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Network Security Analysis and Bandwidth Management

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A B S T R A C T

Computer network users have to spend a lot of money to use the Internet. The Internet has given a very big change in the dissemination of information, so that many people are using data through the Internet. This problem can be solved by MikroTik as a regulator of Internet data traffic and limiting bandwidth that can interfere with computer network activities in accordance with the regulations that have been applied. As a result of not being limited in bandwidth, it causes an overload on a network which has an impact on disrupting internet traffic on that network. Each agency should implement bandwidth restrictions according to the needs of users using the internet. Result from this research is not being limited in bandwidth, it causes an overload on a network which has an impact on disrupting internet traffic on that network. Each agency should implement bandwidth restrictions according to the needs of users using the internet.

Keywords: Data, Database, SQL Injection, Vulnerability.

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1. Introduction

Computer networks are not new at this time. Almost every company has a computer network that facilitates the flow of information within the company. The internet that is becoming popular today is a giant computer network which is a computer network that is interconnected and can interact with each other [1].

This is due to the rapid development of technology, so that in just a few years the number of internet network users has doubled.

If an agency has a bandwidth of about 10 Mb, so that the bandwidth it has can be used properly, each staff section is limited according to the required needs [2]. To overcome the problems that occur, it is necessary to build a bandwidth management system and network security system.

Other research related to the research conducted, namely the Enhancement of E-GSM Channel Capacity with Function Diversion of 3G to 2G Frequency [3], which explained that The main observation of this research is the installation and analysis of frequency function switching from 3G to 2G networks to increase channel capacity. The 850 MHz frequency which was previously owned by Telkom Flexi, was later transferred to Smartfren and will be transferred to 2G GSM operated by Telkomsel Madura. The results showed that the frequency function transfer process went well. This results in the average value of the drive test before diversion is Rx Level = 87.969%, Rx Qual = 87.791%, SQI = 80.809%. The average value of the drive test after diversion is Rx Level = 91.967%, Rx Qual = 89.926%, SQI = 82.049%. The traffic value before the diversion is 503,296 Erlang and 627 Erlang for after the diversion. While the blocking before the transfer was 24.36% and the blocking after the transfer was 1.6%.

one of the other articles is about the Implementation of RC4 Cryptography Algorithm for Data File Security [4], where in the article it is discussed about Communication in the digital era which plays an important role, one can carry out various transactions or exchange data practically and quickly. So that it poses a big risk to information security, ranging from abuse of unauthorized access or authority, modification, information change, destruction to theft, this is in accordance with the main principles of data and information security ranging from Confidentiality, Integrity, Authentication, and Availability. In research that has been carried out using the RC4 Cryptographic Algorithm for Encryption and Decryption of Data Files, it shows that the RC4 algorithm can run well and is able to secure the authenticity of the data so that it is not easily changed by irresponsible people or irresponsible people. does not have access rights either in the form of text or files in several file formats pdf, doc, Docx, Xls, xlsx or text and directly affects the execution time of encrypted and decrypted files.

other related research, discusses the Mobile Phone Application For Someone Fitness Monitoring With Fast Fourier Transform Algorithm [5], in which the research explains The development of science and technology besides facilitating human life in various daily activities. These conditions will cause the body to not fit and the emergence of various health problems. Heart rate is one of the parameters that are useful for providing medical information. Heart rate measurement is very important in the medical world and is one of the standards for knowing one's fitness level. ECG is a medical test to detect abnormalities by measuring the electrical activity produced by the heart. ECG recordings are used to determine the condition of a person's fitness level. Heart rate monitoring can be done using Arduino Uno, AD8232, and Pulse Sensor. The results of heartbeat delivery can be seen

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through the Android application that was created. A person's fitness level data is sent via DataBase which is then forwarded to the Android application. The value range of a person's fitness level is 49-85 BPM for the male category, while for women with a range of values from 54 to 89 BPM. The error value of detection of a person's fitness level with Sensor Pulse and manual is 2.043%, the sensitivity value is 97.63%, the specificity value is 5.82%, and the accuracy value is 50.35%. In addition, ECG waves are also sent to Matlab for extraction using the FFT algorithm.

