Fishing Boat Safety Monitoring System Based *Internet Of Things*

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Abstract

UPP Pangandaran is a Technical Organizing Unit located at Kidang Pananjung Street no. 229, Pangandaran Regency, West Java Province. UPP Pangandaran Office has task to carrying out supervision and law enforcement in sea voyage and to coordinate with government in the port. based on the current problems. UPP pangandaran experience difficulty to monitor fishing boats sailing in the ocean. and they also have difficulty obtaining information when there is an emergency in the ocean. This monitoring system is a system used to monitoring and supervision so that authorized officers can find out who are the fishermen and where ships are sailing in the ocean so that in the event of an emergency at sea, the problem will be quickly overcome. By using the GPS Module to get the position of the ship, the NRF24 module for sending data from the ship to the receiving station, the panic button for emergency reporting and the Sim800 module for sending data to the web server. Based on the tests conducted on the system built it can be concluded that this application can help and facilitate UPP Pangandaran in monitoring fishing boats that are sailing and this application can help UPP Pangandaran in obtaining information in the event of an emergency in the ocean.

Keywords: Monitoring System, monitoring, GPS, emergency, Pangandaran

1. Introduction

Ministry of Transportation, Directorate General of Sea Transportation, UPP Pangandaran is a Technical Organizing Unit located at Kidang Pananjung Street no. 229, Pangandaran Regency, West Java Province. UPP Pangandaran Office has task to carrying out supervision and law enforcement in sea voyage and to coordinate with government in the port.

Based on the results of interviews with Mr. Adi Sumpena as the airport official said that the syahbandar pangandaran had difficulties in the process of monitoring ships, especially fishermen who were sailing. UPP Pangandaran was unable to find out who were the fishermen who were on a voyage and what ships were sailing. UPP Pangandaran also has another obstacle, namely the delivery of information when fishermen are experiencing an emergency in the ocean running slowly. Information is often received based on reports from ships passing around and seeing the incident. So that in the event of an accident at sea it will cause casualties due to help that arrives late.

The monitoring system is a system that is used to conduct monitoring and supervision so that authorized officers can find out who are the fishermen and what ships are sailing in the ocean so that in the event of an emergency at sea, the problem will be quickly overcome. By utilizing internet of things technology, an application will be made that can monitor fishing vessels that are sailing using GPS Modules as a tool to get ship position, NRF24 module as a tool for sending data from ships to receiving stations, panic buttons to report emergency conditions Sim800 module for sending data to the webserver.

Based on the above problems, UPP Pangandaran requires a monitoring system to monitor ships that are sailing and provide information in the event of an emergency at sea. so the researcher will conduct a study entitled "Fishing Boat Safety Monitoring System Based On Internet Of Things"

2. Theoretical Basis

2.1 Software Development Methods

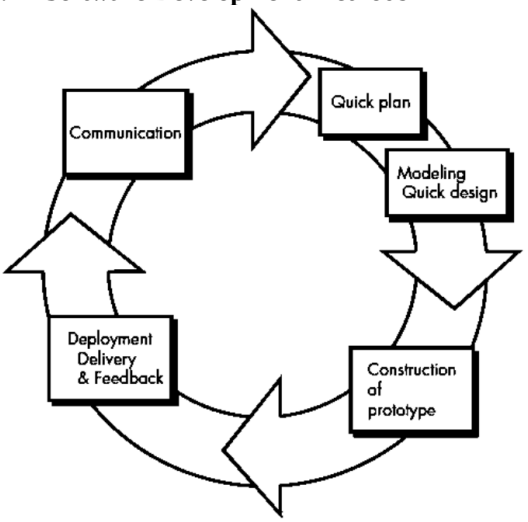

Figure 1 Software Development Methods

Software development methods used in this panelitian is prototyping methods. This method has several stages:

1. Communication
   At this stage, the communication process related problem that is happening in the study were taken.
2. Quick Plan
   At this stage, the process of designing a prototype to illustrate the tools to be built that are tailored to the problems that occurred
3. Quick Modeling Design
   At this stage, prototype modeling process to assist in making the system
4. Construction of Prototype
   At this stage prototype that has been made will be evaluated according to user needs based on the design that has been modeled before.
5. Deployment Delivery and Feedback
   At this stage the system has been built to be done by the user trials. If the user is not satisfied, it will be improved according to user needs.

