EVALUATION OF NETWORK ACCESS RESTRICTIONS USING MAC ADDRESS FILTERING ON MICROTIK TO IMPROVE NETWORK SECURITY

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ABSTRACT

Freedom in the use of the internet network needs to be implemented in a security system in order to keep the hotspot / wifi facilities used by responsible users. Ibnun khalidun Vocational School 1 is a state school that has many study programs, one of which is Computer and Network Engineering. The problem that occurs in the Vocational High School Ibnun Khalidun is the absence of restrictions on internet network access in the use of internet networks at schools so that students, teachers, and school staff are free to use hotspot / wifi facilities, in terms of WLAN (Wireless Local Area Network) network security. still using WPA2-PSK which is easily penetrated by other parties who do not have access rights so that network security is not optimal. To overcome these problems the solution provided using MAC Address Filtering is an internet access limitation to restrict users who will access the internet network by registering the MAC Address to determine the access rights of the user's device, so that the user can be connected if the device has already registered its MAC Address. The purpose of this study is to evaluate internet network security using Mac Address Filtering which is implemented at SMK Ibnun Khalidun by registering Mac Address clients on the Access List menu to obtain access permissions in an effort to improve network security. The result of this research is that after the Wilcoxon test, the value of Asymp.Sig is obtained. (2-tailed) of 0.000 which indicates that the value of Asymp.Sig. (2-tailed) < 0.05 then Ha is accepted and Ho is rejected. So the results of the evaluation of internet network access restrictions using MAC Address Filtering to improve network security are accepted.

Keywords: Computer Networks, MikroTik, Mac Address Filtering, Security network.

INTRODUCTION

The advancement of information technology is increasing, making the internet something that is needed in various fields, one of which is educational institutions.(Samsumar & Hadi, 2018). Networking is one of the supporting factors to be able to obtain information and as a means of communication to access various needs. The increasing need for networks to access information quickly sometimes works not as expected.(Hariadi, Bagye, & Zaen, 2019).
The more internet users in a place, there must be restrictions on use, where only certain devices can use internet facilities. (Purnama-UBSI, 2019). According to research conducted by Kurani Mega Asteroid and Yayan Hendrian in the journal Computer Engineering AMIK BSI with the title "Analysis of Wireless Local Area Network (WLAN) and Design of Mac Address Filtering using Microtik (Case Study at PT. Graha Prima Swara Jakarta)" where in the journal raised the issue of easy in the translucent of security that uses WPA2 / PSK therefore it is necessary to apply the method of security system using mac address filtering. Where the results are obtained after the implementation of restrictions can make internet access more stable because each user already has their own usage rations. (Asteroid & Hendrian, 2016).

The research conducted by Noviar Armanda Nurdin and Septian Ardiansyah in the journal Computer Science and Tenology with the title "Implementation of Mac Address Filtering using hotspot features with Mikrotik in PT. Pertamina Drilling Service Indonesia Jakarta" in the study there are several main problems faced by clients and problems on computer networks including PT. PDSI Jakarta uses Captive Portal on the WLAN network, so users can still login through several different devices in the area. Therefore, it can be applied the mac address filtering method so that by doing this restriction apart from the connection becomes stable security becomes more awake. In addition, with this mac address restriction, administrators can easily track when something happens that causes the network to be disrupted (Nurdin & Ardiansyah, 2018).

Research on network restrictions has also been conducted by Syaiful and Cahyuni Novia in the journal CYBER-TECHN with the title "Network design with Microtik hotspot and Mac Address Filtering" the report in this study is the absence of internet usage filters for wireless network users, so it is necessary to apply the mac address filtering method that makes the security of internet users more secure, so that users can enjoy access comfortably and safely with restrictions that are done. In addition to producing internet users become more controlled and orderly. From this research produce if applied in the school area so that it can control internet use be it students or teachers. (Novia, 2018).

Based on Figure 1 of network usage in SmK Ibn Khaldun can be seen that the use of user access rights in the Computer LAB is 20 PCs. The hotspot security network system in each lab room has no authentication of usernames and passwords to access the network, and the type of network used using a LAN. But for Teacher Admin and Students based on each number of users, in the
authentication process use one username for all users of access rights, and the network used using wireless networks.

In smk Ibn Khaldun has wireless internet access, problems or constraints that occur in the wireless network of Ibn Khaldun Vocational High School including the absence of restrictions on network access, in the use of networks in Ibn Khaldun vocational school so that students, teachers, and staff in schools are free to use the network, in the application of the network using Internet Service Provider in terms of network security WLAN (Wireless Local Area Network) still uses WPA2-PSK so that users who do not have the authority can not access to the internet.

To overcome the problem, the solution provided is to use MAC Address Filtering on microtics, namely to limit users who have the right to access the network, by registering a MAC Address to determine the access rights of the user's device, so that the device can be connected if the computer device has registered mac address, and able to provide WLAN network security in schools can work optimally.

