

WELCOME

INFRA-2024-TECH-01-01 preparation workshop

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On behalf of the coordination working group

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ABOUT THE CALL

GENERAL INFORMATION

- INFRA-2023-TECH-01-01 ;
- Call opening : 06/12/2023 ;
- Call deadline : 12/03/2024 ;
- Budget between 5 and 10 millions € per project ;
- 62 millions total.

SCOPE : specific

• The aim of this topic is to deliver **innovative scientific** instrumentation, **tools, methods and solutions** which advance the state-of-art of RIs in the EU and Associated Countries, and show **transformative** potential in **RIs operation**. The related developments, which underpin the provision of **improved and advanced services**, should lead research infrastructures to support new areas of research and/or a wider community of users, including industrial users. • Cutting-edge technologies will also enhance the potential of RIs to contribute addressing EU policy objectives and socio-economic challenges. • Proposals should ensure complementarity with actions funded under the previous 2022 call (topic HORIZON-INFRA-2022-TECH-01-01 in the 2021-2022 work programme), targeting different instrumentation, tools, methods and solutions. • Proposals should address the following aspects, as relevant: • Research and development of new scientific instrumentation, tools and methods for research infrastructures taking into due account resource efficiency (e.g. energy consumption) and environmental (including climate-related) impacts. This could also include the development of **new, more sustainable** and **efficient methods** of **collecting data** and/or of **providing access**, including **remote and digital**, as well as **digitalisation** of instrumentation, **services** and **results**; their technology **validation** and **prototyping** **ie. demonstrators** **training** of RI staff for the operation and use of these new solutions. When relevant, **developing skills** on technical validation to industrial standards; the innovative potential for industrial exploitation of the solutions and/or for the **benefits of the society**, including facilitating proof of concept for use by SMEs.

SCOPE : large

➤ Complementarity with :

- HORIZON-INFRA-2023-TECH-01-01 Last year awarded projects
- HORIZON-INFRA-2024-TECH-01-02 Focused on digital twins
- HORIZON-INFRA-2024-EOSC-01-02 Focused on EOSC ecosystem
- HORIZON-INFRA-2024-EOSC-01-03 Federated repo and data framework

EXPECTED OUTCOME

- Enhanced scientific competitiveness of RI ;
- Enhanced RI capacities to address research challenges EU policy priorities ;
- Increased collaboration of research infrastructures with universities, research organisation and industry ;
- Increase of technological level of industries through the co-development of advanced technologies of research infrastructures and creation of potential new markets ;
- Integration of research infrastructures into local, regional and global innovation systems and promotion of entrepreneurial culture.

AWARD CRITERIA

1. Excellence

- **Clarity** and **pertinence** of the project's objectives and methodology, and the extent to which the proposed work is **ambitious**, and goes **beyond the state of the art**.

2. Impact

- **Credibility** of the pathways to achieve the expected outcomes and impacts
- **Suitability** and **quality** of the **measures** to maximise expected outcomes and impacts (ex: dissemination and exploitation plan)

3. Implementation

- **Quality** and effectiveness of the **work plan**, assessment of **risks**, and **appropriateness of the effort assigned** to work packages, and the resources overall.

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FIELDS OF APPLICATION

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- Main field : Accelerator physics and technologies and user communities
 - Spans across different applications ;
 - Particle physics ;
 - Nuclear physics ;
 - Light sources ;
 - Medical and industrial applications ... ;
- Connects to transverse applications.

