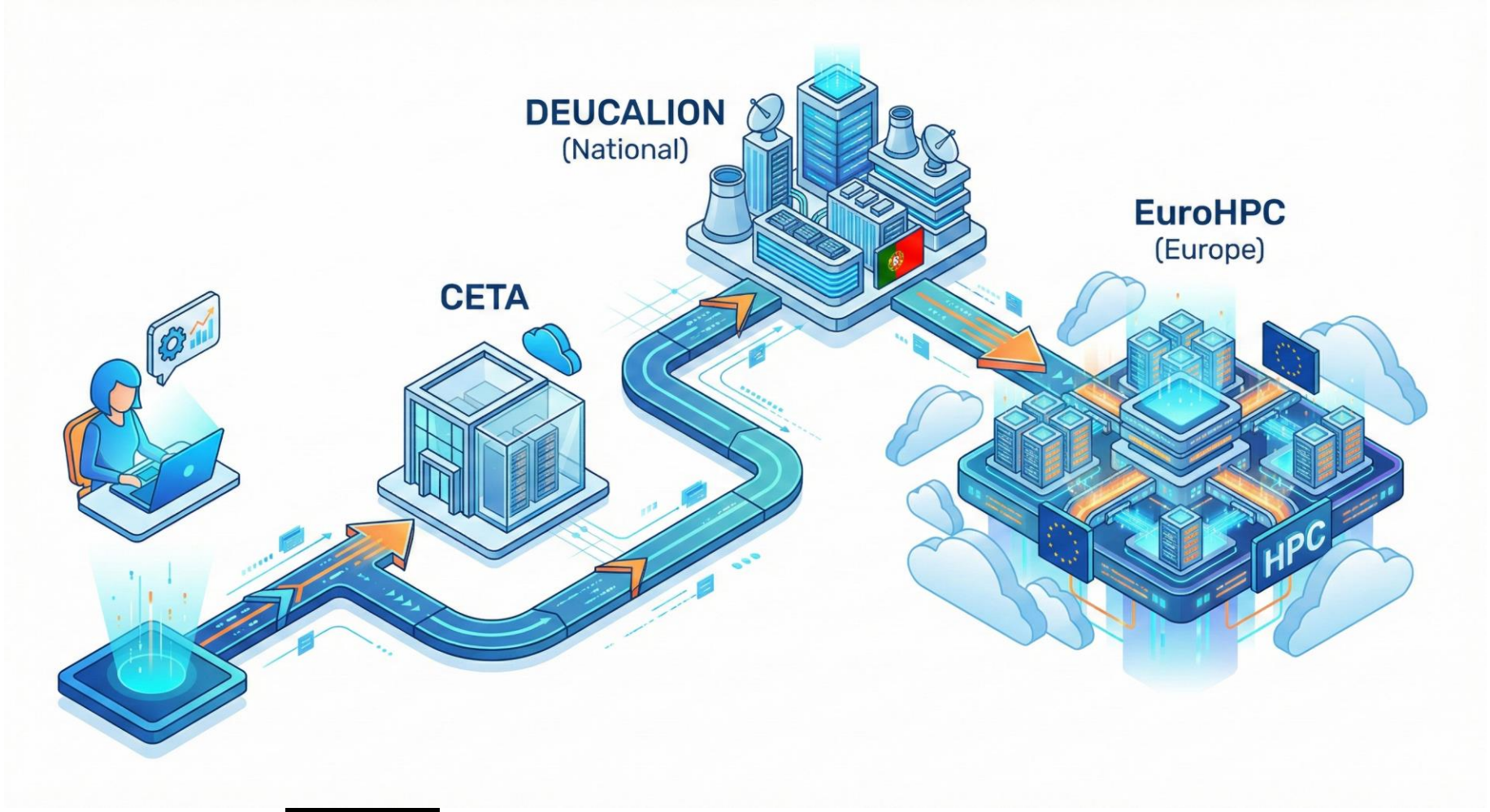
Introduction to National HPC Infrastructure

Ilyass Hankrir | ihankrir@ualg.pt
Alexandre Gomes | ajgomes@ualg.pt

HPCvLAB@UALGARVE
26 January 2026

The Ecosystem



UAlg FCT
UNIVERSIDADE DO ALGARVE
FACULDADE DE CIÊNCIAS E TECNOLOGIA

EURO² PORTUGAL

FCCN serviços digitais fct

fct Fundação para a Ciência e a Tecnologia

CNCA Network

Gateway to EuroHPC (Tier-0)

