

## PERFORMANCE ANALYSIS OF VIDEO FORMATS ENCODING IN CLOUD ENVIRONMENT

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**Abstract:** A revolution in digital video era is being promoted by continued enhancements in the transmission methods, storage capacity, processing performance. But a new paradigm of video streaming has a lot of potential and depth yet to be explored that can be in live video streaming or it can be video on demand. This paper comprises of performance analysis of different video formats in cloud environment and will try to find out which format is favorable to end users requirement.

**Keywords :** RTMP, Hypervisor, MPEG2, MPEG4.

### INTRODUCTION

A new era of video streaming is rising, which is of home streaming via personal server to remotely connected internet users. Potential of such technology need to be analyzed and implemented in such a way that optimal utilization can be achieved of facilities which video streaming provides. Video streaming over the Internet has grown in popularity, representing the largest fraction of Web-based traffic to the home<sup>[1]</sup>.

### REAL-TIME MESSAGING PROTOCOL

It was a closed source protocol developed by macromedia for transmission of audio, data and video over the internet. But now adobe owns macromedia and launched a version of RTMP for public use, it works on TCP and allows smooth communication between server and video player with low latency.

### DIGITAL VIDEO

It is a combination of video and audio in digital sequence rather than analog signal. Digital video means a set of data comprising audio and video in discrete units. In analog data case recording is done on video tapes, signals are transmitted as electron signals provided with a carrier signal of different amplitude or frequency. But in case of digital media the conversion from analog signal to digital signal is done by storing the media in

from of a series of "0" and "1" , "low" and "high" or "+" and "-".

### CODEC

Codec is made up of "Coder or Decoder" or we can say "compressor-decompressor". A codec encodes a data stream or signal for transmission, storage or encryption, or decodes it for playback or editing. Codecs are used in videoconferencing, streaming media and video editing applications<sup>[2]</sup>.

### CONTAINER

Container usually associates with the file format it contain several components of video i.e. images in stream, sounds. It is a metafile format which describes how several types of data and metadata can simultaneously exist within a file.



Figure 1. Container file format

MPEG-4Part14 or MP4: MPEG-4 Part 14 is an instance of the more general ISO/IEC 14496-12:2004 (MPEG-4 Part 12: ISO base media file format) which is directly based upon the QuickTime File Format<sup>[3-7]</sup>. Mp4 store audio and video data not the code of it that's why it is mostly used for streaming over the web.

**AVI:** Audio Video interleaved :it is a container format for multimedia launched by Microsoft in 1992 for windows 3.1. It contains audio and video both data types which serves synchronous audio-with-video requests.AVI files are also used in multiple streaming but this feature is used very rarely.

**Flash Video:** Flash was developed by macro-media and adobe bought it in 2005. It is a container which is used to provide video on internet with Adobe Flash Player version 6 or upper. Flash video is currently the standard of video streaming (over RTMP) .Flash has a drawback that it cannot play on iOS devices such as iPad or iPhone.

**Matroska Multimedia Container:** It is an open standard, flexible, popular file container format which is use to deliver high definition videos over the internet. It is popular alternate of AVI and Mp4 format as it provides multiple audio tracks, subtitles in many languages, rich metadata consisting cover art, information and ratings.

**QuickTime File Format (QTFF):** It is a file format used by QuickTime framework. It is a multimedia file format that consists of tracks and each track can store different type of data ie it can store video, audio, text. Every track stores either a media stream or a reference to the media placed at another location. These tracks are organized in a hierarchical tree like data structure.

**Windows Media (WMV):** It is a Video compr-ession codec developed by Microsoft and used widely for streaming applications. WMV provides physically existing formats like HD DVD and Blueray Disc.

## VIRTUALIZATION

It is a definition used in IT paradigm which segregates computing functionalities and technical implementations with physical hardware. For Example Cloud Computing.

