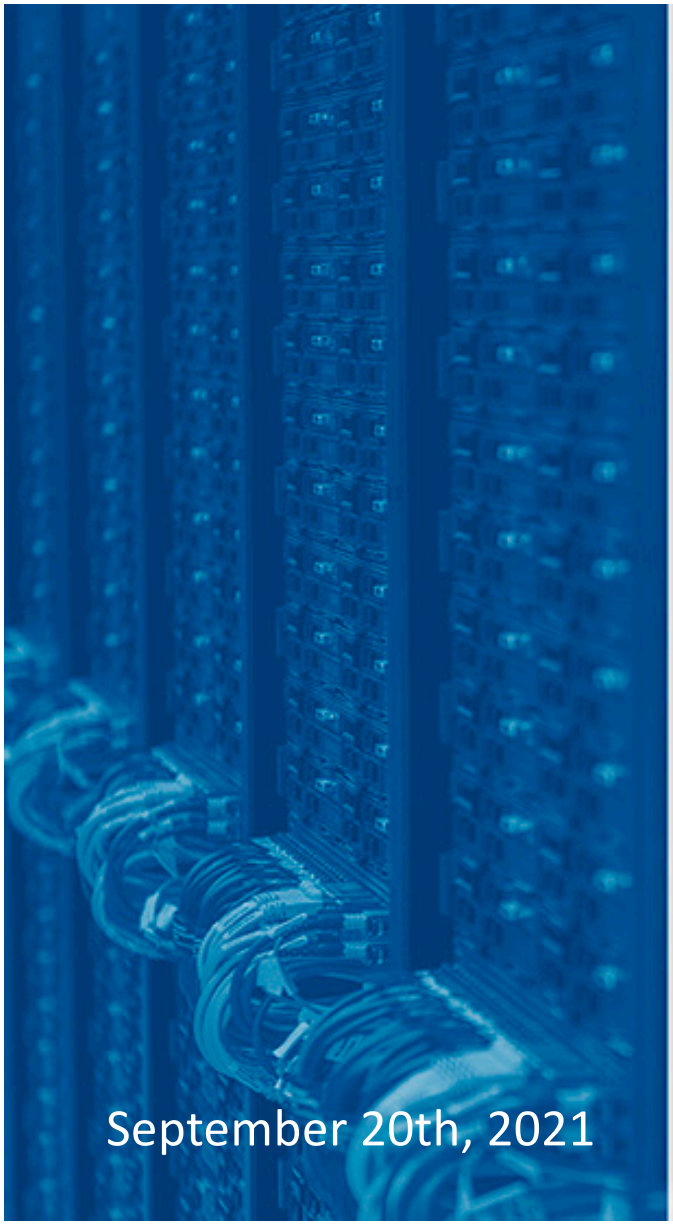

BSC
Barcelona
Supercomputing
Center
Centro Nacional de Supercomputación



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MareNostrum5

Dr. Sergi Girona

19th Workshop on high performance computing in meteorology

September 20th, 2021

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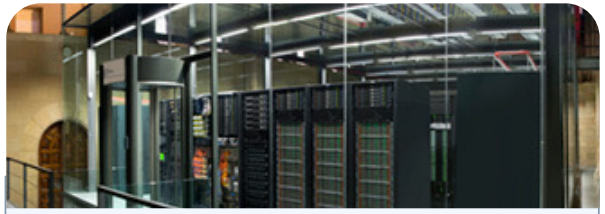
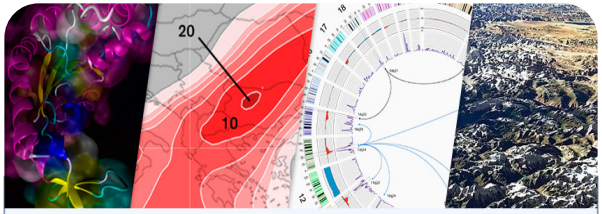
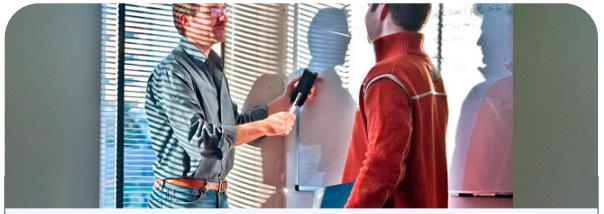
BSC-CNS objectives



