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Developing A Secured Interactive Media with A Web Application Using Real-Time Communications Among Organizations

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ABSTRACT

The instant messaging allows sharing of digital texts and files between users that are connected with each other and can link with the use of computer devices. This study employed an instrument of communication which presents content that is downloaded from the internet. It aimed at utilizing aspects of real-time communications in a web application and to make the communication between users of the web application well secured and facilitate its connectivity. Instant messaging was applied using a database to keep records and a cloud storage bucket to store files which can be shared and downloaded. The study showed a web application that outputs appropriate materials based on user input. Image, audio and video generated from media devices such as webcam and microphone when using the web application was differentiated from other files. These outputs from the media device are therefore considered authentic. Authenticated information prevent impersonation, thereby securing the content of communication.

Keywords: Connectivity, Instant Messaging, Real-Time Communications, Web Application, Media Devices.

1. INTRODUCTION

An interactive media is the integration of digital media with combinations of electronic text, graphics, moving images, and sound, into a structured digital computerised environment that allows people to interact with the data for a specific purposes. Digital environment can include the internet, telecoms and interactive digital television (England and Finney, 2011). Interactive media is a method of communication in which the output values depend on inputs (Cvetković, 2019). In this context users can participate and edit content of communication using an interactive media. The actions of the user's on the media are used for communication. Using internet platform as the digital environment, social media such as Twitter, Instagram, Facebook, and Telegram are very good example of interactive media. In social media graphics and text are used to permit users to share photos, datas and other vital information about themselves.(Dhir, 2019). Interactive media plays a vital role in ICT world, not only does it make people more active, but also it gives them the control and means to communicate with others (people, Communities, companies, organizations) with whom ordinarily they would not have means to contact. This platform makes it possible for free-flow and exchange of ideas and information (Dhir, 2019)

In this context, social networking website refers to a type of interactive media which is implemented with a web application. Web application consist of computer program which is stored in a remote server and accessible through a browser interface. All or some parts of a web application are downloaded from the internet every time it runs. (Gibb, 2016) web application as a computer program that exploits web browsers and web technology to perform tasks over the internet. A web application can be as simple like a message board, it can be a contact form on a website or a multi-player mobile gaming app that can be downloaded to a phone (Nations, 2019). Web applications can be a combination of server-side scripts (ASP and PHP) to handle the storage and retrieval of the information, and client-side scripts (JavaScript and HTML) to present information to users (Gibb, 2016).

Database makes it easy to retrieve, organize, modify and store information needed in a web application. Some web applications do not require a database. (Gibb, 2016) explained that some of the applications are dynamic in nature, requiring server-side processing while as others are completely static with no processing required at the server. (Pluralsight, 2015) dynamic site is a site that is constantly changing and updated, in real-time, and that dynamic site require a database in order to work properly. Static information is stored with the client-side scripts while dynamic information is stored in the database with the server-side scripts. Instant messaging operates in a web application with the help of a database. A web application performing instant messaging may not be a dynamic site because, communication may exists in a real-time environment without a database, example is the instant messaging without past records of communication. Web browser is used to store and retrieve data but data in a web browser is volatile. Instant messaging enables users to have communication in real-time with associates, friends, family and colleagues via the internet. The private text-based informal “chats” can be between two or more participants who are simultaneously connected online (Cunliffe, 2006). (Singh and Passi, 2014) Real-Time Communication (RTC) allows sender and receiver exchange information and data over a channel without any delay and without a barrier like face-to-face, the mode of communication passes information across instantly. Real-time communication is applicable in instant messaging; internet telephony and voip; live video conferencing; teleconference; multimedia multicast; internet relay chat (ir); and amateur radio (Singh and Passi, 2014).

For an efficient communication ranging from instant messaging to video conferencing in a web application, RTC is utilized. (Tomasoni, 2017) reported that **real-time communication** is a new means of integrated communication, based on the standard **WebRTC**. The WebRTC standard enables communication in a web application with the use of media devices. A lot of security measures must be taken when developing a web application like authentication and authorization; database and cloud storage bucket security rules; and so on. This study aim at to develop a web application where organizations can exchange secured information in a real-time environment.

