Effiziente Programme WS10/11

tuning stuff for fun and profit

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Warnings

- oprofile statt papiex
- Davids PC statt g0

oprofile

- low-overhead
- Performance Counter bei unseren Tests
- Profilbasierend (Systemweit)
- akkumulativ $\Rightarrow$ 1000 Durchläufe/Test

oprofile - Beispielsession

```
oprofile --start
./test shortest-path
oprofile -cl shortest-path
opannotate --source --assembly shortest-path
opcontrol --reset
```

oprofile - Beispielsession

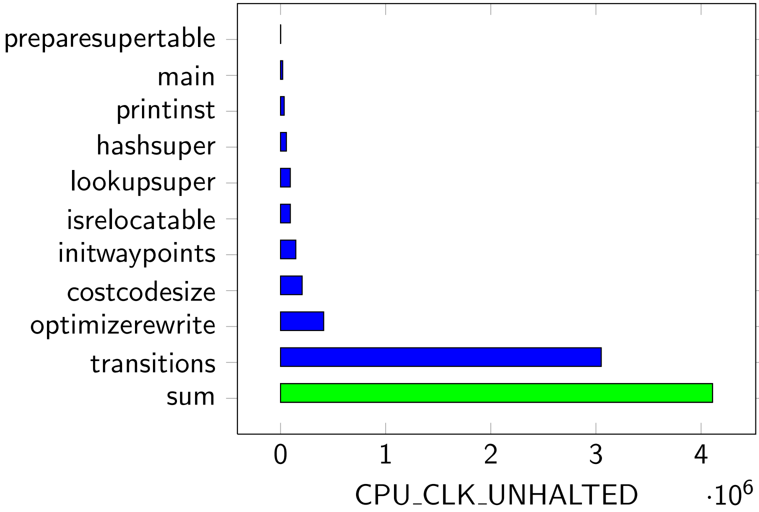
```
-------------------------------------------------------------------------------
1121706   92.6244   optimize_rewrite
  1121706   100.000   optimize_rewrite [self]
-------------------------------------------------------------------------------
78016      6.4421   cost_codesize
  78016      100.000   cost_codesize [self]
-------------------------------------------------------------------------------
11296      0.9328   main
  11296      100.000   main [self]
-------------------------------------------------------------------------------
7         5.8e-04   __libc_csu_init
  7          100.000   __libc_csu_init [self]
-------------------------------------------------------------------------------
1         8.3e-05   _init
  1          100.000   _init [self]
-------------------------------------------------------------------------------
```

oprofile - Beispielsession

```
1121706   92.6244   optimize_rewrite
  1121706   100.000   optimize_rewrite [self]
```

CPU_CLK_UNHALTED - unhalted cycles welche CPU in Funktion verbringt

Ursprungsprogramm



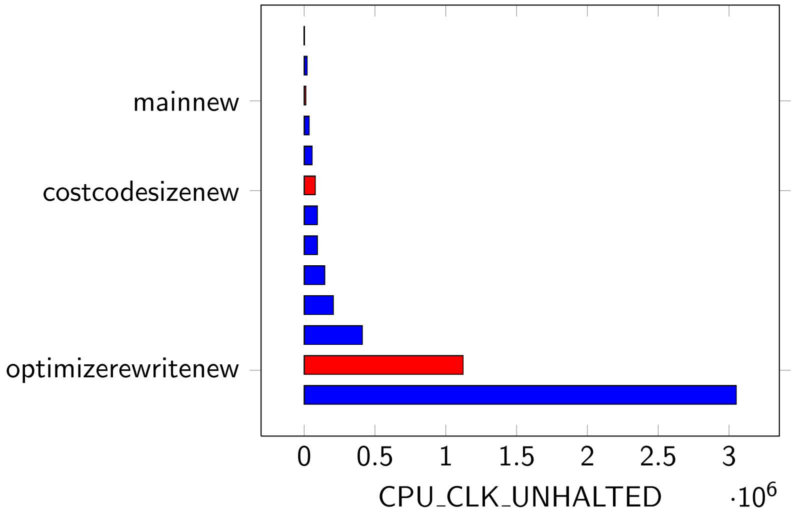
Ask not what you can do for your compiler

... ask your compiler what he can do for you.