Supercomputing services
to Spanish and EU researchers



R&D in Computer, Life, Earth and
Engineering Sciences



PhD programme, technology
transfer, public engagement

BSC-CNS is a consortium that includes

Spanish Government	60%	
Catalan Government	30%	Generalitat de Catalunya Departament d'Empresa i Coneixement
Univ. Politècnica de Catalunya (UPC)	10%	UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH

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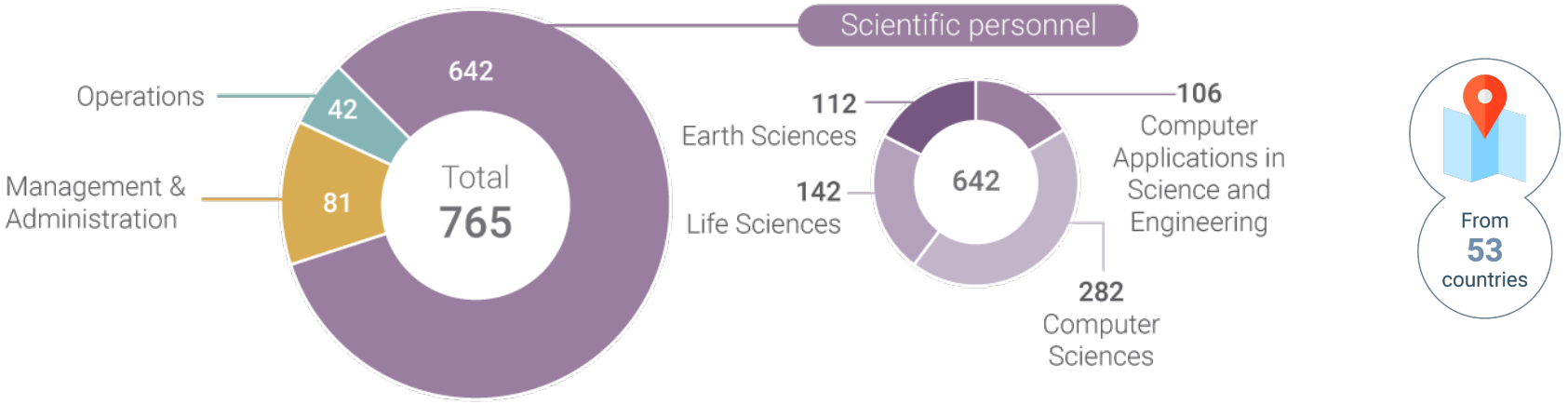
People

HR EXCELLENCE IN RESEARCH

Data as April 30, 2021



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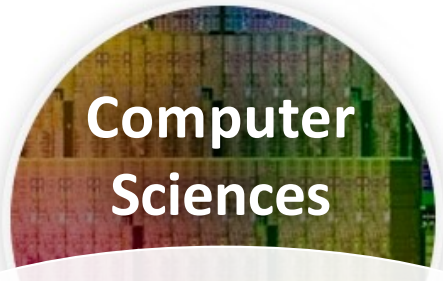
Mission of BSC Scientific Departments



To influence the way machines are built, programmed and used: programming models, performance tools, Big Data, Artificial Intelligence , computer architecture, energy efficiency

To develop and implement global and regional state-of-the-art models for short-term air quality forecast and long-term climate applications

To understand living organisms by means of theoretical and computational methods (molecular modeling, genomics, proteomics)

To develop scientific and engineering software to efficiently exploit super-computing capabilities (biomedical, geophysics, atmospheric, energy, social and economic simulations)

