all Natural programs specified in the Name and Library fields by default, including NOC-compiled programs.</p>
Output Report	<p>Mark any of the options to select statements by category, type or code profile.</p> <p>See <i>Statement Category</i>, <i>Statement Type</i> and <i>Code Profile</i> below.</p>

Field	Explanation	
Output Destination	Mark any of the following options to determine the output format and destination:	
	Screen	Online display.
	CSV to Work File 1	<p>Generates spreadsheets with comma-separated values. Use the file extension <code>.csv</code> to write the work file directly to your PC for further processing.</p> <p>You can only route reports to a PC if Entire Connection is installed.</p>
	XML to Work File 1	<p>Generates XML documents. Use the file extension <code>.xml</code> to write the work file directly to your PC for further processing.</p> <p>If a value is entered in the field "with XSL", a processing instruction is added at the top of the XML output document:</p> <pre><?xml-stylesheet type="text/xsl" href="value" ?></pre> <p>The <i>value</i> entered should be the absolute or relative url of the style sheet, for example:</p> <pre>nocstat.xsl</pre> <p>or</p> <pre>http://natural.software-ag.de/nocstat.xsl</pre> <p>The processing instruction causes the document to be transformed according to the given style sheet when it is viewed by an XSLT-capable browser or transformed by a batch XSLT run. A typical use of this feature is to convert the output XML to an HTML page.</p> <p>There are two XSLT style sheets delivered with Natural as text members NOCSTLS1 and NOCSTLS2 in the Natural library SYSEXUEX in the FNAT system file.</p> <p>NOCSTLS1 provides formatting instructions for report type <i>Statement Category</i>, NOCSTLS2 for report type <i>Statement Type</i> as described below.</p> <p>Download the style sheets with file extension <code>.xsl</code> to the same directory in which the XML work files are stored.</p> <p>You can only route reports to a PC if Entire Connection is installed.</p>

Field	Explanation
Progress Control	Only applies to Work File 1 output destinations. If this option is marked, a brief message appears online for each program listed in the report generated.

Report Formats

You can choose between three output formats described below to display the statistics NOCSTAT provides for the statements analyzed. Different report layouts are produced for programs already optimized with the Natural Optimizer Compiler and for programs to be considered for optimization. The example reports below show the difference. Press PF3 to interrupt report processing and return to the NOCSTAT menu.

Below is information on:

- Statement Category
- Statement Type
- Code Profile

Statement Category

The statistical report generated with the option `Statement Category` lists various categories of statements with the corresponding number of occurrences and the total number of statements already optimized or suitable for optimization, depending on whether or not the program was optimized with the Natural Optimizer Compiler.

Example of NOC-Optimized Program:

14:07:17	***** NATURAL NOCSTAT COMMAND *****	2000-09-04
	Library SAGTEST Name NOCTEST1 Type Program	
	MCG Options: (ON,OVFLW,INDX,MIX,IO)	
Database Loop:	0	
Database Simple:	0	
SORT / WORK I/O:	29	
FOR / REPEAT:	0	
Screen / Printer:	59	
String Manipulation:	6	
Arith / Logical:	0	
Program Calls:	3	
Control Transfer:	49	
Block Start:	25	
Set Environment:	2	
System Functions:	0	
Miscellaneous:	0	
Total Statements:	949	
NOC optimized:	762 (Ratio: 80 %)	
Longest NOC Run:	180 Statements	

Example of Program without NOC Optimization:

14:13:01	***** NATURAL NOCSTAT COMMAND *****		2000-09-04
	Library SAGTEST Name NOCTEST2 Type Program		
	No NOC	NOCable	
	-----	-----	
Database Loop:	0	0	
Database Simple:	0	0	
SORT / WORK I/O:	0	0	
FOR / REPEAT:	0	5	
Screen / Printer:	57	0	
String Manipulation:	4	8	
Arith / Logical:	0	491	
Program Calls:	3	0	
Control Transfer:	19	69	
Block Start:	15	0	
Set Environment:	0	0	
System Functions:	0	0	
Miscellaneous:	0	0	
Total Statements:	672		
NOC optimizable:	573	(Ratio: 85 %)	
Longest NOC Run:	192	Statements	

Report Columns and Fields:

Column	Explanation
No NOC	Statements not suitable for optimization.
NOCable	Statements suitable for optimization.
Field	
Database Loop	The number of database statements that generate a processing loop, such as FIND and READ.
Database Simple	Database statements that do not generate a processing loop, such as STORE, UPDATE, DELETE and GET.
SORT / WORK I/O	SORT and work file statements.
FOR / REPEAT	Statements generating loops.
Screen / Printer	Screen and printer I/O, such as WRITE, DISPLAY and INPUT.
String Manipulation	String statements, such as EXAMINE and COMPRESS.
Arith / Logical	Arithmetic and logical statements, such as MOVE, COMPUTE and IF.
Program Calls	Transfer of control to a subroutine or subprogram, such as PERFORM, CALLNAT and FETCH.
Control Transfer	Jumps within the program, such as ESCAPE BOTTOM, FOR and REPEAT loops.

