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(Received 09 March 2022; received in revised form 18 April 2022; accepted 07 June 2022)

## Analysis, Research and Development of an Innovative Enterprise Digitalization System for Remote Work

**Abstract:** This article presents innovative development of the system for the remote activity implementation. It is all about from remote customer service to the company and private conferences for employees, online conferences, meetings, training, etc. This system refers to devices for implementing the employees' remote production activities of the enterprise, to devices for organizing and managing the business processes. The developed system may be used without restrictions. The most important particularity of this useful system is the opportunity to add various features depending on the demand for a separate enterprise, upon that having saved a range of using the already existing opportunities. By applying this system, it is possible to increase by several times the level of the information and communication technologies usage for enterprises. The developed data device essentially allows economizing various resources on data transmission and storage. Besides, the requirements to the infrastructure of the enterprise may be used either by browsers or mobile devices, upon that by increasing the efficiency of analysis and the agility of making production decisions. Research and analysis of fault tolerance, applicability of modern IT technologies to increase the efficiency of enterprise digitalization have been carried out

**Key words:** Digitalization; remote work; webtrc; development; system

### 1 Introduction

At present, one of the priority areas for the development of society is a high level of digitalization of all types of activities and, as reality has shown, this is especially important for working in conditions such as a pandemic and post-pandemic. Despite a sufficient number of information systems, now there is a need to develop scalable fault-tolerant information systems, which are now in demand due to the constantly growing volume of information, big data, and the need to ensure fault tolerance.

The modern need for the development of information systems for the digitalization of enterprise activities is due to the following shortcomings of many existing systems: the impossibility of processing big data, including unstructured data, poor data security, susceptibility to unauthorized access to data files, the impossibility of making decisions in optimizing document flow routes, high cost available known systems.

There are known the various devices used when conducting remote transactions of the production activities, for instance, Zoom, MS Teams, Google meet and others. However, the devices mentioned

above have some different drawbacks and restrictions, a usage-time restriction, a restriction to quantity of participants, restriction to usage of various device capabilities, no transparency, etc. The usage of such systems may cause to several disadvantages, among them, if necessary to hold any confidential corporate meetings. There are various devices of the Enterprise Content Management and the Electronic Document Management System which are used at organizational activity of an enterprise. The widely used Directum system assigned for document flow of the enterprise (State Registration Certificate of the program for "Directum RX" computing machine dated on 22 April 2015 No.2015614659) has some restrictions such as unavailability to conduct online meeting in real-time mode, no opportunities to interact with external applications and some other restrictions [1].

The purpose of the developing system like this is the development of fault-tolerant, zoomed data device which will enable to conduct organization and management of the employees' remote production activities of the enterprise.

The prospects for the development of this scalable fault-tolerant information system are also

due to the fact that the openness of the architecture, scalability, a high level of independence of the functional subsystems of the complex, maintenance, practical development and application open up a fundamentally new possibility of distributed use by enterprises, united by a common communication intranet and Internet environment, responding general requirements for information systems and information security, intended for implementation in a single information educational space of the Republic of Kazakhstan.

## 2 Research of ensuring fault tolerance

The development of scalable fault-tolerant application for digitalization of enterprise activities is due to the following shortcomings of many existing systems: the impossibility of processing big data, including unstructured data, weak data security, susceptibility to unauthorized access to data files, insufficient optimization of document flow routes, high cost of known systems. The main idea for creation of such application is multitasking: for study, work, teaching, online conference, etc.

**Reliability.** The system architecture supports a transactional model that guarantees the integrity of system data throughout all stages of their life cycle. Managed MongoDB storage allow one to organize reliable storage of documents.

**Safety.** For each object of the system, it can be specified which users or groups have the right to perform certain actions with it. Confidential electronic documents and tasks can be encrypted directly in the system by any Microsoft CryptoAPI-compatible encryption provider, which guarantees protection even from users with unrestricted access to data. Logging of all user actions will allow restoring the history of work with system objects in the event of a security violation. Provides high protection against unauthorized access to document storages of all types.

