Bug Trace Service for IBM Bluemix

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***Abstract*—A cloud-based web service of questions and answers is proposed. This is the first Russian-speaking service for Bluemix platform users. It is designed to share experience between developers, joint solution of developing issues and to simplify work with the environment. The main business function of the service is opportunity to ask questions and receive answers from the independent community. This approach of solving problems minimizes efforts of searching, organizing, processing and analyzing information in the Internet.**

I. Introduction

Modern IT specialists today are facing a lot of requirements. Main requirement while creating new software products is the time limitations or deadlines. When company needs to use new technologies in the projects – developers should learn it in the shortest period of time as possible. Most of the time, full documentation of new technologies is available in the Internet only in English. Full translation of it usually takes a lot of time and not all the developers have sufficient level of English. This situation causes unnecessarily issues in learning modern development tools. The first solutions were forums and special new sites, which adapted information to the end user. Nowadays the most helpful sites are still forums and something new, Questions and Answers (Q&A) services.

In comparison with old solutions, like forums or special sites with articles, Q&A services are run by the community. Since administrators are real people, some operation on forums took much time to be processed. Modern services still have administrators, but in other, not so important role. Topics are created automatically and for the convenience they divided into different semantic groups. Users have an opportunity to vote for the best answers so they can appear in top of the whole discussion. The most important thing is that Q&A services are present in different languages and divided into regions. This makes information accessible and useful to a particular visitor. These services have more direct, quick answers, lack of useless discussions and sometimes even a ready solution. All these factors contribute to improving the efficiency of obtaining information. Based on the recent public statistics from the site Similar Web [1], put on Fig. 1, the forums are significantly inferior to services, they account for only 2% of total traffic. You can see them between two Q&A services in the top of the list and the bottom.

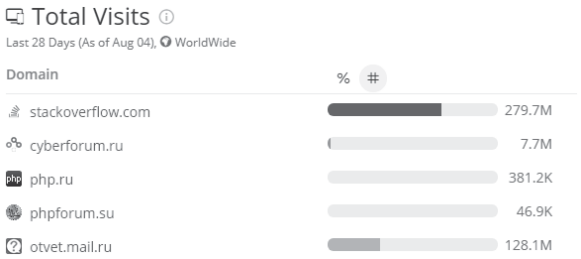

Fig. 1. The number of visitors to compare from similarweb.com

Daily visits to all Russian forums from the comparison are around 300 thousand people. Meanwhile in Russian Q&A service, which is about everything, not only IT sphere, this number goes to 400 thousand visitors per day. And worldwide known service Stack Overflow, which specialized in IT stuff, has over 365 thousands. Monthly attendance for all sites in Stack Exchange Network for 2015 is 3.9 billion people [2]. This fact convincingly makes the choice to create a similar, but more specific Q&A service.

Our own experience of developing a cloud-based application using IBM Bluemix platform showed that there are no systematized materials for Russian-speaking developers. Getting solutions of many technical issues took a long time because of the small number of active discussions of Bluemix on the Internet. Still most questions remain unanswered. Useful discussions in Russian in the official forums are absent as well as there is no translation for complete Bluemix documentation [3]. Ours solution of this problem is the creation own Q&A service, where users could share their experience, together solve their tasks and gain experience. This kind of service can be presented as a web site. Its design should be intuitive clear and simple. As an example, we took site Stack Overflow, which has proven itself well and is familiar to many IT developers, which allows them feel comfortable while using our service [4].

The new service will greatly simplify the search of necessary information for IBM Bluemix users, living in the CIS countries. It makes the information available, easily readable, fast-find and convenient for the end user. As a result, it is possible to minimize the costs of systematizing and analyzing information, which will have a positive influence in learning new technologies.

The goal of the project is the creation of Q&A service in Russian for users who work in the IBM Bluemix environment.

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II. MAIN PART

A. Analysis and design of the system

To construct a required service, we have to follow next list of the most important features:

- Simplicity. System interface should be intuitively simple and easy to handle.
- Convenience. System design must be adaptive and have minimalism style.
- Speed. The site has to load fast on PC as well as on mobile phones.
- Fault tolerance. The site has to consider and process all possible errors users can admit.

