TO DETERMINE BANDWIDTH AND RESOLUTION QUALITY FOR AN AMAZON PRIME VIDEO USING WIRESHARK ANALYSER TOOL

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ABSTRACT

Among many types of web-based applications, real-time streaming footage has become the standard broadcast standard. In this paper, we investigate Amazon Prime Video, which is an online video-on-demand service that allows us to view sporting activities, motion pictures, and other events. Each component of the video that streams online is then further broken into various bit rate variants. The quantity of bits sent in a specific amount of time is known as the rate of transmission for videos. Utilizing the wireless network analysis programme Wire shark, we quantify the bit rates modulated throughput of Amazon Prime Video Streaming. The rate of modulation depends on a pair of factors, like traffic rate and video resolution; the latter is used to gauge a video's capacity and network capacity, which takes into account the higher bandwidth requirement, the better the quality must be.

Keywords: Wireshark, Amazon Prime, Bandwidth, Resolution, Streaming

1. INTRODUCTION

Due to their immense popularity, we sometimes overlook the amount of data that streaming services may require until it becomes too late. It might be a lot, but just a few minor adjustments everywhere, anyone can cut down on data use and save money. It's logical to think one among them could be Amazon Prime Video in general, Pandora, Spotify, Netflix, or YouTube especially considering the wide variety of services that stream and gadgets that are affiliated with them [1]. The fact that there's limits on memory and/or network sharing makes both of these incredibly significant ways to modify how much space they utilize. Netflix, which is Amazon's Prime Video service, and YouTube are likely to take up the most storage space & broadband of these. It's hard to run into problems with bandwidth if it's just listening to music via streaming, however if you've been watching videos as well, it builds up over time, particularly when you're transmitting sound of higher resolution.

1.1 LIVE STREAMING

Live streaming becomes more popular in business, changing how web-based ad campaigns are managed. The companies broadcast real-time broadcasts of product demonstrations and how-to videos. Video transmission is used by non-profit to spread the word about important events to a greater number of people. Online and television broadcasts are both used. Sports leagues employ live streaming to convey contests to its followers, no matter how far away they are. Live streaming is being used by government to comply with open meeting laws. Digital media is used by religious organisations to help their membership grow. It is disseminated, consolidated, and recorded in real-time. It goes without saying that you need a lot of power for computation and specialised hardware support. [2][3]

1.2 VIDEO STREAMING

Operations by chopping up the footage into little bits and transmitting them across the internet to their final location to be put back together and watched. The video streaming market is anticipated to reach $70.5 billions of dollars in revenue by 2021. Video on demand (VOD) offerings have a lot of potential for the future of education, television, movies, e-commerce, medical care, and numerous other industries. In fact, 80% of consumers agree that live company broadcasts add to the brand's credibility and humanization while also being engaging. [3]

1.3 VIDEO BIT RATE

The video's rate of transmission is the number of bits sent in a given amount of period. Note There are eight bits in 1 byte. Bit per sec are used to express video data throughput. The rate of bits serves as the video file's rate of data transfer. As a result, a video input data transfer requirement running at 1 Mbps is going to be given as an 8 Mbps data speed. [4]

File size = bit rate (kilo bits per second) x duration

The number of bytes carried over for a particular period determines bit speed. The remaining portion of a bit's rate comes from the information's stream and is split between the video channel and file sound streaming. The highest rate of bits for a streamed playback is going to be adjusted to be less than the download speed once the median link speed of customers has been determined. Since it will assist in account for a variety of environmental congestion, server separation, and additional elements that are loaded onto a single webpage, we will encrypt below the connection level at an increased rate. [4][5] An HD Blu-ray discs video usually has a bit speed of approximately twenty mbps, a standard-definition Disc generally has a bit rate of approximately six mbps, excellent web material often operates at approximately two mbps, and data for mobile devices is typically given in kilobits. To begin with, the objectives we typically see for broadcasting H.264 are as follows:

TABLE 1: BIT RATE STREAMING

1	LD 240p	3G Mobile @ H.264 baseline profile	350 kbps (3 MB/minute)
2	LD 360p	4G Mobile @ H.264 main profile	700 kbps (6 MB/minute)
3	SD 480p	WiFi @ H.264 main profile	1200 kbps (10 MB/minute)
4	HD 720p	@ H.264 high profile	2500 kbps (20 MB/minute)
5	HD 1080p	@ H.264 high profile	5000 kbps (35 MB/minute)

incredibly crucial to take into account how the bit rate modification affects the quality of video and size of the file. In overall, improved visual quality may be supported by a larger bit rate for the form of video transmission [12]. At the identical bit rate, photographs using a more recent compression like H.264 will appear much smoother than those using an older compression like H.263. Another thing to think about is that for the majority of applications, variable bit rate (VBR) encoding would give images with higher resolution than constant bit rate (CBR).

