Technical Information
The 3,456 compute nodes are interconnected through a high speed interconnection network: Intel Omni-Path (OPA). The different nodes are interconnected via fibre optic cables and Intel Omni-Path Director Class Switches 100 Series. 

There are 2 login nodes and 192 computing nodes. 

MareNostrum4 has 48 racks dedicated to calculations. These racks have a total of 165,888 Intel Xeon Platinum cores with a frequency of 2.1 GHz and 384.75 TB of total memory. 

Each computing node has the following configuration: 

- 2x login node and 33 compute nodes, each of them:  
  - 1 x AMD EPYC 7742 @ 2.250GHz (64 cores and 2 threads/core, total 128 threads per node)  
  - 1 x SSD 480GB as local storage  
  - 8 x Double spine modules (non-blocking)  
  - Up to 786 x 100GbE ports in 20U (+1U Shelf)  
  - Six of the racks in MareNostrum are dedicated to network elements which allow to interconnect the different nodes connected to the OPA network.  
  - 3240 nodes with 12x8 GB DDR4-2667 DIMMS (2GB/core)  
  - A64FX CPU (1 Armv8.2-A + SVE chip) @ 2.20GHz (grouping the cores in 4 CMG - Core Memory group - with 12 cores/CMG and an additional assistant core per CMG for the Operating system, adding a total of 48 cores + 4 system-cores per node)  
  - 2 x IBM Power9 8335-GTH @ 2.4GHz (3.0GHz on turbo, 20 cores and 4 threads/core, total 160 threads per node)  

The compute nodes are based on the last generation Intel Xeon Platinum technology, and they offer high performance, flexibility and power efficiency. You can see below a description of one node: 

It has the following configuration: 

- Each Lenovo SD530 compute rack is composed of:  
  - 2 login node and 52 compute nodes, each of them:  
    - 2x Intel Xeon Platinum 8160 24C at 2.1 GHz  
    - Up to 24 x 32 port leaf modules (20 occupied – 640 ports)  

The login nodes have the CPU Intel(R) Xeon(R) Silver 4216 CPU @ 2.10GHz and 256 GB of main memory. They are used for Cross-compilation for the compute nodes that uses ARM processors. 

MareNostrum is a supercomputer based on Intel Xeon Platinum processors, Lenovo SD530 Compute Racks, a Linux Operating System and an Intel Omni-Path interconnection. 

The operating system is CentOS Linux release 8.1.1911 (Core). 

GPFS via one fiber link 10 GBit  

The operating system is Red Hat Enterprise Linux Server 7.5 (Maipo). 

In total, each rack has 3,456 cores and 6,912 GB of memory. 

MN4 CTE-POWER is a cluster based on IBM Power9 processors, with a Linux Operating System and an Infiniband interconnection... This machine is identical to the bigggest machine in the world, Fugaku Supercumputer in the top500 list of November-2020. 

The peak performance per rack is 226.80 Tflops, and a peak power consumption of 33.7 kW. 

4 32A 3 phase switched and monitored PDUs  

The current usage of the P9-GPU machine, is shown in the following graph, where the total cores available, the cores idle and the allocated ones are shown in red, yellow and green respectively. 

See below a summary of the general purpose cluster system: 

3,456 nodes:  

- 2 x Management modules  
- The main features for the Omni-Path Director Class Switch are:  
  - 12 x hot swap PSUs (N+N)  
- The current usage of the General purpose machine, is shown in the following graph, where the total cores available, the cores idle and the allocated ones are shown in red, yellow and green respectively. 

MN4 CTE-ARM is a cluster based on Fujitsu FX1000 machine, with a Linux Operating System and a Tofu interconnection... This machine is identical to the bigggest machine in the world, Fugaku Supercumputer in the top500 list of November-2020. 

The peak performance of 11.15 Petaflops 

9.4kW power consumption 

It has the following configuration: 

- 1024GiB of main memory distributed in 16 dimms x 64GiB @ 3200MHz 

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