

# OVERVIEW

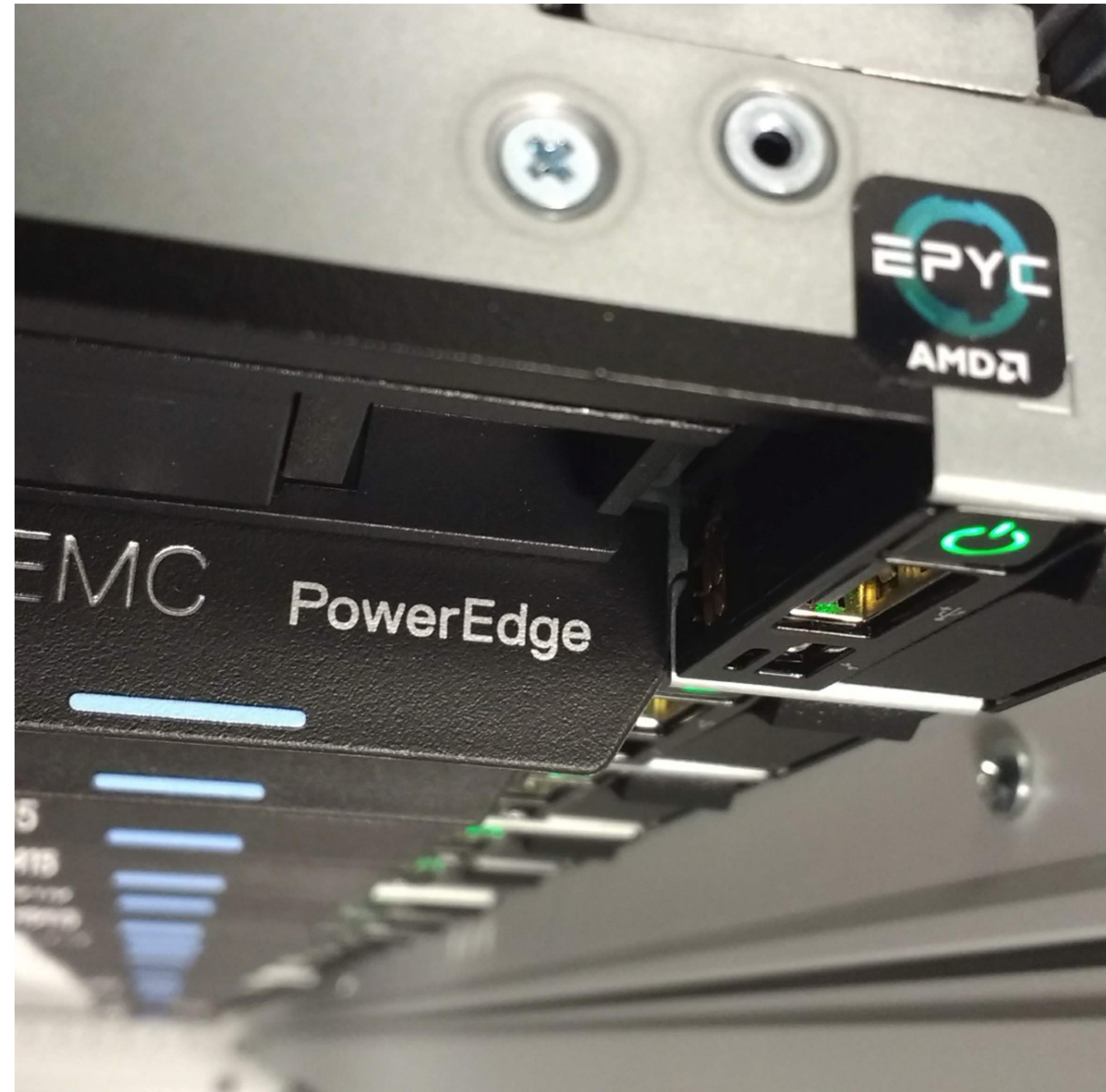
## Nikhef (hardware) resources

- For Nikhef (GW) users:
  - Local computing (Stoomboot cluster with CPUs and GPUs)
  - Local storage (/data, /project, /dcache)
  - Local condor cluster (access from visar.nikhef.nl)
- For Nikhef GW users + Virgo + LIGO:
  - Grid computing resources
  - Virgo Grid storage at Nikhef: 50 TB disk storage + (100 TB tape storage + 50 TB disk storage provided by SURF)

More (software) services available from CT and PDP to help with data analysis

- Some examples:
  - Gitlab (gitlab.nikhef.nl)
  - Jupyterhub (<https://callysto.nikhef.nl/>) (pilot service)
  - ...

