GN4 Phase 1 - Project Initiation Document (PID)

0.1.1 Activity SA8: Real Time Applications and Multimedia Management

Start month	End month
April, 2015	March, 2016

0.1.1.1 *Background and Reasoning*

High quality real-time audio and video communication infrastructure and services, web based collaboration platforms, protocols and applications, and rich media streaming, archiving and management solutions have been in the interest of NRENs for more than a decade now. The strong collaboration in various TERENA task forces (e.g., TF-Stream, TF-VVC, TF-ECS, TF-Media, Webconf) as well as under the GÉANT project (eduCONF task) led to a number of valuable achievements such as the Global Dialling Scheme, the NRENum.net service, the GnuGK software development, the N-ECS images, the SIP Handbook editions, not to mention the GÉANT eduCONF service suite itself.

The GN4 Phase 1 Service Activity 8 (SA8) "Real Time Applications and Multimedia Management" is to cater the most prominent activities of the GÉANT Community under a common, well-coordinated place in order to achieve better collaboration, larger impact, and more end-user attention.

The new Service Activity is to set the foundations and pave the way towards the more sustainable service developments for the next iterations of GN4.

0.1.1.2 *Timing*

Show the timing of the different tasks and their components (Gantt chart or similar)

TBD…

0.1.1.3 *Objectives*

The high-level objectives of SA8: "Real Time Applications and Multimedia Management" are to:

(in Task 1: Real Time Applications)

- continue and further develop the existing eduCONF service support components in the GÉANT service domain (Directory, Certification and Monitoring);

- review the infrastructure aspects of video communications taking into account the global technology trends (H323, GDS, SIP trunking, NRENum.net support, SBC, etc.);

- coordinate with the Web Real Time Communications (Task 2) and investigate the potential gateway implementation options between legacy SIP/H.323 and WebRTC;

- liaise with global peers (Internet2, AARnet, APAN, RedCLARA, Ubuntunet, etc.) and related initiatives (GVA, GRTC, ELCIRA, etc.) worldwide on the basis of technical (i.e. infrastructure) and non-technical (i.e. policy and governance) matters;

(in Task 2: Web Real Time Communications)

- Investigate whether and how WebRTC based solutions and services can be used to enable large scale, easy-to-use, easy to integrate and low-cost use of real-time communication across institutional boundaries for all researchers, lecturers, administrative staff and students in European R&E;

- To ensure the European NRENs are well positioned to realise the full potential of WebRTC technology for their community as the technology emerges in the years to come;

- Contribute to establishing the NREN community as a recognised representative for the European HE&R community in relevant Web-RTC arenas;

- Imagine future WebRTC-based NREN services and infrastructural components that contribute to a smooth evolution of the real time communication infrastructure;

(in Task 3: Open Educational Resource)

- facilitate the connection of the yet scattered institutional/national OERs and unlock the deep-web by enabling structured searching and reuse of content;

- prototype a one-stop-shop (broker) for national learning resource organizations, each of them managing and/or federating one or more learning object repositories within the country;

- keep the barrier of entry to GÉANT OER low and participation high;

- provide open specifications and community source code as much as possible, openly shared among and beyond community members;

- use open standards, where appropriate, and contribute back to the development of these standards based on experiences and best practices;

- respect and build on European values and operate as a community of peers;

0.1.1.4 Description of Work

SA8 will be divided between the following Tasks:

- Task 0: Activity Leadership (AL)
- Task 1: Real Time Applications (RTA)
- Task 2: Web Real Time Communications (WebRTC)
- Task 3: Open Educational Resource (OER)

These are described in detail below.

Task 0: Activity Leadership

Objectives

This Task is to lead the SA8 "Real-Time Communications and Media Management Services Activity" as a whole, to manage and coordinate the work of all 3 Tasks.

Task 1: Real Time Applications

Background

The world has been engaged in real-time audio and video communications for over a hundred years, yet video communications is not ubiquitous. The key objective of this task is to simply make video calling easier within the Education and Research sector, domestically and international. However, today it's not sufficient to stop at video only. The NRENs' real-time communications platforms should cater for all kinds of integrated Unified Communications applications into the future, such as hosted telephony, video services, directory services; and all of this using the existing NREN networks, without the need for PSTN hop-off.

