Developing of a Video Information System for the Technical University of Sofia

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Abstract – **The work described in this paper was carried out at the department of Radiocommunications and Videotechnologies at the Technical University of Sofia, Bulgaria. The major goal of the project was to design, develop, and evaluate a centralized system, based on mini computers to display dynamic information on digital displays located at many locations. Our target displays were located at the entrances of buildings and students offices of faculties.**

Keywords – **Digital Signage System, Video Monitor, Video Information System, IPTV.**

I. INTRODUCTION

There are many commercial and also open source video information and presentation systems described in [1], [2], [3] and [4]. The commercial systems are based on professionally developed software systems. Their main disadvantages are the following:

- the high prices;
- the necessity to adapt the software to the concrete application;
- to use a service provider to which it is necessary to pay monthly or to accept their advertisements;
- to store the client data to the server provider, which is connected with the security of client data and the dependence of the client on the provider.

The open source video information and presentation systems are composed of the necessary open source software modules. The main advantages of the open source video information and presentation systems are the following:

- easy adaptation and expansion according to the concrete video information and presentation system application;
- suitable for academic and education applications, in which it is typical to make the extensions, experiments, practical student works and projects, using different communication technologies, research, etc.

The goal of this article is the development of a video information and presentation system for academic and education applications at the Technical University of Sofia, based on open source programming environment, given the possibility on future expansion and low cost for development in comparison with similar professional video information and presentation systems.

State of the Art. Today, digital media is the most compelling platform to effectively reach employees, students, customers, and partners. This digital media is used to convey important information and messages such as news, training material, and information about upcoming or current events. Digital media is effective because it brings familiarity and closeness to modern communications ([3], [4]). In today's dynamic world digital media has an important role especially for organizations which wish to spread their business throughout the world. For educational organizations digital media plays an important role in informing students about the events, such as: seminars, lectures, meetings, registration deadlines, schedule changes, exams, and sports activities. Digital media represents an emerging new communication technology; in particular digital signage is rapidly gaining popularity today. Digital signage is emerging as a new communication technology. A digital sign is defined as an electronic display that shows information, advertising, or other messages as is shown in [5], [6] and [7]. Digital signage can be implemented using liquid crystal displays, light emitting diodes, digital projection, plasma displays, etc. ([8], [9]). Such digital signage can be used in airports, research organizations, shopping malls, railway stations, and restaurants to dynamically deliver information, graphics, animations, videos, text, and other web contents on a (high quality) display to targeted viewers at a specific time ([10],[11],[12]). Fig. 1 shows the general structure of a digital signage system, including a Web server with a database server, managing server and local client computer to accept and display digital materials, transmitted over the Internet.

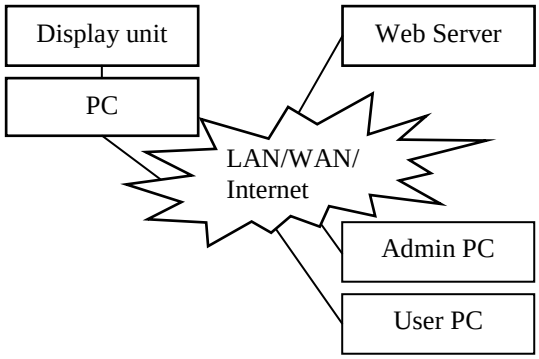

Fig.1. General structure of a digital signage system

The main challenge today for many organizations is the successful deployment and integration of a digital signage network system. In large organizations, such as educational, and research organizations, lots of events are taking place each day. Thus there is a constant need to inform people about what activities are taking place, where they are taking place,

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and how to get from where the sign is to this place. Informing the potential audience in these organizations through conventional signage has many disadvantages and drawbacks. Some of these drawbacks and disadvantages are the financial costs of printing, distributing, and removing paper posters; the environmental costs of these posters over their lifecycle; the fixed contents of such printed posters (i.e., any change is expensive as it requires a physical change to the poster - once it is printed); printed posters can only convey static text and pictures. In this research project we designed and developed a prototype system, based on using a PC directly attached to a digital display in order to display web contents. Our target displays were the large screens located at the TU-Sofia buildings.

II. System Description

The main focus and objective of the project was to design, develop, and evaluate a hardware/software solution based on mini computers, to control and display different contents on digital displays. Instances of this system could be located at different locations. The developed Video Information System (VIS-TU) displays different kinds of information, based upon a "playlist" that can be dynamically updated. A secondary goal of this project was to remove the single point of failure of a television (be it analog or IPTV) based system, since each display has an attached processor and local storage containing both the information to be displayed and the local playlist of what is to be displayed. In existing TV based systems when the main server crashes the whole system stops working. More generally this project will explicitly consider how to generate a cycle of information to be displayed, where the information can be adapted based on time, location, and viewers. The granularity of the cycle's schedule (i.e., playlist) is much shorter than that of existing digital signage systems – leading to a more visually dynamic experience for viewers.

