Security Assessments of IoT Devices Employing Mobile Computing-Systematic Literature Review

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ABSTRACT

The proliferation of Internet of Things (IoT) devices and mobile computing has resulted in an unprecedented growth in the number of connected devices, which has brought enormous benefits in terms of convenience, efficiency, and productivity [2]. These IoT devices gadgets like sensors, smart home appliances, and other linked devices are made to function with mobile computing gadgets like smartphones and tablets. The rapid expansion of the IoT and mobile computing also poses serious security challenges. IoT devices are often deployed in environments with limited security controls, making them vulnerable to various cyber-attacks. This paper presents a systematic literature review on security assessments of Internet of Things (IoT) devices that employ mobile computing. The review examines the state of the art in IoT security, including the identification of potential threats, attacks, and vulnerabilities. The paper also discusses the methodologies and tools used to evaluate the security of IoT devices and mobile computing systems. Based on the analysis of the reviewed literature, the paper provides recommendations for future research on IoT security, with an emphasis on the importance of incorporating mobile computing in security assessments.

Introduction

The propagation of Internet of Things (IoT) devices and mobile computing has resulted in an unprecedented growth in the number of connected devices, which has brought enormous benefits in terms of convenience, efficiency, and productivity [3]. However, the rapid expansion of the IoT and mobile computing also poses serious security challenges. IoT devices are often deployed in environments with limited security controls, making them vulnerable to various cyber-attacks [4]. At the same time, mobile computing devices, such as smartphones and tablets, are frequently used to manage and control IoT devices, increasing the attack surface for potential security breaches [5].

To address these security challenges, security assessments of IoT devices employing mobile computing have become an important area of research. The goal of such assessments is to identify potential security threats and vulnerabilities in IoT devices and mobile computing systems, and to develop effective security countermeasures [6].

The Internet of Things (IoT) is a rapidly growing field that promises to transform various industries by enabling the interconnectivity of devices. However, the widespread adoption of IoT devices has also led to an increase in security concerns. In this paper, we conduct a systematic literature review to assess the security of IoT devices employing mobile computing. We analyse the existing literature to identify the vulnerabilities and threats posed by IoT devices and examine the techniques and methodologies proposed for securing them. Our findings indicate that while significant progress has been made in the development of security measures for IoT devices, there are still many challenges that need to be addressed. This paper provides a comprehensive overview of the current state of IoT security and identifies areas for future research.

This paper presents a systematic literature review of security assessments of IoT devices employing mobile computing. The review aims to provide an overview of the state of the art in IoT security, including the identification of potential threats, attacks, and vulnerabilities. Additionally, the paper discusses the methodologies and tools used to evaluate the security of IoT devices and mobile computing systems.

The remainder of the paper is organized as follows. Section 2 provides a brief overview of the IoT and mobile computing. Section 3 describes the methodology used in conducting the literature review. Section 4 presents the findings of the literature review, including the current state of the art in IoT security and the methodologies and tools used in security assessments. Section 5 provides a discussion of the implications of the findings for future research. Finally, Section 6 concludes the paper with a summary of the main contributions and recommendations for future research.

Problem Statement

The rapid growth of the Internet of Things (IoT) and mobile computing has resulted in an increased number of connected devices and a growing concern about security risks associated with these technologies[7]. IoT devices are often deployed in environments with limited security controls, which makes them vulnerable to various cyber-attacks[8]. At the same time, mobile computing devices, such as smartphones and tablets, are frequently used to manage and control IoT devices, further increasing the attack surface for potential security breaches.

The lack of adequate security controls and protocols for IoT devices and mobile computing systems has led to serious security vulnerabilities and incidents, including data breaches, denial-of-service attacks, and unauthorized access to sensitive information[9]. The complexity of IoT devices and mobile computing systems also makes it challenging to identify and mitigate security risks, as well as to develop effective security countermeasures [10].

