

## **Analysis Of The Quality Performance of the Very Small Aperture Terminal Internet Network at the Darussyahidin Nw Langko Islamic Boarding School**

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### **Abstract**

*The development of information technology has brought significant changes to human life, particularly through internet services that facilitate access to information and communication. The need for quality internet services is increasing, including in the education sector. However, not all regions in Indonesia have equal access to the internet, particularly remote areas with limited network infrastructure. One example is the Darussyahidin NW Langko Islamic Boarding School, which experiences difficulties in accessing conventional internet services. To overcome this obstacle, in 2019 the Islamic boarding school adopted VSAT (Very Small Aperture Terminal) satellite technology as a solution to provide internet access for students and teachers. However, an evaluation of the quality of the resulting internet service is necessary to optimally support the learning process. This study aims to analyze the quality of VSAT network services at the Darussyahidin NW Langko Islamic Boarding School. The analysis was conducted by considering Quality of Service (QoS) parameters such as delay, jitter, packet loss, and throughput. This study also compares the results with several previous studies that discussed VSAT network performance in various contexts. The research results are expected to provide an overview of the quality of VSAT internet services in supporting learning activities, as well as being a reference in developing and improving network services in remote areas.*

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## **1. INTRODUCTION**

The development of information technology is now inevitable, with the discovery of new technologies intended to assist people in their daily lives, freeing up time and energy for other pursuits. (Didik et al., 2024) (Wiryany et al., 2022) Internet services are a way to make it easier for people to find information and share data with others as needed. (Dini safitri et al., 2024.) (Ahadiyah, 2024).

Users of the Sub-district Internet Service Center want the best quality of service. Along with the rapid development of information and communication technology, the internet is something that cannot be separated from Indonesian society, because of the ease of finding information and its low cost. (Nur et al., 2025) (Pandhika & Stiawati, 2024).

However, not everyone can experience the convenience of internet services, because not all areas in Indonesia can reach the internet, in remote areas where access is difficult to reach, making

the internet network unavailable to these people. (Pendidikan & Daerah, n.d.) One of the places that really needs internet access is the Darussyahidin NW Langko Islamic boarding school. Students and teachers really need internet services for learning where other schools can easily access the internet and search for information for both students and teachers. (Setiaji et al., 2025).

In 2019, the Darussyahidin NW Langko Islamic Boarding School decided to use satellite internet technology, or VSAT, to provide internet access for students and teachers. Due to the inability of other internet services to reach the school, the school decided to use VSAT. However, the question arose as to whether this internet service provided adequate quality for learning for students and teachers at the Darussyahidin NW Langko Islamic Boarding School. This study compared several previous studies related to VSAT to determine the differences in this study.

For example, a study conducted in 2025 by Wendel Herman Selsily from the Faculty of Computer Science, Indonesian Christian University (UIK) Maluku, addressed the topic of evaluating the quality of service (QoS) of internet networks in the Faculty of Computer Science, Indonesian Christian University (UIK) Maluku. The results were used to determine the maximum tolerable internet quality. (Selsily et al., 2025).

Furthermore, a study conducted in 2025 by Sirmayanti and Muh. Ilham Ihsary published a research paper in the Ujung Pandang State Polytechnic Journal on the topic of utilizing compact 4G LTE mobile stations to enhance network coverage in rural low-signal areas. The results of this research were used to determine optimal VSAT internet network performance. (Areas, 2025).

Subsequent research, conducted in 2024 by Pandu Laksana and Anggun Fitriani Isnawati in the journal E-Journal Teknik Elektro dan Komputer (Electrical and Computer Engineering), focused on a comparative analysis of QoS for Telkom's VSAT IP and VSAT Star networks. The research findings included analysis of bandwidth, delay, packet loss, upload, and download performance on the MPLIK VSAT network in North Sulawesi. (Laksana et al., 2024).

Further research, conducted by Agus Wahyudin in 2023 in the journal Computational Science, focused on analyzing QoS performance on VSAT DVB-S2X/DVB-RCS networks. The results of this study indicate that implementing Quality of Service (QoS) in a dvb-s2x/dvb-rcs2-based VSAT network is crucial for improving network performance, particularly in managing various types of traffic such as Best Effort (BE), VoIP, Video Conference (ViC), and Critical Data (CD). (No Title, 2023).

Further research by Roni Saputra in 2024, published in the Journal of Appropriate Technology for Agriculture, Environment, and Development, covered the topic of Network Design Planning for Very Small Aperture Terminal (VSAT) in Nagari Rangkiang Luluh, Solok Regency. The results of this study explained that the designed VSAT network successfully provided good service quality and was highly suitable for use in remote areas such as hills, forests, and valleys. VSAT proved to be an effective and stable solution for internet access in areas difficult to reach by BTS networks. (Saputra et al., 2024).

