Hands on: Part 2

SELL-C-σ, likwid-perfctr

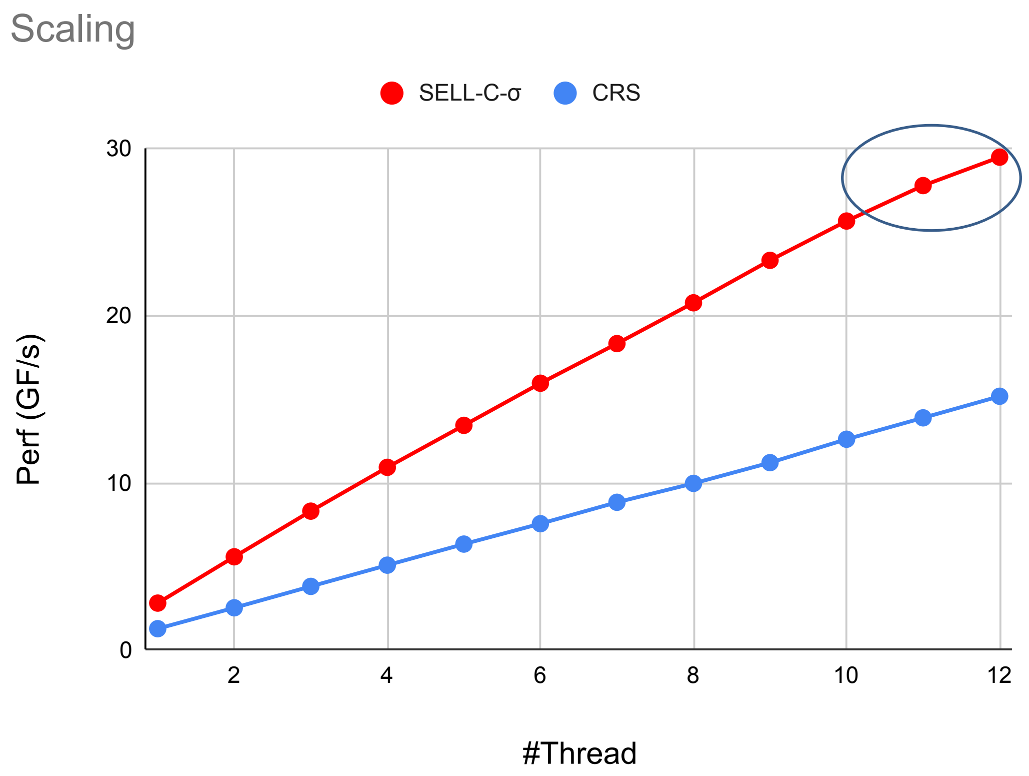
SELL-C-σ

- Have a look at the SELL-C-σ code.

- Run the code with 1 thread
  - `OMP_SCHEDULE=static OMP_NUM_THREADS=1 likwid-pin -c 0 ./spmv-SELLC-GCC`
  - Notice the boost in single core performance

- Do the scaling run on one socket using the `./scaling_SELLC.sh` script.

