

FusionTalk: a remote participation tool

J.H. Santos*, F. Reis*, H. Fernandes*, A. Neto*, A. Duarte*, F. Oliveira*
and W.P. de Sá†

*Associação Euratom/IST, Centro de Fusão Nuclear, Av. Rovisco Pais P-1049-001 Lisboa, Portugal

†Instituto de Física, Universidade de São Paulo, Rua do Matão, Travessa R, 187 05508-090 São Paulo, SP, Brasil

Abstract.

Remote participation tools exist for video conferencing, document co-authoring and even for data sharing mainly through graphics. However, no single integrated solution existed to be used, whether in a daily informal basis among few researchers, or as a in more formal virtual gatherings with many participants wanting to share nuclear fusion data coming from heterogeneous databases.

CFN is now developing *FusionTalk*, an open source project consisting of server and client software available to all nuclear fusion research institutes. It is a major complement to *FireSignal*[1] tools for local and remote experiments, which aims to fill the gap in what video-conferencing, data access and collaboration is concerned. Using *FusionTalk* web tools one can access and compare data already available on the web and which is often ignored or difficult to use. *FusionTalk* data search features allow researchers to easily access not only information on *CFN*'s databases but also in other databases (interfaces are already being developed for *MDS Plus*, *DAS Access* and *SDAS/FireSignal*) in laboratories that run a *FusionTalk* server.

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INTRODUCTION

Remote Participation (RP) is viewed in the nuclear fusion community as being able to bring higher productivity to the researchers work. It includes the communication among geographically dispersed people, the ability to share experimental data and the possibility of having joint experiments with less logistical work and expenses.

Centro de Fusão Nuclear in Lisbon has developed *FusionTalk* to make remote meetings as natural as possible. Its key features are:

- Making use of current client processing power and available internet bandwidth.
- Suitability for daily informal use as well as for formal virtual meetings with no need for advanced booking, enabling a more dynamic collaboration.
- Uses normal computers with Windows, Linux or MacOS and affordable audio headsets and webcams.
- Client and server are both open source to gather adhesion from the community.
- Has a good potential test ground made of worldwide nuclear fusion research labs.
- Integrated tools to retrieve, process and share data. *CFN* has focused on the development of tools for nuclear fusion data, but being *FusionTalk* an open-source project, other communities can adapt them to databases of their needs.

TECHNOLOGY

Each institute has a *FusionTalk* server, and the different servers are organized as a federation. There is a top server that acts as a gatekeeper and has a sub-server registration so that only allowed servers are able to connect to this RP federation. Each regular server connects to this top server either directly or indirectly (through other servers).

On the lower part of the hierarchy, the institution clients connect to the federation through the bottom servers.

Server

The server is implemented in Delphi[2] and is intended to be installed as an appliance where just a network connection and setting up some parameters is enough.

Some of those parameters are the server name, local IP address, parent Server, database parameters, nuclear fusion services and registration policies. Regarding registration policies, it can include POP3 e-mail verification and authentication and authorization in PAPI[3] federation system.

The client streams are redirected using a *Java* open source *Flash RTMP*¹ server: *Red5*[4]. All the video and audio streams are both coded and decoded only in the client, so the server only has management and mirroring tasks, reducing the activity load in the server to a minimum.

Client

The client (figure 1) is implemented in *Actionscript*²[5] and only requires a web-browser with *Adobe* Flash Player 9 plugin. For the video-conferencing capabilities, a web-cam and a microphone are also required.

Server-Client interaction

Upon logging in successfully, the client may be redirected to a server on the local network if it is available. In a video conference the streams are sent from the client to the closest server, then to the participating client servers and then to the clients. This way the bandwidth for the streams is optimized for the internet (figure 2).

For messaging and basic functionality the system uses *HTTPS* calls from the clients to the server, without any security risks. For video and audio streaming it uses the *RTMP* protocol from *Adobe* which is also based in *HTTP* Tunnelling.