2.1 RESOLUTION

The easiest solution is to simply reduce the size of the file and lessen the number of visible pixels. There's no reason to give a higher-resolution copy if we play a video on the website in a 320 × 240 player instead of asking the user to download the game's screen. Despite the fact that the camera records in 1080p, we may still reduce the size to reduce the bit rates. The majority of films are either recorded in 16:9 or 4:3, and changing this aspect ratio will produce an obtrusive squishing or stretched effect. [8][9] The resolution we are using is a number that is equally divided by sixteen, but you shouldn't increase the resolution by making it an additional number of Sixteen unless we under crop, which can result in losing some of the image. Encoding efficiency may be hindered by under-cropping or applying a black border all the way around the picture. Stretching would only make the image worse.

2.2 FRAME RATE

The typical film video, that additionally has a "cinematic appearance," is shot at an average frame rate of roughly twenty-four frames per minute, where many video producers choose to start and where most viewers' eyes are fooled into thinking there is motion. If the footage is a screen capture, we may experience rates of motion as low as 5 fps, which is uncommon. Broad transitioning between clean white or pure black screens, on the opposite hand, could have a noticeable defect of fewer than 30 frames per second, and game graphics additionally require 60 frames per second to maintain cleanliness. While conventional NTSC (used in the US and Japan) utilizes 29.97fps, broadcast standards like PAL use 25fps. In broad terms, we never go beyond the frame dimension of the original video.

2.3 CONSTANT VERSUS VARIABLE

You can choose the lowest and highest bit rate with VBR. The decompression system then attempts to efficiently compress the dipping information to the lowest bit rate whereas there is little or no movement on the monitor, and when there is extensive activity, it spikes to the highest specified level. This may result in a decreased overall size of the file; however unanticipated bit rate variations will stutter during the playing of video that is streaming. Because it needs an uninterrupted flat bit percentage, CBR is employed. Performance throughout the entire format suffers as a result of the codec's constant bit rate. usually results in a bigger file, which speeds up replay. [10]

2.4 QUALITY VERSUS STREAMING

The Kush Gauge is a tool which does a reasonably good job of figuring out a respectable rate of data if we aren't sure how our target link speed is and we aren't interested in paying Amazon's generous bandwidth price rather than uploading our photographs. For a decent bit rate, simply divide the desired pixel count by the frame rate; depending on how much motion is present in the footage, multiply the result by a number of 1, 2, or 4; and finally multiply the results by 0.07 to

convert to bits per second (bps). Divide the output by 1.000 to obtain a median of 1000 kbps or 1000,000,000 to obtain an average pf Mbps.

2.5 STARTING POINTS

But generally speaking, taking into consideration the typical global internet link, we recommend a bit rate of around 2 and 2.5 milliseconds per Once more, though, we advise readers to experiment with different options to see how they will function. These are some beginning points for the streamed connection study in case you're completely unsure right now about what the video's rate might be.

TABLE 2: VIDEO BIT RATES STARTING STREAMING POINTS

Output size	File size
320 * 240 pixels	3 MB / MINUTE
480 * 270 pixels	5 MB / MINUTE
1024 * 576 pixels	11 MB / MINUTE
1280 * 720 pixels	19 MB / MINUTE
1920 * 1080 pixels	30 MB / MINUTE

3. AMAZON PRIME VIDEO NETWORK CONNECTIVITY

A content delivery network is a type of technology that uses a geographically dispersed network of computers to ensure the delivery of media to users. In essence, it makes our streamed service a system that is scalable that can handle any significant increase of demand for our material. There are a few factors that must be taken into account for video connection to the network, as listed below.

