Sistema de Televisão Online – OnTV

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Paper

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Abstract

This document describes the stages that constitute the development of an online TV system’s architecture, by analysing the existent similar platforms choosing the correct ones to be used until the design of the interface with the user. Apart from this, there is also in this document the description of the RTSP protocol, necessary to supply video broadcasting services in real time, as is the case of the live broadcasts.

1. Introduction

Throughout this document there is a description of all the investigation needed in order to define a proper working environment for the establishment of an Online TV system, including the analysis of similar systems and platforms in order to develop the required system. All the steps and methodology to develop an interface are also described like, for instance, the task analysis and the prototypes of low fidelity of the system. This document is organised in the following manner:

In topic 2 there is a comparative analysis of online TV systems by observing similar systems to the one that we intend to develop, so as to understand better what is being done in this field. In topic 3 there is a comparative analysis of the platforms to be used where all the platforms are analysed in order to select those that better serve the requisites of the system in development. Topic 4 is related to all the work that has been done concerning the interface of the system, for this latter to respond in the best way possible to what the user is expecting of it. In topic 5 the protocol RTSP (“Real Time Streaming Protocol”) is approached and analysed, since it is the protocol that allows the live TV service, one of the system’s requisites.

2. Comparative analysis of online TV systems

In this topic we can find an analysis performed on 6 existing TV systems which were chosen by three criteria being the fact that they supply or not the proper services of an online TV (news archive, live broadcasting, etc), and also their design. Another important aspect in the choice of the systems was their country origin, being chosen 2 Portuguese, 2 Spanish and 2 North-Americans in order to analyse what is done in this field in Europe and also in the USA.

This analysis is focused in three main aspects:

- Which services were provided and which should be provided in order to make the site more complete, which also helped us to understand which the vital services in the system’s development were.
• An analysis of the system’s interface, including the evaluation using the Nielsen’s Heuristics [7], since the interface of a system is one of the most important factors in order to guarantee its success.

• Which platforms to be used in the system development.

In table 1 there is a small summary of that analysis, where one can see which are the services supplied by each of the TV systems analysed; a general overview of the design of each of them where 1 means a very bad general overview and 6 a very good one, where the number of violated heuristics were taken into account as well as the overall aspect of the website, meaning, the good colour contrast and the fact that it is pleasing to the sight, the size and style of font being adapted to the background, the coherent alignment of information and the fact that it is user friendly, among all other small aspects that make an aesthetic site. It can also be consulted in this table the number of violated Nielsen’s heuristics by each of the systems and finally in the last column there are the platforms used by each of the systems.

<table>
<thead>
<tr>
<th>ANALYSED SYSTEMS</th>
<th>PROVIDED SERVICES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Live</td>
</tr>
<tr>
<td>TV Beja</td>
<td></td>
</tr>
<tr>
<td>TV Net</td>
<td>![ ]</td>
</tr>
<tr>
<td>CRTVG</td>
<td>![ ]</td>
</tr>
<tr>
<td>Barcelona TV</td>
<td>![ ]</td>
</tr>
<tr>
<td>KCEN-TV</td>
<td></td>
</tr>
<tr>
<td>WSVN-TV</td>
<td>![ ]</td>
</tr>
</tbody>
</table>

Table A6.1: Overall of the analysed systems

<table>
<thead>
<tr>
<th>Analysed SYSTEMS</th>
<th>INTERFACE</th>
<th>PLATFORMS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Design (1 a 6)</td>
<td>Violated Heuristics</td>
</tr>
<tr>
<td>TV Beja</td>
<td>4</td>
<td>1st and 4th</td>
</tr>
<tr>
<td>TV Net</td>
<td>5</td>
<td>---</td>
</tr>
<tr>
<td>CRTVG</td>
<td>3</td>
<td>3rd</td>
</tr>
<tr>
<td>Barcelona TV</td>
<td>4</td>
<td>3rd and 6th</td>
</tr>
</tbody>
</table>
3. Analysis of the platforms to be used

The goal of this analysis is to, before implementing the system, chose amongst all the available platforms the ones that guarantee more liability, which at the same time fulfil the functioning requisites of a system with these characteristics.

In this document the various available options for the several levels of architecture to develop are described, as well as the reasons to opt by one platform and not another.

3.1. Video format to use

In a system like this, the size of a video is a point that deserves special attention since by minimizing the size of a video, without harnessing its quality, we also minimize the time that the user has to wait until the video is available for him to visualize it in his browser.

Hence, the most common formats and the ones that guarantee high quality images were compared; including the most recent format which can only be visualised using flash (.FLV). Next, are the tables 2, 3 that correspond to this analysis, where all the conversions were performed according to the same quality parameters (bitrate, framerate, among others), specially to state which of the formats allow to minimize the occupied size without harnessing the quality of the image.

