High Performance Computing Facility (HPCF)

The Cyprus Institute

Thekla Loizou
Senior Systems Engineer

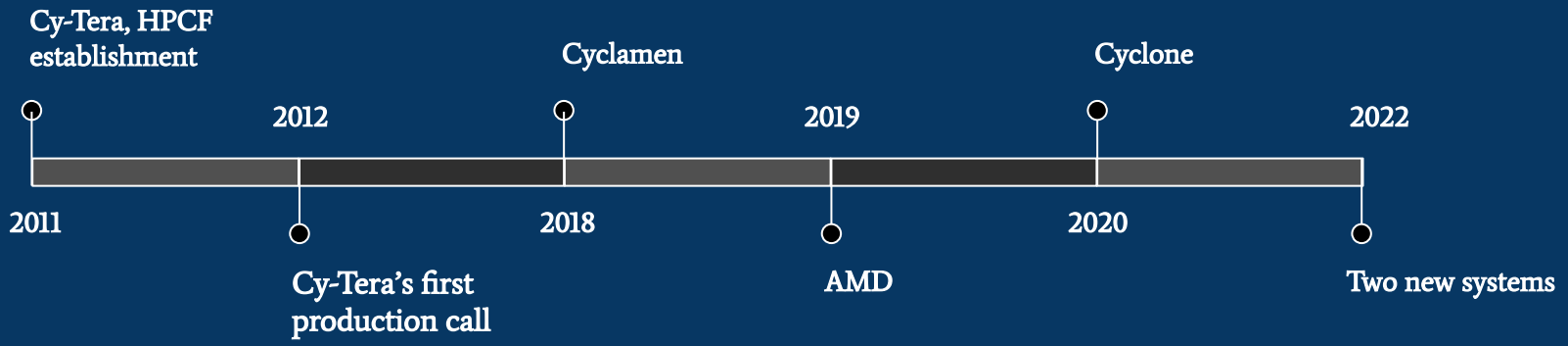
About

- A *national* facility
- Unique in its openness
  - provides cutting edge HPC resources to people in the EMME region
- Key characteristics
  - Multidisciplinarity
  - Open national and regional infrastructures
  - Focus on real-world problems and applications
- Established in 2011

The Cy-Tera supercomputer (2011)

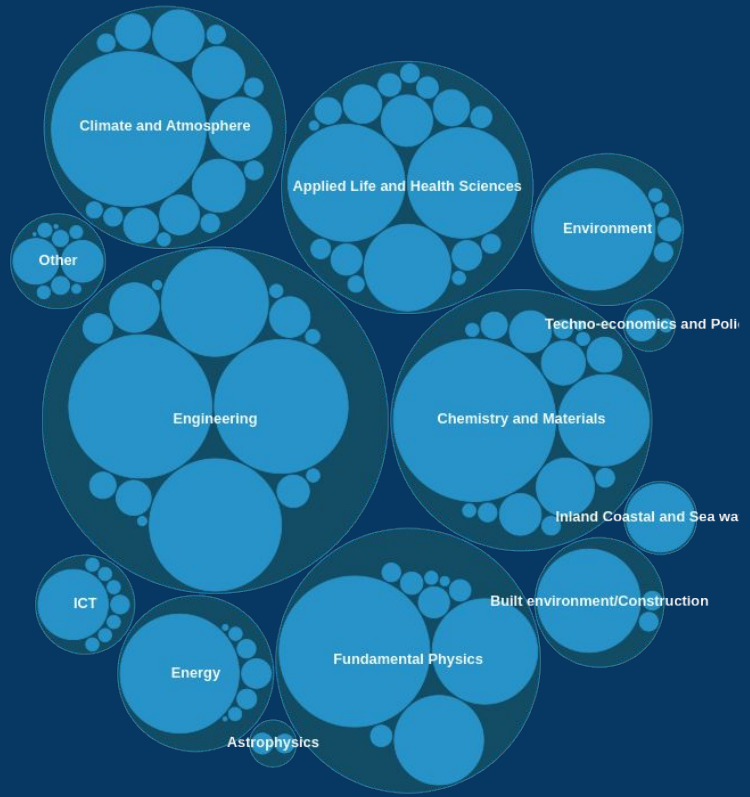
About

- The HPC Facility provides:
  - advanced compute capabilities
  - data analysis infrastructures
  - user support



About

- Has provided services to hundreds of researchers, many of which are from outside of Cyprus.
- Applications at the HPC Facility span the full spectrum of science.



