KNL MCDRAM Usage Lab

In this lab you run simple programs and the stream benchmark to use MCDRAM and DDR on 2 KNLs with different memory/cluster mode configuration.

Appropriate Environment

Open 3 xterms. In 2 xterms first login to the Linux-Cluster (directly reachable from the course PCs, use only account a2c06aa!)

```bash
ssh lxlogin1.lrz.de
```

Then login in one xterm: `ssh mcct03.cos.lrz.de`
and in the other xterm: `ssh mcct04.cos.lrz.de`

Login to the SuperMIC login node in the third xterm.

Lab 1: First steps

- Figure out the number of physical cores, DDR and MCDRAM memory size on both KNLs. Compare with stampede2 shown on the slides.
- Which memory mode is used on mcct03 and mcct04?
- Which cluster modes could be configured?

Lab 2: Testing compatibility on KNL

- Compile `hello.c` using “icc hello.c” and run on the KNLs and the login node.
- Recompile `hello.c` using “icc -xmic-avx512 hello.c” and run on the KNLs and the login node.
- Compile using “icc -xsse2 -axmic-avx512 hello.c” and compare again on the KNLs and the SuperMIC login node.
- You can also test versions compiled with “-mmic” on KNLs and the above versions on the KNCs.
Lab 3: Measuring stream bandwidth on KNL

- Compile the stream benchmark using
  `icc -qopenmp -O2 -xMIC-AVX512 stream.c`
- Measure on both KNLs.
- Compare performance on both KNLs using `OMP_NUM_THREADS=1` and `OMP_NUM_THREADS=x`, where `x` is the number of physical cores
- Use
  `numactl -m 0 ./stream`
  and
  `numactl -m 1 ./stream`
  and compare the performance both with `OMP_NUM_THREADS=1` and `OMP_NUM_THREADS=x`
- Copy `stream.c` in `stream-hbw.c`. Change the code to dynamically allocate the arrays `a,b,c` using `hbw_malloc`.
- Run the code on the KNL with flat memory mode using both
  `numactl -m 0 ./stream-hbw`
  and
  `numactl -m 1 ./stream-hbw`
  and compare the performance both with `OMP_NUM_THREADS=1` and `OMP_NUM_THREADS=x`. Which memory is allocated in these cases, MCDRAM or DDR?