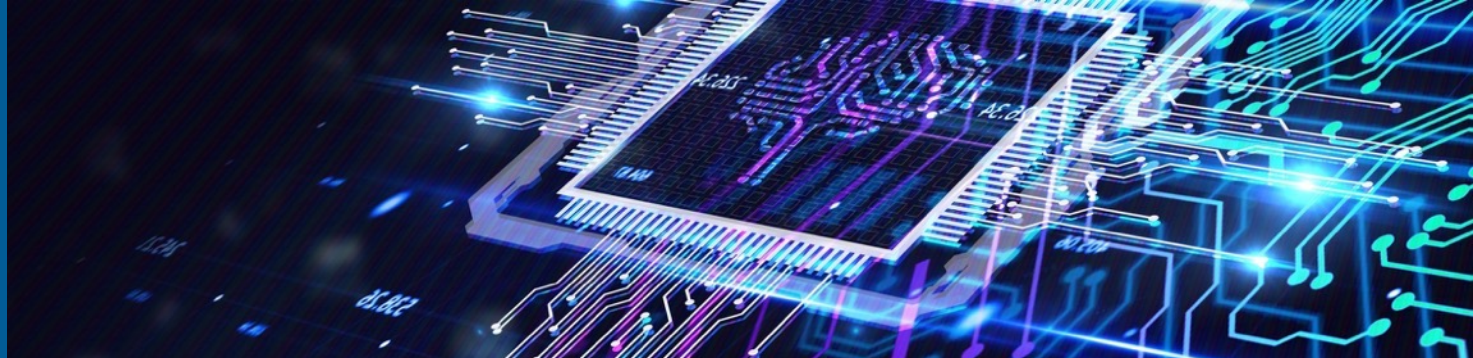




CSC

ICT Solutions for  
Brilliant Minds



## A mini crash course in HPC

Maria Dimitrova, CSC



# What is a computer?

- Motherboard
  - the circuit board which all components are connected to
- CPU (processor)
  - executes computational tasks
- RAM memory
  - stores data actively used for computation
- Disk space
  - permanent storage of data

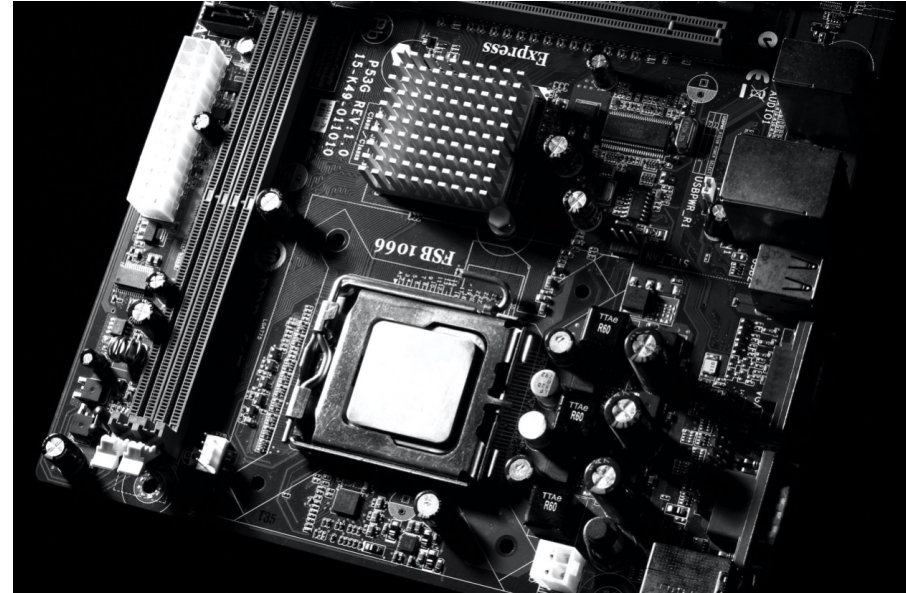


Photo by Miguel Á. Padriñán on Pexels

# How does a supercomputer differ from a laptop?

- Lots of components:
  - Motherboards, *i.e.*, nodes
  - CPUs, *i.e.*, sockets
  - A couple hundred GB of RAM (can reach 1.5 TB)
  - Lots of shared disk space
  - Network connections between nodes



# What is a node?

- Essentially an independent computer
- Holds several CPUs, the memory, possibly local disks
- Nodes are connected via Infiniband – a type of fast and high-throughput network communication technology

# What is a CPU/socket?

- It executes the instructions coded in a computer program
- Performance is measured in operations per second
- Personal computers have one CPU, i.e., one socket
- A CPU consists of multiple subunits called cores

