GROOM II
GLIDERS FOR RESEARCH, OCEAN OBSERVATION & MANAGEMENT : INFRASTRUCTURE AND INNOVATION

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Deliverable abstract & executive summary

This document explores the governance and organisation that the GROOM RI would require to be most efficient. While the distributed nature of the European Marine Research Infrastructures is well acknowledged, adapting it to a RI harnessing the advantages of Marine Autonomous Systems (MAS) requires specific adjustments. The strategy developed in this document is twofold: first, a review of the organisation of other RIs has been performed, while a second phase served to define the requirement for the future GROOM RI in regards to the capacity and needs of the nodes, as well as the services that the RI will produce.

One of these services is called 'legal frameworks', relating to legal aspects of operating assets in marine environments both in national waters and in other countries' exclusive economic zones. These regulations are limiting activities and this document explores how a formal GROOM RI could both support operators in their work and help clarify and simplify the procedures in European waters.

The activities performed by the GROOM RI that would most benefit the users/stakeholders have been developed in other deliverables and Work Packages. The objective of this deliverable is to define how the GROOM RI could be organised and describe the resulting required governance, which also impacts the legal status that should be aimed at. Reviewing the implications of a Research Infrastructure (based on ESFRI roadmap 2021 public guide) and the practice by other MRIs, allows to provide a realistic view of the possibilities for the future GROOM RI.

Setting up an RI is a long and complex process, and a consensus has been reached that GROOM RI should start small with a Minimum Viable Product containing the principal services and grow from there.

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List of Abbreviations

DM	Data Management
EMBRC	European Marine Biological Resource Centre
EC	European Commission
EEZ	Exclusive Economic Zone
EOOS	European Ocean Observing System
ERIC	European Research Infrastructure Consortium
ESFRI	European Strategy Forum on Research Infrastructures
FP7	7th Framework Programme
FTE	Full Time Equivalent
GCOS	Global Climate Observing System
GOOS	Global Ocean Observing System
EuroGOOS GTT	EuroGOOS Glider Task Team
IKC	In kind contribution
ILC	International Law Commission
IOC	Intergovernmental Oceanographic Commission
KPI	Key Performance Indicator
MAS	Marine Autonomous System
MoU	Memorandum of Understanding
MSR	Marine Scientific Research
PI	Principal Investigator
RI	Research Infrastructure
ROOS	Regional Ocean Observing System
SOP	Standard Operating Procedure
UNCLOS	United Nations Convention on the Law of the Sea

1. Background and context

GROOM RI's vision is to be the European Research Infrastructure harnessing the advantages of Marine Autonomous Systems (MAS) to provide high-quality ocean observation data and services for the benefit of society, enabling scientific excellence and moving towards net-zero activities.

Its mission is to integrate national infrastructures for Marine Autonomous Systems (MAS) to provide access to platforms and services to the broadest range of scientific and industrial users, as well as other ocean-observing RIs. It maintains a unique centralised provision of cyber-infrastructure, data and knowledge for the optimised use of MAS to study climate and marine environments, and to support operational services and the blue economy.

To develop a structured RI capable of answering these objectives, there are different possibilities, requirements and limitations to set up the governance and legal framework for the GROOM RI.

One other aspect on which GROOM RI will provide support to the operator is on the legal aspects related to MAS operations. This topic was discussed during GROOM FP7 in Deliverable 2.3 Legal aspects of glider operations in European Waters, and Deliverable 2.4 The legal framework for joint management of a European glider component.

2. Overall organisation of the GROOM RI

2.1. A CENTRALISED DISTRIBUTED INFRASTRUCTURE

2.1.1. Defining a distributed infrastructure

The ESFRI roadmap 2021 public guide defines a distributed infrastructure as 'consist[ing] of a **Central Hub** and interlinked **National Nodes'**. A distributed RI particularly needs to:

- define a joint investment strategy aimed at strengthening the RI through the Nodes and the common/shared facilities, and have a unique specific name, legal status and a governance structure with clear responsibilities and reporting lines, including international supervisory and relevant external advisory bodies;
- have legally binding attributions of coordination competences and resources to the Central Hub;
- have a unique access policy and provide for a single point of access for all users with a support structure dedicated to optimise the access for the proposed research;
- have a user programme absorbing a relevant fraction of the total capacity of the RI;
- identify and adopt measurable Key Performance Indicators addressing both excellence of scientific services and sustainability;
- have a human resources policy adequate to guarantee the effective operation of the Central Hub supporting the research, users programme, education and training by equal opportunity hiring and secondments;

These features characterise a distributed RI and thus mark the difference with respect to coordinated research networks (international collaborations of fully independent research performing organisations). The Nodes may be only partially absorbed by the distributed RI maintaining their national or institutional programmes, but **the capacity and amount of resources devoted to the RI must be clearly identified, coordinated and managed by the Central Hub** according to agreed statutes and common rules and procedures of the RI Consortium. Importantly, **the distributed RI must demonstrate a capability to attribute optimal personnel capacity and coordination resources to the Central Hub**, therefore displaying:

- a high level of integration of the National Nodes (such as a unique portal with thorough explanation and guidance towards the common access policy, harmonised and coherent IPR & data policies; adequate central resources; procurement and upgrading of technological infrastructure; human resources policy allowing for staff exchange and secondment);
- added value compared with the merits of a research cooperation network open to external use. The Central Hub therefore must represent a truly international organisation capable of operating with a high level of efficiency and mediating across different scientific cultures to ensure uniform best practices and scientific quality.

These guidelines concern ESFRI landmarks and consider the partners/nodes to be the Member States. Other possibilities, like applying to become an AISBL, are based on the same assumptions as described above, with the difference there that nodes are institutions and not states. In the remainder of this document, we will refer only to 'nodes', whether national or institutional.