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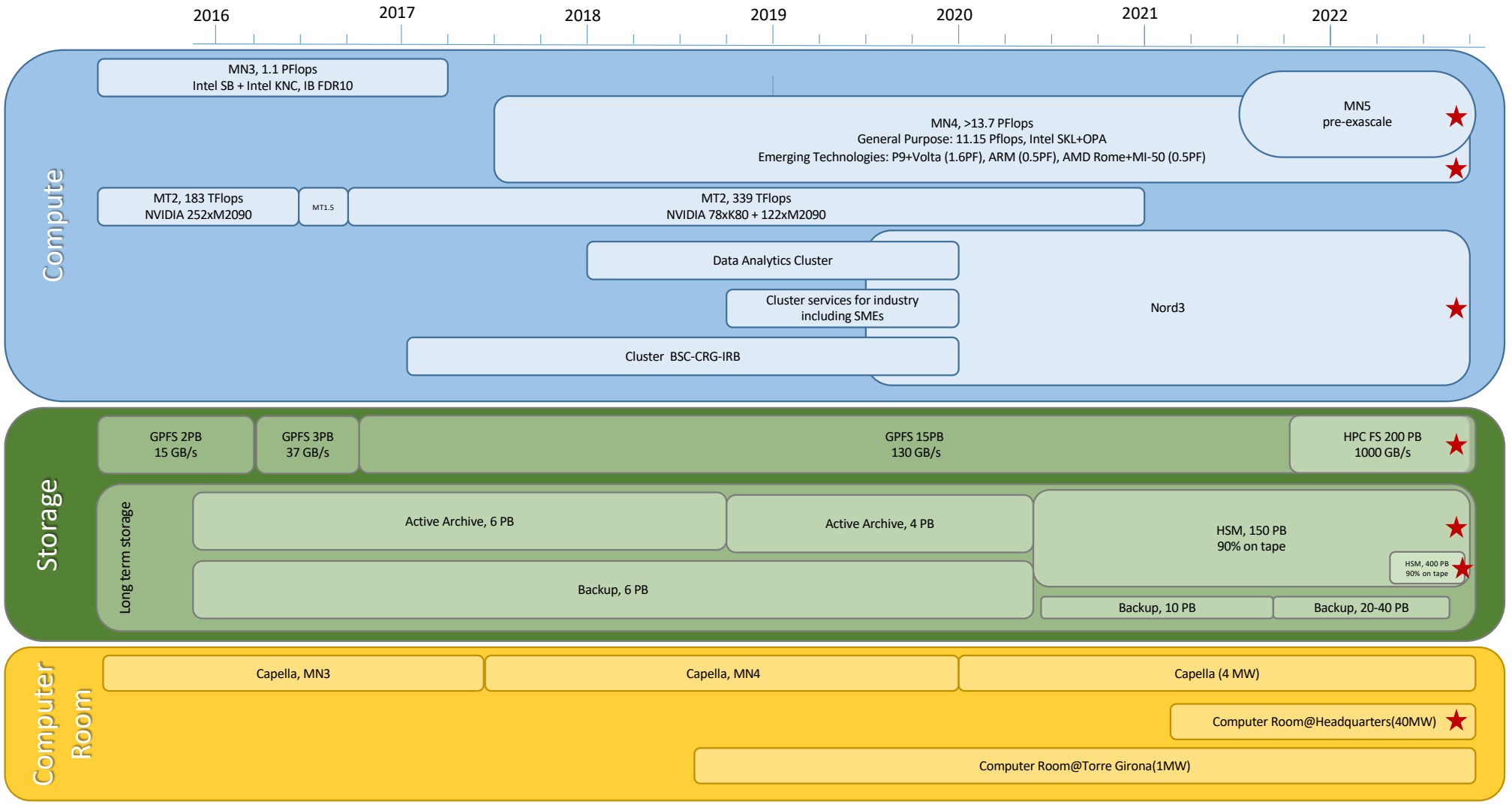
