



## Design of Wireless Computer Network Infrastructure in Implementation of Kemendikbud Distributed Information Systems in Singingi Kuantan Islamic University

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### ABSTRACT

The development of an integrated computer network is very important for the purpose of this research is to be able to build and monitor the performance and computer network of the Kuantan Singingi Islamic University (UNIKS) specifically for the lecturer LAN network which is connected to the SISTER RISTEKDIKTI local server on the UNIKS campus which has been built on the Cisco Packet Tracer simulator. and airLink simulation, this computer network design will use Wireless Media as an Access Point in each unique building so that each lecturer can access Sister without having to go to the admin sister psd who is in bakasi. The beginning of this research by means of storing the situation for access to the special computer network for sisters is very limited, the use of computer networks has not been maximized because the computer network infrastructure of Sister UNIKS is only found in the BAKASI-UNIKS building and can be accessed in that building. In carrying out the process of analyzing and designing Sister's computer network infrastructure using the Network Development Life Cycle (NDLC) Method. Lecturers and several stakeholders at the Kuantan Singingi Islamic University psd Sister in developing Computer Network Infrastructure are very supportive of integrating all existing buildings in the UNIKS environment for the purposes of Lecturer Certification carried out at the Ministry of Education and Culture SISTER.

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## 1. Introduction

The importance of each university in providing effective services to support the activities of lecturers who will apply for certification is not obliged to fill in the sister research and technology education application and in general, each lecturer has various information related to tridharma activities, ranging from educational background, activities, research activities, activities. community service, and other supporting activities [1]. The Directorate of Research and Community Service (DRPM) encourages and facilitates lecturers in carrying out activities and community service in order to support the improvement of the quality of higher education, and programmed and sustainable people's welfare [2]. Through SISTER, each lecturer can build a portfolio that compiles all the tridharma activities that have been compiled. Through SISTER, the portfolio is used for lecturer career development processes. The data in the portfolio can be claimed in the credit production process, certification and other processes. Then the assessor / reviewer measures the claimed activities and products [1]. The rapid demand for lecturers at the Kuantan Singingi Islamic University in carrying out the filling of the sister research and technology education in an integrated manner can be done anywhere within the scope of the campus which so far can only fill in the sister ristekdikti application in the Bakasi Uniks building, so that lecturers who will fill in the sisters ristekdikti must go to the bakasi building and report to admin psd ristekdikti sister. Information technology in various fields of life provides benefits to be utilized appropriately and effectively. Strengthen the plan to outline step by step so that the administration remains uniquely well executed and the achievement of a unique vision and mission and the Strategic Plan of the Kuantan Singingi Islamic University



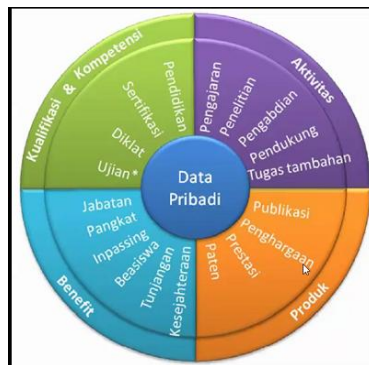


Fig 1. Lecturer Profile Data on Sister Ristekdikti

2. Methods

In designing a wireless Computer Network Infrastructure. The researcher built a wireless computer network design system to connect all buildings within the Kuantan Singingi Islamic University, a wireless network design that was built using 5 Ghz wireless radio and an Access Point in a 2.4 Ghz building to connect the buildings with the Sister Ristekdikti server, to get Accuracy of data and design information is carried out in the simulation, the first is using the AirLink application to get the coordinates and distance between buildings, then using Cisco packet tracer as a wireless network infrastructure design media. and techniques for developing efficient and affordable wireless computer network infrastructure at the Kuantan Singingi Islamic University. In this study using the Network Development Life Cycle (NDLC) method. NDLC itself is a process cycle in the form of phases or stages of the mechanisms needed in a development process design or development of a computer network system [3] - [4] NDLC is one of the methods used in network method development. Where NDLC has six (6) stages, the stages in question are as follows:

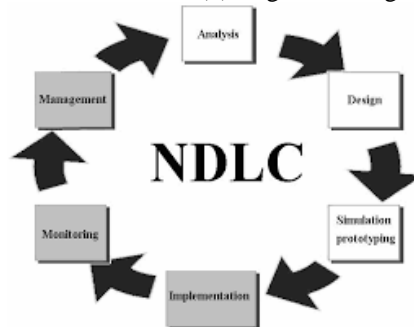


Fig 2. Lecturer Profile Data on Sister Ristekdikti

- A. Analysis, analysis is the first stage carried out, including problem analysis, use analysis, and network topology analysis at the Kuantan Singingi Islamic University;
- B. Design, design is the second stage carried out, in which at this design stage a depiction of the distance between buildings, and a network scheme at certain points proposed at the Kuantan Singingi Islamic University will be drawn;
- C. Simulation Prototyping, in the third stage carried out is, building a simulation into a wireless network prototype at the Kuantan Singingi Islamic University, from the information and data obtained in the previous stages, this simulation was built using an application from Cisco Netacad, namely Cisco Packet Tracert v7.3;
- D. Implementation, in the fourth stage the researchers carried out, the design specifications at the Kuantan Singi Islamic University that would be carried out included the tools to be used, the server installation and WLAN network configuration installation as well as the hardware network installation (hadware);
- E. Monitoring, then the fifth stage, the researcher carries out the monitoring stage to carry out testing of the network infrastructure that has been implemented / implemented at the Kuantan Singingi Islamic University;
- F. Management, at this stage of the management stage regulates policy issues and regulates system problems so that the system that has been built can be implemented properly and safely.



### 3. Result and Discussion

#### 3.1. Knowledge Base Analysis

In the design analysis begins, the first stage is to simulate the distance from the center to several points that will be connected directly to the wireless radio center then see how high the radio is safe to use without interference and how the quality of wireless data transmission with the specified tool, in this study there are 6 The point that will be connected directly to the center, this point is interpreted as buildings in the Kuantan Singingi Islamic University

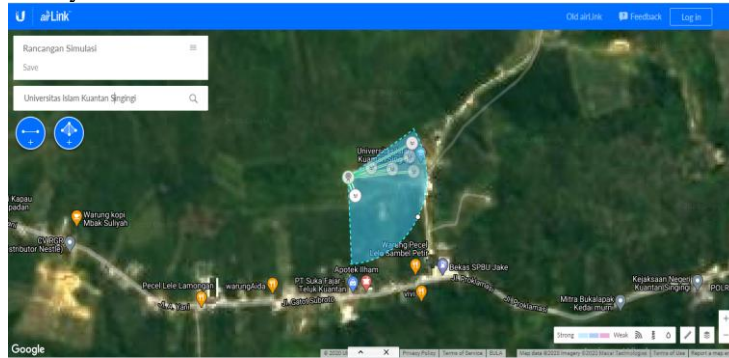


Fig 3. Points connected to central

In Figure 3. This simulation uses the online application from AirLink, which can be accessed at <https://link.ui.com/>. Here we can create several points that will be directly connected to central. In Figure 3. We can see how the center is connected to a point in the gsg building, at the center using a product from the ubiquite type liteAP Ac, the central radio is located at a height of 14 meters on a tower in the engineering faculty, with that height safe from interference. Furthermore, the location of the radio is at -0.507889.101.503086 with an output power of 24 dBm and a 20Mhz channel, the distance between the central and the GSG building is approximately 107 m.

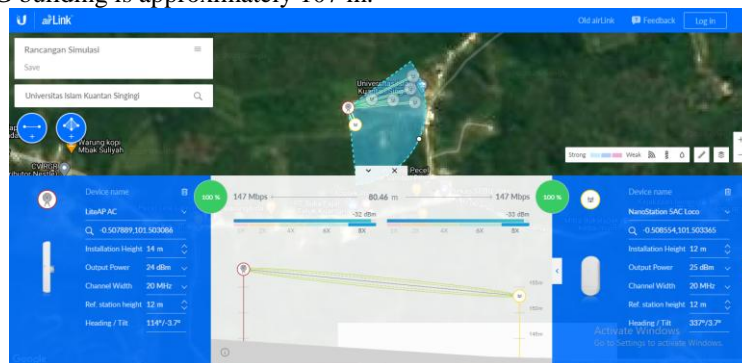


Fig 4. Analysis from Central to GSG Building

In Figure 4. It can be seen that central is connected to the FIS building point with a distance of less than 100m. the radio receiver in the fis building uses the LiteBeam 5AC Gen2 type from ubiquit, the height of the radio is around 5-6 meters to get the best results without interference. With 25 dBm output power and 20 MHz channel.

