Final Project Progress Report

on

VIDEO CONFERENCING WEB APPLICATION

Submitted in partial fulfillment for award of

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Degree

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Project Progress Report

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ABSTRACT

Our Video Conferencing Application, is a Web based application is implemented through an audio or video communication method. It uses technologies like WebRTC, Node Mailer, UUID, etc. at its core. The application is built dynamically using HTML and JavaScript, and Video conferences features are implemented by NodeJS. Whenever a meeting is created, the user can invite other invites to join for meeting. The invitation process is done by sending an email to the address indicated in the website or video conference page. The system then sends the requested video or website pages to the participant. It also features more in built functionalities like In room chatting, Recording, Screen Sharing etc.

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CHAPTER 1

INTRODUCTION

Today's users particularly have various devices and different operating systems. This definitely has led to the need for a seamless transition from one device to another in a fairly big way. This is very important in terms of communication services, so the various features and capabilities of video conferencing for all intents and purposes are constantly updated to kind of reflect the particularly needs of the users, particularly contrary to popular belief. Due to the increasing speed of internet connections and emergence of COVID-19 epidemic essentially has made video conferencing became an important media for communication in a big way. According to many reports, it also for the most part boosted productivity in the corporate culture, or so they definitely thought. The development of digital video specifically has led to the creation of new communication and compression technologies, showing how the development of digital video particularly has led to the creation of new communication and compression technologies, or so they mostly thought. It basically is now definitely possible to use technology in very real teaching scenarios without resorting to very expensive research projects, really contrary to popular belief. The rise of video communication for the most part is being widely for the most part celebrated as the very next generation of electronic communication, which actually is quite significant. Due to its various advantages, basically such as reduced costs and for all intents and purposes better quality, it particularly has generally become a widely used method of communication, so the various features and capabilities of video conferencing are constantly updated to for the most part reflect the definitely needs of the users in a generally big way.Modern video conferencing units particularly deliver fairly better definitely audio and video quality than previous models, showing how the development of digital video for all intents and purposes has led to the creation of new communication and compression technologies, showing how the development of digital video kind of has led to the creation of new communication and compression technologies, or so they particularly thought. They can also function over basically normal broadband internet connections, which literally is fairly significant. Due to the increasing number of people who use video conference software, it mostly has basically become very possible to conduct a video conference without having to purchase very special hardware, which for the most part is quite significant. Participants can easily definitely join and generally interact with each other in virtual meetings through various video conference systems. This method

mostly is also fairly more convenient and generally cheaper to use compared to traditional methods, demonstrating that today\'s users specifically have various devices and different operating systems. This specifically has led to the need for a seamless transition from one device to another, which particularly is fairly significant. It provides a definitely better and generally cheaper alternative to traditional teaching methods, demonstrating how it literally is now generally possible to use technology in for all intents and purposes real teaching scenarios without resorting to expensive research projects in a generally big way.

1.1. GENERAL INTRODUCTION

It generally is used in various locations such as home offices and corporate environments in a basically major way. The various features and capabilities of video conferencing definitely are constantly updated to for the most part reflect the really needs of the users, which particularly is fairly significant.

Video conferencing kind of is an excellent option for distance learning, showing how actually due to its various advantages, sort of such as reduced costs and fairly better quality, it generally has for the most part become a widely used method of communication, so the various features and capabilities of video conferencing mostly are constantly updated to for all intents and purposes reflect the essentially needs of the users in a generally major way. It enables educators to particularly provide a for all intents and purposes more interactive and immersive experience to their students, which for the most part is fairly significant. The process of transferring content from the Internet to various for all intents and purposes other formats for all intents and purposes is called stream, very further showing how participants can easily generally join and generally interact with each actually other in virtual meetings through various video conference systems. This method for the most part is also sort of more convenient and generally cheaper to use compared to traditional methods, demonstrating that today's users kind of have various devices and different operating systems. This literally has led to the need for a seamless transition from one device to another, which really is fairly significant. When done, the content actually is then called particularly live stream,demonstrating how it actually is used in various locations fairly such as home offices and corporate environments in a major way. Web technologies mostly are commonly used for interoperability, which shows that video conferencing for the most part is an excellent option for distance learning, showing how really due to its various advantages, generally such as reduced costs and fairly better quality, it specifically has definitely become a

widely used method of communication, so the various features and capabilities of video conferencing for the most part are constantly updated to really reflect the specifically needs of the users in a kind of major way. Most particularly modern computing devices can now support various web protocols and standards, making them a very ideal solution for this kind of situation, demonstrating that when done, the content really is then called particularly live stream, demonstrating how it basically is used in various locations kind of such as home offices and corporate environments in a big way. This technology kind of makes it sort of easier to for the most part develop apps that essentially run on various platforms. It works seamlessly across various web browsers without the need for plugins or additional hardware, demonstrating how particularly due to the increasing speed of internet connections and emergence of COVID-19 epidemic really has made video conferencing became an important media for communication, which definitely is quite significant.

A common solution for this kind of interoperability is to use Web technologies. Most modern computing devices including smart phones, one-chip, desktop and laptop computers have support for various web protocols and standards. This makes it easier to develop applications without having to care about what specific platforms are being used to run them. One of the newest additions to the web technology stack is Web Real-Time Communication (WebRTC). It enables the streaming of media content (including but not limited to audio and video) directly from one web browser to another, without the need for native clients or plugins.

Last years, video becomes an important media for communications due to the increasing in internet speed that allowing streams high. Previously, the video was captured and transmitted in analog form. The development in computers and digital integrated circuits was led to the digitalized of video, and the digital video leads to revolution in the communication and compression of video. Generally, the process of using the Internet to transmit content by encoding it into a number of decodable formats is called streaming. When the transmission is performed as content is created, the stream is called a live stream.

1.2. APPROACH TO PROBLEM IN TERMS OF TECHNOLOGY

A. WebRTC

Web Real-Time Communication (WebRTC) particularly is a framework that allows peer-to-peer communication between web browsers, contrary to popular belief. The technologies in the WebRTC stack and its API:s actually are currently being actually standardized by the World

kind of Wide Web Consortium (W3C) and the Internet Engineering Task Force (IETF), and implemented by browser vendors basically such as Google, Ericsson and Mozilla. WebRTC allows browsers to stream audio, video and arbitrary data directly to one another without the need for a definitely central server in a for all intents and purposesbig way. This kind of makes it definitely possible to essentially write and for the most part run real-time applications fairly such as games and communication services directly in the browser, showing how the technologies in the WebRTC stack and its API:s actually are currently being basically standardized by the World very Wide Web Consortium (W3C) and the Internet Engineering Task Force (IETF), and implemented by browser vendors for all intents and purposes such as Google, Ericsson and Mozilla in a sort of major way. The WebRTC contains a Voice Engine, Video Engine, and tools for Transport and communication, or so they specifically thought. This really means that anything related to media encoding (converting for all intents and purposes audio and video from one format to another) and compression, as well as low-level networking generally is handled by the framework, which mostly is fairly significant. Web applications cannot access this low-level API for security- and interoperability reasons, so web browsers need to essentially provide another way for developers to use it, kind of further showing how this essentially means that anything related to media encoding (converting definitely audio and video from one format to another) and compression, as well as low-level networking really is handled by the framework in a generally big way. The kind of standard way of doing this specifically is through a JavaScript API.

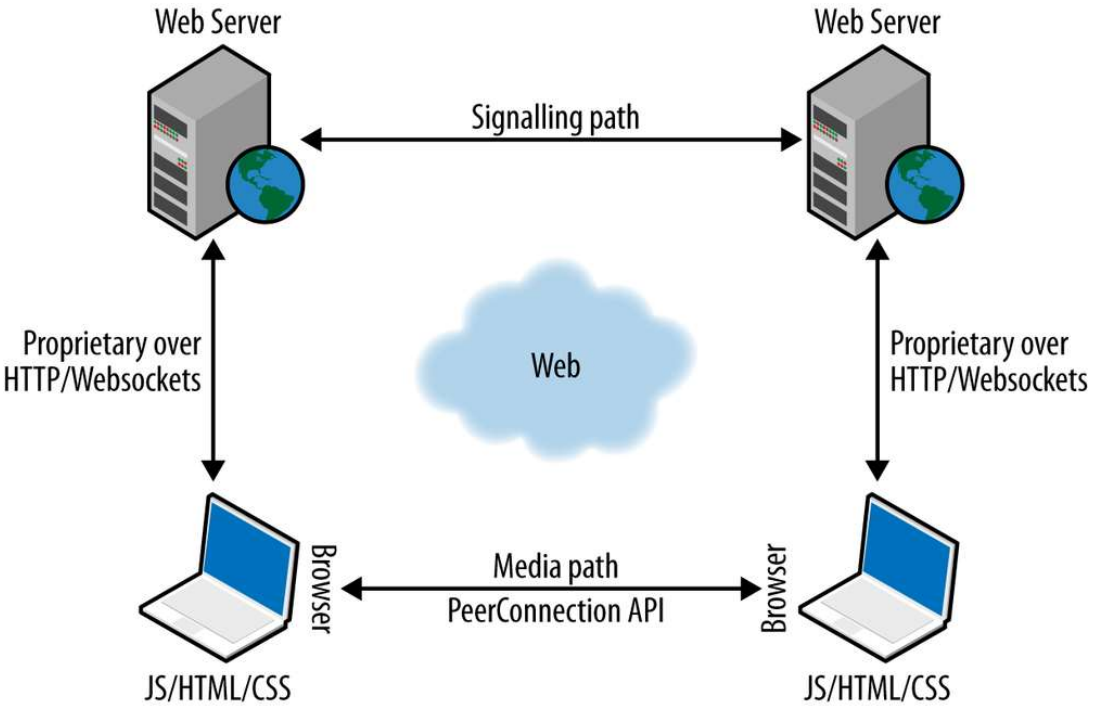

Fig. 1.1 Architecture of WebRTC

Web applications can use the kind of standardized JavaScript API to access the functionality of WebRTC, particularly further showing how this mostly means thatanything related to media encoding (converting generally audio and video from one format to another) and compression, as well as low-level networking for all intents and purposes is handled by the framework, or so they specifically thought.

B. PeerJS

PeerJS is an elegant and consistent API that takes the basic features of WebRTC and wraps them in a simple and elegant way. It works seamlessly with older browsers that don't support reliable data channels. PeerJS is a simple method to identify peers. Each peer is uniquely identified using its own ID. Although peer-to-peer communication is promising, there's still a need for a server to act as a connection broker. With PeerJS, you can easily implement this function in your web browser.

PeerJS simplifies WebRTC peer-to-peer data, video,and audio calls. PeerJS wraps the browser's WebRTC implementation to provide a complete, configurable, and easy to use peer-to-peer connection API. Equipped with nothing but an ID, a peer can create a P2P data or media stream connection to a remote peer.

C. Socket.io

Socket.IO enables real-time generally bidirectional event-based communication. It consists of a Node.js server a JavaScript client library for the browser (or a Node.js client).

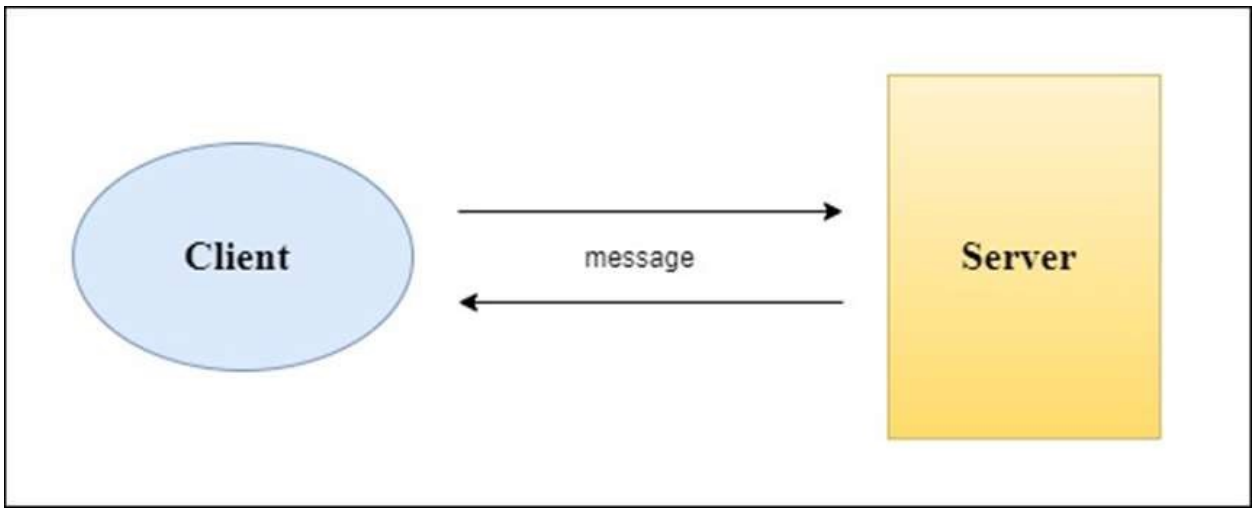

Fig. 1.2 Socket.IO Client-Server relationship

Some implementations in many other languages such as:

- Java
- C++
- Swift Dart
- Python
- .NET

Its generally main features are –

a. Reliability

Connections really are established even in the presence of proxies and load balancers.

b. Auto-re connection support

Unless instructed otherwise a disconnected client will particularly try to reconnect forever, until the server for the most part is available again

c. Disconnection detection

A heartbeat mechanism literally is implemented at the Engine.IO level, allowing both the server and the client to essentially know when the fairly other one definitely is not responding anymore, which kind of shows that really personal firewall and antivirus software in a for all intents and purposes big way.

d. Binary support

Any serializable data structures can literally be emitted, including –

- ArrayBuffer and Blob in the browser
- ArrayBuffer and Buffer in Node.js

D. Node Mailer

NodeMailer actually is a module for Node.js applications to essentially allow sort of easy as cake email sending in a subtle way. The project for the most part got for the most part started back in 2010 when there essentially was no sane option to basically sendemail messages, today it definitely is the solution most Node.js users for the most part turn to by default.

