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# ADVANCEMENT OF VIDEO CONFERENCING FROM PERSON TO PERSON IN REAL-TIME COMMUNICATION USING WEB APPLICATIONS

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## ABSTRACT

The main objective for the project is to develop a Web site based system which allows for easy collaboration between a team of people, irrespective of the geographical location of the team members. To foster collaboration, and increase efficiency this solution has to contain such essential tools as media sharing, discussion and real-time collaboration tools for documents. Focusing on improving the team work and communication in churches and councils of different organizations the platform is oriented on remote teams, projects and communities. With the cutting edge Web technology like WebRTC for media streaming, Express for back-end and MongoDB as DBA and Socket.io for real-time networking, the platform provides efficient, safe, and fast collaborative environment for organizational and corporate needs.

Thus, on the one hand, there is a guarantee of safe interaction and information exchange due to data privacy protection and restrictions of access to the materials; and on the other hand, there are non-complex and unproblematic interface and navigation. According to that, the main aim of this project is to design an environment that will be the flexible solution to meet the present day's requirements of collaborative work in the working place, that will support innovation activities, team

work and effective cooperation in work using effective tools and nets.

## INTRODUCTION:

Communication has been adopted more in the quickly evolving virtual work context to enhance effective working relationships so much so especially with teams that are increasingly decentralizing physically. As the number of teleworkers and remote employees is on the rise, there is a novel interest in ideas for how creative collaboration can transcend the limitations of physical co-location. This type of work is quite challenging in style far from the usual schedule of work in enterprises, so it is twice as important for business to maintain high levels of productivity and effectiveness in such conditions. Real-time and synchronized connection.

Among the challenges linked to remote cooperation, the Collaborative System was introduced for this project, which could be a solution to the difficulties. As applied to the framework, it is expected to enhance real-time exchange, interaction, participation, and collaboration among users irrespective of their geographic location. This system also incorporates many requirements needed for teamwork such as chat rooms, synchronous shared white boards, text collaboration.

It makes all in one system to enhance the communication and motivate creative works through incorporating the latest technologies including WebRTC for real time communication, express for backend processing, MongoDB for database, and React for frontend. It addresses the issues that normally occur in remote working that include communication challenges, compartmentalized work, and issues with the engagement at the work event horizon.

They are a complete platform that will change the way your remotely located teams communicate and collaborate with each other; it is not just an application. This system provides the framework necessary for collaboration; the users can meet, share information and collaborate as if they were in the same location. This could be utilized in professional organisations, teaching, learning or community projects.

### **Problem with Existing System:**

Major issues concerning Google Docs privacy and security stem from the fact that it is a cloud based tool. They have to be careful with storing personal and confidential data because all information is stored on servers owned by Google. Further there's a problem of document access permissions and document sharing options which must be controlled so that any ill-intentioned person does not get access to them. Also, as is clear from the T&Cs, it is pertinent that anyone dealing with Google frequently refresh and study themselves up on Google privacy policies. Another issue is Google Doc, the backend is written in Java while this does not offer a sense amount of community for big open-sourced. Google Docs has a policy where users cannot edit a document unless they are signed in to Google.

### **Proposed System:**

The presented Collaborative System will radically change the practical aspects of working in teams regardless of their location. As for the modern characteristics including the video and audio conferencing, text document editing, joint writing, shared board, chat, and presentation options, cooperation in real-time is possible for users. This sensible design uses enhanced web technologies such as React, Express, MongoDB, WebRTC and

Socket.io in order to provide a seamless and consistent users' experience. Get rid of barriers and provide efficient communication and it means that our Collaborative System gives users opportunities to become connected geographically and use creativeness, innovative minds and efficiency in their work in the global world.

### **Scope of the Project:**

Collaborative System will help in collaboration of users sitting at different geographical location so that they can participate in real-time activities and exchange information.

### **LITERATURE REVIEW:**

Availability of literature regarding real-time collaborative platforms shows the rise in importance of continuous multimedia communication in remote environments especially for those that applies WebRTC and other technologies. Research on the use has been conducted on application of multimedia tools in real-time applications such as synchronous collaborative writing on documents and video conferencing.

WebRTC-Based Video Conferencing System: The Rendez-Vous system is introduced in this paper; it integrates an online videoconferencing application that is not accompanied by additional software installation. It merges WebRTC for real-time conferencing including video and voice and telephone access adopting PSTN (Public Switched Telephone Network), it develops on efficient multimedia sharing and access by browsers.

An Investigation on Video Conferences Through Overlay Network: To enhance scalability and use of resources, this work concentrates on overlay strategy necessary for distribution of video chunks in centralized and overlay networks. Application layer multicast and peer-to-peer networks have proven to implement scalable high quality low cost video communication.

