

Compute Nodes

Nodes Configuration

Anselm is cluster of x86-64 Intel based nodes built on Bull Extreme Computing bullx technology. The cluster contains four types of compute nodes.

Compute Nodes Without Accelerator

- 180 nodes
- 2880 cores in total
- two Intel Sandy Bridge E5-2665, 8-core, 2.4GHz processors per node
- 64 GB of physical memory per node
- one 500GB SATA 2,5" 7,2 krpm HDD per node
- bullx B510 blade servers
- cn[1-180]

Compute Nodes With GPU Accelerator

- 23 nodes
- 368 cores in total
- two Intel Sandy Bridge E5-2470, 8-core, 2.3GHz processors per node
- 96 GB of physical memory per node
- one 500GB SATA 2,5" 7,2 krpm HDD per node
- GPU accelerator 1x NVIDIA Tesla Kepler K20 per node
- bullx B515 blade servers
- cn[181-203]

Compute Nodes With MIC Accelerator

- 4 nodes
- 64 cores in total
- two Intel Sandy Bridge E5-2470, 8-core, 2.3GHz processors per node
- 96 GB of physical memory per node

- one 500GB SATA 2,5" 7,2 krpm HDD per node
- MIC accelerator 1x Intel Phi 5110P per node
- bullx B515 blade servers
- cn[204-207]

Fat Compute Nodes

- 2 nodes
- 32 cores in total
- 2 Intel Sandy Bridge E5-2665, 8-core, 2.4GHz processors per node
- 512 GB of physical memory per node
- two 300GB SAS 3,5"15krpm HDD (RAID1) per node
- two 100GB SLC SSD per node
- bullx R423-E3 servers
- cn[208-209]



Figure 1:

Figure Anselm bullx B510 servers

Compute Nodes Summary

Node type	Count	Range	Memory	Cores	Access
Nodes with- out ac- cel- era- tor	180	cn[1- 180]	64GB	16 @ 2.4Ghz	qexp, qprod, qlong, qfree
Nodes with GPU ac- cel- era- tor	23	cn[181- 203]	96GB	16 @ 2.3Ghz	qgpu, qprod
Nodes with MIC ac- cel- era- tor	4	cn[204- 207]	96GB	16 @ 2.3GHz	qmic, qprod
Fat com- pute nodes	2	cn[208- 209]	512GB	16 @ 2.4GHz	qfat, qprod

Processor Architecture

Anselm is equipped with Intel Sandy Bridge processors Intel Xeon E5-2665 (nodes without accelerator and fat nodes) and Intel Xeon E5-2470 (nodes with accelerator). Processors support Advanced Vector Extensions (AVX) 256-bit instruction set.

Intel Sandy Bridge E5-2665 Processor

- eight-core

- speed: 2.4 GHz, up to 3.1 GHz using Turbo Boost Technology
- peak performance: 19.2 Gflop/s per core
- caches:
 - L2: 256 KB per core
 - L3: 20 MB per processor
- memory bandwidth at the level of the processor: 51.2 GB/s

Intel Sandy Bridge E5-2470 Processor

- eight-core
- speed: 2.3 GHz, up to 3.1 GHz using Turbo Boost Technology
- peak performance: 18.4 Gflop/s per core
- caches:
 - L2: 256 KB per core
 - L3: 20 MB per processor
- memory bandwidth at the level of the processor: 38.4 GB/s

Nodes equipped with Intel Xeon E5-2665 CPU have set PBS resource attribute `cpu_freq = 24`, nodes equipped with Intel Xeon E5-2470 CPU have set PBS resource attribute `cpu_freq = 23`.

```
$ qsub -A OPEN-0-0 -q qprod -l select=4:ncpus=16:cpu_freq=24 -I
```

In this example, we allocate 4 nodes, 16 cores at 2.4GHz per node.

Intel Turbo Boost Technology is used by default, you can disable it for all nodes of job by using resource attribute `cpu_turbo_boost`.

```
$ qsub -A OPEN-0-0 -q qprod -l select=4:ncpus=16 -l cpu_turbo_boost=0 -I
```

Memory Architecture

Compute Node Without Accelerator

- 2 sockets
- Memory Controllers are integrated into processors.
 - 8 DDR3 DIMMS per node
 - 4 DDR3 DIMMS per CPU
 - 1 DDR3 DIMMS per channel

- Data rate support: up to 1600MT/s
- Populated memory: 8x 8GB DDR3 DIMM 1600Mhz

Compute Node With GPU or MIC Accelerator

- 2 sockets
- Memory Controllers are integrated into processors.
 - 6 DDR3 DIMMS per node
 - 3 DDR3 DIMMS per CPU
 - 1 DDR3 DIMMS per channel
 - Data rate support: up to 1600MT/s
- Populated memory: 6x 16GB DDR3 DIMM 1600Mhz

Fat Compute Node

- 2 sockets
- Memory Controllers are integrated into processors.
 - 16 DDR3 DIMMS per node
 - 8 DDR3 DIMMS per CPU
 - 2 DDR3 DIMMS per channel
 - Data rate support: up to 1600MT/s
- Populated memory: 16x 32GB DDR3 DIMM 1600Mhz