

Collaborative Work Capabilities for E-Business Environments

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Abstract: - The EU funded FP 6 was meant to develop applications for optimizing and securing the systems of nowadays society. The [eEurope 2005 Action Plan](#), launched at the Seville European Council in June 2002 and endorsed by the Council of Ministers in the [eEurope Resolution](#) of January 2003 aims to develop modern public services and a dynamic environment for e-business, offered to the citizen through widespread availability of broadband access at competitive prices and a secure information infrastructure. According to the European interests, this article brings new concepts and methods the authors used for designing and implementing a telecommunication infrastructure that provides the end-users with collaborative work functionalities.

Key-Words: - Collaborative work, multimedia, shared access, audio-video, e-business, integrated platform

1 Introduction

Romania, as one of the last EU Members, has to implement a reliable and secure business environment that allows the business mans to remotely manage fruitful affairs not just on the Romanian territory but also abroad. The foreign business mans can also handle the own international investments using this environment.

There are situations when a business man has two important meetings in two different locations, even in two different foreign countries, in the same week. The flight and hotel costs are expensive but the efforts and the wasted time must be also considered.

There are international projects that involve several teams from different countries and organizations and the project manager will be not able to schedule periodic meetings as the basis of the project management tasks. The management costs – traveling, hotels, phone calls, meetings for live demos and scientific workshops – can be expensive.

When planning to make your business growing up, you must invest an important part of your profit for the personnel training. The training sessions need money and time – the tutors have to schedule conferences and tutorials and to present the educational content in an attractive manner.

The e-commerce section is very useful within the e-business process but some time and in several situations it is not enough for getting an important income. The sales process can be improved using multimedia presentations, booklets, or interactive catalogues in order to demonstrate to the customer that he/she is buying the best product for him/herself. If the sales agents can even talk to the customer, using the video telephone, the customer has the impression to visit a normal store not an e-commerce environment.

In those situations, the participants to the business process have no the possibility to perform all the tasks, the only one way to do that is to use a virtual environment that allows the end-users to communicate each other using the audio-video capabilities, to share the content in an interactive manner, to remotely handle the management, sales, and working meetings or training sessions.

2 Problem Formulation

During the article, you will be able to find the answers for the following issues:

- Two business mans must schedule business meetings and share important information when negotiating a partnership.
- The manager of an international project has to schedule periodic meetings between the team leaders and demo sessions regarding the performed tasks in order to avoid the problems that appear when involving organizations located in different places.
- The sales personnel must demonstrate the capabilities of a product to a customer that remotely accesses the e-commerce area in the same manner he/she can present the product lively, in the front of the customer.
- The marketing department in a company completed the work for promoting a product on the market and the sales department can start to sell the product in the country and also abroad. The sales managers must prepare the training sessions the sales agents have to attend to.
- A company launched a new product and the people that bought it need a lot of information when using

it. The sales managers must prepare some additional interactive tutorials that allow the end-users to use the product correctly and in an efficient manner.

The list with the issues can continue but we want to stop here and to fix just these five ones considering them as the most important.

3 Problem Solution

While the telecommunication infrastructure we are talking about can provide the end-users with audio-video web conferencing capabilities, concurrent access to the shared resources (multimedia presentations, booklets, DOC/RTF/PDF descriptions, images, block diagrams, Excel statistics, etc.), media streaming functionalities, multi-channel access to the implemented services, the issues have reliable solutions.

We propose an integrated platform that implements the following services:

- *Video conferencing* module allows the moderator to invite up to twenty persons to attend to a secured video conferencing session and to share important resources such as multimedia presentations, booklets, DOC/RTF/PDF descriptions, images, block diagrams, Excel statistics, etc. in order to define the business aspects.
- *Live customer* service allows the authorized personnel to assist the customers when testing, buying and using a product or service the company provides with.
- *Small group discussion* module enables up to four persons to participate to a formal conferencing session.
- *Interactive tutorial* is a one-to-many multimedia application that provides the end-users with interactive capabilities.
- *Non-interactive webcast* service allows the authorized persons to promote new products and services, to broadcast live events, demos, workshops and advertising materials, using the web capabilities.
- *Video-assisted multimedia presentations* increase the retention factor until 80%, for that reason we encourage the team leaders to use the video-assisted presentations when elaborating the content for the training sessions.

