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Deliverable D3.1
Governance and Sustainability

Deliverable D3.1

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Abstract
This deliverable reports on the future structure and governance of the CLONETS infrastructure. The document also introduces a framework for the assessment of total costs of ownership (TCO) of the infrastructure, presents project budgetary model cases for the implementation of the infrastructure and proposes a roadmap for sustainability.

Table of Contents

Table of Figures

Table of Tables

Executive Summary

This deliverable (*D3.1 Governance and Sustainability)* defines an infrastructure which provides precise time and frequency signal dissemination over fibre optic network across the European continent. We named this the **Pan-European Research Infrastructure for Time and Frequency Signal Dissemination.**

The infrastructure will consist of two main parts: **National Research Infrastructures for Time and Frequency Signal Dissemination** covering the territory of the participating states; and the **CLONETS Research Infrastructure** connecting and synchronising all National Research Infrastructures for Time and Frequency Signal Dissemination through a specialised optical network called the **European Core Network**. This document also sets out the arrangement and interrelationships between the two above-mentioned parts within the European Research Area.

Another primary goal is the design of the governance and organisational structure of the **CLONETS Research Infrastructure**, which will have an international character by its very nature. The document also introduces a framework for assessing the **Total Costs of Ownership (TCO)** of the **CLONETS Research Infrastructure**, details some budgetary model cases for implementing the infrastructure of the **European Core Network** and proposes a roadmap for sustainability.

1 Introduction

The planned Pan-European Research Infrastructure for Time and Frequency Signal Dissemination will be rolled out across the whole European continent. It will include a wide range of organisations: national metrology institutes (NMIs), research institutions, universities, providers of national research and education networks (NRENs) and innovative companies. It is necessary to harmonise relations between the participating countries and organisations at the national and international levels.

1.1 Input Data for Governance and Budgetary Model Proposal

Input data is derived from the work of WP1 (needs of potential users) and WP2 (survey of the current state and technical design) on the future **Pan-European Research Infrastructure for Time and Frequency Signal Dissemination**. Their outputs are summarised in the following sections.

1.1.1 Needs of potential stakeholders (WP1)

A detailed survey of the possibilities of using precise time and frequency signal dissemination for the scientific community and identified application areas in Europe was carried out in WP1 of the CLONETS-DS project. Subsequently, user needs were sorted into clusters, the required parameters of individual services were determined, and the locations of user groups were entered into the geographical arrangement. From this global analysis presented in *D1.2 Requirements and Definitions*, we summarise the following main areas of research, development, and application, and we also present here the approximate numbers of stakeholders who have the potential to connect to the future **Pan-European Research Infrastructure for Time and Frequency Signal Dissemination**:

- Fundamental Science (clocks improvement, precision spectroscopy to search for beyond standard model physics, SI unit second re-definition) – up to 28 locations in total.
- Quantum Technologies (real-world QKD improvement, new protocols development, entanglement distribution beyond QKD) – up to 17 locations plus 27 European member states of the Europe Communication Infrastructure (EuroQCI).
- Earth Observation / Geodesy (height system unification, satellite gravity mission validation, geodetic network consistency) – up to 13 locations in total.
- Astronomy (radio interferometry and VLBI in astronomy, laser ranging, pulsar timing – up to 19 locations in total.

- Telecommunication, Position, Navigation, Synchronisation, and Timing (optical timescales, position, navigation & timing, PNT, resilience for GNSS, synchronisation of networks 5G to 6G) – more than 30 locations in total (including the biggest telco operators).

This therefore totals more than 100 stakeholder sites, which can also have the character of various consortia with a widespread organisational structure. The potential number of stakeholders is much higher.

1.1.2 Technical Design of Pan-European Research Infrastructure for Time and Frequency Signal Dissemination (WP2)

Based on the survey of the Needs of Potential stakeholders, the survey of National Research Infrastructures for Time and Frequency Signal Dissemination in Europe (*D2.1 Technical Design Report*), and technical design of the Pan-European Research Infrastructure for Time and Frequency Signal Dissemination (*D2.2 Roadmap for Technical Implementation of the T&F-Reference System*), the consortium of the CLONETS-DS project defined:

- **Core Sites (CS)** – these are sites which play a fundamental role in the future Pan-European Research Infrastructure for Time and Frequency Signal Dissemination. They are locations of good branching stations and where National Research Infrastructures could connect to the European Core Network.

- **European Core Network (ECN)** is a specialised network for Time and Frequency Signal Dissemination over the whole European continent, interconnecting the Core Sites mentioned above. Some interconnecting (mainly cross-border) optical fibre links are already being implemented thanks to the efforts of some of the partners of the CLONETS-DS project consortium.

Furthermore, we have identified that the following National Research Infrastructures, links, or fibres are currently operating at the national level for the distribution of time and frequency signals:

- National Research Infrastructures (built or existing): Austria (ACO), Czech Republic (CITAF), France (REFIMEVE), Germany (PTB), Italy (INRIM), Poland (PSNC), Switzerland (METAS) – in total there are 7 under construction or existing National Research Infrastructures.

- Networks with the potential to transmit time and frequency signals: Existing Time and Frequency network potential – The Netherlands (VSL), UK (NPL), 2 networks.

- Existing fibre only infrastructure: Spain (ROA) – 1 network so far.

We have also noted the following:

- international connections (mainly cross-border) are lacking, apart from France, Italy and Germany (and the UK) and,

- time and frequency signal optical fibre links on national levels can be used somewhere as parts of ECN to optimise the total costs of the ECN.

1.2 Breakdown of Pan-European Research Infrastructure for Time and Frequency Signal Dissemination into National and European Parts

In this preparatory phase towards building the future **Pan-European Research Infrastructure for Time and Frequency Signal Dissemination**, we designed a mainframe for relations between partners participating in the future Infrastructure in the pre-implementation and implementation (building), as well as post-implementation (operational) phases.

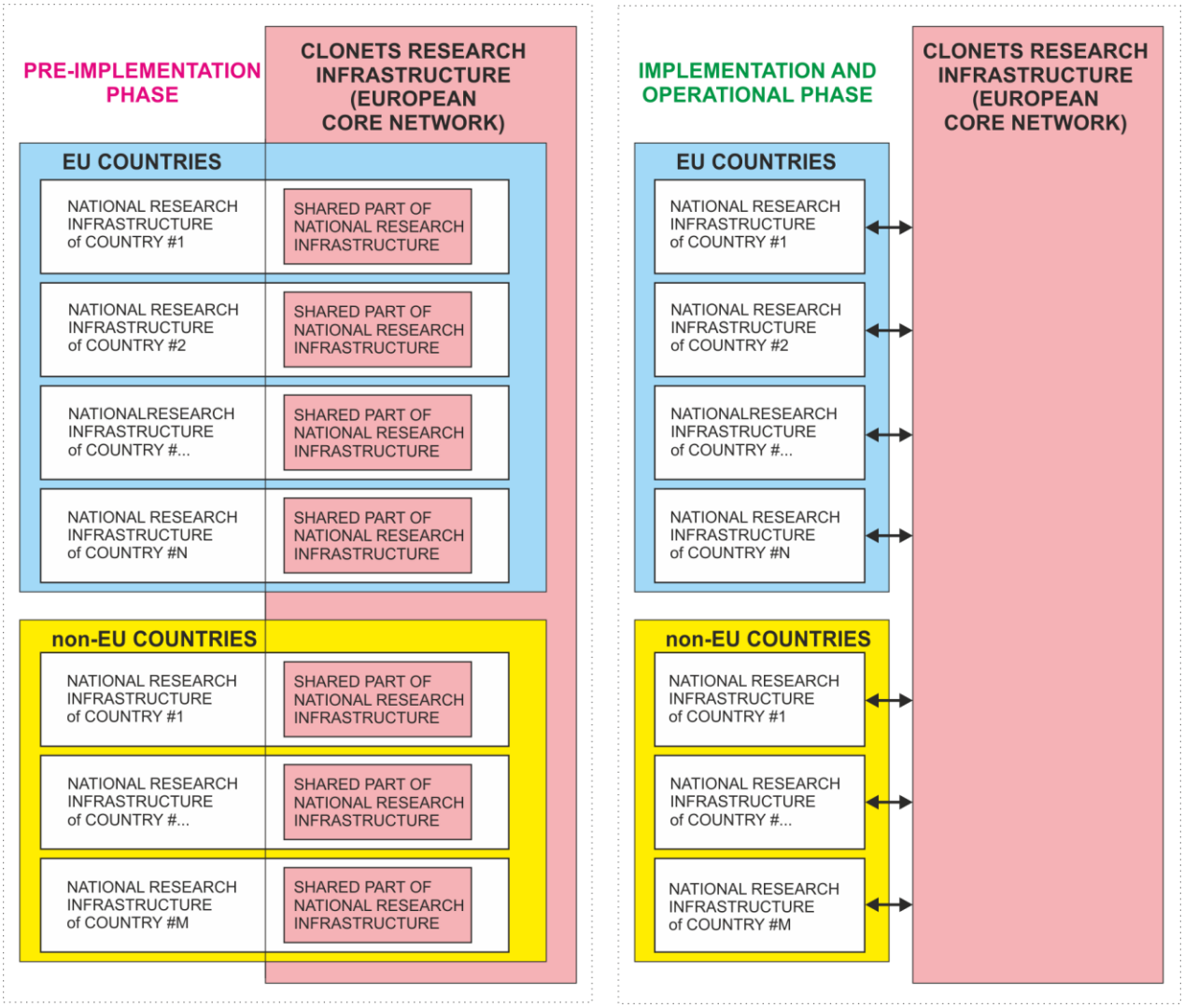

Figure 1. Organisational diagram of the Pan-European Research Infrastructure for Time and Frequency Signal Dissemination*

*Pre-implementation phase (left) and implementation & operational phase (right). The infrastructure's transnational (European) level is called the CLONETS Research Infrastructure.

Based on the input data and several discussions across the CLONETS-DS consortium during the technical work in WP3, we set up an organisational diagram of the **Pan-European Research**

Infrastructure for Time and Frequency Signal Dissemination. This is shown in Figure 1. As a distributed research infrastructure, the Pan-European Infrastructure is formed of:

1) National Research Infrastructures for Time and Frequency Signal Dissemination at the national level in each participating country; and

2) The **CLONETS Research Infrastructure (European Core Network)** for time and frequency dissemination and overall synchronisation of National Research Infrastructures for Time and Frequency Signal Dissemination over the whole continent.

Our work, therefore, focused not only on the arrangement between partners from the point of view of international relations but also on the further tasks that individual parts of the infrastructure have to fulfil.

1.2.1 Role of National Research Infrastructures for Time and Frequency Signal Dissemination

The National Research Infrastructures for Time and Frequency Signal Dissemination are a matter of national interest for the respective countries. In the overall vision of the arrangement, how these infrastructures are built is the responsibility of each participating country. However, the CLONETS-DS consortium has defined the main parameters and especially the purpose of this part of the Pan-European Infrastructure:

a) Usually, one National Research Infrastructure for Time and Frequency Signal Dissemination per member state;

b) Each member state is responsible for the legal form of this National Research Infrastructure (typically, more partners build a consortium under a national project);

c) Is funded mainly from national resources, but EU structural and regional funds for initial investments are possible, and private resources are welcomed;

d) To provide end-user services (optical carrier, radiofrequency and 1 PPS signal distribution) and contracts with end users, which are among the important tasks in terms of the overall use of the Pan-European Research Infrastructure for Time and Frequency Signal Dissemination being built in the European research area,

e) A part of the respective networks (shared part of National Research Infrastructure shown in Figure 1) can be allocated for creating the European Core Network (CLONETS Research Infrastructure), e.g. in a ring topology as mentioned in *D2.2 Roadmap for Technical Implementation of the T&F-reference System* (due total cost optimisation); this point is advantageous during the pre-implementation phase but the goal for the operational phase is to have all National Research Infrastructures interconnected within the CLONETS Research Infrastructure only without shared parts with the National Research Infrastructures.

By “member state” in this document we intend a state which takes part in the **Pan-European Research Infrastructure for Time and Frequency Signal Dissemination.** Many national specifics influence the

legal and technical arrangement of each National Research Infrastructure. In some countries, the leading partners are metrology (NMIs) or other research institutes. In other countries, leaders are national operators of academic networks (NRENs) or universities. **It is, therefore, evident that the creation and building of each National Research Infrastructure is always the responsibility of partners of the appropriate member state**.

1.2.2 Role of CLONETS Research Infrastructure (European Core Network)

The plan and design to build the **CLONETS Research Infrastructure (European Core Network)** is the main subject of interest of the CLONETS-DS consortium, which during its analyses, technical work and meetings defined the following specifics:

a) Provide cross-border connections of T/F networks operated by National Research Infrastructures – leading to the ring topology as presented in *D2.2. Roadmap for Technical Implementation of the T&F-Reference System*;

b) Gradual development in the construction of the legal form of the consortium ensuring the CLONETS Research Infrastructure (European Core Network) – one for the pre-implementation phase and the other for the implementation and post-implementation (operating) phase;

c) When communicating with EU institutions, grant agencies, and other transnational Research Infrastructures in the EU, it will act as one organisation, e.g. it will be a clear and trusted partner for Time and Frequency Signal Dissemination in Europe,

d) Funding of implementation and subsequent operation will more likely be in a co-funding scheme – EU programs and national resources, with the aim of also involving private resources;

e) Provide services for National Research Infrastructures for Time and Frequency Signal Dissemination, e.g. central monitoring and data management and coordination of such national infrastructures;

f) Can deal with part of cross-border links for time and frequency fibre link networks operated by National Research Infrastructures for Time and Frequency Signal Dissemination.

1.2.3 Summary

The Pan-European Research Infrastructure for Time and Frequency Signal Dissemination is made up of two parts: the **National Research Infrastructures for Time and Frequency Signal Dissemination** of the member states and the **CLONETS Research Infrastructure** (from a legal point of view, it is a European research infrastructure), which ensures the connection of the National Research Infrastructures.

The **CLONETS Research Infrastructure** will be responsible for building, operating, and maintaining the European Core Network (ECN), synchronising all **National Research Infrastructures for Time and Frequency Signal Dissemination in Europe**.

In the document's next section, we emphasise the plan to build up the **CLONETS Research Infrastructure**. Where it is important, we also address the principles of partnership within the part of the Pan-European Research Infrastructure comprising **National Research Infrastructures for Time and Frequency Signal Dissemination**.

1.3 Main Goals of the Document

This document covers two essential areas of technical activity outputs of the CLONETS-DS project consortium.

The first is focused on the principles of partnership between partners who will continue to prepare, further, implement, and subsequently operate the **CLONETS Research Infrastructure**. In this section of the document, we therefore focus on the following:

a) **Principles of cooperation between partners** address the setup and further evolution of the community members and define the conditions for joining/leaving the CLONETS Research Infrastructure by partners (members). The partners of the CLONETS-DS project agree upon these principles, which should be reflected in the agreements for future consortia during CLONETS Research Infrastructure building (implementation) and operation (post-implementation).

b) **Proposal of organisational structure for the implementation and post-implementation phase of the CLONETS Research Infrastructure**, which covers efficient policy and operational level decision-making processes, fair representation of involved parties, and partially efficient use of allocated resources of the CLONETS Research Infrastructure.

c) **The policy framework for the use of the services of the CLONETS Research Infrastructure** sets the rules for cooperation between the infrastructure and users (stakeholders) of the CLONETS research infrastructure services.

The second part of the document then focuses on **estimating the costs necessary to build the CLONETS Research Infrastructure** and what **operational costs will be required during the active phase** of the infrastructure.

This is then followed by an in-depth **survey of possible financial resources** that could cover the costs of building the CLONETS Research Infrastructure.

2 Principles of Cooperation between Partners

CLONETS-DS is a Research and Innovation Action (RIA) funded under the H2020 INFRADEV call. The consortium agreement for this project was drawn up based on the standard EU template for this kind of agreement. The current partners of the CLONETS-DS project are connected by long-term cooperation in international research projects, within which many unique results were achieved. The foundations of the future planned CLONETS Research Infrastructure were laid in pilot testbeds and specialised experimental apparatus.

Historically, cooperation between partners has been set up based on consortium contracts, where the main coordinator and individual partners usually provide the leading role and have firmly specified tasks. This was similar in the case of the CLONETS project supported by the H2020 INFRAINNOV call, and is the same in the CLONETS-DS project from the H2020 DESIGN STUDY call. After the current CLONETS-DS project ends, the partners will enter the CLONETS Research Infrastructure pre-implementation phase, which still needs to be covered by a specific or follow-up project.

Therefore, the work on the CLONETS-DS agenda is focused on identifying, examining, and recommending the optimal form of legal arrangement for the pre-implementation phase of the CLONETS Research Infrastructure. At the same time, practical principles of cooperation were sought for this phase where funding may not be secured based on the project, for example, from the Horizon Europe program or other sources. At the same time, it is necessary to continue preparations for the implementation phase.

One of the possible organisational arrangements involves using the existing consortium agreement, which respects the traditional consortium model for EU projects. However, this would mean updating a few paragraphs, for example relating to financing, since in the immediate post-project period it is not possible to assume that a suitable source of funding will be found and the partners will have to rely on their own or, in the best case, national resources. From this point of view, forming a new consortium is a more suitable solution. Another reason for looking for a different model is the diverse composition of the consortium, as some partners will no longer be a part of it, while conversely new entities may bring higher added value. The planned cooperation model will use one of the proposed legal frameworks mentioned in the following chapter.

Principles of cooperation between partners will set the groundwork for all governance. This will be based both on the technical specifications implemented under the agenda of WP1 and WP2 of the CLONETS-DS project and on a knowledge of the legal environment in each participating country and at the European level.

2.1 Consortium Arrangement Scenarios for the Realisation of the CLONETS Research Infrastructure

The consortium CLONETS-DS identified three possible scenarios for a form of consortium arrangement that will appropriately ensure good coordination of activities between the partners in the next phases of the CLONETS Research Infrastructure. These are:

a) **Partners** of the CLONETS-DS project involved in building the future CLONETS Research Infrastructure **establish an ASSOCIATION WITH NO LEGAL PERSONALITY based on a Memorandum of Understanding (MoU) agreement on a joint effort to build the CLONETS Research Infrastructure**. This arrangement is convenient for the pre-implementation phase and the beginning of the implementation phase of this Infrastructure and is open to all subjects from EU and non-EU countries who work in Time and Frequency Signal Dissemination research (typically more subjects from each participating country);

b) Partners of the CLONETS-DS project will build legal entities for National Research Infrastructures for Time and Frequency Signal Dissemination. These legal entities from participating countries e**stablish an ASSOCIATION WITH LEGAL PERSONALITY to build the future CLONETS Research Infrastructure**; a new transnational legal entity will be available. The organisational scheme of the entity must be well defined in accordance with European and member state laws, as well as the rights and obligations of all participating members of the new consortium. This arrangement can be convenient for the implementation phase and realisation of the post-implementation (operational) phase of the CLONETS Research Infrastructure. It will always be open to one legal body per country only, which will represent the National Research Infrastructure for Time and Frequency Signal Dissemination for that country as a participant in the CLONETS Research Infrastructure. This arrangement requires simultaneous coordination of partners of the National Research Infrastructures for Time and Frequency Signal Dissemination,

c) **The states** in which the partners of the CLONETS-DS project will build National Research Infrastructures for Time and Frequency Signal Dissemination will **establish a TRANSNATIONAL CONSORTIUM WITH LEGAL PERSONALITY based on the Council Regulation (EC) No 723/2009 on the Community legal framework for a European Research Infrastructure Consortium (ERIC)** [1] ; a new transnational legal entity will be available. The National Research Infrastructures for Time and Frequency Signal Dissemination that are built may or may not have legal personality. At the same time, when establishing this transnational consortium under the ERIC Regulation, the participating states commit political and economic support for the construction and operation of the future CLONETS Research Infrastructure.

