

Wilcom: Application for Interacting via Voice, Video and Text at Zero Cost in a Wi-Fi Cloud

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Abstract—Wireless Communication has become a part of our daily routine. Wireless devices like mobile phones or portable digital displays (PDAs), Laptops need something other than internet for communication. The paper gives an overview to communicate using Wi-Fi networks, the internet and bypass mobile tariff for such applications.

Index Terms—Video streaming, audio streaming, text streaming.

I. INTRODUCTION

A wireless local area network (WLAN) links two or more devices using some wireless distribution method, and usually provides a connection through an access point to the wider internet. This gives users the mobility to move around within a local coverage area and still be connected to the network.

Wireless LANs have become popular in the home due to ease of installation, and the increasing popularity of computers. Public businesses such as coffee shops and malls have begun to offer wireless access to their customers; sometimes for free. Large wireless network projects are being put up in many major cities.

Peer-to-peer: An ad-hoc network is a network where stations communicate only peer to peer (P2P). There is no base and no one gives permission to talk. This is accomplished using the Independent Basic Service Set (IBSS).

A peer-to-peer (P2P) network allows wireless devices to directly communicate with each other. Wireless devices within range of each other can discover and communicate directly without involving central access points. This method is typically used by two computers so that they can connect to each other to form a network.

If a signal strength meter is used in this situation, it may not read the strength accurately and can be misleading, because it registers the strength of the strongest signal, which may be the closest computer.

II. RELATED WORK

The project is based on wireless communication developed for PCs. It delivers the comfort of broadcasting themselves

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without the need of internet anytime. The idea uses interaction with anyone at ZERO cost. Each device is allocated a separate IP Address in order to communicate. Each device pings others IP address at regular interval to maintain wireless network. LAN connections is made using TCP class (Transmission Control Protocol). For sending message port number 1550 has been used and for sending call request 1450 has been used. These ports can be changed if desired

Tasks fully accomplished:

- Capturing video from a laptop's webcam and Handheld's VGA camera.
- Capturing audio from microphone.
- Voice, video, Text streaming from one device to another via wireless network.

Tasks to be accomplished:

- Capturing video from a laptop's webcam and Handheld's VGA camera.
- Capturing audio from microphone of laptop.
- Stream video, audio, text from one device to another via wireless network on laptops.

III. APPLICATION DEVELOPMENT

A. System Requirements

- The wireless network must have enough bandwidth so that it supports this kind of communication.
- Both the clients must have .NET framework installed on their machines.
- Both the systems must have windows operating system installed.
- Communication might be hindered due to incompatibility between Network Interface Card.
- The handheld must be Wi-Fi enabled.

B. Application Architecture

Flow charts:

- Creating connection among clients.

In order to establish connection between clients, one of the clients need to provide an IP Address of the other client to whom he wants to connect. Before establishing a proper connection, the system will ping to that particular IP (provided above) and will wait for the approval of request from the other client. If the request is accepted, proper connection is made. If not then process is terminated. If the specified IP Address is not present on that network then the client will wait until timeout.

The above flowchart displays the basic idea of connection creation.

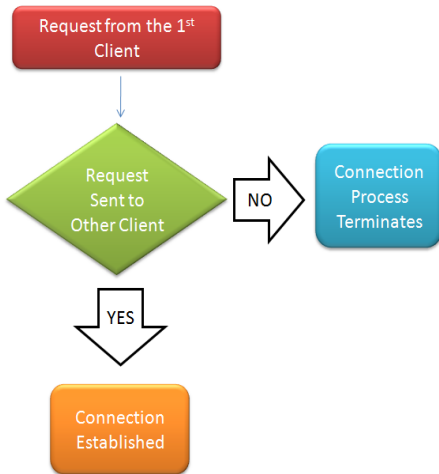


Fig. 1. Creating connection among clients.

- Flow of Data after connection gets establish.

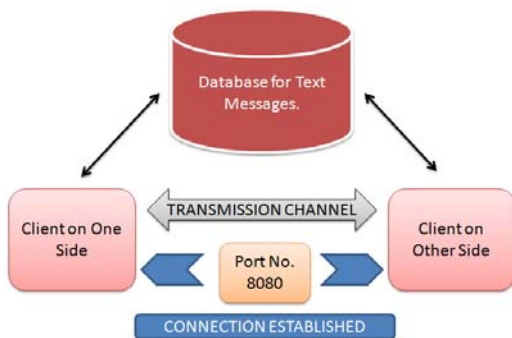


Fig. 2. Flow of data after connection gets establish.