other related research, discusses Combination Deep Belief Networks And Shallow Classifier For Sleep Stage Classification [6], which in this research describes In this research, it is proposed to use Deep Belief Networks (DBN) in shallow classifier for the automatic sleep stage classification. The automatic classification is required to minimize the evaluation of Polysomnography because it needs more than two days for analysis manually. Thus the automatically mechanism is required. The Shallow classifier used in this research includes Naïve Bayes (NB), Bayesian Networks (BN), Decision Tree (DT), Support Vector Machines (SVM), and K-Nearest Neighbor (KNN). The analysis compared each method in shallow classifier before and after the classifier were combined with DBN. The results shown that many combination by using the shallow classifiers and DBN had increased. The experiments that have been done indicated a significant increase of Naive Bayes after being combined with DBN. The high-level features generated by DBN are proven to be useful in helping Naive Bayes' performance. On the other hand, the combination of KNN with DBN shows a decrease because high-level features of DBN make it harder to find neighbors that optimize the performance of KNN.

2. Literature Review

The frequent occurrence of abuse of internet access results in downs on a network which results in slow internet access in an agency which can result in losses to the agency [2].

An agency may not apply bandwidth restrictions resulting in slow internet access even though it uses a large bandwidth capacity from an ISP.

A. Mikrotik

MikroTik uses Linux as its operating system. It is used as a network router. It was created to provide comfort and freedom to its users. Administrative settings can be done using Windows Applications; it's called "WinBox". The computer that will be used as a MikroTik router also does not require high specifications [7][2].

For example, only as a gateway. Unless it is used for complex networks, it must use adequate specifications [2]. MikroTik features include Firewall & Nat, Hotspot, Routing, Bandwidth Limiter, DNS server, Point to Point Tunneling Protocol, Hotspot, DHCP server, and many more [8].

Related research, regarding Performance Analysis Of Umts Networks As Reference Of Signal Interference Handling [9], where there is explained A network, not apart from the existence of the maintenance process, not least in the telecommunications network. In the maintenance of telecommunication networks, especially 3G -UMTS network, it is necessary to report on UMTS network performance in the previous days. The purpose of this study is to conduct a study of network performance reports in the previous days to help the UMTS network maintainers in analyzing and determining corrective measures in the area in trouble. The results of this study indicate that the RTWP method is helpful in deciding whether NodeB is affected by interference at the maximum acceptance signal threshold of -92dBm/cell. The resulting report resumes can be used as a reference of areas where signal interference is occurring for improvement in the area in which the signal interference is occurring.

Other related research, SMS Gateway-Based Job Vacancies Information System in Pamekasan Region [10], where the research describes The increased growth of the society in Pamekasan from year to year is directly proportional to the number of job seekers increase continuesly. A large number of job seekers is not only due to the inadequate number of jobs, but also because of the slow and precise job information to the proper parties (the people who need jobs). Disnakertrans as an institution formed by the Government has made several attemps to minimize the number of job seekers, but until now the result obtained are not optimal, because there is no systemthat can accommodate the needs of both parties (providers and job seekers). Therefore, the research aims to create a website that accommodates data vacancies and job seekers. Later, the data is automatically going throught the process of weighting by means of the Simple Additive Weighting, this method is expected to optimize the selection of a job based on the latest education, gender, and age that has been mentioned by job seekers when registering. Once the selection process is complete, the job information is sent via SMS Gateway to job seekers. This SMS will send the job information suitable for the number of job seekers who have posted on the website.

Another study, Mobile Ad-hoc Network Design (manet) for Tactical Communication Systems [11], which explained that tactical communication requires a network with self-forming and self-healing characteristics. Node characters can quickly form into a network. However, the military operating environment presents significant challenges, namely unreliable connectivity and limited bandwidth. With these conditions, in this study a tactical communication system was designed that involved aspects of the routing protocol (AODV), Medium Access Control (CSMA) scheme, node formation and the number of nodes that were different for each network. The results of the AODV routing protocol and MAC CSMA protocol with 3 different formations and the increasing number of nodes resulted in a fairly fast network formation time and throughput that still met the Link-16 Enhanced Throughput standard.