<table>
<thead>
<tr>
<th>WMV</th>
<th>AVI</th>
<th>MPEG</th>
<th>FLV</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>10.8</td>
<td>9.0</td>
<td>7.1</td>
</tr>
<tr>
<td>10</td>
<td>19.2</td>
<td>16.8</td>
<td>14.4</td>
</tr>
<tr>
<td>20</td>
<td>38.2</td>
<td>33.4</td>
<td>30.2</td>
</tr>
<tr>
<td>50</td>
<td>94.1</td>
<td>79.1</td>
<td>72.9</td>
</tr>
</tbody>
</table>

Table A6.3 - WMV to AVI, MPEG and FLV conversion

<table>
<thead>
<tr>
<th>FLV</th>
<th>WMV</th>
<th>AVI</th>
<th>MPEG</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>4.2</td>
<td>6.8</td>
<td>5.9</td>
</tr>
<tr>
<td>10</td>
<td>8.7</td>
<td>13.2</td>
<td>12.2</td>
</tr>
<tr>
<td>20</td>
<td>17.9</td>
<td>31.4</td>
<td>28.7</td>
</tr>
<tr>
<td>50</td>
<td>40.3</td>
<td>81.6</td>
<td>73.6</td>
</tr>
</tbody>
</table>

Table A6.4 – FLV to WMV, AVI and MPEG conversion
We shall now focus on the advantages and disadvantages presented by the WMV and FLV formats. In regards to the WMV format the only advantage towards FLV is the fact that it is a bit more compact since another advantage taken into account until now, the fact that it was more used and recognized by the users, is no longer verified as we can see in chart 1.

![Chart 1: videos formats that are more used in the web, source Screen Digest](image)

Another relevant factor in this choice is the fact that WMV is a Microsoft owned technology and can only be correctly visualised in platforms that have windows media player, which comes with windows by default, or plugins that despite the fact that are available for MacOS and Linux, are not installed by default in the system, being this a task for the user. To visualise FLV it is also necessary to have a small Macromedia plugin, which is installed in most of the computers as can be seen in chart 2.

![Chart 2: percentage of computers with the mentioned installed platforms, source – Adobe](image)

Finally, and to conclude the analysis, nowadays almost every systems of video streaming available in the internet use Flash technology, as we can see in the following picture:
Therefore, one can conclude from this analysis that even though it is possible to use WMV and FLV, the one that presents more advantages for the developing of such a system is the second option.

3.2. Content management system

In regards to the content management system to use, Joomla system arises as a valid option. Developed in PHP and of easy interaction with MySQL, all OpenSource platforms, it enables important functions for an online tv system’s development. For instance:

- Allows the use of Templates
- Allows the reutilisation of contents inside the same web, which is an important factor in a system where the same content (for instance news) can be on more than one menu.
- Allows user profiles, i.e., allows that new user profiles with different features can be created through an administration interface.
- Has a photo gallery, i.e., a storage to manage and present images which is a very important functionality bearing in mind that in the system that we want to develop we wish to have an image per news.
- Has a document manager, that allows the edition and creation of new versions of the document offline, which is an important feature taking into account that the system to develop will have a text for each news, and that allows more liberty in the edition of those texts.
- Allows URL’s re-writing in order to make them more understandable for the users.
- Has a garbage system, similar to windows recycling which allows the website administrators to recover the contents that are no longer available on the website.
- Allows that the contents are automatically added or removed from the system at a certain time, which, for these types of systems that are daily modified is a very important functionality.
3.3 Summary

All in all, the architecture of an online TV system can be implemented recurring to PHP technologies for the design of front end, joomla as a content manager, MYSQL for the managing of databases and FLV as an extension of the videos present in the system.

4. Methodologies for the interface development

To design a good interface we need, and before starting the implementation, to perform a search of requisites, in order to establish what the user wants from the system and what are the necessary functionalities for the system to be well succeeded. One way to do that is to use a survey, and afterwards to provide answers to the 11 questions of the tasks analysis which synthesise what needs to be known about the target public of the application in development. The 11 questions are the following:

1. Who is going to use the system?
2. What tasks are actually performed by similar systems?
3. What are the desired tasks in the system to develop?
4. How do we learn the tasks to be performed?
5. Where are those tasks performed?
6. What is the connection between users and information?
7. What others instruments are the user provided with to execute the same service?
8. How do the users communicate amongst each other?
9. What is the frequency of the tasks performance?
10. What are the time restrictions imposed?
11. What happens if something goes wrong?

