2018-00440 - [CORDIS 2018-DIANA] QoE aware content management in the Internet: caching and transport

Level of qualifications required: Graduate degree or equivalent
Fonction: PhD Position

About the research centre or Inria department
The Inria Sophia Antipolis - Méditerranée center counts 37 research teams and 9 support departments. The center's staff (about 600 people including 400 Inria employees) is composed of scientists of different nationalities (250 foreigners of 50 nationalities), engineers, technicians and administrators. 1/3 of the staff are civil servants, the others are contractual. The majority of the research teams at the center are located in Sophia Antipolis and Nice in the Alpes-Maritimes. Six teams are based in Montpellier and a team is hosted by the computer science department of the University of Bologna in Italy. The Center is a member of the University and Institution Community (ComUE) "Université Côte d'Azur (UCA)."

Context
The work will be carried out at the premises of the Diana team at Inria Sophia Antipolis (south of east of France). The work will profit from collaboration with the partners of the ANR BottleNet and the IPL BetterNet projects.

Assignment
A large body of the literature is dedicated to solutions for efficient content caching in the Internet in general and in mobile networks in particular. The main objective is always to reduce the load on the core of the network by bringing popular content as close as possible to the edge of the network and to improve the time to access the content. The second main objective is to transport the content in the most efficient way to on one side fully profit from the available network resources, and on the other side improve as much as possible the service offered to the end users. Mobile edge computing, HTTP/2, adaptive streaming and multi-path TCP are typical examples of these research directions. These different efforts and optimizations have been mostly carried out separately from each other. Furthermore, they aim to optimize network-level or application-level metrics, while ignoring the real metric of interest to the end user which is related to its Quality of Experience. In this proposal we want to bridge the gap between these different efforts and the Quality of Experience. We will leverage recent efforts in terms of Quality of Experience modelling (ref. our project http://project.inria.fr/acqua/ and references therein) and revisit these existing directions from Quality of Experience viewpoint. We are interested by two main issues:

i) what does quality of experience bring to these solutions and how they can be improved to take it into consideration, and

(ii) what does the joint consideration of these different solutions bring to the user and to the network itself.

The work will follow a data driven approach mixing controlled experiments and machine learning to bridge the gap between caching and transport strategies on one hand, and Quality of Experience on the other hand, and to shed light on the optimal decisions to be taken so as to improve Quality of Experience without impairing network resource usage. The utilization of stochastic tools and nonlinear/linear programming is not excluded in the course of this research.

Main activities
First, the candidate will have to go via the literature to be familiar with past and current projects on content caching and content transport in the Internet, and on Quality of Experience modelling.

Second, the candidate will have to define the scenarios of the study, and set up the experiments to produce the required data. Some of the data might be available in the literature or within the ACQUA project.
Third, and in parallel to the second step, the candidate will get familiar with Machine Learning techniques and start preparing the framework for the data analysis.

Fourth, the candidate will carry out the experiments and learn about the impact of the different solutions on the Quality of Experience, and propose directions for how to improve this latter one by revisiting existing caching and transport solutions, either individually or jointly.

**Skills**

Technical skills and level required: Good knowledge of Internet architecture and protocols is required. Network experimental skills are also required.

Languages: English

Relational skills: Capacity to work in group

Other valued appreciated: Machine learning, stochastic calculation, optimization.

**Benefits package**

- Subsidised catering service
- Partially-reimbursed public transport
- Social security
- Paid leave
- Flexible working hours
- Sports facilities

**Remuneration**

Duration: 36 months
Location: Sophia Antipolis, France
Gross Salary per month: 1982€ brut per month (year 1 & 2) and 2085€ brut/month (year 3)