

Tools/likwid/example_perfctr_dgemm

Example likwid-perfctr performance group FLOPS_AVX on benchmark dgemm

- Prepare environment

```
module purge
module add \
    compiler/intel/2022 \
    numlib/mkl/2022
```

- Build dgemm benchmark

```
icc \
    -O2 -qopenmp -xHost -ipo \
    -DUSE_MKL -lmkl_intel_lp64 -lmkl_intel_thread -lmkl_core \
    timing.c stats.c matrix_common.c dgemm.multithread.c -o dgemm
```

- Set up OpenMP and MKL environment

```
export MKL_NUM_THREADS=76
export OMP_NUM_THREADS=76
export KMP_AFFINITY="verbose,granularity=fine,respect,scatter"
```

- List available performance groups

```
likwid-perfctr -a

...
    FLOPS_AVX  Packed AVX MFLOP/s
    FLOPS_DP   Double Precision MFLOP/s
    FLOPS_SP   Single Precision MFLOP/s
...
```

- Get detailed information on performance group FLOPS_AVX

```
likwid-perfctr -H --group FLOPS_AVX
```

Group FLOPS_AVX:

Formulas:

Packed SP [MFLOP/s] = 1.0E-06*(FP_ARITH_INST_RETIRED_256B_PACKED_SINGLE*8+FP_ARITH_INST

Packed DP [MFLOP/s] = 1.0E-06*(FP_ARITH_INST_RETIRED_256B_PACKED_DOUBLE*4+FP_ARITH_INST_RETIRED_256B_PACKED_SINGLE*4)

Packed 32b AVX FLOPs rates.

- Measure performance group FLOPS_AVX on CPU Hyperthread 0 to 151

```
likwid-perfctr \
  --group FLOPS_AVX \
  -c 0-151 \
  ./dgemm -m 30 -n 8000
```

```
-----
CPU name:      Intel(R) Xeon(R) Platinum 8368 CPU @ 2.40GHz
CPU type:      Intel Icelake SP processor
CPU clock:     2.39 GHz
-----
```

```
Matrix size: 8000
Repeat multiply 30 times.
Alpha = 1.000000
Beta = 1.000000
Allocating Matrices...
Allocation complete, populating with values...
Performing multiplication...
Calculating matrix check...
```

```
=====
|| E ||_∞:      0.000000E+00
-> Solution check PASSED successfully.
Memory for Matrices: 1464.843750 MB
Multiply time:      6.370304 seconds
FLOPs computed:     3072384000000.000000
Min GFLOP/s:        4473.591902 GF/s
Max GFLOP/s:        4950.916234 GF/s
Average GFLOP/s:    4825.537147 GF/s
Std. dev. GFLOP/s:  597.602110 GF/s
Median GFLOP/s:     4870.102613 GF/s
MAD GFLOP/s:        38.695209 GF/s
=====
```

...

Metric	Sum	Min	Max	Avg
Runtime (RDTSC) [s] STAT	968.6808	6.3729	6.3729	6.3729
Runtime unhalted [s] STAT	495.9688	1.188787e-05	6.6924	3.2630
Clock [MHz] STAT	405351.9133	2182.7358	3242.0543	2666.7889
CPI STAT	467.1632	0.3788	16.9742	3.0734

	Packed SP [MFLOP/s]	STAT		0		0		0		0	
	Packed DP [MFLOP/s]	STAT		4.826735e+06		0		66241.9113		31754.8333	
+-----+-----+-----+-----+-----+											

- Validity check

```

Packed DP [MFLOP/s] STAT: 4.826735e+06 MFLOP/s
                        = 4826.735      GFLOP/s
Average GFLOP/s:      4825.537147    GFLOP/s

```

=> The specified FLOP/s may overestimate the actual FLOP/s, since the AVX registers may not always be fully loaded