2.1.2. MAS operators landscape

MAS activities are performed, in Europe, by multiple stakeholders that are divided into 4 categories:

- **National Research Infrastructure (RI):** These are large-scale research facilities or infrastructures that are often funded and supported at the national level. National RIs may include observatories, laboratories, and other facilities that serve the research needs of a country. Examples could include national observatories, research vessels, or large-scale experimental facilities.
- **Institutional Facility:** Research observation activities can also occur within specific institutions such as universities, research centers, or other academic or scientific organisations. These facilities may focus on specific research themes or disciplines and cater to the needs of researchers affiliated with the institution.
- **Laboratory Activity:** Laboratories are controlled environments where scientists and researchers conduct experiments and observations. Laboratories can be part of larger institutions or stand-alone facilities.
- **Private Company:** Research and observation activities are not limited to academic and public institutions. Private companies, especially those in industries like pharmaceuticals, environmental monitoring, and technology, often conduct research and observation as part of their business activities. This can include R&D facilities, testing laboratories, and observational studies.

Each of these settings comes with its own set of characteristics, objectives, and funding structures. National RIs often receive support from government funding agencies, institutional facilities are generally affiliated with academic or research institutions, laboratories may be part of various entities, and private companies typically fund their research activities through their own resources or external investments.

2.1.3. A Distributed infrastructure adapted to GROOM RI

Given the nature of the activities aimed to be delivered by the GROOM RI and the variety of operators, the concept of a distributed infrastructure is particularly relevant. Throughout the GROOM II project, discussions have taken place, leading to the following foreseen organisation.

First, the **Central Hub** is key to deliver the operational programme, in particular for deployment of MAS (whether funded by the European Commission or by Members and Observers who may request such service) and engages in the following activities:

- Coordination of Node activities
- RI services entry point
- KPI monitoring
- Dissemination & outreach

The **distributed Nodes** are the participating Agencies, who operate with direct resources. As part of the GROOM RI, they agree to a multi-annual commitment of resources through service agreements and under contract with the GROOM RI itself or external users (through the Central Hub), in particular in terms of MAS to be deployed and for the data system, and to coordinate their activities through the Central Hub. All resources engaged by the Nodes in support of the GROOM RI objectives will be considered as contributions to the GROOM RI. The Nodes will engage in providing one or more of the following resources:

- Expert personnel;
- Vehicles & sensors;
- Sea access and logistics;
- Specialised workshops;
- IT and physical infrastructure;
- Data management.

Depending on the final legal status of the GROOM RI, a member country can organise and coordinate all national facilities under the National Node, or each facility can be a member, a part of the distributed nodes of the GROOM RI on its own. In either scenario, the facility decides on and defines the fraction of its resources committing to the GROOM RI.
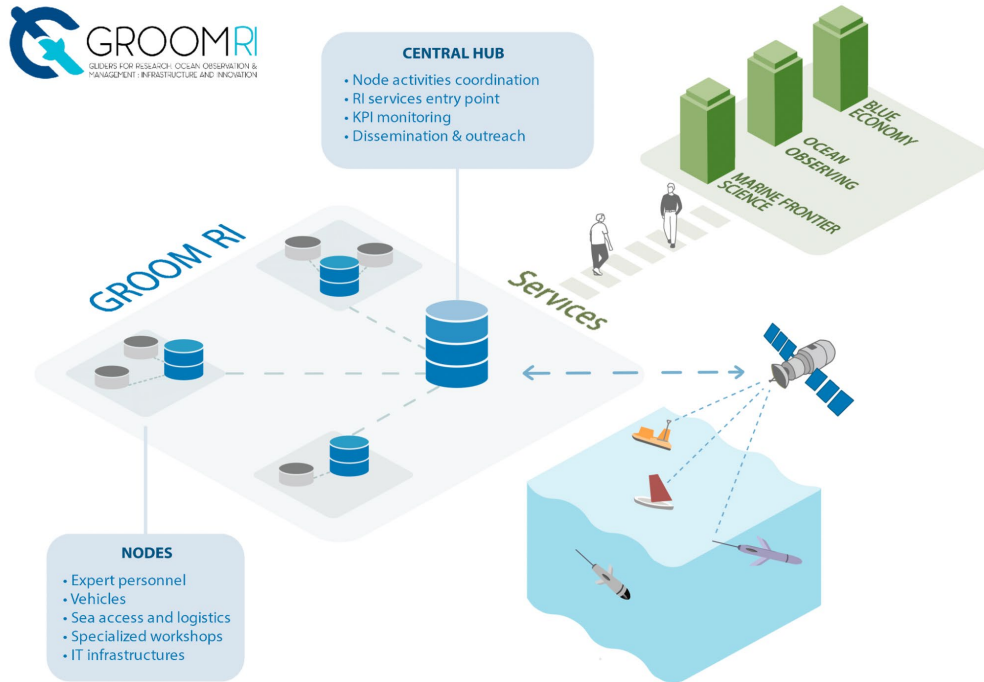
Figure 1 - The overall organisation of GROOM RI's distributed infrastructure

The Nodes manage the day-to-day operations of the GROOM RI and planning of their activities. The activity of the Nodes will be supported by **Working Groups**, which will have the responsibility of ensuring that user needs are met and strategic requirements addressed, as further developed under the next section Governance.

2.2. GOVERNANCE

At the time of drafting this report, the legal status of the future GROOM RI (mainly its Central Hub) is subject to a number of options. Regardless, an overall governance is foreseen, with necessary adaptation depending on the future GROOM RI legal status. It will consist of:

A Strategic Board, which has the ultimate decision-making authority. It will mainly make strategic decisions on the development and evolution of the GROOM RI. It may be composed, depending on the legal status of the Central Hub, of one delegate per Member acting collectively or a combination of state-of-the-art experts with the Funders and Policy Makers and/or with representatives of EU Member States and Associated Countries. It is envisioned that Observers or scientific advisors may attend the Strategic Board meetings, but they will support and be represented by a delegate with a vote right for decision-making. Observers have the right to participate, without voting rights. The Strategic board shall develop and adopt the rules of implementation and services, govern memberships, appoint the GROOM RI Programme Director and provide strategic guidance to the RI.

