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Novel Tool for Conduction of Automation Testing of Optical Network Devices

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Abstract: Telecommunication networks of high capacity based on optical technologies and components are termed as optical networks. They are used to are used to groom, route, and restore wavelength levels and wavelength-based services. Automation testing of optical devices plays an important role in successful delivery of these devices. Not only does it help in increasing the quality of the device, it also decreases the product delivery time by replacing the efforts in manual testing. With rapid development in technology in the optical domain, a further decrease in the time required for testing is necessary. Time taken in creation and submission of tests to test features needs to be significantly reduced. Conduction of repeated tests after correction in the defects of the system leading to new releases also plays an important role in quality delivery of products. With the advancement in techniques of natural language processing and text processing, involvement of these techniques in conduction of repeated tests helps in significant reduction of time taken and increase in accuracy. Across new releases, analysis of improvement factors is extremely important. Maintenance of records of conducted testcases and analysis will also help in increasing the quality of tests conducted.

Keywords: telecommunication, Optical devices, automation testing

I. INTRODUCTION

An optical network comprises optical devices interconnected by optical transmission links. A repository that houses computing facilities like routers, switches and firewalls is termed as datacentre. It will also have supporting components like backup equipment, fire suppression facilities and air conditioning. Connecting data centre with the infrastructure, scaling networks, virtualizing resources and simplifying the cloud operations will be handled by datacentre optical devices. With the current trends, video traffic is growing rapidly. Content Delivery Networks (CDNs) will carry 71 percent of Internet traffic by 2021. To keep up with the demand for more video, content providers will need to scale their networks at speed. A web-scale network needs to scale at high speed. At the same time, it has to be operationally simple. Automation testing of optical devices that are used in these network plays an important role in successful delivery of these devices. Not only does it help in increasing the quality of the device, it also decreases the product delivery time by replacing the efforts in manual testing. With rapid development in technology in the optical domain, a further decrease in the time required of testing is necessary. A type of software testing to confirm that a recent program or code change has not adversely affected existing features is termed as regression testing. All testcases are re executed to ensure that existing functionalities are working fine. A user-friendly tool which will help in further reduction of time in automation testing including regression testing is to be designed.

II. MODULES INVOLVED

The main goal of the tool is to reduce the time involved in conducting automation testing of optical devices by providing a user-friendly and neatly compartmentalized environment. The tool design is made in such a way that the same tool can be reused for any optical device. It mainly consists of the following main modules.
1)Module for running tests
2)Module for viewing the previously submitted runs,
3)Module for viewing health report of the runs conducted.

A. Modules for running tests

Conduction of automation tests using command line interface involves highly time-consuming redundant work that can be easily minimized by providing a user-friendly environment. Essentially the following three types of test conduction are required for successful delivery of product.
1)Area wise testing - Tests that help in testing a particular area/features
2)Defect based testing – Tests conducted to verify the defects that have been corrected based on Natural Language Processing techniques.

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3)Randomized conduction of tests. – Random execution of testcases.

B. Modules for viewing the previously submitted runs

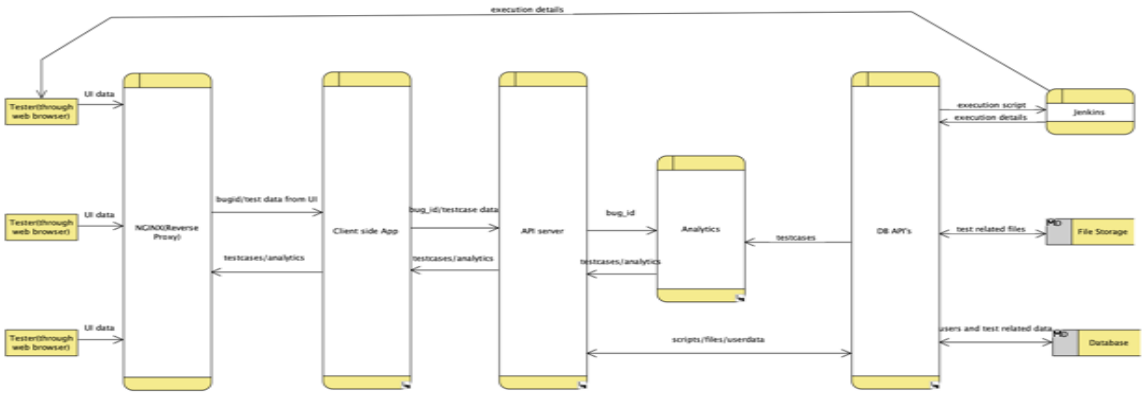
This module becomes an essential part of the tool as the users should be able to keep track of the execution process and status of previously submitted tests.

