Information technology for video broadcasting

I. Olenchenko, A. Oliinyk, S. Subbotin

***Abstract*—**This paper presents description of real-time video broadcasting features, created business process diagrams that shows main functions of developed software, analysis of the client-server architecture, review of protocol RTMP and exiting multimedia server software such as Wowza Streaming Engine. Basing on the results of this analysis software tools for system development were selected.

***Keywords*—** Android, client-server, geolocation, real-time video broadcasting, RTMP, Wowza Streaming Engine.

I. Introduction

Real-time video broadcasts are rapidly gaining popularity because there are a lot of different events and incidents in the world and around us.

Online video stream is a "compressed" video and audio information transmitted over the Internet in real-time. Information technology advancement make possible to broadcast not only from special equipment and personal computers but also through smartphones. Also online broadcasts are being implemented in social networks and video platforms.

The area of video broadcasting covers many spheres of human life and work and nowadays it is very important to organize the broadcasting process from places of accident. This allows you to observe extraordinary events from the first person, respond quickly to these events and analyze what's happening. All well-known social networks and video platforms are also trying to implement live video broadcasting.

II. Statement of the problem

The relevance of the project lies in the fact that despite the large number of existing mobile applications, not all have a well-implemented main functionality for video broadcasts and user-friendly and understandable user interface. These facts leads the development of software that will combine a user-friendly interface and a well-implemented main functionality.

The main goal of the project is development of software that will allow creating video broadcasts, viewing already created ones, organizing work with geolocation and a map. In addition, the software should support the registration and authorization of users.

In the context of the tasks, it became necessary to choose the most appropriate application architecture and study the existing methods of streaming video and audio signals.

III. Analysis of application architecture

Creating a client-server architecture marked a new stage in development of network information technology. It has been made possible by increased internal and external memory, computer speed, data rates and the advent of powerful mobile devices - smartphones and tablets.

The main idea of the client-server concept is to deploy servers on powerful computers and client applications - on less powerful computers or on mobile devices such as smartphones and tablets. Due to this, resources of a more powerful server and less powerful equipment of clients will be involved.

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Therefore, "client-server" architecture was chosen as the basis for the implementation of future software.

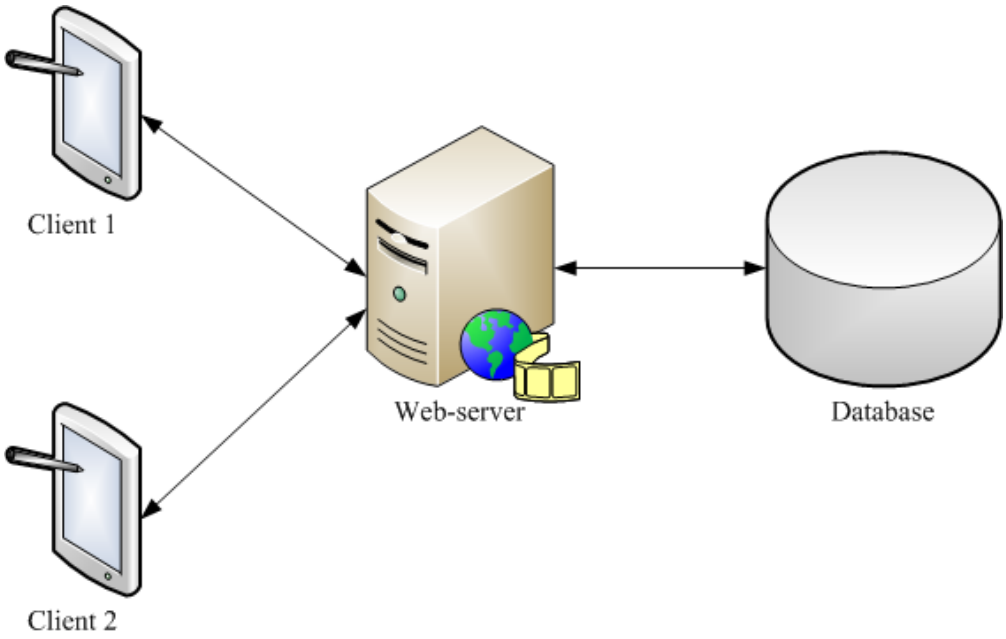

Fig. 1 – Overall structure of developed software using client-server architecture

The concept of "client-server" made possible to combine the positive qualities of systems with one user (high level of dialogue support, user-friendly interface) with the advantages of large computer systems (integrity support, multitasking) [1].