Further research, discusses the Traffic Monitoring System On Microtic Mobile App Based On Telegram Notification, from the research results explained [12], Regional Apparatus Organizations (OPD) and Regional Apparatus Work Units (SKPD) are closely related to public services in the city of Surabaya, the complexity of public services managed by each OPD / SKPD often creates several network and web server problems. For this reason, infrastructure management is needed, which can prevent network and web server problems that occur in OPD / SKPD. The research objective is to produce a real-time network and webserver traffic monitoring system with telegram notifications, to prevent obstacles and speed up the process of handling public service problems in OPD/SKPD. This research produces a network traffic monitoring system with a mobile app interface and a website. The mobile app interface can be used by the user while in the field, while the website interface can be used by the user while in the office environment. Testing of the monitoring system was carried out on 10 OPD/SKPD located in Surabaya and 2 demo web servers that provided notifications in the form of UP and Down in real time using telegram

notifications. As well as notifications also through the website by displaying network history and web servers.

Another field research, discusses FTP Server Security Based On IDS And IPS Using Ubuntu Linux Operating System [13], which explains the Vulnerability of server computers on computer networks that can be used by hackers or attackers to take unauthorized actions aimed at disrupting a computer system. In 2020 it was noted that attacks carried out by hackers occurred every 39 seconds, it was also recorded that computers used for research had been attacked 2,244 times per day. Sniffing is a major security threat in computing this form of client-server communication. In this study, build a data security system on an FTP server computer by implementing an Intrusion Detection System (IDS) and an Intrusion Prevention System (IPS). The result is that the Portsentry application is very effective and very good at detecting port scanning activity, and is also very good at blocking attacks from attackers, this is because Portstentry has a mechanism to record the attacker's IP address through the portsentry.ignore.static file system. The Snort application is very effective when detecting all types of attacks, be it ping of death attacks, port scanning or sniffing, this is because Snort has a detection mode mechanism to provide warning information or alerts to network admins if there are intruders through command rules in the Snort file system. So that Portsentry and Snort are quite effective in implementing IDS and IPS systems on FTP servers.

Another field of research, discusses Implementation Of Firewall And Port Knocking As Data Transfer Security On FTP Server Based On Linux Ubuntu Server [14], where in the study it is explained that FTP (File Transfer Protocol) server provides file transfer services between computer machines on a network. FTP is an application level protocol in OSI that is used as a standard file transfer process. Initialize FTP transfer on port number 21 using TCP (Transmission Control Protocol) port as client and server computer data communication. The active port 21 opens the file transfer service between the client and server computers. When the client is exchanging data, it must connect to TCP port number 21, after the server allows it, a new connection is formed via the TCP port as a data exchange path, both uploading and downloading. FTP servers are targets for hackers because their ports are always active and open. With port 21 open, hackers can scan the FTP port used to find out the FTP port number. Furthermore, hackers do sniffing to steal username and password information, so hackers can enter the FTP server which results in data loss on the FTP server. The solution is to use a firewall to close all ports by giving the client access rights that can access the server, the use of port knocking requires the client to authenticate before using the FTP service. The results of the test, by activating the firewall makes hackers unable to find out which ports are active. Using a port knocking authentication system can protect the access rights of using FTP services.

Other research, discusses the Design Of Computer Networks With Bandwidth Management Using Brust Limit And Firewall Techniques As Network Security [15], where the research explains that the progress of information technology today has an impact on the smooth running of a job. This research is applied to a socks distributor. This distributor provides an offline store for purchase transactions and provides hotspot access for visitors. The hotspot network will be connected to the server so it is necessary to apply a filter to restrict visitor access. In addition, to maintain the stability of internet access requires a bandwidth management. To solve this problem, this research uses a firewall feature using Mikrotik RB941 as a security for network access and a burst limit technique for bandwidth management. The test results show that the system can run well. The system can provide access rights as needed where staff can access the internet and store servers while visitors can only access the internet and cannot access store servers. Bandwidth management of the system manages the supply of bandwidth to all users connected to the hotspot. The system will provide maximum bandwidth when the number of users is small so that the network throughput value is high. When the number of users is large, the throughput value will decrease to maintain connection stability for all users.

other related research, discussing about Deep Learning-Based Object Recognition Robot Control Via Web And Mobile Using An Internet Of Things (IoT) Connection [16], where the research describes The paper presents the intelligent surveillance robotic control techniques via web and mobile via an Internet of Things (IoT) connection. The robot is equipped with a Kinect Xbox 360 camera and a Deep Learning algorithm for recognizing objects in front of it. The Deep Learning algorithm used is OpenCV's Deep Neural Network (DNN). The intelligent surveillance robot in this study was named BNU 4.0. The brain controlling this robot is the NodeMCU V3 microcontroller. Electronic board based on the ESP8266 chip. With this chip, NodeMCU V3 can connect to the cloud Internet of Things (IoT). Cloud IoT used in this research is cloudmqtt (https://www.cloudmqtt.com). With the Arduino program embedded in the NodeMCU V3 microcontroller, it can then run the robot control program via web and mobile. The mobile robot control program uses the Android MQTT IoT Application Panel.

