

Safe Guarding the Fishermen on Indian Maritime Boundaries Using GNSS and Cloud Computing

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ABSTRACT

Recently accusations are being continuously leveled by Tamilnadu fishermen, who used to stray into the Srilankan border, about them being harassed, assaulted, shot at and chased by the Srilankan navy. Our purpose is to help the fisherman not to stray into the border. If the fisherman navigate into the border of any country, then immediately an alarm is generated which indicates that the fisherman has crossed the border. A message is relayed to the Indian coastal navy and higher authorities using GNSS and cloud computing. This proposes new system of cloud computing for saving the fisherman's valuable life and their properties from the Srilankan navy. This project makes use of cloud computing as a service, now which is used for much more major purpose. Boats and Ships use GNSS to navigate in all lakes, seas and oceans in the world. Maritime GNSS units include functions useful into water, such as "man overboard" (MOB) functions that allow instantly marking the location where a person has fallen from overboard, which simplifies their rescue efforts.

GNSS is connected into the ship/boat's self-steering and Chart plotters using the NMEA 0183 interface and also helps to improve the security of shipping traffic by enabling Automation Identification System (AIS)^[4].

Keywords

Cloud computing, Global Navigation Satellite System, International Maritime Boundary Line, Automation Identification System.

1. INTRODUCTION

The project induces the new methodology for saving the fishermen's priceless life and their properties from the Srilankan navy. This proposed new system uses cloud computing for saving the fisherman's valuable life and their properties from the Srilankan navy. This project makes use of cloud computing as a service, now which is used for much more major purpose. Cloud computing is considered as the "NEXT BIG THING". For all the major purposes, with this new technology users can access their programs and get storage space online. Our proposal is mainly focused for reducing the hardware cost and in order to avoid the hardware error and problem in tracking vessel because all the existing projects use much more hardware device which this leads to more hardware cost. First of all, cloud computing will help reduce hardware cost as businesses would no longer need to spend on advanced and expensive hardware.

India has successfully launched its first navigational satellite into orbit. IRNSS-1A is the first of seven satellite constellation to be deployed under the Indian Regional

Navigation Satellite System (IRNSS) program^[5]. The IRNSS system mainly consists of following three components namely,

1) Space Segment

2) Ground Segment and

3) User Segment.

IRNSS constellation consists of seven satellites. IRNSS is represented as independent regional navigation satellite system designed to provide position information in the Indian region and about an area of 1,500 km around the Indian mainland. IRNSS would provide a service – Standard Positioning Services (SPS) – to all users. Boats and Ships use GNSS to navigate in all lakes, seas and oceans in the world. Maritime GNSS units include functions useful into water, such as "man overboard" (MOB) functions that allow instantly marking the location where a person has fallen overboard, which simplifies to rescue their efforts.

2. PREVIOUS RELATED WORK

At present, there are few existing systems which help to identify the current position of the boats/ships using GPS/RADAR Navigation system and view them in an electronic map. This provides the most accurate and speedy method for mariners to navigate, measure quicker, and determine their location^[2]. It also enables increased levels of safety and efficiency for mariners' worldwide travel and provides accurate location or position, speed level and heading which are needed to ensure the vessel reaches its target safely. The exact location information becomes even more critical as the vessel departs from or arrives at port and a person has to watch the system for detecting the anomaly of the boats/ships. In this situation, there may be manual error to find the boats crossing boundaries of any region and also the information regarding the boundary crossing boats has to be passed on to the higher officials, coastal guards by manual communication. It helps to give them time to trace and warn the boats/ships. Another new system is GPS72H by the GARMIN which is mostly used by the fishermen. It is battery based power supply which stands for 18 hours but if the fishermen may be unfortunately missing their backup batteries then it will lead to a dangerous situation. Also another problem is this GPS72H has to be manually watched to identify whether they crossed the boundary of any region or not. There is no indication for the fishermen whether they are traced by the foreign navy^[2].