2. LITERATURE REVIEW

The face-to-face (FTF) communication has shown to serve many important functions in organizations, including complex coordination, problem solving, and social learning (Whittaker, Frohlich and Daly-Jones, 1994). The uses of instant messaging by organizations and other business partners can be used to make a conference, where files and information are shared over the Internet (Essays, 2018). Informal face-to-face communication as was the case in social networking website does not require people to be physically present in the same room, it is an effective way of communication because it allows remote communication which supports collaboration among organizations, particularly in oilfield sectors. Instant messaging is a tool used by organizations in many ways such as communications, marketing and learning. Lack of internet in some remote locations such as offshore facilities and onshore locations has made communications limited to a two-way radio and daily reports. With real-time communications networks, offshore data is transferrable to onshore offices in a real-time environment.

Instant Messaging (IM), has been of great concern to the global community because it is an instrument that successfully provides informal communication (Nardi, Whittaker, and Bradner, 2000). Lack of use of this may pose a security threat to people particularly the offshore personnel's. IM supports cooperation and real-time communication among people, personnel, employees, business entities, customers and then brings new threads of threats to local area network and makes organizations to have a knowledge of likely potential risks whenever employees share illegal or inappropriate content over the internet (Essays, 2018).

3. METHODOLOGY

A flow chart and Pseudo code was used in the study to signify the implementation of the web application this is because pseudo code is very effective and efficient way for writing an algorithm before coding. Fig.1 shows the flow chart that was adopted for the study.