SA8 Task 1 has a long history dating back to the beginning of GN2 SA6 (2008) where eduCONF as a "VC & VoIP coordination and support service" was first introduced to GÉANT. Following the recommendations of the predecessor TERENA Task Force TF-VVC the initial eduCONF task was to solve:

- the availability of MCU resources in large-scale,

- the creation of a single directory of VC venues and VoIP deployments, and

- the dialling instability issue including the interoperability problems of virtual numbers, protocol gateways and content sharing.

Interestingly, these key objectives haven't really changed throughout the years although the priorities and the main focuses have been shifted.

When eduCONF was re-introduced in GN3 SA3 (2010), the community-wide survey and NREN workshop resulted in the eduCONF Business Case document. This document identified the main areas where immediate actions must be taken as:

- Addressing, Phonebook and Gatekeeper monitoring service development

- Certification Service and Training Support development

- Web Conferencing solution for GN3 and gateway development

- MCU Cloud service investigation and deployment

It's important to note that the initial scope was narrowed down to video-based communications only by dropping all the VoIP aspects of eduCONF. The large-scale centralised MCU service idea was developed towards a distributed MCU solution following the cloud service delivery model while the certification service and the web conferencing support was introduced as new components.

Moving into the GN3plus project extension (2013) the eduCONF Directory, Certification and Gatekeeper Monitoring service components have eventually been piloted, deployed and rolled out.

The demand for an MCU Cloud style of service still exists despite the initial business case for this has been rejected on cost grounds.

A simple NREN-hosted Web Conferencing service (based on SUNET's Adobe Connect installation) has been adopted by eduCONF however, no significant breakthrough has happened in that area.

It was identified in GN3plus as a risk that stakeholders may take matters into their own hands via non-GÉANT forums (as it has partly happened by joining the Global Video Alliance and the GRTC initiative of the CEO Forum), turning eduCONF into a blind alley with reduced functionality.

The biggest challenge in front of GN4 Phase 1 SA8 Task 1 (2015) is to find its way in the rapidly changing global real-time communications space where the SIP protocol, ENUM based dialling, scalable SBC-based infrastructures, web-based real-time applications and commercial cloud offerings become predominant.

To address these challenges, SA8 Task 1 proposes:

- to continue and further develop the existing eduCONF service support components in the GÉANT service domain (Directory, Certification and Monitoring);

- to review the infrastructure aspects of video communications taking into account the global technology trends (H323, GDS, SIP trunking, NRENum.net support, SBC, etc.);

- to coordinate with the Web Real Time Communications (Task 2) and investigate the potential gateway implementation options between legacy SIP/H.323 and WebRTC;to liaise with global peers (Internet2, AARnet, APAN, RedCLARA, Ubuntunet, etc.) and related initiatives (GVA, GRTC, ELCIRA, etc.) worldwide on the basis of technical (i.e. infrastructure) and non-technical (i.e. policy and governance) matters.

Objectives

- To continue the coordination and support of the existing eduCONF service components including:
    - o the eduCONF Directory service roll-out;
    - o the eduCONF Room and End-point Validation and Certification service support;
    - o the GnuGK Gatekeeper deployment support and GDS zone reachability monitoring service.

- To further develop these services taking into account the state-of-the-art global video communication architectures and user requirements
    - o Develop the directory service towards interfacing with other directory services worldwide based on the API proposed by the Global Video Alliance (GVA) group.

- o Evaluate and enhance the room and end-point validation and certification service considering the consolidation of addressing and dialling options (SIP-URI/GDS/ENUM).
- o Propose the extension of the monitoring service to cover the reachability of SIP end-points and the Global NRENum.net service based dialling.

- Investigate and assess the possibility of complying and/or migrating towards a distributed Session Border Controller (SBC) of similar functional equipment based unified communications infrastructure for GÉANT, such as proposed by the Global Real-Time Communications (GRTC) working group of the CEO Forum.Take up the support and roll-out of the Global NRENum.net service in the GÉANT countries.

- Engage with the European NREN videoconferencing community to develop consensus on national and global policy and governance for this type of real-time communications services and liaise with the global peers worldwide.

- Coordinate and actively collaborate with the Cloud Services Activity of GN4 in the areas of
  - o SIP Trunking service procurement for the GÉANT countries;
  - o Web Conferencing service procurement for the GN4 project; and
  - o cost sharing approach for a potential MCU Cloud service among NRENs.

