Smart Fishing Vessel Monitoring for Handling of Illegal Fishing in the EEZ Of Indonesia Using WSN TDMA

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Abstract. Illegal fishing which until today is still a very serious attention by the government due to resource depletion can lead to fish in the EEZ of Indonesia. It was due to conduct surveillance in Indonesian waters is difficult where Indonesia is an archipelago with a lot of beaches. Wireless Sensor Network (WSN) used for monitoring, tracking and controlling short distance and long distance. Wireless Sensor Network The randomized in a particular region to get comprehensive information. However, namely the possibility of data collision will occur in the data transmission process if performed simultaneously. So the application of methods of TDMA (Time Division Multiple Access) as a channel access method for networks together, allowing users to be able to share signals with time slots that are not the same in sharing the same frequency channel. Smart fishing Vessel Monitoring function for handling the problem of illegal fishing, where the latter any fishing vessels will be monitored from the location, the number of crew, cargo and fishing licenses.

1. Introduction

The Indonesian archipelago has a very wide territorial waters. A wealth of marine resources, especially fish course must be maintained to avoid a crisis of fish resources due to one of the sources of income of Indonesian people who live on the coast of course depend on the availability of fish resources. The main problem faced by Indonesia in maintaining the wealth of fish resources is the issue of illegal fishing which until today is still a very serious attention by the government because it has not obtained the maximum settlement solutions. It was due to conduct surveillance in Indonesian waters is difficult where Indonesia is an archipelago with a lot of beaches. The area is a point prone to these problems lies in the Sea Arafuru

Many factors contribute for illegal fishing on EEZ of Indonesia. One of them is a legal loophole contained in Law Number 31 of 2004 concerning Fisheries in Article 29. In the provision of Article 29 paragraph (2) of Law No. 31 of 2004 on Fisheries said that a person or a foreign legal entity that can enter the EEZ of Indonesia to conduct fishing effort by international agreement or the provisions of applicable international law. The provisions of Article 29 paragraph (2) of Law No. 31 of 2004 on Fisheries seemed to open the way for the fisherman or foreign entity to enter the Indonesian EEZ to then explore and exploit the wealth of biodiversity in the EEZ of Indonesia.

But it can not be blamed because it is one form of application of the rules set forth in the Law of the Sea Convention of 1982 which is one of the international conventions which have been ratified by Indonesia through Law No. 17 of 1985. In the provisions of Article 62 paragraph (3) and (4) Law of the Sea Convention of 1982 requires coastal states to grant permissions to other countries to exploit the wealth of biodiversity in coastal states EEZ if there is a surplus in the utilization of biological
resources by state beach. Foreign fishing vessels that have access rights to the EEZ of a coastal state must obey the laws coastal countries concerned, which may contain the obligations and requirements regarding various things.

Based on the problems of illegal fishing in the EEZ of Indonesia, the implementation of the Smart Fishing Vessel Monitoring is one way that can be applied in the EEZ of Indonesia by creating a device that will be used every seagoing ship Indonesia. Such devices can be directly accessed at Indonesian ports centralized in one server and is equipped with high security system so that only interested parties who obtain access rights. This is an effort which will facilitate the handling of Indonesia in addressing the problem of illegal fishing.

2. The problem

   From the background of the problem, then the problem is formulated as follows:
   a. How Indonesia deal with the problem of illegal fishing?
   b. How to implement the Smart Fishing Vessel Monitoring devices that will be applied on any vessel sailing in the EEZ of Indonesia to be accessed and monitored directly in each port, and can be accessed directly on the central government.

3. Exclusive Economic Zone Indonesia

   The definition of EEZ is contained in the provisions of the 1982 Sea Law in Article 55 and Article 57, namely the convention as an area outside and adjacent to a territorial sea, not exceeding 200 nautical miles from the baseline from which the territorial sea is measured (i.e. 200 miles sea which is not measured from the outer sea boundary of the territorial sea).

   Other than that the definition of the Indonesian Exclusive Economic Zone based on law number 5 of 1983 in article 2, namely: "Indonesian Exclusive Economic Zone is the route outside and bordering waters of Indonesia as defined under the Act in force on Indonesian waters covering the sea floor, the ground underneath and the water above the outer limit of two hundred nautical miles measured from the base of the waters of Indonesia".

