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Build: Web Services based Source Code Editor Integrate with Community Question Answer

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Abstract— **Source code editor have different features to ease and speed-up the developer works. This paper proposed the source code editor *BUILD* integrated with Community Question and Answer (Q&A) and stack overflow web service. While programming developer often came across the set of questions, programming errors, thus in order to find the solutions or resolving the errors developers take reference from the different online resources (Documentations, Books, Q & A Services) through web browser. This leads to switching windows between source code editor and web-browser. To reduce development time and effort, neglect web or internet distractions and to get the specific result to questions we form a community. we combine source code editor and community Q & a services (Stack Overflow, institutional CQA). We also understand different learning resources and development tool which preferred by the developers. Explains the important of the Community Question &Answer (CQA) services.**

Keywords — Source code editor, Development tool, Crowdsource knowledge community question and Answer services, Stack overflow, Webservices.

I. INTRODUCTION

During the development of the computer program. Developers often come across different types of programming errors/ exceptions set of questions and for understanding these errors the developer's spent plenty of time on searching for solutions on the web browser. Web browsers used to retrieve information using the search engines (ex. google, bing, yahoo) [1] Also, developers have to switch between the working environment and the search engines.

The search engine provides a set of results (link of web pages) for the user query and the user has to visit every result in order to find the needed information. To retrieve the related information a user should know effective search keywords related to query without it, users may have to spend a longer time [2]. In a study by Brandt et al. [3] developers spent about 19% of their time in searching for an accurate answer. Goldman and Miller [4] conducted a study where they analysed and concluded that 23% of the web pages visited which are related to software development. Web search engines are not intelligent enough for finding a single result that can directly answer such a query. Finding an accurate result, the web search engine is moving towards the question-answer search engine [5].

Community question answer service is like a social network where relations are formed by sharing a common interest and problem-solving [6]. Community is the best way to transfer knowledge among users [7]. It is also an intelligent agent question/answering system due to the collective intelligence of all users to provide satisfying answers for questions that simulate a conversation between users seeking information and sharing information [8]. This service gives the user the ability to post their queries online and have multiple expert users/developers to answer them. Computer programming tool [9] (Source code editor) is a software application that eases and speed up the development process by offering programmers graphical widget to write, edit, compile or interpret. The source code editor provides the developing environment for programmers with different features. Community question answer services are broadly used by the programmers for obtaining the optimal solutions during software development but currently they are not integrated within the development platforms. The integration between the source code editor and community-supported Q&A platforms can enhance the code editor usage [10].

Ponzanelli et al. [10] propose Seahawk, an eclipse IDE plugin, which integrates the community Q&A services (ex. stack overflow) to the development platform. During the developers have to switch the windows between the source code editor and the web browser, while they should be focused only on their working project without disturbance

to avoid wasting time and to get a quality answer [11]. Seahawk has a limitation while using the stack overflow data dump of September 2011, so it is not useful for current technologies. (ex. data before September 2011 is present on the platform but after that, it is not updated) Mohammad Masudur Rahman et al. [12] proposed Eclipse IDE based web search solution, SurfClipse, which provides the solution by using a searching algorithm of three most reliable search engines (ex. google, bing, yahoo and stackoverflow) for retrieving the information.

This paper, proposed source code editor *BUILD* integrated with the stack overflow and specific institutional community Q&A web service.

Integration between source code editor tool and community Q&A platform gives a better result. Mostly the stack overflow is popular among the developers and gained large community support in the technical world and it is also important to share the knowledge. In stack overflow, 92% of the questions on important topics are answered in an average time of 11 minutes by community and it is very effective for code reviews, for a conceptual question and for exceptions [13].

But sometimes the results provided by stack overflow have not related to the same work or it is not in the same context of the actual problem. Build forms an organizational/ institutional community that can improve the performance of the developers. Though forming a small-scale organization has its own advantages that the developers working on the same task can get related solutions to their queries with better answer quality and faster support. It can be used at lower level institutions/organization (ex. colleges and companies)

II. LITERATURE SURVEY

A survey on developers' preferences in integrated development environments [9]. Albert Bergström is a quantity survey in which 20 developers participated. The purpose of this survey is to find the preference of the development environment and what improvisation needs. Also, most developers preferred Eclipse or microsoft visual studio some developers also referred to some other development environment (IntelliJ, Atom, PyCharm, Notepad++). A part of survey result states that are most important qualities (reliability, support for integration tool, support for collaborative, development, ease of use, versatility, aesthetic design, efficiency, customization, update rate, cross-platform support) of integrated development tool. And developer also placed
importance on "support for collaborative development" is an important and satisfaction graph.

