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Superintend Healthcare Assistance Application

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***Abstract*: As people become older in age and during the times of pandemic disease, many felt difficult to visit the hospital in person. An online consultation has secured a position in the market and individuals are explored up to the likelihood of replacing a visit to a physical facility with an online application. This paper proposes an online application with different interactive features with video call facility along with collaborative system based on WebRTC technology to improve the quality of the video conferencing with the doctor. It allows doctors and patients to interact anytime and anywhere through web browser and communicate via chat, audio and camera to analyse the health condition of the patients. It supports all types of camera and stream with low latency. Kurento Media WebRTC server act as opensource software to stream our video in web browser.**

***Keywords*: Live-Chat, WebRTC, Media Streaming, Kurento Media Server.**

1. Introduction

Elderly people feel very difficult to commute to the hospital for their regular health check-ups. The pregnant ladies may find uncomfortable to visit the doctor in the hospital. During the times of COVID-19, most of the patients were not recommended to visit the doctor in person. They were asked to self-quarantine in order to protect each other from that pandemic situation. Many lost their lives because of lack of treatment during the time of pandemic.

In order to avoid such pathetic situation, we have designed an online application to have live interaction with the doctor through live camera streaming along with live chat, symptoms, medication prescription etc. It can be accessed from any devices such as laptops, PC, tablets and smartphone. Video streaming protocol is essential to deliver the video into pieces of chunks to send to the receiver and it can be reassembled to it. There are various video streaming protocols which are essential for live streaming. Among various video streaming protocols WebRTC [1] is found to be more suitable for this purpose of live media streaming, so WebRTC protocol is applied to achieve video streaming with low latency and good audio-video synchronization. This application supports different kinds of camera like IP, USB cameras etc., in order to achieve high-definition video.

The rest of this paper is organized as follow: Section II Outline various streaming protocols, section III describes the functionalities, architecture and components of our web application, section IV presents the result of implementation of the web application. Finally, section V provides the conclusion

2. Real-time Communication Protocols Survey

Real-time communication protocols are designed to have one-to-one communication in form of channels. There are various protocol which is suitable for monitoring which are listed below,

A. HTTP Live Streaming Protocol [HLS]

HLS is widespread bitrate streaming communication protocol as shown in table 1, developed by Apple Inc, where the audio and video is transmitted over the internet.

Table 1
HTTP live streaming

Sl.no	Features	Specification
1	Video Codec	H.265, H.264
2	Audio Codec	AAC
3	Latency	6-30 seconds
4	Fps	≤ 30 fps
5	Browsers Supported	All Google Chrome, Safari, Microsoft Edge.
6	Devices Supported	iOS, Android, Linux ,Microsoft, macOS.
7	Security	AES-128 algorithms

B. MPEG Dash

MPEG Dash is streaming method [4] which similar to HLS protocol. DASH stands for “Dynamic Adaptive Streaming”. It transmits data by breaking the content into a sequence of small packets, the specifications are as shown in table 2.

Table 2
MPEG Dash

Sl.no	Features	Specification
1	Video Codec	H.264
2	Audio Codec	AAC
3	Latency	24-40 seconds
4	Fps	≤ 24 fps
5	Browsers Supported	Chrome 23 +Version, Internet Explorer 11 on Windows 8+,Microsoft Edge, Opera 20+,Safari8+ On Mac. .
6	Devices Supported	Windows 10, Mac Os10.6,Linex,Tizen,Web Osios 3.0+,Android 4.4+
7	Security	CENC (common Encryption)

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C. WebRTC

WebRTC is streaming protocol [2] , which is open source created by Google Inc is depicted in table 3, to have peer to peer communication in browser and mobile application.

Table 3
WebRTC

Sl.no	Features	Specification
1	Video Codec	H.264 , VP8, VP9
2	Audio Codec	Opus
3	Latency	less than one second
4	Fps	≤ 15 fps
5	Browsers Supported	Google Chrome,Mozilla FireFox ,Opera ,Safari
6	Devices Supported	Android, IOS ,linux, Windows
7	Security	Datagram transport layer security

Among the real-time communication protocols WebRTC is designed to have efficient monitoring so, implemented the project using WebRTC protocol.

3. Methodology

A web-based interactive portal is proposed to monitor patients anytime and from anywhere. Almost all the popular web browser can run this application and support all the features as shown in Fig. 1.