According to the project of Mr. Naveen, they have developed equipment which can stop the fuel connection to the engine of the fishermen vessel when they tend to cross the boundary of any region^[3]. They have ready chance to restart

the engine with reverse motion if not their fuel supply is permanently stopped. Hence, this system makes the vessels to be trapped nearer to boundaries and which may in turn too caught by the foreign navy officers and also this system can be applicable only to the inboard engine and not for the outboard engine based vessels.

3. METHODOLOGY

3.1 Tracking the boat

Indian maritime boundary line value is stored in GNSS of boat. At the time of movement of boat, GNSS calculates the longitude and latitude of the boat from the satellite. GNSS is connected with the alarm device. The automatic warning system includes the saved waypoint values of the display in GNSS and is checked with the constant maritime boundary values^[4]. If the result of the comparison shows the boats/vessels is beyond the other country area (area which is 1km nearer to maritime boundary) then the captain is alerted.

3.2 Alert To The GNSS Device

The alarm device generates sound with signal to the fisherman when the saved waypoints values of the display in GNSS are checked with the constant maritime boundary values. This enables the fisherman to understand that they are in danger zone and take precautionary steps.

3.3 Alert To The PC Using Cloud

Longitude and latitude position of the boat is sent to the satellite with the help of GNSS. All the information is stored from satellite to cloud^[4].

Indian coastal navy PC is connected with cloud, which instantly sends the information to the Indian coastal navy PC and PC generates the alarm when the boat/vessel stray into the other country border (area which is 1km nearer to maritime boundary). After the alarm is generated the navy guards can easily track the boat/vessel^[7].

Another good thing of our proposed system is, higher officials' PC is connected with cloud, which instantly sends the current location of the boat along with alarm sound to the higher official PC when the boat/vessel cross into the other country border^[8]. This will enable the higher official to take immediate worthwhile action to safe guard the fisherman.

This technology provides India with assured navigation service for vital civilian & Military Applications without having to depend on another country. IRNSS is the first Satellite to be launched on JULY 1; remaining 6 by 2015.

