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DI RIPRESA E RESILIENZA



WP1, WP2 Activity Status

S. Della Torre, G. Puglisi, M. Spera, M. Valentini

Spoke 3 General Meeting, Elba 5-9 / 05, 2024

Outline

- **WP activities**
- **Codes and thematic areas**
- **Meetings**
- **Key Science Projects - KSPs**
- **Publications and presentations**

Two WPs in one

- **Clear division between WP1 and WP2 activities, within a joint community effort and meetings**

WP1 → projects whose main goal is the porting of the code on GPUs
(for all those codes that before ICSC were either not on GPUs or just in a prototypical form)

WP2 → projects whose main objective is the HPC algorithm optimisation
(for codes that were already running on GPUs before ICSC and for which ongoing work mainly targets optimisation, functionality extension, inclusion of state-of-the-art hardware...)

WP ongoing activities in a nutshell

- Most activities at cruise speed
- Hiring procedures completed (link to [doc](#))
- Rich set of targets and KPIs for M8 and beyond (links to [WP1](#) and [WP2](#) doc)

>20 lines of development

Porting on GPU

CUDA
OpenACC

~20 Codes

Code performance profiling

Algorithm
Issues

~15 WP meetings

Model implementation
Issues

Codes in the WPs

# WP	Proponent	Thematic Area	Use Case
1	1 Mario Spera - SISSA	Gravitational Waves	ISTEDDAS - Implementazione MPI multi nodo, multi-gpu, multithread
2	1 Andrea Mignone - UNITO	High Energy Astrophysics	PLUTO - GPU porting of finite-volume methods for astrophysical MHD
3	1 Filippo De Lillo - UNITO	Turbulence	TURBO - GPU porting of pseudo-spectral codes for incompressible flows.
4	1 Stefano Della Torre - INFN	High Energy Astrophysics	COSMICA - GPU porting and optimization of Monte Carlo particle Propagation Code
5	1 Massimiliano Lattanzi - INFN	Observational Data Analysis and Processing	GPU porting of a Cosmological Boltzmann solver
6	1 Giacomo Mulas - INAF OA Cagliari	Observational Data Analysis and Processing	NP_TMCode - GPU porting of analytical solution of T-Matrix
7	1 Andrei Mesinger - SNS	Large scale cosmological simulation	21cmFAST - Efficient forward modeling of reionization and cosmic dawn observations
8	1 Diego Turrini - INAF-OATO	Planet and exoplanet	Mercury-Arxes - GPU porting of n-body and protoplanetary disk simulator
9	1 Paolo Giacobbe, Aldo S. Bonomo - INAF OATO	Observational Data Analysis and Processing	GUIBRUSH(R)-Graphic User Interface for Bayesian Retrieval Using Spectroscopy at High Resolution

Codes in the WPs

# WP	Proponent	Thematic Area	Use Case
10	1 Francesco Calura - INAF OAS	Cosmological simulations, galaxy formation	RAMSES - code profiling and preliminary porting on GPUs. Optimization of hydrodynamic simulations and implementation of algorithms for stellar feedback
11	1 Marina Migliaccio - UniTOV, Giuseppe Puglisi - UniCT	Observational Data Analysis and Processing	BrahMAP- data reduction for CMB experiments
12	1 Hervé Bourdin - uniTOV	Observational Data Analysis and Processing	Sparse representations for spectral-imaging codes.
13	1 Gianfranco Brunetti/Claudio Gheller - INAF	Observational Data Analysis and Processing	RICK - HPC and GPU development for radio astronomy data reduction
14	1 Andrea Possenti - INAF-Cagliari	Observational Data Analysis and Processing	PRESTO - Identification of non stationary periodicities in timeseries
15	2 Andrea Lapi - SISSA	Cosmological and Galaxy Simulation	GalaPy - the Spectral modelling tool for galaxies in python.
16	2 Stefano Borgani - UniTs	Cosmological and Galaxy Simulation	OpenGadget - Cosmological simulations of structure formation

