1. **Open Source Video Conferencing Tools**

As mentioned earlier, multiple tools have been assessed based on factors as,

1. Platform Dependency
2. Compatibility
3. System Requirements
4. Installation
5. Configuration
6. Ease of Use
7. Performance

The following tools have been tested,

1. Adobe Lccs (Livecycle Collaboraton Service)
2. Flazr
3. Ajax Chat
4. Big Blue Button
5. Openfire - Red5 Chat
6. Redfire 03 & Redfire 06
7. Sparkweb
8. Openmeetings

A detailed description of some of these is provided in this report.

1.1. Adobe LCCS

The Collaboration service enables developers to easily add real-time collaboration and social capabilities to their applications. The service is implemented as LiveCycle Collaboration Service. Adobe hosts the service so developers don't have to worry about deployment, maintenance, and scalability.

Using LiveCycle Collaboration Service you can add collaboration to new and existing applications. Some examples of applications with collaborative capabilities include social games, customer service applications, e-learning solutions, and sports broadcasts. LiveCycle Collaboration Service provides the following features:

* Real-time push messaging: Create collaboration-aware components and applications.
* Pre-built components: Accelerate development using white board, chat window, webcam, and other prebuilt components.
* Multimedia streaming: Use audio and video sharing with support for P2P (RTMFP) streaming.
* User management: Detect and change presence, status, and roles.

### Key capabilities

* Easily integrate text chat, whiteboard, webcam, and VoIP functionality.
* Rapidly build and deploy applications with the complete SDK.
* Manage user and session data.
* Build your applications in the best-of-breed mix of onsite and cloud environments.

Factors

1. Platform Dependency: currently supports Macintosh, Windows (3.1, 95, NT), and UNIX (HP-UX, SunOS (TM), Solaris (r), IBM (R), AIX (R)) platforms.
2. System Requirements: Minimum System Requirements for Macintosh and Power Macintosh Users
   1. Macintosh with a 68020 or greater processor, or a Power Macintosh
   2. 3.5 MB of RAM (5 MB for Power Macintosh) available to Acrobat Reader
   3. Apple System Software version 7.1 or later
3. Installation: Required each Moderator and each Client to have a Adobe LCCS account to be able to login and use web services
4. Configuration: Requires Each Client Computer to download a Adobe SDK file inorder to use its services
5. Ease of Use: Not very easy to use
6. Performance: Flash makes performance a little slow

1.2. Big Blue Button

Big Blue Button is an [open source](http://en.wikipedia.org/wiki/Open_source) [web conferencing](http://en.wikipedia.org/wiki/Web_conferencing) system developed primarily for distance education. It supports:

* Multiple audio and video sharing
* Presentations with extended whiteboard capabilities - such as a pointer, zooming and drawing
* Public and private chat
* Desktop sharing
* Integrated voip using asterisk or freeswitch
* Support for microsoft office documents using openoffice.
* Users may enter the conference in one of two roles: viewer or moderator.

As a viewer, a user may join the voice conference, share their webcam, raise their hand, and chat with others. As a moderator, a user may mute/unmute others, eject any user from the session, and make any user the current presenter. The presenter may upload slides and control the presentation.

Although its components are open source, the BigBlueButton client depends on a browser plugin for the Adobe Flash platform. The BigBlueButton server runs on Linux and can be installed either from source code or from Ubuntu packages. BigBlueButton is also downloadable as a Virtual Machine (VM) that runs within VMware Player on PC and Unix computers and within VMWare Fusion on Macs.

**Architecture:** Similar to Openmeetings, BigBlueButton uses red5, an open source implementation of Adobe's Flash Media Server, to support its real-time collaboration. The BigBlueButton server can run within a cloud environment, such as Amazon EC2, but in version 0.70 there were problems with audio delays using the built-in VoIP in such environments. The core developers recently demonstrated improvements to the VoIP in the upcoming BigBlueButton 0.8.

