DICOM Query Tool

Shrinidhi G S[1], Prof. Bhavani Shankar K[2]

[1]*Computer Science and Engineering, RNS Institute of Technology, Channasandra, Bangalore, India*

[2]*Assistant Professor, Computer Science and Engineering, RNS Institute of Technology, Channasandra, Bangalore, India*

Abstract--In this paper A DICOM Query tool is a tool to query a medical imaging studies from PACS(Picture Archival Communication System) and imaging modalities(CT, X-ray, MRI etc..,) and move studies across different stations.(including different review stations).

Developing an application which can query Imaging modalities and PACS for availability of studies related to a given patient and remotely moves studies from one station to other stations. The solution relies on DICOM query retrieve and C-Move protocols it uses DICOM query retrieve to query a station about the availability of a study related to a given patient. Then the tool uses C-move protocol to move the study across different stations. The tool provides updated of the moving process based on C-move job updates.

I.   INTRODUCTION

DICOM QUERY TOOL, it's a web portal, its web application which is also a single page application, and the flexible java script language vue.js is used, and sophisticated API for developers, basic Web-site installation and administration of the framework require no programming skills. Marketers and web developers can easily create and manage great web and mobile experiences using vue.js. Customizable themes are provided where users can customize the themes as per their requirements. Modules expand Web app's functionality through which users can add additional features to the website. It's a great choice for creating integrated digital frameworks. It can be extended with one, or many, of thousands of add-ons. Web app is a powerful framework that has inspired a new generation of digital experiences. It is an essential part of marketing ecosystem with content-first, commerce-first and community-first marketing solutions to achieve the business goals [1]. The client's business goal can be achieved through the Web app digital experiences that grow rapidly and gain the power of the largest open source community. Web app has great standard features, like easy content authoring, reliable performance, and excellent security. But what sets it apart is its flexibility; modularity is one of its core principles. Sometimes it can be stated that Web app is not a user-friendly interface because it requires advanced knowledge and few basic things about the platform to install and modify and it is not compatible with other software.

This tool helps for the people in the field of healthcare, where the lab operator are pushing the report to the corresponding stations for the sake of the other station operators and patients, for the security purpose and authentication separate login page is provided to each user with password and user name and if the user forgot the password he can get it by the registered email id or phone number and specific OTP number is sent to the entered phone number or link to the entered email address for the user convenience and after login only account holder can make read or write to the page and send various notification to other users and receive notification from other users, and pages are designed in a such way that user can add his family members report to the portal for the extra upload purpose , and every family member profile picture can be edit and user has a specific profile page to edit and add the personal details, email cannot be added in the profile page , has it have already registered in the database previously.

Query tool provides the various information related to the user and the report, it shows the date when report been uploaded and the size of the report and also provides the option to share with the other users through email.

Query tool webpage is divided into doctor and patient page for the user convenience purpose, where the doctor have the special options and an additional paged like report that have already been seen, reports that are copied to the clip board and the comments to the corresponding reports Another page for the uploading of the normal jpeg image for the user, if user has a certain case of uploading of jpeg image. After uploading of the DICOM, one can view the report completely with description and details.

II.   QUERY TOOLARCHITECTURE

Query tool is implemented in Python language, so it can run on a variety of servers, such as Windows and Apache server. Query tool also supports MONGODB.

It allows more than one website to share a same database. Only need to use prefix to distinguish each other. Another situation is that every website owns their data base. Certainly, there is no any impact to our scheme matter which situation is to make the proposed scheme work, the method almost is same under the two different situations [6].There are 46 tables in the database installed with default where the tables of extended modules are not included. One of them are related to user's information. It is the user's table keeps all users' information when to install a website use Query tool. When we install extended

modules to make our website powerful, the data base of Web app will generate related tables [3]. Clearly, the information of user's and the stalled modules in different website are independent each other before we modify.

The architecture of Query tool(in figure1) contains the following layers and menus:

A. Flask/eve

Client Server: This limitation works on the idea that the customer and the server ought to be isolated from one another and permitted to advance independently.

Stateless: REST APIs are stateless, implying that calls can be made freely of each other, and each call contains the majority of the information important to finish itself effectively.

