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SA8T2 Internal Deliverable
RENdez-Vous: One year of operation experience

SA8T2 Internal Deliverable

Abstract
This document concerns RENATER's first year of operational experience with delivering the RENATER WebRTC based desktop video conferencing service RENdez-Vous. The technology scout was conducted by the Service Activity 8 (SA8, Real Time Communication and Media), Task 2 (WebRTC) team as part of the GN4-1 project. This report should, as such, be read in context of the related work produced by GN4-1 SA8-T2.

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1   Introduction

1.1   About this document

This report documents the experiences obtained by the French NREN RENATER from it's first year to operate and deliver a native WebRTC service to both its national and the wider R&E community.

This write-up activity was undertaken as part of the Geant4 Phase 1 project by the WebRTC Task 2 (T2); one of three tasks of the Real Time Communication and Media activity (SA8). This report should, as such, be read in context of the related work produced by GN4-1 SA8-T2.

The WebRTC task ran from 1 May 2015 to 30 April 2016.

1.1.1   Target audience

This document targets a technical management as well as a technical specialist audience, in particular those working in the fields of real time communications, eLearning and eResearch.

1.1.2   Responsible task members

Frédéric Loui (RENATER) had the lead on this tech scout. Jan Meijer (UNINETT) and Simon Skrødal (UNINETT) were the document editors.

1.2   Background

NRENs have provided online audio/video conferencing services for decades and, in this regard, RENdez-Vous is yet another one of these offerings. However, RENdez-Vous promises a number of new features and benefits to the domain of real-time communication; it is powered by WebRTC technology. WebRTC, which enables audio and video conferencing through any device able to run a modern web browser, is set to change the landscape of how online communication is implemented and accessed.

Since March 2015, RENdez-Vous has been provided as a production service by the French Education & Research Network, RENATER. RENdez-Vous utilises the global inter-federation service eduGAIN,

allowing staff and students from NREN communities around the world meeting-host access to the service.

This document provides insights into the experiences from the first year of running the service.

1.3   Rationale

For the Task 2 team it made sense to systemise RENATER's hands-on experience with operating, delivering and supporting a native WebRTC desktop videoconferencing solution. This information is particularly apt with regard to deliberations to facilitate possible build-or-buy decisions in European R&E.

1.4   Tech scout objective and methodology

The objective for this tech scout is to enable Task 2 (and the wider R&E community) to learn from RENATER's experiences with building and deploying a native WebRTC desktop video conferencing service.

The report is a write-down of the experiences from those directly involved at RENATER in establishing and delivering the service.

2   Why did RENATER establish RENdez-Vous?

Traditional videoconferencing services are typically deployed in the form of Multipoint Control Units (MCUs) using the SIP or H.323 protocols. These implementations have reached a moderate level of popularity and have satisfied some common use cases within the Research and Education (R&E) community. Most of them, however, share common constraints:

Cost — Modern H.323/SIP telepresence hardware is relatively expensive and demands substantial, often prohibitive, investments of entities. An even more exorbitant cost is found on the infrastructure side, making large-scale deployments in many cases unattainable.

Usability — Access to traditional videoconferencing systems can be unintuitive and difficult, both in terms of logistics and actual use. Joining a meeting for example, often implies manual entering and editing of IP addresses. It is not uncommon for a local support service (helpdesk) to be involved in setting up meetings, adding further to the cost of operating the service.

Reliability — For a number of years, SIP and H.323 implementers ignored problems related to traversing NATs and firewalls. Vendors therefore often relied on users forwarding ports or setting up "Demilitarized Zones" (DMZs). The complexity of all these manipulations made human-induced errors quite common and non-trivial to troubleshoot.

Diversity — The cost and complexities associated with the development of traditional Real-Time Communications (RTC) stacks made the industry quite inflexible. This part pf the RTC market is ruled by a handful of vendors, with slow evolution and limited choices as a consequence.

In 2010, Google started work on their open source webrtc.org initiative. It was quickly taken to the Internet Engineering Task Force (IETF), the World Wide Web Consortium (W3C) and joined by the Mozilla Foundation. The rupture potentials became, as such, fairly obvious. The world of real-time communication was opening up to armies of resourceful and innovative start-ups and web developers.

Back in 2012, there were still no affordable and easy to use audio/video conferencing solutions available to lecturers, students and researchers in France. While Skype did, of course, exist at this time, the French National IT Security agency advised public organizations not to use the service. The institutions' Chief Security Officers had to face the usual plea; "Well, if Skype is not an option, what are the valid candidates to provide instant click audio/video conference?" This plea then was, in turn, cascaded to RENATER during the recurrent annual survey.

At RENATERs bi-annual French National Conference in 2013, the French start-up Blue Jimp presented their first version of the open source WebRTC-based multi-party video conference solution called

Jitsi Meet. Following their presentation, RENATER engaged a partnership with Blue Jimp in order to elaborate a French R&E based multi-party conference solution.

