

Usando PIN framework instrumentation no SPEC 2006

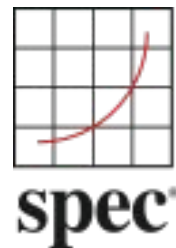
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Agenda

- 1- Introdução;
- 2- Pin e SPEC 2006;
- 3- Resultados do inscount;
- 4- Criação de uma nova pintool;
- 5- Resultado do media inst;
- 6- Referência;
- 7- Dúvidas.

Introdução

- Overview SPEC 2006



- Overview PIN



- Infra-estrutura



- Objetivos

Pintool e SPEC 2006

- Gerar executável da pintool desejada
 - Para o inscount, existe mais de um pintool

```
paulo@Carla:~/Documentos/PauloH/pin-3.0-76991-gcc-linux/source/tools/ManualExamples$ make obj-ia32/inscount2.so
g++ -DBIGARRAY_MULTIPLIER=1 -Wall -Werror -Wno-unknown-pragmas -D__PIN__=1 -DPIN_CRT=1 -fno-stack-protector -fno-exceptions -funwind-tables -fasynchronous-unwind-tables -fno-rtti -DTARGET_IA32 -DHOST_IA32 -DTARGET_LINUX -fabi-version=2 -I../..../source/include/pin -I../..../source/include/pin/gen -isystem /home/paulo/Documentos/PauloH/pin-3.0-76991-gcc-linux/extras/stlport/include -isystem /home/paulo/Documentos/PauloH/pin-3.0-76991-gcc-linux/extras/libstdc++/include -isystem /home/paulo/Documentos/PauloH/pin-3.0-76991-gcc-linux/extras/crt/include -isystem /home/paulo/Documentos/PauloH/pin-3.0-76991-gcc-linux/extras/crt/include/arch-x86 -isystem /home/paulo/Documentos/PauloH/pin-3.0-76991-gcc-linux/extras/crt/include/kernel/uapi -isystem /home/paulo/Documentos/PauloH/pin-3.0-76991-gcc-linux/extras/crt/include/kernel/uapi/asm-x86 -I../..../extras/components/include -I../..../extras/xed-ia32/include -I../..../source/tools/InstLib -O3 -fomit-frame-pointer -fno-strict-aliasing -c -o obj-ia32/inscount2.o inscount2.cpp
g++ -shared -Wl,--hash-style=sysv ../..../ia32/runtime/pincrt/crtbeginS.o -Wl,-Bsymbolic -Wl,--version-script=../..../source/include/pin/pintool.ver -fabi-version=2 -o obj-ia32/inscount2.so obj-ia32/inscount2.o -L../..../ia32/runtime/pincrt -L../..../ia32/lib -L../..../ia32/libext -L../..../extras/xed-ia32/lib -lpin -lxed ../..../ia32/runtime/pincrt/crtendS.o -lpin3dwarf -ldl -dynamic -nostdlib -lstlport-dynamic -ldynamic -lc -dynamic
paulo@Carla:~/Documentos/PauloH/pin-3.0-76991-gcc-linux/source/tools/ManualExamples$
```

Pintool e SPEC 2006

- Usando inscount pintool
 - Invoca o ./pin que está no diretório raiz onde o pin foi instalado, passando a pintool desejada e o programa a ser executado.

```
paulo@Carla:~/Documentos/PauloH/pin-3.0-76991-gcc-linux/source/tools/ManualExamples/obj-ia32$ ls inscount*.so
inscount0.so  inscount2.so
paulo@Carla:~/Documentos/PauloH/pin-3.0-76991-gcc-linux/source/tools/ManualExamples/obj-ia32$ ../../../../pin -t inscount2.so -- /bin/ls
inscount0.o  inscount0.so  inscount2.o  inscount2.so  inscount.out  mediainst.o  mediainst.so  pin.log
paulo@Carla:~/Documentos/PauloH/pin-3.0-76991-gcc-linux/source/tools/ManualExamples/obj-ia32$ cat inscount.out
Count 511936
paulo@Carla:~/Documentos/PauloH/pin-3.0-76991-gcc-linux/source/tools/ManualExamples/obj-ia32$
```