The following sections describe the organisational structure and principles of cooperation for all mentioned scenarios of the consortium arrangement on the building of the CLONETS Research Infrastructure.

[1] Council Regulation (EC) No 723/2009 of June 25, 2009, on the Community legal framework for the European Research Infrastructure Consortium (ERIC) (OJ L 206, 8.8.2009).

2.2 Cooperation between Partners in the Pre-Implementation Phase

This arrangement (**ASSOCIATION WITH NO LEGAL PERSONALITY**) is the freest kind of association and does not obligate individual partners to specific tasks. At the same time, it supports the mutual communication of the participating CLONETS Research Infrastructure partners to inform each other about progress in building National Research Infrastructures in particular and to further focus on the search for possible financial resources (project calls) for building the CLONETS Research Infrastructure (European Core Network).

At this stage of cooperation between partners on building the CLONETS Research Infrastructure, an arrangement based on a Memorandum of Understanding is appropriate. Partners interested in future cooperation after the end of the CLONETS-DS project can proceed to sign this agreement, thus becoming active contributors to the realisation of the Infrastructure. Figure 2 shows the arrangement of cooperating partners who intend to continue the preparatory and pre-implementation work towards the construction of the CLONETS Research Infrastructure.

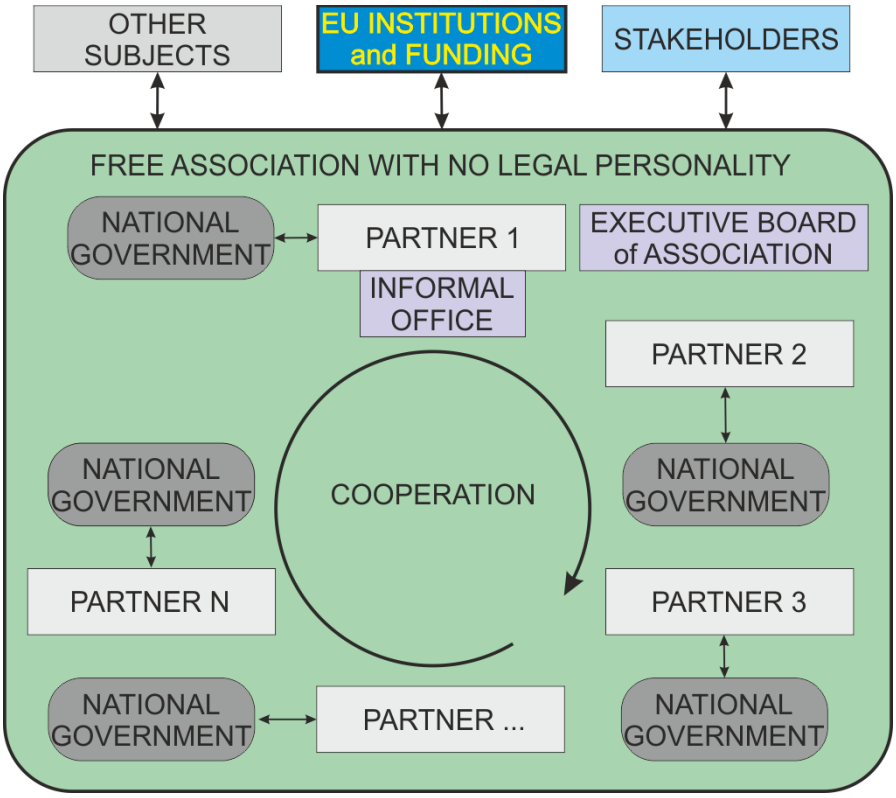

Figure 2. Arrangement of cooperation between partners for pre-implementation and beginning of implementation phase based on the **ASSOCIATION WITH NO LEGAL PERSONALITY**

2.2.1 Main Principles for Cooperation within the Framework of Free Association with No Legal Personality

This arrangement is based on the equality of rights and obligations of the participating partners. Each PARTNER or PARTNERS are in contact with national entities in their respective countries that ensure the establishment and operation of national research infrastructures. These may be, for example, ministries, organisational units of the state or directly a government office. A partner or several partners from a given country aim to create and/or operate ready-made National Research Infrastructures for Time and Frequency Signal Dissemination in a given country. To gradually build up the CLONETS Research Infrastructure, the partners of the CLONETS-DS project have agreed to draw up an MoU with the following essential partnership principles:

1) The cooperation aims to prepare and build the CLONETS Research Infrastructure, ensuring the operation of the European Core Network for mutual synchronisation of National Research Infrastructures for Time and Frequency Signal Dissemination in Europe. The name of this initiative will be “CLONETS Free Association”.

2) The participating partners of the "CLONETS Free Association" will proceed according to the CLONETS Research Infrastructure proposals described in the CLONETS-DS project's deliverables.

3) The partners participating in the "CLONETS Free Association" will create a management body, **the Executive Board of CLONETS Research Infrastructure**, abbreviated as "Executive Board". Each participating partner delegates one representative to this body. The "Executive Board" will, by its majority vote, have the authority to:

    a) Entrust a selected partner with "Informal Office" activity. The Informal Office activity will include in particular:

        i. at least once every 3 months, calling a meeting of the "CLONETS Free Association" partners, at which the partners will inform each other of progress in designing or building the National Research Infrastructures for Time and Frequency Signal Dissemination and their interconnection within the built CLONETS Research Infrastructure,

        ii. coordinating efforts of all partners of the "CLONETS Free Association" in negotiating financial support with the EU for the initial investment to create fully operating cross-border links supporting the European Core Network building and operation,

        iii. initiating and coordinating joint projects for creating cross-border links (bilateral and multilateral) by partners of "CLONETS Free Association",

        iv. preparing for the creation of a transnational legal entity for the CLONETS Research Infrastructure for the implementation and operational phase of such Infrastructure;

    b) Decide on the acceptance of a new partner as a member of the "CLONETS Free Association", should they apply for membership;

c) Decide on the departure of a partner from the "CLONETS Free Association" in the event of a request for termination of membership on their part.

2.2.2 Preparations and Timeline for the Creation of the CLONETS Free Association

At their meetings, the partners of the CLONETS-DS consortium agreed on the principles for cooperation for the pre-implementation phase. They agreed to draw up a Memorandum of Understanding for the "CLONETS Free Association".

The agreement's text was sent to all partners of the CLONETS-DS consortium and to potential partners in the field of Time and Frequency Signal Dissemination research from other countries that do not participate in the CLONETS-DS project. It was agreed that within three months of the end of the CLONETS-DS project, this agreement would be signed on creating a "CLONETS Free Association" by partners interested in continuing joint work aimed at building the CLONETS Research Infrastructure.

Subsequently, there will be a joint meeting of the participating partners and the fulfilment of the individual points of this agreement. As envisaged in the approved principles, the created "CLONETS Free Association" will proceed to the pre-implementation phase of the CLONETS Research Infrastructure.

2.3 Cooperation between Partners in the Implementation and Post-Implementation Phases

This chapter is scoped on two scenarios where the CLONETS Research Infrastructure has the form of a legal entity based on:

- An ASSOCIATION WITH LEGAL PERSONALITY, which will build the future CLONETS Research Infrastructure;
- A TRANSNATIONAL CONSORTIUM WITH LEGAL PERSONALITY based on the Council Regulation (EC) No 723/2009 on the Community legal framework for a European Research Infrastructure Consortium (ERIC)[2].

2.3.1 Association with Legal Personality Scenario

Establishing an **ASSOCIATION WITH LEGAL PERSONALITY** will represent a form of legal arrangement which expresses the cooperation of the partners participating in the implementation and operation of the CLONETS Research Infrastructure. This arrangement respects that the National Research Infrastructures for Time and Frequency Signal Dissemination will be established at the national levels of EU members (and EU non-member states) with legal entity.

[2] Council Regulation (EC) No 723/2009 of June 25, 2009, on the Community legal framework for the European Research Infrastructure Consortium (ERIC) (OJ L 206, 8.8.2009).

Figure 3 shows such an arrangement where, at the national level, partners are joined to this National Research Infrastructure for Time and Frequency Signal Dissemination. This Infrastructure then allows stakeholders access to services, such as acquiring very accurate time and frequency signals via optical fibres, transmitting user signals from one point of the optical network to another location, etc. The introduced arrangement is advantageous because it allows the implementation of different variations of the arrangement of the research infrastructure at the national level (the optical network for time and frequency signal dissemination is operated, for example, by one entity, a national association may be formed, etc.). At the same time, at the European (international) level, the future CLONETS Research Infrastructure can act as a single entity, especially when negotiating the acquisition of financial support or connections at the level of services provided with other European research infrastructures.

Partners of the CLONETS-DS consortium provided an analysis of the legal arrangements currently used by the existing European research infrastructures in the European Research Area. Research infrastructures are funded mainly from public sources and often provided by a consortium of partners due to their enormous financial, energy and labour demands. Their aim is to ensure users' access to technologies and services that would take more work to implement individually in several institutions. Therefore, research infrastructures' primary goal is not to make a profit but to provide unique, top-quality services under economically efficient conditions. These facts show that a consortium of partners is the ideal model for providing the research infrastructure. There will undoubtedly be a more significant number of partners for the distributed CLONETS Research Infrastructure, which the partners of the CLONETS-DS project are preparing.

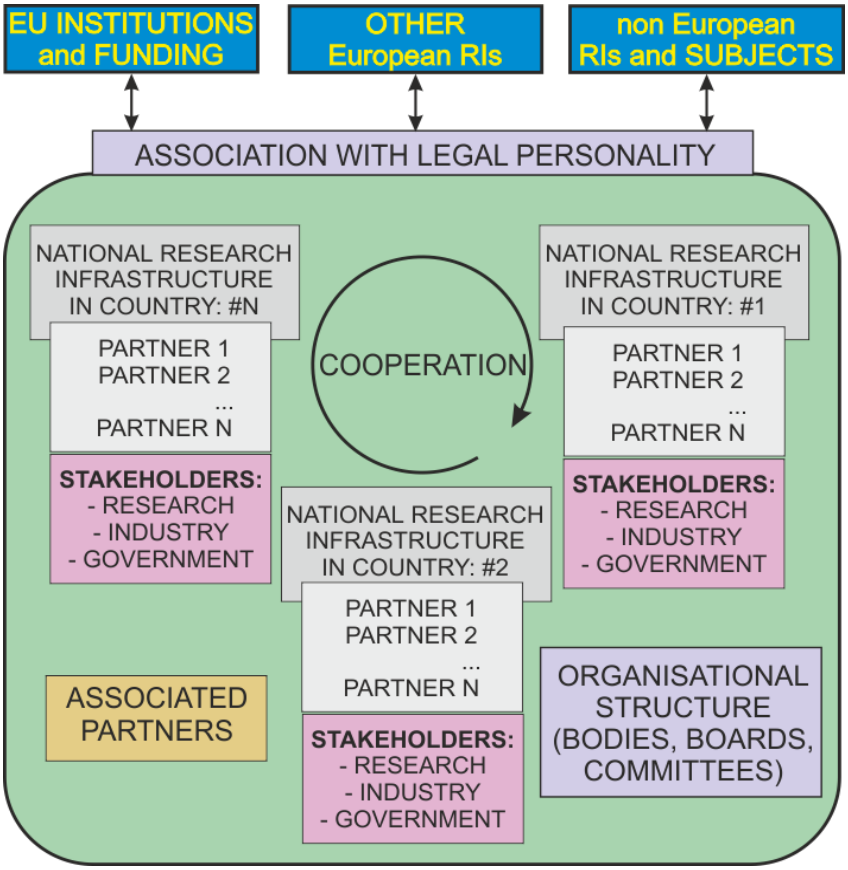

Figure 3. Arrangement of cooperation between partners for implementation and post-implementation phase based on the ASSOCIATION with LEGAL PERSONALITY SCHEME

Several transnational research infrastructures have been created in the European Research Area in the last decades. In parallel with this, the legislative process has also developed, as consortia of partners were looking for variants of legal arrangements that would ensure cooperation in the creation and subsequent operation of these transnational research infrastructures. These consortia first looked for a possible arrangement according to national legislation for so-called non-profit organisations in the form of an association.

The creation of such associations is regulated by legislation in many European countries. However, only in some cases do these associations have a legal personality. The partners of the CLONETS-DS project, therefore, surveyed the legal forms of association in selected EU countries to enable them to select the best variant of legal entity for the CLONETS Research Infrastructure association for the implementation and post-implementation phases. Regarding the member countries of the EU partners of the CLONETS-DS project, we focused on the legislative arrangement for the creation of an association with legal personality in law:

2.3.1.1 *Law in the Czech Republic*

As in most civil law countries in Europe, associations and foundations are the leading legal forms of non-profit organisations in the Czech Republic. The Czech Republic has several other legal forms of companies, including funds and registered institutes. The Civil Code contains general provisions for the establishment, creation, operation and dissolution of legal entities and processes of the merger, division or other changes in legal form[3]. According to the Civil Code, a characteristic feature of an association is its status as a non-profit, non-commercial, legal entity with a certain minimum number of members. It is supposed to serve the interests of its members and/or enable its members to promote certain activities and public interests. The Civil Code stipulates that an association must be established and consist of at least three persons. Foreign natural and legal persons are expressly permitted to establish and participate in the activities of association bodies. From the point of view of the organisational structure, the Association Statutes should establish the assembly of all association members as the highest governing body, but another structure can also be defined. Associations may engage in mutually beneficial and public benefit activities but may not be established primarily for business and other profitable activities. The prohibition of expressly commercial activity does not prohibit the association from carrying out certain for-profit activities. As long as the business or gainful activity is ancillary and its purpose is to further the lawful purpose of the association or to enable more efficient use of its assets, the association may engage in it. However, the profit generated by such auxiliary economic activity must be used exclusively to support the association's statutory activities, including its administrative costs. The Civil Code stipulates that a publicly beneficial legal entity (in this case, an association) can register its public benefit status in the public register, thereby acquiring legal personality.

2.3.1.2 *Law in France*

French law envisages two general legal forms of the non-profit association: associations and foundations, as established by the Law of 1 July 1901 on the contract of association[4] and by Law No. 87/571 of 23 July 1987 on the development of philanthropy[5]. Associations may be established by two or more (natural or legal) persons "for a purpose other than profit sharing" (Article 1 of the 1901 Act). Therefore, associations can even be established to achieve private economic interests as long as there

[3] Civil Code of the Czech Republic, Act No. 89/2012 (entered into force on January 1, 2014), link.
[4] Law on the Contract of Association in France, link.
[5] Law on the Development of Philanthropy in France, link.

is no distribution of profits. Associations can have legal personality, according to the law mentioned above. Associations acquire legal personality by publishing a notice of their establishment in the Official Gazette. The legal framework for associations is rich and complex, due to the existence of many legal statutes and specific entities, as well as the complex interaction between laws. To obtain the status of public benefit, associations must meet specific legal requirements, and adopting a model statute approved by the State Council is strongly recommended. They are subject to stricter general control but, on the other hand, they have the total legal capacity and a more favourable tax regime.

2.3.1.3 *Law in Germany*

The regulation of traditional non-profit organisations – i.e. associations and foundations – enshrined in the prestigious Civil Code of 1896 ("BGB") is not as detailed and elaborate as in other jurisdictions, nor has it been substantially changed over time[6]. The reason for this is probably the fact that, in principle, any legal type of entity (including a joint-stock company) can be used for non-profit purposes and that the neutrality of legal forms characterises the fiscal regime of "public benefit organisations", which, in our opinion, represents the most remarkable feature of German law from a comparative point of view. The legal forms traditionally used in Germany to establish a non-profit entity are associations and foundations. In fact, the law does not explicitly state that they must have a non-profit purpose, nor does it precisely define them. The use of a limited liability company ("Gesellschaft mit beschränkter Haftung" - GmbH), especially for public benefit purposes, is becoming increasingly widespread. The BGB Civil Code distinguishes between "non-commercial associations", whose object is not a commercial activity, and "commercial associations", whose object is a commercial activity. Two categories of associations acquire legal personality, each in a different way, the first by registration with the relevant court, the second by a concession of the "federal state" in which they have their headquarters. Registered "non-commercial associations" allow the additional element "eingetragener Verein" or "eV" to be added to their name, meaning "registered association". An example is the association "Mitglied der Hermann von Helmholtz-Gemeinschaft deutscher Forschungszentren e. V" (HGF).

2.3.1.4 *Law in Italy*

The two primary general legal forms of non-profit organisations in Italy are associations and foundations[7]. Their regulation is found in the articles of the Civil Code. Presidential Decree No. 361/2000 established the procedure by which they acquire legal personality[8]. Most Italian associations are associations without legal personality. The reason for this is that unrecognised associations have the same legal capacity as recognised associations and enjoy greater organisational autonomy than recognised associations, as they are directly subject to only a few provisions of the Civil Code and are primarily governed by the agreements of their members. However, the procedure for obtaining legal personality for an association is lengthy, and the requirements for its granting are strict, so most Italian associations prefer to act without legal personality. The Civil Code determines the activities of general interest that an association must carry out to obtain the status of a non-profit organisation and provides a long list of activities considered for this purpose, including scientific research of particular social interest.

[6] German Civil Code BGB, link.
[7] Code of the third sector in Italy, legislative decree no. 117/2017, link.
[8] A. Fici, A statute for European cross-border associations and non-profit organizations, ISBN 978-92-846-8081-8, link, p. 45.

2.3.1.5 *Law in Poland*

According to Polish law, a "Civil Society" ("Spółka cywilna") association can be established, used mainly for smaller businesses[9]. According to the Civil Code[10], this is an association of persons ("Kodeks cywilny"). This company does not have a legal personality, and the "partners" are liable for all their assets. Should the net income of this company exceed EUR 1,200,000 for two consecutive years, the association should be transformed into one of the forms of commercial companies and registered in the commercial register ("Rejestr przedsiębiorców").

2.3.1.6 *Law in the Netherlands*

There are two types of associations in the Netherlands: 1) associations with total legal capacity ("volledige rechtsbewegheid"), which have the same rights and obligations as a citizen, for example, they can take out loans and own and inherit registered property; and 2) associations with limited legal capacity ("beperkte rechtsbewegdeung"), where both the association and the members are patrimonially liable for obligations. Therefore, the first option is suitable for setting up the CLONETS Research Infrastructure[11]. For this variant, registration in the commercial register is mandatory if it is to have "full legal capacity". A notary usually ensures registration; in such a case, the members are not personally liable for the association's obligations. Articles of association are part of the charter. An example is the GÉANT association, the coordinator of the CLONETS-DS project, which mainly ensures international data transmission between national network service providers (NRENs). This governance structure is used within the design of the CLONETS Research Infrastructure.