**Scalability.** The invention enables to add some other features at customer's option as well. This is the key factor for own data device of the enterprise.

**Fault tolerance and speed.** Thousand or even millions of concurrent connections in the world may become the cause of failure in operation even in the largest analogue projects. This invention may operate independently for a certain enterprise, and they may be supported separately from the basic flow. That way it is possible to obtain essential increases in as well operating speed of the application.

**Big data processing.** The invention enables to process large volume of data of different type, which is very topical at present time.

All control services can be installed both on one server and on multiple ones – in order to distribute the load and safety. Users randomly select a server and perform their actions.

**Management manipulate** has been defined as the system with the aid of which managers have an effect on other participants of their agencies to put into effect their strategies, and additionally assures that the sources are obtained and used correctly and correctly in achieving its objectives.

The work of the personnel Department of a fairly large enterprise is associated with the accumulation of a large amount of data about the individual data of employees. Traditionally, data is put away on paper. Also, it is difficult to quickly select the necessary data when hiring, firing, or compiling reports. The basis of the development was a number of reasons that arise due to the influence of the human factor, which negatively affect the quality and intensity of the human resources Department:

- a) the possibility of an accidental error in manually filling out forms;
- b) inability to quickly cope with a large amount of information;
- c) the complexity of finding the necessary information;

The purpose of the development is to eliminate as much as possible random errors, the listed shortcomings of the existing system of work of the personnel Department, and to introduce into it factors that positively affect the quality and timing of the functions implemented in it:

- a) reducing the execution time of each function;
- b) automatic creation of documentation and reports;
- c) simple and fast search;
- d) automatic affixing of dates and service numbers;

All of the above indicates the relevance of the problem, a solution to which is presented in this diploma work.

**Verbal description of the subject area.** Main functions of the company's human resources Department:

- hiring
- calculation from work

For a detailed description, you can divide the main functions into a number of additional ones. For example, hiring involves performing the following actions:

### 2.1 Data Analysis

Data analysis is performed when a person is hired. To perform this function, the following documents are required: passport, work record and education document. Provided that the person has passed the interview, an order for employment is drawn up. The acceptance order must include the full name, position (workplace), date, and, accordingly, the order number.

### 2.2 The Preparation of an employment contract

Drawing up an employment contract is made according to the prescribed form of the contract. An employment contract (contract) is filled out when an employee is hired. Contains data: last name, first name, patronymic, service number, position (workplace), reason (number and date of the order for employment). After drawing up the employment contract, the corresponding mark is entered in the employment record and the employee's personal file is formed [2].

### 2.3 Formation of a personal file

Passport data and General information about the employee are stored in the personal file. In addition to the data required for drawing up an employment contract (full name, workplace (position), no. of the order of acceptance), it contains the employee's service number, personal and other data:

- Personal data:
  - date of birth, place of birth;
  - address;
  - passport: series, number;
  - pension certificate;
- Education;
- Employment history (employment history before working at the company) with the following data:
  - enterprise;
  - position;
  - experience;
  - article of dismissal;
- Documents (inventory of documents attached to the employee's personal file), indicating the fields:
  - document type;
  - identification number;
  - date of acceptance;
  - date of issue;

### 2.4 Changing the staffing table

The staff list of employees in the company (in the position format-the number of people working for this position), when hiring a new employee, must be changed accordingly.

### 2.5 Making marks in the personal file and work record

If there is a dismissal order, a corresponding note is entered in the personal file indicating the article of dismissal and the date of settlement, as well as the number of the dismissal order. In this case, a mark on the calculation is also put in the work record.

### 2.7 Making a service provisioning system

The technological support of the business processes continuity is, in our opinion, almost the priority task of IT system. Nobody needs in any separate feature-packed hardware and expensive software in case all this is not a reliable support, a basement for users' daily successful operations.

The capability of any system to keep its operability after failure or abrupton of one or several composite components is named as the system fault tolerance. The fault-tolerance system shall keep its operability in case of abrupton of one node at least, and respectively, the main way to increase the fault tolerance is to create the hardware redundancy by way of reservation (redundancy).