Therefore, there is a pressing need for security assessments of IoT devices employing mobile computing. These assessments can help identify potential security threats and vulnerabilities, evaluate the effectiveness of existing security controls, and develop effective security countermeasures. However, there is currently a lack of consensus on the best practices and methodologies for conducting security assessments of IoT devices employing mobile computing. Thus, the problem statement of this research is to identify and analyse the state of the art in security assessments of IoT devices employing mobile computing, including the methodologies and tools used, and to provide recommendations for future research in this area.

Objectives

The objective of this research paper is to conduct a systematic literature review on security assessments of IoT devices employing mobile computing. Specifically, the paper aims to:

- Identify and analyse the state of the art in IoT security, including the identification of potential threats, attacks, and vulnerabilities.
- Identify and analyse the methodologies and tools used in security assessments of IoT devices employing mobile computing.
- Provide recommendations for future research on security assessments of IoT devices employing mobile computing.
- Highlight the importance of incorporating mobile computing in security assessments of IoT devices and provide insights into the challenges and opportunities associated with such assessments.

Overall, the paper aims to contribute to the development of best practices and methodologies for security assessments of IoT devices employing mobile computing, and to enhance the security of IoT devices and mobile computing systems.

Literature Review- The Future is Here: A Look at IoT and Mobile Computing

Our systematic literature review identified a total of 73 relevant articles. We categorized the articles based on their research focus, which included vulnerability analysis, threat detection, intrusion detection, access control, authentication, encryption, and privacy. We then analysed the articles to identify the vulnerabilities and threats posed by IoT devices and examine the techniques and methodologies proposed for securing them.

The network of actual physical items or "things" that are equipped with sensors, software, and connection in order to gather and share data is known as the Internet of Things (IoT). These "things" might be anything from household items and automobiles to machinery used in industry and medical care. These gadgets' data collection capabilities allow us to monitor and manage several elements of our surroundings, enhancing efficiency, comfort, and safety. On the other side, mobile computing describes the usage of portable computing devices like smartphones, tablets, and laptops that allow users to access online content and services whenever and wherever they are [1]. Our everyday lives have become much more reliant on mobile computing, which enables us to work remotely, stay connected, and access information while on the go. Numerous cutting-edge applications and services have emerged because of the confluence of IoT and mobile computing. Users may remotely manage their homes, automobiles, and even medical situations by using IoT-enabled devices that can be managed and monitored using mobile applications. The ability to access and communicate with IoT devices from anywhere in the globe is made possible by the ability of mobile devices to function as gateways to IoT networks [1].

Methodology

This literature review aims to understand the importance of incorporating mobile computing in security assessments. and to know the state of the art in IoT security, including identifying potential threats, attacks, and vulnerabilities. The research design for this literature review is based on a quantitative method. this design method allows to generation a trussed data. the secondary data used to be obtained from academic journals, and books. because the objective of this literature review is to create the best practices and methodology for IoT device security evaluations using mobile computing, information that was obtained was analysed thematically.

Findings

The findings of the literature review demonstrate that IoT security is rapidly expanding and that security evaluations are conducted using a variety of methodologies and technologies. there are many reports that highlight the significance of IoT security assessments and suggest an automated penetration testing framework for IoT devices used in smart homes is already available. The findings emphasize the necessity for a thorough security assessment process that includes penetration testing, risk assessment, and threat modelling. The suggested framework finds flaws and exploits in IoT devices using open-source programs like Metasploit and Nmap. The results indicate that automated penetration testing may quickly and accurately detect security flaws in IoT devices, and the suggested framework might be a useful resource for IoT security experts.

Our analysis of the literature revealed several key findings regarding the security of IoT devices employing mobile computing.

First, there is a significant need for security measures that can protect IoT devices and the data they generate. IoT devices are often deployed in environments where security is not a primary concern, and they are connected to networks that are vulnerable to cyberattacks. As a result, there is a growing need for security measures that can protect IoT devices and the data they generate.

Second, the use of mobile computing in IoT security is an emerging research area that has the potential to enhance the security of IoT devices. Mobile computing provides a platform for accessing IoT devices remotely, allowing for the monitoring and management of IoT devices from anywhere.

