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IMPLEMENTASI ANTENA WAJANBOLIC SEBAGAI PENGUAT SINYAL UNTUK KONSEP PERTANIAN CERDAS DI PASAMAN SUMATERA BARAT

IMPLEMENTATION OF WOKBOLIC ANTENNA AS SIGNAL AMPLIFIER FOR SMART AGRICULTURE CONCEPT IN PASAMAN, WEST SUMATERA

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Abstrak
Sumatera Barat sebagai salah satu Provinsi daerah beriklim tropis di Indonesia teridentifikasi mempunyai keunggulan dalam produksi komoditas pertanian seperti padi, jagung, ubi, kacang-kacangan dll. Karenanya banyak inovasi teknologi muncul untuk membantu petani dalam mengolah pertanian. Salah satu contohnya yaitu Penggunaan *Internet of Think* (IoT), IoT banyak digunakan di lingkungan untuk meningkatkan hasil produksi melalui keputusan pertanian yang cerdas dan memperoleh informasi tanaman seperti pengukuran suhu, kelembaban, dan sistem irigasi hingga penggunaan drone. Namun, penggunaan sensor di *IoT* memiliki sumber daya terbatas terkait pembatasan, energi, transmisi, dan kemampuan memori yang dapat berdampak negatif pada produksi pertanian. Untuk mengirimkan data dari hasil pengukuran ke sensor, diperlukan akses jaringan internet yang cepat. sedangkan di persawahan besar tidak mungkin memasang wifi di setiap sudut sawah. Maka dari itu Penelitian ini bertujuan untuk memperkuat sinyal seluler melalui aplikasi wajanbolic. Dengan demikian akses internet di daerah pertanian menjadi lebih mudah dalam menerapkan penggunaan IoT dan hasil panen meningkat dengan menggunakan internet dalam konsep pertanian cerdas. Pengembangan wajanbolic ini menggunakan model prototipe yang dianggap sederhana untuk langsung diaplikasikan ke lahan persawahan. Hasil pengujian QoS menunjukkan bahwa nilai *throughput* pada jarak 50 m adalah 550 Kbps. Wajan menangkap waktu sinyal rata-rata > 50 ms saat menggunakan internet. Aplikasi *wireless router* yang terhubung dengan wajanbolic dapat diakses ± 50 meter dari pusat *wireless*.
Kata kunci: *IoT*, pertanian, internet, transmisi, wajanbolic

Abstract
West Sumatera as one of the Provinces with a tropical climate in Indonesia is identified as having advantages in the production of agricultural commodities such as rice, corn, potatoes, beans,etc. Therefore many technological innovations appear to help farmers in processing agriculture. One example is the use of Internet of Think (IoT) is widely used in the environment to increase production yields through intelligent agricultural decisions and obtaining crop information such as measurement of temperature, humidity, and irrigation systems to the use of drones. However, the use of sensors in IoT has limited resources regarding restriction, energy, transmission, and memory capabilities which can negatively impact agricultural production. To transmit data from measurement results to sensors, fast internet network access is required. while on large farms it is not possible to install wifi in every corner of the farm. The purpose of this research is to strengthen the cellular signal through the application of wokbolic. Thus internet access in agriculture areas becomes easier to implement the use of IoT and crop yields increase by using the internet in the concept of smart agriculture. The development of wokbolic uses a prototype model that is considered simple to be directly applied to rice fields. The results of the QoS test show that the throughput value at a distance of 50 m is 550 Kbps. The wokbolic captures the average signal times > 50 ms when using the internet. The application of a wireless router connected to a bolic wok can be accessed ± 50 meters from the wireless center.
Keywords: IoT, agriculture, internet, transmission, wokbolic

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1. Introduction

Internet technology contributes to global increase in crop and livestock production, in terms of: product quality, environmental considerations and human and livestock welfare [1]. Indonesia is an agricultural country where the majority of the population is farmers in the agricultural sector. There are many rice field owners who manage their fields in a conventional way, but are constrained by the weather and the physical conditions of the farmers themselves. Many of these obstacles can disrupt the process of managing rice fields. Along with technological developments in big countries such as, Japan, China, America and several other countries, these countries have started to implement Smart Farming systems to make it easier for farmers to manage their agricultural land [2]. Smart and "Smart" device development “Agriculture system” is a breakthrough that has a big impact worldwide where the Internet network can be extended to the realm of the Internet of Things (IoT), which connects the Internet network to an object and then controls it remotely [3].

