

Video Transceiver (VT): An Application for AV Broadcasting through Wi-Fi

Prashant P. Deshmukh, Prof. Dr. Anjali Potnis, Prof. Sanjeet Kumar

Abstract— Today's world needs robust broadcasting application for broadcasting AV in a small premises wirelessly without huge setup. As some applications, systems and websites are available that can broadcast AV through the Internet or other wired network. In this paper, we present, how one application is able to broadcast AV in a small premises through Wi-Fi over Wireless Local Area Networks (WLANs) even in the absence of Internet connection. For the multimedia communication, we present an application Video Transceiver (VT) using Android platform. We described IP multicasting and Network Service Discovery (NSD) through which the audio-video broadcasting is possible in an application. We present theoretical analysis broadcasting AV through Wi-Fi, as well as experimental results that demonstrate the performance of the proposed application over existing systems.

Index Terms— Audio-video (AV), digital video broadcasting, IEEE 802.11, IP multitasking, multimedia communication, network service discovery, wireless local area networks.

I. INTRODUCTION

Multimedia transmission like audio-video streaming over wired networks, such as the Internet, have been popular now for quite some time. With the growing broadband wireless networks, attention has only recently turned to delivering video over wireless networks. As, the wireless Local Area Network (LAN), which can operate at high enough bit rates to allow transmission of high quality video data.

During the past few years live streaming technology has become advanced, affordable and accessible to people and video production companies.

Nowadays, it is seen that many commercial, non-commercial, public and private events does audio-video (AV) broadcasting on the big screens in a small premises through the wired network/system. Many times, it is also seen that the people plays movie on the TV from a mobile phone or a laptop using video graphic array (VGA) or high-definition media interface (HDMI) cable. However, in this time TVs and mobile phones became smart, and coming with high processing capabilities, robust operating systems (OS) and Wireless Local Area Network (WLAN) support, as well as many applications available are providing video recording, store and stream facility through the Internet[9]. But, there is no well-known mobile application that is available for the video broadcasting through the Wi-Fi.

In this paper, an Android application VT is proposed to use

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with smart phones for broadcasting a recorded video through wireless local area network (WLAN). This application is intended to be used by the people when they want to watch the same AV on the different places without paying any cost to the Internet. Only, the mandatory condition for this application is, all the devices that wants to watch AV should be in the same WLAN. An application does work as both transmitter as well as receiver.

Following scenarios can explain the importance/relevance of the proposed application.

A. Scenario 1

Three-four person are seated in the different rooms and wants to watch same AV i.e. movie, presentation or AV clip at the same time. Only one person amongst them has that AV. A person who has AV will play a role of transmitter and others will play a role of receiver.

B. Scenario 2

All the persons have VT application and connected to the same WLAN. Then, they opened VT application in their mobile phones. When all applications opened, they made connection to the transmitter from the connection category. Connection category searches all VT applications over WLAN, then all receivers sent request for watching AV to the transmitter.

C. Scenario 3

Once, the connection made after accepting the request by transmitter. A transmitter is then played that recorded video in the application, all receivers started receiving AV frame streams from the transmitter as well as an applications of all the receivers began playback of the AV at the same time automatically.

The concept of VT (Video Transceiver) application development is proposed to support any Governmental, Non-Governmental, public and private organization for broadcasting recorded AV of any event or presentation in a small premises.

II. RELATED WORK

Many number of similar mobile applications are available that provide live video streaming[10] for both commercial and non-commercial use. To the best of our knowledge, none of them is a specific Android application which offers broadcasting of recorded AV in real-time through a WLAN.

There are some related applications to VT, such as Ustream, Wifi camera, Periscope, etc. Which are used for recording videos and live streaming. Ustream[1] is an application that allows live streaming. A client side application is needed in order to connect with the Ustream and record or view the videos. It always need internet

connection. Wifi camera[2] is an application that makes your Android phone to a wifi based IP camera by which one can watch mobile phones video on computer’s browser. It is just a plug and play type application. Periscope[3] is an application that offers live video streaming. Google Play Movies & TV[4] is an application that allows to watch movies and TV shows purchased or rented on Google Play. It also needs Internet connection. Sling TV[5] is another application that allows to watch live TV channels over the Internet. Twitch[6] is an application that allows to watch broadcasts of the games.

III. ARCHITECTURE OF VT

The proposed application has two parts integrated, the first part is transmitter and second one is receiver. An application can be installed on any Android smart phone with Wi-Fi. Depending on the situation any user can make himself transmitter or receiver.

An application Video Transceiver (VT) works on the concept of Internet Protocol (IP) multicasting[8] for Local Area Network. IP multicasting allows to broadcast a single information to all the devices connected over a same Local Area Network (LAN). At present, the protocol IEEE 802.11g for WLANs is also providing a maximum data rate of 54 Mbps, we can see in TABLE I. Such a high transmission rate makes broadcasting of AV through Wi-Fi possible.

