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Deliverable D11.1

Review of SA7 Online Services Supply Chain Work in GN4-1

Deliverable D11.1

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Authors:	A. Steijaert (SURFnet), B, Radojevic (CARNet), P. Louridas (GRNET), M. Saini (GEANT Limited), M. Wets (SURFnet)

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Abstract
During GN4-1, the Service Activity 7 (SA7) team strengthened the project's capabilities across the services supply chain through joint-NREN efforts to achieve pan-European delivery and adoption of online applications in the cloud. This deliverable presents an overview of the effort and services delivered during the 12-month project, including collaborations that took place across different organisations and countries.

Table of Contents

Table of Figures

Table of Tables

Executive Summary

Building on the foundation established in GN3plus SA7, the NRENs expanded their collaboration on clouds and online services delivery as part of the GN4-1 project's Service Activity 7 (SA7) Supply Chain Support. During the past 12 months, SA7 strengthened the position of GÉANT as a service delivery gateway.

- The number of cloud providers listed in the GÉANT Cloud Catalogue increased from 14 to 18, with Axess, Dropbox, IBM and Zettabox as new additions.
- SA7 negotiated breakthroughs with
  - Amazon: announcing to waive data traffic charges for the Research and Education community.
  - Microsoft: to connect the Microsoft cloud directly to GÉANT via dedicated, private ExpressRoute network connections.
- The RENATER Rendez-Vous community cloud web conferencing service was scaled up and the GRNET ~okeanos IaaS service was prepared for production-level usage in the GÉANT project.
- SA7 launched a pan-European tender for Infrastructure as a Service (IaaS) solutions, which will establish a single digital market for the use of these services and sees a strong interest from over 30 providers. 36 NRENs are involved with the tender and will make the services available to their community. The tender will be completed in July 2016.
- 78% of the GÉANT NRENs are now planning to deliver cloud services and the NRENs actively exchanged knowledge through the communication and adoption channels provided by SA7.

The combination of demand aggregation and economies of scale, technical and organisational assets, legal, procurement and business development expertise, puts GÉANT and the NRENs in a unique and trusted position, to bring online services to the European Research and Education community with the right conditions of use.

1 Introduction

This section provides a roadmap to the content included in this document.

Section 2 reminds the reader of the purpose and objectives of SA7.

Section 3 outlines the GÉANT community's service needs and translates the demand for services into brokerage, and eventual inclusion in a catalogue of providers.

Section 4 provides a view of the approach by the SA7 team to fulfil those needs.

Section 5 describes the results for each cloud delivery component.

Section 6 describes the results for each service type area covered within GN4-1.

Section 7 summarises the deliverables and milestones

Appendix A provides information about the support material created during Task 1, 2, 3 and 4 including websites, events and presentations.

References and a glossary are also provided at the end of this report.

2 Purpose and Objectives

2.1 Background

In the previous GÉANT project, GN3plus, Service Activity 7 (SA7) led six tasks focused on serving the NREN community by initiating collaborations on clouds, aimed at delivering online services with the right conditions of use. SA7 also (somewhat ahead of demand) engaged with mobile providers to procure mobile telephony and data services at a reduced rate.

The SA7 team and the NRENs established a joint approach, supported by a strategy baseline for organisational change and standardisation efforts for technical interoperability, to jointly consume clouds from commercial providers (outsourced solutions) and produce cloud services (insourced solutions). This hybrid model accommodated an aspect of *choice*: the GÉANT community has many different needs for online services they want to use. It also takes into account the element of *control*: the community wants to use cloud services via their trusted partner, their NREN.

This early work introduced GÉANT as an efficient delivery vehicle and single route to market. The providers' response to the invitation outlining the community's requirements resulted in development of a Cloud Catalogue, which is extended in the GN4-1 work from 14 to 18 providers, as detailed in 5.3.1.

Previous work also formed a focused and interested set of NRENs that is collaborating on mobile services (3G, 4G) delivery.

Through this collective effort, SA7 continues to contribute to the European digital single market, provide clarity on clouds and other service offerings and more favourable conditions of use, to help the GÉANT community adopt needed services in a predictable and affordable way.

GÉANT is now able to provide a unique service with this combination of demand aggregation and economies of scale, technical and organisational assets, legal, procurement and business development expertise.

2.2 Goal of SA7 During GN4-1

As detailed in **Error! Reference source not found.**, four main Tasks helped to focus the aims of the work:

- Task 1:
  Conducted brokerage and procurement of online services.
- Task 2:
  Facilitated NRENs in the creation and sharing of community cloud services, handled the technical integration of online services with the GÉANT and NREN Identity Management and Network infrastructure and handled the technical development of the cloud catalogue.
- Task 3:
  Improved service delivery/distribution and eventual NREN adoption of services.
- Task 4:
  Provided communication and support efforts, such as forging new alliances with strategic partners and dissemination activities.

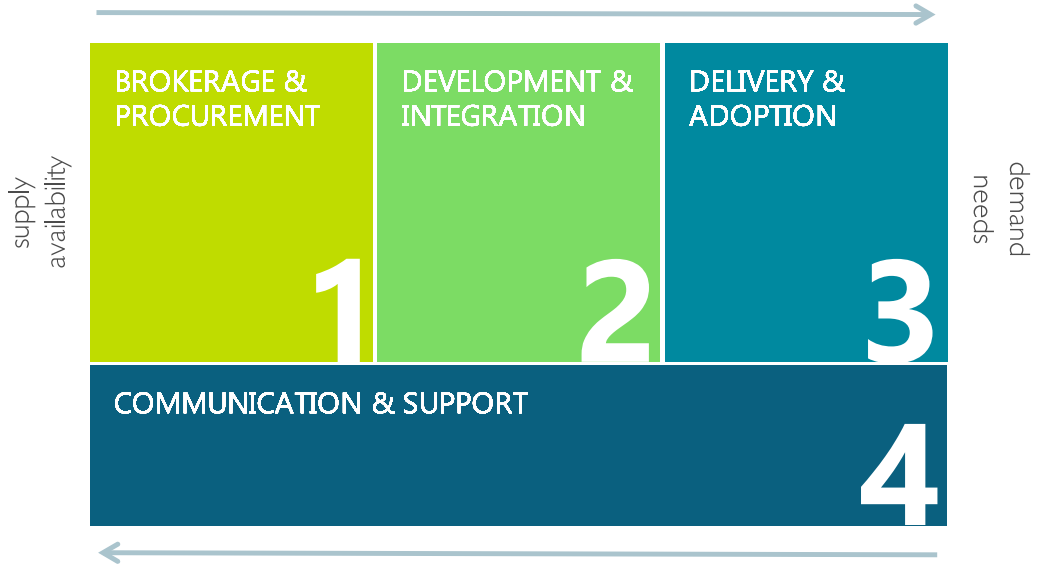

Figure 2.1: Task overview

2.3 Impact

In GN4-1, Service Activity 7, GÉANT strengthened its capabilities across the services supply chain, through joint-NREN efforts to achieve pan-European delivery and adoption of online applications in the cloud.

SA7 ensured that NRENs' demand and collaboration on service supply chain development and management helped to advance the range of services on offer. SA7 organised joint NREN efforts that:

- Prepared a rich set of suitable application services by providing service brokerage and procurement to build up the service set.
  - Put services 'on the shelves'.
- Provided service development and integration to help deliver application services to the community
  - Moved services 'off the shelves' and into the hands of R&E users.

SA7 supported the NRENs to deliver application services to their communities by establishing a service delivery gateway and connection hub. These services help R&E users with their computation and communication needs and allow them to collaborate across different organisations and countries, through services that are safe and easy to use, accessible, affordable and interoperable. The Activity managed both organisational and technical aspects in order to create a successful ecosystem that meets users' needs

Through this joint approach, NRENs are 'moving up the stack' and are bringing value to the GÉANT community. Linking the pan-European service delivery capabilities to the strong assets already in place (the network and middleware capabilities) offers GÉANT a unique position, and the education and research community a well-integrated user experience.

The following sections cover the key areas of achievement for the Activity, grouped by service type instead of mapping Task by Task output, as each Task brought its expertise to a particular part of the service delivery chain for each of those service types.

2.4 Service Types

During GN4-1, SA7 focused on the delivery of the following types of application services:

- File storage and collaboration.
- Real-time communication (RTC).
- Infrastructure as a Service.
- Mobile services, in a separate, exploratory track.

