

Streaming Scalable Video Sequences with Media-Aware Network Elements Implemented in P4 Programming Language

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Abstract—

Index Terms—Scalable video streaming, media-aware network element, software-defined network, rate-distortion optimization

I. INTRODUCTION

In recent years, people are getting used to rely on Over-The-Top (OTT) services such as Skype, Facebook, online games, video streaming, etc. Among these services, video streaming is one of the services which consumes the most network resources. Video streaming services needs more and more bandwidth because customers prefer higher video quality than before, and thus incur high traffic amount on the best-effort Internet. Thus, streaming high quality video with less network resources becomes much more important.

Scalable Video Coding (SVC) is one of solutions for network congestion. Each of the SVC sequences contains a base and multiple enhancement layers. Furthermore, the encoder will encode the discardability into the packetize header. Therefore, We can drop the discardable packets without affecting its decodability in the middle-box of the Internet. The dynamic decisions on which video packets to drop can be sub-optimally done by streaming servers or clients without the global knowledge of the Internet. The better way to approach is through *Media-Aware Network Elements (MANEs)*, which are switches with knowledge of packets header.

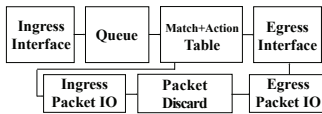


Fig. 1. Packet processing in a P4-based MANE.

II. MEDIA-AWARE NETWORK ELEMENT

III. SYSTEM ARCHITECTURE

IV. DEMONSTRATION SETUP

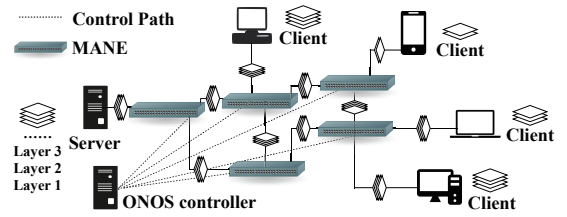


Fig. 2. High-level system architecture with a network of MANEs.

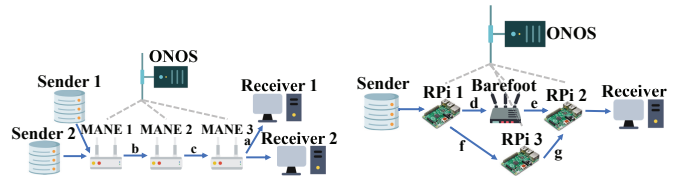


Fig. 3. Mininet testbed topology (scenarios 1 and 2).

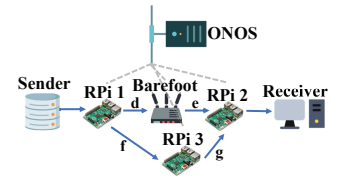


Fig. 4. Real testbed topology (scenario 3).