



Turkish National Science e-Infrastructure (TRUBA)

Sevil Sarıkurt



TÜBİTAK ULAKBİM, TRUBA

14 October 2023



- TRUBA HPC System
- HPC Architecture
- OpenVPN
- SSH connection
- Jupyter Notebook
- SLURM Files

TRUBA – Turkish National Science e-Infrastructure

- TRUBA: National center providing high performance computing and data storage for all research institutions and researchers in Türkiye.



Supporting Organization: Presidency of Strategy and Budget

Resources

- 80.000 CPUs (new resources)
- 216 GPUs (P100, V100, A100)+ **96 GPUs (H100)**
- 14 PB data storage space

Services

- Research institutes, public organizations, and private sector
- > 190 National Scientific Research Project support
- > 6000 Registered researchers
- > 400 Researcher using the system at the same time
- > 180 Universities & Institutes & Research Centres



ARF - ThinkSystem SD650 v3, Xeon Platinum 8480+ 56C 2GHz, Infiniband NDR200

TRUBA, Turkey

is ranked

No. 313

among the World's TOP500 Supercomputers

with 3.00 PFlop/s Linpack Performance

in the 63rd TOP500 List published at the ISC24

Conference on June 01, 2024.

Congratulations from the TOP500 Editors



Who Can Use TRUBA?

- ❑ Academic Researchers: Including faculty members, PhD candidates, postdoctoral researchers, and Master's students (with advisor approval).
- ❑ Researchers from Public Institutions: Government-affiliated researchers are eligible.
- ❑ Industry Researchers: Professionals from companies **established or located in Türkiye**



How to Apply?

- ❑ Register: Visit <http://portal.truba.gov.tr> to begin the application process.
- ❑ Verification: The researcher's identity is verified through e-Government and YÖKSİS.
- ❑ Access Credentials: Upon approval, login credentials (username and password) are provided to the researcher through TRUBA portal.