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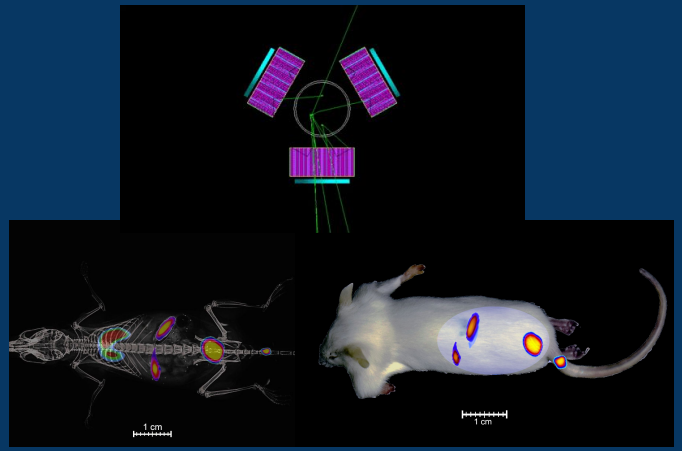
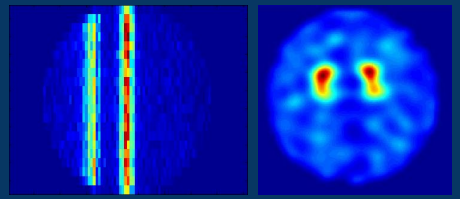
Applications

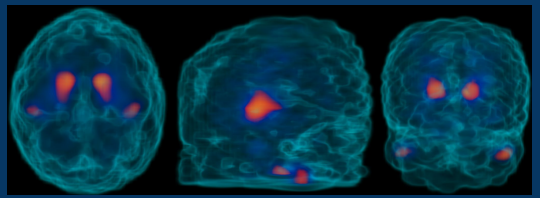
Medical Imaging

Development of algorithms and innovative techniques in medical applications

Applying supercomputing for higher resolution imaging with reduced radiation exposure



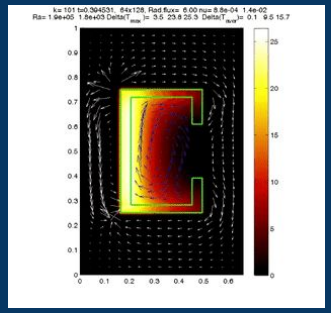


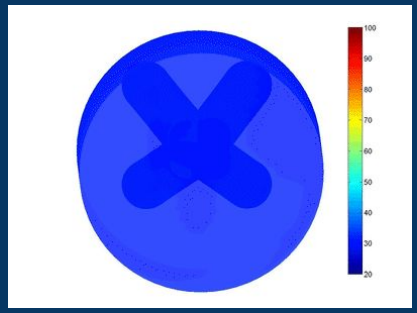


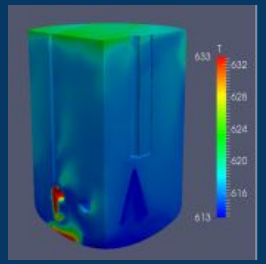
Applications

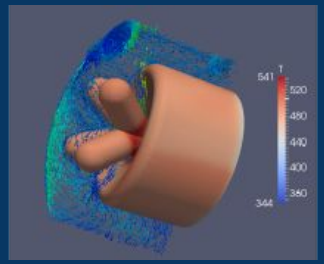
Energy

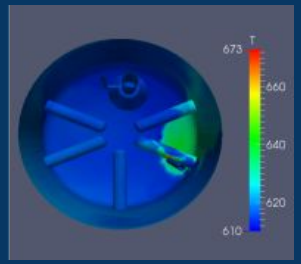
Using supercomputers to design solar collectors