![Figure 1. Map of Potential fish in Indonesian waters](image)

4. Illegal Fishing

   Illegal fishing or illegal fishing according to the IPOA-IUU Fishing (International Plan of Action-IUU, Unreported and Unregulated Fishing) is the activity of fishing carried out by a particular country or foreign vessels in waters that are not a jurisdiction without the permission of the state which has jurisdiction or the fishing activities contrary to the laws and regulations of the country (activities conducted by national or foreign vessels in waters under the jurisdiction of a state, without the permission of that state, or in contravention of its laws and regulation).

   Illegal Fishing activities in the waters of Indonesia common are as follows:
a. Fishing by not having a license;
b. Catching fish by using a false license;
c. Fishing using prohibited fishing gear;
d. Catching fish by species (species) that are not in accordance with the permit.

Cause Illegal Fishing:
a. Increases and high demand for fishes in domestic and foreign
b. Reduced / Endless Fish Resources in other countries
c. Weak national fishing fleet
d. Permit / supporting documents issued in more than one institution
e. Weak monitoring and enforcement at sea
f. Weak offense demands and the court decision
g. There are no common vision of law enforcement officers
h. Weak regulatory and criminal provisions.

The impact of IUU fishing activities for Indonesia as follows:
a. The threat to the conservation of fish resources;
b. Recessive livelihoods of local fishing communities with small-scale fishing fleet and fishing gear is simple, because it can not compete with those involved in illegal fishing;
c. Partial loss of fish production and foreign exchange acquisition opportunities;
d. Reduced Tax State Revenue (non-tax);
e. Inhibition of Indonesia's efforts to strengthen the fish processing industry in the country, including improving competitiveness;
f. Damaging the image of Indonesia in the international arena, because foreign vessels using Indonesian flag or vessels owned Indonesian citizens do illegal fishing activities that are contrary to international conventions and agreements. It can also affect the threat of an embargo on Indonesian fishery products are marketed.

5. Smart Fishing Vessel Monitoring For Handling Of Illegal Illegal Fishing

a. Framework

![Figure 2. Framework Smart Fishing Vessel Monitoring](image-url)
b. Smart Fishing Vessel Monitoring

Smart Fishing Vessel monitoring have multiple devices as follows:
- Fish Net Smart Sensor equipped with sensors to pick the fish, the depth measuring sensor, sensor water flow and temperature control sensors. Fish Net Smart sensors will detect the type of fish, which the fish only with a certain type (big fish) that will go into the net. Nets fitted with the current flow in the net (tunnel flow), in which fish small into the nets, the small fish that do not need to be arrested can exit through the end of the net that has a small hole (located on the filling indicator).
- Smart fishing vessel monitoring equipped with a wireless sensor network Time Division Multiple Access method which will be capable of monitoring the ship along with conveyance. Smart Fishing Vessel monitoring also equipped with a security system via the https protocol with public key scheme and asymmetric key kritography.
- Wireless Sensor Network used for monitoring, tracking and controlling short distance and long distance. Wireless Sensor Network The randomized in a particular region to get comprehensive information. However, namely the possibility of data collision will occur in the data transmission process if performed simultaneously. So the application of methods of TDMA (Time Division Multiple Access) as a channel access method for networks together, allowing users to be able to share signals with time slots that are not the same in sharing the same frequency channel.
- TDMA works by making many nodes to be able to transmit data alternately, in order to avoid interference in the data transmission. In applying the TDMA method, the local clock of the entire WSN nodes need to synchronize, but there is a significant problem in wireless synchronization, since the propagation delay is too long, even in a small area. Because of this problem, will be applied to the time synchronization algorithm "Time-sync Protocol in Sensor Network (TPSN) to support TDMA method

6. Conclusions

Illegal fishing is is a problem faced by Indonesia in maintaining the wealth of fish resources in Indonesian waters (EEZ). Smart fishing Vessel Monitoring makes it easy for the Indonesian government in handling the problem of illegal fishing where the location, number of crew and fishing licenses can be monitored directly through the device.

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