The above figure displays the basic idea of the working of communication channel.

The communication channel used may be of wired or wireless in nature. The channel can transmit video/audio in the following formats:

- 3GPP
- WAV
- AMR
- MP3

XML file has been used in the form of database for storing text messages from both the clients, thus a shared database exist for both the clients.

- Data inputs from the sender side for transmission

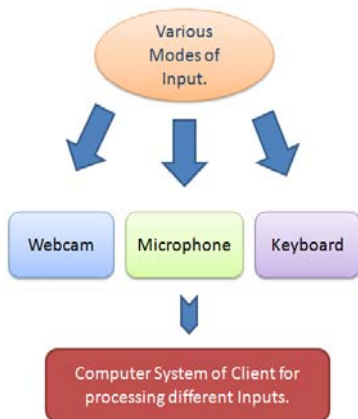


Fig. 3. Data inputs from the sender side for transmission.

The above figure displays different modes of inputs and their processing.

The different modes of input can be webcam, microphone and keyboard which provide data for the transmission processes to the computer system of client. This computer system process data and makes it in a format that is supported by transmission channel. Then the information is send over to the channel to the other client

Implementation Diagram:

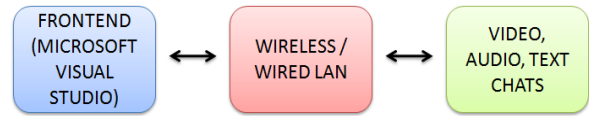


Fig. 4. Implementation.

The above figure displays an overview of the implementation.

The application uses Microsoft Visual Studio for the development of the frontend (interface) for video conferencing and uses XML files and transmission channel as backend.

Host Side:

- Host comes with the following events:
- On Connection()
- Lost Connection()
- errEncounter(ByVal ex As System.Exception)

The OnConnection and LostConnection events are raised when a connection was created or a connection is lost, respectively.

errEncounter is raised when an error occurs.

On the host side, application will start listening to any incoming connection, so it would use following method:

- Webcam.StartListening(): Opens the connection to accept clients.

When the application is closed, it should close all the Listening threads by using the following method:

- Webcam.StopListening(): Closes the connection and does not accept clients.

Client Side:

The client comes with the following events:

- Connected()
- Disconnected()
- errEncounter(ByVal ex As System.Exception)

The Connected event is called when a connection is successfully made.

Disconnected event is raised when a disconnection occurs [1].

errEncounter is raised when an error occurs [2].

- On the client side application will first connect the capture source (camera).

On acceptance Form_Load event handler will do the following:

- Webcam.Connect(IP Address): Connect to the host.
- Webcam.StartCamera(): Starts the camera to capture the video stream.

Disconnect:

First disconnect then stop the camera by initiating the following method [3]:

- Webcam.Disconnect(): Disconnects any open connection.
- Webcam.StopCamera(): Stops the camera capture.

Snapshots

Webcam Streaming:



Fig. 5. Implementation.

The above snapshot describes the webcam chat between two clients.

- Video streaming refers to the technique of sending images at some rate (say 24 frames per second).
- The main purpose of streaming is to provide user a sense as if he is watching some live video.
- For streaming a video, application need some predefined library function for converting the video to set of frames.
- Then the frame rate is set to the value specified by the user.
- So as the user enters the IP address of the person to whom he wants to connect, then a request will be sent to his system and will wait for the connection to get established.
- It would work better if done over a wired LAN than a wireless LAN.
- Once the connection gets establish, the client on the other side will get a message “Connection Received”.
- Both the clients will be able to see each other on their individual screen.

Dialing to an IP Address (Sender side):

- In the “call to” section we write the IP address of the person to which we want to chat.
- After the “call” button is pressed a request is sent to the person to whom we want to connect asking him to accept or decline the call.
- Once the connection is accepted by the other person, connection gets established

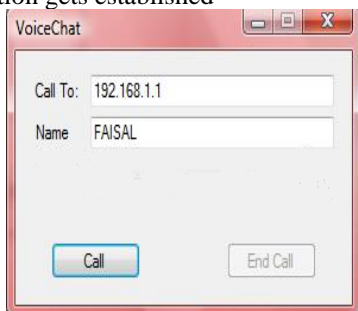


Fig. 6. Interface for starting voice chat.