Internet network is a technology that is widely used today. Many people use the internet for various purposes such as connecting with other people through social media, looking for video tutorials to do or making things, playing games, or doing productive things such as marketing products, monitoring agricultural land, and so on. see the increasing potential of the internet used by the wider community and from all walks of life In life, many researchers are competing to create systems that can be controlled, monitored, and accessed using the internet network. The system is Internet of Things or ordinary called IoT. IoT will rely on hardware, software, and services provided by most of the IT industry [4-6]. However, to realize this IoT technology, good network strength is needed so that the quality of internet services can support the IoT system properly.

Some typical applications of Agricultural IoT Sensor Monitoring Network technology that use cloud computing as the backbone were also surveyed. This survey is used to understand technological differences and to build sustainable smart agriculture [7-8]. in smart agriculture, the obstacle in using IoT devices is internet access that is not possible in rice fields, especially agricultural land in mountainous areas or areas that are not covered by signals or blank spots. it is also impossible to install a router in every corner of the rice field because of the high cost. Therefore, a transmitter antenna is needed that can transmit wifi signals with a wide coverage so that it covers each side of the agricultural land using only one transmitter. Previously, research related to "Comparison of Network Quality of Service Using Wokbolic Antenna" has been conducted and Antenna Wifi Gun" by Tomi Hidayat, Ilham Faisal and Mufida Hairani. The aim of this research is to compare how big the difference in the quality of network traffic is. using a wok bolic antenna and a wifi gun antenna in providing Quality of Service (QoS) services when capturing long-distance signals. The results of this comparison serve as a reference for the community to choose the best long-distance signal catcher between the Wok Bolic antenna and the wifi gun antenna [9].

there is also a study related to "Implementation of wokbolic in the blank spot area in the tourist village area of Cibuntu-Kuningan" by Lukman Hakim. The purpose of this study is to strengthen the cellular signal through the application of wok bolik. Thus internet access in the area becomes easier and tourism promotion can be intensified by utilizing the internet. Development. This study also succeeded in proving that the wokbolic antenna can transmit wifi signals up to a distance of more than 50 m. keep in mind that the wokbolic antenna is only able to amplify the signal so that its coverage is much wider and not increase internet speed [10]. for the first time a research was conducted "Implementation of Wokbolic Antenna as Signal Amplifier for Smart Agriculture Concept in Pasaman, West Sumatera". in this study the author made a wokbolic antenna for use in smart agriculture. The researcher conducted an analysis of the Quality of Service

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(Qos) of the signal transmitted through the wokbolic antenna using the Telkomsel provider. The researcher uses jitter, throughput, packet loss and delay parameters in conducting the analysis.

2. Method and Basic Theory

2.1 Research Method

Before the research was conducted, the author conducted a literature study from various books, journals and various other library sources to collect information related to the research to be carried out. The collected information is then analyzed and developed into an innovation. The research flow chart can be seen in Figure 1 below:

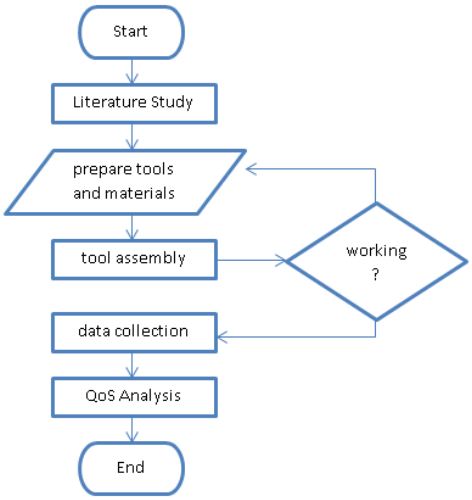

Figure 1. Flowchart research

Equipment testing was carried out in an agricultural area in the Pasamaan sub-district, West Sumatera. The purpose of this research is to build the creation of an agricultural area based on Information Technology, to make wokbolik antennas as cellular signal amplifiers in land agriculture and to increase agricultural yields by utilizing one of the technological evolutions, namely IoT technology in agriculture. The benefit of this research is to provide convenience for farmers in communicating in rice fields and using the internet for agricultural monitoring processes (checking water pH, plant temperature and humidity, soil fertility, etc.), preparing smart agriculture that has wireless-based communication and telecommunications and access points.

