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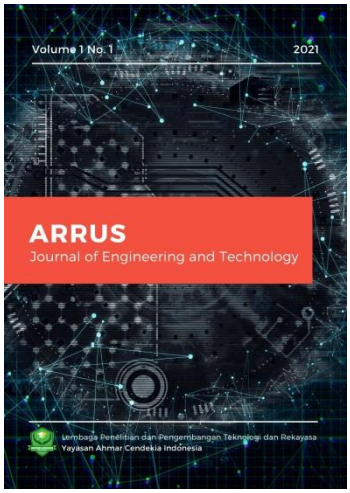

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RESEARCH ARTICLE

Design Of Computer Network Communication In JASDAM II Sriwijaya With Top-Down Method

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Abstract: The need for reliable and extensive network infrastructure in a military environment, especially in Jasdam II Sriwijaya, is becoming increasingly important along with the security tasks and challenges faced. This research aims to design a network that meets military standards and performance by applying the Top-Down method. The Top-Down method in the context of network design, along with network needs analysis in a military environment. Through this approach, this research aims to strengthen operations and expand the network in Jasdam II Sriwijaya. The research methodology includes data collection on network needs, needs analysis, Top-Down design, implementation, and testing. The expected results of this research are the design of a network structure at 3 locations that are in accordance with well-defined military needs, as well as expanding network communications in a military environment, measuring how well the network is using the QoS method. This research provides optimal network infrastructure development in JASDAM II Sriwijaya, with the potential for a wider scale.

Keywords: Computer Network, Internet, Top-Down, Network Topology.

1. INTRODUCTION

As an implementing agency in the Military Regional Command (KODAM) and the Military Regional Jasmani (JASDAM) has the main task of organizing the physical development of soldiers both individuals and units as a whole. Communication networks play a complex role in maintaining operational effectiveness and security in the military environment. As an important center in defense operations, JASDAM II Sriwijaya requires a reliable, extensive, and secure network infrastructure to support its activities. However, with technological advancements and security challenges, the existing network infrastructure may no longer meet the necessary needs. The challenges faced in designing and building the Computer Network Communication at Jasdam II Sriwijaya include the increasing demand for network speed. In addition, dynamic changes in military tactics and technology demand a network infrastructure that can adapt quickly. Based on the background discussed in the research to be carried out, the research formulates the problem of how to design a network communication using the Top Down method at JASDAM II Sriwijaya. In order that the problem does not expand and is more focused, in this study the authors limit the problem, namely designing network communications at JASDAM II Sriwijaya at 3 location points and implementing network communications using the Top Down method which involves network topology and existing hardware specifications.

A computer network is a connection between two or more devices that are connected physically or logically so that they can exchange information with each other. A computer network can be said to be connected if the devices in the network can exchange data,

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information and share their resources (Astuti, 2018). A computer network is a set of interconnections of a number of computers, in popular language it can be explained that a computer network is a collection of several computers, and other devices such as routers, switches and so on (Antariksa & Aranta, 2022). Computer network topology is a way of connecting one computer to another to form a network. Ways that are currently widely used are bus, token ring, and star. In a computer network, the type of topology chosen will affect the speed of communication (Supriyadi & Gartina, 2014).

The internet can connect technology users in different parts of the world. It is also used for learning and sending news. The Internet is very efficient for data exchange. The Internet is a network that is used as a window for the delivery of information and the exchange of data packets used to provide services throughout the world (Apriyanti et al., 2022). WiFi (Wireless Fidelity) is a technology that allows electronic devices to connect to the internet or local networks without using physical cables. WiFi uses radio waves to transmit and receive data, so devices connected to a WiFi network can exchange data or information wirelessly (Tan & Akbar, 2021). 2.4 GHz WiFi is one of the "frequencies" used in wireless networks for transmitting data. This frequency is part of the radio spectrum used by Wi-Fi devices to communicate. Wi-Fi networks at 2.4 GHz frequency are commonly used by many electronic devices such as Wi-Fi routers, smartphones, laptops, Smart Home, etc (Satwika & Sukafona, 2018). 5 GHz WiFi technology is an upgrade from the 2.4 GHz frequency, which offers several advantages over 2.4 GHz Wi-Fi. The main advantage of 5 GHz Wi-Fi is the higher data transfer rate. The 5 GHz frequency has a wider channel, which allows for faster data transfer. This makes it a good choice for internet that requires a stable connection at high speeds, such as video streaming, online gaming, or large file transfers (Helwa et al., 2023).