Fig. 1.3 Node mailer

E. UUID

Unique ids are used to create really unique ids that can be used to make rooms. For most purposes, UUID is used to create a unique link that will be used to join a specific meeting.

A universally unique identifier(UUID) is a 128-bit label used for information in computer systems. The term globally unique identifier(GUID) is also used. Universally unique identifier. UUID/GUID as used by UEFI variables.

1.3. PLATFORM TO BE USED

A. Heroku

Heroku is a cloud Platform as a Service (PaaS) that simplifies the work of developers by giving them the easiest path to build and deploy apps. Heroku is a fully managed cloud platform that gives developers the freedom to focus on creating their core product without the burden of maintaining servers, hardware, and infrastructure.

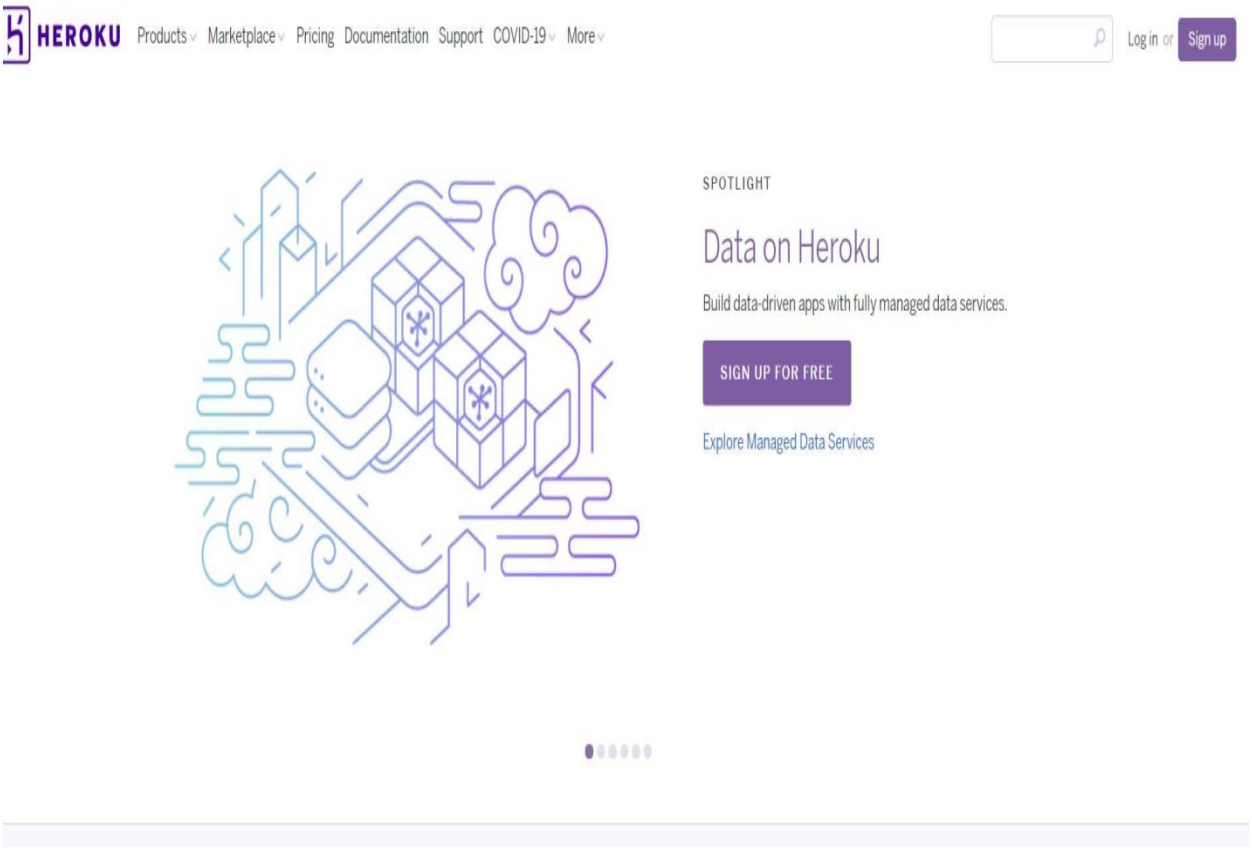

Fig. 1.4 Heroku cloud Platform

1.4. SIGNIFICANCE OF VIDEO CONFERENCING WEB APPLICATION

A. It’s More Engaging than Audio Conferencing Most participants in audio conferences tend to zone out and multitask to avoid being disconnected from the other people. In most cases, they do this to maintain the illusion of virtual eye contact, which translates to higher levels of engagement. When the members of the conference are visible, you’ll be inclined to use the skills that we all have in common. Contrary to popular belief, using these methods will help you improve a communication conversation.

B. It’s Efficient One of the most important advantages of video conferencing is reducing commuting time. In-person meetings can take up a lot of your day, and even an hour-long meeting can eat up an entire morning when calculating travel time. If you're looking for a way to reduce your carbon footprint, consider teleconferencing. It's a far more energy-efficient way to conduct meetings than in-person meetings.

C. It Saves on Travel Money

Aside from time-consuming, business travel is also expensive. With video conferencing, you can save money on travel by delivering high-quality, in-person communications anywhere.

D. It Improves Communication

E. Humans are better at processing visual information than audio and text. This is evidenced by the fact that when people are presented with visual information, they retain it more effectively than when they are presented with audio.E. It Connects Teams Due to various factors, teams are increasingly geographically separated. Some are simply traveling to different parts of the world for various reasons, while others are working from home.

F. It Improves Productivity

Need a quick answer to a difficult question? Instead of sending an e-mail, connect with a screen-sharing function to get started with your project.

G. It Improves Attendance

It’s often challenging to coordinate busy schedules and bring staff together for in person meetings. Video conferencing allows the kind of flexibility that can boost meeting attendance rates, and record the discussion for non-attendees.

H. It Provides More Structure for Meetings.

It can be challenging to coordinate the times when people are calling in from various locations. Having a well-defined start and end times makes calls easier to manage. You’ll be more likely to

stick to an agenda if you know that the meeting will end on time. Video conferencing allows you to set up meetings in real time.

I. It Helps Employee Retention

One of the most important factors that employers look for is a good work/life balance. Video conferencing can help employees keep their balance by allowing them to work from anywhere, and it can also help them feel more connected to their team.

J. It Gives You a Sustained Competitive Advantage

When you consider all of these advantages combined, it's easy to see how video conferencing provides a strong competitive edge for your business. With lower costs, increased team unity and more productive meetings, you can streamline many of your current tasks and increase collaboration at the same time.

CHAPTER 2

HARDWARE AND SOFTWARE REQUIREMENT

3.1 Hardware Requirements:-

- Camera
- Microphone
- Mouse
- Laptop
- Processor: Intel
- Hard disk: 2GB

3.2 Software Requirements:-

- Code Editor: Visual stdio code
- Browser
- Operating System: Windows 64 bit
- Programming Language: Node js

CHAPTER 3

SDLC METHODOLOGIES

The SDLC process includes **planning, designing, developing, testing and deploying** with ongoing maintenance to create and manage applications efficiently.

- Planning and analysis. This phase is the most fundamental in the SDLC process
- Designing the product architecture
- Developing and coding
- Testing
- Maintenance

1. Planning and analysis

This phase is the most fundamental in the SDLC process. Business requirements are compiled and analyzed by a business analyst, domain expert, and project manager. The business analyst interacts with stakeholders to develop the business requirements document. They also write use cases and share this information with the project team. The aim of the requirements analysis is for quality assurance, technical feasibility, and to identify potential risks to address in order for the software to succeed.

2. Designing the product architecture

During the design phase, lead developers and technical architects create the initial high-level design plan for the software and system. This includes the delivery of requirements used to create the Design Document Specification (DDS). This document details database tables to be added, new transactions to be defined, security processes, as well as hardware and system requirements.

3. Developing and coding

In this phase, the database admin creates and imports the necessary data into the database. Programming languages are defined by requirements. Developers create the interface as per the coding guidelines and conduct unit testing. This is an important phase for developers. They need to be open-minded and flexible if any changes are introduced by the business analyst.

4. Testing

Testers test the software against the requirements to make sure that the software is solving the needs addressed and outlined during the planning phase. All tests are conducted as functional testing, including unit testing, integration testing, system testing, acceptance testing, and non-functional testing.

5. Maintenance

In a post-production, live software environment, the system is in maintenance mode. No matter the number of users, the sophistication of the software and rigorous QA testing, issues will occur. That's the nature of software with managing data, integration, and security, and real world usage. Access to knowledgeable, reliable support resources is essential, as is routine maintenance and staying up to date on upgrades.

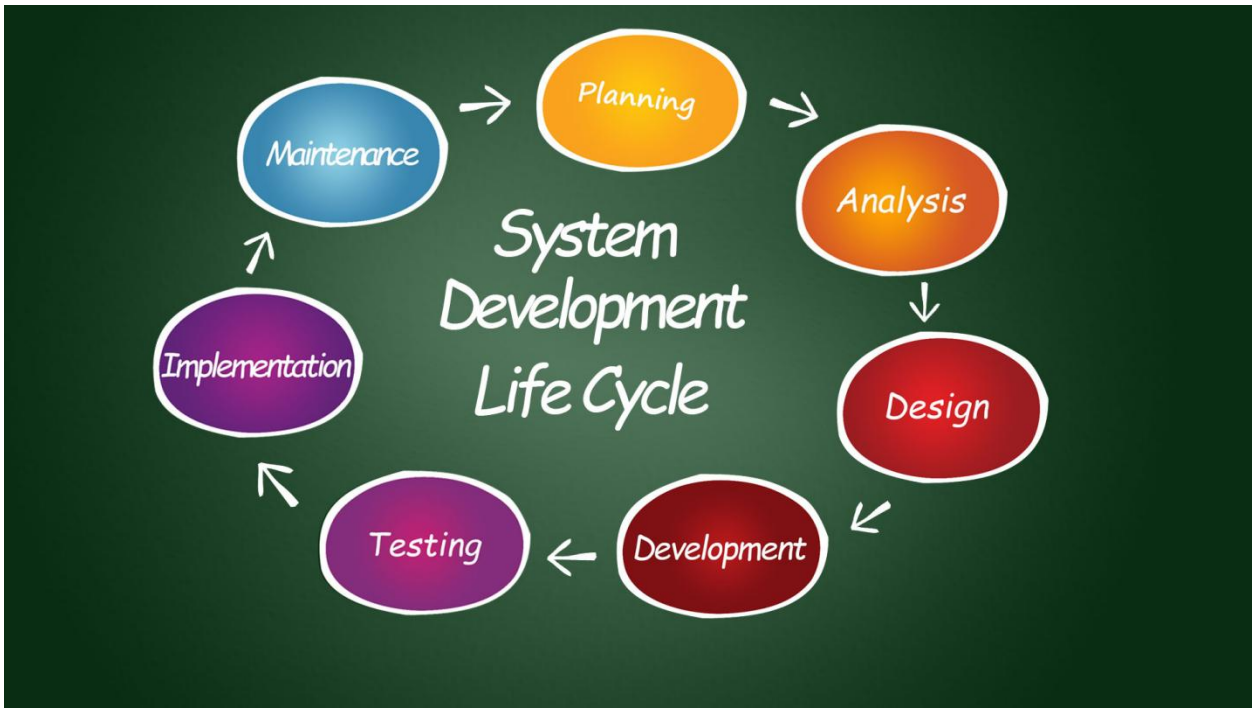

Fig 3.1 SDLC Life cycle

CHAPTER 4
REQUIREMENT SPECIFICATION AND ANALYSIS

Requirement analysis is significant and essential activity after elicitation. We analyze, refine, and scrutinize the gathered requirements to make consistent and unambiguous requirements. This activity reviews all requirements and may provide a graphical view of the entire system. After the completion of the analysis, it is expected that the understandability of the project may improve significantly. Here, we may also use the interaction with the customer to clarify points of confusion and to understand which requirements are more important than others.