Pintool e SPEC 2006

- Source shrc
 - Carregar kit SPEC 2006

```
paulo@paulo:~/programs$ . ./shrc  
paulo@paulo:~/programs$
```

- Criar um arquivo de configuração
 - Permite configurar os parâmetro de execução do benchmark
 - ext
 - submit
 - use_submit_for_speed
 - Iterations
 - Variáveis de execução
 - Definir compiladores

Pintool e SPEC 2006

```
28 #####
29 # ia32 (32-bit) gcc 4.3, 4.4 and 4.6 config file
30 # Sample Config file for CPU2006
31 #####
32
33 tune          = base
34 basepeak      = yes
35 # Select and/or modify as needed
36 #ext          = gcc43-32bit
37 #ext          = gcc44-32bit
38 ext           = gcc46-32bit
39 output_format = asc,csv,html
40 flagsurl0     = ${top}/config/flags/Example-gcc4x-flags-revA.xml
41 flagsurl1     = ${top}/config/flags/Example-linux-platform-revA.xml
42
43 hw_avail      = Dec-9999
44 license_num   = 0
45
46 submit = /home/paulo/Documentos/PauloH/pin-3.0-76991-gcc-linux/pin -t /home/paulo/Documentos/PauloH/pin-3.0-76991-gcc-linux/inscount2.so
         o /home/paulo/programas/count_numbers_fp/${benchmark}_${workload}.out -- $command
47 |
48 use_submit_for_speed = 1
```

Pintool e SPEC 2006

```
70 default=default=default=default:
71 #####
72 #
73 # Compiler selection
74 #
75 #####
76 # NOTE: The path may be different if you use the compiler from
77 #       the gnu site.
78 CC      = /usr/bin/gcc
79 CXX     = /usr/bin/g++
80 FC      = /usr/bin/gfortran
```


Pintool e SPEC 2006

- Quando compilado cada benchmark, o config file é atualizado com os seus respectivos md5

```
156 __MD5__
157 400.perlbench=base=gcc46-32bit=default:
158 # Last updated Thu Sep 15 00:48:11 2016
159 optmd5=8c4687abad10f0fe52588da97420afb8
160 baggage=
161 compile_options=\
162 @eNqtUU9PgZAUV/dTNL1X4ryRsQRK3VCghEGiXghDWKrQmgImfnnvL2BjOqBebJn197/X9/jSUAjf5\
163 a1nxuoTyreNStCZo08WLLl09e0Yqey8Vrz4sdI0AYUFkQqNvlbHjwgtgXBcR6y9PTKwmxu40oyUiU\
164 6jB0qZ0udRDR2M8IiymEELMFxJWQeITBec3zlos9xM3NAh7XeUzme2H6cMovW9mroLwBYkJCLDTn\
165 gg5J5tyxKLHQF2IIaNS62K1vr7e69p3koc0hIdlkU9PEGgE2TI4SL/CeqC79JuGIxeLEdjjzfsx7n\
166 eKMaBPRxf+Hk3878YmpS7l7KontXQ0vdTBZ06gdfFPfSrP+WpEEC09noqz04VzdoxGXp8Buzr/gE\
167 XAu1wQ==
168 exemd5=e7be182acdb6388dccf40c51da22d529
```

Pintool e SPEC 2006

- Uso do comando runspec
 - Comando para executar benchmark
 - runspec --config=config_file.cfg benchmark

```
paulo@Carla:~/programas$ runspec --config=paulo_gcc_fp.cfg --size=ref --noreportable --iterations=1 --action=build fp
runspec v6674 - Copyright 1999-2011 Standard Performance Evaluation Corporation
Using 'linux-suse10-ia32' tools
Reading MANIFEST... 22481 files
Loading runspec modules.....
Locating benchmarks...found 31 benchmarks in 6 benchsets.
Reading config file '/home/paulo/programas/config/paulo_gcc_fp.cfg'
Running "specperl /home/paulo/programas/Docs/sysinfo" to gather system information.
Retrieving flags file (/home/paulo/programas/config/flags/Example-gcc4x-flags-revA.xml)...
Retrieving flags file (/home/paulo/programas/config/flags/Example-linux-platform-revA.xml)...
Benchmarks selected: 410.bwaves, 416.gamess, 433.milc, 434.zeusmp, 435.gromacs, 436.cactusADM, 437.leslie3d, 444.namd, 447.dealII, 450.sople
x, 453.povray, 454.calculix, 459.GemsFDTD, 465.tonto, 470.lbm, 481.wrf, 482.sphinx3, 998.specrand
Compiling Binaries
  Up to date 410.bwaves base gcc46-32bit default
  Up to date 416.gamess base gcc46-32bit default
  Up to date 433.milc base gcc46-32bit default
```