UTP (Unshielded Twisted-Pair) cable is a type of network cable that can use copper base material, which is not equipped with an internal shield. UTP is the most common type of cable that is often used in local networks (LAN), because it is cheap, the performance it shows is also relatively good (Hanif Abdullah, 2021). Routers are network equipment that can connect networks with other networks. At first glance, a router is similar to a bridge, but a router is smarter than a bridge. Routers work using routing tables stored in their memory to make decisions on where and how packets are sent. The router can decide the best route for the data packet to take (Jaya et al., 2020). Modem is an abbreviation word, which means Modulator and Demodulator. Modem is a network device that carries analog-digital signals so that it can connect to the internet network. Modems function to convert analog signals to digital signals, so that we can connect to the internet network. In addition, modems are also useful for checking data packets and communication (Juliansyah & Rachmatika, 2023).

2. Literature Review

2.1 Quality Of Service

Quality of Service is a method of measuring how good a network is and is an attempt to define the characteristics and nature of a service. Quality of Service is used to measure a set of performance attributes that have been specified and are usually associated with a service (Faisal & Fauzi, 2018).

2.2 TIPHON

TIPHON is a QoS parameter assessment standard issued by the ETSI (European Telecommunications Standards Institue) standards body TIPHON stands for Telecommunications and Internet Protocol Harmonization Over Networks. The TIPHON standard is used to evaluate network performance with respect to key parameters such as Throughput, Delay, Jitter, and Packet Loss (Komputer & Nusantara, 2024).

2.3 WireShark

Wireshark is one of the many Network Analyzer tools that are widely used by Network administrators to analyze the performance of their networks including the protocols in them.

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Wireshark is widely preferred because of its interface that uses a Graphical User Interface (GUI) or graphical display. Wireshark is capable of capturing packets of data or information traveling on a network. All types of information packets in various protocol formats will be easily captured and analyzed (Kumara et al., 2017).

2.4 Meteor Speed Test

Meteor is one of the Internet speed check applications to test the Internet both on Wifi, 3G, 4G and 5G networks. The test can be done very quickly in seconds, and the results displayed are very accurate. Meteor has an extra feature that can show whether selected applications such as Chrome, Maps and Youtube can run optimally on your Internet connection (Pratnyawan, 2021).

2.5 Visio

Visio is a Microsoft Office application that can be used to create or edit diagrams, flowcharts, organizational charts, and other types of visual representations of data. One of the main benefits of Visio is its ease of use, which allows even non-technical users to create and customize professional-looking diagrams with Visio making it easy for users to save images that have been created digitally (Prastya et al., 2023).

3. Research Method

The location of this research is in JASDAM II Sriwijaya Palembang City and the method used in the design of network communication is Top-Down. Top-Down, where the decision maker of an organization makes a decision to build a network by calculating the needs of computers and their facilities for all units in the agency (Rizal & Saputra, 2018). Development of a local computer network design with implemented in 4 main phases :

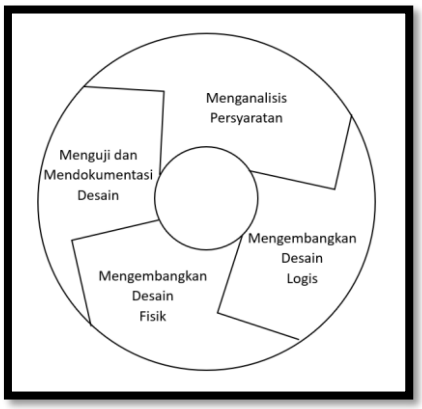

Figure 1. Top-Down Methodology

1) Analyze Topology and Site Plan

This phase produced a model of the company's local network development needs. The phase begins with collecting information needs through interviews and measuring the quality of the existing local network.

In this phase the author has obtained data that is analyzed for design, through interviews with several members of Jasdam II Sriwijaya such as analyzing the area where the network will be installed and identifying users who need network services. Building a logical design of the resulting network such as logical topology, network location points and network service planning.

2) Building a Logical Design Network Plan

Based on the resulting requirement model, a logical design of the local network was built. The resulting models included logical topology, network address mapping, network management, and network service planning.

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In this phase the author completed most of the logical design of the indoor and outdoor locations, according to the requirements gathered during the analyzing phase.