In this application VT, for the discovery of same type of applications and making links between transmitter and receivers, Network Service Discovery (NSD) is used. It searches, all VT applications that are available over the one WLAN. NSD makes link of transmission by exchanging the keys, so that only those receiver users can see AV whose request for AV has been accepted by transmitter user.

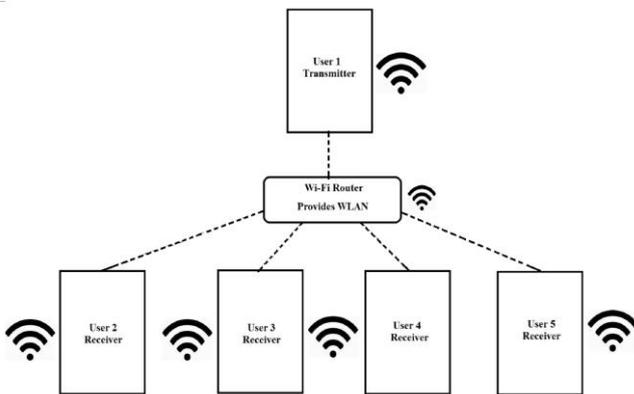


Fig. 1. Architecture of Video Transceiver (VT). Dotted lines shows user’s connection with Wireless Local Area Network (WLAN).

Architecture of Video Transmitter (VT) is shown in Fig. 1, the system has two different user category, transmitter and receiver. Transmitter broadcasts AV over the Wireless Local Area Network (WLAN), only those receivers can see that real-time broadcasting AV, which are permitted by transmitter. For being part of this broadcasting system, a mandatory condition is that all the applications, those wants to be a part of the system should be connected with the same Wireless Local Area Network (WLAN) through Wi-Fi.

Applications which plays a role of receiver that doesn’t need permanent storage for AV. An application creates temporary storage during the broadcast and delete it after the use.

TABLE I
IEEE 802.11 WI-FI PROTOCOL SUMMARY

| Protocol | Frequency | Signal | Maximum data rate |
|---------------|--------------|--------------|------------------------|
| Legacy 802.11 | 2.4 GHz | FHSS or DSSS | 2 Mbps |
| 802.11a | 5 GHz | OFDM | 54 Mbps |
| 802.11b | 2.4 GHz | HR-DSSS | 11 Mbps |
| 802.11g | 2.4 GHz | OFDM | 54 Mbps |
| 802.11n | 2.4 or 5 GHz | OFDM | 600 Mbps (theoretical) |
| 802.11ac | 5 GHz | 256-QAM | 1.3 Gbps |

Acronyms and abbreviations: FHSS = Frequency Hopping Spread Spectrum, DSSS = Direct Sequence Spread Spectrum, OFDM = Orthogonal Frequency Division Multiplexing, HR = High-Rate, QAM = Quadrature Amplitude Modulation.

Table I shows summary of IEEE 802.11 protocol, if we see there, the Legacy 802.11 is the first Wi-Fi protocol developed in the series of IEEE 802.11 having the maximum data rate 2 Mbps. After that, the next versions developed with increasing maximum data rate of Wi-Fi.

IV. PROTOTYPE OF AN APPLICATION

A prototype of Video Transceiver (VT) is made for the both purpose broadcast as well as receive AV. As it is an Android application, its prototype is developed using developed using Android platform. Whole application is designed using Android SDK[7]. For the video transmission and playback Android API 6.0 is used.

Internet Protocol (IP) multicasting is used here as a backbone of application. Here, for broadcasting one-to-many concept of IP multicasting we used. For the broadcasting, we take frames from real-time playing AV to put them into a data frames. Then all the data frames sent sequentially over the Wireless Local Area Network (WLAN) in order to maintain the flow of AV at the receiver side. These data frames are highly secured so that only those receiver can receive them who has permission from transmitter.

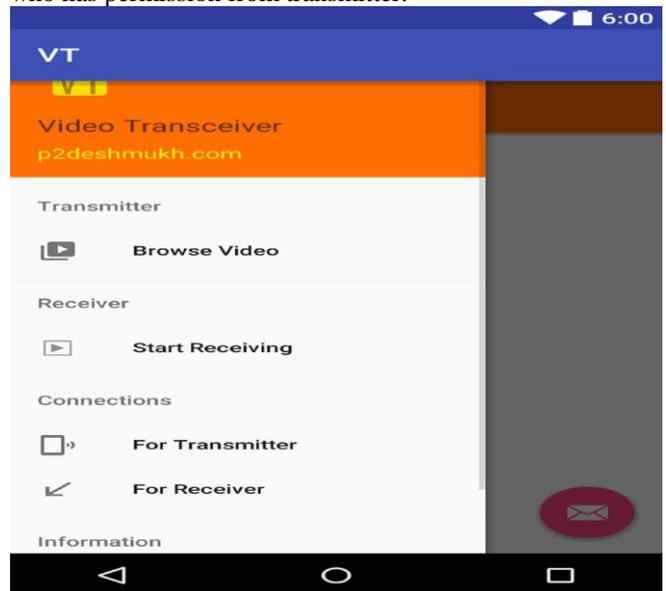


Fig. 2. User Interface (UI) of an Application VT.