2.0.3 Module for viewing health report of the runs conducted

The overall performance monitoring is a significant part for the tool to deliver it's needs. The managers and the testers must be able to analyze the test results easily with the help of graphical representations.

III. DEVELOPMENT OF THE TOOL

A. High level design



The design mainly consists of

- NGINX reverse-proxy where user submits the input to the tool
- A NoSQL database (MongoDB in this case)
- A client-side API server that receives requests from the clients and forwards it to the relevant server.
- A database server that handles requests corresponding to database queries
- An analytics engine that makes calculations required
- A file storage system where the generated files are stored.

3.0.2 Detailed design

Usage of distributed architecture – In order to reduce the load of the whole application on a single server, distributed architecture was followed in the design of the tool. The user interface system, Application Programming Interface (API)s for interacting with the database, API's for analytics, API's for interacting with the user interface are being hosted on different servers as microservices.
This helps in enhancing the scalability of the tool both horizontally and vertically which results in easier deployment.

User Interface- The application was developed with the help of React JS. It mainly involved a user-friendly implementation of the modules.

Database – The pre-loading of the database with the testcases are made in such a way that those testcases can be delivered easily for accurate conduction and submission. The testcase documentation is redefined to help the cause.

Backend servers – These servers are designed with the help of flask which is a Python framework for easier development of server-side programming with cross server design.

Execution engine – Jenkins is used as the execution engine. Publisher – Subscribe model is being used for the submission of runs. Whenever a user submits the test data, the runs are queued and the submission of the runs is made based on pull mechanism considering the availability of the testbeds and the execution engines.

Analytics for defect-based testing – Verification of rectified defects plays a significant role in the successful delivery of products. A novel technique for automated prediction of testcases after defect correction is being developed. Stop word removal, bag of words algorithm, topic modeling techniques have been used. It involves analysis of the defects and testcase documentation using Natural Language Processing and Text Processing techniques to give suggestions to the users on verification of the rectified areas. The algorithm mainly analyzes the bug to determine what area of the device is affected and tries to find the corresponding testcases by analyzing the documentation of the testcases. The suggestion includes a superset of testcases based on the order of priority as predicted by the analytics algorithm.

Analytics for overall testcase conduction – A graphical representation of the test results with details including the statistics of passed, failed or aborted testcases is presented to the user. The user will be able to view the time taken for execution of the runs. A cumulative health report of the success rate obtained over different releases of the device is also presented to the user.

Randomized conduction of testing – This is motivated by an attempt to find out defects in a device that usually go unseen due to the tendency of testers to conduct testcases in a predefined order. It also helps in utilization of ideal testbeds and thus effective test conduction resulting in delivery of high-quality products.

Design of file system – The generated files during the whole process is stored in a systematic way so that search time involved in analytics is reduced.

IV. FUTURE ENHANCEMENTS

The logs produced during conducted tests will have significant amount of data pertaining to test details. Manual analysis of the logs to incur conclusions is a highly tedious job. Machine learning techniques can be used to analyze the logs produced that helps in increasing the performance of the defect-based testing. This will further help in improving the quality of the delivery of the product.

V. CONCLUSION

This paper presents a novel technique for automation testing by developing a tool that helps in easier conduction of tests. Due to the analytics that helps in giving suggestions for testcases, and systematic provision for conduction of tests, significant amount of manual effort is reduced. Randomized conduction of tests helps in finding out defects that can go unseen during traditional testing which can hinder deployment in later stages. User friendly graphical representation of the test results and a centralized repository of conducted tests helps in systematic maintenance of data over different releases that helps in increase in efficiency. Overall the tool helps in enhanced efficiency of automation testing.

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