Column	Explanation
Block Start	Non-executed statements that demarcate code blocks, such as DEFINE SUBROUTINE and AT END. These statements are never optimized because they are never executed.
Set Environment	Statements that set the environment, such as SET CONTROL, SET GLOBALS and SET KEY.
System Functions	Statements, such as TOTAL, SUM, COUNT, MAX, MIN and *COUNT.
Miscellaneous	Pseudo-code statements not relevant for optimization and, therefore, ignored by the NOC.
Totals	
Total Statements	The total number of statements found in the program. This number may not correspond to the actual source statements as described in the introduction to NOCSTAT command above.
NOC optimized	For an optimized program, these are the actual pseudo-code statements (as described in the introduction to NOCSTAT command above) that have been NOC-optimized to machine code.
NOC optimizable	For non-optimized programs, this is the possible number of statements that could be optimized. The figure may be slightly higher than the actual number, since certain factors are not considered in the NOCSTAT program. For example, a SUBSTRING statement that has more than four arrays will be indicated as "optimizable" though it will not be optimized.
Ratio	Relation between Total Statements and NOC-optimized statements or Total Statements and NOC-optimizable statements in percent.
Longest NOC Run	NOC-optimized program: The number of contiguous optimized statements - the fewer fragment sequences, the better the performance. Non-optimized program: The number of contiguous statements to be expected if the program were optimized.

Statement Type

The statistical report generated with the option "Statement Type" lists single statements with the corresponding number of occurrences and the NOC coding generated for optimized objects.

Example of NOC-Optimized Program:

```

09:21:45          ***** NATURAL NOCSTAT COMMAND *****          2000-09-06
                Library SAGTEST Name NOCTEST1 Type Program

Statement          Number
-----
DB AT CONDITION          6
READ/WRITE WORK FILE    29
EXAMINE                 6
WRITE                   51
INPUT                   3
NEWPAGE                 2
REINPUT                 3
FIND                    1
READ                    2
NOC CODE                 760
BLOCK START             18
ON ERROR                1
END                     1
STOP                    2
RETURN                  3
RETURN INLINE           15
ESCAPE ROUTINE          3
ESCAPE ROUTINE IMMEDIATE 1
MORE
    
```

Example of Program without NOC Optimization:

```

09:23:15          ***** NATURAL NOCSTAT COMMAND *****          2000-09-06
                Library SAGTEST Name NOCTEST2 Type Program

Statement          No NOC   NOCable
-----
DB AT CONDITION          6         0
MOVE/COMPUTE/ASSIGN      0       371
EXAMINE                  4         0
COMPRESS                 0         7
WRITE                    47        0
INPUT                    2         0
NEWPAGE                  2         0
REINPUT                  6         0
FIND                     1         0
READ                     1         0
HISTOGRAM                1         0
ELSE/CLOSE LOOP          0       55
LOOPEND FOR/REPEAT       0         5
BLOCK START              8         0
ON ERROR                 1         0
END                      1         0
STOP                     2         0
RETURN                   2         0
MORE
    
```

Code Profile

The statistical report generated with the option "Code Profile" displays contiguous sequences of statements grouped by categories in a source program suitable for optimization, or lists the NOC coding generated for an optimized program. Occurrences are highlighted.