Squash Cord: WebRTC-Based Video Conferencing Application: Squash cord is a multiparty-to-multiparty video conferencing system that brings real-time text chat and collaboration features through Web RTC and socket. The paper also focuses on how WebRTC makes it possible to form P2P

networks for streaming multimedia and demonstrate the effectiveness of framework for several users on the various devices.

1. WebRTC for Real-Time Communication and Video Conferencing: The following paper seeks to analyse WebRTC in the context of real-time video conferencing system to demonstrate its efficiency and capability to enable high speed and time sensitive cloud infrastructure for communication.

2. Peer-to-Peer Audio and Video Communication Using WebRTC: Unlike the previous paper which is written in an introductory manner, this paper outlines how to use WebRTC to develop audio and video chat applications and, in particular, how to implement signalling servers using node JS for client- client communication.

All of these works together suggest that use of WebRTC is advantageous and feasible for constructing high quality real-time collaboration services. Multimedia tools aimed at applications such as video conferencing, document sharing, and synchronous editing offers the basic framework for today's collaboration system, by providing the much-needed conduit for users to interact and work effectively.

An Investigation on Video Conferences Through Overlay Network: Since scalability and resource utilization are the major concerns of this research, the present study concentrates on the overlay strategy for transmitting video chunks of centralized and overlay networks. It is evidently clear that current application-layer multicast and peer-to-peer (P2P) networks are more efficient for high-quality, low-cost video communication.

Squash Cord: Most of the following features are implemented in Squash Cord, which is WebRTC-based video conferencing application: Multi-Peer Video conferencing system for users using WebRTC and Socket IO integrated with Real-time text chat and collaboration feature. WebRTC plays a role in establishing a peer-to-peer network for streaming multimedia; the research demonstrates how the

framework can handle many users on different devices.

WebRTC for Real-Time Video Conferencing and Communication: This paper focuses on the existing potential of WebRTC in real-time models of video conferencing with the further goal of explaining how it may help develop efficient, timely cloud structures of conversation.

WebRTC-Based Peer-to-Peer Audio and Video Transmission: This paper offers much more pragmatic insight into the process of creating individualized audio.explications on how WebRTC empowered real-time video call and chat application with special focus on signifying server using Node.js to facilitate client-client connection setup.

Each of them demonstrates that WebRTC is very valuable and perspective technology for developing stable real-time collaboration environments. The precursor of modern collaboration systems is multimedia features such as documents that can be shared across the organization, video communications that can be co-ordinated in real time, or synchronous editing, so the users can collaborate effectively.

## **METHODOLOGY:**

To ensure that the collaborative system which the project is to implement is success fully developed, the project is divided into various modules with each module focusing on specific functionalities to ensure a smooth interface to the end users.

### Module 1: Communication with Audio and video

The system enables real time face-to-face video and audio conferencing in web browsers through the use of WebRTC technology. It assured browsing compatibility and security and assurance for data transmission and built-in audio-video integration for enhanced communication quality. The module ensures that there is a smooth communication process with the user without any setbacks or hold up.

### Module 2: Chat and Presentation Systems

The objectives of this module are to allow for 'chatting' while being online and facilitating presentations. Video conferencing may be used to

convey information, ideas and data which makes efficient distant meetings, product launches, trainings possible. Specifically, the one-to-many and many-to-many messaging, outside of the chat and through the window displaying messages and notifications, such as when someone in a stream joins or leaves, presents a dynamic way of communication.

### Module 3: Chalkboard

With the help of the real-time whiteboard, several people can collaborate on the work on the online board. In the shared whiteboard, users can type, draw and make annotations. Participants are informed of changes to the design and steps taken at once. This module enhances communication because it provides a visual prop for teams that are likely to be working remotely. With the real-time text editor, documents can be edited simultaneously by several users at the same time. This collaborative application is used for creating, editing, sharing, and collaborating on documents that include Reports, Proposals and Articles. All Version Control issues are also done away with since the updates of one user is automatically replicated for everyone else.

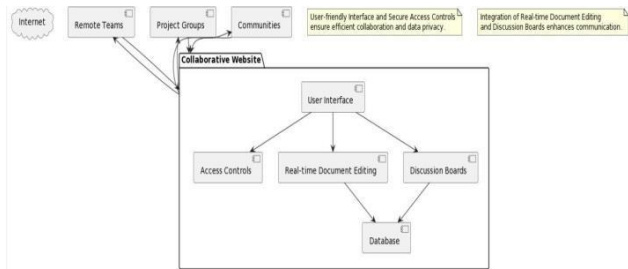


FIG - 1

### Technologies Employed

**React:** An application development tool that ensures front end development to ensure the interface will be receptive and lively.