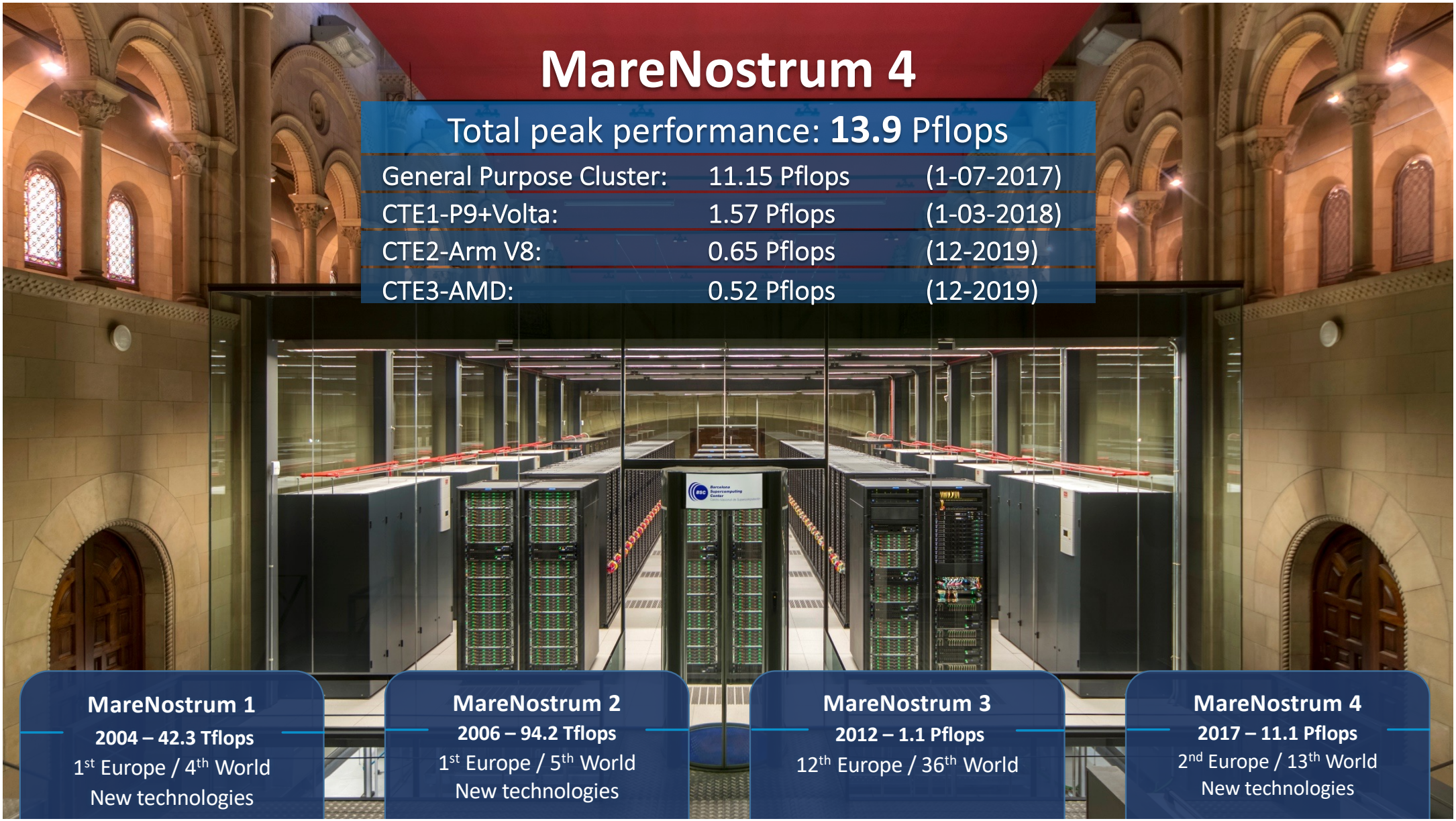
BSC infrastructure roadmap




