A Study on Network Test Automation Using Robot Framework

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Abstract: **Management systems must be capable of intellectual thinking, complex real time decision making, and experienced based self-adaptation and development in today's ever-changing world of computer networks. In the rapid technological advancements, networks have become increasingly complex. Long downtimes can result from network system failures as a result of this increasing complexity So, the network automation uses software to automate network and security provisioning and management in order to continuously maximize network efficiency and functionality. Automation reduces the need for human intervention, resulting in cost-effective and time-saving solutions for the proper and complex monitoring of these massive systems as well as heterogeneous networks. Robot Platform is a test automation framework that is widely used in NMS automated testing. This paper surveys some significant multidisciplinary research efforts that suggest using a robot system to improve network management.**

Index Terms **– Network Management, NMS, Test Automation, Robot Framework.**

I. Introduction

The scale, complexity, and number of users of organizational networks have all grown rapidly in recent years. The administration of these networks is becoming increasingly complicated as a result of this development. Given the broad range of network management activities and the scale and complexity of large networks, management is becoming increasingly difficult. As a result, manual maintenance of vast networks could be impossible. For efficient and complex management and control of large networks, automated techniques must be used. Network control, identification, and repair are some of the most important management tasks. The number and type of users, as well as the amount and type of network resources used, are all variables that can change quickly and almost constantly.

II. Network Management

Method of managing and maintaining computer networks through the use of various methods, protocols, and tools is the network management. Deployment, setup, testing, debugging, error handling, and repair are only a few of the activities that must be performed for network component management (devices, connections, users, and applications). The following features are available via NMS [4] as shown in Figure 1.

Fig 1

The five stages of network management job goals are classified by FCAPS. The fault-management (F), configuration (C), accounting (A), performance (P), and security(S) levels are the five levels (S).

2.1 Performance Management

Performance management involves monitoring and tracking the performance of network equipment and also the overall network.

Key network performance management functions:

- Examining the network to identify roadblock devices and links
- Observing link availability and performance
- Calculating the network bandwidth and traffic exploitation
- Examining the traffic usage patterns to know applications and users' network behavior

Classifying network traffic by application, transport layer protocol, users, and other factors is a valuable tool for trend analysis. This type of traffic analysis is often employed in network management applications such as protection, fault repair, and accounting.

2.2 Fault Management

Fault management is an important part of network management because it requires the rapid detection and successful repair of any flaws or issues. The whole procedure can be separated into the following steps to make it more systematic.

- Identifying and describing flaws.
- Linking issues of defective conduct.
- Diagnosing and determining the trigger.
- Network maintenance and reconstruction to get things back to normal.
- Assessment of efficacy for future comparison and accounting

To detect any faults, network devices and connections must be maintained and controlled. For

successful fault management and minimizing the impact of faults, the ability to quickly recognize and locate faults is essential.

2.3 Configuration Management

The modification, and restoration of network devices such as bridges, routers, switches, and links are all concerned with configuration management. Improperly modifying the configuration of any system can have a major negative impact on the network and hinder user services. Configuration management is responsible for a wide range of activities, including:

- Initial network interface configuration
- Making configuration changes easier
- Minimizing the impact of misconfiguration
- Configurational flaws Since networking technologies and hardware are constantly evolving and improving.

2.4 Security Management

To safeguard the network, its elements, and infrastructures in order to keep them in the most open state possible, with complete integrity and operational continuity security management is required. Identifying network security risks and selecting the right strategy and tools to mitigate their impact and harm is what network defense is all about.

Network security is mainly concerned with threats that are launched using a computer network which must be analyzed and removed from the network. The best method is determined by a number of factors such as the nature of the threat, the significance of maintaining the network safe, the type and complexity of the network, the loss of revenue and credibility in the event of a successful security attack, and so on.

2.5 Accounting Management

Determining network usage in order to monitor and allocate network capacity to users is concerned with accounting management. Accounting is critical for reducing network issues caused by inequitable resource allocation. Billing and other related activities must be completed in a timely and constructive manner, and effective and equitable means and measures must be taken to provide acceptable services to customers. Accounting methods must be properly carried out and observed if business plans and revenue acquisition are to be effective. Network processors are proposed for accounting management systems that are scalable, reliable, and high-performing.

III. Testing Process in Manual and Automation Testing

Manual testing and automation testing are two approaches for performing testing activities as shown in Figure 2.

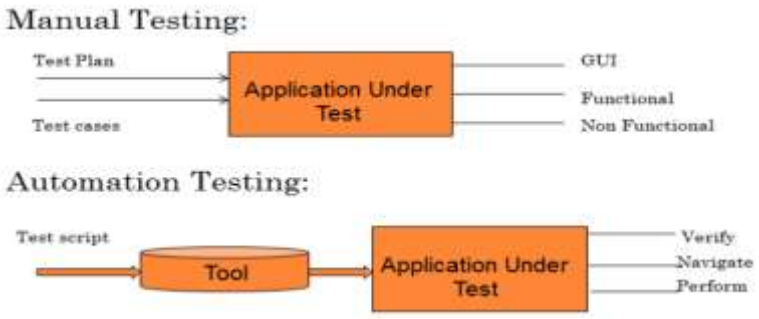

Fig 2

Manual testing is a method of testing in which a tester follows a written test plan that guides them through a set of critical test cases. A test case is a collection of conditions written for a specific application that a software tester runs to ensure that the software functions properly.

The execution of test cases without the need for human intervention is referred to as automation testing. It uses specialized software to write and run test cases in order to compare the actual and predicted outcomes. Tests can be run easily and repeatedly once they've been automated. It is the most effective, efficient, and comprehensive method of increasing the effectiveness, performance, and coverage of software testing.

