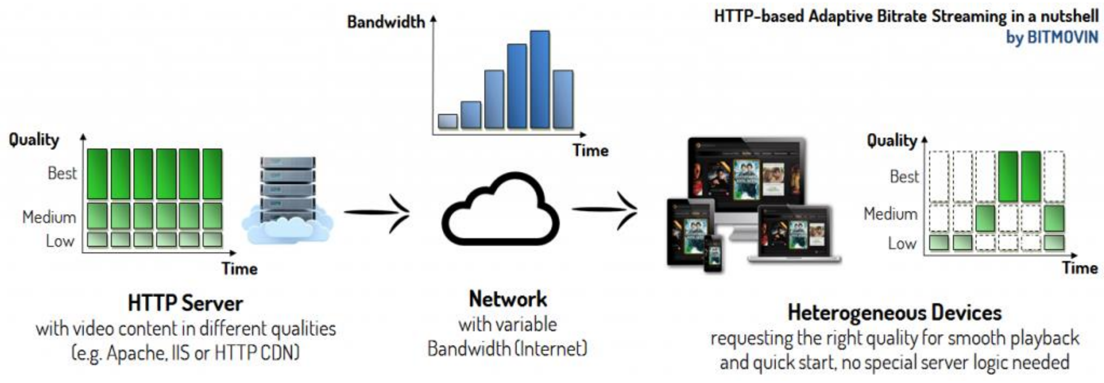
MPEG-DASH Live streaming in unstable environment

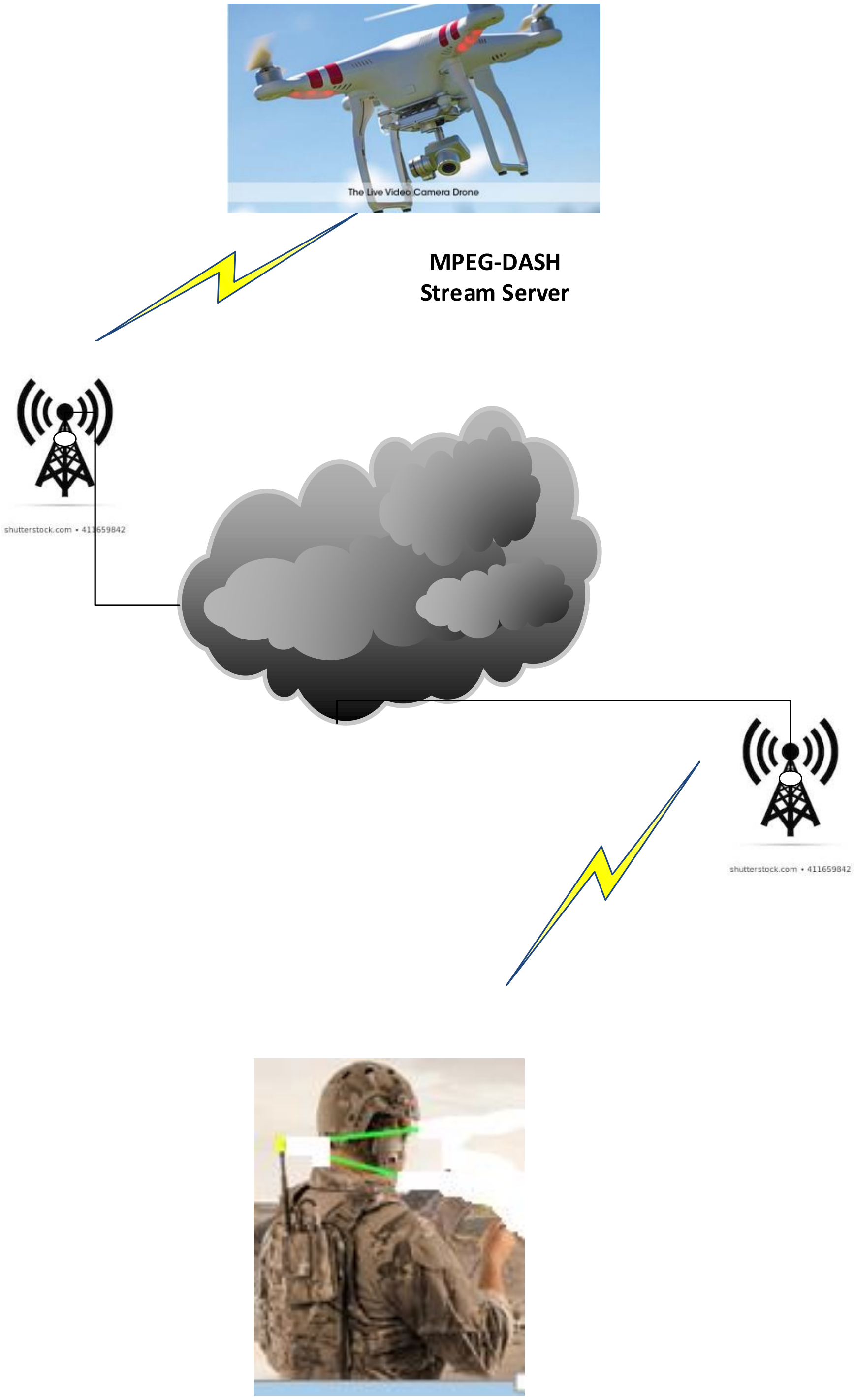
Abstract:

MPEG-DASH *(Moving Picture Experts Group - Dynamic Adaptive Streaming over HTTP)* is a vendor independent, international standard ratified in 2012. One of the main benefits of MPEG-DASH is reduction of startup delays and buffering/stalls during the video and continued adaptation to the bandwidth situation of the client.
Today, MPEG-DASH is gaining more and more deployments, accelerated by services such as Netflix or Google, which recently switched to this new standard. With these two major sources of internet traffic, 50% of total internet traffic is already MPEG-DASH.

The basic idea of MPEG-DASH is as follows: chop the media file into different bitrates or spatial resolutions encoded segments. The segments are provided on a Web server and can be downloaded through HTTP standard compliant GET requests where the HTTP Server serves different qualities, chopped into segments of equal length. Since the client knows its capabilities, received throughput and the context of the user best - the adaptation to the best bitrate or resolution is done on the client side for each segment.


HTTP-based Adaptive Bitrate Streaming in a nutshell
by BITMOVIN
Bandwidth
Time
Quality
Best
Medium
Low
Time
HTTP Server
with video content in different qualities
(e.g. Apache, IIS or HTTP CDN)
Network
with variable
Bandwidth (Internet)
Quality
Best
Medium
Low
Time
Heterogeneous Devices
requesting the right quality for smooth playback
and quick start, no special server logic needed

In previous semester, we managed to achieve MPEG-DASH live streaming (sub 1 second delay) in stable environment where the bandwidth is not changing. In this project we assume the client's bandwidth and connection quality can vary. The challenge is to stream to such client the best possible quality, while maintaining live streaming.


The Live Video Camera Drone
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MPEG-DASH
Stream Server

MPEG-DASH Client

Goals:

1. Refer to project from last semester: https://gitlab.cs.technion.ac.il/lccn/s2019-mpeg-dash-live-streaming
2. Raise a working environment based on this project.
3. Verify MPEG-DASH live streaming in steady environment when the MPEG-DASH client buffer size thresholds are constant.
4. Implement algorithm that manages the buffer and adjusts it to the changing bandwidth, while maintain live streaming. Refer to Monte Carlo methods.
5. Stretch goal – implement bandwidth prediction in the buffer management algorithm. The prediction should be based on trained bandwidth model.

Requirements:

Introduction to Networking (Must), Internet Networking (Optional)

Programming Language:

Python

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