# WP1: HPC codes enabling and optimization
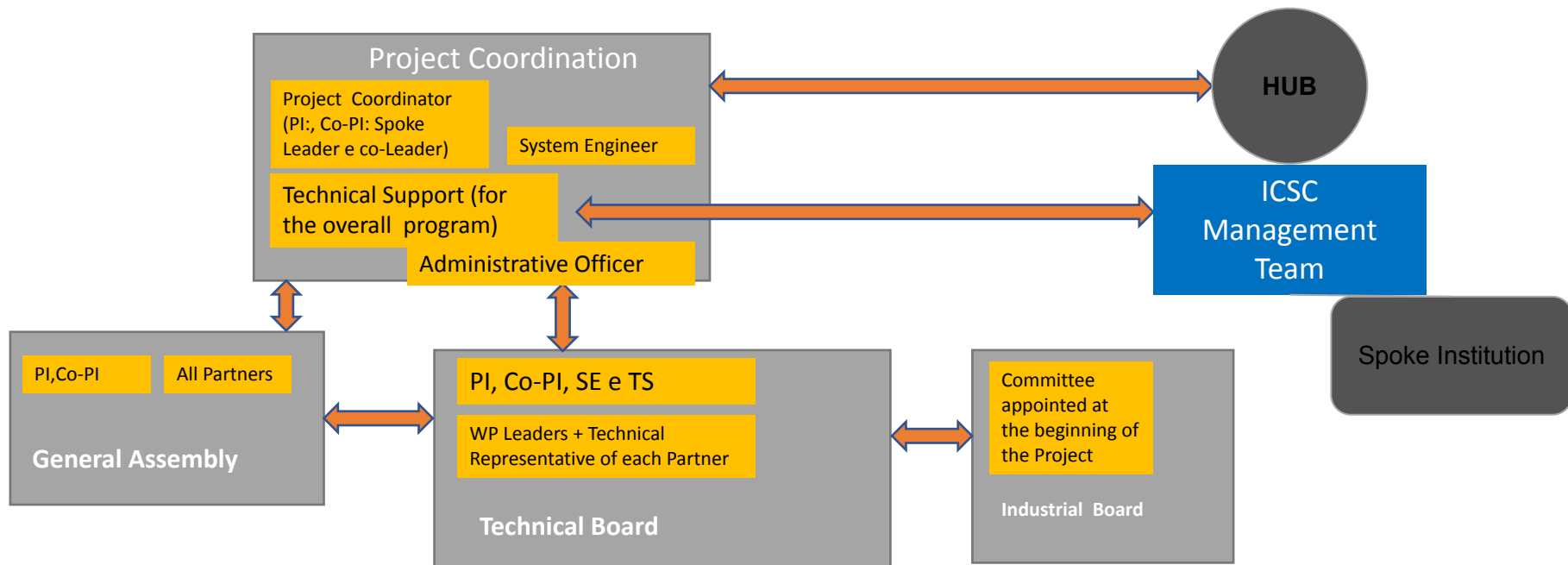
Giuseppe Puglisi for the WP1 group

Università di Roma Tor Vergata

26/10/2022

