Development of Performance Dashboards in CT Systems

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***Abstract*-Static nature of performance in healthcare sector has resulted in conflicting, time consuming and stable process studies that are unable to transparently indicate the round picture of performance and effectively support healthcare manager's decision makings. There is the need of interactive performance management dashboard to assess and monitor the working of these health care systems. The main focus lies on identifying some of the important topics that needs to be answered for producing highly efficient performance dashboards.**

Healthcare sector is one of the business that relies on dashboards to inform to different stakeholders that the organization is meeting specific criteria and providing high quality service to the people. Healthcare based dashboards primarily focus on error tags and accuracy within the system. The opportunity goes for the organizations research, analysis and development team. Keeping in mind that every organization would want to create its dashboards, dependent on the goals and the people whom they are providing data to.

Keywords -CT Scan, Reliability Dashboard, Performance analysis, Error tags, Protocols Distribution

I. INTRODUCTION

A CT scan also known as Computed Tomography scan is a medical imaging procedure that uses computer-processed combinations of many X-ray measurements taken from different angles to produce cross-sectional (tomographic) images (virtual "slices") of specific areas of a scanned object, allowing the user to see inside the object without cutting. Development of Reliability Dashboard for CT scan system. CT-eye Analytics team has a task of monitoring the error tags and levels and create a reliable dashboard which ensures improvements in upcoming versions of CT Scan system.

The following are the objectives of the project.

- Primary objective is to determine error rate and performance analysis of the system.
- To determine protocol distribution analysis of the system.
- To determine region based performance analysis of the system.

II. NEED AND MOTIVATION

The purpose is to assess the reliability and accuracy of CT scans. The primary objective for this project was to create a dashboard which depicts various graphs regarding the number of studies done in various countries across the globe. Dashboard also explains top passing and failing protocols over 90 days, most frequent error tags and which of those tags occurred the most. Around 1 million studies were taken from different regions of the world in the tenure of Nov-(19) to Jan-(20) for performing the analysis.

The need and motivation behind the project was to get key and valuable insights of the working of CT division systems. To monitor the error tags and their levels and ensure the improvements are made in future versions. The complete need is thoroughly depending upon further optimization of the CT system.

III. METHODOLOGY

Several test cases collected from past results of CT scans are taken as record log files. Data analysis techniques are applied on these files to generate specific defined data with well explained reasons for all the error tags and types. There are several parameters upon which analysis are performed and trends can be set. These parameters include error tags, error types, status pass or fail, protocols their families and their distribution and many other parameters. After all the data preprocessing techniques are performed and structured and meaningful data is created the next task comes of plotting and depicting these datasets. The idea is that plotting of these datasets is real time in nature. So to provide reactive sense to the plotting Plotly is used to create reactive graphs with extreme clarity, accuracy and precision.

After this comes designing the front end web part which has to be scalable and responsive in nature. Dash is used as the hosting environment for the software. Styling and formatting has to be done in HTML and CSS. Meanwhile, the primary language is python so after dashboard is created with multiple tabs and all the created datasets and plotting's. Machine learning models are also being used in some parts of project to create few complex data models and their decision trees. These were the primary tasks overview that were the part of methodology of the project:

• The reliability Dashboard is to analyse and find out the percentage of failure in studies ranging from all regions of globe.

• Dashboard manages several other sections based on several other parameters for ex- Failure percentage based on parameter of region or Failure percentage classified on the basis of types of errors while mentioning the error tags.

• Ensure the servers in the backend are up and running, so the analytics system is always up at work.

• CT uses several Protocols which have their respective families so the dashboard also analyses the data involving all these protocols and their family.

IV. LITERATURE SURVEY

Work regarding the reliability dashboard involves several sections such as protocols their families and their distribution within the test cases. All the error types and error tags present in the test cases observed. Several other parameters within the test cases that can be handled and are to be used for graph plotting procedure. So all the work performed on the project is based on experimental testing performed by CT systems and then eventually these test cases act as a raw dataset upon which all the analysis needs to be performed so these test cases along with their several parameters act as a part of literature survey to be performed for the project.

• [1] Deals with the basics of CT scan. It explains about the terminology and working protocols of CT systems. All the fundamental ideas and components used in scanning of human body has been mentioned.