A primary objective of the partnership was to address the plea expressed by the CSOs/CIOs of the French R&E institutions by providing an audio/video conference service that was:

- simple to access and easy to use
- accessible from any common end user device (desktop, laptop, tablet, mobile phone)
- affordable and able to run on commodity hardware, allowing the infrastructure to scale and cater for an unlimited number of users
- compliant with the French national IT security agency (network traffic matrix is well identified between all the parties)

3 Software selection process

Alternative software available to our community of users in 2013 was limited. Pricing models tied to proprietary software was such that a procurement phase would have been necessary. These steps would have prevented agile, flexible and open innovation. At the time, Jitsi Meet was therefore the most suitable candidate solution supported by a French start-up. However, there were a few issues that stood in the way for RENATER to adopt and deploy Jitsi Meet "as is", e.g.:

- authentication via Federation was a "must-have" requirement
- the absence of video bridge load distribution prevented Jitsi to be used at the intended scale (hundreds of thousands of users)
- Jitsi Meet was not compatible with Firefox, one of the most used browsers in the French R&E community.
- audio, video SIP ➔ WebRTC and WebRTC ➔ SIP bridge

By entering into a partnership with Blue Jimp, RENATER sponsored further developments to resolve the abovementioned service limitations. By mid-2014 Blue Jimp had extended their service to implement functionalities pertaining to the first two requirements. Blue Jimp tackled the third requirement by assisting the Mozilla team to develop the WebRTC stack, making the Firefox browser compatible since version 40 (see https://hacks.mozilla.org/2015/06/firefox-multistream-and-renegotiation-for-jitsi-videobridge/).

Audio SIP ➔ WebRTC was made possible through development of the JIGASI component. An audio WebRTC ➔ SIP bridge is currently being studied by RENATER in the frame of the H2020 MAGIC project. Different implementations of existing video conferencing systems severely complicate SIP/WebRTC video integration and there is no open source solution on the market today that addresses this highly requested feature.

Further to the four mandatory requirements, other value-adding features are also being developed:

- Recording functionality
- A Media API is currently being developed in Jitsi to allow audio/video/media to be integrated with business applications

The latter point refers to a key feature that will facilitate in-context application development (e.g. to build-in/embed real-time communication apps into existing services for e-learning, research, call-centres, etc.).

RENATERs model of deploying open source Jitsi components avoided vendor lock-in dependencies and procurement cycle requirements.

4 **Feedback from R&E community**

RENdez-Vous was rolled out as a pilot service in mid-2014. At the time, the scope was limited to the French user-base only. Before long, however, people leading the GEANT SA7 video conference brokerage activity expressed a strong interest in getting involved in the pilot. After some deliberation, the pilot scope was extended to include the entire GEANT SA7 community. The new scope placed the service in an international context, resulting in tremendous amounts of valuable feedback.

KPI-indices comprising the number of conferences held and the number of users engaging with the pilot service were much higher than expected:

October 2014 — 12000 conferences, 25000 users

November 2014 — 14000 conferences, 30000 users

December 2014 — 12000 conferences, 25000 users

January 2015 — 11000 conferences, 24000 users

February 2015 — 10000 conferences, 24000 users

Although user feedback was for the most part positive, RENATER was also notified of challenging and outstanding issues that will be discussed later in this document.

Based on the positive experiences from the pilot, RENdez-Vous was put in production in March 2015. Restrictions on room creation (i.e. hosting a meeting) were introduced by tying eduGAIN to RENdez-Vous. These restrictions had an impact on the KPI-indices when compared to those of the pilot, 2015 data below;

	January	February	March	April	May	June	July	August	September	October	November	December
Total confs			1280	1955	1714	2520	1413	611	2071	2053	2448	1871
Total cnx			5113	8190	7109	10277	5458	2290	9098	8857	10752	8704
Total duration in days			37.2	76.8	74.6	110.3	63.5	27.1	95.4	96.6	98.1	67.8
Average cnx			4.0	4.2	4.1	4.1	3.9	3.7	4.4	4.3	4.3	4.6
Average duration in minutes			41.9	56.6	62.6	63.1	64.7	63.9	66.4	67.8	57.7	52.2

In 2016, we have observed the following monthly KPIs:

- **Total confs**: 2500

- **Total connections**: 10000 (users)

- **Total duration**: 100 days

- **Average connections per conference**: 4,6

- **Average duration of a conference**: 50 minutes

The above numbers strongly suggest that the RENdez-Vous service has indeed filled a gap in the real-time communication space in the French R&E community. Service adoption continues to be unexpectedly high, despite of little publicity around the service.

In December 2015, RENATER hosted the French R&E national conference. The user community, represented by around 2000 attendees, provided RENdez-Vous further momentum. While everyone agreed that the service in its current form is far from perfect, CIOs/CSOs also expressed their positive feedback and encouraged RENATER to continue to refine and improve service usability and to take the innovation to the next level. RENATER has since received a number of suggestions for feature improvements as well as signals effectively validating that the RENdez-Vous service has successfully addressed and filled the gap of absent multi-party desktop conference applications.

5 Lessons learned

5.1 Positives

- The idea to have an alternative to Skype does not only solve a very real problem, but is also a breath of fresh air for CSO, CIO and their respective users.