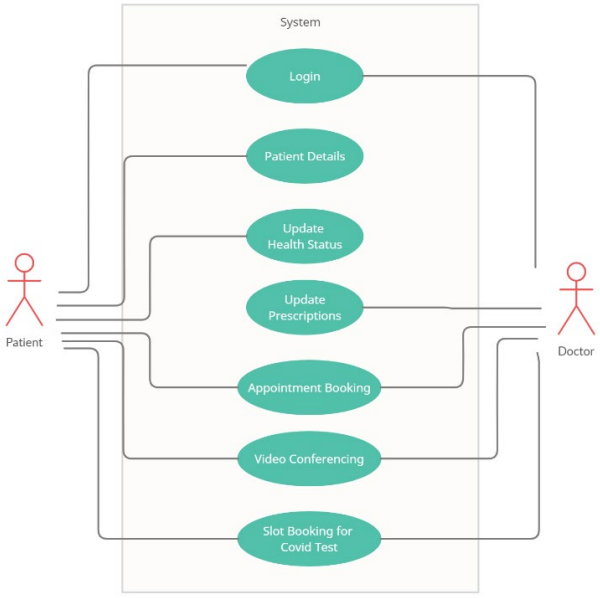

Fig. 1. Use case diagram

A. User Portal

The portal access will be given only after hospitals going through the patient's health condition. If the user is unable to reach the hospital due to their health conditions, in that case login credentials will be provided for online consultation. The user will be given with username and password and their basic details will be stored in database.as of in fig. 2.

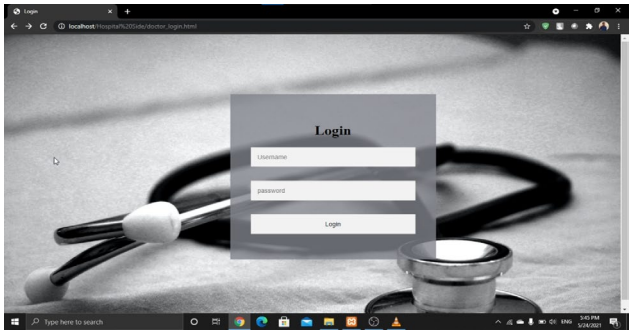

Fig. 2. Login

Fig. 3. Personal info

After successful login, the user's personal details will be displayed and health status can be updated at any time as shown in fig.4. The personal details are fed by hospital management during providing the login credentials to the user. Users should 3 update their health status at regular intervals as per the doctor's advice.

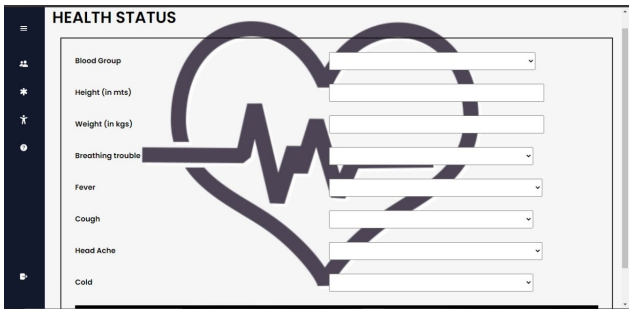

Fig. 4. Health status (Editable)

Based on the user's health condition, the doctors can prescribe medicine. The prescribed medicine will be shown in the user's profile as of fig. 5.

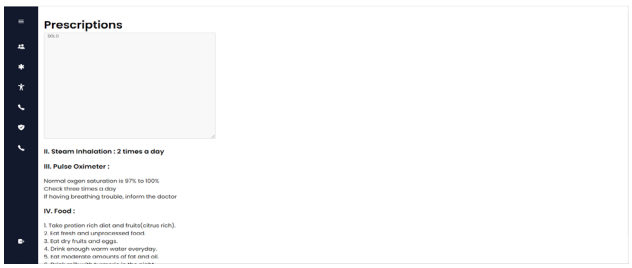

Fig. 5. Prescription

If the user is in need to consult the doctor, can request for an appointment through the portal and consult the doctor through

video conferencing in the portal.

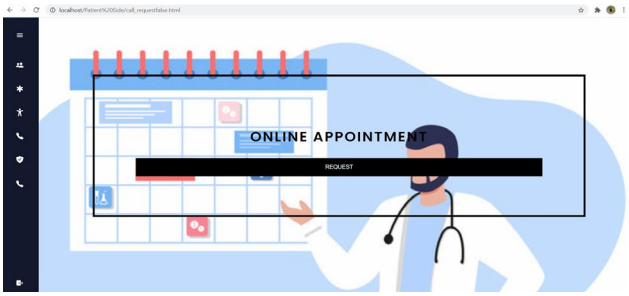

Fig. 6. Online appointment

Openvidu provides free library for video streaming and conference. Kurento is a WebRTC server where the openvidu library run as shown in fig. 7.

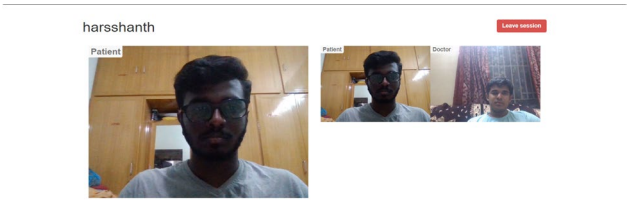

Fig. 7. Video conferencing

After the consultation, the users can pay the consultation fee directly in portal through the payment methods shown in portal.

