Scalable Media Transcoding
For Cross Platform Streaming

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Introduction

Video of all kinds is being consumed on a wider range of devices than ever before, and consumers expect a high quality experience on every device without being made to wait. This demand for quality and speed across such a variety of platforms creates demand for better ways of managing and serving video files. While previous solutions have already solved these in a variety of ways, there is always room for improvement since existing solutions are not perfect.

This research investigates current solutions in depth, presents a new solution centred around streaming transcoded video on demand, and evaluates the cost-effectiveness and user experience gain from this method.

Aims & Objectives

- Provide future developers with valuable information regarding the effectiveness and scalability of various video transcoding technologies
- Develop a system to test and evaluate various methods of streaming high quality video to multiple platforms on demand
- Investigate whether streaming transcoded video on demand is possible, and measure scalability to assess whether it is viable for use in real world scenarios
- Calculate economic cost of on demand transcoding and compare with current methods of serving video to multiple platforms

Transcoding

To store video data as a file on a digital storage medium such as a hard disk or flash drive in a useful way, a specification for the layout and content of this data must be defined formally. This formal specification of stored video data is the definition of the general term *video format*.
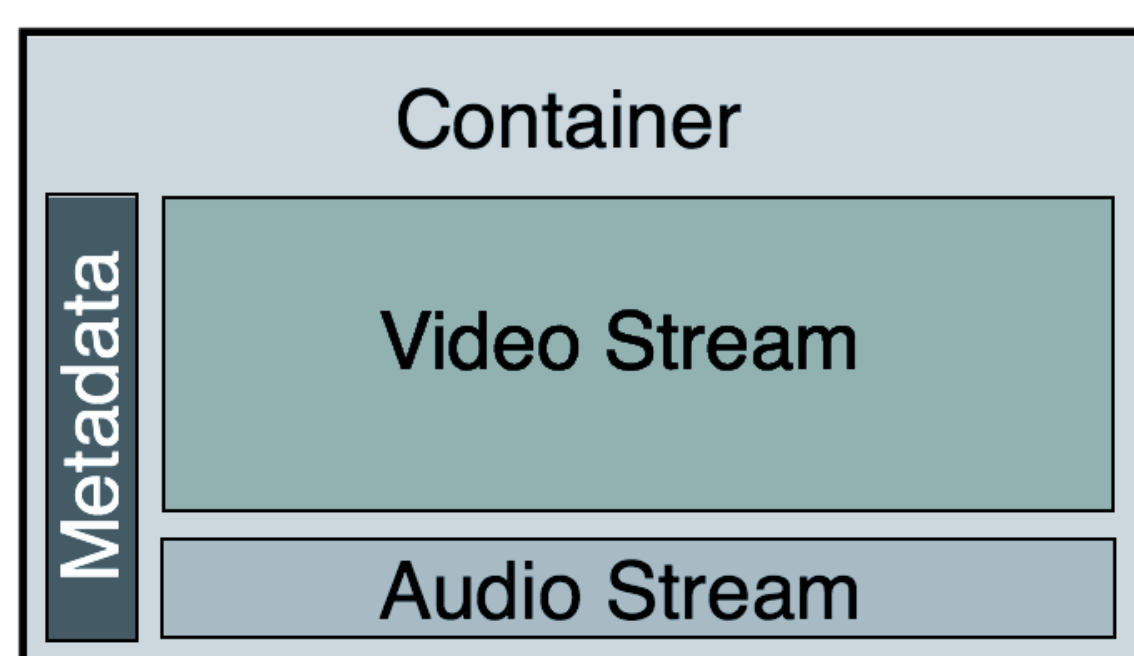

Fig. 1: Structure of a video file

To *stream* a video file over the internet, the video stream inside the file must be in a *compression format* which is supported by the viewer. To avoid any waiting for the video to load, the bit rate of the file must be lower than the bit rate supported by the viewers internet connection. As there are many different supported formats by different viewers, and internet connection speed varies greatly, to serve video in a way which makes it available to everyone, it must be converted to different formats and bit rates.

