

Linux client with WiFi and LTE

Project proposal

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1 Project description

The task of this project is study of Dynamic Adaptive Streaming over HTTP video delivery in a mobile scenario using WiFi and Long Term Evolution (LTE). Case scenario is that the user is connected through LTE, but periodically gets the internet access through WiFi. The main goal of this project is to evaluate the quality gain in the parallel LTE/WiFi video transmission in comparison to a single LTE transmission using multi-path TCP (MPTCP).

Key Performance Indicators (KPIs) will be the following:

- **Bit Rate:** Measuring the bitrate differences on LTE vs. LTE and WiFi to define quality of the video stream.
- **Buffering:** How big needs the buffer to be to ensure no waiting time for loading the video. Fill the buffer up when WiFi is available.
- **Lag:** Keeping the lag at a minimum, especially when streaming a live event where the buffer should be small to reduce overall lag.

2 Roadmap of project

Idea is to study the topic using MPTCP on Linux. User equipment (UE) will be connected to LTE and it will periodically get access to WiFi. First step will be establishing experimental setup on several laptops and PCs. Then we will start downloading video from some video server using only LTE. While the video is downloading, we will turn on and off WiFi. When WiFi access point is on we expect better experience in comparison to LTE. In next steps we will study quality gain in different scenarios.

3 Explanation of concepts

Long Term Evolution (LTE) is standard for high-speed wireless communication for mobile devices. It increases capacity and speed using new digital signal processing techniques. It represents 4th generation technology.

Wireless fidelity (WiFi) is technology for wireless local area networking (WLAN) with devices based on the IEEE 802.11 standards. Devices compatible with WiFi can connect to the Internet using WLAN and a wireless access point. Access points have range of about 20 meters indoors.

Dynamic Adaptive Streaming over HTTP (DASH) is streaming technique that enables high quality streaming of media content over the Internet. Client automatically selects the next segment to download based on current network conditions. It can adapt to changing network conditions.

Multi-path TCP (MPTCP) is solution that allows applications to use multiple paths for streaming. This feature is common on today's laptops and smartphones. Using MPTCP dramatically improves Quality of Experience of video streaming. Streaming video over MPTCP may incur undesired network usage.

4 Milestones

March 2018	Start of project
Early April 2018	Implementation & first draft version of report
Late April 2018	Finishing implementation
30. April 2018	Midterm presentation
Early May 2018	Evaluation & Analysis of results, writing report
Late May 2018	Finishing up
28. May 2018	Final project presentation

References

- [RE1] Bo Han, Feng Qian, Lusheng Ji, and Vijay Gopalakrishnan. 2016. MP-DASH: Adaptive Video Streaming Over Preference-Aware Multipath. In Proceedings of the 12th International on Conference on Emerging Networking EXperiments and Technologies (CoNEXT 16). ACM, New York, NY, USA, 129143.
- [RE2] Thomas Stockhammer. 2011. Dynamic Adaptive Streaming over HTTP Design Principles and Standards. MMSys '11 Proceedings of the second annual ACM conference on Multimedia systems. San Jose, CA, USA .133-144.