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Utilization of the Agora Video Broadcasting Library to Support Remote Live Streaming

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Abstract. In daily life, people utilize the video technology, especially live streaming to provide a real time transmission of an event or activity. Live streaming helps the robustness of a long-distance view by enabling the viewer to see what would normally be seen if on-site. It describes the real time situation in video mode to fulfill the particular information. In this case, a minimal capture-display delay is important. By using recent technological advances have certainly made it possible to produce remote live-streaming. In this research, we utilize the Agora.io in broadcasting live streaming video to help people view an event real time without being in the same place. We analyzed the limitations of mobile-based live streaming applications, such as delay, frames per second, and resolution. The paper describes experimentally the most relevant approaches for the research. The results of this research present an overview for the public to choose the characteristics of remote live streaming.

INTRODUCTION

In daily life, people around the world have started and spent their valuable time to watch live streaming video as a part of their daily activities. People like to communicate with others in real time through video technologies, such as live streaming, which no longer limit their personal connection (Jyothi and Vardhan, 2016). They utilize live streaming to provide a real time transmission of an event or activity. Live streaming helps the robustness of a long-distance view by enabling the viewer to see what would normally be seen if on-site. It describes the real time situation in video mode to fulfill the particular information. Live streaming refers to continuous broadcasts that are carried out live or in real time (Lohmar, et.al, 2011).

Live streaming provides excellent opportunities for society and businesses to increase their exposure each other's. Live streaming also important for enterprise to build strong relationship with their customers. In today's modern customers, enterprise might actively share their new products, expertise and knowledge through live streaming platforms. Enterprise can take advantage this technology to post the informative video to stay at the top of the market.

Live streaming can make major impact and make people feel different experience compared with other communication channel such as email or an audio. The visuals can create an instant connection among people. Video using live streaming convey the information to people more easily and efficiently.

Information reach and spread into new audience as it is appealing to cross generation with live streaming. Company and organization recognize these trend as new emerging strategies to popularize their brand, product and services. They can utilize live streaming as a part of marketing strategies to new customer who are not in their reach. By creating and distribute a consistent live streaming, they can increase their new customer and your revenue exponentially. A

particular live streaming session with customer will help understanding the information better which other communication channel can do like this type of interaction.

Live streaming convinces audiences to see what is happening now although they are not on site with you. The audience feels like they are taking part in a more genuine engagement. Live streaming content can be exciting to watch as they are not aware of what would happen in your live videos.

Based on the advantages and phenomenon as explained above, we know live streaming penetration in our daily life is getting deeper with time. In this case, a minimal capture-display delay is important. By using recent technological advances have certainly made it possible to produce remote live-streaming. In this research, we utilize the Agora.io in broadcasting live streaming video to help people view an event real time without being in the same place. We analyzed the limitations of mobile-based live streaming applications, such as delay, frames per second, and resolution. The paper describes experimentally the most relevant approaches for the research.

LITERATURE STUDY

Live Streaming

Live streaming is an exciting technology that changes us to communicate with other people around the world. By leveraging the incredible power of the Internet and technology, companies can easily transform their office, parlor or any other space into global stage (Wasen, 2017). Live streaming is term that is used to describe the process of broadcasting real time or live video footage to an audience over the Internet (Cambridge Dictionary, 2018). In principle, live streaming is a data transferring technique where it is processed to flow as a continuous stream in real time. Therefore, live streaming features allow a person to broadcast an event on the Internet as it occurs. Moreover, live streaming allows one to enjoy both, audio and video, directly from the Internet without having to download it to their computer first.

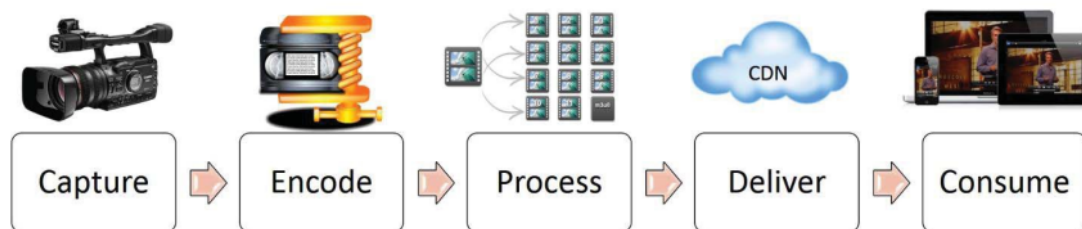


FIGURE 1. Live Streaming Workflow (Kaltura Knowledge Center, 2020)

There are five processes in live streaming workflow as present in Figure 1. The first step is capturing a good quality video towards ensuring a smooth live streaming workflow. Some encoders have abilities to make up the missing pieces of information in raw video, but it is better to have good quality input right at the start to smoothen up the workflow. Good quality streaming can be achieved by optimizing the three factors of utmost importance for live streaming which are the camera, lighting and audio. We do not need buying high end camera, all we need is a decent camera and a well-lighted source. Some cameras have features to change the setting to get the desired output, as far as colour coding is concerned. Finally, no less important is the audio and this needs to check microphone time and again and reduce the background noise to make the audiences to hear source loud and clear. The next step of the workflow is the encoder. Encoder is a must for live streaming. Encoder (can be both software or hardware) works for compressing video and audio file in real time prior to being processed for streaming (digital format). After encoding, the next step is converting the video into multiple display qualities for adaptive streaming, packaging the stream into an adaptive bitrate streaming protocol, optionally encrypting the content and delivering the packaged content to the consumption device/player typically via a CDN (Content Delivery Network). CDN helps a live streaming service to publish audio/video faster to audiences around the globe. When the audiences try to request streaming video from a CDN, the edge server closest to the audiences attempts to deliver it because it already has the media files cached, or

in case it doesn't, it will find a request to another server that does. In this way, CDNs streamline delivery of content by streaming the videos from local servers, rather than sending them directly from the origin server each time. Hence, a CDN uses a large network of servers placed all around the globe to distribute content quickly. The final step is consume; the video is displayed within device (Kaltura Knowledge Center, 2020).

