

Web based testing application security system using semantic comparison method

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Abstract. Computer and web security system is an attempt to avoid attacks from crackers because a form and method of crime on internet network can not be predicted. Therefore, we just keep trying to use various methods in securing the system that is running. It is the same in web testing that can be accessed online by people who are not responsible from along distance to change and remove the test results or even damage the web testing system. So, the purpose of this paper is to design and implement web security testing system by using semantic comparison method to avoid structured query language injection (SQLI) attack and to do security on web testing application using Message Digest 5 encryption (MD5). Research data were obtained by using direct observation and documentation and literature review. After the design and application of the system, it can be obtained that by using semantic comparison method in web testing can prevent the occurrence of SQL injection attacks and can secure account from web testing users by using MD5.

1. Introduction

Web security is a form of effort to protect the important data or information contained in the web application either information in the form of video, pictures, text or other data[1], while the web security system is the way used by a programmer or web developer to protect and secure the data of a system from a hacker[2]. Web security and computer networks appear to be a serious problem that must be secured and protected against threats, in order to prevent data loss or even tapping, as current technological developments look increasingly sophisticated from various aspects and more people are experts in becoming heckers [3]–[5]. Therefore we need to know computer security, especially the web as a media platform to access the internet. Protection from external interference resulting in loss of data is coming



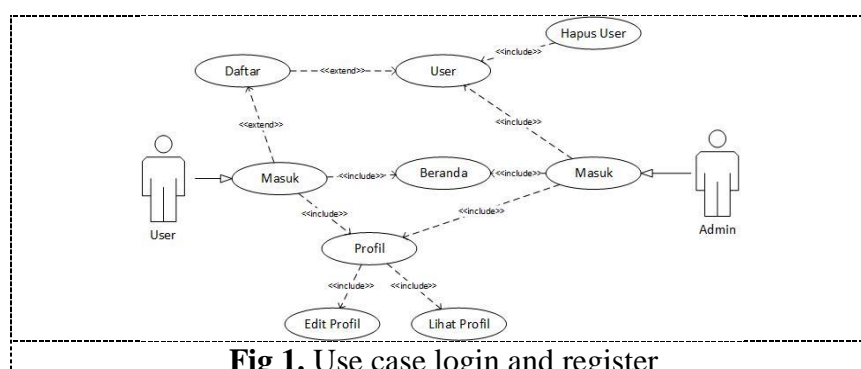
from information theft or destruction. Discussing about web security will be related to the security of computers and networks as well as hardware and software of a system. The increasing freedom of information available on the internet will further trigger those who intend to damage data by software or applications that are available and spread it in various sources of information that can not be detected one by one [1], [6]–[9].

SQL injection is a form and technique that has been widely recognized by hackers and methods that can be used by crackers in using the weaknesses of the system and from the weakness they will take advantage by entering a special code through the intended web[10]. SQL Injection attacks are a serious security threat to web application of STMIK AKBA web testing in various forms and types of attacks that can damage and steal data where information that can not be known by those who have no interest. In addition, the Structured Query Language Injection Attack (SQLIA) attack is one of the most dangerous, where an attacker can execute a malicious SQL statement that controls the database of a web application server by exploiting the vulnerability of a database[11], [12].

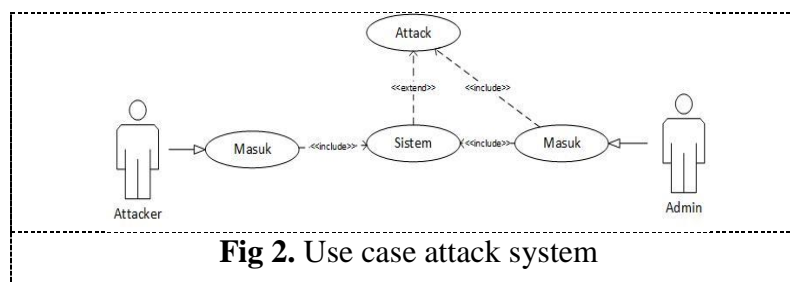
The rise of attacks and cyber crimes in web applications against private organizations and government agencies in various countries is not separated from the negligence of the object in attack. Therefore, a technique is needed to secure important systems and information that exist in a system or application, and to prevent the presence of SQL Injection. In this research, we propose a method to prevent SQL Injection in a web application testing or business web by using semantic comparison method and to process password security in a web application using MD5 encryption (Message Digest 5). The semantic comparison method offers an automatic query structure validation technique, compiles the query structure for each SQL query location and it will perform the process of checking the SQL query before it is executed and every user input will always be checked. For this reason, the researchers attempt to apply the method which refers to the website <https://siakad.akba.ac.id/> which is integrated with web testing for data retrieval and design process.

2. Methodology

This research uses semantic comparison method to detect SQL injection. Semantic comparisons are performed by parsing each statement and comparing syntactic data structures. If the syntax structure of the two queries is equivalent, then the query induces equivalent semantic action on the database server, since the semantic action is determined by the Original_Query structure [11], [13]. This research was conducted at STMIK AKBA with siakad.akba.ac.id object integrated with web testing, then supporting data of the research was obtained through direct observation, documentation and literature study. Then, testing was carried out by using white box testing. While the process design can be seen in figure 1 for use case login and register then for figure 2 for use case attack system.