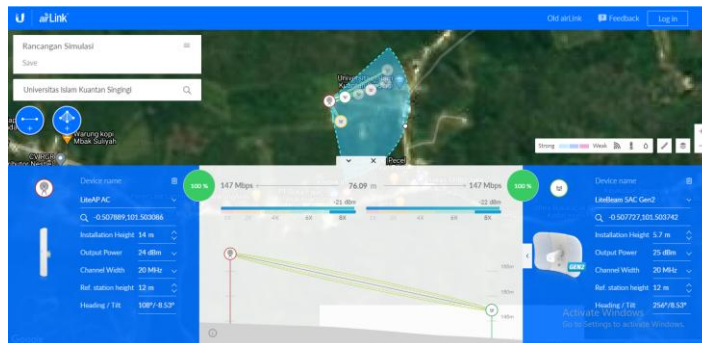


Fig 5. Analysis from Central to FIS Building

If seen in Figure 5. There is no difference with the radio receiver in the Fis building, it's just that the location of the radio in the Faperta is recommended at a height of 7-9 meters to get a safe distance without any interference.

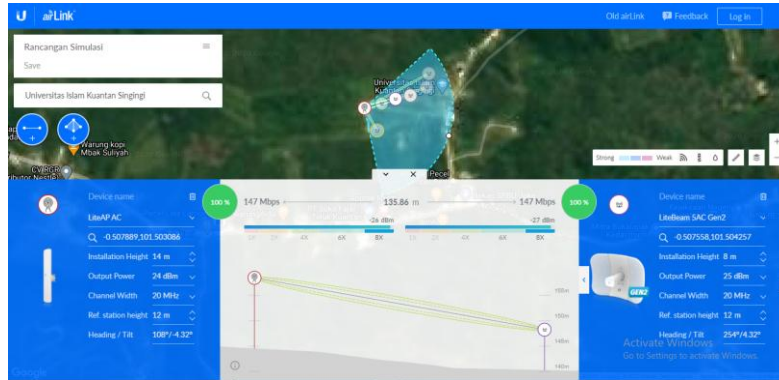


Fig 6. Analysis from Central to FAPERTA Building

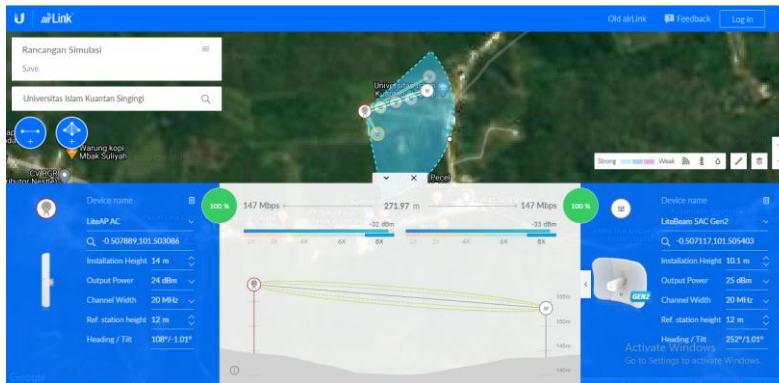


Fig 7. Analysis from Central to BAKASI Building

The distance from the center which is located in the engineering faculty with the BAKASI-Uniks building ranges from 270-280m and we can see this in Figure 6. The height of the radio receiver is bakasi as high as 9-11m to get a safe distance.

### 3.2 Design and Design Simulation

From the results of the design analysis, then start with the hardware design in this study to achieve the objectives of this study as well as the network topology to be built and the concept of the lecturer wireless network at the Kuantan Singingi Islamic University.

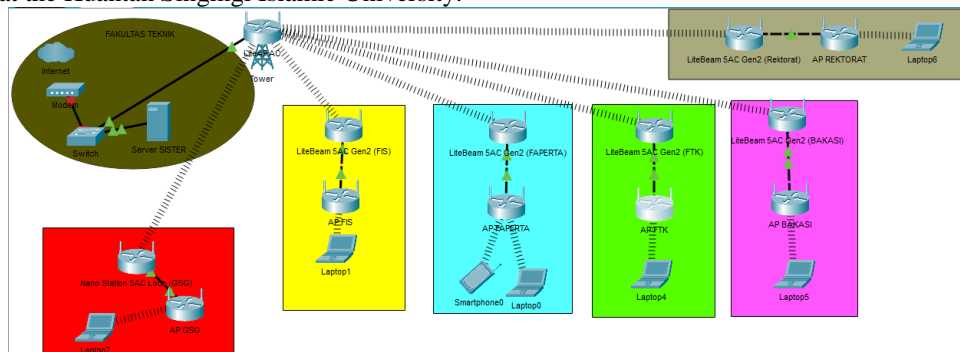


Fig 8. Topology of Hardware Design

In this topology design, researchers use a point to multipoint system where the Point to Multipoint topology is a common network architecture for outdoor wireless networks to connect multiple locations to a single central location. In a point-to-multipoint wireless Ethernet network, all remote locations do not