Source of figure: https://rnca.fccn.pt/en/rede/

UAlg FCT
UNIVERSIDADE DO ALGARVE
FACULDADE DE CIÊNCIAS E TECNOLOGIA

EURO² PORTUGAL

FCCN serviços digitais fct

fct Fundação para a Ciência e a Tecnologia

HPCvLab-UAlg

https://hpcvlab.ualg.pt

UAlg FCT
UNIVERSIDADE DO ALGARVE
FACULDADE DE CIÊNCIAS E TECNOLOGIA

EURO² PORTUGAL

FCCN serviços digitais fct

fct Fundação para a Ciência e a Tecnologia

Start Your Journey

Designation	Type	Start date	End date	Status
Call for Advanced Computing Projects (6th ed) - A0 | A1 (Round C)	Advanced Computing Projects	15.01.2026 - 17:00	16.03.2026 - 17:00	Open
Call for Advanced Computing Projects (6th ed) - A2 | A3 (Round C)	Advanced Computing Projects	15.01.2026 - 17:00	16.03.2026 - 17:00	Open
European Partnership for Brain Health (EPBH) 2026 Calls	Projects	08.01.2026 - 09:00	10.03.2026 - 13:00	Open
DEFENSE + SCIENCE: Call for Exploratory Projects 2025	Projects	30.12.2025 - 17:00	24.02.2026 - 17:00	Open
Call for Exploratory Research Projects under the CMU Portugal Program 2025	Projects	23.12.2025 - 17:00	10.02.2026 - 17:00	Open
Call for Exploratory Research Projects under the UT Austin Portugal Program 2025	Projects	23.12.2025 - 17:00	10.02.2026 - 17:00	Open
Individual Call to Scientific Employment Stimulus - 8th Edition	CEECIND	15.12.2025 - 16:00	29.01.2026 - 17:00	Open
R&D Projects in All Scientific Domains 2025	Projects	27.11.2025 - 17:00	11.03.2026 - 17:00	Open

Source: https://myfct.fct.pt/MyFCT/homepage.aspx

UAlg FCT
UNIVERSIDADE DO ALGARVE
FACULDADE DE CIÊNCIAS E TECNOLOGIA

EURO² PORTUGAL

FCCN serviços digitais fct

fct Fundação para a Ciência e a Tecnologia

Call Advanced Computing Projects

A0 - Acesso Experimental | Experimental Access (Deucalion, Cirrus & Stratus)
A1 - Acesso Desenvolvimento | Development Access (Deucalion, Cirrus & Stratus)
A2 - Acesso Regular | Regular Access (Deucalion, MareNostrum 5, Cirrus & Stratus)
A3 - Acesso Maior Dimensão | Larger Access (Deucalion & MareNostrum 5)

Source: https://myfct.fct.pt/MyFCT/homepage.aspx

Call Advanced Computing Projects

	A0	A1	A2	A3
Computational Model	HPC, IA, Cloud			HPC, IA
Platforms	Cirrus, Stratus, Deucalion		Cirrus, Stratus, Deucalion, MareNostrum 5	Deucalion, MareNostrum 5
Duration (months)	**6**	**12**		
CPU core.hours	50.000	100.000	100.000 a 3.000.000	1.000.000 a 30.000.000
vCPU.hours			1.200.000	-
GPU.hours	500	5.000	10.000	100.000
Quotas	5%	15%	80%	

UAlg FCT
UNIVERSIDADE DO ALGARVE
FACULDADE DE CIÊNCIAS E TECNOLOGIA

EURO² PORTUGAL

FCCN serviços digitais fct

fct Fundação para a Ciência e a Tecnologia

Call Advanced Computing Projects

A0 - Acesso Experimental | Experimental Access (Deucalion, Cirrus & Stratus)
A1 - Acesso Desenvolvimento | Development Access (Deucalion, Cirrus & Stratus)
A2 - Acesso Regular | Regular Access (Deucalion, MareNostrum 5, Cirrus & Stratus)
A3 - Acesso Maior Dimensão | Larger Access (Deucalion & MareNostrum 5)

Source: https://myfct.fct.pt/MyFCT/homepage.aspx

•**Need more power?** Apply to **EuroHPC** for access to European Tier-0 supercomputers (LUMI, Leonardo, etc.).
•**Industry/Commercial?** Computing resources can be purchased directly for private R&D or pre-competitive innovation.