These service types were identified in GN3plus SA7 as the areas with the highest demand from the community (both by NRENs and research and education institutions).

2.5 Scope

SA7 did not build any of the offered services itself, but instead, it stimulated and linked service development efforts from other organisations (both providers within the R&E community and commercial suppliers), to make these fit the requirements of the R&E community, integrate them with the GÉANT infrastructure and bring them to the R&E community.

3 Community Needs

Organisational, technical and financial structures used by Research and Education institutions do not easily integrate with the way service providers offer their services. SA7 gathered the needs specific to R&E organisations for cloud services. In summary, for members of the GÉANT community, to be able to 'get into the clouds' and start using online services, clarity and assurances of providers must be in place. Also, the GÉANT community needs to be able to 'get out of a cloud' when required or desired, and move to another provider or solution.

Below these requirements are described in more detail.

3.1 Terms and Conditions

Data needs to be handled safely and securely, meeting European and national legislation and regulations. Conditions of use must be transparent, which will overcome the biggest obstacle of using clouds and online services: trust and security.

The work carried out in SA7 helped to improve trust and security through:

- Provider engagement and the GÉANT cloud catalogue, which is based on a joint NREN requirements document, clearly describing pre-conditions in this domain and lists the answers from providers to these needs; to which extend providers can meet the requirements.
- Interaction with the EC and other e-Infrastructure organisations to exchange knowledge in this area.
- Joint delivery and procurement efforts, including an IaaS procurement.

3.2 Purchase Models and Reducing Costs

Purchasing models for buying application and cloud services must match the financial structures in Research and Education, for instance, users in R&E institutions do not have access to company credit cards. Cloud services have to be acquired through the institutions' purchasing structures, meeting procurement and tender regulations.

In addition, the payment structures offered by cloud providers are too unpredictable, as they contain variable cost components (network ingress and egress charges). The large opex component conflicts

with the capex-driven R&E funding. To prevent the (fear of a) bill shock, predictable cost models and purchase-order-based systems are needed.

The variable costs of services can be reduced by limiting network traffic charges (data ingress and egress), through peering arrangements and connecting cloud providers to the GÉANT network.

The work carried out in SA7 improved this topic by:

- Aggregating expertise in this area (which is hard to find) within the SA7 team.
- Provider engagement, the requirements and cloud catalogue.
- Joint delivery and procurement efforts, including:
  - An IaaS procurement, which aims to establish suitable purchase models and reduce costs (Section 5.3.2).
  - Negotiating with Amazon, to have Amazon waive data traffic costs for the Research and Education community (Section 5.4.1).

3.3 Technical Integration

Network peering also offer technical benefits, in terms of latency and bandwidth, by establishing the best and most direct network connection between the provider and the R&E community.

For user management and access, the R&E community wants to log-in to cloud services with a trusted institutional account, which:

- Is convenient for users, as it allows them to log-in to many cloud services using one account.
- Gives granular access management to institutions: the R&E organisations control the user accounts and can revoke access to all connected (cloud) services for a user when required, by simply blocking the account in their database.
- Provides assurance to cloud providers, since the eligibility of our users is guaranteed. Without such an identity management platform, every online service would need a separate user database, which is unmanageable.

Network peering and eduGAIN bring cloud providers into the heart of the Research and Education domain [eduGAIN].

SA7 contributed to improving this topic by:

- Providing information to providers on the relevance of these connections; *why* should they care and invest in these links and *how* they can connect.

- Including the network and Identity Management aspects in the GÉANT IaaS procurement and organising deep-dive sessions on these topics.

- By helping providers to establish the actual connections, by linking the teams involved within GÉANT and the NRENs (e.g. other GN4-1 Activities, operational teams), as well as those teams

at the providers' side. A result of this work is the agreement between GÉANT and Microsoft, to directly connect the Microsoft cloud to GÉANT and the R&E community (Section 5.4.2).

3.4 Data Portability

Members of the GÉANT community need to be able to 'get out of a cloud' when required or desired, and move to another provider or solution. Data and metadata owned by our community and held by cloud providers must be easy to export and delete.

SA7 contributed to improving this topic by:

- Gathering suitable standards and protocols.
- Advocating their use at meetings and conferences.
- Including data portability requirements in the IaaS tender.

4 Approach

SA7 supported joint NREN efforts to fulfil the cloud needs of the European Research and Education community: to enable and facilitate the European Research and Education community to use online services with the right conditions.

4.1 Trusted Partners

The interactions in SA7, between the NRENs and with the Research and Education community, showed that clouds cannot be considered as an asset that only affects, or can be owned by one organisation. It is a distribution model which impacts all organisations that deliver and use IT services. Users and peers consider NRENs as their trusted partner, delivering online services for many years. It is only natural that NRENs facilitate the community, to transition to a cloud distribution model.

4.2 Full User Experience

Cloud and online services are disruptive, as they empower users and change the traditional service delivery chain. The cloud market is experiencing an initial growth spurt, with organisations scrambling to claim their position, before a cyclical growth stage will set-in. NRENs have the opportunity to be in a unique position within this cloud ecosystem, to deliver a complete cloud solution:

- To aggregate community needs and demand.
- To provide clarity about cloud providers' capabilities.
- To broker agreements with commercial providers, which meet institutional needs.
- To offer community cloud solutions (built and operated by NRENs).

- To connect clouds to the GÉANT and NRENs networks and federated Identity Management ecosystem.
- To allow institutions to consume these offerings.
- To assist with adoption.

The R&E community asks NRENs to fulfil this role.

4.3 Hybrid Model

Cloud services lead to a considerable shift, which require NRENs to adapt their business, service and even organisation models accordingly. A key conclusion is that NRENs have now moved beyond asking "If clouds…?" or "Why clouds...?" and are now (starting with) delivering suitable services.

In this delivery, there is not a single 'one size fits all' solution, as NRENs and the organisations they represent have different requirements at different points in time. There is no single "right way of doing things", 10 000 institutions and 50 million users present a range of needs and preferences.

SA7 helped the NREN's with their strategy and tactics for cloud services and key questions such as:

- Which cloud services should NRENs and their communities consider?
- Which deployment models are most effective (e.g. public, private, hybrid, community)?
- How to build and buy and what is the role of brokering cloud services?
- What is the operational model e.g. own resources, for outsourced managed service?
- What is the best way to collaborate with other NRENs?
- What will be the impact of the cloud distribution model on the organisation e.g. resources and skillsets?
- Are there any business case and financial models and funding aspects?

There is trend towards a hybrid delivery model, where NRENs offer both community cloud services which they build and operate themselves and broker agreements with public cloud providers (commercial suppliers). The NRENs actively collaborated in both areas, in SA7.

SA7 tried to accommodate this diversity: by working on in-house and outsourced cloud solutions, different service types and a mix of small and large providers, from within Europe and abroad, illustrated by the spread of providers listed in the cloud catalogue and the range of providers who are interested in the IaaS tender.

4.4 Collective Approach

The joint NREN efforts in SA7 made it clear that this collective approach is a necessity to be successful in the clouds area.

- The user-driven aspect of clouds and the diversity of the user-base: users want to choose the services that fit their needs.

- The complexity of the topic (the right expertise is scarce) and speed of new developments.
- The volume aspect: becoming a cloud player requires size and clout.

SA7 forged a collective approach between NRENs and suppliers to work on clouds, to share expertise, and learn and evolve together. This includes moving 'up the stack' to offer more than the network, by providing more advanced online and middleware services to support the complex and evolving requirements of the end-user institutions. By combining efforts, NRENs are able to develop new skills and services and offer these to their clients quicker and cheaper than they would be able to do on their own.

4.4.1 Size Matters

Working together as NRENs within GÉANT on clouds, opens doors to suppliers and stakeholders. The impact of such economies of scale are significant. The joint service delivery activity through SA7, contributes to a connected Europe and a single digital market. The collective approach works, as shown by the number of providers listed in the cloud catalogue and interested to deliver their services to the European Research and Education community through GÉANT (and the IaaS tender).

4.4.2 Business Development and Procurement Expertise is Scarce

Tackling the challenges for cloud and other service delivery requires expertise and business development, procurement experts and legal specialists. These non-technical roles are scarce within the NREN community. A good team was brought together in SA7, that had the required skills in place.