Users may simultaneously create their requests. For their servicing some servers are required. The quantity of servers can be several or the great one. Advantages of this approach are as follows: a request is a stream of jobs, has quality of service contract,  $n$  is kept optimal to minimise energy consumption ( $n \leq N$ ). QoS contract:

- Charge: For each accepted and completed stream a user shall pay a fee.
- Obligation: The average waiting time,  $w$ , of the jobs in an accepted stream shall not exceed a certain bound.
- For each stream where the average waiting time exceeds the bound, a user shall receive compensation.

Thus, a contract for a given type of service is characterised by the triple:  $(r_i, q_i, p_i) = (\text{charge, obligation, penalty})$ . Objective. Maximize the average revenue per unit time,  $R$  [3]:

$$R = \sum_{i=0}^m a_i [r_i - p_i P(w_i > q_i)] - cS$$

where:

- $a_i$  is the average number of type  $i$  streams accepted per unit time
- $w_i$  is the average waiting time for the jobs in a type  $i$  stream
- $S$  is the average number of operative servers
- $C$  is the cost of a single server per unit time

### 3 Analysis and technologies

One of the first technologies that were used in application is .NET Core. Many developers think that the nature of .NET platform is unfinished. And because of that, it is practically almost always under rework and upgrades. If earlier versions of the technology are tool for the applications with large functionality, in modern times the technology allows supporting the development of API and support of Visual Basic. The technology gives the developers a great deal of freedom and, at the same time, allows fully controlling all the processes, especially when uploading the product to industrial environment. And what about the SignalR library, which is the main gateway for data exchange. SignalR is remarkably similar to SocketIO. Their main similarity is that they both support negotiation/fallback. Of course, it is important that SignalR is a library, not a server. Therefore, it should be placed on individual server together with .NET Core. There were also hosts for ASP.NET, Owin and self-host, that is why it would be possible to easily launch it in its own process, for example, right now it is a Windows service. Investigations showed that SignalR is supported by clients for JS, .NET, Silverlight, and Windows Phone 7 browsers. There are also clients for the same items as IOS, Mono Touch, etc. SignalR provided the project with much higher level of API than raw sockets, which is a great advantage compared to other similar technologies. It means that SignalR allows us to do such things as “RPC” from server to clients in a broadcast form.

The next investigation is related to Angular. Using the latest versions of Angular CLI allowed us to make the project structure in Model-View-Controller format. There was an opportunity to use Model-View or View-Model as well. When selecting this technology, the function of two-way data binding was of interest. In Angular, this function is designed so simply that there is no need to spare a lot of time to solve certain tasks. It allows aligning models and presentations without any problems. The following factors were the main reasons for technologies selection: Angular allows using HTML to create a user interface, Angular has a small number of observable functions, it facilitates modification and changes of