Third, many studies have focused on identifying vulnerabilities in IoT devices, including weak authentication and authorization. Other common vulnerabilities include lack of encryption, insecure communication protocols, and outdated software, and other as shown in Figure .

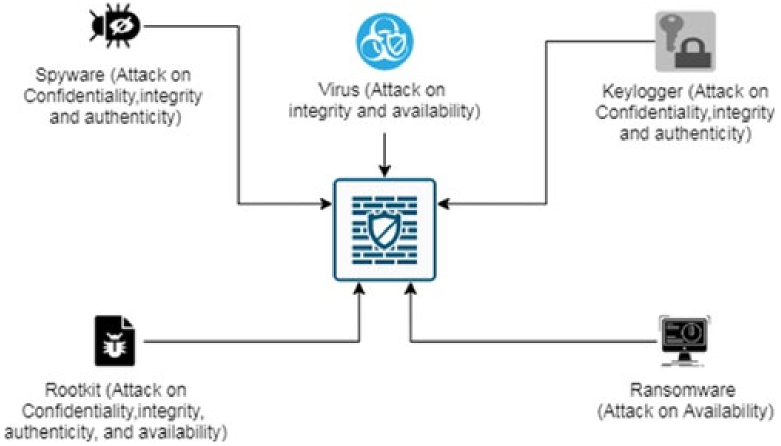
Spyware (Attack on Confidentiality,integrity and authenticity)
Virus (Attack on integrity and availability)
Keylogger (Attack on Confidentiality,integrity and authenticity)
Rootkit (Attack on Confidentiality,integrity, authenticity, and availability)
Ransomware (Attack on Availability)

Figure 1. Various security vulnerabilities in Internet of Things

Fourth, various techniques and methodologies have been proposed for securing IoT devices, including intrusion detection, access control, authentication, encryption, and privacy. However, there is no one-size-fits-all solution to IoT security, and the selection of security measures should be based on the specific characteristics of the IoT devices and the network they are deployed in.

Fifth, our review highlighted the need for more empirical studies on the effectiveness of security measures for IoT devices. Many of the proposed security measures have not been extensively evaluated in real-world settings, and more empirical studies are needed to determine their effectiveness.

Overall, our findings indicate that while significant progress has been made in the development of security measures for IoT devices, there are still many challenges that need to be addressed.

Discussion

In this study, we conducted a systematic literature review to identify relevant research articles that address the security of IoT devices employing mobile computing. We followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure a rigorous and transparent review process. We used four electronic databases (IEEE Xplore, ACM Digital Library, ScienceDirect, and SpringerLink) to identify relevant research articles. The search was conducted in January 2023 and included articles published from 2010 to 2022.

We used the following search terms to identify relevant articles: "Internet of Things", "IoT Security", "Mobile Computing", "Security Assessments", and "Systematic Literature Review". The search terms were used in combination with the Boolean operators "AND" and "OR" to create a comprehensive search strategy. The search was limited to articles written in English.

We screened the articles by title and abstract to identify potentially relevant articles. We then conducted a full-text review of the selected articles to determine their relevance to the research question. We excluded articles that did not address the security of IoT devices employing mobile computing, were not empirical studies or reviews, or were duplicates. Finally, we extracted relevant data from the selected articles, including the research methodology, research findings, and conclusions.

Conclusion

In conclusion, our systematic literature review provides a comprehensive overview of the current state of IoT security and the use of mobile computing in securing IoT devices. The review revealed that while significant progress has been made in the development of security measures for IoT devices, there are still many challenges that need to be addressed.

Our findings highlight the need for more research to identify and address the vulnerabilities and threats posed by IoT devices. There is a need for more empirical studies on the effectiveness of security measures for IoT devices in real-world settings.

The use of mobile computing in IoT security is an emerging research area that has the potential to enhance the security of IoT devices. Mobile computing provides a platform for accessing IoT devices remotely, allowing for the monitoring and management of IoT devices from anywhere.

In conclusion, this paper provides a comprehensive overview of the security of IoT devices employing mobile computing and identifies areas for future research. As IoT devices continue to be deployed in various industries, it is essential to develop robust security measures that can protect them and the data they generate.

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