4.4.3 Build on and Share What is Already in Place

SA7 allowed NRENs to share services initially developed in a single country with the whole pan-European community. Scaling up the Rendez-Vous webconferencing from RENATER and ~okeanos IaaS offering from GRNET are examples of inter-NREN service use [RENDEZ-VOUS]. The NRENs also shared knowledge on cloud platforms, such as OpenStack [OPENSTACK].

Using cloud services should not require a leap of faith, but instead, should be an evolution of steps, building upon IT structures already in place. NRENs have been delivering online services for many years and clouds are nothing more than a new model to distribute those services. R&E organisations can control services delivered through their NRENs. The eduGAIN identity management ecosystem developed within GÉANT and GÉANT network itself are assets to connect the clouds to the community [eduGAIN]. Combined with aggregated provider engagement, the cloud catalogue and joint procurements, more affordable and predictable cost models and conditions of use that meet the needs of our community, can be achieved.

5 Results per Delivery Component

The following paragraphs describe the result for the different service delivery components:

- Community needs (Section 3)
- Data management and risk classification (Section 5.2}
- Brokerage and procurement (Section 5.3)
- Network (Section 5.4)
- Identity management (Section 5.5)
- Delivery models (Section 5.6)
- Adoption and communication (Section 5.7).

5.1 Community Needs

5.1.1 R&E Survey

A survey was conducted amongst the R&E community, to evaluate the use patterns, demands and "wish lists" for cloud services, including:

- How institutions perceive cloud services.
- Which cloud components institutions currently have in place.
- What cloud services or components are being planned.
- Gauge user needs and "wish lists".
- The roles NRENs play in the minds of NREN customers/institutions.

The survey report is published on the intranet [SURVEY].

The main outcomes are as follows:

- Both the NRENs and institutions responded that the relevance of cloud services for them is high.
- The appeal of cloud services are their flexibility, scalability and ease of use.
- Primary obstacles to deployment are lack of funding and personnel shortages.
- Institutions and/or NRENs are willing to share components.
- Attractive services for the R&E community:
  - IaaS
  - e-learning
  - Tools for file sharing,
  - Storage backup disaster recovery
  - Web hosting - new
- Concerns still exist in the realm of security and privacy, reliability and location.

- On the demand side, users and decision makers are looking towards NRENs for cloud solutions, especially in the area of network and storage services.

5.1.2 GÉANT Compendium

Also, SA7 wrote the cloud chapter for the 2015 edition of the *GÉANT Compendium*, a yearly NREN survey on a range of topics, including clouds. The respondents are NRENs inside and outside of Europe [COMPENDIUM].

The results show that many NRENs are now involved with cloud and online application services and aim to bring these to their communities with the right conditions of use. A reported 56% of the GÉANT partner NRENs are active in delivering cloud services and a further 22% are planning to be involved. This maps on the number of NRENs (36) who joined the GÉANT IaaS tender (Section 5.3.2).

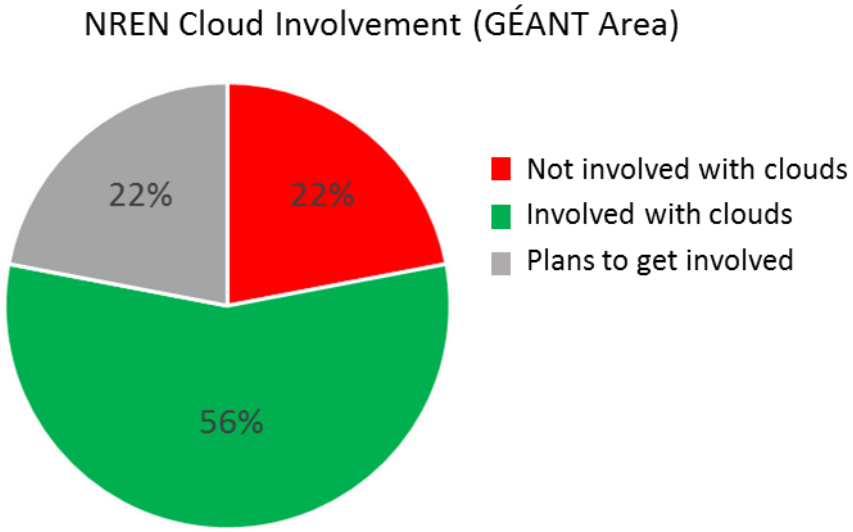

Figure 5.1:Percentage of NRENs involved with cloud and online application services

The map in Figure 5.2below shows the role NRENs take in cloud service delivery.

build	NRENs which (have plans to) offer cloud services not obtained through a vendor, are marked orange
broker	NRENs which (have plans to) broker agreements with cloud service providers, are labeled blue
build and broker	NRENs which (plan to) do both, a hybrid approach, are presented in purple
	NRENs with no plans, no interest, or which have provided no input, are marked brown
	Remaining countries are displayed in grey

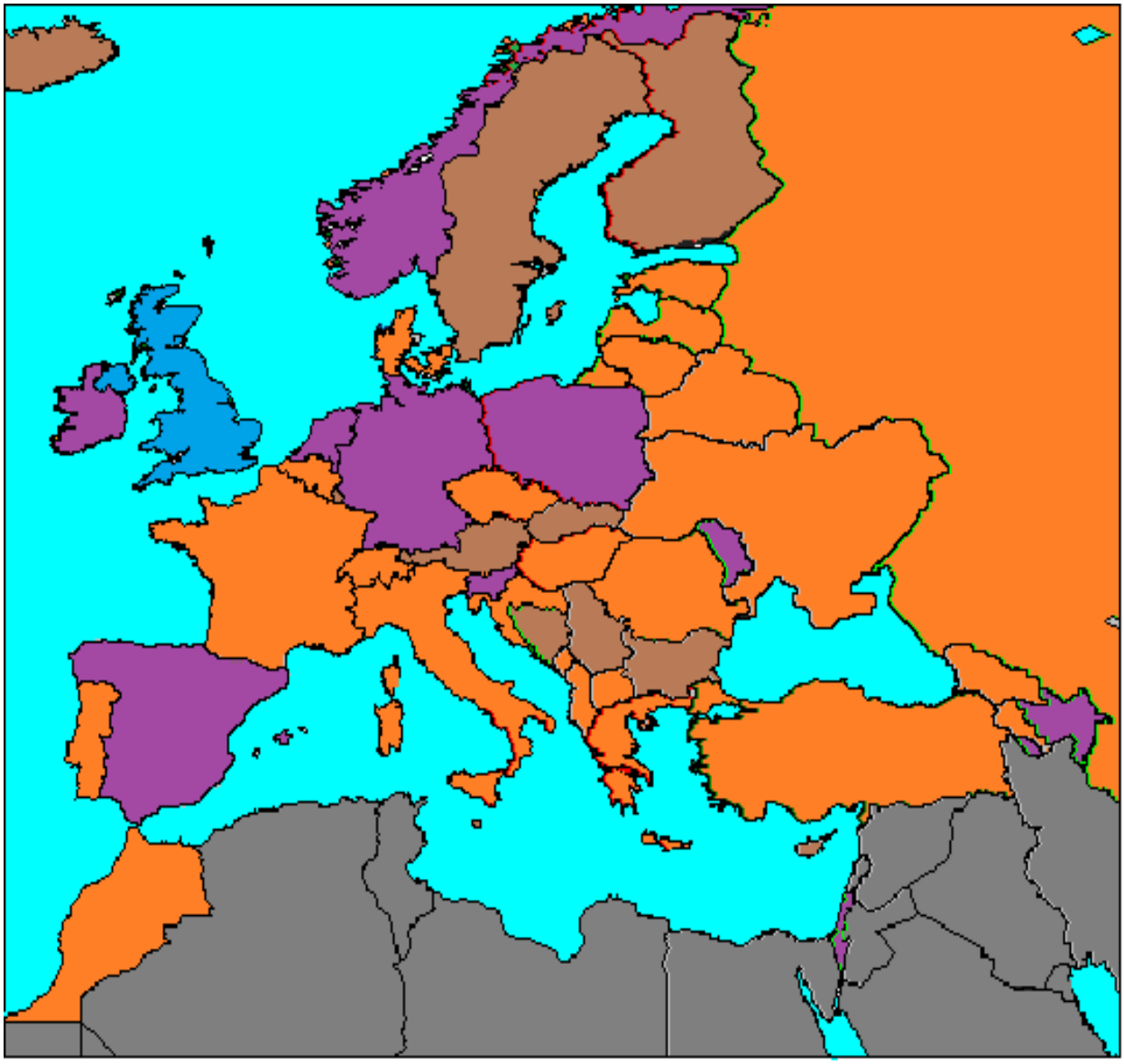

Figure 5.2: NREN involvement in Clouds

Service types

There is a clear top three service types:

1. **Infrastructure as a Service (IaaS):** virtualised computing resources, such as data processing and the ability to run virtual machines over the Internet.