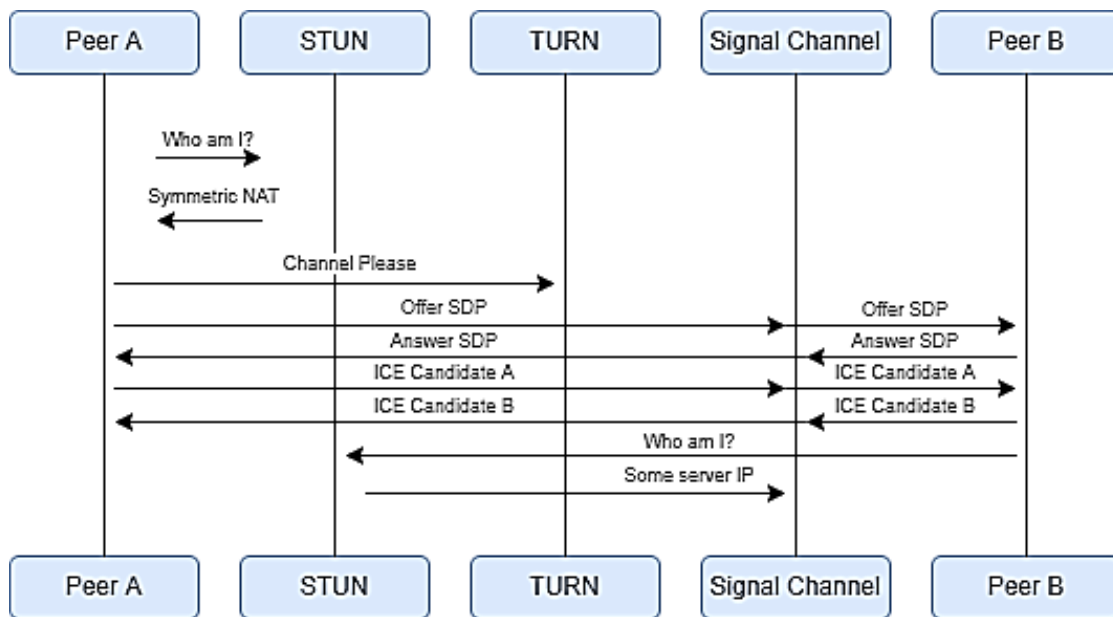
properties, huge support from community and framework designers themselves. Not every similar technology may afford some of the possibilities of Angular.

WebRTC is a browser technology designed to implement the transmission of streaming data among several browsers or applications using the special technology of point-to-point transmission. One of particularities of this technology is that the technology enables to establish communication among users by using browser applications only. Previously this was becoming a kind of discovery for some developers of the community when they had been inquiring after the WebRTC: in fact, it is possible to create a video chat or even an audio chat independently of an outside server— you need a certain browser only where the WebRTC is supported. The WebRTC does not require for downloading any additional extensions or plugins. You need only to do some HTML or JavaScript coding and video streams, audio streams in a browser will be working with no trouble. Perhaps, there is the next question: for which projects the WebRTC is suited? Initially, the purpose of the WebRTC is to create video conferences using technologies independently of any additional servers. The technology is ideal for developing new applications for video conferences with the help of a browser. It means that for this project the WebRTC is ideally suited. The WebRTC does not use any outside servers which may be located in various servers where it is possible to implement the data security. But the technology operates via the secure network protocols which may provide with the safety of data or streams transmission. When the WebRTC-agent is run, it does not aware of who it needs to be connected with and what kind of information it will be shared. And in this situation the Signaling comes to the rescue. Signaling solves this problem. Signaling is required for two or several browsers could find and call each other before within the network before the data transmission was started [4]. The Signaling may use the current or a secure protocol. SDP is a simple text protocol. Every SDP message consists of key-value pairs that are placed in the strict order (rfc4566), which, in return, comprise a set of streams [5]. As signaling the SignalR library had been used, and with the help of it, the WebRTC could find

each other. After setting the signaling, all sides of WebRTC browsers have enough data to connect each other. And after this, another created technology named ICE is used.

ICE (Interactive Connectivity Establishment) is a protocol of the WebRTC. The ICE enables to establish communication among several browsers. These browsers may be located both within the same network or maybe

in various parts of the world. The ICE allows solving the problem of establishing the direct communication independently of various intermediate servers. After establishing the communication between two browsers, the WebRTC moves on to setting an encrypted transmission channel. Further, this channel will be used for audio/video and data transmission [6].



**Figure 1** – WebRTC. How it works

Other standards or technologies could be used to create streaming connections between the users, but the choice fell on WebRTC [7]. The main advantages include the following:

- No need to install additional SO.
- High quality of connection and in audio stream and video stream.
- Custom modifications may be incorporated into this project with open-source code.
- There is a built-in possibility of screen, desktop capture, etc.
- Cross-platform scripting.
- Possibility to create any interface based on HTML5 and JS technologies.