2.3.1.7 *Law in Belgium*

Belgium represents a certain exceptionality in the legal anchoring of associations with legal personality. Belgium is a country in which non-profit organisations, especially associations, play an important role, and the legislation concerning them has a long tradition. There are two primary legal forms of non-profit organisations: the non-profit association (Association Sans But Lucratif - ASBL), and the international non-profit association (Association Internationale Sans But Lucratif - AISBL) regulated under the law called *Code des sociétés et des associations*[12]. Regarding international consortia, the AISBL is the most advantageous variant for creating an association with legal personality, as it is intended for an organisation that brings together various organisations operating abroad (within or even outside the EU).

An AISBL association has the following main features:

- Any natural or legal person, Belgian or foreign, can be a member of the association;
- It must have at least 2 members;
- The association has legal personality under Belgian (and thus EU) law;
- It enjoys all the general public and private rights of legal entities;

[9] Wiki info about Civil Society in Poland, link.
[10] Civil Code in Poland, link.
[11] Rules for establishing an Association in the Netherlands, link.
[12] Code des sociétés et des associations - International associations without a profit purpose (AISBL), Belgium law enacted on 23 March 2019 and came into force on 1 May of the same year, link.

- A notary public must draw up and sign the founding agreement of the AISBL, which includes the Articles of Association. The founding members must sign the contract;
- Establishment fees are higher due to the work of a notary (around €2,000). No capital is needed to set up an association;
- The Articles of Association of the AISBL must be written in Dutch, French or German, depending on the region in which the company's registered office is located.

An AISBL acquires legal personality only when it is recognised by royal decree. The requirement to obtain the King's signature means that the incorporation process takes longer than for an ASBL, where the Business Court ensures approval of a new association. The founding agreement and statutes must contain the names and addresses of the founding members, the name of the association and the region where it will have its headquarters (in Belgium), a description of the non-profit goal (a goal of general interest) and a list of the activities of the association that will be its subject (the goal must be international). Any kind of public or private philanthropic, cultural, scientific or general purpose is acceptable as long as it is legal and does not aim to enrich the members. The agreement must also include the conditions for accepting new members and for the departure of members, rules for the appointment and dismissal of members of the board of directors and other legal representatives of the association, the length of their term of office, the non-profit goal to which the association will contribute its assets in the event of its liquidation, the duration of the association if it is based on a fixed period, the exact address of the registered office of the association, and the names of its directors and any other legal representatives. The legal provisions of the AISBL also specify the association's bodies in detail. The minimal version comprises mainly the board of directors (administrative board) and the general meeting. The association can create other bodies based on the social contract. The association can develop any (legal) activity that contributes to achieving its goals. It can have all kinds of business activities, hire employees, acquire all types of assets, and be a member of other associations or a company shareholder if it is helpful towards achieving its goal[13].

An example of an Association of European Infrastructure according to AISBL is ERF-AISBL[14], a European non-profit association with the aim of promoting cooperation between research infrastructures at the European level and external researchers, PRACE-AISBL [15] , which coordinates access to high-performance computing facilities in many countries.

2.3.2 Transnational Consortium Scenario with Legal Personality based on ERIC

Establishing a TRANSNATIONAL CONSORTIUM WITH LEGAL PERSONALITY based on ERIC represents a form of legal arrangement which is an expression of states participating in the implementation and operation of the CLONETS Research Infrastructure. This arrangement respects that the National Research Infrastructures for Time and Frequency Signal Dissemination will be established at the national levels of EU members (and EU non-member states) but are not required to be legal entities.

[13] A. Fici, A statute for European cross-border associations and non-profit organizations, ISBN 978-92-846-8081-8, link, p. 13.
[14] The Association of European-Level Research Infrastructures Facilities (ERF-AISBL), link.
[15] Partnership for Advanced Computing in Europe (PRACE-AISBL), link.

2.3.2.1 *History of the European Community/European Union Legal Framework for the European Research Infrastructure Consortium (ERIC)*

The importance of research infrastructures for the development of research in the EU (formerly the European Community) was emphasised by the European Commission's Communication on the European Research Area in 2000, which called for the formulation of a common European approach to existing and intended infrastructures and conditions for entry into them[16]. This was also one of the impetuses for the establishment of the European Strategic Forum for Research Infrastructures (ESFRI) in 2002. Although established by the European Council as an informal "advisory body", this forum was tasked with helping to develop a coherent and strategic approach to developing research infrastructures in the EU and their better use. In 2006, ESFRI drew up the first European plan for new and modernised pan-European research infrastructures. In 2007, the European Commission stated that the building of world-class research infrastructures in the EU can only be done with adequate funds, the provision of which requires the mobilisation of EU, national and private resources. Furthermore, the European Commission stated, "a complication for the creation of new forms of pan-European research infrastructures is the absence of a legal structure enabling the creation of suitable partnerships". This is also confirmed by the survey of the legal environment for establishing associations with legal personality at national levels for the purposes of the European research infrastructure, summarised in Chapter 2.3.1.

In this Communication, the European Commission also submitted for public consultation the question of whether a European legal framework should be proposed, which would enable the creation and functioning of new forms of research infrastructures of pan-European interest, including electronic infrastructures. The answer was a general reaction that the initial state, in which the legal framework for creating and operating research infrastructures is fragmented between the member states' legal systems, is not considered satisfactory by the majority. The European Commission thus stated that there is a demand to define a European framework that would be flexible enough, reduce the costs of establishing and operating infrastructures and include rules on access to these infrastructures or the protection of intellectual property in the context of their use.

The subsequent legislative process, started in 2008, resulted in several variant solutions, only some of which turned out to be entirely suitable. One of these variants was, for example, the creation of a "joint venture of participating partners", in which the European Union itself would be one of the partners. The European Commission has assessed such a construction as politically inadequate, as it would not correspond to the current situation where member states still want the central role in the development and financing of research infrastructures, and at the same time the EU only has limited resources available to support the establishment and operation of research infrastructures.

The European Parliament also intervened in the legislative process to create a legal definition of the European research infrastructure. Furthermore, the scope of this legislation does not only apply to the establishment of new research infrastructures but also affects the transformation of existing research infrastructures, while the non-profit nature of the entire legal form is strengthened.

In 2009, it became possible to reach a final agreement on the amended draft regulation in the Council of the European Union, which then officially approved the draft under the modified name "Regulation on the Community legal framework for the European Research Infrastructure Consortium (ERIC)"

[16] J. Malíř, ERIC consortia and their place in the EU legal system (in Czech), The Lawyer - Scientific Review for Problems of State and Law, 160, pp. 81-104, 2021

(ERIC Legislation Regulation) in June 2009[17]. However, EU member states were favoured in this proposal, as the legislation did not allow EU-associated states or third states (e.g. Israel, Switzerland) to become association members. In 2012, however, the ERIC Legislation Regulation was amended[18], and in 2014, several ERIC consortia were already established, with, e.g. Norway or Turkey becoming members.

The total number of ERIC[19] consortia reached 25 in 2023. The following subsections summarise the main principles of legal personality under the ERIC legislation.

2.3.2.2 *Main Principles of the ERIC Legislation Regulation*

From the general nature of the ERIC Legislation Regulation, it is clear that the ERIC label can only be used by Infrastructures whose benefits exceed or can exceed the borders of one member state of the ERIC consortium or which are significant for conducting scientific research at the level of several or even all member states that are members of the ERIC consortium. ERICs are required to:

1) state a research purpose that is necessary for the implementation of European research programs and projects, including the proper implementation of EU programs for research, technological development, and demonstrations;

2) bring added value in strengthening and structuring the European Research Area;

3) bring significant improvements in their relevant scientific and technical fields at the international level;

4) be formed by at least one EU member state and two other EU member states or associated countries.

The planned future CLONETS Research Infrastructure can fulfil these requirements as mentioned above without reservations.

2.3.2.3 *Non-Economic and Economic Activity of the ERIC Consortium*

An important principle that is essential for the future operation of the CLONETS Research Infrastructure is the possibility of carrying out so-called 'other' consortium activities if ERIC-type legislation is adopted. According to ERIC, the main activity is focused on establishing and operating research infrastructure, but only on a non-economic basis. This means that access to research infrastructures of this type should be without the application of usual market relations and should occur on a non-economic basis. At the same time, the regulation of the ERIC legislation does not exclude that the consortium may also carry out other economic and non-economic activities. In the case of "economic activities of a limited scope", they can be carried out if two conditions are met:

1) such other activities are closely related to the main activity of the ERIC-type consortium;

[17] Council Regulation (EC) No 723/2009 of June 25, 2009, on the Community legal framework for the European Research Infrastructure Consortium (ERIC) (OJ L 206, 8.8.2009).
[18] Council Regulation (EU) No 1261/2013 of December 2, 2013, amending Regulation (EC) No 723/2009 on the Community legal framework for the European Research Infrastructure Consortium (ERIC) (OJ L 326, 6.12.2013, p. 1).
[19] Website of European Research Infrastructure Consortium (ERIC) overview, link.

2) their implementation does not threaten the performance of the main activity of the ERIC-type consortium.

Therefore, if the consortium simultaneously carries out non-economic and economic activities, the ERIC legislation's regulation obliges them to keep separate accounts for both activities or their costs and revenues. At the same time, it charges market prices for economic activities. Alternatively, where market prices do not exist or cannot be ascertained, prices will reflect all costs plus a reasonable profit. This construction reflects the EU legislation's approach today to assess state support for research organisations. There was no illegal support from public money during the implementation of contractual research activities. Considering the users of the future CLONETS Research Infrastructure from the field of telecommunications, the possibility to provide services of an economic nature within the framework of the European Research Infrastructure is a great advantage.

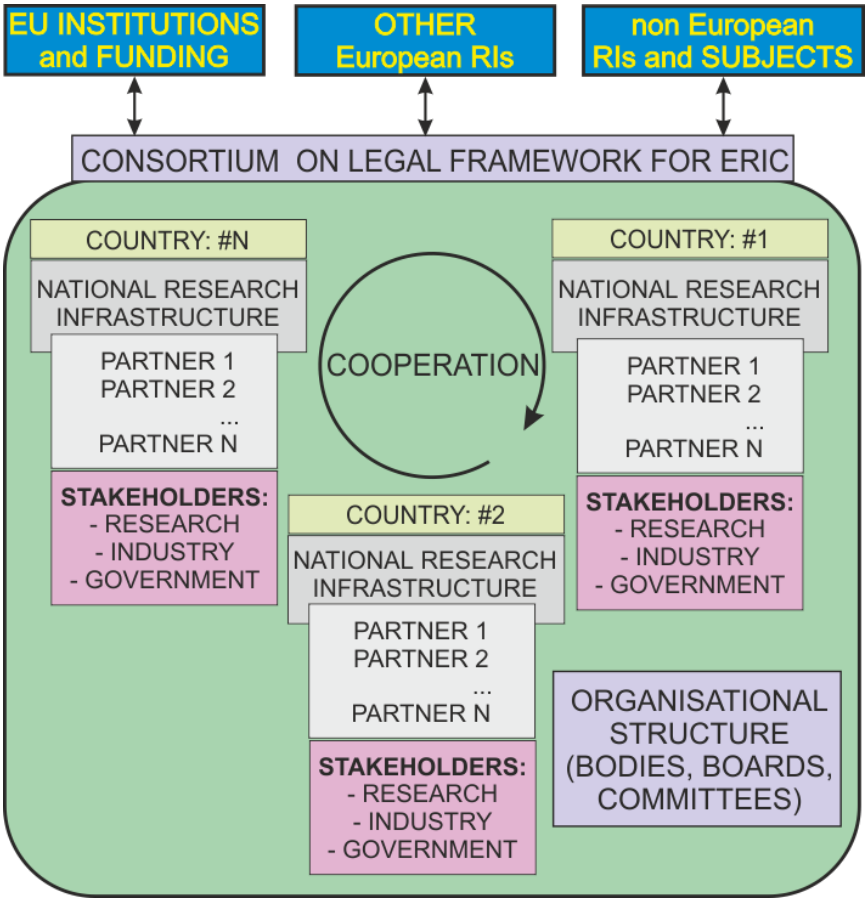

Figure 4. Arrangement of cooperation between partners for implementation and post-implementation phase based on TRANSNATIONAL CONSORTIUM WITH LEGAL PERSONALITY*.

*Based on the Council Regulation (EC) No 723/2009 on the Community legal framework for a European Research Infrastructure Consortium (ERIC).

2.3.2.4 *Establishing a Consortium under ERIC Legislation Regulations*

Although the initiative to establish an ERIC consortium is left to entities that are interested in such an arrangement (this is especially the case for research organisations in the relevant research areas – National Research Infrastructures for Time and Frequency Signal Dissemination), the members of the ERIC consortium are **legally directly the EU member and associated states, possibly third countries,**

not the research subjects from these countries – see Figure 4. The establishment of such a consortium is subject to a favourable decision of the European Commission to which applications for establishing an ERIC-type consortium are submitted. The establishment of ERIC consortia is based on the authorisation principle whereby the European Commission directly exercises public administration. Its executive acts affect not only all EU member states but also third countries that participate in establishing such consortia. Applications for the establishment of an ERIC consortium must contain the particulars prescribed by the ERIC Legislation Regulation, and include:

1) in particular, the articles of association (statute) of the consortium must be attached containing the requirements prescribed by the ERIC legislation Regulation;

2) a technical and scientific description of the intended research infrastructure, which is important to assess whether the establishment of the consortium complies with the requirements of the ERIC Legislation Regulation;

3) a declaration by the host Member State (the place where the consortium will have its seat) that it will recognise the consortium as an international organisation from its inception for the purposes of:

    - exemption from some indirect taxes (e.g. value added tax) and

    - general rules on the awarding of public contracts (stating that it can establish its own rules on the awarding of public contracts and does not have to proceed according to the legislation of the country in question).

The process of deciding on an application to establish a consortium under the ERIC legislation behind closed doors consists of two phases:

- In the first phase, based on the opinion of independent experts, the European Commission first "evaluates" whether the application "formally" meets the requirements of the ERIC Legislation Regulation, especially in the planned activity of the future consortium. It then invites the applicant to complete or amend their application before physically submitting it.

- The second decision-making phase involves the physical submission of the application, which must have all the required details and be signed by all applicants. The applications are evaluated by a special committee (the "ERIC Committee"). This committee comprises representatives of all EU member states, and representatives of states affiliated with the EU framework program for research and technological development are also admitted to it. However, unlike the representatives of member states, the latter do not participate in voting. Considering the results of the evaluation and the opinion of the ERIC Committee, the European Commission ultimately decides whether to accept or reject the application for the establishment of a consortium according to the ERIC Legislation Regulation.

The decision is subsequently communicated to the applicants. If the decision is unfavourable, the European Commission must "clearly and precisely explain" the reasons for the rejection to the applicants. If the decision is favourable, it will also be published in the L series of the Official Journal of the EU, including the essential elements of the consortium statutes. The significance of the publication of the decision in the Official Journal of the EU is symbolic. It reflects the breadth of legal consequences of a favourable decision's issuance. From this moment, the consortium, according to the regulation of the ERIC legislation, can start its executive activity.

2.3.3 Summary

If the partners of the CLONETS-DS project were to adopt the national legislation of one of the countries mentioned above, they evaluated the use of the legal form according to the Belgian Law on Associations with Legal Personality (AISBL) as a suitable procedure, as it appears to be elaborated in detail while at the same time not being burdened by extensive administration from the legal point of view in Belgium. It is also worth mentioning that some European research infrastructures have associations with legal personality established under this law.

However, the CLONETS-DS partners discussed both the above mentioned scenarios (AISBL and ERIC) for the implementation and operation period of the future CLONETS Research Infrastructure. Although the original intention was to build an association with legal personality, e.g. based on the GEANT infrastructure, and according to the Belgian AISBL law, after considering the legal, economic and political aspects, the partners are moving towards the TRANSNATIONAL CONSORTIUM WITH LEGAL PERSONALITY scenario based on ERIC as described in Section 2.3.2. Should additionally the CLONETS-DS partners decide to establish the CLONETS Research Infrastructure on the Roadmap of ESFRI (see *D4.2 Roadmap towards an ESFRI listing*), this would also involve a legal arrangement according to the ERIC legislation. However, should the future CLONETS Research Infrastructure on the Roadmap of ESFRI fail in the long term, in that case the CLONETS-DS partners may still adopt the proposed ASSOCIATION WITH LEGAL PERSONALITY scenario described in Section 2.3.1.

2.4 Timeline for Partnership Creation for the CLONETS Research Infrastructure Build

The partners of CLONETS-DS have agreed that they will first finalise the MoU agreement “CLONETS Free Association” according to Chapter 2.3.1, within the framework of which activities focused on implementing National Research Infrastructures for Time and Frequency Signal Dissemination will take place in the individual states of the participating partners. There will also be an effort by the partners to include the creation of CLONETS Research Infrastructure in the ESFRI Landscape Analysis process and the evaluation of National Research Infrastructures for Time and Frequency Signal Dissemination in terms of the challenges of national roadmaps for research infrastructures (see *D4.2 Roadmap towards an ESFRI listing*). This period will last 3 to 4 years from the end of the CLONETS-DS project.

In parallel, CLONETS-DS partners will continue to further negotiations towards the participation of their member states in the TRANSNATIONAL CONSORTIUM WITH LEGAL PERSONALITY based on the ERIC scheme, as discussed in Section 2.3.2. This will mainly involve obtaining financial and political support for the construction and subsequent operation of the future CLONETS Research Infrastructure.

The partners should specify the amount of financial support required for each member state for the construction and operation of this Infrastructure in the context of the “CLONETS Free Association” meetings according to the budgetary model presented in Chapter 5. Subsequently, the partners should negotiate with the government institutions involved in the ESFRI process and ERIC the creation of a TRANSNATIONAL CONSORTIUM WITH LEGAL PERSONALITY based on ERIC as described in Section 2.3.2, towards the establishment of a CLONETS-ERIC consortium. For these purposes, Principles for the Statutes of this legal entity are specified in Chapter 3.

3 Proposed CLONETS Research Infrastructure Governance Model

The governance model of the **CLONETS Research Infrastructure** (the transnational part of the Pan-European Research Infrastructure for Time and Frequency Signal Dissemination) defines the management of the implementation and the subsequent operation of the infrastructure. It will be responsible for efficient policy and operational decision-making processes, fair representation of involved parties, and efficient use of allocated resources. The organisational structure is based on an in-depth survey of national and EU law and reflects the known areas of responsibility of and trust between the partners involved. The CLONETS-DS project partners assessed ERIC as likely to be the most efficient legal framwork for building and operating the CLONETS Research Infrastructure. The proposed governance model was inspired by the ERIC Infrastructures LifeWatch ERIC[20], ELI ERIC[21], and JIV ERIC[22].

