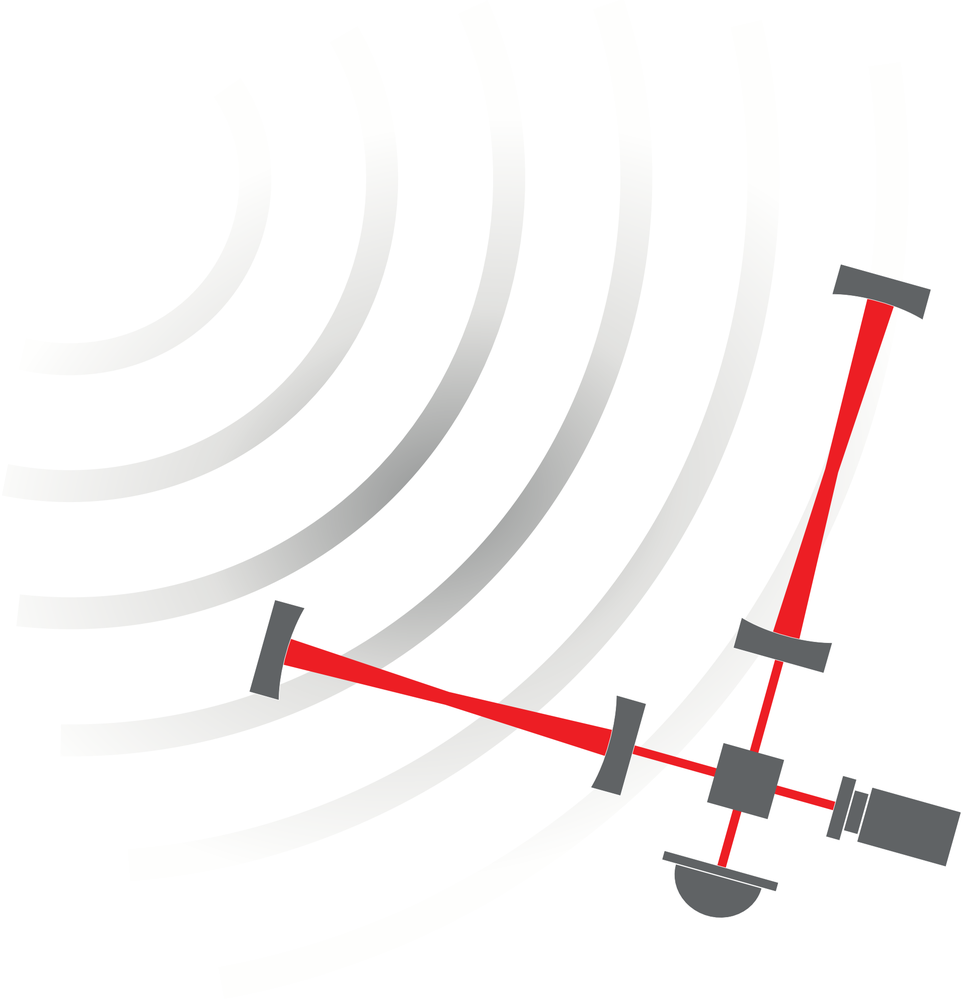
ET Organisation (ETO)