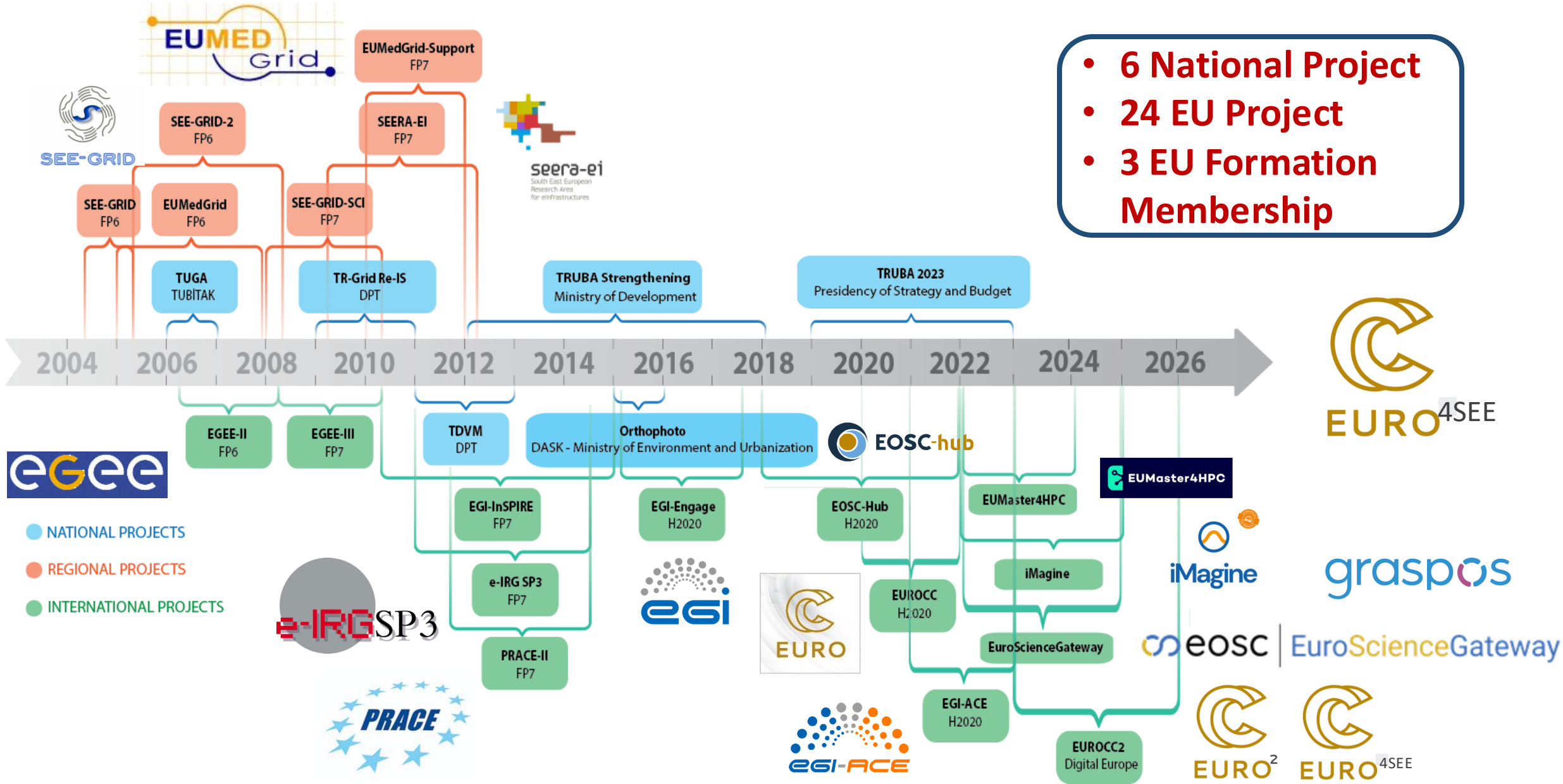
grid-teknik@ulakbim.gov.tr

ardeb@ulakbim.gov.tr



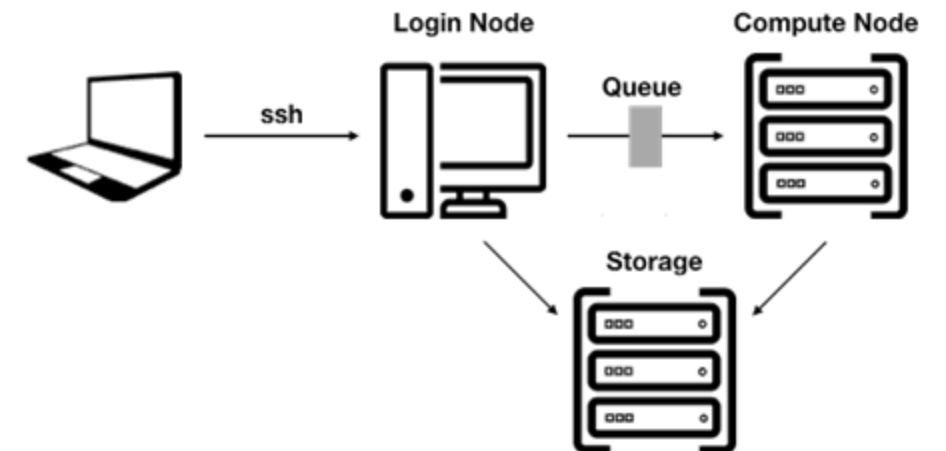
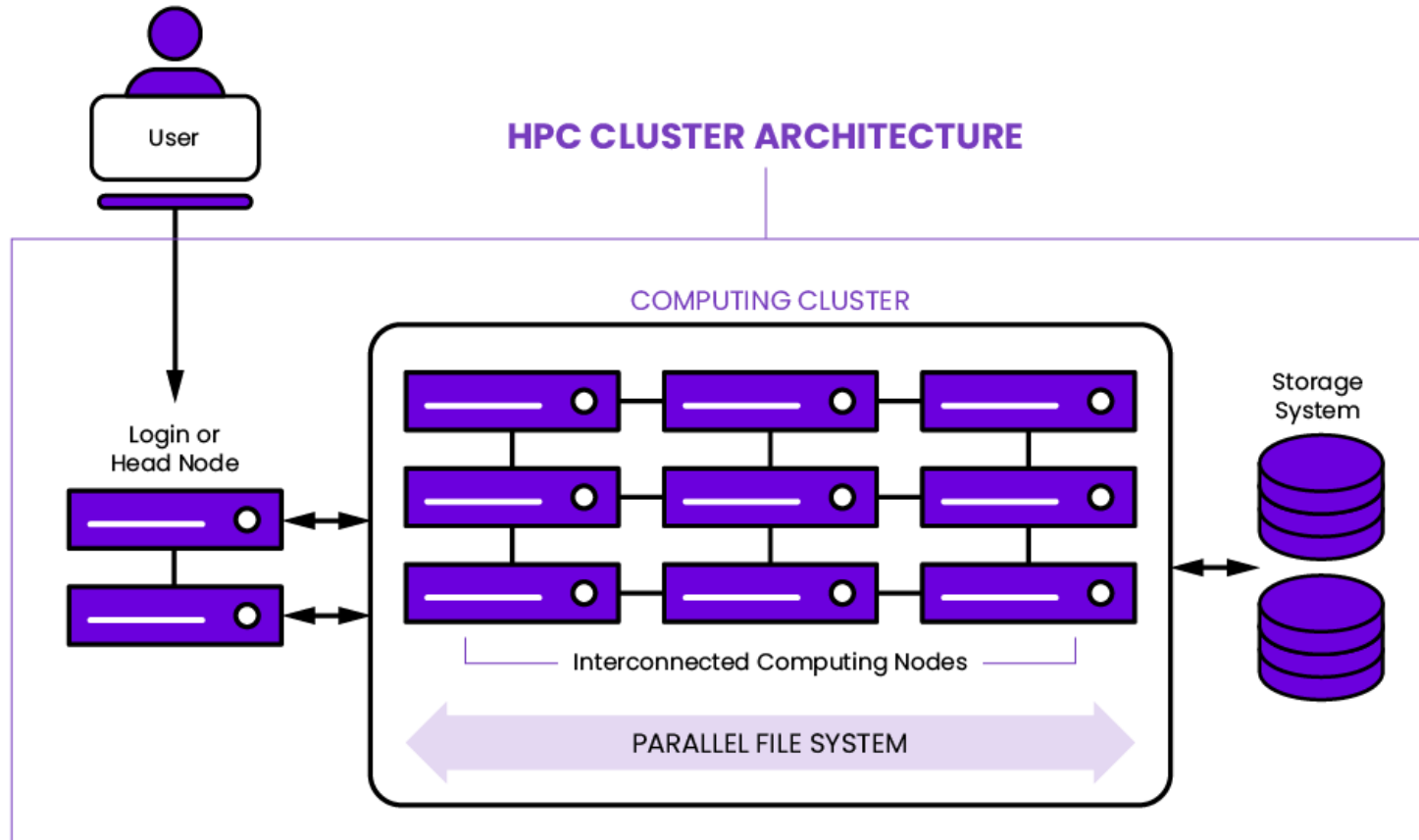
TRUBA
Turkish Science e-Infrastructure