In the following Sections, we present the fundamental principles of the Statutes on which the provisions for cooperation and operation of the proposed CLONETS ERIC Consortium are based. These show how having the status of legal entity under EU law could potentially lead to the best organisational arrangement for the effective operation of the future CLONETS Research Infrastructure in Europe and for securing financial commitments from the governments of the Consortium member states.

3.1 Principles of Statutes of Future CLONETS Research Infrastructure ERIC Consortium

We put together a Consortium Governance model based on multi-level management. The model of the CLONETS-ERIC Consortium is shown in Figure 5. The basis of the model is the General Assembly comprising representatives of the partners participating in the Consortium. This body appoints the Director General, the executive director of the Consortium.

The Consortium appoints several advisory bodies that help both the General Assembly and the Director General to successfully manage the individual parts of the CLONETS Research Infrastructure

[20] COMMISSION IMPLEMENTING DECISION (EU) 2017/499 of 17 March 2017 on setting up **the e-Science and Technology European Infrastructure for Biodiversity and Ecosystem Research — European Research Infrastructure Consortium (LifeWatch ERIC)** (notified under document C(2017) 1648)
[21] COMMISSION IMPLEMENTING DECISION (EU) 2021/960 of 30 April 2021 on setting up **the Extreme Light Infrastructure – Extreme Light Infrastructure European Research Infrastructure Consortium (ELI ERIC)** (notified under document C(2021) 2923)
[22] COMMISSION IMPLEMENTING DECISION of 12 December 2014 on setting up **the Joint Institute for Very Long Baseline Interferometry as a European Research Infrastructure Consortium (JIV-ERIC)** (notified under document 2014/923/EU)

and optimally communicate, collaborate and offer services to the community of users and scientific partners. The Director General appoints the director of the Europen Core Network Facility, the Director of the Repository Facility and the Director of the Administrative Department.

The mutual relationship between these three departments of the CLONETS Research Infrastructure is based on the support of the technical departments of the Europen Core Network Facility and the Repository Facility by the Administrative Department. It is an effective structure of management and cooperation in which there is no unnecessary duplication of administration, but both technical departments share the services of the Administrative Department. In the model presented, we assume that all three departments will be located at the headquarters of the Consortium. A specific exception is the European Core Network Facility, which while having its central management and daily operations monitoring based at the Consortium headquarters, includes technical infrastructure that is physically distributed across the territories of all Consortium member states. This means, for example, that the technical staff of the European Core Network Facility tasked with maintenance and operation will be located across all participating states of the Consortium.

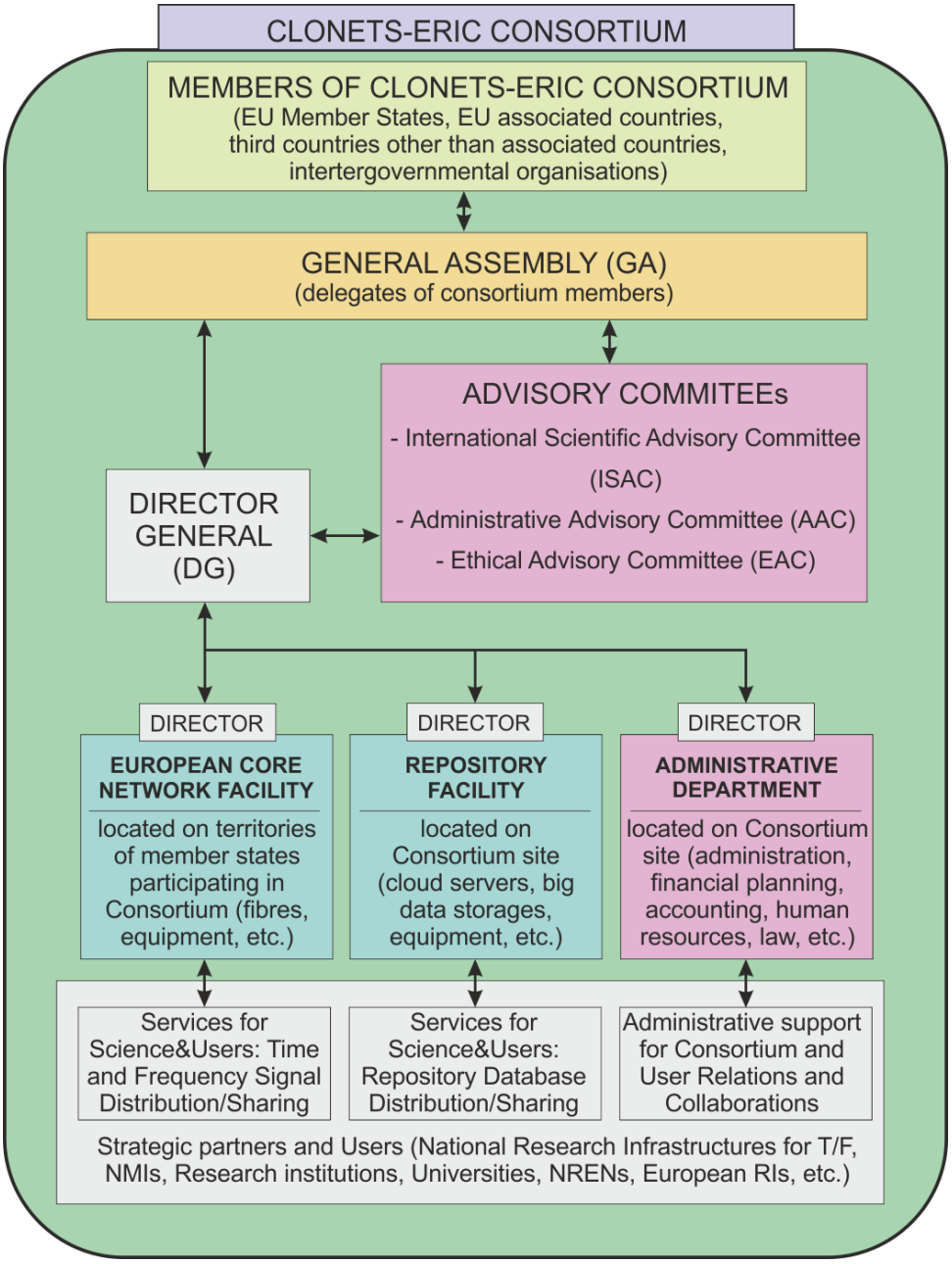

Figure 5. Schematic arrangement of the organisational model of CLONETS-ERIC Consortium*

*T/F is the Time and Frequency Dissemination, and RIs are Research Infrastructures.

Concerning European Research Infrastructure legislation, the presented Governance model also considers the required policies in accordance with ERIC in the various areas of the expected impacts of the future CLONETS Research Infrastructure. The principles governing the joining and withdrawal of Consortium members, their rights and obligations, and the obligations resulting from membership in the Consortium have also been drawn up. A separate section is devoted to the financial issues and duties of Consortium members. As this is a legally oriented text, the paragraphs in the individual Sections are numbered for the purposes of referencing between the areas of regulation. The partners of the CLONETS-DS project propose the following principles for the future CLONETS ERIC Consortium:

3.1.1 Proposed Name and Composition of the CLONETS ERIC Consortium

1) A European research infrastructure with a single headquarters and operating facilities distributed in the territory of several member countries of the CLONETS ERIC Consortium is established as an ERIC European research infrastructure consortium according to Council Regulation (EC) No. 723/200923 under the name "CLOck NETwork Services (CLONETS) Research Infrastructure - European Research Infrastructure Consortium", commonly called "CLONETS ERIC".

2) The countries of Poland, Germany, France, Italy, Austria, and the Czech Republic (these are considered the most likely participating EU member states) will ask the European Commission to set up the "CLOck NETwork Services (CLONETS) Research Infrastructure - European Research Infrastructure Consortium". Spain and the Netherlands (these are considered the most likely observer EU member states) will announce their decisions to participate in the CLONETS ERIC Consortium first as observers. They have agreed that the host Member State of CLONETS ERIC would be France (considered the likely host state).

3.1.2 Definitions of Names and Terms

For CLONETS ERIC and its draft Statutes, the following definitions apply:

1) USER ACCESS means the legitimate and authorised physical or remote use of scientific facilities and services provided by CLONETS ERIC by individuals, teams and institutions from academia, industry and public services under CLONETS ERIC's User Access Policy (Section 3.5.1).

2) ACCESSION means joining the CLONETS ERIC Consortium as a member after the implementing decision of the European Commission on establishing the CLONETS ERIC Consortium enters into force.

3) CLONETS FACILITIES means the facilities operated by the CLONETS ERIC Consortium and whose technical and scientific description is given in *D2.2 Roadmap for technical implementation of the T&F-reference system.* These devices are:

- European Core Network facility for Time and Frequency Signal Dissemination over fibre links that have a distributed nature and are located on the territory of all member states of the CLONETS ERIC Consortium and are managed by and from the headquarters of the CLONETS ERIC Consortium;

- Repository facility for storing, sharing and computing data generated by Europeans Core Network facility for Time and Frequency Signal Dissemination over fibre links, located at the CLONETS ERIC Consortium headquarters.

4) The ADMINISTRATIVE DEPARTMENT, located at the headquarters of the CLONETS ERIC Consortium, ensures the administrative operation of the CLONETS FACILITIES.

5) FINANCIAL RULES shall mean the internal regulations adopted by the General Assembly, which relate to the budget of the CLONETS ERIC Consortium, accounting standards, monetary and in-kind

[23]Council Regulation (EC) No 723/2009 of June 25 2009, on the Community legal framework for the European Research Infrastructure Consortium (ERIC) (OJ L 206, 8.8.2009, p. 1).

contributions and resources, and rules regarding the compilation, presentation, audit and publication of financial statements.

6) FOUNDING OBSERVER means a country with observer status that participates in the CLONETS ERIC Consortium at the establishment of this Consortium and that has the rights outlined in Section 3.4.3, paragraph 3.

7) IMPLEMENTING RULES shall mean the internal regulations detailing the conditions for implementing the policies of the CLONETS ERIC Consortium approved by the General Assembly.

8) HOST MEMBER STATE means the member state where the CLONETS FACILITIES are located and that has the rights and obligations outlined in Section 3.4.6.

9) MEMBER means a country or an intergovernmental organisation which, after the General Assembly approves its application for ACCESSION, has the rights and obligations outlined in Section 3.4.6.

10) OBSERVER means a country or intergovernmental organisation with the rights and obligations outlined in Section 3.4.7.

11) RULES OF PROCEDURE shall mean regulations that describe in detail the functioning and organisation of the statutory and advisory bodies of the CLONETS ERIC Consortium.

12) STRATEGIC PARTNER means a third party, such as national agencies and/or institutions (National Infrastructures for T/F Dissemination, which will contribute to the mission of CLONETS ERIC and support the involvement of its user communities and the operation of the CLONETS FACILITIES in the long term through a partnership agreement under the principles set out in Section 3.4.5.

13) USER means the individuals, teams and institutions from academia, industry and public services who will access the CLONETS FACILITIES under the CLONETS ERIC User Access Policy (see Section 3.5.1).

3.1.3 Scientific Goals and Activities of the CLONETS ERIC Consortium

1) The CLONETS ERIC Consortium develops, builds, and operates the research infrastructure European Core Network for CLOck Network Services described in document *D2.2 Roadmap for technical implementation of the T&F-reference system* (hereinafter referred to as the "CLONETS FACILITIES") as a single integrated organisation with a single governance structure and a single leadership. The General Assembly of CLONETS ERIC may recognise and include additional CLONETS FACILITIES according to the principles outlined in Section 3.2.2, paragraph 9) letter (d).

2) The CLONETS ERIC Consortium manages user access to CLONETS FACILITIES through an international peer review system. In order to achieve its objectives, the CLONETS ERIC Consortium performs the following activities in particular: (a) exploits, in cooperation with STRATEGIC PARTNERS defined in Section 3.4.5 paragraph 1), the full scientific potential of the CLONETS FACILITIES by working closely with user communities, developing and making available a set of complementary resources and tools, providing efficient services and ensuring optimal conditions for users, and performing information activities for new potential users; (b) maintains excellence and enhances the value, quality and effectiveness of members' research communities through an international peer-reviewed approach; (c) provides members with a unique platform for the development of know-how through the coordination of research and development of relevant technologies, the coordination of joint training of scientific and technical personnel and the promotion of cooperation between leading

research centers and industry; (d) develops and implements policy and strategy for innovation, including intellectual property, technological exploitation and industrial development support; (e) ensures effective internal and external communication, supports the activities of the CLONETS ERIC Consortium and disseminates scientific and technical results; (f) performs any other activities in support of the objectives of the CLONETS ERIC Consortium.

3) The CLONETS ERIC Consortium is operated on a non-profit basis. It may carry out economic activities of a limited scope where these activities are closely related to its main tasks and do not threaten their fulfilment. Details of such activities must be given in the FINANCIAL RULES.

3.1.4 Consortium Headquarters

The site of the CLONETS ERIC Consortium is located in *Paris, France (this is an example of a hosting site).*

3.1.5 Duration and Termination of Activity

1) The CLONETS ERIC Consortium is established for an initial period of twenty years, which may be extended by decision of the General Assembly in accordance with the principles in Section 3.2.2, paragraph 9) letter (f).

2) Termination of the activity of the CLONETS ERIC Consortium requires a decision of the General Assembly in accordance with the principles in Section 3.2.2, paragraph 10) letter (k) and shall be notified to the European Commission in accordance with Article 16 of Council Regulation (EC) No. 723/2009. The decision must contain at least the following information: (a) the number of liquidators, as well as the rules of operation of the commission of liquidators, if there are more liquidators; (b) the appointment of liquidators and the designation of liquidators who will legally represent CLONETS ERIC during the winding-up; (c) criteria for termination of activity, including the possible transfer of activities to another legal entity, as well as the powers of liquidators.

3) The CLONETS ERIC Consortium shall notify the Commission immediately after the termination of the activity and, in any case, within ten days of such termination.

4) In the event of cancellation, the CLONETS ERIC Consortium remains bound by all unfulfilled obligations and liabilities towards third parties. The decommissioning and/or reuse of each of the CLONETS FACILITIES is the responsibility of the relevant HOST MEMBER STATE.

3.1.6 Legal Anchoring and Organisation of Consortium Activities

The internal functioning of the CLONETS ERIC Consortium is governed by the following:

1) Community law, in particular, Council Regulation (EC) as amended by Council Regulation (EC) No. 1261/2013[24] and decisions in accordance with Article 6 paragraph 1 letter a) and Article 11 paragraph 1 of said regulation;

[24]Council Regulation (EU) No 1261/2013 of December 2 2013, amending Regulation (EC) No 723/2009 on the Community legal framework for the European Research Infrastructure Consortium (ERIC) (OJ L 326, 6.12.2013, p. 1).

2) In matters that are not regulated or are regulated only in part in the acts referred to in letter a) of said article, by the law of the state in which the CLONETS ERIC Consortium has its seat;

3) In matters not covered by letters a) and b) of said article, by the law of the country in which the CLONETS ERIC Consortium operates the CLONETS FACILITIES;

4) By the Statutes of the CLONET ERIC Consortium approved based on these Principles of the Statutes, by their IMPLEMENTING RULES and RULES OF PROCEDURE.

5) The working language of the CLONETS ERIC Consortium is English.

3.2 Governance and Consortium Bodies

The statutory bodies of the CLONETS ERIC Consortium are the General Assembly and the Director General. They manage CLONETS ERIC as a single integrated organization, including the scientific and user program of CLONETS ERIC and the operation of CLONETS FACILITIES according to the established objectives of CLONETS ERIC activities, see Section 3.1.3, paragraph 1).

3.2.1 General Assembly

1) The General Assembly is the governing body of CLONETS ERIC with the final authority to determine the legal policies of CLONETS ERIC and all other matters necessary to fulfil the mission of CLONETS ERIC. The General Assembly may issue instructions to the Director General.

2) The General Assembly shall draw up its own RULES OF PROCEDURE in accordance with the Statutes. The General Assembly takes all decisions on an objectively reasonable basis.

3) Each MEMBER may appoint up to two delegates to be represented at the General Assembly. Each MEMBER shall inform the President of the General Assembly in writing without undue delay of each appointment or termination of the appointment of its delegates. Should one or both of the MEMBER's delegates not be able to attend the meeting and need to be represented by another authorised person, the MEMBER in question shall send a written notification to the Chair of the General Assembly in accordance with the RULES OF PROCEDURE of the General Assembly before the meeting. The Director General and other employees of the CLONETS ERIC Consortium and the CLONETS FACILITIES cannot act as delegates to the General Assembly at the same time.

4) Delegates may be accompanied by a limited number of expert advisors in accordance with the RULES OF PROCEDURE of the General Assembly.

5) Up to two non-voting delegates may participate in the General Assembly for each OBSERVER.

6) Up to two delegates without voting rights can participate in the General Assembly for each STRATEGIC PARTNER if this STRATEGIC PARTNER is invited to the General Assembly meeting according to Section 3.4.5, paragraph 2).

7) The General Assembly elects the Chair and Vice-Chair from among the MEMBERS' delegates for a three-year term of office. The elected Chair and Vice-Chair are impartial and cease to act as

representatives of the members. Re-election is allowed only once for a second term not exceeding two years.

8) The Director General, the Chair of the ISAC Committee and the Chair of the Administrative Advisory Committee attend all meetings of the General Assembly unless the Chair of the General Assembly decides otherwise.

9) Decisions of the General Assembly are taken in accordance with the text of Section 3.2.2. The President of the General Assembly may determine and stipulate that the decision is to be made by written procedure between meetings of the General Assembly. Details are set out in the RULES OF PROCEDURE of the General Assembly.

10) The General Assembly meets at least twice a year. The session of the General Assembly is convened by its Chair. The substitute chair represents the Chair in their absence and in the event of a conflict of interest.

11) Participation in the meetings of the General Assembly and the exercise of membership rights may also be carried out through electronic media. The RULES OF PROCEDURE of the General Assembly govern the details.

12) The costs of the participation of MEMBERS' delegates and their experts in the General Assembly shall be borne by MEMBERS. The costs of the participation of OBSERVERS' delegates at the General Assembly shall be paid by OBSERVERS. The proposed OBSERVER or STRATEGIC PARTNER shall bear the cost of participation for other invited participants proposed by OBSERVERS or STRATEGIC PARTNERS. The costs of other persons in an advisory capacity invited by the Chair (e.g. Chairs of the ISAC Committee and the Administrative Advisory Committee or auditors) shall be borne by the CLONETS ERIC Consortium unless otherwise agreed.

3.2.2 Voting Procedure of General Assembly

1) Each MEMBER has one indivisible vote. A MEMBER will be appropriately represented if at least one delegate is present in person or via electronic media. Non-performing members do not have voting rights.

2) MEMBERS' votes are weighted according to the proportion of their respective dues to the total annual dues of MEMBERS.

3) "Simple majority" means a majority of more than 50% of the votes of the MEMBERS represented at the meeting, with no more than half of the MEMBERS voting against.