other related research, Discusses Planning Of 5G Network Path Loss In Geometry Based Stochastic Concept By Using Linear Regression Methods [17], which in this research is explained This research is a continuation of several previous studies that made 5G network planning using the Free Space Reference Path Loss model. In this study, a 5G network path loss planning was made using the Geometry Based Stochastic model. A forecasting system is created that connects the path loss with the distance between the transmitter and the receiver antenna using the linear regression method. It is important to look at 5G network planning on a different side. The result shows that the path loss value in the light of sight condition is better than the non-light of sight condition with the lowest value of 94.4271 dB at the frequency of 28 GHz and 99.5856 dB at the 73 GHz frequency. Linear Regression analysis shows that the best path loss calculation is the frequency 28 GHz of LOS conditions with MSE is 0.001 and the standard deviation error is 0.0319.

Other related research, discusses The Evaluation Of Land Area Measurement Using GPS Technology [18], which in this study explains The use of GPS is now widely used by various parties, especially in determining the position of object location. GPS can be used to measure the land areas, on both wide and flat areas. It can also be used both at night and day, and even it can be used in bad weather conditions. This paper discusses the evaluation of the measurement result of land area using GPS technology compare to the information containing on the land certificate document. The generated GPS coordinates will be converted into units of meter so that the length of each side can be known. Heron formula is used to calculate the area of a land plotted on the Google Map. From the series of measurement, GPS measurement fall above the land area expressed in the certificate and bellows the meter tape measurement. This measurement still needs to study further to get a stable measurement. But it can be used by

the public community to show the land location to facilitate the land trading. The limitation that must be considered in using GPS is that GPS signal should not be hindered by any barriers such as leafy trees or tall buildings.

other related research, discusses Hillmail: A Secure Email System For Android-Based Mobile Phone Using Hill Cipher Algorithm [19], which in this research describes Nowadays, email has become the most widely communication way in daily life. Email is a very important method of communicating across the internet. During transmission and downloads, it uses protocols which are not secure. Spammers and scammers misuse these protocols to gain access to critical data stored in the email. This triggered concerns because sometimes email is used to exchange confidential messages. To improve security and efficiency of email system, we made an email security system for Android mobile phone using Hill Cipher algorithm. Hill Cipher is a classic cryptography algorithm that uses matrix inverse and matrix multiplication operations to hide the message. The initial stage of the encryption process is forming ciphertext by multiplying the key matrix with plaintext matrix. The contents of encrypted messages can only be read by legitimate recipient who has the key. Converting the ciphertext into plaintext is done by multiplying the ciphertext matrix with the inverse key matrix. The email content can be a plain message or a message with an attached file.

other related research, discusses the Optimal Relay Design Of Zero Forcing Equalization For Mimo Multi Wireless Relaying Networks [20], which in this study is described In this paper, we develop the optimal relay design for multiple-input multiple-output (MIMO) multi wireless relaying networks, when we consider the problem of zero-forcing processing is studied for multi-input multi-output multi-relay communication system in which MIMO source-destination pairs communicate simultaneously. It is assumed that due to severe shadowing effects which communication links can be established only with the aid of relay node. The aim is to design the relay amplification matrix to maximize the achievable communication sum-rate through the relay, which in general amplifying-and- forward relaying mechanisms are considered. The zero forcing (ZF) algorithm has been studied for a MIMO multi relay network by comparing its performance in terms of bit-error-rate (BER) at destination algorithm. In particular, we investigated its performance with and without using the ZF at the relay. Our results demonstrate that the system performance can be significantly improved by using the ZF algorithm at relay (optimal relay ZF algorithm).

3. Research Methods

Limiting bandwidth so as not to overload one user's internet usage which can cause other users to have difficulty accessing the internet.

A. Tools and Materials

1) Tools

• Personal Computer
• Laptops
• ISP
• ISP routers
• Mikrotik

B. Data collection

Data collection is done so that we can find out what tools are used on the agency network so that we can identify problems quickly[21].

