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## **NI4OS-Europe**

National Initiatives for Open Science in Europe

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### Deliverable D3.4

## Best practices for on-boarding and related policies 2<sup>nd</sup> version

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**Abstract:** Deliverable D3.4 – Best practices for on-boarding and related policies 2<sup>nd</sup> version – builds upon the first version of the deliverable, describing the upgrades and the changes of the on-boarding process and policies. Practicing the proposed model in the previous version led to identifying points where it could be enhanced and updated.

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## References

- [1] Project NI4OS-Europe-857645 - Annex I - Description of the Action
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## List of Acronyms

<b>AAI</b>	Authentication and Authorization Infrastructure
<b>API</b>	Application Program Interface
<b>EOSC</b>	European Open Science Cloud
<b>FAIR</b>	Findability, Accessibility, Interoperability, Reusability
<b>FitSM</b>	Federated IT Service Management
<b>ITSM</b>	IT Service Management
<b>ORDM</b>	Open Research Data Management
<b>OS</b>	Open Science
<b>REST</b>	Representational State Transfer
<b>SCORM</b>	Sharable Content Object Reference Model
<b>SRIA</b>	Strategic Research and Innovation Agenda



## Executive summary

### **What is the focus of this Deliverable?**

The main focus of this deliverable is to follow up on the changes in the EOSC on-boarding best practices and policies, as well as the lessons learnt from the first set of on-boarded resources through the NI4OS-Europe[1] project. It builds on the D3.1 [2], the first version of the deliverable, highlighting the changes and updates in the originally proposed on-boarding procedure. Additionally, new recommendations regarding the policies that accompany the on-boarded resources are addressed in this deliverable.

### **What is next in the process to deliver the NI4OS-Europe results?**

The updated on-boarding procedure, as well as the accompanying policies and templates, will provide better and smoother on-boarding of the majority of the services that is expected to be done in the second half of the project. The initial set of services was on-boarded using the procedures defined in D3.1 [2] and D5.1 [3]. The lessons learnt from these on-boarded services are reflected in this deliverable. The on-boarding checklist defined in this deliverable simplifies the process for the service providers. The updated procedure will be used to continue on-boarding resources from the regional service providers to EOSC.

### **What are the deliverable contents?**

The first part of the deliverable gives a short overview of the changes in the EOSC governance model. It also describes how the Rules of Participation evolved from the RoP WG to the Task force of Rules of Participation Compliance Monitoring within the Implementation of the EOSC Advisory Group. The second part focuses on the necessary set of policies identified as mandatory for the services to be on-boarded. Different types of policies and their key elements are presented, as well as recommendation for improvement of the policies of the already on-boarded services. Next part of the deliverable describes the specific elements of the practical on-boarding. Changes and updates of the monitoring and accounting systems are described next, following with the conclusion.

### **Conclusions and recommendations**

Defining implementable rules for participation, as well as their translation to actual measures and procedures, accompanied by relevant policies are crucial for the on-boarding and adoption of the EOSC services by the end-users. The NI4OS-Europe project has provided necessary framework from both technical and organizational aspect to enable broader engagement of the regional service providers and users with the EOSC.

# 1. Introduction

The transition of the EOSC from the first, EC governed phase toward the second phase marked by the establishment of the EOSC Association, represented a significant change in the EOSC governance. The newly formed bodies of the Association, including the Advisory groups and the Task forces are expected to give significant contribution to the development of the policy framework for EOSC. The input from the implementation projects is invaluable, providing hands-on experience in implementing the current guidelines as well as providing feedback for their enhancement.

NI4OS-Europe team has identified a set of necessary policies that resources have to produce and publish, clearly stating to the users the ways these resources could be used, as well as the actions that are not allowed. Depending on the service, detailed privacy policies are required, showing what user data is collected and how it is used by the providers.

By offering service providers a clear procedure for on-boarding, NI4OS-Europe project partners will be able to on-board more services with pan-European significance. Describing the procedure in the form of a checklist makes it easy and simple to follow, removing barriers toward the process of service integration and on-boarding.

Monitoring and accounting are key activities for tracking the availability and the usage of the on-boarded services. The NI4OS-Europe monitoring team has been working on the development of new probes to address the monitoring of different types of resources within the well-established ARGO monitoring platform.

