WebRTC service for educational and research society

3 presentations + moderated discussion panel + live demos

Audience: moderately technical audience

Keywords: *WebRTC*, web based videoconferencing, audio-video remote collaboration, 4K, *GÉANT* services

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WebRTC technology becomes more and more popular in research and educational societies. Wide scope of technological usage seems to push this technology into one of most important collaboration engines in nearest future. Flexibility and high adaptivity of this standard would most probably make it one of key engines for virtual meetings, remote collaboration, advanced e-learning and similar mechanisms. *GÉANT* is involved in both creating standards (with *W3C*) and implementing interactive tools, basing on these standards.

Main aim of this session would be to:
- introduce and summarize actual state of the technology,
- present own tools for academical society,
- underline internal involvement in standardization processes,
- analyze potential impact for society,
- initialize discussion on potential usage within research, educational and art societies.

I. Presentations

The key goal of scheduled presentations within the session is to introduce technical audience to the technology, present current state of the art and introduce *GÉANT* tools portfolio: *eduMeet* service with all its adaptive components – *KnockPlop* virtual meetings engine, worldwide *STUN/TURN* service, as well as dedicated monitoring and statistics modules. This set of services is being designed and developed as one on tasks within joint research activities.

1. VC application

WebRTC-based videoconferencing solutions are becoming more and more popular because of easy way of usage, simple access, availability and reliability.

One of *GÉANT*'s aims in this range is to propose and deliver own VC solution. Free alternative to commercial solutions is dedicated for institutions without budget for buying one or willing to use locally hosted, transparent and trustworthy service. Free of charge, open-source licensed tool includes most of key functionalities, offered by commercial makers: high quality audio-video

connectivity (including 4K resolution), interactive chat, screen sharing, simple and user friendly interface. And the functional scope is still being extended.

Future development plans are ambitious and include among others: integration with virtual and augmented reality engines, connection with common open-source collaboration services and extending general web-collaboration functionalities.

2. *STUN/TURN* service

Nowadays NAT-based networks with highly restrictive firewalls politics are becoming a must, because of significant growth of security abuses. Average level of videoconferencing connections, that fails because of these network characteristics, is about 30%. Such high level of connection limitations is sufficient enough to justify considerable commitment in flexible traversal services.

Therefore *STUN/TURN* infrastructure was created with 7 nodes in Europe, 1 in Central Asia and 2 pending ones, in Americas.

GÉANT is involved in development of *coturn* – open-source multi-tenant *TURN/STUN* server project, which is used for nodes implementation.

3. Monitoring and statistics

Standard monitoring engines, as *Nagios / Icinga* or *Munin,* are important for general supervision of servers and as such need to be introduced. However, service-specific approach is also needed, in order to achieve wider overview of service state and availability.

Simulating user experience is natural and reliable way for checking availability of service. Headless web browsers can act as virtual endpoints and test connectivity, using all elements of infrastructure - starting from initialization systems, *SFU*s (*Selective Forwarding Units*), *STUN/TURN* nodes, gateway engines and even network conditions.

This dedicated solution will be extended with statistics module, analyzing data gathered on both server and browser sides, to assess performance of an end-to-end *WebRTC* video session (i.e. the rate adaptation in response to changing network conditions).

II. Discussion panel

Communication and collaboration in research and education – impact of web technology.

There are many potential areas of using *WebRTC* and *STUN/TURN* services. Virtual meetings are just one of options, with significant interest in research society. But there are more potential areas, as low latency communication, e-leaning and remote collaboration systems, as examples.

Discussion panel would help to identify more areas of interests, where *WebRTC* technology could support our societies. One of already identified new research areas is *LOLA* (support in case of problematic and demanding network topologies) and searching alternative tools for cutting edge AV transmission technologies.

III. Demos

Two demonstrations would be presented during session or/and within dedicated demo slot. 4K live stream from Poznań to Trondheim would confirm product maturity in scope of high resolution transmission. Additional local multi-point webconference (with audience participation) would be also established in order to present service functionalities and capabilities.

During TNC18 remote presenters will connect and share their presentations using services described in this paper. This will be first official usage of the service for large scale, which may be also treated as "practical demo" and use case example.

IV. Bio

Stefan Otto studied physics with minor subject computer sciences at University of Rostock in Germany and is part of the NREN community since 2013. He is part of the realtime group at Uninett in Norway and working there at WebRTC related projects since 2014; He was member of GN4-1 SA8 T2 project and is now active member of successor GEANT 4-2 JRA4 T5.

Mészáros Mihály studied information technology at John von Neumann University of Kecskemét (BsC), and University of Miskolc (MsC) in Hungary, is part of the NREN community since 2002. He is part of the R&D group at KIFÜ/NIIF Program in Hungary and working there at WebRTC related projects since 2014; He was Task Lead of TERENA TF-WebRTC Task Force, and member of GN4-1 SA8 T2 and is now active member of successor GEANT 4-2 JRA4 T5.

Luca De Cicco has graduated in Computer Science Engineering in 2003 with honors. He received the PhD in Information Engineering in July 2008 from Politecnico di Bari (advisor Prof.Saverio Mascolo). He is currently Assistant Professor at Politecnico di Bari. His main research interests range from modeling and design of congestion control algorithms for multimedia transport, to adaptive live video streaming, performance evaluation of congestion control algorithms, future internet paradigms, virtual reality/augmented reality applications. He is one of the authors of the Google Congestion Control implemented in the Google Chrome browsers. Since 2017 he serves as Associate Editor for Internet Technology Letters (Wiley).

Maciej Stróżyk received the M.Sc. degree in Computing Science from the Poznan University of Technology. Since 2003 he has been working for Network Department of PSNC. His main research interests focus on the ultra high resolution (4K, 8K) multimedia streaming technologies and real time communications systems. He has been participating in many European and national research projects including GN2 and GN3, and currently he is a member of GN4-2 JRA4 T5 activity.

Bartlomiej Idzikowski graduated from Poznan University of Technology in 2003 (Computing Science - Computer Networks and Distributed Systems) and has become PSNC employee (Network Department). His research interests focus on video- and web-conferencing, high resolution video systems (4K, 8K), web-based applications, streaming technologies, network management and traffic monitoring. Bartlomiej's professional background is asserted by long-term cooperation within different European projects (GN2 – GN4, 6NET, Porta Optica Study, Phosporus, VISIONAIR), as well as national ones (Platon, Future Internet Engineering, Future ICT). Currently TL for WebRTC task in *GÉANT* and technical coordinator for TNC.