Based on the background that has been listed above, this study is proposed with the title "Evaluation of Network Access Restrictions Using MAC Address Filtering on Microtics to Improve Network Security". The reason for the creation of the thesis with the title above is to manage the device that will access the network by registering the MAC Address of the user device concerned, to be able to connect to the network in an effort to improve network security so that the WLAN network at Ibn Khaldun Vocational High School can work optimally.

The purpose in the study with the title of evaluation of network access restrictions using Mac address filtering to improve network security to design network systems in schools using Mac Address Filtering. Furthermore, to implement Mac Address Filtering to improve network security using rb951Ui-2nd microtics, evaluate network security using Mac Address Filtering applied in SmK Ibnu Khaldun.

METHODS

The research approach used in this research is the quantitative approach (Riyanto & Hatmawan, 2020). The population in this study is the number of wireless internet users smk Ibn Khaldun as many as 86 users. Based on the existing population, the scale of the pengukuran to be used is a saturated sample. In this study, researchers used saturated samples which means that the entire population is used as a sample of 86 people.

RESULTS AND DISCUSSION

The population used by the Study evaluation of Network Access Restrictions Using Mac Address Filtering on Microtics to Improve Network Security amounted to 86 users consisting of staff, teachers and students of Ibn Khaldun Vocational School.

The sampling technique used in this study used saturated sampling. Saturated sampling is a sample determination technique when all members of the population are used as samples. The number of samples used as many as 30 users.

In the study Evaluation of Network Access Restrictions Using Mac Address Filtering On Microtics To Improve Network Security has research variables and interrelated indicators. The variables used are variable X = Network Security and Variable Y = Network Services. The indicators used in variable X = Availability, Privacy, Integrity, and Authentication. While variable indicator Y = Throughput, Packet Loss, Delay (Yuisar & Yulianti, 2015).

The population in this study is the number of wireless internet users smk Ibn Khaldun as many as 86 users. Based on the existing population, the measurement scale to be used is a saturated sample. In this study, researchers used saturated samples which means the entire population is used as a
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A sample of 86 people. Questionnaires or Questionnaires in the evaluation study evaluated restrictions on network access on microtics to improve network security. The source object is the students and teachers of Ibn Khaldun Vocational School. The process of measuring variables uses a likert scale that contains statements that have been provided answers. The answer consists of five answer options, and each of those answers has a value.

Testing for validity in this study used a statistical formula of the person product moment correlation coefficient with a 5% signification rate. Because testing applies to so many research questionnaire items, technical calculation of statistical correlation coefficients uses the SPSS program, where each item will be tested in relation to the total score of the variable in question. With the following conditions:

1. If the value \( r \) of the table < \( r \) calculates, then the questionnaire item is declared valid.
2. If the table \( r \) value > \( r \) calculates, then the questionnaire item is declared invalid.

The value of the table \( r \) is obtained from the table \( r \) statistics with the formula \( df = N-2 \), in this study the value \( N = 86 \) then obtained \( df = 84 \) with the value of the table \( r = 0.212 \). From the calculation using SPSS obtained the following results(Ghozali, 2018):

| Pernyataan | R Hitung | R Tabel | Keterangan |
|------------|----------|---------|------------|
| 1          | 0.298221 | 0.212   | Valid      |
| 2          | 0.205475 | 0.212   | Tidak Valid|
| 3          | 0.11689  | 0.212   | Tidak Valid|
| 4          | 0.511462 | 0.212   | Valid      |
| 5          | 0.013654 | 0.212   | Tidak Valid|
| 6          | 0.57163  | 0.212   | Valid      |
| 7          | 0.224145 | 0.212   | Valid      |
| 8          | 0.517924 | 0.212   | Valid      |
| 9          | 0.089661 | 0.212   | Tidak Valid|
| 10         | 0.46265  | 0.212   | Valid      |
| 11         | -0.03954 | 0.212   | Tidak Valid|
| 12         | 0.559183 | 0.212   | Valid      |
| 13         | 0.115336 | 0.212   | Tidak Valid|
| 14         | 0.114158 | 0.212   | Tidak Valid|
| 15         | 0.392261 | 0.212   | Valid      |
| 16         | 0.43506  | 0.212   | Valid      |
| 17         | 0.479316 | 0.212   | Valid      |
| 18         | 0.259539 | 0.212   | Valid      |
| 19         | 0.286548 | 0.212   | Valid      |
Based on table 1, it can be known from 20 statements that there are 7 statements namely P2, P3, P5, P9, P11, P13 and P14 in which it is not valid, because \( r \) calculates < \( r \) table (0.3610), then will be tested reliability for questionnaire after the implementation of *Mac Address Filtering* for better results as in the following table

| STATEMENT | R COUNT  | R TABEL | INFORMATION |
|-----------|----------|---------|-------------|
| 1         | 0.537133 | 0.212   | Valid       |
| 2         | 0.573399 | 0.212   | Valid       |
| 3         | 0.664403 | 0.212   | Valid       |
| 4         | 0.444963 | 0.212   | Valid       |
| 5         | 0.407301 | 0.212   | Valid       |
| 6         | 0.688619 | 0.212   | Valid       |
| 7         | 0.606582 | 0.212   | Valid       |
| 8         | 0.74583  | 0.212   | Valid       |
| 9         | 0.468828 | 0.212   | Valid       |
| 10        | 0.617793 | 0.212   | Valid       |
| 11        | 0.728276 | 0.212   | Valid       |
| 12        | 0.765186 | 0.212   | Valid       |
| 13        | 0.618218 | 0.212   | Valid       |
| 14        | 0.850082 | 0.212   | Valid       |
| 15        | 0.786586 | 0.212   | Valid       |
| 16        | 0.786586 | 0.212   | Valid       |
| 17        | 0.416402 | 0.212   | Valid       |
| 18        | 0.850082 | 0.212   | Valid       |
| 19        | 0.579034 | 0.212   | Valid       |
| 20        | 0.850082 | 0.212   | Valid       |

