Indian Institute of Information Technology, Vadodara

Parallel Programming(CS403)

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Lab 06

Submission Date - October 17, 2016 **Deadline** - Oct 10, 11:59 PM

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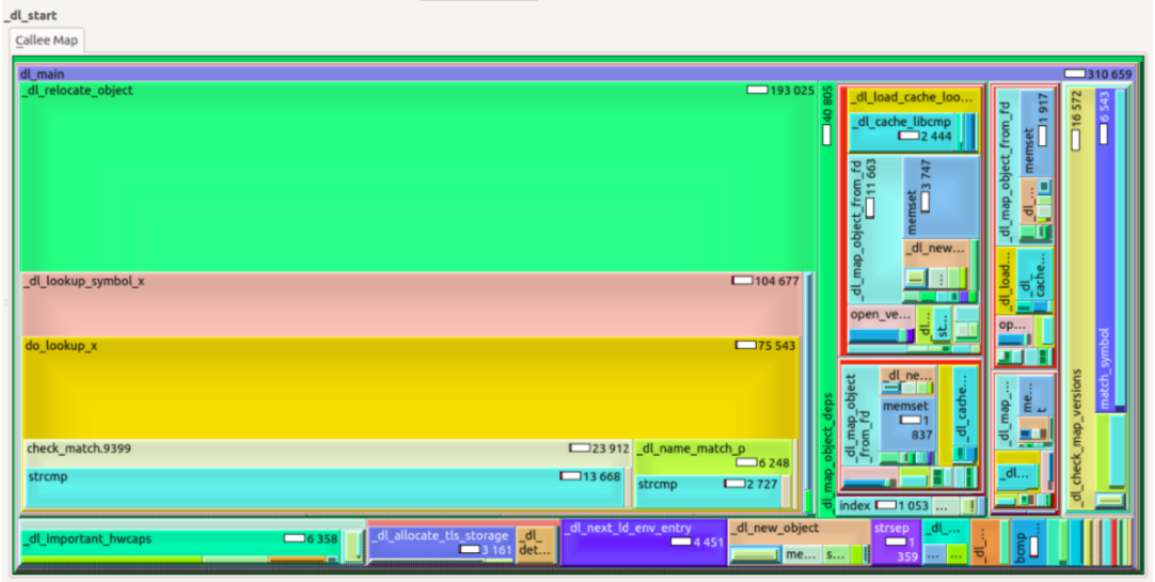
1. In the Callgrind tutorial link and the attached file "Lab6_callgrind.pdf" familarize yourself with the callgrind tool.

2. For the lab exercise, refer to the attached valgrind_eg.c.

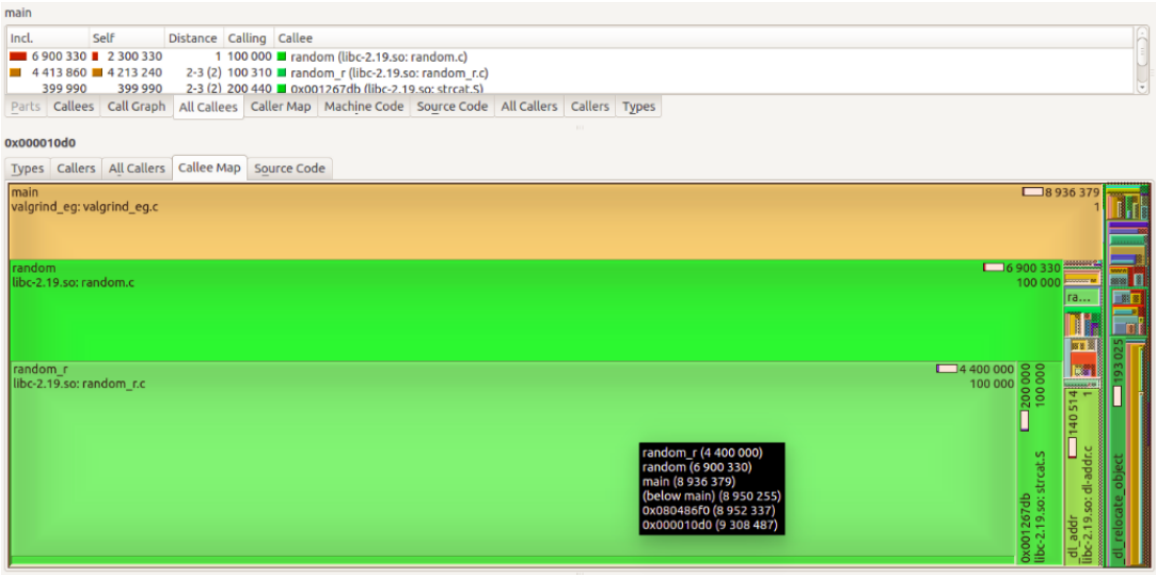
```
$ gcc -g -o valgrind_eg valgrind_eg.c -pthread
$ ./valgrind_eg 1
completion time for put phase = 2.758351
0: 0 keys missing
completion time for get phase = 2.270119
This is the same program as used in the previous lab.
valgrind --tool=callgrind --dump-instr=yes --simulate-cache=yes ./val_eg <>
```

   Use the above command on this sample C-code to find the call-graph. Toggle the "Cycle Detection" and "% Relative" menu in the top of kcachegrind to observe to menu output. Using this option, find

   - callee map



- cost (in terms of cycles) associated with the most expensive function calls.