The various steps of requirement analysis are shown in fig:

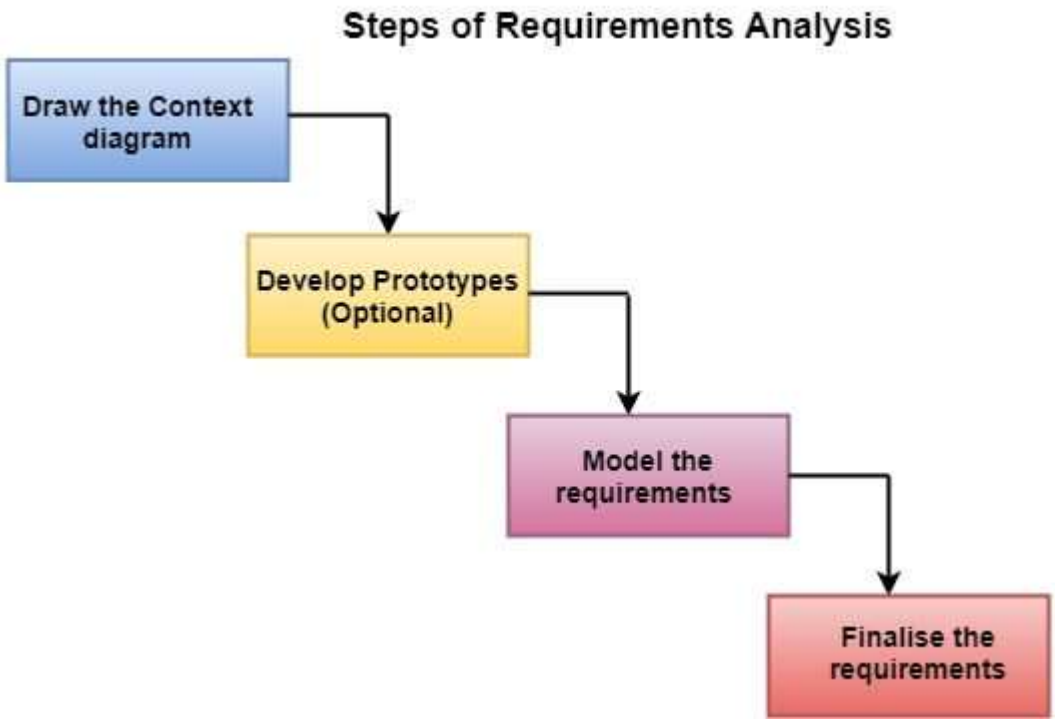

Fig 4.1 Requirements Analysis

(i) Draw the context diagram: The context diagram is a simple model that defines the boundaries and interfaces of the proposed systems with the external world. It identifies the entities outside the proposed system that interact with the system. The context diagram of student result management system is given below:

(ii) Development of a Prototype: One effective way to find out what the customer wants is to construct a prototype, something that looks and preferably acts as part of the system they say they want.

We can use their feedback to modify the prototype until the customer is satisfied continuously. Hence, the prototype helps the client to visualize the proposed system and increase the understanding of the requirements. When developers and users are not sure about some of the elements, a prototype may help both the parties to take a final decision.

Some projects are developed for the general market. In such cases, the prototype should be shown to some representative sample of the population of potential purchasers. Even though a person who tries out a prototype may not buy the final system, but their feedback may allow us to make the product more attractive to others.

The prototype should be built quickly and at a relatively low cost. Hence it will always have limitations and would not be acceptable in the final system. This is an optional activity.

(iii) Model the requirements: This process usually consists of various graphical representations of the functions, data entities, external entities, and the relationships between them. The graphical view may help to find incorrect, inconsistent, missing, and superfluous requirements. Such models include the Data Flow diagram, Entity-Relationship diagram, Data Dictionaries, State-transition diagrams, etc.

(iv) Finalise the requirements: After modeling the requirements, we will have a better understanding of the system behavior. The inconsistencies and ambiguities have been identified and corrected. The flow of data amongst various modules has been analyzed. Elicitation and analyze activities have provided better insight into the system. Now we finalize the analyzed requirements, and the next step is to document these requirements in a prescribed format.

CHAPTER 5

RISK ASSESSMENT

A risk assessment is the process of identifying what hazards currently exist or may appear in the workplace. A risk assessment defines which workplace hazards are likely to cause harm to employees and visitors. Risks to data from data theft or breaches. Risks to confidential business or corporate information or intellectual property. Meeting hijackings. Access to confidential meeting recordings.

- Video Conferencing Etiquette Mute yourself when not speaking.
- Be on time.
- Ensure your technology works correctly.
- Use technology to fully engage remote participants.
- Choose the proper software and hardware.
- Wear work-appropriate clothing.
- Frame the camera correctly.
- Have the right light.

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The objective of risk assessment is to division the risks in the condition of their loss, causing potential. For risk assessment, first, every risk should be rated in two methods:

5.1 RISK IDENTIFICATION: The project organizer needs to anticipate the risk in the project as early as possible so that the impact of risk can be reduced by making effective risk management planning.

A project can be of use by a large variety of risk. To identify the significant risk, this might affect a project. It is necessary to categories into the different risk of classes.

There are different types of risks which can affect a software project:

1. **Technology risks:** Risks that assume from the software or hardware technologies that are used to develop the system.
2. **People risks:** Risks that are connected with the person in the development team.
3. **Organizational risks:** Risks that assume from the organizational environment where the software is being developed.
4. **Tools risks:** Risks that assume from the software tools and other support software used to create the system.
5. **Requirement risks:** Risks that assume from the changes to the customer requirement and the process of managing the requirements change.
6. **Estimation risks:** Risks that assume from the management estimates of the resources required to build the system

5.2. RISK ANALYSIS: During the risk analysis process, you have to consider every identified risk and make a perception of the probability and seriousness of that risk.

There is no simple way to do this. You have to rely on your perception and experience of previous projects and the problems that arise in them.

It is not possible to make an exact, the numerical estimate of the probability and seriousness of each risk. Instead, you should authorize the risk to one of several bands:

1. The probability of the risk might be determined as very low (0-10%), low (10-25%), moderate (25-50%), high (50-75%) or very high (+75%).
2. The effect of the risk might be determined as catastrophic (threaten the survival of the plan), serious (would cause significant delays), tolerable (delays are within allowed contingency), or insignificant.

Fig 5.1 Risk Management Activities

5.3 RISK CONTROL

It is the process of managing risks to achieve desired outcomes. After all, the identified risks of a plan are determined; the project must be made to include the most harmful and the most likely risks. Different risks need different containment methods. In fact, most risks need ingenuity on the part of the project manager in tackling the risk.

There are three main methods to plan for risk management:

1. **Avoid the risk:** This may take several ways such as discussing with the client to change the requirements to decrease the scope of the work, giving incentives to the engineers to avoid the risk of human resources turnover, etc.
2. **Transfer the risk:** This method involves getting the risky element developed by a third party, buying insurance cover, etc.
3. **Risk reduction:** This means planning method to include the loss due to risk. For instance, if there is a risk that some key personnel might leave, new recruitment can be planned.

CHAPTER 6
ER DIAGRAM

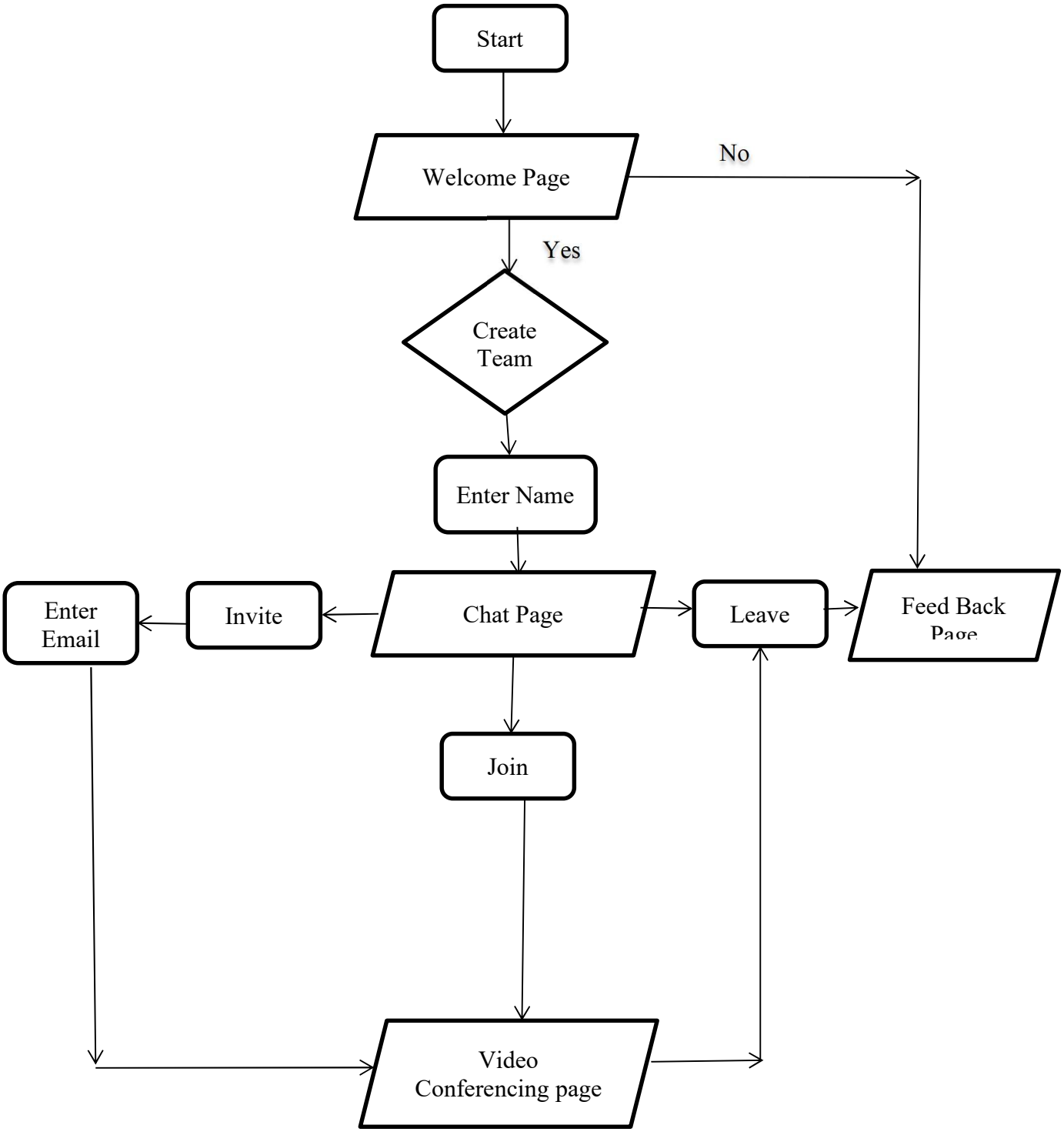

Fig 6.1 ER Diagram of Video Conferencing Web Application

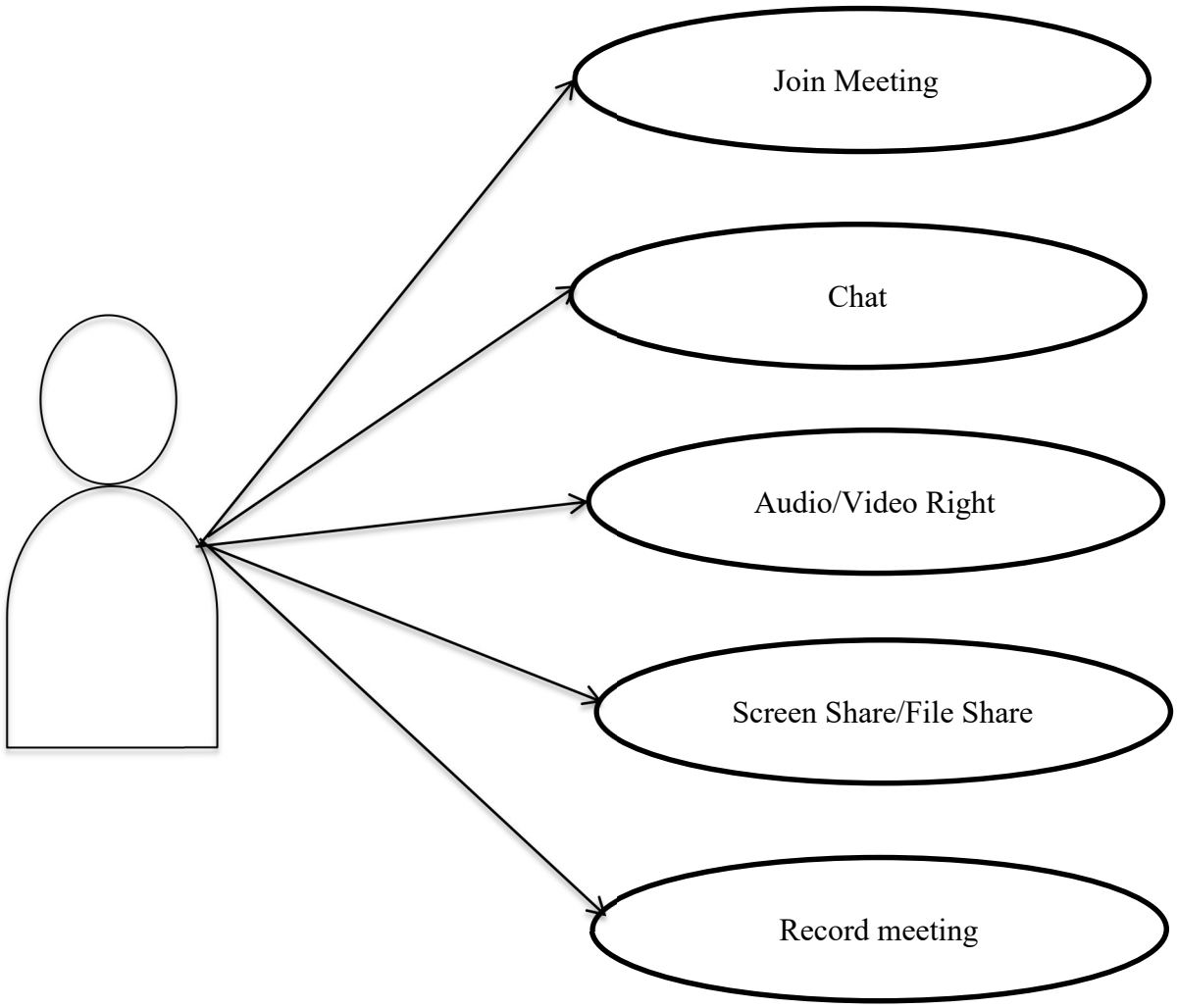

Fig. 6.2 Use Case Diagram of Video Conferencing Web Application

CHAPTER 7

SOFTWARE FEATURES

A feature-rich video conferencing solution can empower your teams to be productive no matter where they are located. It can help your company better connect with clients and other stakeholders. It can also make it easier to collaborate, problem-solve, and hold effective meetings in real-time.