Transcoding is the process of converting a video to a new format.

Method / Results

A web-based testing platform was developed to investigate and devise a solution to enable on demand streaming of video whilst a transcoding process is still in progress. A successful algorithm to solve the problem was found and tested using this platform.
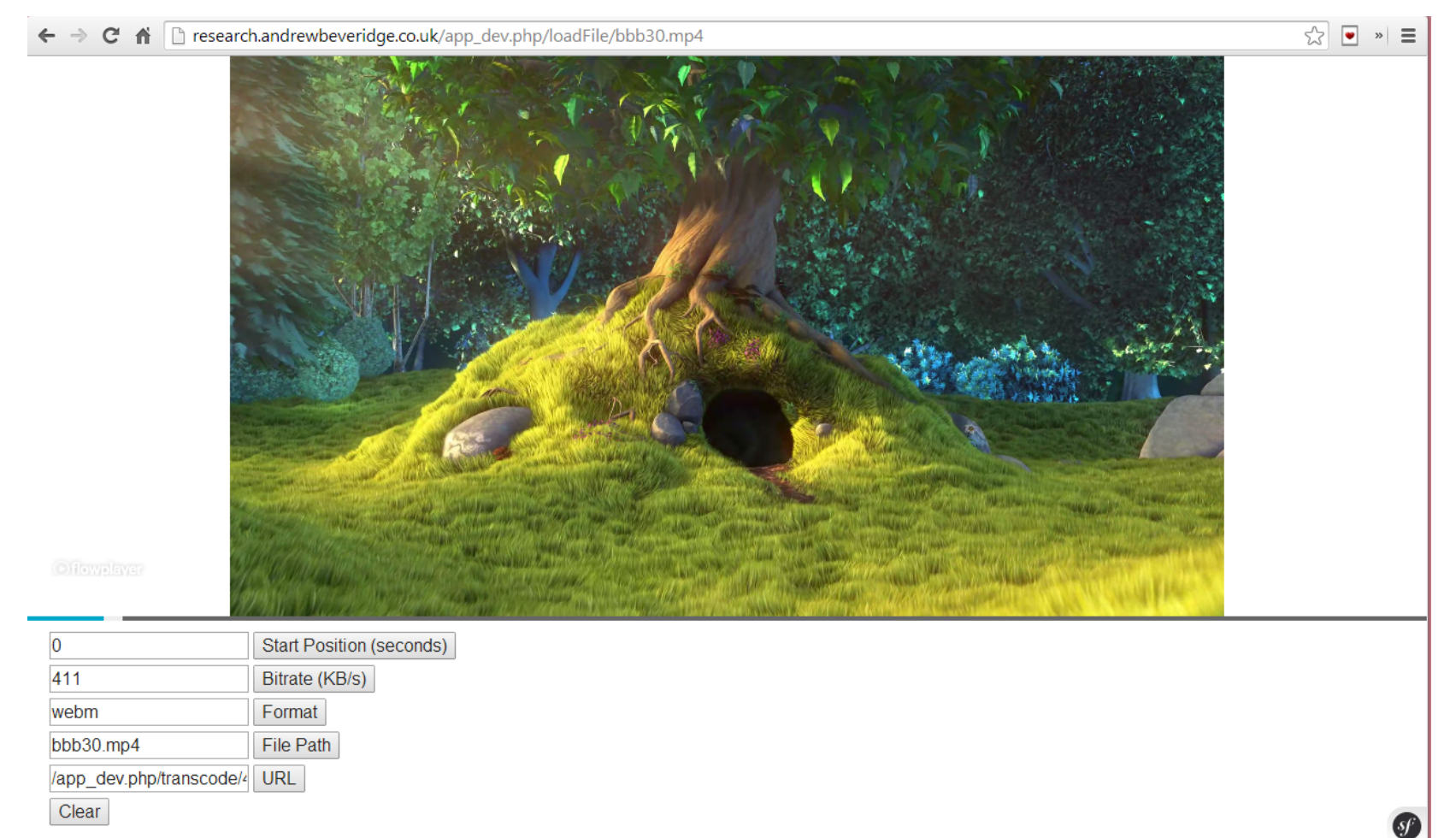

