Browser-Based Video Streaming

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1 Context

WebRTC's primary goal consists in enabling direct communication between two browsers for media and real-time communication [4]. For this reason, WebRTC relies on a signaling server that makes it possible to establish a connection between two browsers that do not know each other. While this feature is very convenient for applications that need to establish a small number of connections, the signaling server quickly becomes a bottleneck in the context of large-scale P2P applications [3]. This has led researchers to explore decentralized solutions that can enable serverless operation in WebRTC [5].

2 Objective

The internship will start from these existing solutions and explore how a serverless WebRTC infrastructure can support high-bandwidth applications such as video streaming[7, 9, 8, 6, 2]. We will start by analyzing existing protocols for peer-to-peer video streaming, with a particular emphasis on epidemic (gossip) protocols, as well as the existing solutions for streaming data on WebRTC. We will then propose one or more new protocols that combine the strength of both approaches.

3 Tasks

- Detailed bibliography on peer-to-peer and WebRTC video streaming.
- Identify the threats that characterize a query oriented application in a network of plug computers.
- Extend our aggregation protocols with effective means to support selection queries, and/or devise protocols for other types of aggregate operators.
- Analyze the privacy guarantees of the protocols.
- Design and implement a working prototype based on the protocols.

Environment

The candidate will work in the ASAP Team at the Inria/IRISA research centre located in Rennes. Inria (`www.inria.fr`) and IRISA (`http://www.irisa.fr`) are among the leading research centres in Computer Sciences in France.

Requirements for candidacy

- Java and Javascript programming skills
- Interest for distributed systems
- Previous experience in the research topic is a plus

References

[1] Raziel Carvajal-Gómez, Davide Frey, Matthieu Simonin, and Anne-Marie Kermarrec. Webgc: Browser-based gossiping. In *Proceedings of the Posters & Demos Session*, Middleware Posters and Demos '14, pages 13–14, New York, NY, USA, 2014. ACM.

[2] Davide Frey, Rachid Guerraoui, Anne-Marie Kermarrec, Boris Koldehofe, Martin Mogensen, Maxime Monod, and Vivien Quéma. Heterogeneous Gossip. In *Middleware*, 2009.

[3] Márk Jelasity, Spyros Voulgaris, Rachid Guerraoui, Anne-Marie Kermarrec, and Maarten van Steen. Gossip-based Peer Sampling. *TOCS*, 25(3):1–36, 2007.

[4] Alan B. Johnston and Daniel C. Burnett. *WebRTC: APIs and RTCWEB Protocols of the HTML5 Real-Time Web*. Digital Codex LLC, USA, 2012.

[5] Brice Nédelec, Julian Tanke, Davide Frey, Pascal Molli, and Achour Mostéfaoui. An adaptive peer-sampling protocol for building networks of browsers. *World Wide Web*, Aug 2017.

[6] R. Roverso, S. El-Ansary, and S. Haridi. Peer2view: A peer-to-peer http-live streaming platform. In *2012 IEEE 12th International Conference on Peer-to-Peer Computing (P2P)*, 2012.

[7] R. Roverso and M. Högqvist. Hive.js: Browser-based distributed caching for adaptive video streaming. In *Multimedia (ISM), 2014 IEEE International Symposium on*, Dec 2014.

[8] Roberto Roverso, Sameh El-Ansary, and Mikael Högqvist. On http live streaming in large enterprises. In *Proceedings of the ACM SIGCOMM 2013 Conference on SIGCOMM*, SIGCOMM '13, New York, NY, USA, 2013. ACM.

[9] Roberto Roverso, Riccardo Reale, Sameh El-Ansary, and Seif Haridi. Smoothcache 2.0: Cdn-quality adaptive http live streaming on peer-to-peer overlays. In *MMSys*, 2015.