3.1 System architecture

The project design involved several technologies used for implementing the set of functionalities. For instance, the Macromedia Flash Communication Server or Adobe Flash Media Server are used for handling the media content and the shared objects, the Sun Open Office SDK is used for

converting DOC/PPT/Excel/RTF/TXT files in SWF scenes, Apache is used for hosting the web components or Java technologies are used for implementing the interface between the Open Office and the media server (Flash Communication Server/Flash Media Server). In conclusion, the system architecture respects the multi-tier architecture of the enterprise systems and can be illustrated as in the figure just below:

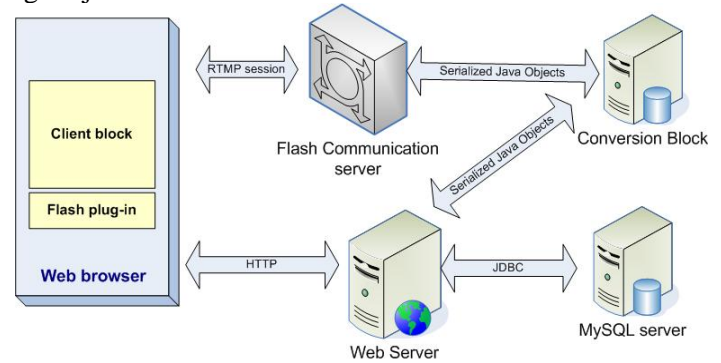


Fig. 1 – System Architecture

The client block will be loaded in web browser and consists of the HTML pages dynamically generated by the web components (JSP/PHP/Java Servlets) and the Flash scenes interpreted by the Flash Plug-in. The web server hosts the web components and assures the concurrent access to the services. The Flash Communication/Media Server handles the media content and allows the developer to implement the rich client concept. The conversion block consists of a Java application that invokes the OpenOffice SDK capabilities in order to handle the resources and import them in the system as internal symbols. It also converts the media standards into FLV format using FFMPEG open source. The MySQL database stores the information regarding the end-users, the modules and the billing system. There are two protocols used for the data transport – Flash Plug-in communicates to the media server via RTMP (RTMPT) protocol, and the web browser communicates to the web server using the HTTP sessions.

3.2 Web conferencing module

The system offers a very flexible live video conferencing module with the following capabilities:

- Up to 20 attendees per conference session
- Unlimited number of simultaneous conference sessions
- Conference scheduler available for the moderators
- Conference pre-registration (optional).
- Two video windows (320x240) for the conference moderator and current speaker (if any). The conference moderator moves speakers in and out of the speaker window.
- Instant messaging capabilities among conference participants.

- Raise Hand/Lower Hand button to request recognition by conference moderator. The system indicates which attendees have raised hands.
- Whiteboard is built-in, allowing document collaboration by all attendees.
- Conference can be recorded (at no charge) and replayed, as Video-On-Demand at will.

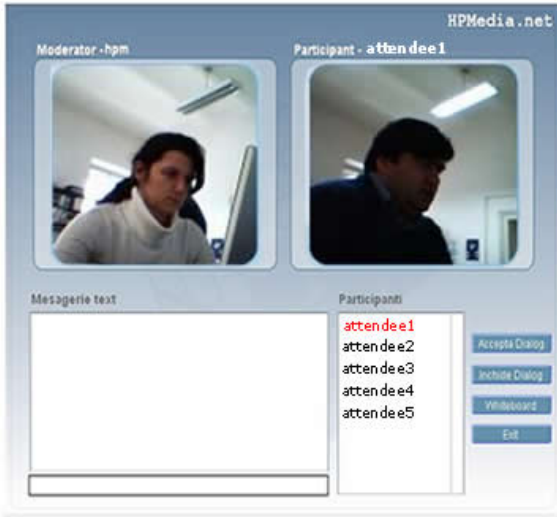


Fig. 2 – Moderator leading the conference session

The video conferencing module respects the multi-tier architecture of the multimedia distributed systems:

- The client block consists of the Flash scenes (*moderator.swf*, *attendee.swf*, *whiteboard.swf*) that communicate to the media server via RTMP protocol. The *shared objects* concept is used in order to implement the shared scenes within the video conferencing and whiteboard sessions. A suggestive example is listed below:

```
nc = new NetConnection("rtmp://confHost/sharedspace/");
vid_so = SharedObject.getRemote("course_so", nc.uri, true);
vid_so.onSync = function(){
    d = vid_so.data.course;
    if (d!="" and d!="undefined"){
        wb_mc.loadFile_mc._visible = true;
        wb_mc.loadFile_mc.loadMovie("myfiles/"+doc_txt.text);
    }
}
vid_so.connect(nc);
```

If the end-user needs a video conferencing service that runs over proxies and firewalls, the first code line in the example just above has to specify the RTMPT (tunneled) protocol:

```
nc = new NetConnection("rtmpt://confHost/sharedspace/");
```

- The server-side component handles the RTMP/RTMPT requests, processes them and provides the clients with the last updates in the shared objects attributes. This way, the session management can be implemented using the shared objects concept.