An **Executive / Management Board** may consist of one representative of each Node, typically an assigned national facility leader, the key representatives of Central Hub and the chair of the strategic board.

The **Working Groups** internal to the GROOM RI will have the responsibility of ensuring that user needs are met and strategic requirements addressed and support the Nodes in their activities. So far, the need for Working Groups of experts (set up by the Strategic Board) has been identified on:

- Best Practices (connected to other initiatives at EU and international (OceanGliders) levels)

- Data Management

- IAG-MAS to develop links with industrial stakeholders and foster the Blue Economy

- Harmonization and integration with the other MRIs

- Establishing and developing the GROOM RI business model

- Facilitating compliance with Maritime Regulations and an improved european integration of MAS

Scientific topics will also be at the centre of the RI. They will be closely aligned with OceanGliders Task Teams: Boundary Currents, Storms, Water Transformation, Ocean Health, Polar Operations, Passive Acoustics, Data assimilation,...). The risk of duplicating effort by recreating a working group inside the RI should be considered, and one consideration would be that participation of experts to OceanGliders could be counted as in-kind contribution to the RI, allowing to sustainably maintain and develop the OceanGliders capacity.

GROOM RI will also take part in the Working Groups external to its organisation as it will rely on the already established communities as much as possible and will seek to be part of them as a member. One conclusion from *D4.1: Report on plans for an EU contribution to OceanGliders, the GOOS/GCOS and EOOS, and data delivery on a sustained basis*, is that GROOM RI should be part of the EuroGOOS GTT and OceanGliders Steering Team.

2.3. REQUIRED RESOURCES

At the time of the writing of this report, investigations are being carried out to host the Central Hub at NOC, in Southampton, UK and define more precisely the resources that may be made available by NOC, to both set up GROOM RI and run the Central Hub as well as to deliver services as a Node.

2.3.1. Digital Infrastructure

GROOM RI will provide a digital environment consisting of tools and softwares to elaborate, store, and share information (repositories), that should be cloud based and easily accessible. GROOM RI will also provide tools and softwares to help and develop operation capacities. This digital infrastructure is detailed in *D6.1 : Technology roadmap of WP6 the GROOM RI*.

The digital infrastructure that will be provided by the GROOM RI has both to be developed and maintained. A RI's main objective is to provide sustainability to its members, and should be designed to maintain the digital infrastructure, while its development requires strong investments that fall out of the direct scope & possibilities of the RI. Hence, it is envisioned that in order to develop new, and increase capacity, participate in project calls and receive funding for specific technological

development. While for the maintenance of the developed digital infrastructure, there should be 1 IT engineer paid by the RI.

2.3.2. Physical infrastructure

The physical infrastructure contains all the activity performed by the facilities, partners that are part of GROOM RI, as well as the physical actions undertaken by the central hub. The facility is the owner and operator of the physical infrastructure, which is offered and made available through service agreements. The node has the technical skills to support the physical infrastructure and the committed service.

Nodes will only be partially absorbed by GROOM RI, and the capacity and amount of resources devoted to the RI will be clearly identified, coordinated and managed by the Central Hub according to agreed statutes and common rules and procedures of the RI Consortium. Access policies and requirements for the RI should be implemented in addition to the already existing policies established in the nodes.

2.3.3. HR resources

First estimates for the resources for the Central Hub team consist of a Programme Manager assisted by at least 5 persons (dedicated full-time or part-time to GROOM RI).

The other marine RIs are organised as follows:

- **Euro-Argo ERIC** : Director General, Administrative Assistant, Operational Engineer, Science Officer, Project Manager, Communication Officer, Senior Advisor, Data Scientist

- **EMSO ERIC** : The CMO (Central Management Office, equivalent to a Central hub) is presently composed by: the Director General (DG), DG Assistant, Financial Officer, Administration and Personnel Assistant, Policy and Project Management Officer, Project Management Officer, Science Officer, Information Technology and data Services Director, Data Systems Engineer, IT Analyst, Data Officer, Engineering and Logistics Officer, Programme and Industry relations Officer, Communication Officer

- **EMBRC**: Executive Director, Chief Financial and Administrative Officer, Access Officer, General Assembly Secretary, Administrative Assistant, Access and Benefit Sharing (ABS) Compliance Officer, Observation, Data and Service Development Officer, International Cooperation Officer, Scientific Officer and Project Manager, Communications Manager, Industries Liaison Officer, Data Scientist, Project Manager, Project Manager.

- **ICOS ERIC** is a larger ERIC, with a partial marine contribution. The head office is much wider, with 51 persons working in the head offices grouped in 10 teams:
  - Head Office
  - Central Analytical Laboratories
  - Administration
  - Operations
  - Strategy and International Cooperation
  - Communications
  - Carbon Portal (20 persons)
  - Atmosphere Thematic Centre

- ○ Ecosystem Thematic Centre
- ○ Ocean Thematic Centre
- ○ Central Analytical Laboratories

This 'expanded' version shows the same categories as the previous examples, but with multiple persons for each task. It is interesting to note the digital IT workforce for the Carbon portal.

In GROOM RI, the required personnel for the Central Hub can be listed as:

- 1 Director General/ Project manager, which shall be appointed by the Strategic board, for a period of up to 4 years and can be eligible for a maximum of two terms.
- 1 Scientific officer, in charge of steering best practices and SOP work, data management support
- 1 Administrative support officer
- 1 Communication officer
- 1 IT engineer

All of these tasks can represent a fraction of FTE or more, depending on the final size of the central hub.

2.3.4. Overall budget and Financial resources

The GROOM RI global budget and the financial resources needed will be defined through a detailed business model. While this business model requires further investigations, supported by the potential leadership of NOC, it is interesting to compare different marine RIs to get a sense of different scale of activities.