The in-house developed accounting platform is constantly being upgraded to include accounting for various types of resource usage. The current efforts are focused on the development of modules to process the accounting data from cloud computing resources as well as repositories.

## 2. Rules of participation

Building a complex ecosystem like EOSC requires strong policy foundation. In the previous period, the policy development in EOSC was done in parallel with the implementation, leading sometimes to situations where implementations were in doubt how to proceed due to lack of relevant policy, which on the other hand led to building the policies based on the practical issues and obstacles that the implementation projects were facing.

### 2.1. Current EOSC development

EOSC is currently entering the second phase of its development. The first phase of EOSC implementation was EC governed, based on the 2018-2020 EOSC roadmap. The governance was supported by the two high-level Expert Groups, focusing on the vision for EOSC and on its practical implementation, as well as on FAIR data. This is also the period of the beginning of more than 35 EOSC related projects, addressing the policy and the implementation foundations of EOSC.

The period between 2019 and 2020 represented a transition of the EOSC governance model. The governance of EOSC was done by the Governance board and the Executive board. The Governance board consisted of representatives of member countries and associated states overseeing the transitioning of the EOSC toward the second phase, which was tasked to the Executive board. It represents expert group reporting to the European Commission forming part of the interim EOSC Governance, comprising eight individuals representing stakeholders and three independent experts. The third element in the EOSC governance on this period was the Stakeholder Forum, aimed toward the collection of input and provision of feedback on the implementation of EOSC via event and online consultations. To provide better foundations for the governance model, the Executive board of EOSC established six working groups:

- WG Architecture
- WG FAIR
- WG Landscape
- WG Skills and training
- WG Sustainability and
- WG Rules of participation

The WG Rules of participation produced the document called "EOSC Rules of participation" [4], stating the high-level principles guiding the EOSC participation. The key principles include openness, FAIR, ethical behavior and research integrity, as well as interoperability. It also provides the initial definitions of the most important terms in the EOSC ecosystem, such as users, participants, providers, resources and EOSC resources.

The second phase of EOSC implementation is based on EOSC Strategic Research and Innovation Agenda – SRIA [6] on EOSC. The SRIA goals to define the general framework for future strategic research, development and innovation activities of EOSC.

The establishment of the EOSC legal entity, the EOSC Association AISBL marks an important change in the EOSC governance model, shifting it from the EC toward the members of the Association. The new governance model includes the General Assembly, the Board of Directors, and the Secretariat. The General Assembly is composed of the

members and observers and is the supreme authority of the Association. The Board, led by the President, directs the activities of the Association by implementing the decisions adopted by the General Assembly. The Secretariat, led by the Secretary General, supports and advises the President and the Board as well as the General Assembly, and coordinates implementation of their decisions.

In the SRIA, EOSC Association as a legal entity, is responsible for the RoP, including their monitoring, enforcement and periodic review and updating, ensuring their impact is understood and that they respond to the requirements of the maturing EOSC.

The Association has established five Advisory Groups (AGs) focusing on overarching themes that are important for the realization of EOSC. Each group consist of Task Forces (TFs) working on specific topics related to the Advisory Groups [7], as shown below:

- Advisory Group - Implementation of EOSC
  - TF PID Policy and Implementation
  - TF Researcher Engagement and Adoption
  - TF Rules of Participation Compliance Monitoring
- Advisory Group - Technical Challenges on EOSC
  - TF AAI Architecture
  - TF Infrastructure for Quality Research Software
  - TF Technical Interoperability of Data and Services
- Advisory Group - Metadata and Data Quality
  - TF FAIR Metrics and Data Quality
  - TF Semantic Interoperability
- Advisory Group - Research Careers and Curricula
  - TF Data Stewardship Curricula and Career Paths
  - TF Research Careers, Recognition, and Credit
  - TF Upskilling Countries to Engage in EOSC
- Advisory Group - Sustaining EOSC
  - TF Defining Funding Models for EOSC
  - TF Long-Term Data Preservation

Within the AG Implementation of ESOC, a task force on Rules of Participation Compliance Monitoring was initiated. NI4OS-Europe project supported the writing of the draft charted of this TF [5]. The main aims of the TF include bridging from the high-level principles of the RoP WG toward a more practical EOSC implementation criteria, as well as defining the levels of monitoring to these entry requirements.