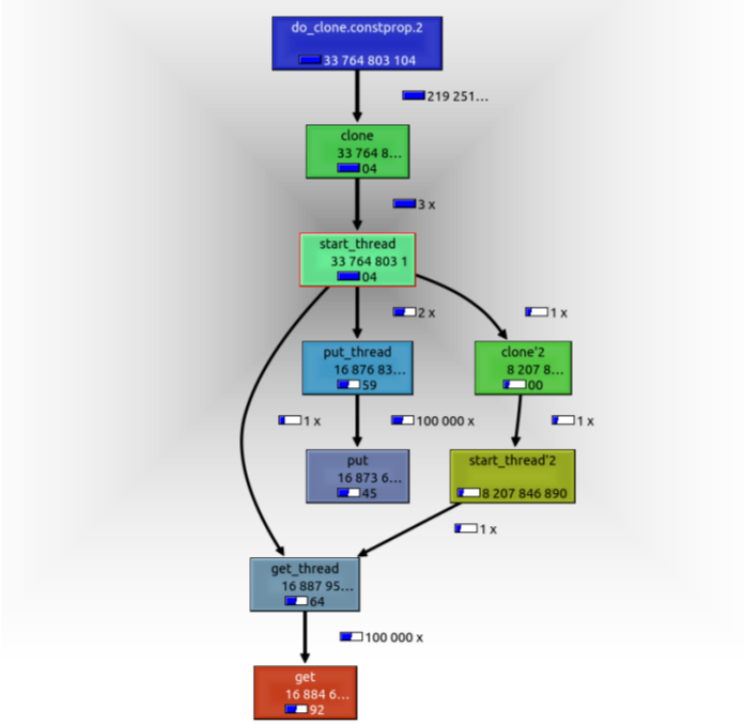


- cost (in terms of cycles) associated with pthread_mutex_lock.c and pthread_mutex_unlock.c

```
==4219== Callgrind, a call-graph generating cache profiler
==4219== Copyright (C) 2002-2015, and GNU GPL'd, by Josef Weidendorfer et al.
==4219== Using Valgrind-3.11.0 and LibVEX; rerun with -h for copyright info
==4219== Command: ./valgrind_eg 2
==4219==
--4219-- warning: L3 cache found, using its data for the LL simulation.
==4219== For interactive control, run 'callgrind_control -h'.
completion time for put phase = 407.358839
1: 0 keys missing
0: 0 keys missing
completion time for get phase = 423.969385
==4219==
==4219== Events    : Ir Dr Dw I1mr D1mr D1mw ILmr DLmr DLmw
==4219== Collected : 30032474217 9009883757 2005841782 1273 373521843 358345 1209 20317 6703
==4219==
==4219== I   refs:      30,032,474,217
==4219== I1  misses:             1,273
==4219== LLi misses:             1,209
==4219== I1  miss rate:           0.00%
==4219== LLi miss rate:           0.00%
==4219==
==4219== D   refs:      11,015,725,539  (9,009,883,757 rd + 2,005,841,782 wr)
==4219== D1  misses:       373,880,188  (  373,521,843 rd +       358,345 wr)
==4219== LLd misses:            27,020  (       20,317 rd +         6,703 wr)
==4219== D1  miss rate:            3.4% (          4.1%   +           0.0%  )
==4219== LLd miss rate:            0.0% (          0.0%   +           0.0%  )
==4219==
==4219== LL refs:          373,881,461  (  373,523,116 rd +       358,345 wr)
==4219== LL misses:             28,229  (       21,526 rd +         6,703 wr)
==4219== LL miss rate:             0.0% (          0.0%   +           0.0%  )
```

Incl.	Self	Called	Function	Location
33 764 803 104	2 387	3	start_thread	libpthread-2.19.so: pthread_create.c
16 887 953 964	3 254 640	2	get_thread	valgrind_eg: valgrind_eg.c
16 884 691 092	16 873 728 058	100 000	get	valgrind_eg: valgrind_eg.c
16 876 830 759	3 153 314	2	put_thread	valgrind_eg: valgrind_eg.c
16 873 677 445	16 873 677 445	100 000	put	valgrind_eg: valgrind_eg.c
8 207 846 900	10	1	clone'2	libc-2.19.so: clone.S
8 207 846 890	225	1	start_thread'2	libpthread-2.19.so: pthread_create.c
9 308 487	274	(0)	0x000010d0	ld-2.19.so
8 952 337	458	1	0x080486f0	valgrind_eg
8 950 255	633	1	(below main)	libc-2.19.so: libc-start.c
8 936 379	1 789 655	1	main	valgrind_eg: valgrind_eg.c
6 900 330	2 300 330	100 000	random	libc-2.19.so: random.c
6 669 987	6 451 399	100 002	pthread_mutex_lock	libpthread-2.19.so: pthread_mutex_lock.c
4 413 860	4 213 240	100 310	random_r	libc-2.19.so: random_r.c
4 290 906	300 126	100 002	pthread_mutex_unlock	libpthread-2.19.so: pthread_mutex_unlock.c
3 990 780	3 766 826	100 002	__pthread_mutex_unloc...	libpthread-2.19.so: pthread_mutex_unlock.c

Function Name	Inclusive Cost(In terms of Cycles)	Self Cost(In terms of Cycles)	Called(In terms of Cycles)
get	16 884 691 092	16 873 728 058	100 000
get_thread	16 887 953 964	3 254 640	2
put	16 873 677 445	16 873 677 445	100 000
put_thread	16 876 830 759	3 153 314	2
main	8 936 379	1 789 655	1


do_clone.constprop.2
33 764 803 104
219 251...
clone
33 764 8...
04
3 x
start_thread
33 764 803 1
04
2 x
1 x
put_thread
16 876 83...
59
clone'2
8 207 8...
00
1 x
100 000 x
1 x
put
16 873 6...
45
start_thread'2
8 207 846 890
1 x
get_thread
16 887 95...
64
100 000 x
get
16 884 6...
92