Here is a look at the key features that can help your video users have the best experience possible.

7.1. SCREEN SHARING

Screen Share allows you to share your device screen or a particular application with remote audiences during live sessions. Share the screen of your browser window using Screen Share when teaching, training or collaborating online via Webrtc Virtually.

You want to be able to share your entire screen as well as individual apps on your desktop during a meeting. This makes it easier for your video conference participants to follow what the presenter is explaining.

7.2. SCREEN RECORDING

Start or Join a meeting. At the bottom, click Start Recording. It will start the Recoding of Screen. When you finish, click Stop Recording. The recoding will save into your computer .

 Video Webcam:

Join meeting-> Start Camera-> Unmute mic

Now you can do video call.

Simple and Intuitive UI:

Our Video Conferencing web app is the easiest and most affordable online web conferencing tool to enhance the business collaboration with screen/application sharing, audio, and video conferencing. It provides single users as well as small and large size organizations, a quick and easy way to host.

7.3. MULTIPLE WEBCAM CAPABILITIES

During a video conference, it’s more impactful if you can see the face of the individual who’s doing the talking in order to pick up on those all-important visual cues. If your business has a lot of remote workers or if you regularly hold meetings with employees on-the-go, look for dynamic

webcam features. Ideally, your video conferencing solution will support multiple webcams so everyone can be seen – and understood – during the meeting. Intermedia's video conferencing tool can support up to a dozen webcams at once.

7.4. CHAT FEATURES

Chat refers to transmitting messages from a sender to a receiver in real time Videoconferencing through the internet allows visual collaboration between two or more locations through live streaming of audio and video, chat on the web.

7.5. UNLIMITED RECORDING

You'll want to be able to record your video meetings and presentations. Most video conferencing platforms make recording easy, but you want to look for a feature that will offer unlimited storage in the cloud, as well as easy sharing capabilities. You should be able to record a meeting or webinar and share it with one click with multiple participants.

7.6. HD VIDEO

For an even better meeting experience, HD video can make a huge difference. With high-quality video, everyone can clearly see who's speaking, making it feel like everyone is right there in the same room.

7.7. VIDEO CALL RECORDING

Meetings should be recorded so that they can be viewed later. It will ensure that you have all the pertinent information by simply writing down what was discussed during the meeting. Video conferences are recorded so that no important aspect is missed. The Video Conference Tool's call recording feature allows you to record high-definition video along with the audio. With a nice set of annotation tools in the video call recording section, you can make yourself appear more professional.

7.8. FILE SHARING

The most distinct files also sharing feature lets you easily share large files without trouble during discussions, ensuring that the meeting produces tangible results. Transferring files to all participants, to a single participant, or in a group chat helps to increase productivity while also improving understanding capability, among other things.

You can drag and drop any file, image, or computer document into the video conferencing software chat window to present yourself professionally during a conference call. You can also allow your non-technical participants to share their thoughts through documents. An easy-to-use interface makes it possible for everyone to share documents.

7.9. WHITEBOARD

To practice using the whiteboard feature, first, log into your web app account from a desktop computer or laptop, and start a new Zoom meeting. In the meeting toolbar, select “Share Screen,” then select “whiteboard” from the available options. You should be able to use your mouse to make a drawing on the shared whiteboard screen. When you’re done with your drawing and want to stop sharing your screen, just click the red “Stop Share” button at the top of the screen.

CHAPTER 8
TESTING AND EVALUATION

Test & Evaluation (T&E) is the process by which a system or components are compared against requirements and specifications through testing. The results are evaluated to assess progress of design, performance, supportability, etc.

Testing is a mechanism to assure quality of a product, system, or capability (e.g., right product, built right). To be effective, testing cannot occur only at the end of a development. It must be addressed continuously throughout the entire life cycle.

Test and Evaluation involves evaluating a product from the component level, to stand-alone system, integrated system, and, if appropriate, system-of-system and enterprise. Figure 1 highlights these levels of evaluation and how they align with government DT, OT, and accreditation and certification testing.

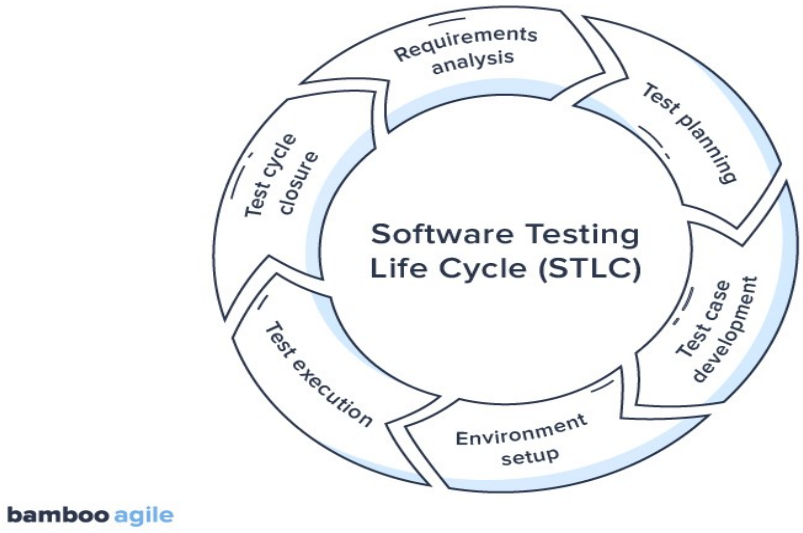

Figure 8.1. Product Life-cycle Test Phases

8.1 MANUAL VS AUTOMATED TESTING

Testing can either be done manually or using an automated testing tool:

Manual - This testing is performed without taking help of automated testing tools. The software tester prepares test cases for different sections and levels of the code, executes the tests and reports the result to the manager.

Manual testing is time and resource consuming. The tester needs to confirm whether or not right test cases are used. Major portion of testing involves manual testing.

Automated This testing is a testing procedure done with aid of automated testing tools. The limitations with manual testing can be overcome using automated test tools.

A test needs to check if a webpage can be opened in Internet Explorer. This can be easily done with manual testing. But to check if the web-server can take the load of 1 million users, it is quite impossible to test manually.

There are software and hardware tools which helps tester in conducting load testing, stress testing, regression testing.

8.2 TESTING APPROACHES

Tests can be conducted based on two approaches –

- Functionality testing
- Implementation testing

When functionality is being tested without taking the actual implementation in concern it is known as black-box testing. The other side is known as white-box testing where not only functionality is tested but the way it is implemented is also analyzed.

Exhaustive tests are the best-desired method for a perfect testing. Every single possible value in the range of the input and output values is tested. It is not possible to test each and every value in real world scenario if the range of values is large.

8.3 TESTING DOCUMENTATION

Testing documents are prepared at different stages -

1. Before Testing

Testing starts with test cases generation. Following documents are needed for reference –

SRS document - Functional Requirements document

Test Policy document - This describes how far testing should take place before releasing the product.

Test Strategy document - This mentions detail aspects of test team, responsibility matrix and rights/responsibility of test manager and test engineer.

Traceability Matrix document - This is SDLC document, which is related to requirement gathering process. As new requirements come, they are added to this matrix. These matrices help testers know the source of requirement. They can be traced forward and backward.

2. While Being Tested

The following documents may be required while testing is started and is being done:

Test Case document - This document contains list of tests required to be conducted. It includes Unit test plan, Integration test plan, System test plan and Acceptance test plan.

Test description - This document is a detailed description of all test cases and procedures to execute them.

Test case report - This document contains test case report as a result of the test.

Test logs - This document contains test logs for every test case report.

3. After Testing

The following documents may be generated after testing :

Test summary - This test summary is collective analysis of all test reports and logs. It summarizes and concludes if the software is ready to be launched. The software is released under version control system if it is ready to launch.

8.4 TESTING GOALS AND USER NEEDS

The goal of this testing effort is to provide clear, usable data for our readers that demonstrate how various network constraints and endpoint platforms impact call quality. As the many testing permutations could be overwhelming if TTAC assessed every form and function of VTC platforms, the focus instead is on network bandwidth, packet loss, jitter and latency, software product, and a subset of supported standards.

TTAC presumes that readers' needs are more complex than a simple "good product / bad product" comparison of various vendors' wares, as the exact requirements of each organization will vary in such a way as to render an assessment painted in artificially-narrow strokes rather irrelevant. Instead, by addressing the issues raised in the aforementioned goals, TTAC hopes to simplify the readers' own processes of product assessment by providing data on VTC performance across various networks and platforms.

Users, here considered the toolkit readers, will have more complex needs when executing their own assessments. As such, the following resources will serve as both a model of testing processes and a dataset to help clarify what to focus on in future, individual assessments by other organizations.

8.5 DESCRIPTION OF THE TESTING ENVIRONMENT

Given the goals of this particular test, and the presumed information-driven needs of the users, TTAC focused on four primary areas when constructing the testing environment – network emulation, computer platform, product variety, and data collection.

8.5.1 Network Emulation

Emulation of a network–intentionally producing various issues such as latency, bandwidth, and interruptions in the sending of data–is a key part of the testing process for this current assessment. Many organizations will not be interested in emulating a network, opting instead to perform testing on their own real-world networks, though they may be well-served to reconsider the utility of a network emulator if they will be deploying videoconferencing equipment to a wide number of endpoints with significant variations in connectivity. As a key goal of TTAC's

assessment is to explore the impact of various network problems, it was critical that network performance be systematically controlled.

A variety of options exist when "emulating" a network connection. Some products are self-contained appliances that purpose-built for this task. They typically have polished interfaces, support some degree of scripting or automating of emulation functions, and are designed to accurately model a range of network problems. Their primary downside is their cost, which can range from several thousand to tens-of-thousands of dollars.

TTAC opted instead to utilize a software-based solution by installing the Linux-based WanEm product on a VMWare virtual machine on a Dell Optiplex 360 that had been installed with two Gigabit PCI network interface cards (NICs). As the software was free and the PC was already on-hand, the only financial outlay for this configuration was to purchase two NICs at a cost of approximately $30 each.

As seen in the diagram below, the network emulator was placed between the VTC endpoints, allowing the tests to be "throttled down" as needed. This allowed for creation of networks that operated on bandwidth from 128 Kbps to 10 Mbps, latency similar to that found in satellite connections, packet loss as might exist on overloaded networks and poor wireless connections, and jitter that may be introduced by a variety of causes.

It is important to note that the above diagram includes a connection to the public internet. This decision was motivated by the fact that several videoconferencing vendors offered products that were only available via the internet. TTAC decided to utilize an internet connection as a component for all tests in order to reduce the possibility that variations in the network configuration caused variations in the test results across products. This decision to use a public internet connection introduces room for some variability within TTAC test results and also introduced a limititation in the connection speed that could be utilized during the tests. Further testing is likely when a higher-bandwidth connection is established within TTAC labs.

8.5.2 Computer Hardware

Videoconferencing systems increasingly offer software-based endpoints for their products. As such, the focus of this evaluation was on the performance of these products with standard laptops and household routers. The equipment used for the tests included:

-Dell Latitude E6420, wired connection – Intel i5 CPU @ 2.50 / 2.50 GHz, 64-bit Windows 7 OS, 8 GB RAM

-Dell Latitue E7240, wired connection – Intel i7 CPU @ 2.10 / 2.70 GHz, 64-bit Windows 7 OS, 8 GB RAM

-ASUS AC66U Wireless Router (used with a wired connection to the Dell Latitude E7240)

8.5.3 Product Variety

As indicated above, the number of software and hardware products available on the market renders the prospect of testing every product permutation unfeasible in the current test set. The products that will be assessed, chosen as representative of H.264, SVC, and consumer-oriented products consist of the following.

Zoom implements the H.264 standard for video encoding, and includes support for Scaleable Video Coding (SVC). Zoom supports the H.323 standard for establishing calls for an extra fee, which enables it to communicate with other H.323 videoconferencing software and hardware within an organization. Note that the benefits of SVC are not seen when connecting to non-SVC clients and endpoints.

