Indoor multimedia network model and remote control in e-advertising in international business

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Abstract

It is almost impossible to talk about modern business without mentioning electronic business, electronic marketing and contemporary e-advertising models. E-advertising can be viewed from a number of aspects. The development of the Internet and its services, as well as the advancements of cutting-edge information technology, are making room for new, sophisticated business solutions in e-advertising. Among the various types of advertising, e-advertising on so-called indoor and outdoor multimedia networks of diverse characteristics is popular today. Attention is focused on promoting e-advertising as an increasingly prevalent e-marketing activity. This paper explores this new approach, business model, and results of research analysis.

Keywords: Indoor MultiMedia Network, Internet - Remote Control, Analysis

Introduction

Presentation (informative advertising) is the primary purpose of outdoor and indoor advertising networks. A major advantage of dynamic advertising is that data can be changed at any given time regardless of location (for example: a display set up in Rijeka can be updated in the same way a display that is much further way, say in Zagreb. The result is immediately visible, in real time), (Mušović, 2005). A number of approaches were used in writing this paper. With regard to the technology available, the paper presents a range of possible solutions that can be used in dynamic advertising. The implementation of indoor advertising networks depends upon a variety of parameters to be defined with regard to location (display type and size, minimum and maximum distance for screen viewing, location leasing costs, etc). The basic features, advantages and disadvantages are given for each solution.

1. Video compression standard

At present, there are two families of standards (Šimunić, Maćešić, 2008.):

- ITU-T (International Telecommunications Union-Telecommunications)
  The first standard was ITU H.261, designed for ISDN-based videoconferencing. Later, ITU-T initiated standardisation aimed primarily at videoconferencing via PSTN (public switched telephone network), the speed being only 33.6 kb/s. The resulting standard was H.263 (later H.263 V2 and H.26L or H.264/AVC)
- ISO (International Organisation for Standardisation)
  The first standard made was MPEG-1 that has VHS-quality of video image and sound with 1,5 Mb/s. Later came the MPEG-2 standard for digital television (DTV or HDTV) and higher sending speeds, followed by MPEG-4, designed to improve compression utilisation and reduce transmission errors.

Video standard	Application	Speed
H.261	ISDN-based video telephony and videoconferencing	p x 64 kb/s
MPEG-1	Video on digital media (CD-ROM)	1.5 Mb/s
MPEG-2	Digital television	2-20 Mb/s
H.263	PSTN-based video telephony	33.6 kb/s and higher
MPEG-4	Video streaming	Variable
H.264/MPEG-4 (AVC)	Video streaming with improved compression	10 – 100 kb/s

1.1. Delivering video signals via Internet download

One of the ways of displaying a video format file is to download the entire file from the Internet and display it. What makes video format files specific is their size, which is this solution's major disadvantage. The downloading time and the space required for recording a file of such size are crucial. Also, the entire video needs to be recorded before presentation can begin, calling for a lot of patience from viewers.

1.2. Delivering video signals through video streaming

Delivering video signals in through video streaming way helps to overcome the problems mentioned above. The basic idea of video streaming consists of compressing and dividing video signals into parts, sending these parts, decoding them and displaying parts of the video signals as they arrive without waiting for the entire video signal (file) to be delivered (Šimunić, Maćešić, 2008.)
Video streaming involves:

1) Compressing video signals into packages
2) Delivering these video packages
3) Decoding and displaying a video package, while other packages are being received.

Video streaming enables simultaneous video delivery and display, which is the opposite of the previous method that requires the entire file to be downloaded before it can be displayed.

In this method, there is a typical delay (5 – 15 seconds) between the beginning of delivery and the beginning of display on the client's part. This delay provides a number of advantages, including a short delay before presentation and minor requirements with regard to space a client needs for storing the video packages (large capacity hard disks are not required). The length of the delay is expressed as buffer duration time, while the space required is approximately given with the quantity of data in this buffer (Šimunić, Maćešić, 2008.)

1.3. Video streaming requirements

The problem with sending streaming video can be expressed in the required sequence, where Δ is the time interval between image displays (Šimunić, Maćešić, 2008.)

- Image N needs to be delivered and decoded in the time TN
- Image N+1 needs to be delivered and decoded in the time TN+Δ
- Image N+2 needs to be delivered and decoded in the time TN+2Δ

The disadvantage is that any data that are lost and arrive later cannot be used.