## *2.2. Adopting the RoP in NI4OS-Europe*

As described in the D3.1 [2], the NI4OS-Europe project defined the on-boarding procedure bridging the gap from the high level RoP principles toward the operational steps needed to be undertaken by the resource providers to on-board their resources to EOSC.

Using this procedure, an initial set of services was on-boarded in the NI4OS-Europe catalog system.

The lessons learnt from this initial set of on-boarded services was conveyed to the task force Rules of Participation Compliance Monitoring as practical experience. Chapter 4

describes in more detail the technical checklist used to simplify the on-boarding process for the service providers.

## 3. Policies review and enhancement

A key requirement for the resource on-boarding within the NI4OS-Europe project was the existence and visibility of relevant policies for the services to be made EOSC available.

The policies included the Terms of use policy, the Privacy policy and the Access policy. Only services that provide all those policies are considered for on-boarding. Services currently working on the policy documents have the status "Candidate" and once the policies are provided and verified, they can be considered for on-boarding.

### 3.1. Status of the policies

The NI4OS-Europe services can be accessed through the following access policies:

- Policy-based: users are granted access based on policies defined by the resource providers; such policies usually apply to resources being offered with "sponsored use" to meet some national or EU level objective; for instance, a country may offer resources with "sponsored use" to support national researchers involved in international collaborations.
- Wide access: users can freely access scientific data and digital services provided by resource providers.
- Market-driven: users can negotiate a fee to access services either directly with resource providers.

For example, a policy-based access is provided to the cloud resources, such as FINKI Cloud, with terms of use/access policy given [here](https://openstack.finki.ukim.mk/assets/terms-of-use.html) (<https://openstack.finki.ukim.mk/assets/terms-of-use.html>).

On the other hand, web based computational services such as DREAMM or FEPREPREPARE have wide access [policies](https://catalogue.ni4os.eu/pdf/FEPPrepare-Terms_of_use.pdf) ([https://catalogue.ni4os.eu/pdf/FEPPrepare-Terms\\_of\\_use.pdf](https://catalogue.ni4os.eu/pdf/FEPPrepare-Terms_of_use.pdf)).

The NI4OS-Acceptable use policy template offers the service providers a blueprint to specify their specific usage rules. The core of the policy is the set of requirements that includes statements such as:

- You shall only use the Services in a manner consistent with the purposes and limitations described above; you shall show consideration towards other users including by not causing harm to the Services; you have an obligation to collaborate in the resolution of issues arising from your use of the Services.
- You shall only use the Services for lawful purposes and not breach, attempt to breach, nor circumvent administrative or security controls.
- You shall respect intellectual property and confidentiality agreements.
- You shall protect your access credentials (e.g. passwords, private keys or multi-factor tokens); no intentional sharing is permitted.
- You shall keep your registered information correct and up to date.
- You shall promptly report known or suspected security breaches, credential compromise, or misuse to the security contact stated below; and report any compromised credentials to the relevant issuing authorities.

- Reliance on the Services shall only be to the extent specified by any applicable service level agreements listed below. Use without such agreements is at your own risk.
- Your personal data will be processed in accordance with the privacy statements referenced below.
- Your use of the Services may be restricted or suspended, for administrative, operational, or security reasons, without prior notice and without compensation.
- If you violate these rules, you may be liable for the consequences, which may include your account being suspended and a report being made to your home organisation or to law enforcement.

The privacy policy is relevant to the services that collect user data, in most cases using the NI4OS-Europe Login AAI service. The basic privacy policy of the AAI service is given [here \(https://aai.ni4os.eu/privacy/en/\)](https://aai.ni4os.eu/privacy/en/). Other service builds their policies based on this policy, depending on the data they request from the IdP and/or from the user.

Currently, all the services that have status "on-boarded" have all the required policies in place.