C. Problem Identification

At this stage the author makes direct observations at an agency to find problems that occur in the cause of Down's internet access at the agency.

4. Discussion

One of the causes of internet downtime is the absence of bandwidth restrictions on the user which causes the user's internet usage to be overloaded, causing slow Internet use on the network.

I. Results of testing stages

1. Basic Mikrotik Router Settings
2. We set the IP address according to the needs and the IP address that has been determined
3. Setting the IP Address according to the ether that we will use.

Figure 1. Setting the IP Address on each ether that will be used.

4. DNS Server Settings

Figure 2. DNS Server settings

5. Configure Hotspot

Hotspot Installation Stages on Mikrotik.

6. Setting Port interface

Figure 3. Determine which port to use as a hotspot

7. Setting IP Address

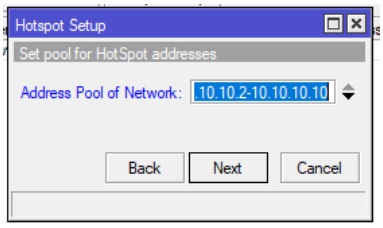

Figure 4. Setting IP Address

8. Setting IP Pool

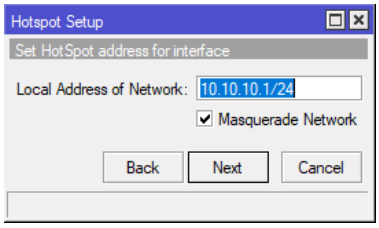

Figure 5. Setting IP Pool

9. Local DNS settings

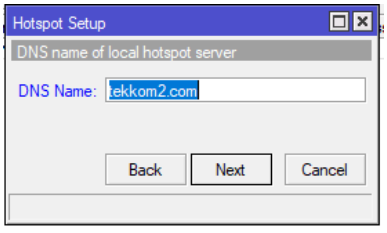

Figure 6. Local DNS settings

This is a DNS name server, where every user who accesses will be directed to this address to login

Figure 7. Success in creating a hotspot server

II. User Configuration Stage

1. Configure User Management

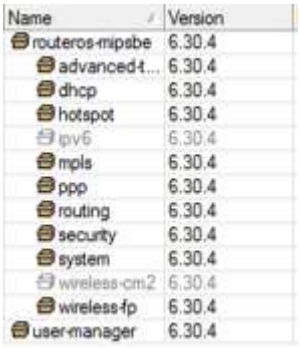

Figure 8. Install the user management package first

2. Display Mikrotik Login Page

Figure 9. Mikrotik Login Page Display

Display admin user management login to login user so they can access the internet.

3. Distribution of Bandwidth for each User

Profil	Bandwidth	
	Download	Upload
Admin	8 MB/sec	8 MB/sec
User	2 MB/sec	2 MB/sec

Figure 10. Distribution of Bandwidth for each User

Distribution of bandwidth for each user so that there is no overload on each user's internet usage.

4. Profile creation

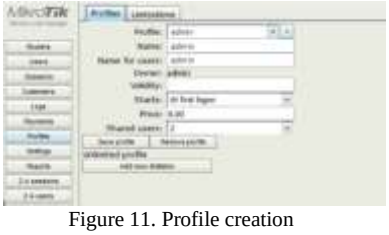

Figure 11. Profile creation

Adjust the configuration as shown in the image.

5. Bandwidth Limit

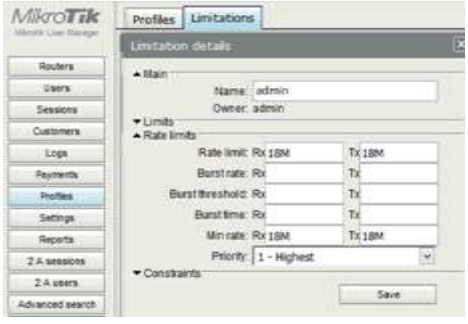

Figure 12. Bandwidth Limit

Adjust the bandwidth limitation according to the profile we created earlier.

6. Create User Hotspot

The last step is to add the user we created earlier.

4. Conclusion

1. As a result of not being limited in bandwidth, it causes an overload on a network which has an impact on disrupting internet traffic on that network.
2. Each agency should implement bandwidth restrictions according to the needs of users using the internet.

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