Factors

1. Platform Dependency: platform independent implementation for desktop sharing.
2. System Requirements: dual-core machine with at least 2 GB of memory and a 2.0+ Ghz processor for good upstream and downstream bandwidth from the server (recommended - Ubuntu 10.04 32-bit/64-bit on the server )
3. Installation: Very Huge download and installation procedure even for Linux
4. Configuration: Requires a change of much of the code to get a tolerable performance and hence requires too much initial configuration
5. Ease of Use: Slowness makes it difficult to use
6. Performance:

a. The viewers never have access to the conference if it is configured to have to wait for connecting the moderator.

b. Extremely slow.

1.3. Openfire - Red5 Chat

Openfire (previously known as Wildfire, and Jive Messenger) is an [XMPP](http://en.wikipedia.org/wiki/Extensible_Messaging_and_Presence_Protocol) **server** written in [Java](http://en.wikipedia.org/wiki/Java_%28programming_language%29) and dual-licensed under both a proprietary license and the [Apache License](http://en.wikipedia.org/wiki/Apache_License) 2.0. Openfire supports the following features:

* Web-based administration panel
* Plugin interface
* Customizable
* [SSL/TLS](http://en.wikipedia.org/wiki/Transport_Layer_Security) support [[2]](http://en.wikipedia.org/wiki/Openfire#cite_note-1)
* User-friendly web interface and guided installation
* Database connectivity (i.e. embedded [Apache Derby](http://en.wikipedia.org/wiki/Apache_Derby) or other [DBMS](http://en.wikipedia.org/wiki/DBMS) with [JDBC](http://en.wikipedia.org/wiki/JDBC) 3 driver) for storing messages and user details
* [LDAP](http://en.wikipedia.org/wiki/Lightweight_Directory_Access_Protocol) connectivity
* Platform independent, pure [Java](http://en.wikipedia.org/wiki/Java_%28programming_language%29)
* Full integration with [Spark](http://en.wikipedia.org/wiki/Spark_%28software%29)

The proprietary extension to Openfire allows multiple server instances to work together in one clustered environment. This extension is now open source as well (but depends on Oracle Coherence, a commercial product).

Red5 Video Chat is a full FLASH video chat with audio and video support made using Open Source RED5 technology and Flash : You do not need to purchase expensive solution such as Flash Media Server. If you have your own server, deploy the RED5 server side solution, and install our Red5 Video chat. It supports

* No plugin to be installed
* Video webcam
* Audio chat
* Private Messages
* Registration process
* No duplicate entries
* Full customized design
* Multi langage chat
* is watching me feature
* 4 webcams
* Invite for chat
* Rooms

Factors

1. Platform Dependency: Completely Independent
2. System Requirements: The server should be a high configuration which is dependent on the load that is expected by the number of clients
   1. **Web server with PHP/mySQL** (we use PHP/mySQL for database connections between the Flash application and the database that stores infos about registered chat users): if you want a chat without connection, you can remove this feature. If you do not need authentification, you do not need PHP/MySQ.
   2. **Windows or Linux dedicated server:** we need to install and run RED5 solution on your server. For this you need a dedicated server that allows you to install JAVA applications. If you do not have any dedicated server, including 120 Gigas of HardDisk, remote desktop access and 100 mega of bandwith.
3. Installation: Requires PHP and MYSQL and the setup of the Red5 Server
4. Configuration: Requires the PHP files to be modified to the MYSQL database and the Server to be Configured to our own server
5. Ease of Use: Easy to Use and customize
6. Performance: It is fast as it is only the basic services that are provided.
7. Existing Errors: Requires other methods to support logging in and choosing the chat partners and other specifications
8. Future Enhancement: Should be made to a ready made chat application with easily customizable options. HTML5 or something should be used as Flash is becoming obsolete.