UAlg FCT
UNIVERSIDADE DO ALGARVE
FACULDADE DE CIÊNCIAS E TECNOLOGIA

EURO² PORTUGAL

FCCN serviços digitais fct

fct Fundação para a Ciência e a Tecnologia

Cirrus' Hardware

Queue	The Engine (Hardware)	Best For...
CPU	**AMD EPYC 7643** (96 cores, 512 GB RAM)	General-purpose HPC. Simulations, CFD, physics, chemistry, parallel CPU workloads.
Memory	**AMD EPYC 7643** (96 cores, 2 TB RAM)	Memory-intensive applications. Bioinformatics, large datasets, graph processing.
GPU	**NVIDIA Tesla T4 / V100s / A100** (16 GB / 32 GB / 64 GB RAM)	Deep Learning, Training models, heavy matrix math.

Deucalion's Hardware

Partition	The Engine (Hardware)	Best For...
ARM	**Fujitsu A64FX** (48 Cores)	**Efficiency.** Physics, fluid dynamics...
x86	**AMD EPYC** (128 Cores)	**Compatibility.** Standard stuff. If it runs on your laptop, it runs here (but faster).
GPU	**NVIDIA A100** (40GB/80GB)	**AI & Acceleration.** Deep Learning, Training models, heavy matrix math.

Deucalion is a hybrid HPC. It has CPUs for standard math and GPUs for AI.

UAlg FCT
UNIVERSIDADE DO ALGARVE
FACULDADE DE CIÊNCIAS E TECNOLOGIA

EURO² PORTUGAL

FCCN serviços digitais fct

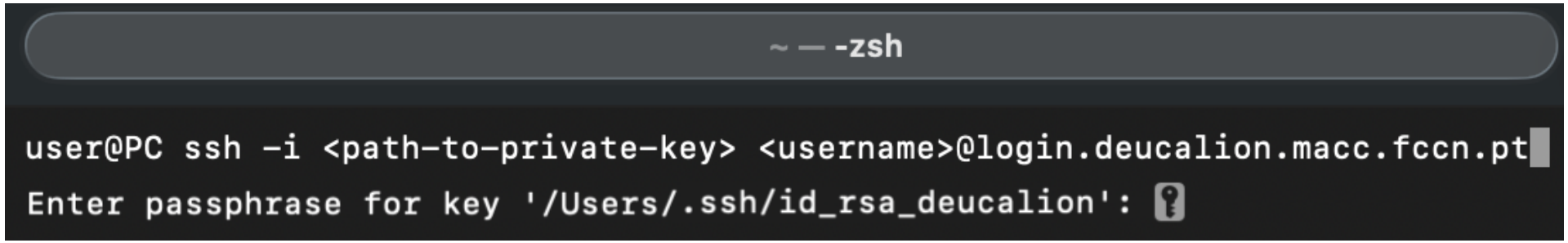
fct Fundação para a Ciência e a Tecnologia

How to connect

If using a Microsoft Windows OS:
- MobaXTerm Home Edition (freely available from https://mobaxterm.mobatek.net/)

Alternatives for Windows OS/MacOS:
- Visual Studio Code (free)

- Using the terminal connect using SSH:



Details will be given on account creation.

UAlg FCT
UNIVERSIDADE DO ALGARVE
FACULDADE DE CIÊNCIAS E TECNOLOGIA

EURO² PORTUGAL

FCCN serviços digitais fct

fct Fundação para a Ciência e a Tecnologia

After log in

```
8888888b.  8888888888 888     888  .d8888b.        d8888 888      8888888 .d88888b.  888b    888
888   Y88b 888        888     888 d88P  Y88b      d88888 888        888  d88P   Y88b 8888b   888
888    888 888        888     888 888    888     d88P888 888        888  888     888 88888b  888
888    888 8888888    888     888 888           d88P 888 888        888  888     888 888Y88b 888
888    888 888        888     888 888          d88P  888 888        888  888     888 888 Y88b888
888    888 888        888     888 888    888  d88P   888 888        888  888     888 888  Y88888
888  .d88P 888        Y88b. .d88P Y88b  d88P d8888888888 888        888  Y88b. .d88P 888   Y8888
8888888P   8888888888   Y88888P     Y8888P   888 8888888 8888888  888888   Y88888P   888    Y888
Last login: Sat Jan 17 19:31:46 2026 from xxx.xxx.xxx.xx

Greetings user

Welcome to the Portuguese EuroHPC supercomputer, *please* read documentation before use:
https://docs.macc.fccn.pt/

The following scripts are now available for user reference:

1. Home Quota Check:               quotahome
2. Lustre (projects) Quota Check:  quotaprojects
3. Slurm Billing Information:      billing

Run these scripts directly to get up-to-date information on
your storage usage and job-related billing.

(base) [user@ln02 ~]$
```

