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Utilization of Hotspot Network Bandwidth Management at SMK Muhammadiyah Parkan

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ABSTRACT

Mikrotik is a routing activity using Wireless Local Area Network (W-LAN) technology. Mikrotik is an operating system and software used to function a computer as a router. The model used in this study refers to the PPDIOO type development model with 6 stages, namely Prepare, Plan, Design, Implement, Operate, and Optimize. Validity tests and effectiveness tests include the product being able to run optimally and successfully improving the quality of existing network bandwidth. Data collection instruments used interviews and observation. Data collection was carried out in November 2022 at Muhammadiyah Parakan Vocational School. The results of the material expert validity test were 92%, the media expert validity test was 80%, the teacher response effectiveness test was 80% and the student effectiveness test was 88%

Keywords: *Bandwidth, Mikrotik, Network*

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INTRODUCTION

In the field of education, the use of computer network technology media is used as a means of communication using the internet, for example as a medium for a teacher giving assignments to his students through school information communication media which includes communication functions for the school and students (AlGhadhban, 2021). To help the learning function in schools run, internet network infrastructure will be built (Aryai, 2023). In building a good network infrastructure, infrastructure design must first be carried out carefully according to needs (Cheng, 2019). Technology can be a liaison with media to improve education, not only in the relationship between teachers and students, but can also allow teachers and students to access the outside world to find more learning materials (Ding, 2019). Apart from that, schools can also create schools

that are more organized in terms of technology and knowledge, making it easier for teachers and students to access them (Gola, 2023).

Computer network

A computer network is a combination of computers and communications technology, namely a group of large numbers of computers that work separately but are interconnected to carry out their tasks (Gu, 2022).

Mikrotik

Mikrotik is an operating system and software that allows a computer to function as a router. Mikrotik is a router operating system published under the name router Os proxy and can be installed on a computer (Khan, 2019).

Bandwidth

Bandwidth is the ability or capacityof an Ethernet cable to carry a certain amount of data packet traffic (Li, 2019). Bandwidth canalsomean the number of data packets consumedper unit time, expressed in bits per second(bps) (Lin, 2023). Bandwidth is the width or widthofthe frequency range used by signals on a transmission medium. Bandwidth can be interpreted as the difference between high frequency signal components and lowfrequency signals (Raveendran, 2019).

RESEARCH METHODOLOGY

This research uses the PPDIOO development model which aims to develop products. In this research, performance tests and application of the ranking method are carried out through method of collecting data (Ye dkk., 2022). The aim of using this method is to produce development as well as validation. With the concept of this method, it canbeinterpreted as a joint development effort with validation efforts (Pracht dkk., 2020). In this research the author used the PPDIOO method. PPDIOO is an abbreviation for Prepare, Plan, Design, Implement, Operate, and Optimize. The results of data collection are the documented for planning so that TRIPLE A: Jurnal Pendidikan Teknologi Informasi Volume 15 Nomor 2 Bulan September Tahun 2023 appropriate recommendations are produced as PPDIOO bandwidth management and controlling internet use in schools where in this study the designer used the PPDIOO method to organize the research framework in order to obtain effective results. From the results of this plan, conclusions will be drawn about the advantages and functions of the ranking method using PPDIOO, more specifically in controlling the use of internet computer networks. The work plan and implementation of the PPDIOO system as a guideline for internet use in schools is as follows:

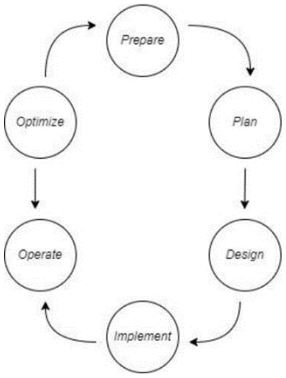

Figure 1. Guidelines for internet use in school

This research was carried out by collecting information through observation, interviews and literature study. After data collection is complete, the research method begins with a problem solving plan, followed by a needs analysis, followed by a final design which can then be applied to the problem at hand (Ström dkk., 2020). The procedure for developing a needs analysis for this hotspot network system was developed using a proxy router, which can be seen in the chart below:

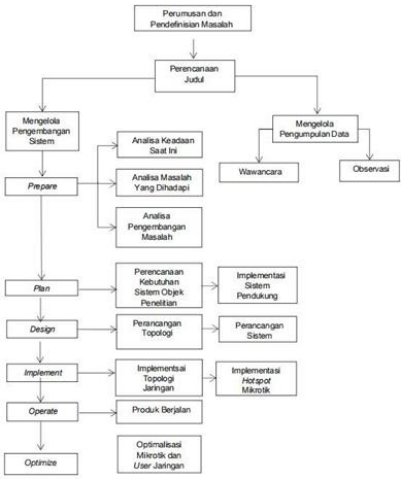

Figure 2. The proxy router

RESULT AND DISCUSSION

Needs analysis rials needed in product development, inclu at this stage an analysis of hardware and software requirements is carried out. This analysis includes an analysis of the needsfor tools and mateding:

No.	*Nama Perangkat*	*Jumlah*
1.	Laptop	1
2.	MikroTik Rb941-2nD	1
3.	Kabel UTP RJ 45	2
4.	Access Point TP-LINK TL-WR844N	1

Table 1. Analysis of hardware and software

Topology Design

The internet used at Parakan Muhammadiyah Vocational School only uses wifi in the teacher's room, here is thetopology:

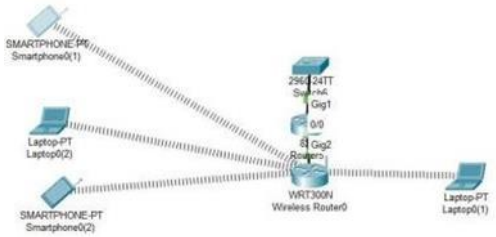

Figure 3. Thetopology

The following is a topology design so that it can be implemented according to school conditions:

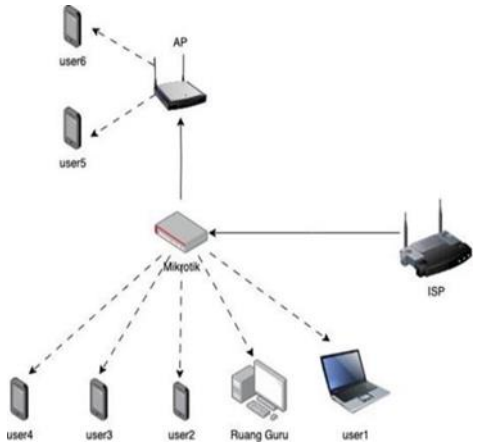

Figure 4. The topology design

Product Implementation

At this stage, the network topology is implemented in the form of hotspot implementation by configuring the proxy on Winbox.

Hot spot

1. Server (to connect to the internet).

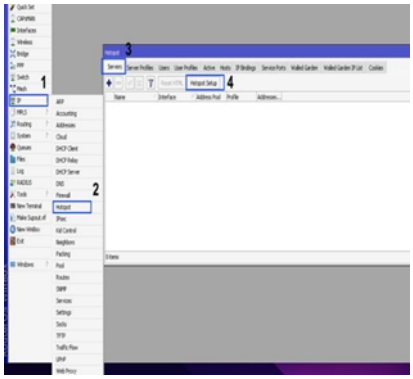

Figure 5. Server

2. Hotspot User Profile

2.1 Hotspot User (to create or addauser, just fill in the name and password).

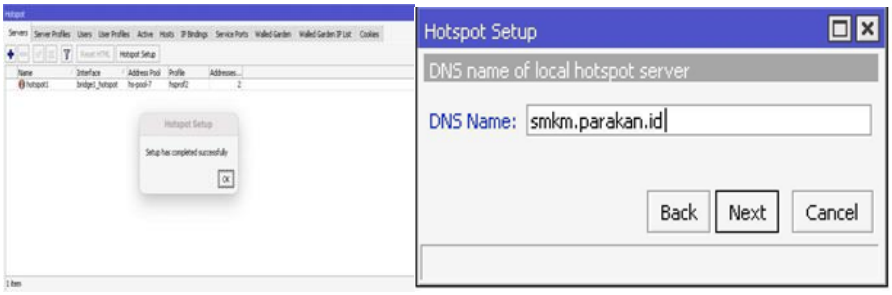

Figure 6. Hotspot User

2.2 Hotspot Server Profile

Figure 7. Hotspot Server Profile

Product Validation

1. Throughput

Kategori	*Throughput* (bps)	Indeks
Sangat Bagus	100 bps	4
Bagus	75 bps	3
Cukup	50 bps	2
Buruk	<25 bps	1

Persamaan perhitungan *throughput* :

$$Throughput = \frac{\text{Paket data diterima}}{\text{Durasi pengamatan}}$$

$$= \frac{20364785\ bytes}{158{,}305\ s}$$

$$= 1{,}029\ mb$$

2. Packet Loss

Kategori	*Packet Loss*	Indeks
Sangat Bagus	0%	4
Bagus	3%	3
Cukup	15%	2
Buruk	25%	1

Persamaan perhitungan *packet loss*:

$$\textit{Packet Loss} = \frac{\text{Paket data dikirim - Paket data diterima}}{\text{Paket data dikirim}} \times 100\%$$

$$= \frac{26128 - 24454}{26128} \times 100\%$$

$$= 6{,}407\%$$

3. Delay

Kategori	Besar *Delay*	Indeks
Sangar Bagus	<150 ms	4
Bagus	150 ms s/d 300 ms	3
Cukup	300 ms s/d 450 ms	2
Buruk	>450 ms	1

Persamaan pengukuran *delay*:

$$\textit{Delay} = \frac{\textit{Total delay}}{\textit{Total paket yang diterima}}$$

4. Jitter

Kategori	*Jitter*	*Index*
Sangat bagus	0 ms	4
Bagus	0 ms s/d 75 ms	3
Cukup	75 ms s/d 125 ms	2
Buruk	125 ms s/d 225 ms	1

Berikut pengukuran persamaan *jitter*:

$$\textit{Jitter} = \frac{\textit{Total variasai tertunda}}{\textit{Total variasi diperoleh dari penjumlahan = Delay - (rata-rata penundaan)}}$$

$$= \frac{9}{25965}$$

$$= 0{,}0003466\ s$$

$$= 0{,}3466\ ms$$

Validation test results in the table above:

In the Quality of Services (QoS) test that the researchers carried out, it produced a throughput index of 4 with very good categories.