Reliability tests aim to determine the reliability of a series of statement items in their reliability measuring a variable. In this study, the reliability test was conducted with *Cronbach's Alpha* test with the provision that if the alpha value > 0.60 then the questionnaire was declared consistent/ reliable. Based on the results of spss calculations obtained the following results.
Based on Table 3 of the results of the questionnaire disseminated with calculations using SPSS obtained by Cronbach's Alpha 0.656, it can be done that the questionnaire is declared reliable / consistent because the value is more than 0.6 and is not worth continuing to the normality test.

Based on Table 3 questionnaire results disseminated with calculations using SPSS obtained Cronbach's Alpha 0.913, it can be done that the questionnaire is declared reliable / consistent because the value is more than 0.6 and worthy of continuing to the normality test.

The normality test is used to determine whether the data population is normal or abnormally distributed, by comparing sig values. The normality test uses the Shapiro-Wilk method, because the amount of data in this study is 86 respondents, the method is acceptable in this study. Under the following conditions:

- if the sig value > 0.05 then the data is declared normal distributed.
- if the sig value < 0.05 then the data is declared normal distributed.

The following are the results of the normality test using SPSS calculations:

In Table 4 it can be explained that the sig value in the Shapiro-Wilk column of the questionnaire before implementation with a value of 0.007 and the questionnaire after implementation with a value of 0.000. Based on the sig values of both questionnaires, it can be concluded that 0.007 < 0.05 and 0.000 < 0.05 which means that the data in this study can be said to be abnormally distributed, because the sig value is less than 0.05.

After the normality test, the data showed abnormal results therefore continued by doing the wilcoxon test. The wilcoxon test is part of the non-parametric statistical method. This wilcoxon test is used to test data with abnormal distributions. Wilcoxon is also used to find
out whether or not there is an average difference between two samples that pair up with each other.

The parameters of the wilcoxon test are:
1. If the value of Asymp.Sig. (2-tailed) < 0.05 then Ha accepted
   a. If the value of Asymp.Sig. (2-tailed) > 0.05 then Ha was rejected

### Tabel 5 Tabel uji Wilcoxon

**Test Statistics**

| Sesudah - Sebelum |  |
|-------------------|---|
| Z                 | -8.058<sup>a</sup> |
| Asymp. Sig. (2-tailed) | 0.000 |
| a. Wilcoxon Signed Ranks Test |
| b. Based on positive ranks. |

In table 5 it can be explained that the value of Asymp.Sig. (2-tailed before and after implementation with a value of 0.000. Based on asymp.sig. (2-tailed) Of the two parameters, it can be concluded 0.000 < 0.05 and it can be concluded that Ha was received and Ho was rejected.

Based on the hypothesis test on the Evaluation of Network Access Restrictions using *Mac Address Filtering* on Microtics to Improve Network Security there is an increase. This result is known from the calculation of the hypothesis, namely the value of Asymp.Sig. (2-tailed) 0.000 < 0.05 thus Ha is accepted. Therefore, the evaluation of network access restrictions on microtics using *Mac Address Filtering* to improve network security has a positive impact with increased network security. Here are the average calculations using SPSS.

### Table 6 Mean Table

| Report | Sebelum | Setelah |
|--------|---------|---------|
| Mean   | 67.67   | 73.57   |
| N      | 30      | 30      |
| Std. Deviation | 6.418 | 7.628 |

Furthermore, it can be known the amount of increase that occurs from the average results, among others, as follows:

\[
\text{Mean Sesudah} - \text{Mean Sebelum} \times 100\% \\
\text{Mean Sebelum}
\]

\[
73.57 - 67.67 \times 100\% = 8.71\%
\]

Based on these calculations it can be known that the increase after the implementation of network access restrictions using *Mac Address Filtering* to increase network security increased by 8.71%.

**CONCLUSION**

Based on the writing of this thesis research, which has discussed evaluating network access restrictions using Mac Address Filtering on Mikrotik to improve network security, it can be concluded
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that implementing MAC Address Filtering hotspots on school network systems can improve network security, only users registered with mac addresses can use hotspot networks, so that network security is more guaranteed. Based on the results of the hypothesis showed that it can be concluded the value of Asymp.Sig. (2-tailed) < 0.05 then Ha is accepted and Ho is rejected. Then the evaluation results of network access restrictions using MAC Address Filtering to improve network security are accepted.

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