

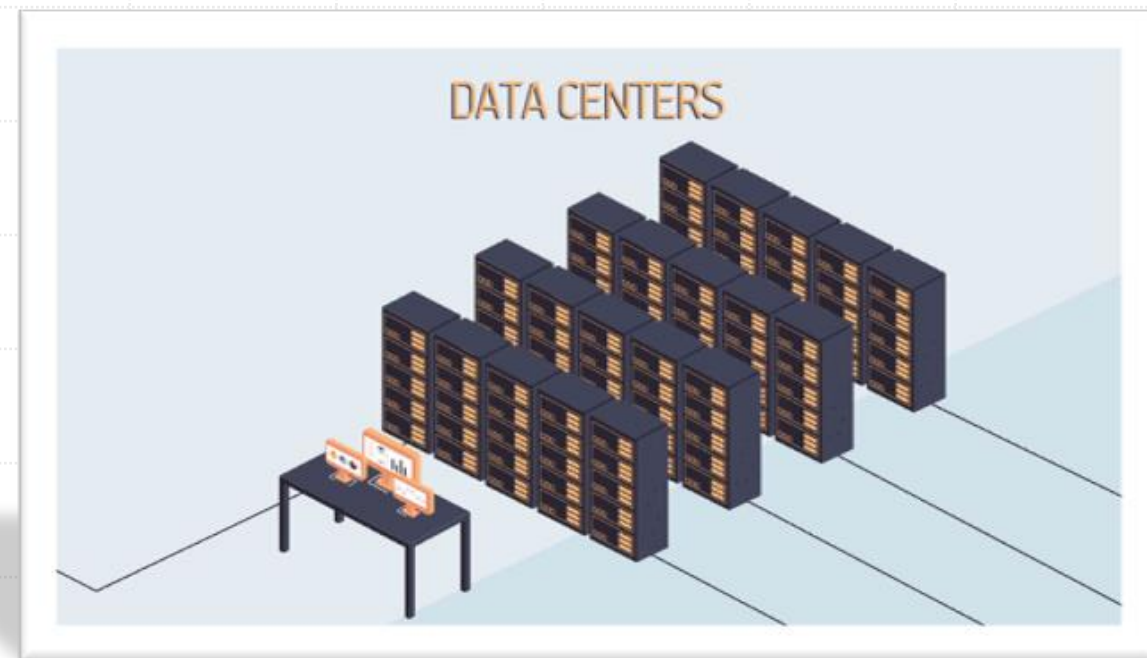
**DAEDALUS, Southeast
European EuroHPC petascale
collaboration with GRNET-GR,
Cyprus Institute - CY, UKIM -
MK, UDG - ME**

Evangelia Athanasaki, GRNET



GRNET: Advanced computational and storage services for the research and higher education community

- High Performance Computing (HPC) infrastructures (ARIS)
- Provision of IaaS resources (IaaS public cloud services – Okeanos + ViMA)
- Online file storage and syncing (Pithos+ Service)
- Dynamic deployment and management of Information Systems using Kubernetes



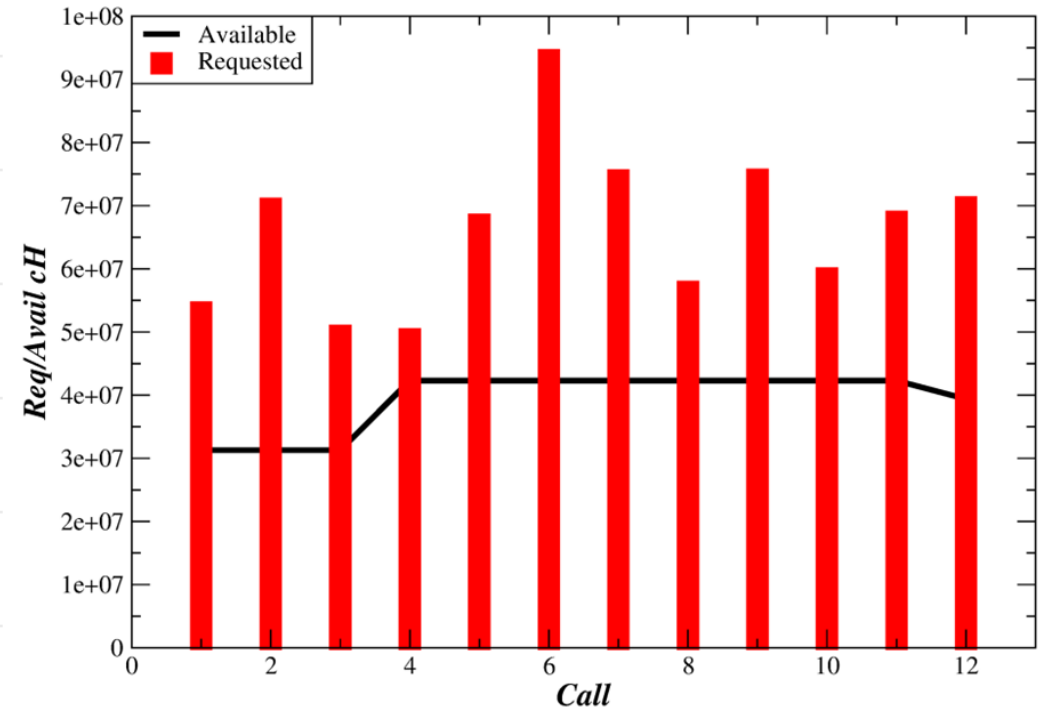
GRNET current HPC infrastructure (ARIS)

