

VIDEO CONFERENCING USING WEB-RTC

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ABSTRACT

Internet plays an important role in connecting people throughout the world. Many businesses have taken certain measures to connect and collaborate in these unwanted times. With the advancements in technology we now have access to more sophisticated and effective methods of communication. People can collaborate in a better way with their employees and partners using such communication tools. There are now a lot of options in which conferences can take place where people can connect and collaborate without being actually present at the location. Video conferencing is one such type of distance collaboration where users can connect over a bridge to interact virtually. This has been useful for the organizations to connect in these pandemic times without risking the life of their employees. In this paper, we develop a tool to increase collaboration without restricting people to be physically present at the location, or to have any particular OS or plug-in. Our application allows users to interact virtually and collaborating using features such as screen sharing, chatting, and video and voice sharing. The tool does not require any plug-in to be downloaded, it is easy to use and has no limit on the number of clients. We have implemented this system by using Web-RTC, Node.js, and Socket.io.

Keywords: Web-RTC, Socket.io, Node.js, Peer-To-Peer Real-Time, Multimedia.

I. INTRODUCTION

In the modern world and fast development of the internet, the connection among people is being very significant than ever, people are looking for new methods to do advance communication between them without any issue, real-time communication is one of this way. WebRTC (Web real-time communication) is a futuristic technology that makes real-time communication capabilities in audio, video and data transmission possible in real time communication through web browsers by using JavaScript APIs (Application Programming Interface) without the plug-in [1].

A video conferencing application is a tool through which users can connect virtually and collaborate. This tool has many use cases in real life. Video conferencing can be used amongst organizations to hold regular meetings, it can be used amongst teachers to connect with students who are not able to reach offline classes, it can also be used to hold presentations and sessions in-order to address a larger public etc. This way we can use this tool to address a larger audience, save time and money and increase productivity.

To create this video conferencing application we have used technologies such as Web-RTC for audio and video communication by allowing direct peer-to-peer connection, Socket.io for connecting users to different rooms and data transferring, Node.js which is event-driven, and it will be used to create a fast and light server and React.js for our frontend as it is fast in updating DOM elements and thus reducing overall application latency as well.

II. RELATED WORK

A. Nayyef, Zinah & Amer, Sarah & Hussain, Zena discussed in their research paper how communication has changed with the development of technologies and how video conferencing has become a way of seamless virtual connection. They have also demonstrated in their video how they utilized Web-RTC to create a video calling application.

B. Roopika and Naveen discussed in their research paper on how they can leverage technologies such as Web-RTC to enable a video sharing application for shoppers and vendors to connect and review the products through video sharing.

C. Denstadli, Jon & Julsrud, Tom & Hjorthol, Randi discussed in their research paper how important is distant communication and how important role does video conferencing play in that.

D. Rop, K.V. & Bett, Nelson discussed in their research paper how video-conferencing can be used to by

teachers for educating students who cannot attend offline schools .

E. Majid, Hairudin & A Samah, Azurah & Mi Yusuf, Lizawati & Nasien, Dewi & Cheah, T.L discussed in their research paper about the issues faced by the students of Universiti Teknologi Malaysia(UTM) university and in order to tackle those they proposed a audio and video calling application using Web-RTC.

F. Choroś K., Hilterski M.discussed in their research paper about the performance testing they did with a video-audio sharing application built using Web-RTC in different conditions such as internet speed and different camera devices for different aspects such as latency , image and voice quality.

G. Jian Cui, Zhuying Lin discussed in their research paper about the architecture and technologies related to Web-RTC. They researched about the peer-to-peer connection which is setup in case of using Web-RTC for video and audio communication.

III. TECHNOLOGIES USED

A. Web-RTC: It is an open-source project which provides web-browsers with real-time communication via API's. It allows users to connect over video and voice channels by creating a direct peer-to-peer connection.

B. Socket.io: It is a JavaScript library for real-time data communication. It enables real time, bi-directional communication between web clients and servers. It has two parts: a client-side library that runs in the browser and a server-side library for Node.js. Socket.io uses Web-Sockets API for real-time communication and as web-sockets use TCP connections they are faster and reliable.

C. Node.js: It is a platform built on Chrome's JavaScript runtime for easily building fast and scalable network applications. Node.js uses an event-driven, non-blocking I/O model that makes it lightweight and efficient, perfect for data-intensive real-time applications that run across distributed devices.

D. React.js: It is a frontend framework which is used to build high performance applications. It uses virtual DOM and certain diffing algorithms to update real DOM in very fewer amounts of time and hence reducing latency and improve performance of applications.

