

Intra College Communication Application Using Distributed Architecture

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Abstract

The application focuses on bridging the communication gap among the students in colleges and also between the faculties and the students that always existed pertaining to the facts such as, lack of time, or even fear of approachability. As of current scenario, the common ways of interaction between various groups of people are mainly through social network groups, WhatsApp, Facebook, emails, etc. The problem that remains with these are that they are also the same spot for socializing, thereby leading to problems such as loss of information, which need to be re-accumulated/re-shared for accessing them again. Thus, the application aims to serve as a platform for the students who wish to connect with other students or faculties for assistance on various topics (including but not limited to academics), and also provide a means for faster retrieval of information as and when required from a centralized info-hub.

Keywords: communication gap, centralized information, user forum, file sharing platform, intra-college communication.

1. Introduction

In an age of internet and technology, it might seem contradictory that the school and college students often find it difficult to connect with their faculties and fellow students. This communication gap can lead to disastrous effects such as unclear visions towards a subject and many doubts, pertaining to which, one may lose interest and hence a bright career of one's future. Not only communication gap is responsible for the student's lag in career, but the factor which is equally at fault is the wrong knowledge; and being a world of internet, such devastation can be attained from anywhere. There are various forums available to gain familiarity of any subject, but none gives the affirmation of providing the accurate content. Since the forum is open for everybody, therefore providing green light for the wrong or irrelevant data.

The idea proposed here, is to develop a web application in which the students and the faculties can interact on a common platform and share the files. So, basically this is an application comprising of two major tasks- forum and a file sharing platform. The forum will allow all the students of the college to post their respective doubt to whom the answers shall be provided by any member of college (be it faculty or their fellow students); but the answers verified by the concerned authority will only be posted and hence this approach fades out the obstacle of faulty knowledge that can be known to students.

This idea motivates the students to learn effectively without getting hampered by any wrong content and also gives a new way to approach their seniors and teachers without hesitation by using the customized forums. By this means, they can achieve the accurate content and also discuss their doubts openly without having any second thoughts.

2. Related Work

In this field, there are many examples which set ways of providing knowledge to each student and also enables the feature of interaction for the communicating bodies. Such are discussed below:

2.1. Personal Message

The very simple and common methodology to communicate is by sending a personal text message to the person with whom connection is to be prepared. The only thing required for this method to accomplish is the contact number and hence is the easiest approach.

The disadvantage is if the person receives various number of texts from different users, then it becomes difficult to set the preference order as to view which message first. So, if anything important is required to convey and such aforesaid condition occurs, this is not a favorable approach.

2.2. WhatsApp Groups

Being the most used application for interaction via text, audio and video modes, it has its own benefits and drawbacks. The benefits include using internet to send messages instead of phone's balance available.

Drawback includes the probability of messages being lost. It also has the added disadvantage that the non-downloaded/lost media are deleted from the server after 30 days.

2.3. Information Boards

Not very unfamiliar, the notice boards are the most prone to information loss because of the removal of pages from the board. Such a means cannot be relied onto delivering and interacting important content.

The only advantage of notice boards is its low cost and hence can be used over the places where the storage of data is not an important issue to be cared of.

2.4. Direct Interaction with People

This form of communication, though, comprehensive, tend to be confusing over time as we fail to remember what was exactly spoken during the conversation.

Holds the advantage of consuming less time when compared with writing the long text messages; and also it does not require any medium for it to occur.

2.5. E-Mail Communication

E-mail, truly is an effective way of communicating with people but they are the kind of service where information is mixed and not segregated as per their topic/theme.

Email though great in regular communication, can become daunting in case the person forgets anything such as the subject, or the sender.

3. Proposed System and Construction

The system put forth here is a combination of two modules when viewed on a broader scale, which are:

- Forum – A place for collaborative discussion about a topic. It will comprise of various threads (questions/issues) segregated by their respective topics. Queries related to

academic subjects, and also domain related topics will be open for discussion in the forum.

- **File Sharing Platform** – A place where study materials will be available for students to download. The study materials will be related to academics and segregated based upon the subject code. It will serve as a common platform for sharing of study material thereby reducing the redundancy that exist in creating the notes every time.

3.1. Construction

The system architecture with its components and working is as follows:

- Authentication and Authorization:** Authentication means confirming your own identity, whereas authorization means being allowed to access the system. So it uses a relational database to store the user's credentials which are further used for authentication.
- Forum:** After getting authorized, the user gets the right to post or answer any question segregated on the basis of subject's code in order to make it easy for anyone searching for the specific question under particular object.
- File System:** Along with giving or reading the answers posted onto the forum, if the user finds it helpful by sharing any relevant code or block of information that might help in getting a deeper and finer knowledge of the topic concerned, a file can also be uploaded for a better point of understanding.