1.4. Redfire 0.0.03 & Redfire 0.0.06

Redfire - Open Source XMPP + RTMP Collaboration Platform based on Red5 and Openfire

Redfire is a new plugin for Openfire that embeds the Red5 server and provides audio/video stream tools for XMPP application development. It replaces the old red5 plugin for Openfire and the previous Redfire web app for

Red5 server.

Key features

* **An RTMP server (Red5) that can be used to deliver audio/video media along side XMPP** messaging and signalling.
* **A plugin for Spark.**
* **A SIP-based soft phone that uses RTMP protocol developed in Flex.**
* **A Java web start application that** captures **and publishes the desktop screen as an RTMP video stream.**
* **2 person audio/video conversation web page**
* 12 persoon audio/video conferencing web page

Factors

1. Platform Dependency: Client systems can be of any platform
2. System Requirements: The server should be a high configuration which is dependent on the load that is expected by the number of clients
3. Installation: Requires Openfire and Redfire acts as a plugin for it along with the Spark plugin.
4. Ease of Use: Easy to Use and customize
5. Performance: It is fast as it is only the basic services that are provided
6. Existing Errors: Requires other methods to support logging in and choosing the chat partners and other specifications
7. Future Enhancement: Should be made to a ready made chat application with easily customizable options. HTML5 or something should be used as Flash is becoming obsolete.

1.5. Openmeetings

OpenMeetings is software used for presenting, online training, web conferencing, collaborative whiteboard drawing and document editing, and user desktop sharing. OpenMeetings is suitable for any work environment. In developing and IT departments as well as in schools, universities and other educational institutions. In short, in every scenario where Job and location independence play an important role. The product is based on OpenLaszlo RIA framework and Red5 media server, which in turn are based on a bunch of open source components. Communication takes place in meeting rooms which are set to different communication, security and video quality modes. The recommended database for backend support is MySQL. The product can be set up as an installed server product, or used as a hosted product. OpenMeetings is used for web conferencing in FOSS e-learning solution Moodle and Atutor. It was first integrated as a replacement for the proprietary, Flash server based, video conference tool in Dokeos and started from there as an independent open-source application (only developed by Sebastian Wagner at the time). **It is available as hosted service or you download and install a package on your server with no limitations in usage or users.**

The software is translated in over 30 languages and counting. All the user needs is a Flash Plugin.

OpenMeetings implements the following features:

* Audio Video conferencing
  + Audio + Video
  + Audio Only
  + Video Only
  + Picture Only
  + change video-/audio-quality
* Meeting recording
  + Recorded sessions can be downloaded as AVI/FLV files
* Screen sharing
* Collaborative document editing
* Private Message Center
  + Send users messages and organize them in folders.
  + The booked event automatically is in your and the participants calendar, changes to that event will be populated to all users booked to the event
* Calendering
  + Plan your conferencing and invite attendees from OpenMeetings or External.
  + The invited attendees will recieve an E-mail with details to the meetings and a link with a secure hash to the conference room.
  + Share your calendar with your contacts.
* Polls and Voting
  + With yes/no or 1-10 questions, let the user vote and see the voting results.
* Chat and whiteboarding
  + You can save each whiteboard instance as a file. The file is located in the File-Explorer and can be drag n’ drop’ed to the whiteboard again and organized like any other document, image or folder
  + Drawing, writing, Drag&Drop, Resizing, Images (Drag&Drop from Library), Symbol(s).
* User and room management
* Backup
  + You can backup the whole user-generated data including files uploaded by the users in a single ZIP file and import that ZIP into a new installation of OpenMeetings again.

