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### **Policy Briefing**

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#### **Abstract**

This briefing for policy makers provides contributions based on the AARC TREE work, to EU policy goals and recommendations to inform future policy and programme developments.

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## Table of Contents

1. Introduction to AARC Initiative	3
1.1. AARC TREE Project	4
1.2. Key Exploitable Results (KERs)	4
2. Methodology for the AARC Policy Briefing	6
2.1. Target Audience	6
3. Policy Briefing and Recommendations	7
4. Conclusions	9

# 1. Introduction to AARC Initiative

The Authentication and Authorisation for Research and Collaboration (**AARC**) initiative was launched in 2015 to address the growing need for interoperable, scalable, and policy-aligned federated **Authentication and Authorisation Infrastructures (AAs)** to enable international research collaborations.

AARC champions **federated access** as the privacy-focussed and user-friendly framework to access services in the research and education community. When they try to access a federated resource, federated access kicks in: users are redirected to their own home organisation or Identity Provider (IdP), such as their university or research lab, where they authenticate using the familiar interface and authentication methods. Upon successful authentication, a limited set of information about the users (**minimum disclosure principle aligned with GDPR**) is transferred to the resource where the authorisation request started from; the resource provider uses this information to authorise access to the requested resource..

Over the years, federated access has become the preferred model, including in industry, where users can now log into different services using their Facebook, Apple, Google or Microsoft account, which work like Identity Providers. However these providers do not handle users' academic information (such as affiliation, a university email address, etc.) nor take users' privacy as their core goal.

AARC started its journey by focusing on developing a **Blueprint Architecture [BPA]** for federated AAI, which was the result of extensive dialogue with not only AARC project participants but major research collaboration and infrastructures in Europe and beyond. The AARC BPA defines an architecture consisting of a set of software and logical building blocks that can be used to implement federated access management solutions for international research collaborations. The BPA enables software architects and technical decision makers to mix and match their preferred components (following the BPA model) to build customised AAs that meet their requirements. Core to the BPA are a set of policies and technical guidelines that ensure that security and trust among all components is established and allow different AAs to interoperate with each other. The latter enables different research collaborations to share resources with one another.

It is important to note for the majority of the research infrastructures ,the AAI is not a core business, but an essential enabler for them to manage users and access to resources to carry out their research activities. e-Infrastructures exists in Europe and beyond with the aim to provide horizontal services (such as the AAI, network, and others) to their constituency. Three of the main e-infrastructures in Europe, namely EGI, EUDAT and GÉANT, have been engaged in AARC since its inception and are beneficiaries in the AARC TREE project as well.

The AARC BPA model, supported by the “Engagement Group For Infrastructures” (**AEGIS**), established in 2019, has become the reference model for many national research AAs, research and e-infrastructures in Europe, the Americas, and the Asia-Pacific region. In the last few years, the AARC BPA has become the reference model for large scale Initiatives such as EOSC AAI and EuroHPC AAI and Erasmus+ AAI.

## 1.1. AARC TREE Project

The AARC Technical Revision to Enhance Effectiveness [AARC TREE] project took the successful and globally recognised “Authentication and Authorisation for Research Collaboration” (AARC) model and its flagship outcome, the AARC BPA, as the basis to drive the next phase of integration for research infrastructures. AARC TREE’s main goal was to expand and evolve the AARC BPA, its set of guidelines and the policy framework to prepare for the integration of user-centring technologies and policies and to evolve authorisation aspects. All this work was augmented by the AARC TREE Compendium and a Validator tool, to better support the deployment of AAls that follow the AARC BPA model and avoid fragmentation and unnecessary duplication of effort.

AARC TREE also worked to define **common strategies** for the **deployment** and **sustainability** of its results and more in general of AARC-BPA compliant AAls used in the Research Infrastructures at large.

## 1.2. Key Exploitable Results (KERs)

A Key Exploitable Result (KER) is a project result or a group of similar project results with particularly high exploitation potential, i.e. use and benefits from something often for commercial purposes, public policymaking, or further research.

The AARC TREE project has successfully delivered three Key Exploitable Results, in line with the description of the action, which are described below.

### **KER1: Updated AARC Blueprint architecture for emerging technologies and services in pan-European research infrastructures**

The AARC Blueprint Architecture (BPA) 2025 provides an updated reference architecture for federated Authentication and Authorisation Infrastructures (AAls) supporting research collaborations. Building on previous AARC Blueprint releases, this version consolidates architectural concepts, components, and interaction patterns, reflecting current practices across research infrastructures in Europe and beyond. The AARC BPA does not prescribe specific technologies or implementations. Instead, it offers a technology-agnostic reference framework that can be adapted to different deployment models and operational environments.