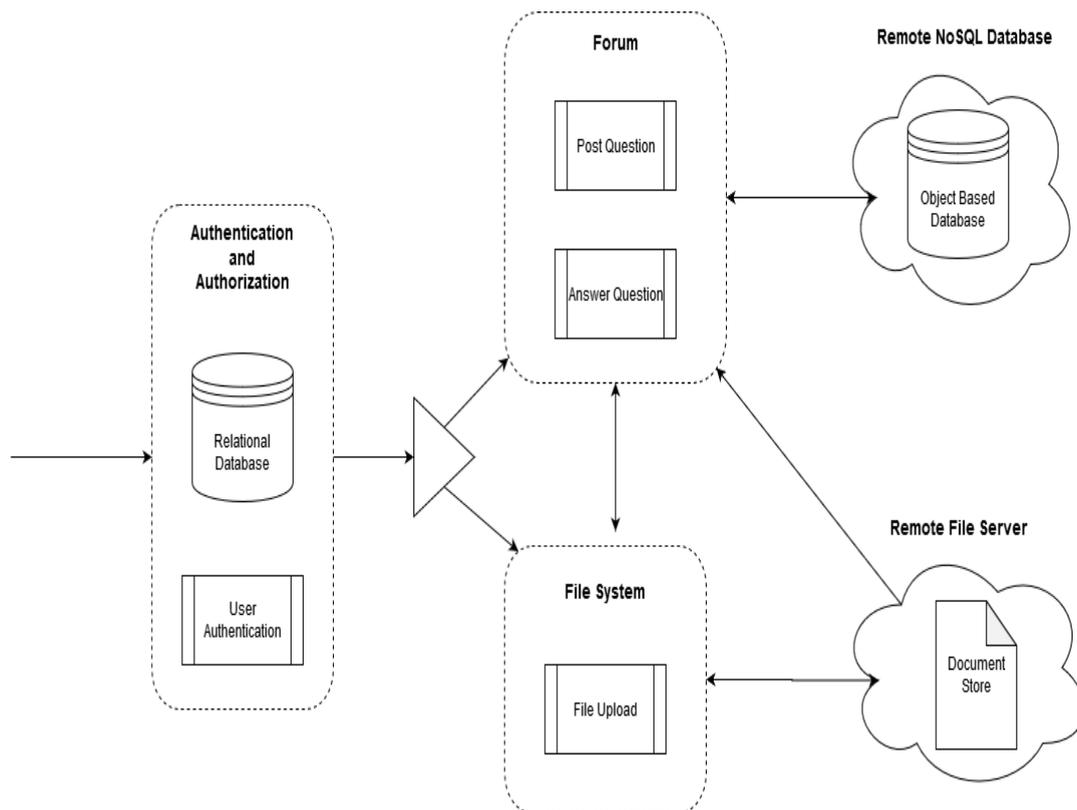


Figure 1. System Architecture

- Remote NoSQL Database:** This is an object based database or in common terms, it can be said as a non-relational database i.e the data stored here is not in the forms of tables. So this is used for to store all the Questions and Answers posted onto the forum so that when needed by anybody at anytime, this could be accessible from

anywhere. Also, the key usage of this NoSQL database is its capability of maintaining records at a higher and faster accessible period when compared to relational database.

- E. Remote File Server:** This is responsible for storing all the files uploaded onto file sharing platform i.e forum.

4. Algorithm used

The algorithm works by classifying the document type i.e the type of question specific to the subject's code where list of tags and question id is provided as the parameters. The list of tags the question has are checked for existence in the current database. If match is not found, the tag is updated to the list of tags in database. The question is added to the collection of the respective tag.

Algorithm 1: Library Classification

```
Function classifyDocument(listOfTags[n], questionId)  
  listOfTagsInDatabase ← Database  
  foreach tag in listOfTags do  
    if tag not in listOfTagsInDatabase then  
      | Append listOfTagsInDatabase ← tag  
    end  
    Append questionId to CollectionOfTag  
  end  
end
```

Figure 2. Library Classification Algorithm

5. Working of the system

The application tries to bridge the communication gap by introducing a forum and a file sharing system where the students can post their doubts and the teachers/students can answer the question. As far as the application's data security is concerned, all the data during transmission, will be encrypted using the AES-JS package from the Node Package library. The AES-JS implements the Advanced Encryption Standard algorithm, using key length of 128, 192, or 256 bits. The key size is selected randomly during the session initiation at the initial login and maintained throughout the session. Also, the focus is on building a Mobile-First application, which despite of being a web-application, will give the user a feeling of a mobile application. The application is based upon the distributed architecture in the sense that, the core application files are saved on a server, while the data of the application, those from the forum will be stored on a cloud based NoSQL server. The files uploaded by the people for sharing, such as subject notes and other files will be uploaded on other cloud based server, which will be used solely for the purpose of hosting the files.

5.1 Registration Module

The user registers as a student or a teacher using their unique identifier, such as their register no. or staff id. The registration process then requires the system administrator to approve their account after verification with the university

database. If the account is approved, the user is notified through an email. If the account is not approved, it is discarded, and the user is notified. The data is stored in a relational database, which is hosted with other application files. The user's password is not stored as a plain text but is stored as a hash generated by passing the password through SHA-256 one-way hashing algorithm.