Firstly, creation of a project on Angular platform for customer part, development of initial UI/UX design, which will be further supplemented, as specific tasks are completed. Secondly, NodeJS was

created with support of PeerJS. Thirdly, ASP .NET Core with SignalR library was created. This library allows exchanging messages with the server-side and the client in real-time. Operation with server part required HTTPS on the client-side for the stable operation of sockets; Fourth, creation of a database [8]. MongoDB was chosen as the database. The necessary collections for the application to work were created in advance [9].

An interface was required to start the work. The interface could be created from scratch, without using various libraries. However, that would not be rational. So, Angular CLI was chosen. Angular is an open and free platform for creating a web application. It makes the work faster, and small tasks, usually consuming a lot of time, take a few seconds on Angular. Material UI for Angular and the usual Bootstrap were used as an initial design [10].

Depending on the project, the following items are included:

1. [Bootstrap@5.0.1](#)
2. [Uuid@8.3.2](#)
3. [Microsoft/signalr@5.0.7](#)
4. PeerJS
5. MomentJS
6. Ngx-ui-loader
7. There are also built-in Angular dependencies, such as rxjs, router, angular forms, typescript, etc.

Bootstrap was used for a quick layout of required components, and Material UI was already used for a good version of project. On the one hand, it might seem that one Material UI would be enough. However, Material UI lacks some Bootstrap qualities, without which it is difficult to create a flexible interface. For example, 12 column grid, margins, etc. Many conferences require creation of a unique ID for each of them. UUID dependency is used for these purposes.

One of the main technologies of this project is WebRTC (Web Real-Time Communications). It is some kind of standard for transfer of streaming audio data, video data and various content between browsers [11]. This method gives opportunity to turn a browser into a real-time terminal [12]. To start the conference, simply click on the conference link. Examples of using WebRTC:

- Google Meet is a ready-made service for instant messaging, as well as video and audio calls [13]. Chromium browsers have many hidden WebRTC functions used by this application. Official documentation does not indicate these functions. Maybe it indicates some of them. For example, screen capture, background blur, etc [14].

- Jitsi Meet is an open-source application developed by 8x8. Technologies of this application are based on Simulcast, which means that there is unstable work on weaker communication channels and rather high requirements for a web server.

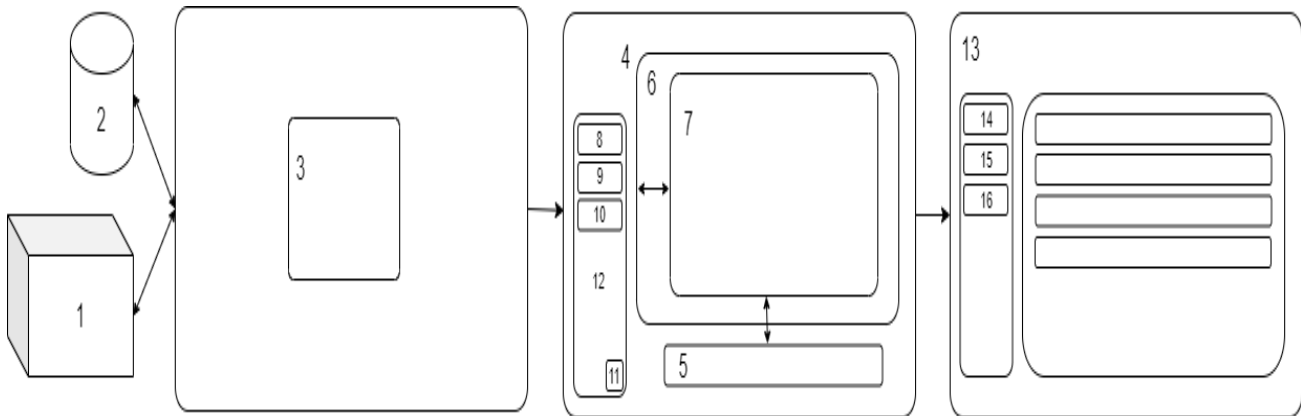
- Zoom is the only application where WebRTC is not used. It was made for improvement of communication quality and for saving server resources.