3. SOLUTION 1 – Video streaming using software or hardware encoders and decoders

Using this method, video signals can be transmitted via ISDN, DSL, Ethernet, GPRS and, most recently, via 3G/UMTS. Each of these telecommunication technologies has its advantages and disadvantages. To set up a connection, we have an online system, with the video signal being sent through an encoder that compresses the video signal and sends it in packages, while the other side has a decoder that converts the video signal and displays it instantaneously on the screen. The encoder side may also have a computer (server) attached, with specialised software that makes it possible to send the same or different video signals to other locations, and keeps track of what needs to be sent when, and whether a video signal has been successfully sent and displayed. A client/server technology is used here in which it is recommended to use RTOS platforms (QNX, Linux, …) as servers to ensure the system's stability and reliability or to use at least two clusters (should one computer malfunction, the other will immediately take over all its functions and continue working). The volume of telecommunication technology adopted (ISDN, DSL, …) will depend upon the number of locations to be serviced, meaning that the server must be able to simultaneously connect to a number of locations. The remote location (client) at which the contents are being displayed should possess telecommunication technology for an online connection, an advertising screen (LED screen of required dimensions, LCD or a plasma screen), a decoder and electrical

outlets for these devices. The advertising-screen technology will depend upon the display requirements, the size of the screen, and the screen's minimum and maximum viewing distance (figure 1) (Šimunić, Maćešić, 2008.)

This solution requires the following equipment and services (Šimunić, Maćešić, 2008.)

SERVER	CLIENT
▪ Specific number of telecommunication technology connectors (ISDN, DSL, Ethernet, network, GPRS or 3G/UMTS) ▪ RTOS, or OS with cluster possibilities (MS Advanced Server, Linux, ...) ▪ Specialised software with databases for sending video signals to a specific location and keeping records ▪ A specific number of computers depending upon the OS selected (OS with clusters or RTOS ▪ encoder for compressing and sending video signals in packages ▪ Continuous UPS in case of power failure (UPS power depending on time required for system to continue operating) ▪ Electrical outlets	▪ Telecommunication technology connectors (ISDN, DSL, Ethernet, network, GPRS or 3G/UMTS) ▪ video decoder for converting images and sending them to a screen ▪ Screen (LED or LCD or plasma screen) depending upon above mentioned display requirements ▪ Continuous UPS in case of power failure (UPS capacity depending on how long the system needs to continue operating ▪ Electrical outlets

In this solution, protection is addressed at the level of the telecommunication technology selected (ISDN has the option "dedicated"), and the entire system in online once a connection has been made (Šimunić, Maćešić, 2008.)
Disadvantages:

- If the connection is lost, the presentation stops until the connection has been set up again.
- There is a certain delay depending on the standard selected for video streaming - e.g. MPEG-2 or MPEG-4,- (Mušović 2005.)
- The number of telecommunication connectors increases with the number of locations.

Advantages:

- The client location is not required to have large space for keeping data (hard disks)
- Updating presentation data is carried out instantaneously.

4. SOLUTION 2 - Video streaming over the Internet

This type of video signal transmission is done through a server located on the ISP side that enables and guarantees the required bandwidth for serving remote locations with video signals. The server must have a public DNS address with firewall protection, or a VPN can be used. The server becomes an Internet provider (or Web service) that connects on to a client's computer, reads the data and displays them on a screen. It is recommended to use RTOS platforms (QNX, Linux, …) as servers to ensure the system's stability and reliability, or to use at least two clusters (should one computer malfunction, the other will immediately take

over all its functions and continue working). For video compression and signal sending, commercial video streaming servers can be used together with special software with databases that keeps track of what needs to be sent when, and whether a video signal has been successfully sent and broadcast. Databases can be loaded independently from any location and at any time. In doing so, an online connection is set up, which is disconnected once the required material has been sent (Šimunić, Maćešić, 2008.)

The remote location (client) at which the contents are being displayed should possess telecommunication technology for an online connection; an advertising screen (LED screen of required dimensions, LCD or a plasma screen); a computer with specialised software for connecting on to a server, reading data and displaying to on a screen; and electrical outlets for these devices. The advertising-screen technology will depend upon the display requirements, the size of the screen, and the screen's minimum and maximum viewing distance (figure 2) (Šimunić, Maćešić, 2008.)

This solution requires the following equipment and services (Šimunić, Maćešić, 2008.)

SERVER	**CLIENT**
▪ Server collocation on the ISP's side ▪ Bandwidth hired on the ISP's side, as bandwidth must grow with the number of advertising locations ▪ RTOS, or OS with cluster possibilities (MS Advanced Server, Linux, ...) ▪ Specialised software with databases for sending video signals to a specific location and keeping records ▪ A specific number of computers depending upon the OS selected (OS with clusters or RTOS) ▪ video streaming server ▪ Continuous UPS in case of power failure (UPS capacity depending on how long the system needs to continue operating) ▪ Electrical outlets	▪ Adopted telecommunication technology (ISDN, DSL, Ethernet, network, GPRS or 3G/UMTS) ▪ Computer with stable OS capable of working 7/24 ▪ Specialised software for connecting on to a server, reading data and displaying it on a screen ▪ Screen (LED or LCD or plasma screen) depending upon above mentioned display requirements ▪ Continuous UPS in case of power failure (UPS capacity depending on how long the system needs to continue operating ▪ Electrical outlets

In this solution, protection is addressed at both the ISP side and the client side, and the entire system in online once a connection has been made.