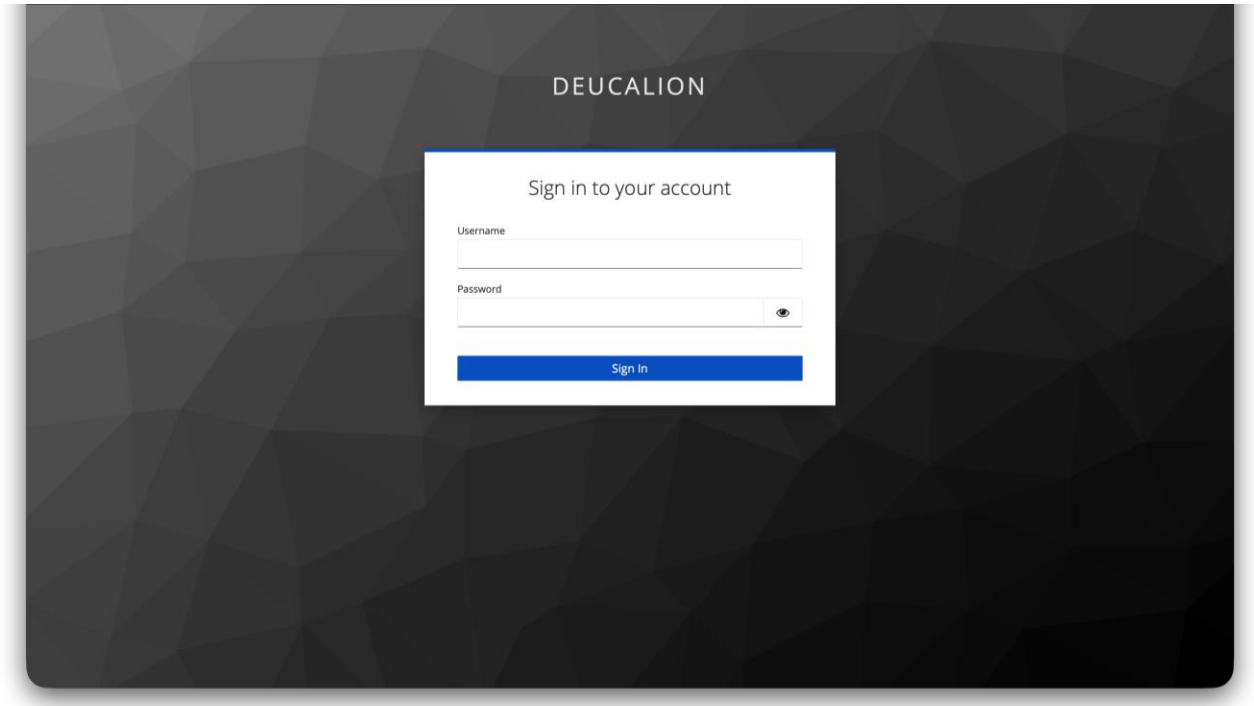
UAlg FCT
UNIVERSIDADE DO ALGARVE
FACULDADE DE CIÊNCIAS E TECNOLOGIA

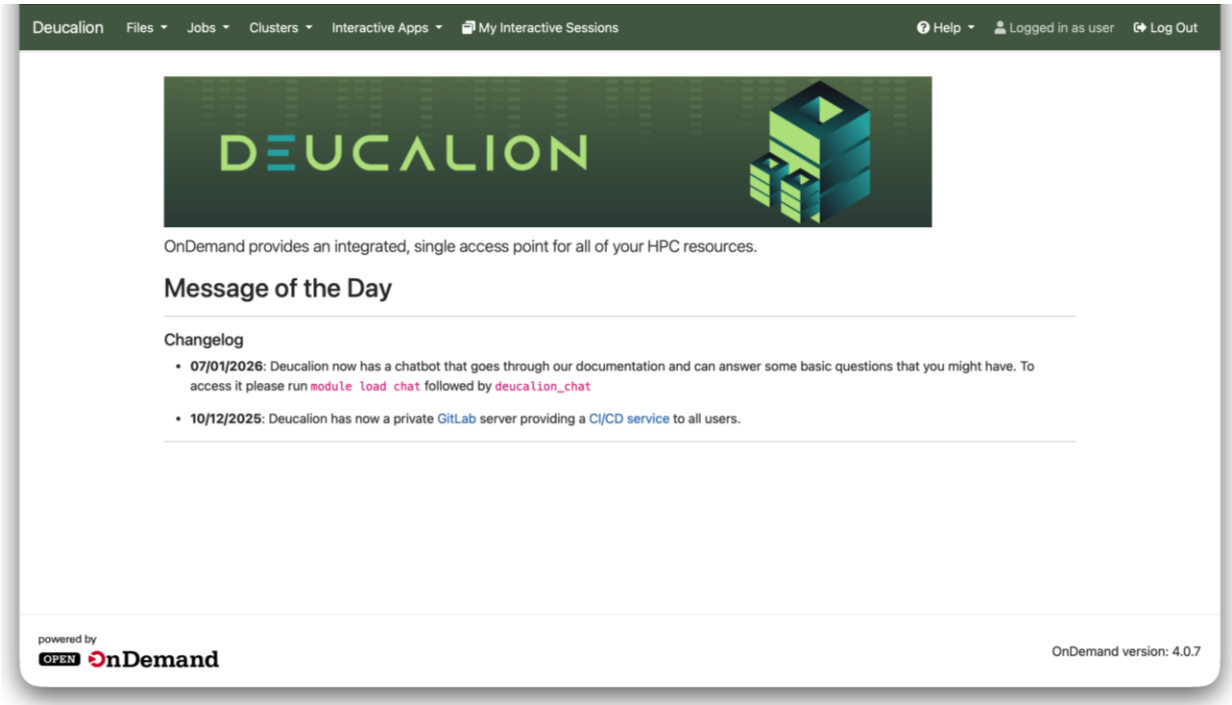
EURO² PORTUGAL

FCCN serviços digitais fct

fct Fundação para a Ciência e a Tecnologia

Open On Demand





https://login.deucalion.macc.fccn.pt/

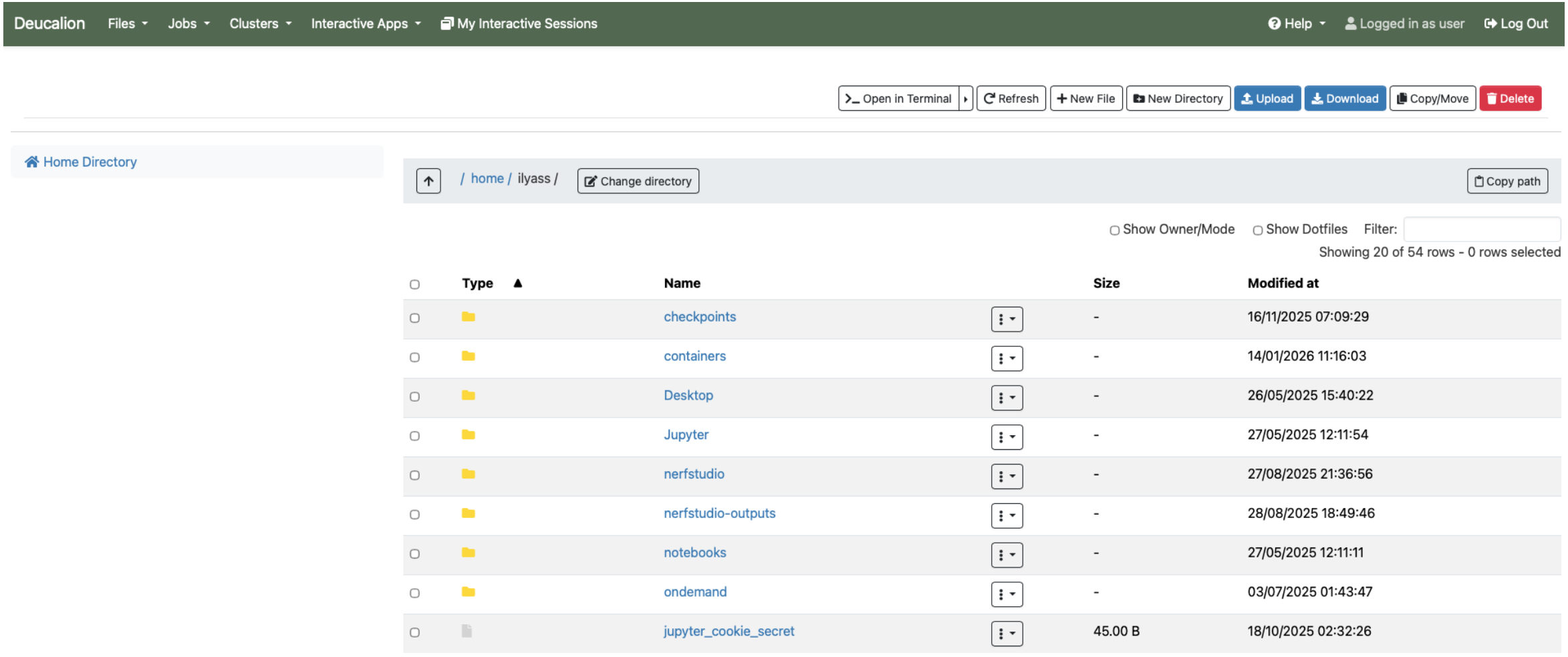
UAlg FCT
UNIVERSIDADE DO ALGARVE
FACULDADE DE CIÊNCIAS E TECNOLOGIA

EURO² PORTUGAL

FCCN serviços digitais fct

fct Fundação para a Ciência e a Tecnologia

Open On Demand



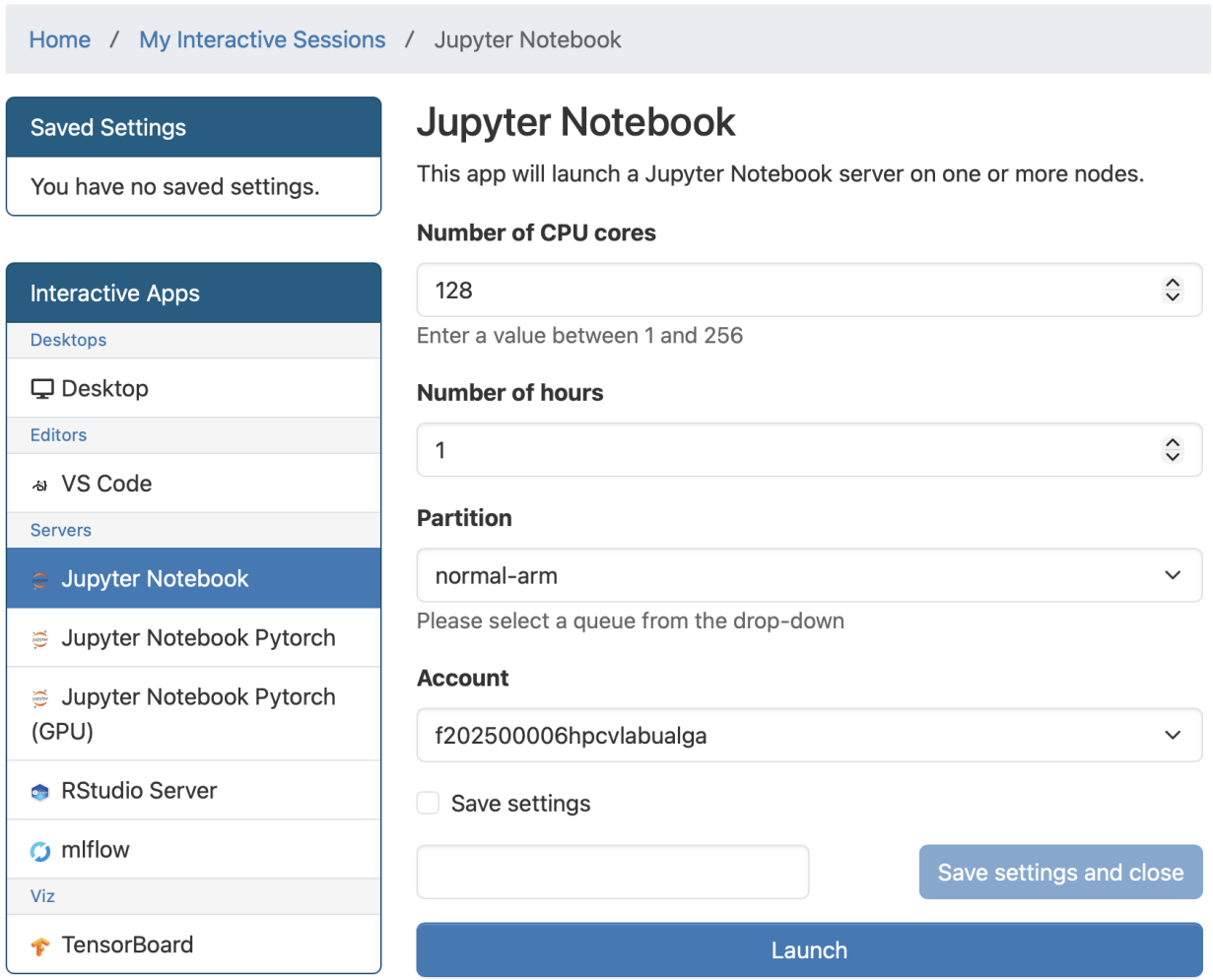
UAlg FCT
UNIVERSIDADE DO ALGARVE
FACULDADE DE CIÊNCIAS E TECNOLOGIA

EURO² PORTUGAL

FCCN serviços digitais fct

fct Fundação para a Ciência e a Tecnologia

Open On Demand



UAlg FCT
UNIVERSIDADE DO ALGARVE
FACULDADE DE CIÊNCIAS E TECNOLOGIA

EURO² PORTUGAL

FCCN serviços digitais fct

fct Fundação para a Ciência e a Tecnologia

Partitions