3) Hardware Physical Network Design

This phase produces a physical network design in the form of, selection of technology and specifications of computer network infrastructure including cables, switches, access points, and routers, and planning the placement of network infrastructure devices.

In the physical network phase, the author has purchased some of the hardware used for design and installation at indoor and outdoor locations.

4) Network Design testing and documentation

Implement the test plan and optimize the network design. The last phase in this top-down method the author will later conduct monitoring during this phase for performance problems and any errors to provide input into the network lifecycle optimization phase, after the problem is resolved the author will check the Quality of Service or quality of service and documentation for the final result of the design.

4. Results and Discussion

4.1 Needs Analysis

Network communication will be used for army members, administrative staff, general visitors, internet access for training, and special events. JASDAM II Sriwijaya uses 2 types of network communication, namely wired and wireless, where the internet network is distributed at 3 points, namely the main building, soccer stands, and training Center.

4.2 Network Topology of JASDAM II Sriwijaya

Figure 2 shows the location of JASDAM II Sriwijaya, which has a land length of 557 meters and a width of 286 meters. The Main Building is the center point of this location, with a distance of 56 meters to the Mosque and 30 meters to the Picket Post. In addition, the distance between the Guard Post and the Picket Post is 78 meters.

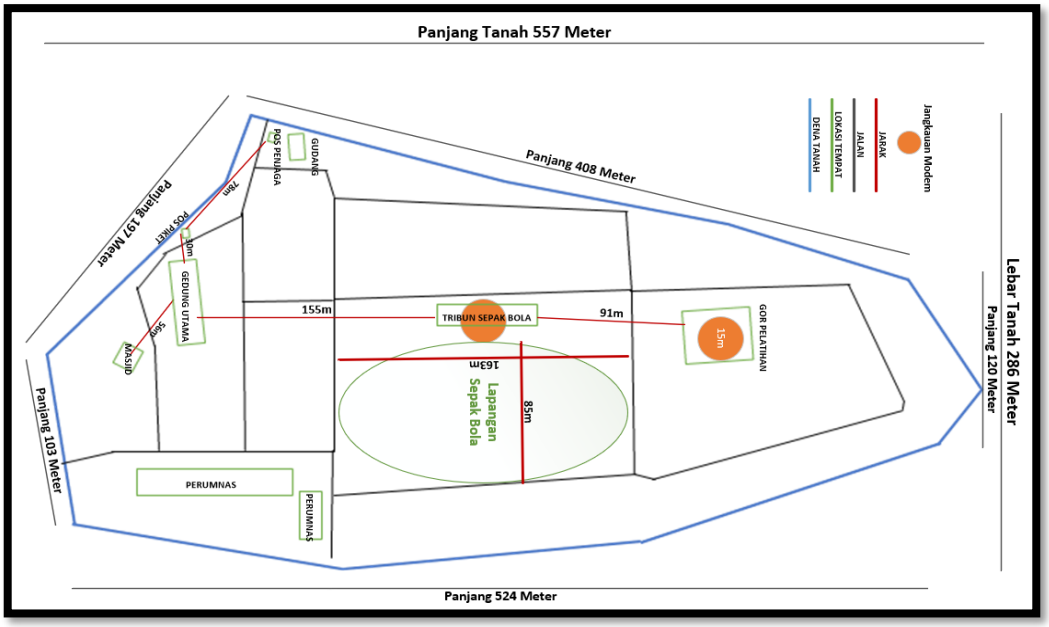

Figure 2. Plan of 3 Network Communication Points

This plan design aims to measure and determine the optimal points in designing network communications at JASDAM II Sriwijaya. In this report, the author has determined three

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main locations for network design, namely the Main Building, Football Tribune, and Training Center.

The distance between the Main Building and the Football Tribune is 155 meters, while the distance between the Football Tribune and the Training Center is 91 meters. Overall, the distance between the Main Building and the Training Hall is 246 meters. Determining this distance is important to ensure proper and optimal network hardware, so that each point can be well connected and support communication needs throughout the JASDAM II Sriwijaya area.

4.3 3 Point Communication Network Topology

4.3.1 Main Building Topology

The main building has a building length of 51 meters and a building width of 15 meters with 11 rooms in the main building, namely the KAJASDAM & WAKAJASDAM Room has an area of 7x6 meters, a hall & TU'UT Room with an area of 17x6 meters, a meeting room with an area of 12x6 meters, a posture room with an area of 3x6 meters, a GARJAS room with an area of 7x6 meters, a guest room has an area of 8x6 meters, an OR room with an area of 12x6 meters, the last rest room is 6x6 meters.