At the time of testing the tool, the wokbolic antenna was placed at a height of 12 meters and directed to agricultural land as shown in figure 2 for later testing by connecting smartphone devices to the wifi network using the Telkomsel provider which was transmitted through the wokbolic antenna.

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Figure 2. Wokbolic antenna

2.2 Basic Theory

2.2.1 Wokbolic Antena

Wokbolic is a form of antenna. Antenna is a device used to capture and receive an electromagnetic signal, such as radio waves [12]. There are different types of satellite dishes for specific purposes; The bolic griddle is included in the directional parabolic type antenna because the physical shape used is a conical wedge curve resulting from a cross-section of a cone, and only radiates power in a certain direction [13]. This method is used on grid antennas (the source of inspiration for making a bolic griddle) and satellite dishes that are commonly used for pay television and banking services. A bolic pan is essentially a parabolic antenna which is homemade consisting of a frying pan (as the name implies), used cans, and paralon pipes, which are intended to be used in RT/RW-Net environments with a range of between 2-4 kilometers (generally Wi-Fi networks only reach less than 100 meters) . The idea of making a bolic wok was conceived by Pak Gunadi (aka e-goen), an Indosat employee from Yogyakarta[14]. Selection of the size of the diameter and depth of the pan is very important to ensure the signal is right on target, while the paralon pipe and aluminum can (can be replaced with aluminum foil) function as a reflector that will reflect the wireless signal; a modem will be placed in it [13].

2.2.2 Quality of Service(QoS)

QoS is a method of measuring how well services from a network [15]. wireshark is a software to test internet speed while displaying network quality parameters such as upload speed, download speed, jitter, latency, streaming test and browsing test. Throughput is the effective data transfer rate, which is measured in bps (bits per second). Throughput is the total number of successful packet arrivals observed at the destination during a given time interval divided by the duration of that time interval. while jitter is a variation of delay/latency. High jitter will affect real-time applications such as sending sensor measurement results in agriculture, uploading sensor data to databases and several other applications that use video and audio signals. High jitter will cause the signal to be distorted so that it can result in buffering and other interrupts. Finally, delay is the total time that the packet has passed in a network. In applications used for IoT-based smart agriculture, especially those that use interactive voice and video, the appearance of delay will cause disturbances such as the system not responding or commonly called buffering. the greater

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the delay value, the slower the internet connection used. Latency often occurs when the transmission medium experiencing instability [16].

3. Result

After collecting the tools and materials, calculations were made to design the bolic griddle antenna. This formula is used to determine the size of the pipe covered by aluminum foil. calculation can use the following formula:

$$F = D^2 : (16 \times d) \quad (1)$$

where F is the aluminum foil layer on the pipe while D is the diameter of the pan and d is the depth of the pan. because in this study using a frying pan with a diameter of 50 cm and a depth of 11 cm, the F value obtained is:

$$F = 50^2 : (16 \times 11) = 14{,}2\ cm \quad (2)$$

then the wokbolic antenna is placed at a height of 12 m using a USB cable with a length of 12 m and the height of the paralon on the antenna reflector is 35 cm .

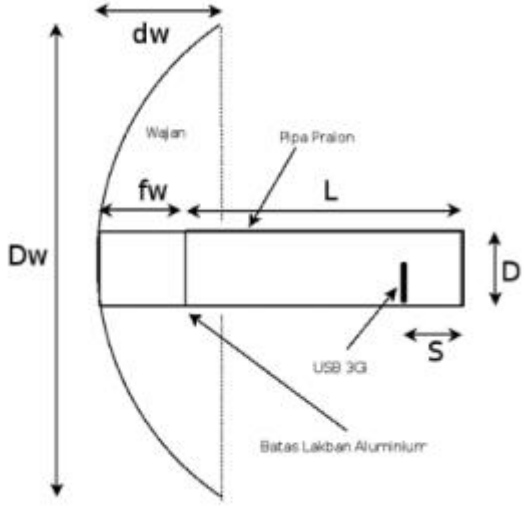

Figure 3. Wokbolic antenna configuration

3.1 Wokbolic Implementation in Smart Agriculture

The wok material used will be made in such a way as to form a frying pan with a diameter of 50 cm and will be installed in the fields to test its signal reception power. The following is the appearance of the bolic wok according to the selected material:

Figure 4. Wokbolic antenna design

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The architectural design of the wokbolic in the rice field area is the same as the previous research related to the wokbolic, namely by taking directly at the nearest BTS, which has the strongest signal from the provider, determining a strong provider makes it easy when implementing the wok bolic, because the use of a wireless modem directly accesses the nearest BTS shown in Fig. image 5 as follows:

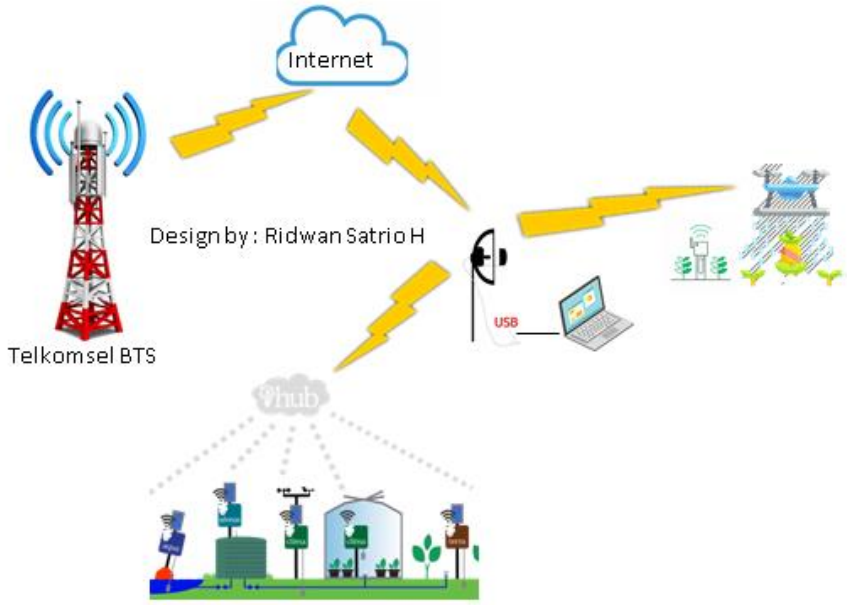

Figure 5. The architectural design of the wokbolic on smart agriculture

The Wajanbolic antenna requires a long cable to connect to a PC or laptop during testing and implementation in agricultural areas using a 12 m extension cable based on the stability of the captured signal by wok bolic. Because the Wok bolic antenna requires a line of sight connection, it is not uncommon to have to install the wokbolic antenna at a certain height to obtain line of sight so as not to be obstructed by whatever, the antenna that is installed has a height of ± 12 meters. If you use a regular USB cable it definitely won't maybe because in general, ordinary USB cables are short, and if you force them to be connected to long then data will be lost in the middle of the road. If you use a USB extension cable then the price will be expensive but that's it the easy way because it has been bought and sold in computer shops.

3.2 Analysis of Quality of Service Antenna Wokbolic

For network performance, checks are made using ping and wireshark software. At the time of testing, a recapitulation of the test results of throughput, packet loss, delay and jitter per distance of 10 meters to 50 meters from the Access Point was obtained when streaming YouTube and when uploading and downloading videos on YouTube, as follows:

Figure 6. Wokbolic antenna testing every 10 meters to 50 meters from the access point

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The speed measurement to test QoS was carried out 3 times, in the 3 trials, a video streaming test was carried out using the youtube platform as well as a test sending data via short messages. test results using wireshark software can be seen in the image 7.