Codes in the WPs

# WP	Proponent	Thematic Area	Use Case
17	2 Pierluigi Monaco - UniTS	Cosmological and Galaxy Simulation	PINOCCHIO - Cosmological simulations to produce large sets of realizations of a galaxy survey like Euclid
18	2 Matteo Bachetti - INAF-OAC	Time series	STINGRAY - Temporal analysis of large data archives from X-ray missions
19	2 Andrea Pallottini - SNS	Cosmological and Galaxy Simulation	RAMSES/other numerical nbody+hydro code - Modularize complex physical processes (chemical computation, turbulence evolution, etc) and substitute them with neural network emulators,
20	2 Roberto Trotta - SISSA	Observational Data Analysis and Processing	PBJ: Power spectrum and Bispectrum Joint analysis: inference of cosmological parameters from spectroscopic galaxy surveys.
21	2 Giovanni Signorelli - INFN	Observational Data Analysis and Processing	Simulations for LiteBIRD experiment.
22	2 Alfredo Luminari - UniTOV, Francesco Tombesi - UniTOV	High Energy Astrophysics	TEPID-WINE - photoionization modeling and spectral fitting
23	2/3 Roberto Trotta - SISSA	Observational Data Analysis and Processing	StratLearn: Improving photometric redshift estimation under covariate shift

Codes in the WPs - new entries in 2024

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2	1 Matteo Viel - SISSA		HI-emulator -
3	1 Andrea Mignone - UNITO	High Energy Astrophysics	PLUTO - GPU porting of finite-volume methods for astrophysical MHD
	1 Filippo De Lillo - UNITO	Turbulence	TURBO - GPU porting of pseudo-spectral codes for incompressible flows.
5	1 Stefano Della Torre - INFN	High Energy Astrophysics	COSMICA - GPU porting and optimization of Monte Carlo particle Propagation Code
6	1 Massimiliano Lattanzi - INFN	Observational Data Analysis and Processing	GPU porting of a Cosmological Boltzmann solver
15	1 Gianfranco Brunetti/Claudio Gheller - INAF	Observational Data Analysis and Processing	RICK - HPC and GPU development for radio astronomy data reduction
	1 Andrea Possenti - INAF-Cagliari	Observational Data Analysis and Processing	PRESTO - Identification of non stationary periodicities in timeseries
17	2 Andrea Lapi - SISSA	Cosmological and Galaxy Simulation	GalaPy - the Spectral modelling tool for galaxies in python.

Use cases in the WPs with a talk today

WP Use Case

1	1	ISTEDDAS - Implementazione MPI multi nodo, multi-gpu, multithread
2	1	HI-emulator
3	1	PLUTO - GPU porting of finite-volume methods for astrophysical MHD
4	1	TURBO - GPU porting of pseudo-spectral codes for incompressible flows.
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9	1	Mercury-Arxes - GPU porting of n-body and protoplanetary disk simulator
10	1	GUIBRUSH(R)-Graphic User Interface for Bayesian Retrieval Using Spectroscopy at High Resolution

WP Use Case

11	1	RAMSES - code profiling and preliminary porting on GPUs. Optimization of hydrodynamic simulations and implementation of algorithms for stellar feedback
12	1	BrahMAP- data reduction for CMB experiments
13	1	Sparse representations for spectral-imaging codes.
14	1	RICK - HPC and GPU development for radio astronomy data reduction
15	1	PRESTO - Identification of non stationary periodicities in timeseries
16	2	GalaPy - the Spectral modelling tool for galaxies in python.
17	2	OpenGadget - Cosmological simulations of structure formation

WP Use Case

18	2	PINOCCHIO - Cosmological simulations to produce large sets of realizations of a galaxy survey like Euclid
19	2	STINGRAY - Temporal analysis of large data archives from X-ray missions
20	2	RAMSES/other numerical nbody+hydro code - Modularize complex physical processes (chemical computation, turbulence evolution, etc) and substitute them with neural network emulators,
21	2	PBJ: Power spectrum and Bispectrum Joint analysis: inference of cosmological parameters from spectroscopic galaxy surveys.
22	2	Simulations for LiteBIRD experiment.
23	2	TEPID-WINE - photoionization modeling and spectral fitting
24	2/3	StratLearn: Improving photometric redshift estimation under covariate shift