In a 2025 study by M. Hendro Kartiko Budi Hartono in the Journal of Informatics, Technology, and Science (JINTEKS) on the topic of "comparative analysis of network services using quality of service parameter calculations," overall, based on the QoS standards used, the VSAT network performance was categorized as good and suitable for use as an internet access solution, especially in remote areas or areas difficult to reach by conventional network infrastructure. Thus,

VSAT technology has proven capable of providing stable, reliable, and effective network services to support data communication needs. (M Hendro et al., 2025).

Research conducted by Pande Gede Wipradnyana in the Indonesian Journal of Electrical and Electronics Engineering (INAJEEE) in 2024. Based on the results of the study on the performance of the VSAT (Very Small Aperture Terminal) network in seismic data transmission within the BMKG Region III area, it can be concluded that the network performance is generally in good condition and capable of effectively supporting long-distance data communication needs. (Wipradnyana et al., 2024.) The description above demonstrates that this study differs from previous studies that focused on VSAT (Very Small Aperture Terminal).

2. METHOD

The research methodology used in this study is the NDLC. Four of the six stages are used: Analysis (identification stage), Design (design stage), Simulation Prototyping (evaluation stage), and Implementation (application stage). The research process is shown in Figure 2.1.

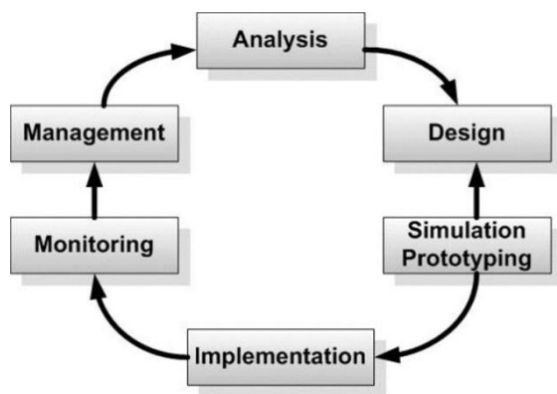


Figure 2.1. Research Flow

a. Analysis

Non-Functional Requirements Analysis Hardware requirements for system development to ensure its smooth operation. The hardware used in building the system includes:

Table 2.1. VSAT Hardware List

No.	Module Name	Type	Qty
1	Antenna	Ku-Band 1,2 m off-set, Prodelin 1122	1 unit
2	Mounting Pedestal	NPRM	1 set
3	Modem	Hughes Jupiter HT 2300	1 unit
4	BUC	3 watt (13,75-14,5 GHz) NJRC NJT8302UF	1 unit
5	LNB	Ku-Band (10,7-12,75 GHZ) NJRC NJR2842L	1 unit

6	Router	Mikrotik RB 960PGS - hEX-PoE	1 unit
7	Outdoor Access Point	Ubiquity UAP-AC-M-Pro	2 unit
8	Rackmount	Indorack WIR4512S - 12U	1 unit
9	Power Stabilizer	Matsuyama 1500 VA	1 unit
10	Kabel Coax	RG11	2 x 30 meter
11	Kabel UTP	Cat5	30 meter
12	Kabel Power	3x2.5 NYMHY (inc. steker & terminal)	10 meter
13	Kabel Grounding	6mm NYAF	25 meter
14	Connector F	RG11	4 pcs
15	Connector RJ45	-	10 pcs
16	Kuku macan	5/8 (16mm)	1 pcs
17	Scun grounding + vinyl	-	4 set
18	Stick Root	Tembaga 5/8 x 1,5 m	1 unit
19	Rubber tape	Scotch 23	1 pcs
20	Kabel Ties	25 cm	25 pcs
21	Paku klem	10 mm	25 pcs
22	Paku klem	14 mm	25 pcs
23	Stiker		1 lembar

Software requirements are equally important in building a system. The software used in developing this system includes: Microsoft Windows 10 Professional 64-bit operating system and Axcence NeTools Pro 4.0.

#### b. Design

In this stage, a design of a system or topology is needed before continuing this research, just like doing regular pointing which is done between one point and another point which is still on the surface of the earth, but different from VSAT the main function of VSAT is to receive and send data to the satellite. The satellite functions as a signal forwarder to be sent to other points on the earth. Actually the VSAT dish is facing a geostationary satellite. Geostationary satellites are satellites that are always in the same place in line with the rotation of the earth on its axis which is possible because they orbit at the same point above the earth's surface and follow the rotation of the earth on its axis. The VSAT network design which contains the network topology used and IP addressing is as shown below.