### Advantages:

* Real Open Source
* Recordings can be downloaded as AVI/FLV
* Chat and private messaging
* Calendar with Notification System (EMail or Ical)
* Multicolor Interface and easy branding and 30++ Languages and Language Editor
* SOAP-Integration API
* Ready to run LDAP and MS Active Directory Support

Factors

1. Platform Dependency: Windows, MacOS or Linux
2. Compatibility: Platform independent
3. System Requirements: The server should be a high configuration which is dependent on the load that is expected by the number of clients
4. Installation: A basic server startup Batch file (shell file for Linux) and then server side direct installation.
5. Configuration: Minimum tweaks to make the performance faster. These can be ignored for most part for usages over the intranet.
6. Ease of Use: Very easy and self-explanatory in usage and installation
7. Performance: Desktop Sharing is extremely fast (compared to all other tools we tried) as it is Java WebStart application and directly runs on the client without any need of installation.
8. Future Enhancement: More options on restricting the usability on users

# 2. Architecture

Architecture focuses on the foundation technologies and principles which sustain the Product, including FrontEnd, BackEnd and Middlewares.

# 2.1 Moodle Architecture

### Core components

* [Database abstraction layer](http://docs.moodle.org/dev/XMLDB_Documentation)
* [Roles and Capabilities system](http://docs.moodle.org/dev/Roles) for controlling who can do what
* [Forms library](http://docs.moodle.org/dev/lib/formslib.php) for creating accessible and secure HTML forms that let users edit things
* [File API](http://docs.moodle.org/dev/Using_the_file_API) for managing files stored by Moodle
* [The database schema](http://docs.moodle.org/dev/Database_schema_introduction)
* [What happens when you require config.php](http://docs.moodle.org/dev/What_happens_when_you_require_config.php)
* [lib/moodlelib.php](http://docs.moodle.org/dev/lib/moodlelib.php)
* [lib/weblib.php](http://docs.moodle.org/dev/lib/weblib.php) for outputting stuff

## An overview of Moodle core

### Courses and activities

A Moodle course is a sequence of activities grouped into sections.

Courses are organised into a hierarchical set of categories within a Moodle site.

### Users

Users, profile, my moodle ...

### Groups and cohorts

### Enrolments and access control

Contexts, roles, capabilities, and permissions, ...

### Activity and course completion

### Navigation, settings and configuration

### Forms library

### JavaScript library

Moodle has adopted the [Yahoo User Interface library](http://developer.yahoo.com/yui/3/). There is also a nice system for loading the additional JavaScript files required by each page.

### Installation and upgrade

### Logs and statistics

# 2.2 OpenMeetings Architecture

* Client OpenLaszlo [http://www.openlaszlo.org](http://www.openlaszlo.org/)
* Server (Remoting and Streaming) Red5 <http://www.osflash.org/red5>
* Persistence layer: Hibernate [http://www.hibernate.org](http://www.hibernate.org/)
* Database: !MySQL or Postgres, or any other with a Hibernate-Dialect
* DocumentConverter: OpenOffice [http://www.openoffice.org](http://www.openoffice.org/) and JOD (<http://www.artofsolving.com/opensource/jodconverter>),
* ImageConverter: [http://www.imagemagick.org](http://www.imagemagick.org/)
* Axis2, see available/planned Services at [SoapMethods](http://code.google.com/p/openmeetings/wiki/SoapMethods)

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# 3. How to Integrate

# The college now contains

# A running moodle on Xampp server

# An email server

# Now a Red5 Server is required which will run Openmeetings

# The Clients will need to only access the moodle server

# So the Xampp Server will be made public and the Openmeetings Server will be made on the localhost so that the required action can be done only through moodle and the clients will not be able to access Openmeetings directly

*Pesit Server*

Email Server

Red5 Server (running OpenMeetings)

XAMPP Server (running Moodle)

# 4. Future Enhancements

Many more enhancements can be added to this project to make it much more useful and attractive. As one of the primary reasons for this analysis has been to find the ideal tool for the college e-learning site, we plan on creating a plugin for direct integration with Moodle Server. We are also looking for ways to increase the performance so that the process of web chatting or desktop sharing is seemless and independent of the number of users.

We would also like to integrate our previous projects (Automatic Notes Creation and Realtime Video Editing) so that the entire process of E-Learning and E-Course-Creation can be all done on one website and we can share this as an opensource package with moodle.

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