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Service Delivery and Operations Report

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Abstract

This document reports on the services operated in GN4-2 by SA2 T2 and T3, including updates on uptake and usage, KPIs, and information on activities and issues occurring in the reporting period, from the beginning of March until the end of December 2017. The full technical and operational descriptions of the services can be found in Deliverable D5.2 which covers the previous reporting period.

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Executive Summary

This document reports on the services operated by Tasks 2 and 3 of the Trust & Identity and Multi-Domain Services activity (SA2), which is responsible for operating, monitoring and managing GN4-2 services in production. This is the second service operations report and it covers the activities and status of the services in the second 10 months of the project, from the beginning of March to the end of December 2017.

SA2 ensures that the services it operates in production are provided with the infrastructure and support needed to run at the required levels, as established by the Key Performance Indicators (KPIs), among other measures. The activity executes the day-to-day operation and maintenance of its services following the DevOps paradigm, which enables the teams to perform agile operation and maintenance of the services in production. At the beginning of the reporting period, SA2 was operating and providing support for six services. Trust and Identity services – which include eduroam, eduGAIN, Federation as a Service (FaaS) and eduPKI – are operated in Task 2 ("Trust & Identity"). Task 3 ("Multi-Domain Services") managed perfSONAR and the Brokerage Service Catalogue until December 2017, when the Brokerage Service Catalogue retired its operations from SA2, so that at the end of the reporting period SA2 is providing production support for five services.

This second Service Delivery and Operations Report includes service descriptions, information about operations and support teams, users, update and usage, KPIs, as well as information on activities and issues occurring in the reporting period. The detailed technical descriptions of the services have remained unchanged and can be found in the report for the previous reporting period [[Deliverable D5.2](#)].

All services have once again recorded progress in terms of increase in usage and footprint, delivered stable operations and exceeded their KPIs in the second reporting period. Several dissemination activities took place at various events and are listed in Appendix A. This was all achieved through strong collaboration between team members within the Activity, with other relevant GÉANT project development, service and networking activities, as well as with the PLM team.

1 Introduction

GN4-2 Service Activity 2 (SA2) Trust & Identity and Multi-Domain Services, delivers and operates services in production, ensuring that they are of acceptable quality, that the relevant procedures, processes and documentation are in place for their efficient operation, and that their operational health and usage are monitored and reported to stakeholders. While Task 2 and Task 3 are responsible for the service operations of the T&I and Multi-domain services respectively, Task 1 runs the test and validation process for the transition of the services in production and Task 4 investigates cross-service improvement opportunities.

The set of operated services in the activity has remained unvaried since the previous service operations report (except for one service that was retired in December 2017). These services are:

- **eduroam:** provides a secure, worldwide roaming access service for the international research and education community.
- **eduGAIN:** interconnects identity federations around the world, simplifying access to content, services and resources for the global research and education community.
- **eduPKI:** provides certificates to GÉANT services that are unable to obtain the needed certificates through standard bodies.
- **FaaS:** supports GÉANT NREN organisations that have yet to establish their own identity federation.
- **perfSONAR:** is an open-source, modular and flexible framework for IPv4 and IPv6 active network measurements and monitoring.
- **Brokerage Service Catalogue:** provided information on the cloud services offered to the GÉANT community, either by GÉANT or by commercial service providers. (In the last month of the reporting period, the Brokerage Service Catalogue was replaced by a new Cloud Service Catalogue developed by JRA4 and operated by GÉANT IT.)

The services are operated in a federated manner by GÉANT and its NREN partners who provide the needed infrastructure and operational teams, with SA2 as the dedicated service production operations activity. As well as by GÉANT project participants, the perfSONAR service is developed and managed, via international cooperation between ESnet, Internet2, Indiana University, University of Michigan, and many others.

SA2 collaborates closely with services development activities and teams. For the Trust and Identity services, SA2 peers with the development teams in JRA3. During the GÉANT symposium in October 2017, a dedicated T&I program track was used for the collaborative sessions during which all of the projects participants were presented with the activities of the operational team as well as ongoing development activities. A significant part of the sessions was devoted to round table discussions

where proposals for near and long future roadmaps were gathered and discussed. perfSONAR's global collaboration is organised through several teams, including a Steering Committee, perfSONAR Leads, developers and a training group. In addition, the perfSONAR team in the GÉANT project actively collaborates with SA1, SA3 and JRA2, as well as with a number of NRENs, in shaping multi-domain monitoring solutions for the community.

SA2 coordinates the process for the transition of services to operations that underpins Product Lifecycle Management (PLM) as defined and managed by NA1. This transition process ensures through testing and validation that services are of adequate quality, that they are compliant with relevant policies (GDPR, IPR etc.) and that they properly transition into the operational environment with established operational and support teams in place. During the reporting period, the SA2 team tracked the progress of several JRA3 services at the pilot stage, as this stage precedes transition to production. SA2 representatives participated in several PLM review gate meetings regarding T&I services which entered pilot stage under JRA3, as well as one exit pilot stage meeting for the enhanced eduGAIN support, which started transition to production in December 2017.

The sections that follow provide information on the six services that were in production in GN4-2 SA2 Tasks 2 and 3 from the beginning of March to the end of December 2017. The reports provided for each service include a service description, contact details for operations and support teams, data on uptake and usage and KPIs, and key activities and any issues encountered in service operations. The service KPIs reported here specifically capture the performance indicators for operation of these services in production. KPIs related to the uptake of services fall under the domain of the respective development activities and are not within the scope of this report. However, some basic uptake figures and trends are included in order to provide a holistic image of services operations in production.