Basic functional was analyzed and allocated using concepts of client-server architecture that shown in fig.2. For the client side main task is implementation of user interface and work with camera of device. For the server side main task is processing data that comes from the client and saving it to a server.

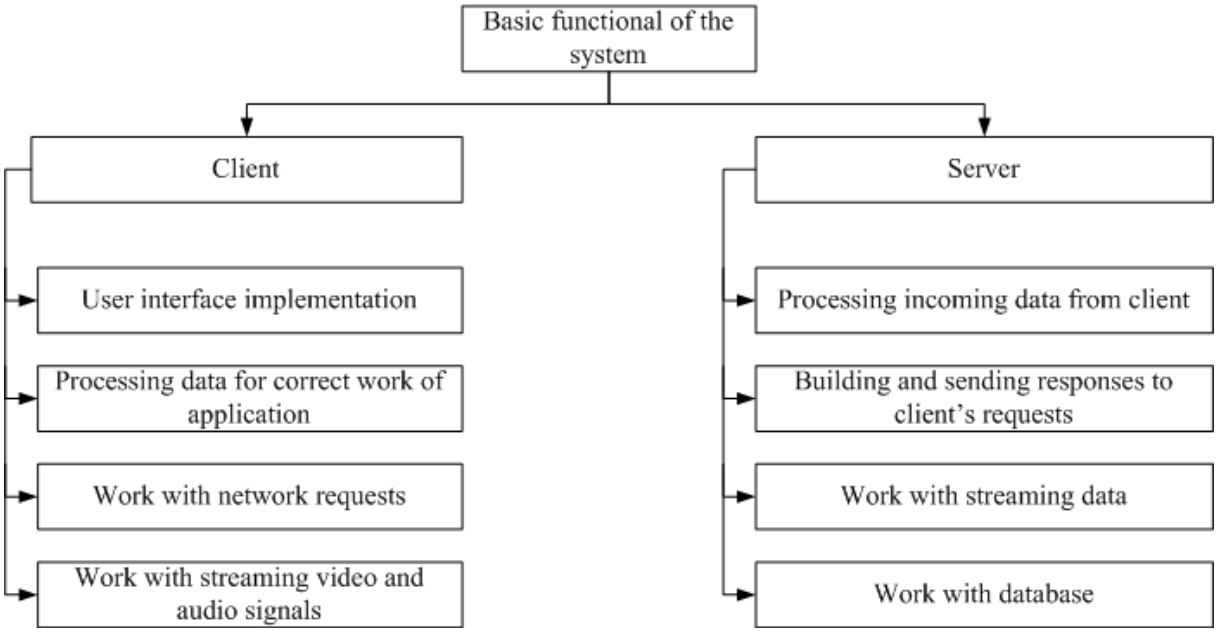

Fig. 2 – Overall structure of basic functional of the system

IV. Realization of information technology for video broadcasting

During the design phase of the system, information models were created in the form of business process diagrams. Their features consists in fact that with help of a certain set of symbols you can present any process in the form of a block diagram [2]. In our case created diagrams describe the main software functions such as user registration, creation and viewing streams. The diagrams are shown in Figures 3-5

Figure 3 shows a diagram, which describe process of user registration. It shows possible user actions during registration and reaction of the system to incorrect user actions - input of incorrect data and shows interaction of the client and server parts of the software.