- Compute Nodes – 533 computational nodes – 535 TFLOPS:
 - 426 thin nodes: Regular compute nodes (64GB memory/node-20 cores).
 - 44 fat nodes: Regular compute nodes (512GB memory/node-40 cores).
 - 44 gpu nodes: “2 x NVIDIA Tesla k40m” accelerated nodes.
 - 18 phi nodes: “2 x INTEL Xeon Phi 7120p” accelerated nodes.
 - 1 ML node: “8 x NVIDIA Volta V100” accelerators
- Storage
 - 2 PB storage space through IBM’s GPFS.
 - 6PB maximum storage capacity of IBM TS3500 library.
- Available Software modules on:
 - Life Sciences, Computational Chemistry/Material Science, Weather Forecast, Engineering, Numerical Libraries, Visualisation Software, Machine Learning, Containers, Big Data,

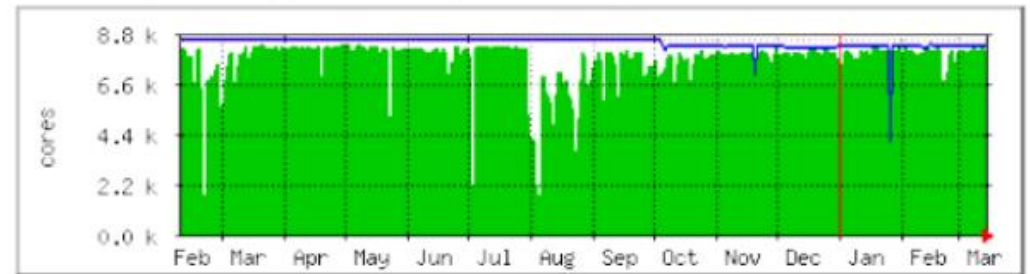


Usage of ARIS

- Request for higher number of resources than available.
- Requests are close to actual needs – significantly difficult to cut requested resources.
- Expansion of current DC (early 2023) covers only essential needs.



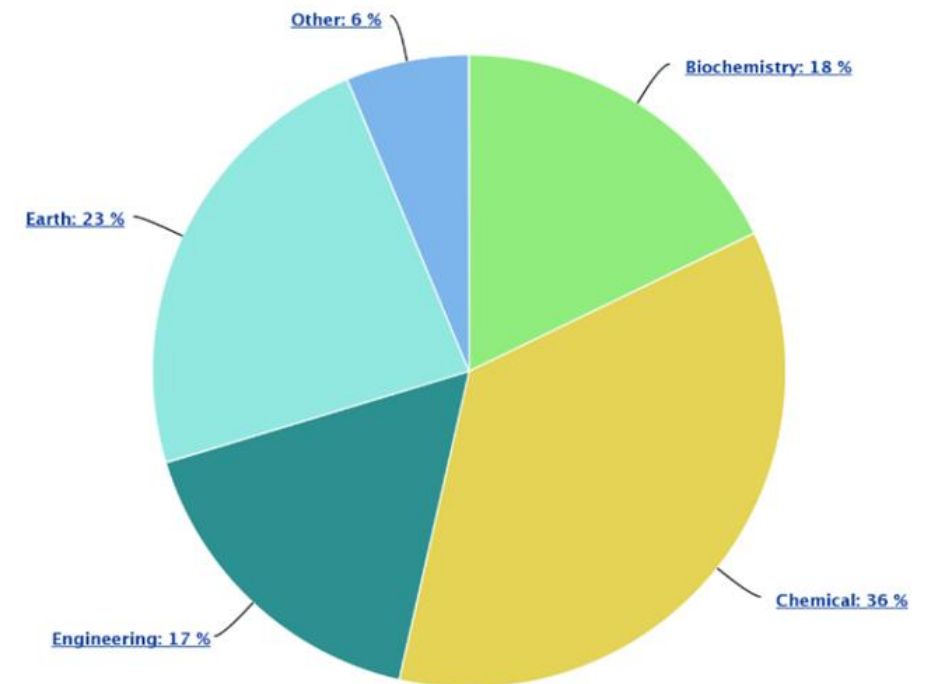
'Yearly' Graph (1 Day Average)



