【CN】 Day19(2)

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【Ch2】 Application Layer

2.6 Video Streaming and Content Distribution Networks

2.6.1 Internet Video

In streaming stored video applications, the underlying medium is prerecorded video. These prerecorded videos are placed on servers, and users send requests to the servers to view the videos on demand.

A video itself is a sequence of images, typically being displayed at a constant rate. An important characteristic of video is that it can be compressed, therefore trading off video quality with bit rate.

From a networking perspective, the most salient characteristic of video is its high bit rate. 4k streaming envisions a bitrate of more than 10Mbps. This can translate into a huge amount of traffic.

By far, the most important performance measure for streaming video is average end-to-end throughput. In order to provide continuous playout, the network must provide an average throughput to the streaming application that is at least as large as the bit rate of the compressed video.

We can generate multiple versions of the same video, each at a different quality level. Users can decide which version they want to watch as a function of their current bandwidth.

2.6.2 HTTP Streaming and DASH

In HTTP streaming, the video is simply stored at an HTTP server as an ordinary file with a specific URL. When a user wants to see the video, the client establishes a TCP connection with the server and issues an HTTP `GET` request for that URL.

The server then sends the file to the client. On the client side, the bytes are collected in a client application buffer. Once the number of bytes in this buffer exceeds a predetermined threshold, the client application begins playback. The streaming video application periodically grabs video frames from the client application buffer, decompresses the frames, and displays them on the user's screen.

The HTTP streaming has a major shortcoming: All clients receive the same encoding of the video, despite the variations in the amount of bandwidth available to a client, both across different clients and also over time for the same client.

This has led to a new type of HTTP-based streaming, often referred to as Dynamic Adaptive Streaming over HTTP(DASH).

In DASH, the video is encoded into serveral different versions, with each version having a different bit rate and thus quality level. The client dynamically requests chunks of video segments of a few seconds in length. When the amount of available bandwidth is high, the client naturally selects chunks from a high-rate version. When the bandwidth is low, it selects from a low-rate version.