MareNostrum 4
Total peak performance: 13.9 Pflops
General Purpose Cluster: 11.15 Pflops (1-07-2017)
CTE1-P9+Volta: 1.57 Pflops (1-03-2018)
CTE2-Arm V8: 0.65 Pflops (12-2019)
CTE3-AMD: 0.52 Pflops (12-2019)
MareNostrum 1
2004 – 42.3 Tflops
1st Europe / 4th World
New technologies
MareNostrum 2
2006 – 94.2 Tflops
1st Europe / 5th World
New technologies
MareNostrum 3
2012 – 1.1 Pflops
12th Europe / 36th World
MareNostrum 4
2017 – 11.1 Pflops
2nd Europe / 13th World
New technologies

MareNostrum 5. A European pre-exascale supercomputer

- **200 Petaflops** peak performance (200 x 10^{15})
- **Experimental platform** to create supercomputing technologies “made in Europe”
- **217 M€** of investment

EuroHPC Joint Undertaking

Hosting Consortium:

Spain Portugal Turkey Croatia

European Commission

Generalitat de Catalunya
Departament d'Empresa i Coneixement

GOBIERNO DE ESPAÑA MINISTERIO DE CIENCIA, INNOVACIÓN Y UNIVERSIDADES

UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH

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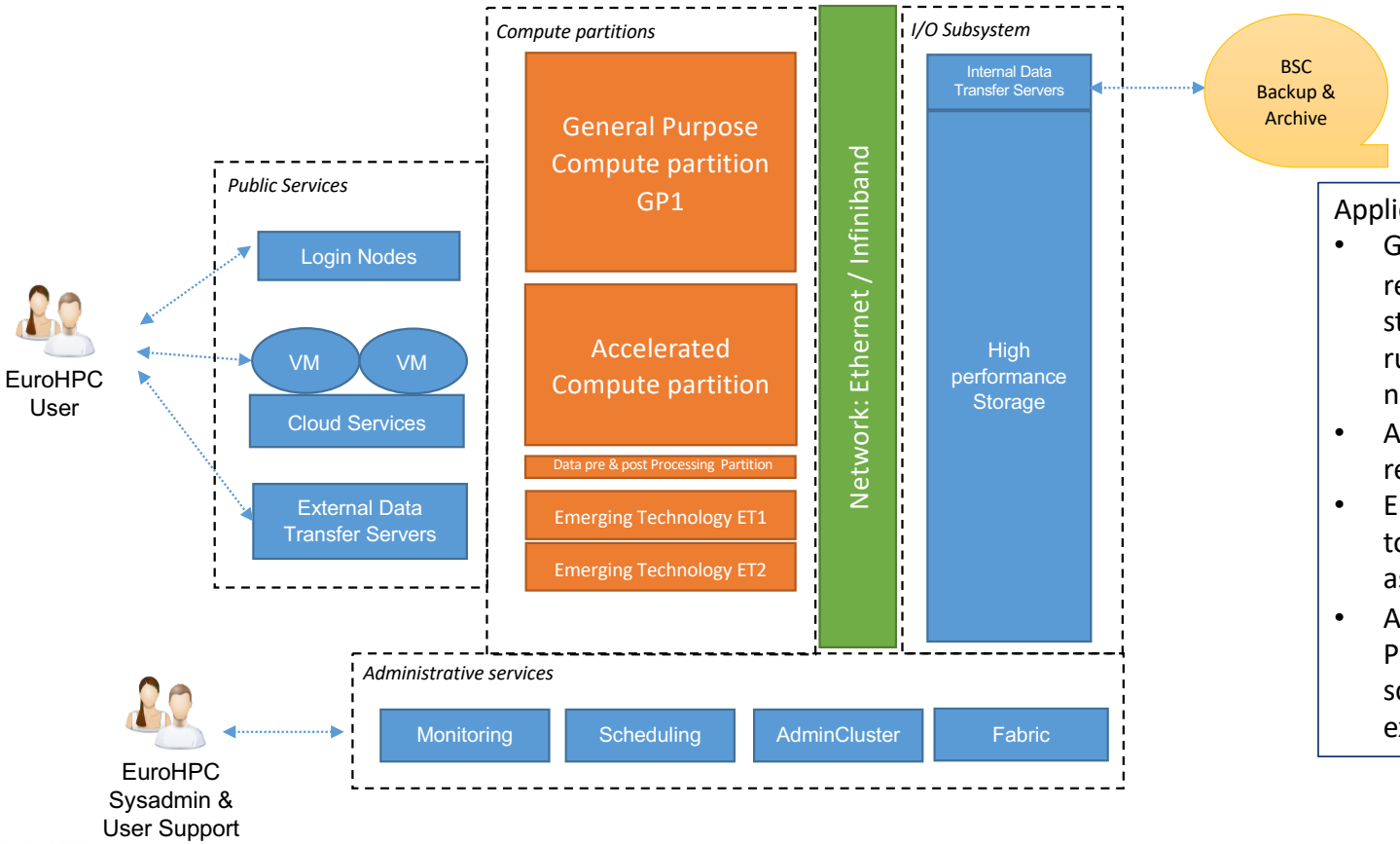
The acquisition and operation of the EuroHPC supercomputer is funded jointly by the EuroHPC Joint Undertaking, through the European Union’s Connecting Europe Facility and the Horizon 2020 research and innovation programme, as well as the Participating States Spain, Portugal, Croatia, and Turkey