Disadvantages:

- If the connection is lost, the presentation stops until the connection has been set up again
- There is a certain delay depending on the standard selected for video streaming (e.g. MPEG-2 or MPEG-4,...).
- Bandwidth grows with the number of display locations.

Advantages:

- The client location is not required to have large space for keeping data (hard disks).
- Updating presentation data is carried out instantaneously.
- The number of telecommunication connectors does not grow with the number of display locations.

5. SOLUTION 3 - Video presentation (offline)

This method of transmitting video signals involves the server connecting on to the client location only while filling the client location's local databases, upon which the server disconnects. On the client's side, there is a computer with specialised software for reading data and displaying it on a screen. When the presentation is over, the software makes a record of the material broadcast and then erases it from the database. In this way, although the material broadcast is removed, its sending status remains, and space is made free for new material. It is recommended to use RTOS platforms (QNX, Linux, …) as servers to ensure the system's stability and reliability, or to use at least two clusters (should one computer malfunction, the other will immediately take over all its functions and continue working). Specialised database software is also needed. One such software is installed on the server's side to define the material and time for connecting the server to the client and filling his databases. When finished, the server is disconnected. The client's computer has another software for receiving data from the server (even if some data are displayed), keeping record of when specific material should be displayed, confirming the status of broadcasting, and erasing material that has been successfully sent (otherwise, broadcasting continues until this happens). The client location must have telecommunication technology for occasional connections, a computer with the software depicted above, an advertising screen (LED of the size needed, LCD or plasma screen), and electrical outlets for these devices. The advertising-screen technology will depend upon the display requirements, the screen size, and the screen's minimum and maximum viewing distance (figure 3) (Šimunić, Maćešić, 2008.)
This solution requires the following equipment and services (Šimunić, Maćešić, 2008.)

SERVER	**CLIENT**
▪ Adopted telecommunication technology (ISDN, DSL, Ethernet, network, GPRS or 3G/UMTS) ▪ RTOS, or OS with cluster possibilities (MS Advanced Server, Linux, ...) ▪ Specialised software with databases for connecting to the client, sending video signals to a specific location and keeping records ▪ A specific number of computers depending upon the OS selected (OS with clusters or RTOS) ▪ Continuous UPS in case of power failure (UPS capacity depending on how long the system needs to continue operating) ▪ Electrical outlets	▪ Adopted telecommunication technology (ISDN, DSL, Ethernet, network, GPRS or 3G/UMTS) ▪ RTOS, or OS with a cluster possibilities (MS Advanced Server, Linux, ...) ▪ A specific number of computers depending upon the OS selected (OS with clusters or RTOS) ▪ Specialised software with databases for connecting to a server, sending video signals to a specific location and keeping records ▪ Screen (LED or LCD or plasma screen) depending upon above mentioned display requirements ▪ Continuous UPS in case of power failure (UPS capacity depending on how long the system needs to continue operating) ▪ Electrical outlets

In this solution, protection is addressed at both the ISP side and the client side. For most of the time, the system is offline and, occasionally, online (only while filling databases on the client side) (Šimunić, Maćešić, 2008.)

Disadvantages:

- The database on the client location side is occasionally filled with data.

Advantages:

- The client location is not required to have large space for keeping data (hard disks).
- Updating presentation data is carried out instantaneously.
- The number of telecommunication connectors does not grow with the number of display locations.
- There is no ONLINE connection, so the client computer operates and displays data independently.

6. IMPLEMENTATION IN PRACTICE - Video presentation (OFFLINE)

As in the previous chapter, this method of transmitting video signals involves the server connecting on to the client location only while filling the client location's local databases, upon which the server disconnects. The following section describes how this technological solution for indoor multimedia networks is implemented in practice. With regard to the solutions described for indoor multimedia networks, and with regard to the accessibility, reliability, safety and practicality of the technologies available today, the offline video presentation has been selected, as it meets the criteria of modern business in all its business and technological aspects (figure 4) (Šimunić, Maćešić, 2008.)