The following is the topology of network communication in the main building after being redesigned.

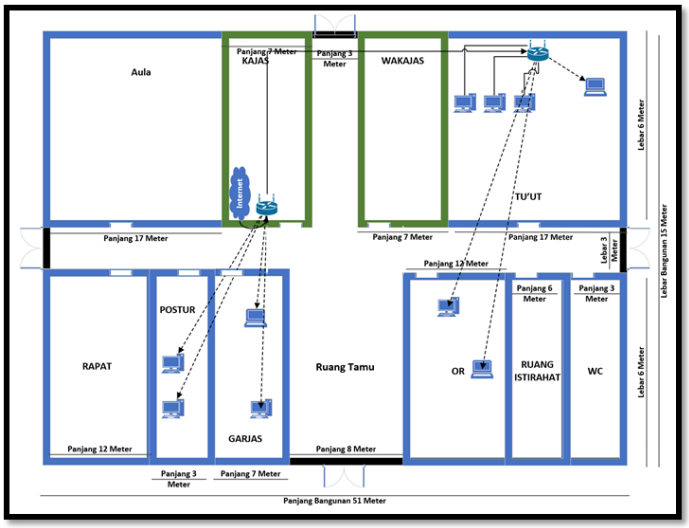

Figure 3. Main Building Topology Network Redesign

The network topology in JASDAM II Sriwijaya Main Building has been redesigned using Bus topology, where all network devices such as routers, PCs, laptops, wireless routers, and smartphones are structured. In this topology, connections between devices are made through UTP and WI-Fi cables, which are also used to connect routers to the internet. This approach allows a stable and wide distribution of the network in each room and ensures stable and optimal connectivity. The results of this redesign can be seen in Figure 3.

The following hardware is used in the Main Building after the redesign as follows :

1) The internet connection used in the Main Building is ISP IndiHome Fiber Optic with a speed of 20 Mbps.
2) Router.

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Figure 4. Router Fiberhome Hg6145d2

Table 1. Specifications of Fiberhome Hg6145d2 Router

Product Code	HG6145D2
LAN Port	4
Wifi Type	Wifi 2.4 Ghz & Wifi 5.0 Ghz
Antenaas	2

Figure 5. Router TP-Link Archer C54 AC1200 Dual Band Wi-Fi

Table 2. TP-Link Archer C54 AC1200 Router Specifications

Product Code	*C54 AC1200*
LAN Port	4
Wifi Type	Wifi 2.4 Ghz & Wifi 5.0 Ghz
Wifi Standarts	IEEE 802.11ac/n/a 5 GHz IEEE 802.11n/b/g 2.4 GHz
Wifi Speeds	5 GHz: 867 Mbps 2.4 GHz: 300 Mbps
Wireless Security	WEP,WPA,WPA2,WPA/WPA2-Enterprise
Antenaas	4

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3) LAN cable

Figure 6. Cat 5e UTP Cable

Table 3. LAN Cable Specifications

LAN cable	UTP Cat 5e
Connectors	RJ45 Cat 5e

4.3.2 Football Stand Topology

The Football Tribune topology has building dimensions of 60 meters long and 14 meters wide. There are seven rooms in it, namely the middle room measuring 20x14 meters, changing rooms A & B measuring 14x14 meters, a warehouse with an area of 16x9 meters, and a 6x5 meter WC.

The following is the network communication topology of the Football Tribune :