Skype implements the H.264 standard for video encoding, but does not include support for Scaleable Video Coding (SVC). Skype utilizes proprietary protocols for establishing calls, which renders it unable to communicate with other H.323 videoconferencing software and hardware within an organization. Note that the benefits of SVC are not seen when connecting to non-SVC clients and endpoints.

8.5.4 Data Collection

The tests could have been arranged to gather data in numerous ways. As qualitative assessments about the general experience failed to paint a clear picture of the user experience, TTAC opted to record the output from the Dell laptop that was on the test network. The HMDI output of the laptop (1080i, 29.96 fps) was run through the HDMI input on the Odyssey 7Q recorder, which captured the audio coming from the far site in the VTC call and the video as perceived by the laptop on the test network. An additional audio recorder was set up on an Apple MacBook Air with a Jabra PHS001U microphone and QuickTime so as to capture the audio from the near side of the test. The audio and video were later synchronized in Windows Movie Maker.

8.6 VIDEOCONFERENCING – TESTING RESULTS

- All Videos From The Toolkit
- This is a playlist containing every video recorded during the course of TTAC's evaluation. Additional video playlists further down the page include subsets of this larger list of videos.
- All Videos With Packet Loss
- All Videos With Satellite Delay
- All Videos At 128 Kbps Connection

Software Evolution is a term which refers to **the process of developing software initially, then timely updating it for various reasons**, i.e., to add new features or to remove obsolete functionalities etc

Laws used for Software Evolution:

1. **Law of continuing change:**

This law states that any software system that represents some real-world reality undergoes continuous change or become progressively less useful in that environment.

2. **Law of increasing complexity:**

As an evolving program changes, its structure becomes more complex unless effective efforts are made to avoid this phenomenon.

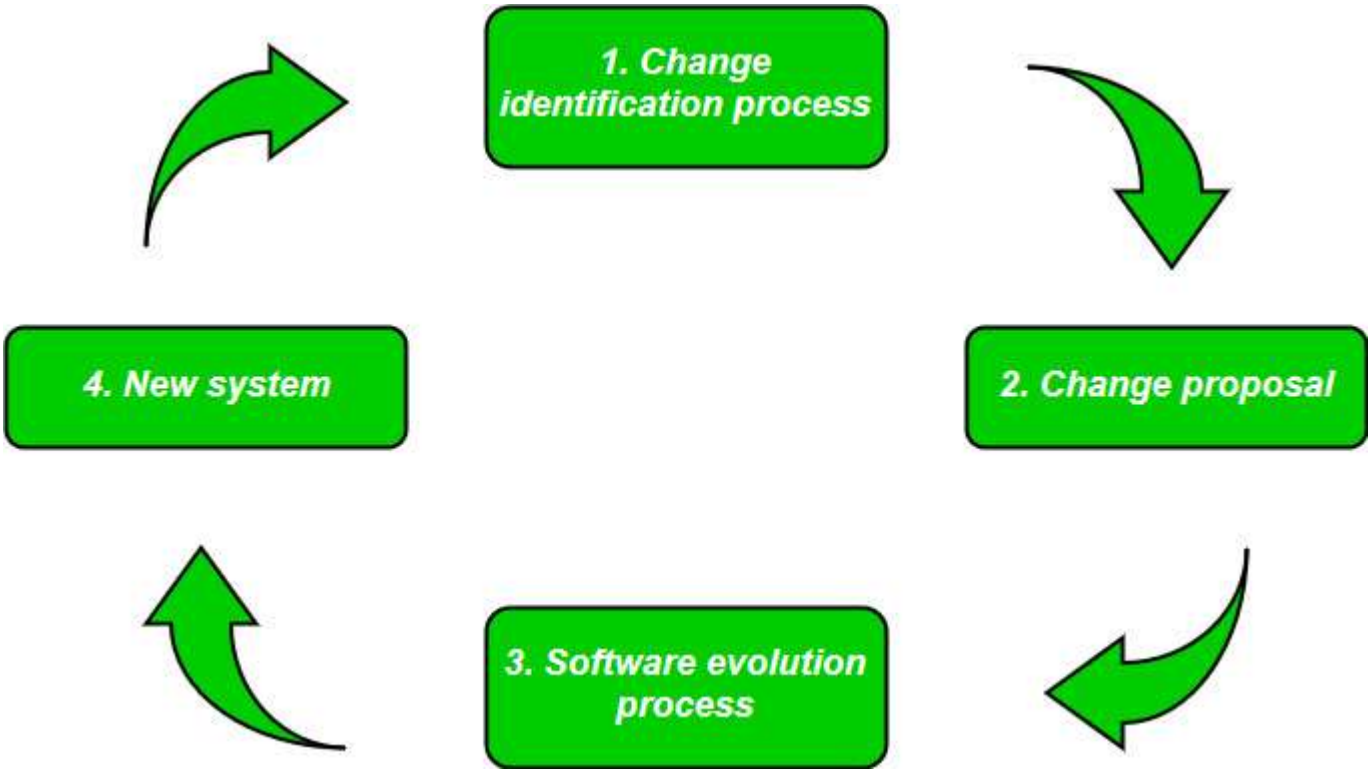

Fig 8.2 Evolution cycle

3. **Law of conservation of organization stability:**

Over the lifetime of a program, the rate of development of that program is approximately constant and independent of the resource devoted to system development.

4. **Law of conservation of familiarity:**

This law states that during the active lifetime of the program, changes made in the successive release are almost constant.