2.2 *Internet Of Things*

Internet of things (IOT) is a concept that aims to provide broad benefits from internet connectivity that is always connected at all times and has remote-control capabilities and the like to objects in the real world such as the production of food, electronics and anything including live object connected to local and global networks that are connected using sensors that are embedded and always active. The benefits of using Internet Of Things are as follows

Benefits in getting from the use of the internet of things, namely

1. The system works alone without knowing the time,
2. Facilitate human information
3. Facilitate the process of Controlling devices
4. Reduce the risk of user error in the system
5. The system can work alone every time

2.3 *Arduino*

Arduino is an open source electronic board that has an AVR type controller that is produced by a company called Atmel based in San Jose California. A microcontroller is an integrated circuit that can be programmed by users using a computer in order to be able to read inputs, process these inputs and produce output as desired by the user. So the microcontroller functions as the brain that controls an electronic circuit. The advantages of Arduino compared to other similar electronic boards are:

1. No need to chip device programmer
2. Own means of USB communication
3. Relatively simple programming language
4. Having a ready-made modules

Arduino models used in this study is the Arduino Uno. Brief specification Arduino Uno can be seen in Table 1.

Table 1. Specifications Arduino Uno

Specification	Value
Microcontroller	ATmega328
Digital I / O pin	14
Analog pin	6
DC current per I / O pin	50mA
DC current when 3.3V	50mA
Flash memory	32 KB
SRAM	2 KB
EEPROM	1 KB
Clock speed	16 Hz

2.4 *GPS module*

Figure 2 GPS Module 6m Ublox Neo V2

Global Positioning System is a system that is useful for determining the location of an object where ever on the surface of the earth, whenever necessary and in any weather conditions. This process is assisted by various satellites clicking orbit above the earth.

While the device functions to receive signals transmitted by satellites that can be used by general users or the so-called GPS Tracker GPS Tracking, using this device, it can allow users to track the position of an object on the earth in real-time.

GPS modules NEO-6 series are included in the category that serves as a standalone GPS receivers (Global Positioning System Receiver) that can detect and capture and process the signals obtained from satellite navigation. This module can process up to 50 signal channels quickly so that the time required to determine the position from off state for less than 1 second. High performance is obtained with the use of specialized processors that collect satellite data which has up to 2 million correlator that can process the data time and frequency massive satellite very quickly. Brief specification 6M GPS Neo v.2 can be seen in Table 2.

Table 2. Specifications 6M GPS Neo V.2

Specification	*Value*
update rate	up to 5 Hz
Accuracy	
position	2.5 m CEP
SBAS	2.0 m CEP
sensitivity	
Tracking	-161 dBm
Cold starts	-147 dBm
Hot starts	-156 dBm

2.5 *Radio Module NRF24*

Figure 3 Module NRF24

NRF24L01 module is a module for wireless data sender / wireless energy saving, which uses radio waves with a frequency of 2.4 GHz as a medium for data traffic. Each module can send and receive data. nRF24L01 has a speed of up to 2Mbps with a choice of options date rate of 250 Kbps, 1 Mbps, and 2 Mbps. Transceiver consists of integrated frequency synthesizer, power amplifier, crystal oscillator, demodulator, modulator and Enhanced protocol ShockBurst ™ engine. output power, frequency channels, and setup protocols are easily programmed via the SPI interface. To add to the range able to use the power booster (power amplifier) and use a larger antenna. Brief specification NRF24 module can be seen in Table 1.