2. **File storage and backup**: dedicated solutions for storing, managing, archiving, sharing and / or synchronising files.

3. **Software as a Service, collaboration services and video conferencing**: a broad category encompassing (web-based) tools such as e-mail, calendars, document management and sharing, messaging and real-time communication (live messaging, co-editing shared documents, screen sharing, audio and videoconferencing).

Suppliers

Several suppliers are explicitly mentioned by NRENs; stating that they either have an agreement with this provider or are interested in establishing an agreement. The vast majority is the latter, NRENs seeking a (framework) contract which establishes the right conditions of use.

Suppliers named by multiple NRENs:

- Amazon Web Services [AMAZON]
- Blackboard [BLACKBOARD]
- BOX [BOX]
- Google Apps [GOOGLE_APPS]
- Microsoft Azure and Office 365 [MICROSOFT]
- OwnCloud [OWNCLOUD].

5.2 Data Management and Risk Classification

Moving data outside of the walls of an organisation, from an in-house, on-premises server to an outsourced cloud solution, is not a 'black or white decision'. The type of data involved determines where it can be placed: the sensitivity of the data and the impact on the business, when loss of confidentiality, integrity, or availability of the data occurs, determine the sourcing options.

SA7 created a guide, to help the community with a risk classification of their data and the subsequent sourcing decisions. The document describes the following aspects:

- What is data and risk classification?
- Why is this relevant (for cloud outsourcing scenarios)?
- What does a risk classification look like?
- How can an institution implement and apply a risk classification model (through a set of questions)?

5.3 Brokerage and Procurement

5.3.1 Cloud Catalogue

GÉANT's cloud catalogue is a growing resource for the European research and education community, with a structured listing of a number of service providers and cloud services [CLOUD_CATALOGUE]. It provides NRENs and the research and education community with a quick and easy guide to cloud providers' answers to the cloud requirements of the R&E community, and aims to clarify the capabilities of providers, helping in the procurement of cloud services.

What is the GÉANT Cloud Catalogue
The basis for this online directory is a coordinated list of pan-European core requirements, which cloud service providers are expected to meet. These pre-conditions cover intellectual property rights and ownership, legal aspects, security, continuity, confidentiality, communication, billing and technical requirements. In addition to the core requirements, suppliers are provided with objectives and contractual positions that GÉANT members will be seeking in their future commercial relationships, which, in turn, help providers to understand how to offer their services to the research and education market. Providers' self-assessment of their ability to meet the core requirements is based on a red / amber / green (RAG) scoring system of each of the indicative elements identified in the Cloud Catalogue requirements document: • **Green**: supplier fully complies with / meets the requirement. • **Amber**: supplier partially complies with / meets the requirement and explains the difference through concise, descriptive text. • **Red**: supplier does not comply with / does not meet the requirement. Providers that offer multiple services send in a response for each service, since parameters for each service can be different. The GÉANT Cloud Catalogue offers the research and education community clarity about providers' capabilities and enables a comparison of providers (against a single set of questions). The catalogue can be used by NRENs and Research and Education institutions for their internal processes when procuring cloud services (subject to domestic procurement legislation and applicable EU threshold values). The catalogue is not an online shop where users can buy services, but a tool that supports research and education network providers and institutions across Europe with their procurement of services from the cloud. It allows NRENs and R&E institutions to select services that meet their needs and contact the right teams at the providers: It fulfils a recommendation role.

Table 5.1: Introduction to the GÉANT Cloud Catalogue

During the timeframe of GN4-1, SA7 added four new providers to the GÉANT Cloud Catalogue:

- Axess [AXESS}
- Dropbox [DROPBOX]
- IBM [IBM]
- Zettabox [ZETTABOX]

The GÉANT Cloud Catalogue now contains the following providers
(the descriptions in the table are provided by the suppliers):

	Advania Advania is a Nordic IT company with staff of 1100 people and 20 offices in three countries. The company is built on a solid foundation that spans over 70 years of information technology service to both the private and public sectors.
	Amazon web services Amazon Web Services is a collection of remote computing services, also called web services, that make up a cloud computing platform offered by Amazon.com. These services are based in 11 geographical regions across the world.
	AXESS Axess Systems is a UK based, Infrastructure-as-a-Service provider that specialises in the delivery of Citrix virtual desktops via an enterprise class, highly efficient, flexible and available hosting solution.
	Box Box is the secure way to share content and improve collaboration for over 275,000 organisations and 32 million users as we believe that technology should never limit the invention and productivity of enterprising minds
	CARNet CARNet is the Croatian NREN offering over 70 services, ranging from education to Internet connectivity, multimedia, computer security and IaaS-based community CMSs, which are available to users from primary school to higher education, research centres and institutes.
	CloudSigma CloudSigma is a pure-cloud Infrastructure-as-a-Service provider that offers highly available, flexible, enterprise-class cloud servers and cloud hosting solutions.
	Code42 Code42 connects people to the files they need on their devices, enabling continuous data protection and secure access for people and businesses everywhere. 35,000 business and leading educational institutes globally use our products.
	Dropbox Dropbox is a service that lets you bring all your photos, docs, and videos anywhere, and share them easily. Any file you save to your Dropbox will automatically save to all your computers, your phone or tablet, and the Dropbox website. Dropbox also

	makes it easy to share with others. And if your computer melts down, you can restore all your files from the Dropbox website with a couple clicks.
edu zone	**EduZone** Dedicated to provide cloud services exclusively to the Research and Education community, through a specially designed platform that follows NRENs and institutions business logic.
Google for Education	**Google** Google is a global technology leader focused on improving the ways people and organizations connect with information.
grnet	**GRNET** The Greek Research and Technology Network provides networking and cloud services to the Greek academic research and education community and beyond.
IBM	**IBM** International Business Machines Corporation (commonly referred to as IBM) is an American multinational technology and consulting corporation, with headquarters in Armonk, New York. IBM manufactures and markets computer hardware, middleware and software, and offers infrastructure, hosting and consulting services in areas ranging from mainframe computers to nanotechnology.
Microsoft	**Microsoft** Microsoft Corporation develops, licenses, markets, and supports software, services, devices and cloud services comprising Office 365, Dynamics CRM Online and Microsoft Azure worldwide.
netskope	**Netskope** Netskope™ is the leader in cloud app analytics and policy enforcement.
ULTIMUM TECHNOLOGIES	**ULTIMUM Technologies** Ultimum Technologies s.r.o. is a European provider of OpenStack-powered Infrastructure as a Service for public clouds, hosted private and on-site private cloud solutions in the CEE Region based in Prague, Czech Republic. The company was established in 2010 primarily focusing on Research and Development of analytical software for complex systems simulations. Since then, it has expanded the scope of its activities to the development of Open cloud platforms and services. This vast experience has been exploited in company's offering which comprise the Ultimum Cloud and Ultimum Cloud Platform.

	**Zettabox** Zettabox is Europe's cloud storage and team collaboration tool developed with protection by design to meet the needs of academic and research institutes, in compliance with the EU's upcoming General Data Protection Regulation. Zettabox stores your content only in Europe, in ISO27001 certified facilities. With Geo-Tool, you can specify one of 10 European locations. Integrating with a broad range of collaboration tools, you are never locked into a single provider's tool set. Zettabox provides easy to use administrative dashboards, to manage a small research team or an entire university. Simple. Secure. European. Store, Sync, Share and Collaborate with Zettabox.

The Cloud Catalogue was rebranded, with the new GÉANT look-and-feel.

SA7 planned the next iteration of the cloud catalogue, to provide more granularity in how services are presented and better selection options.

5.3.2 IaaS Tender

Infrastructure as a Service (IaaS suppliers provide virtualized computing resources, such as data processing and the ability to run virtual machines, over the Internet.