ICSC

Centro Nazionale HPC,
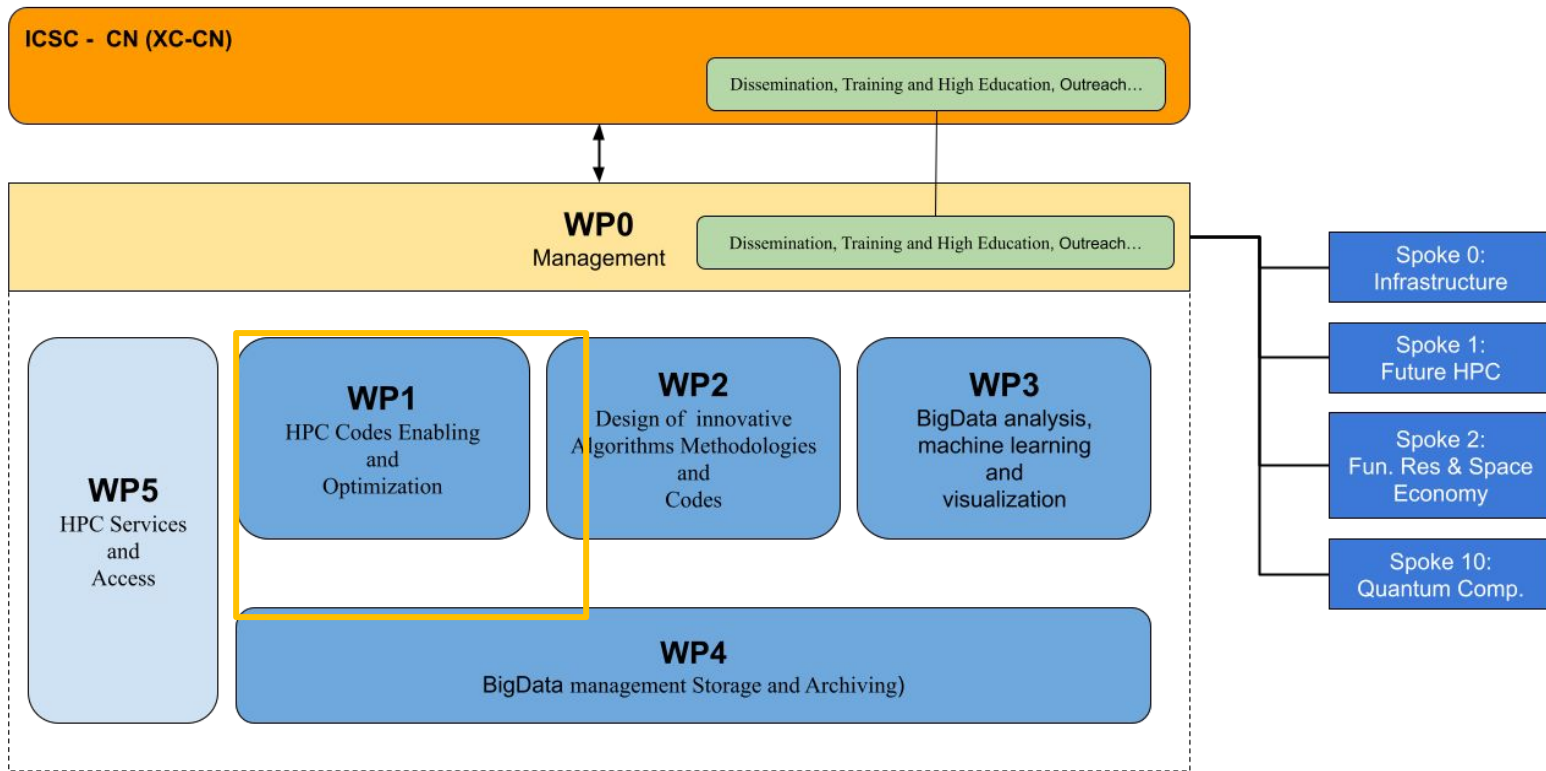Big Data e Quantum Computing

# Spoke 3

Repository: [link to google drive](link to google drive)