2 eduroam

eduroam (education roaming) provides a secure, worldwide roaming access service for the international research and education community. The eduroam service allows students, researchers and staff from participating institutions to obtain Internet connectivity on their mobile devices across their campuses and when visiting other participating institutions. Its architecture is based on several different technologies and regulated by a number of agreements, which combined provide the essential eduroam user experience: “open your laptop and be online”.

The contact details for eduroam for all users and interested parties are:

- Web: www.eduroam.org
- Support for users: eduroam@help.geant.org
- Support for National Roaming Operators: eduroam-ot@lists.geant.org
- eduroam Steering Group: eduroam@lists.geant.org

In the reporting period, the eduroam service recorded the highest level of availability in terms of performance of its core operations and supporting infrastructure and services. The work of the DevOps and JRA3 development activity teams mainly focused on the CAT (Configuration Assistant Tool) eduroam supporting service. One minor release of CAT was deployed and preparation of its next major release is in its final stage. The usage and uptake of the eduroam service recorded continuous growth. On the global scale, the eduroam service provided by GÉANT contributed to the work of the Global eduroam Governance Committee (GeGC) and provided supporting services – eduroam database, CAT, monitoring, authentication traffic measurement (f-ticks) – that are used around the world.

2.1 Users, Uptake and Usage

eduroam user data is provided on the eduroam monitor site [[eduroam Monitor](#)]. 39 GÉANT partners use the eduroam service, that is, all projects partners with the exception of the Albanian NREN RASH (which recently joined GÉANT). However, the number of National Roaming Operators (NROs) in Europe is 47, as these cover more European countries than those of the GÉANT partners.

At the global scale, 89 territories represented by 85 National Roaming Operators (NRO) participate in the eduroam service (Figure 2.1 shows the global map of eduroam participants). Of these NROs, 68 provided detailed data on the distribution of eduroam service at a national level, which at the end of the reporting period totaled over 5200 institutions participating as identity providers and more than 23000 service locations for eduroam.



Figure 2.1: Global map of eduroam participants

The growth of eduroam usage is measured monthly by counting the number of successful user authentications, as follows:

- National authN as grand sum of all successful roaming authentications in the same country counted via f-ticks system for all European countries that provide this info (for more info on f-ticks see the eduroam Monitor site [[eduroam Monitor](#)]).
- International authN as total number of successful international (cross-border) authentications counted in the logs of ETLRs.

2017 was another year of expansion for eduroam, which saw a 17% increase in international authentications and a 14% increase in national authentications compared with the previous calendar year. In total, over 2.9 billion national authentications and more than 694 million international authentications were recorded in 2017.

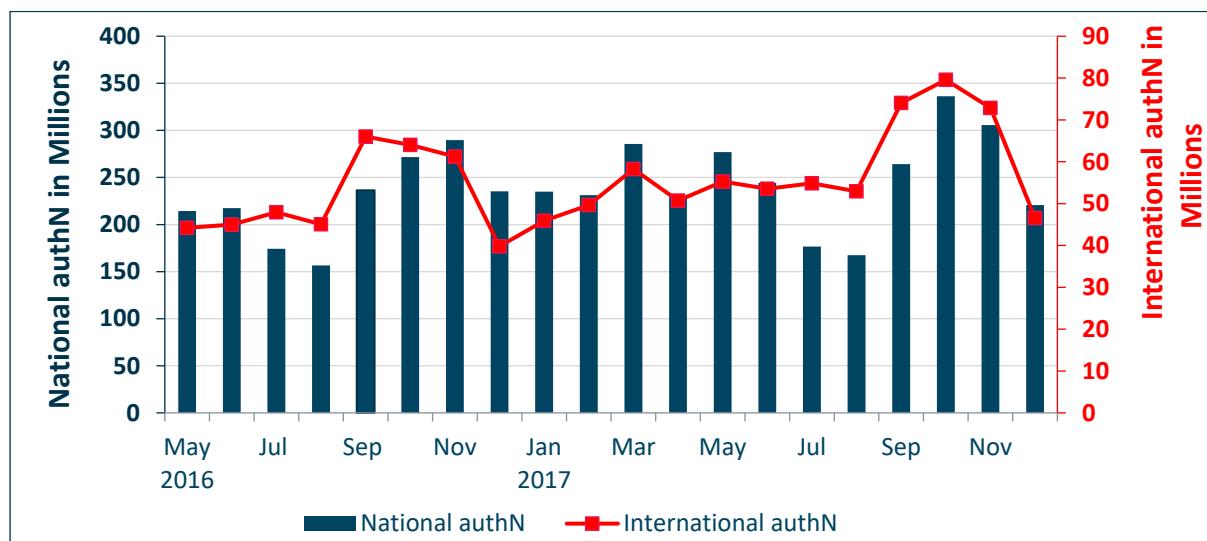


Figure 2.2: eduroam usage statistics: number of successful authentications per month

2.2 Key Performance Indicators

eduroam KPIs measure the availability of its core service (European Top Level Radius servers). Table 2.1 shows that the services are running with at least one top-level roaming server 100% available, therefore performing better than the set target.

Name of the KPI	Baseline	Target	Measured
ETLR availability	99%	99.9%	100%

Table 2.1: eduroam KPIs – over the period 01 March 2017 – 31 December 2017

2.3 Activities and Issues

During the reporting period, the operations and support team dealt with standard day-to-day routine activities related to the service. eduroam core services were operated to a very high standard, with at least one top-level roaming server 100% available at all times.

A number of business development and support questions were received and answered, mostly related to the use of CAT and other supporting services (monitoring, eduroam DB, F-ticks). An increase in interest in eduroam was noted and eduroam was promoted at several events. Extensive support was provided to the African region in establishing the eduroam service at a regional level. By invitation of NA3 Task 1, European and Global NREN Account Management, the SA2 team gave a presentation about eduroam during the RoEduNet user conference in September 2017. In liaison with NA1 Task 6, Human Capital – Learning and Development, it held an eduroam training for ASNET-AM during their computer science conference in September 2017. Initial contact was made with new GÉANT partner RASH regarding their joining eduroam.