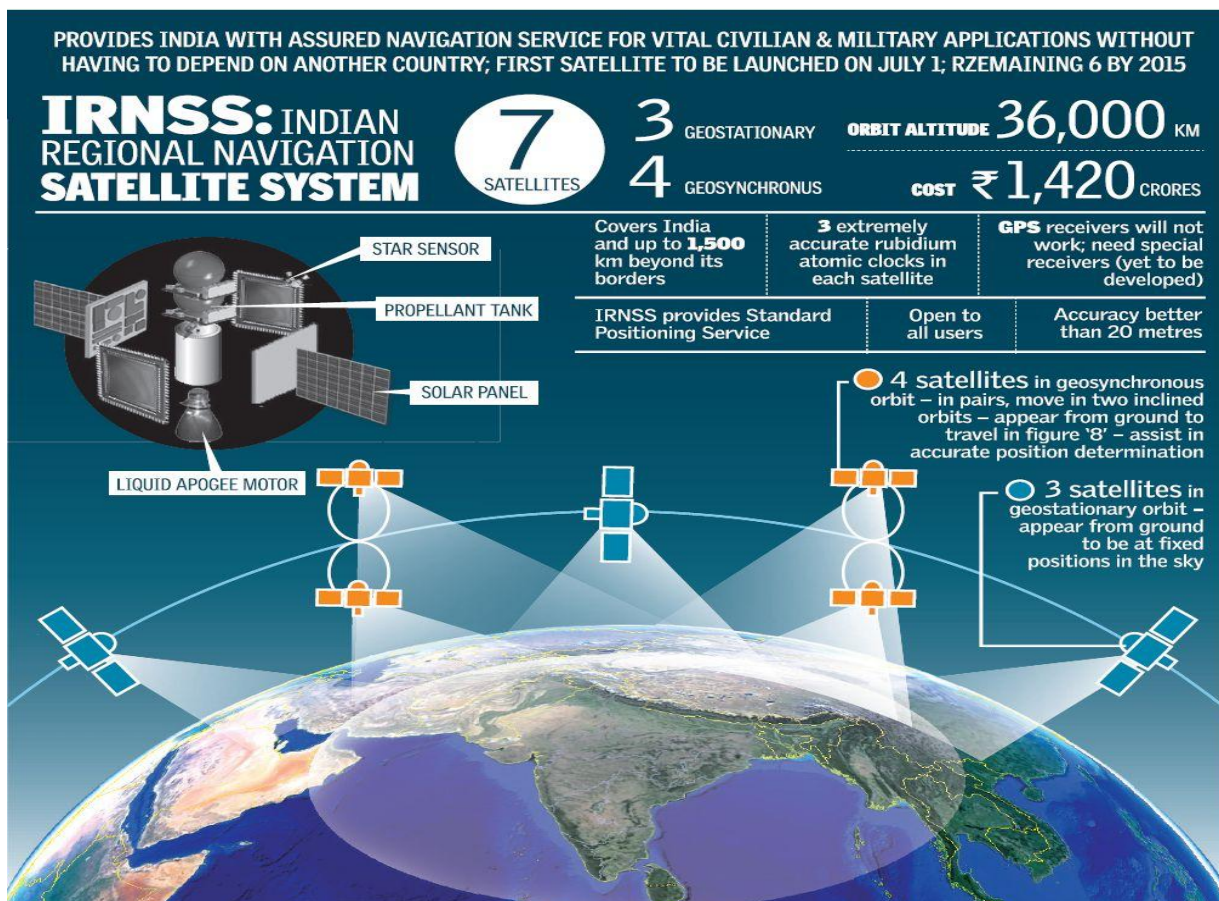


Fig1 IRNSS WORKING PLAN

4. SYSTEM ARCHITECTURE

Fig.2.refers to the system framework that consist of three main phases are,

1. Tracking the boat.
- 2.Alert to the GNSS device and
- 3.Alert to the PC using Cloud.

The main objective of our proposal is protecting fisherman itself from the foreign navy and automatic alerting to the fisherman using GNSS and cloud computing^[9]. At the same time,another important feature is to alert the Indian coastal navy and higher authorities hence they should immediately take the worthwhile action to safe guard the fisherman.