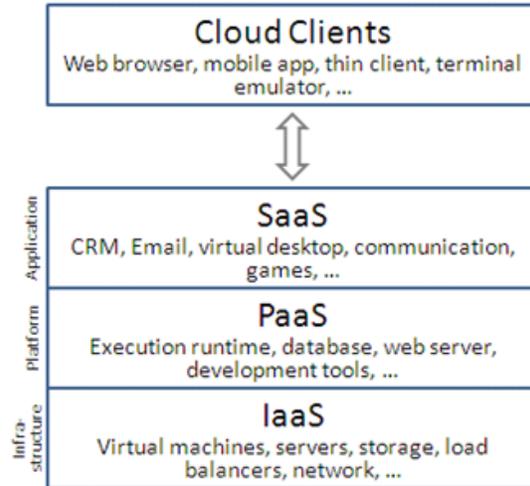


Figure 2. Cloud Computing Layers

**Hypervisor :** It is also called Virtual machine monitor. It can be understood as a software, hardware or firmware which is used to run virtual machines. A machine over which hypervisor is running virtual machines is called host machine, hypervisor provides end user with a virtual operating system and carries out execution of their requests.

**Hypervisor Type-1 :** It is client hypervisor which connects itself directly to hardware that is to be virtualized. It is totally independent of Operating system, unlike Hypervisor type 2 and boots to operating system (OS). Presently hypervisor type 1 is used by big market leaders in field of desktop virtualization space which includes VMware, Microsoft and Citrix but not limited to them.

**Hypervisor Type 2:** It is a client hypervisor over operating system on which you work. Hypervisor of this type is dependent upon the operating system we are using. The functioning of hypervisor is only in existence when operating system is functional, the security of hypervisor is also similar as of operating system user works on it is a big drawback's hypervisor type 2 are Operating System depend they cannot provide full control to end users.

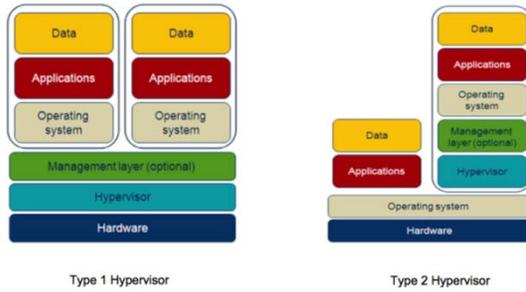


Figure 3. Types of Hypervisor

**Hypervisor Type-1 vs. Hypervisor Type-2** : If we talk about high performance, expandability and delivery of user requirements hypervisor type-1 is far superior to Hypervisor type-2. It is mainly because type-1 is independent from operating system. As hypervisor type-2 comes above the operating system, it makes end user's work hard to handle.

**PROPOSEDWORK**

**Parameters:** In cloud environment we will test several parameters like encoding bit rate, streaming bit rate and CPU utilization at the time of streaming.

**Quality of video:** While streaming two videos in virtual cloud environment we will check the changes in quality of video and also identify the performance of video while encoding them.

**TOOL USED**

**Wowza media server:** It is a software which is developed by Wowza Media Systems this software provides a virtual server to end user. It is a java application compatible with several operating systems like Unix, Linux, Mac, Windows and Solaris. Wowza media server is basically used for streaming live and video on-demand, audio and rich internet applications through Public and Private internet protocol networks.

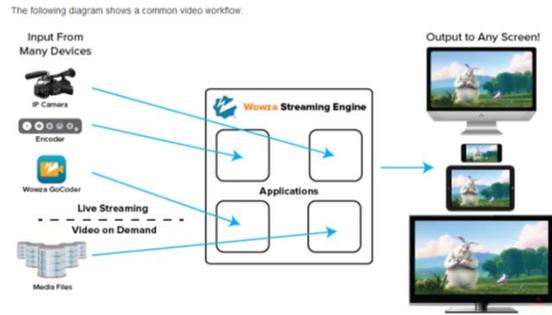


Figure 4. Functioning of Wowza Media Server

**Telestream Wirecast:** Wirecast from telestream is a tool which is to produce live video streaming and allows Windows and Mac users to create live or on-demand broadcasts over the internet.. It works like an encoder provides multiple format support and video switcher as it controls switching in real-time between several video cameras simultaneously mixing audio, video and slides to provide professional broadcast product distribution on internet.