The development environment is IBM Bluemix, because it allows you easily add the necessary services to the system and monitor its performance.

The functioning of the site is represented by the main business process – ask a question and get the answer. The algorithm of the system operation is described in detail on the conceptual diagram [5], presented in Fig. 2.

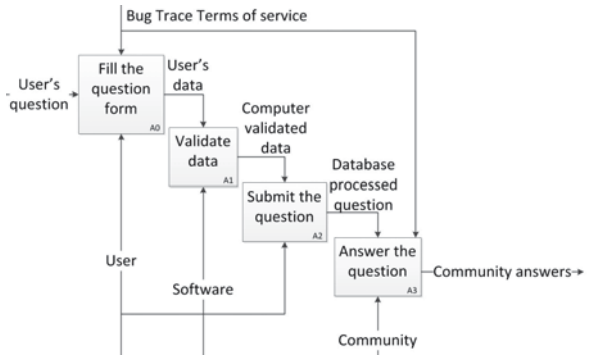

Fig. 2. Conceptual diagram for Bug Trace

The input data of the system is written by user and consist of the question, user name, subject of the question, category and priority. User chooses the category and priority from the existing list. After the user has entered all the data – it is additionally checked on the server side to find malicious entries, if they exist. Only after this verification, the data is assembled into an array and written to the database. At the same time, the DB adds three additional fields: the date, the number of views and answers to the question. This information will be displayed on the site in the list of questions. Once all these processes are completed, the question becomes open to the community. The question is placed on the public list, where all other questions and answers are.

The database of the system consists of two tables: questions and answers. For the safety of the tables, we included prefixes before their names to reduce the risk of data leakage [6]. All fields in the tables are optimized in accordance to the stored data. It speeds up the interaction of the database with the site. The presence of a small number of tables is a controversial decision. On the one hand, this is convenient for querying, since you only need to call the database once. On the other hand, data should be separated in meaning, which will ensure safe storage and clear understanding of tables. The choice was made in the direction of speed. The database is a separate service on the Bluemix platform. In this project, we use MySQL ClearDB as the main database, connection to which can be carried out from any local machine. Database tables with the filed types and sizes are shown in the Table I and Table II.

TABLE I. TABLE FOR QUESTIONS IN THE DATABASE

Field	Type
id	int(11)
name	varchar(150)
subject	varchar(100)
category	varchar(50)
message	text
priority	varchar(20)
date	datetime
answers	tinyint(5)
views	tinyint(5)

Special verification of the stored data is also presented in the database itself. For the unique identifier “id” we choose integer type with the eleven characters, but the number of characters in the fields “name”, “subject”, “category” and “priority” is limited differently. These fields have type varchar, which means, they store some text with characters limitation. The question itself is stored as a “text”. There is only one verification of its content on the server side, because there are not any other powerful resources to do that. The date is stored in the most optimal format for the database and created automatically when every new entry is inserted to the table. To save memory, fields ”answers” and “views” have five-digit numbers, instead of the standard int. All these factors allow the database to execute queries faster. Although with small tables the difference without optimization is almost insignificant.

TABLE II. TABLE FOR ANSWERS IN THE DATABASE

Field	Type
id	int(11)
question_id	int(11)
name	varchar(150)
answer	text
date	datetime

Table II is similar with the Table I in structure and optimization. Field “answer” is checked on the server side as well as “question”. The “question_id” field stores identical number of a question to which the given response belongs. Login of the user, who left the comment, is stored in field “name”. Date of comment is generated automatically inside the database. Requests to the database are made only from certain pages, where they are needed. This approach is significantly reduces the load on the servers.

When the user asks his question and presses the button that confirms its sending, all the fields on the page are processed using the Ajax-request, written in JS language. After the array of object data is generated, it is sent to the Bug-Trace server, where the verification of the some entered data occurs. In case the data is entered correctly and suitable for all the limitations – it is loaded into the database, where it gets unique identifier (id). Otherwise the user will be notified that somewhere he has made a mistake. The scheme of interaction with the database while the question is creating presented in Fig. 3.