TRUBA - Projects



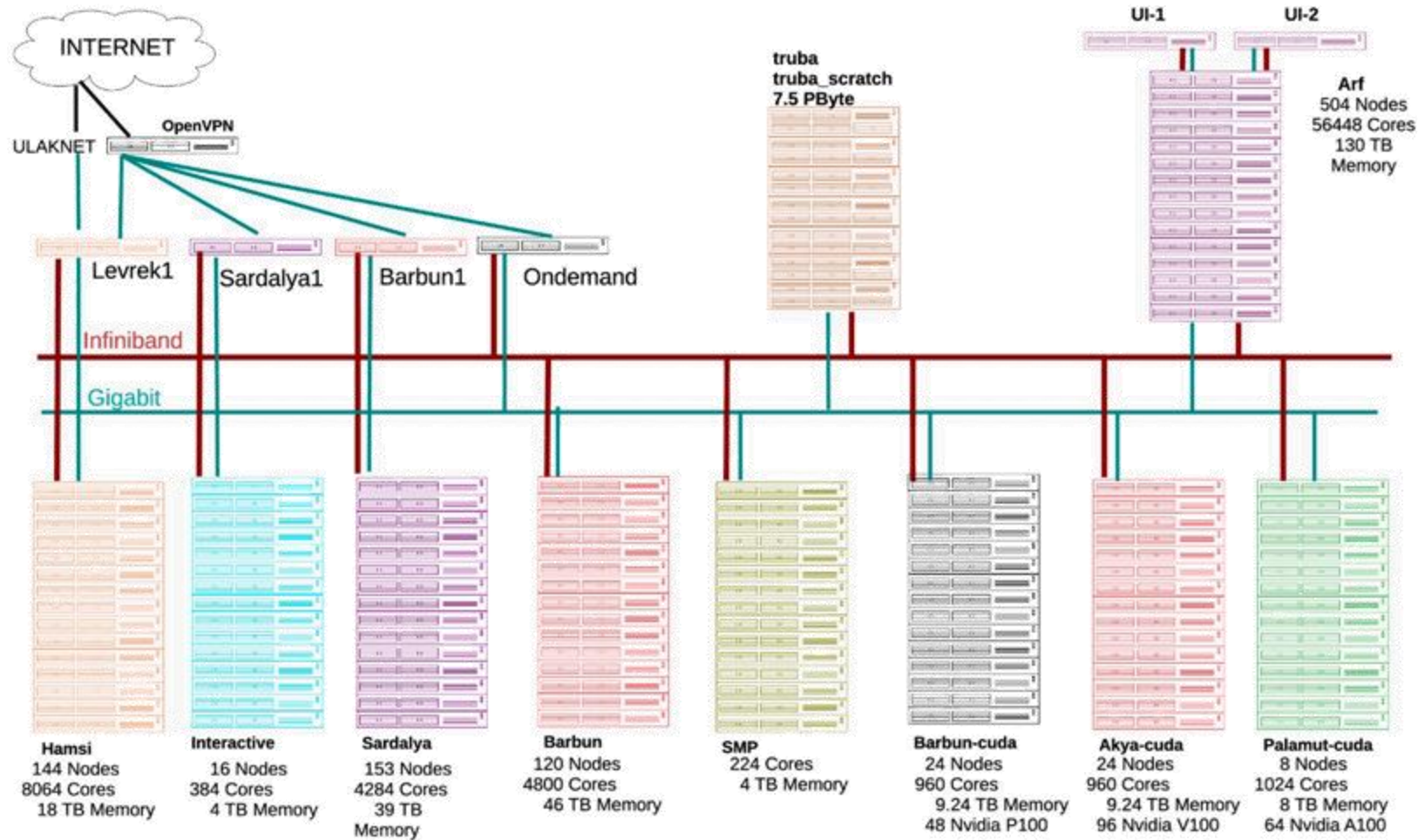
- 6 National Project
- 24 EU Project
- 3 EU Formation Membership