The Robot platform, which is an open-source test automation system, was created by Nokia Siemens Communication Technology Limited. Acceptance testing and acceptance test-driven implementation were carried out using the Robot framework (ATDD). It employs a keyword-driven analysis strategy and a tabular test data structure. Since the Robot system is based on a modular architecture, test libraries written in Python can be used to expand its testing capabilities. The Robot framework's core framework is written in Python, making it platform and device separate.

Table 3.1 Comparison between Manual and Automation Testing

Sl. No	Manual Testing	Automation Testing
1	Manual testing is carried out by a human tester and a programmer.	In automation research, test cases are run using automation tools. Manual testing is inefficient.
2	Manual testing is time-consuming and expensive.	Automated testing is far more effective.
3	Manual testing is less successful due to the chance of human error.	Automated testing is a dependable method since it is carried out by tools and scripts. Fatigue isn't something that can be measured.
4	Manual experiments can be performed in parallel, but it would cost more money to recruit more staff.	This research can be done in parallel on different operating systems, which cuts down on test execution time.
5	Manual research has a higher probability of missing the test deadline.	An automated test has no risk of missing a pre-determined test.
6	Manual research will be done in a systematic order.	Automation Testing is performed on several platforms.

Table 1 shows the main difference between manual and automation testing. Manual testing is well-suited to situations in which specifications change frequently and automated testing is best suited to circumstances where a lot of repetitive testing is needed.

IV. Robot Framework Architecture

Robot Platform is a flexible method, with applications and techniques that are unrelated to one another. It is also a set of automated testing tools. As shown in Figure 3[1].

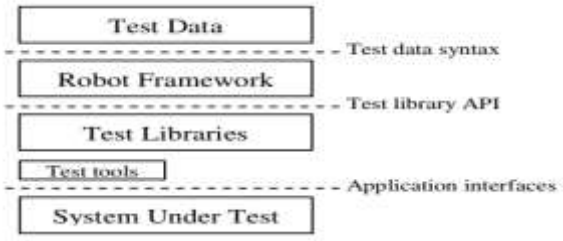

Fig 3

- Test Data: Test Data is presented in a simple, editable tabular format. Robot Framework processes test data, performs test cases, and when it is started, it generates logs and reports.
- Robot framework: The Robot framework is in charge of taking test data and converting it into a format that is compatible with the attached libraries. It is written in Python or Java and must run on that platform.
- Test Libraries: Test libraries communicate with the framework being tested, which results in the generation of reports.
- Test tools: Test libraries can use certain test methods if they want to interact with the under-evaluation framework Internally, this is not known to the Robot framework.
- System under Test: An application under test must be used when using a system under test.

V. Comparison of Automation Frameworks

There are a variety of testing automation methods, each withits own set of advantages and disadvantages, and each serving different functions.

4.1 Selenium

Selenium is a web application testing system for Windows, Mac OS X, and Linux. Selenium allows testers to write tests in Java, PHP, C#, Python, Groovy, Ruby, and Perl, among other programming languages. It enables you to record and replay tests without learning a test scripting language. Selenium is a popular web application testing automation framework that includes a variety of tools and plugins. This tool may require new teams to spend time in setup and integration up front, and community support is very slow.

4.2 Unified Functional Testing (UFT)

In the commercial world, functional and regression tests are widely used automation platforms. To register test procedures, operate various artefacts, and monitor in application testing, this tool uses the Visual Basic Scripting Edition scripting language. This tool, in contrast to other testing systems, requires license and maintenance fees and only supports VB script.

4.3 Katalon Studio

It is a Robust automated testing framework for constructing solutions for automated testing like Web, API, desktop, and mobile applications. It enables teams to quickly get started with test automation by reducing the time and effort taken to learn and implement these frameworks for automated testing needs. In either case, this framework has a low level of community interest and only supports a few features.

4.4 Junit

JUnit is a Java programming language unit testing platform. Since it allows developers to create an oracle for each test case and run test sets automatically, it's a great tool for developers. Unit was instrumental in the development of test-driven development. JUnit, in particular, allows for the automated testing of multiple regression test suites. If a formal specification exists, it can be converted into statements that canbe tested at runtime, effectively serving as a test oracle. In either case, writing and testing this method necessitates programming skills.

Many of the above-mentioned testing frameworks have theirown set of benefits and drawbacks, but the robot framework is flexible enough to solve all of the drawbacks of other automation frameworks.

VI. Conclusion

As network management is a complex, challenging, and dynamic area, proper initialization, planning, maintenance, monitoring, troubleshooting, and repair of computer networks necessitates automation and intelligence. Automation is used to configure network components, which has many benefits over manual testing. There are several network elements, and manually configuring the network elements and their parameters is complicated and time-consuming. As a result, using the Robot platform to automate testing eliminates all of the difficulties and problems associated with manual testing.

The main advantage of robot framework in network automation is in the rapid technological advancements, networks have become increasingly complex. Long downtimes can result from network system failures as a result of this increasing complexity, putting a financial strain on business operations and potentially overloading IT workers as they attempt to mitigate the problem. Network automation can aid in the management of your IT infrastructure as it becomes more complex. People in charge of network operations will become more efficient and capable as network system provisioning, setup, and management become more automated so that the network will become more robust, scalable, and resilient in the end.

Acknowledgement

I take this opportunity to thank my guide, Prof. Anisha B S, Assistant Professor, Department of Information Science & Engineering, RV COLLEGE OF ENGINEERING, Bengaluru for her valuable suggestions, support and regular source of encouragement and assistance throughout this project and senior authorities whose constant encouragement made it possible for me to take up the challenge of doing this project.

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