Block 1: Study behavior of HTTP Live streaming client from Apple (iPad)

In state-of-the-art adaptive streaming solutions, to cope with varying network conditions, the client side can switch between several video copies encoded at different bit-rates during streaming. To facilitate the switching, each video copy is divided into segments of equal duration. The perceptual quality of a segment increases with the segment size in bits, whereas bigger segments require more transmission time and, as a result, have a higher risk of missing transmission deadline. To achieve continuous video playback, each segment needs to arrive at the client before its playback deadline. Therefore, there is a trade-off between the overall video quality and continuous playback, which can be optimized by proper selection of the next segment from the encoded versions.

The decision-making process on the client device is the common denominator for existing adaptive streaming protocols and it is a determining factor for the overall QoE. With adaptive streaming, it is the responsibility of the client to observe changing network conditions, predict the transmission time for the next segment from different quality levels and choose the quality level that minimizes the risk of late segment delivery while maximizing the quality. The main challenge in using adaptive streaming protocols is making the most appropriate quality level choice in real-time under given network conditions.

Problem Description
Understanding behavior/capabilities of adaptive-streaming clients is an important step in deciding which of the available protocols to choose for building a multimedia streaming platform. However, due to the proprietary nature of the commercially available clients, studying how, e.g., network conditions influence decision-making of a particular client is a challenging task. The current assignment is to investigate behavior of the Apple HTTP Live Streaming client (iPad) under varying network conditions and create an empirical model for the client that allows approximation of bandwidth utilization.

Process
The initial part of the assignment requires identifying the scenarios for changing network condition such that responses of the client will be non trivial (e.g. a trivial response is continuously choosing the highest or the lowest bit-rate) and defining a number of test configurations for video (i.e. number and bit-rates of streams as well as segment duration).

The implementation part includes installing and configuring a web-server that will server HTTP Live Streaming content, encoding video (.ts) with multiple quality settings (4-5 quality levels), split .ts files into segments, integrating HTTP Live streaming protocol with the web-server.

The evaluation part is accessing video with an iPad, record web-server statistics and reporting the observed behavior. The observed results shall be used to build a client-behavior model that can later be used to approximate network utilization for new network conditions. The results of the approximation shall be compared to the real measurements.