EuroHPC Joint Undertaking

MareNostrum5 concept



Hosting Consortium:

Spain Portugal Turkey

Applications:

- General purpose partitions, open to all researchers with MPI, OpenMP codes, standard HPC codes. Scalable machine to run codes with high scalability, thousands of nodes.
- Accelerated partition: Any GPU application ready to scale to thousands of GPUs
- Emerging technologies: prepare workloads to exascale era, exascale technology assessment
- Any domain with workflows mixing General Purpose and GPU, e.g. Earth science, Life science, Engineering, AI and AI driven executions.

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Personnel

System Administration		13
	System group manager	1
	Security officer	1
	Network administrator	1
	HPC system administrator	4
	HPC system operators	3
	System performance officers	2
User Support		
	User Support group manager	1
	High level support engineers	2
	Senior HPC support officers	2
	HPC spport and applications consultants	4
	Junior HPC 1st level support	3
Facility management		4

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BSC headquartes

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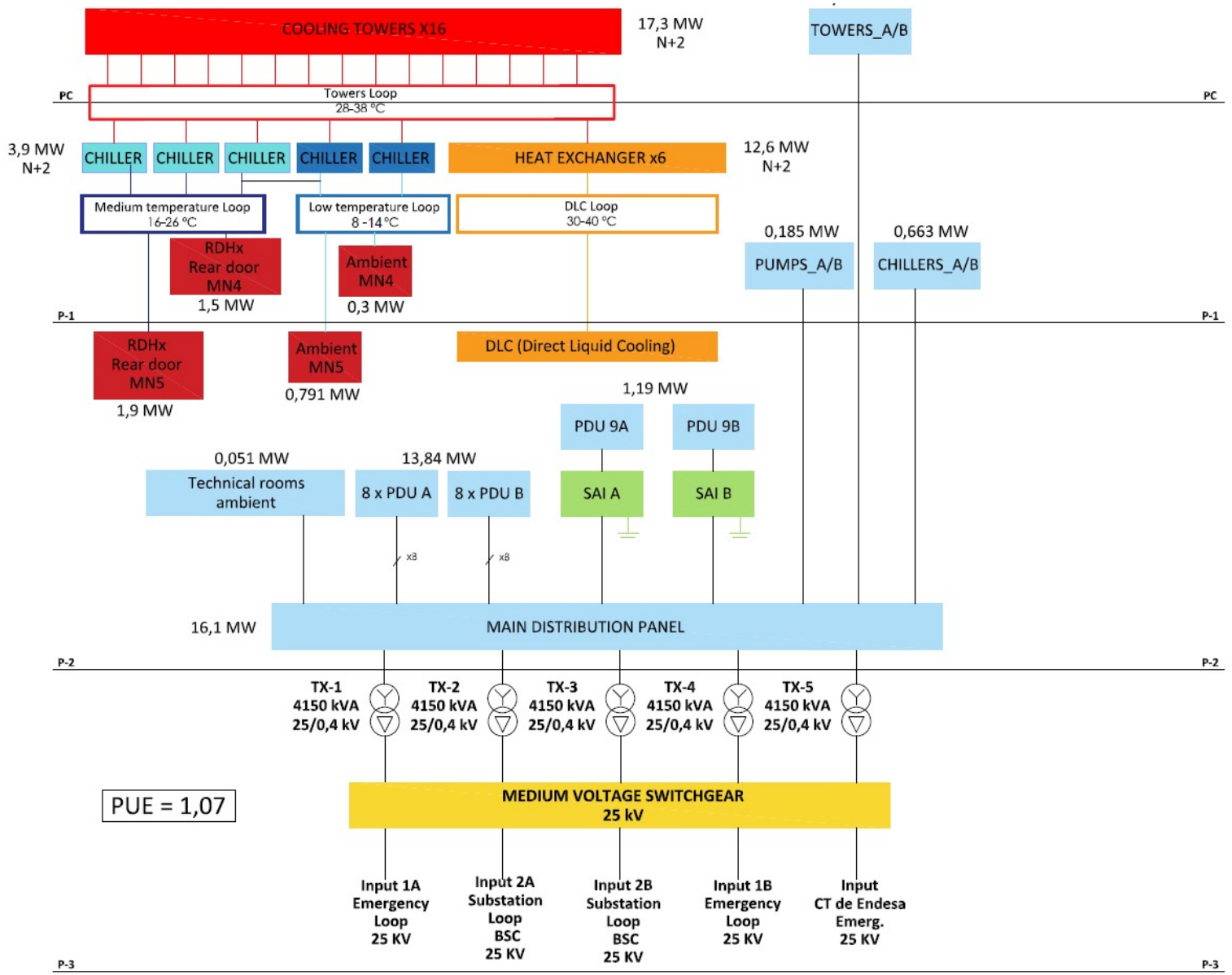

