

# 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:

- Example 1 - No Improvement through Optimization
  - Example 2 - Considerable Improvement through Optimization
  - Examples 3 and 4 - CPU Usage depending on the NOC Options set
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## 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:

	<b>Size in Buffer Pool</b>	<b>Size of Machine Code generated by NOC</b>
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=' MEAN 10X 'DEVIATION=' DEVIATION  
END
```

## 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 OS/390 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,NDBG	1.61	18.34
INDX,OVFLW,NDBG,NOSGNTR	1.61	18.34
NDBG	0.44	5.01
NOSGNTR	0.63	7.18
NDBG,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,NDBG	5.26	28.26
INDX,OVFLW,NDBG,NOSGNTR	5.09	27.35
NDBG	4.79	25.74
NOSGNTR	4.81	25.85
NDBG,NOSGNTR	4.63	24.88
NDBG,NOSGNTR,ZD=OFF	4.51	24.23
NDBG,NOSGNTR,ZD=OFF,SIGNCHCK=OFF	4.41	23.70