It was decided to use PeerJS library for easier work with WebRTC. The task of this library is simple. This is convenience and simplicity. Also needed a webserver to synchronize two clients for work with two clients [14]. The launch requires peer

dependency, which keeps a lot of methods and properties. After connection of the library, the application can get PeerServer property and start it with port 9000 and path /peerjs. That is, after starting NodeJS server, the application can access PeerJS via path localhost:9000/peerjs. Of course, after the global publication, this path may change. On the client-side, peerjs library is used for communication between the client and the server. After that, this stream can be controlled at your discretion [15].

In addition, as mentioned above, .NET Core is used for server part of the application. The correct work of the server part of the project requires connection with database and client part [16]. Standard REST API was used for these purposes. The server may receive various requests with different HTTP methods. Method GET is used for obtaining any data, and method POST is used for addition of new element. Methods PATCH, PUT are used for changing the element. Method DELETE is used for deleting. The request accepts a JWT token, which users receive when logging in [17]. This token controls the user roles. That is, you can control who will be allowed to delete, add or receive records. The next library for .NET Core is SignalR. SignalR is a library from Microsoft that specializes specifically for applications that work in real-time. That is, there is no need to update the page every time you receive any data from other users. The data will be sent immediately via the socket to all users in the group. The principle of the library is simple. One or more users are added to the same group [18]. Once added, they can send various data to all users of the group in the form of a text or even a file. Thus, they can communicate in real-time via chat or take a test together, etc.

The common pattern of the proposed “Digital Enterprise” data device with the streams of information is represented in Fig. 2, where the following is designated: 1 – data exchange web-server, 2 – stored data module, 3 – authentication module, 4 – general software package, 5 – controlling videoconference units, 6 – participant’s module, 7 – organizer’s module, 8 – features for the latest sessions viewing, 9 – features for voting, 10 – training process module, 11 – features for personification, 12 – features for viewing the participants’ list, 13 – training process module, 14 – training materials module, 15 – timesheet module, 16 – statement module.



**Figure 2** – Pattern of “Digital Enterprise” data device with the streams of information

#### 4 Description of results of the conducted research

Using the proposed development, it is possible to increase the level of use of information and communication technologies in enterprises several times. The developed information device allows you to significantly save various resources for data transmission and storage. In addition, the requirements for corporate infrastructure are reduced, since Digital Enterprise can be used through browsers and mobile devices, while increasing the efficiency of analysis and the efficiency of production decision-making.

The following is a description of the results of the development of the main modules that ensure the functioning of a web application:

The authentication module is the first stage of the device usage. Users may personally pass registration or ask an administrator to add their data in the database for further authorization. If the user who has such a mail address and a password is found in the database then the user will be enabled to operate further. To ensure security of the user’s data there is the open standard used for creating access tokens to JWT. Authorization and registration were implemented in order to store user data. This functionality allows registration of new users and storing their data for subsequent authorization [19]. When registering, the E-mail, password and name fields are filled in. During authorization, these data are pulled up and filled in on the client-side. Authorization should be required for the correct operation of the project and for data logging purposes. This functionality allows identifying people entering the conference.

The data of authorized users can be stored in the database [20].

The problem of links also appeared in implementation of the functionality. When a new user joins a conference, the /conference link is used and a unique conference number is transmitted at the end. If an unauthorized user clicks the link, he/she will automatically go to the authorization page. At the same time, there is a risk of losing the unique conference number [21].

This problem was solved using the returnUrl principle. This principle is simple. When you go to the /conference page, the program records a unique conference number and transmits it to the authorization page. In turn, the authorization page stores the unique number. Upon successful authorization, the unique number will be automatically transmitted to the conference page.

The training module is one of the main modules, which is important for increasing the employees’ qualification. This module allows conducting the learning process, trainings for employees, including probationers and interns of the enterprise. The algorithm of roles division among users is developed in order to divide into students and teachers. At registration for the application, a user may automatically to get a role of a student. And in order to get a role of a teacher it is required to address to the administrator. Access to educational materials may be obtained on a page of educational materials. Every teacher is enabled to add materials for his future lessons. The lessons can be seen in the timesheet module which, in its turn, has a timetable for the next academic year. There is the knowledge evaluation is scheduled in the module – a teacher posts grades into a grade report sheet.

