Homework 1

Question 3

Select a node on the Discovery Cluster and report the following information about that node:

After running the secure shell command and once in the login command line of the Discovery cluster, we first run the command “srun --pty /bin/bash” to access one node in the Discovery Cluster.

a. *The CPU model*

To access the CPU information of the node, we run the commant “lscpu”, which returns the following information:

```
Architecture:          x86_64
CPU op-mode(s):        32-bit, 64-bit
Byte Order:            Little Endian
CPU(s):                48
On-line CPU(s) list:   0-47
Thread(s) per core:    2
Core(s) per socket:    12
Socket(s):             2
NUMA node(s):          2
Vendor ID:             GenuineIntel
CPU family:            6
Model:                 63
Model name:            Intel(R) Xeon(R) CPU E5-2690 v3 @ 2.60GHz
Stepping:              2
CPU MHz:               2999.902
CPU max MHz:           3500.0000
CPU min MHz:           1200.0000
BogoMIPS:              5200.27
Virtualization:        VT-x
L1d cache:             32K
L1i cache:             32K
L2 cache:              256K
L3 cache:              30720K
NUMA node0 CPU(s):     0-11,24-35
NUMA node1 CPU(s):     12-23,36-47
```

Figure 1: Node information

Where we can observe the CPU model: Intel® Xeon® CPU E5-2690 v3 @ 2.60GHz

b. *The cache memory hierarchy, including the size and associativity*

From Fig.1 we can also observe the cache memory hierarchy and size, consisting in 4 levels:

- L1d (32KB)
- L1i (32KB)
- L2 (256KB)
- L3 (30720KB)

If we run the command “getconf -a | grep CACHE” we obtain the following information:

```
LEVEL1_ICACHE_SIZE                32768
LEVEL1_ICACHE_ASSOC               8
LEVEL1_ICACHE_LINESIZE            64
LEVEL1_DCACHE_SIZE                32768
LEVEL1_DCACHE_ASSOC               8
LEVEL1_DCACHE_LINESIZE            64
LEVEL2_CACHE_SIZE                 262144
LEVEL2_CACHE_ASSOC                8
LEVEL2_CACHE_LINESIZE             64
LEVEL3_CACHE_SIZE                 31457280
LEVEL3_CACHE_ASSOC                20
LEVEL3_CACHE_LINESIZE             64
LEVEL4_CACHE_SIZE                 0
LEVEL4_CACHE_ASSOC                0
LEVEL4_CACHE_LINESIZE             0
```

Figure 2: Cache information

From Fig. 2 we observe that cache memories L1i, L1d and L2 have 8-way associativity, whereas L3 have a 20-way associativity. A higher associativity of the cache would bring a higher probability of a cache hit at the expense of performance, since there are more addresses to check.

c. The main memory size of this node.

With the command " free –mega" we can determine the amount of memory dedicated to this node:

```
               total        used        free      shared  buff/cache   available
Mem:          128067       14330      103475          41       10261      113075
Swap:          19999         441       19558
```

Figure 3: Main memory size of the node

From Fig. 3 we see that the allocated node has a total memory size of 128GB approximately.

d. The version of Linux installed

Using the command "cat /etc/os-release" we obtain the output displayed in Fig.4. From there, we observe that the Linux version is "CentOS Linux release 7.9.2009 (Core).

Figure 4: Linux version