

# Videoconferencing System using Open Source Technologies

Narendra Kohli  
Electrical Engineering department  
Indian Institute of technology  
Kanpur, India

Nishchal K. Verma  
Electrical Engineering department  
Indian Institute of technology  
Kanpur, India

## ABSTRACT

This paper describes a Videoconferencing System using Open Source Technologies for the hospital systems connected through internet. There may be a situation where patient is present in a rural hospital where sufficient expert doctors are not available. To handle such situations, doctor present in the remote hospital may need to contact an expert to take his advice for better treatment of the patient. This paper discusses the use of graphical user interface for Low Cost Videoconferencing System to provide communication in situations. For our conceptual Videoconferencing Platform, we have developed the features like live audio video, text chat, video recording, user management and quality control. Videoconferencing modules have been carried out using open source technologies like Red5, XML and other languages like Action Scripting, Adobe Flash CS3 and J2EE.

## Keywords

Red5, Videoconferencing System, Open Source Technologies, Graphical User Interface, XML, J2EE .

## 1. INTRODUCTION

Telemedicine is the use of telecommunication and information technologies in order to provide clinical health care at a distance [8]. It helps eliminate distance barriers and can improve access to medical services that would often not be consistently available in distant rural communities. It is also used to save the life of the patients' in emergency situations. It may be as simple as two health professionals discussing medical problems of a patient and seeking advice over a simple telephone to as complex as transmission of electronic medical records of clinical information, diagnostic tests such as E.C.G., radiological images etc. and carrying out real time interactive medical video conference with the help of IT based hardware and software. Telemedicine is a very exciting field worldwide. India has large number population and a major percentage of which live in the remote rural areas. However, best-equipped hospitals and expert doctors are mostly present in the urban cities. The people living in remote rural and poorer areas have limited access to basic healthcare. Geographic isolation, the non-availability of doctors and hospitals and problems in traveling to places where such medical facilities are available are among the factors which affect this access.

Governments at national, state and local levels have been making efforts to provide health-care in these remote rural areas. Establishment of an Internet-based telemedicine system would be most useful in achieving the aim of the government in bringing healthcare facilities to these remote and poorer areas. This will improve the quality of healthcare in rural and outlying areas, lower the cost of delivering healthcare and give remotely

placed physicians the opportunity to consult over any patients' case.

This paper is organized into five sections. Section II describes the open source and other software components. Section III describes the Videoconferencing System. Working snapshots of the developed Videoconferencing System has been discussed in section IV. Section V describes the conclusion and future work.

## 2. OPEN SOURCE AND OTHER SOFTWARE COMPONENTS

We have made the videoconferencing platform using Red5, open source application and other applications such as Action Scripting, Adobe Flash CS3, J2EE and XML. We have used Red5, Action Scripting and Adobe Flash CS3 for user graphical interface applications and J2EE and XML for recording

**Red5:** Red5 is a free, open source software package written in the java programming language. Its purpose is to support communication between Adobe flash applications. It has support for live stream publishing, audio and video streaming, object sharing as well as the recording of streams. Using Red5 we can make a working prototype videoconferencing application that works in the web browser. Red5 also support for user to broad a video stream live from a webcam for other users to view immediately or for the server to record for users to view later. Red5 supports RTMP (Real Time Messaging Protocol), a communication protocol developed by Adobe Systems for streaming audio, video and data over the internet between a flash player and a flash media server (FMS) [9].

Red5 server comes with a suite of server-side and client-side demo applications. This includes the OFLA (Online Open Source Flash Conference) application. We have utilized the source code two client side applications (Publisher and Recorder) to create our browse- side component for display our video streams. This component builds and displays a grid of webcam videos amongst users during a videoconference. This application can also record the video for archival. Red5 flash media server is an open source and free. It offers same functionality as Adobe Flash Server. It is hosted on Google code and contained J2EE container and can host JSP and PHP pages. It also supports multiuser chat, live streaming and client steam recording. [1, 2]

In Red5, we have used to develop browser based videoconferencing application. Here client uses Adobe Flash Player for capturing video and audio from players continuously media clips from web server.