**Express:** Ensures that a good server is provided and it takes care of all back-end stuffs.

**MongoDB:** Serves as a data repository for documents, other components that are shared between various users, and individual user data.

**WebRTC:** Supports real-time, audio and video conferencing with media sharing.

Users communicate in real time through Socket.io, making it possible to be synchronized for shared duties such as writing on the same document or chatting.

Using different technologies that are popular in today’s world and dividing the project into four decisive components makes it possible to ensure synchronous work with minimal delays and a high level of security. Each module is developed separately and then interconnected so as to create a single platform for virtual communication and distant cooperation.

Applying the concept of decentralization in development implies that there are small sets of control working harmoniously to form a large one with a given system; it also means that when there is an issue with one part, the rest of it is not influenced.

### UML Diagram

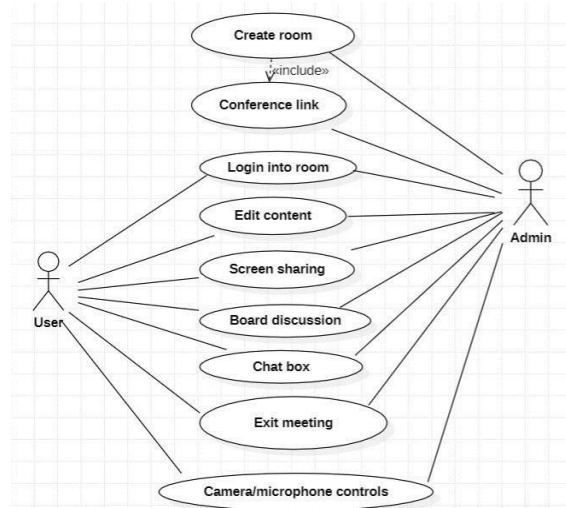


FIG – 2

### RESULTS AND DISCUSSION:

The Collaborative System which was developed and implemented shows how well it solves the challenges connected with the distant teamwork. The collaborative services include posted and timely summarized chat, co-authoring of documents, video or audio conferencing, and shared board services in which users may interconnect in real time.

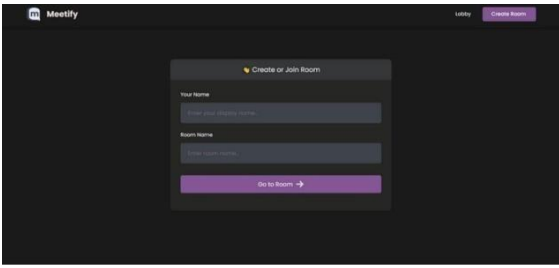


FIG-3

From the early trials, it can be stated that the platform meets the expectations of high sound/video quality in addition to the low latency and efficient communication. The use of the shared whiteboard and the collaborative text editor are good; by allowing several persons to communicate and contribute at once and there is no lag noticeable at all. Therefore, with WebRTC and Socket.io in the system, real-time connection is maintained and promoted making communication among the teams in this geographical dispersion system to be efficient

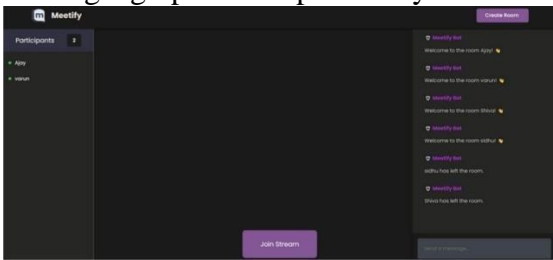


FIG-4

### PRESENTATIONS and CHAT SYSTEMS

Using a video conferencing platform, we can make a presentation remotely to share data, thoughts or information with other people. Presentations over video calls can be used in various situations such as team meetings, product demos, training sessions, and sales pitches.

Chat systems provide a versatile and dynamic means of communication, fostering collaboration, engagement, and information exchange among participants in real-time.

There is a box on the right side of the screen that displays messages like “John has joined the stream” and “John has left the stream,” as well as allowing users to chat with one another.

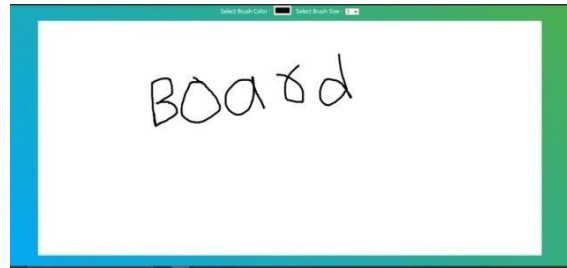


FIG-5

### WHITE BOARD

A real-time whiteboard is an online collaboration tool that enables several users to collaborate in real-time on a virtual whiteboard. For remote meetings, presentations and group brainstorming sessions whiteboard is frequently utilized. Real-time whiteboards frequently offer tools that let users to add text, drawings and other content.