Fig. 2 shows User Interface (UI) of an application. Before starting an application, the device on which an application is installed should always be connected to WLAN through Wi-Fi. In the broadcasting system, one who is transmitter will first go into the option "For Transmitter" receivers first go into the option "For Receiver" of the category "Connections".

When they both goes in their appropriate option, Network Service Discovery (NSD) activates and applications on both sides will start searching all the devices which are connected to the WLAN through an application VT. After detecting the id of transmitter, receivers start sending request to the transmitter for broadcast. Once, all the requests came will be accepted by transmitter, all receiver applications will connect to the transmitter through wireless links over WLAN using Wi-Fi.

After forming connection, transmitter have to select AV file which it want to broadcast by going into the option "Browse Video". Selected file will start playback automatically. At the same time receivers have to go into the option "Start Receiving" receiver will start playback of that AV automatically. For it application creates temporary storage in the phone's memory while broadcast process, after broadcast it will remove the temporary storage.

Fig. 3 shows a scenario when a video broadcasting takes place over a WLAN through Wi-Fi using application VT. Only playback of broadcasting AV in the receiver's application starts after a small time delay. It is a time taken by AV's data frame to reach from transmitter to receiver.

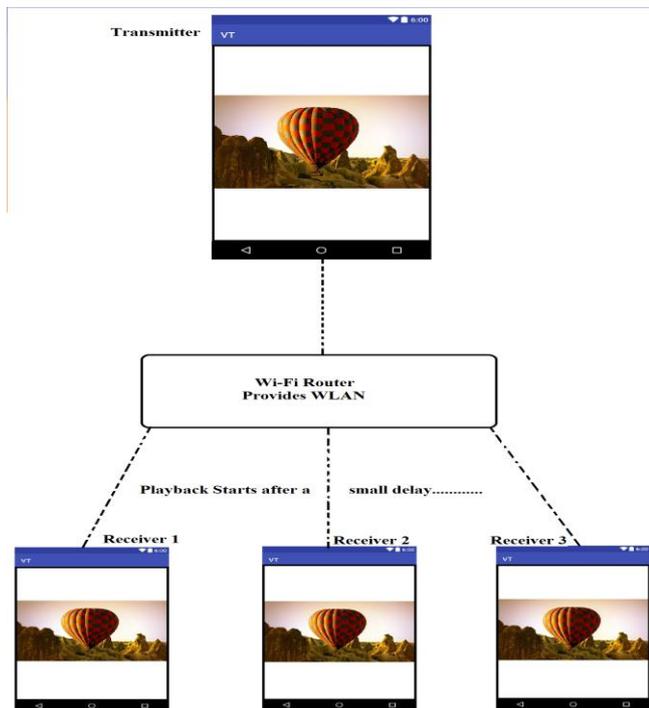


Fig. 3. Scenario when video broadcasting takes place over WLAN through Wi-Fi using application VT.

V. CONCLUSION

We have been seeing, today's AV broadcasting systems that are wired, bulky and costly. They need huge wired setup even for broadcasting in small premises. Everyone cannot afford it. In this work, we have seen some applications that does video streaming through the Internet as well as, always, they requires high speed Internet connection.

Video Transceiver (VT), is an Android application for broadcasting a video through Wi-Fi and has a capability to broadcast AV over WLAN through Wi-Fi. We addressed, how IP multicasting and NSD plays an important role for this application. For broadcasting AV, VT doesn't require Internet connection. A mandatory condition is all applications should be connected to the one WLAN through Wi-Fi in order to be a part of broadcasting. System requires only Android devices having VT application installed on it with Wi-Fi. Where, the data rate of Wi-Fi is very high, it does multimedia transmission smoothly over WLAN. This application is compact form of wired broadcasting systems, which are currently using for broadcasting AV in a small premises. Application provides simple UI for the users. The proposed prototype is at initial stage and requires more research to make it applicable.

VI. FUTURE WORK

In this work, we studied how AV broadcasting is possible in a small premise by using only one application. We discussed, the importance of services provided by Wi-Fi and WLAN for this kind of application.

In future, an application will be made for all Operating Systems (OS) in order to provide connectivity to all the devices like laptops, computers and TVs. By making updates in it, it will also provide a facility to broadcast live concerts or presentations in real-time as well as people would do live video chat in a small premises without paying any cost to the service provider. A small premises means an area covered by single WLAN.

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