SELL-C-σ on 1 socket



Weak saturation

HPCG-128^3 matrix

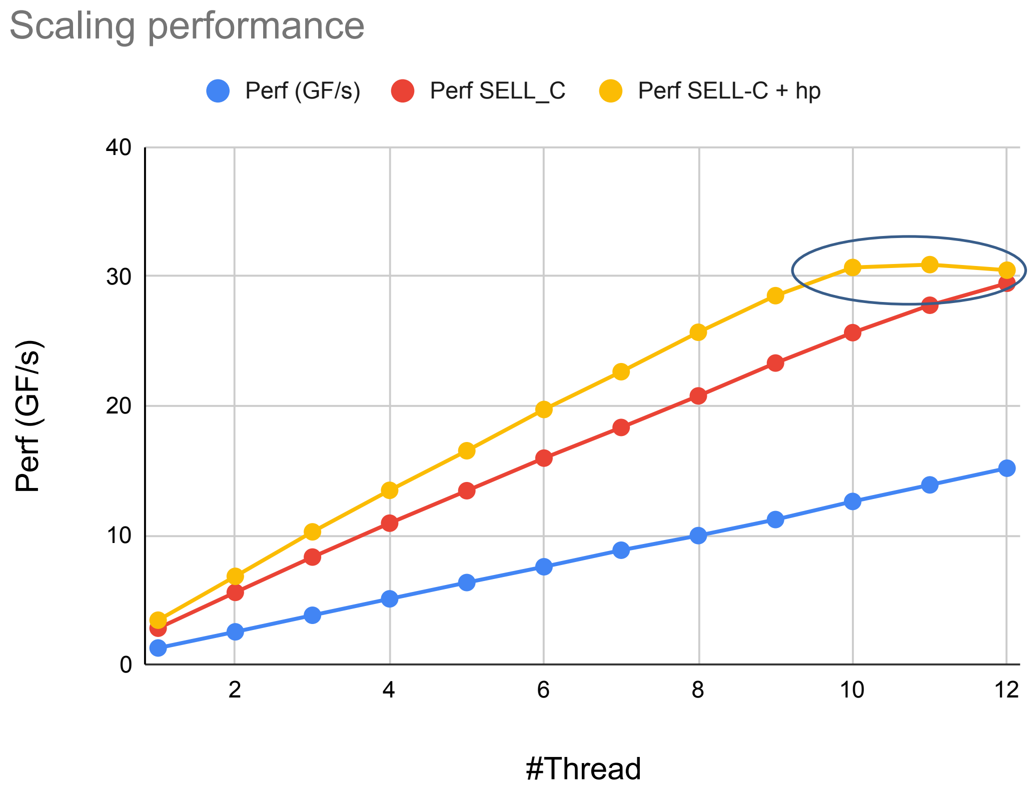
A practical advice

- On A64FX huge pages matter
  - See https://arxiv.org/abs/2103.03013 for details

- Link with the Fujitsu's LIBMPG library to use huge pages. Generally, a good idea for streaming codes.

- Remember to `export  XOS_MMM_L_PAGING_POLICY=demand:demand:demand` for first touch when using LIBMPG library with multiple CMG.

Effect of huge pages



Higher single core performance
➔ stronger saturation

☺

HPCG-128^3 matrix

likwid-perfctr

- Does my code actually saturate the bandwidth? What is the my code’s code balance?

- Let’s insert LIKWID markers

- source /lustre/projects/global/samples/FAU_webinar/likwid-ur/sourceme.sh
- /var/lib/pcp/pmdas/perfevent/perfalloc –d → switch off PCP running on OOKAMI

- OMP_SCHEDULE=static OMP_NUM_THREADS=12 likwid-perfctr -m -g MEM -C 0-11 ./spmv-SELLC-GCC
  - Observe the main memory bandwidth
  - Derive code balance and compare with optimal code balance

Life isn’t always easy

- One could encounter sparse matrices with not so friendly sparsity pattern,
  - e.g., kkt_power from SuiteSparse Matrix collection (https://suitesparse-collection-website.herokuapp.com)

- Let’s try running on 1 socket:

  -
    ```
    OMP_SCHEDULE=static OMP_NUM_THREADS=12 likwid-perfctr -m -g MEM -C 0-11 ./spmv-SELLC-GCC -m /lustre/projects/global/samples/FAU_webinar/demo/kkt_power.mtx
    ```
  - Check code balance

- What’s happening? Get statistics (histogram) on N_{nzr} distribution.

  -
    ```
    OMP_SCHEDULE=static OMP_NUM_THREADS=12 likwid-perfctr -m -g MEM -C 0-11 ./spmv-SELLC-GCC -m /lustre/projects/global/samples/FAU_webinar/demo/kkt_power.mtx  --stat
    ```
  - Observe load imbalance
  - Play with different OMP_SCHEDULE