- Euro-Argo[1] has a total budget in 2022 of 866 k€, central procurement of floats excluded (2500 k€ considering all the national Argo Programs) ;
- EMSO ERIC[2] has a budget of 1,2 M€, of which 280 k€ of member fees, and 450 k€ from projects;
- EMBRC[3] has a membership contribution of 1,549 k€, and 113 k€ from projects;
- The ICOS[4] overall annual budget including all parts of the RI was over 30 M €.

These MRIs have been operating for a long time and it is irrelevant to think that right from the beginning, GROOM RI should have the same size. It would start small and grow with time.

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[1] https://www.euro-argo.eu/content/download/167491/file/EA-ERIC-2022-Annual-Report.pdf
[2] https://emso.eu/wp-content/uploads/2023/10/WEB_EMSO_ANNUAL_REPORT_2022.pdf
[3] https://www.embrc.eu/sites/default/files/publications/Annual%20report%202022_EMBRC.pdf
[4] https://www.icos-cp.eu/ICOS_RI_FinancialReport2022

3. Operational organisation
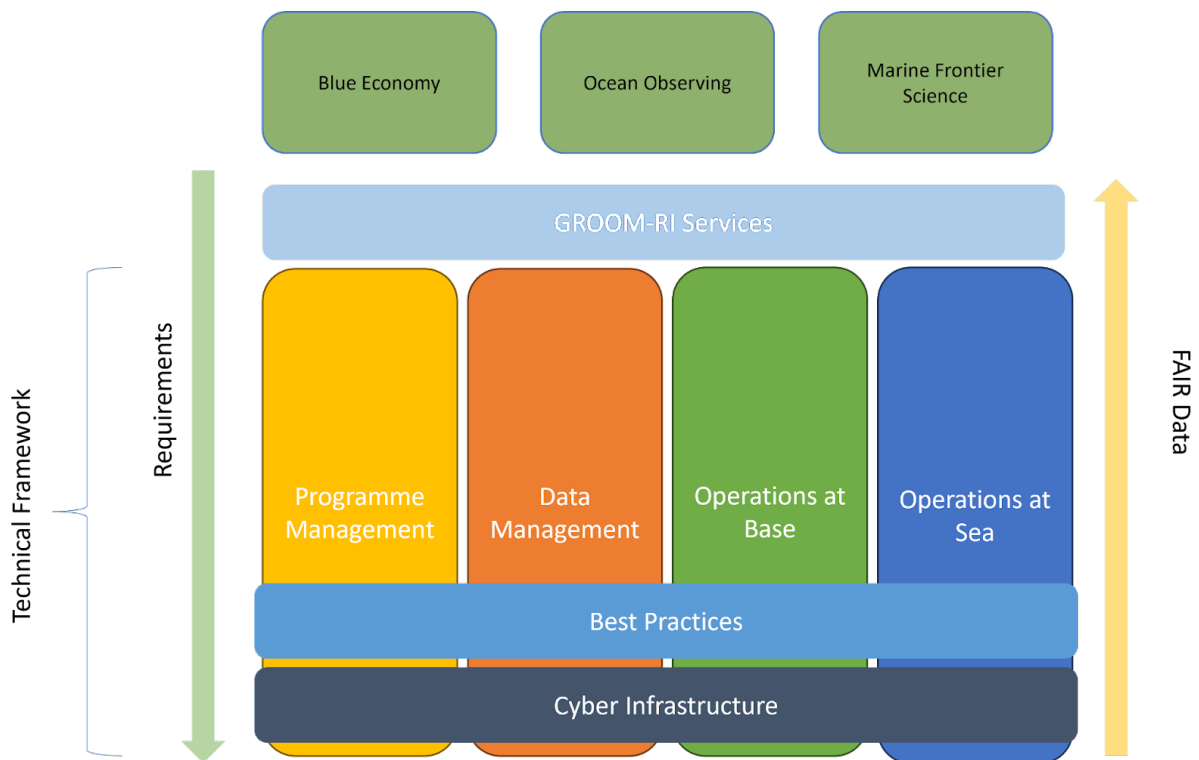
Figure 2 - GROOM II technical framework

As described in D6.1, The infrastructure relies on four pillars: programme management, data management, operations at base and operations at sea, and two horizontal workstreams: best practices and cyberinfrastructure. This proposed technical framework will allow the RI to provide the services that were developed in D5.1 Glider services for public and private needs, which comprises core services that the RI will provide, both internally and to external stakeholders, to improve MAS operations quantitatively and qualitatively.

Figure 3 - The MAS Workflow: the activities needed around MAS operations match the framework pillars