	Max	Average	Current
Cores Allocated	8324 Cores (97.7%)	7493 Cores (87.9%)	8016 Cores (94.1%)
Total Cores	8520 Cores (100.0%)	8381 Cores (98.4%)	8240 Cores (96.7%)

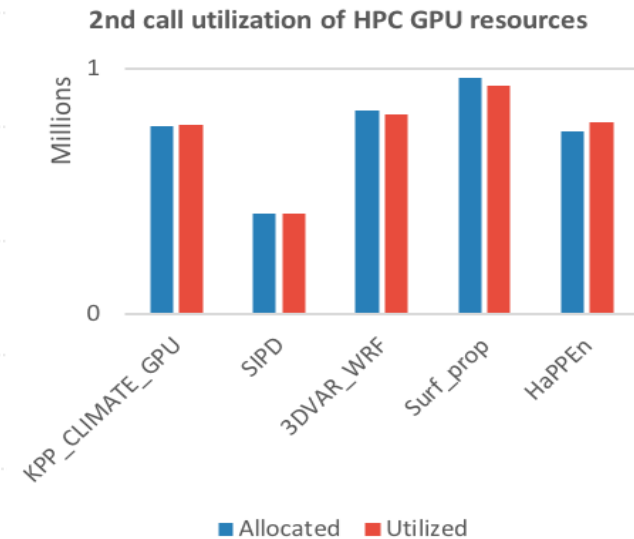
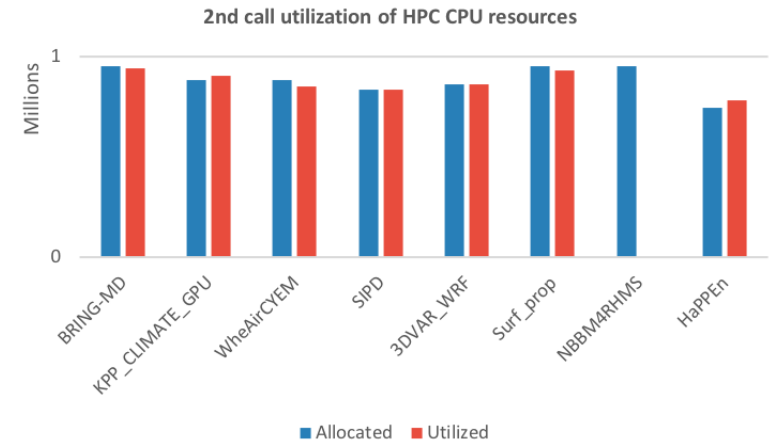
Usage of ARIS

- Access to Greek researchers is provided by submitting proposals for research projects:
 - periodic invitations announced by GRNET (large production projects)
 - continuous open call for development or preparation projects.
 - fast-track procedures for COVID-19 research.
- European researchers can gain access to ARIS:
 - 5% of total CPU time is given to PRACE calls.
 - 3% is given to SEE researchers through other regional projects.
- GRNET user support is usually the motivation for researchers to apply for ARIS thanks to GRNET HPC support team.
- GRNET operates as PRACE Training Center (PTC) funded by PRACE projects since 2017 (5 trainings –technical and domain specific - 11 full training days/year).