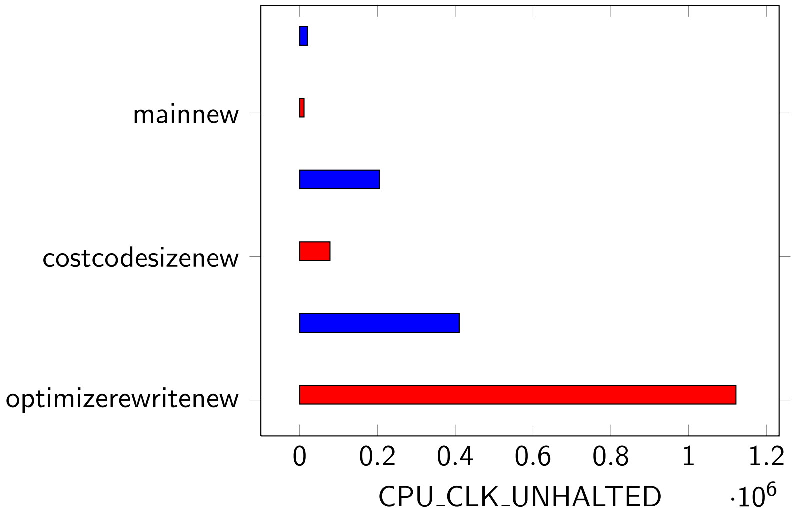
Ask not what you can do for your compiler

- -O3 statt -O0
- $\Rightarrow$ mass inlining
- $\Rightarrow$ unrolling
- $\Rightarrow$ a lot of other optimizations

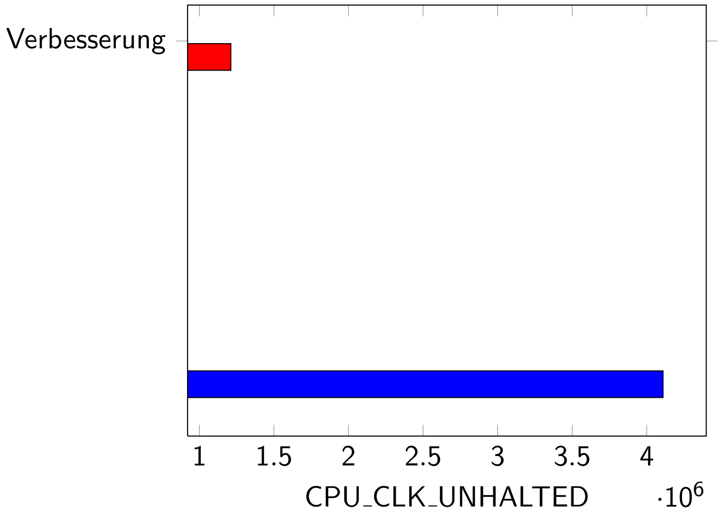
Ask not what you can do for your compiler



Ask not what you can do for your compiler



Ask not what you can do for your compiler



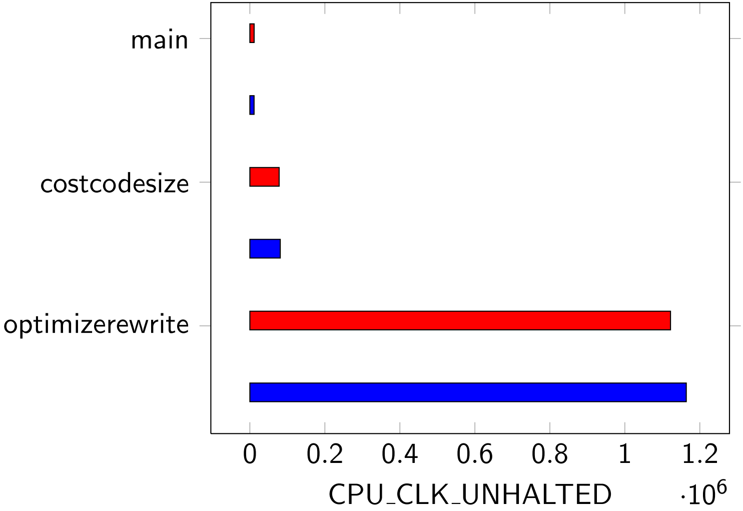
Ask not what you can do for your compiler

... but don't ask too much of him.