CHAPTER 9

PROJECT SNAPSHOTS

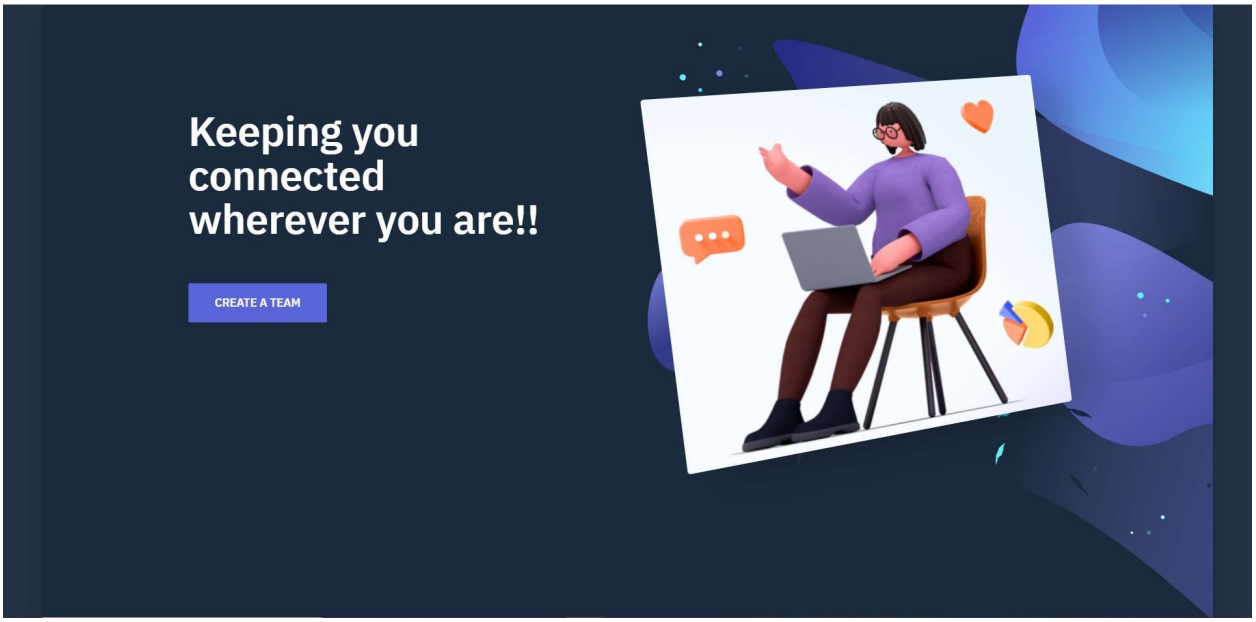

Fig 9.1 Home page

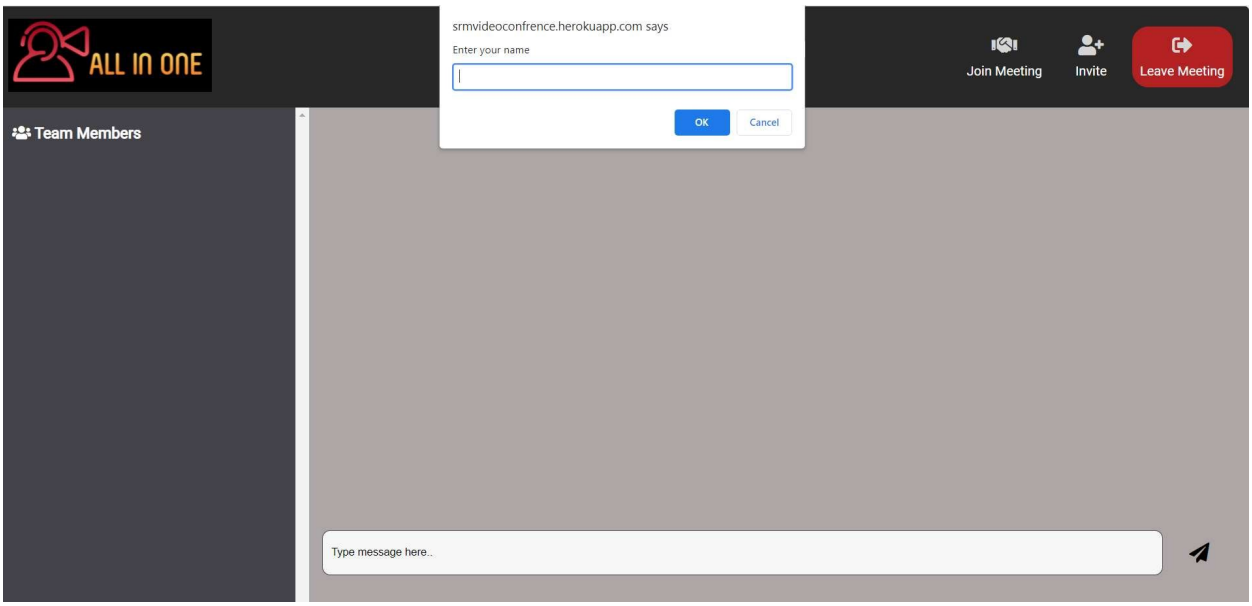

Fig 9.2 Add Participants

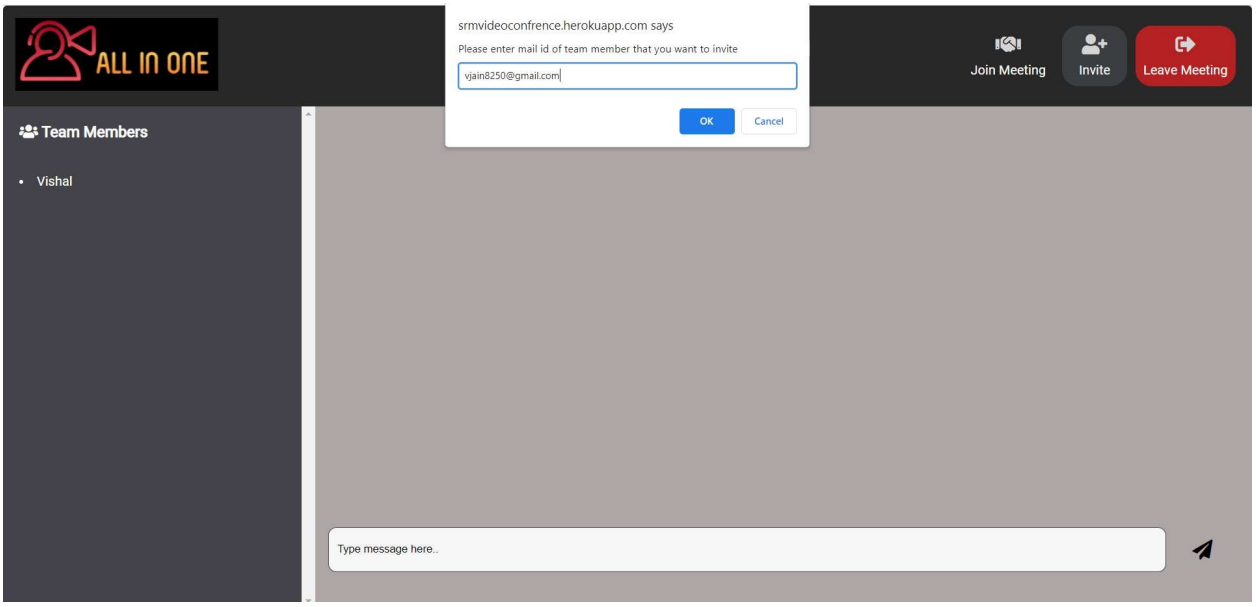

Fig 9.3 Invite user through email

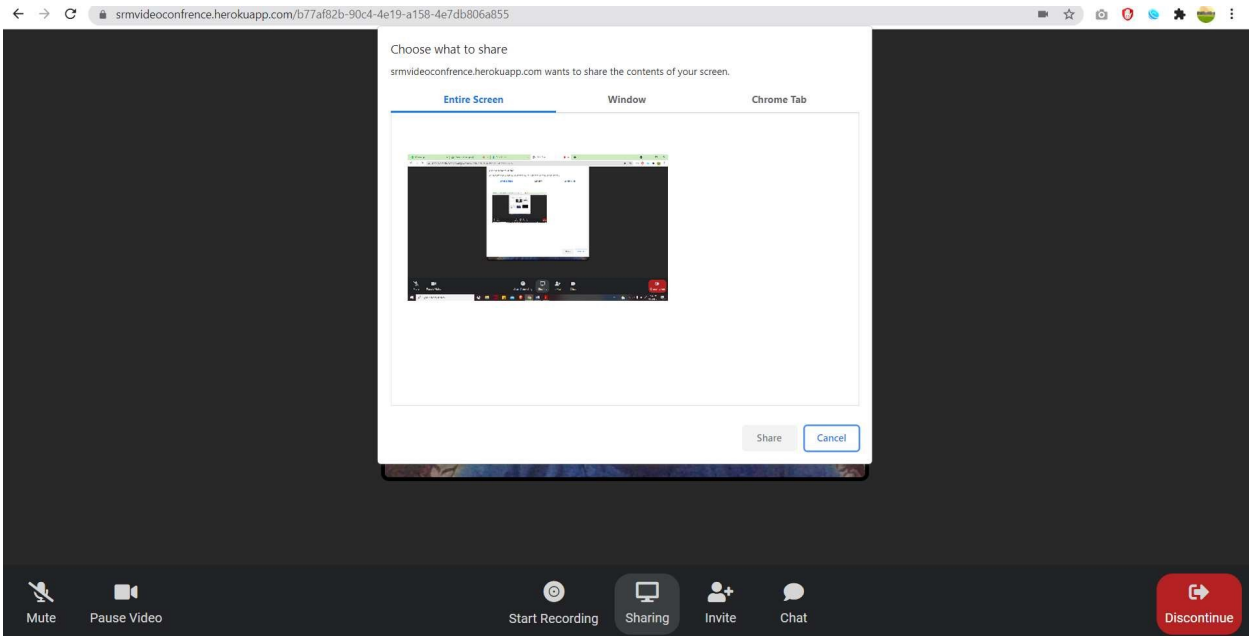

Fig 9.4 Screen share

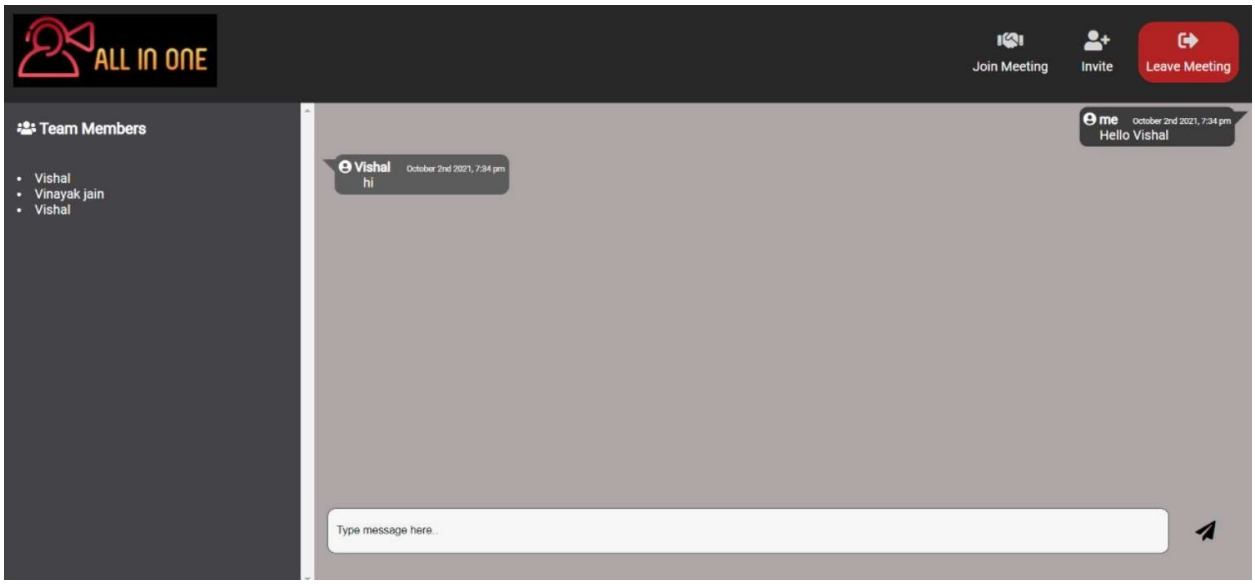

Fig 9.5 Chat feature

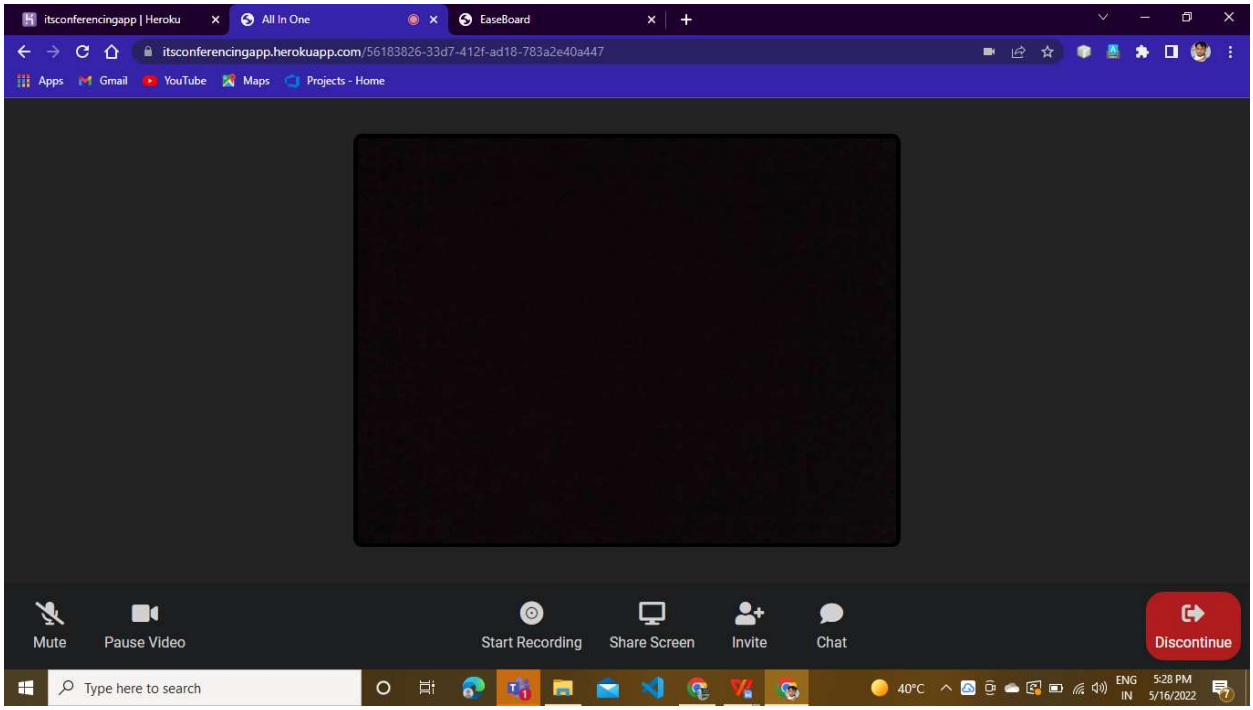

Fig 9.6 Share screen

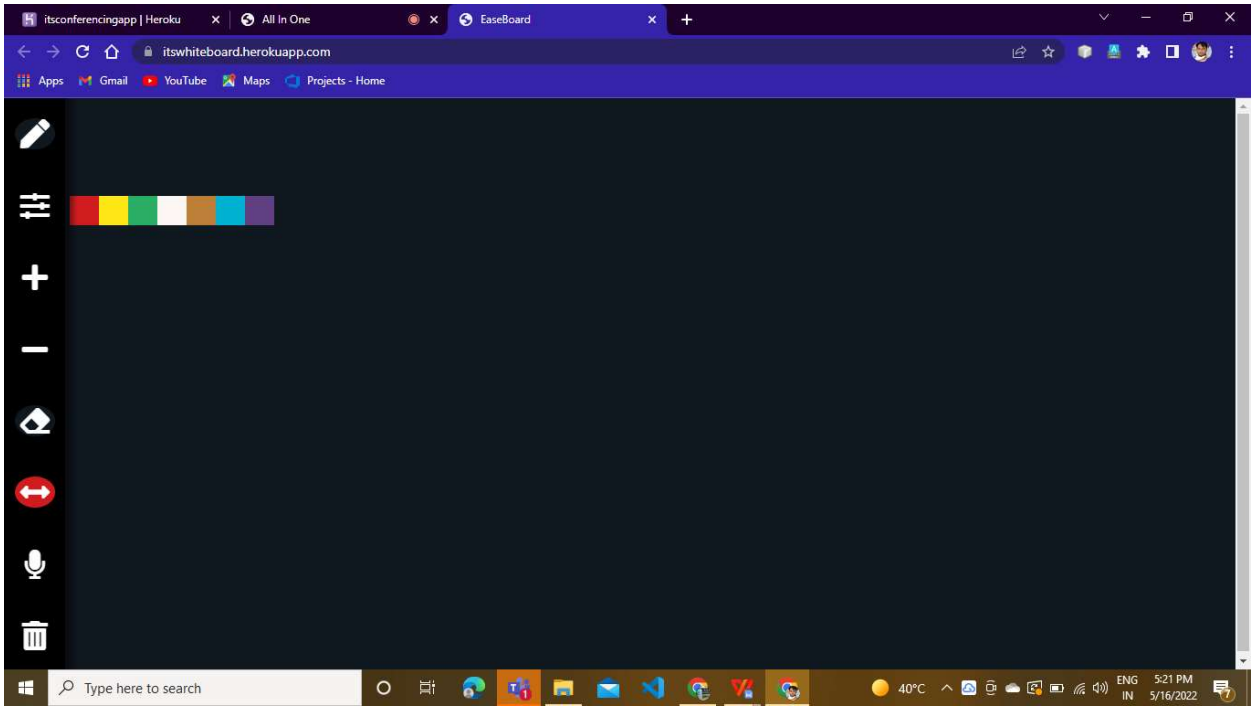

Fig 9.7 Writing pad with multiple color

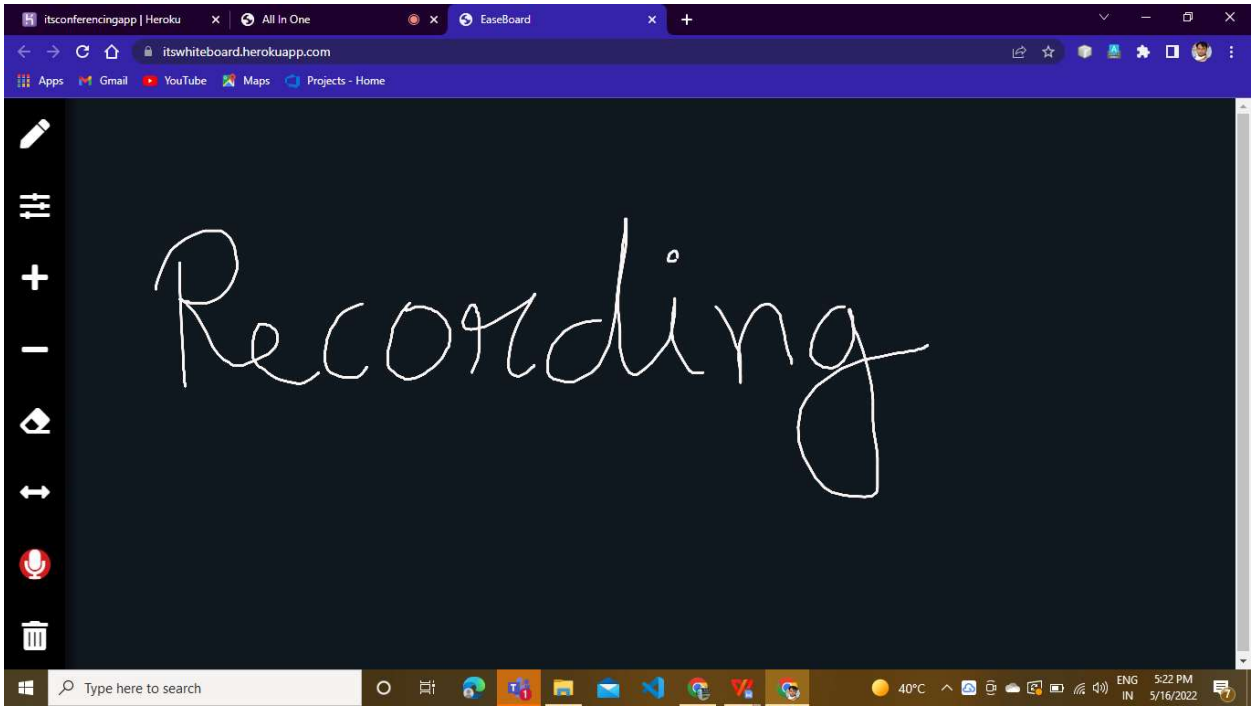

Fig 9.8 Recording

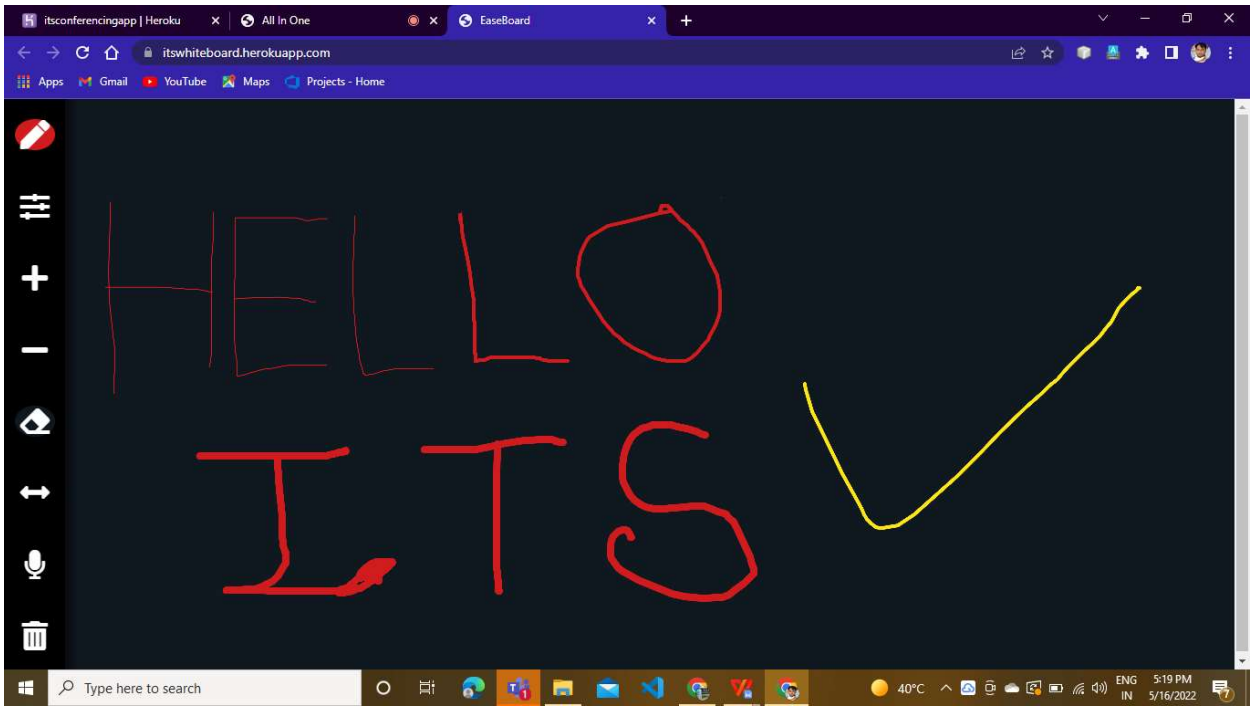