2019 stack overflow annual developer survey [14] in which nearly 90k developers participate key result states in the survey are as following. Each month 50 million people visit stack overflow and 21 million are profession developers or university-level student. Around 14.7 % of student share in the usage of stack overflow. Above 85% of the participants in the survey have registered accounts. Developers use stack overflow to find the answer to questions and contribute some knowledge. The most popular development environment is visual studio code with a 50.7 % share. What are the causes of the developers who don't participate on stack overflow? (no need, busy, answer already solved /asked)

2018 stack overflow survey [15] results show the different ways of developers to learn on their own. Total 53734 developer-profile contributed to this question. The Table 1 shows their percentage count.

According to table the percentage of CQA platform used by developers is 82% So it shows the need and usefulness of question answer services.

Table 1 Percentage of developers learn from different resources

Ways	Percentage count
Official documentation/or standard for technology	83 .0
Question answering on stack-overflow	82.7
E-Book	50.2
A college/university computer science or software engineering book	19.7

Atom code editor [16] has the external plugins to integrate the view of the community Q and A services (Stack-overflow). Atom is a desktop application built using web technologies. Atom is based on electron (also known as atom-shell) framework that used chromium and node.js. In which we can add packages for adding new features. "stack overflow-help" [17] a package that renders stack overflow answers to inline questions from within atom.

Notepad++ [18] is free to use a windows desktop application. It consumed less computer memory and run faster. It Supports multiple files opening under a single view.

Sublime text [19] supports many programming languages and mark-up languages. It has many built-in features and it also supports plugins, snippets, and themes. Handle the entire workplace, which files are modified and unsaved. Flexible and easily customizable the system.

Visual studio code [20] is also a web-based electron framework desktop application. It has several packages available to customize the development environment. It supports different languages (such as C++, C#, Java, Python, PHP, Go). It has the greatest number of the user according to a stack overflow survey. It also has the "stack overflow instant search" plugin which provides stack overflow service inside the code editor itself.

Table 2. Comparison between Code Editors

Name	Minimum Install Size (MB)	Cost (US $)	Programming language Support	Support for Community Q&A services

Visual Studio Code	180-200 MB	Free	All	Yes Available
Notepad++	11.9 MB	Free	C++	Not Available
Sublime Text	21 MB	$80	ALL	Not Available
Atom	~ 150 MB	FREE	ALL	Yes Available

Table 2 compares the different code editor's software based on installation size, cost, programming language and community question answer service (stack overflow). Here we see that atom and visual studio code can client plugin program to access to stack overflow question answer service. "stack overflow-instant search" plugin for visual studio code and "stack overflow help" for atom code editors.

III. Proposed System

Build have two main user-interactive components source code editor and community question answer web services. In this section, we discuss the architecture diagram and its components. We use GTK, Python, and PyGObjects for the source code editor and Web-technologies, Stack-overflow API for community question-answer services.

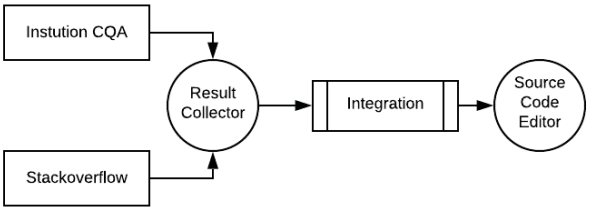

Fig.1 Architectural Diagram of Build

Intuitional CQA: It is a community questions and answer platform for an institute to contribute their knowledge and queries on a certain topic.

Stack overflow: It is a global community for the programmers to obtain the solution for their problems and they get rewards for the responding to questions from the other users.

Result Collector: Gathers all the possible results referring to the asked questions/problems.

Integration Module: Used to integrate or to merge the CQA module and the source code editor module.

3.1 Source code editor

GUI based software application to write, edit, compile the computer programs to increase the development productivity. It is a desktop application that can run on the system locally. This paper introduces the client program plugin which is used to access community question answer web service through the HTTP protocol, web technology.

3.1.1 Syntax highlighting

Fig. 2 is useful to enhance the presentation and understand-ability of the program file. Syntax highlighting is one strategy to improve the readability and context of the text. It specifies the visual presentation of the text by using file extension or based on the content of the file. GTK provides GTK Source View Library for syntax highlighting, undo/redo, file loading and saving, search and replace text.

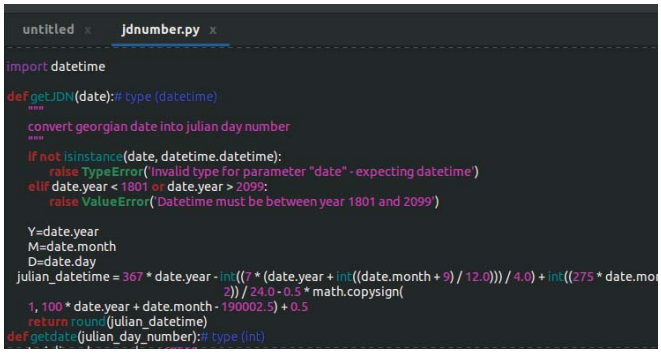

Fig.2 Syntax Highlighting

3.1.2 Auto-complete

Autocomplete predicts the word that a user intends to enter after only a few characters have been entered in the file and what functions are provided by the library/API are listed out. This feature gets used when the developer wants to know the usage of the imported library/API in the program file such as descriptions of functions, particularly parameter lists. It also displays a short description of a function.