TARGET

What we will tackle

Reliability

Faults

① Detect

② Predict

③ Prevent

Frugal and embedded AI

Need precision twin models

Optimized operation

Beam lines upgrades

Optimized design

Towards exascale precise simulation

precision surrogate models

Downscaling to frugal learning

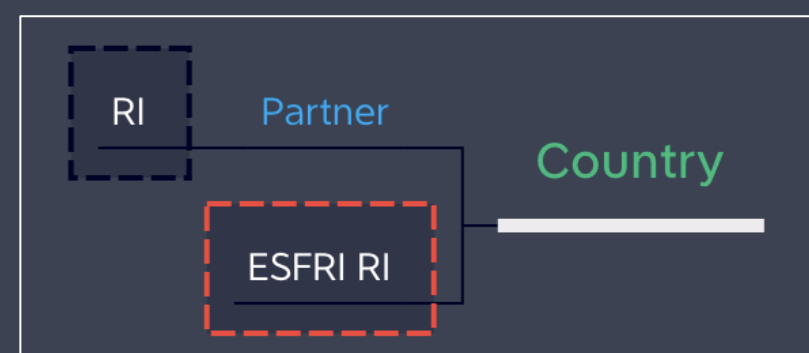
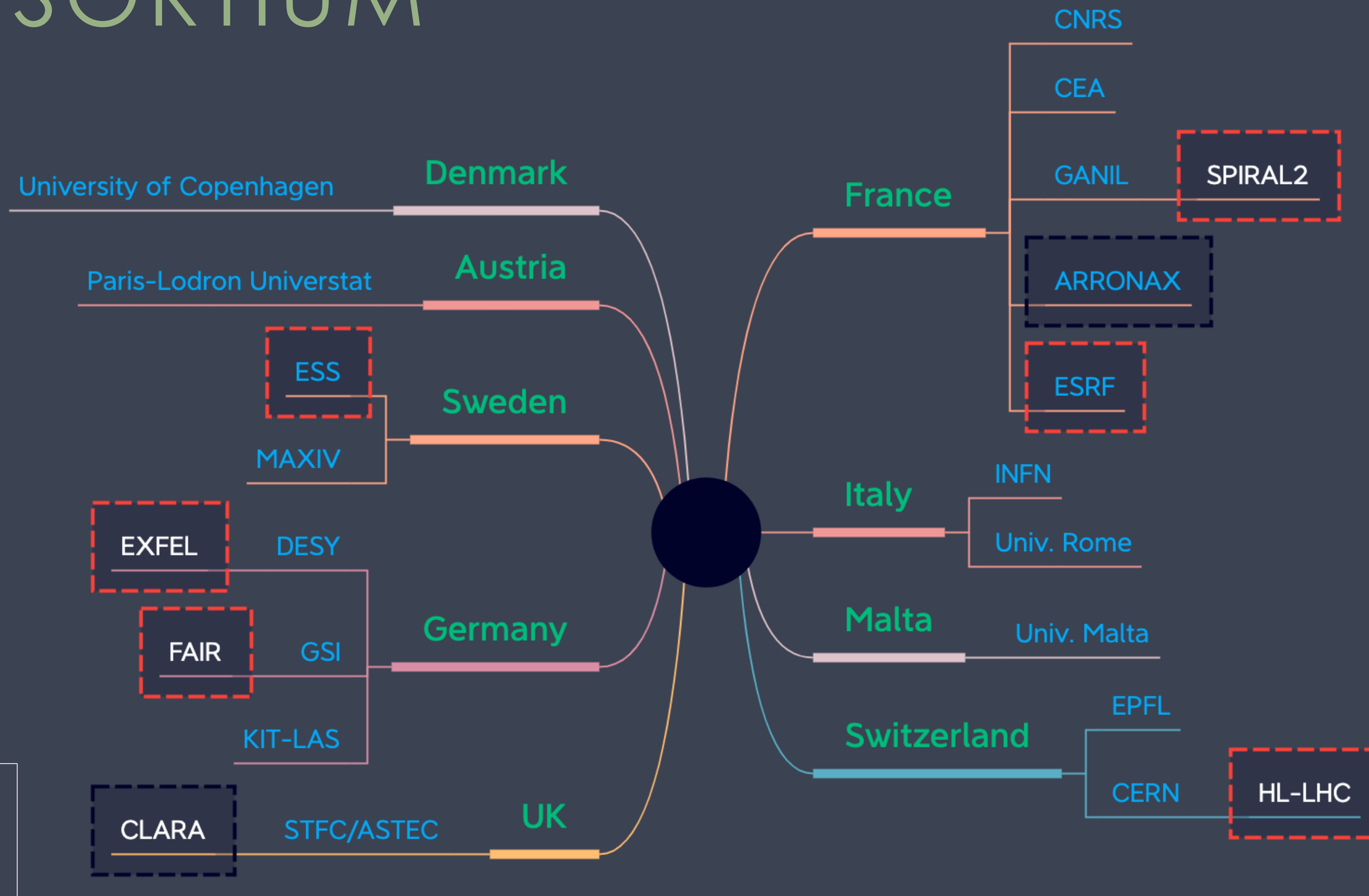
Light surrogate models