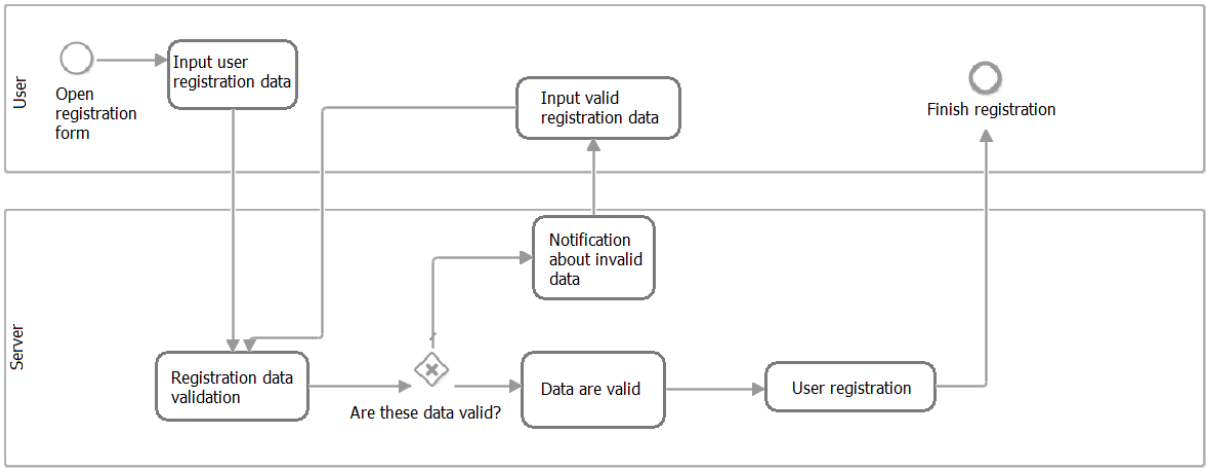

Fig. 3 Diagram “User registration process”

The figure 4 shows a diagram of the process of creating a broadcast, describing the basic actions needed to create the broadcast, the system's response to user actions and the interaction between client and server.

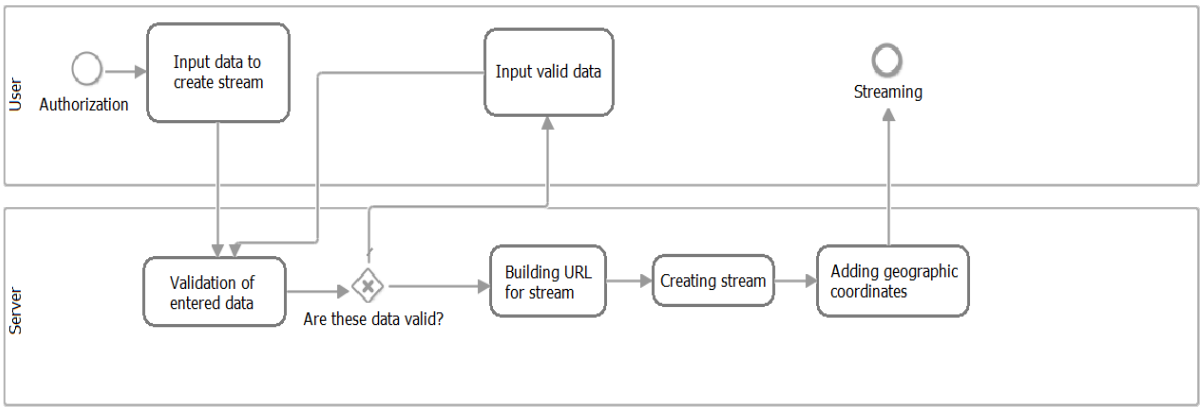

Fig. 4 Diagram “Creating stream process”

Figure 5 shows a diagram, which describe process of selecting and viewing already created broadcasts. The structural elements of this diagram are similar to those that used in the diagrams pictured in Figures 3 and 4.

The visualization of the interaction between the client and server parts of the software was an important component in design of the future system because it clearly demonstrated the advantage of client-server architecture over other types of architectures.

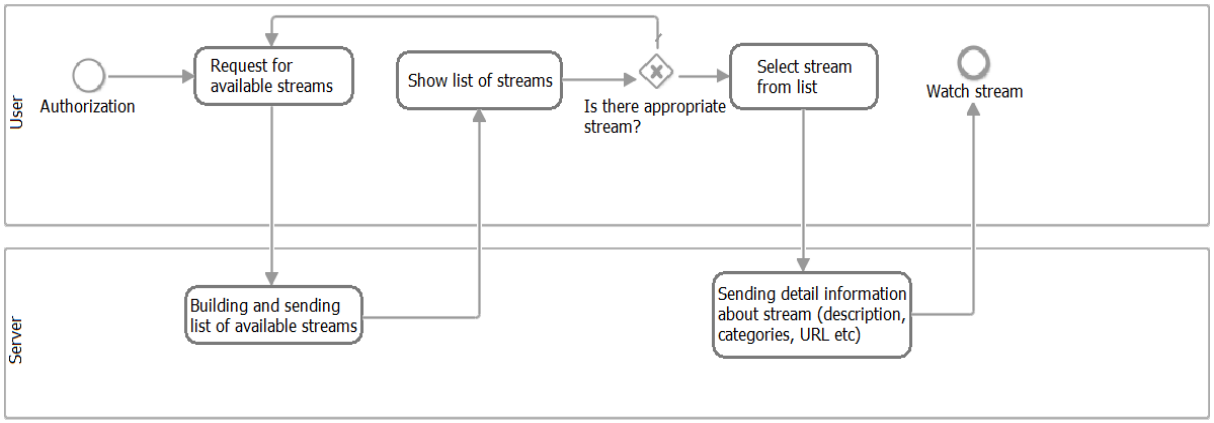

Fig. 5 Diagram “Watching stream process”

Based on the developed diagrams (Figures 3-5), main requirements for the software being developed were specified. In addition, created diagrams influenced the choice of system architecture.