HPC Architecture



TRUBA – Turkish Science e-Infrastructure

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TRUBA-GPU Resources

Calculation Nodes	Year	#Node	Architecture	Processor	Performance	RAM	#GPU
Barbun-cuda	2018	24	20 cores x 2 CPU +2 x Nvidia P100 GPU	Xeon Scalable 6148 2.40GHz	2048Gflops +9400Gflops	384 GB + 2x16 GB HBM2	2
Akya-cuda	2018	24	20 cores x 2 CPU +4 x Nvidia V100 GPU	Xeon Scalable 6148 2.40GHz	2048Gflops + 4x7800Gflops	384 GB + 4x16 GB HBM	4
Palamut-cuda	2021	9	64 cores x 2 CPU + 8 x Nvidia A100 GPU	AMD EPYC 7742 2.24 GHz	4600 Gflops + 8x9600Gflops	192GB + 8x80GB HBM	8
Kolyoz-cuda	2024	24	32 cores x 2 CPU & 4xNvidia H100 GPU	Intel(R) Xeon(R) GOLD 6548Y+ 2.5GHz	5Tflops & 4x34Tflops	1 TB & 4x80GB HBM	4

TRUBA – Pre-Requirements

Basic Linux Knowledge

- ☐ Linux basic structure
- ☐ File, directory structure
- ☐ User permissions on files and directories
- ☐ Basic shell commands
- ☐ File operations, file editing (cp, mv, mkdir, cd, find, vi, etc.)
- ☐ Connection and file transfer (ssh, scp, sftp, etc.)
- ☐ X-forwarding

➤ First Time Users

<https://docs.truba.gov.tr/tutorials/TRUBA-quick-start.html>

<https://docs.truba.gov.tr/>

Application Knowledge

- ☐ What/How does it calculate?
- ☐ How it works (serial, MPI, OpenMPI)
- ☐ Dependency on other applications and libraries
- ☐ Installation/Compilation processes
- ☐ Structuring according to the problem
- ☐ Input and output files
- ☐ Amount of resources needed

➤ Commonly Used Linux Commands

<https://docs.truba.gov.tr/tutorials/linux-intro.html>



OpenVPN

- Linux: installation through command line
 - `sudo apt-get install openvpn`

OpenVPN config file:

<https://tinyurl.com/TRUBA-openvpn>

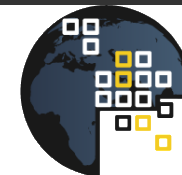


```
sevil@pop-os:~/VPN$ sudo openvpn TRUBA-genel.ovpn
2023-09-10 22:20:22 Note: Treating option '--ncp-ciphers' as '--data-ciphers' (renamed in OpenVPN 2.5).
2023-09-10 22:20:22 DEPRECATED OPTION: --cipher set to 'AES-256-CBC' but missing
). Future OpenVPN version will ignore --cipher for cipher negotiations. Add 'AES-256-CBC' to --data-ciphers-fallback 'AES-256-CBC' to silence this warning
2023-09-10 22:20:22 OpenVPN 2.5.5 x86_64-pc-linux-gnu [SSL (OpenSSL)] [LZO] [LZ4] [
t on Jul 14 2022
2023-09-10 22:20:22 library versions: OpenSSL 3.0.2 15 Mar 2022, LZO 2.10
Enter Auth Username: sevil
Enter Auth Password: *****
2023-09-10 22:20:29 TCP/UDP: Preserving recently used remote address: [AF_INET]
2023-09-10 22:20:29 UDP link local (bound): [AF_INET][undef]:1194
2023-09-10 22:20:29 UDP link remote: [AF_INET]193.140.99.241:1195
2023-09-10 22:20:29 [midye.truba.gov.tr] Peer Connection Initiated with [AF_INET]
2023-09-10 22:20:40 Options error: Unrecognized option or missing or extra parameter
(2.5.5)
2023-09-10 22:20:40 TUN/TAP device tun0 opened
2023-09-10 22:20:40 net_iface_mtu_set: mtu 1500 for tun0
2023-09-10 22:20:40 net_iface_up: set tun0 up
2023-09-10 22:20:40 net_addr_v4_add: 10.3.9.106/22 dev tun0
2023-09-10 22:20:40 WARNING: this configuration may cache passwords in memory - use
s
2023-09-10 22:20:40 Initialization Sequence Completed
```

```
sevil@pop-os:~$ ssh sevil@172.16.7.1
sevil@172.16.7.1's password: 
```

`ssh username@172.16.11.1`


<https://docs.truba.gov.tr/TRUBA/kullanici-el-kitabi/open-vpn/index.html>




TRUBA
Türk Ulusal Bilim e-Altyapısı


OpenVPN

- MacOS:
 - <https://tunnelblick.net/index.html>
 - <https://openvpn.net/client-connect-vpn-for-mac-os/>
- Windows: <https://openvpn.net/community-downloads/>

 Tunnelblick free software for OpenVPN on macOS

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Support


Tunnelblick helps you control OpenVPN® VPNs on macOS. It is Free Software that p — we don't even keep logs of your IP address or other information. We just supply op

Tunnelblick comes as a ready-to-use application with all necessary binaries and drive installation is necessary — just [add your OpenVPN configuration and encryption infor](#)

To use Tunnelblick you need access to a VPN server: your computer is one end of the [Getting VPN Service](#).

Tunnelblick is licensed under the [GNU General Public License, version 2](#) and may be

OpenVPN is a registered trademark of OpenVPN Inc.]

 Products Solutions Pricing Resources Partners Community Request a Demo [Get Started](#)

OFFICIAL OPENVPN CONNECT CLIENT PROGRAM

OpenVPN Connect for macOS

This is the official OpenVPN Connect client software for macOS developed and maintained by OpenVPN Inc. This is the recommended client program for the OpenVPN Access Server. The latest version of OpenVPN Connect client for macOS is available on our website.

[Download OpenVPN Connect v3](#)

sha256 signature: 4805f3098fede5e75de48670735b16031ee9eb22d1702289ac99d57e0f85f

For macOS versions titled El Capitan, Sierra, High Sierra, Mojave, Catalina, Big Sur, Monterey, and Ventura.

OpenVPN config file:

<https://tinyurl.com/TRUBA-openvpn>



SSH Connection

Windows:

<https://www.putty.org/>

<https://mobaxterm.mobatek.net/>

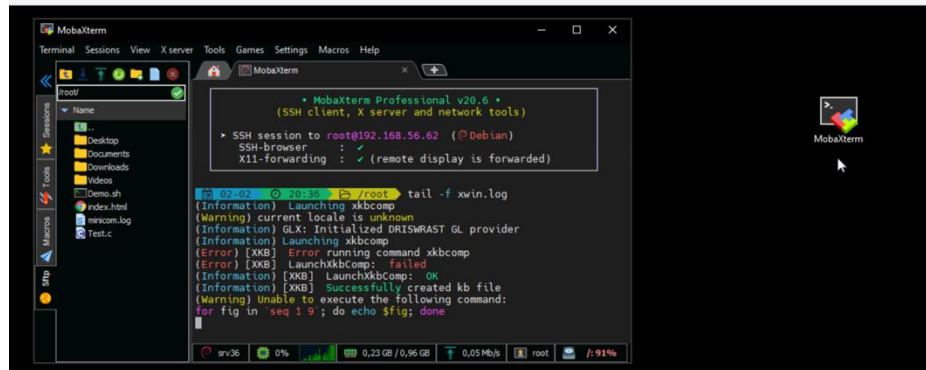
Download PuTTY

PuTTY is an SSH and telnet client, developed originally by Simon Tatham for the Windows platform. PuTTY is open source software that is available with source code and is developed and supported by a group of volunteers.