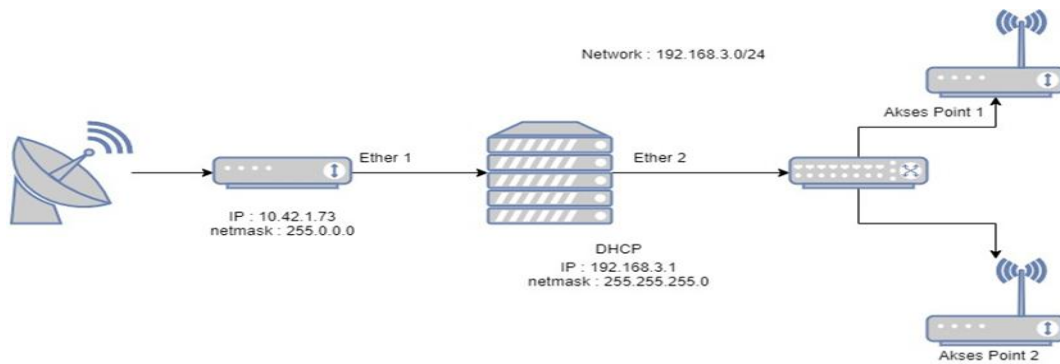


Figure 2.1. VSAT topology design

A VSAT antenna serves to receive and transmit signals to geostationary satellites. These satellites are positioned in the same location, following the Earth's rotation. The signals received from the satellites are radio waves, which are transmitted via a coaxial cable connected to a modem, which converts the baseband signal to an IF signal. It is then connected to a Mikrotik router for bandwidth management before being distributed to the desired locations using an access point.

**c. Simulation Prototyping**

At this stage, we will prepare the tools that will be used to collect data for analyzing the quality of the VSAT internet network using Axcence NetTool Pro 4.0.

**d. Implementation**

This implementation stage is the stage where all the VSAT devices that have been provided to build the network will be applied in the field, starting from the hardware to the software that will be used to analyze the quality of the internet.

**3. RESULTS AND DISCUSSION**

**a. Device installation**

Outdoor and indoor VSAT device installation. This device installation consists of several parts, for outdoor use: the antenna, mounting pedestal, BUC, LNB, coax cable, UTP cable, outdoor access point, grounding cable, grounding scun, and grounding rod. Each part of this device has its own role in pointing to the satellite.



Figure 3.1. VSAT Antenna

**b. VSAT Antenna Device Manufacturing**

This step shows the parts of the outdoor device that will be combined and assembled to function properly. Starting from building the antenna dish to the antenna's legs to installing the BUC and LNB. This antenna is very small but can be used to send and receive frequency transmissions from satellites. VSAT antennas measuring approximately 2 to 10 feet (0.55-2.75 m) are installed on roofs, walls, or above ground and the choice of antenna size depends greatly on the type of frequency (e.g., C band or Ku band) to be used.



**Figure 3.2** Making a VSAT Antenna Device

**c. Installation of Grounding Equipment on VSAT Antenna**

The next step is to install a grounding device for the VSAT antenna. The function of this grounding device is to neutralize excessive electrical charges from electronic devices. The implementation of this grounding device is by planting a good conducting electrode. An electrode is a conductor used to contact the non-metallic parts or media of a circuit. The tools used for grounding are a grounding rod and a grounding cable that has been installed with a grounding scun. How to use the grounding rod is by inserting the grounding rod into the ground and connecting it using a grounding cable connected to the BUC section of the antenna.



**Figure 3.3.** Grounding and grounding cable

**d. Coaxial cable installation on VSAT Antenna**

The next step is to install the coaxial cable on the VSAT antenna. Coaxial cable has another name, namely BNC, which stands for Bayonet Naur Connector, which is commonly referred to as "Coax". Meanwhile, in Indonesian, Coaxial Cable means a cable with the same axis. In general,

this cable can be interpreted as a data transmission medium by channeling various information that is converted into electrical signals. The function of the coaxial cable is as a connecting medium that is useful in streaming data transmission from one computer hardware to another computer hardware. In this case, the coaxial cable is connected via the BUC and LNB on the VSAT antenna and is then forwarded to the modem.