The common block scheme of the developed Video Information System is shown on Fig. 2. The main structured blocks, included in the system are:

- Server system for information control (*VIS-TU Server System*). The system includes Content Server, based on Windows Server 2008 OS and an open source digital signage solution (Video Editing system - Xibo), centrally managed via a web administration panel (PHP/MySQL Database) and distributed over a local network or the Internet to one or more clients (.NET 3.5 Framework for Windows XP OS) connected to display hardware (TV Monitors, Projector, IP Cameras etc).
- Client's subsystems for visualization on the Samsung TV monitors in the TU buildings (*VIS-TU Client System*). The systems are based on Windows XP mini computers LEC-7000, configured with Intel Atom N270 1.6 Ghz two cores processors, 512 MB DDR2 RAM, 160 GB local hard disks, two 1 GBps Lan controllers, SVGA video controllers.
- Internet IP Cameras for real time streaming of video information. The live streaming of videos, slide show presentations, advertisements, screen shots etc. are performed using a Windows Media Encoder 9 tool. This is powerful for content producers who want to take advantage of the many innovations, including high-quality multichannel sound, high-definition video quality, new support for mixed-mode voice and music content, and more. For the adoption of broadcasting materials in the client's computers are used Media Player or VLC Player.
- Client's subsystems for remote control and administration of the VIS-TU system. For the purpose of remote administration, management and control of the local computers in a VIS-TU, two software systems - UltraVNC and LogmeIn are used. This approach guarantees the reservation and the security of remote administration and management of local computers in the VIS-TU, in the event that one of the two systems making improper connection with any of the managed computers. As a result of the need for a tool for quick access to configuration settings of the LCD monitors a software system Samsung Monitor for management and control the local computers by the RS232 serial port was developed. The software system was developed with Visual Studio 2010 program environment, in two versions - SamsungONF in command mode for use in remote mode by the programming environment UltraVNC and SamsungMonitor in graphics mode for self-management and control of a separate monitor features (brightness, contrast, sound, volume, power on/off and etc.). In Fig. 3 the starting screen of a SamsungMonitor GUI program is shown.

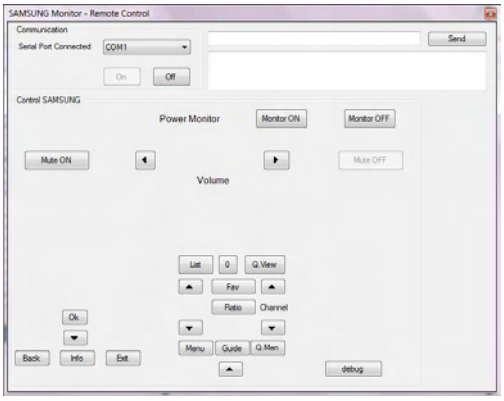

Fig.3. Starting screen of the program SamsungMonitor

- Connection with the university network and possibilities for visualization in computer classes and conference halls.

III. Experimental Results

Digital signage has a very important role in educational organizations to inform their employees and students about upcoming events and to distribute information. It improves campus communications and facilities emergency notifications. It can inform students about upcoming seminars, registration deadlines, exams, and sports activities.

The appropriate layout information shown on video monitors, makes it possible to display current messages, static images (photographs) and moving images (video clips) of the life at TU was created. The created layout is consistent with the fact that the monitors are with plasma screen technology and it is no longer necessary to display static graphic elements. This information was created and edited with the

possibilities of editorial environment in the VIS-TU system that is shown in Fig.4. In Fig. 5 the general appearance of the unit for displays control is shown.

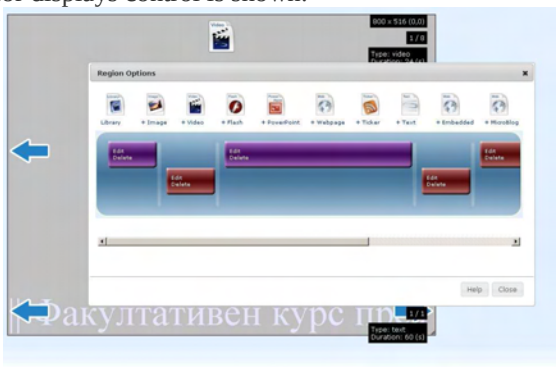

Fig.4. Video Information System editing unit.

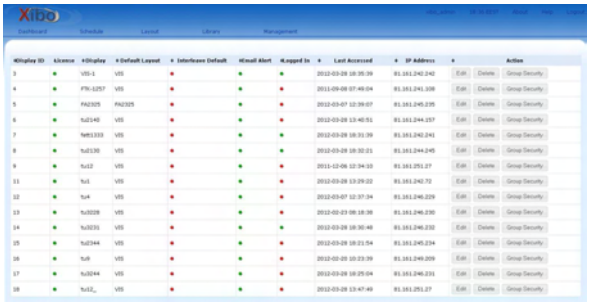

Fig.5. Control displays subsystem.