### *3.2. Recommended changes*

To increase the quality of the policies, leading to better user understanding of the underlying services, the project recommends the following steps to be undertaken by the services providers

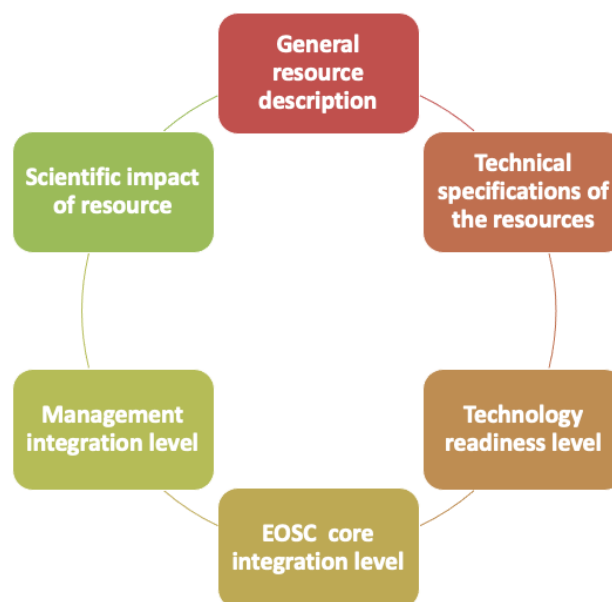
- Changes in the hosting of the policies. Initially, the hosting of the policies was provided either by the technical wiki or the service catalog. To provide self-sustainability of the services, as well as increased control over their usage, we recommend that all policy documents (where available) should be hosted at the same location as the services. For the web based thematic services, this means the same web server. For the API based services, the policies should be hosted at the same server, and linked at the documentation (swagger) page.
- Making the policies more specific and closely related to the service they refer to.

The WP3 team will continue to support the service providers in developing and upgrading their policies in order to provide clearer understanding from the end-users of the services capabilities and limitations, as well as to help them use these resources for the research activities.

## 4. On-boarding procedure in practice

Although the EOSC is an inclusive environment, some concrete procedural and technical rules of participation are imposed by the FAIR principles and by the architecture of the pre-production environment (EOSC core layer). Within the NI4OS-Europe, we transformed the participation principles into a set of technical requirements to be satisfied by resources in order to be exposed through the catalogue. This transformation is performed using the on-boarding methodology that we have developed D3.1[2], D5.1[3] and that identifies the main aspects of resource description. Each aspect is organized hierarchically into the levels based on the EOSC core integration complexity and the necessity for a particular integration. In this way, we can identify a minimal integration level between the EOSC exchange and core layers to be satisfied by resources.

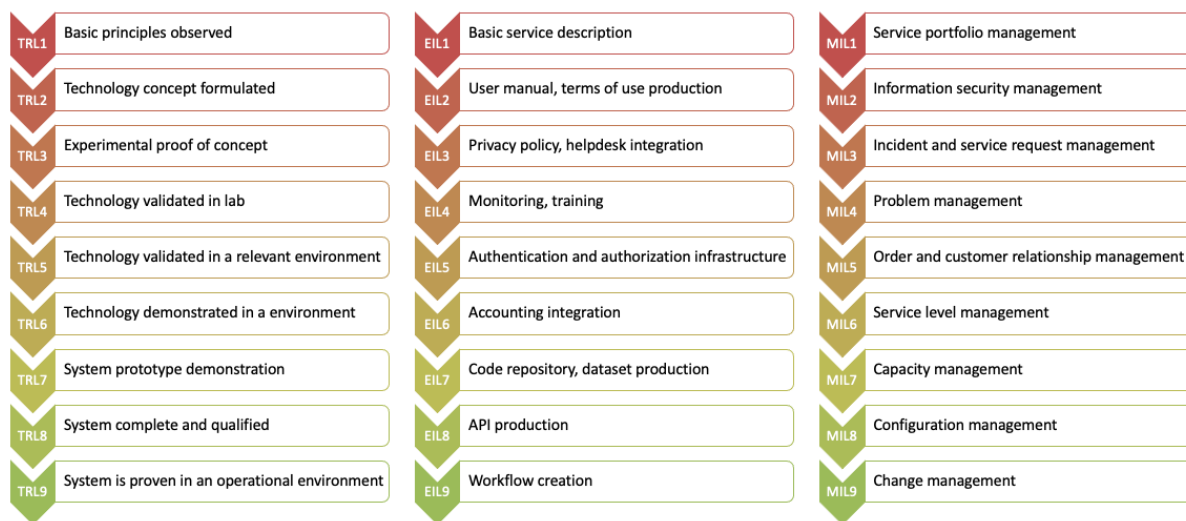
We identified the main aspects of the resource description during the landscape analysis at the beginning of the project D5.1[3]. We aimed to structure collected information and identify criteria for the on-boarding. In this process, we ended up with six different aspects of a resource description illustrated in Figure 1. The first aspect is general resource description that accumulates basic, marketing, classification, location, and service provider-related information. The second aspect is the technical specification of the resource, resource capacity in terms of CPU-cores, GPU-cores, storage capacity, number of datasets, etc. To assess the resource development stage, we reused EU-TRL[14] the concept of Technology Readiness Level (TRL). Following the same approach, as a fourth aspect, we have introduced EOSC Integration Levels (EIL) to estimate the level of integration of a particular service with the pre-production environment. A fifth aspect is related to placing various resource management perspectives on an equal footing. This is done by following the FitSM standardization [8] to measure the resource management development. All these levels are organized gradually (from 1 to 9) based mainly on the integration complexity and the necessity for a particular integration. Besides these five technical aspects, during the on-boarding process, the scientific impact of a particular resource is also equally considered.