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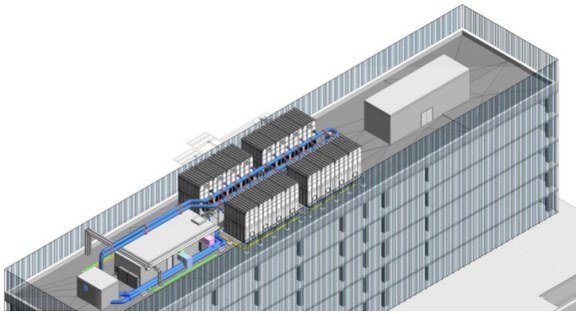
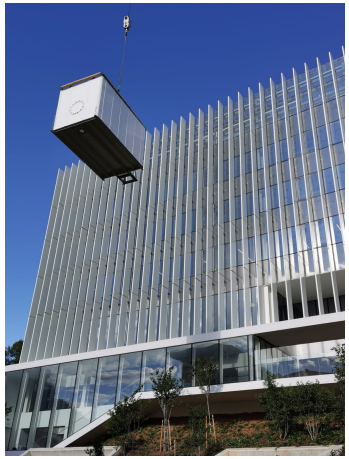
Cooling towers



- 14+2 Torraval CTFP-2436(SB)
- Water flow: 1500 m^3/h
- Outlet: 28,1ºC
- Inlet: 38,1ºC
- Wet bulb temperature: 25ºC
- Total dissipation power: 17300 kW



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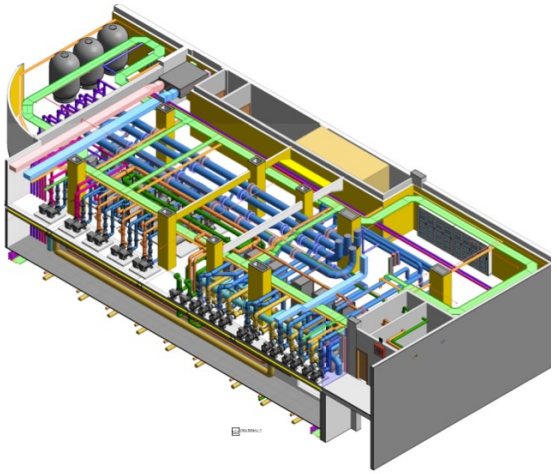
Heat exchanger, chiller and pumps room



- 6 (4+2) Heat exchanger T25-PFM
  - Water flow: 1170 m^3/h (tower) – 1170 m^3/h (racks)
  - Temperatures
    - To tower: outlet: 28,1ºC , Inlet: 38,1ºC
    - To rack: outlet: 30ºC , Inlet: 40ºC
  - Total dissipation power: 13500 kW
- 5 (2 MT + 1 LT+ 2) Chillers
  - Water flow: 302 m^3/h + 151 m^3/h
  - Temperatures, separate loops
    - 16ºC – 26ºC
    - 8ºC – 14ºC
    - To rack: outlet: 30ºC , Inlet: 40ºC
- Redundancy: N+2 in chillers and heat exchangers