TOOLS AND METHODS

- Advanced digital methods : Artificial intelligence
 - Data centred solutions
 - New collaborative approaches
 - Field agnostic methods
- Multiple challenges to overcome

CONSORTIUM &
ORGANISATION

CONSORTIUM



CONSORTIUM

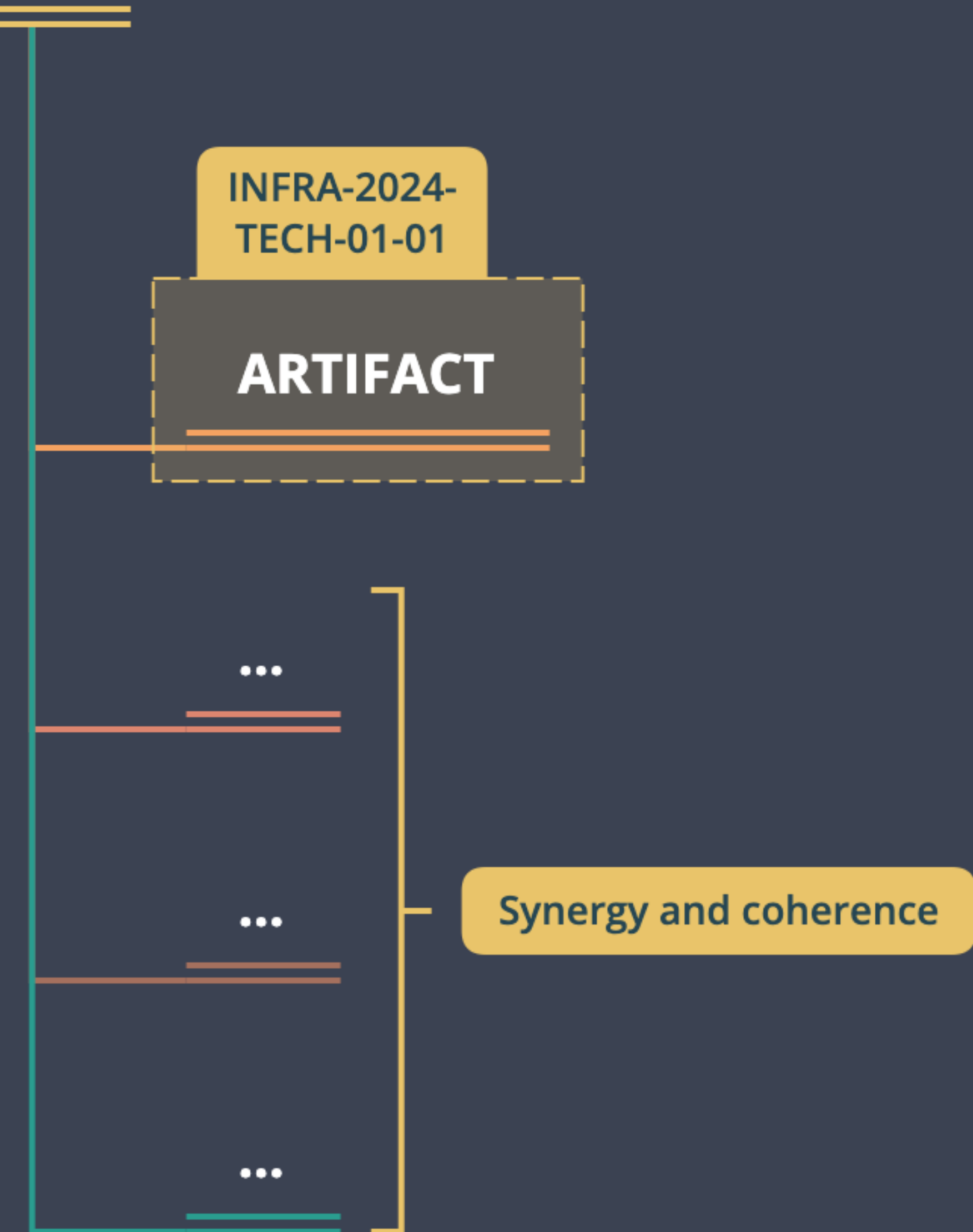


➤ TRAINABLE network

TowaRds An INternational network for multiphysics modelling, machine learning And model-Based control in accelerator sciences and technoLogiEs