Work Plan

Work item number	Work item title	Work item description
1	Directory service development and roll-out	Continue the coordination and support of the existing eduCONF Directory service roll-out. Develop the directory service towards interfacing with other directory services worldwide based on the API proposed by the Global Video Alliance (GVA) group.
2	Room and End-point Validation and Certification service support	Evaluate and enhance the room and end-point validation and certification service taking into account the consolidation of addressing and dialling options (SIP-URI/GDS/ENUM).
3	Monitoring service operation and development	Continue the operation of the Gatekeeper hierarchy and GDS zone reachability monitoring. Propose the extension of the monitoring service to cover the reachability of SIP end-points and the Global NRENum.net service based dialling.
4	NRENum.net service support and roll-out in the GÉANT countries	Take up the support and roll-out of the Global NRENum.net service in the GÉANT countries.
5	Assessment of the Global Unified Communications infrastructure compliance	Investigate and assess the possibility of complying/migrating towards a distributed Session Border Controller (SBC) of similar functional equipment based unified communications infrastructure for GÉANT, such as proposed by the Global Real-Time Communications (GRTC) working group of the CEO Forum.
6	Consultation on technical and non-technical (policy and governance) aspects of this type of services	Create and maintain a pool of Subject Matter Experts for video collaborations support existing and developing services with a requirement for video expertise such as such as Low Latency High Quality collaborations and AV transmission with QoS.

		Engage with the NREN videoconferencing community to develop consensus on national and global policy and governance for this type of real-time communications services and liaise with the global peers worldwide.
7	Liaison with the Cloud Services Activity of GN4	Coordinate and actively collaborate with the Cloud Services activity of GN4 in the areas of: - SIP Trunking service procurement for the GÉANT countries; - Web Conferencing service procurement for the GN4 project and; - cost sharing approach for a potential MCU Cloud service among NRENs.

Task 2: Web Real Time Communications

Background

WebRTC is a combined effort by the IETF and the W3C consortium to enable real-time communications in web browsers: voice calling, video communication, and data sharing without plugins. The effort has been underway since 2011 and even though most standardization documents are still in a working draft stage most of them have reached rather mature states. The number of new services based on WebRTC is increasing as is the number of components (libraries, frameworks, software MCUs, gateways/SBC-s, etc.) that support WebRTC. It is expected that with the standardization effort maturing and WebRTC capabilities becoming available to over a billion endpoints, by 2016 a wide range of innovative new WebRTC-based services and solutions should emerge.

The NREN community needs to prepare for this change in real time communication technology and enable itself to meet the opportunities and challenges with the right and timely response.

WebRTC offers high quality audio/video communication capabilities to anyone with a web browser, capabilities that previously only were available using proprietary systems and software. This creates an opportunity for the European R&E community to solve its real time communication challenges in novel ways. WebRTC may finally offer a path towards a large-scale, low-cost and easy to use real time communication infrastructure for group conversations across institutional boundaries. Whether and how it can deliver on its promise, needs to be investigated.

WebRTC doesn't simply mean transformation of a normal web browser into a soft video conference endpoint. It opens many new ways for communication and collaboration, generating a fast growing new market, in spite of the lack of a finalized draft standard, and the several not in every details compatible implementations. There are already three widely deployed browser implementations which have demonstrated already basic video call compatibility (Google Chrome, Mozilla Firefox, Opera).

A feature-rich web complemented with real-time communication capability will also offer the opportunity for a more component-based approach to including real-time communication in all sorts of e-Learning and e-Research web applications at a low price point and without locking our community to any particular vendor or solution. The combination of ubiquitous availability of standardised high quality capabilities at the users' endpoint devices combined with widely accepted open standards indeed carries significant promise. Using the web as an application and service delivery model will allow for truly large scale deployments of inexpensive one-to-one, one-to-many and many-to-many (video) communication.

Since mid-2013 (after TNC2013) the NREN community has performed preliminary investigations of WebRTC technology. The technology has now evolved to the point where we need to do more and we need to do it systematically.