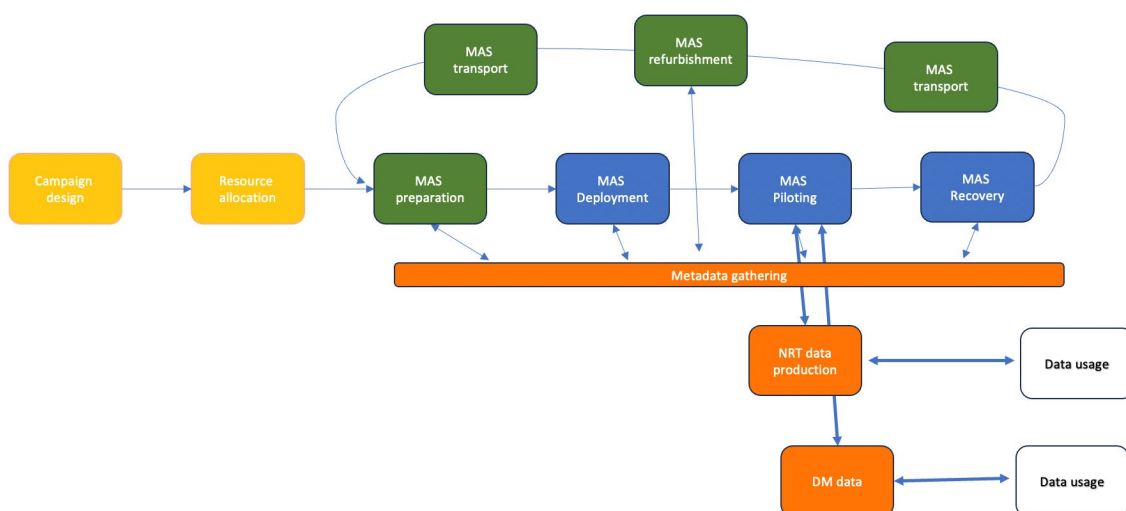## 3.1. SERVICES

GROOM RI aims at supporting MAS activities by coordinating the nodes and facilitating exchanges between the nodes and providing fit-for-purpose tools. This will allow simplification, standardisation and homogenisation, avoid duplication, as well as answering the European Ocean Observing requirements. This added-value will cover the expenses of the central hub.

The next schemata explains where each service will be performed, whether by the central hub, the nodes or a coordination between nodes, for internal (to the GROOM RI partners) or external partners or the whole MAS operators community.
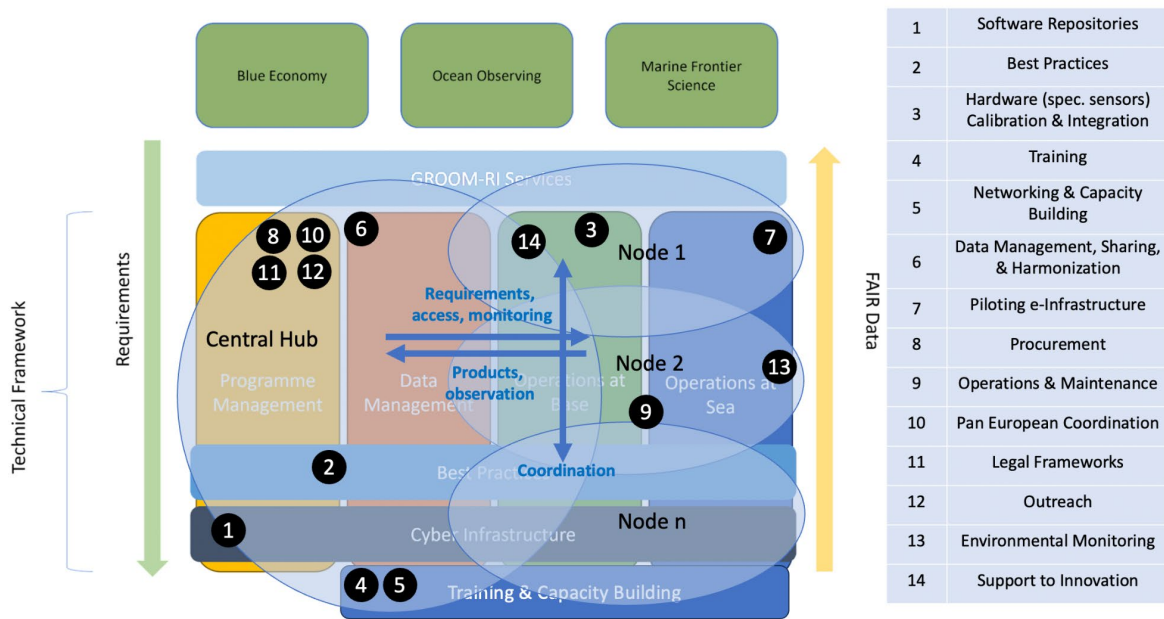

Figure 4 - GROOM RI: from a technical framework to delivering services

We can separate the services between the 'core' services, subdivided into 3 categories, and external services, all of which are summarised in the following subsections.

3.1.1. Services centralised in the Central Hub for the whole community

1 - Software repositories	2 - Best Practices	6 - Data Sharing and Harmonization
7 - Piloting e-infrastructure	8 - Procurement	10 - Pan European Coordination
11 - Legal Frameworks	12 - Outreach	

These services aim at:

- Providing the community with **dedicated, state-of-the-art and fit-for-purpose tools (1, 7) and guideline (2, 6)** for MAS operations;

- Ensuring a **central role and an entry point (10, 12, 8)** to the community;

- Facilitating **users' activities (11)** with regards to legal clearance.

These services require Human Resources that will be hired in the Central Hub, and rely on a digital infrastructure that will be built on the Central Hub's host and already developed cloud solutions (e.g. OceanGliders github repositories for Best Practices).

Focus on Maritime regulations Challenges

Maritime regulations represent specific challenges which the GROOM RI could help alleviate to support the effective running of operations. For all operational oceanography, Marine Scientific Research (MSR) clearance process issues are incompatible with sustained ocean observing activities and limit the extent of the observing undertaken by the major networks in a number of important areas of the global ocean. There is no consistency in the practice among coastal States in response to applications for consent to conduct MSR in areas under national jurisdiction, in particular the EEZ. The information required by one State is not the same as another. MSR clearance is often impossible to obtain in zones where EEZs are disputed.

Areas under national jurisdiction cover over one-third of the ocean and are therefore essential for an effective global ocean observing system. The 1982 United Nations Convention on the Law of the Sea (UNCLOS) provides the legal basis for maritime areas such as territorial seas and exclusive economic zones (EEZs), which are areas under national jurisdiction with different rights and obligations for States and international organisations. The concerns expressed by the scientific community raise important issues of legal clarity.

Also, MAS are new platforms and there has not been any procedure developed to get legal clearance yet. This concerns mostly the surface vehicles that are rapidly developing and that can be of all size and range, which complexifies the process.

