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**Высокопроизводительные**

**вычисления**

**Семинар 4**

Профилирование

# Test code

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```
for (int threads = 2; threads <= 8; threads+=2) {  
    exec (a, sum, N, threads);  
}
```

```
void exec (double *a, double &sum, long N, int threads) {  
    double start, end;  
  
    omp_set_num_threads (threads);  
    printf ("Threads = %d \n", threads);  
  
    sum = 0;  
    start = omp_get_wtime();  
    critical (a, sum, N);  
    end = omp_get_wtime();  
  
    printf ("Critical: \n Time = %f Sum = %f \n", end - start, sum);  
  
    sum = 0;  
    start = omp_get_wtime();  
    reduction (a, sum, N);  
    end = omp_get_wtime();  
  
    printf ("Reduction: \n Time = %f Sum = %f \n\n", end - start, sum);  
}
```

# GPROF, compilation

---



```
$ g++ -pg -fopenmp -o test_gprof ex_profile.cpp
```

# GPROF, profile

```
$ gprof.exe -b test_gprof.exe
BFD: Dwarf Error: Could not find abbrev number 3926.
Flat profile:

Each sample counts as 0.01 seconds.
%   cumulative   self           self         total
time  seconds    seconds   calls  ms/call  ms/call  name
100.00    0.04    0.04         4     10.00    10.00  reduction(double*, double&, long)
  0.00    0.04    0.00         4      0.00     0.00  critical(double*, double&, long)

          Call graph

granularity: each sample hit covers 4 byte(s) for 25.00% of 0.04 seconds

index % time   self  children   called    name
-----
[1]   100.0   0.00   0.04      4/4      <spontaneous>
      0.04   0.00      4/4      main [1]
      0.00   0.00      4/4      reduction(double*, double&, long) [2]
      0.00   0.00      4/4      critical(double*, double&, long) [78]
-----
[2]   100.0   0.04   0.00      4/4      main [1]
      0.04   0.00      4       reduction(double*, double&, long) [2]
-----
[78]   0.0     0.00   0.00      4/4      main [1]
      0.00   0.00      4       critical(double*, double&, long) [78]
-----

Index by function name

[78] critical(double*, double&, long) [2] reduction(double*, double&, long)
```

# PERF STAT

---

```
$ perf stat ./test_perf
```

```
Performance counter stats for './test_perf':
```

37,441.58 msec	task-clock:u	#	5.665 CPUs utilized
0	context-switches:u	#	0.000 K/sec
0	cpu-migrations:u	#	0.000 K/sec
2,591	page-faults:u	#	0.069 K/sec
88,170,750,251	cycles:u	#	2.355 GHz
3,318,817,039	instructions:u	#	0.04 insn per cycle
937,273,517	branches:u	#	25.033 M/sec
41,480,166	branch-misses:u	#	4.43% of all branches

```
6.609393255 seconds time elapsed
```

```
29.987282000 seconds user
```

```
9.261211000 seconds sys
```

# PERF RECORD

---

```
$ perf record ./test_perf
```

```
[ perf record: Woken up 20 times to write data ]  
r[ perf record: Captured and wrote 6.217 MB perf.data (162873 samples) ]  
[echoj@cn-003 omp_profile]$ ll  
total 8560  
-rwxr-xr-x 1 echoj users 13152 Sep 28 13:08 a.out  
-rw-r--r-- 1 echoj users 1648 Sep 28 10:37 ex_profile.cpp  
-rw----- 1 echoj users 6559876 Sep 28 13:36 perf.data ←  
-rw----- 1 echoj users 6584276 Sep 28 13:20 perf.data.old  
-rwxr-xr-x 1 echoj users 13152 Sep 28 13:30 test_perf
```

# PERF REPORT

```
$ perf report
```

```
echoj@cn-003:~/test/omp_profile
Samples: 162K of event 'cycles:uapp', Event count (approx.): 83295984707
Overhead Command Shared Object Symbol
72.85% test_perf libgomp.so.1.0.0 [.] gomp_mutex_lock_slow
10.97% test_perf libgomp.so.1.0.0 [.] GOMP_critical_end
8.33% test_perf libgomp.so.1.0.0 [.] GOMP_critical_start
2.74% test_perf libc-2.17.so [.] __random
1.42% test_perf test_perf [.] Critical
0.83% test_perf libgomp.so.1.0.0 [.] gomp_team_barrier_wait_end
0.83% test_perf libc-2.17.so [.] __l1l_lock_wait_private
0.75% test_perf libc-2.17.so [.] __random_r
0.45% test_perf test_perf [.] reduction
0.24% test_perf [unknown] [.] 0xffffffff9a974ed0
0.20% test_perf libgomp.so.1.0.0 [.] gomp_barrier_wait_end
0.11% test_perf test_perf [.] main_omp_fn.0
0.06% test_perf libc-2.17.so [.] __l1l_unlock_wake_private
0.04% test_perf test_perf [.] GOMP_critical_start@plt
0.04% test_perf test_perf [.] GOMP_critical_end@plt
0.03% test_perf [unknown] [.] 0xffffffff9a96b4d6
0.03% test_perf libc-2.17.so [.] __L_lock_130
0.03% test_perf libc-2.17.so [.] __L_unlock_140
0.02% test_perf libc-2.17.so [.] rand
0.02% test_perf test_perf [.] rand@plt
0.00% test_perf ld-2.17.so [.] __dl_relocate_object
0.00% test_perf ld-2.17.so [.] check_match.9524
0.00% test_perf libc-2.17.so [.] __GI__printf_fp_1
0.00% test_perf ld-2.17.so [.] strcmp
0.00% test_perf ld-2.17.so [.] __dl_lookup_symbol_x
0.00% test_perf libc-2.17.so [.] __strcasemp
0.00% test_perf libgomp.so.1.0.0 [.] gomp_thread_start
0.00% test_perf libc-2.17.so [.] __clone
0.00% test_perf ld-2.17.so [.] __dl_start
```