CONCLUSION

Following are the conclusions that can be drawn from this research:

1. Network access Designing a valid hotspot network for use at Parakan Muhammadiyah Vocational School by utilizing an internet network that has been developed, in Quality of Services (QoS) testing what the researchers did resulted in a throughput index of 4 with a very good category.

2. In practical schools it is used by teachers and students, this can be seen based on the validator results. The resulting value for media experts is 80%. 2. Then tested the effectiveness of the teacher's response, obtained practical results with a valueof 80% and tested the effectiveness ofstudent responses obtained effective results with a value of 88%. The purposeof making this final assignment is to help the school so that the teaching and learning process at Muhammadiyah Parakan Vocational School is more practical and effective.

3. Implementation of the simple queue method in the utilization of hotspot network bandwidth management at Muhammadiyah Parakan Vocational High School, is carried out by the data collection method. The purpose of usingthis method is to produce a development as well as validation.

REFERENCES

AlGhadhban, A. (2021). F4Tele: FSO for data center network management and packet telemetry. *Computer Networks*, *186*(Query date: 2024-05-26 14:52:17). https://doi.org/10.1016/j.comnet.2020.107711

Aryai, P. (2023). SIMOF: swarm intelligence multi-objective fuzzy thermal-aware routing protocol for WBANs. *Journal of Supercomputing*, *79*(10), 10941–10976. https://doi.org/10.1007/s11227-023-05102-9

Cheng, X. (2019). A low-cost and energy-efficient noc architecture for GPGPUs. *2019 ACM/IEEE Symposium on Architectures for Networking and Communications Systems, ANCS 2019, Query date: 2024-05-26 14:52:17*. https://doi.org/10.1109/ANCS.2019.8901890

Ding, Y. (2019). Adaptive Routing Protocol for Underwater Wireless Sensor Network Based on AUV. *Lecture Notes of the Institute for Computer Sciences, Social-Informatics and Telecommunications Engineering, LNICST*, *286*(Query date: 2024-05-26 14:52:17), 541–553. https://doi.org/10.1007/978-3-030-22968-9_49

Gola, K. K. (2023). Underwater Acoustic Sensor Networks: Concepts, Applications and Research Challenges. *Lecture Notes in Networks and Systems*, *717*(Query date: 2024-05-26 14:52:17), 365–373. https://doi.org/10.1007/978-3-031-35510-3_35

Gu, J. (2022). Research on Terminal-Side Computing Force Network based on Massive Terminals. *Electronics (Switzerland)*, *11*(13). https://doi.org/10.3390/electronics11132108

Khan, W. (2019). A Multi-Layer Cluster Based Energy Efficient Routing Scheme for UWSNs. *IEEE Access*, *7*(Query date: 2024-05-26 14:52:17), 77398–77410. https://doi.org/10.1109/ACCESS.2019.2922060

Li, B. (2019). Hummer: A Stream Computing Engine with Unikernel Support. *Jisuanji Xuebao/Chinese Journal of Computers*, *42*(8), 1755–1766. https://doi.org/10.11897/SP.J.1016.2019.01755

Lin, J. (2023). Flow Control for 5G Smart Distribution Grid Protection. *Lecture Notes in Electrical Engineering*, *1013*(Query date: 2024-05-26 14:52:17), 263–270. https://doi.org/10.1007/978-981-99-0451-8_26

Pracht, P., Bohle, F., & Grimme, S. (2020). Automated exploration of the low-energy chemical space with fast quantum chemical methods. *Physical Chemistry Chemical Physics*, *22*(14), 7169–7192. https://doi.org/10.1039/C9CP06869D

Raveendran, A. V. (2019). TaR based hotspot prediction in cloud data centres. *International Journal of Grid and High Performance Computing*, *11*(3), 1–22. https://doi.org/10.4018/IJGHPC.2019070101

Ström, P., Kartasalo, K., Olsson, H., Solorzano, L., Delahunt, B., Berney, D. M., Bostwick, D. G., Evans, A. J., Grignon, D. J., Humphrey, P. A., Iczkowski, K. A., Kench, J. G., Kristiansen, G., Van Der Kwast, T. H., Leite, K. R. M., McKenney, J. K., Oxley, J., Pan, C.-C., Samaratunga, H., … Eklund, M. (2020). Artificial intelligence for diagnosis and grading of prostate cancer in biopsies: A

population-based, diagnostic study. *The Lancet Oncology*, *21*(2), 222–232. https://doi.org/10.1016/S1470-2045(19)30738-7

Ye, M., Shen, J., Lin, G., Xiang, T., Shao, L., & Hoi, S. C. H. (2022). Deep Learning for Person Re-Identification: A Survey and Outlook. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, *44*(6), 2872–2893. https://doi.org/10.1109/TPAMI.2021.3054775