Regular monthly conference calls with the eduroam Steering Group were organised and chaired. An eduroam SG face-to-face meeting was held in Budapest in conjunction with the GN4-2 Project Symposium in October 2017. In June 2017, new nominations for the Global eduroam Governance Committee (GeGC) were made three eduroam SG members were appointed from the GÉANT community.

Additional activities carried out in the reporting period include:

- New NROs/territories onboarded to eduroam: Åland Islands (.ax, managed by Finland NRO), Tajikistan (.tj), Faroe Islands (.fo) and Greenland (.gl, managed via Danish NRO).
- Work on defining eduroam database version 2.0, taking into account the input and discussion from the NROs through eduroam SG meetings and the eduroam mailing list, and from the GeGC and community at large via the mobility mailing list. A final specification was accepted by the eduroam SG in December 2017 [[eduroam_db](#)].
- The eduroam Configuration Assistant Tool, CAT v 1.1.4 release was deployed in production in April 2017 and contains six bug fixes and three new features. In June 2017, one hotfix was performed on the same version to renew the support for TTLS on Windows 10 which was made defunct in the Windows 10 update of the built-in supplicant. Preparation for the transition of the new major release of CAT v.2.0 is ongoing.
- eduroam probes reporting format specification version 1.0 was accepted [[eduroam_probes_spec](#)]
- Work on auditing of NROs is in progress – It is planned to have both automatic and self-assessments

One issue regarding a WPA2 vulnerability was noted in October 2017: the Key Reinstallation Attack (KRACK) vulnerability allows the decryption of WPA2 messages as the key exploit. This affects any Wi-Fi network, and does not have any particular repercussions on the eduroam service. The eduroam authentication infrastructure is not affected and user login credentials (username/password or certificate) continue to be securely transmitted. To address this exploit, an advisory was issued via the eduroam website, recommending that technicians responsible for wireless networks closely monitor the availability of software updates from their vendor and patch as soon as possible.

3 eduGAIN

eduGAIN is one of GÉANT's key Trust and Identity services, allowing trusted digital identities to be used to simply and securely access available web content and services. The eduGAIN service interconnects identity federations around the world, simplifying access to content, services and resources for the global research and education community.

Through eduGAIN:

- Identity providers offer a greater range of services to their users, delivered by multiple federations in a truly collaborative environment.
- Service providers offer their services to users in different federations thereby broadening their target market.

Users benefit from a wider range of services provided seamlessly and accessed through a single identity.

The eduGAIN interfederation service delivers a platform for the trustworthy exchange of metadata through the coordination of technical infrastructure and policy. The platform supports the needs of federations in establishing a common baseline for metadata interoperability and furthers the goals of federations to operate in a global identity access and service exchange.

The contact details for eduGAIN for users and all interested parties are:

- For general information about eduGAIN and joining procedures: edugain@geant.net.
- For technical questions: edugain-ot@lists.geant.org.

During the reporting period, the eduGAIN core and supporting services were maintained by implementing regular updates, applying patches, providing support to identity federation operators, etc. The operational KPI that measures the availability of the core service was met and exceeded. Significant work in the reporting period was carried out on improving the web visibility of eduGAIN service , including providing support for creation of a new PR site, the move of the eduGAIN wiki to the common platform and update of its content, and work on the new user interface for the eduGAIN technical site. Various updates to the metadata validator were implemented to support metadata validation against the aggregation policy. The supporting tools suite was updated with new features and APIs.

3.1 Users, Uptake and Usage

Users of the eduGAIN service are listed on the status page of the eduGAIN technical web site [[eduGAIN tech](#)]. As at the end of the reporting period, eduGAIN had 48 active members and six voting-only members. Of these, 32 are GÉANT partners' identity federations that are active members of eduGAIN; these are listed in Table 3.1 below:

Country	Identity Federation
Armenia	AFIRE
Austria	ACOnet Identity Federation
Belarus	FEBAS
Belgium	Belnet Federation
Croatia	AAI@EduHr
Czech Republic	eduid.cz
Denmark	WAYF
Estonia	TAAT
Finland	HAKA
France	Fédération Éducation–Recherche
Georgia	GRENA Identity Federation
Germany	DFN AAI
Greece	GRNET
Hungary	eduid.hu
Ireland	eduGATE
Israel	IUCC Identity Federation
Italy	IDEM
Latvia	LAIFE
Lithuania	LITNET FEDI
Luxembourg	eduid Luxembourg
Moldova	LEAF
Macedonia	AAIEduMk
Norway	FEIDE
Poland	PIONIER.Id
Portugal	RCTSaaI
Slovenia	ArnesAAI Slovenska izobraževalno raziskovalna federacija
Spain	SIR
Sweden	SWAMID
Switzerland	SWITCHaaI
The Netherlands	SURFconext
Ukraine	PEANO
United Kingdom	UK federation

Table 3.1: eduGAIN member GÉANT partners' identity federations

During the reporting period, seven new federations joined eduGAIN, including BIF (Bulgaria), CARSI (China), CyNet Identity Federation (Cyprus), HKAF (Hong Kong), IR Fed (Iran), LIFE (Lebanon) and SGAF (Singapore). Three federations which had joined in the previous period became active participants – ARNaai (Algeria), INFED (India) and Oman KID (Oman). Figure 3.1 shows the global map of eduGAIN participants.



