Luca Tornatore, I.N.A.F.

2025 INAF Course on HPC - Basic Module

September, 22nd - 26th, OACT, Catania

Welcome

Welcome at the Basic Module of the HPC INAF School 2025 edition

hosted from 22nd to 26th of September by the Observatory of Catania.

Welcome

Let’s express our gratitude to the LOC

Alessandro **Costa**
Fabio **Vitello**
Salvo **Scavo**

that has co-organised the course, all the logistics and the set-up of the cluster PLEIADI @ OACT

Welcome

Your teachers and instructors will be

Luca **Tornatore**
David **Goz**
Giovanni **Lacopo**
Antonio **Ragagnin**
Giuliano **Taffoni**

from OATS (Trieste)

What you’re gonna learn this week ?

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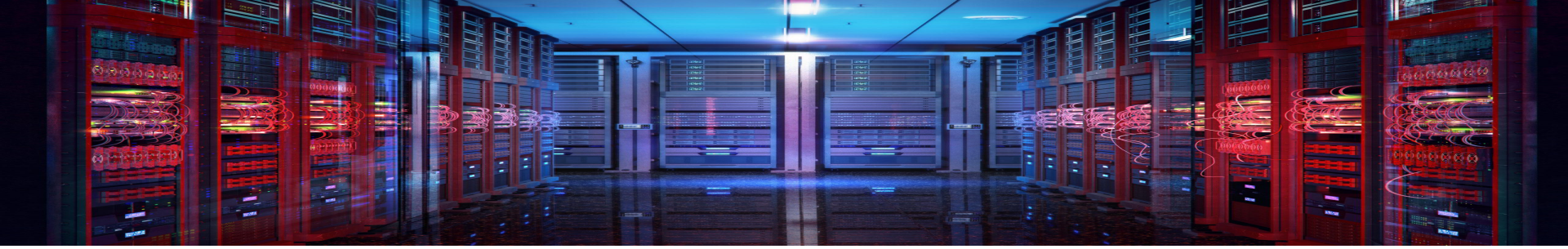
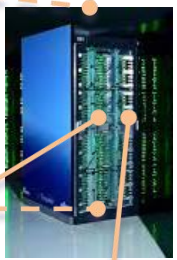
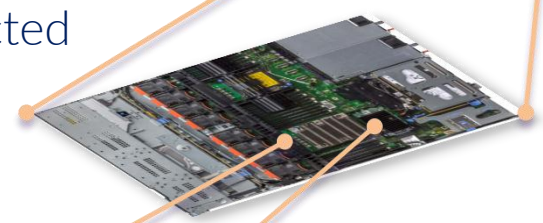


HPC
platform

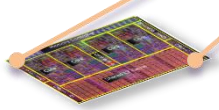
~100
interconnected
racks



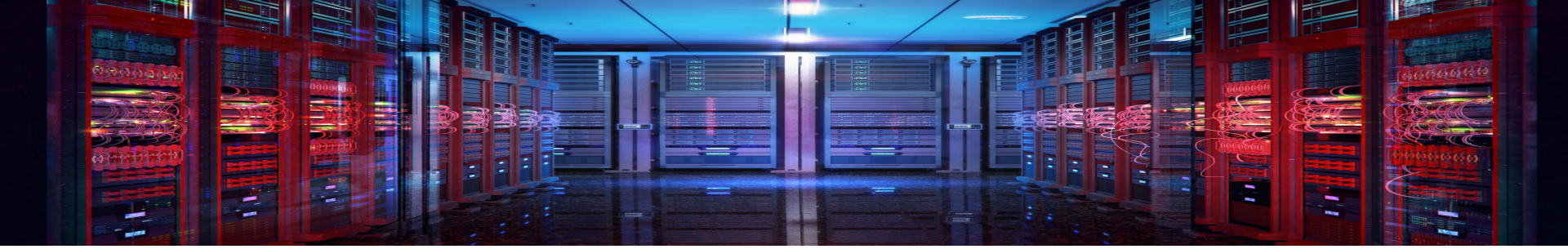
RACK
~100 of
interconnected
nodes



NODE
multiple CPUS (2-4)
multiple GPUs (2-8)
multiple FPGAs
multiple Vector Acc.



CPU
many cores



HPC
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~100
interconnected
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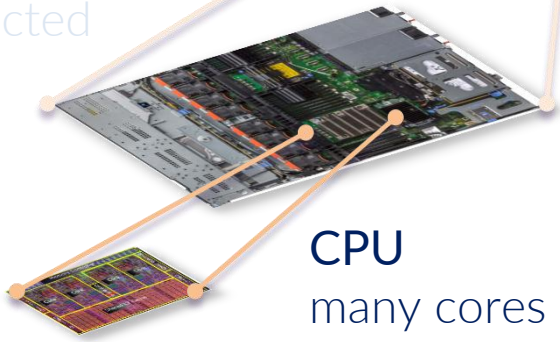

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CPU
many cores

What you're gonna learn this week ?

The INAF school is (being) planned to be modular

BASIC HPC single node

Modern Architecture
Code Optimization
Multi-threading
Debugging
Profiling

Introduction, fundamental concepts, toolbox to exploit a **single node**
1 week

BASIC HPC multi node

MPI
Message Passing

toolbox to exploit **multiple nodes** in distributed memory
3 days

Advanced HPC

Advanced MPI
Advanced OpenMP

more **sophisticated parallelism** and algorithms, scaling at thousands of nodes
4 days

GPUs

~3 days

Advanced profiling

~3 days

What you're gonna learn this week ?

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The plan of the week

	22/9 MONDAY	23/9 TUESDAY	24/9 WEDNESDAY	25/9 THURSDAY	26/9 FRIDAY
	CPU architecture & code optimization	*Parallelism & Intro to OpenMP*	*OpenMP*	*OpenMP / Profiling & Debugging*	*Profiling & Debugging*
09:00	Welcome Address	Intro to parallel computing	OpenMP	OpenMP	Debugging
09:30					
10:00	CPU Arch. & Optmization		exercises	exercises	exercises
10:30					
11:00	break	break	break	break	break
11:30	exercises	Intro to OpenMP	OpenMP	Profiling	Conlusions
12:00					exam
12:30			exercises		
13:00	LUNCH BREAK	LUNCH BREAK	LUNCH BREAK	LUNCH BREAK	----
13:30					
14:00					
14:30	CPU Arch. & Optmization	OpenMP	OpenMP	exercises	....
15:00					....
15:30					....
16:00	break	break	break	break	....
16:30	*exercises*	exercises	exercises	exercises	....
17:00					....
17:30				Debugging	....
18:00					....
18:30				exercises	....

The (temporary) repo

https://github.com/lucatornatore/INAF_HPC_School_2025

Before starting

If some of you has any issue in accessing the cluster

`pleiadi.oact.inaf.it`

with the user name and ssh key, please at the coffee break ask either Fabio Vitello or Salvo Scavo.

Your user name is **`hpcschool`**`$NN`
Find the association name<>list in the file
`Account_list.pdf` on the git
https://github.com/lucatornatore/INAF_HPC_School_2025

that's all, have fun