IaaS is a focus area for SA7, in response to:

- Demand from NRENs and institutions.
- Interest from IaaS providers assembled by SA7 in working on the cloud catalogue, that want to deliver their services to the R&E community through GÉANT and the NRENs.

SA7 prepared and launched a pan-European, collective NREN tender, with the goal to establish a service delivery chain which enables all Research and Education institutes in Europe to adopt and use IaaS cloud solutions, in an easy, safe, predictable and controlled manner. Through this joint tender, the NRENs want to put in place agreements with suppliers of IaaS solutions and connect these providers to the Research and Education IT ecosystem. Framework agreements will be awarded to all providers who meet the requirements (a multi-vendor approach, to bring choice to the community).All NRENs and their Institutions who are part of this tender, will then be able to use the outcomes and consume these services without additional procurement.

The tender aims to ensure that:

- Providers offer a IaaS feature set which matches the community's needs.
- Data is handled safely and providers meet European and national regulations.
- The community can aggregate demand and costs are affordable and predictable.
- Services can be acquired and used through the institutions' purchasing and management structures.
- Services are connected to and compatible with the community's network and Identity Management capabilities.

This tender initiative will bridge the demand and supply sides for Infrastructure as a Service, to:

- Make it easier for the Community to consume IaaS solutions in a manner compliant with European procurement legislation and with the right conditions of use. By aggregating demand across the community and negotiating integrated brokerage and service delivery, the Community will be able to get the best possible value from cloud services.

- Make it easier for Cloud Service Providers to reach and deliver their IaaS solutions to the Community, efficiently and at large. This procurement provides a direct route to the Community.

The tender is being carried out as an Open Procedure in accordance with the UK Public Contracts Regulations 2015. The tender builds on the new 2014 EU procurement directive (2014/24/EU). The anticipated completion date of the agreements is July 2016, three months later than initially planned.

Why the delay? The requirements set out in the new 2014 EU procurement directive allow NRENs to run a joint procurement via one Central Purchasing Body (such as GÉANT). EU member states have until 18 April 2016, to implement this new directive on a national level. This means SA7 can launch the RFP / final bids when these national implementations are in place, on 19 April 2016. SA7 then needs three months to complete this part, which means that framework agreements will be available in July 2016.

The delivery model is as follows:

1. GÉANT runs the tender and establishes framework agreements with providers.
2. The tender does not have a 'winner takes all' approach, but instead, involves framework agreements with all capable providers, with a four year duration. This will allow NRENs and their connected institutions the flexibility to choose the services that best fit NRENs' needs and the needs of their users.
3. NRENs adopt these frameworks (in some cases, add national legislative elements).
4. Institutions consume the service via their NREN, without the need to run a tender themselves, which brings considerable savings.

The IaaS tender formed a major part of the SA7 work, and involved contributions from all Tasks. It required:

- Preparing the tender (aligning the community and their needs, the procedural aspects and documents).

- Vendor management: Getting the attention from and interacting with a large group of over 30 suppliers. The list of interested providers contains a good spread between providers from the EU and abroad, and a mix between large and smaller providers. All these providers needed to be informed about the opportunities, tender approach and requirements; to try and ensure these providers are willing and able to respond and deliver, once the tender launches in April. It involved an elaborate consultation track, with numerous meetings with providers; bi-lateral meetings and sessions open to all suppliers.

- Liaising with the NREN community, to ensure their involvement, gather their needs (specific country requirements) and help them prepare, to adopt the outcomes of the tender. At present, 36 NRENs have joined the tender.

More information is available at [IaaS].

5.3.3 Cloud Management Portals

Many NRENs have adopted a hybrid cloud strategy, offering a mix of community cloud (built and operated within R&E) and commercial (public cloud) offerings. These services have different interfaces, pricing models, reporting and billing mechanisms. A new layer is required to abstract the underlying complexity and to manage these different systems and resources. SA7 facilitated joint efforts by the NRENs in this area. The NRENs discussed their plans, shared their blueprints and engaged with providers that can deliver these cloud management portal capabilities. Some of these providers include: Arcus, Cisco, Dell, and GreenQloud.

5.4 Network

GÉANT wishes to provide the optimum service in terms of performance, security and end to service assurance to its client institutions by utilising the GÉANT network.

The GÉANT and NRENs' networks, operating at speeds up to 500 Gbps for each fibre, with extensive wireless coverage provided through the eduroam service, is one of the most advanced networks in the world. The GÉANT backbone and the national NREN network capabilities provide secure, high capacity and low latency network access to 10.000 institutions across Europe. GÉANT and the NRENs want to connect cloud providers directly (peer) to this network.

By establishing physical network connections with cloud service providers, GÉANT and the NRENs:

- Deliver a high-quality service in terms of performance, security and end-to-end service assurance.
- Make possible to minimize or remove the data transport related costs, which cloud providers currently charge our community. These data ingress and egress charges are a barrier to the adoption of cloud services by institutions. By directly peering, no commercial network routes need to be used, removing the need for providers to charge transport costs.

5.4.1 Amazon Data Egress Waiver

On March 1, Amazon Web Services announced that it will waive data egress charges for the Research and Education community. A decision made following extensive consultation with SA7. This represents an important step forward, as it reduces the costs for using Amazon Web Services and leads to higher cost predictability. SA7 hopes and expects that other providers will follow Amazon's decision, also considering the data egress waiver is a 'must-have requirement' in the upcoming SA7 IaaS tender (which is described in detail in paragraph 5.3.2).

More information about the Amazon announcement can be found [NEWSAMAZON1], [NEWSAMAZON2].

5.4.2 Microsoft Express Routes

Microsoft Azure ExpressRoute lets an institution extend their on-premises network into the Microsoft cloud (Microsoft Azure, Office 365, and CRM Online) over a dedicated private connection. This connection is facilitated by a third party: a connectivity provider.

There is significant interest in these connections from the community. However, the fact that these ExpressRoutes are implemented through commercial third parties leads to substantial costs and has institutions relying on commercial parties for a network connection, for which they already have a partner: their NREN.

SA7 therefore worked with Microsoft to have GÉANT become such a connectivity provider:

- Removing the third party cost component (which was substantial; on average EUR400 per month, per institution, for a single 1 Gbps connection).
- Allowing NRENs who want to, to offer this service to their institutions (a one-stop-shop for their network needs).

On 12 April 2016, Microsoft and GÉANT signed an agreement which made GÉANT a Microsoft connectivity provider partner.

The agreement involves establishing a direct network connection between the Microsoft cloud and GÉANT and lets GÉANT offer the ExpressRoutes to R&E institutions, via the NRENs.

Institutions consume ExpressRoutes via their NREN. The price the institutions pay, consists of:

- Microsoft component: currently a regular price, with an ‘education deal’ expected as an outcome of the IaaS tender.
- NREN component (to be decided by the NREN).

5.5 Identity Management

The eduGAIN identity management eco-system lets users access online services with their trusted institutional account. This federated, Single Sign-On feature is convenient for users, gives granular access management to institutions and assurance to cloud providers.

Support by cloud providers for this Single Sign-On feature, using existing Institution based IDs, will accelerate the adoption of cloud services as it lowers the complexity of creating and supporting multiple sets of IDs. GÉANT and NRENs provide authentication services based on the SAML2 protocol which is effectively a standard within the sector worldwide [SAML2].

The eduGAIN service is founded on SAML2 as the key enabler for the exchange of identity attributes in a trust relationship between an Identity Provider (IdP) and a Service Provider (SP). Using SAML2 on its own requires configuration on a per institution basis for each service and therefore does not scale. Participation in the eduGAIN federation provides access to an authentication service for all participating vendors and institutions without the need for individual configuration [eduGAIN].

SA7 worked with a range of providers (all providers interested in the GÉANT IaaS tender), to inform them about the opportunities and necessities: SAML2 support is a minimum requirement in the

upcoming IaaS tender and eduGAIN support is an Awarding Criteria. The SA7 IaaS tender is described in detail in Section 5.3.2. A summary of the team's discussions about Identity Management with a number of key providers, is provided below.

Microsoft:
In March 2014 Microsoft added SAML 2 support to their Office 365 offering. SA7 was among the group of organisations who convinced Microsoft of the need to support this protocol [MS-SAML2].