Figure 3.1: Global map of eduGAIN participants

By the end of the reporting period, eduGAIN was providing metadata containing 4389 entities. This is a growth of 19% compared to the same period last year. The biggest growth was recorded for Service Providers (27%), while the increase in Identity Provides was 14%.

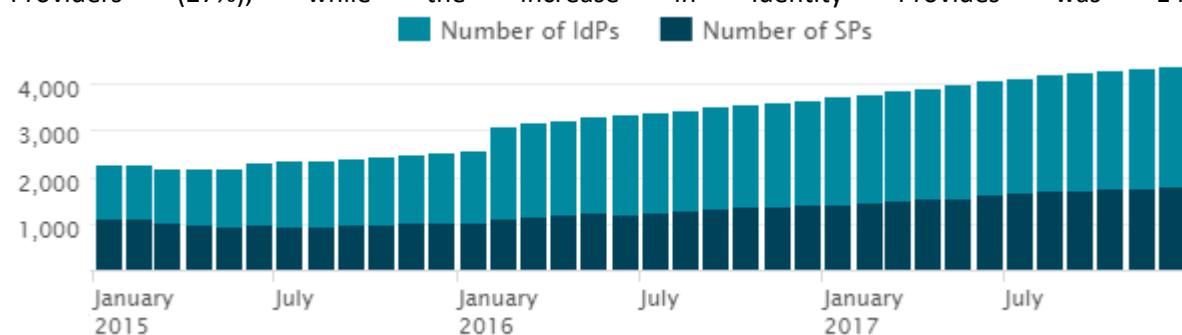


Figure 3.2 shows the growth trends by number of entities in eduGAIN in the last two years. It is expected that further increase in the number of entities will be achieved through greater coverage within existing member federations rather than through the addition of new, smaller federations..

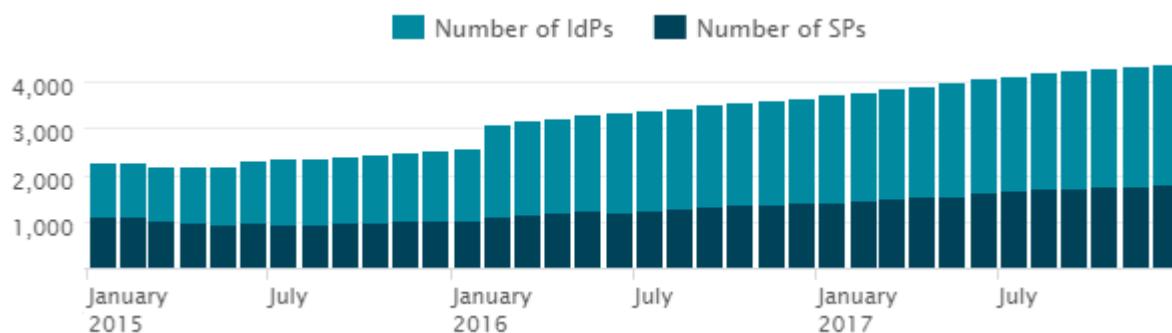


Figure 3.2: eduGAIN uptake statistics: growth in number of entities

3.2 Key Performance Indicators

KPIs for eduGAIN measure the availability of the eduGAIN core service (Metadata Distribution Service). Table 3.2 shows that the services are running with minimum disruption and performing better than the set targets.

KPI	Baseline	Target	Measured
MDS availability	99%	99%	99,98*

(*) a single outage has been reported by the external monitor and was due to a local network problem.

Table 3.2: eduGAIN KPIs – over the period 01 March 2017 – 31 December 2017

3.3 Activities and Issues

During the reporting period, DevOps and the support team dealt with standard day-to-day routine activities related to the service operations. eduGAIN core services were operated to a very high standard, as shown by the MDS availability KPIs.

Additional activities that were carried out in the reporting period include:

- 10 federations were onboarded to eduGAIN (Bulgaria, China, Cyprus, Hong Kong, Iran, Lebanon, Singapore, Algeria, India and Oman).
- Participation in the JRA3 working group that reviewed and updated the eduGAIN constitution and the eduGAIN SAML profile, representing the point of view of eduGAIN operations.
- Contribution to the JRA3 pilot of the eduGAIN enhanced support service.
- Extension of the eduGAIN technical site's supporting tools, database schema and access API including:
 - addition of "what's new" feature that was requested by the eduGAIN community. This enables presentation of information such as eduGAIN entities appearing and dropping out from eduGAIN metadata, changes in federations status etc.;

- presentation of the eduGAIN membership data via an API call;
- addition of the eduGAIN name resolver as an API call, that based on the entityid allows to return the entity display name in a requested language (with fallback to English);
- multiple extensions of the validator to implement checks against observed metadata errors.
- The new design of the technical site was accepted and work continued on updating the supporting tools. The updated technical site is now installed on the test site and undergoes content verification.
- The eduGAIN wiki has been moved from a standalone site to the GÉANT projects wiki platform. During the move, the content was restructured and updated to make it current and to accommodate the change in the underlying software platform. The new implementation is superior compared to the previous one and its inclusion into the global GÉANT site reduces its maintenance cost and optimises the use of common platforms.

The operations team also managed a number of issues not directly in the scope of eduGAIN service operations themselves, but which nevertheless could have potentially impacted the service, such as federation metadata feeds nearing their expiry dates or the need for a signing key rollover. The team investigated and resolved problems reported by the samlbits operator (discovered by the team to be on the samlbits service side).

4 eduPKI

eduPKI supports GÉANT services in defining their requirements for digital certificates. It helps coordinate the provision of certificates at a pan-European level as well as enables existing Certification Authorities (CAs) to issue certificates for GÉANT services that require them.