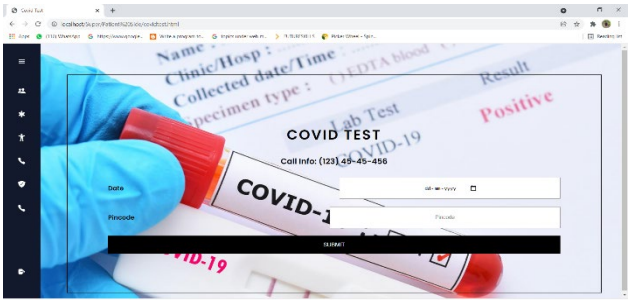

Fig. 8. Slot booking (Covid Test)

During pandemic situation like COVID-19, this portal comes handy for booking slots for taking tests. Since every user will get unique time slots, unwanted crowd gatherings can be avoided depicted as shown in fig.8.

B. Hospital Portal

Fig. 9. Health status (View only)

In hospitals, every doctors will be given a login credential (see img). After successful login, they can view the list of patients under their wing. By selecting the patient id, they can view the patient's status as of in fig. 9.

Based on health status updated by patients, prescriptions can be suggested in fig. 10. Once the doctor adds the prescription, it will be displayed on user's portal.

Fig. 10. Prescription management & modification

Once the patients request for consultation, doctors can allot the date, time and session id for video conferencing. At the allotted date and time, both patients and doctors can join the video conference on the mentioned session id.

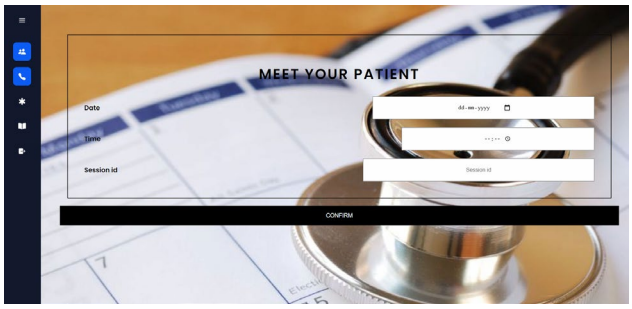

Fig. 11. Consultation

During pandemic situation like COVID-19, if patients request on taking tests, hospitals can allocate timings, so that unwanted gatherings can be avoided in fig. 11.

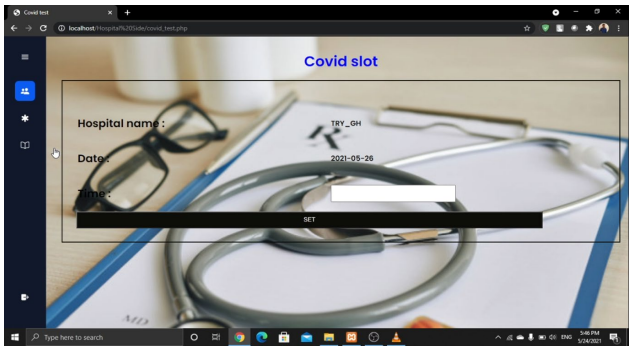

Fig. 12. Slot allocation

C. Architecture

This platform is authenticated with login system so that it can be securely accessed by the hospital management and others who have login credential. Permission for accessing the camera and microphones during video conferencing should be permitted by the respective system to keep up the privacy. From

web browser the input video is transmitted through WebSocket to OpenVidu server. From there irrespective of protocols it is forwarded to Kurento Media Server, where the input stream is converted to WebRTC and streamed in web browser on either side and the architecture is shown in fig. 13.

The permission for fetching the details of user only lies with doctor. No user can view the details of another user and the same phenomenon lies with doctors.

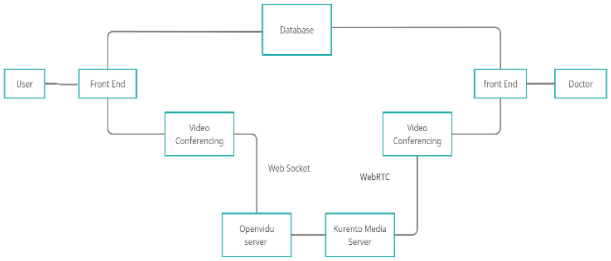

Fig. 13. Architecture

4. Conclusion and Future Scope

This paper proposed a solution to monitor patients through online with their regular updating on health status and video conferencing consultation. Using WebRTC protocol will provide high frame rate and low-level latency using Kurento WebRTC Media Server for video conferencing. It has a user-friendly interface.

In future we are planning to build an AI based approaches to monitor the patient. Based on the patient report, specialists can be filtered, so that users can approach them for consulting for better treatment

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