The above snapshot displays an interface that is used for starting a voice chat between the two clients.

Receiver side:



Fig. 7. Incoming voice call request.

The above snapshot displays the interface used to accept or reject a call request.

- When the user accepts the request then, microphone gets activated automatically.
- Hence the systems are ready to have voice chat.
- The threads utilized can be run independently of each other, thus if one thread blocks, it will not block other threads.
- So, the webcam and microphone can be used from the same application without each other intervention.

Text chat:

- The text chats gets stored in the database in the form of XML files.
- To retrieve the messages stored in XML file a timer is set which extract the data by traversing each node of XML file.
- This Timer ticks every 1 second so that there is no communication delay.
- Also at most 15 messages can be stores in an Xml file so as to avoid over filling of messages.

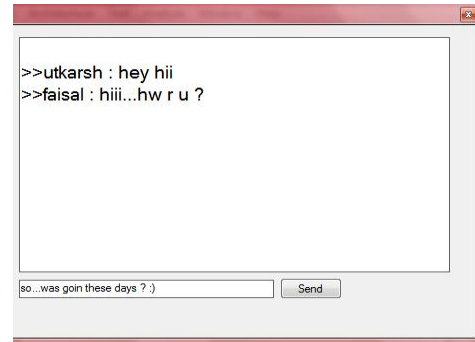


Fig. 8. Text Chat.

The snapshot displays an interface used for having text chat.

Overall Communication:



Fig. 9. Overall Communication.

The above picture shows the overall communication among the two clients. The interface shown above is simple and easy to use.

C. Technologies

- Wired LAN or Wireless LAN.
- The IP Addressing used for this application should be one of the following:
- 10.*.*.*
 - 172.*.*.*
 - 192.*.*.*
 - Supports IEEE 802.11g/n/above.

Software Technologies Used:

- Active X: this technology is a control which allows you to drag and drop it to your form like any other control including the host and the client method in the same control.
- Client and Host, including some advanced methods for advanced users.
- The main concept of this library is that the client that is connected to the image source (camera) sends the frame to the host (serializes the frame and then send it).
- The host deserializes the image and updates the picture box/control. (Receiver screen) [4] , [5].

ActiveX comes with the following events:

- OnFrameDraw
- Connected()
- Disconnected()
- OnConnection()
- LostConnection()

IV. DISCUSSION

Based on the tests that measure the system performance, the system has some strong and weak features:

- The system built is portable and can run on any mobile phone that supports J2ME.
- The system can run on mobiles that have a built in GPS Receiver.
- On the mobile side, the application size is small because all user lists and other data are stored on the server.
- GPS does not work indoor. This problem was solved by always storing the last location updated by the application.

The system provides the user with the member time of update whenever a friend location is requested. This will help the user to know whether the location is recently updated or not.

V. CONCLUSION AND FUTURE WORK

This work was successfully completed over wireless enabled devices and wired LAN or where ever the network is supported using TCP/IP.

Future extensions:

- The application can be developed for Windows Mobile as well.
- The application can be made compatible to work on operating systems other than Windows for laptops and Symbian for Handhelds.
- Presently, the application uses less efficient compression techniques for voice, video streaming.
- Better compressions can be used for sending Video, voice over long distances.

For example:

- H.264 → YouTube video transmission.
- H.264→In video recording for Sony and
- Panasonic mobiles, digital video broadcasting.
- H.264→ Real time streaming.

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Utkarsh Goel is expected to graduate with a Bachelor of Technology in Computer Engineering in June 2012 from the Aligarh Muslim University. He has been actively involved in a number of projects and services deployed in the Research & Development Cell at the faculty of Engineering & Technology, Aligarh Muslim University. Apart from receiving the Nurul Hasan Education and Research Foundation Scholarship for the session 2011-2012 and receiving a Certificate of Merit from Central Board of Secondary Education, India, he was also awarded the Sir Syed Excellence in Science Award by the Aligarh Alumni Association of New England, USA. He participated in international and national events, presented papers at reputed conferences. As a result of which, his research was published at the IEEE Xplore and the ELSEVIER. He was also selected to be a campus representative by the Opera Software ASA and the Mozilla Corporation.



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