**Important Protocols of Red 5:** We have used following two protocols for Videoconferencing System:

1. Action Message Format (AMF): It is a proprietary data format created by Adobe Systems and used by different mediums i.e. Flash Remoting, ByteArray, IExternalizable, NetConnection, NetStream, LocalConnection, Shared Objects etc.
2. Real Time Messaging Protocol (RTMP): It is a proprietary protocol developed by Adobe Systems for streaming audio, video and data over the Internet, between a flash players and a server. The RTMP protocol has three variations
  - a) The plain protocol which works on top of TCP and uses port number 1935.
  - b) RTMPT which is encapsulated within Hyper Text Transfer Protocol (HTTP) requests to traverse firewalls.
  - c) RTMPS which works just like RTMPT, but over a secure HTTPS connection.

#### Ports used by RED5:

rtmp.host-port = 0:0:0:0 : 1935  
 debug-proxy.host-port = 0:0:0:0 : 1936  
 proxy-forward.host-port = 127:0:0:1 : 1935  
 rtmpt.host-port = 127:0:0:1 : 1945  
 http.host = 0:0:0:0  
 http.port = 5080  
 rtmpt.host = 0:0:0:0  
 rtmpt.port = 8088

**Action Script:** It is object oriented programming language for Adobe Flash Player run time environment. Its code is compiled in byte code format. It is giving very good performance for streaming as compared to java. It is supported by all browser and server. It is easily integrated with XML event driven programming model support [6].

**Adobe Flash CS3:** It is a multimedia platform used to add animation, video and interactivity to web pages [5].

**J2EE:** It is a widely used platform for server programming in the java programming language [10].

**Extensible Markup Language (XML):** It is a set of rules for encoding documents in a machine readable form [7].

### 3. VIDEOCONFERENCING SYSTEM

A typical Videoconferencing System has the following:

1. Live Audio/Video: The live audio/video tool supports multiple video displays, showing the video streams from the cameras focused respectively on the doctors and patients.
2. Text Chat: Text chat facilitates chatting amongst expert doctors and doctor sitting at remote place.
3. Video Recording: This provides the ability to automatically record and save all videos to a central archive, where doctors can access them conveniently for review purposes afterwards.

Total four modules have been developed for the Videoconferencing system

1. Audio/Video Message Compression Module: This module is for controlling the quality of images and audio, and capturing the video and relaying it at the receiver's end. It deals with the transmission in the form of streams and frames.
2. File Sharing and Recording Module: This module facilitates the users to share files and record their video/audio conferencing and text chatting through internet.

3. User Management Module: This module is for authentication and identification of registered users. It also facilitates joining the user groups for audio/video conferencing.

4. Quality Control Module: This module is for controlling the quality of images and audio and capturing the video and relaying it at the receiver's end. It deals with the transmission in the form of streams and frames.

#### 3.1 Data Flow Diagram (DFD)

Zero and first level dataflow diagrams of the developed Videoconferencing System are as per Figure 1 and 2.