The GÉANT Community needs to position itself to realise the potential benefits of this new capability sooner rather than later and put WebRTC technology in a research and educational context. It should take an active approach to shape the market such that it also works for HEI. This will require a good understanding of the technology, the market, service deployment scenarios, business models, infrastructure architectures and integration challenges with existing or legacy infrastructure as well as the institutional and end user perspective.

A larger scale NREN effort on WebRTC like a GN4 task should be based on a systematic approach. This task undertakes to deliver a roadmap for such an approach with the following larger objectives in mind:

- Investigate whether and how WebRTC based solutions and services can be used to enable large scale, easy-to-use, easy to integrate and low-cost use of real-time communication across institutional boundaries for all researchers, lecturers, administrative staff and students in European R&E.

- To ensure the European NRENs are well positioned to realise the full potential of WebRTC technology for their community as the technology emerges in the years to come.

- Contribute to establishing the NREN community as a recognised representative for the European R&E community in relevant Web-RTC arenas.

- Imagine future WebRTC-based NREN services and infrastructural components that contribute to a smooth evolution of the real time communication infrastructure.

Objectives

- Build competence, track developments, demonstrate possibilities and identify possible challenges. Experimentation, piloting and testing is needed in the areas of:
  - security architecture and integration with SAML 2.0 / eduGAIN;
  - IPv4/IPv6 interworking, NAT traversal and STUN/TURN servers;
  - legacy VC/VoIP system integration and commercial WebRTC interoperability/interworking gateways;
  - streaming solutions from PC with a webcam or any other media sources;
  - web-rtc bridges, peer to peer architectures and their interaction;
  - strategies for smooth conversations with participants at long latency.

- To propose a comprehensive and executable roadmap for WebRTC development and deployment in the R&E context. The roadmap will present an integrated view of the envisioned real-time communication infrastructure for European R&E from 2016-onwards to European NRENs, GÉANT and the European HEI. This roadmap is to provide the basis for further GN4 WebRTC activities.

- Deliver a demonstrator for WebRTC group video conversation and document based collaboration.

- Contribute to establishment of a network for the NREN community practitioners working on WebRTC and liaise with other networks and fora.

Work Plan

(Note: Because WebRTC is a very volatile field with a high pace of development the work plan may need to be adapted to the reality this task faces when it starts in April 2015.)

Work item number	Work item title	Work item description
1	WebRTC technology scouting and feature testing	Ensure the European NRENs are well positioned to realise the full potential of WebRTC technology for their community as the technology emerges in the years to come. Possible aspects are: - Security architecture and AAI integration - Pv4/IPv6 interworking, NAT traversal and STUN/TURN servers - Legacy VC/VoIP system integration and commercial WebRTC interoperability/interworking gateways - Streaming solutions from PC with a webcam or any

		other media sources
		- Web-RTC (compatible) bridges, peer to peer solutions and their interaction
		- Solutions and architectures for global long latency
		- Participation in group video meetings
		Experimentation and piloting will be done both in-house and using solutions available in the market. Involvement of end user (use cases) from the R&E community will be used.
2	WebRTC roadmap development	Propose a comprehensive and executable roadmap for WebRTC development and deployment in the R&E context.
		In this work item the task will closely look at the functionality and capabilities provided by WebRTC and other real time communication technologies, the situation in the market and the requirements of the end user community (researchers, educators, students, administrative staff). These will be synthesised in to a comprehensive road map.
		As WebRTC is new technology that alters the playing field this work item will investigate the assumptions underpinning current real time communication infrastructures and solutions.
3	WebRTC demonstrator	A demonstrator will be built to show the potential of WebRTC in component based web applications. One use case will be picked, for example document-based collaboration.
		The demonstrator may be built using building blocks or using readily available solutions in the market place.
		Integration with federated authentication is part of this work item.
4	Liaison with the relevant market parties, other GN4 activities and NREN/R&E community	A regular presence at the TF-WebRTC will be established.

Task 3: Open Educational Resource

Background

By definition, OER (Open Educational Resources) are teaching, learning, and research objects that reside in the public domain or have been released under an intellectual property license that permits their free use and re-purposing by others. Open educational resources include full courses, course materials, modules, textbooks, streaming videos, tests, software, and any other tools, materials, or techniques used to support access to knowledge.