IV. DESIGN AND IMPLEMENTATION

The application starts with user entering credentials for the room to join .There is no limit on the number of connected clients. Users will be connected with their audio and video. Users will have the option to turn their audio and video off. Users can also collaborate by sharing their screens. Users can also use the chat feature for messaging. Following flow was used to design the application:-

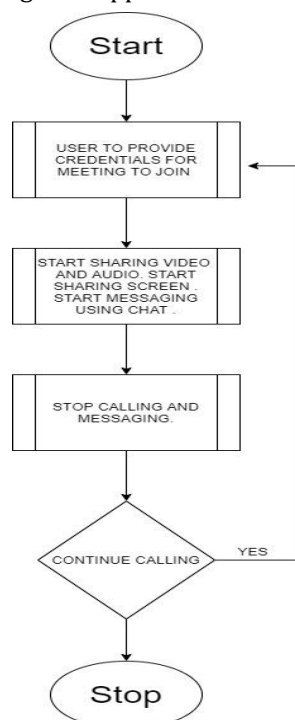


Fig 1.0 Flow Diagram of the Application

The system contains two sides a client-side and a server-side. Connection requests are made from client-side to the server-side which in turn uses Web-RTC server to create a unique id for every user that makes request. That unique id is used in the backend side to connect users in a room with their audio and video . Simple-peer library is used to create a user id from Web-RTC server and socket.io is used to connect users in a room. As socket.io uses web-sockets changes made by users are updated in real-time with less delay.

V. RESULT

For the testing of the application two users were connected in a room and following output can be seen:-

A. The application starts with a home page where user enters the credentials for the meeting to join.

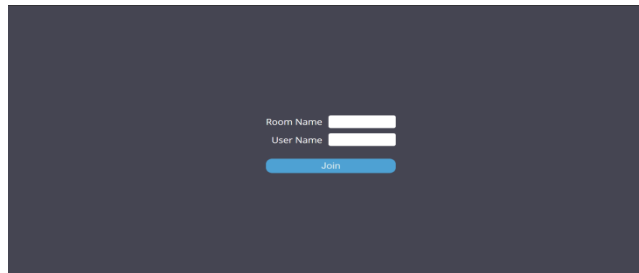


Fig 2.0 Starting Page of Application

B. After clicking “Join” users get connected to a room where they can see videos of other users present in the room. Users also have the feature to turn off their audio and video.



Fig 3.0 Two Users connected in a room

C. Users can use the chat application as well to publish messages which will be visible to the entire room.

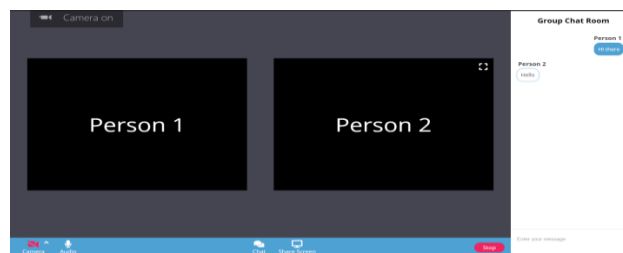


Fig 4.0 Users using chat application for messaging

D. Users can also share their screen by clicking on the “Share Screen” button which in turn will trigger a pop-up (if not blocked by your browser) to select the type of window user wants to share . It could be a specific window or his entire screen. After selecting the sharing option other users can view the shared screen.

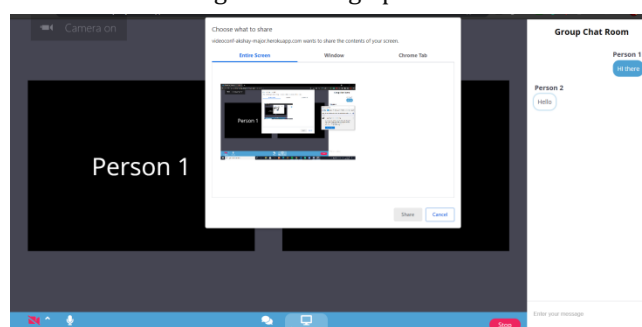


Fig 5.0 User selecting the screen to share

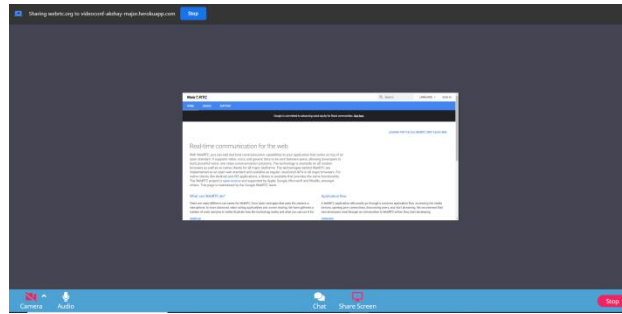


Fig 6.0 User sharing a screen

VI. CONCLUSION

Web-RTC can be used to enable secure and high data transmission amongst the users by the use of peer-to-peer connection. Our project is a real-time video conferencing application which can be used for different purposes to connect online and share videos, audio, screen or a text to multiple connected clients in a room with no limit on the number of clients. The future scope of the application involves addition of features such as screen recording, a role based system to provide an admin role to the users, file sharing amongst the users and many more.

VII. REFERENCES

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