B. Cleary

Celery requires a message transport to send and get messages. The RabbitMQ and Redis agent transports are highlight finished, but on the other hand there's help for a heap of other trial arrangements, including utilizing SQLite for nearby advancement.
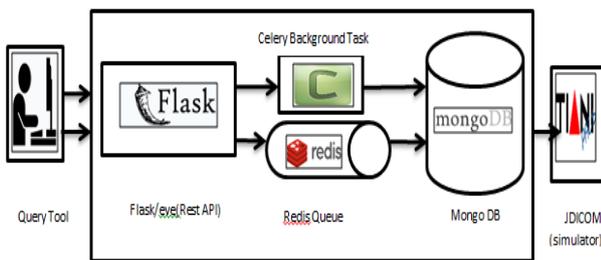

Figure 1: Tool Architecture

C. Redis:

To start with, developing a fabricate channel Adapter class, as a point of correspondence between the application example and Redis administration. The class will uncover strategies whose functionalities are: send undertaking to hold up lineandheck for accessible errands in hold up line.

D. MONGODB

MongoDB is a report based information store which implies that it stores the data in rather an unstructured, where it is largely used when there is no need for the relations and expensive join operations, it provides the flexibility for the users , in the other way it is also called as place where user can dump any information that is required.

Organization when contrasted with organized tables like in MySQL or PostgreSQL. This basically implies the information put away in MongoDB is "construction less". Along these lines, MongoDB gives a quick and adaptable information stock piling administration which settles on it a well-known decision in execution basic application.

MongoDB ought not be utilized in applications that require table joins basically on the grounds that it doesn't bolster joins (like in SQL). This is ascribed to the way that the information put away in MongoDB isn't organized and accordingly, performing joins is a very tedious procedure which may prompt a moderate execution.

III.   PROPOSED WORK

After an examination is completed in the Imaging Modality, the operator is supposed to push the study to other review stations after performing quality check. Sometimes the operators forget to push the studies or do not push to all the required stations, as it is not possible to go every station and check if a study for a particular patient has been pushed to all the require stations or not.

Developing an application which can query imaging modalities and PACS for availability of studies related to a given patient and remotely moves studies from one station to other, where the DICOM related pattern images are made configuration with the DICOM connection details of the PACS.DICOM related applications will identify them when they connect. Where the application uses the "FIND-MOVE" node where "C-FIND" will query a PACS for the particular patient, studies, images and series, then uses the "C-MOVE" command for reaching the destination which is configured before, this is the core work functionality of the web service. Additional functionalities like sign in for the security purpose with sign in details, profile page for the display of the user information, sending notification to other people, adding an admin rights to users are added. The mechanism of this web services includes the frontend and backend with data base, where frontend uses the vue.js java script language in it which is trending and most flexible nowadays with the application of the single page application on it, backend which uses the flask/eve with the usage of the python language which is most flexible for the API to run, database MONGODB is used for the storage purpose and the special DICOM applet called the JDICOM server is used for the organization of the nodes.

Medical organizations got understood the potential strong benefits of the secured healthcare service data sharing and how they transferred in between the server, many genetic related studies and cancerous disease got analyzed across the country through the sharing of data with the well maintained quality and security. Some of the benefits by the sharing of the medical health care data are, Sharing of data can enable in depth understanding of the generated studies from an individual clinical report.

DICOM which specifies a distinct set of information about thousands of patients, imaging devices, procedures and also the images, DICOM is hierarchically structured and it

has "Client-server" architecture, it includes the following parts:

Communication between the user and the server takes place using HTTP.

a) DICOM file/data format

b) DICOM interchanges protocol

c) DICOM network protocol architecture.

