

Optimizer Usage Examples

The examples below illustrate when to use the Natural Optimizer Compiler to the best advantage and to give an indication of its power:

This chapter covers the following topics:

- Example 1 - No Improvement
- Example 2 - Considerable Improvement
- Examples 3 and 4 - CPU Usage

Example 1 - No Improvement

Nothing would be gained by using the Natural Optimizer Compiler for the following program:

```
DEFINE DATA LOCAL
  1 EMPLOYEES VIEW OF EMPLOYEES
    2 JOB-TITLE
    2 BIRTH
    2 NAME
  END-DEFINE
  FIND EMPLOYEES WITH JOB-TITLE = 'PROGRAMMER' OR = 'ANALYST'
                                OR = 'PROGRAMMER/ANALYST'
                                OR = 'SYSTEM ANALYST'
  DISPLAY JOB-TITLE BIRTH NAME
  END-FIND
  END
```

Example 2 - Considerable Improvement

If the following program is compiled with the Natural Optimizer Compiler, you will see a performance improvement of approximately 30 % (that is a 30 % reduction in CPU load). The program performs a statistical analysis of the age of IT-employees. Optimized statements are indicated in boldface.

In this example, NOC increases the object size by 20.5 %, due to 952 bytes of additional machine code:

Profile Parameter Setting	Size in Buffer Pool	Size of Machine Code Generated by NOC
OPT=NODBG	5768	952
OPT=OFF	4784	0

```
DEFINE DATA
  LOCAL
  1 EMPLOY VIEW OF EMPLOYEES
    2 JOB-TITLE      (A25)
    2 BIRTH          (D)
  1 I                (I1)  INIT <1>
  1 CDATE           (D)
  1 NUMB            (N4)
  1 SUMM            (P7.2)
```

```

1 SQUARE          (F8)
1 DEVI            (F8)
1 DEVIATION       (N3.4)
1 MEAN            (P2.3)
1 AGEDIS          (F8/1:70)
1 AGEMAX          (F8)
1 AGEH            (P3)
1 AGE             (P3)
1 AGEDAYS         (P15)
1 LINE            (A71/1:20)
1 REDEFINE LINE
  2 POINTS        (A1/1:20,0:70)
END-DEFINE
*
MOVE *DATX TO CDATE
*
FIND EMPLOY WITH JOB-TITLE = 'PROGRAMMER' OR = 'ANALYST'
  OR = 'PROGRAMMER/ANALYST' OR = 'SYSTEM ANALYST'
AGEDAYS:= CDATE - BIRTH
AGE:=AGEDAYS / 365
ADD 1 TO AGEDIS(AGE)          /* DISTRIBUTION
ADD 1 TO NUMB
ADD AGE TO SUMM
COMPUTE SQUARE = SQUARE + AGE * AGE
END-FIND
*
*****
* COMPUTE ESTIMATES
*****
*
COMPUTE DEVI = NUMB * SQUARE / (SUMM * SUMM) - 1
COMPUTE DEVIATION = SQRT(DEVI)
COMPUTE MEAN = SUMM / NUMB
*
*****
* GRAPHIC DISPLAY
*****
*
FOR I 1 70
  IF AGEDIS(I) > AGEMAX MOVE AGEDIS(I) TO AGEMAX
  END-IF
END-FOR
FOR I 1 70
  COMPUTE AGEDIS(I) = AGEDIS(I) * 20 / AGEMAX
END-FOR
FOR I 1 70
  COMPUTE AGEH = 21 - AGEDIS(I)
  IF AGEH < 21 MOVE '*' TO POINTS(AGEH:20,I)
  END-IF
END-FOR
*
*****
* COMPLETE GRAPHIC DISPLAY
*****
*
MOVE '! ' TO POINTS(*,0)
WRITE TITLE LEFT
  AGEMAX(EM=999) 20X 'DISTRIBUTION OF IT-EMPLOYEES BY AGE'
WRITE NOTITLE NOHDR
LINE(*) /
'0-----10-----20-----30-----40-----50-----60-----'
/ 'MEAN='

```

Examples 3 and 4 - CPU Usage

The following program illustrates the difference in CPU usage, depending on the options you select when compiling the program. The table below lists the CPU usage in seconds and percent. The figures provided in the table were determined during a test run in an IBM z/OS environment. They can only serve as general orientation, since absolute values vary depending on the hardware applied.

```

DEFINE DATA LOCAL
1 #I1      (I4) INIT <1>
1 #I2      (I4) INIT <2>
1 #J1      (I4) INIT <3>
1 #J2      (I4) INIT <4>
1 #F       (I4)
1 #ARR1    (N7/10,5)
1 #ARR2    (N5/10,5)
END-DEFINE
*
FOR #F = 1 TO 1000000
  MOVE #ARR1(#I1,#I2) TO #ARR2(#J1,#J2)
END-FOR
*
END

```

Option	CPU seconds	CPU percentage
OFF	8.78	100
ON	0.63	7.18
INDX	0.85	9.68
OVFLW	1.71	19.48
INDX , OVFLW	2.00	22.78
INDX , OVFLW , NODBG	1.61	18.34
INDX , OVFLW , NODBG , NOSGNTR	1.61	18.34
NODBG	0.44	5.01
NOSGNTR	0.63	7.18
NODBG , NOSGNTR	0.44	5.01

```

DEFINE DATA LOCAL
1 #I1      (P7) INIT <1>
1 #I2      (P7) INIT <2>
1 #J1      (N7) INIT <3>
1 #J2      (N7) INIT <4>
1 #K1      (I4) INIT <5>
1 #K2      (I4) INIT <6>
1 #F       (I4)
1 #FIELD1  (P5)
1 #FIELD2  (N5)
1 #FIELD3  (I2)
END-DEFINE
*
FOR #F = 1 TO 500000
*
  #FIELD1:= #I1 - #I2 + (13 * 10 / 5)

```

```
#FIELD2:= #J1 - #J2 + (13 * 10 / 5)
#FIELD3:= #K1 - #K2 + (13 * 10 / 5)
*
END-FOR
*
END
```

Option	CPU seconds	CPU percentage
OFF	18.61	100.00
ON	4.95	26.60
INDX	4.95	26.60
OVFLW	5.38	28.91
INDX , OVFLW	5.38	28.91
INDX , OVFLW , NODBG	5.26	28.26
INDX , OVFLW , NODBG , NOSGNTR	5.09	27.35
NODBG	4.79	25.74
NOSGNTR	4.81	25.85
NODBG , NOSGNTR	4.63	24.88
NODBG , NOSGNTR , ZD=OFF	4.51	24.23
NODBG , NOSGNTR , ZD=OFF , SIGNCHCK=OFF	4.41	23.70