- The significant volume of constructive feedback and feature requests demonstrates a strong community interest.

- The proposed Media API provides exciting and beneficial features for service leverage and adding value to the existing application portfolio.

- Audio/video conferencing has been made available to all users in a number of R&E communities, with no compromise in terms of quality.

- Significant large scale financial savings have been achieved as the service runs on commodity hardware; the current service only require 4 virtual machines and 1GE interface.

- Savings are observed for service support; compared to the traditional H323 audio video systems, the RENATER support ticket system recorded 1/5 less tickets pertaining to RENdez-Vous.

    o The nature of support requests has also changed; RENdez-Vous tickets are typically software-based and less complex to solve than for H323, which typically pertain to network, firewall and configuration issues.

- As a web technology, feature integrations are more straightforward and hold a lot of potential in the IT landscape.

- Additional features are being developed in pace with the service's popularity; e.g. a native app for iOS and a rework of the Jitsi Meet Media API. Simulcast and other features aiming to improve user experience are also under way.

5.2 Challenges

RENATER has had a strong "network culture", but is now challenged to develop new competencies for end-user services as well:

- As the media complexity is handled on the browser side, the developer must focus on application GUI usability and polish user experience.
    o Competency in web application development to ensure compatibility with major browsers in the market.
- Deploying this type of service requires strong competencies in Software Life Cycle Management. Release management, software package management, cloud management and containerization becomes relevant areas of expertise to acquire and/or develop.
- Strong open source software management experience, and particularly extensive testing phase, is mandatory in order to deliver a seamless and continuous service.

The more popular the service is, the more attention the service gets, especially when an outage occur. Availability of the service should be set to 99,999%, especially at a very high scale. When launching RENdez-Vous, our small team of engineers were caught off-guard by its popularity. This has added pressure to all facets involved in delivering an end-user production service.

RENdez-Vous is still a work in progress, with a number of concerns in need to be addressed. Issues related to browser updates, incompatibilities between browsers and client-side setup, in particular, are pressure points that needs further consideration. Regarding the latter, we are aware that new users to the RENdez-Vous service often experience difficulties to apprehend and set up the service, with many reluctant to use it during this phase. We are therefore committed to make the experience easier for novice users. We also want to make it easier and more seamless to submit feedback.

Naturally, RENdez-Vous will be subject to comparison with alternative services that the end user is familiar with, e.g. Skype. A highly requested feature is for RENdez-Vous to provide a Federated Application-aware presence system. While not a WebRTC issue, it is a clear message that supporting middleware need to be developed.

We observe a fluctuation of the number of tickets that can be correlated. Tickets associated to the service are not necessarily directly related to WebRTC, but may also refer to JavaScript browser add-ons used by the service (e.g. screen sharing, shut/unshut video stream etc.).

WebRTC is an innovative technology and is evolving at a great pace. The service is dependent on both the browser version and also browser's flavor. Vendors frequently release new browser version, often with WebRTC stack modifications that can potentially break the RENdez-Vous application.

Blue Jimp (Strasbourg, France) attracted a lot of positive attention with its portfolio and it was arguably inevitable that they one day be acquired. Indeed, in April 2015, Atlassian (Austin/Texas) announced the acquisition. On the upside, Blue Jimp may now pursue their remarkable work as a lab inside a larger and presumingly better funded organization. The downside, however, is that existing customers (RENATER included) are at risk of having less influence on the project (e.g. due to change of geographic location, organizational structures and priorities). Blue Jimp/Atlassian have nonetheless committed to continue their support of Jitsi. In order to lower adoption barriers, they switched to the Apache license and contributor agreement.

6 Future work

Future work is tightly coupled with feature requests:

- Improve user experience, features and audio/video quality (using Skype as the reference point).
- Consolidate, elaborate and collect audio/video indicators that would help to qualify user experience (MOS: Mean Opinion Score). A meeting host/admin should also be able to observe real-time technical information about an ongoing meeting that may be pertinent in identifying reasons for any issues.
- Provide a more efficient and encouraging process for users to provide feedback.
- Add a presence management component (e.g. to avoid email exchange to set up a meeting).
- Appreciate the possibility to integrate RENdez-Vous with existing SIP solutions (audio and potentially video).
- Implement highly requested functionalities such as recording and webinar behaviour.
- Encourage and promote Jitsi Meet client device compatibility.

7   Conclusion

The first year of operation experience with RENdez-Vous has been very exciting. Judging by community feedback, building a new service on top of innovative WebRTC technology has been a complete success considering. While the service is nevertheless not perfect, it still managed to catch the attention of French R&E institution CIOs, convincing them to embrace the technology.

Within the French R&E community, RENdez-Vous is the first WebRTC use case that provide an easy to use desktop video conference and that, at the same time, is so affordable and scalable that it can be used to pave the way to the elaboration of a digital collaborative platform.

There is always room for improvement in terms of audio/video quality and overall end-user experience. Feedback and our own research has pointed out key directions that RENATER need follow and investigate.