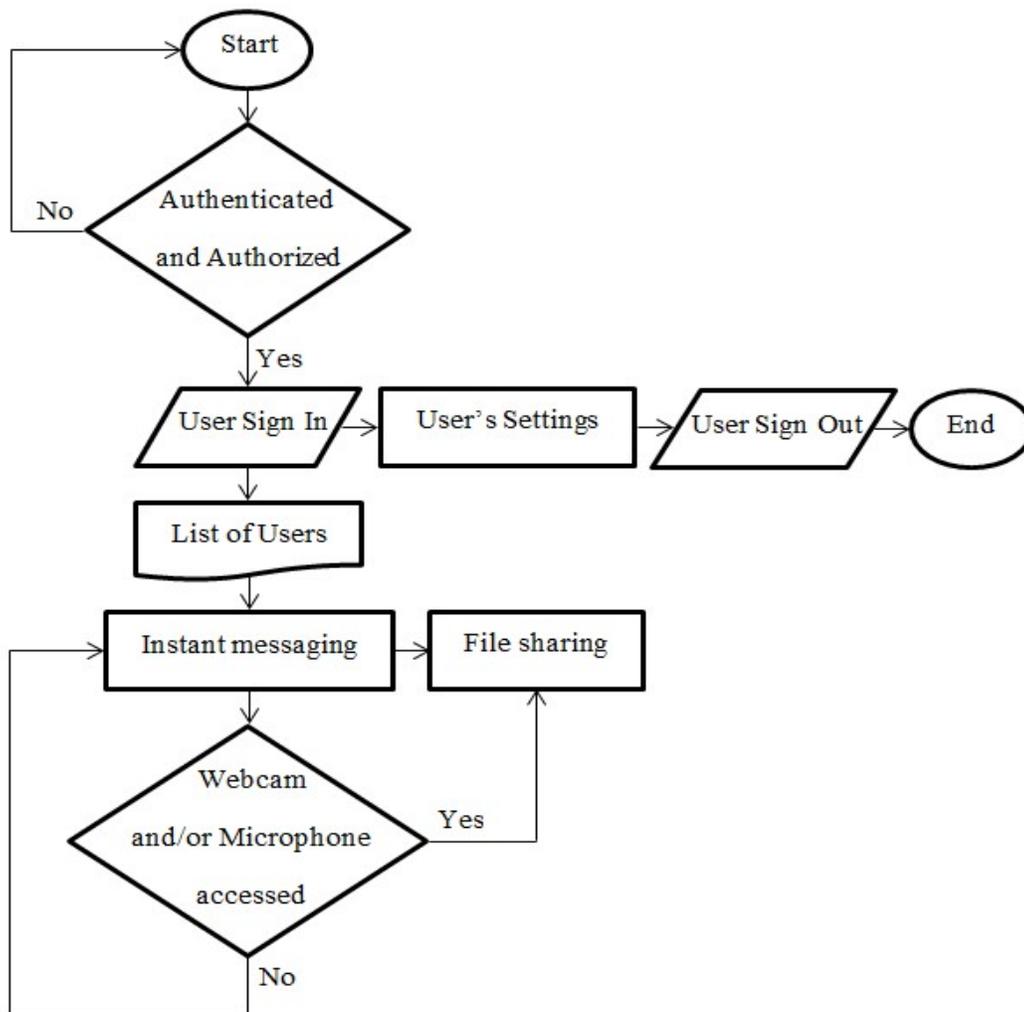


Figure 1: Flow chart implementation of the web application

```
IF authenticated and authorized THEN
    user sign in
ELSE
    retry
ENDIF
IF user sign in THEN
list of users or user's settings
ENDIF
IF list of users THEN
instant messaging
ENDIF
IF instant messaging THEN
file sharing or acquire access to webcam and/or microphone
ENDIF
IF webcam and/or microphone accessed THEN
file sharing
ELSE
retry
ENDIF
IF user's settings THEN
user sign out
ENDIF
```

Source code of the web application is available at <https://github.com/Onawola/Theytalk>

The web application development is of two parts the back-end (otherwise called server-side) and front-end (client-side). Back-end is responsible for storing and retrieving data for web application and used to communicate with database and front-end. All security works like authentication and authorization are managed by back-end of the web application. The Front-end of the web application represents a graphical user interface which helps in collecting and displaying information. Users interact with the application by filling forms, clicking and scrolling which is provided by the front-end development. The Front-end of the web application also aids in acquiring access to microphone, webcam and other computer devices. The front-end of the web application was implemented using combination of programming languages like hyper-text mark-up language (HTML), cascading style sheets (CSS), and java-script. HTML assist in creating and organizing the web application content which were composed of element such as form, input, canvas, audio, video and button. The CSS was used in beautifying the web application pages. All the operations that the users perform with the web application are done with the aids of JavaScript carries.

3. RESULTS AND DISCUSSION

Communication occurs only between users of the web application. At the initial stage of the web application, user's details are requested for to sign-in a user into the web application. Registration was carried out by each user of the web application so as to be part of the communication. Details like name, unique identity, and other information about a user are needed for communication. Registration to the web application can be done with various sign-in methods. One of it is by using email address and password. A registration form requests for email address, password and may include more information. Provision of email address and password creates a prototype of a user with a unique identity. Other form permits users to sign-in with their email address and password.

Authentication state observer receives information whenever the user's sign-in state changes. Observer holds information about the signed-in user which can be stored in the database for other users to see. After a user is authenticated and authorized, a list of users is updated to contain details of the entire users. Location of files uploaded to the cloud storage bucket are downloaded and stored in the database so as to locate each file in the web application. The database was designed to keep communication that take place between two or more users private and to list users of the web application to every authorized person.

Access to microphone and webcam are gotten almost the same way. The web application detects available media devices when users request to access these computer devices. A prompt from the web browser is used to receive user's permission to turn on a webcam and/or microphone which provides a media stream containing a video track and/or an audio track depending on the request. A constraint parameter was manipulated to produce image, audio and video into the web application. The constraints limitation is a media stream constraints object with two members' i.e video and audio, describing what the media types requested. However, either or both must be specified. If the browser couldn't discover all media tracks with the specified types that meet the constraints given, then the returned promise is rejected with no found error.