Resultados do inscount

- Essa pintool é responsável por contar o número de instruções de um programa

```
paulo@Carla:~/programas$ cd count_numbers
paulo@Carla:~/programas/count_numbers$ ls
400.perlbench_0.out  401.bzip2_5.out    403.gcc_7.out       445.gobmk_4.out     471.omnetpp_0.out
400.perlbench_1.out  403.gcc_0.out      403.gcc_8.out       456.hmmer_0.out     473.astar_0.out
400.perlbench_2.out  403.gcc_1.out      410.bwaves_0.out    456.hmmer_1.out     473.astar_1.out
401.bzip2_0.out      403.gcc_2.out      429.mcf_0.out       458.sjeng_0.out     483.xalancbmk_0.out
401.bzip2_1.out      403.gcc_3.out      445.gobmk_0.out     462.libquantum_0.out 999.specrand_0.out
401.bzip2_2.out      403.gcc_4.out      445.gobmk_1.out     464.h264ref_0.out
401.bzip2_3.out      403.gcc_5.out      445.gobmk_2.out     464.h264ref_1.out
401.bzip2_4.out      403.gcc_6.out      445.gobmk_3.out     464.h264ref_2.out
paulo@Carla:~/programas/count_numbers$ cat 400.perlbench_0.out
Count 1096503046051
paulo@Carla:~/programas/count_numbers$
```

Criação de uma nova pintool

- PIN disponibiliza uma API que permite a criação de novas pintools;
- Nova pintool mediainst
 - Calcular o tempo médio por instrução, em segundos;
 - Calcula o tempo total de instrução;
 - Calcula o número de instruções do programa.
- Gerar executável da pintool

```
paulo@Carla:~/Documentos/PauloH/pin-3.0-76991-gcc-linux/source/tools/ManualExamples/obj-ia32$ ls  
inscount0.o  inscount0.so  inscount2.o  inscount2.so  inscount.out  mediainst.o  mediainst.so  pin.log  
paulo@Carla:~/Documentos/PauloH/pin-3.0-76991-gcc-linux/source/tools/ManualExamples/obj-ia32$
```

Resultado do media inst

- Usando a pintool criada para contar o tempo médio de instruções em 5 benchmarks do SPEC 2006

```
paulo@Carla:~/programas$ cd count_media/
paulo@Carla:~/programas/count_media$ ls
400.perlbench_0.out  401.bzip2_1.out  401.bzip2_5.out  403.gcc_3.out  403.gcc_7.out  450.soplex_1.out
400.perlbench_1.out  401.bzip2_2.out  403.gcc_0.out  403.gcc_4.out  403.gcc_8.out
400.perlbench_2.out  401.bzip2_3.out  403.gcc_1.out  403.gcc_5.out  434.zeusmp_0.out
401.bzip2_0.out      401.bzip2_4.out  403.gcc_2.out  403.gcc_6.out  450.soplex_0.out
paulo@Carla:~/programas/count_media$ cat 403.gcc_1.out
MediaInst 1.32851e-09
paulo@Carla:~/programas/count_media$
```

Referências

- PIN documentation:
 - <https://software.intel.com/sites/landingpage/pintool/docs/67254/Pin/html/>
- PIN tutorial:
 - <http://www.cs.du.edu/~dconnors/courses/comp3361/notes/PinTutorial>
- SPEC 2006 documentation:
 - <https://www.spec.org/cpu2006/docs/>

Dúvidas