The result of the correct work of the developed Video Information System is presented in Fig.6.

Fig.6. Example of the work of VIS-TU.

IV. Conclusion

There are many benefits of a web based approach to digital signage. These benefits include efficiency, scalability, low system cost, and low complexity. The system is also scalable in the sense that we can easily add more displays to the system.

In this project we have successfully implemented a complete digital display information system. We have designed, developed, and evaluated a hardware & software solution based on a PC, to control and display different contents or other dynamic information on digital displays located at different locations.

In addition there are a number of areas for future work that would make the system more attractive and competitive with commercial digital signage systems.

There should be an easy means of setting up a backup server and offering hot-failover to this alternate server – should the main server fail (for example, using a network dispatcher – as it is often used to support load balancing across a set of web servers).

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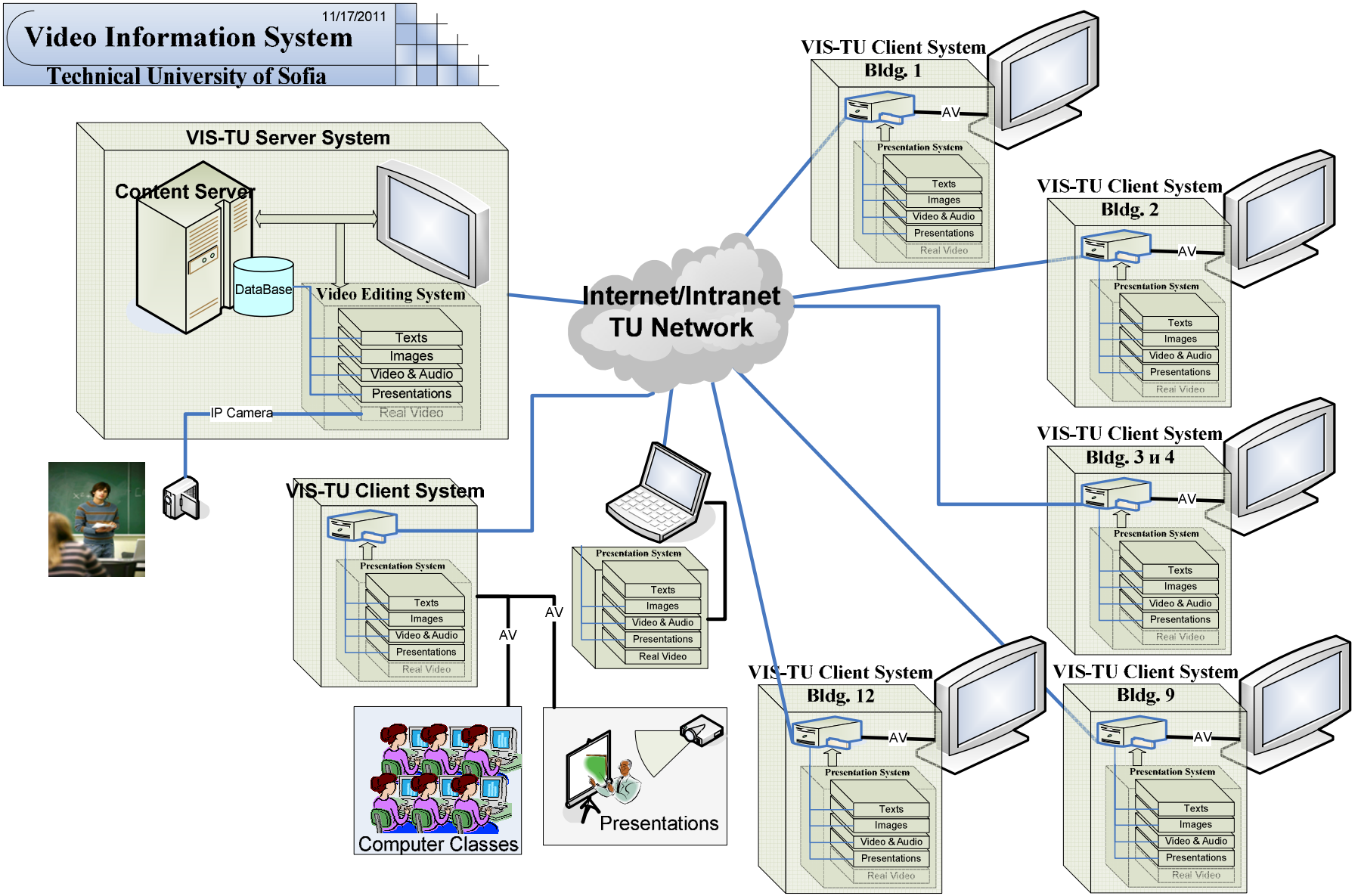

Fig. 2. Block scheme of the developed Video Information System