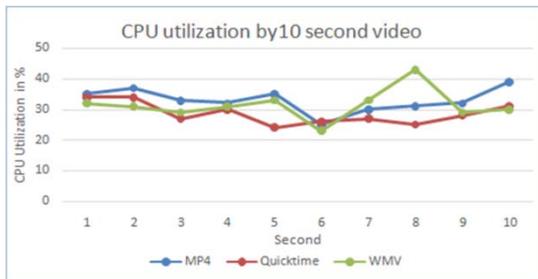
Table 1. Result for 10 second Video

10 SECOND SAMPLE VIDEO.	MP4 (Mpeg-4)	QUICKTIME (Mpeg-2)	WMV (WMV9)
AVERAGE ENCODING (BITRATE)	2126 kbps	2782 kbps	3030 kbps
CPU UTILIZATION	32.9	28.6	31.4
AVERAGE STREAMING (BITRATE)	1895.6kbps	1913.7kbps	1951.4 kbps
STREAMING DELAY	5 Sec	6sec	4Sec

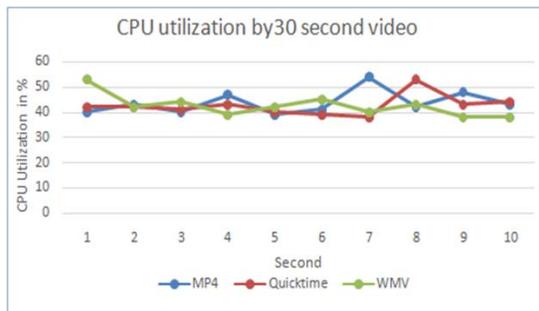
**Table 2. Result for 30 second Video**

30 SECOND SAMPLE VIDEO.	MP4 (Mpeg-4)	QUICKTIME (Mpeg-2)	WMV (WMV9)
AVERAGE ENCODING (BITRATE)	2009 kbps	2686 kbps	3169 kbps
CPU UTILIZATION	43.7	42.5	42.4
AVERAGE STREAMING (BITRATE)	1998.6kbps	2014.6kbps	2047.3k bps
STREAMING DELAY	5 Sec	6sec	4Sec

CPU utilization by video while encoding them in cloud environment.

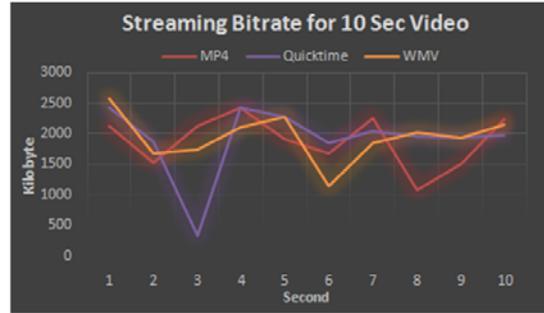


**Figure 5. CPU utilization by 10 sec Video**

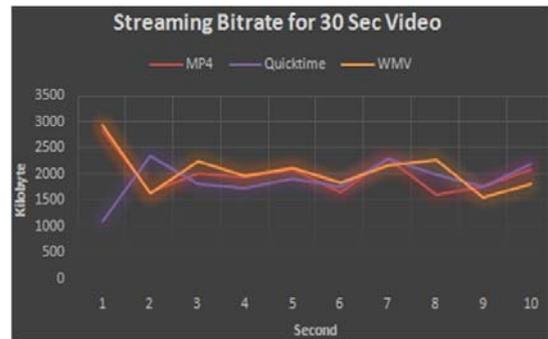


**Figure 6. CPU utilization by 30 sec Video**

Streaming Bit rate of videos after encoding them in cloud environment



**Figure 7: Streaming bit rate of 10 sec Video**



**Figure 8. Streaming bit rate of 30 sec Video**

**CONCLUSION**

Conclusion after streaming most popular streaming formats i.e. Mp4 (MPEG4/H.264), QuickTime (MPEG2), WMV (WMV3/WMP v9). While streaming two sample video of 10Sec MP4 (1280\*720) and 30Sec MP4 (1280\*720) in cloud environment and encoded into different formats.

- 1.) The most suited format for streaming over the web is Mp4 (Mpeg4) as it takes less encoding time and average bit rate for streaming is low.
- 2.) But CPU Utilization is minimum in Quick Time format.
- 3.) WMV encoded video provide less delay to the user.

**FUTURE WORK**

This type of experiment can be conducted by creating a virtual cloud on different operating systems like UNIX, Linux, and Solaris etc. Several codec formats can also be tested by using a type-1 Hypervisor i.e. direct communication can be made between physical peripherals without operating system.

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