communicate directly with each other but have a single connection to the central network where one or more base stations are usually located [5]. we can see in Figure 7. The server will be located in the engineering faculty building - Uniks. Then the server is connected using the STP CAT 7 cable to the wireless radio transmitter at a height of 12 m in the tower and later the radio transmitter will be connected to 6 points / buildings then each of these points will distribute bandwidth / information to the access point (AP) using a UTP cable CAT 7 then the AP supplies to the enduser via a wireless local network. Each building has a different network using bridge technology on the router / radio. Wireless Bridge is a hardware component used to connect two or more networks (LAN or part of a LAN) physically and logically [6].

Furthermore, each of these devices will be given each a network address and subnet mask as well as a default gateway, in order to facilitate the research an addressing table is created containing the network interface on the device, we can see in table 1

**Table 1.**  
Table Addressing point to multipoint from the server

Device	Interface	Ip Address	Subnet Mask	Default Gateway
Modem	Fa0/0	192.168.100.1	255.255.255.0	N/A
Switch 1	N/A	VLAN1	N/A	N/A
Server	Fa0/0	192.168.100.88	255.255.255.0	192.168.100.1
LiteAP AC	Fa0/0	192.168.100.55	255.255.255.0	192.168.100.1
	Wlan	192.168.77.254	255.255.255.0	N/A
Nano Station(GSG)	Wlan Bridge - WISP	192.168.77.2	255.255.255.0	192.168.77.254
	Fa0/0	192.168.14.1	255.255.255.0	N/A
LiteBeam SAC(FAPERTA)	Wlan Bridge - WISP	192.168.77.3	255.255.255.0	192.168.77.254
	Fa0/0	192.168.15.1	255.255.255.0	N/A
LiteBeam SAC(FTK)	Wlan Bridge - WISP	192.168.77.4	255.255.255.0	192.168.77.254
	Fa0/0	192.168.16.1	255.255.255.0	N/A
LiteBeam SAC(BAKASI)	Wlan Bridge - WISP	192.168.77.5	255.255.255.0	192.168.77.254
	Fa0/0	192.168.17.1	255.255.255.0	N/A
LiteBeam SAC (FIS)	Wlan Bridge - WISP	192.168.77.6	255.255.255.0	192.168.77.254
	Fa0/0	192.168.18.1	255.255.255.4	N/A
LiteBeam SAC (REKTORAT)	Wlan Bridge - WISP	192.168.77.7	255.255.255.0	192.168.77.254
	Fa0/0	192.168.19.1	255.255.255.0	N/A

The order of the addressing table is in accordance with the topology that has been designed as shown in Figure 7. So that later the device will be adjusted to the addressing table. At point to multipoint, the ac liteap device acts as a central connection with other devices so that in a single network position, each device will have its own local network that is different from the other networks but will still be able to access the Sister Ristekdikti application.

**Table 2.**  
Table Addressing local network for each device

Device	Interface	Ip Address	Subnet Mask	Default Gateway
AP FIS	Fa0/0	192.168.18.2	255.255.255.4	192.168.18.1
	WLAN	192.168.110.1	255.255.255.0	N/A
AP GSG	Fa0/0	192.168.14.2	255.255.255.4	192.168.14.1
	WLAN	192.168.111.1	255.255.255.0	N/A
AP FAPERTA	Fa0/0	192.168.15.2	255.255.255.4	192.168.15.1
	WLAN	192.168.112.1	255.255.255.0	N/A
AP FTK	Fa0/0	192.168.16.2	255.255.255.4	192.168.16.1
	WLAN	192.168.113.1	255.255.255.0	N/A
AP BAKASI	Fa0/0	192.168.17.2	255.255.255.4	192.168.17.1
	WLAN	192.168.114.1	255.255.255.0	N/A
AP REKTORAT	Fa0/0	192.168.19.2	255.255.255.4	192.168.19.1
	WLAN	192.168.115.1	255.255.255.0	N/A

#### 4. Conclusion

With the construction of a special network for lecturers and education personnel, it makes it very easy for lecturers and education personnel to implement and update the tridharma of higher education in the system, both for the Ristekdikti, SIAKAD and others anywhere in the campus environment of the Kuantan Islamic University to sing without having to go to the BAKASI building and meet the admin. This special security also remembers that the network is only specifically for lecturers and education personnel, not students or public in that network.

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