1 About the XXLMEM node

Since November 2018, occigen has been integrating a Bull x808 node with:

- 3TB of RAM accessible in NUMA (glueless interconnect) by 8 sockets Intel® Xeon® Platinum 8176 (224 cores total).
- 2 Nvidia GPU Tesla P100 (12GB).

Here is the simplified representation of this node:

2 Get the access

Access the node via Slurm, by adding constraint `-C XXLMEM` in your submission script.

Here are some examples of how to use such a machine:

- large memory or non-optimal jobs on thin nodes
- production / processing of images, meshes and data analysis outside interactive visualization
- Proof of Concept: GPU software testing not used in a production mode

Note that in the same batch job, you cannot request this SKYLAKE node together with other HASWELL, BROADWELL, or visualization nodes.
3 File systems

This node can access 4 disk spaces:

- $HOME
- $SCRATCHDIR
- $STOREDIR
- /tmp

A full description of the three first file systems can be found [here](#).

/tmp is local and take advantage of SSD disks. This volatile workspace can make you benefit of a high performance 1.2TB storage.

Warning: this workspace is not defined to store data on a long term. If you want to keep your data between jobs, please use secured filesystems as $HOME or $STOREDIR.

4 Module

Software environment: module

CINES enables the use of multiple softwares on its clusters, with multiple versions.

To avoid conflicts between different versions of the same software, we usually need to define a specific environment for a given version.

Available softwares can be handled using the following commands:

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<tr>
<th>Command</th>
<th>Description</th>
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<tbody>
<tr>
<td>module avail</td>
<td>show the list of available softwares</td>
</tr>
<tr>
<td>module load</td>
<td>load a software to your environment</td>
</tr>
<tr>
<td>module list</td>
<td>list the loaded modules</td>
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<tr>
<td>module purge</td>
<td>remove all loaded modules</td>
</tr>
<tr>
<td>module show</td>
<td>show information of the module</td>
</tr>
</tbody>
</table>

Si vous ne trouvez pas le logiciel dont vous avez besoin dans la liste, [contactez nous](#).

5 Usage modes

The node can be used in three different ways:

- MPI only
- OpenMP only
- Hybrid MPI+OpenMP

Example scripts are available in the following sections.

5.1 MPI
#!/bin/bash
#SBATCH --nodes=1
#SBATCH --ntasks=224
#SBATCH --ntasks-per-node=224
#SBATCH --time=0:40:00
#SBATCH -C XXLMEM
#SBATCH --exclusive
#SBATCH --output xxlmem_mpi.output.slurm
set -e

#####Intelmpi placement auto
# module load intel/18.1 intelmpi/2018.1.163
# export I_MPI_DOMAIN=auto
# export I_MPI_PIN_RESPECT_CPUSET=0
# ulimit -s unlimited
# srun ../../../bin/hello_mpi

#####Intelmpi avec placement pour mpirun
# module load intel/18.1 intelmpi/2018.1.163
# export SLURM_CPU_BIND=None
# export I_MPI_PIN=1
# ulimit -s unlimited
# mpirun ../../../bin/hello_mpi

###Openmpi placement auto
module load intel/18.1 openmpi/intel/2.0.2
ulimit -s unlimited
srun ../../../bin/hello_mpi

5.2 OpenMP

#!/bin/bash
#SBATCH --nodes=1
#SBATCH --ntasks=1
#SBATCH --cpus-per-task=224
#SBATCH --time=0:40:00
#SBATCH -C XXLMEM
#SBATCH --exclusive
#SBATCH --output xxlmem_omp.output.slurm

(continues on next page)
set -e

#Make sure that OMP_NUM_THREADS = cpus-per-task * KMP_HW_SUBSET
export KMP_HW_SUBSET=1T
export OMP_NUM_THREADS=$SLURM_CPUS_PER_TASK
export KMP_AFFINITY=verbose,compact,1,0,granularity=fine

module load intel
ulimit -s unlimited
rm -f *.out
srun ../../../bin/hello_omp

5.3 Hybrid

#!/bin/bash
#SBATCH -J xxlmem_hybrid
#SBATCH --nodes=1
#SBATCH --ntasks=8
#SBATCH --ntasks-per-node=8
#SBATCH --cpus-per-task=28
#SBATCH --time=0:40:00
#SBATCH -C XXLMEM
#SBATCH --exclusive
#SBATCH --mem=50GB
#SBATCH --output xxlmem_hybrid.output.slurm

set -e

#####Intelmpi
# module load intel intelmpi
# export I_MPI_DOMAIN=auto
# export I_MPI_PIN_RESPECT_CPUSERT=0
# #Make sure that OMP_NUM_THREADS = cpus-per-task * KMP_HW_SUBSET
# export KMP_HW_SUBSET=1T
# export OMP_NUM_THREADS=12
# export KMP_AFFINITY=verbose,compact,1,0,granularity=fine
# ulimit -s unlimited
# srun ../../../bin/hello_hybrid

#####Openmpi
module load intel/18.1 openmpi/intel/2.0.2
#Make sure that OMP_NUM_THREADS = cpus-per-task * KMP_HW_SUBSET
export KMP_HW_SUBSET=1T
export OMP_NUM_THREADS=28
export KMP_AFFINITY=verbose,compact,1,0,granularity=fine
ulimit -s unlimited
srun ../../../bin/hello_hybrid