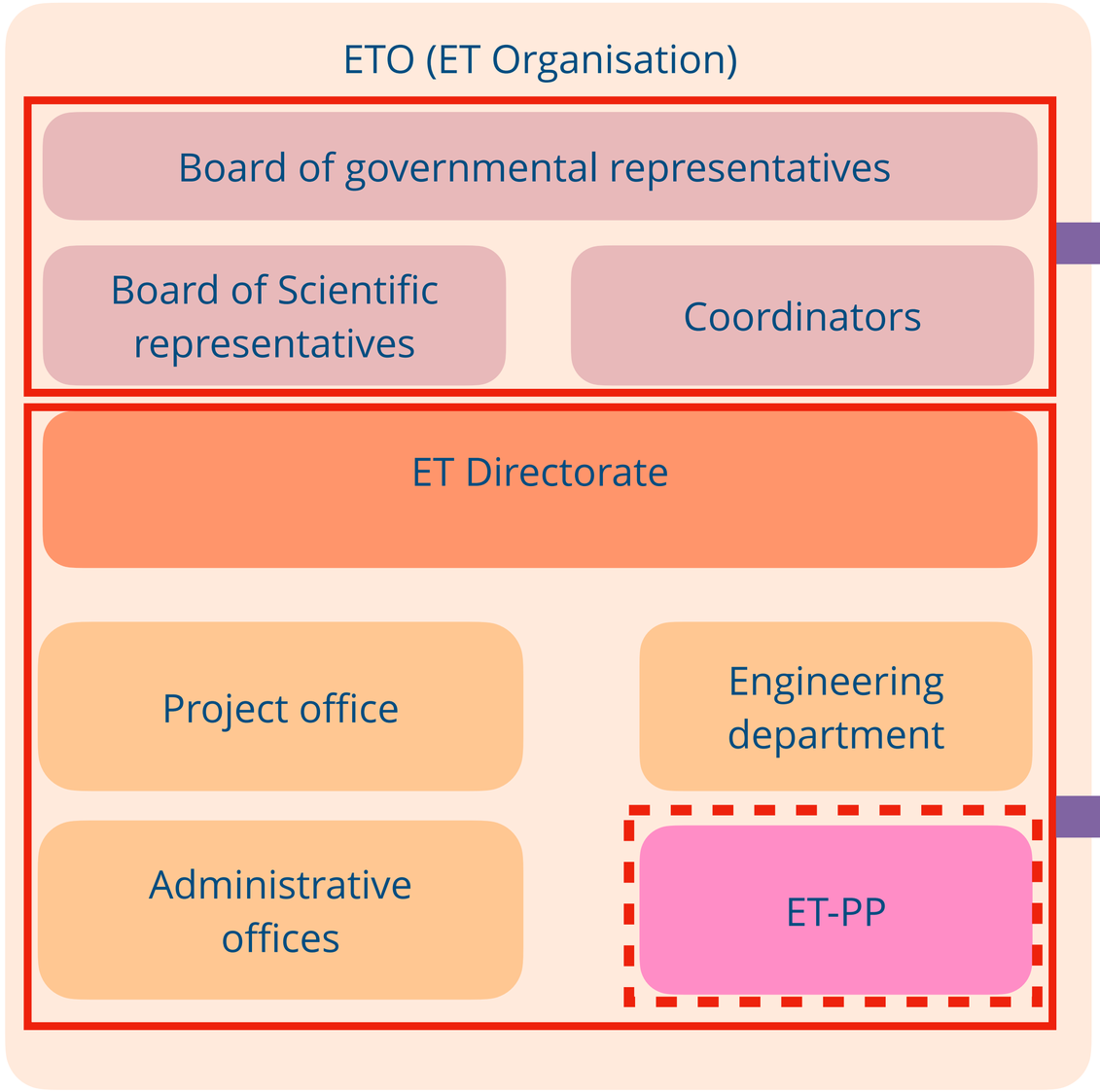
Freise, Ferroni, Martinez, ET-PP meeting, 12.06.2023, ET-0217A-23

Activities required on three fronts

- **ET Collaboration (international)**
  - Define **scientific vision and detector requirements**. For example: science case for ET, which are the key characteristics of a good ET site.
  - **Research and development the technology** required for ET. For example, silicon mirrors, cryogenic suspension systems, …
- **ETO (international project organisation)**
  - Provide **project management** and all **engineering work**.
  - Decide on **governance**, type of legal entity and financial frameworks, …
  - **Engineering work and technical design** of the research infrastructure.
- **Local teams**
  - **Site characterisation** with seismic and geological studies.
  - Deliver design and implementation plans that are **unique to the region**.
  - Develop **economic case** and deliver socio-economic impact plan.