➤ ARTIFACT project

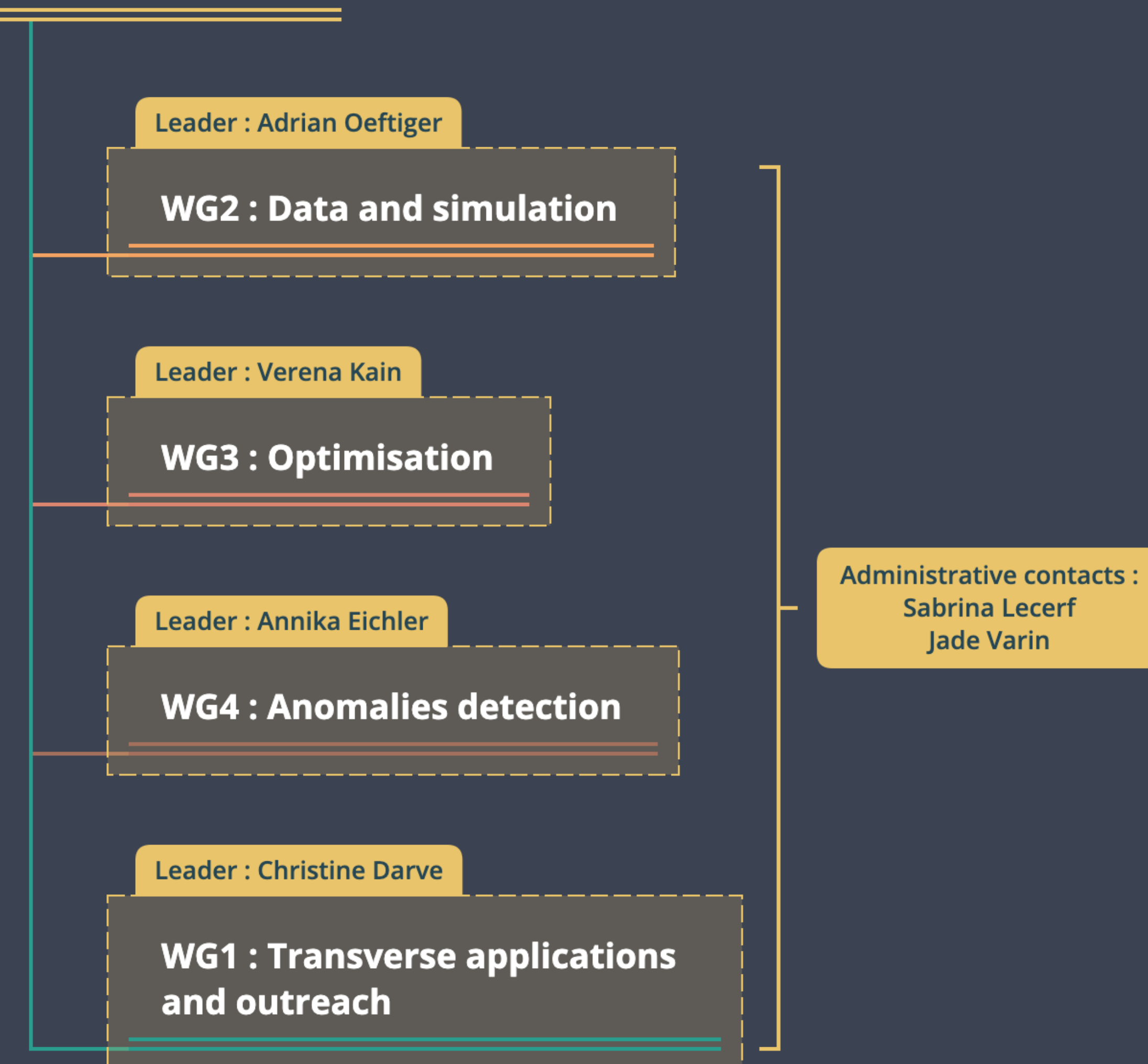
ARTifical Intelligence For Accelerators, user Communities and associated Technologies.