Interactive screen sharing by all meeting participants. Screen sharing or interactive screen sharing is a handy feature that in turn allows you to share a user's screen with other users in real-time. This feature allows to share screen with anyone in the conference and provided by the shareScreen option.

The chat was created for this purpose. When the session starts, it becomes possible to send messages to the rest of the conference participants. The chat appears on the lower right side when you click on the "Chat" button. In order to save space, it was decided to use a pop-up window that stands on top of all other parts of the application. At the top of the window, there is an inscription "Messages" with a green indicator, which in turn means the possibility of sending a message. The window can be closed by clicking on the cross or on any other place except the chat itself. On the bottom side, there is a field for filling in the message. The send button is next to it. When the send button is clicked, a request `SendMessageToConference` is sent to the server [22]. The component implements methods such as: `initTextAreaResizer`, `keepMessagesScrollInBottom`, `changeChatView`.

- `initTextAreaResizer` is an algorithm that allows expanding the chat field (If the message is too long)

- `keepMessagesScrollInBottom` – Does automatic scrolling when a new message is added

"Recent Sessions" functionality is one of the first functionality that was developed. This functionality has the standard role of storing the latest sessions and the ability to restore the connection with the latest sessions. It was initially planned to use a database for storing the latest sessions, and it likely will be done so. But at the moment, the last sessions are stored in the local store. The local store holds an array with the objects of the last session. The session ID and the date of the last connection are recorded there. The data is stored in JSON format for further processing [23].

The next module is poll. The project required a new functionality for some diversification. In addition, the possibility of implementation of various functionalities should be demonstrated. The poll was created for these purposes. This functionality helps conference participants to create polls and vote anonymously. That is, no user will be able to see who voted for what. This is one of the main advantages [24].

A new block called "Polls" was also created after "Recent Sessions" block. The poll can only be created

during an active session. Every time someone tries to create a poll, they will be able to see a text with a description that only the conference organizer can create a poll. It helps to avoid creation of many polls in one session. As soon as the session starts, the organizer has the opportunity to click on the "Add question" button. As soon as he/she clicks, a modal window opens with the contents of the Angular component.

This component contains a form, which should be filled by the organizer in order to create a new question. After filling in the "Enter a question" field, the user can click on the "Add" button. After confirmation, a SignalR request under the name questions is sent to all conference participants. As soon as such request comes from the server, the client part begins to draw a window with polls. A list of polls appears in the window, clicking on which you can vote. Every time a participant clicks on a poll, a request is sent to the socket that the participant clicked, and the data in the database should be saved and updated.

The Angular component, which adds new polls, keeps the save method. This method sends a request to SignalR method `CreateQuestion`, which in turn creates a question in the DB with the use of received data. The poll data is processes in cycle. When the value of the questions comes from the socket, the client part accepts the received data and puts it in the questions variable. After that, the total number of votes is calculated for each question in the cycle. This procedure is required for further calculations of the percentage of votes. The component part uses the built-in Angular cycle. If the number of polls is zero, then the list of polls is not shown. In the cycle, the percentage is calculated for each poll. The formula is simple:  $number\ of\ poll\ votes / total\ number\ of\ votes\ of\ all\ polls * 1$

The function of module Conference input queue of accepting new participants was developed in order to make the conference confidential. The organizer or other participants can accept new users who want to join the current conference. At the same time, the new user will wait until he/she is accepted, or until he/she cancels the call.

The mobile version of the app is very important for good UI/UX. Since more than half of users access websites and other applications through a smartphone. In some cases, the mobile version is more important than the desktop version. And that's



why it was decided to slightly refine the mobile version. Unnecessary details have been removed and hid large parts of the UI. However, they can still be opened by clicking on the corresponding buttons in the mobile version of the application [25].