It was necessary to divide the server part into a multimedia server and an HTTP server for accomplish this objective. The HTTP server was designed to receive and process data that comes from the client (information about user and streams) and organization of work with the database. HTTP server implemented via Node.js programming platform, JavaScript programming language [3-7], MongoDB has been chosen as database management system [8-10]. The interaction between the client and server parts was implemented using the developed API-interface [11-14].

Multimedia server was designed to work with streaming video and audio signals, for the organization of its work using the Wowza Streaming Engine software.

Wowza (full name - Wowza Streaming Engine) is a server software for streaming audio and video signals and video delivery on request. It has the ability to install on the following operating systems: Linux, Mac OS X, Solaris, Unix, and Windows [15]. RTMP is using for streaming video and audio.

RTMP (Real Time Messaging Protocol) is a streaming data protocol optimized for networks with weak bandwidth, mainly used to transfer streaming video and audio signals from cameras over the Internet [16].

The client part has been developed for Android operating system using Java programming language [17-26].

The main task that had to be solved in the process of creating a mobile application is the organization of video broadcasts using the built-in camera. To do this, it was necessary to avoid the use of the standard application "Camera", which is available for use in the development of applications and work directly with the camera of the smartphone. This allowed you to adjust the video quality by changing the resolution, working with the focus. After the connection to the server is established, the transfer of video from the camera to the multimedia server starts in real-time. Figure 6 shows the process of broadcasting video to multimedia server.

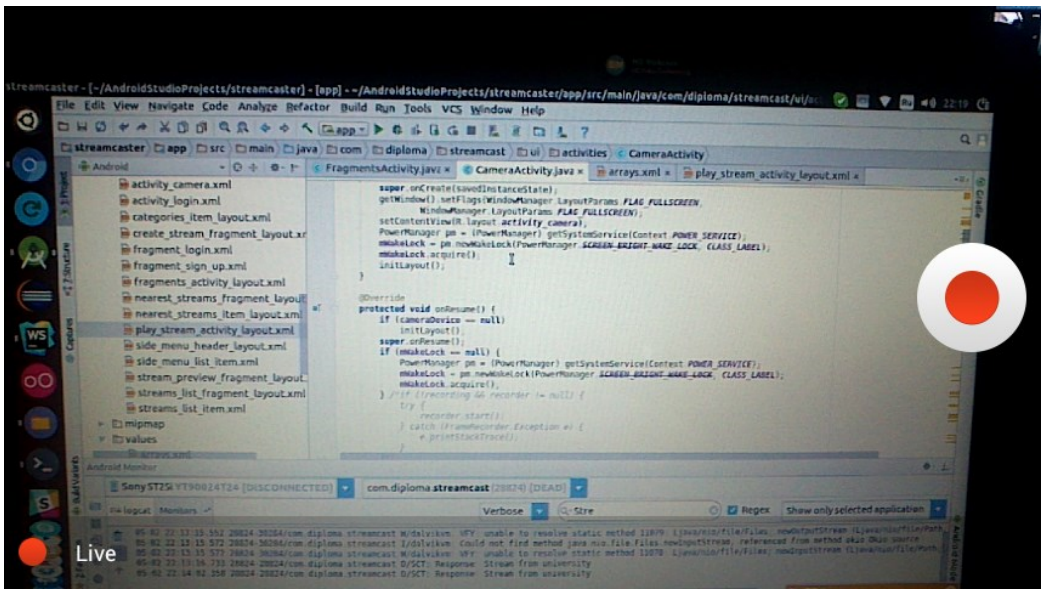

Fig. 6 Screen “Camera”

In addition, one of the features of the developed mobile application is the work with geolocation and map. While each stream is being created, geographic coordinates of the user are sent to the server, which created this broadcast. This allows you to display location of this stream on map with marker and serves to locate address where the broadcast will take place. (Fig.7).