4) "Qualified majority" means a majority of at least 67% of the votes of the MEMBERS represented at the meeting, with no more than half of the MEMBERS voting against.

5) "Unanimous vote" means a situation where no MEMBER votes against and the total number of votes cast represents at least 90% of the MEMBERS' votes.

6) Abstentions are not considered a cast vote but are recorded in the minutes.

7) The General Assembly has a quorum, and decisions are valid if the following conditions are met: (a) two-thirds of the MEMBERS are represented; (b) the member states of the European Union and the associated countries jointly hold the majority of the votes.

8) The delegates of the General Assembly shall make every effort to achieve consensus in their decisions.

9) Approval by unanimous vote of the General Assembly requires the following matters: (a) admission of MEMBERS or OBSERVERS and termination of MEMBERSHIP or OBSERVER status and agreement between the CLONETS ERIC Consortium and the acceding MEMBER or OBSERVER according to the text of Section 3.4.2 and Section 3.4.3; (b) a proposal to amend these articles of association; (c) in exceptional cases closing loans; (d) if the MEMBER adds a device that completes the CLONETS FACILITIES file; (e) annual contributions of MEMBERS; (f) the decision to extend the duration of the CLONETS ERIC Consortium.

10) Qualified majority approval of the General Assembly shall be required for the following matters: (a) strategic partnership agreements in accordance with Section 3.4.5; (b) the organisational and operational structure of CLONETS ERIC; (c) RULES OF PROCEDURE for the General Assembly in accordance with Section 3.2.1, paragraph 2); (d) CLONETS ERIC FINANCIAL RULES; (e) legal policies of CLONETS ERIC; (f) election of the Chair and Vice-Chair of the General Assembly; (g) establishing advisory committees or entities other than the International Scientific Advisory Committee (ISAC), the Administrative Advisory Committee (AAC) and the Ethics Advisory Committee (EAC); (h) the appointment of the Chair and members of the ISAC in accordance with Section 3.3.1, paragraph 2), the the AAC in accordance with Section 3.3.2, paragraph 1) and the EAC in accordance with Section 3.3.3, paragraph 1); (i) the appointment or termination of the appointment of the Chief Executive Officer and the assignment of special powers; (j) during the period of stable operation, confirmation of the appointment or termination of the appointment of the directors of the CLONETS FACILITY and the director of the ADMINISTRATIVE DEPARTMENT; (k) termination of CLONETS ERIC and liquidation of assets; (l) the annual program of activities and the five-year scientific and technical program of the CLONETS ERIC Consortium; (m) the CLONETS ERIC cost book applied to cost estimates including the value of in-kind contributions; (n) the annual budget and five-year budget plan of CLONETS ERIC; (o) adoption of specific projects and related budgets; (p) approving the upgrade of the CLONETS FACILITIES; (q) adoption of the annual financial statements of the CLONETS ERIC Consortium; (r) adoption of the annual report on the activities of CLONETS ERIC; (s) policy for allocating time to use and access the CLONETS FACILITIES; (t) approving the RULES OF PROCEDURE of the ISAC, the AAC and EAC.

11) Unless these Statutes provide otherwise, a simple majority of votes adopt all other decisions of the General Assembly.

3.2.3 Director General

1) The Director General is the statutory representative of the CLONETS ERIC Consortium. The Director General is responsible for the day-to-day management of CLONETS ERIC with due diligence and in accordance with these Statutes, the instructions and resolutions of the General Assembly and applicable legal requirements.

2) The Director General submits the organisational structure to the General Assembly for approval. This structure identifies directors and senior executives within the organisation. The Director General

appoints the directors of the respective CLONETS FACILITIES and the ADMINISTRATIVE DEPARTMENT to maintain coherence and cooperation between these departments.

3) The Director General prepares and presents strategic, technical, scientific, legal, budgetary and administrative decisions to the General Assembly.

4) The Director General submits an annual activity report to the General Assembly and submits a revised financial statement of the organisation once a year.

5) The General Assembly appoints the Director General for a period of up to five years; this appointment may be extended once for a period of up to five years.

6) If the position of Director General becomes vacant, the General Assembly may designate an acting Director General per Section 3.2.2, paragraph 10). The appointment decision sets out the powers and responsibilities of the acting Director General.

3.3 Overview of Consortium Advisory Bodies

The CLONETS ERIC Consortium appoints several advisory bodies to ensure the optimum security of the areas and the fulfilment of the provisions under Council Regulation (EC) No. 723/2009:

3.3.1 International Scientific Advisory Committee

1) The International Scientific Advisory Committee (ISAC) shall provide independent advice to the Director General and the General Assembly on all strategic issues as well as scientific and technical activities, specific projects and upgrades carried out by the CLONETS ERIC Consortium.

2) The General Assembly appoints, in accordance with Section 3.2.2, paragraph 10) letter (h), ISAC members who are outstanding personalities in the fields related to CLONETS. The number of members, the mandate and the RULES OF PROCEDURE of the ISAC are determined by the General Assembly.

3) The ISAC elects a Chair from among its members, who the General Assembly approves.

4) The CLONETS ERIC Consortium shall bear the costs of the functioning of the ISAC.

3.3.2 Administrative Advisory Committee

1) The General Assembly establishes the Administrative Advisory Committee (AAC), which consists of up to two delegates appointed by each MEMBER. The General Assembly appoints the Chair of the Administrative Advisory Committee, and is impartial. The Administrative Advisory Committee advises the General Assembly on all administrative, legal, procurement, and financial management matters. Up to two delegates of each OBSERVER may be invited to exercise the advisory function of the Administrative Advisory Committee.

2) The functioning of the Administrative Advisory Committee is described in detail in the RULES OF PROCEEDINGS of the Administrative Advisory Committee, which the General Assembly establishes.

3) The CLONETS ERIC Consortium shall bear the costs of the operation of the Administrative Advisory Committee, while the MEMBERS and OBSERVERS shall pay the costs of the participation of the Administrative Advisory Committee delegates.

3.3.3 Ethics Advisory Committee

1) The General Assembly shall establish an Ethical Advisory Committee (EAC) to advise the General Assembly and the Director General on all ethical matters relating to the activities of CLONETS ERIC, including user experiments to be conducted at CLONETS FACILITIES, scientific evaluation, research integrity and employment issues.

2) The General Assembly appoints, in accordance with Section 3.2.2, paragraph 10) letter (h), members of the Ethics Advisory Committee, who must be well informed about matters concerning the CLONETS ERIC Consortium. The number of members, the mandate and the RULES OF PROCEDURE of the ethical advisory committee are determined by the General Assembly.

3.4 Principles of Consortium Membership

3.4.1 Consortium Membership, Members and Entities Representing Members

1) The following entities can become MEMBERS or OBSERVERS: (a) member states of the European Union (EU); (b) associated countries; (c) a third country other than an associated country; (d) intergovernmental organisations.

2) Each MEMBER may appoint one or more "representative entities" whose task is to carry out activities on its behalf directly related to the scope and activities of the CLONETS ERIC Consortium. When appointed, each MEMBER shall specify the exercise of specific rights and fulfil the MEMBER obligations, which are transferred to the representing entity. The representative entity can be a public entity, including regions, or a private entity entrusted with performing a public service.

3) Each MEMBER informs the Chair of the General Assembly of all changes to its representative body, special rights and obligations transferred to it, the termination of appointment, or any other significant changes.

4) The list of MEMBERS and OBSERVERS of the CLONETS ERIC Consortium and their representative entities will be kept as a Document called "LIST OF MEMBERS and OBSERVERS”. The Chair of the General Assembly will regularly update the Document.

3.4.2 New Member Access Policy

1) The General Assembly assesses applications for JOINING new MEMBERS in accordance with Section 3.4.1, paragraph 1). The decision of the General Assembly should take into account the ability of the new MEMBER to commit to the scope and activities of the CLONETS ERIC Consortium and contribute to its sustainability.

2) The General Assembly shall adopt a policy for the admission of new MEMBERS, including the application process, the expected criteria governing contributions and the general conditions of JOINING.

3) The Director general is responsible for negotiating terms with new MEMBERS and submitting the membership proposal to the General Assembly for approval.

3.4.3 New Observer Access Policy

1) The CLONETS ERIC Consortium is open to considering and accepting OBSERVERS. OBSERVERS may be countries or intergovernmental organisations that intend to apply for full membership, but whose situation does not allow them to join immediately as MEMBERS for specific reasons. Applicants submit a written application to the President of the General Assembly. OBSERVERS are generally accepted for a period of three years; The General Assembly may extend the period of observer status in exceptional cases.

2) The General Assembly sets a fee for OBSERVERS, with the exception of FOUNDING OBSERVERS, depending on the conditions listed in Annex II.

3) FOUNDING OBSERVERS are countries with observer status that participate in the establishment of the CLONETS ERIC Consortium but are not required to pay the observer fee for three full fiscal years following the establishment date. FOUNDING OBSERVERS will have the same rights as OBSERVERS. At least six months before the end of the third full fiscal year from the establishment of the CLONETS ERIC Consortium, the FOUNDING OBSERVER shall notify the General Assembly whether it wishes to join CLONETS ERIC as a MEMBER, in which case the FOUNDING OBSERVER and the General Assembly shall agree on the respective MEMBER contributions and the timetable for accession. Should the FOUNDING OBSERVER not join as a MEMBER, it shall cease to participate in the CLONETS ERIC Consortium at the end of its term of office, unless otherwise agreed with the general meeting in accordance with Section 3.2.2, paragraph 9) letter (a).

4) Each OBSERVER may appoint up to two representatives who will participate in the General Assembly and up to two members who will participate in the meetings of the Administrative Advisory Committee in accordance with Section 3.2.1, paragraph 5) and Section 3.3.2, paragraph 1). OBSERVERS do not have voting rights.

3.4.4 Withdrawal of Member or Observer and Termination of Membership and Observer Status

1) MEMBERS may withdraw from CLONETS ERIC after the first five years of membership by sending an official notice of withdrawal to the Director General at least 24 months in advance. Withdrawal takes effect at the end of the second full financial year following the year in which the notification is given.

2) FOUNDING OBSERVERS and OBSERVERS may resign at the end of the budget year subject to a request being submitted 6 months before such resignation.

3) The withdrawing MEMBER remains bound by any duties and obligations towards CLONETS ERIC and third parties that are unfulfilled at the time when the withdrawal takes effect, subject to the limitation outlined in Section 3.6.1, paragraph 2). These obligations may include compensation for damages to

the burden of the CLONETS ERIC Consortium due to decisions or actions that occurred before the withdrawal.

4) Subject to the conditions set out in Section 3.4.4, paragraphs 1) and 2) MEMBERS, FOUNDING OBSERVERS and OBSERVERS who are associated countries, third countries other than associated countries or intergovernmental organisations may withdraw from the CLONETS ERIC Consortium following the implementation of amendments to the Council Regulation (EC) No. 723/2009, which would significantly affect their rights and obligations concerning the CLONETS ERIC Consortium. In this case, and where the above applies, the obligation to pay all contributions also ends. An independent arbitrator will evaluate other commitments agreed to by the withdrawing party and the CLONETS ERIC Consortium in accordance with Section 3.6.1, paragraph 2) and Section 3.4.4, paragraph 2).

5) If a MEMBER or OBSERVER does not fulfil its obligations under Council Regulation (EC) No. 723/2009 or these Statutes, the General Assembly may terminate its membership or OBSERVER status. The MEMBER or OBSERVER may remedy such a breach of their obligations within six months of receiving written notice of the breach. In the event of termination by decision in accordance with Section 3.2.2, paragraph 9) letter (a), the MEMBER or OBSERVER who has not fulfilled its obligations shall cease to be a MEMBER or OBSERVER. When deciding on the matter of non-fulfilment of obligations, the MEMBER in default does not have the right to vote. Concerning termination of membership or observer status, the principles according to Section 3.4.4, paragraph 2) apply.

3.4.5 Partnership with Strategic Partners

1) The Director General may, based on specific agreements with third parties, such as national agencies and/or institutions, propose strategic partnerships that will contribute to the mission of the CLONETS ERIC Consortium and support the involvement of its user communities and the operation of the CLONETS FACILITIES in a long-term perspective. These are the National Research Infrastructures for Time and Frequency Dissemination, National Metrology Institutes (NMIs), research institutions and universities operating optical quantum clocks, national operators of academic research networks (NRENs), GÉANT e-infrastructure, etc.

2) Strategic partnership agreements are subject to approval by the General Assembly in accordance with Section 3.2.2, paragraph 10) letter (a). The General Assembly may invite STRATEGIC PARTNERS to participate in the meetings of the General Assembly, during which points related to the given STRATEGIC PARTNER will be discussed.

3.4.6 Rights and Obligations of Members

1) The rights of MEMBERS include (a) the right to appoint a representative body in accordance with Section 3.4.1, paragraph 2); (b) the right to appoint representatives to the General Assembly and the Administrative Advisory Committee in accordance with Section 3.2.1, paragraph 3) and with Section 3.3.2, paragraph 1); (c) the right to vote at the General Meeting in accordance with Section 3.2.2.

2) Each HOST MEMBER and MEMBER: (a) is committed to supporting the CLONETS ERIC Consortium as a single integrated organisation in accordance with *D2.2 Roadmap for technical implementation of the T&F-reference system* ; (b) contributes to the operating costs of CLONETS ERIC in accordance with the FINANCIAL RULES; (c) informs the Chair of the General Assembly of any changes to its representative entity in accordance with Section 3.4.1, paragraph 3).

3.4.7 Rights and Obligations of Observers and Founding Observers

1) OBSERVERS have the right to appoint representatives to the General Assembly and the Administrative Advisory Committee per Section 3.4.3, paragraph 4). OBSERVERS do not have voting rights. FOUNDING OBSERVERS have the same rights as OBSERVERS.

2) Each FOUNDING OBSERVER and OBSERVER may appoint a representative entity in accordance with Section 3.4.1.

3) OBSERVERS are required to pay the annual observer fee in accordance with Section 3.4.3, paragraph 2). This obligation does not apply to FOUNDING OBSERVERS.

3.5 Overview of Main Consortium Policy Principles

The CLONETS ERIC Consortium, for the fulfilment of Council Regulation (EC) No. 723/2009, adopts the following Policies:

3.5.1 User Access Policy

1) The CLONETS ERIC Consortium offers users access to the CLONETS FACILITIES through a transparent tendering process based on an international peer-review procedure for proposals managed through a shared electronic entry point. The selection criteria are based on the scientific quality and feasibility of the experiment. Ethical aspects of evaluating proposals or implementing the approach should be addressed with the support of the Ethical Advisory Committee (EAC) referred to in Section 3.3.3.

2) USERS who request technical and/or scientific services and access to them outside of a peer-reviewed selection approach shall pay a reasonable price for the services received in accordance with the limitations outlined in Section 3.1.3, paragraph 3).

3.5.2 Scientific Evaluation Policy

1) The CLONETS ERIC Consortium regularly evaluates and compares the quality of its scientific activities through international peer review, including a regular assessment of its impact on the European Research Area, the regions hosting its activities and at the international level.

2) CLONETS ERIC shall ensure that research conducted by its USERS meets the highest standards of quality and excellence and shall promote training and the exchange of best practices. Ethical aspects should be considered by the ethical advisory committee mentioned in Section 3.3.3. CLONETS ERIC will assess the impact and effectiveness of its research policy and program design and the resources needed to support these standards.

3.5.3 Information Dissemination Policy

1) The tasks and activities of the CLONETS ERIC Consortium aim to strengthen research, technological development and innovation in Europe and worldwide. In particular, CLONETS ERIC will carry out

communication and dissemination activities supporting this objective, using various platforms to reach out to all relevant stakeholders and the general public.

2) The CLONETS ERIC Consortium supports disseminating scientific activities, results, publications and scientific and technical knowledge from its activities to the research community, industry and the general public. In accordance with Section 3.5.1, according to which access is open and granted based on scientific excellence, CLONETS ERIC also follows a policy of open access to the FAIR datasets and metadata listed in Section 3.5.7 as well as to scientific publications based on publicly funded research conducted in the CLONETS ERIC Consortium.

3.5.4 Intellectual Property Rights Policy

1) The term "intellectual property" means intellectual property within the meaning of Article 2 of the Convention Establishing the World Intellectual Property Organization, signed on 14 July 1967.

2) Subject to the terms of the agreement between CLONETS ERIC and users, intellectual property rights created, acquired or developed by users are owned by such users.

3) CLONETS ERIC shall adopt an intellectual property rights policy and specific processes and procedures in accordance with Section 3.2.2, paragraph 10) letter (e).

3.5.5 Employment Policy

1) CLONETS ERIC shall ensure equal treatment and opportunities for its workers and shall promote mobility in order to facilitate their training and development.

2) The hiring and management policy is defined by the Director General of the CLONETS ERIC Consortium and approved by the General Assembly. The employment policy applies internationally recognised selection and evaluation procedures as well as remuneration principles to attract and retain highly qualified personnel. Selection procedures for job applicants in the CLONETS ERIC Consortium are transparent, non-discriminatory and comply with the principle of equal opportunities. Recruitment and employment must not be discriminatory.

3) The CLONETS ERIC Consortium has a uniform employment policy defined in accordance with the laws of the countries in which its workers are employed.

3.5.6 Procurement Policy

The Director General of CLONETS ERIC defines the procurement policy. This procurement policy adheres to the principles of transparency, proportionality, mutual recognition, equal treatment, competition and non-discrimination.

3.5.7 Data Policy

1) "Data" means all information collected by USERS and employees when conducting scientific experiments under the USER ACCESS policy and when performing the activity of the CLONETS FACILITIES.

2) Open access repositories are preferred for data collected as a result of the use of CLONETS FACILITIES and to the extent possible for software and computer programs created by CLONETS ERIC and CLONETS FACILITIES; FAIR[25] principles are taken into account.

3.5.8 Innovation and Industrial Policy

1) Within its mission, the CLONETS ERIC Consortium serves as a reference for European industry, as it carries out cutting-edge research and technological development through information activities and opportunities for cooperation with industry. This will strengthen the economic impact of CLONETS ERIC on the European Research Area and MEMBERS, as the Consortium will serve as a platform for building synergies and enhancing knowledge and technology transfer, especially in metrology, photonics, and advanced telecommunications technology.

2) The vision and approach of the CLONETS ERIC Consortium in the field of innovation and industry are defined in a specific policy approved by the General Assembly.

3.6 Financial Matters, Obligations, and Responsibilities

In this section of the principles of the CLONETS ERIC Consortium Statutes, we define the main elements of financial management:

3.6.1 Limitation of Liability

1) The CLONETS ERIC Consortium is liable for its debts.

2) MEMBERS' financial responsibility for the obligations of the CLONETS ERIC Consortium is limited to their respective contributions to the Consortium for the last full year of activity.

3) The CLONETS ERIC Consortium shall take out adequate insurance to cover the risks specific to its operation.

3.6.2 Liabilities and Resources

1) The General Assembly approves the annual budget, taking into account the assessment of the Administrative Advisory Committee, if necessary, supported by the review of the International Scientific Advisory Committee (hereinafter referred to as "ISAC").