¹ Real Time Messaging Protocol is a proprietary protocol developed by *Adobe* for streaming audio, video and data over the Internet, between a *Flash* player and a server

² *Adobe* scripting language for *RIA* – Rich Internet Applications



FIGURE 1. Client screenshot

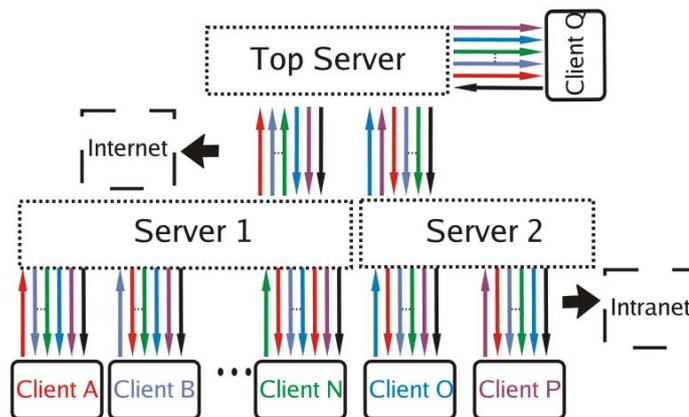


FIGURE 2. Connections diagram

Advantages over H.323

H.323[6] is the most widely used protocol for video-conferencing applications. It is also used by EFDA and IAEA. H.323 allows for multi-party video conference, in which each client sends to the server audio streams and video streams. The server then combines all video and audio streams, sending to each client only two streams: one containing all client video streams and another with its audio counterpart.

There are four advantages of FusionTalk over H.323:

- FusionTalk is designed to handle fusion data, either by getting it from databases, performing calculations over it or sharing with other participants.
- The H.323 scheme puts most of the processing load on the server, which has to

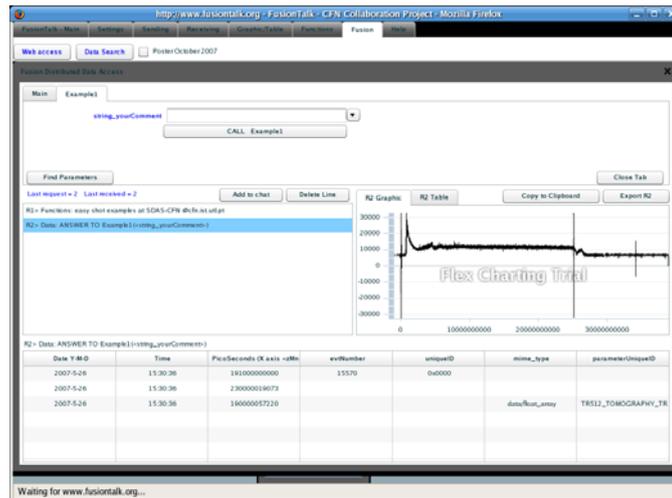


FIGURE 3. Fusion data

code and decode every stream. *FusionTalk* makes use of modern computing power available to the client side, which only has to handle its own conversations.

- *H.323* requires a previous reservation of a virtual room. *FusionTalk* allows video-conferences to be created without delay, making the remote participation a daily used tool, and not only a tool for regular meetings.
- *FusionTalk* allows users to broadcast multiple streams, including screen sharing.

REMOTE PARTICIPATION CAPABILITES

FusionTalk aims to integrate different video-conferencing tools with fusion data handling capabilities.

Regarding the video-conferencing, the user can either call other users for private conversations or join virtual rooms with many participants. The user can then, on multi-party conferences, enable or disable video or audio from the different participants.

Each user can send multiple streams, each one of them allowing for independent video and audio hardware source. Video quality options, such as frames per second and quality, are also configurable. There is also a free screen capture software[7] for *Windows* that may be used as a video source, thus enabling screen sharing.

Finally, using the available chat, the user may contact a single user or all participants in a given room.

As for the fusion data, there is an interface (figure 3) to *SDAS* functions, which may be used to obtain data. In the future, other fusion database interfaces will be implemented. Once obtained, the raw data can be visualized as a table, or presented in a graphic. It is also possible to share it with other users.

FUTURE WORK

The server is now being implemented from scratch in *Java*. This will enable *FusionTalk* to be a truly multi-platform project, since *Delphi* code, used for the server, does not port well to non-*Windows* systems. Moreover, there is currently more interest in *Java* than on *Delphi* and, hopefully, this change of implementation will attract more contribution to the project. In addition, being implemented in *Java*, the server management tasks (*Delphi* code) will be more naturally integrated with the mirroring tasks (*Red5* project).

Following the *Java* implementation, the focus will return to the client code and expanding its fusion data capabilities. It is also planned to implement *FireCalc*[8] through *FusionTalk* client, enabling the client to run heavy calculation code over the data on a remote calculus server.

CONCLUSION

FusionTalk provides researchers a tool for both daily discussion and regular meetings. The ability to show presentations and share fusion data further expands the researchers expressiveness and thus their productivity.

Being an open source project, as *FusionTalk* number of users rise, so expectedly will the number of code contributions. This will ultimately lead to a more robust and complete fusion-oriented remote conferencing tool.

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