



# Video Conferencing Platform - A Case Study

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## Executive Summary

Mindfire Solutions is now the primary software services provider for a US based IT firm that in turn provides software services to its clients in the Media/Entertainment industry. At the start of the project our client wanted us to design and implement a videoconferencing platform that would enable users to connect and invite others to start an Audio-Visual conference call. Mindfire's experienced team of software engineers worked in close collaboration with the client to produce a robust product of which we are all proud of.

The result was a communications platform that supported all types of communications including video, audio, chat, email, file sharing, and screen sharing. It could be accessed from a native application installed on the computer or from a browser client. It has a user friendly dashboard (very similar to Skype) that has buttons (links) in an email signature, website, or business application. It was designed to be easy and intuitive for everyone. As newer functionalities and features were added to the product increasing its universal appeal, the client then decided to white label the product and aggressively market it to other domains.



We used WebRTC with Socket.io and also Easy RTC to implement peer to peer based chat rooms. Other features implemented included integration with Twilio APIs to allow users to set up call forwarding which then routes the call to their phone. We used Express.js framework on top of Node.js and Jade/twitter bootstrap for the templating engine with Stylus for styling. MongoDB was used for the backend along with STUN/TURN servers which handled the connection between the peers.

## About our Client:

**Client:** IT Solutions Provider

**Location:** USA

**Industry:** Media and Entertainment

## Technologies Used:

**Web RTC, Socket.io, EasyRTC, Node.js, Express js, Jade, Stylus, MongoDB, jQuery, JavaScript, HTML5, CSS3, TURN/STUN server, Twilio API, SVN**



## Business Situation

### Project Scope

High speed Internet connectivity, reduced cost of video capture and display technology and increase in personal videoconferencing systems has made Video conferencing a preferred medium for communication. Not only does it find use in corporate meeting rooms, but there is a rise in acceptance of the technology in other areas such as healthcare, education, retail, human resources and market research. A disruptive technology that has helped companies save millions on travel compels the rest to have it as well.

With this idea in mind, our client who is an IT services provider for the Media and Entertainment Industry approached Mindfire Solutions to develop a webRTC based video conferencing platform that would enable users to connect and invite others to start an audio-visual conference call.

### The Mindfire Solution

Mindfire Solutions engaged the services of an expert team of engineers that worked closely with the client to research and develop a top of the line Peer-to-Peer video conferencing platform with the latest webRTC based technology.

Some of the preliminary features of the application are as follows:

- WebRTC with Socket.io and also Easy RTC to implement peer to peer based chat rooms
- Implemented a native thin client app for windows which behaves similar to Skype and allows users to communicate with other users who can connect via their browser
- Backend was implemented using Node.js and MongoDB which helped maintain contacts, status and other such information about the users
- Implemented the ability to create unique URLs which could be shared with non-system users to allow them to connect and conference
- Integrated with Twilio APIs to allow users to set up call forwarding which then routes the call to their phone
- Used Express.js framework on top of Node.js and Jade/twitter bootstrap for the templating engine along with Stylus for styling
- Setup STUN/TURN servers which handled the connection between the peers

Eventually once we had the basic web version running we then leveraged on OpenSource webRTC libraries and implemented a C++ app for windows desktops.

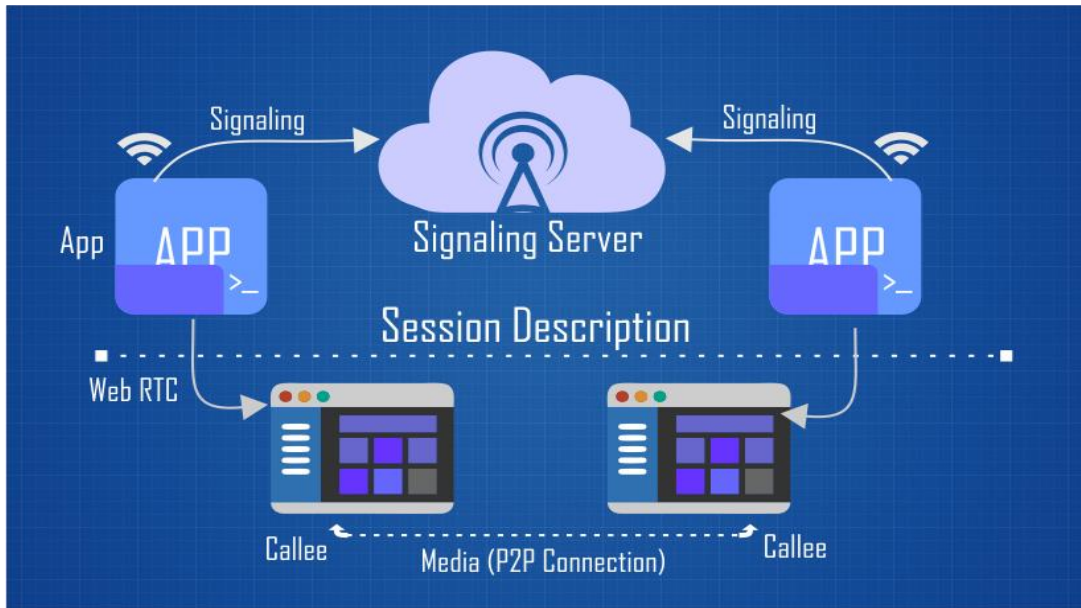
### How the Application/System works?