Table 3. Specifications Table Nrf24

Specification	Value
Maximum output power	+20 dBm
Emission mode current (peak)	115 mA
Receive Mode Current (peak)	45 mA
Power-down mode current	4.2 uA
Sensitivity mode 2Mbps in received	-92 dBm
Sensitivity mode 1Mbps in received	-95 dBm
Sensitivity 250kbps mode in received	-104 dBm
PA gain	20 dB
LNA gain	10 dB
LNA noise figure	2.6 dB
Antenna Gain (peak)	2 dBi

2.6 *module Sim800l*

Figure 4 Module SIM800L

Sim 800l is a GSM module offers 2G GSM network and GPRS data networks. Backed by its small size and low power usage. This module uses a current of 1mA sat in the state of sleep. This module can communicate with the microcontroller using the UART port. Sim800L module features offered are:

1. Supports Quad-band 850/900 / 1800/1900 MHz Network
2. Supports Multislot GPRS class 12: max. 85.6kbps (down load / up-load)
3. GPRS mobile station class B
4. Supports 2.8V to 5.0V logic level
5. Low power usage
6. Compact module size
7. Using standard sim size

3. Research Contents

3.1 Proposed System

The system proposed workflow describes the proposed system so that the existing process can run faster. The proposed system can be seen in Figure 5

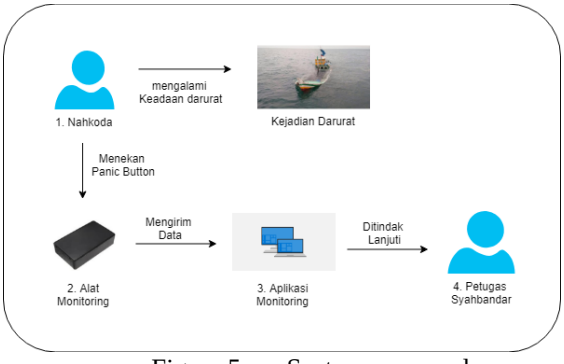

Figure 5 System proposed

Based on Figure 3.2 The following is an explanation of the emergency reporting system proposed.

1. The master experiencing an emergency at sea presses the panic button on the monitoring tool
2. After the panic button is pressed, then the monitoring tool will send latitude, longitude, status and time.
3. The monitoring application will display the position of the ship in the map with supporting data such as vessel data, fisherman data and the latest status.
4. The officer will follow up on the information received through the monitoring application.

3.2 Architectural System

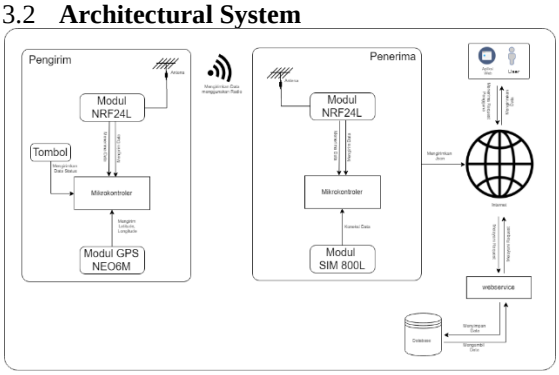

Figure 6 Architectural System

1. The device is divided into two parts, the sender will be located on board and reception which will be located on land. Here is an explanation of the functions and features of the device.
   a. Sender
      1) As Arduino Uno microcontroller serves as a tool to convert analog signals received from the sensors connected to a digital signal
      2) Module Global Positioning System (GPS) will receive signals from the satellites and process them to calculate the latitude and longitude position of fishing vessels
      3) Module Nrf24l01 duty to transmit the data collected by the microcontroller from the sensor using radio waves with a frequency of 2.4Ghz with an antenna that serves as a tool to emit a signal.
      4) The button that is used as an emergency button that will serve as a trigger to change the status of the fishing boats were sailing.
   b. Receiver
      1) As Arduino Uno microcontroller serves as a tool for processing data received
      2) NRF24L01 module is responsible for receiving data sent from the receiver using a radio signal with a frequency of 2.4Ghz
      3) Module Sim800l duty to transmit the received data to a web server and stored into a database via GPRS network.
2. The web application and the user will pick up the requested data already stored in the database through the Internet

3.3 Icon Analysis

Icon analysis is intended to determine the intent and purpose of the Icon that will be used in the system. Analysis Icon used can be seen in Table 4.

Table 4. analysis Icon

No.	Name	Status	Icon used
1	Normal icon	Normal	
2	Warning icon	Danger	

3.4 Diagram Context

Context diagram is a diagram illustrating the relationship between the system and other entities outside the system. Context diagram is shown in Figure 5.