The eduPKI service provides other GÉANT services with support in defining their security requirements and issuing the digital certificates they require. eduPKI CA is a Certification Authority that issues X.509 digital certificates for GÉANT Services that are not able to obtain suitable certificates from a CA local to them. The certificates are issued in accordance with the Trust Profiles defined by the eduPKI Policy Management Authority (PMA) to meet the demands of GÉANT Services. The GÉANT services that have eduPKI trust profiles are eduroam and Multi-Domain Network services.

The contact details for eduPKI for users and all interested parties are:

- Official website: www.edupki.org
- E-mail: contact@edupki.org

During the reporting period, the eduPKI service was operated on a regular basis by maintaining infrastructure and service components, providing support and serving certificate requests. The operational KPIs that measure service availability were met and exceeded. One operational issue was noted that led to an approximately 30-minute outage in certificate issuing, but no users were affected. Extensive support through consultations and discussions was provided to development teams in JRA3 T4 for eduroam Managed IdP and let's RadSec.

4.1 Users, Uptake and Usage

eduPKI's users are the GÉANT services and tools that require valid and up-to-date certificates. At the end of the reporting period, those services included eduroam and the GÉANT Multi-Domain Network services.

With regard to the eduroam eduPKI trust profile, the following NRENs have one or more certificates issued for their constituency (either for the NREN federation operator or for individual institutions within the NREN): ACOnet, ASNET-AM, Belnet, CARNet, CESNET, DFN, FCCN, GARR, HEANET, Jisc/Janet, NIIF/HUNGARNET, NORDUNET (DeIC, UNINETT, SUNET, FUNET), PSNC, RENATER, RESTENA, redIRIS, SANET, SURFnet, SWITCH, and UbuntuNet. Additionally, certificates are issued for the IETF and GÉANT

organisations. 29 new certificates were issued during the reporting period. Taking into account the ongoing expiration of certificates the total number of valid certificates at the end of the reporting period for the eduroam eduPKI trust profile is 92.

The main user of the GÉANT Multi-Domain Network Services eduPKI trust profile is GÉANT, followed by the PSNC NREN. During the reporting period there were no new certificates issued for these services. At the end of the reporting period there were 10 valid certificates for this eduPKI Trust Profile.

4.2 Key Performance Indicators

The eduPKI service's KPIs measure the availability of the Certification Authority (CA) and Certificate Status Check services. The availability of the Certificate Status Check is shown by measuring the availability of the current Certificate Revocation List (CRL) and responses via Online Certificate Status Protocol (OCSP) through their dedicated web services. Table 4.1 shows that the services are running with minimum disruption and performing better than set targets.

KPI	Baseline	Target	Measured
Availability of Certificate Status Check	99.9%	99.9%	100%
Availability of CA Service	99.7%	99.9%	99.92%*

(*) planned and unplanned downtimes for the CA service which cumulated to 6 hours during the 306 days of the reporting period

Table 4.1: eduPKI KPIs – over the period 01 March 2017 – 31 December 2017

4.3 Activities and Issues

During the reporting period, the DevOps and support team dealt with standard day-to-day activities related to the service. Additional activities carried out in the reporting period include:

- Support for certificate requirements was provided to the development JRA3 T4 task that works on eduroam Managed IdP and let's RadSec.
- Operation of eduPKI CA and issuance of certificates for eduroam RadSec infrastructure servers.
- Support for eduroam's Registration Authority within eduPKI CA.

Operationally, there have been a couple of issues with the underlying infrastructure of the eduPKI CA (after an update of the CA software) that led to certificate application and approval functions being unavailable for about 30 minutes. No eduroam infrastructure operator has been affected by this, and measures have been put in place to prevent the same problems occurring in the future.

5 FaaS

GÉANT Federation as a Service (FaaS) provides an easy entry point for NRENs joining eduGAIN who are developing or are in the early stage of operating a web single sign-on identity federation. FaaS is offered to Federation Operators (typically NRENs), to facilitate them in the uptake and day-to-day operation of their identity federation. By taking advantage of the FaaS offer, Federation Operators can:

- Operate their Identity federation in a scalable manner according to best current practices.
- Exchange metadata with the eduGAIN metadata service in an automated manner.

FaaS delivers a service that supports NRENs by providing them with the infrastructure needed to operate an identity federation (web based Single Sign-on) with access to eduGAIN included.

The FaaS offering can be accessed via a server name chosen by the NREN, and the Web UI localised as desired (language, logo, etc.) to maintain the same look and feel of services provided by the NREN Federation Operator for NREN members.

The contact details for FaaS for users and all interested parties are:

- Website: http://www.geant.org/Services/Trust_identity_and_security/Pages/FaaS.aspx
- e-mail address: faas@lists.geant.org

During the reporting period, FaaS user instances were maintained on a regular basis by implementing updates, applying patches, supporting users, etc. Operational KPIs for the service were met and exceeded. One minor issue with metadata aggregation was reported and appropriate scripts have been patched to address this.

5.1 Users, Uptake and Usage

FaaS users are GÉANT partners who have not yet deployed or are in the early stages of operating a SAML2-based identity federation. With FaaS these users benefit from a hosted set of tools (SaaS - Software as a Service) that help significantly decrease the effort required in creating and maintaining a secure Identity Federation.

At the time of writing, seven NRENs are using FaaS: LITNET, MREN, GRENA, ASNET, MARnet, AMRES and CyNET. An indicator of service usage can also be the number of entities registered through a FaaS user instance. This number depends on the level of federation progress and growth and is also an indicator of federation maturity. At the end of the reporting period, there were 53 entities registered overall in all FaaS user instances.

5.2 Key Performance Indicators

KPIs for FaaS measure the availability of FaaS user instances. This availability is calculated based on the mean value of the availability of the Apache SSL service of all FaaS user instances. Table 5.1 shows that FaaS user instances are available with minimum disruption and performing better than set targets.