Thematic Areas in the WPs

- High-energy astrophysics
- Cosmological simulations and galaxy formation
- Observational data analysis and processing
- Planets and exoplanets
- Turbulence
- Time series
- Gravitational waves

Monthly meetings

Webpage: <https://indico.ict.inaf.it/event/2746/> Europe/Rome English (United Kingdom) Login

Monthly WP1-2 Meeting

Wednesday 17 Apr 2024, 10:00 → 12:00 Europe/Rome

[Meetings Minutes](#) [Zoom Meeting Room](#)

- 10:00** → 10:10 **Welcome and communications from the WP leaders** 10m
Speakers: Giuseppe Puglisi (Università di Roma Tor Vergata), Mario Spera (Istituto Nazionale di Astrofisica (INAF)), Mario Spera, Milena Valentini (University of Trieste), Stefano Della Torre (INFN Sez. Milano-Bicocca)
[2024_04_17_WP1-2...](#)
- 10:10** → 10:25 **NP_TMCode** 15m
Speaker: Dr Giovanni La Mura (INAF - Osservatorio Astronomico di Cagliari)
[NPTM_code_status...](#)
- 10:25** → 10:40 **PBJ** 15m
Speaker: Chiara Moretti (Istituto Nazionale di Astrofisica (INAF))
[pbj_moretti.pdf](#)
- 10:40** → 11:10 **Round table of updates** 30m
- 11:10** → 11:15 **Final remarks from WP leaders** 5m

Monthly meetings: format

Monthly meetings feature a recent **format**:

- 5 min: Welcome and communications from the WP leaders
- 15 + 15 min: two long presentations contributed by selected speakers
- 20 min: round table of updates
- 5 min: final remarks from WP leaders

A representative of each project is supposed to provide a **long presentation** once in a while. Each presentation has to focus on the methodology of the work and on the main technical aspects of the ongoing work. The speaker has to frame their work in terms of planned KPIs and address the question of whether they are on schedule.

All the other speakers contributing in the **update round** have to answer the following three questions:

1. – What's the main result you have accomplished during last month?
2. – Which KPI(s) have you fulfilled so far?
3. – What's the main (not yet solved) issue you are facing?
4. – Report deviations from the planned targets/KPI - prompt corrective measures

The **agenda** of our past meetings:

- December 13th, 2023 at 10 AM
- January 17th, 2024 at 10 AM
- February 21st, 2024 at 10 AM
- March 20th, 2024 at 10 AM
- April 17th, 2024 at 10 AM

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Come and talk with us if you have **feedback** on the format!

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Attendance at the monthly meetings is usually high (on average >~30 participants), even if reaching the full capacity of the WP1 and WP2 community is very difficult!

Please, try to **join** as much as you can!

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Key Science Projects - KSPs and international collaborations

8 Key Science Projects:

- all involving both WP1 and WP2
- all linked to the code-developing activities of the Spoke
- most of them with high relevance for large international collaborations, including SKA, LIGO-Virgo-KAGRA, Einstein Telescope, LiteBIRD, LOFAR, Euclid, ALMA, Ariel, NICER, NuSTAR, JWST

Waiting for computational resources to be allocated

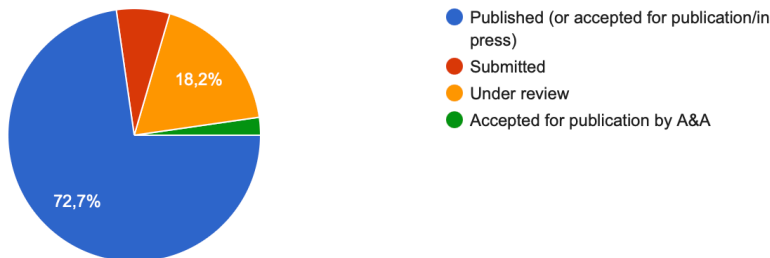
Links to relevant documents:

- [KSP list](#)
- International collaborations and thematic areas [list](#)

Publications and presentations in the WPs

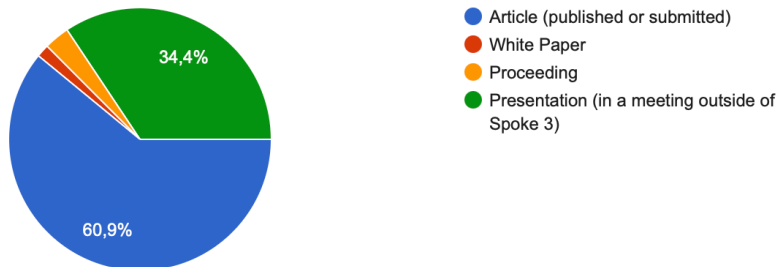
Status of the article (if applicable)

44 risposte



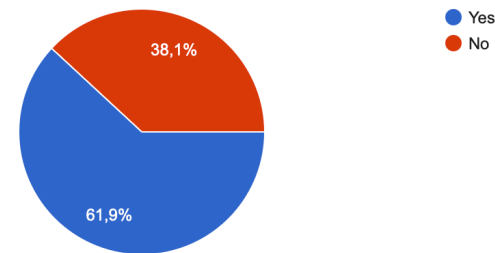
Type of publication

64 risposte



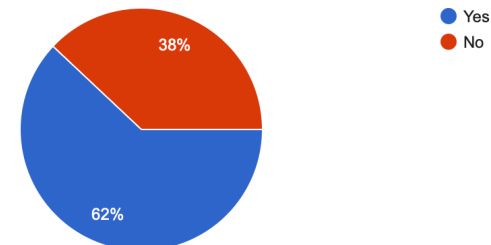
Was the publication/presentation related to your work within Spoke 3?

63 risposte



In the case of a (submitted/published) paper, did you insert specific acknowledgements to Spoke3/ICSC?

50 risposte



Spoke 3 - GitHub Repository

We have a GitHub organization profile to be used as code repository <https://github.com/ICSC-Spoke3>
people who want to be invited please write to: dario.gasparrini@roma2.infn.it

Please remember that documentations, KPIs and other materials of the WP1&2 should be made available through the OpenAccess repository within our community ([useful link](#))

The screenshot displays the INFN Open Access Repository (OAR) interface. At the top, there is a navigation bar with the INFN logo, a search bar, and buttons for 'Upload' and 'Communities'. Below the navigation bar, the main content area features the title 'ICSC Spoke 3 - WP1 and WP2 repository'. Underneath the title, there is a section for 'Recent uploads' with a search bar and a 'More' button. On the right side, there is a green 'New upload' button and a panel titled 'Want your upload to appear in this community?' which contains a list of instructions for uploading content. Below this panel, there is another panel titled 'ICSC Spoke 3 - WP1 and WP2 repository' which provides a description of the community's content.

INFN
OAR
Open Access Repository

Search [] [Q] Upload Communities

ICSC Spoke 3 - WP1 and WP2 repository

Recent uploads

Search ICSC Spoke 3 - WP1 and WP2 repository [] [Q]

More

New upload

Want your upload to appear in this community?

- Click the button above to upload straight to this community.
- The community curator is notified, and will either accept or reject your upload (see community curation policy above).
- If your upload is rejected by the curator, it will still be available on INFN Open Access Repository, just not in this community.

ICSC Spoke 3 - WP1 and WP2 repository

This community contains research outputs and other types of contents produced by the Working Package 1 and 2 of the Centro Nazionale di Ricerca in HPC, Big Data and Quantum Computing (ICSC)

Issues and announcements

Spoke 3 **computational resources**: some participants are waiting for them, and reported on how difficult it is to validate codes using the GPUs of their own laptop. The majority of people working in the WPs would benefit from additional resources.

Next WP monthly meeting: Wednesday, **May 29**, at 10 AM.