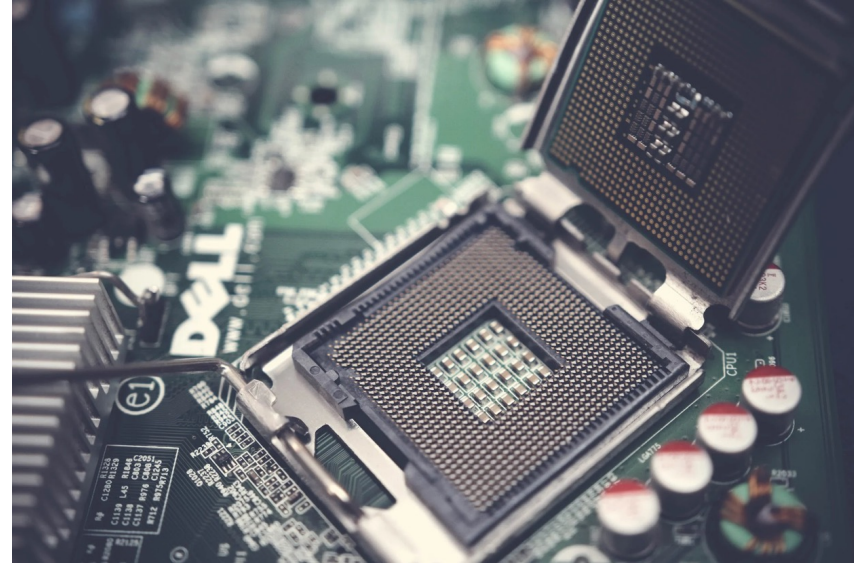


Photo by Pok Rie on Pexels



# What is a core?

- A physical core is execution unit with its own pipeline
- Hyperthreading: a physical core may consist of two logical cores (threads)
- Threads execute tasks on the same physical core but in parallel

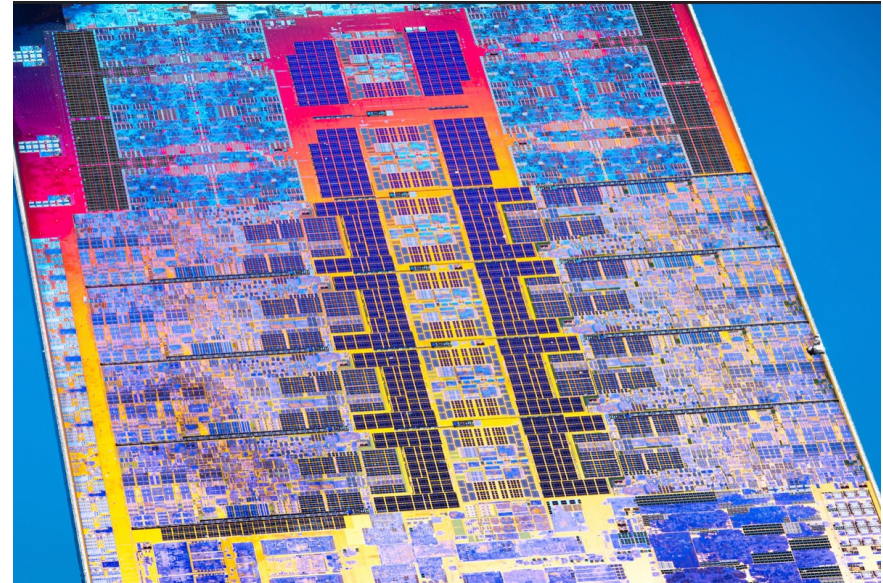


Photo by Fritzchens Fritz on Flickr  
<https://flic.kr/s/aHBqjAcECv>

# What is RAM?

- RAM = random-access memory
- The working memory where programs and some of their data reside
- It is not retained if power is turned off
- Laptops nowadays have between 8 and 64 GB of RAM
- On HPC: up to 1.5 TB
- RAM is not shared between nodes

# What is disk space?

- A hard drive (HDD) or a solid-state drive (SSD) are meant for long-term data storage
- Disks tend to be slower than RAM
- Disks can be shared between many nodes



Photo by Evan-Amos on Wikimedia



# How to use the hardware properly?

- Check out the CSC training materials and courses:
  - <https://www.csc.fi/training>
- Materials from previous courses:
  - <https://docs.csc.fi/support/training-material/>
- CSC Computing Environment Moodle course:
  - <https://e-learn.csc.fi/enrol/index.php?id=76>