Partition	Architecture	Max Nodes	Time Limit
dev-arm	aarch64	2	4 hours
normal-arm	aarch64	128	48 hours
large-arm	aarch64	512	72 hours
dev-x86	x86_64	2	4 hours
normal-x86	x86_64	64	48 hours
large-x86	x86_64	128	72 hours
dev-a100-40	x86_64	1	4 hours
normal-a100-40	x86_64	4	48 hours
dev-a100-80	x86_64	1	4 hours
normal-a100-80	x86_64	4	48 hours

Several Architectures: Deucalion supports four distinct computing paradigms.

Available hardware:

- **ARM (aarch64):** Powered by **Fujitsu A64FX** processors (High Bandwidth Memory). Ideal for memory-bound applications.
- **x86 (x86_64):** Powered by **AMD EPYC** processors. Standard general-purpose computing.
- **Accelerated (A100):** Nodes equipped with **NVIDIA A100** GPUs (40GB or 80GB VRAM) for AI and MD workloads.

Environment Management

Deucalion uses **environment modules** to manage compilers (GCC, Intel), MPI versions, Python, etc.

module avail	**# show available modules**
module spider	**# search for a module**
module load [module]	**# load a module**
module list	**# list all loaded modules**
module unload [module]	**# unload a module**
module purge	**# unload all modules**

Environment Management

module avail

```
(base) [ilyass@ln02 ~]$ module avail

--------------------- /projects/F202500006HPCVLABUALG/.eb/x86/modules/all ---------------------
   Fiji/2.14.0-Java-11    Java/8.452 (8)    code-server/4.104.1

------------------------------ EasyBuild -------------------------------
   ACTC/1.1-GCCcore-12.3.0
   ADIOS/20221212-foss-2023a
   ALAMODE/1.4.2-foss-2022b
   ANSYS/241
   AOCL-BLAS/5.0-GCC-14.2.0
   AOCL-BLAS/5.1-GCC-14.3.0
   AOCL-BLAS/5.1-llvm-compilers-20.1.8                    (D)
   ATK/2.38.0-GCCcore-11.3.0
   ATK/2.38.0-GCCcore-12.3.0                              (D)
   Abseil/20230125.3-GCCcore-12.3.0
   Abseil/20240722.0-GCCcore-13.3.0                       (D)
   AlphaFold/2.3.4-foss-2024a-CUDA-12.6.0-ColabFold
   AlphaFold3/3.0.1-20250908-foss-2024a-CUDA-12.6.0
   AmberTools/23.6-foss-2023a
   Anaconda3/2023.07-2                                    (D)
   Anaconda3/2025.06-1
   Armadillo/12.6.2-foss-2023a
   Autoconf/2.69-GCCcore-8.3.0
   Autoconf/2.71-GCCcore-10.3.0
   Autoconf/2.71-GCCcore-11.3.0
   Autoconf/2.71-GCCcore-12.2.0
   Autoconf/2.71-GCCcore-12.3.0
   Autoconf/2.71-GCCcore-13.2.0
   Autoconf/2.71
```

UAlg FCT
UNIVERSIDADE DO ALGARVE
FACULDADE DE CIÊNCIAS E TECNOLOGIA

EURO² PORTUGAL

FCCN serviços digitais fct

fct Fundação para a Ciência e a Tecnologia

Environment Management

module avail	# show available modules
module spider	# search for a module
module load [module]	# load a module
module list	# list all loaded modules
module unload [module]	# unload a module
module purge	# unload all modules