SA7 has remained in touch with the Microsoft team about this topic and during GN4-1, worked with Microsoft on connecting the Microsoft cloud offerings, Office 365 and Azure, to eduGAIN. Significant progress has been made; Microsoft sees the benefits, wants to connect and connection scenarios have been investigated. These require changes to the Azure middleware stack, which will take time to implement (are not expected to occur before the end of GN4-1).

Google:
SA7 had several sessions with Google on joining eduGAIN. Although it seems the Google infrastructure has the technical capabilities, the Google organisation decided not to commit to an implementation. It is hoped the GÉANT IaaS tender will help the Google decision making process.

Zettabox:
As part of the interaction with Zettabox to put in place a dedicated product offering for research and education, Zettabox connected to eduGAIN.

Webinars:
SA7, together with SA5, organised several webinars to educate cloud providers, how they can support SAML2 and connect to eduGAIN. These sessions were attended by approximately 20 providers with others expected to view the recording of one of those sessions [WEBINAR].

AARC:
For the AARC project, SA7 wrote an advice on how to evolve eduGAIN, to make it easier to connect cloud providers. This text is incorporated in the following report [AARC].

SWITCH and SA7 organised a workshop on Federated Identity for Cloud Services in Zurich on January 21 and 22 [SWITCH].

5.6 Delivery Models

5.6.1 Service Delivery

The team completed a feasibility study on service delivery: how NRENs offer services and inter-NREN service delivery. The report was milestone M11.1 and is available on the GN4-1 intranet [M11.1].

The report looks at NRENs with service delivery capabilities either for:

- In-house development of the service and offering the service on the resources owned or managed by NREN.

- Brokering and/or re-selling the services provided by third parties (vendors) based on the vendor hardware and software resources.

The report describes several business and funding models employed for service sustainability: internal budget, government and project funding, as well as user fees and subscriptions, in order to support cloud services development and operation.

The report concludes that:

- The NRENs that participated in the report are ambitious and active in developing and providing various kinds of cloud services.
- Compared to market players, NRENs are early adopters or pioneers in important areas related to security and identity management, such as data privacy protection and federated identity management. They also develop and exploit advanced networking systems, on top of which they offer cloud services.
- Limited budgets designated for cloud projects and a shortage of dedicated staff are obstacles.
- Better cloud service development and delivery strategies would improve the NRENs' position.
- It is not yet common to re-use products of NRENs internationally at a large scale and over a long term.

5.6.2 Service Delivery Pipeline for IaaS

As part of the GÉANT IaaS tender preparation, SA7 designed the IaaS delivery pipeline, which involved close interactions with the NRENs and GÉANT Product Management. The delivery approach for the IaaS solutions is as follows:

- GÉANT runs the IaaS tender and awards Framework Agreements to Bidders.
- GÉANT and each NREN may take one of the three following roles for each Framework Agreement.

    - **Referrer**: an NREN will act as intermediary by making the Framework Agreements available in its respective country and facilitating connected institutions to buy from service providers. (Direct delivery model)
    - **Reseller**: expanding the referrer role, an NREN is responsible for more activities and also involved in the contracting and billing of (some of) its Institutions' service orders. The cloud provider interfaces primarily with the NREN and the NREN may provide additional value added services to the end user institution.

      Also, GÉANT may act as reseller and provide contracting and billing in cases where an NREN asks GÉANT to fulfil this role.

    - **Underwriter**: an NREN makes purchases from Providers (on behalf of its connected institutions) and distributes the acquired resources across its community (institutions and end-users).
- Also, GÉANT may act as an underwriter and make purchases from service providers in cases where an NREN asks GÉANT to fulfil this role.

The role of GÉANT and each NREN is individually chosen for each service and may change during the four year duration of the Framework Agreement .

Depending on the role of their NREN, an institution can, at its discretion:

- Directly procure and use the IaaS services from the Providers.
- Procure and use the IaaS services through its NREN.
- Use the IaaS services made available through its NREN.

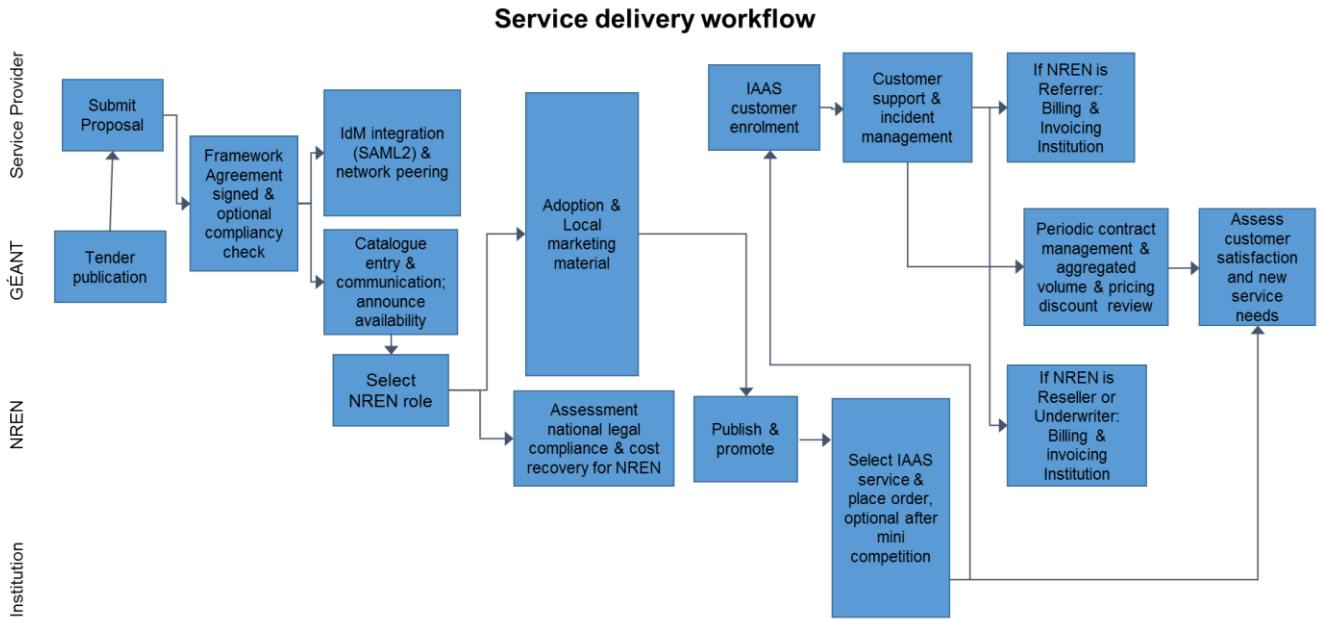

Figure 5.3: Stakeholder roles in the service delivery

5.7 Adoption and Communication

SA7 facilitated the NRENs to transition to a cloud delivery model and adopt the outcomes of the SA7 activity.

5.7.1 Cloud Showcases and Workshops

The team organised a series of online webinars [SHOWCASES]:

- Cloud Opportunities – 2 November 2015
- Cloud Operation – 26 November 2015
- Cloud Implementation and Adoption – ~okeanos – 8 December 2015
- Rendez-vous - Cloud-based WebRTC pilot – 14 December 2015

5.7.2 Clouds Website

The clouds website was restructured, and GEANT Showcases and Cloud Academy pages were added [WEBSITE].

6 Results for Each Service Area

6.1 Collaboration Suites

An online collaboration suite provides NRENs and their users with an integrated set of (web-based) tools to span their collaborative needs, such as e-mail, calendars, document management and sharing, messaging and real-time communication.

BOX
This service has evolved from an online file storage platform into an online file sharing /collaboration platform. SA7 was involved in making BOX available for use within GÉANT:

- For use internally within the GÉANT organisation.
- By assessing wider adoption opportunities, including BOX's suitability for use in future GÉANT project work.

IBM
SA7 discussed the R&E cloud requirements of R&E users and delivery opportunities with one of IBM's Vice Presidents for Cloud in the US. This helped to raise the level of interest from this company. It resulted in a close collaboration with a dedicated team from the IBM EU office. This team was specifically made available to work with education and research on an European level (to mimic the GÉANT approach of having national cloud specialists and NRENs collaborate on this topic in GÉANT). It resulted in IBM entering the GÉANT Cloud Catalogue and significant interest from IBM in follow up activities.

6.2 File Storage and Sync

File storage and sync services provide dedicated solutions for storing, managing, archiving, sharing and/or synchronising files.