**Figure 3.4.** Coaxial Cable Connected to the Modem

**e. Indoor VSAT Device Installation**

After building the outdoor device for VSAT, the next step is to build the indoor device. The tools used for this indoor device are the Hughes Jupiter HT 2300 type Modem, Mikrotik RB 960PGS – hEX-Poe Router, Indorack WIR4512S – 12U Rackmount, and Matsuyama 1500VA Power Stabilizer.



**Figure 3.5.** Indoor device parts

**f. Modem installation**

The first step in installing this indoor device is to configure the modem. This involves several steps: Install the antenna until it's ready for pointing, select Power On Modem, connect LAN 1 of the modem to the PC/laptop using a LAN cable, and configure the laptop's Ethernet adapter with the IP obtain (DHCP) configuration as shown below:

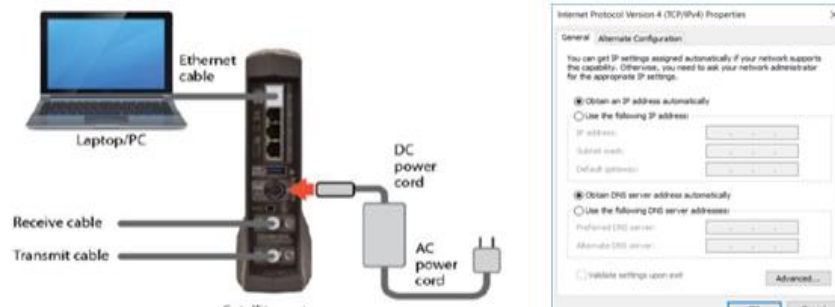


Figure 3.6. Modem installation and IP configuration

**g. VSAT antenna pointing**

This step is crucial for connecting to the desired satellite. After completing the previous steps of setting up the modem and clicking submit, a pointing page will appear. Point the antenna to the desired position.



Figure 3.7. VSAT antenna pointing

**h. SQF modem settings**

After adjusting the VSAT antenna to the desired angle, the next step is to determine the desired SQF. Point the antenna until you achieve the maximum SQF. The standard SQF for the BAKTI project in the center beam is greater than 135 (minimum modcode 32 Apsk 25/36).

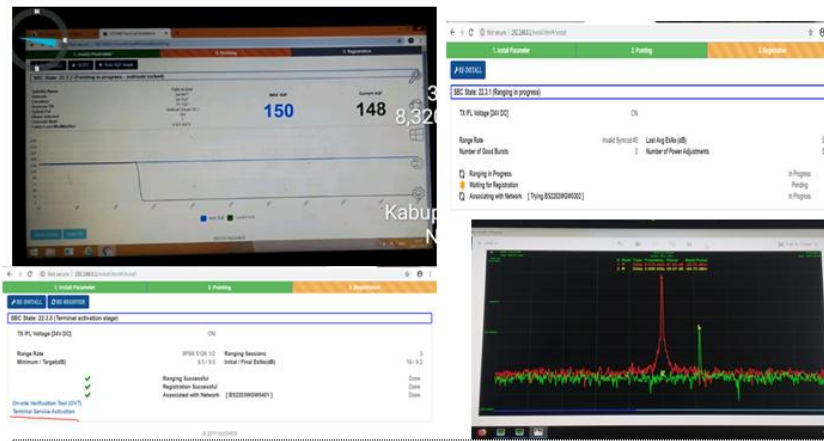


Figure 3.8. SQF modem settings

Then, coordinate again with the NOC at the central office to obtain the site ID for the location being installed. Enter the site ID obtained from the NOC and then click "Submit." After successfully entering the site ID, a notification will appear saying "Terminal activation successful."



### Terminal Activation

#### Terminal activation successful

The customer's modem has completed *Terminal Activation* and will now update to the latest software. Please monitor the [System Status Screen](#) for the update to complete. The modem will then reboot to activate the software. After the modem restarts and the Service Activation link appears on the System Control Center, please disconnect your Laptop and connect the modem to the customer's PC.

Figure 3.9. Terminal Activation Successful

## 4. CONCLUSION

Based on the results of research conducted on the analysis of the quality performance of the VSAT (Very Small Aperture Terminal) internet network at the Darussyahidin NW Langko Islamic Boarding School, it can be concluded that the resulting internet network service shows good, stable performance, and meets quality of service (Quality of Service/QoS) standards. This is indicated by the values of key parameters such as throughput, packet loss, and bandwidth which are in the very good category, so they are able to support data communication activities optimally. In addition, the existence of the VSAT network has proven to be an effective solution in providing internet access in areas with limited terrestrial network infrastructure. With relatively stable service quality, this network is able to support various digital-based activities, especially in supporting the learning process such as access to online materials, online communication, and the use of web-based educational platforms.

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