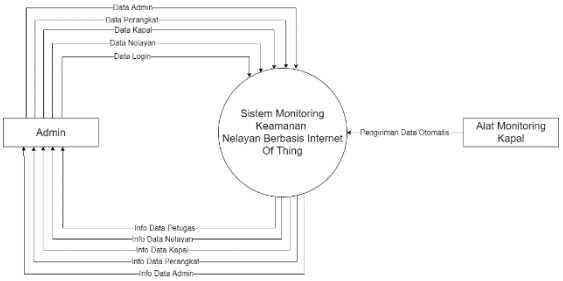

Figure 7 diagram Context

3.5 Data Flow Diagram (DFD)

Data Flow Diagram is a system diagram illustrating the logical workflow applications ranging from the top level down to the lowest level. Data Flow Diagram Level 1 can be seen in Figure 8.

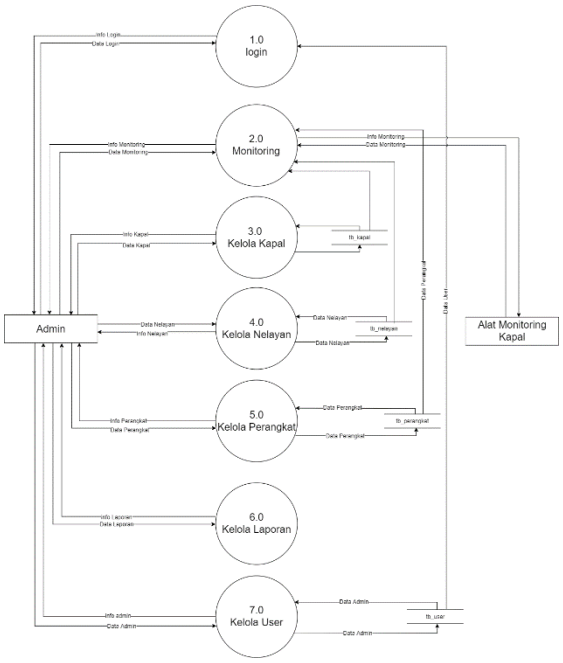

Figure 8 DFD Level 1

3.6 Relationship Diagram

Relationship diagram is part of database design that describes the relationship of each table in the database. Relationship diagram can be seen in Figure 9.

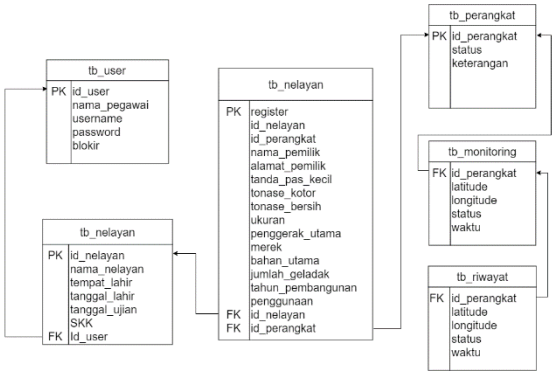

Figure 9 Relationship Diagram

3.7 Schematic Device

Describing the relationship between devices that are used to enable the exchange of data between modules used

3.7.1 Sender Schematic

The schematic design of the sending device can be seen in Figure 10

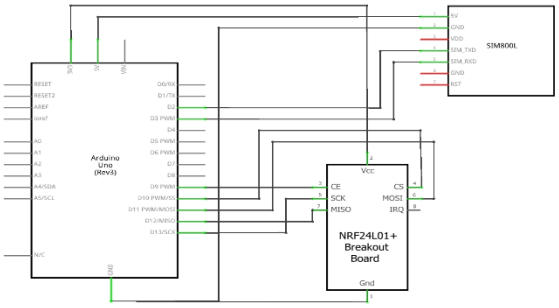

Figure 10 Schematic Sender

3.7.2 Receiver Schematic

The schematic design of the receiver device can be seen in Figure 11

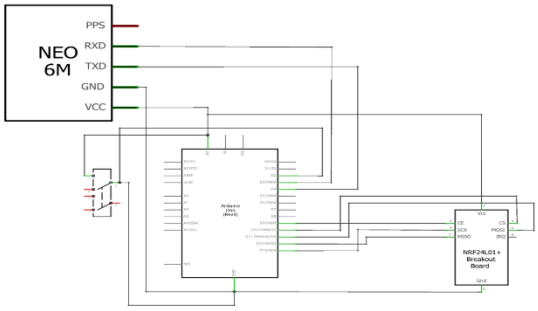

Figure 11 Receiver Schematic

3.8 Menu Design

Menu design is needed to facilitate application usage limits. With the design of this menu the user can operate the various applications without any difficulty because the menus and features are provided in accordance with the requirements and in accordance with the access rights in the work unit. The design of the menu structures can be seen in Figure 12