\*\* Focus on local computing and storage resources.



# LOCAL COMPUTING - WHAT IS AVAILABLE

## 2 Interactive CPU nodes:

- stbc-i1.nikhef.nl, stbc-i2.nikhef.nl (32 cores and 256GB RAM)

## 4 Interactive GPU nodes:

Node name	Node manufacturer	Node type name	GPU manufacturer	GPU type	GPU number
stbc-g1	Fujitsu	CELCIUS C740	NVIDIA	GeForce GTX 1080	1
stbc-g2	Fujitsu	CELCIUS C740	NVIDIA	Quadro GV100	1
wn-lot-001	Lenovo	ThinkSystem SR655	AMD	Radeon Instinct MI50	2
wn-lot-008	Lenovo	ThinkSystem SR655	NVIDIA	Tesla V100	2

## 2 batch systems: pbs (torque/maui), htcondor

- pbs workernodes: ~ 52 servers (range of 32-64 cores per server); total ~1900 cores
- htcondor workernodes (execute nodes): 2 servers x 64 cores \*\*
- gpu workernodes: 9 servers (various flavours of interactive nodes)

\*\* Scaled down; will scale back up as usage increases.

# LOCAL COMPUTING - HOW TO USE IT

Where to start:

- Check out: [https://wiki.nikhef.nl/ct/index.php?title=Stoomboot\\_cluster](https://wiki.nikhef.nl/ct/index.php?title=Stoomboot_cluster)
- Login to interactive node (stbc-i1, stbc-i2)
  - Try scripts out
  - Shared resource with other Nikhef users
  - Questions? Email [stbc-admin@nikhef.nl](mailto:stbc-admin@nikhef.nl)

Next level up:

- Batch your jobs
- Parallelise code
- Try running on stoomboot cluster:

```
qsub [-q <queue>] [-l resource_name[=[value]]  
[,resource_name[=[value]],...] ] [script]
```

Not enough?

- Submit jobs to the Grid



<https://julijapauriene.medium.com/towards-data-science-learning-to-walk-before-you-run-7d09279d90fd>

# LOCAL STORAGE

## - Where to put your data:

- /project
  - This is backed up
  - Good for source code, jupyter notebooks, etc.
  - Data not easy to replicate
- /data
  - Suitable for transient data — data that can be reproduced
  - Not backed up
- /dcache/gravwav
  - Used for larger data products (on the order of 5-10+ GB)
  - Accessible on interactive nodes and worker nodes
  - Better read/write performance for larger load
  - Not backed up but RAID 6



<http://www.hooiberg.info/?page=themas/laden>

# ... AND THERE'S MORE

- **Grid computing** offers a way to distribute computing jobs (think on the order of 500+) to various sites around the world or to a specific site. Two ways this can be done are:

(1) Submitting jobs to a computing element (CE) from your laptop (with certificate proxy)

Ex: `arcsbub -c brug.nikhef.nl test.sh`

(see: <https://wiki.nikhef.nl/grid/Grid@Nikhef>)

(2) Submitting jobs to an HTCondor pool (aka the IGWN pool) to reach global computing resources from an HTCondor Submit node, for example, `stro.nikhef.nl`

Ex: `condor_submit test-job-description-file.sub`

(see: <https://computing.docs.ligo.org/guide/condor/tutorial/>)

- Distributed storage systems available for storing data for grid jobs (such as the dCache Virgo pool: <https://virgo.dcache.nikhef.nl:2880/pnfs/nikhef.nl/data/virgo>).

# REFERENCE LINKS

- Useful tips and tricks for unix:

[https://indico.nikhef.nl/event/2068/contributions/4272/attachments/2008/2330/talk\\_notes.pdf](https://indico.nikhef.nl/event/2068/contributions/4272/attachments/2008/2330/talk_notes.pdf)

- Stoomboot cluster wiki page:

[https://wiki.nikhef.nl/ct/index.php?title=Stoomboot\\_cluster](https://wiki.nikhef.nl/ct/index.php?title=Stoomboot_cluster)

- Details about Nikhef storage setup (2019):

<https://indico.nikhef.nl/event/2068/contributions/4273/attachments/2010/2332/stoomboot-storage.pdf>

- More about batch systems and jobs:

<https://indico.nikhef.nl/event/2068/contributions/4275/attachments/2006/2328/sb-cc-2019.pdf>

- Questions? Need help?

Email [grid.sysadmin@nikhef.nl](mailto:grid.sysadmin@nikhef.nl) or [stbc-admin@nikhef.nl](mailto:stbc-admin@nikhef.nl)

- **Nikhef-organised Computing Course:** Keep an eye out for tutorial in coming months.