There is a large interest around the global education community in establishing and maintaining OER or Learning Object (LO) repositories as exemplified by the number of existing repositories (e.g., MERLOT, MAOR), organizations building and sustaining them (e.g., MITOpenCourseWare, GLOBE), contributors integrating learning objects in repositories (e.g., OpenContent), and users of these learning objects (e.g., Universities, Libraries). The fundamental reasons are:

- the growing educational demands in all countries,

- the limited capacity of face to face education to fulfil the demand in a timely manner (i.e. emerging MOOCs),

- the effort and cost involved to build multimedia learning materials, and the new possibilities offered by the Internet.

While it is a fact that millions of LO/OER can be found on the Internet using search engines like Google, there is no guarantee that a query will lead to trustable, properly licenced material on which high quality open education can be built. Well managed OER repositories that aggregate high quality content offer a solution to this problem.

Many of the universities operate local content repositories (using community open-source or home-grown software tools) where they store recorded lectures, handbooks, presentations and other teaching-learning materials. In some countries, the NREN provides a centralise repository to universities where all the content can be aggregated to and made available for public or selected user groups. Some of the repositories only aggregates the metadata of the OER (i.e. the information about the learning object) and leaves the content in its originating domain (i.e. in the local content repository of the University). These repositories often called metadata repositories or simply referatories.

The main motivation for developing a metadata repository (European-level aggregation point) and an OER portal (central access front-end) service in GÉANT would be to support the NRENs and their stakeholders (i.e. the broader GÉANT community) in engaging with open education by providing repository services.

The TERENA task force TF-Media came up with the idea to try and implement a European-level OER metadata repository for the benefit of the Research and Education community gathered under TERENA/GÉANT. TF-Media was concluded in December 2013. During 2014, TERENA facilitates the development of an OER portal pilot service in form of a small project. It is expected that by mid-2015 the service pilot will get to the stage where it can be adopted and validated by GÉANT in order:

- to facilitate connection of the yet scattered institutional/national OERs and unlock the deep-web by enabling structured searching and reuse of content; and

- to prototype a one-stop-shop (broker) for national learning resource organizations, each of them managing and/or federating one or more learning object repositories within the country.

GÉANT can make a suite of online services and tools available to its partners for the exchange of learning resources, and facilitates the access to the worldwide Open Community (i.e. GLOBE, Open Education Europa) guided by the principles as follows:

- Keep the barrier of entry to GÉANT OER low and participation high.

- Provide open specifications and community source code as much as possible, openly shared among and beyond community members.

- Use open standards, where appropriate, and contribute back to the development of these standards based on experiences and best practices.

- Respect and build on European values and operate as a community of peers.

Objectives

- To pilot a European-level metadata aggregation service for the GÉANT Community by adapting and validating the TERENA OER pilot platform that helps NREN stakeholders to reach the critical mass and join global repositories.

  o Use existing open-source tools (ARIADNE, PuMuKit) and apply metadata standards (LOM, OAI-PMH)

  o Leverage on the former SURFmedia and the recent CampusdoMar, MAOR, SwitchCollections, and other NREN-led service developments.

- To develop the open source software and the service components, where possible, to be able to successfully prototype the OER platform and services in GÉANT.

- To liaise with OER, MOOC and other kind of repository services in the broader community (EUNIS, museums, libraries, Europeana, DCH-RP project partners, etc.) Do not compete with YouTube, Google and other commercials but create additional value.

- To prepare for a detailed business case for a potential GÉANT OER production service.
  - Target, identify and survey the primary user groups being; the end-users (educators, professors, students) and the system integrators (multimedia service managers, LMS administrators, content providers).
  - Make sure that the necessary marketing and PR efforts are available and aligned with the primary business goals.

Work Plan

Work item number	Work item title	Work item description
1	Adaptation and validation of the TERENA OER platform and services	To pilot a European-level metadata aggregation service for the GÉANT Community by adapting and validating the TERENA OER pilot platform that helps NREN stakeholders to reach the critical mass and join global repositories.
2	Software development to ensure the seamless prototyping	To develop the open source software and the service components, where possible, to be able to successfully prototype the OER platform and services in GÉANT.
3	Liaison with the major stakeholders	To liaise with OER, MOOC and other kind of repository services in the broader community (EUNIS, museums, libraries, Europeana, DCH-RP project partners, etc.).
4	Preparation for a GÉANT OER service business case study	To prepare for a detailed business case for a potential GÉANT OER production service taking into account the CAPEX/OPEX of:: - the necessary technical service developments, deployment, and roll-out; and - the proportion and marketing efforts.