1. reduces the risk of server overload
2. A faster response to requests and a lower chance of packet loss

3.1 BANDWIDTH CALCULATION FOR AN AMAZON PRIME VIDEO STREAMING

For viewing a 720p movie in actual time, a user needs 4Mbps. Suppose there were more than 2,500 people watching a single film at once. That is 10 Gbps! Even more is needed for high-definition footage (1080p). 15 Mbps is recommended for Prime Video on Amazon. The amount of bandwidth must be ensured by two factors: A Video clarity and frequency

1. BANDWIDTH CALCULATION

However, these do not greatly increase the bandwidth. Other aspects include audio frequency and protocols (interaction and compressing) expenses. Thus, the following formulas are appropriate:

Frame Size = Resolution * Color Depth

Bit Rate = Frame Size * Frame Rate (fps)

If we consider a device that records at 720 x 480 D1 (DVD) resolution and transmits at 30 fps (frames per second), the pertinent figures add out to:

Frame Size = (720*480)*24 = 829440 bits = ~ 830 Kbps (Kbits/sec)

Bit Rate = 829440 *30 = 248832000 = ~ 250 M bps (Mbits /sec)

That is the necessary raw data capacity. It is enormous and shows the amount of capacity needed by a single source for data (in this case, a security camera).

2. BIT-RATES AND VIDEO QUALITY ESTIMATION

The number of bytes carried over a specific amount of time determines bit velocity. The remaining portion of the compression rate is derived from the information's stream and is split between the video channel and file audio streaming. The highest rate of bits for a streaming playback is going to be set to be less than download speed once the average connection download speed for customers has been determined. A number of Bit-Rate choices are available:

1	65 KBPS	2048 KBPS
2	128 KBPS	2560 KBPS
3	256 KBPS	3072 KBPS
4	512 KBPS	3584 KBPS
5	1024 KBPS	4096 KBPS
6	1536 KBPS	4608 KBPS

TABLE 3: BIT-RATES AND VIDEO QUALITY ESTIMATION

3.2 EXAMPLE ANALYSIS OF AMAZON VIDEO STREAMING

3.2.1 LOW MOTION EXAMPLE 1

For instance, if the footage is a low-motion webcast at 5 frames per second with a 1280x720 screen size, the formula would look as follows:

Quality = pixel counts x motion factor x 0.07 ÷ 1000 = bit rate in kbps

(Frame width x height = pixel count) and motion factor is 1, 2 or 4)

1280 x 720 = 921,600 pixel count
5 frames per second
1 = Low Motion

(921,600 x 5) x 1 x 0.07 = 322,560 bps / 1000 = 322 kbps bit rate

3.2.2 HIGH MOTION EXAMPLE 2

Another instance on the opposite end of the range would be the 1920 x 1080 screen size, twenty-four

frames per second, high action picture of an action scenario with several fast cuts:

Quality = pixel counts x motion factor x 0.07 ÷ 1000 = bit rate in kbps

(Frame width x height = pixel count) and motion factor is 1, 2 or 4)

1920 x 1080 = 2,073,600 pixel count

24 frames per second

4 = High Motion

(2,073,600 x 24) x 4 x 0.07 = 13,934,592 bps / 1000 = 13,934 kbps bit rate

You need to encrypt a poor-quality video that is streamed for people who do not possess the greatest available bandwidth if you wish to give an excellent clip. Use this indicator to determine both the lowest and highest bit rates for the variable bit rate (VBR), which uses 75 and fifty percent, respectively, of the associated bit rates. The interest rate converter will give an equivalent outcome if you don't want to do the math: The greatest bit rate is what a remote spectator would prefer to use, but we aren't living in a perfect world (unless the viewer has a 100 Mbps Internet connection to its position).

Taking the amount of data accessible across the location where the surveillance cameras are placed and the distant user—let's say 2 Mbps—and dividing it by the number of security sensors at the location—let's say 7, is a different approach for determining which bit-rate to utilise. The result of the calculation is 292.571, which leads the viewer to believe that the bit rate is 256 Kbps. Although the video stream's quality might not be the best, viewers still get a live feed from each camera at the location being watched.