Name of the KPI	Target	Baseline	Measured
Availability of FaaS user instances	99 %	99%	99,95%

Table 5.1: FaaS KPIs – over the period 01 March 2017 – 31 December 2017

5.3 Activities and Issues

During the reporting period, the operations and support team dealt with standard day-to-day routine activities related to the service.

Additional activities that were carried out during the reporting period include:

- Setup of a new FaaS service instances for AMRES and CyNET identity federations.
- Regular system and software updates on all FaaS instances.
- In collaboration with NA3 partner relations team, a FaaS training was organised in August for MREN.
- Minor bug fixes in Jagger software that is used as a Resource Registry tool in FaaS.
- Multiple improvements on the Jagger UI to enhance user experience.
- Several certificates used on web servers on production instances were renewed in coordination with the users.

One issue was noted concerning the metadata aggregation process employed on FaaS instances. This issue led to temporary unavailability of the metadata files during their aggregation. The cause of the issue was the aggregation script configuration in which the metadata files were served directly from the directory that the metadata aggregator was writing to, so that they were unavailable while the changes were made. Appropriate scripts have been patched to take care of this issue. The issue however had negligible impact, as the metadata aggregation is done regularly once a day, or upon a change in metadata which occurs rather seldom.

6 perfSONAR

perfSONAR is an open-source, modular and flexible architecture for active network performance monitoring that provides a view of network performance across multiple domains, allowing NOC and PERT engineers to seamlessly analyse and diagnose network behaviours across the entire end-to-end path. The tools provided in the perfSONAR suite perform active measurements of throughput, packet loss, delays and jitter, and record network route and path changes.

The SA4 Task 2 team offers two types of perfSONAR-related services:

- The perfSONAR international project within which perfSONAR software is developed, maintained and supported by the international perfSONAR collaboration, and which involves the participation of the perfSONAR SA2 T3 team.
- perfSONAR consultancy and expertise, where advice, training and support are provided in designing and deploying a perfSONAR-based measurement architecture, primarily for the GÉANT community.

6.1 perfSONAR International Project

The perfSONAR project is supported by five international partners: ESnet, Internet2, Indiana University, University of Michigan and GÉANT. The global perfSONAR team develops, maintains, distributes and provides support for the full perfSONAR tools suite that is installed and used on numerous R&E networks around the world to perform active measurements and monitor network performance.

The GÉANT project partners that are providing resources for the development, maintenance and support of perfSONAR are CARNet, DFN-FAU, GÉANT Association and PSNC. PSNC also provides a perfSONAR Service Manager, who is responsible for managing and supervising development, operations and support.

The contact details for the perfSONAR project are:

- Main website: <http://www.perfsonar.net>
- Installation and usage documentation: <http://docs.perfsonar.net>
- User mailing list as the entry point for any support request: perfsonar-user@internet2.edu or <https://lists.internet2.edu/sympa/info/perfsonar-user>
- Developers' resources are available at: <http://github.com/perfsonar/>

6.1.1 Users, Uptake and Usage

Active network measurements are useful to network engineers, PERT engineers, system administrators, researchers and students. perfSONAR users include:

- Organisations (e.g. Universities, GÉANT NRENs and GÉANT itself) that want to provide active network measurement possibilities to their users or to any collaborating organisations' users (enabling multi-domain measurement possibilities).
- Organisations that want to perform active measurements within their own domain or any other perfSONAR-enabled domain.
- Individual users who want to monitor end-to-end performance or performance on particular links of interest.
- Network researchers interested in developing or monitoring and assessing the performance of new high-speed networks, technologies and protocols.

perfSONAR users are located worldwide and form the global perfSONAR community. The current usage map is available on the perfSONAR website [[perfSONAR usage](#)]. Figure 6.1 shows 1975 nodes with 14770 services implemented worldwide In December 2017.

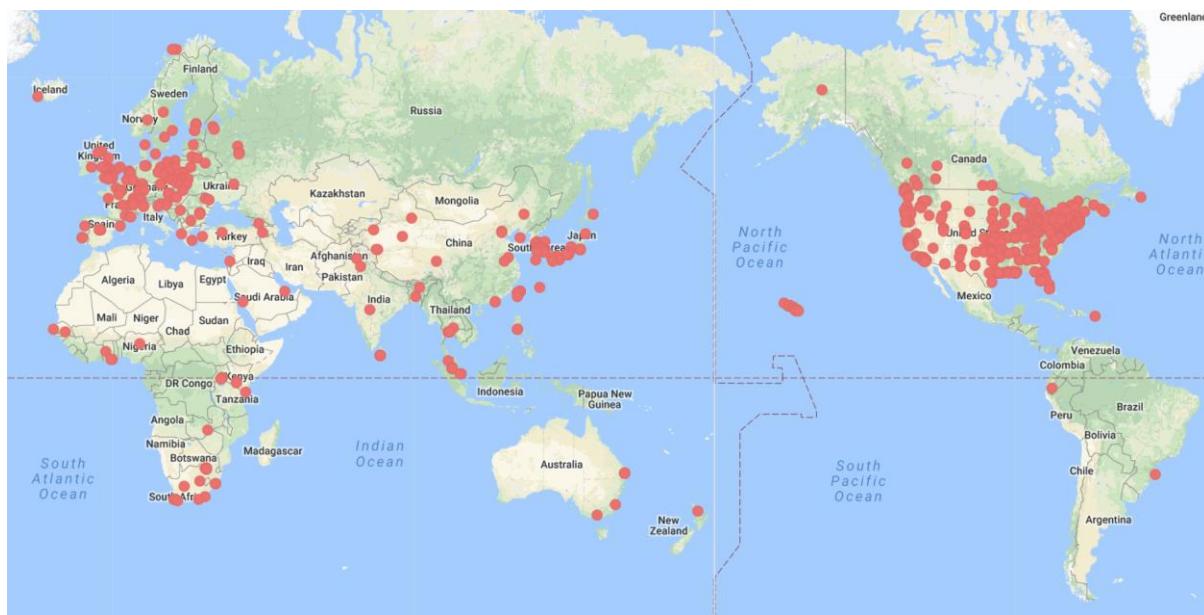


Figure 6.1: perfSONAR installations worldwide

6.1.2 Key Performance Indicators

The key performance indicator for perfSONAR measures the number of perfSONAR major releases per year. Table 6.1 shows the KPI value for the reporting period.