# Spoke 3

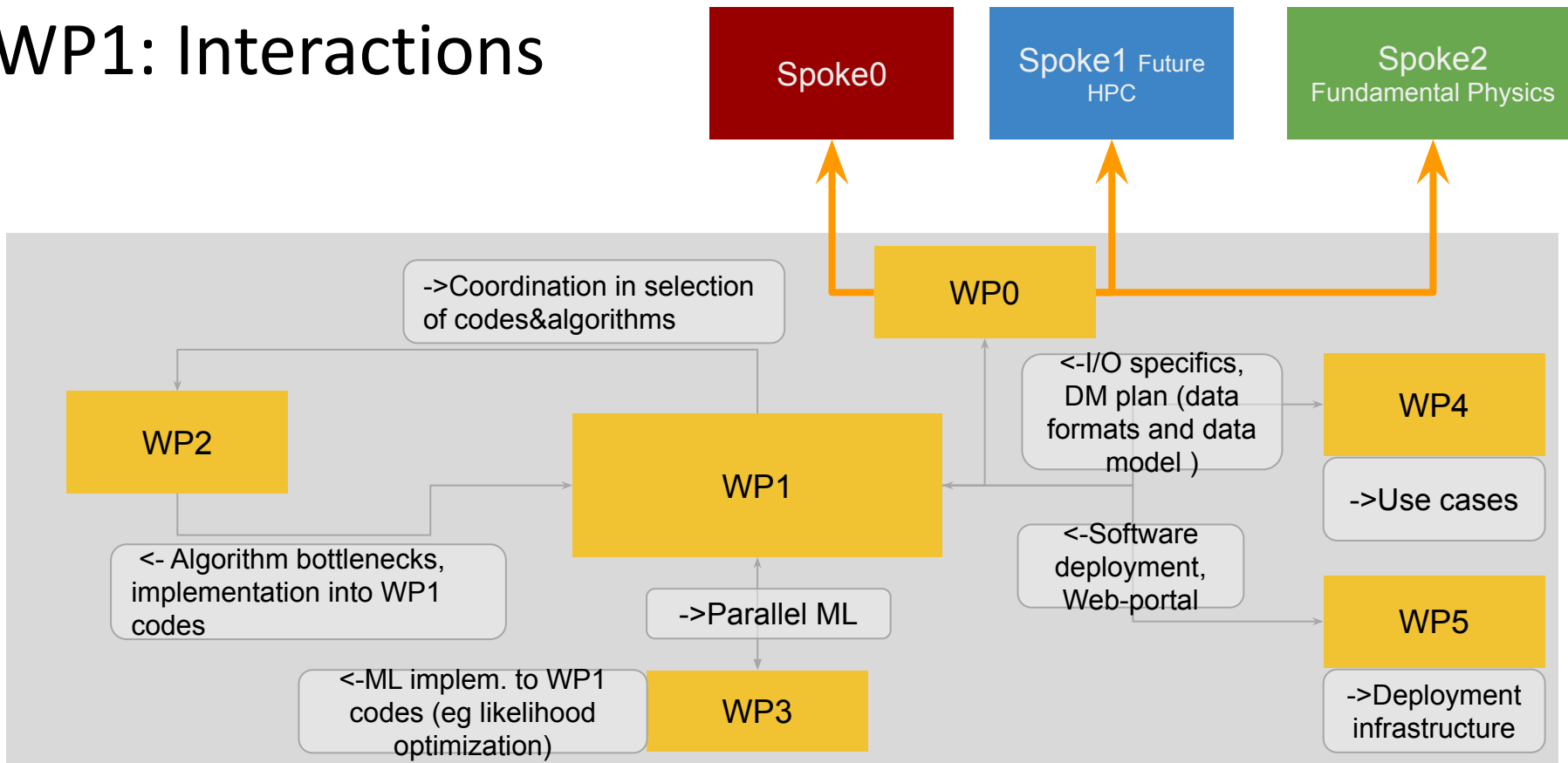# WP1: HPC codes enabling and optimization

**Scope**: selects a number of codes that require intensive computational resources to face the next generation of scientific challenges and performs their redesign, reimplementation and optimisation in order to effectively exploit state-of-the-art HPC solutions.