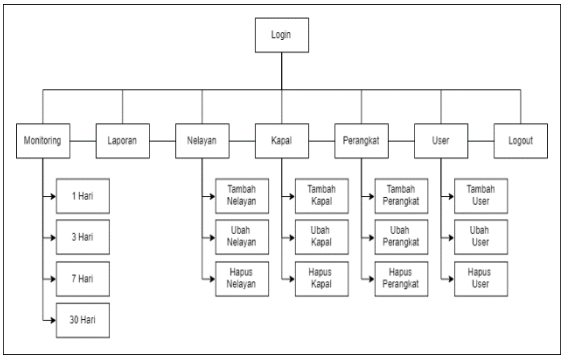

Figure 12 Menu Design

3.9 Interface Design

The interface design is the look is still shaped design programs that will be implemented into the application when the application is made.

3.6.1 Login Interface

Login interface on shipping safety monitoring system based on Internet Of Things fishermen can be seen in Figure 13.

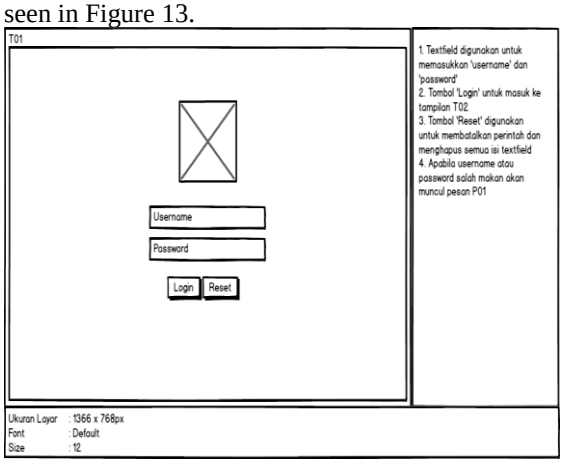

Figure 13 Login Interface Design for Fishing Boat Safety Monitoring System Based On Internet Of Things

3.6.2 Monitoring Interface

Monitoring interface for Fishing Boat Safety Monitoring System Based On Internet Of Things can be seen in Figure 14.

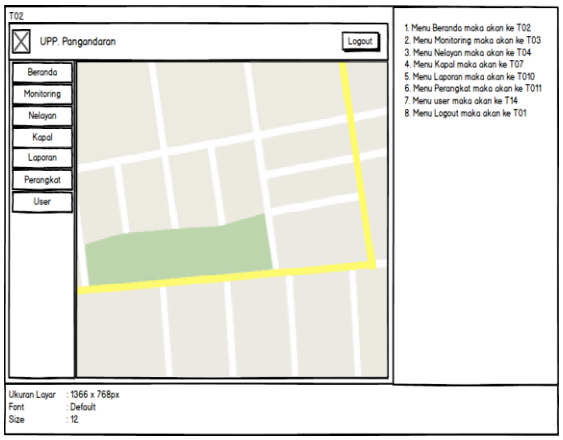

Figure 14 Monitoring Interface Design for Fishing Boat Safety Monitoring System Based On Internet Of Things

3.10 Interface Implementation

Interface implementation is a view that has been applied to the program in its finished form and may be used by the user to the appropriate air-interaction design that has been created previously.

3.7.1 Login Interface

Login interface implementation for Fishing Boat Safety Monitoring System Based On Internet Of Things can be seen in Figure 15.