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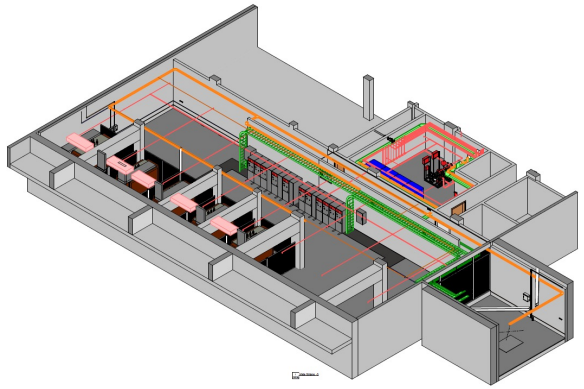
Transformers



- 5 x TRANSFORMADOR 4150KVA VACUUM CAST FILLED DRY
- 4150 kVA
- Primary: 25 kV, Secondary: 420 V
- Frequency: 50Hz
- 3 phases

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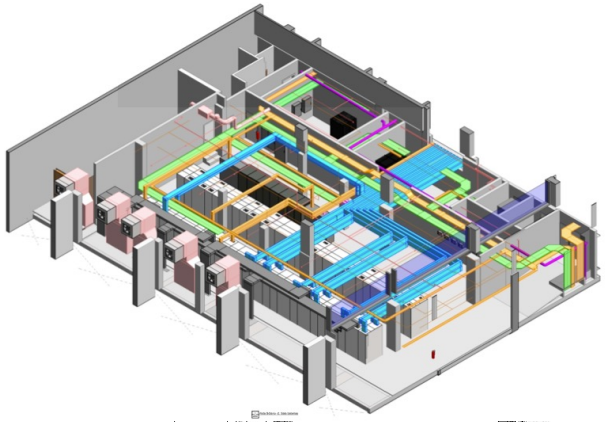
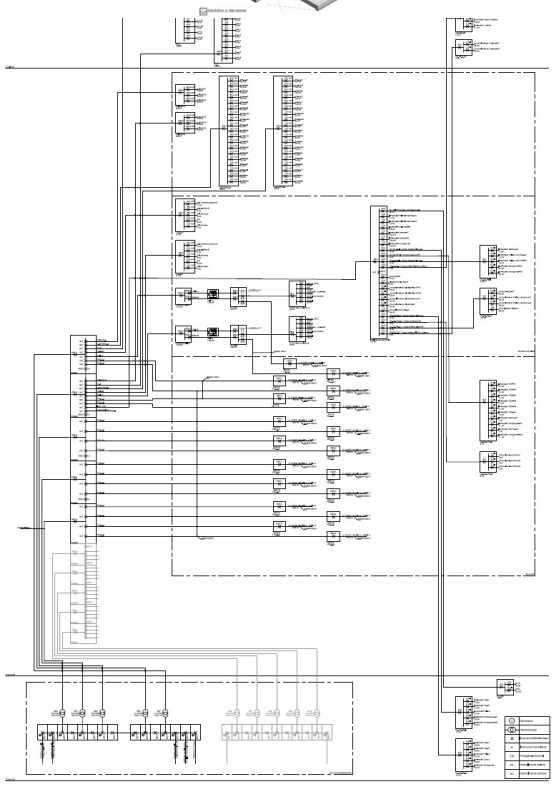
Low Voltage/Switchboard Room





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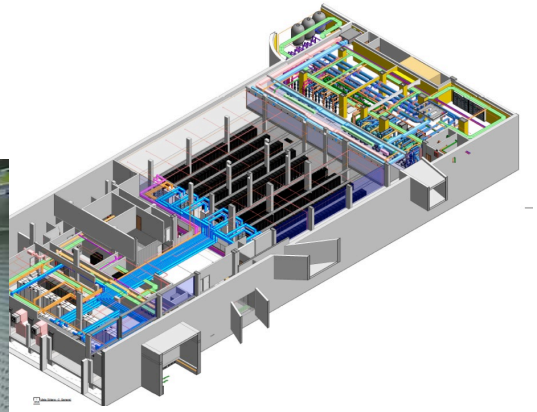
Compute room



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EXCELENCIA
SEVERO
OCHOA
Thank you
sergi.girona@bsc.es