**Figure 1: Different aspects of resource description in NI4OS-Europe**



Following the concept of integration levels, we defined the minimal requirements for the resource on-boarding within the NI4OS-Europe: the existence of a users' manual, terms of use, privacy policy and access policy, integration with the helpdesk system, the configuration management database, and the monitoring system. In terms of the levels, we on-board resources with the technology readiness level 8/9, the EOSC integration level 4 and above, and the management integration level 3 and above, as illustrated in Figure 2. However, these should not be considered as a static set of rules. They reflect the current EOSC development stage and will evolve through the time following the EOSC expansion.



**Figure 2: Technology readiness, EOSC integration, and management levels in the NI4OS-Europe project**

All resource providers are encouraged to perform integration with the accounting system and AAI, or to produce service-specific monitoring probes, etc. At the moment, this is not required by the on-boarding procedure. If we compare these requirements with the EOSC ones, we will see that they are more rigorous, mainly because no integration with the EOSC federated core is required at the moment. However, we believe that this is very important because only deep integration with monitoring, accounting, and helpdesk system allows measurement of the technical performance of a particular resource. Based on these results we can confidently perform the assessment of resource's quality.

#### 4.1. From rules to technical checklist

The current EOSC rules of participation could be seen as one concrete implementation of the FAIR principles. However, to focus further development of individual resources towards the EOSC federation, we expressed the current rules of participation as a technical checklist to be followed by resource providers during the on-boarding process:

- **The creation of provider's AGORA account** is performed by the provider via AGORA catalogue [9] with the support of the on-boarding team member from a particular country, if necessary. Since AGORA is fully integrated with the project's AAI, the provider is authenticated with an institutional credential or social identity.