The application of this type of operation is exceptionally good, for example, for remote handling of indoor multimedia networks in large shopping centres. One such network is installed in Tower Centre Rijeka, and it has been operating exceptionally well and reliably for about one year. The installation of a multi-office solution (provided by T-Com) has made it possible to handle and change content in real time, and this is extremely useful to chain stores with a great number of products and drives that can change daily due to changing market conditions. Thus, the supply market can inform the demand market, in real time and in a very simple way, about any changes and sales on offer. When the user (renter) of part of the indoor multimedia network has advertising material ready, he uploads it on to the company's ftp server, which then takes this material and uploads it on to the plasma network server (Šimunić, Maćešić, 2008.)

7. Analysis of IMMN implementation in practice

With regard to what has been stated in the previous chapters, this paper would carry little weight without business parameters. Namely, the indoor multimedia network installed last year in Tower Centre Rijeka has recorded a substantial increase in the acceptance of this way of doing business. For the purpose of this article, growth is illustrated using a simple presentation of the quantity of uploaded advertising material, demonstrating that renowned companies are embracing this method of operations and this technology in their businesses. The case below refers to the results of processed business data of Croatia's largest chain shop (Konzum d.d.) over the last year (by monthly increase of uploaded commercials – table 1 and figure 5 (Business data of the company Apex It d.o.o. – Business collaboration with the economy, 2008/2009.)

Conclusion

As a modern trend in providing information to consumers, indoor multimedia networks are able to display multimedia contents, which are subject to rapid change in real time. This is done by network handling using a personal computer from an office or from multiple locations depending upon the technology implemented. With regard to the available technology and its characteristics, one of the proposed models may be selected. According to business experience and based on business analysis, it can be concluded that modern companies are rapidly embracing this business concept, adjusting to it, and efficiently using it to communicate with and provide information to their target market in real time.

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Web:
http://www.faqs.org/patents/app/20080298337

Figure 1: Video streaming using software or hardware encoders and decoders

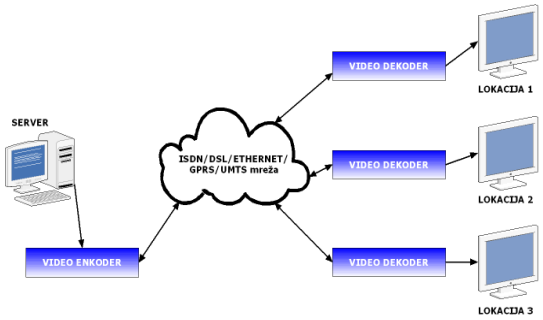

Figure 2: Video streaming over the Internet

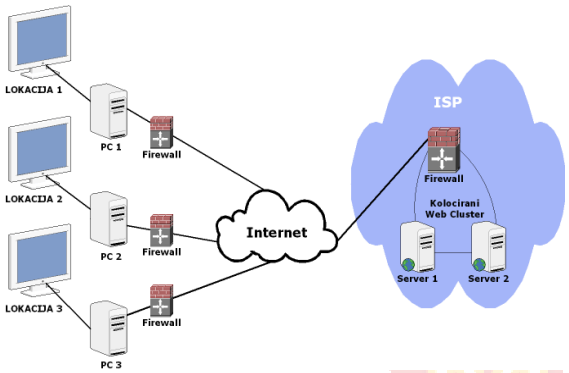

Figure 3: Video presentation (offline)

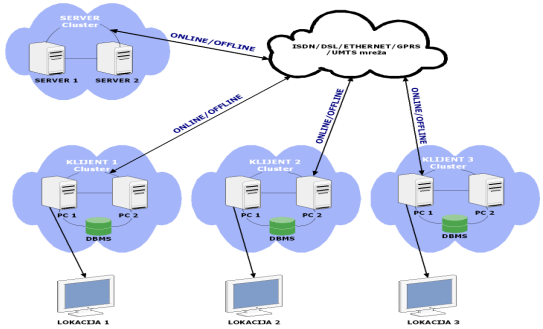

Figure 4: MMIN powered by multioffice

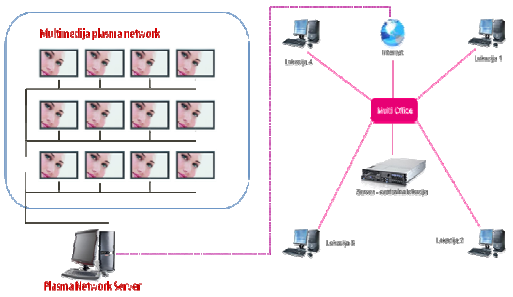

Table 1: Quantity of uploaded commercials

	V-2008	VI-2008	VII-2008	VIII-2008	IX-2008	X-2008
Quantity of uploaded commercials (Konzum d.d)	4	8	12	12	16	16

	XI-2008	XII-2008	I - 2009	II - 2009	III- 2009	IV-2009
Quantity of uploaded commercials (Konzum d.d)	20	22	26	28	30	32

Figure 5: Quantity of uploaded commercials