SA7 discussed delivery opportunities with several file storage providers:

- Code42 (CrashPlan, SharePlan) [CODE42]
- Dropbox [DROPBOX]
- Zettabox [ZETTABOX]
- Owncloud [OWNCLOUD].

All these providers are listed in the Cloud Catalogue. Dropbox and Zettabox joined during this project period.

Code42 offers file storage solutions with an option to store data in their public cloud and encrypt those files using a key server that runs at the customer's site. SA7 continued the efforts started during the GN3plus project, where CARNet installed such a key server locally in their data centre and makes it available to the GÉANT community.

Dropbox showed a strong initial interest in working with GÉANT and the NRENs which lead to Dropbox entering the Cloud Catalogue. Follow up discussions made it clear that the company lacks a strong support from their top management to invest in meetings to assess the specific needs of the community.

Zettabox is an European provider of online file storage and committed to delivering a suitable solution for the research and education sector, by working with GÉANT and the NRENs. Zettabox joined the Cloud Catalogue, connected to eduGAIN and worked with GÉANT on a dedicated offer, tailor-made for the community.

OwnCloud is an application which can be installed on a server infrastructure, to create on-premises file storage system with cloud-type access, sync and share capabilities. NRENs previously worked together with GÉANT (when formerly TERENA) to negotiate an educational licence with the OwnCloud company. To date, 15 NRENs and institutions made use of this licence agreement, which served a total number of 400 000 users. Also, in a joint effort from the SA7 and the TF-storage Task Force, the NRENs exchanged expertise on implementing and running the OwnCloud software and held joint discussions with the OwnCloud company.

6.3 Real Time Communication

Real time communication services allow users to exchange messages, co-edit shared documents, share their screen and / or conduct audio and video conferences, 'live' or instantly, without excessive latency.

6.3.1 Rendez-Vous / JITSI

In GN4-1, SA7 continued the efforts launched in the GN3plus SA7 project with the Rendez-Vous webconferencing service from RENATER. It scaled up the intern-NREN service delivery pilot to a larger part of the GÉANT community where:

- RENATER offers their Rendez-Vous installation to users from across the GÉANT community
- Other NRENs deploy their own instance of the Rendez-Vous software.

Rendez-Vous is based on the open-source JITSI software [JITSI], which leverages the WebRTC protocol (an open standard) [WEBRTC].

More NRENs are deploying the open-source, WebRTC-based Rendez-Vous webconferencing system from RENATER. There are now five NRENs active with Rendez-Vous/JITSI.

- ACOnet
- IUCC
- RedIRIS
- CYNET

6.3.2 Commercial Webconferencing Offerings

SA7 also discussed delivery opportunities with two commercial suppliers BlueJeans and Fuze.

For Bluejeans: SA7 discussed how its webconferencing offering can be delivered to the European Research and Education community. This meeting made it clear that the company's current approach does not match with the requirements of the research and education community.

For Fuze: the company is interested in offering their products to the European Research and Education community. Fuze and GÉANT are exploring options.

6.4 Infrastructure as a Service

Infrastructure as a Service suppliers provide virtualized computing resources, such as data processing and the ability to run virtual machines, over the Internet.

SA7 organised a pan-European IaaS tender, as described in Section 5.3.2.

SA7 also facilitated community cloud IaaS efforts:

6.4.1 ~okeanos

~okeanos is the IaaS offering from the Greek NREN GRNET. During the GN3plus project, GRNET created a specific version of this service, called ~okeanos global, which allowed users from across the GÉANT community to run their Virtual Machines at this facility for free. In GN4-1, SA7 continued this pilot [OKEANOS].

During GN4-1 SA7 worked with GRNET on transitioning ~okeanos global from a pilot to a production service, by making ~okeanos global available for use in the GN4-2 project by all project participants.

6.4.2 OpenStack

OpenStack has quickly become one of the most widely used free and open-source software platforms for cloud computing. It is mainly used to deploy and manage Infrastructure as a Service offerings. Numerous NRENs are interested in OpenStack for running their community cloud solutions [OPENSTACK]. SA7 facilitated knowledge sharing on OpenStack for this group of NRENs, who met regularly to share experiences.

6.5 Mobile Services

The NRENs gathered in the Global CEO forum collaborated on mobile services (3G, 4G): to share expertise on how NRENs can provide better mobile services to their communities. The European NRENs participated in this Mobile project group through GEANT SA7. SA7 provided the project leader for this group. This team worked on:

- A user survey.
- Mobile strategy scenarios.
- A use case (by the Mexican NREN CUDI).

The reports are available to GN4-1 project participants [SA7DOCS].

These results can be used by the NRENs for their own mobile strategy and service offerings. There are currently no follow-up activities planned.

7 Deliverables and Milestones

7.1.1 SA7 Deliverables

Code	Name	Lead	Due date (project month)	% complete	Actual / forecast delivery date	Comments
D11.1	Review of SA7 Online Services Supply Chain Work in GN4-1	Andres Steijaert	30/04/16 (M12)	100%	30/04/16	Available at D11.1

Table 7.1: SA7 Deliverables

7.1.2 SA7 Milestones

Code	Name	Lead	Due date (project month)	% complete	Actual / forecast delivery date	Comments
M11.1	Online Services Q1, Q2 Progress Report	Andres Steijaert	31/10/15 (M6)	100%	23/10/2015	Available to GN4-1 participants [M11.1]
Internal Milestone	Online services Q1, Q2 progress report Report on feasibility of inter-NREN service delivery	Andres Steijaert SA7 T1 WI1	31/01/16 (M9)	100%	25/01/16	Available to GN4-1 participants [SA7DOCS]
M11.2	Online services Q3, Q4 progress report Progress report on vendor engagement, services integrated with the NREN infrastructure and services published in the service catalogue	Andres Steijaert SA7 T2 WI2	30/04/16 (M12)	100%	28/04/16	Document Review

Table 7.2: SA7 Milestones

Appendix A Event Participation Activities

#	Type of Activities[1]	Main Leader	Title	Name of Event	Date/ Period	Place	Type of Audience[2]	Size of Audience	Countries Addressed
1	Other	SA7	Global Service Delivery group	Global Service Delivery SA7 participated in monthly meetings of a group of global NRENs (NRENs outside of Europe include AARNET, REANNZ, CANARIE, Internet2), discussing cloud services delivery.	Monthly	Online	Scientific Community (Higher Education, Research)	15	Global
2	Conference	SA7	Amazon conference	AWS Symposium for US public sector SA7 visited this Amazon conference and spoke with the VP for education about the Amazon - GÉANT interaction.	June 2015	Seattle	Industry		US, global

#	Type of Activities[1]	Main Leader	Title	Name of Event	Date/ Period	Place	Type of Audience[2]	Size of Audience	Countries Addressed
3	Conference	SA7	TNC 2015	TNC 2015 [TNC2015] During TNC 2015, SA7 • presented on clouds • hosted a provider panel discussion • and a meet-and-greet with providers and the NREN community. Providers present: • Advania • Amazon • Code42 • Google • GRNET • Microsoft	June 2015	Porto	GÉANT Community	100 attendees in SA7 session	Global
4	Conference	SA7	Helix Nebula & PICSE: Towards a European Open Science Cloud conference	The Helix Nebula Initiative organised an open day event entitled Towards a European Open Science Cloud. SA7 attended Slides can be found at [EOSC].	July 2015	Geneva	Scientific Community (Higher Education, Research), Industry	100	Europe
5	Presentation / discussion	SA7	EU liaison meeting	Presentation and discussion on clouds in GÉANT EU liaison meeting	July 2015	Online	GÉANT Community	20	Europe
6	Other	SA7	EC meetings	EC meetings, with DG CONNECT's Clouds Strategy Unit and Augusto Burgueño Arjona, Head of Unit 'eInfrastructure'	July 2015	Brussels	EC	10	Europe

#	Type of Activities[1]	Main Leader	Title	Name of Event	Date/ Period	Place	Type of Audience[2]	Size of Audience	Countries Addressed
7	Presentation	SA7	TF-MSP presentations Status update on the cloud catalogue and IaaS tender; service adoption in Croatia using SA7 results - Sasa Cavara, CARNet NREN service adoption opportunities by SA7 - Mandeep Saini, GÉANT Cambridge	Link for GN4-1 participants: [M11.1]	10 Sept 2015	Espoo, Finland	GÉANT Community	20	Europe