Another important step in the conception of an interface is the definition of a conceptual model for the system, which is composed by a definition, i.e., a high level description of how a system is organized and how it works, of the objects that compose it, as well as the actions available to use those objects, and finally a connection between concepts. In the end, the low fidelity prototypes should be performed. A low fidelity prototype is constituted by non functional pictures of the system that allow to test, through usage scenarios, the interface with the user before it is effectively implemented, allowing to correct still in a pre-implementation phase some mistakes that could happen if this system’s development phase was to be ignored. Next we have an example of a task prototyped:
A tarefa difícil será consultar uma notícia de cultura do mês de Maio. Para tal, o utilizador deve clicar em Arquivo, na barra de navegação superior. De seguida, surgirá o menu apresentado na segunda imagem, o utilizador escolhe a data que deseja e surgirá o menu descrito na terceira imagem. O utilizador é, de seguida, convidado a seleccionar quais os temas pelos quais tem interesse, ao que se segue um menu onde poderá visualizar as notícias correspondentes aos temas que selecionou. Finalmente, a notícia é apresentada num esquema igual ao apresentado na última imagem.

5. Broadcast architecture

This topic is focused on the IP broadcast technology, which is vital for the implementation of the live TV service. In this topic there is a summary of the performed investigation in regards to this matter, focusing on the RTSP protocol which is responsible for the IP video broadcast, which is next described.
5.1 Simple diagram

The broadcast architecture adds a new layer to the traditional Web platforms, in which a client sends a request to a web server and this one responds. In a video transaction the web server enroots the client’s original request to a media server, which, after some operations, sends the video back to the client’s video reader.

What follows is an illustration that describes the existing interactions between the several layers, as well as the functionality attributed to each one of them:

![Diagram of layer's interaction](image)

5.2 Differences between HTTP and RTSP

In this figure, HTTP and RTSP are shown as separate layers, with HTTP containing Browser, HTTP, TCP, IP, and Physical Connection, while RTSP contains Media Player, RTSP, RTP/UDP, IP, and Physical Connection. HTTP is used for browsing the Web, while RTSP is used for streaming video.

Nesta figura encontram-se esquematizadas as camadas necessárias para efectuar uma transacção por HTTP, bem como as camadas necessárias para efectuar uma transacção por RTSP – “Real Time Streaming Protocol”.

![Diagram of differences between HTTP and RTSP](image)
5.3 RTSP Protocol

In this image there is a description of the RTSP’s functioning. As it was already mentioned above the RTSP protocol uses meta files as pointers to the files that are afterwards transferred directly by RTP (“Real Time Protocol”) between media server and the client’s video reader, where RTSP comes up as a way of adding the usual commands associated to a video (“play”, “pause”, “stop”, …).

In the next image it is illustrated an example of a RTSP usage

This is a typical example of the usage of RTSP. Initially the user sends an http get (data needed to initiate all the transactions by http), to which the web server responds. After this, all the commands executed by the client are sent to media server, place where is the file that is pointed by the meta file, through RTSP protocol, being the video transported by RTP between media server and the user’s video reader, at the same time that it is presented.
5.4 Existing broadcast architectures

The three existing architectures belong to real media, Microsoft and Apple, being the correspondent extensions to each one of them in the following table.

<table>
<thead>
<tr>
<th>Architecture</th>
<th>Meta file</th>
<th>Video File</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real Media</td>
<td>.rpm, .ram</td>
<td>.rm</td>
</tr>
<tr>
<td>Windows Media</td>
<td>.asx, .wax, .wvx</td>
<td>.asf, .wmv</td>
</tr>
<tr>
<td>QuickTime</td>
<td>.mov, .sdp</td>
<td>.mov, .qt, .qti</td>
</tr>
</tbody>
</table>

6. Conclusion

In this document the main steps to bear in mind on how to develop an online TV system were approached. The initial work was only of research throughout various similar websites to the one that we intend to develop, and choosing the most interesting ones for a much deeper analysis to the most relevant aspects in a system of this kind, i.e., interface quality, what are the provided services and the ones that should be, and in which platforms does the system’s functioning rely on. Then we went into another step where the platforms that allow to build such a system were analysed having to opt by several platforms and not by others. All these options are detailed in this document. After that, a decisive aspect for the success of the web system was analysed, more precisely the interface with the user, pointing the main aspects to take into account in its development. Then, the document focused of the IP broadcasting technology, since it’s a vital technology to implement the online TV system, researching about which protocols are used and what are the available architectures,

7. References


[8] Arash Amel, Dan Cryan - User-generated online video: Competitive review and market Outlook, In ScreenDigest