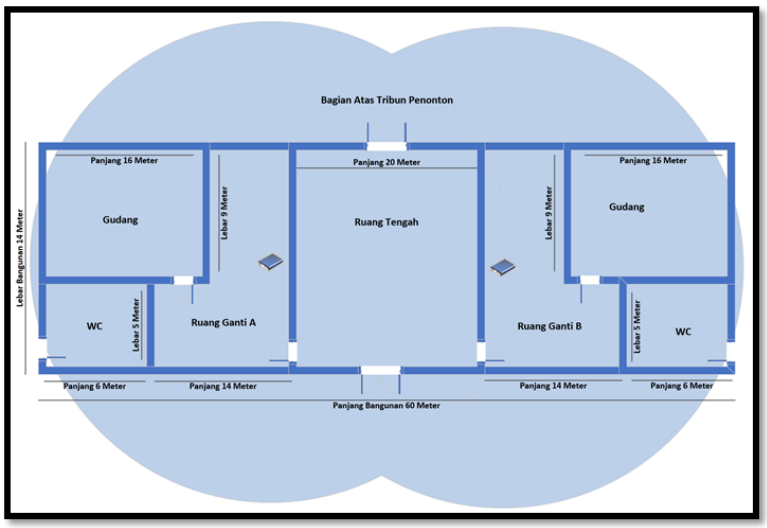

Figure 7. Football Stand Topology

Based on Figure 6. the modeling above shows that there are two SIM Card Modems connected to the internet. These modems function to deploy the internet network in two rooms, namely Dressing Room A and B. The network range of each modem is 15 meters from the installation point, which ensures adequate coverage in the surrounding area. The internet network aims to facilitate faster uploading of trainees' physical test results. In addition, this network can also be utilized by general visitors who are within range, thus increasing accessibility and comfort in the Football Tribune environment.

The following hardware is used at the Soccer Tribune as follows :

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Figure 8. Modem SIM Card 4G LTE

Table 4. 4G LTE SIM Card Modem Specifications

Connection Type	4G LTE Cat.12
Transmission Level	500 Mbps
Card Slots	1 (One)
USB Port	1 (One)

4.3.3 Training center topology

The topology of the Training Hall has building dimensions of 44 meters long and 34 meters wide. It contains three rooms as well as one field area measuring 32x34 meters, which houses two badminton courts of international standard size. In addition, there is a rest room of 12x20 meters, a warehouse of 12x10 meters, and a WC of 12x4 meters.

The following is the network communication topology of the Training Center :

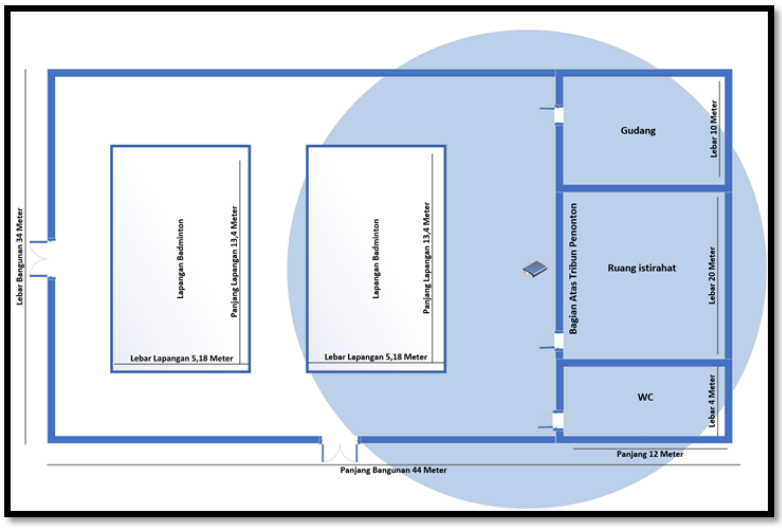

Figure 9. Training center topology

Based on Figure 9, the modeling above shows that there is one SIM Card Modem connected to the internet. This modem serves to spread the internet network into one room with a range of up to 15 meters from its installation point. This internet network is designed to facilitate faster uploading of trainees' health test results, and can be used to support various events held at the Training Center. As such, it not only improves internet accessibility, but also supports various important activities taking place in the area.

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The following hardware is used in the Soccer Tribune as follows :

Figure 10. Modem SIM Card 4G LTE

Table 5. 4G LTE SIM Card Modem Specifications

Connection Type	4G LTE Cat.12
Transmission Level	500 Mbps
Card Slots	1 (One)
USB Port	1 (One)

5. Conclusion

The following are the conclusions from the research on the design of network communications at JASDAM II Sriwijaya:

1) This research successfully designed a communication network that covers three main points in JASDAM II Sriwijaya, namely the Main Building, Football Tribune, and Training Center. This design was made to support the communication and internet needs for army members, administrative staff, as well as general visitors, by combining wired and wireless networks.
2) This research also managed to overcome problems that previously occurred, such as the lack of internet coverage in some areas and the inability of some rooms to utilize existing network facilities. With a more structured design, the implemented network provides a more optimal and equitable solution.

Overall, this communication network design provides a significant solution in supporting the operations of JASDAM II Sriwijaya, as well as improving the quality of internet services at various key points.

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