Fig. 2: Testing platform with video playing

The transcoding system uses the open-source software stack *FFmpeg* to transcode source video files to the ideal format and bit rate for a client, after performing a bandwidth measurement over 3 seconds.
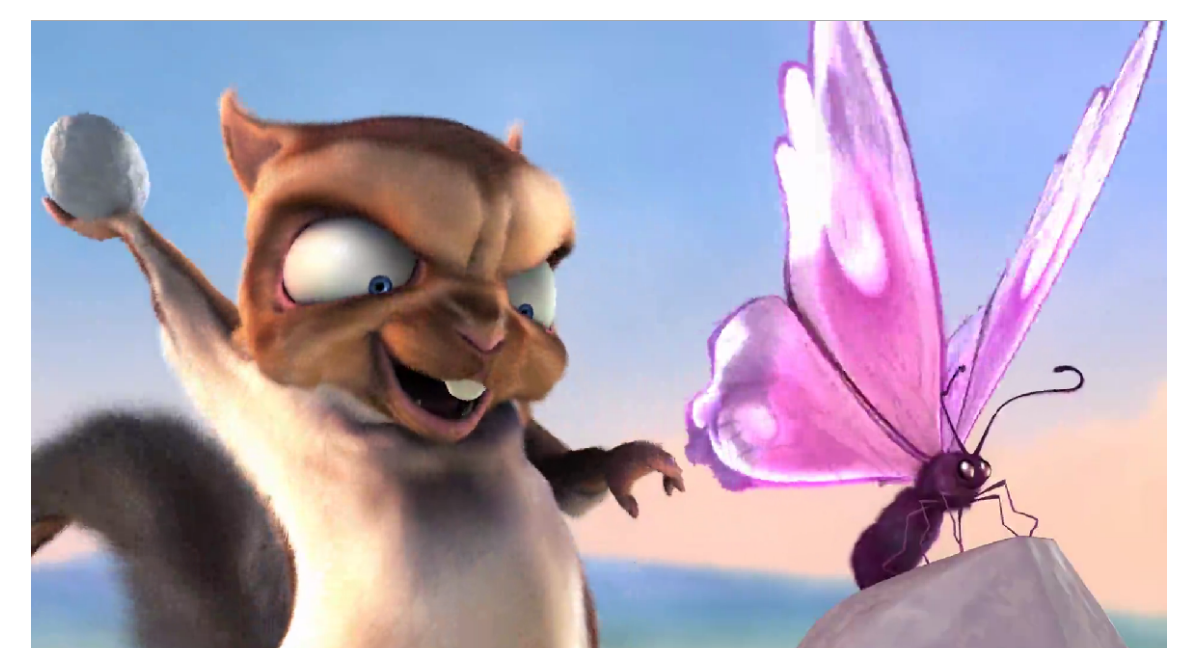

Fig. 3: MP4 format transcoded video, streamed at 50 KB/s

The resulting video file is then streamed to the viewer as fast as it is created by the transcode process, with customised metadata in the container file; this allows for on demand streaming of a video file during transcode.

Conclusion

- A system to test and evaluate methods of streaming high quality video was developed. This system is functional and useful for testing any transcoding activity.
- A new technique for solving the problem of streaming transcoded video on demand was successfully developed and tested.
- Existing research into the economic cost of on demand transcoding was found, concluding it was more cost effective than existing methods of serving video, however an issue with latency was identified which made the technique unusable. The algorithm presented in this research solves this problem of latency.