5.2 Login Module

The login module is a common interface for both – student and teacher login and takes their unique identifier (acting as username) and their password. The password is passed through the SHA-256 hashing algorithm to generate the hash which is checked against the hashed password stored against the given username. The login system then initializes the session and sets the key length of the AES encryption for all further communication with the application.

5.3 Forum

The forum is the place where the questions are asked, and the answers are provided. But as there will be huge number of questions, it is not a good idea to display all the questions in one place. Rather the forum follows the disclosure principle to present data to the user. As per the principle, question related to each other, as per the tags they have, will be grouped together under a single tag name. For example – all the question related to C++ will have the C++ tag and the forum will have a segment called C++, clicking on which all the questions having the tag will be listed to the user. The user can then open any question to answer it or see the answers that are available. All the data of the forum will be hosted on a cloud based NoSQL database system, MongoDB. And the language used for database transactions will be the MongoDB Query Language. The advantage MongoDB presents over relational database is that the content is store in JSON format, thereby enabling a dynamic schema for the data that is stored. Also, it supports storing of complex values, which can be an array or even an object. Like the answers to a question will be an array. And each element in an array represents an answer. But each element in itself is an object consisting of information such as who and when answered it along with the actual answer.

5.4 Post Question Module

This module is responsible for posting the question that a student may have. The interface includes a simple form, where the student can specify a title to the question, provide a detailed description if any, and attach any file needed for others to understand the context. The files uploaded will be hosted under special hidden folders under the active directory of the application. Also, the question will need to be applied with appropriate tags which will help in displaying it in appropriate forum segment(s). The question once posted, will undergo through the Library Classification algorithm, which will update the categories that are available in forum by parsing the tags given to the question. If a tag is found that is not already available in the database, the tag will be added to the list of tags in the database, which in turn will a new category in the forum. Once the tag identification is done, the classification algorithm will then add the question Id to the data collection with the same tag. During rendering of a given forum segment, example while loading the segment of Java, all the question Ids that are listed in the collection of Java will be rendered to the user. This is how the Disclosure Principle will be applied.

5.5 Answer Question Module

This module presents a simple form to input the answer, where the user can type the answer for the given question. The form will also support uploading of additional files as needed for explaining the answer. The files, as in the Post

Question Module, will be stored in a separate folder under the active directory and will not be accessible directly. Each answer will be sent out for review by the faculty. It can be reviewed by any faculty and once approved, only then they will be shown in the answers for the given question. If the faculty feels, that there is need for revision/editing, they will mark it for editing and the student who answered will be notified over email. Once edited, it will be again reviewed. If the faculty selects the reject option, it will await approval from another faculty. If there are 3 consecutive rejections, the answer will be discarded and not shown with the question.

5.6 File Upload Module

This module serves as a cloud store for file sharing and forms the central part of the File Sharing system of the entire application. Any student or teacher can upload their notes related to any subject and like the Forum's question part, include tags for the file. The tags then will be used to classify the files using the same Library Classification algorithm. If a student wishes to download a notes for a particular subject, all they would have to do is enter the subject code (tag name) in the search text box and the files with the particular tags will be listed, which can then be downloaded. If the student just wants to see the files available and not perform a search, the file system will allow browsing by grouping the files under folders with same tag. This again is in accordance to the disclosure principle being followed in the forum.

6. Results and Discussions

The above described system will help in bridging the gap between students and teachers, and also will provide correct knowledge for the particular subject categorized based on their subject's code. This will endorse the students in finding the specific question under the categorized subject's code. Many existing forums like stack overflow provides the solution but not the explanation due to which the students are getting answers only without the details which results in achieving low grade information because incomplete knowledge/information is the most dangerous. When compared with other file sharing systems, the files are lost once the user has deleted them whereas in the proposed system, local file sharing systems will allow the database to store every file separately i.e the user won't be needed to have the file in one's local storage. And also, by using an object based database, fast access and retrieval of contents posted over forums is also accomplished.

7. Conclusions and Future Works

The system thus proposed above, is expected to reduce the communication gap as it will support accurate replies to the forum's post that will be authorized by the system admin. And also there will be no hanging or ignorance for long time as other ways for interaction like WhatsApp, personal messaging and many more do not support. Future Prospects: The future of the application has a huge opportunity as far as features are concerned, some of which are discussed below:

- Enable students/teachers to connect not just over question/answer but also support Live Chat/audio/video calls
- Apply Internationalization, which will enable translating the content to anyone's given native language. This can be beneficial because English may be tough for some to understand some people to understand complicated concepts.
- Machine learning based, automatic classification of the questions
- Support multi-factor authentication for user login, securing the user accounts further.

- The entire network can be hosted on the college intranet and secured by a network level firewall, and provide access to users only when connected directly to the college intranet or using a VPN from the internet.

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