Position availabl e	Open PostDoc position : « QoE driven Software Defined Networking » (M/F)

Research or Domain Activities

- *Networks, Systems and Services, Distributed Computing*

Team Research name : DIANA

Environment Inria

« Established in 1967, Inria is the only public research body fully dedicated to computational sciences. Combining computer sciences with mathematics, Inria's 3,500 researchers strive to invent the digital technologies of the future. Educated at leading international universities, they creatively integrate basic research with applied research and dedicate themselves to solving real problems, collaborating with the main players in public and private research in France and abroad and transferring the fruits of their work to innovative companies.

The researchers at Inria published over 4,500 articles in 2013. They are behind over 300 active patents and 120 start-ups. The 172project teams are distributed in eight research centers located throughout France. »

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Team Presentation / Service presentation

The DIANA team (ex. Planète) at Inria Sophia Antipolis (INRIA - SAM) conducts research in the domain of networking, with an emphasis on designing, implementing, and evaluating Internet protocols and applications. The team has a strong background in Internet measurements covering different aspects such as the measurement and modeling of network performance and user quality of experience. Another important objective of the team is the design and evaluation of new software-defined network architectures for the Internet and the development of large scale platforms for the experimentation of networking protocols. The DIANA team is located in Sophia Antipolis on the French Riviera. The web page of the team is: https://team.inria.fr/diana/

Proposed Work

In a few years, video became the number one service in the Internet pressuring the infrastructure and forcing not only the ISPs but the whole industry to reconsider the way of building and managing networks. Among all the enablers for a truly multimedia Internet, the Software Defined Networking (SDN) concept has made its proof.

Video is also sensitive to the quality of service delivered by the network, it is thus of prime importance to make sure the playout of video is as smooth as possible to avoid any degradation of user Quality of Experience, and hence avoid any negative impact on user engagement. A large number of studies and tools have emerged to capture this dependency between network performance and user/application level Quality of Experience [1,3,4,5]. Adaptive video streaming (ex. DASH) has also emerged as a new concept to adapt the video quality as a function of what is available as resources inside the network [2,6]. Whereas a lot of optimizations have been made in the user terminals to improve quality of experience in general, and video quality of experience in particular, a little has been done on the network side to get the maximum from the network in terms of end users quality of experience.

In this post-doc, we will leverage the existence of SDN to entirely rethink the way traffic is routed within ISP networks in the hope of breaking the tradition of over-provisioning networks. Instead, we will focus on the sole metric that truly matters for users: their Quality of Experience. With QoE in mind, we have much more flexibility in the way we can route packets. For example, the first chunks of a video must be delivered with the smallest delay but once the buffer are full, it is possible to delay their delivery, freeing low delays paths for other more critical traffic. One can also envisage an intelligent interplay with caching where the first chunks are cached locally and hence leverage shorts delays, whereas subsequent chunks can be cached deep in the network as their sensitivity to delay is lower.

The candidate will propose a solution to provide QoE based routing in Software Defined Networks. We propose to rely on the latest tools to date such as P4 to provide a way to program such QoE based networks, OpenFlow to have the finest control on traffic flows and MPTCP to aggregate traffic over multiple low quality links but also optimisation frameworks for capturing the optimal QoE based routing behavior. The work will consider the latest models for video Quality of Experience as developed within the Diana team, but also available in the literature, and will take into account the interaction between the control implemented in the terminals and the control proposed for the network.

References

[1] A. Balachandran, V. Sekar, A. Akella, S. Seshan, I. Stoica, and H. Zhang, "Developing a predictive model of quality of experience for internet video", In ACM SIGCOMM Computer Communication Review, 2013.

[2] X. Yin, A. Jindal, V. Sekar, B. Sinopoli, "A Control-Theoretic Approach for Dynamic Adaptive Video Streaming over HTTP", in ACM SIGCOMM 2015.

[3] T. Spetebroot, S. Afra, N. Aguilera, D. Saucez, C. Barakat. From network-level measurements to expected Quality of Experience: the Skype use case. In IEEE International Workshop on Measurement and Networking (M&N), Oct 2015, Coimbra, Portugal.

[4] T. Hoßfeld, R. Schatz, E. Biersack, and L. Plissonneau, "Internet video delivery in youtube: from traffic measurements to quality of experience", in Data Traffic Monitoring and Analysis, Springer, 2013.

[5] ACQUA: ACQUA: Application for prediCting Quality of User experience at Internet Access, URL http://project.inria.fr/acqua/

[6] V. Poliakov, L. Sassatelli, and D. Saucez, "Case for Caching and Model Predictive Control Quality Decision Algorithm for HTTP Adaptive Streaming: is Cache- Awareness Actually Needed?", In IEEE GLOBECOM QoEMC2016, December 2016.

Skills and profile

Required qualities (desired – essential)

Computer Networks, Programming Skills, SDN, Measurements and Data Analysis, Machine Learning

Required Diploma and experience

Master in Computer Sciences

Advantages …

Business Restaurant on site, etc…

Additional Information

Gross Salary per month according to the level of diploma and the experience in the domain.

Place of work: Sophia Antipolis (Nice area).

Starting date: As soon as possible

Contract Duration: 12 months funded by Inria

Required documents and sending of the application
Please send your detailed resume, your bachelor and master transcripts, a covering letter showing your interest, and letters of recommendation by email to :

Damien Saucez Damien.Saucez@inria.fr and Chadi Barakat Chadi.Barakat@inria.fr

- *Applications will be admitted until the position is filled*

Inria's disabilities policy: All positions at the institute are open to disabled people.

Security and defense procedure

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