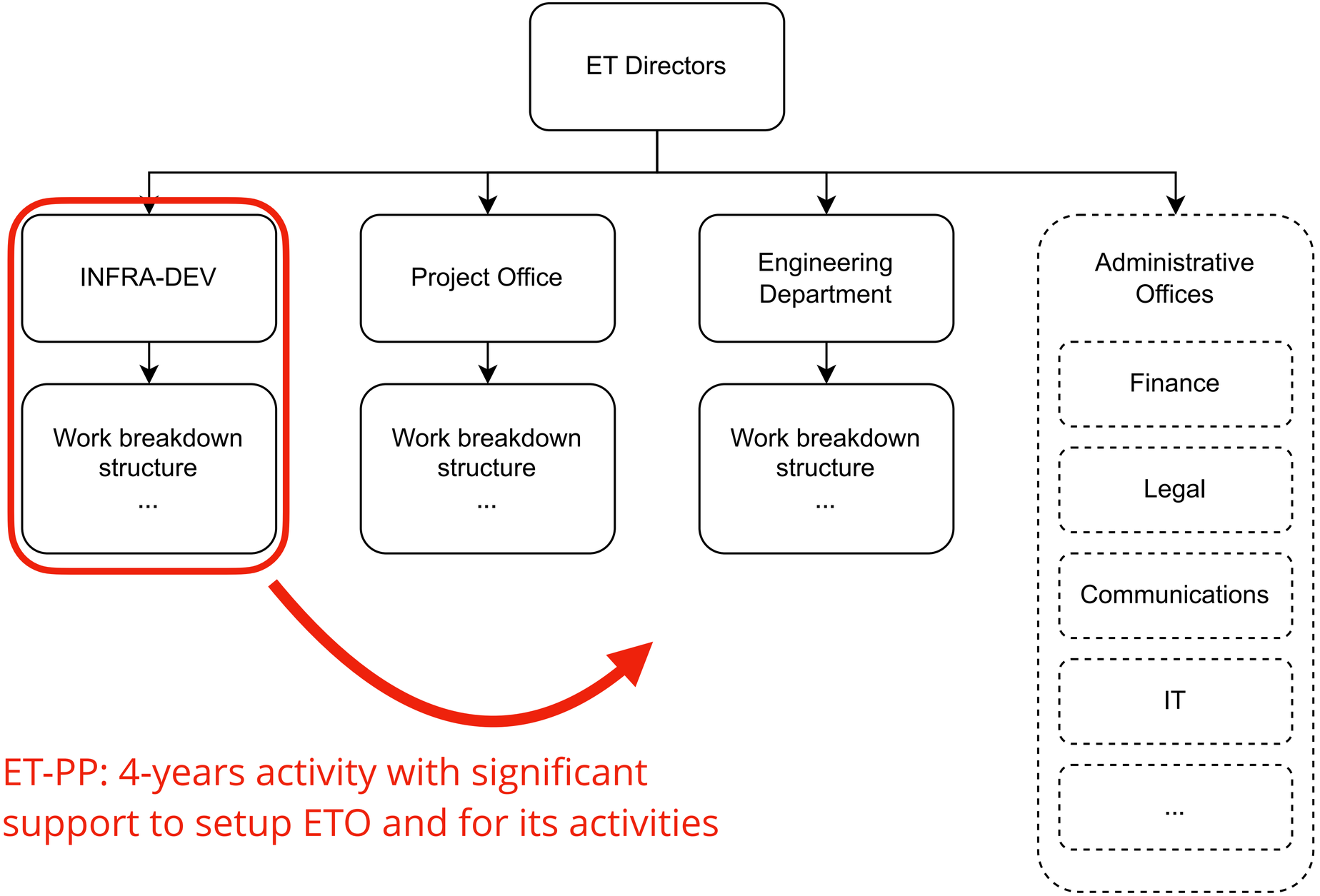
Update on the ETO structure

ETO: an organisation for realising ET



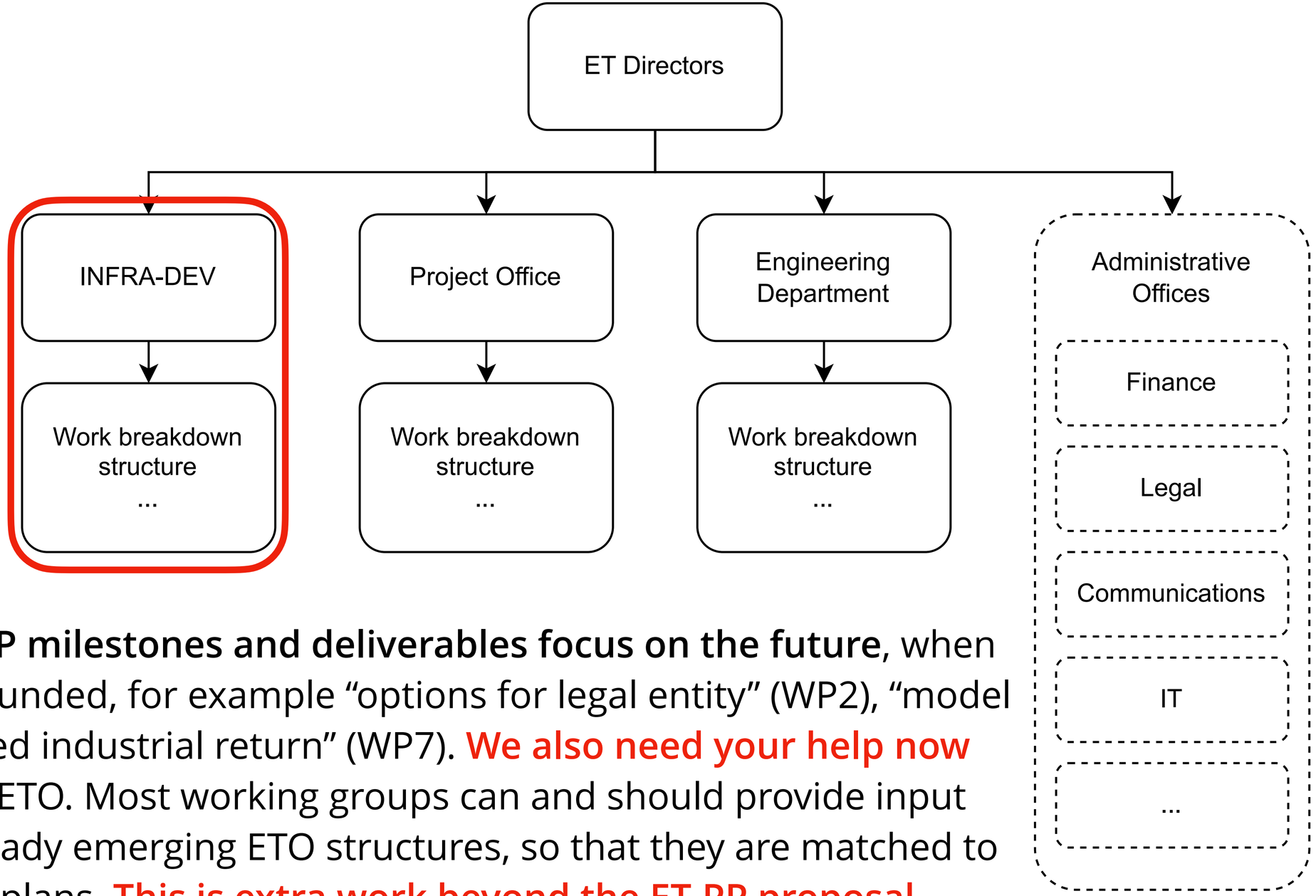
Temporary groups, working towards becoming the ET governing body, such as a Council. Our most important link to governments and funding agencies.

An small but active organisation with full-time people working towards the realisation of ET. A future legal entity for ET could be based on this structure.



ET-PP: 4-years activity with significant support to setup ETO and for its activities

