# Overview: CORS, HLS, and FFmpeg

## CORS (Cross-Origin Resource Sharing)

Definition: CORS is a security feature implemented by web browsers to restrict how resources on a web page are requested from different domains. When a web page makes a request to a different domain (cross-origin request), the browser checks if the server explicitly allows it.

Use Case: In web applications, CORS allows the server to permit resources (like APIs, images, videos) to be accessed by web pages hosted on different origins.

Why It’s Important: By default, browsers block cross-origin requests for security. Enabling CORS in our Flask application (using flask\_cors library) allows us to handle these requests safely and ensure the browser doesn't block access to resources.

## HLS (HTTP Live Streaming)

Definition: HLS (HTTP Live Streaming) is a protocol designed by Apple for streaming audio and video over HTTP. It’s commonly used for video-on-demand services, live broadcasts, and adaptive streaming.

### How It Works:

1. Segmentation: The original video is broken down into short segments, usually a few seconds each, stored as .ts (Transport Stream) files.  
2. Playlist File: An .m3u8 file, or playlist, lists these segments and provides URLs to each one, so the player can download and play them sequentially.  
3. Adaptive Streaming: Different quality levels (bitrates) can be defined in the playlist, allowing the player to adjust playback quality based on network speed.

### Benefits:

- Efficient streaming by loading small segments, leading to less buffering and faster playback.  
- Adaptive bitrate ensures smooth playback on varying network conditions.  
- Compatibility with many devices, especially Apple devices, and can be supported on others via libraries like HLS.js.

## FFmpeg (Fast Forward MPEG)

Definition: FFmpeg is a powerful open-source tool for handling video, audio, and multimedia files. It supports encoding, decoding, transcoding, streaming, and segmenting media files.

### Use Cases in Our Application:

- Video Processing: FFmpeg is used to convert videos to HLS format, breaking them into segments (.ts files) and generating an .m3u8 playlist file.  
- Command Usage: In our case, the ffmpeg command is used with parameters to specify input files, codecs, segment duration, playlist type, and output pattern.

Example Command:  
```bash  
ffmpeg -i input.mp4 -codec:v libx264 -codec:a aac -hls\_time 10 -hls\_playlist\_type vod -hls\_segment\_filename "segment%03d.ts" -start\_number 0 output/index.m3u8  
```

Explanation: This command takes an input video, encodes it using the H.264 codec, breaks it into 10-second .ts segments, and creates an .m3u8 playlist file.