- T1.1: Selection, Analysis and testing of codes

- T1.2:  Software development, Refactoring and Optimization

- T1.3: Integration, Verification and Validation

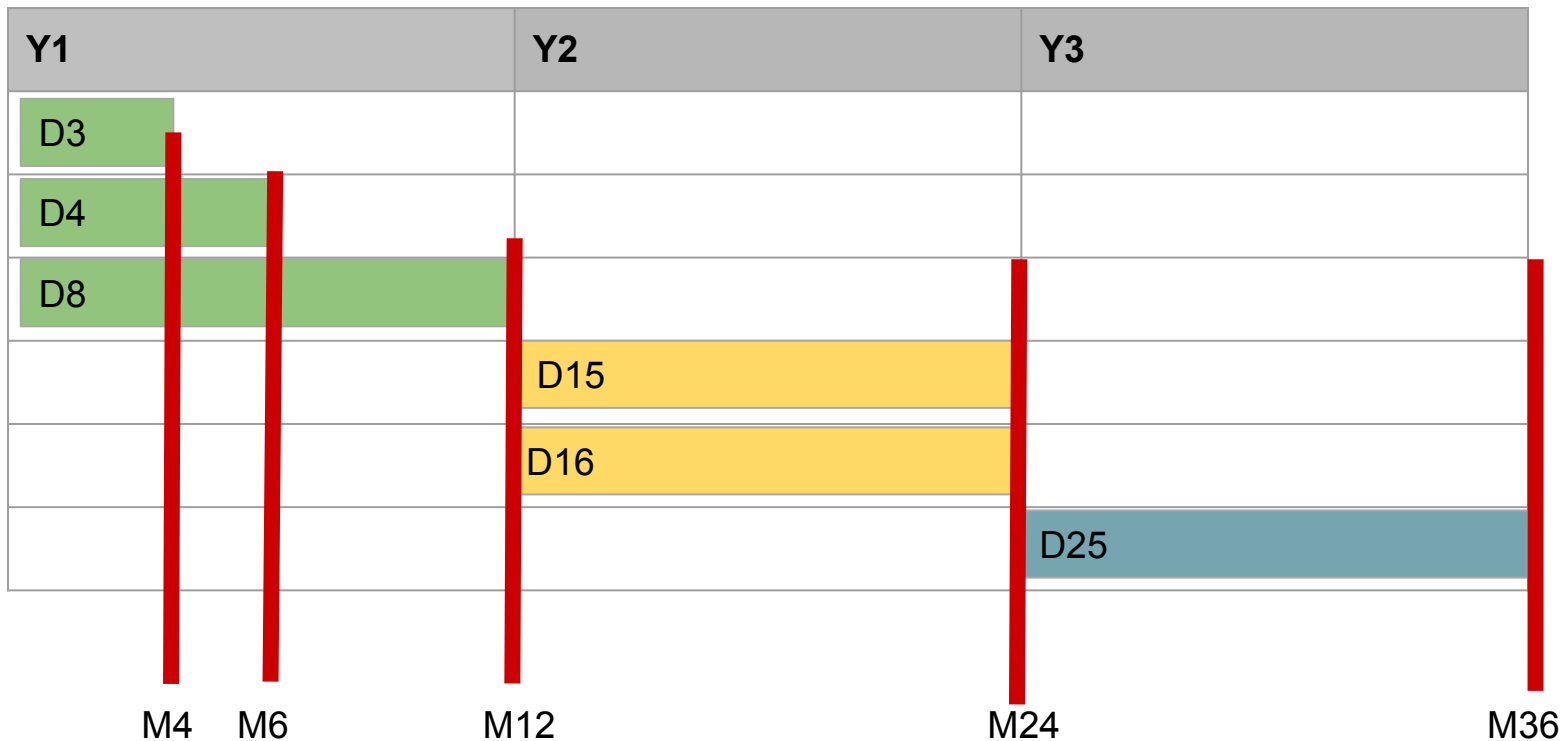| Institution | Participants | PMs |
|---|---|---|
| INAF | Gianfranco Brunetti, Matteo Bachetti, Maura Pilia, Giacomo Mulas, Cesare Cecchi-Pestellini, Diego Turrini, Aldo Bonomo, Francesco Calura,  2 TD | 176,1 |
| SCUOLA NORMALE SUPERIORE | Andrea Pallottini | 48 |
| TOR VERGATA UNIVERSITY OF ROME | Pasquale Mazzotta, Tombesi Francesco, Herve' Bourdin, Giuseppe Puglisi,  2 PHD, 1 AdR | 72 |
| SISSA | Matteo Viel, Andrea Lapi, Enrico Barausse, Mario Spera, Alessandro Bressan, 1AdR | 44 |
| INFN Istituto Nazionale di Fisica Nucleare | Stefano Della Torre,  Massimiliano Lattanzi, Martina Gerbino, Tecnologo Ferrara, 1 PhD, 1AdR | 31 |
| UNIVERSITÀ DI TORINO | Andrea Mignone | 38 |
| UNIVERSITÀ DEGLI STUDI DI TRIESTE | Stefano Borgani | 43.5 |

Total = 452.6

# WP1: Interactions

# **WP1:** Deliverables (as in the [PROPOSAL]( ) )

| #ID | Deliverable name | Short description | Type | Lead | Dissem. level | Delivery date (months) |
|-----|-----|-----|-----|-----|-----|-----|
| D3 | Spoke Project Plan (M4.2) | This will be written by all WPs | Report | INAF, INFN | Public | M4 |
| D4 | Activity status report (M6.1) | Science cases/requirements definition activity status report | Report | INAF | Public | M6 |
| D8 | Activity status report (M12.2) | Spoke's first year activity status report, written by all WPs | Report | ALL | Public | M12 |
| D15 | Activity status report (M24.2) | Spoke's second year activity status report, written by all WPs | Report | UNITTOV | Public | M24 |
| D16 | Software Pilot codes and related documentation (M24.3) | Software Pilot codes and related documentation including verification and benchmarking (UniTO, INAF, UniTS) | Report | UNITTO | Public | M24 |
| D25 | Final activity report (M36.2) | Spoke's final activity status report, written by all WPs | Report | UNITOV | Public | M36 |

# WP1: Milestones and timeline

# Working groups

1. Eulerian Codes (WP1, WP2 )
2. Lagrangian Codes (WP1, WP2 )
3. Time series  (WP1, WP2, WP3 )
4. Feature extraction ( WP3 )
5. Bayesian inference(WP2 , WP3 )
6. Deep learning ( WP1,WP3 )
7. Visualization (WP3)
8. Data-reduction & imaging (WP1, WP2 )
9. Semi-numerical codes  (WP1, WP2 )
10. Data-model (WP1, WP2, WP3 )
11. Web-tools (WP4, WP5)
12. Platforms (WP4, WP5)