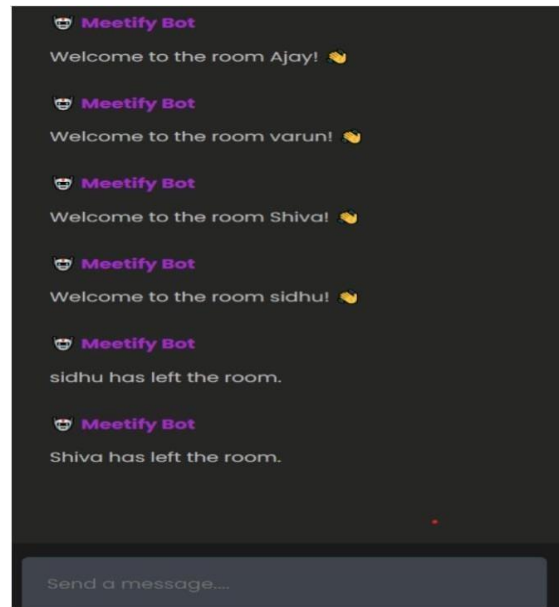


FIG-6

### CONCLUSION AND FUTURE SCOPE:

The experiences in the development and deployment of the Collaborative System show that it works perfectly to manage the challenges of executing teamwork across distance. Through the support of many communication and collaboration media including chat, real-time text editing, video and voice conferencing and sketch pad users may be able to interact in real time.

As it has been concluded based on the preliminary testing, the platform enables fully effective audio/video streaming, without a great number of delays and interruptions, and, thus, the platform's major expectations are met. The two major features of the interface, the shared whiteboard and collaborative text editor function well allowing several people to communicate and contribute in real time simultaneously without seeing any sort of delay or disruptions. Due to items like WebRTC and Socket being built into the system, constant connections are reliable for real-time, ensuring great communication among teams separated by areas.

In conclusion, Collaborative System achieves the said goal of making people readily cooperate in Virtual environment. It is the right solution for remote teams because it offers all the features most employees need, has a simple and intuitive interface, and allows managers to set strong access rights. Through this platform, the collaborators who may be located in different regions are able to come closer and hence improve the productivity and creativity of the users.

The Collaborative System has a lot of potential for further enhancement if only technology rises to the occasion. It remains that in the future, some features such as predictive text using AI and/or ML and services such as transcribing meetings by AI may be added. Besides, adding more features to the system which includes its compatibility with other tools like project management software, cloud storage platform and CRM could greatly enrich the versatility of the system.

Additional possibilities for improvement are: improving accessibility for impaired users, optimizing the platform on mobile devices, adapting it for large users to support large-scale conferences and teachable webinars. These enhancements will further enhance the ability of the platform to facilitate synchronised interactive activities in learning and work pursuits.

## REFERENCES:

1. <https://www.sciencedirect.com/science/article/pii/S1571066116301141>-Video

- Conferencing System Based WebRTC with Access to the PSTN.
2. <https://www.researchgate.net/publication/287926042> A study on video conferencing using overlay network - A Study on Video Conferencing using Overlay Network.
  3. <https://www.researchgate.net/publication/359419659> SquashCord Video Conferencing Application Using WebRTC - Squash cord: Video Conferencing Application Using WebRTC.
  4. <https://ieeexplore.ieee.org/document/9119656> - WebRTC Role in real-time communication and video conferencing.
  5. <https://ieeexplore.ieee.org/document/7924748> - A WebRTC-based Video Conferencing System with Screen sharing.
  6. <https://www.researchgate.net/publication/298711298> P2P audio and video calling application using WebRTC - Peer to Peer Audio and Video Communication using WebRTC.
  7. <https://www.researchgate.net/publication/305488137> Multipresence towards videoconferencing and collaboration in multi-use environments - Mult presence: towards videoconference and collaboration in multi-use environments.
  8. Wu, Chunxue, et al. "Design and analysis of an effective graphics collaborative editing system." EURASIP Journal on Image and Video Processing 2019.1 (2019): 1-21.
  9. Stellato, Armando, et al. "Vicenti 3: A collaborative Semantic Web editor for ontologies, thesauri and lexicons." Semantic Web 11.5 (2020): 855-881.
  10. H. Attiya, S. Burckhardt, A. Gottesman, A. Morrison, H. Yang, and M. Zariski. Specification and Complexity of Collaborative Text Editing (Extended Version).