[Download PuTTY](#)

MobaXterm

Enhanced terminal for Windows with X11 server, tabbed SSH client, network tools and much more



Dark mode: helps to reduce eye strain

[GET MOBAXTERM NOW!](#)

Package files

You probably want one of these. They include versions of all the PuTTY utilities (Not sure whether you want the 32-bit or the 64-bit version? Read the [FAQ entry](#).)

We also publish the latest PuTTY installers for all Windows architectures as a free

MSI ('Windows Installer')

64-bit x86: [putty-64bit-0.79-installer.msi](#) [\(signature\)](#)

64-bit Arm: [putty-arm64-0.79-installer.msi](#) [\(signature\)](#)

32-bit x86: [putty-0.79-installer.msi](#) [\(signature\)](#)

Unix source archive

.tar.gz: [putty-0.79.tar.gz](#) [\(signature\)](#)

ssh username@172.16.11.1



TRUBA
Turkish Science e-Infrastructure

UI & Open OnDemand Connection

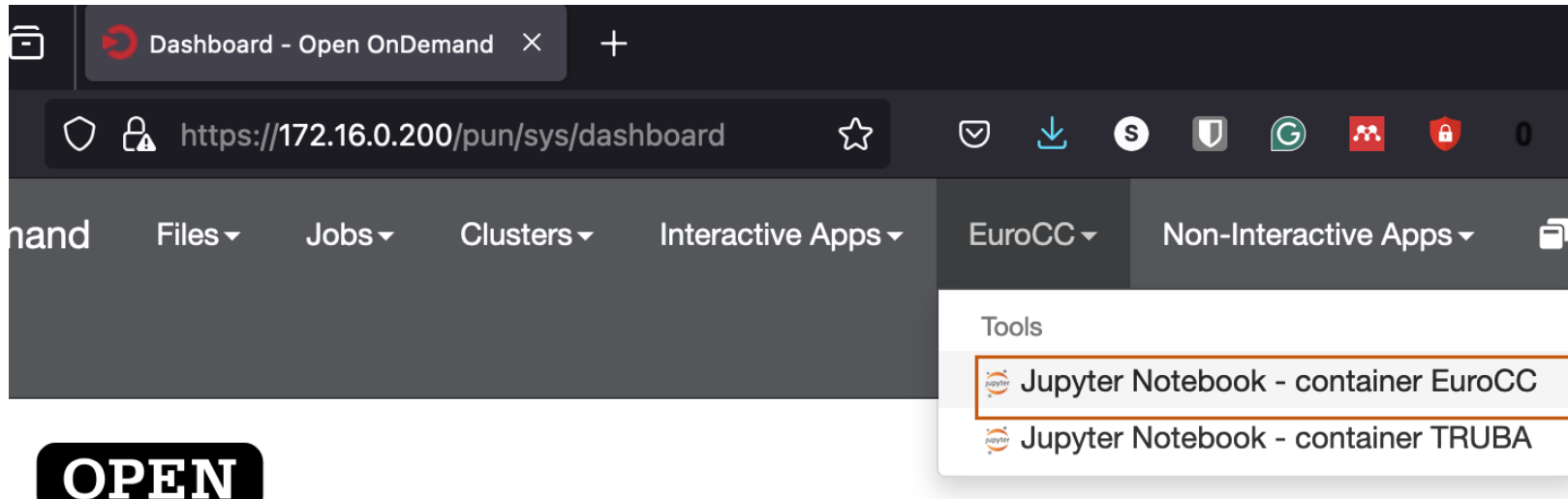
User Interface	Address
barbun1	172.16.11.1
Open OnDemand	http://172.16.0.200
Grafana	http://grafana.yonetim:3000

```
ssh user_name@172.16.11.1
```

```
ssh -l user_name 172.16.11.1 (-l lower case 'L')
```

Open OnDemand

- Open OnDemand Interface
 - can be accessed at <https://172.16.0.200>
 - Only CPU and akya-cuda partitions can be requested.



OnDemand provides an integrated, single access point for all of your HPC resources.