2) MEMBERS' contributions to operating costs are listed in Annex II of these Statutes.

3) The resources provided to the CLONETS ERIC Consortium consist of (a) monetary and material contributions of MEMBERS and OBSERVERS to the operation of the CLONETS ERIC Consortium, including USER support activities, are established annually in the "cost book" of the CLONETS ERIC

[25] Wilkinson, M., Dumontier, M., Aalbersberg, I. et al. The FAIR Guiding Principles for scientific data management and stewardship. Sci Data 3, 160018 (2016). https://doi.org/10.1038/sdata.2016.18

Consortium, which is approved by the General Assembly; it takes into account the budgetary principles in accordance with Section 3.6.3, paragraphs 2), 5) and 6) and FINANCIAL RULES, including the limitation of in-kind contributions in accordance with Section 3.6.3, paragraphs 4) and 5) and the rules of material performance, which the General Assembly establishes and approves; (b) financial grants, support and other financial contributions from activities in the field of research and technological development. The General Assembly shall adopt IMPLEMENTING RULES for the use of revenues from external contracts and contributions it approved pursuant to Section 3.2.2, paragraph 10), in particular from the European Union and/or from nationally funded activities; (c) all other income outlined in Section 3.1.3, paragraph 3); these revenues are accounted for in accordance with Section 3.6.3, paragraph 9) and 10); (d) other deposits and financial resources for the purpose of carrying out specific activities or projects falling within the scope of Section 3.1.3; (e) donations and grants, for example from charities, lottery funds and not-for-profit entities. Subject to the approval of the General Assembly, CLONETS ERIC may accept grants, extraordinary contributions, donations, subsidies and other payments from any natural or legal person, such as a charity or a lottery fund, for the non-profit tasks and activities outlined in these Statutes.

4) The resources available to the CLONETS ERIC Consortium shall be used exclusively for the performance of tasks and activities in accordance with Section 3.1.3. In order to ensure an adequate and sustainable level of monetary resources for operations, the General Assembly shall determine in the FINANCIAL RULES the permissible in-kind contributions within the contribution of each MEMBER. The General Assembly may, on the recommendation of the Administrative Advisory Committee, decide to offset MEMBERS' contributions with additional income in accordance with Section 3.6.3.

5) The methods, limits and accounting rules for in-kind and monetary contributions are established in the FINANCIAL RULES adopted by the general assembly in accordance with Section 3.2.2, paragraph 10) and Section 3.6.3.

3.6.3 Definition of Financial Terms: Fiscal year, Annual Financial Statements, Budgetary Principles and Fiscal Aspects

1) The fiscal year begins on January 1st and ends on December 31st.

2) Income and expenditure in the budget must be balanced. MEMBERS shall contribute to the operating costs of CLONETS ERIC, and the allocation of MEMBERS' contributions to operating costs shall be determined in accordance with the FINANCIAL RULES.

3) The General Assembly strives to ensure no permanent and significant imbalance occurs between the use of the CLONETS FACILITIES by the scientific community of any of the MEMBERS and the financial contribution of such members to the CLONETS ERIC Consortium.

4) The annual budget plan is reviewed by the Administrative Advisory Committee and approved by the General Assembly at least one month before the beginning of the upcoming budget year.

5) The CLONETS ERIC Consortium shall keep accounting records of cash and in-kind contributions and expenditures and shall ensure proper financial management aimed at achieving a balanced budget.

6) The annual financial statement is reviewed by the Administrative Advisory Committee and approved by the General Assembly within five months after the end of the budget year. The annual financial statements will be accompanied by a report on budgetary and financial management for the

past financial year with the aim of including it in the "Annual Activity Report of the CLONETS ERIC Consortium" submitted to the European Commission.

7) The annual financial statements must include the agreed value of in-kind contributions and other income provided in accordance with Section 3.6.2.

8) Exemption from VAT and excise taxes based on Article 143 paragraph 1 letter g) and Article 151 paragraph 1 letter b) Council Directive 2006/112/EC[26], Article 12 of Council Directive 2008/118/EC [27]and in accordance with Articles 50 and 51 of Council Implementing Regulation (EU) No. 282/2011[28] is limited to purchases of goods and services made by the CLONETS ERIC Consortium and to any of the MEMBERS of the CLONETS ERIC Consortium within the meaning of Chapter 3 of these Statutes, which are intended for the official and exclusive use of the CLONETS ERIC Consortium, provided that such purchases are made exclusively for the non-profit activities of the CLONETS ERIC Consortium in accordance with its activities. Exemption from VAT is limited to purchases over €300. The tax exemption does not apply to employee purchases.

9) The CLONETS ERIC Consortium shall open separate accounts for the purpose of keeping records of the costs and income of its economic activities. Market prices are charged if they can be determined or the total cost plus a reasonable margin. Value-added tax is applied to these activities.

10) The General Assembly shall establish FINANCIAL RULES, which define all other IMPLEMENTING RULES regarding the budget of the CLONETS ERIC Consortium, accounting standards and finances, including rules governing the compilation, storage, audit and publication of financial statements.

11) The Director General submits to the General Assembly the budget documents detailed in the FINANCIAL RULES after they have been reviewed by the Administrative Advisory Committee.

12) The audit of the financial situation and the annual financial statements and the verification of whether the transactions indicated in the annual financial statements are in accordance with the legal requirements and with the articles of association are entrusted to one or several auditors appointed by the General Assembly in accordance with the relevant regulations. Auditors perform their functions, which are set out in the FINANCIAL RULES. The Director General provides auditors with the information and assistance they request.

3.7 Basic Principles and Final Provisions

In this section of the principles of the CLONETS ERIC Consortium Statutes, we define the following final provisions:

3.7.1 Consolidated Consortium Statutes Text

Future approved Statutes will be regularly updated and published on the website of the CLONETS ERIC Consortium and at its headquarters. Each amendment to these Statutes will be clearly marked with a

[26]2006 /112/EC of November 28 2006 on the common system of value-added tax (OJ L 347, 11.12.2006, page 1).
[27]on the general adjustment of excise duties and on the repeal of Directive 92/12/EEC (OJ L 9, 14.1.2009, page 12).
[28]Council Implementing Regulation (EU) No. 282/2011 of March 15 2011, laying down implementing measures for Directive 2006/112/EC on the common system of value-added tax (OJ L 77, 23.3.2011, page 1).

note indicating whether the amendment concerns a core or non-core element of these Statutes in accordance with Article 11 of Council Regulation (EC) No. 723/2009 and the procedure for its adoption.

3.7.2 Reporting to the European Commission

1) The CLONETS ERIC Consortium shall draw up an annual activity report, ("CLONETS ERIC Annual Activity Report"), detailing in particular the scientific, operational and financial aspects of its activities. The report must be approved by the General Assembly and forwarded to the European Commission and the relevant public administration bodies by June 30th after the end of the applicable budget year. The report will be made publicly available.

2) The CLONETS ERIC Consortium shall notify the European Commission of any circumstances that could seriously jeopardise the performance of its tasks or limit its ability to meet the requirements outlined in Council Regulation (EC) No. 723/2009.

3.7.3 Applicable Law

The internal functioning of the CLONETS ERIC Consortium is governed by: (a) Community law, in particular, Council Regulation (EC) No. 723/2009 as amended by Council Regulation (EC) No. 1261/2013 and decisions under Article 6 paragraph 1 letter a) and Article 11 paragraph 1 of this regulation; (b) in matters that are not regulated or are regulated only in part in the acts referred to in letter a) of this article, by the law of the state in which the CLONETS ERIC Consortium has its headquarters; (c) in matters not covered by letters a) and b) of this Article, by the law of the country in which CLONETS ERIC operates the CLONETS FACILITY; (d) these articles of association, their IMPLEMENTING RULES and RULES OF PROCEDURE.

3.7.4 Conflict Resolution

1) The MEMBERS and OBSERVERS shall as far as possible try to settle by amicable means any disputes that may arise concerning the interpretation or application of these Statutes.

2) The Court of Justice of the European Union is competent to decide disputes between the MEMBERS in connection with the CLONETS ERIC Consortium, disputes between MEMBERS and the CLONETS ERIC Consortium and all conflicts in which the European Union is one of the parties.

3) The legal regulations of the European Union on jurisdiction shall be used to resolve disputes between CLONETS ERIC and third parties. In cases that are not governed by the legislation of the European Union, the court competent to resolve such disputes shall be determined according to the law of the country in which the CLONETS ERIC Consortium has its registered office.

3.8 Summary

These proposed CLONETS ERIC Consortium Statutes comprise the first complex characterisation and guidelines for legalising the CLONETS Research Infrastructure. After the end of the CLONETS-DS project, it will be possible to start negotiations for the creation of the CLONETS ERIC Consortium at the relevant national levels in the states that are expected to become members of the planned Consortium. These negotiations are directly related to the plan for establishing the CLONETS Research

Infrastructure on the ESFRI Roadmap. It will therefore be necessary to proceed coherently and refer to other documents created during the CLONETS-DS project, especially the Budgetary model described in Chapter 5 and the document *D4.2 Roadmap towards an ESFRI listing*.

4 Policy Framework for Use of Future CLONETS Research Infrastructure Services

The proposed Pan-European Research Infrastructure for Time and Frequency Signal Dissemination (T&F services) is designed to support and strengthen the European research community. The goal is to provide unique time and frequency services for a wide range of users. The project focuses on the scientific community but does not exclude other users who are interested in time and frequency services.

To ensure access to the highest quality T&F services for such a large group of users, it is necessary to define a Policy Framework for T&F services. The Policy Framework for the use of the services of the intended infrastructure will be created based on discussions with representatives of individual areas of use of the provided services. It will set out the guidelines of engagement between the infrastructure and the service users, while taking into account the effects of public support for research and development. Care will also be taken in considering the rules for the use of infrastructures for the technological development of private sector companies, where cooperation will focus primarily on so-called contractual or collaborative research.

The Policy Framework will consist of the following main parts:

- Purpose of Policy Framework
- Definition of User Requirements
- Definition of Services
- Legal Policy
- Other Information

These are described in detail in the next Sections.

4.1 Purpose of Policy Framework

The aim of the policy framework is to develop appropriate procedures that enable the connection and use of time and frequency services to a wide range of end-users. It should be noted that the proposed topology of Pan-European Research Infrastructure for Time and Frequency Signal Dissemination covers most of Europe and could connect hundreds of advanced users. They must have clearly defined procedures for connecting and using an advanced environment that delivers precise time and frequency signals.

4.2 Definition of User Requirements

The CLONETS Research Infrastructure Consortium ERIC will have a close connection to users and STRATEGIC PARTNERS including National Infrastructures for Time and Frequency Signal Dissemination, NRENs, NMIs, T&F labs, as well as other entities involved in the construction and maintenance of the T&F network. It should be noted that STRATEGIC PARTNERS of the Consortium will also act as users of the European Core Network operated by the CLONETS Research Infrastructure.

The policy will specify which requirements users must meet to be included in the Pan-European Research Infrastructure for Time and Frequency Signal Dissemination, especially regarding user infrastructure and whether a user's infrastructure allows to connect and deliver the T&F service with sufficient quality.

4.3 Definition of Services

The definition of services, and their parameters such as reliability and stability, period of service delivery, etc. will be determined in accordance with *D2.2 Roadmap for technical implementation of the T&F-reference system*.

4.4 Legal Policy

The Pan-European Research Infrastructure for Time and Frequency Signal Dissemination will operate in the territory of several European countries, therefore legal rules regarding the use of its website in different countries should be defined, with particular emphasis on European and national regulations:

1) For users using the services of the CLONETS Research Infrastructure directly, the principles stated in Chapter 3 will apply;

2) For users who will use the services of the CLONETS Research Infrastructure through the National Research Infrastructures for Time and Frequency Signal Dissemination, the rules defined by these infrastructures and legal regulations in the territory of the relevant member state will apply.

The infrastructure should help to improve the accuracy of legal time and frequency in the member countries; therefore, it is necessary to address the legislative continuity of time frequency signals to the national legal time in each country and vice versa.

4.5 Other Information

This section will provide any other information important in the development, implementation and maintenance of the Policy Framework.

5 Budgetary Model Cases for Implementation

Total Cost of Ownership (TCO) is the purchase price of an asset plus the costs of operation. The costs of the established CLONETS Research Infrastructure (T&F network) were first divided into two main categories:

- CLONETS Research Infrastructure build costs;
- CLONETS Research Infrastructure maintenance and development costs.

This distinction facilitates an analysis of which funds need to be raised first for the construction of the network as well as for its maintenance and development.

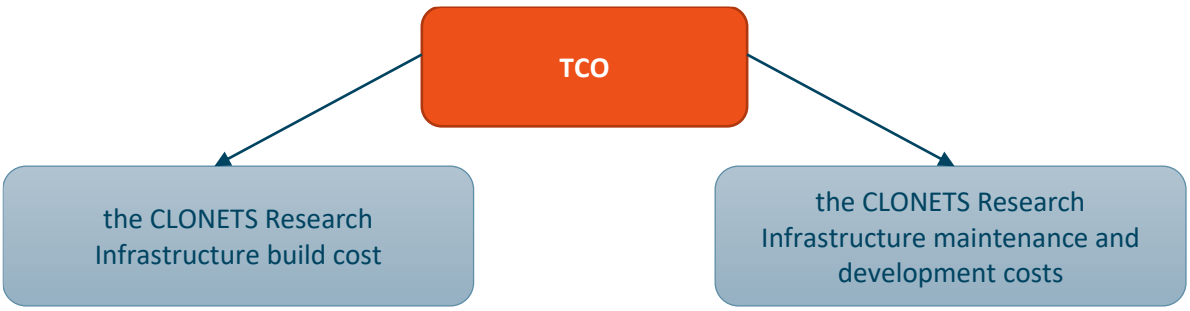

Figure 6. Total Cost of Ownership for the CLONETS Research Infrastructure

Both the CLONETS Research Infrastructure build costs and the CLONETS Research Infrastructure maintenance and development costs in turn include three types of costs: Infrastructure costs, Personnel costs, and other costs.

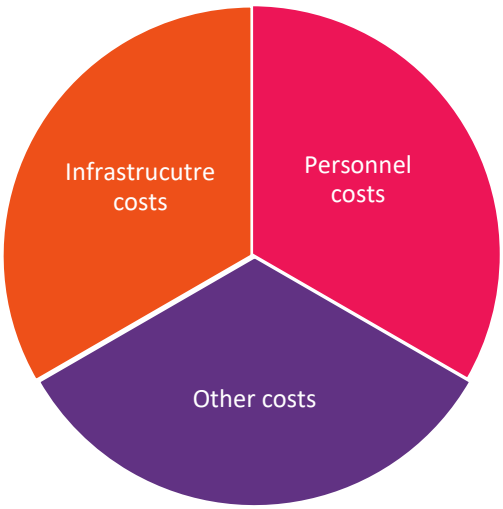

Figure 7. Type of costs

5.1 CLONETS Research Infrastructure Build Costs Analysis

The costs related to the construction of the CLONETS Research Infrastructure do not just include costs related to the acquisition of active and passive network infrastructure, but also the costs of specialists working on the construction of such a network, as well as other additional costs.

The following network construction costs can be identified:

- Infrastructure costs:
  - Acquisition costs of passive infrastructure (fibre, locations, etc.)
  - Acquisition costs of active infrastructure (T&F equipment, energy)
- Personnel costs
  - Costs of specialists to install, configure, validate and supervise T&F network infrastructure
- Other costs
  - Taxes
  - Travel
  - Promotion

5.1.1 Infrastructure Costs

The costs of infrastructure can be divided into the costs of passive infrastructure and active infrastructure. Passive infrastructure costs include the cost of acquisition of fibre and space for transmission equipment. Active infrastructure costs include the cost of T&F equipment and energy costs.

Passive infrastructure in the form of fibre optics should be obtained either from telecommunications network operators or as a contribution from e.g. NRENs, National Research Infrastructures for Time and Frequency Signal Dissemination, or other subjects. Despite recommendations to use existing network fragments to build **the CLONETS Research Infrastructure** where possible, the cost of acquiring fibre optics can be significant.

Active infrastructure such as amplifiers, regeneration points and equipment installed in PoPs (Points of Presence) must be partly obtained from manufacturers and partly built by our own efforts. The uniqueness of the proposed hardware solutions for the CLONETS Research Infrastructure means that these devices are not widely available.

5.1.2 Personnel Costs

Personnel costs include all costs related to payment for specialists who develop, install, configure, and validate the CLONETS Research Infrastructure and supervise all equipment. The topology of the network proposed in WP2 is about 20,000 km. Regeneration stations should be placed every 300 km or so, and optical repeaters every 60-70 km. For the whole network, this requires about 70 regeneration stations and about 300 amplifiers. In addition, at least 1 PoP in each country is planned. Installing, commissioning and configuring the entire infrastructure requires a lot of manpower from network specialists and metrologists. Personnel costs also include staff such as researchers developing new techniques, methods, experimental instrumentation and devices for permanent improvement of the state-of-the-art maturity of the implemented European Core Network Facility in accordance with Section 3.1.3 Scientific Goals and Activities of the CLONETS Research Infrastructure.

5.1.3 Other Costs

Building such an extensive network, covering most of Europe, requires regular meetings, making arrangements, and staff travel. An important element is also the promotion of both the network itself and the services it will provide. Workshops, Infoshares and presentations at scientific conferences are planned.

5.2 CLONETS Research Infrastructure Maintenance and Development Costs Analysis

Additional costs are required to ensure the smooth operation of the CLONETS Research Infrastructure. The following network maintenance and development costs can be identified:

- Infrastructure costs:
  - Maintenance of the technical infrastructure of fibre optic lines (lease of optical fibres)
  - Maintenance of the technical infrastructure of T&F equipment (fault repairs, update)
  - Equipment upgrades
- Personnel costs
  - Costs of specialists responsible for maintenance of T&F infrastructure

- End-user support
- Other costs
  - Taxes
  - Travel
  - Promotion

5.2.1 Infrastructure Costs

Infrastructure costs do not end at the network construction stage. The network requires constant maintenance, in addition to improvements, upgrades, and repairs to components. the network topology is open to building new connections and connecting new users, which involves additional costs.

5.2.2 Personnel Costs

Personnel costs include all costs related to payment for specialists who are responsible for maintenance of T&F equipment, as well as for those responsible for end-user support. Such a large network requires continuous work by specialists to ensure its correct operation at the highest level. In addition, the network will connect a large group of end users who will require support in using the CLONETS Research Infrastructure services.

5.2.3 Other Costs

Similar to 'other costs' from point 5.1.3, regular meetings, workshops, infoshares and promotion of network activities will be necessary.

5.3 Estimated Project Budget for the Implementation of Precision Time and Frequency Network and Service Delivery

WP2 has proposed a topology based on rings that connect European countries. Each country should have at least its PoP, which connects the European network to national and local T&F infrastructures. More information about the rings' topology can be found in deliverable *D2.1 - Technical Design Report*.

It should be noted that the costs shown are estimated for the end of 2022 and may change in the future.