For example, new observing technologies, such as gliders, are being used to operationally sample within storms and hurricanes in order to provide vital in situ profiles of the heat content of the water column. It is obviously not possible to state for such operations exactly where the observations will take place six months in advance, although a region of activity could likely be indicated. This information has been shown to significantly improve the prediction of the violent storm strength in

several parts of the global ocean, which is becoming increasingly important where large areas of coastal population are threatened by violent storms on an annual basis.

In Europe, there is no EU competence on MSR and an EU Member State must go through its European neighbour's clearance procedure to work in its EEZ. Fisheries are regulated by the European Union and therefore have a different regulation. Stock abundance research for fisheries is not considered MSR but under the sovereign jurisdiction of the coastal State.

Although there is no EU marine space in general and the EU has no official competence on this issue, a project for a simplified procedure for the Member States of the EU was discussed in the past but never accepted. Structures such as EuroGOOS and the European Ocean Observing System (EOOS) support coordination at a EU level. These clearances are really embedded in the local (national and regional) geography, and as such engaging with the Regional Operational Oceanographic Systems (ROOS) could be a first way to tackle this issue.

GROOM RI could help in this regard:

- by facilitating operators demands for clearance: keeping track of successful demands, providing support and documentation to the operators;

- by participating in the elaboration of a general context that simplifies access at sea, lobbying at European and Global level (along with EuroGOOS, WMO, and IOC) to generate a clear process that simplifies access at sea for MAS.

One success that has been developed is the Argo Notification scheme. Floats have been recognized as non-steerable, and therefore can drift in other nations EEZ. When this happens a notification is sent to the national Argo PI, that can accept or shut down the float.

Although the solution in itself is not compatible with MAS (that are steerable), a similar method as the one led by IOC, that managed to create a Member State agreed framework and mechanism for the provision of data from the global Argo Programme from floats that drift into EEZs, in compliance with UNCLOS, could be developed through GROOM RI and would answer several partners' needs and expectations towards the GROOM RI.

GROOM RI, once formally established with a legal status (especially ERIC), would acknowledge the operational value of MAS at European level and act as a strong catalyst for unified and clarified legal clearance at EU level.

3.1.2. Services provided by the nodes for the whole community

4 - Training
5 - Networking and Capacity Building
14 - Support to Innovation

These services aim at:

- Ensuring that expertise in the consortium is shared to other partners;

- Developing new capacities;

- Enhancing observing technological capabilities.

The requirements, the technology and the capacity of each institute is growing rapidly, pushed by the increased anthropogenic pressure on the oceans and seas, the decarbonisation of the Ocean Observing Systems and the development of the autonomous capacities. GROOM RI, by coordinating the support to innovation, will ensure that technological developments will be fit-for-purpose and answer scientific needs, allowing to build solid private-public partnership and acting as a common voice for the GROOM RI members. It will then support the nodes providing training and capacity building activities in line with the gap detected by the GROOM RI members. In a nutshell, by having a global vision of the activities, in terms of deployment, operations, capacities and innovation in Europe, GROOM RI will ensure that the progress is spread throughout European institutions and in line with the EC requirements.

3.1.3. Services provided by the nodes for specific users

3 - Hardware calibration and integration
9 - Operations and Maintenance
13 - Environmental monitoring

These services are provided internally and externally with the same characteristics as the external services described in the next part of this document.

3.1.4. External Services

Five key sectors were identified to focus marine autonomous systems (MAS) External Services over a time span from present day to 5 to 10 years into the future, as described in detail in "D5.1 Glider Services for Public and Private Needs". The five key sectors include:

- Fishery Management and Scientific Support

- Marine Renewable Energies

- Climate Observations

- Statutory Ecosystem Monitoring/Assessment Ecosystem Stressors

- Operational Monitoring for Good Environmental Status (GES) and Emergencies in the Ocean

These services are already performed by institutes in Europe, but by being performed under the GROOM RI umbrella, nodes will benefit from the whole GROOM RI ecosystem, assuring that both nodes and users follow a given set of rules detailed in D2.1: GROOM RII access policy and WP2 rules.

3.2. GROOM RI ACCESS AND POLICIES

By agreeing to be part of GROOM RI, both the nodes and the users, while benefiting from the RI's environment and capacity, will comply with a list of rules that ensure the quality and efficiency of the proposed services.

3.2.1. Rules for the nodes

- If the access generates observations, the data must follow FAIR and be open. Exceptions to this rule will be considered if there is an apparent reason for not opening the data (e.g., a test of a new commercial sensor).
- If the access generates observations, a data management plan must be created.
- The GROOM Nodes providing facility access must follow the GROOM RI-approved working practices and the GROOM RI-endorsed best practices.
- While nodes are free to define which services they offer, once they do, they must treat users fairly and in a non-discriminatory way in compliance with the future GROOM RI ethics policy. The latter has not yet been defined, but will be compliant with the code of conduct for Research Integrity.
- Nodes will provide clear costings to users following a GROOM RI standard costing template.
- Nodes will establish the appropriate start and end times for facility access. Likewise, it will ask for the necessary documentation to support and justify access. This documentation will explain the type of service provided and provide a record of the users' names, nationalities and home institutions.
- Nodes must have clear and documented terms and conditions specific to the services they offer. Those terms and conditions must specify the consequences for failed missions or loss of assets.

3.2.2. Rules for the users

- If the access generates observations, the data must follow FAIR and be open. Exceptions to this rule will be considered if there is a clear reason for not opening the data (e.g., a test of a new commercial sensor).
- If the access generates observations, a data management plan must be created. This is the same rule as the one that the nodes. There will be a single data management plan for both the node and the users.
- GROOM RI will have an ethics policy. Users must comply with that policy.
- Users must agree to the local rules of the Node.
- The applicant, or most applicants within a group, must be employed by an organisation established in an EU Member State or an associated country.

This will ensure trust that the operations performed are cost-effective and provide high-quality results.