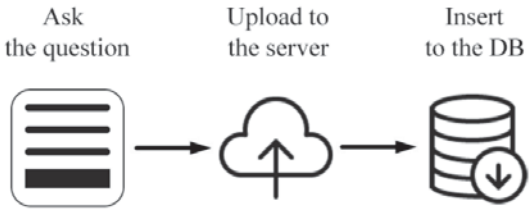

Fig. 3. The scheme of interaction with the DB while question is creating by user

After successfully uploading the question to the database, it instantly becomes available in the list of all questions. Database querying, when user wants to load question, has step-by-step principle. Firstly, when the page is just loading, an ajax-request is sent to the PHP handler file, which requests the output of all available information from the database. Secondly, request is processed by the server and in case there were no errors, it displays information on the user's screen using special template file with layouts. The output of all the questions works similar, but in this case the ajax-request does not contain the specific id of the question (id). All available information about all the questions is loaded onto the page. In more detail, we will consider this mechanism further. The scheme of interaction with the database when loading the question from the server is presented in Fig. 4.

Fig. 4. The scheme of interaction with the DB while question is required by user

Realization of these schemes on IBM Bluemix platform allows you not to use the full power of the entire server, but to break it into separate clusters. The "auto-extension" service would help to increase the capacity of the server, when load is exceeding normal. Another service is designed to collect statistics on the operation of the server and allows you to monitor its characteristics in real time.

B. Implementation of the system and examples of use

Development language for back end (server) was chosen PHP, because of its reliability, speed with databases and server [7]. To restrict the execution of some functions and make their use more correct for the end user, also JavaScript was added to the front end (client). To increase the reliability of the code, we need to create configuration files. It also allows developers to change system catalogs easily, which is especially effective when domain is changed. These files store program constants for reusing the code over and over again. To separate the layout from the code we used special type of template files (.tpl). In the layout files, we leave only the js code that will be responsible for POST requests. It sends data from the site form to a handler file written in PHP. The values of all fields of the form shown in Fig. 5, will be written into the js variables, which afterwards will be sent by the POST request to the server. For these purposes, we use ajax-request, since it does not require reloading the page. For now, it is the most effective solution for working on the Internet.

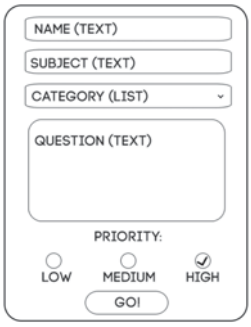

Fig. 5. Layout of the “ask question” form

The most important is to mention url of the handler page in the body of a function. Also we have to write type of request (POST) and data for the transmission, which we will take from the form fields. Since IBM Bluemix runs on the Cloud Foundry engine, some ajax-scripts do not start, as they do on a regular Linux server. Using additional libraries is complicated by the structure of the Bluemix platform. As a second solution, we can use the usual loading of variables via the global $ _POST array in PHP. But this style of programming will negatively affect the usability of the entire system [8].

After adding questions to the database, they become fully available to the community.

This resource will be useful for the beginners when working with the IBM Bluemix platform and specialists in finding new technological solutions. Questions are displayed on a page-by-page basis to reduce the load on the database and the server. On Fig. 6 you can see, how page navigation is implemented. Also there you can see what the question looks like and what information it contains. It includes the number of views and comments, the priority of the question, the topic and a brief description (the first 100 symbols of the question), the author's name, date and category. Similar information is displayed on the page where all the questions are shown.