Environment Management

module spider

```
[(base) [ilyass@ln02 ~]$ module spider Python                                  ]

----------------------------------------------------------------------------
  Python:
----------------------------------------------------------------------------
    Description:
      Python is a programming language that lets you work more quickly and integrate your
      systems more effectively.

     Versions:
        Python/2.7.16-GCCcore-8.3.0
        Python/2.7.18-GCCcore-11.3.0-bare
        Python/2.7.18-GCCcore-12.3.0-bare
        Python/2.7.18-GCCcore-12.3.0
        Python/2.7.18-GCCcore-13.3.0
        Python/3.9.5-GCCcore-10.3.0-bare
        Python/3.9.5-GCCcore-10.3.0
        Python/3.10.4-GCCcore-11.3.0-bare
        Python/3.10.4-GCCcore-11.3.0
        Python/3.10.8-GCCcore-12.2.0-bare
        Python/3.10.8-GCCcore-12.2.0
        Python/3.11.3-GCCcore-12.3.0
        Python/3.11.5-GCCcore-13.2.0
        Python/3.12.3-GCCcore-13.3.0
        Python/3.13.1-GCCcore-14.2.0
        Python/3.13.5-GCCcore-14.3.0
     Other possible modules matches:
        Biopython  Boost.Python-NumPy  GitPython  IPython  Python-bundle-PyPI  SymEngine-python
...
```

UAlg FCT
UNIVERSIDADE DO ALGARVE
FACULDADE DE CIÊNCIAS E TECNOLOGIA

EURO² PORTUGAL

FCCN serviços digitais fct

fct Fundação para a Ciência e a Tecnologia

Environment Management

module avail	# show available modules
module spider	# search for a module
module load [module]	**# load a module**
module list	**# list all loaded modules**
module unload [module]	**# unload a module**
module purge	**# unload all modules**

Environment Management

module load + module list

```
[(base) [ilyass@ln02 ~]$ module load Python/3.13.5-GCCcore-14.3.0
[(base) [ilyass@ln02 ~]$ module list

Currently Loaded Modules:
  1) GCCcore/14.3.0                      8) Tcl/9.0.1-GCCcore-14.3.0
  2) zlib/1.3.1-GCCcore-14.3.0           9) SQLite/3.50.1-GCCcore-14.3.0
  3) binutils/2.44-GCCcore-14.3.0       10) XZ/5.8.1-GCCcore-14.3.0
  4) bzip2/1.0.8-GCCcore-14.3.0         11) libffi/3.5.1-GCCcore-14.3.0
  5) ncurses/6.5-GCCcore-14.3.0         12) OpenSSL/3
  6) libreadline/8.2-GCCcore-14.3.0     13) Python/3.13.5-GCCcore-14.3.0
  7) libtommath/1.3.0-GCCcore-14.3.0



 (base) [ilyass@ln02 ~]$
```

Environment Management

module avail	# show available modules
module spider	# search for a module
module load [module]	# load a module
module list	# list all loaded modules
module unload [module]	**# unload a module**
module purge	**# unload all modules**

Environment Management

module unload [module] / module purge

```
[(base) [ilyass@ln02 ~]$ module purge
[(base) [ilyass@ln02 ~]$ module list
 No modules loaded
```

Support

Check the Docs

Search the Error:
Google the error message + "slurm" or "linux".

Send message to HPCvLab-UAlg.

The Golden Rule:

"One Issue = One Ticket. Please don't bundle 5 different problems into one email."

UAlg FCT
UNIVERSIDADE DO ALGARVE
FACULDADE DE CIÊNCIAS E TECNOLOGIA

EURO² PORTUGAL

FCCN serviços digitais fct

fct Fundação para a Ciência e a Tecnologia

References

- Deucalion User Guide:
  https://docs.macc.fccn.pt/

- Cirrus User Guide:
  https://wiki.incd.pt/shelves/hpc-htc-user-documentation

- Contact us at:
  https://hpcvlab.ualg.pt

UAlg FCT
UNIVERSIDADE DO ALGARVE
FACULDADE DE CIÊNCIAS E TECNOLOGIA

EURO² PORTUGAL

FCCN serviços digitais fct

fct Fundação para a Ciência e a Tecnologia

Acknowledgements

This initiative is supported by the project “NATIONAL COMPETENCE CENTRES IN THE FRAMEWORK OF EUROHPC PHASE 2 – EUROCC2”, funded by Fundação para a Ciência e Tecnologia, I.P., and “DIGITAL-EUROHPC-JU-2022-NCC-01” of the European High-Performance Computing Joint Undertaking ('JU’). Computer infrastructures targeted include Deucalion supercomputer and Cirrus supercomputer of CNCA - National Distributed Computing Infrastructure.

UAlg FCT
UNIVERSIDADE DO ALGARVE
FACULDADE DE CIÊNCIAS E TECNOLOGIA

EURO² PORTUGAL

FCCN serviços digitais fct

fct Fundação para a Ciência e a Tecnologia