0.1.1.5 *Deliverables*

Deliverable no.	Deliverable name and brief description	WP no.	Nature	Dissem- ination level	Delivery date (project month)
D.8.3.1.	OER pilot service adaptation and validation in GÉANT	8	Service pilot	R	M8
D.8.2.1.	Web portal service and backend (aka. the demonstrator) for WebRTC client signalling and interoperability testing	8	Service pilot	R	M9
D.8.3.2.	GÉANT OER business case development	8	Document	P	M10
D.8.1.1.	eduCONF service assessment and development directions	8	Document	P	M11

Deliverable no.	Deliverable name and brief description	WP no.	Nature	Dissemination level	Delivery date (project month)
D.8.2.2.	WebRTC requirements and roadmap for deployment in R&E	8	Document	P	M12

Table 1: SA8 deliverables

0.1.1.6 *Milestones*

Milestone number	Milestone name	Description	Work package(s) involved	Expected date	Means of verification
M.8.1.1.	Assessment of the existing eduCONF service KPIs	Check whether KPIs met and propose the necessary steps forward		M3	Measuring and analysing KPIs
M.8.3.1	Preparation for a GÉANT OER service business case study	Progress report		M5	Preliminary document
M.8.2.1	WebRTC technology scout requirements and roadmap	Progress report		M6	Preliminary document
M.8.3.2.	OER pilot service adaptation and validation	Prototype and test the GÉANT OER platform.		M8	Feedback form the initial stakeholders
M.8.2.2.	Web portal service and backend for WebRTC client signalling and interoperability testing	Prototype and test the demonstrator.		M9	Feedback form the initial stakeholders
M.8.1.2.	Taking up the European part of the Global NRENum.net service coordination	Promote and where needed assist the GÉANT NRENs joining NRENum.net		M10	Number of NRENs joined
M.8.1.3.	Successful liaison with cloud service activities in the relevant areas	Give technical support to the cloud activity for investigating services such as SIP Trunking, Web Conferencing		M11	Feedback from the cloud service activity

Milestone number	Milestone name	Description	Work package(s) involved	Expected date	Means of verification
		and MCU Cloud.			

Table 2: SA8 milestones

0.1.1.7 *Dependencies*

List any major tasks that can only be performed once other tasks are fully or partially completed in your Activity or any other Activity. It is important to include both the tasks that are responsibility of this project/activity to deliver or the task upon which your project or activity is dependent upon. Please also list what you expect from other activities, or what are you going to provide to other activities or any other inter-relations.

The SA8 Task 1 "Real-time Video Services Support and Development" has an internal dependency on the initial assessment of the eduCONF service components due to M3 (Milestone M.8.1.1). Depending on the pre-defined KPIs met, the development directions will be determined and due to service extensions new KIPs may be introduced. Task 1 also has an external liaison with the Cloud Services Activity in GN4. This assumes that Task 1 will provide input and technical consultation primarily on the SIP Trunking, Web Conferencing and MCU Cloud type services to the cloud activity and closely collaborate with them on the potential outcomes.

The Sa8 Task 2 "WebRTC Roadmap Development" has an internal dependency on the test platform to be designed and deployed in GÉANT for functional and interoperability testing. Task 2 also has strong relations to both the legacy audio and video communication services dealt by Task 1 and the lecture streaming and recording type services dealt by Task 3. Task 2 is seeking input from Task 1 and Task 3 to define the WebRTC deployment roadmap for NRENs and also providing information to the other tasks in SA8 on the potential game-changer role of the novel WebRTC based applications and services. In general, Task 2 has a project external dependency on the market trends, standardisation efforts and vendor take-up of WebRTC.

The SA8 Task 3 "Open Educational Resource Platform and Services Validation" has a strong project external dependency on the outcome of the TERENA OER pilot project as it is proposed to take over, adapt and validate that platform. Due to the foreseen role of WebRTC in lecture recording applications Task 3 also has some light dependency on the recommendations of Task 2. The GÉANT OER service business case development provides input to the relevant support activities of GN4.

0.1.1.8 *Project Components*

Provide a graphical presentation of the components showing their interdependencies (Pert diagram or similar)