Within the AARC TREE project, the BPA underwent a comprehensive revision, resulting in the 2025 edition. This updated version introduces a refined architecture structured around three core Functional Capabilities — Identity Management, Collaboration Management, and Service Integration — while retaining the established five-layer component model. The capability-based perspective clarifies functional responsibilities, supports modular deployment approaches, and enables interoperable implementations across independent administrative domains.

**KER2: Recommendations for a common long-term strategy for AAI services and best practices**

The AARC TREE best practices and recommendations promote alignment of technical, policy and trust approaches and foster collaborative implementation across scientific domains.

During the AARC TREE project, the team engaged with the research and e-infrastructures (also outside the AARC TREE project) to assess the adoption of the AARC guidelines and their sustainability models with regards to AAI.

This work identified key challenges not only related to the implementation of an AARC BPA compliant AAI, but also in relation to the need for stable and sustainable funding models to support AAI operations within the R&E sector.

The AARC TREE Compendium — to be published as the AARC Handbook — presents a set of targeted recommendations tailored to different stakeholder groups.

It is intended to serve as both an outreach and engagement tool, supporting and encouraging broader uptake of the AARC guidelines among research collaborations and infrastructures.

This document augments the AARC Handbook recommendation to address more specifically policy makers.

**KER3: Update the AARC Interoperability Framework**

The AARC Interoperability Framework comprises the AARC policy and technical guidelines, together with the latest version of the Policy Development Kit [PDK]. These guidelines support research communities and infrastructures in implementing and operating AAI services that are compliant with the AARC Blueprint Architecture (BPA) in an interoperable and sustainable manner.

The AARC guidelines address a range of topics and are developed in response to concrete use cases identified across research and e-infrastructures. They are endorsed by AEGIS (AARC Engagement Group for Infrastructures), established in 2019. AEGIS brings together representatives from research infrastructures, e-infrastructures, operators of AARC BPA-aligned AAI, and the AARC policy and technical teams. Its role is to endorse AARC guidelines, ensure alignment of practices, and leverage synergies across the community.

Through this framework, AARC TREE promotes the deployment of AAI services aligned with the AARC BPA model, not only within individual research infrastructures but across the broader scientific ecosystem.

## 2. Methodology for the AARC Policy Briefing

This policy briefing draws upon qualitative interviews with research collaborations and e-infrastructures conducted during the AARC TREE project. The interviews captured new use-cases to be supported via their AARC-BPA compliant AAI, analysed implementation patterns captured also in terms of adopted AARC guidelines and gathered operational and governance challenges.

This document is produced with the purpose of raising awareness about key issues namely:

- further optimise the approach to AAI in the R&E sector with the aim to reduce duplications, ensure interoperability and reduce time to production;
- contributing to strengthening security and privacy best practices across Europe and beyond, knowing that research is typically cross borders and collaborative.

Whilst some of these aspects are covered more in detail in other deliverables, this document focuses on summarising key recommendations for future work and funding.

### 2.1. Target Audience

The policy briefing document is primarily targeting **policy makers within the European Commission**, who are responsible for informing EU policy goals and drafting future funding programmes. In addition to the primary target audience, other target groups have also been identified. The full list is shown in the table below.

Target Audiences (TAs)
1. <b>Policy makers within the European Commission</b>
2. <b>National/regional Policy Makers and Funding agencies</b>
3. <b>Research infrastructures</b> including the domain-specific <a href="#">Science Clusters</a>
4. <b>e-infrastructures</b> , National Infrastructure (is NRENs) that define policy and strategies locally
5. <b>AARC community/AEGIS</b> , notably those that operate AAI that follow the AARC BPA and its interoperability framework, those that provide resources within research and e-infrastructures, users that access services via an AARC BPA compliant AAI and anyone involved in the enhancement and maintenance of AARC BPA results.

### 3. Policy Briefing and Recommendations

The AARC Compendium, renamed AARC Handbook, already provides an initial set of recommendations; additional recommendations are added to provide a more complete picture.