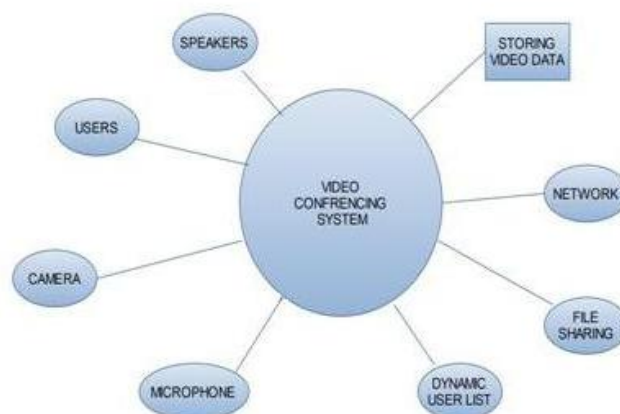


Figure 1: Zero Level DFD

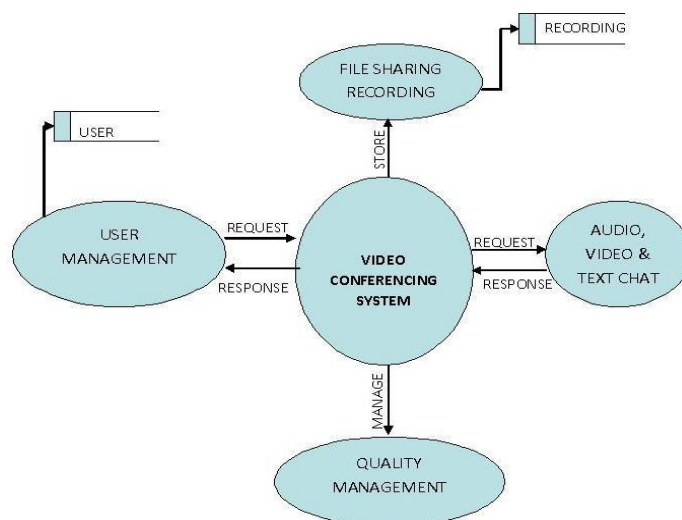


Figure2: First Level DFD

#### 3.2 Work Flow

Figure 3 shows overall working flow of the videoconferencing system. The system has a webcam and a microphone attached to the computer through which input in the form of audio and video respectively is given. This input is given by the users through the user interface. The session of the user is maintained by the session manager. The data is transmitted through the transmitter via network. At the other end, receiver receives the audio and

video which is handled by the audio/video handler. The output is shown through the monitor and the speaker. The graphical user interface is used to interact with application.

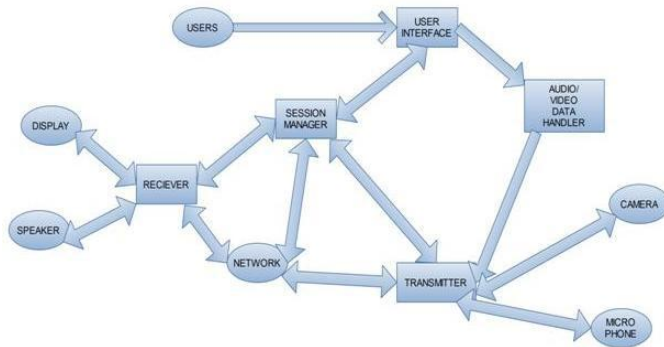


Figure 3: Data Flow in Videoconferencing System

#### 4. WORKING SNAP SHOTS OF VIDEOCONFERENCING USING RED5 AND TEXT CHATTING

Two snap shots of the videoconferencing and text chatting are as shown in Figure 4 and Figure 5 respectively.



Figure 4: Snapshot of the Videoconferencing System at the Sender End



Figure 5: Snapshot of the Videoconferencing System at the Receiver End

#### 5. CONCLUSION AND FUTURE WORK

A Low Cost Videoconferencing System can be developed using Open Source Technologies. It is intended to support consultations among remote patients, rural health workers and experts in the urban areas. For future work, Videoconferencing System with 3G and 4G mobile telephony and virtual reality technologies can be developed.

#### 6. REFERENCES

- [1] Liu Lu and Dong XiaoGuo, 2010. Red5 flash server analysis and video call service implementation. In Proceedings of IEEE symposium on web society, pages 397-400.
- [2] Libing Zou, Huajun Wang, and Sanmei Zhang, 2008. An implementation of jabber in video communication based on Red 5. Journal of Information and Communications, 3.
- [3] [3] Tomcat Apache: The apache software foundation, 2009-11.  
<http://tomcat.apache.org>.
- [4] Herbert Schildt. 2002. Java 2: The Complete Reference, Fifth Edition.
- [5] Adobe Flash Player:  
<http://www.adobe.com/products/flashplayer>
- [6] Flash Actionscripting Tutorials:  
<http://www.tutorialized.com/tutorials/Flash/Actionscripting>.
- [7] XML tutorials: <http://www.w3schools.com/xml/default.asp>.
- [8] Telemedicine in India: [www.telemedindia.org](http://www.telemedindia.org).
- [9] Red5: An open source flash server, 2005.  
<http://www.red5.org>.
- [10] Java 2 platform, enterprise edition (J2EE) overview.  
<http://www.java.sun.com/j2ee/overview.html>.