3.2.3. Access to the RI's services

The Central Hub will coordinate and facilitate access to the distributed RI. At this stage, 2 access models to the RI are being considered:

The first, **market driven access model**, acknowledges the diversity of the GROOM RI partners and the different access constraints associated with each. In this approach, similar to the EMBRC system, the GROOM RI would act as a facilitator between the potential user and the individual glider facilities. The final contractual relationship would be between the user and the individual glider facility.

The second, **excellence driven access model**, would be used for situations where the GROOM RI is funded (e.g. through European projects) to provide free or subsidised access to the facilities. In this model the GROOM RI would sub-contract the individual glider facilities using pre-arrange agreements between the RI and the individual glider facilities.

While the market driven access model will require only light touch implication of the Central Hub, being the entry point and a third party between the user and the node performing the activity, the **excellence driven access model** requires that an expert group be set up to analyse and validate the applications.

3.3. KPIs, MONITORING AND REPORTING

Monitoring an activity is important and KPIs are important tools for that. As of right now, the MAS activity in Europe has been scarcely monitored due to a lack of resources. GROOM RI will improve the monitoring due to:

- Harmonisation and standardisation of the data streams. Having standard data flow will improve the overall FAIRness of the European MAS operations, facilitating the monitoring.
- Providing personnel dedicated to this task in the central hub.

KPI's to be set up by RI have been presented and discussed in D3.2 : Financial sustainability at Regional, National WP3 and EU levels. The following table has been designed to assess where the different services provided by GROOM RI will impact the different objectives to be quantified by quantitative and qualitative objectives proposed by the ESFRI Working Group (2019)[5].

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[5] ESFRI Working Group (2019)

Table 1 - Impact of the GROOM RI services on the ESFRI objectives

	Enabling scientific excellence	Delivery of education and training	Enhancing collaboration in Europe	Facilitating economic activities	Outreach to the public	Optimising data use	Provision of scientific advice	Facilitating international cooperation	Optimising management of RI
Software Repositories	x	x	x	x		x	x	x	
Best Practices	x	x	x	x		x	x	x	
Hardware Calibration & Integration	x			x					
Training	x	x	x		x				
Networking & Capacity Building	x		x		x			x	x
DM, Sharing, & Harmonization	x					x			
Piloting e-Infrastructure				x				x	
Procurement				x					
Operations & Maintenance	x			x					
Pan European Coordination	x		x				x	x	x
Legal Frameworks		x							x
Outreach					x				
Environmental Monitoring	x						x		
Support to Innovation	x			x					

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4. The establishment of an RI

This project has concluded the need to establish a formal RI with dedicated means. The PI driven approach that has shaped the MAS activity in the last 2 decades has reached its limits to face the future requirement and the increase of activity that is required. The shape of the RI will depend on the capacity of the partners to engage, as the constraints in terms of human and financial resources are increasing, and most partners are already involved in multiple RIs.
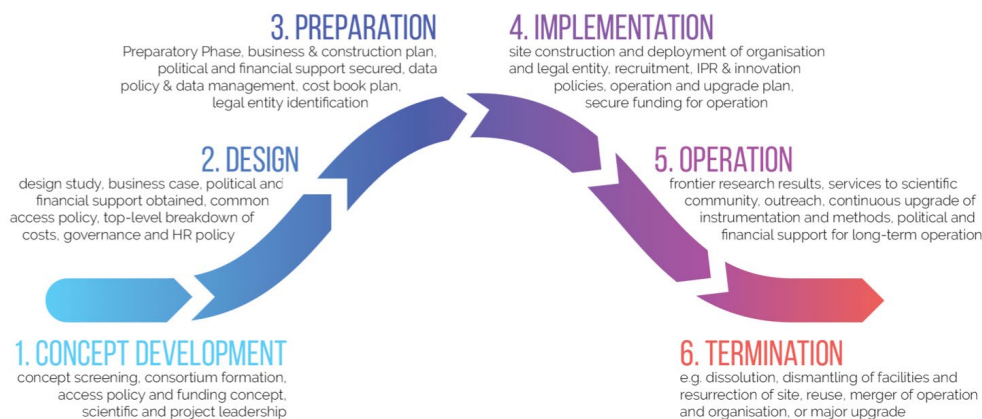

Figure 5 - Lifecycle approach of a research infrastructure

([ESFRI - Strategy report on research infrastructure 2021 roadmap -public guide](#))

Recently, EC pushes for integration and development of synergies of the MRIs. The possibilities for merging have been investigated and this question is not mature yet, due to different reasons:

- Euro-Argo ERIC applies the OneArgo line of conduct and is bound to concentrate to Argo floats, even when considering the similarities between the platforms;
- EMSO ERIC has investigated adding gliders to complement the spatial resolution of their sites, but the outcome was negative;
- JERICO RI operates gliders, but the restriction to coastal zones would limit GROOM RIs range of actions. Being a thematic RI, synergies and complementarity are evident and both have an important role to play together;
- EuroFleets is an interesting option, and a MoU has been signed during the project, but discussions have not gone further.

While merging can be described as a very strong step that is not possible yet, creating synergies and building on similarities between RIs is key. In that sense, the technical framework designed for GROOM is highly interoperable and can interact with some of the key marine observing RIs.

AMRIT, which derives from GROOM II, is a great step in that movement toward more synergies. And to have RIs working together, they need to be established.

4.1. POSSIBLE LEGAL STATUS

The legal status of the GROOM RI will apply to the Central Hub, and the members linked to the Central Hub through service agreements. Among the multiple options, one main difference is based on the type of partners that can be part of the RI, whether institutions on nations.

The different possibilities are detailed in *D3.2: Financial sustainability at Regional, National and EU levels.* The 2 remaining options are: trying to set up an ERIC or an AISBL (or any other association type). Nowadays, the EU is pushing to consolidate RIs, and establishing a heavy ERIC, although beneficial in the long term for the community, might not be the best way. The landscape is evolving rapidly, and the ERIC timeline limits the visibility for the future RI which will have to adapt to the changes.