Name of the KPI	Target	Baseline	Measured
Number of perfSONAR major releases per year	1	1	1

Table 6.1: perfSONAR KPIs – over the period 01 March 2017 – 31 December 2017

A major perfSONAR 4.0 release was issued in April 2017. Additionally, two minor releases were issued: perfSONAR 4.0.1 in August 2017 and perfSONAR 4.0.2 in November 2017.

6.1.3 Activities and Issues

During the reporting period, the work of the perfSONAR global team was focused on the new major release, perfSONAR version 4.0, and the two subsequent minor releases. The GÉANT team contributed to building, testing, and fixing all Debian/Ubuntu packages, helping with the portage to CentOS7, the testing and debugging of perfSONAR 4.0 release candidates, and a major review of the installation and configuration documentation as well as with running the European time zone webinars.

Key new features and improvements in the new perfSONAR major release version 4.0 include:

- New scheduling and orchestration software – pScheduler (that has replaced BWCTL).
- More informative GUI with improved presentation.
- OS support upgrade to include Debian 8 and 9; Ubuntu 16 and CentOS 7 while still supporting Debian 7, Ubuntu 14 and CentOS 6.
- New mesh configuration GUI.
- Improvements on MaDDash and new alerting feature.

The first minor release perfSONAR version 4.0.1 focused mostly on minor updates and bug fixes. The second minor release perfSONAR version 4.0.2 brought performance improvements and new features including pScheduler support for contexts which enables measurements on virtual interfaces. The roadmap for the perfSONAR project can be found on the perfSONAR website [[perfSONAR roadmap](#)].

The new perfSONAR release was promoted through webinars and presentations at different events (GÉANT Service and Technology Forum, GÉANT Symposium, etc.). Online training and dissemination events have been published and archived on a dedicated YouTube channel [[perfSONAR YouTube](#)].

Support provided via the mailing list was mostly related to first installations by new users and feedback about the installation and usage of the new perfSONAR releases. A single security issue was recorded in July 2017 in the MaDDash software and was corrected promptly¹.

¹ See the reported issue at <https://github.com/esnet/maddash/issues/52> and the announce of the resolution at <https://lists.internet2.edu/sympa/arc/perfsonar-announce/2017-07/msg00000.html>

6.2 perfSONAR Consultancy and Expertise

perfSONAR Consultancy and Expertise aims to provide support and disseminate knowledge about perfSONAR usage for the GÉANT community and it offers four different activity types:

- Helping to ensure that design measurement architectures and infrastructures based on perfSONAR fit the performance monitoring and measurement needs of the requesting party.
- Providing specific training on perfSONAR deployments, usage and best practices.
- Providing extra support in deploying and operating perfSONAR in GÉANT and the NRENs whenever requested.
- Maintaining and operating a set of perfSONAR services useful to the global perfSONAR community and GÉANT area perfSONAR users in particular.

In order to support these activities, operations and maintenance of the perfSONAR Small Nodes platform were continued.

The GÉANT project partners that provide resources to the perfSONAR project are CARNet, DFN-FAU, GÉANT Association and PSNC, which also provides a Service Manager who supervises and manages service operations and support. The contact details for perfSONAR Consultancy and Expertise are:

- Main website: <http://www.personar.net>
- Demo psUI instance: <http://psui.geant.net>
- perfSONAR Small Nodes project dashboard: <http://perfsonar-smallnodes.geant.org/>

6.2.1 Users, Uptake and Usage

Target users of this service are teams and individuals from the GÉANT community. Since active network measurements and network performance monitoring require specific and advanced knowledge, users are mostly from Network Operating Centres (NOCs) and/or the Performance Emergency Response Teams (PERTs) of NRENs, the NRENs' constituencies or cross-domain projects that they might participate in. However, the service's availability is not limited to a specific user group.

6.2.2 Activities and Issues

During the reporting period, the SA2 Task 3 perfSONAR team provided the service per request and according to the available effort. Support for the GÉANT Network team was continued through cooperation with SA1 for the installation of perfSONAR and perfSONAR UI, as well as on adding a TWAMP (two-way active measurement) tool to the perfSONAR toolkit.

The team gave several presentations and training sessions during the reporting period, as listed in Appendix A, related either to the new perfSONAR releases or to the Small Nodes project and measurement platform. In addition, the team organised a hands-on training for the Jisc community, which is actively working on a perfSONAR deployment for their universities and research centers.

There were no issues recorded in the reporting period.

7 Brokerage Service Catalogue

GÉANT's Cloud Catalogue Portal, also referred to as Brokerage Service Catalogue, provides structured listing of service providers that collaborate with GÉANT on providing cloud services for the GÉANT community. During this reporting period, the Brokerage Service Catalogue operated in SA2 was retired and replaced by a new Cloud Service Catalogue that was designed and developed by JRA4 and is operated by GÉANT IT.

7.1 Users, Uptake and Usage

There are two main group of users of the Brokerage Service Catalogue:

- Users – NRENs and institutions from the GÉANT community.
- Providers – who offer their services to the GÉANT community (including potential future providers interested in doing so).