- The web components implement several management functionalities, from the authorized access or security routines to flow data management, complex statistics, billing capabilities or conference scheduling. The communication between the Flash scenes and the web components involves XML data structures.
- The information is stored into the MySQL tables and the system can be considered as safe because of the periodic backups. The communication between the web components and the database is realized using JDBC/ODBC protocol.

3.2.1 Small group discussions

Small group discussion is an alternative to holding a formal conference. Up to four people can be involved, and all are active in their own 320x240 video windows. Instant messaging and whiteboard capabilities are supported among the attendees.

3.3 Live customer service

The e-business environment provides the end-users with the functionalities that improve the customer service such as:

- Sales and customer statistics
- Video telephony capabilities
- Interactive sales tracking
- Media streaming support
- Import capabilities – booklets, PPT presentations, movies can be imported as internal symbols
- Session can be recorded (at no charge) and replayed, as Video-On-Demand at will.

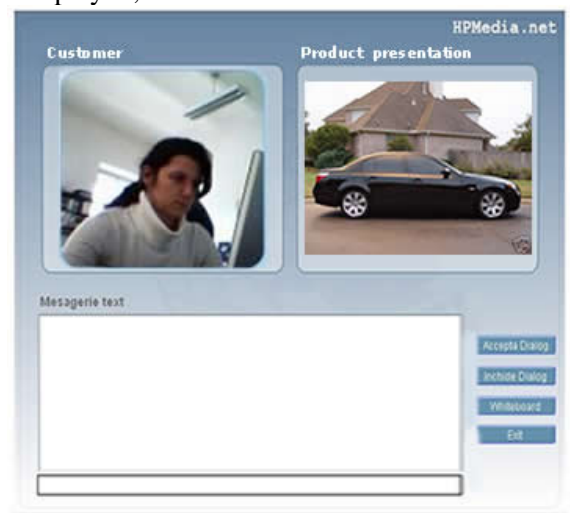


Fig. 3 – Real-time sales session

We used the multi-tier architecture of the multimedia distributed systems when designing the customer service:

- The client block consists of the Flash scenes (*provider.swf*, *customer.swf*, *whiteboard.swf*) that communicate to the media server via RTMP/RTMPT protocol. The *shared objects*

concept is used when implementing the shared scenes within the customer’s activity tracking or whiteboard sessions.

- The server-side component handles the client requests, processes them and provides the clients with the last updates in the shared objects attributes. This is the basis of the session management implementation (using the shared objects concept).
- The web components implement several management functionalities, from the authorized access or security routines to flow data management, complex statistics, activity tracking, etc. The communication between the Flash scenes and the web components involves XML data structures.
- A MySQL database is used for storing the information about the customers and sales assistants but also regarding the customers’ activities during the sales process or products, catalogues, advertising clips, booklets, etc. The communication between the web components and the database is realized using JDBC/ODBC protocol.

3.4 Training module

Both of individual and group studies are very important in these days, when the technology is growing up in a very fast manner. Individual study is provided: the author can upload the educational materials in different formats (PowerPoint, Word, RTF), the system converts the original files in internal symbols and allows the authors to record video explanations for each slide/page. The educational content will be provided to the student using the media streaming capabilities.

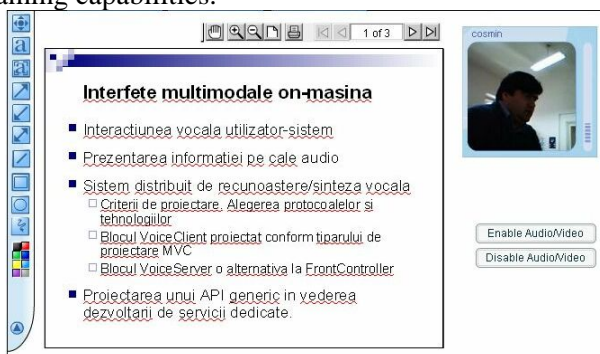


Fig. 4 – Interactive tutorial

The system also provides the end-users with training session capabilities, e.g., a team leader schedule training sessions for the members of his/her team and the classware section will be enabled during the period of training. Each team member can access the classware using the web browser on his/her PC/Mac/notebook, and attend to the lessons/tutorials/demonstrations the team leader presents.

The classware is very useful when the teams involved in the project are located in different areas and the project manager can easily schedule a real-time discussion based on training materials. If an authorized person want to control the training quality, he/she is able to access the service, using his/her user account, and attend to the training session in order to get an idea about how the training is realized. He/she is also able to see the attendees’ point of view related to the training subject and approach methods.



Fig. 5 – Classware session

3.5 Media streaming service

The most important part of the services used the media streaming concept, from the customer service or video conference to product presentation and interactive tutorials. As we already talked about, the media server handles the multimedia content and the shared objects, thus, the media server controls the streaming management according to the clients connected to the system.

