# FlexStream: Towards Flexible Adaptive Video Streaming on End Devices using **Extreme SDN**

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Motivation

**Existing Solutions** 

When HTTP Adaptive Streaming (HAS) players compete over the bottleneck:

- Instability in the quality
- Playback Stalls

Unfairness



- Long startup delay
- Root cause: ON/OFF traffic pattern

adaptation algorithm)

(throttling or bitrate control)

**Edge-based solutions** (traffic management and control)

# Issues with Existing Solutions

- **Not effective:** they can not address the main performance issues, and can not comply with network policies.
- **Invasive:** Players have to follow specific adaptation logic.
- **Not generic:** Specific for HAS.
- **Costly:** Require large and special-purpose network infrastructure.
- Infeasible (in practice): they requires CDN edge server

# FlexStream Overview

Data Collection Flow statistics (OVS), device context, user context

2 Control & Management Resource allocation, admin polices



changes, or require player feedback and interactions.

#### FlexStream Architecture



### Implementation Challenges

- Rate control on an end device: extending SDN planes and open flow control to enable controlling the data rate on the end device through TCP flow control mechanism (modifying TCP receiving window).
- **Binding OVS to the cellular interface:** Installing a number of rules to the OVS flow table to rewrite the source/ destination IP and MAC addresses with OVS addresses to force all traffic to pass through OVS.

### Network Topology

### Sample Results





(\*) Big Buck Bunny. https://peach.blender.org

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