- **The authorization of provider's AGORA account** is done by an on-boarding team member from the corresponding country. Thus, practically, the role of a particular provider's account is changed from default (observer) to the provider admin role, which allows the provider to edit the corresponding provider information.
- The provider performs **provider registration** using AGORA. In this process, all EOSC profile's mandatory information has to be collected within AGORA, which includes: basic, classification, location, marketing, maturity, and contact information. The AGORA's interface is developed in a way that requires all EOSC profile's mandatory information to be entered before the form is submitted. This is an additional technical check of the collected provider's description.
- Once the provider description is completed, an on-boarding team member from the corresponding country performs a manual validation of the collected information and **publishes the provider information**. This is done by changing the provider's state from draft to published within the catalogue. After this step, it is possible to register resources that will be associated with a particular provider.
- **The creation of resource provider's AGORA account** is performed by the resource provider via the AGORA catalogue with the support of the on-boarding team member from a particular country, if necessary.
- **The authorization of resource provider's AGORA account** is done by an on-boarding team member from the corresponding country. Thus, practically, the role of a particular resource provider's account is changed from default (observer) to the resource admin role, which allows the resource provider to edit the corresponding resource information.
- The resource provider enters a **basic resource description** using the corresponding AGORA form, which follows the EOSC profiles specification. We collect basic, marketing, geographical and language availability, classification, maturity, and contact information in this process.
- For each resource that aims to be on-boarded, a **user manual** must be produced. This can be a document or a web page with instructions and guidelines on using a particular resource.
- If the resource has no **terms of use**, the resource provider must define one. To support providers, we prepared terms of use template and guidelines on how to prepare this document ([https://wiki.ni4os.eu/index.php/Terms\\_of\\_use\\_template](https://wiki.ni4os.eu/index.php/Terms_of_use_template)).
- If necessary, and if it is not covered already by terms of use, the provider can describe the **access policy** as a separate document. The main purpose of the access policy is to define criteria for access, target communities, etc. All on-boarded resources can be freely reached at the technical point of access. Some of them are entirely free to use services, while some of them have certain restrictions. Typically, academic resources are oversubscribed, and their capacity is limited, and therefore access is subject to prioritization. The access policy should clearly explain the access procedure, so that potential users know what to expect and how to apply for access.
- The **privacy policy** is another document that must be produced as a part of the on-boarding procedure. Here the information on how the resource collects, uses, and manages users' data, if any, must be provided. In general, we expect all resource providers to be committed to securing and respecting users' privacy, i.e., protect and secure users' data in compliance with all relevant regulations and

cultural, moral, and ethical norms. To support providers in the privacy policy preparation, we provided guidelines and a template document available at <https://app.box.com/s/vkl956p5tbql35nu3oqwvasm0w7gdjt1>.

- Typically, resources are used among multiple users in a shared way. The users' actions can have a serious impact on the system and affect other users. Therefore, the **acceptable use policy** must be defined to ensure proper and fair use of the resource and to prevent unauthorized or malicious use.
- Once the resource is fully described and equipped with the relevant policies, the on-boarding team member responsible for a particular resource initiates a **helpdesk integration** process by creating a corresponding ticket within the helpdesk. In this step, we create a dedicated support channel for the resource in the project's helpdesk system.
- **Integration with the monitoring system** starts with the registration of the resource within the configuration management database. Then, based on the type of resource specified within the configuration management database, the ARGO monitoring system executes a set of monitoring probes to measure the availability and reliability of the resource.
- Once the monitoring is activated for the resource, the on-boarding team validates the provided resource description, after which the **publication of the resource** within the catalog follows.

This technical checklist is produced to ensure that the minimum requirements for the on-boarding are met. However, all resource providers are encouraged to additionally perform integration with the accounting system and AAI, and to produce service-specific monitoring probes.

## 5. Technical guidelines

### 5.1. Monitoring

Monitoring of Services to be on-boarded and already on-boarded services is strongly encouraged as it ensures that services continuously meet quality criteria as defined by the EOSC Rules of Participation [4] and by the NI4OS-Europe deliverable [2]. NI4OS-Europe monitoring solution is based on ARGO Monitoring Service, a flexible and scalable framework for monitoring status, generating availability and reliability reports and raising alarms in case of service disruptions. NI4OS-Europe Monitoring Service consists of production [10] and development [11] instances.

A Detailed procedure [12] for enabling monitoring for on-boarded services in NI4OS-Europe was provided to Service Providers. According to this procedure services need to be listed in the topology system (GOCDB [13]) which includes the necessary set of information needed to monitor each service such as service endpoints, service types, the way they are organized, the service actors and contact points used to send alarms to the service owners. In addition, the following service attributes must be set: Production Status, Monitored and Notifications.

In order for a Service to be monitored, one needs to associate each service type with one or more Service Metrics. A service metric is a procedure that checks specific functionality of any given service. ARGO provides an interface for browsing existing probes ([https://poem.ni4os.eu/ui/public\\_probes](https://poem.ni4os.eu/ui/public_probes)) which can be associated with one or more service metrics and thus a service type. In case new probes are needed, ARGO team provides support to service providers in developing their own service-specific probes. Crucial in this process is development infrastructure where new probes can be thoroughly tested without affecting production monitoring.