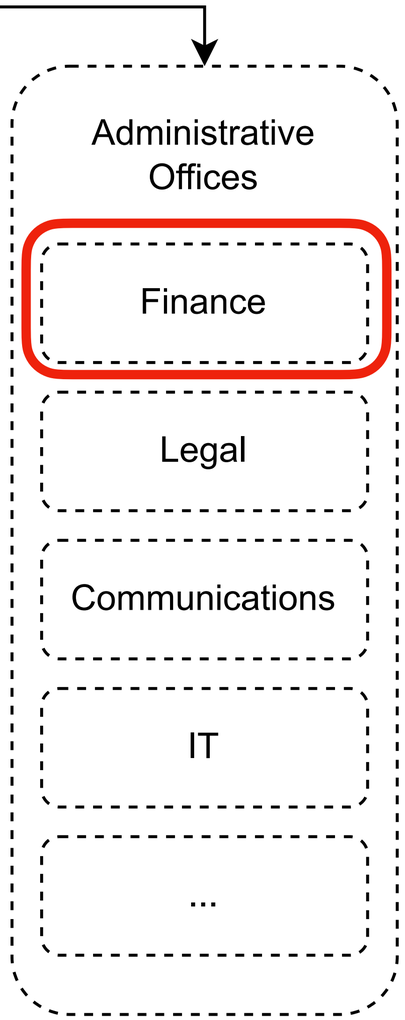
https://apps.et-gw.eu/tds/ql/?c=16590



Many **ET-PP milestones and deliverables focus on the future**, when ET is fully funded, for example “options for legal entity” (WP2), “model for balanced industrial return” (WP7). **We also need your help now** setting up ETO. Most working groups can and should provide input on the already emerging ETO structures, so that they are matched to our future plans. **This is extra work beyond the ET-PP proposal.**

https://apps.et-gw.eu/tds/ql/?c=16590

Finance office



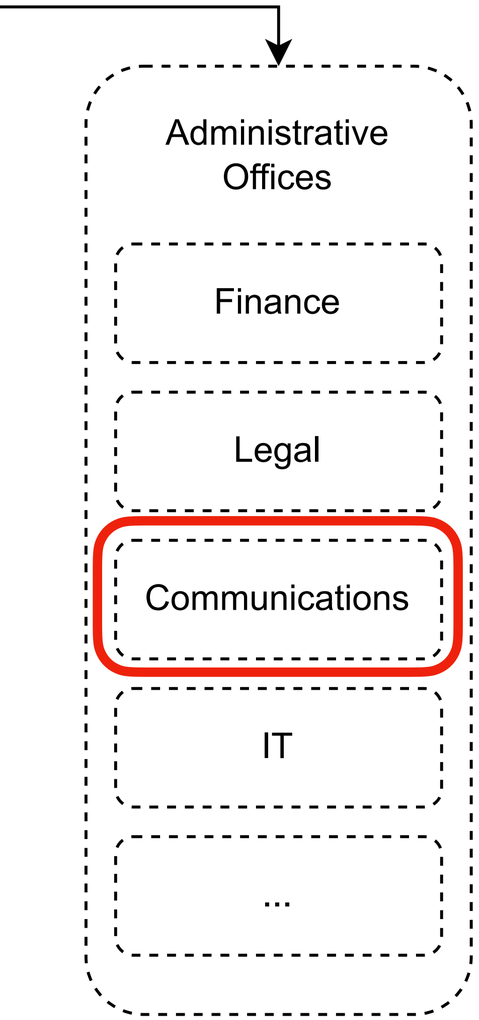
ET-PP funding is far from sufficient for the full preparation phase of ET.

Substantial extra funding has been made available for the regional teams in Sardegna and EMR to study the sites and prepare bids to host ET.

Additional funding is required at the international level, most importantly for feasibility studies regarding the infrastructures and specific parts of the detectors, but also for organisational tasks, for example communication.

Over the coming months we plan to set-up a finance office within ETO, with the aim to help with setting up and then administrating a scheme for managing such funding and expenditures now. The new office will work in collaboration with WP3.