3.3 ESTIMATED DATA BANDWIDTH

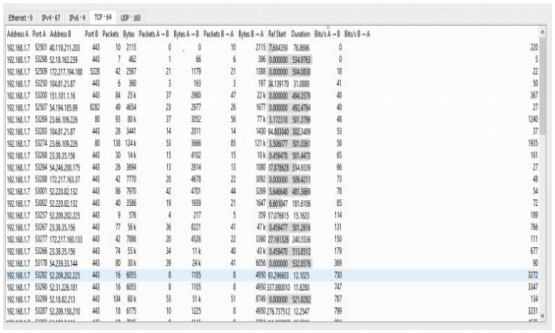
Following computations and estimates for Amazon Prime pictures, we investigate and arrive at an estimated bitrate of a video and its level of quality, which is detailed in the table beneath.

TABLE 4: ESTIMATED DATA BANDWIDTH

QUALITY	USGAGE DATA PER HOUR	USGAGE DATA PER MONTH	RECOMMENDED DATA PER MONTH
Low quality(MOBILES)	240 MB	10 GB	15 GB
Standard definition(SD)	900 MB	36 GB	100 GB
High definition(HD)	3 GB	120 GB	500 GB
Ultra HD	7 GB	280 GB	unlimited

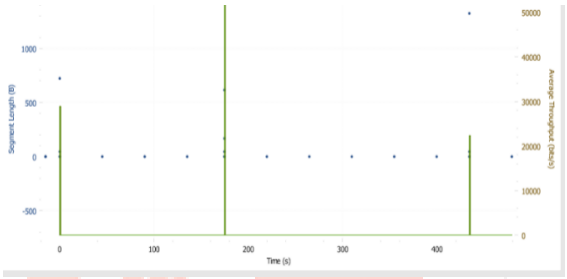
4. EXPERIMENTAL RESULTS

Our performed up the experimental findings using the method of determining the capacity of an internet connection on the client as well as the server side. For determining the video streamed internet access, we must examine all packet sequences and their sequence lengths.



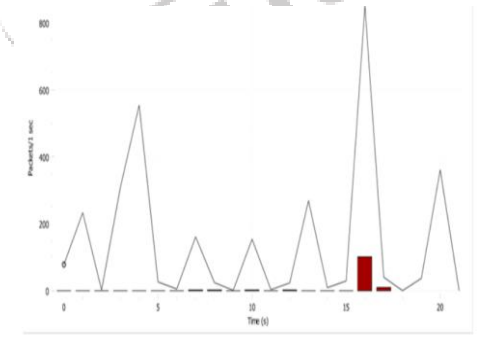
RESULT 1: NETWORK BANDWIDTH VARIATION

In Result 1, one is able to observe all of the packages that have the appropriate bit rate fluctuations from the point of origin to the endpoint of a video broadcast.



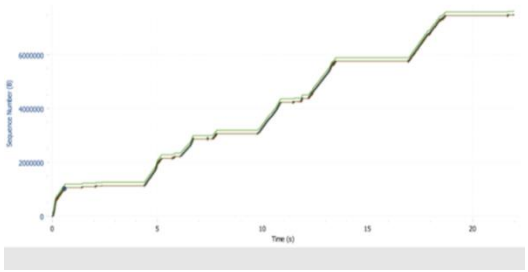
RESULT 2: AVERAGE THROUGHPUT OF A VIDEO STREAMING WITH SEGMENTS

In order to evaluate the overall speed of the network used for video transmission, we first investigated the transfer of individual bit sections in result 2.



RESULT 3: INPUT/OUTPUT GRAPHS OF PACKETS IN AN AMAZON VIDEO STREAMING

In result 3, we calculated the inputs as well as the outputs of every packet based on the beginning and finish points of the stream of video.



RESULT 4: TCP TRACE OF A SEQUENCE PACKET

In result 4, we traced out packets sent via TCP with an elevated sequential number in order to calculate capacity and estimate resolving level.

5. CONCLUSION

In the present piece, we investigated the online streaming app Amazon Prime Video, a service where you can view movies, motion pictures, athletics, and other content in real time and via streaming video. We calculate and estimate the download speed of Amazon's prime movies using an internet analyser programme called Wire a shark, using the findings of a network bandwidth and its performance. We discovered that the higher the quality demanded, the more internet it takes.

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