• [2] All the implementation tools and requirements needed for the dashboard with complete detailing's have been mentioned here. Judicious use of these implementation techniques and their methodology has been explained here.

• [3] This paper provides application purposes of CT scanning in healthcare industry. The jobs and types of protocols handled by CT systems all of these are pointed out in this respective paper.

• [4] Deals with performance measurement criteria for the healthcare industry and how it is important for reliability dashboard. All the other parameters and their workings, the manner in which they affect the performance has been explained.

• [5] Provides developmental issues and challenges faced while creating a reliability dashboard. All the factors affecting and issues established while running these test cases scans.

• [6] Gives detailing about how the increase the efficiency of dashboards. The procedure through

which error tags and error levels can be monitored effectively.

• [7] Explains the importance why the analytics in highly involved and important in creating the dashboards. Role and importance of several determining parameters discovered during analysis.

• [8] Provides the idea behind importance of dashboards in healthcare domain. Role and working of these dashboards in the manner such that boost up the levels of upcoming versions of CT systems.

• [9] Deals with idea of managing and visualizing those dashboards. Features deployed in the dashboard and manner in which they can be used.

• [10] Explains about the research approaches and methods used or adapted while creating a dashboard.

V. ARCHITECTURE

Test cases based on 3 to 4 months of testing are taken into account of system logs. Using data analysis techniques these test cases are analyzed based on several parameters. Many Business logic and design are taken into account. Then java ETL framework architecture also comes into account. Lastly Dash is used as the hosting environment. Plotly characteristics are used for plotting purposes.

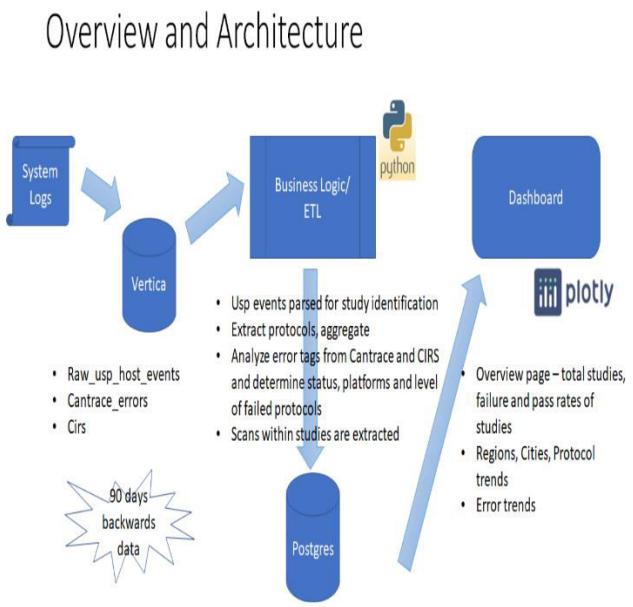

Figure 1: Architecture overview

Plotting's:

• Accuracy of the graphs must be at optimum scale.

• Scale must be carefully chosen so that all the parameters get represented.

• Plotting's must be clear and structured to provide complete overview.

Front End:

• Styling and formatting is done under HTML and CSS.

• Dash is being used for hosting environment.

VI. CONCLUSION

Reliability dashboard is essential component of every healthcare division system whether its CT scan or X RAY or any other system. On road to achieve error free result with well optimized efficiency reliability dashboard acts as a huge support system to achieve this goal. Reliability dashboard for CT system ensures proper protocol distribution within the test cases for all the respective protocol families. The dashboard also provides complete overview about the working condition and efficiency of the system. All the generated error tags are taken into consideration and extensive research and analysis is performed on the occurring of those errors. The reliability dashboard also aims generating region specific results and thus providing better view point for the system. To conclude, reliability dashboard always aims at creating better and improved version of CT system to achieve best results.

VII. FUTURE ENHANCEMENTS

This software is made according to the requirement of organization but expansion of modules can be easily included in the software. This package can be used in an internet environment that will make handling of different customers easier.

Following features can be added for enhancement:

- This software can be used for B2B and B2C sites.
- A proper revenue model for the system can be defined.
- With slight modifications it can be made to work or to fit into any such organization.

Future expandability and interconnectivity are the features, which are considered for scope in future

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