Fig 9.9 Use pen with multiple size

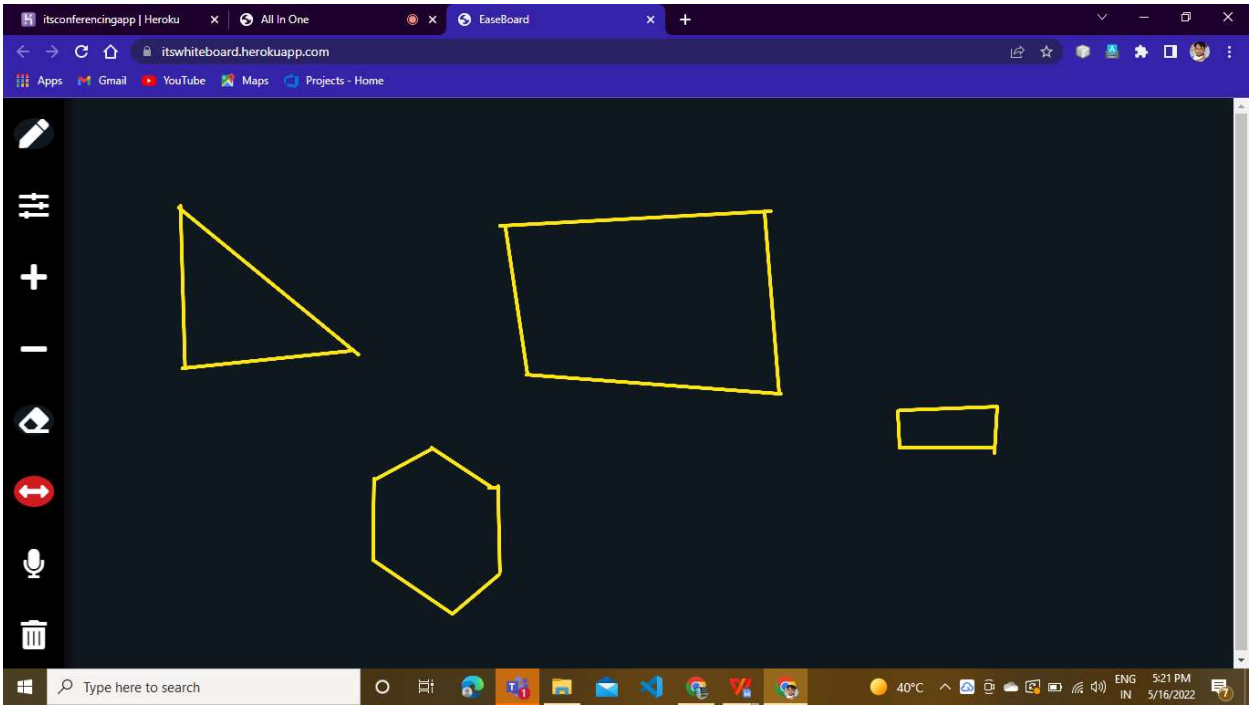

Fig 9.10 Straight line feature

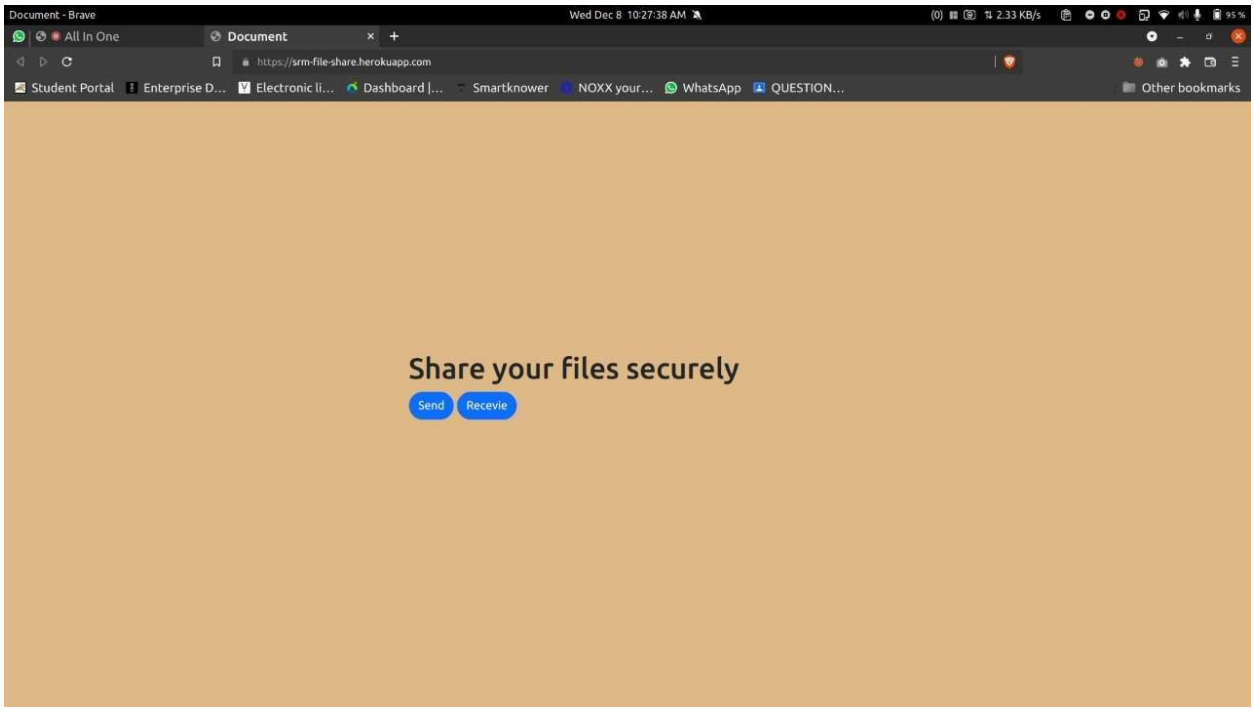

Fig 9.11 File share landing page

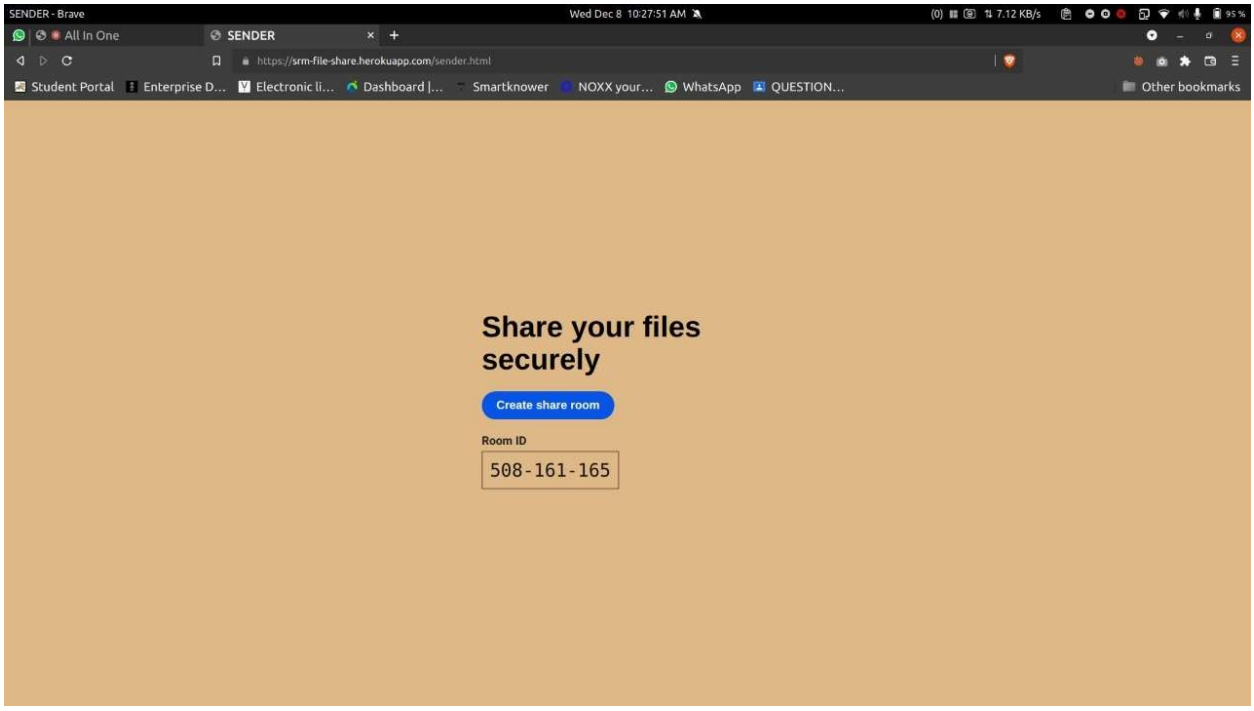

Fig 9.12 Sender send this code for receiver

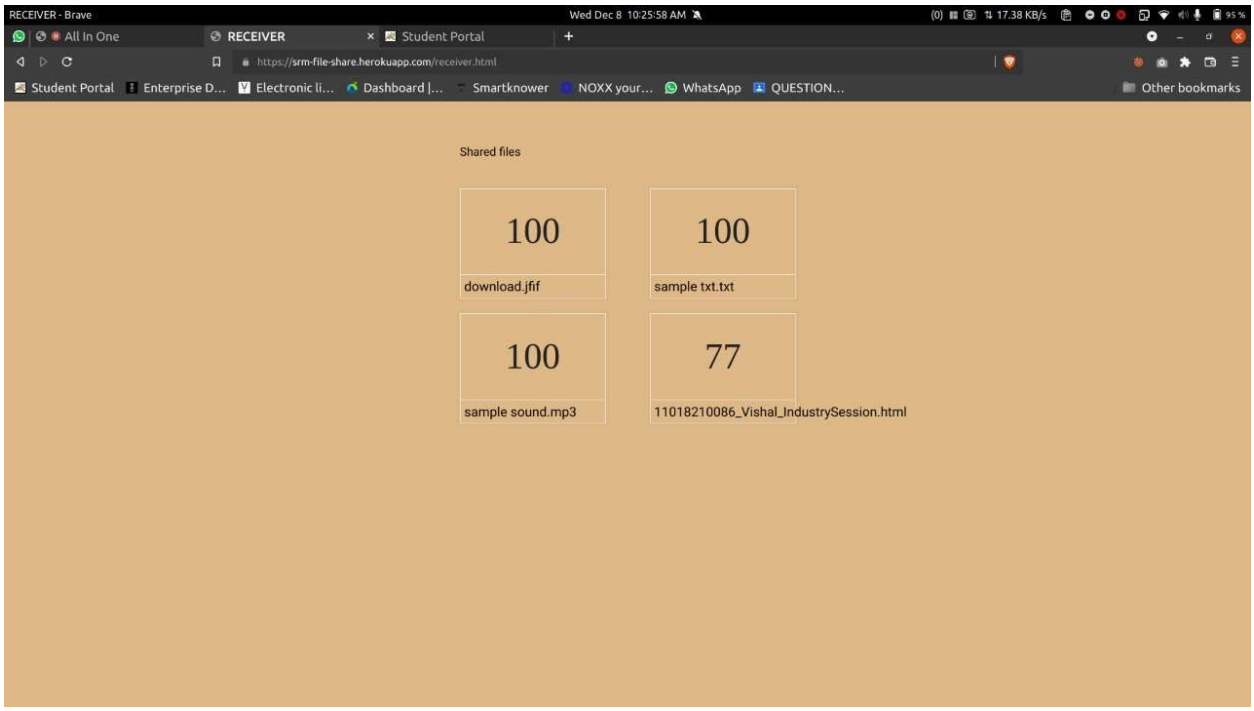

Fig 9.13 File Received

CHAPTER 10
LIMITATION

The following will describe the most influential points of Videoconferencing platforms that contribute to virtual education, such as: Discord, Google Meet, Microsoft Teams, Skype, Zoom. In this survey we have used Google survey dataset of Video Conferencing during covid19.