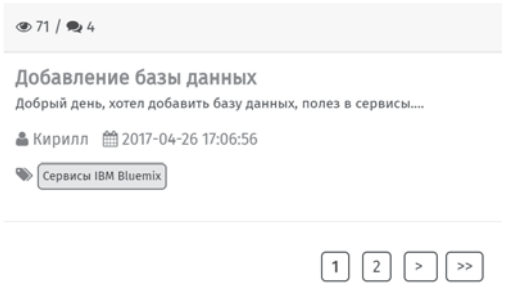

Fig. 6. Question and navigation on the list of questions

All operations on the site are running in the user mode. So, every visitor is able to use all the features of the service, without having any special IT skills. The service itself, in addition to questions and answers, allows users to work from various circle of devices through adaptive layout. Bug Trace services also allow users asking the questions and initiate discussion of interesting topics. Also they can participate in existing

discussions, having access to any question any time. The list of questions is presented in chronological order from recent to older. An example of the questions design and discussion is presented in Fig. 7.

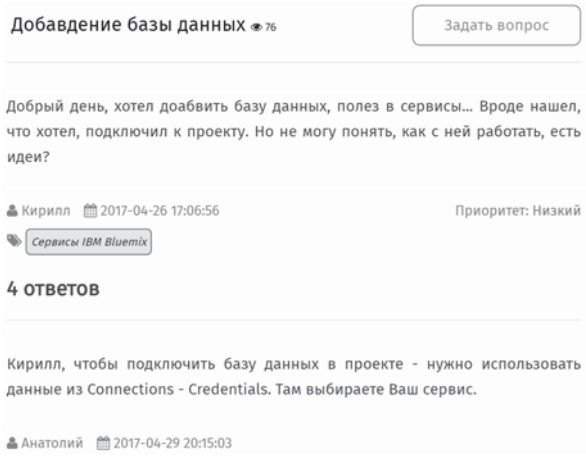

Fig. 7. User question page

As can be seen, the commentary includes names and dates so that you can easily enter into a discussion, if it is not so old. The number of comments on the page is unlimited and all of them are downloaded one-time, which means, that page technically could load longer, than usual. Thus, anyone can become part of the project by participating in the discussion of any question. The design is made in a tree-like style. This means that any page is available to the user no more than three clicks. This approach is commonly used in relatively small sites.

In addition to the Q&A service on the site there is description of the whole system, where we described pros and cons. As information articles, you can find about our development team and detailed instructions about how to use IBM Bluemix. It is specially designed to avoid unnecessary identical questions from the beginners.

The advantages of the proposed service are that this is the first Q&A Russian-language service for IT specialists with platform-independent, intuitive interface. The disadvantages are that this service is not globally recognized or popular and it is not responsible for the correctness of the provided information.

III. Conclusion

A cloud-based web service [9] for questions and answers for Russian-language users of the Bluemix platform is offered. IBM does not have analogues of Russian Q&A services among official resources. The service allows IT specialists quickly find answers to questions when using the IBM Bluemix platform, as well as to conduct discussions on various topics or create new ones. There are also video instructions how to use Bluemix platform for the beginners [9]. This service could become extremely useful for students at universities from CIS region. In addition, students have the opportunity to get valid diploma, which prove their achievements. Main educational business process of the system would help a large numbers of universities join the IBM Academic Initiative and Bluemix training program. Currently, all the developed materials are used for several education disciplines at Kharkov National University of Radioelectronics.

In the plans for the further development of the service, we expect the expansion of certain functions. These include the introduction of rating comments, which will allow better answers to be displayed above the rest in the list. To include these and other extra features, service should recognize all the users. It is reachable through adding the registration. In users' personal account, they will be given different options and statistics. They include the opportunity of viewing detailed information of their questions, saving interesting or important discussions and choosing the most helpful comment for their questions. To improve user experience, email and site notifications should be added. It is important to let the user know what happens with his question while he is out. To decrease the amount of questions, it is planned to continue adding educational content, like instructions or guides, to the the relevant sections.

Acknowledgment

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The project was discussed on the forum in Facebook community "IBM University Relations in Ukraine" and received positive feedback. According to this discussion, Bug Trace was added to the article, published in Habrahabr, the most respectful Russian IT portal [10]. In summary, over 1300 people got acquainted with Bug Trace. That will help to popularize this service to end users.

The work was presented by the students team "Vindict team" [11] within the framework of the academic training in IT technologies at the Kharkov National University of Radio Electronics (Ukraine).

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