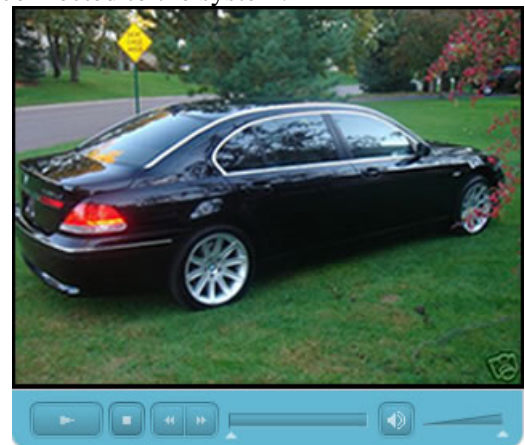


Fig. 6 – Video streaming within the product presentation

The figure just above illustrates the video streaming concept used for presenting a product in the live customer service from the end-users’ point of view – the end-user handles the video playback using the media player controls.

3.5.1 Media conversion block

The media streaming concept Adobe/Macromedia proposed is based on the FLV format and the live media streaming involves RTMP (RTMPT) protocol. When a sales agent prepares the product presentations he/she normally uploads

video files in different formats (WMV, AVI, MPG/MPEG, MOV, etc.) and the system automatically converts those files into FLV format, invoking the media conversion component.

The media conversion component is a platform independent application that converts the video standards (MPG/MPEG, AVI, WMV, MOV, etc.) into FLV files. We are using an optimized open source that works properly when converting the most important part of the media formats including WMV 9, MPEG-4, MOV, etc. It also allows the developer to configure the conversion process by setting up the parameters: sample rate, bit rate, file size and format, etc.

4 Conclusion

Current personal computers, workstations and servers are designed to handle traditional forms of data. Their performance is optimized for a scientific or transaction-oriented type of workload. Those systems do not perform well for multimedia data, requiring fast data retrieval and guaranteed real-time capabilities. The I/O capacity is usually a severe bottleneck.

There are several advantages that transform the virtual environment in a very useful integrated platform. Some of them are remembered just below:

- Meeting costs are almost completely eliminated. Air fare, hotel, rental car and meal costs are zero.
- Productivity loss is minimized. There are no longer two travel days lost for a one-day meeting.
- Equipment needs are minimal and inexpensive. A web camera and headset/microphone are all that is required.
- There are no expensive communication requirements. Any Internet connection (cable modem or DSL) will allow the access to the services.
- If the business man thinks “training” rather than “conference”, this product opens up a wide range of possibilities. Training can be more frequent, a larger number of people can be directly trained and location no longer impacts training. Sales people around the world can attend a training session directly from their offices.
- For customer service use, all calling customers are placed in a “lobby” and the CSR retrieves them from the lobby to speak with them.
- Ad-hoc *hallway* meetings can be held with co-workers separated by large geographic distances.
- Sales people can present to key individuals at a prospect company and eliminate travel expense. This would not be suitable for presenting to multiple sales prospects at one time because all attendees can see and hear each other.
- Communication sessions can be archived and played back at will. Training classes, once held, can

be made available anytime to train new people, or as refresher training.

- The incorporation of video creates interest and increases the message retention factor to approximately 80%, according to recent studies.

The testing session allows us to check the system working properly and how the most important parameters respect the indicated values. We want to describe just a few of those parameters such as:

Minimal response time is a crucial factor for the success of multimedia services and can be defined as the response time the client got when using the system. The system provides with a minimal response time up to 100 ms, the maximum limit for the video conferencing services.

Real-time delivery: The media server guarantees real-time delivery for individual streams as well as for all the streams combined together.

Quality of Service (QoS) requirements: The Quality of Service (QoS) is a set of parameters describing the tolerable end-to-end delay, throughput, and the level of reliability in multimedia communication and presentation. The media services adapt themselves to different QoS requirements, according to the characteristics of the client's terminal, the network connection and the requested data type. For example, when talking about an Internet connection up to 28 kbps, the dimension of the media player will be about 100x60 pixels and the video recording has a frame rate about 3 fps (frames per second). If the Internet connection is about 128kbps, the media player has a dimension about 160x120 and the video recording has a frame rate about 12 fps. For a broadband Internet connection the visual part of the media player will be about 320x240 pixels and the video recording has a frame rate about 30 fps.

Cost effectiveness: A very important requirement governing the future of the interactive multimedia services is the cost effectiveness. The technology providers changed the target focusing on the narrow bandwidth Internet connections and basic peripherals (cheap web cams and microphones). This means low cost for both of service providers and students.

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