<b>Recommendation 1</b>	<b>TAs:</b>
<b>Recognise AAI as Critical Infrastructure for Research and Education and promote the AARC BPA as the reference model for AAI in the research and education community.</b>	<b>Funding Agencies e/research infrastructures</b>
<b>Action</b>	
Require compliance with the AARC BPA in all funding calls for infrastructures and interoperability in the Research and Education space.	
<b>Why</b>	
The AARC BPA provides a reference model architecture driven by the Research and Education community. It is technology agnostic whilst at the same time provides a reference to ensure interoperability among AAI. Given that the AARC BPA to date underpins the EOSC AAI, EuroHPC Federated Platform AAI and Erasmus+ AAI, there is a merit in capitalising the investment made over the last 10 years and ensuring that interoperability with the AARC BPA is preserved.	
To that end the European Commission does not always speak with a unified voice, which contributes to the ambiguity and to the fragmentations of effort and funding.	
Whilst innovation should be pursued as a main driver, it is important to ensure continuity and reliability of essential services like the AAI.	

<b>Recommendation 2</b>	<b>TAs:</b>
<b>Support the expansion of the AARC BPA to ensure it can also address emerging education use-cases</b>	<b>Funding Agencies, AARC Community/AEGIS</b>
<b>Action</b>	
In addition to the research community, many of the AARC Stakeholders, such as the National Research and Education Networks (NRENs) and the e-infrastructures, also support education. With the university alliances gaining more momentum in addition to the growth of the Erasmus+ programme, the need for consistent <a href="#">user identification</a> throughout a learner's academic journey has	



been highlighted as a key element to support the university alliances use-cases<sup>1</sup>.

Whilst AARC BPA was driven by the researcher community there are several similarities in the education use-cases that can be well supported by the AARC BPA.

As new mobility use cases are emerging in the education space, it is important to create a trusted space where representatives of the University Alliances, NRENs, e-infrastructures, AARC Community and others can come together and discuss their identity needs. To date there are different places and groups where different aspects are discussed, which is important to raise awareness but it also creates fragmentation.

A dedicated support actions EC grant (that spans across different EC Units) would be an ideal solution to address identity related aspects in an inclusive manner.

**Why**

Digital identities are a cornerstone of any system in today’s world. The AARC BPA has already been used to model the AAI for Erasmus+ .

Bringing the various stakeholders together and initiating a dialogue would enable everyone to learn from each other and to avoid duplication of effort.

It would be possible to work towards developing and implementing strategies that reduce the footprint of digital services while maximising the existing ones for educational benefits.

<b>Recommendation 3</b>	<b>TAs:</b>
<b>Ensure sustainable funding and long-term operational models for AAI services</b>	<b>Funding Agencies Research infrastructures</b>
<b>Action</b>	
Funding agencies should require early involvement of AAI operators in grant proposals, ensuring best practices are followed and avoiding delays or suboptimal implementations due to late or unfunded AAI integration.	
<b>Why</b>	
Ongoing funding for Research AAI communities of best practice (such as the AARC Projects or FIM4R) is essential. These are critical resources for new or evolving research collaborations who require customised guidance to navigate this complex, specialised domain and identify the best AAI solution for their unique requirements.	

<sup>1</sup>

<https://education.ec.europa.eu/focus-topics/digital-education/digital-education-hub/workshops-and-working-groups/interoperability-framework?>

<b>Recommendation 4</b>  <b>Invest in capacity building, training, and knowledge exchange mechanisms</b>	<b>TAs:</b>  <b>Funding bodies</b>
<b>Action</b> Support AAI gathering and consultations across all ESFRI funded projects and across projects funding under in the education area. These events could be in person and participation for attendees could be funded via the respective projects.	
<b>Why</b> AAI and digital infrastructure services are not “deploy once and forget” systems. They require:ongoing operational expertise, continuous policy alignment and adaptation to new standards and technologies.  Without skilled people and institutional knowledge, even well-designed architectures become fragile. Capacity building reduces dependency on a few experts and strengthens institutional resilience.  AARC and FIM4R are driven by volunteers that believe in the importance of having open fora for discussion and provide a place where newcomers can get in touch with experienced people. However without dedicated funding it is not possible to organise capacity building events.	

## 4. Conclusions

The AARC TREE project represents a critical step in maturing federated Authentication and Authorisation Infrastructures for research. By consolidating architectural guidance, capturing real-world experiences, and promoting interoperable and sustainable AAI models, AARC TREE has strengthened the foundation for cross-border and cross-disciplinary collaboration.

Policymakers are encouraged to support consistent adoption, embed AAI sustainability into funding and governance frameworks, and maintain alignment across European and international initiatives. Building on the AARC BPA and the AARC Compendium will enable a coherent, secure, and scalable digital identity framework for collaborative research.



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