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PLEIADI@IRA CLUSTER: CALL5 USAGE REPORT

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ABSTRACT

This report documents the usage of the INAF Pleiadi@IRA cluster computing resources during Call 5 (March – August 2025). The PLEIADI partition delivered ~2.3M CORE hours supporting astrophysical simulations and data processing. The LOFAR partition consumed ~2.6M CORE hours for radio astronomy data processing. All PLEIADI nodes were upgraded to 256 GB RAM during this period.

1. INTRODUCTION

This report provides an overview of the Pleiadi@IRA cluster operations and resource consumption for USC-C Call 5.

1.1 PLEIADI@IRA

PLEIADI is a project by USC-C Computing of INAF-National Institute for Astrophysics, offering high-performance computing (HPC) and high-throughput computing (HTC) resources.

Individual researchers and teams belonging to research projects, European projects, PRIN, INAF mainstream projects, scientific missions, etc. that require computing can apply requesting the resources.

The Pleiadi infrastructures is distributed on the following sites: Bologna (IRA), Catania and Trieste (+ soon Palermo). [0] [1]

Pleiadi cluster at the INAF's Istituto di Radio Astronomia (Institute of Radio Astronomy) in Bologna, also called Pleiadi@IRA, is composed of 6 chassis with 12 nodes each, for a total of 72 nodes.

The cluster is managed with Slurm scheduler and is split in 2 between "normal" Pleiadi and Pleiadi-Lofar which is dedicated to Lofar parallel computing.

The Pleiadi@IRA cluster is deeply integrated in IRA's Computing Centre and could not function stand-alone, it uses the common networking, storage, software, power and cooling of the other IRA's computing facilities.

1.2 CALL TIMELINE

Call	Start Date	End Date	Duration
Call5	2025-03-01	2025-08-31	6 months

1.3 CLUSTER INFRASTRUCTURE

The Pleiadi@IRA cluster consists of 72 blade servers organized in 6 chassis (12 servers per chassis):

Partition	Chassis	Servers	Dedicated Use
pleiadi	1,2,6	36	USC-C allocations, astrophysical simulations
lofar	3,4,5	36	LOFAR radio astronomy data processing

Server specifications:

- CPU: 2× Intel Xeon E5-2697 v4 @ 2.30GHz (18 cores / 36 threads each)
- RAM: 256 GB DDR4 (all pleiadi nodes upgraded during Call5)
- Total cores per server: 36 physical / 72 logical

2. RESOURCE ALLOCATIONS (PLEIADI PARTITION)

2.1 NEW ALLOCATIONS (CALL5)

Account	User	Project	Allocated (CORE hours)
pleia03	Alice Damiano	From Galaxies to Gravitational Waves	500,000
pleia10	Giovanni Bruno	Stellar granulation in late-K and M stars	100,000
pleia11	Franklin Aldás	Galaxy quenching during cluster mergers	500,000
pleia12	Mattia Bulla	Kilonova polarization for neutron star mergers	500,000
pleia13	Kosuke Nishiwaki	Cosmic-ray acceleration in galaxy clusters	300,000