5.3.1 Middle Ring

The middle ring covers 7 countries. Its total geographical length is **6,181 km**, and the project fibre distance is **10,199 km**. The total cost of acquiring the fibre pairs for this ring is estimated to be about **23,700,000 EUR** for 10-year TCO.

The cost of the equipment is estimated at **16,150,000 EUR** where the cost of renegade stations and repeaters is **3,400,000 EUR** and the cost of 15 PoPs is **12,750,000 EUR**. In addition, the cost of installation is estimated at 20% of the cost of the equipment, at about **3,230,000 EUR**.

The total cost of equipping the middle ring is **19,380,000 EUR**.

It was assumed that at least one person in each country should maintain the network. With different PM costs in the countries concerned, the estimated personnel cost is **600,000 EUR** per year and **6,000,000 EUR** in 10 years. In addition, it should be noted that the above personnel costs are only for maintenance of the existing network. Building the T&F network needs at least two additional full-time people for a period of 2 years, for an additional **2,400,000 EUR**.

It is estimated that other costs such as equipment repair and maintenance and meeting costs could amount to **100,000 EUR** (repair and maintenance) and **20,000 EUR** (meetings) per year respectively, bringing the total other costs to **1,200,000 EUR** over 10 years.

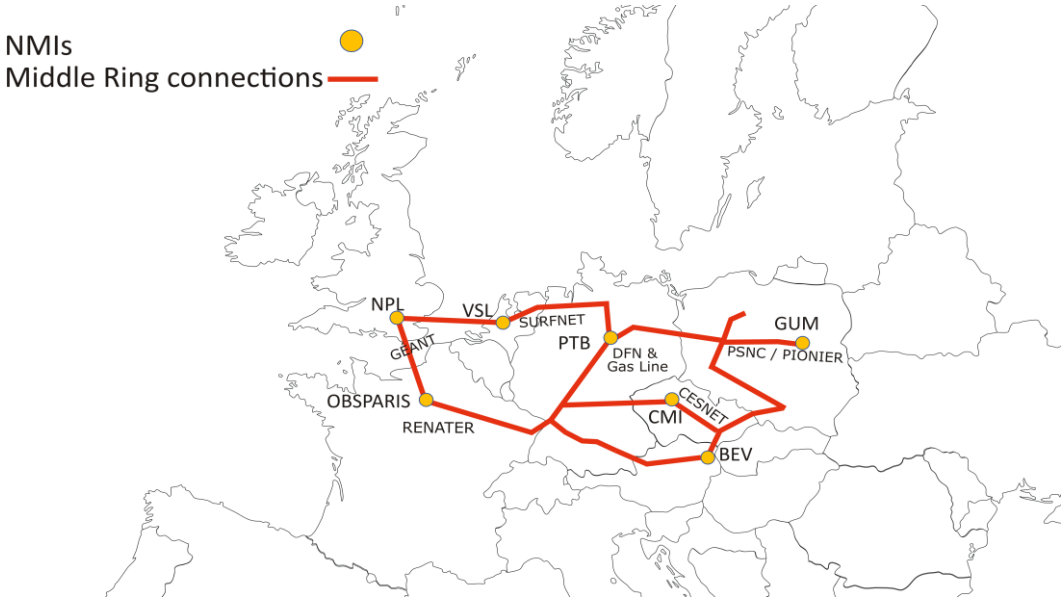

Figure 8. Topology of Middle Ring

The total costs for the Middle Ring for a 10-year period are shown in Table 1.

Cost type	Costs
Fibre	**23,700,000 EUR**
Equipment	**19,380,000 EUR**
Personnel	**8,400,000 EUR**
Other	**1,200,000 EUR**
Total	**52,680,000 EUR**

Table 1. TCO for Middle Ring over 10 years

TCO	Costs
T&F network build costs (Fibre, Equipment, Personnel, etc.)	**45,480,000 EUR**
T&F network maintenance and development costs (Personnel, Other, etc.)	**7,200,000 EUR**
Total	**52,680,000 EUR**

Table 2. Build and maintenance costs

5.3.2 Southern Ring

The southern ring covers 7 countries. Its total geographical length is **3,395 km**, and the project fibre distance is **5,602 km**. The total cost of acquiring the fibre pairs is estimated to be about **9,400,000 EUR** for 10-year TCO.

The cost of the equipment is estimated at **9,520,000 EUR** where the cost of renegade stations and repeaters is **1,870,000 EUR** and the cost of 9 PoPs is **7,650,000 EUR**. In addition, the cost of installation is estimated at 20% of the cost of the equipment, at about **1,900,000 EUR**.

The total cost of equipping the southern ring is **11,420,000 EUR**.

It was assumed that at least one person in each country should maintain the network. With different PM costs in the countries concerned, the estimated personnel cost is **520,000 EUR** per year and **5,200,000 EUR** over 10 years. In addition, it should be noted that the above personnel costs are only for maintenance of the existing network. Building the T&F network needs at least two additional full-time people for a period of 2 years, for an additional **2,120,000 EUR**.

It is estimated that other costs such as for equipment repair and maintenance and meeting costs could amount to **30,000 EUR** (repair and maintenance) and **20,000 EUR** (meetings) per year respectively, bringing the total other costs to **500,000 EUR** over 10 years.

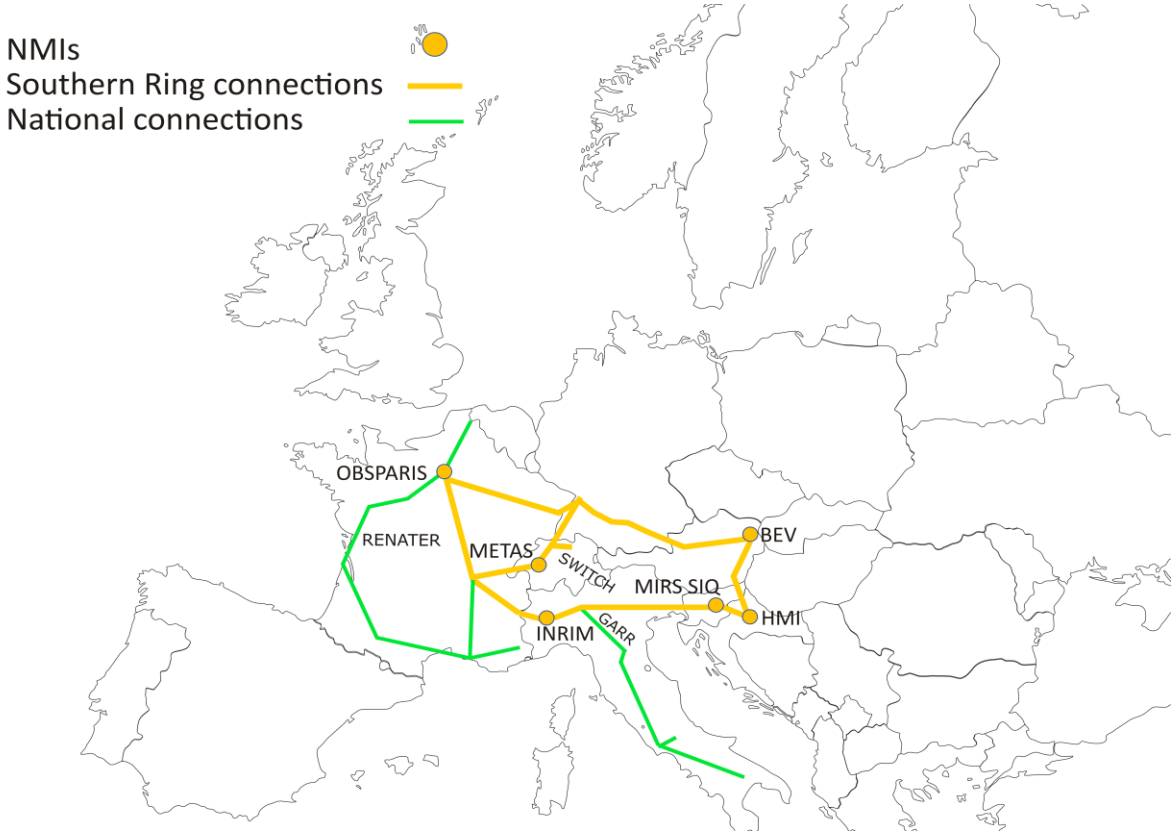

Figure 9. Topology of Southern Ring

The total costs for the Southern Ring over a 10-year period are shown in Table 3.

Cost type	Costs
Fibres	**9,400,000 EUR**
Equipment	**11,420,000 EUR**
Personnel	**7,420,000 EUR**
Other	**500,000 EUR**
Total	**28,740,000 EUR**

Table 3. TCO for Southern Ring over 10 years

TCO	Costs
T&F network build costs (Fibre, Equipment, Personnel, etc.)	**23,040,000 EUR**
T&F network maintenance and development costs (Personnel, Other, etc.)	**5,700,000 EUR**
Total	**28,740,000 EUR**

Table 4. Build and maintenance costs

5.3.3 Northern Ring

The northern ring covers 8 countries. Its total geographical length is **4,775 km**, and the project fibre distance is **7,879 km**. The total cost of acquiring the fibre pairs is estimated to be about **20,000,000 EUR** for 10-year TCO.

The cost of the equipment is estimated at **8,580,000 EUR** where the cost of renegade stations and repeaters is **2,630,000 EUR** and the cost of 7 PoPs is **5,950,000 EUR**. In addition, the cost of installation is estimated at 20% of the cost of the equipment, at about **1,720,000** EUR.

The total cost of equipping the northern ring is **10,300,000 EUR**.

It was assumed that at least one person in each country should maintain the network. With different PM costs in the countries concerned, the estimated personnel cost is **610,000 EUR** per year and **6,100,000 EUR** over 10 years. In addition, it should be noted that the above personnel costs are only for maintenance of the existing network. Building the T&F network needs at least two additional full-time people for a period of 2 years, for an additional **2,440,000 EUR**.

It is estimated that other costs such as equipment repair and maintenance and meeting costs could amount to **50,000 EUR** (repair and maintenance) and **20,000 EUR** (meetings) per year respectively, bringing the total other costs to **700,000 EUR** over 10 years.

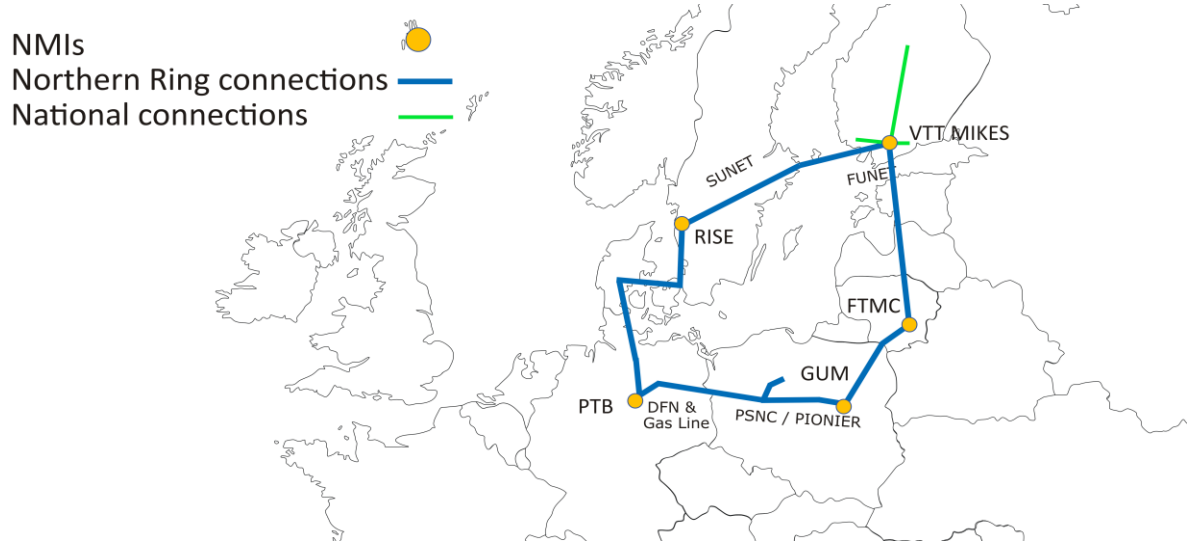

Figure 10. Topology of Northern Ring

The total costs for the Northern Ring over a 10-yearear period are shown in Table 5.

Cost type	Costs
Fibres	**20,000,000 EUR**
Equipment	**10,300,000 EUR**
Personnel	**8,540,000 EUR**
Other	**700,000 EUR**
Total	**39,540,000 EUR**

Table 5. TCO for Northern Ring over 10 years

TCO	Costs
T&F network build costs (Fibre, Equipment, Personnel, etc.)	**32,740,000 EUR**
T&F network maintenance and development costs (Personnel, Other, etc.)	**6,800,000 EUR**
Total	**39,540,000 EUR**

Table 6. Build and maintenance costs

5.3.4 Three Rings

The costs of the three rings do not amount to the sum of the costs of the separate rings because some of the fibre optic lines are shared, less equipment is needed, and personnel costs for maintenance are lower.

The three rings cover 17 countries. Their total geographical length is **11,696 km**, and the project fibre distance is **19,298 km**. The total cost of acquiring the fibre pairs is estimated to be about **42,700,000 EUR** for 10-year TCO.

The cost of the equipment is estimated at **27,690,000 EUR** where the cost of renegade stations and repeaters is **6,440,000 EUR** and the cost of 25 PoPs is **21,250,000 EUR**. In addition, the cost of installation is estimated at 20% of the cost of the equipment, at about **5,540,000 EUR**.

The total cost of equipping the three rings is **33,230,000 EUR**.

It was assumed that at least one person in each country should maintain the network. With different PM costs in the countries concerned, the estimated personnel cost is **1,365,000 EUR** per year and **13,650,000 EUR** over 10 years. In addition, it should be noted that the above personnel costs are only for maintenance of the existing network. Building the T&F network needs at least two additional full-time people for a period of 2 years, for an additional **5,460,000 EUR**.

It is estimated that other costs such as repair and maintenance equipment and meeting costs could amount to **180,000 EUR** (repair and maintenance) and **20,000 EUR** (meetings) per year respectively, bringing the total other costs to **2,000,000 EUR** over 10 years.

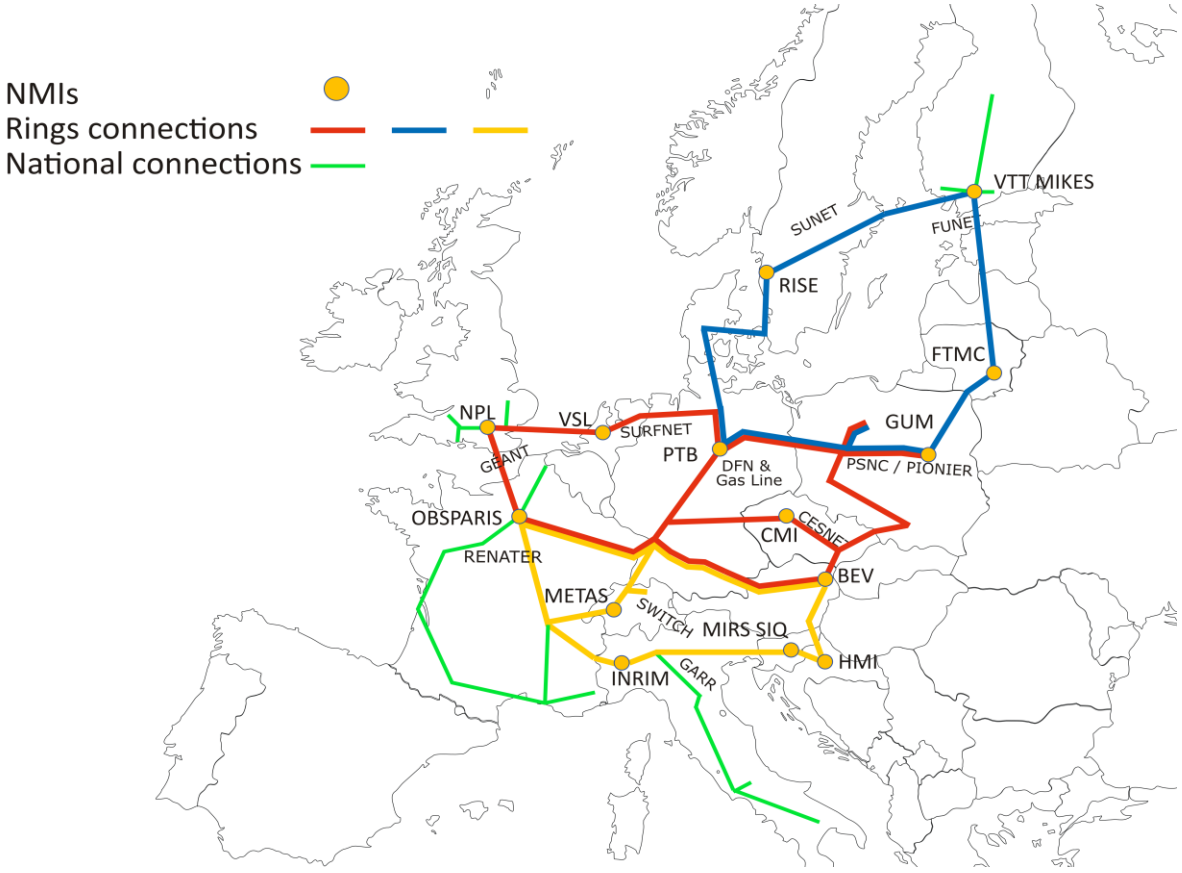

Figure 11. Topology of Three Rings

The total costs for the Three Rings over a 10-year period are shown in Table 7.

Cost type	Costs
Fibres	**42,700,000 EUR**
Equipment	**33,230,000 EUR**
Personnel	**19,100,000 EUR**
Other	**2,000,000 EUR**
Total	**97,030,000 EUR**

Table 7. TCO for Three Rings over 10 years

TCO	Costs
T&F network build costs (Fibre, Equipment, Personnel, etc.)	**81,380,000 EUR**
T&F network maintenance and development costs (Personnel, Other, etc.)	**15,650,000 EUR**
Total	**97,030,000 EUR**

Table 8. Build and maintenance costs

5.4 Financing the CLONETS Research Infrastructure

The cost of building and maintaining **the CLONETS Research Infrastructure** is high. It should be noted that, at 44% and 35% respectively, the costs for aquiring the fibre and the equipment together account for more than 75% of the total costs. This means that a large part of the costs must be incurred during the construction phase of the infrastructure.

This amount may need to be financed from several sources and it should be considered whether part of the funds may be raised through European projects and national or bilateral projects. Moreover, in order to reduce the cost of acquiring fibre optics, the CLONETS consortium is studying the possibility of using NRENs fibres as a contribution on the part of the NRENs towards building the CLONETS Research Infrastructure.

Another source of funding, especially in the maintenance phase, could be government entities or even business entities, which could benefit from paid services built within **the CLONETS Research Infrastructure**.

6 Survey of Funding Opportunities for the Implementation Phase

In this chapter, we focus on financing possibilities for the construction of the **CLONETS Research Infrastructure** once the funding of the design study phase of the CLONETS-DS project ends. This subsequent period can be described as the pre-implementation phase.