HPC resources usage in SEE

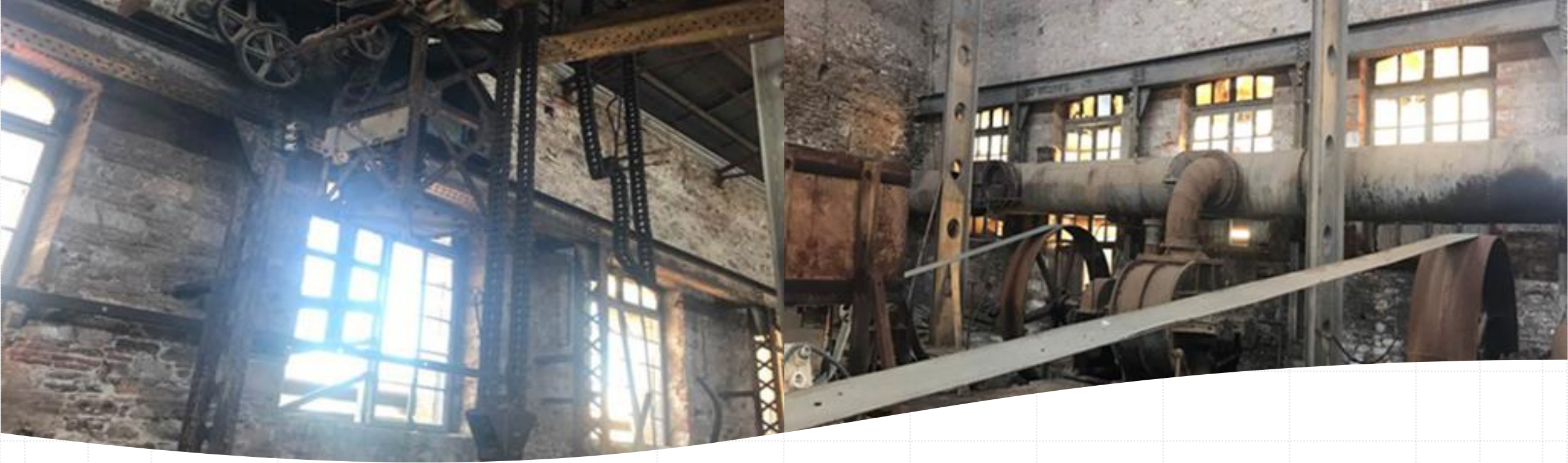
- MoU signed already in 2012 and extended in 2018 for High-Performance computing resource sharing in the region of South Eastern Europe among 16 countries.
- >14 Million CPU core hours, 3.4 Million GPU core hours, and 1 Million Phi core hours have been awarded to scientific projects from the SEE region (1st call VI-SEEM).
- 2.2 million CPU-core hours, 1.1 million GPU-card hours, and and 20 Thousand Phi core hours were allocated (2nd call VI-SEEM).
- 9.3 Million CPU core hours, 0.2 Million GPU card hours, and 1 Million Xeon Phi core hours have been awarded to projects requiring among others access to the HPC services (3rd call VI-SEEM)
- 3.1 million CPU-core hours, 115 thousand GPU-card hours were allocated (NI4OS pan-European call).
- ~1/3 of above resources were offered by GRNET





GRNET future HPC infrastructure (DAEDALUS)

- Location: Technological and Cultural park of Lavrion (TCPL).
 - Today on site there are more than 20 hosted institutions:
 - NTUA's laboratories
 - Startup businesses
 - Educational institutions
 - Educational and cultural activities are often organized in LCPL premises.