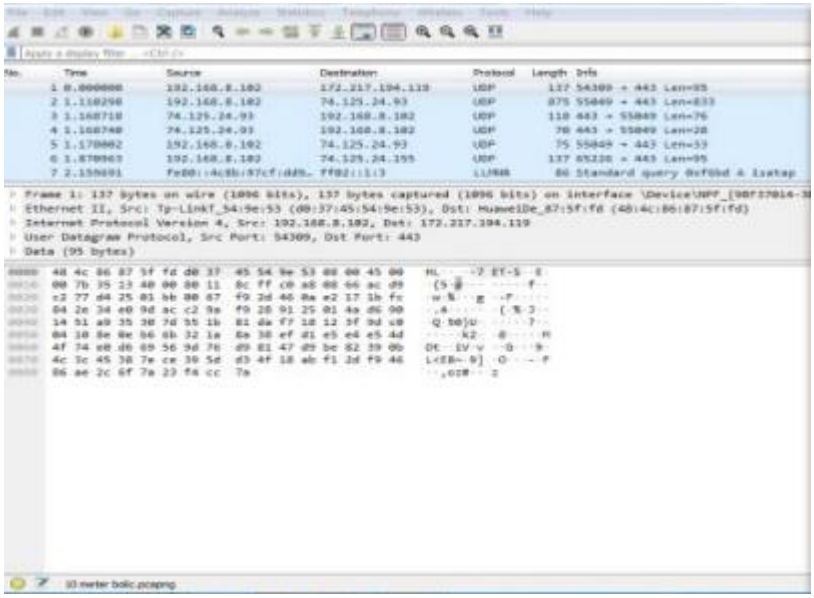

Figure 7. Testing Quality of Service (QoS) Using Wireshark Software

In table 1, it can be seen that the average throughput test results using a wokbolic show good throughput results. From the test results above, it can be concluded that the wokbolic antenna has better throughput management.

Tabel 1 Throughput Test Results

Distance(m)	Throughput(Kbps)	Parameters
10	845	Good
20	809	Good
30	794	Fair
40	716	Fair
50	550	Poor

During testing, it was also found that the Telkomsel network using a wokbolic antenna for smart agriculture has good upload and download speeds so that it can support network connectivity for drone operations, a telemetry system to monitor plantations as well as electronic devices and other sensors to help agriculture. At the time of testing, the average upload speed was 2 Mbps and the average upload speed was 4 Mbps. picture x shows the results of upload and download speed testing

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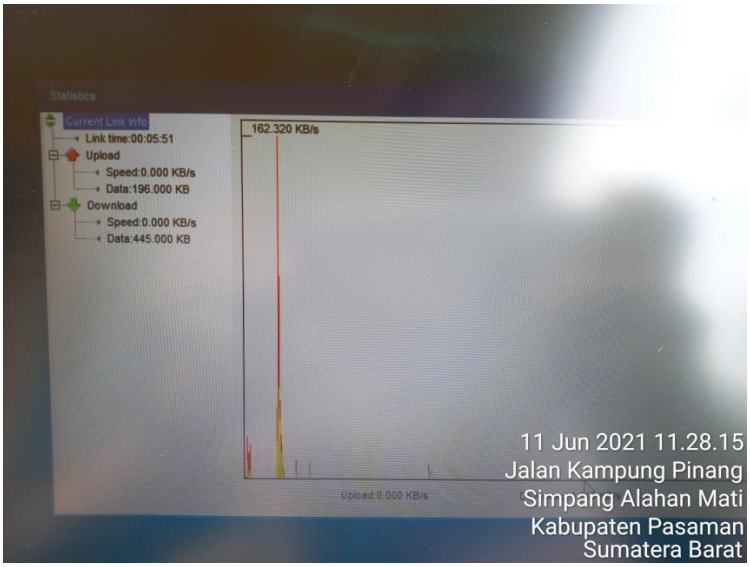

Figure 8. upload and download speed test results

In table 2, it can be seen that during the test uploading videos on youtube, the wokbolic antenna has quite good throughput, delay and jitter during testing.

Tabel 2 Recapitulation of Test Results When Uploading

QoS Parameter	Test Result	Parameters
Throughput	2635 bps	Excellent
Packet Loss	0	Excellent
Delay	30 ms	Excellent
Jitter	6,865 ms	Good

While in table 3, it can be seen that during the video download test on youtube, the wokbolic antenna also has better throughput, delay and jitter than the wokbolic antenna. So from the test results in tables 2 and 3, it can be concluded that the wokbolic antenna has a good QoS compared to both upload and download tests and no packet loss was found during testing on the antenna.