The planned **CLONETS Research Infrastructure** has the character of a so-called distributed infrastructure. This means that a substantial part of its facilities and operating capacities (National Research Infrastructures for Time and Frequency Signal Dissemination) are located in EU Member States. These participating states in turn have their parts of the infrastructure interconnected using cross-border communication lines. Therefore, it is likely that funding in the pre-implementation phase of the **CLONETS Research Infrastructure** will come from multiple sources.

In the following sections, we present some examples of financing possibilities for the pre-implementation phase of the **CLONETS Research Infrastructure**. This overview is based on the latest information on the financial resources programmes of the European Commission and member states in the period 2020-2022. It is possible that in the coming years, new funding schemes and options may also emerge.

6.1 Summary of the Present Funding

The planned **CLONETS Research Infrastructure** is primarily intended to offer and deliver time and frequency services for the wider scientific community. At the same time, it will conduct research leading to quantitative and qualitative improvements in the services offered. Several countries have already started building their national part of the **Pan-European Research Infrastructure for Time and Frequency Signal Dissemination**, with work at various stages of development, including in France [T-REFIMEVE], Italy (Italian Quantum Backbone), Germany (links from PTB to Hannover, Garching and Paris, France), Poland [OPTIME], Czech Republic [CITAF]. In these cases, funding comes mainly from national sources. These are often research projects from national agencies in basic and applied research or institutional funding from partners of the CLONETS-DS consortium. Funding from national roadmaps, which member state governments have in many cases created, is no exception. E.g. partners in France have already successfully implemented the T_REFIMEVE project in a national research infrastructures scheme.

6.2 ESFRI Roadmap and Support for New Infrastructures

The long-term strategy of the partners of the **CLONETS Research Infrastructure** which is currently under construction is its inclusion on the European Strategy Forum on Research Infrastructures [ESFRI] roadmap. This consortium plan is developed in more detail in document *D4.2 Roadmap towards ESFRI*. ESFRI is an advisory body to the European Commission that monitors and evaluates the need of the scientific community in the European Research Area to obtain unique services that cannot be covered individually at the national level.

For example, where there is an intention to build a European infrastructure, ESFRI will evaluate its planned impact on the scientific landscape and readiness for implementation. If the scheduled infrastructure passes the ESFRI evaluation process, it is subsequently included in the ESFRI roadmap. In this case, the participating partners may apply for funding for the implementation phase of their national government's infrastructure. In the EU member states, this means that the planned infrastructure is included in the program for building and supporting **National Research Infrastructures for Time and Frequency Signal Dissemination**.

It is possible to finance this new infrastructure's implementation and subsequent operation from the federal funds obtained, even on a transnational scale. While this form of support is long-term in nature, the process to obtain it can be time-consuming, as the evaluation of infrastructure proposals by ESFRI usually takes 2 to 3 years. In addition, the subsequent inclusion of the infrastructure on the ESFRI roadmap in the national roadmaps may also take several years. On the other hand, in 2021-2027, the European Commission issued calls to support the preparatory phase of new European infrastructures (Horizon Europe WP-3 Research Infrastructures). Such support can be requested if the planned infrastructure is already on the ESFRI roadmap. In the years 2021-2022, the following call was open:

- HORIZON-INFRA-2021-DEV-02-01: Preparatory phase of new ESFRI research infrastructure projects
    - This topic supports the preparatory phase of new ESFRI research infrastructure projects identified in the 2021 update of the ESFRI Roadmap. These ESFRI projects have been selected for the excellence of their scientific case, their strategic importance for the European Research Area, and the structuring of the European research infrastructure ecosystem.
    - Budget 36.0M EUR total, 1.5-3.0M EUR per project, call 2021 (30 Sep 2021 - 20 Jan 2022).
    - Potential support for CLONETS Research Infrastructure: cannot be accessed yet, but after inclusion on the ESFRI roadmap, it would support start-up implementation.

The amount of support in this call appears to be very limited and will certainly not be enough to build, for example, an international fibre connection between the national CLONETS research infrastructures of member states. Another possible way of financing this could be through the **National Research Infrastructure for Time and Frequency Signal Dissemination** support programs (national roadmaps) of the member states or obtaining support from the EU from other programs.

6.3 Synergy EuroQCI and CLONETS

Since June 2019, all 27 EU Member States have signed the European Quantum Communication Infrastructure [EuroQCI] Declaration, signalling their commitment to the EuroQCI initiative. The participating countries work with the European Commission and the European Space Agency (ESA) to design, develop and deploy the EuroQCI. The aim is for it to be fully operational by 2027.

The CLONETS-DS consortium has been working for a long time to create closer links to the community that is building the EuroQCI. The aim of this infrastructure is to enable secure communication between government, companies and EU citizens through Quantum Key Distribution (QKD). The main link between CLONETS and the EuroQCI is that both require the use of dark optical fibres. Specifically, the EuroQCI initiative plans to install or lease a pair of dark optical fibres to connect all major cities in Europe. This is a very attractive prospect for the construction of the CLONETS Research Infrastructure, as the cost of fibre interconnection of its individual nodes with the necessary amplifiers is a significant initial investment. We envisage two possible synergy scenarios between the EuroQCI and CLONETS:

a) Dark fibre pair sharing: precision time and frequency transmission services would be operated simultaneously on these fibres in the bands next to the QKD central communication. Thanks to phase-coherent transmission techniques, QKD transmission would benefit from a significant reduction in the bit-error rate [DOI]. Furthermore, the security of the QKD at the physical level would be increased, as the phase-coherent transmission would be an indicator of optical fibre tampering.

b) Additional dedicated dark fibre pair: Another pair of dark optical fibres could be installed as part of the installation of the dark fibre pair for the EuroQCI, which will physically follow the same path. The advantage for the CLONETS infrastructure would be the lower cost of acquiring the additional pair while the EuroQCI would obtain a simultaneous monitoring network to indicate tampering with the fibre. And as in the previous scenario, EuroQCI would be able to synchronise the laser wavelengths for QKD transmission, again reducing the bit-error rate. Another advantage of this scenario would be the considerable independence of both infrastructures concerning separate communications for QKD and time and frequency services.

EU support for the construction of the EuroQCI is divided into several programs. The EuroQCI deployment will be partly supported by the Digital Europe Programme (DEP), while the Connecting Europe Facility 2 (CEF-2) programme will support the interconnection of national quantum communication infrastructure networks between neighbouring countries, as well as the interconnection of the EuroQCI ground and space segments. At the same time, the construction will take place in two phases.

In 2021-2022 the DEP programme funds support for the development of European QKD devices and systems, the development and deployment of national quantum communication networks, and testing and certification infrastructure for QKD devices, technologies and systems that will ultimately be used in the EuroQCI. The main tasks for building the national parts of the EuroQCI at this stage are highlighted in the following call:

- DIGITAL-2021-QCI-01-DEPLOY-NATIONAL - DIGITAL-SIMPLE DIGITAL Simple Grants:
    - Deploying advanced experimental quantum systems and networks combining the best of quantum and classical security technologies. Where possible, use pilot devices,

technologies, and systems developed and manufactured in the EU to support their further development towards maturity and compliance with the EuroQCI security needs. Making these systems and networks widely available for undertaking and testing (in several real use cases) the functioning and the provision of very high-security QKD components and systems, their interoperability and the end-to-end secure functioning of the system architecture.

- Budget: 108.0M EUR with 5.0M EUR for single grant per country, with additional support with 5.0M EUR for every single grant from the national government, thus total 10.0M EUR per single grant and member state, call 2022 (17 November 2021 - 29 March 2022).
- Potential support for CLONETS Research Infrastructure: partners of CLONETS-DS should talk to EuroQCI partners about implementing the above-mentioned scenarios in each member state. Reaching out to DG Connect will also be necessary.

In 2022-2023, the CEF-2 programme will fund support for cross-border connections between national quantum communication networks, along with links between the EuroQCI earth and space segments. Calls for the construction of the EuroQCI cross-border connections at this stage are postponed. The objectives of these calls will be:

- The deployment of the first cross-border quantum terrestrial backbone networks for interconnecting neighbouring national quantum communication infrastructures across borders, built with EU technologies, including if necessary through the deployment of "trusted nodes" (i.e. secure access points to the network which make it possible to link distant sites securely).
- Interconnection with the EuroQCI space segment will be implemented via the optical ground stations serving as an interface between the EuroQCI space components and its terrestrial fibre network. Provision of fibre links between the EuroQCI and a pan-European network of Security Operation Centres (SOCs).
- The management of encryption keys between all elements of the EuroQCI in an end-to-end manner. This would include the actions needed at the level of telecommunications networks to manage these keys efficiently and securely and ensure their transmission to recipients.
- Budget: 110.0M EUR approx. with co-fund at 110.0M EUR from member states, the form of the supporting actions will not be known for a while, calls will be open in 2023 (expected) or later.
- Potential support for CLONETS: partners of CLONETS should talk to EuroQCI partners about implementing the above-mentioned scenarios for interconnecting important national points of the CLONETS infrastructure in member states. It will also be necessary to discuss incorporating these possible scenarios with DG Connect.

A note on the potential partnership between the EuroQCI and the CLONETS Research Infrastructure

CLONETS-DS project partners must bear in mind that the EuroQCI is not intended for research purposes but to be a fully functional communication structure for secure communications at the EU level. Therefore, the question is whether scenario a) Dark fibre pair sharing is feasible at all, unless, for example, the phase-coherent transmission technique is integrated directly into the QKD facilities subject to certification. Scenario b) The additional dedicated dark fibre pair, in turn, significantly increases the cost of building EuroQCI, while DG Connect did not take this option into account when

setting budgets. This means that additional EU funding would have to be obtained, or some planned items in the EuroQCI budget would have to be reduced, which may not be acceptable to members of the EuroQCI implementation consortia.

With these aspects in mind, the CLONETS-DS partners should negotiate with DG Connect and communicate the idea of infrastructure synergies between EuroQCI and CLONETS. It is also essential for the partners of the CLONETS-DS consortium to intensify communication with EuroQCI partners at the national level and try to identify possible areas of cooperation as soon as possible.

6.4 Other Funding from the CEF-2 Programme

The CEF-2 programme covers other areas where the EU intends to support the development of communication technologies, including:

- Deployment of 5G infrastructures in Europe:
  - 5G coverage along transport corridors
  - 5G for smart communities
- Backbone networks for pan-European cloud federations
- Backbone connectivity for Digital Global Gateways
- Terabit connectivity for High-Performance Computing

Should the realisation of synergies between EuroQCI and CLONETS not be feasible, it will be appropriate for CLONETS-DS partners to consider coordination in the above areas of EU CEF-2 support.

6.5 Synergy between GÉANT and CLONETS

The possibility of cooperation with GÉANT is conditional on the willingness of GÉANT to act as a future strategic partner of the CLONETS Research Infrastructure in accordance with Section 3.4.5.

6.6 Funding through European Metrology Partnership

Cooperation between the National Metrology Insitutes in Europe is coordinated by the European Association of National Metrology Institutes [EURAMET]. EURAMET's mission is to develop and disseminate an integrated, cost-effective and internationally competitive measurement infrastructure for Europe. EURAMET are constantly weighing up the needs of industry, business and governments. Through their services, they support their members to meet their national requirements and establish a balanced European measurement infrastructure. Enhancing the benefits of metrology to society is one of the highest priorities of EURAMET and their members.

In the last ten years, EURAMET has conducted two successful programmes supported by the European Union through a co-funding scheme: the European Metrology Research Programme (EMRP) and the European Metrology Programme for Innovation and Research (EMPIR) including more than 350 joint

research projects. In 2021-2027, EURAMET is conducting a European Partnership on Metrology (EPM) research funding programme.

The EPM supports research projects in:

- The development of the European Metrology Networks and their coordination by EURAMET so that the European Metrology Infrastructure that emerges at the end of the Partnership can benefit from multiple diverse funding sources and not rely on a single A185 instrument for its operation. The national contributions to the programme should primarily fund these activities.
- A series of calls for Joint Research Projects in priority areas and fundamental science, similar to those under EMRP and EMPIR. These activities should be funded mainly by the EU contributions to the programme. These calls may decline in value over the programme's life to encourage the networks to seek other funding sources for their priorities. Financing under these calls to industrial and academic partners should increase to an average of 40% of the available budget (from 2 % in EMRP and 30% in EMPIR).
- A supporting programme of capacity building activities, like those in EMPIR, funded through national contributions. In addition, new mechanisms for implementing capacity building should be developed.

The EPM Calls are opened periodically each year from 2022 in EPM sub programmes: Health, Digital Transformation, Integrated European Metrology, Research Potential, and Normative.

6.7 Other Funding Opportunities

The following call of the Horizon Europe program to support new research infrastructures may be considered :

- HORIZON-INFRA-2022-DEV-01-01: Research infrastructure concept development
  - This topic aims at supporting the development of new concepts for the next generation of research infrastructures of European interest, single/multi-, distributed or virtual, that none or few countries might individually be able to afford. All fields of research can be considered. Major upgrades of existing infrastructures may also be considered if the result is significantly transformative and equivalent to a new infrastructure concept. Proposals for RI concept development will tackle all key questions concerning the technical and conceptual feasibility of new or upgraded fully-fledged user site facilities.
  - Budget 20.3M EUR, 1.0-3.0M EUR per project, 2022 call (19 Jan 2022 – 20 Apr 2022).
  - Potential support for CLONETS Research Infrastructure: this is probably a similar challenge to that as for CLONETS-DS. It is necessary to hold consultations as to whether it would be possible to use this call for the CLONETS-DS consortium to complete or prepare the essential documents for the implementation phase.

Under the Quantum Flagship initiative, the EU likely planned 3 quantum infrastructures. In addition to [EuroQCI] (Section 6.3), these include the European Quantum Computing & Simulation Infrastructure [EuroQCS] and the European Quantum Sensing and Metrology Infrastructure

(EuroQSM). Unfortunately, for EuroQCS and EuroQSM, with the exception of mentions in some presentations by the EC, no other links or programme documents are yet available.

6.8 Estimated Pre-Implementation and Implementation Phases Timetable

Based on the known input data mentioned in the previous sections, the proposed timetable for building the CLONETS Research Infrastructure is shown below:

Action/Year	2022	2023	2024	2025	2026	2027	2028
CLONETS design study		X					
CLONETS Free Association (MoU)		X					
ESFRI application			X				
CLONETS on ESFRI roadmap (optimistic estimation)					X		
EU Preparatory project for ESFRI infrastructure (implementation phase)						X	
Other funding application for cross-border interconnection (pre-implementation phase)			X				

Table 9. Estimated Pre-Implementation and Implementation Phases timetable

7 Sustainability of the CLONETS Research Infrastructure

Once the implementation phase of the **CLONETS Research Infrastructure** has taken place, it will be necessary to ensure its sustainability for the next period, both in terms of maintaining scientific excellence and of technological and financial sustainability.

7.1 Scientific Excellence

The scientific results, often published in the world's most prestigious journals, which many of the partners of the CLONETS-DS consortium have achieved, meet the standard of highest scientific excellence. CLONETS participants and the **CLONETS Research Infrastructure** team itself will therefore need to ensure that this highest scientific standard is maintained. To do this, it will be necessary for the **CLONETS Research Infrastructure** to not limit itself to supplying one type of scientific service but to also become directly involved in other essential research in collaboration with the stakeholders indicated in the survey conducted by WP2. These efforts will support the level of knowledge of the **CLONETS Research Infrastructure** and thus contribute to its scientific excellence. The acquired skills of the **CLONETS Research Infrastructure** team will also lead to a qualitative increase in its technological level and the financial benefit from the earmarked funds of scientific projects will contribute to its financial sustainability.

7.2 Technological Sustainability

The **CLONETS Research Infrastructure** will need to maintain the deployed technologies regularly to distribute accurate time and frequency signals over optical fibres. In addition to participating in joint projects of the **CLONETS Research Infrastructure** users, this infrastructure will carry out its targeted research and development to increase the technological and quality level of the services operated. This activity should be covered by the institutional budget of the infrastructure as well as by individual research projects ideally funded through EU resources.

7.3 Financial Sustainability and Cost Models

We assume that the financing of the implementation phase of **the CLONETS Research Infrastructure** will be through one or more of the sources described in Chapter 5. Similarly, it can be assumed that its operation in the post-implementation period will also be financed through co-funding modalities.

The cost model presented in Chapter 5 suggests that a huge part of the costs of the **Pan-European Research Infrastructure for Time and Frequency Signal Dissemination** must be incurred during its implementation phase. In order to ensure the **CLONETS Resarch Infrastructure**'s financial sustainability, charging end users for the services it provides as well as periodic contributions from the CLONETS Research Infrastructure consortium members should be considered.

8 Conclusions

Building, managing and maintaining the **Pan-European Research Infrastructure for Time and Frequency Signal Dissemination** is a complex and long-term undertaking. While the construction of **National Research Infrastructures for Time and Frequency Signal Dissemination** has been taking place in some countries on the European continent for many years, and there are countries where pilot operation of such infrastructures is running, the construction of the **CLONETS Research Infrastructure** overall is still at the stage of technical, legal, and above all scientific design.

The objective of the **CLONETS Research Infrastructure** is mainly the development, creation, and operation of the **European Core Network** described in *D2.2 Roadmap for technical implementation of the T&F-reference system*. This entire network will be almost 20,000 km long, and further expansion in the future is possible. The costs that will be incurred during the network's construction exceed individual project participants' financial capabilities; therefore, without the support of European institutions and the national governments of participating states, the construction of the **CLONETS Research Infrastructure** will not be successful.

This document, *D3.1 Governance and Sustainability,* provides a detailed and advanced guide to the next steps for the partners of the CLONETS-DS project on the way to realising the planned construction of the **CLONETS Research Infrastructure**, which will present a significant challenge in terms of financial, legal, labour, and time demands. If this implementation is successful, the new pan-European Research Infrastructure will fill a now largely vacant space in the landscape of research infrastructures in the European Research Area.

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Glossary

AAC	Administrative Advisory Committee
CEF-2	Connecting Europe Facility 2
DEP	Digital Europe Programme
EAC	Ethics Advisorty Committee
EMPIR	European Metrology Programme for Innovation and Research
EMRP	European Metrology Research Programme
EPM	European Partnership on Metrology
ERIC	European Research Infrastructure Consortium
ESA	European Space Agency
ESFRI	European Strategy Forum on Research Infrastructures
EuroQCI	European Quantum Communication Infrastructure
EuroQCS	European Quantum Computing & Simulation Infrastructure
EuroQSM	European Quantum Sensing and Metrology Infrastructure
GA	General Assembly
ISAC	International Scientific Advisory Committee
MoU	Memorandum of Understanding
NMI	National Metrology Institute
NREN	National Research and Education Network
PM	Person Month
PoP	Point of Presence
PRT	Potential Research Topics
QKD	Quantum Key Distribution
RIA	Research and Innovation Action
SOC	Security Operation Centres
TCO	Total Cost of Ownership
T&F	Time and Frequency
CS	Core Sites
ECN	European Core Network