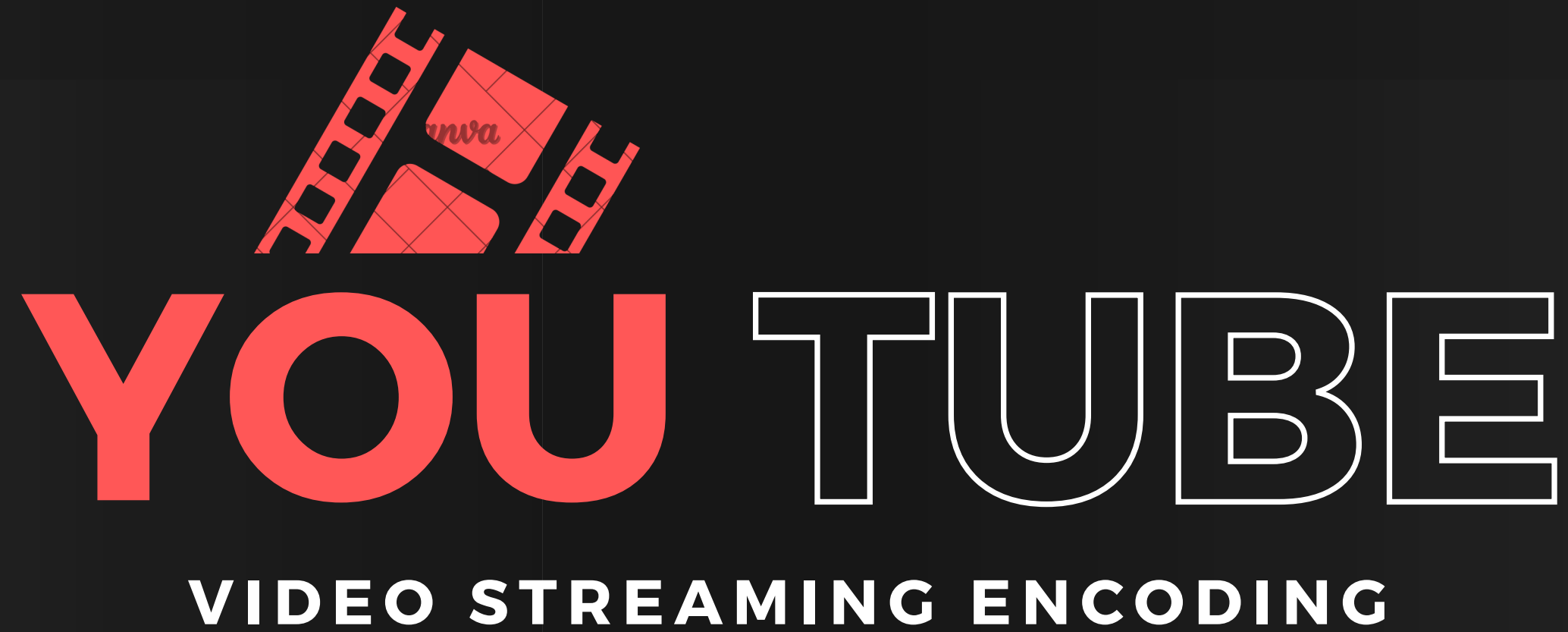


Movie Apps.



Information and Coding

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Introduction to Video Streaming

Video streaming is a method of delivering video content in real time over the internet. Unlike downloading, streaming allows users to watch videos immediately as they load, without needing to save the entire file. Streaming has become the preferred method for video delivery, driving platforms like YouTube, Netflix, and Twitch to deliver massive amounts of content every day.





Adaptive Bit-rate Streaming (ABR)

Adaptive Bitrate Streaming (ABR) is a technique used to improve the streaming experience by adjusting video quality based on the user's internet speed and device performance.

ABR ensures that the video plays smoothly, switching between resolutions (e.g., 1080p, 720p) to minimize buffering. YouTube uses ABR to deliver the best possible quality without interruptions.





Role of Codecs in Video Streaming



Codecs are algorithms used to compress and decompress video files. They play a critical role in streaming, balancing video quality with file size. Different codecs have different compression techniques and levels of efficiency. Advanced codecs allow platforms like YouTube to deliver high-quality video with minimal data usage, reducing storage and bandwidth requirements.



Choose Your Favorite Codec

VP9

VP9, developed by Google, offers better compression efficiency than older codecs, reducing file sizes by up to 50% while preserving quality. This enables YouTube to deliver high-quality video at lower data rates, improving playback for users with slower connections.



AV1, a codec developed by the Alliance for Open Media (Google, Amazon, Netflix, and others), is up to 30% more efficient than VP9. Although it requires more processing power, AV1 enables higher quality streaming at lower bitrates, making it ideal for the future of streaming.



How does it work?

- Temporal and spatial prediction and Adaptive quantization
- Block partitioning, down to 4x4 pixels
- Directional prediction modes
- Deblocking, CDEF (Constrained Directional Enhancement Filter), and Loop Restoration





YouTube's Video Encoding Process





Challenges and Benefits of Codec Evolution

Benefits: Newer codecs like AV1 reduce bandwidth usage, enable higher quality streaming, and make streaming accessible on limited connections.

Challenges: High-efficiency codecs require more processing power and can be difficult for older devices to support. Encoding in advanced codecs can also be time-consuming, impacting content creators and platforms.



Future of Video Streaming Technology

As internet speeds and devices continue to improve, video streaming technology is evolving as well. Future developments may include even more efficient codecs, improvements in real-time adaptive streaming, and new standards for 8K and immersive video experiences. These advancements will drive higher quality video streaming with lower data costs and improved accessibility.



Conclusion

In summary, YouTube's encoding process, adaptive bitrate streaming, and advanced codecs like VP9 and, nowadays, AV1, all work together to provide a seamless streaming experience. As streaming continues to grow, innovations in encoding and delivery technology will help ensure high-quality, reliable video content for audiences worldwide.





THANKS

YOUTUBE VIDEO ENCODING

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