Figure 2: Authentication and authorization process by a user of the web application



Figure 3: List of users that registered to the web application

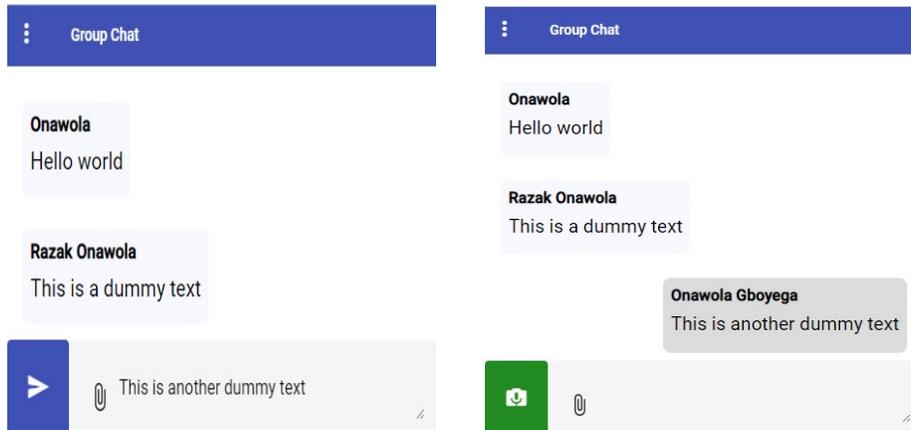


Figure 4: Instant messaging between two or more participants in the web application

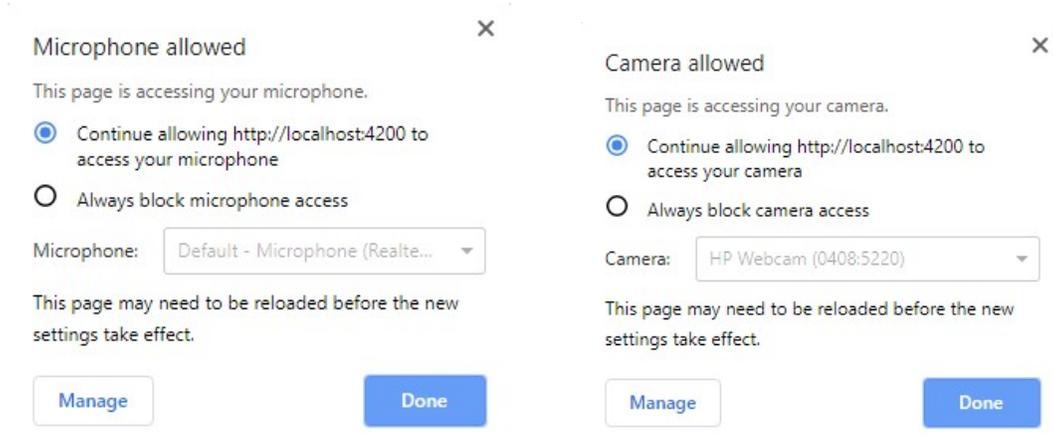


Figure 5: Web application accessing media devices through web browser

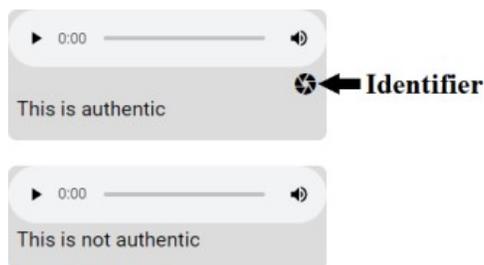


Figure 6: Web application identifies authentic information between two audios with an icon

The problem in instant messaging is that junk messages pop up in the window, however it is a requirement to handle the messages immediately. Secondly, virus and Trojan worms can spread through instant messaging channel in which the malicious program are spread when an instant messaging user is in the process of clicking the hyperlink or trying to download it (Yi, Pettersson and Daniels, 1994).

5.CONCLUSION AND RECOMMENDATIONS

The security of the application was tested with three core areas viz confidentiality; integrity and availability (CIA). Measures are taken to prevent sensitive information from unauthorized people. Communication that occurs at real-time were found to be accurate, consistent and trustworthy also information were only made available to authorized people and other information about a user is kept from other users so that it is not stolen or mimic. The application developers should consider security of their connections very key factor, to avoid data piracy (Al-Saadoon, 2009). For further study multimedia-based content such as voice over internet protocol (VoIP) can be added and video (Laguarda, 2004), and testing the application on other operating systems (Yulianto et al., 2015).

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