Use case login and register is a dialog between actors and applications, in the form of transactions or activities with the application. Transactions or activities can be performed by the actor towards the application. In the use case of this application is described about the actions performed by actors and administrators where each action responds in accordance with the purpose of the design.



3. Results and Discussion

The tests, measurements, assessments and evaluations are an integral and interconnected one another in measuring student learning outcomes[2], [14], [15]. Furthermore, web testing is a medium used to measure the ability of students through online tests and must be safe from various threats that can damage the system. Normally if a user logs in by entering the correct username and password according to the query contained in the database, the user will be allowed to login.

It is known that the security of information on the internet is very important to always be maintained, moreover when the information is private information that should not be known by those who try to commit crime. Therefore, every website or web application needs to apply the semantic comparison method and apply Message Digest 5 (MD5) algorithm which is widely used to prevent the occurrence of attacks from crackers who are trying to find a web vulnerability because most applications accessed via the internet has a login page which can be used to authenticate app users[16].

This login page is usually used by the attackers to input malicious SQL statements and can successfully log in without having an account. The attacker intends to log in without using the correct username and correct password. But as if entering the correct username, where if the attacker uses injection like "hacker OR 1 '=' 1" as username and suppose "something" is used as password, then the query will be like this: *Select * from login where user = 'hacker' OR '1' = '1' - 'and pass = ' something* When this query is run in the database, it will always be considered correct and authentication will work.

Based on the results of the design and testing of the system on the registration form, it is shown that if there is field that has not been filled or empty on the registration form then it shows a message notification that the field must be filled and after all the fields are filled, semantic comparison will compare the query in the system database. Additionally, when the user performs the registration process, the password created by the user has been encrypted and the encrypted password will be decrypted using MD5 decrypter where the data is encrypted using an encryption key to be something that is difficult to read by someone[17], [18]. If there is a similar user in the database then a notice appears that the user has been used or has been registered. In addition the field in the registration form has also been determined the minimum number and maximal characters. It is intended to prevent SQL Injection by

exploiting the weakness of query structure. If the user inputs a username or password less than a minimum or a maximum of characters that have been specified, the notice appears as shown in figure 3.

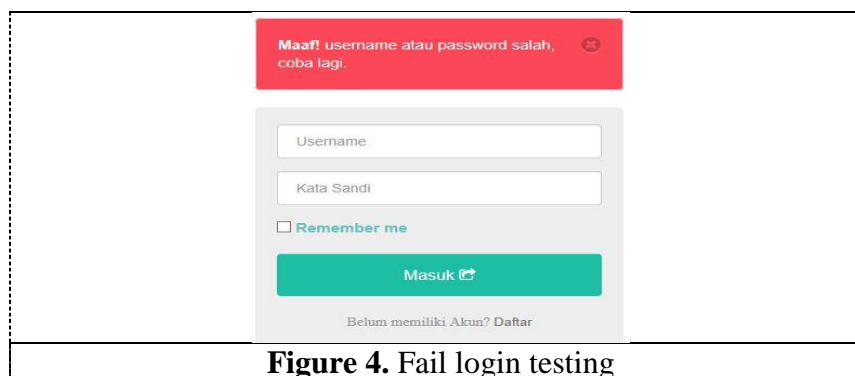


The screenshot shows a registration form with the following elements:

- Two red error messages at the top: "username harus Minimal 5 Karakter" and "password harus Minimal 6 Karakter".
- Input fields for "username" (containing "bece"), "password" (containing "*****"), "confirm password" (containing "*****"), and "email" (containing "becceng").
- A green "Registrasi" button.
- A link at the bottom: "Sudah Terdaftar? Masuk".

Figure 3. Field that must be filled

In addition, in login form, there are two accesses i.e. user and administrator who control the system. Then, to enter as user or administrator, they have to possess different access rights and when the user succeeded in doing registration, the login proses will be done. When the user input the username and password, semantic comparison will compare the query whether the data input by user is the same or not. If the user and password is not the same, it will show information that username or password are incorrect. The information can be seen in figure 4.



The screenshot shows a login form with the following elements:

- A red error message at the top: "Maaf! username atau password salah, coba lagi." with a sad face icon.
- Input fields for "Username" and "Kata Sandi".
- A checkbox labeled "Remember me".
- A green "Masuk" button with a right arrow icon.
- A link at the bottom: "Belum memiliki Akun? Daftar".

Figure 4. Fail login testing

It is known also that in developing the web application, there are various types of methods that can be used by crackers in detecting the weakness of security of web application by input dangerous SQL statement, doing bypass login and password page, changing web of others or even changing or deleting the existing data in system. Therefore, if username and password input is correct when doing login process and success in having otentication phase, the user can access the main web as user. The success login process is shown in Figure 5.



Figure 5. Success login testing

4. Conclusion

Based on the results and design of research, it can be concluded that using semantic comparison method can prevent dangerous Structured Query Language Injection Attack (SQLA) and can secure the account of web testing users by using MD5.

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