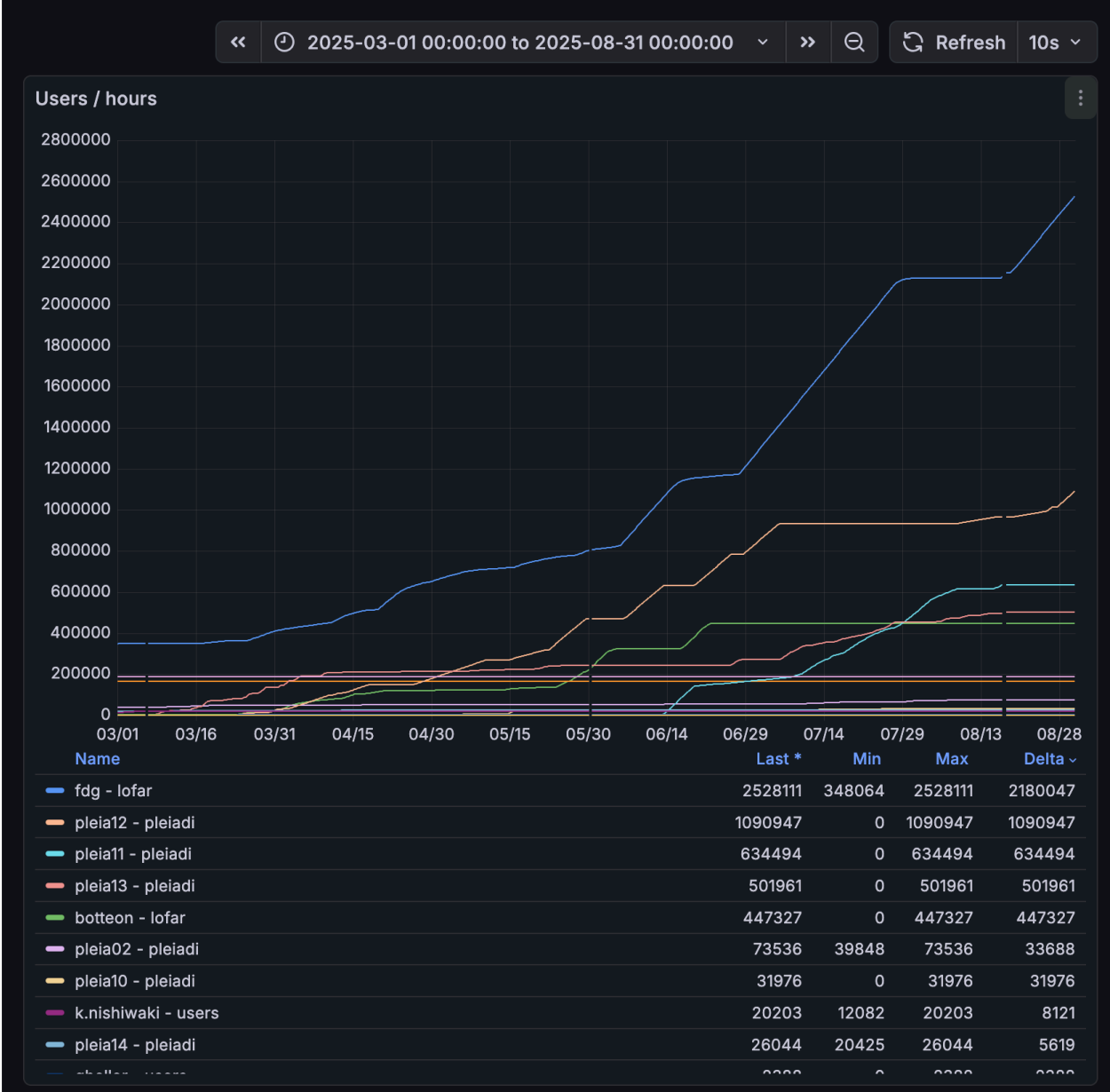
2.2 EXTENDED/RENEWED ALLOCATIONS

Account	User	Project	Allocated (CORE hours)
pleia02	Massimo Dall'Ora	The Galactic Bulge view with Pleiadi	106,000
pleia14	Shourya Khanna	Modeling the Milky Way	100,000

Note: pleia15 (Angela Bongiorno, AGILE nelle PLEIADI) allocation ended in Call4 (2024-10-31).

3. RESOURCE USAGE

3.1 GRAFANA REPORT



3.2 SUMMARY

Total cluster consumption: 4,936,573 CORE hours

Partition	CORE hours	% of Total
pleiadi	2,298,685	46.6%
lofar	2,627,374	53.2%
users (other)	10,514	0.2%

3.3 PLEIADI PARTITION USAGE

Account	User	Project	CORE hours	% Pleiadi
pleia12	Mattia Bulla	Kilonova polarization	1,090,947	47.5%
pleia11	Franklin Aldás	Galaxy quenching	634,494	27.6%
pleia13	Kosuke Nishiwaki	Cosmic-ray acceleration	501,961	21.8%
pleia02	Massimo Dall'Ora	Galactic Bulge	33,688	1.5%
pleia10	Giovanni Bruno	Stellar granulation	31,976	1.4%
pleia14	Shourya Khanna	Milky Way modeling	5,619	0.2%

3.4 ALLOCATION EFFICIENCY (PLEIADI)

Account	User	Allocated	Consumed	Efficiency
pleia12	Mattia Bulla	500,000	1,090,947	218% ⚠
pleia13	Kosuke Nishiwaki	300,000	501,961	167% ⚠
pleia11	Franklin Aldás	500,000	634,494	127% ⚠
pleia02	Massimo Dall'Ora	106,000	33,688	32%

pleia10	Giovanni Bruno	100,000	31,976	32%
pleia14	Shourya Khanna	100,000	5,619	6%

Note: Efficiency >100% indicates additional resources were available and utilized beyond the original allocation.

3.5 LOFAR PARTITION USAGE

Account	User	CORE hours	% LOFAR
fdg	Francesco De Gasperin	2,180,047	83.0%
botteon	Andrea Botteon	447,327	17.0%

3.6 EFFICIENCY AND OVER-ALLOCATION CONSIDERATIONS

The users pleia11, pleia12 and pleia13 used respectively 127%, 218% and 167% than initially allocated.

This has been permitted for different reasons, first of all we do not enforce a hard limit on the allocations, also we don't wish to hinder the usage of the cluster as long as it does not become overcommitted.

4. INFRASTRUCTURE IMPROVEMENTS

4.1 PLEIADI RAM UPGRADE

All PLEIADI partition nodes upgraded from mixed configurations (some 128 GB, some 256 GB) to uniform 256 GB DDR4 per server.

Impact: enables larger memory-intensive simulations, particularly beneficial for:

5. TECHNICAL ISSUES AND SUPPORT

No significant technical issues were recorded during Call 5.

The Computing Centre needed to power-off the cluster to do some electrical maintenance and some blades had issues, this translated to a reduced number of nodes available to Pleiadi users for a limited amount of time.

6. CONCLUSIONS

PLEIADI partition:

- Delivered 2,298,685 CORE hours (46.6% of cluster total)
- High utilization: 3 projects exceeded their allocations
- Primary consumers: kilonova modelling (47.5%), galaxy evolution (49.4% combined)

LOFAR partition:

- Delivered 2,627,374 CORE hours (53.2% of cluster total)
- Continued strong demand for radio astronomy processing

Infrastructure:

- RAM upgrade completed for all PLEIADI nodes (256 GB uniform)

7. APPENDIX

7.1 TICKET REFERENCES

No significant support tickets were opened during Call 5.

7.2 LINK REFERENCES

[0]:

https://indico.ict.inaf.it/event/2870/contributions/20389/attachments/9211/18944/Pleiadi_USCVIII.pdf

[1]: <https://www.ict.inaf.it/computing/pleiadi/>