WORKING GROUPS

WG1 : coordination

- 4 Working Groups have been chosen
- Have been meeting and progressing independently towards the definition of the target, tasks, use cases, ...
- This workshop concludes the Working Groups mission.



WORKING GROUP 1

- Outreach, transverse applications and industrial partnership (Christine Darve, ESS)
 - brings together collaborators exchanging AI/ML methodologies ;
 - gathers expertise and exchange knowledge transfer with the following goals:
 - Infuse a global network based on transverse applications ;
 - Develop simulations to enable a trans- and cross-disciplinary training ;
 - Establish a sustainable eco-system between RI, industry and academic as a Global endeavour.

WORKING GROUP 2

- Data and simulation (Adrian Oeftiger, GSI)
 - Brings together collaborators investigating sustainable data generation in a more economic and efficient fashion ;
 - Aims to streamline progress in individual laboratories and provide knowledge transfer with the following goals :
 - Investigate suitable strategies for active learning queries in guided parameter scans ;
 - Identify common metadata and features to simplify data collection ;
 - Establish infrastructure and procedures for sharing data and results.
 - A pool of evaluation-costly study cases from the participating laboratories serves as a testing ground to compare strategies, identify common metadata and organically set up shared infrastructure during the collaborative exploration.

WORKING GROUP 3

- Optimisation (Verena Kain, CERN)
 - Focuses on establishing a suite of state-of-the-art algorithms for more efficient parameter optimisation at design or accelerator exploitation stage. In particular the WP aims at:
 - Identifying suitable optimisation and control algorithms for the various use cases in the community ;
 - Defining/reviewing infrastructure requirements to use optimisation algorithms for simulation or accelerator parameter control ;
 - Defining frameworks in Python for optimisation problem definition to easily share algorithms ;
 - Defining and driving the implementation of a pilot project for ML optimisation/control at the edge.

WORKING GROUP 4

- **Anomalies detection** (Annika Eichler, DESY)
 - Brings together collaborators investigating anomaly detection, fault diagnosis, fault prediction and prevention for a more efficient, safe, reliable and autonomous operation of accelerator infrastructure.
 - Aims to streamline progress in individual laboratories and provide knowledge transfer with the following goals :
 - Identify common applications that are of high relevance for improving the operation ;
 - Investigate suitable algorithms that are available and can deal with the common applications ;
 - Identify common challenges, i.e., about online vs. offline implementation, dealing with environmental drifts and propose adequate solutions ;
 - Establish infrastructure and procedures for sharing data and results.

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GUIDELINES

OBJECTIVES

- Select one or two main (clear) targets ;
- Set the path/tasks to achieve the targets.

Specific needs

What are the specific needs that triggered this project ?

Expected results

What do you expect to generate by the end of the project ?

Dissemination, exploitation and communication measures

What dissemination, exploitation and communication measures will you apply to the results ?

Task 1

Task 2...

Target groups

Who will use or further up-take the results of the project? Who will benefit from the results of the project?

Outcomes

What change do you expect to see after successful dissemination and exploitation of project results to the target group(s)?

