A Literature Review on Issues and Challenges with Respect to Quality Testing Methods for IoT Based Systems

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ABSTRACT

The trend and usage of IoT (Internet of Things) based systems is rapidly increasing day by day. IoT is a network of objects/devices embedded together by means of some technologies like sensors, software, etc. for the sake of collection and further communication of data over a network without any Human to Human or Human Computer Interaction. Real world objects are rapidly transmuting into smart objects. Basically the objective behind IoT is to group objects, make their communication easier and to make humans capable enough so that they can control objects as well as to introduce such aspects which can be helpful in updating these things. Various objects can be linked in an IoT Based Systems and their security is highly essential. To ensure security of such systems we have to test each and every layer of IoT because a single piece of threat can cause serious destruction. Modern development in the field of IoT brings about various issues and challenges in terms of Quality Assurance. Challenges with respect to the security, interoperability, reliability, privacy and protection of user data should be addressed properly. In this paper, we will discuss current issues and challenges regarding Quality Assurance & Testing Methods involved in IoT Based Systems.

Keywords: Cloud Computing; Internet of Things; Interoperability; Quality Assurance; Security; Software Engineering; testing methods.

INTRODUCTION

Software Quality Assurance is a process which deals with the checking and testing of all the processes involved in software engineering in order to ensure software quality. For providing a valued software product, software quality assurance is highly essential. Software Quality Assurance is a systematic method to ensure the quality of service with high level of customer satisfaction. With the increase of software quality, customer satisfaction along with the marketed value of product also increases. To meet customer requirements and to fulfill customer satisfaction SQA (Software Quality Assurance) is highly recommended. Software Quality Assurance and Software Quality Testing techniques can be applied in various fields like: Software Engineering, Big Data, Artificial Intelligence, Internet of Things, Cloud Computing, etc.

IoT is an emerging technology these days. It incorporates various networking devices which are responsible for the collection of data throughout the world through different sensors. Not only they just collect that data but also they communicate and transfer that collected data for various purposes via internet. IoT is a network of objects/devices embedded together by means of some technologies like sensors, software, etc. for the sake of collection and further communication of data over a network without any Human to Human or Human Computer Interaction. Quality Assurance & Quality Testing Techniques/Methods play a vital role for assuring the quality of a product. Core functionalities of IoT based applications/systems receive a high impact of Quality Assurance. Various objects can be linked in an IoT Based Systems and their security is highly essential. This paper is based on a literature survey that enlightens various issues and challenges which may arise in software quality assurance and testing methods for IoT based systems and their probable solutions as well. This paper

consists of total 5 sections. Section 1 is about introduction of the paper. Section 2 summarizes the related work. Section 3 will highlight issues and challenges. Section 4 will propose probable solutions. Section 5 will sum-up the whole research paper in terms of a conclusion.

Related Work

This literature survey was conducted to get familiarized with IoT concerns and challenges which are particularly associated with the quality testing of IoT product and services (Ryan and Watson). These can make it difficult enough to deliver and installed a proper working hundred percent reliable product to its customers and users. Furthermore, this survey enlightened and suggested solutions which can either resolve or else can minimize such challenges. However, the total resolution of such severe challenges is quite difficult. During this literature survey, various IoT based challenges and concerns have been encountered (Mustafa et al.). Several research papers having good citations have been targeted to gather the material regarding issues, challenges, security and privacy threats, performance related issues and to present them collectively in a single research paper.

Through literature survey we analyzed several research papers which indicated the concerns for privacy and security of IoT based systems. Through their research they have presented some architectures, methods and strategies which can be used to address and resolve these concerns. (Bures et al.) Highlighted several major issues and challenges associated with the quality assurance and testing method for Interne t of Things.

Software Quality Assurance is playing an imperative part for producing and assembling technologies which can compete and meet the highest level of customer satisfaction. It should be the foremost target of all software development companies to present and introduced an advanced, modified and improved version of products. Proper verification and validation of an application is highly recommended in this regard.

(Sirshar et al.) Threw an ample light on SQA testing methodologies and IoT challenges. Application testing is the application product verification and validation process. We can't make sure of the product's approximation without testing the value. High-quality product means better user-friendly applications. In this literature survey, we have gone through a research paper (Tawalbeh et al.) which targeted the domain of Internet of things. From this survey analysis we found a detailed discussion about Internet of things, their infrastructures and related challenges as well as issues and concerns of IoT systems and devices in terms of software quality testing. During survey we have found and explored more complex challenges. Various critical and crucial challenges along with their solutions have been mentioned and discussed in detail. (Gomez and Bajaj) was based on description of the challenges associated with the testing of complex IoT systems and devices. The main issues of IoT are the heterogeneity in its many aspects, issues with standardizations, its security and privacy challenges, its complexity with interoperability and its test environment and architecture. These issues bring challenges to testing by: having multitude of variants, versions, and combinations to

test; making it expensive, hard to define, and mixed with unknown variables; changing and adding new factors to traditional testing; and making testing complex and involve a lot of layers and devices all at once (Gomez and Bajaj).

OBJECTIVES

Our main objective is to identify the main issues and challenges involved in quality testing of IoT based systems and to suggest some solutions which can minimize the rate of the occurrence of these problems and issues.

METHODOLOGY

For this literature survey we have read various articles and research papers related to the quality testing of IoT based systems and gathered the most highlighted points. We have researched and found out the most prominent problems and issues related to the quality testing of IoT based systems.

CONCLUSION

During few decades, it has been noticed that the emerging technologies with respect to IoT are rapidly increasing day by day. There is a rise in the demand of IoT devices. With the advancement of any technology, it is to ensure that how much any product is reliable and secured. According to security point of view either the product is secured and reliable, either the information is in secure hands or not. To overcome such major issues several satisfactory and necessary measures must be taken.

IoT is the field which is related to the communication and interaction of objects including sensors and system devices. It is functioning for the provision of numerous services and systems. All the systems and services provided by IoT must qualify and satisfy standard quality assurance and testing requirements. But creating a reliable and quality wise best product can be a drastic challenge because of its complexity. Several issues including security, privacy, accessibility, integration, reliability, interoperability, scalability, usability, testing environment and architecture challenges, performance issues, robustness, heterogeneity and standardization concerns can be caused which can lower the level of quality of system.

Quality testing phase has to face various challenges due to these issues and problems such as increased number of alternatives, versions and testing arrangements which can make it costly, difficult to express and assorted with other unidentified variables. The alterations and bringing up new features in traditional testing methods as well as these issues can make the testing process difficult to perform.

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