Tabel 3 Recapitulation of Test Results When Downloading

QoS Parameter	Test Result	Parameters
Throughput	4580 bps	Excellent
Packet Loss	0	Excellent
Delay	45 ms	Excellent
Jitter	2,3142 ms	Good

The results of measuring the speed / speed of the signal captured by cellular on wifi in the agricultural area as a result of the wokbolic implementation, an average of 71 ms, this is good enough to be used to access the internet and call the domains of several internet sites such as detik.com, google.com, kompas.com , and several other domains. Figure 9 shows the position of the antenna facing the farm.

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Figure 9. Wokbolic antenna implementation on smart agriculture

To find out the stability of the signal, testing is carried out by calling several domain addresses such as on google.com using the network from the Telkomsel provider as shown in Figure 10. In testing the youtube.com domain, the times value still shows an average of 230 ms, this shows that the signal captured by Wok Bolic is good enough for internet use and access to Google can run well. With the speed in the ping test, it is certain that the wokbolic antenna can be used to access the web server when using sensors on agricultural land.

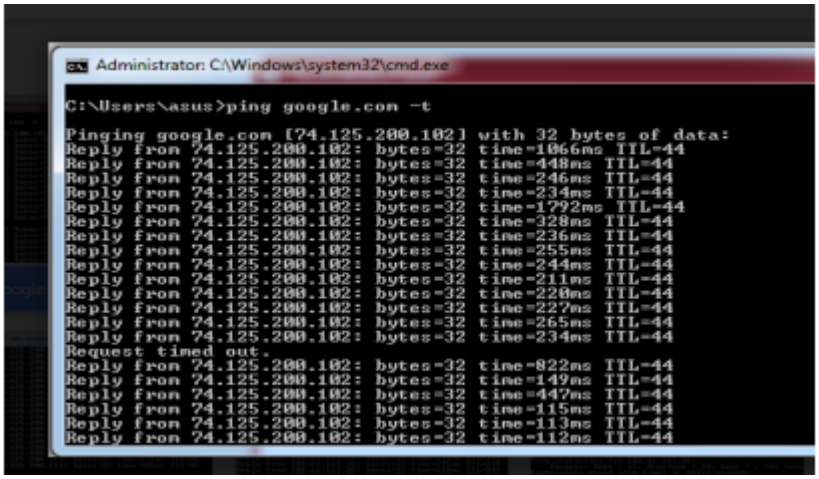

Figure 10. Testing on the Telkomsel provider for the google.com domain

Tabel 4 Comparison of test results using a wokbolic with not using a wokbolic

No	Test	Bandwith (mbps)	Upload (mbps)	Max Distance (m)
1	Access test results without using a wokbolic antenna	0,33	0,5	45
2	Access test results by using a wokbolic antenna	0,40	0,7	125

Based on results of the comparison table, it was found that using the wokbollic antenna had better service quality results than not using the wokbolic antenna and the range of the resulting area is also wider using a wokbolic antenna.

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4. Conclusion

Based on the results of testing and implementation of wokbolic on agricultural land in Samaan Regency, West Sumatera. conclusions and suggestions can be given as follows: The use of wokbolic in agricultural areas is very appropriate because it produces better signal strength with a wide range so that it can be used to apply the concept of smart agriculture in using the IoT system. Implementing a bolic griddle with an antenna height of 12 meters the signal obtained is quite stable even though the BTS position is too far away, still blocked by hills, the location of the BTS position determines the signal that is captured well, and the height of the antenna mast determines the captured signal. good or stable, Wok bolic can capture signals with average times > 50 ms when accessing the google domain with an average throughput at download of 2635 bps and at download of 4580 bps. Use of wireless routers originating from wokbolic can be accessed up to distance of ± 50 meters. The use of the type of provider greatly affects the signal obtained. The type of provider used greatly affects the signal that is captured, based on the distance from the nearest BTS provider. The results of the test results on the bolic pan with the Telkomsel provider have a good QoS value. It is recommended for the next development to use a larger diameter pan to improve signal accessibility.

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