Communication office

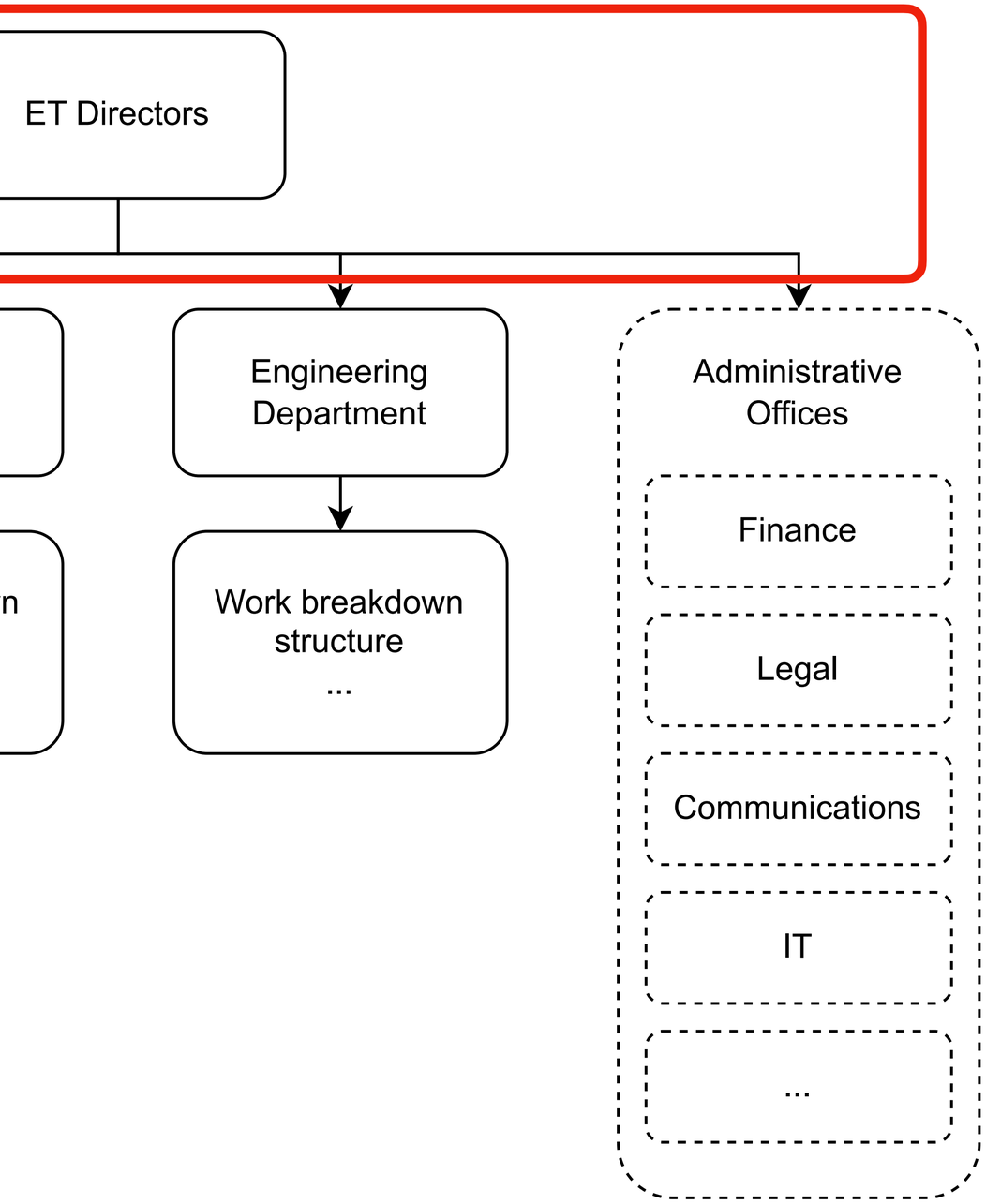


We have recently started the communication office within ETO, led by Martine Oudenhoven (additional in-kind contribution from Nikhef) to work in collaboration with WP10. Initial tasks include:

- Oversee the (interim) ETO communication office.
- Provide strategic advice and support to directors.
- Contribute to alignment of different communication activities/entities.
- Develop business plan for communication of ETO for next years, building on and connected to activities in WP10.
- ...

Martine Oudenhoven

Office of the directors



The main objective of the ETO Directorate is to provide the Board of Governmental Representatives (BGR) with all the material necessary for a first approval of the creation of the research infrastructure in the selected construction site(s).

The Office of the Directors will support the ETO Directorate in the preparation of the **business plan for ETO**. This set of documents will describe in detail the **strategic plan, the timeline, the milestones, the budget, the human resources required**.

Update on the ETO activities

Working with CERN

- We actively seek collaborations with technical teams at CERN. Those teams can provide extremely valuable expertise for urgent topics, such as vacuum pipe systems and the construction of underground infrastructures.
- By working with CERN we are established links and building ET-related knowledge within the technical teams at CERN and we are establishing ET as a active topic within the CERN systems, opening the doors for future opportunities.
- An generic MOU between ET partners and CERN, as a framework for future collaboration, was negotiated in 2019 and signed January 2020 between CERN, INFN and Nikhef. Recently IFAE has joined as a fourth partner. **We strive for other national partners to join in the future.** Based on this MOU we are starting specific collaborative activities on vacuum pipes and civil engineering.
- The Einstein Telescope is now a ‘recognised experiment’ at CERN (since last month), following an application process from the ET Collaboration. This will allow easier access to CERN itself and to CERN tools.