WP4, WP5

# WG distribution into WP1

Data reduction

Lagrangian

Semi-numerical

Time series

Eulerian

- Simflowny, Einstein Toolkit, PLUTO, PARSEC RAMSES,

- Pinocchio ,OpenGADGET, GADGET, NyX,, Gaussian,Mercury-Arxes

- WINE,Helmod,21cmFAST,

- LOFAR calibration&imaging , TOAST , Spectral-imaging & denoising

- Exo-planet atmosphere modelling, Stingray, FARI
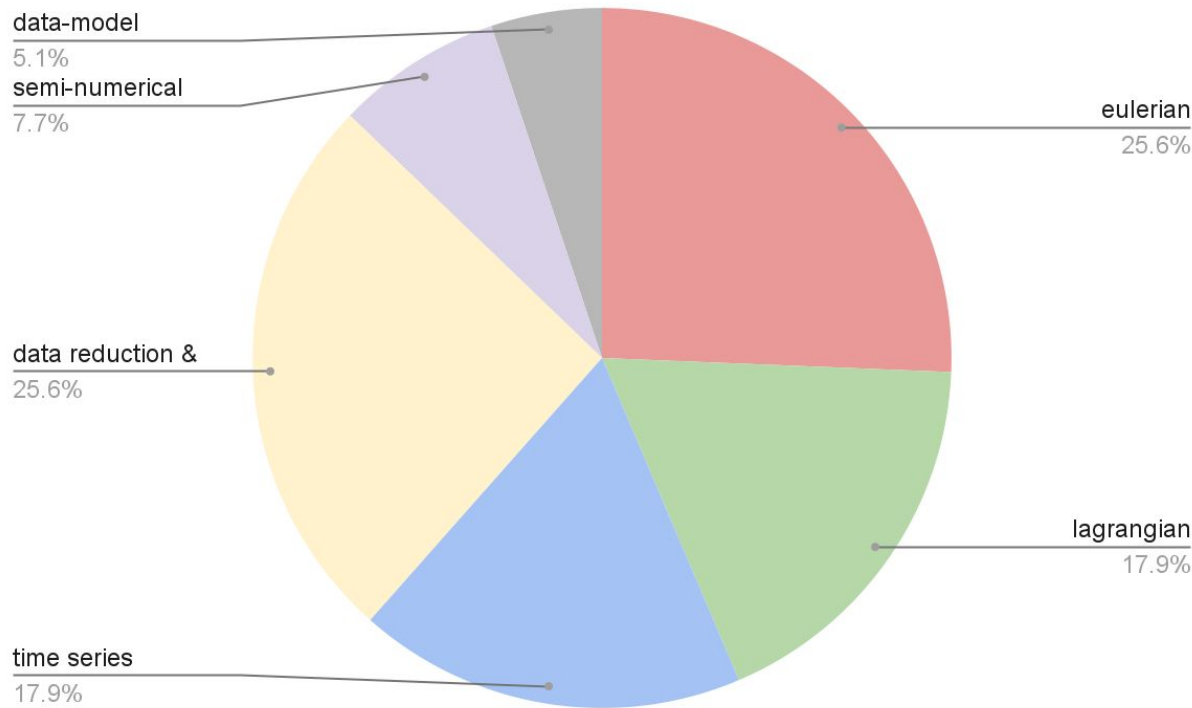
# Surveying WP1

Preliminary results from the survey sheet :

Data reduction

Lagrangian

Semi-numerical

Time series

Eulerian

Data-model



data-model
5.1%

semi-numerical
7.7%

eulerian
25.6%

data reduction &
25.6%

lagrangian
17.9%

time series
17.9%

# Summary

- Started addressing T1.1 (first WP1 meeting Oct 19): surveying the codes, identifying the *flagship* codes

- The WG organization for WP1  seems to be representative of the interests of institutional partners

- WP interactions:  coordination w/ WP2 and WP3, weekly interaction w/ WP4 and WP5

# **Immediate** actions

- December 2022: we need a **draft workplan**, that details WG structure, deliverables, milestones.

- February 2023: identify codes that are i) **useful** for our scientific needs, ii) **critical** to the success of the project, iii) likely to be **delivered**

- We need to identify internal organization: **5 WG leaders** (shared w/ WP2) + 1 **Deputy** and a **reference person** for each participant, responsible for checking that PM are suitably declared.

- **/!\** T1.2 highly-dependent on the available infrastructures (Spoke0)