#	Type of Activities[1]	Main Leader	Title	Name of Event	Date/ Period	Place	Type of Audience[2]	Size of Audience	Countries Addressed
8	Presentation	SA7	IaaS supplier briefing	Over 20 suppliers attended the SA7 briefing on the IaaS delivery track, including the tender. Six companies sent representatives to attend in person. The rest participated online. The session was worthwhile, as it provided the suppliers with more information about the SA7 and community needs, requirements and the process steps towards delivery. It was also a good opportunity to receive their feedback. The session was streamed live and recorded. It is available to view at: http://surfnet.mediamission.nl/Mediasite/Catalog/Full/ace3f0271054456e9aff21af37b23d0c21	14 Oct 2015	Utrecht, Nether-lands	Industry	30	Europe
9	Presentation	SA7	NORDUnet Technical Workshop: Services marketing presentation (by Lars Fuglevaag and Kristin Selvaag)	[NORDUNETWS]	15 Sept 2015	Kastrup, Denmark	Scientific Community (Higher Education, Research	20	Nordic countries
10	Workshop	SA7	Amazon – EC meeting	Meeting between Amazon and the EC. SA7 was invited to participate in this discussion meeting, which included a presentation about the SA7 efforts	9 Sept 2015	Brussels, Belgium	Policy Makers and Industry	15	Europe

#	Type of Activities[1]	Main Leader	Title	Name of Event	Date/ Period	Place	Type of Audience[2]	Size of Audience	Countries Addressed
11	Conference	SA7	Research Data Alliance conference	SA7 attended the Sixth Plenary Meeting of the Research Data Alliance [RDA]	22 Sept 2015	Paris, France	Scientific Community (Higher Education, Research	300	Europe
12	Conference	SA7	BOXworks conference and meetings with Dropbox, IBM and BlueJeans in San Francisco area.	SA7 attended a conference from BOX.com and discussed service delivery with the BOX management. SA7 used this trip to also have meetings with IBM (Vice President clouds), Dropbox and BlueJeans.	29 - Sept – 2 Oct	San Francisco	Industry	BOXworks conference 4000 attendants Size of meetings: BOX: 8, IBM: 3, DropBox:3, BlueJeans:3	US

#	Type of Activities[1]	Main Leader	Title	Name of Event	Date/ Period	Place	Type of Audience[2]	Size of Audience	Countries Addressed
13	Conference	SA7	EC, Cloud Select Industry Group	1. EC, Cloud Select Industry Group plenary meeting to discuss the initiatives announced by the Commission in the Digital Single Market (DSM) strategy on cloud and on the free flow of data, as well as to take stock of the implementation of the European Cloud Strategy, including the draft Code of Conduct on Data Protection. During the meeting, SA7 invited the Cloud Select Industry Group to establish a stronger interaction with user groups (such as GÉANT). This was well received by the participants and EC representatives. There were only two visible user in this C-SIG meeting: EuroCIO and GÉANT) 2. Meeting with Jean-Luc Dorel to discuss clouds.	29 Oct	Brussels	Industry, Policy Makers	125	Europe
14	Presentation	SA7	Cloud Opportunities	Cloud Showcase: Cloud Opportunities [CSC]	2 Nov 2015	Online	GÉANT Community	20	Europe
15	Presentation	SA7	Cloud Operation	Cloud Showcase: Cloud operation [CSC]	26 Nov 2015	Online	GÉANT Community	20	Europe
16	Presentation	SA7	Cloud Implementation and Adoption – Okeanos	Cloud Showcase: Cloud Implementation and Adoption – Okeanos [CSC]	8 Dec 2015	Online	GÉANT Community	20	Europe

#	Type of Activities[1]	Main Leader	Title	Name of Event	Date/ Period	Place	Type of Audience[2]	Size of Audience	Countries Addressed
17	Presentation	SA7	Rendez-vous - Cloud based webRTC pilot	Cloud Showcase: Rendez-vous – Cloud based webRTC pilot [CSC]	14 Dec 2015	Online	GÉANT Community	20	Europe
18	Presentation	SA7	Presentation about service delivery at TF-MSP	TF-MSP meeting in Berlin Slides from presentation [TFMSP]	11 Jan 2016	Berlin	GEANT Community	25	Europe
19	Workshop	SA7	Workshop on Federated Identity for Cloud Services	SWITCH and SA7 organised a workshop on Federated Identity for Cloud Services [FedID].	21 and 22 Jan 2016	Zurich	GÉANT Community	25	Europe
20	Presentation	SA7	GÉANT Symposium IaaS tender briefing,	Briefing for the NRENs about the IaaS tender	7 March 2016	Vienna	GÉANT Community	20	Europe
21	Workshop	SA7	GÉANT Symposium cloud session	Presentation at GÉANT Symposium about cloud service delivery.	8 March 2016	Vienna	GÉANT Community	130	Europe
22	Presentation	SA7	General Assembly	GÉANT General Assembly meeting Short presentation about SA7 IaaS tender.	15 March 2016	Utrecht	GÉANT Community	70	Europe
23	Presentation	SA7	EaPConnect	Presentation for the EaPConnect countries [EAPCONNECT] about cloud and service delivery	16 March 2016	Utrecht	GÉANT Community	20	Europe
24	Presentation	SA7	TF-CPR	Update on SA7 activity, zooming in on the IaaS tender at TF-CPR	16 March 2016	Amster-dam	GÉANT Community	20	Europe

#	Type of Activities[1]	Main Leader	Title	Name of Event	Date/ Period	Place	Type of Audience[2]	Size of Audience	Countries Addressed
25	Presentation	SA7	TF-MSP	Update on SA7 activity zooming in on the IaaS tender, Amazon network announcement, Microsoft network agreement	8 April 2016	Ljubljana	GÉANT Community	25	Europe

Table A.3: Event dissemination activities in GN4-1

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[RDA]	https://rd-alliance.org/plenary-meetings/rda-sixth-plenary-meeting.html
[RENDEZ-VOUS]	https://rendez-vous.renater.fr/
[SA7DOCS]	https://intranet.geant.org/gn4/1/Activities/SA7/Shared%20Documents/Forms/AllItems.aspx?RootFolder=%2Fgn4%2F1%2FActivities%2FSA7%2FShared%20Documents%2FMobile&FolderCTID=0x0120006FC9F34B68435B4D9B85AFA361B07B15&View=%7B9F5A7E0F-DE76-4999-82AF-8B09D4692C12%7D&InitialTabId=Ribbon%2EDocument&VisibilityContext=WSSTabPersistence
[SAML2]	http://saml.xml.org/saml-specifications
[SHOWCASES]	http://services.geant.net/clouds/Activities/Pages/Clouds_Showcases.aspx
[SURVEY]	https://intranet.geant.org/gn4/1/Activities/SA7/Shared%20Documents/SA7T3-Internal-Milestone_R-and-E-Community-Cloud-Survey-December%202015.pdf
[SWITCH]	http://services.geant.net/clouds/Activities/Pages/Workshop-on-Federated-Identity-for-Cloud-Services.aspx
[TFMSP]	https://www.terena.org/activities/tfmsp/meetings/20160111/Andres1.pdf
[TNC2015]	http://www.geant.org/News_and_Events/Pages/Clouds_session.aspx
[WEBINAR]	https://connect.sunet.se/p9gnbjgb9jh/
[WEBRTC]	http://www.webrtc.org/
[WEBSITE]	http://services.geant.net/clouds/Pages/Home.aspx
[ZETTABOX]	https://www.zettabox.com/

Glossary

GN3plus	GÉANT Network 3 plus, a project part-funded from the EC's Seventh Framework Programme under Grant Agreement No.605243
GN4-1	GÉANT Network 4, Phase 1, a project part-funded from the EC's Horizon 2020 research and innovation programme under Grant Agreement No.691567
IaaS	Infrastructure as a Service
IdP	Identity Provider
ITU	International Telecommunication Union
MNC	Mobile Network Code
NREN	National Research and Education Network
R&E	Research and Education
RAG	Red / Amber / Green
RTC	Real Time Communication
SA7	Service Activity 7: Supply Chain Support
SP	Service Provider
TF-CPR	Task Force on Communications and Public Relations
TF-MSP	Task Force on Management of Service Portfolios