Also, the administrative part is developed which allows seeing the analytics of all sessions. This is the total number of sessions, quantity of participants, quantity of organizers, quantity of users, interval between creation of sessions, etc. The data are prohibited to be removed as they are fixed which allows keeping the accurate analytics. This has the large potential when introducing new capabilities in the device as these data are also can be collected and analyzed.

## 5 Discussion and conclusion

The system with new functionalities is developed for enterprises, which can handle various tasks: remote customer service to the company, local private conferences for employees, meetings, etc. Moreover, the using this application is regardless of the type of enterprise, small, medium, or large enterprise.

Currently, the number of online users is growing (because of Covid 19), and this process will continue for many reasons, such as post-pandemic. And not every project will be able to withstand the flow of thousands or even millions of users [26].

Main result is the data device for business communication in real time with the help of video and audio streams exchange, by using some developed updated features: a chat, anonymous surveys, training module, interactive screen sharing, etc.

The system refers to devices for implementing the employees' remote production activities of the enterprise, to devices for organizing and managing the activities of the enterprise without any time restrictions, by number of participants. The system represents the zoomed data device for digitalization of the enterprise activities by implementing the videoconference system with extended updated additional capabilities. The organizer may create its own sessions and hold online conferences. Participants may join the organizer's conference and take active, among them interactive participation, these processes result in the video and audio streams intensive exchange. Except the video and audio streams the live exchange of messages or data which

are translated to the stored data module. With the help of authentication device participants may login the applications via the link at any time of a session. The conference organizer is sharing the link and the participants who have clicked this link, may connect to the single stream of data exchange. The interrelated modules have different roles within one session. Majority of actions is controlled by the conference organizer who, at any time, may log out the current session or to disconnect from various accesses for the conference participants. The data stream is automatically translated to the database and the administrative part of the application. The administrative part has all data on users, on number of online sessions, information on all actions during the session, etc. The organizer and participants may give access to the application to use camera and microphone for further operation of the program. Current system is assigned for increasing the efficiency of enterprises activities by enabling to implement the wide range of managerial and organizational production solutions in the real-time mode, including in case of distant locations from the main workplace. Besides, the features of the tasks to solve may be expanded at customer's option – the enterprise itself.

Our developed application has several advantages. Primary advantages are: firstly, our application is not limited in operating time and does not require payment for the time of use; secondly, scalability, which was developed with using of the REST API (it is the ability to process requests from any operating system iOS, Android, Microsoft) or other systems will be able to use network requests to communicate with the API. This means that other systems can integrate thanks to the REST API and protected methods; the third advantage is "Interactive Screen Demonstration", Interactive screen sharing between all meeting participants; Another significant advantage is voting. This feature helps conference participants create polls vote anonymously.

It was possible to achieve the maximum data processing speed. This means that any requests will be processed quickly and efficiently. In addition, when developing, first of all, in addition to the server's properties, you should optimize the code. All the possibilities of object-oriented programming on the server-side of the developed application were used. Moreover, thanks to this, it was possible to avoid the procedural programming style. Furthermore, the main advantage of the "Digital

Enterprise" project is that it was possible to develop a digital application that will be different for each enterprise since other new functions can be added to our application at the request of a customer – an enterprise following the specifics of the operation of this enterprise.

The top priority of its usage is multitasking. It can be used for various purposes: holding online meetings, voting, demonstration and discussion, increase in performance of the personnel (rated surveys, trainings, education) and others. The application developed is assigned for enterprise digitalization. It allows adding features at customer's option and completely integrating into the information environment of an enterprise.

The developed application for real-time business communication through the exchange of video and audio streams, using the developed modern functionality: chat, anonymous surveys, used without restrictions, training module, interactive use of the screen, etc. The most important feature of this is the ability to add various functions depending on the requirements of an individual enterprise, while maintaining the range of use of existing capabilities.

Currently, the developed application "Digital Enterprise" is used for online meetings, training and plan to expand its use in the activities of other companies.

### Acknowledgment

This research was funded by the Science Committee of the Ministry of Education and Science of the Republic of Kazakhstan (Grant #AP09259208).

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