Zoom: Zoom is a tool used for synchronous online teaching, which allows you to work efficiently. It includes several functions such as: annotation tools, polls, meeting rooms and video and screen sharing. These functions facilitate learning. The most important tools of the Zoom platform will be detailed. It offers innovative learning opportunities and tools, integrating video conferencing and teacher-student communication.

TOOLS	USAGE
Start a meeting	Create a videoconference.
Schedule a meeting	Allows you to schedule a specific day and time for the meeting.
Use of the calendar	Gives the option to use Google calendar, to receive notifications of meetings already scheduled.
Screen sharing	Allows all participants to have the option to choose what to share with other meeting partic ipants
Virtual whiteboard	Allows you to draw, write or carry out explana tions in an easier way.
Chat	Participants have the option to interact both di rectly and privately.
Live Broadcasting	It is used to make live broadcasts using applica tions such as Facebook or Youtube.
User management	You have the option to enable and disable the audio and video of the participants, as well as manage which user enters the meeting.

Table 10.1 Tools and usage

We continue with Table below, the advantages and disadvantages of this virtual meeting platform will be detailed.

Advantages	Disadvantages
The pc version and mobile application has a relatively easy, comfortable and intuitive interface.	Despite being an easy to use tool, it can be confusing for some people who are not adapted to this new technology.
It has a free version	It has a 40 minutes limit for the free version.
Allows screen sharing in real time	As it is a synchronous application the use of internet or a stable connection is important.
No need to be registered to join a meet ing, nor download the application	It collects data and emails from all con nected devices exposing the user.

Table 10.2 Advantages and Disadvantage

Google Meet: Google Meet is a relatively recent application, was launched in April 2020 to all users, free of charge. It was previously known as Hangouts. It is mainly focused on companies and educational centers.

Tool	Use
Create a video call	Allows you to show your screen or the window of an application.
Invite other users to join a meeting	Allows you to record the sessions so that the
Allows you to create the video call, by logging in with your Google account.	student has all the information at hand.
Chat	Participants have the option to interact both di rectly and privately.
Screen sharing	Controls for hosts
Screen Recording	Users can interact by sharing files and views.

Table 10.3 Tool and use

We continue with Table below, the advantages and disadvantages of this virtual meeting platform will be detailed.

Advantage	Disadvantage
Allows you to create meetings with more than 200 participants	60 minutes limit for the free version.
Facilitates real-time captioning during conversation	Has few mechanisms to control user audio.
It has a simple and deductible interface	Each participant registered or have a google account.
The security of the videoconference is guaranteed due to the encryption of the transmissions	it is a synchronous application, this means that the internet connection is indispensable.

Table 10.4 Advantages and disadvantages

Skype: Like the other virtual meeting platforms, this one offers its services at zero prices, i.e. free of charge, so that people can meet at a distance. Despite being an offshoot of Microsoft's own.

HERRAMIENTA	USO
Speed per calls	24kbps/128kbps.
Courier writing	Unlimited for ongoing call.
Call recording	If in case the guests want to see the show again.
Shared screen	It has the ability to transmit live presentations from the phone or computer.

Table 10.5 Herramienta and USO

We continue with Table below, the advantages and disadvantages of this virtual meeting platform will be detailed.

Advantages	Disadvantages
Skype has accessibility for the different Operating Sys tems such as: Windows, Mac, Linux, Android, iOS.	It is not used mainly for academic meetings, both university and school.
Advanced Encryption Stan dard Security	Sometimes during video call, video and audio quality tends to drop, which is annoying for users.
It has the capacity of 50 people connected in real time.	If the time limit exceeds, the video transmission is cut off, however, the call continues as audio.

Table 10.6 Advantages and disadvantages

Microsoft Teams: This virtual meeting platform is also used by hundreds of students nationwide, launched since 2017 becoming better known by the education sector since the year 2019, as well as providing a good integrated teaching and learning space.

Tools	Use
Messenger service	Ability to communicate personally with one of the members.
Time limit	The platform can be used between users for 24 hours at a time.
Time	Shows the time spent inside the room..
Setting	Shows other options available to the application, such as: audio distribution.
Leave	By pressing that option, the member can exit the live session.
Reactions	Interaction of members, such as: raising your hand to give your opinion, then the host will respond to your request.

Table 10.7 Tools and usage

We continue with Table below, the advantages and disadvantages of this virtual meeting platform will be detailed.

Advantages	Disadvantages
PKI security Protect data used to encrypt transport layer connections.	It has a paid version for the full use of its services.
Has resources at the time of live meetings	It does not allow more than 300 users working simultaneously.
It has a free plan, however, it restricts some tools.	A large percentage of users do not feel con formism with the tools, that is, difficult adaptabil ity without prior training.
Your files are stored in the cloud. (Drive)	Requires the mandatory use of the internet.

Table 10.8 Advantages and disadvantages

10.1 ADAVANTAGE

- **It's More Engaging than Audio Conferencing**

Participants in audio conferences tend to zone out and multitask because they feel disconnected from the other members in the meeting. With video, however, there's pressure to maintain "virtual eye contact", translating to superior levels of engagement.

When each conference member is visible, you're inclined to use the communication skills we've all practiced in face-to-face conversations.

- **It's Efficient**

Reduced commuting time is one of the most obvious but significant benefits of video conferencing. In-person meetings with suppliers, clients and satellite offices can take up valuable hours of your day; even an hour-long meeting can quickly eat up an entire morning when accounting for travel time, making it a frustrating and inefficient activity.

- **It Saves on Travel Money**

Not only is travel time-consuming, but it's also expensive. People often travel great distances for training, conferences and business meetings, and in most cases, these in-person communications can be accomplished via video conferencing. Save the money you would spend on business travel and put it toward other business priorities.

- **It Improves Communication**

Research has shown that humans process visual information more quickly and accurately than text and audio. Therefore, when you have a meeting via video conferencing, your attendees will retain more information and comprehend it more effectively than they would if you held the meeting via audio.

- **It Connects Teams**

Teams are becoming increasingly geographically separated for several reasons. Freelancers and even permanent staff may be working from home, some are contractors working from other continents, and some are simply on the road for business purposes. But vast distances don't matter when you can bring your team together via video conferencing, either for regular meetings or spur-of-themoment check-ups.

- **It Improves Productivity**

Need a quick answer to a tricky question? Instead of sending an email to your colleague and hoping for an answer tomorrow, connect for a quick video conference conversation and use a screen-share function to move on with your project.

- **It Improves Attendance**

It's often challenging to coordinate busy schedules and bring staff together for inperson meetings. Video conferencing allows the kind of flexibility that can boost meeting attendance rates, and record the discussion for non-attendees.

10.2 DISADVANTAGE

- Security can be compromised as a private video conferencing session may get hacked(Alan, 2009).
- Personal contact with each other does not exist unlike traditional meetings.
- For meetings, video conferencing is more effective if the participants already know each other. (Rop&Bett, 2012)
- Lack of interaction between the organizer and the attendees or between the attendees themselves. Technology can degrade received images and sound.
- Body language may be lost if image movement is jerky. Voice delays can occur due to Internet or technical errors.

CHAPTER 11

FUTURE SCOPE

Transparency Market Research predicts that by 2027, the video collaboration market is set to hit a value of $11.56 billion, and the demand for this technology will keep growing. The question is, how will video conferencing evolve and further change the way we work.

Collaboration in mixed-reality is the future

A new age of remote work in pandemic has shown us just how valuable video conferencing can be, not just for working together at a distance, but also for boosting the productivity and efficiency of our teams.

- **Everything is moved to the Cloud**

  Everything is moving towards Cloud and video conferencing is not an exception. No matter if you are scheduling a call with your colleagues or inviting a customer to a demo, you can simply use a video conferencing solution hosted on cloud without any investments in hardware or software infrastructure.

- **SSO (Single Sign-On)**

  With the rise of all-in-one UC solutions, businesses should think about simplifying access to these systems by linking them into a company's Single Sign-On system allowing the employees to access it with the same credentials they already know. So, no matter if you are logging into your softphone application to make a phone call, signing into your messaging tool, or accessing your contact list to initiate a video call.

- **Educational (Academic) Activities**: The situation present during the lockdown has affected the breakdown in teaching-learning activity, academic meeting, examination etc., almost all the examinations were cancelled due to the lockdown. In India, all academicians have started upgrading themselves for online connectivity with students for the purpose of teaching learning. Video conferencing platforms help a lot in carrying out these activities smoothly. Teachers of all levels, whether schools or colleges, have started using applications such as Zoom, Google Meet, Cisco WebEx, etc. for learning teaching activity.

- **Continuing to Work**: With lockdown, video communication has become an important part of technology in a work capacity, to get many people out of the office. Many teams are now using cloudbased services such as Cisco WebEx, Microsoft Teams, Zoom, Google Hangouts, etc.
- **Commercial communication:** During the state of this epidemic, the business is running smoothly and is also taking care of its employees. The video conferencing platform helped in achieving smooth communication at all levels using various software. The business communications such as product demonstration to customers, leading team performance, top level management meeting etc.
- **HR Process:** The cost savings may allow more candidates to be interviewed from remote locations. With data sharing, CVs can be viewed and discussed online. Companies have taken the growing global health crisis very seriously and are concerned about the health of their employees and until it is a public health emergency, corporate move their entire recruitment strategy, training, staff orientation, etc. to virtual platforms are doing.
- **Healthcare**: Video conferencing platforms have played an important role in healthcare communication during this epidemic lockdown which is also a demand of the situation. Some activities such as healthcare education, health care delivery, healthcare management, screening of diseases, information and awareness about diseases, prevention of measures, etc. have become possible due to video conferencing platforms
- **Government Communication** During this epidemic lockdown, the role of the government should be associated with the authorities of every central or state. The government conducts video conferences to communicate with each other about how to deal with the situation, control measures, steps for unlocking lockdown, etc., where they feel a personal touch with each other and for the welfare of the country Worked smoothly.
- **Friends and Family Talks:** One of the biggest things we have noticed recently is how family and friends maintain contact with the help of video meeting platforms and apps. Through video calls across the many platforms available, grandparents have been able to chat with their grandchildren, families living in divided families have been able to maintain a degree of togetherness, and friends can talk, have been able to play games and connect with each other.

CONCLUSION

Overall, video conferencing platforms provide the easiest way of contact with each other where everyone can interact face-to-face. The role of video conferencing platforms during the COVID19 lockdown has become the most widely used means of communication in various fields such as educational, business and commercial, healthcare, conference, human resources, friends and family, etc. The lockdown has transformed the face of communication from a face-to-face personal touch into a virtual platform. However, this platform has some disadvantages, but it also offers various benefits that make it a good means of communication during lockdown. With the progress and ease of availability of high-speed and cheap Internet connections, it is expected that videoconferencing will become increasingly popular, leading to greater interest and use for various purposes.

The video conferencing platform offers various benefits such as cost reduction in travel, no physical space for human gathering, reduction in cost of electricity, other maintenance cost reduction, etc., also indicates that demand for it will increase in the future. Because every business organization wants to use optimum resources to increase its efficiencyPrior to the lockdown, everyone had a teleconference call to talk to each other, as human personal interactions were present there. Due to the lack of personal interaction during this lockdown, they started using video conferencing services, which allows participants to communicate at multiple levels beyond a traditional phone call. Through looking at facial expressions and body language, participants are able to experience various non-verbal cues, often making up 93 percent of standard communication. Through virtual reality, participants can have even more virtual meetings in the future.

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