Applications

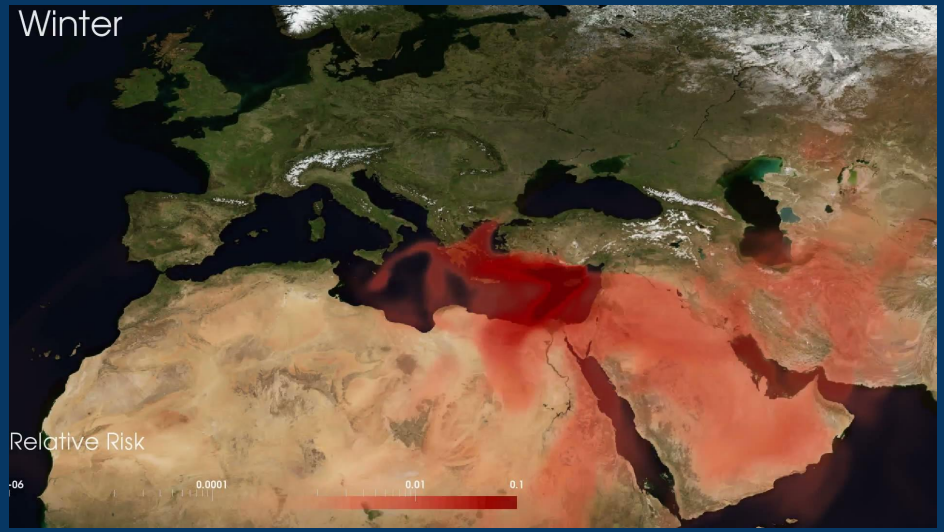
Risk Assessment

Simulation of extreme dust incidents

Applications

Risk Assessment

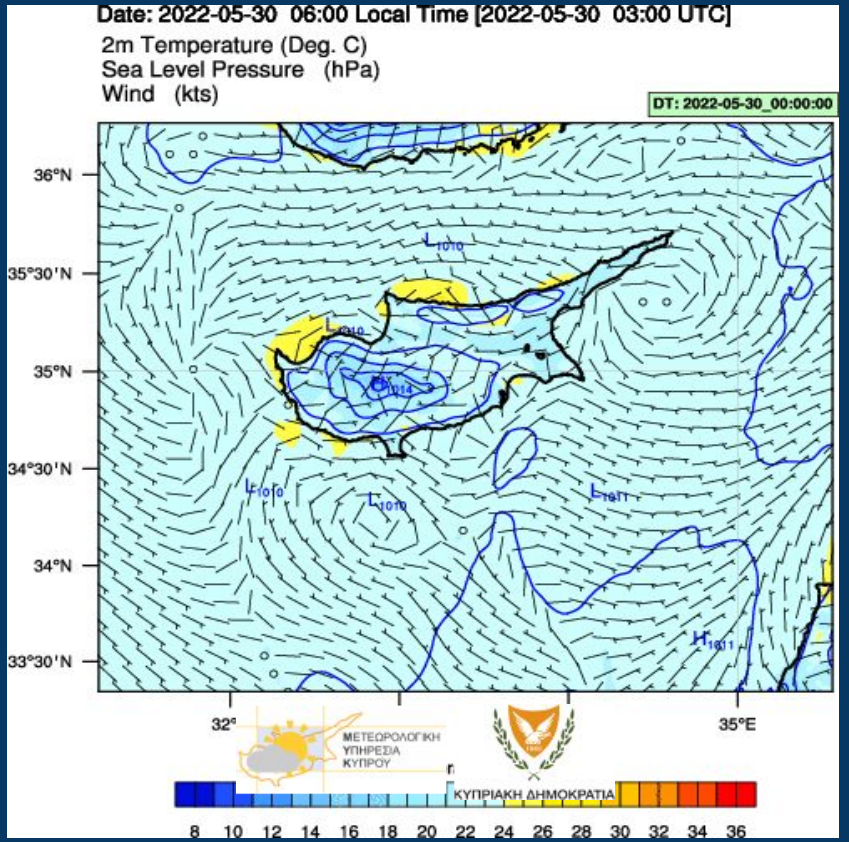
Assessment of risk in case of an accident at the Akkuyu nuclear plant



Applications

Cyprus Meteorology Service

Provision of supercomputing resources and technical support for running daily weather prediction models



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HPC Systems

Cyclone: Open to researchers/companies in the EMME region

- 600 TFlop/s
- 17 nodes with 40 cores each (2 x Intel Xeon Gold 6248 CPUs)
- 16 nodes with 4 GPUS each (4 x Nvidia V100 GPUs)
- 192GB RAM per node
- HDR100
- CentOS
- 135TB NVMe storage
- 3PB Disk storage (shared)