CERN vacuum project, the CERN team

See Paulo Chiggiato's talk later today

Name	Competences	Workpackage
Cedric Garion	Structural mechanics	WP1
Carlotta Accettura	Mechanical design	WP1
Ana Teresa Perez	Metallurgy	WP2/WP8
Gilles Favre	Manufacturing	WP2
Audrey Vichard	Welding	WP2
Stefano Sgobba	Metallurgy	WP2
Manjunath Dakshinamurthy	Metallurgy	WP2
Leonel Ferreira	Surface treatments	WP3
Mauro Taborelli	Surface analysis	WP3

Name	Competences	Workpackage
Luigi Scibile	Premises and logistics	WP4&WP5
Gregory Pigny	Vacuum control	WP6
Giuseppe Bregliozzi	Vacuum engineering	WP6
Carlo Scarcia	Vacuum engineering	WP2/WP6
Jose Ferreira	Vacuum modeling	WP6/WP7
Alice Michet	Vacuum measurement	WP6
Jan Hansen	Mechanical engineering	WP7
Ivo Wevers	Vacuum measurement	WP6/WP7
Paolo Chiggiato	Coordination	WP8

By contract, during the three-year agreement, two FTE/y of CERN staff and two CERN fellows work for ET.

Example: Welding cost+time

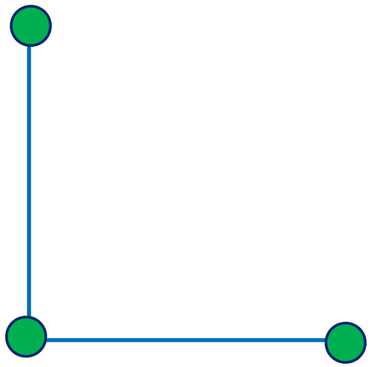
10000 m/14=714 welds per line -> ≈4 x 750 welds per line, including pumping modules, ≈ 3000 welds per triangle side, 9000 for the whole triangle; therefore **900 team.weeks** of mechanical installation are needed.

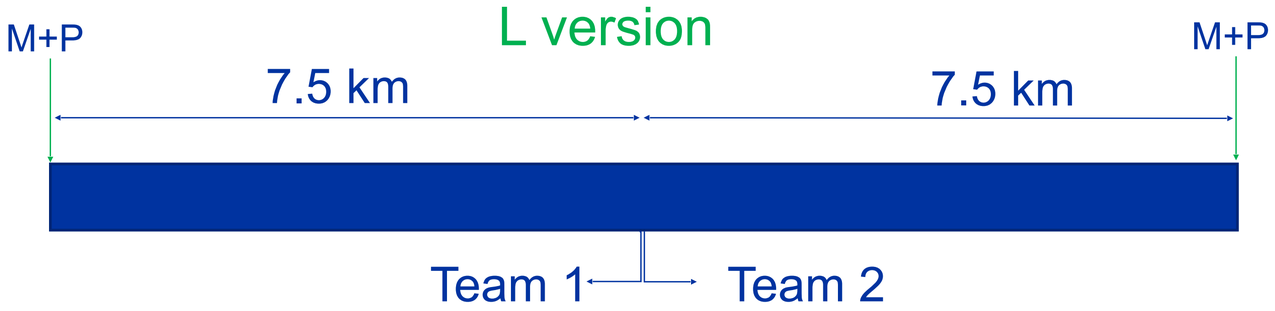
With 6 welding teams (2 per side): **≈3 years of mechanical installation**

Minimum beampipe production rate: **12 tubes/working day**. This will imply parallel manufacturing and testing benches.

The teams would have to **travel a maximum of 5 km** to reach the working point. If the installation started from the centre of the triangle side, the transport of personnel would happen in an empty tunnel (time required: maximum 10-15 minutes to reach the installation front).

Example: Welding cost+time





As the total length of the beampipes is identical in the two options (i.e. 120 km), for **two L** we have 9000 welds and **900 team-weeks** of mechanical installation.

450 team-weeks of mechanical installation for one L; 225 team-weeks per L side.