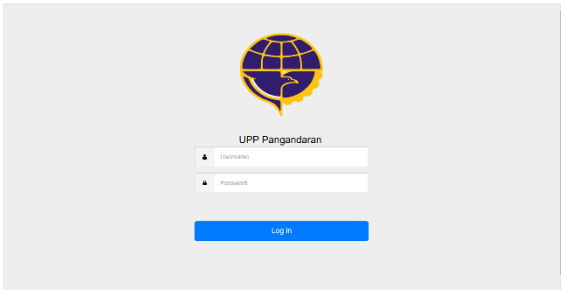

Figure 15 Login Interface Design For Fishing Boat Safety Monitoring System Based On Internet Of Things

3.7.2 Monitoring Interface

Monitoring interface implementation for Fishing Boat Safety Monitoring System Based On Internet Of Things can be seen in Figure 16.

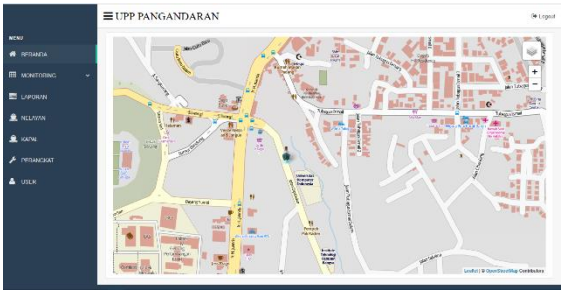

Figure 16 Monitoring Interface Design for Fishing Boat Safety Monitoring System Based On Internet Of Things

3.11 Implementation Devices

In the implementation process of security for Fishing Boat Safety Monitoring System Based On Internet Of Things, of course, requires hardware and software. The following is a description of the hardware and software used.

3.8.1 Computer Hardware

Construction of Fishing Boat Safety Monitoring System Based On Internet Of Things need hardware in order to run the system properly. Computer hardware used can be seen in table 5

Table 5. Hardware Implementation Computer

No.	Device	Specification
1	processor	Speed 2.2 GHz
2	Hard drive	500 GB
3	RAM	2 GB
4	monitor	Monitor 16 ", 1024 x 768 resolution
5	connectivity	Internet
6	keyboard	Standard
7	Mouse	Standard

3.8.2 Iot Hardware

IOT hardware necessary for the construction of the for Fishing Boat Safety Monitoring System Based On Internet Of Things can be run in accordance with its development objectives. Iot hardware can be seen in Table 6.

Table 6. Hardware Implementation Iot

No.	hardware	Type
1	microcontroller	Arduino Uno R. 3
2	GPS	Neo 6M v2
3	Data Transmitter	NRF24L01 and SIM800L

3.8.3 Software

The software used for Fishing Boat Safety Monitoring System Based On Internet Of Things can be seen in Table 7

Table 7. Software Implementation

No.	Software	Specification
1	Computer Operating Systems	Microsoft Windows 7
2	browser	Google Chrome, Mozilla Firefox
3	DBMS	MySQL
4	web Hosting	Cpanel

3.12 Testing Systems

System testing conducted to determine whether the system is built fit for use or not. Tests carried out on three aspects: blackbox, hardware and user

3.9.1 Conclusion Testing Blackbox

Based on the results of black box testing is done, it can be concluded that the Fishing Boat Safety Monitoring System Based On Internet Of Things have gone through the stages of repair on each process so as to produce the expected output.

3.9.2 Conclusion Testing Hardware

Based on the results of hardware testing conducted by the above test, it can be deduced that the hardware for Fishing Boat Safety Monitoring System Based On Internet Of Things have been running as expected.

3.9.3 Conclusion User Testing

Based on user testing has been done before it can be concluded that the monitoring system is in accordance with the expected goals of helping and facilitate UPP Pangandaran in conducting monitoring activities of fishing vessels who are sailing and can help UPP Pangandaran in obtaining information in the event of an emergency at sea,

4. Cover

4.1 Conclusion

Based on the results obtained in this study, it can be concluded as follows:

1. This application can help and facilitate UPP Pangandaran in carrying out monitoring activities of fishing boats that are sailing
2. This application can help UPP Pangandaran to get information if an emergency situation happens in the sea

4.2 Suggestion

Based on the results obtained in this study, it still has deficiencies, therefore it is offered to add things that can complement in the future, including :

1. Implementing icon for different situation like in normal condition and emergency condition
2. Adding better Power amplifiers and antennas to increase scope area for monitoring activities.

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