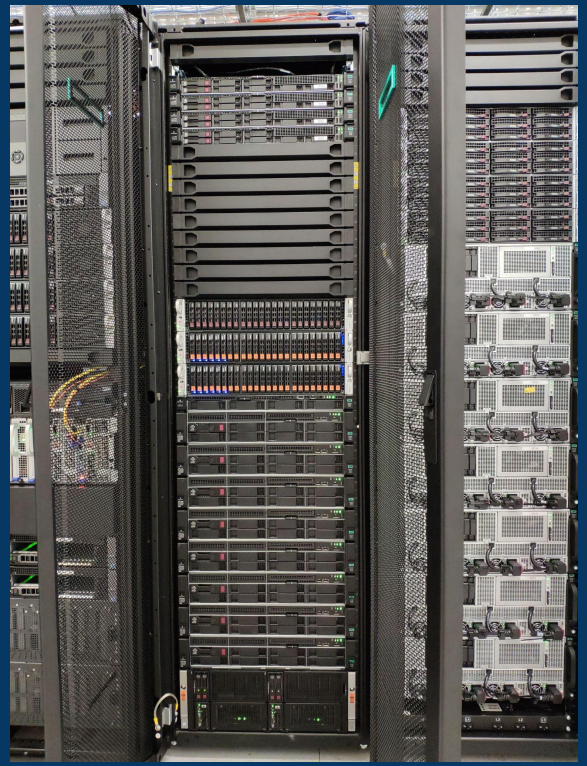
HPC Systems

Cyclamen: Cluster of Lattice QCD group of CyI

- 8 GPU nodes with 2 GPUs each (2 x NVIDIA P100 GPUs)
- 128GB RAM per node
- EDR
- CentOS
- 3PB of disk storage (shared)

AMD: Cluster of Climate and Energy groups of CyI

- 8 compute nodes with 128 cores each (2 x AMD EPYC 7702 CPUs)
- 256GB RAM per node
- HDR100
- CentOS
- 3PB of disk storage (shared)



HPC Systems

Two new HPC systems to be deployed in 2022

- A GPU cluster
  - 24 A100 NVIDIA GPUs
- An AMD Milan cluster
  - ~ 4500 cores

Cyclone Access

- Preparatory Access
  - Small projects, code development, code scalability testing
  - Access is open throughout the year
  - Simple application form through the HPC Facility ticketing system
  - Technical review only
- Production Access
  - Projects with greater computational requirements
  - Production calls open twice a year
  - Peer review process with technical and scientific evaluation
  - Resource Allocation Committee (RAC) oversees the whole process
- Businesses/Industry Access
  - Access can be given to businesses for non-scientific purposes
  - Access is given in a billable way
  - Businesses can be granted access for scientific (and open dissemination) purposes through Preparatory or Production Access

User Support, Education and Training

- User support
  - Accounts creation (~ 1400 over 10 years)
  - Guidance on using the systems, software installation, code compilation, help with any other issues
  - 576 tickets received over the last 12 months
- Education
  - Access to CyI PhD and Masters program students
  - Access to University students in the region
- Training
  - Access to participants of CyI training events
  - Training events and seminars in the region

Software

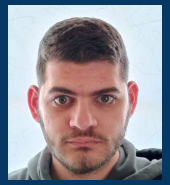
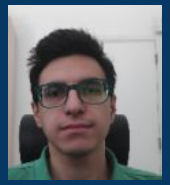
- Automated reproducible build processes using EasyBuild
- Maintain multiple compilers/versions
- 1000's of software packages

Beyond HPC

- Private cloud
  - 15 servers (previously Openstack based, now Proxmox)
  - 300TB
  - shared NVMe partition over Infiniband (fast)
  - NI4OS VMs are hosted there
- Container-based systems
  - Docker swarm cluster
  - CING apps are hosted there
- Storage
  - 3PB High-capacity / High-performance / General-purpose (i.e. shared between systems)
  - 200TB traditional “cloud based” dropbox-style storage

The Team

- Personnel
  - Minas Trattou (Junior Engineer – Systems/Software)
  - Marios Pantekhis (Junior Engineer – Developer/Integration)
  - Panagiotis Vorkas (Engineer – Networking/Datacenter/Security)
  - Thekla Loizou (Senior Engineer – Systems/Software/Support Lead)
  - George Tsouloupas (Manager – Systems/all of the above)
  - *Vassilios Tsakalos (DRTS - CyI Facilities overlord)
- A combined HPC systems experience of 25+ years
- Contact us
  - hpc.support@cyi.ac.cy




Thank you!

Production Access