Impacts

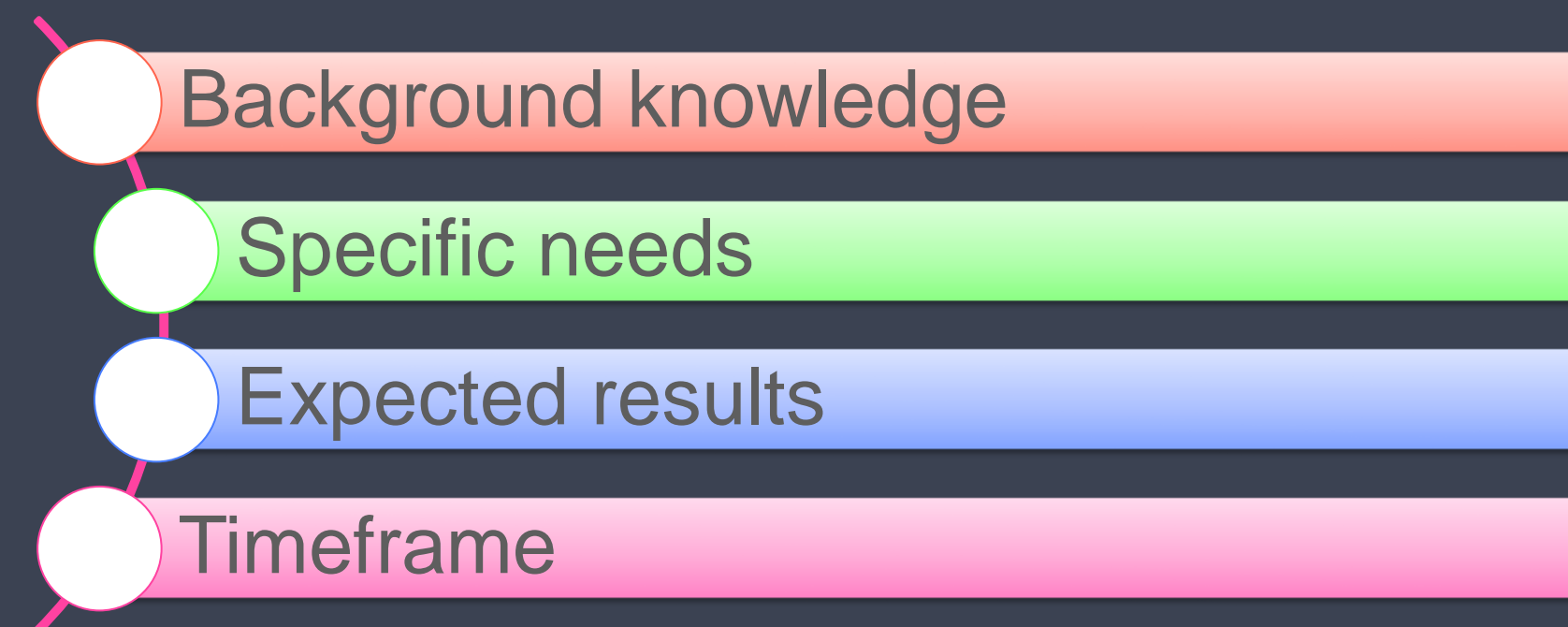
What are the expected wider scientific, economic and societal effects of the project contributing to the expected impacts outlined in the respective destination in the work programme?

Task 1

Task 2...

IMPACTS

- Identify the impacts of the project ;
- Are the objectives SMART ?
- Make it « quantifiable » ;
- Make it readable/tangible ;
- Link it to the call's keywords.
- What is the path (WP, tasks, subtasks, ressources, ...) to warrant achievement ;
- Identify wider impacts (society, industry) ;
- Make it sustainable (long term).



WORK PACKAGES

- Define work packages in a development cycle like scheme ;
- Work packages have to be linked to call keywords and targets ;
- Make it a more generic and less technical ;
- Then complexify as you go down ;
- State clearly the tasks, leaders and deliverables ;
- Make the demonstrator appear clearly

WORDS OF ADVICE

- Address **all** expected outcomes (see call detail) ;
- Highlight the **complementarity** of the ESFRI RI ;
- Make sure that contributions and roles are **balanced** ;
- Make sure there is an **industrial** participation (partnership)
- Highlight how the project will advance European **sovereignty** in our field ;
- Take into account gender/age **balance** as well as ethical consideration ;
- Identify the **risks** and how to mitigate them ;
- Make sure to include a **dissemination** part ;
- Make sure to include a **training** part.

WORKSHOP
ORGANISATION

OVERALL ORGANISATION

- Meeting rooms :
- <https://indico.cern.ch/event/1294919/timetable/#20230718.detailed>

GOOD LUCK !