Agora.io

Agora is changing the way people communicate by providing audio, video and interactive broadcast SDKs that allow to integrate interactive communications right from within your own mobile, desktop and web applications. Agora offers capability to provide high quality communication with their core technologies i.s Real Time Communication (RTC). RTC uses real time video and audio service as an online broadcasts. Developer might connect to API Agora in a short time and apply video communication (Zekun, 2019).

Some of Agora.io's products are very useful for communication:

- Voice, an SDK that is useful for making voices clearer, uses 3D Spatial Audio and detects the user who is speaking and indicates the user is talking and adds funny sound effects.
- Video, an SDK that is useful for making a video call, with internet conditions as bad as it can still make calls clearly, able to accommodate 17 users directly and able to do customization.
- Recording, an SDK that is useful for recording in real-time with features to increase visibility, guarding content from unwanted things.
- Live Audio Streaming, an SDK that is useful for broadcasting audio with low latency and can be listened to across different platforms and devices.
- Live Video Streaming, an API used for integration, low latency, high quality, and broadcast audio and video.
- Agora Video Broadcasting, an SDK (Software Development Kit) used for live streaming of one-to-many and many-to-many or live streaming video.

RESEARCH METHODOLOGY

This research analyzed the limitations live streaming applications. The paper describes experimentally the most relevant approaches for the research. We use several specifications of smartphone as shown in Table 1.

TABLE 1. Devices

Smartphone Device	Operating System	Display Size	CPU	Front Camera	Rear Camera	Memory Internal
#1	Funtouch OS	1080 x 2340 Pixels	2.0 GHz Snapdragon 665 Octa-core	32 MP	48 MP	128 GB, 8 GB RAM
#2	Funtouch OS	1080 x 2340 Pixels	1.95 GHz Snapdragon 660 AIE Octa-core	25 MP	12 MP	64 GB, 6 GB RAM
#3	Realme UI RMX1922_11_C.04	1080 x 2340 Pixels	Qualcomm Snapdragon 845 2.30 Ghz	64 MP	16 MP	128GB RAM 8GB

The system design of this research is using the system architecture as presented in Figure 2.

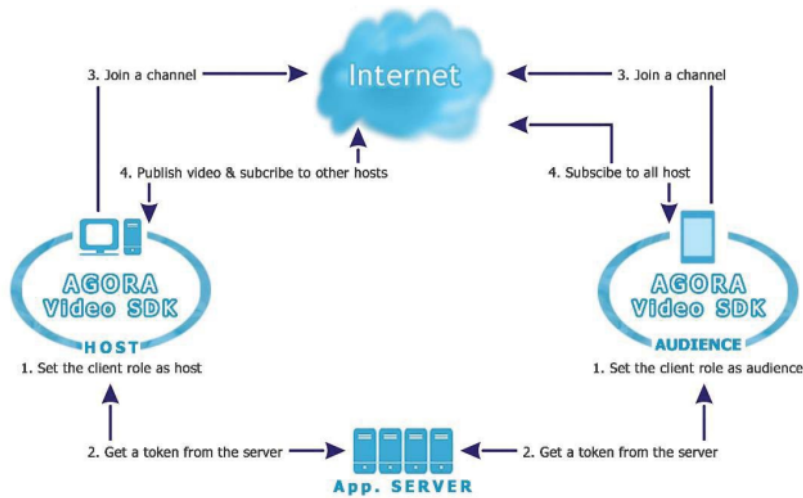


FIGURE 2. System Architecture

System architecture in this project can be explained as follows:

1. Set the role of the client as host or audience. Host publish the video to the channel, and the audiences join the channel.
2. Get a token from server. Joining the channel needs a token as credential that authenticates a host or audiences.
3. Join a channel.
4. Publish and subscribe. Host can publish video after join a channel.

RESULT AND DISCUSSION

This part reflects on the findings of how live streaming performance related to the limitation of live streaming applications.

The testing scenarios are conducted using mp4 (bitrate 256kbps) which is captured by webcam with network background traffic 50Mbps, 75Mbps and 100Mbps. Table 2 shows the average delay on various devices for testing.

TABLE 2. Average delay

Device #	Resolution	Bit per second	Average Delay (ms) Background traffic : 50 Mbps	Average Delay (ms) Background traffic : 75 Mbps	Average Delay (ms) Background traffic : 100 Mbps
1	640 x 360 (360p)	30	131.153	134.323	156.231
	720 x 480 (480p)	30	153.232	159.344	180.224
	1920 x 1080 (1080p)	30	182.123	184.211	175.835
2	640 x 360 (360p)	30	175.245	172.567	195.347
	720 x 480 (480p)	30	190.345	194.298	237.345
	1920 x 1080 (1080p)	30	243.619	236.235	135.137
3	640 x 360 (360p)	30	132.913	134.987	138.328
	720 x 480 (480p)	30	132.949	135.751	182.345
	1920 x 1080 (1080p)	30	178.321	184.987	190.761

CONCLUSION

Real time live streaming requires a clear and smooth internet connection. Network background traffic has important influence in this situation. Congestion points on the internet are a serious barrier to real time performance live streaming. This bottleneck point is what makes the delay so that the audio/video is random or blurry. Hardware specifications, especially memory, are also an influence on the smoothness of live streaming. Using agora provide reliable live streaming video.

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