A special third group includes administrators who maintain the site by uploading relevant information relating to either of the two groups of users above, but who have special tasks and therefore additional administrative rights.

7.2 Key Performance Indicators

The KPI for the Brokerage Service Catalogue measures the availability of the catalogue web server. Table 7.1 shows the KPI value for the reporting period.

Name of the KPI	Target	Baseline	Measured
Cloud catalogue availability	99%	99%	99,98%

Table 7.1: Cloud service catalogue KPIs – over the period 01 March 2017 - 31 December 2017

7.3 Activities and Issues

The role of the SA2 operations team was to maintain the Brokerage Service Catalogue until JRA4 developed and deployed the new Cloud Service Catalogue. Day-to-day operations were performed including regular system updates and fulfilling JRA4's requests for content change.

In the reporting period JRA4 was in the final stage of launching the new Cloud Catalogue for which the SA2 team exported the existing database. In November 2017, JRA4 announced that the new Cloud Catalogue was fully operational and would be managed by GÉANT IT. Since 1 of December 2017, the old Brokerage Service Catalogue platform, its operations and support were decommissioned from SA2 operations.

8 Conclusions

The Trust & Identity and Multi-Domain Services Activity (SA2) manages the services fully or partially developed within the GN4-2 project. At the time of writing, these include four Trust & Identity services – eduPKI, eduroam, eduGAIN and FaaS – and the Multi-Domain service, perFSNAR. Its other Multi-Domain service, the Brokerage Service Catalogue, was retired from SA2 during this reporting period.

This report covers the second ten months of operations of those services in the GN4-2 project. The report covering the first ten months of operations was presented in the previous Deliverable D5.2 [[Deliverable D5.2](#)]. One more such report will be produced, covering the last ten-month period of the project.

The KPIs for all services for the reporting period were met and exceeded. Each of the services recorded a number of DevOps activities that were performed in line with day-to-day operations and the uptake trends for all of the services showed continuous growth. Some minor issues were reported and resolved quickly, without impacting the delivery of the services. The services were promoted through various events including trainings, presentations for higher management, technical presentations and participation in conferences. All these dissemination activities are listed in Appendix A.

Appendix A List of Dissemination Activities

#	Type of Activities ¹	Main Leader	Title	Name of Event	Date/ Period	Place
1	Service and Technology Forum	Trocha Sz.	perfSONAR latest release update	10th Service and Technology Forum	01/03/2017	Nicosia, CY
2	Workshop	Trocha Sz.	Essentials of the Modern Performance Monitoring with perfSONAR	Networkshop45	11/04/2017	Nottingham, GB
3	Webinar	Delvaux A., Trocha Sz.	Overview of the new features in perfSONAR 4.0	Online webinar	24/05/2017	Public webinar Youtube .
4	Presentation	Delvaux A.,	Good things come in small packages — Creative perfSONAR	TNC17	31/05/2017	Linz, AT
5	Presentation	Milinovic M.,	Update on monitoring and statistics for eduroam	TNC17, Mobility Working Group	2/06/2017	Linz, AT
6	Training	Ilic N.	FaaS training	FaaS training	19-21/07/2017	Podgorica, ME
7	Presentation	Milinovic M	eduroam in GÉANT Trust and Identity services portfolio	16th RoEduNet Conference	22/09/2017	Târgu-Mureş, RO
8	Training	Milinovic M., Eremija M.	eduroam Service training	CSIT 2017	25-26/09/2017	Yerevan, AM
9	Presentation	Delvaux A.,	Network monitoring and Security — perfSONAR update	Symposium 2017	04/11/2017	Budapest, HU

#	Type of Activities ¹	Main Leader	Title	Name of Event	Date/ Period	Place
10	Demo	Delvaux A.	perfSONAR Small Nodes update	Symposium 2017	04/11/2017	Budapest, HU
11	Demo	Delvaux A.	pScheduler context and Linux Network Name Spaces	SC17	14-15/11/2017	Denver, CO USA
12	Training	Delvaux A., Garnizov I.	Jisc Hands-On perfSONAR training	Jisc internal training	22-23/11/2017	Manchester, UK
13	Presentation	Trocha Sz.	Monitoring and exploring virtual digital infrastructures with perfSONAR	Digital Infrastructures for Research 2017	30/11/2017	Brussels, BE

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Glossary

AAA	Authentication, authorisation, and accounting
ARP	Address Resolution Protocol
CAT	Configuration Assistant Tool
CRL	Certificate Revocation Check
CSI	Continual service improvement
DHCP	Dynamic Host Configuration Protocol
DNS	Domain Name System
eduroam OT	eduroam Operations Team
eduroam SG	eduroam Steering Group
EAP	Extensible Authentication Protocol
ETLR	European top-level RADIUS server
FLRS	Federation-level RADIUS proxy server
GeGC	Global eduroam Governance Committee
HI	Home Institution
IdM	Identity Management
IdP	Identity Provider
KPI	Key Performance Indicator
L1	Layer 1
L2	Layer 2
LDAP	Lightweight Directory Access Protocol
MA	Measurement Archive
MAC address	Media access control address
MDS	Metadata Distribution Service
MP	Measurement Point
NAPTR	Name Authority Pointer
NAT	Network address translation
NOC	Network Operating Centre
NREN	National Research and Education Network
NRO	National Roaming Operator
OT	Operations Team
PERT	Performance Enhancement Response Team
RADIUS	Remote Authentication Dial-In User Service
SAML	Security Assertion Markup Language
SLS	Simple Lookup Service
SP	Service Provider
TLS	Transport Layer Security
UDP	User Datagram Protocol
VI	Visited Institution