Ask not what you can do for your compiler

- -funroll-loops
- $\Rightarrow$ GCC unrolled Schleifen aggressiv
- $\Rightarrow$ Codesize größer
- $\Rightarrow$ Performance schlechter

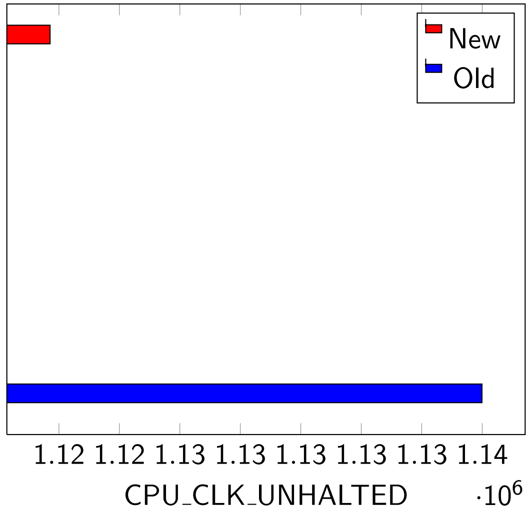
Ask not what you can do for your compiler



Lets actually do something

- ersetze ss_cost durch cost_codesize
- cost_codesize verschwindet komplett
- main und optimize_rewrite marginal besser

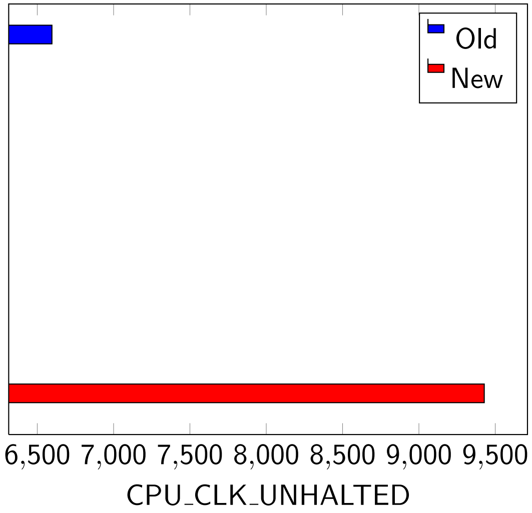
Lets actually do something



Lets actually do something

- Verbesserung main Schleife

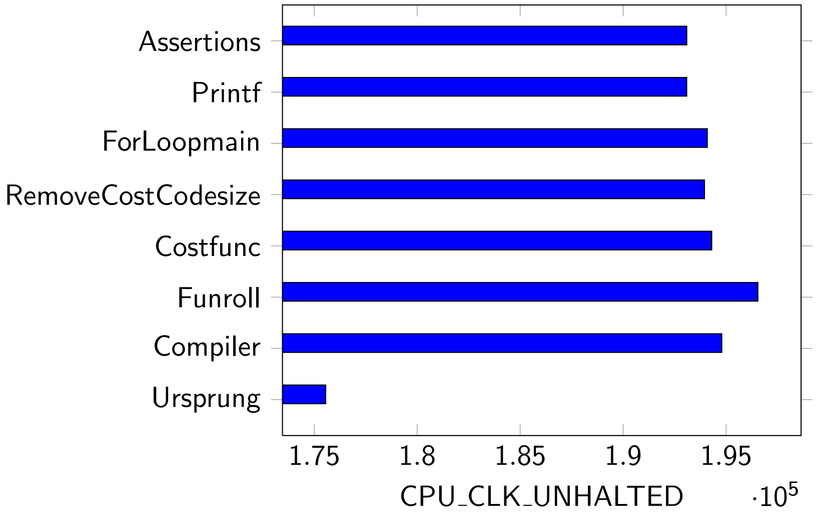
Lets actually do something



That's it?

- GCC leistet ganze Arbeit
- viele unserer anderen "Optimierungen" schlecht
- Codesize kann man noch verbessern

Codesize


Assertions
Printf
ForLoopmain
RemoveCostCodesize
Costfunc
Funroll
Compiler
Ursprung
1.75
1.8
1.85
1.9
1.95
CPU_CLK_UNHALTED
$\cdot 10^5$

papiex Endergebnisse

```
PAPI_TOT_CYC  .......4.27796e+08
PAPI_TOT_INS  .......5.30222e+08
PAPI_BR_MSP  .........1.28136e+06
PAPI_FP_OPS  .........487
```

Listing 1: "Ursprung"

```
PAPI_TOT_CYC  .......1.44674e+08
PAPI_TOT_INS  .......2.2851e+08
PAPI_BR_MSP  .........1.04732e+06
PAPI_FP_OPS  .........507
```

Listing 2: "Ursprung -O3"

```
PAPI_TOT_CYC  .......1.42435e+08
PAPI_TOT_INS  .......2.00493e+08
PAPI_BR_MSP  .........1.42997e+06
PAPI_FP_OPS  .........486
```

Listing 3: "Endergebnis"

Food for Thought

http://leto.net/docs/C-optimization.php#Compute-bound

http://people.redhat.com/drepper/cpumemory.pdf

http://www.fefe.de/dietlibc/diet.pdf

http://www.fefe.de/know-your-compiler.pdf