3.1.3 Run the source-code

Compile or interpret by the invoke compiler and interpreter of specific language program files and display the output of the file.

3.1.4 Files and folder operations

Basic operations of the file system are called to manage the program files and directory. Create new and delete the file/folder, also picking different language files.

The fig.3 show that on hitting the keyboard event (ctrl+O) the editor opens the file chooser UI and user can select the local files/folders.

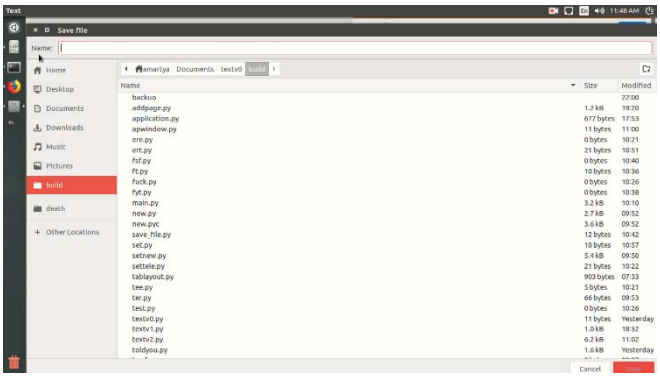

Fig. 3 Select the file

3.1.5 Client program plugin

The client program plugin which is used to access CQA web services through the HTTP protocol, web technology. A collector is used gathered query results from the CQA services with most related contain.

3.2 Community question answer web services

A web application where developers contribute their knowledge and that attempts to answer questions. Users must create an authenticated account now user can ask or solved the questions. Rewards point will be an offer to users based upon question asking and solving the other people's queries. The knowledge contribution from others leads to even more people to share their knowledge.

This paper offers two different CQA web services one is stack overflow and another is institutional CQA service.

3.2.1 Stack overflow API

To use API of stack overflow the application should be registered with a stack app store to get access key.

It can interface the stack overflow application as a webservice in the Build source code editor. Here query responses are sent in JSON format.

3.2.2 Institution CQA

For an institutional user, we are building the CQA web application. Like social network but only used for the academic/study purposes. It creates an information network which maps users to common share knowledge/information topic. A graph G can use to create a network /relation between the topics and user entities. Graph G = (V, E), v is set of nodes which referred to user and e set of edges referred to user question asked. Link prediction algorithms can use to recommend the topic/ to the user based on user preferred topic.

3.3 User Interface

Fig. 4 shows the user interface of the build. The left part of the image represents the working environment of the editor for programmers. The output is shown in the bottom-right corner of the image. The right-upper corner used as a client plugin providing the CQA and the stack overflow webservices.

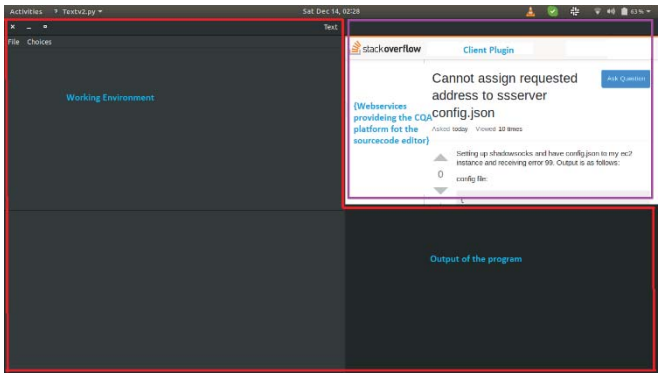

Fig. 4 User Interface of Build

IV. CONCLUSION

Firstly, we introduce the problem that the programmers face difficulties like window switching and distraction from source code editor when the question, programming exception/error come across during programming.
Second, by taking reference to different survey results we state that the programmer values the CQA Service and ready to contribute to it. Also compare different ways, programmers learn on their own and different code editor software parameters.
Third, define the method and architecture for the proposed system. Thus, combining the source code editor, stack overflow, CQA services would help programmers to stick to their logic of the program and help them to solve their errors or their problem via QA forum which will provide them a solution with related answer in the community. The main motive behind the community Q&A forum is to encourage users to ask and solve queries to obtain the optimal solution and to share knowledge among other participants.

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