In more detail, the procedure to enable monitoring for a service has the following steps:

1. GOCDB contains a service type for on-boarded service?
  - Yes: Service Provider adds service to GOCDB and ARGO automatically starts monitoring it.
  - No: Service Provider follows procedure for adding new service type to GOCDB, adds service to GOCDB & proceeds with the step 2.
2. ARGO contains probes needed for monitoring the new service type?
  - Yes: ARGO team enables relevant probes for the new service type.
  - No: Service Provider in collaboration with ARGO team develops new probes.

Services are monitored with probes compatible with flexible and widely adopted Nagios plugin format. Large number of probes for various services ranging from basic TCP or ping check, HTTP, SSH to more advanced application tests is available in public repositories (<https://exchange.nagios.org/>, <https://www.monitoring-plugins.org/>).

Examples of most commonly used metrics in NI4OS-Europe:

- Checks that a given service endpoint returns correct HTTP response
- Checks that a given service endpoint uses a valid digital certificate – issued by recognized Certificate Authority, non-expired, non-revoked and with matching hostname of the service.

For NI4OS-Europe pre-production services, each team provided its own probes:

- AAI - [https://github.com/rciam/rciam\\_probes](https://github.com/rciam/rciam_probes)
- Agora - <https://github.com/ARGOeu/agora-probes/>
- ARGO - <https://github.com/ARGOeu/nagios-plugins-argo>.

For generic HPC resources, monitoring of frontend or gateway machines is implemented by using standard SSH check. HPC resources monitoring will be further improved by adding monitoring of accounting data.

For generic cloud resources, OpenStack probes (<https://github.com/ARGOeu/nagios-plugins-fedcloud>) are used:

- Check that user compute interface to spawn test virtual machine and destroy it
- Check that uses object storage interface to create object and destroy it.

ARGO team developed a Nagios probe that can return different status based on defined text patterns found in HTTP response body (<https://github.com/ARGOeu/nagios-plugins-http-parser>). This probe is appropriate for thematic services that expose Web-API or services that provide API that reports internal state of the service.

## 5.2. Accounting

The changes we are working on for the accounting service are:

- Adding capability for the accounting service to monitor usage of repositories.
- Automating the capability for the accounting service to monitor cloud compute usage.

### 5.2.1. **Repository monitoring**

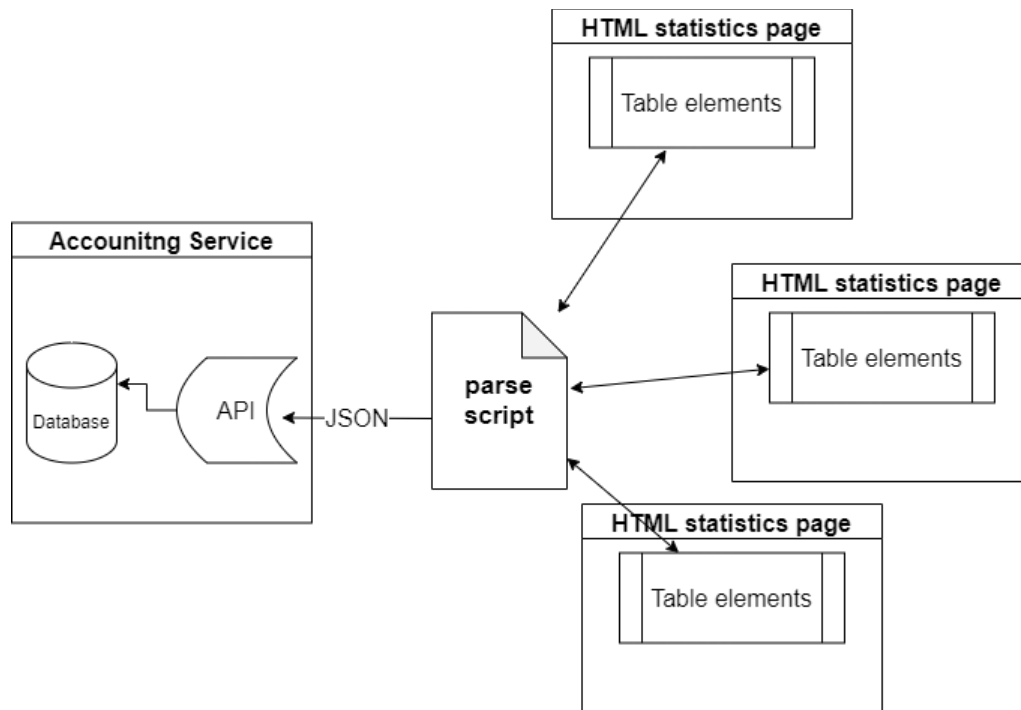
Repository monitoring for the purposes of accounting is a feature that automatically gathers usage information about certain web sites (repository services) of the type of: on which given month how much queries were made to the given sites, number of the unique users logged for the same month (if the users are not anonymous). The information is to be organized in a table format and it will be sortable and filterable.