- To start a call, the users have free access to login where they can invite/add and find their contacts.
- Depending on the contact's presence (Available/Offline) information the application then allows the logged in user to call his contact.
- In case the user wants to connect to a non-user then she can share a unique URL specifically created for this to connect and set up a conference

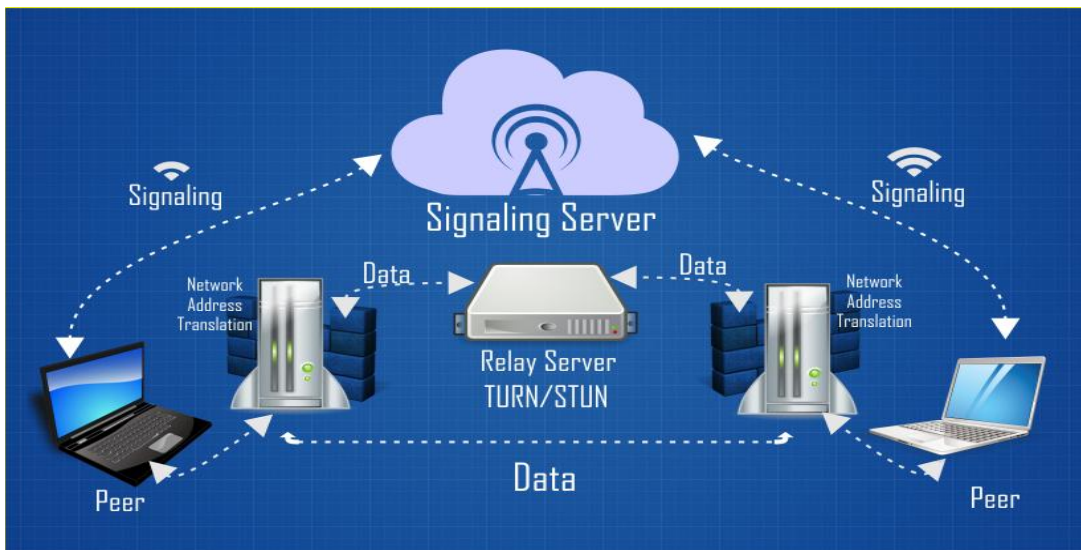


## Architecture Diagram

It is a hosted unified communications service based on client-server architecture as well as peer-to-peer architecture that includes video and voice as well as chat, file sending, screen sharing, presence, and more. The application uses WebRTC as the core technology. All the communication takes place using web-socket messages (also called as events). The following diagrams would help understand the system better.



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### Meeting app:

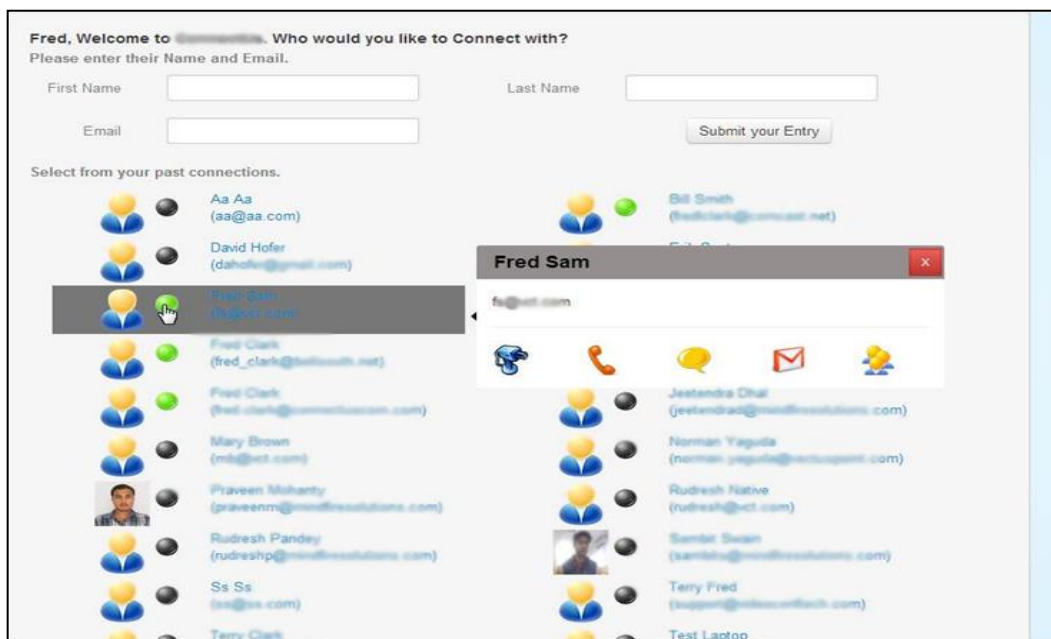
This is a web application which is completely separate from browser or native client application. It provides the WebRTC connection when opened. This meeting application is implemented using EasyRTC libs which uses socket.io as signaling server. The chat, file sending, adding peer in call, screen share functionality are provided in this web application.