With **4 teams per site (2 in each L side),** it would needs ≈ 2 years + a few months for a whole L.
If the installation is performed at the same time in the two sites, **8 teams** are needed: **2 years and a few months** to complete the whole beampipe installation.

If 8 (4+4) teams worked in parallel, 16 vacuum chambers would have to be manufactured/tested/cleaned in a working day (challenging).

The teams would have to **travel a maximum of 7.5 km** to reach the working front. If the installation started from the centre of the L side, the transport of personnel would happen in an empty tunnel (time required: maximum 15-20 minutes to reach the installation front).

GWs in the CERN Courier

12.05.2023

BEAMPIPES FOR GRAVITATIONAL WAVE TELESCOPES 2023

Beampipe know-how for GW observatories

The direct detection of gravitational waves (GWs) in 2015 opened a new window to the universe, allowing researchers to study the cosmos by merging data from multiple sources. There are currently four gravitational wave telescopes (GWTs) in operation: LIGO at two sites in the US, Virgo in Italy, KAGRA in Japan and GEO600 in Germany. Discussions are ongoing to establish an additional site in India. The detection of GWs is based on Michelson laser interferometry with Fabry–Perot cavities, which reveals the expansion and contraction of space at the level of ten-thousandths of the size of an atomic nucleus, i.e. 10^{-19} m. Despite the extremely low strain that needs to be detected, an average of one GW is measured per week of measurement by studying and

C Hervet

Beam me up
The participants of the March workshop that was dedicated to vacuum technologies for beampipes of

solutions were adopted, then the vacuum pipe system would amount to half the estimated cost of the CE and almost one-third of the ET, with underground civil engineering the dominant amount. Reducing the cost of vacuum systems requires the development of different

vacuum systems provided a starting point for the presentations of ongoing developments. To conduct an effective cost analysis and reduction, the entire process must be taken into account – including raw-material production and treatment, manufacturing, surface treatment, logis-

https://cerncourier.com/a/cern-shares-beampipe-know-how-for-gravitational-wave-observatories/

CERN, next steps

- **Civil engineering**: an extension to the MOU has been agreed on and is now being formalised: CERN will provide consultancy and technical support towards the creation of the TDR for the civil engineering and technical infrastructure. That project will start in 2023 and run for 3 years.

- **Health and safety**: technical designs at CERN are usually done by a large interdisciplinary team, including for example the safety group. We had a first exploratory meeting with CERN's Occupational Health & Safety and Environmental Protection Unit (HSE) on 04.04.2023. To be continued.

- **Engineering support**: we are organising a first meeting with Katy Foraz, the Head of the Engineering Department at CERN, and her Group Leaders to explore other opportunities for collaboration.

- **Document management**: project management requires specific tools, we are investigating the use of the CERN tool EDMS. Hosting and support could be add/by CERN or from another partner.

Formal project management: PBS

- Following the initiative from the ETO Project Office (PO), an ad-hoc working group was appointed
- Made of both PO and Collaboration members (Mandate/Composition - ET-0026A-23), the WG met (mostly) in presence four times in different locations with monthly cadence. All presentations and meetings executive summaries available in the ET Wiki: https://wiki.et-gw.eu/Main/PBSWorkingGroup/WebHome
- The Product Breakdown Structure (PBS) is a first step in a formal project management process:
  - PBS will define the structure of the Requirements Breakdown Hierarchy (not considering crosscutting systems or others)
  - PBS shall represent the backbone of the WBS (Work Breakdown Structure)
  - PBS is triggering the OBS (Organization Breakdown Structure) via the definition of the WBS
  - PBS shall produce the Hardware Project Object costing

The next six months…

- Our priority task is to develop a **business plan for ETO**, containing a schedule and budget for Phase 1, based on a detailed plan of work.
- Most urgent is the request for additional funding for key activities. We should make the best use of windows of opportunity.
- In particular, a number of teams at CERN are available only for a limited time due to the LHC upgrade/ run cycle.
- In February this year we reported this plan to the Board of Governmental Representatives (BGR), today we will provide an update to the Board of Scientific Representatives (BSR). We plan to deliver our business plan by the end of this year.
- **Over the next 6 months we will develop specific plans and structures for ETO during Phase 1. Please get in touch if you think you can contribute.**

… end