These 2 options offer different timelines which means that they are not incompatible, with the possibility to set up an AISBL and provide a minimum viable product with core services, while at the same time implementing the ERIC benefiting from the ESFRI environment.
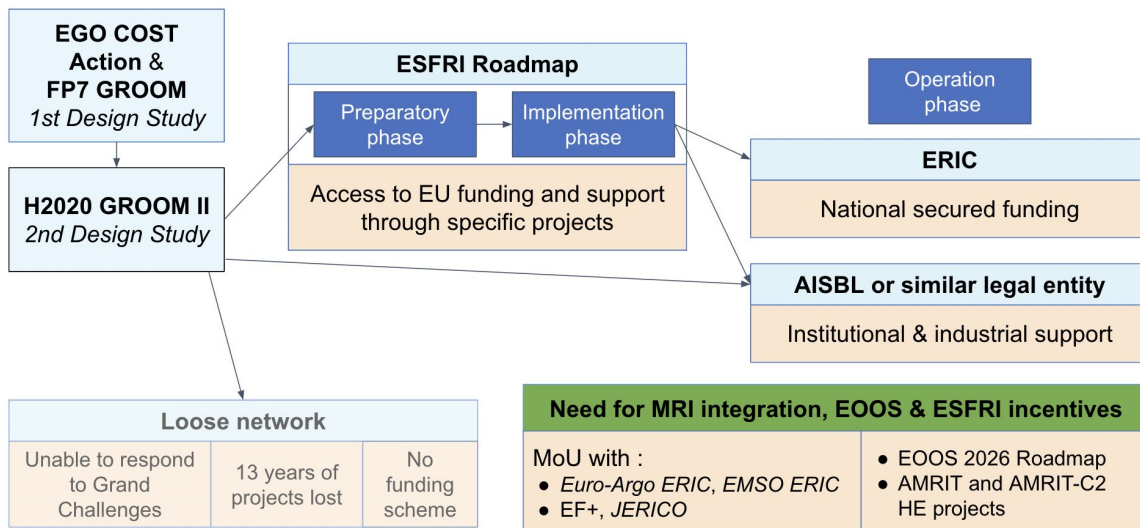

Figure 6 - Possible next steps after GROOM II

The final General Assembly was held in Southampton at the beginning of March 2024, with a review of the capacity and possible involvement from institutions/countries in the next steps required to set up the GROOM RI. GROOM II established a clear case to base the reflection on whether or not an application for the 2024-2025 roadmap should be set up. Investigations are pursued to host the central hub in the UK, which would be the leading country, and the leader of an ESFRI application.

4.2. THE ESFRI ROADMAP

The ESFRI roadmap is a strategic instrument that outlines the long-term development of pan-European research infrastructures. This roadmap, updated regularly, identifies priority areas for the development and coordination of major facilities and resources across European countries. The goal is to enhance collaboration, efficiency, and impact in various scientific and research domains. ESFRI focuses on infrastructures that are essential for addressing societal challenges, fostering innovation, and advancing scientific knowledge. The roadmap serves as a guide for member states, the European Commission, and other stakeholders in allocating resources and investments. It covers diverse fields such as energy, environment, health, and technology. Inclusion in the roadmap signifies a commitment from member countries to support the construction and operation of specific research infrastructures. ESFRI promotes cooperation between nations and the integration of research efforts, fostering a more cohesive European research landscape. The roadmap reflects a collective effort to address complex scientific questions and promote the sustainable development of research infrastructures across Europe. It plays a crucial role in shaping the future of European research and innovation by identifying and prioritising projects of strategic importance.

4.3. SETTING UP AN AISBL

Establishing a lighter RI more rapidly is an interesting way to continue the dynamic created within the GROOM II consortium, as well as engaging with other European partners (e.g. Italy). Thanks to GROOM II, most countries in Europe are building a cohesion roadmap at national level that will impact the timeframe of GROOM RI. Although an AISBL requires participation at institutional level, developing an infrastructure in line with the national roadmap is of prime importance.

It would require a few months to set up a final business case, articulating the partnership and defining the size of the central hub, depending on the in-kind contribution of the leading country, the membership fees and the capacity to get other funding sources, starting with the minimum capacities and expanding along the way.

5. Conclusions

The case of a GROOM RI has been well acknowledged over the years and refined during the GROOM II project, and most people are convinced of the place and the need of a GROOM RI in the future. This project has helped the community to converge on a common understanding of what this RI harnessing MAS capabilities should do.

The future GROOM RI will be offering services to the wide community of MAS users, to its partners and to external stakeholders, for the benefit of Marine Frontier Science, Ocean Observing and the Blue Economy. It will be provided by a coordination of the nodes and the central hub, following defined rules to ensure the highest quality and efficiency possible. One of these services is to develop solutions with regards to obtaining legal clearance to put platforms at sea. As of today, this depends from country to country, and is very cumbersome and lacks clarity. By working on a solution at European level, as well as providing support to operators when requiring access at sea.

The distributed infrastructure will implement a clear governance, similar to what is in place in other MRIs, dedicated to ensure the good functioning of the RI, taking responsibility of the strategic direction (Advisory Board) and the day-to-day operations (Executive Board), monitoring the activity (KPIs) and developing the global capacity of the RI, based on the nodes' capacities.

Different working groups will be set up to tackle specific topics, and in-kind contribution from the partners in expert personnel time, to both these working groups and other entities (EuroGOOS GTT and Oceangliders) will be set up to ensure sustainability of these initiatives. This will also ensure the global uptake of the progress made in the GROOM RI, by using these entities with a large footpring to reach to different groups.

Setting up an RI is a long and complex process, and a consensus has been reached that GROOM RI should start small with a Minimum Viable Product containing the principal services and grow from there.

6. References

 D5.1 : Glider services for public and private needs

Lifecycle approach of a research infrastructure:
ESFRI - Strategy report on research infrastructure 2021 roadmap -public guide

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