Some of the features of the meeting app are as follows:

- **File Sharing:** Easyrtc filesharing api is used to send and receive files. We can drag and drop or select files to send. The check box on the left can be marked to send the files to all the connected users in the meeting.
- **Screen Share:** Easyrtc screensharing api is used to share screens. This also helps in presenting the sales proposal virtually. This function requests that screen capturing be used to provide the local media source rather than a webcam.
- **Co-Browsing:** Just like screen share, this feature helps to show your browser tab to other users while you are browsing. You can also pass control to other users to click and navigate the browsing too.
- **Group Conversation:** This feature enables up to a maximum of four people to join in a group conversation and have access to the files and other media shared in the chat window.
- **Image Capture:** Image capture is done by making use of the settings menu available on the dashboard.
- **Video/Audio recording:** The chat conversations between peers can be recorded for future use.

### Dashboard:

Here's what the application dashboard looks like. The buttons are color coded to represent status of the users such as Online (Green), Offline (Gray), Red (Busy), Blue arrow (Call forwarded to another person/number), Red w/line (Donot Disturb)





## Customer Benefits

Mindfire implemented certain interesting functionalities into the video conferencing platforms. Apart from regular features such as Login, Fetching contacts, Directing to a default room and Calling facilities (including Call Forwarding), Adding fresh contacts, Password reset and update systems such as Presence, Heartbeat were introduced. They could also get a snapshot of the bandwidth of data usage at the click of their fingers. While they had stated off to make this application for a limited user group, Mindfire Solutions experienced team at the back end gave them the impetus to market their product to various other domains as well.

The following are two very interesting features that we implemented in the project:

### *Presence System:*

Using the Presence System a client can get the status of other clients. When a client creates a connection and joins the “default” room, the server sends the status of other clients to those who are in contacts of it. Also, other clients get notified that a new client joins the room if the new client is in their contact.

We have the following four status updates along with a special one:

- **Online / available:** Client can make and receive call.
- **DND or Do-not-Disturb:** Client can make call but can't receive.
- **Busy:** Can't make or receive call.
- **Offline:** If client is not present is “default” room regardless for being connected with server.
- **Call-Forward:** A special status that is available only to the native client.

In case of any change the server sends one of the following four events to every client in order to update the status:

- **ALREADY\_PRESENT:** Server sends this to a client who has newly joined.
- **JOINED:** Server sends this event to existing clients
- **PEER\_STATUS\_CHANGED:** Server sends to other existing clients when a client changes status.
- **LEFT\_DEFAULT\_ROOM:** Server sends to client's contacts members if client is gone or left the “default” room.

### *Heartbeat System:*

In addition to the Presence System, the application also provides another system to update the false status of clients. This system can be turned on or off. The system works in the following manner:

- Each online clients automatically pings the server on a regular interval (20 sec).
- The server updates the last pinged time of each client.
- After a certain period (2 min), the server goes through to the list in which it maintains the last ping time and refreshes those clients who have pinged within the time limit (2 min)
- The Server then updates the database with correct presence of all the clients



## Future Relationship

The project started off on a very professional note where the client was included in all the stages of software development. The client was extremely cooperative and allowed time for research and prototyping/development which yielded a robust product which we are all proud of. Use of agile methodologies and indigenous project status reporting tools ensured that there was transparency and clear communication between both the sides. The client was extremely happy with the team's in-depth technical knowledge and attention to the minutest details in all key areas viz. web frontend, backend, native desktop client. In appreciation of the good work done, they have also consented to share product demonstrations with other interested clients who want similar video conferencing platforms for their business.

From Mindfire's point of view, this resulted in a very satisfying work experience and great learning for Mindfire Solutions as well. It also strengthened client's faith in Mindfire Solutions which resulted in reaching out to us when they decided to white label the application and market it to different domains where it would be a value addition as it would help them to seamlessly integrate the web client into their web sites. And as the client grows today by continuously reaching out to businesses in other domains, Mindfire remains its preferred primary software services provider.



Founded in 1999, Mindfire Solutions is an award-winning provider of software development and testing services to the global market with 650+ talented software engineers at 3 centers in India. For its people and its work, Mindfire has won coveted international awards such as Deloitte Technology Fast50 India Award 2013 and 2014, Dun & Bradstreet Fastest Growing SME 2013 Award, Red Herring Top 100 Asia Award and Zinnov GSPR 2014. Mindfire has been recognized with ISO 9001:2008 and ISO 27001:2005 certification, is a continuous member of NASSCOM, and has established a strong track record of 2000+ projects successfully delivered for 500+ technology clients.

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