Jupyter Notebook: Open OnDemand

- Open OnDemand Interface: <https://172.16.0.200>

EuroCC

Tools

Jupyter Notebook - container EuroCC

Jupyter Notebook - container TRUBA

Interactive Apps

Desktops

TRUBA Desktop

GUIs

GNUPLOT

MATLAB

Mathematica

Rstudio

Rstudio-1.456

VMD

Tools

Jupyter Notebook

Jupyter Notebook - container

Jupyter Notebook - container EuroCC

This app will launch a [Jupyter](#) Notebook server on one or more nodes. You may install Jupyter and other useful apps via [Anaconda](#). Please follow anaconda installation from [TRUBA-wiki](#).

Account

You may leave blank

Time limit (Hours)

Time limit for the job. Max 4 Hours

Number of cores

Number of cores. Max 40 Cores, 1 Node

Reservation

GPU

Launch

* The Jupyter Notebook - container EuroCC session data for this session can be accessed under the [data root directory](#).

Jupyter Notebook: Open OnDemand



Session was successfully created.

[Home](#) / [My Interactive Sessions](#)

EuroCC

Tools

Jupyter Notebook - container EuroCC

Jupyter Notebook - container TRUBA

Interactive Apps

Desktops

Jupyter Notebook - container EuroCC (1706595)

Queued

Created at: 2024-10-14 01:16:03 +03

Time Requested: 4 hours

Session ID: [febb8f9a-1b01-4377-addd-1ac1ff4e6ceb](#)

Delete

Please be patient as your job currently sits in queue. The wait time depends on the number of cores as well as time requested.

[Home](#) / [My Interactive Sessions](#)

EuroCC

Tools

Jupyter Notebook - container EuroCC

Jupyter Notebook - container TRUBA

Interactive Apps

Desktops

Jupyter Notebook - container EuroCC (1706595)

1 node | 10 cores | Starting

Created at: 2024-10-14 01:16:03 +03

Time Remaining: 3 hours and 59 minutes

Session ID: [febb8f9a-1b01-4377-addd-1ac1ff4e6ceb](#)

Delete

Your session is currently starting... Please be patient as this process can take a few minutes.

<https://github.com/TRUBA-HPC/MLforMultipleDomains>

Jupyter Notebook: Open OnDemand



Home / My Interactive Sessions

EuroCC

Tools

Jupyter Notebook - container EuroCC

Jupyter Notebook - container TRUBA

Interactive Apps

Desktops

Jupyter Notebook - container EuroCC (1706595)

1 node | 10 cores | Running

Host: >akya13.yonetim

Delete

Created at: 2024-10-14 01:16:03 +03

Time Remaining: 3 hours and 59 minutes

Session ID: febb8f9a-1b01-4377-addd-1ac1ff4e6ceb

Connect to Jupyter

File Edit View Run Kernel Tabs Settings Help

/ eurocc-test /

Name	Last Modified
dusan.ipynb	2 days ago
EUROCC4SEE.ipynb	2 days ago
LiveJournal_commu...	2 days ago
LiveJournal_edges.c...	2 days ago
LiveJournalNet.graph	2 days ago
PLM_Finetuning_Eur...	2 days ago
test-file.ipynb	2 days ago

EUROCC4SEE.ipynb

Python 3 (ipykernel)

NetworkKit for large-scale networks analysis

```
[ ]: import networkx as nx
import networkkit as nk
import matplotlib.pyplot as plt
import numpy as np
import scipy as sc
import pandas as pd

[ ]: load_ext autotime

[ ]: g = nk.generators.HyperbolicGenerator(5000000).generate()

[ ]: G = nk.nxadapter.nk2nx(g)

[ ]: nc=nx.number_connected_components(G)
print("Number of connected components", nc)
```

<https://github.com/TRUBA-HPC/MLforMultipleDomains>

Jupyter Notebook: Open OnDemand



FileEditViewRunKernelTabsSettingsHelp

NewNew LauncherOpen from Path...New View for NotebookNew Console for Notebook

Console

Notebook

Terminal

Tensorboard

Text File

Markdown File

EUROCC4SEE.ipynbTerminal 1

Apptainer> nvidia-smi
Mon Oct 14 01:20:24 2024

NVIDIA-SMI 550.90.07		Driver Version: 550.90.07		CUDA Version: 12.4	
GPU	Name	Persistence-M	Bus-Id	Disp.A	Volatile Uncorr. ECC
Fan	Temp	Pwr:Usage/Cap		Memory-Usage	GPU-Util Compute M.
	Perf				MIG M.
0	Tesla V100-SXM2-16GB	Off	00000000:61:00:0	Off	0
N/A	33C P0	54W / 300W	1MiB / 16384MiB		0% Default N/A
1	Tesla V100-SXM2-16GB	Off	00000000:62:00:0	Off	0
N/A	33C P0	54W / 300W	1MiB / 16384MiB		0% Default N/A
2	Tesla V100-SXM2-16GB	Off	00000000:89:00:0	Off	0
N/A	34C P0	54W / 300W	1MiB / 16384MiB		1% Default N/A
3	Tesla V100-SXM2-16GB	Off	00000000:8A:00:0	Off	0
N/A	35C P0	53W / 300W	1MiB / 16384MiB		0% Default N/A