The ways the accounting service is planned to gather data for repositories, shown in Figure 3, are:

1. A parser of the HTML reports of the given web service. The way this works is it cycles thru the HTML pages that report statistics (for example for the DSpace repository: <https://repository.ukim.mk/statistics> we can cycle from <https://repository.ukim.mk/statistics?date=2017-8> to <https://repository.ukim.mk/statistics?date=2021-6> by only changing the date in the url), and then for example we get the html element that holds the information we need (like the second element of a table row), we parse it and lastly we send it to the accounting repository API (in JSON format) which pushes the data to the accounting data base.

2. A parsing script that parses a log file (or files) from the given repository (e.g. log file from DSpace or logs from apache or nginx) and then sends it to the accounting repository API (in JSON format) which pushes the data to the accounting data base.
3. Directly make a post query to the accounting repository API with array of repository information – when service owners desire to use their own system for gathering usage information.

Note: the header of the POST query for the API must hold a resource key that only authorized people will have.



**Figure 3: Illustration of gathering data from HTML reports**

### **5.2.2. Cloud computing usage monitoring**

Cloud compute data monitoring for the accounting is a feature that will show accounting information about the usage of virtual machines from each cloud service provider of the type of: on which given month and for each provider how much virtual machines of which type were in use and the total usage of those machines (e.g. sum of CPU hours). The information shown will be in table format and it will be sortable and filterable.

The ways the accounting service shall gather data for cloud compute usage are:

1. By installing a parsing script on the cloud manage machine (which will run for example once a day) that will parse the cloud data report log file and send the data in JSON format to the accounting cloud API, which will push the data to the accounting data base.
2. By attaching an accounting appliance virtual machine which will have the necessary software to obtain data and publish it to the accounting service.

3. Directly make a post query to the accounting cloud API with array of cloud compute data information – when the service provider has their own established system for collecting accounting data.

## 6. Conclusions

EOSC implementation projects, like NI4OS-Europe, have a crucial role in the development of the complex EOSC environment. They provide significant input to the EOSC Association governance policy framework, and at the same provide platforms for practically verifying the framework through on-boarding of specific resources.

This deliverable covers the on-going changes of the EOSC governance model. It specifically focuses on the transition from the Rules of Participation, produced by the RoP Working Group toward the Rules of Participation Compliance Monitoring Task Force, established within the "Implementation of EOSC Working Group", as part of the changes within the EOSC governance.

Since policies have been identified by NI4OS-Europe as one of the mandatory elements that an EOSC ready service should have before being on-boarded, this deliverable also addresses the set of necessary policies, their structure, as well as proposals for their improvement.

Finally, the deliverable tackles the upgrades done within the NI4OS-Europe pre-production environment, with respect to monitoring and accounting. Monitoring of additional types of resources is presented, helping the service providers to integrate these monitoring elements with their services. Special attention is given to the API and web-based services, HPC and storage resources as well as cloud computing platforms. Regarding the accounting, this deliverable focuses mostly on the repositories and cloud computing infrastructures.

Proposed changes and upgrades of the on-boarding and related policies, as well as the enhancements of the pre-production environment are targeted toward more seamless and simplified on-boarding of the resources from the NI4OS-Europe partner countries, contributing to the development of EOSC as a truly pan-European infrastructure to support the scientific excellence.