An examination unique number is generated previously to the imaging course, when the order is created at the time to sync the image transfer to PACS using ID,Where the patient related data arrive from the EMR or EHR or HIS systems have HL7 data which gets securely coupled with the device, transmits search or query the medical related and particular patient data from the storage systems (PACS, RIS), finally report are allowed for monitoring in different review stations. The proposed web service DICOM query tool has the following features, after the many evaluation and survey of the imaging modality and transfer through DICOM structure to the PACS, it's been detected that during the course, lab operator fails to push the studies related to the corresponding patient data to the specific or requested stations, so a health care service DICOM query tool been developed for the convince of end users. Web service provides a DICOM pattern to organize an application which supports "C-FIND" and "C-MOVE" operations, and pattern to query patient details, studies details, image from PACS using a web-based service developed by flexible JDICOM

DICOM related image pattern is designed with the DICOM network details of the PACS. The network information includes the name of the host and port of the PACS, and DICOM applications establish themselves when they connect, hence it configures the pattern with the DICOM Application Entity Titles (AET) and PACS. DICOM image pattern uses the operation like "DICOM FIND MOVE" node to make bridge connection to the PACS. The "DICOM FIND MOVE" node has enable two operations, they are

A. To make or pass query a PACS for the details of the required data related to the patients details and their examination studies, search options are given in the input panel, that is in frontend page of the website and they propagate to the input terminal of the node and result of the requested queries propagate from the output terminal of the node.

B. The second operation is, "DICOM FIND MOVE" node move the obtained results which includes the query to a DICOM server using a "C-MOVE" command, destination of this command be a DICOM input configured node, and PACS should be configured previously with the "C-MOVE".

C. The request from the web service sends the search conditions with an API in the rest client, the requested message passes to the "DICOM FIND MOVE" node, and the response sent back to the node.

IV.   ANALYSIS AND TESTING

The analysis of the website is the complete examine of the website. The initial analysis includes to assure that the tool is web-responsive. Responsive Design is the design of the system responds/adapts depending upon the layout of the device[16]. The primary reason to keep your design responsive is to increase the reach of your application to a larger user base using an array of devices.

A responsive structure improves the convenience of the item. before the appearance of portable Internet specialized gadgets, Developers used to make their applications good with screens of different goals. This can likewise be called making the structure responsive. In this day and age, where an ever increasing number of clients are expending data on the cell phones, there is a need to deal with the changing viewports and equipment [11].Irrespective of how the site looks, the responsive structure can be accomplished. This is preferably a useful angle over a structure viewpoint, despite the fact that the usefulness is accomplished by the architect.

Figure 2 depicts the results of the particular webpage that is tested, and it has the scale as set by the user. The testing techniques such as Functionality Testing, Usability Testing, Interface Testing, Database Testing, Compatibility Testing, Performance Testing, Security Testing and Crowd Testing are done. Further the website is deployed into the production.
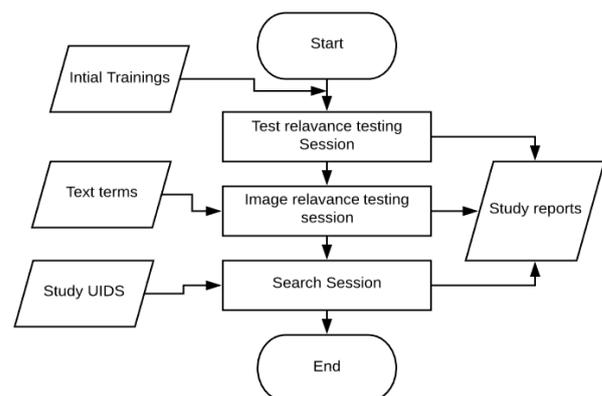

Figure 2 : A Flow of Testing Scenario

Testing the website includes the search of potential bugs before it is made live or before the code is moved into the production environment. During this stage issues such as that of web application security, the functioning of the site, its access to handicapped as well as regular users and its ability to handle traffic is checked.

Initially trainings sets are taken in the start and related test terms study UIDS which is searched and tested in many session and given study results.

V.   CONCLUSION

In this thesis, we have developed a web application, DICOM QUERY RETRIEVE TOOL, to resolve the problem which occurs when the study is completed in the Imaging modality at the operator who might miss to push to respective review stations using the web application over internet.

The DICOM QUERY RETRIEVE TOOL was designed and implemented using frontend tools like VueJs, HTML and CSS with the rest API called Flask/Eve and the backend tools like Python with database Mongodb. The hence developed tool would accept queries related to the patient information and produce the details of where those details of a patient are stored.   This web application with the booming technologies helps in end users like patient, doctors and lab operators for easy querying of the related DICOM studies related to the particular patient

Experimental results and analysis shows that the Further it can be enhanced to mobile android app usage and viewing the DICOM image directly over the web without any external software.

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