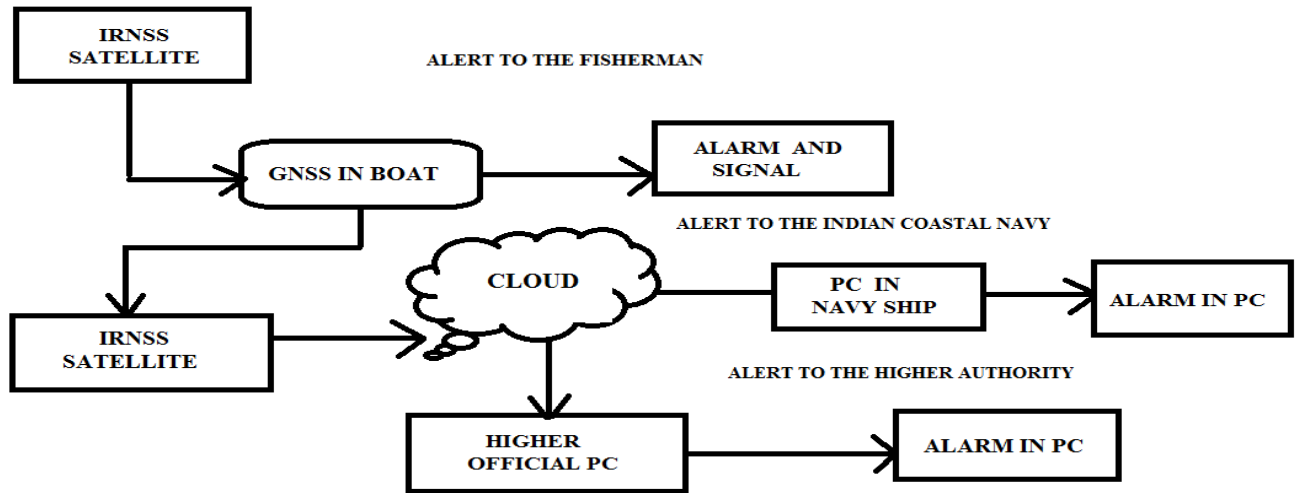


Fig 2: System Architecture

5. RESULTS AND DISCUSSION

5.1 Boundary Locations

The maritime boundary region between Sri Lanka and India in the Gulf of Mannar shall be arcs of great circles between following locations, in the sequence given below, defined by longitude and latitude^[3]. Maritime boundary region in the Bay of Bengal is as follows,

5.2 Positions Latitude Longitude

- Position 1 09° 06'.0 N 79° 32'.0 E
- Position 2 09° 00'.0 N 79° 31'.3 E
- Position 3 08° 53'.8 N 79° 29'.3 E
- Position 4 08° 40'.0 N 79° 18'.2 N
- Position 5 08° 37'.2 N 79° 13'.0 E
- Position 6 08° 31'.2 N 79° 04'.7 E
- Position 7 08° 22'.2 N 78° 55'.4 E
- Position 8 08° 12'.2 N 78° 53'.7 E
- Position 9 07° 35'.3 N 78° 45'.7 E
- Position 10 07° 21'.0 N 78° 38'.8 E
- Position 11 06° 30'.8 N 78° 12'.2 E
- Position 12 05° 53'.9 N 77° 50'.7 E
- Position 13 05° 00'.0 N 77° 10'.6 E

5.3 Positions Latitude Longitude

- Position 1 10° 05'.0 N 80° 03'.0 E
- Position 2 10° 05'.8 N 80° 05'.0 E
- Position 3 10° 08'.4 N 80° 09'.5 E
- Position 4 10° 33'.0 N 80° 46'.0 E
- Position 5 10° 41'.7 N 81° 02'.5 E
- Position 6 11° 02'.7 N 81° 56'.0 E
- Position 7 11° 16'.0 N 82° 24'.4 E

The boundary between India and Sri Lanka in the waters from Adam's Bridge to Palk Strait shall be arcs of Great Circles between the following positions, in the sequence given below, defined by latitude and longitude.

5.4 Point Latitude North Longitude East

- 1 10° 05' 80° 03'
- 2 09° 57' 79° 35'
- 3 09° 40'.15 79° 22'.60
- 4 09° 21'.80 79° 30'.70
- 5 09° 13' 79° 32'
- 6 09° 06' 79° 32'

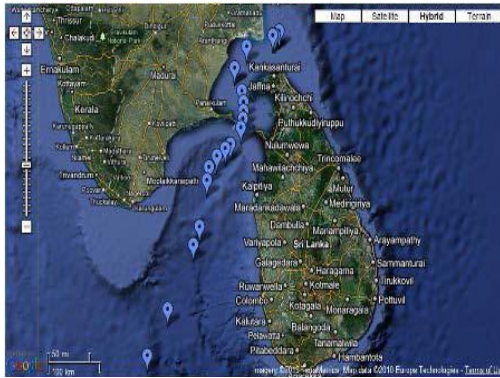


Fig 3: Indian Srilanka Maritime Boundaries

6. CONCLUSION

This paper deals with a current major problem of TamilNadu fishermen. According to our concept, every fisherman can be traced out automatically by Indian costguards and they can be safer and also protect themselves from the foreign navy which leads them to a peaceful life. Thus the loss of innocent life can be prevented and our ties with Sri Lanka can improve.

7. ACKNOWLEDGMENTS

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