Processes:

GPU	GI	CI	PID	Type	Process name	GPU Memory Usage
	ID	ID				
No running processes found						

Apptainer>

Jupyter Notebook: SLURM

Sample SLURM file to run Python code on akya-cuda:

- The limitations on GPU nodes
 - 10*[GPU_NUMBER] for akya-cuda cluster
(4xV100s on one node)
- Submit the slurm file to the system to run your code
\$> sbatch slurmname.sh

```
#!/bin/bash
#SBATCH -A egitim
#SBATCH -J MLtest
#SBATCH --partition=akya-cuda
#SBATCH --gres=gpu:1
#SBATCH -N 1
#SBATCH -n 10
#SBATCH --cpus-per-task=1
#SBATCH --reservation=eurocc
#SBATCH --time=2:00:00
#SBATCH --output=%A.out
#SBATCH --error=%A.err
```

```
eval "$(/truba/home/egitim/miniconda3/bin/conda shell.bash
hook)"
```

```
conda activate envname
```

```
python youcode.py
```

```
exit
```

Machine Learning for Multiple Domains: From Concepts to Implementation

***Interactive Session: HPC Technical Support for Hands-on
15 October 2024, 13:30 – 14:00 GMT+3 (12:30-13:00 CET)***



The banner features a dark blue header with a decorative graphic of yellow chevrons on the left. The title is in white and orange text. Below the header, the date and platform are listed. The footer contains a row of logos for the participating organizations.

> > >
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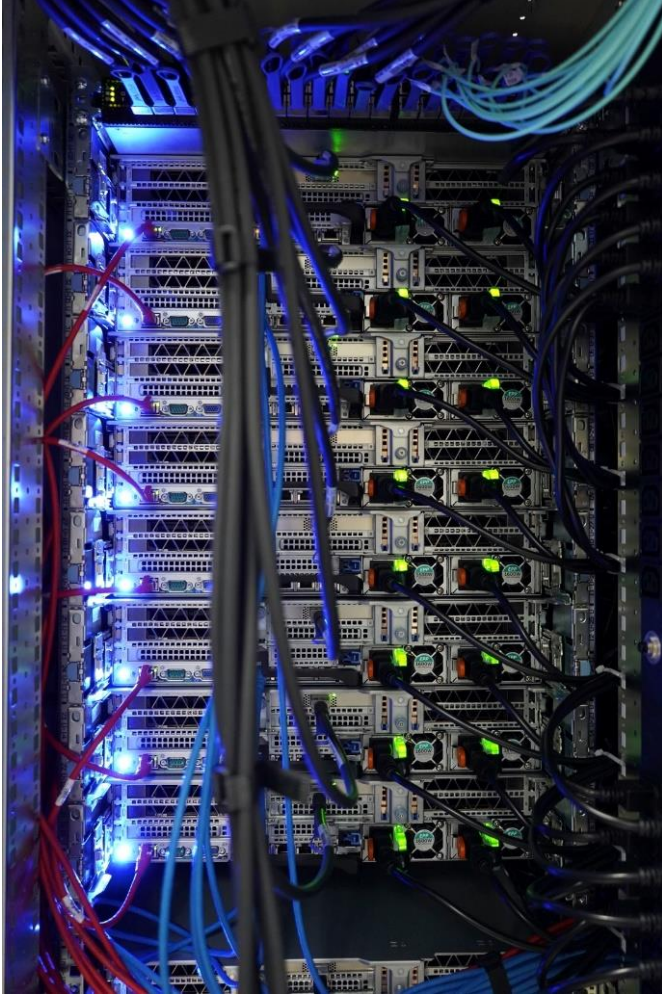
**Machine Learning for Multiple Domains:
From Concepts to Implementation**

14-15 October 2024
ZOOM



TRUBA
Turkish Science e-Infrastructure



User Support

grid-teknik@ulakbim.gov.tr

TRUBA HPC Center

<http://www.truba.gov.tr>

<http://docs.truba.gov.tr>

<http://portal.truba.gov.tr>



<https://twitter.com/TrubaUlakbim>



<https://www.linkedin.com/company/truba>