Example of NOC-Optimized Program:

```

09:59:04          ***** NATURAL NOCSTAT COMMAND *****          2000-09-06
                   Library SAGTEST  Name NOCTEST1 Type Program

Line  Statement
-----  -----
0000  ON ERROR
0000  MCG OPTIONS
0045  MCG OPTIONS
0050  NOC CODE
0050  NOC CODE
0050  NOC CODE
0050  NOC CODE
1110  SET KEY
1140  NOC CODE
1140  NOC CODE
1145  NOC CODE
1145  NOC CODE
1150  NOC CODE
1150  NOC CODE
1155  NOC CODE
1155  NOC CODE
1160  NOC CODE
1160  NOC CODE
MORE

```

Example of Program without NOC Optimization:

```

10:01:36          ***** NATURAL NOCSTAT COMMAND *****          2000-09-06
                   Library SAGTEST  Name NOCTEST2 Type Program

Line  Statement
-----  -----
0000  ON ERROR
0000  MCG OPTIONS
0100  MOVE/COMPUTE/ASSIGN      <-- NOCable
0100  MOVE/COMPUTE/ASSIGN      <-- NOCable
0100  MOVE/COMPUTE/ASSIGN      <-- NOCable
1920  MOVE/COMPUTE/ASSIGN      <-- NOCable
1920  FOR                       <-- NOCable
1920  MOVE/COMPUTE/ASSIGN      <-- NOCable
1920  FOR/REPEAT IF            <-- NOCable
1930  COMPRESS                  <-- NOCable
1940  LOOPEND FOR/REPEAT        <-- NOCable
1960  MOVE/COMPUTE/ASSIGN      <-- NOCable
1960  MOVE/COMPUTE/ASSIGN      <-- NOCable
1970  MOVE/COMPUTE/ASSIGN      <-- NOCable
1970  MOVE/COMPUTE/ASSIGN      <-- NOCable
1980  MOVE/COMPUTE/ASSIGN      <-- NOCable
1980  MOVE/COMPUTE/ASSIGN      <-- NOCable
1990  MOVE/COMPUTE/ASSIGN      <-- NOCable
MORE

```

Batch Execution

Below are job examples for processing NOCSTAT reports in batch mode. After job execution, the work files generated can be transferred from host to PC for further processing with standard transfer tools.

Example Job z/OS:

```
//NOCBATCH JOB (NOC,,,30),CLASS=K,MSGCLASS=X                00000100
//NATEX EXEC PGM=NATBAT31,REGION=6200K,PARM=('IM=D')          00000200
//STEPLIB DD DISP=SHR,DSN=TESTNAT.LOAD                      00000300
//CMPRINT DD SYSOUT=X                                       00000400
//CMWKF01 DD DSN='NOC.NOCSTAT.OUT',DISP=(NEW,CATLG),        00000500
                    SPACE=(CYL,(1,1)),UNIT=SYSDA,VOL=SER=SAG001 00000600
//SYSOUT DD SYSOUT=X                                        00000700
//CMSYNIN DD *                                             00000800
NOCSTAT                                                    00000900
*,library,X,,,X                                           00001000
.                                                            00001100
FIN                                                         00001200
/*                                                          00001300
```

Example Job z/VSE:

```
* $$ JOB JNM=NOCTST,CLASS=5,DISP=D
* $$ LST CLASS=Q,DISP=D
// JOB NOCTST
// ASSGN SYS001,DISK,VOL=xxxxxxx,SHR
// DLBL CMWKF01,'NOCSTAT.FILE.ONE',0
// EXTENT SYS001,xxxxxxx,1,0,1,150
// EXEC NAT234BA,SIZE=NAT314BA,PARM='SYSRDR'
IM=D,OBJIN=R
/*
ADARUN DBID=185
/*
NOCSTAT
*;library;X; ; ; ;X;
.
FIN
/*
/&
```

Example Job BS2000/OSD:

```
/.BAT234 LOGON NAT,1
/      SYSFILE SYSOUT=NAT314.OUT
/      SYSFILE SYSLST=NAT314.LST
/SKIP  .NOP000
=====
NAME      : E.NAT314          S T A R T   B A T C H   N A T U R A L
=====
/.NOP000 REMARK
/      OPTION  DUMP=YES,MSG=FL
/      FILE    NOCSTAT.OUT,LINK=W01
/      FILE    ADAUSER  ,LINK=DDCARD
/      FILE    $SAG.ADA623.MOD          ,LINK=BLSLIB00
/      SYSFILE TASKLIB=MOD234
/      SYSFILE SYSDTA=(SYSCMD)
/      FILE    NAT314.CMPRMIN,LINK=CMPRMIN
/      DCLJV   NATJV1,LINK=*NATB2JV
/      FILE    $NAT.ADALNK.PARMS,LINK=DDLNKPAR
```

```
/      REMARK  %%%%%%%%%% BATCH-PHASE  %%%%%%%%%%
/      EXEC    NAT314
NOCSTAT
*,ADE,X, , , ,X, , ,X
.
FIN
```