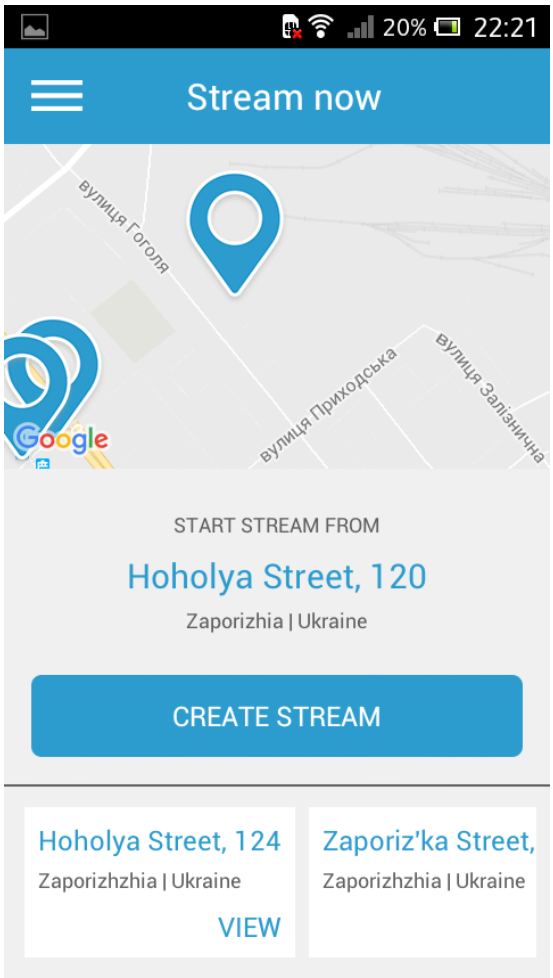

Fig. 7 Main screen of application

Geographic coordinates are used to sort the list of all streams. All broadcasts are sorted in descending order from the location from the user (Fig. 5). Calculation of the distance between position of user and location of the video is performed on the server.

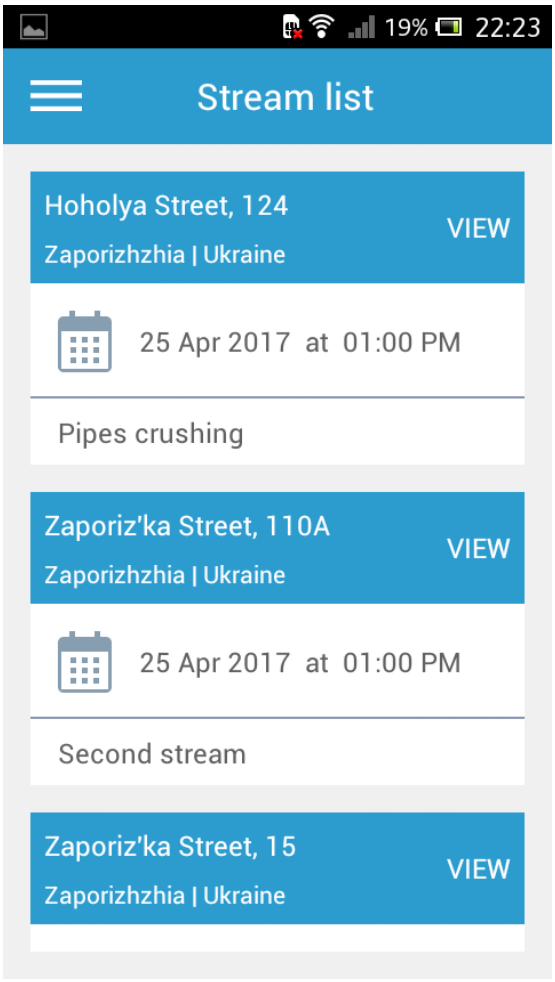

Fig. 8 Screen “Stream list”

These features of the user interface simplify the user's work with the application [27]. The usability of the user interface and implemented functionality of the system make it possible to recommend the developed software for use in practice for work with real-time video broadcasts.

V. Conclusion

Thus, the following tasks have been solved:

1. The requirements for the system being developed are formulated.
2. Business process diagrams describing the main functions of the software and demonstrating examples of interactions between the client and server parts were developed.
3. The architecture of the application, which allows the most effective implementation of software for working with video broadcasts, was chosen.
4. The server part of the software, which allows processing and storing user data, information on video broadcasts and organizing the streaming of video and audio signals, is implemented.

5. The client part is implemented as a mobile application that runs under the operating system Android 4.0 and higher, has a user-friendly interface, maximally oriented to the majority of users.

The developed software is the first version of the project, in which the basic functions necessary for the normal functioning of the system are realized. In future, it is planned to expand the basic functionality and work on user interface.

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