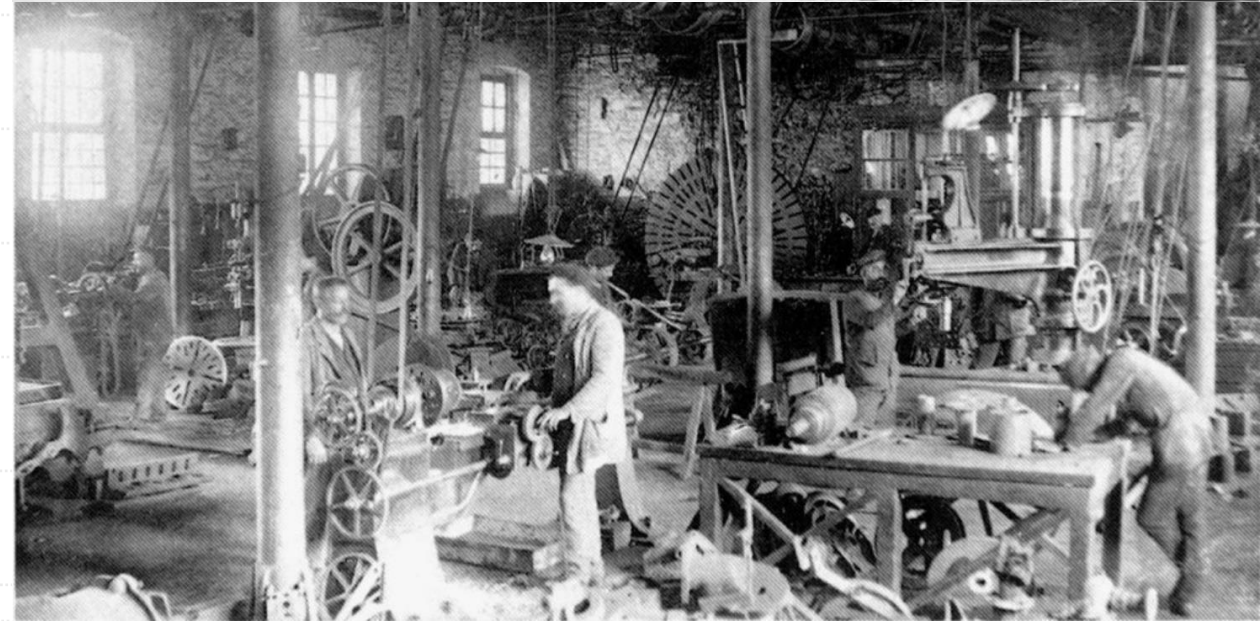


DAEDALUS: historical building renovation

- The building under consideration is a 1500 sq.meter historical building, a modern monument located in the Technological and Cultural park of Lavrion (TCPL), a former industrial area, under the supervision of National Technical University of Athens (NTUA).
- The renovation will keep the historical nature of the building, highlighting the monumental constructions to be a showcase for visitors.

DAEDALUS: historical site

- All the area is full of ancient and modern mining galleries. Its name comes from “lavra” or “lavri”, which means narrow passage, tunnel.
- The ancient Greeks started mining in the area before 3000 BC. The immortal monuments of the Golden Age of Pericles have been realized by means of the silver of Lavrio, together with the tax contributions of Athens' allies (508 BC).





DAEDALUS: historical site

- In 1863, the Italian mining engineer and operator J.B.Serpieri, gets convinced to exploit the ancient slags, In 1864, Serpieri founds the Italian - French company "Hilarion Roux et Cie" at the port of Lavrio. The company undertakes the exploitation of the ancient slugs and the extraction of silver containing lead ores.
- Lavrion Technological and Cultural Park (LTCP), is founded in place of the old French Mining Company of Lavrion (Compagnie Francaise des Mines du Laurium).



DAEDALUS: A green infrastructure

- For 10 months per year, the HPC infrastructure is expected to use free sea water cooling (using the old industrial underground pipeline routes, taking advantage of both low temperature of sea water and soil). The rest of the Datacenter- air cooled devices- will be cooled by in water/air exchanger.
- High temperature episodes will be mitigated by auxiliary cooling power for max 2 months per year.
- A nearby field of 15.000 sq.meters is engaged for installation of 2MWp solar panels to offset the consumption of the new data center.

DAEDALUS specifications

- Planned to be available in 2024
- Funded by 35% EuroHPC JU, 65% National funds, total acquisition cost 28,5M€
- Capacity ~ 30 PFlops (Rpeak) (**x60 the current infrastructure**)
- Green Datacenter
- Hybrid system including both CPUs and GPUs



DAEDALUS: the partnership

- It is in strategic interest of Greece to support science and technology in the wider area of South-East Europe, where traditionally supports a number of large electronic infrastructure projects in the last 2 decades.
- SEE consortium with in-kind contribution
 - The Cyprus Institute (Cyprus) - 1FTE
 - Ss. Cyril and Methodius University in Skopje (North Macedonia) - 1,5 FTE
 - University of Donja Gorica (Montenegro) - 0,5 FTE
 - potential new partners (Serbia, Albania and Bosnia-Herzegovina)



DAEDALUS: the partnership

- Extending the Greek partnership with countries from the region does not include the collection of new funds.
- The model is to engage the countries that are interested in exploiting the system through contributing with experts, expertise, applications, and scientific cases.
- Each partner joining the consortium will contribute in-kind with matching manpower, according to its needs and capability.
- The partner obtains in return use of the system translated into shares of access time to be used by national communities.
- The consortium will create a joint operation unit, where each partner contributes to support Greece for the management and exploitation of the system by proposing scientific challenges or helping other users in improving their applications through a coordinated high-level support team (integrated in the application support team).
- The consortium will operate between 2023 and 2029.



Thank you for
your attention!



Any questions?