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Coastal Region Offshore Transportation and System

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Abstract: Marine fishermen menace their lives when they go the extent that 120 km from the shore on a fishering trip enduring 5-7 days. They are totally cut off from the territory. Cell coverage exists just up to 12-15 km from the shore. In crisis circumstances, the fishermen have no real way to call for offer assistance. Since, the marine fishermen are not financially well off particularly in the creating nations there has not been much business enthusiasm for tending to this issue. Regardless, keeping an eye on this issue will benefit the marine fishermen gather massively. Our center coordinated gatherings with a couple fishermen to appreciate this issue and prepared a handy game plan. The plan engages the fishermen to use the propelled cell phones which they have starting at now to get web unfastened using Wi-Fi. The Access Point (AP) on the vessel relates over Ethernet to a locally accessible way to long range Wi-Fi backhaul sorts out. This system can be worked on a helpful group premise by the fishermen group at sensible per capita CAPEX and OPEX.

Key words: Internet, Long Range (LR) Wi-Fi, base station, gateway, backhaul network, field trial, Point-to-Multi-Point (P2MP) network

INTRODUCTION

Marine fishing is a key contributor to the economy of the countries with a long coastline. There are various groups of fishermen living along the waterfront areas whose work has relied on upon looking for eras together (Unni *et al*., 2015). Larger part of these individuals is utilized as every day breadwinners by the vessel proprietors. Up to 10 fishermen set out in 70 ft long average sized water crafts known as trawlers for marine angling. These trawlers are furnished with frosty stockpiling to save the fish. Each angling trip keeps going 5-7 days commonly, some of the time significantly more with a specific end goal to catch enough fish to make it beneficial to the boat proprietors. During these fishing trips these fishermen are totally isolated from their families and friends. Collision with a ship is a common problem faced by these fishermen that leads to loss of lives and damage to boats (Pathmasuntharam *et al*., 2008).

Currently, the fishermen use hand-held radios for communication which have a limited range within the line of sight and do not work reliably under adverse conditions when the sea state is rough. It was evident that they had a real problem for which they didn't have an affordable solution. Any arrangement proposed ought to come at no cost to them with the goal for it to be reasonable (Jennath *et al*., 2015). Since, the marine fishermen are not financially well off particularly in the creating nations, there has not been much business enthusiasm for tending to this issue. It was likewise discovered that a substantial rate of them claimed Android based advanced mobile phones and that number is ascending with PDAs accessible now a days. In light of these perceptions, it was chosen that extending the internet to the ocean utilizing the least expensive backhaul innovation choice would be the most ideal approach to build up a reasonable and savvy answer for interfacing the marine fishermen to the terrain.

In order to overcome the unique challenges in the marine environment for achieving coverage and connectivity an innovative backhaul network architecture which opportunistically stitches together several Point-to Multi-Point (P2MP) networks using Ethernet and Wi-Fi mesh networks was envisaged. The standard Wi-Fi Access Point (AP) on board the boats will enable the fishermen to connect to the internet using their Wi-Fi enabled smart phones. The on-board access points will be capable of routing the traffic within the Wi-Fi mesh network and also connecting to the backhaul gateway over Ethernet in order to provide internet access. The backhaul network is anchored at the base station on the shore at a height of 50-60 m or more which provides the primary P2MP network. The network range is extended opportunistically by forming secondary P2MP networks with the help of boats that act as mobile base stations. Controllability of second order impulsive neutral functional integrodifferential inclusions with an infinite delay is explained by Subramaniyan *et al*. (2015). Design and performance analysis of MIMO-OFDM system using different antenna configurations is explained by Agarwal and Mehta (2016). A design of optical sensor for detection of brininess of water discussed by Lavanya *et al*. (2014).

MATERIALS AND METHODS

Comparative analysis of backhaul technology options: Our challenge was to identify a low cost backhaul technology that would still provide the required performance, range and other features. These technologies were evaluated based on the following parameters-spectrum licensing cost, capital expenditure, vendor support, communication range, channel bandwidth, supported data rate, latency and mobility. All technology options were graded based on each of these parameters. It can be seen that Wi-Fi scores significantly higher than the following best choice, cognitive radio. In light of this examination, Long Range (LR) Wi-Fi is picked as the backhaul innovation of decision. LR Wi-Fi is a variation of standard Wi-Fi which utilizes directional reception apparatuses to expand the transmission range and uses TDMA rather than CSMA/CA for medium access with a specific end goal to beat the shrouded hub issue and to maintain a strategic distance from long affirmation timeouts. FCC compliant long range Wi-Fi equipment is commercially available.

Field trials: FCC compliant long range Wi-Fi equipment from Ubiquiti Networks was used in the field trial along with cisco linksys access routers. Three field trials were conducted-one with the 5.8 GHz gear, one with the 2.4 GHz gear and one with both gear side by side.

In the first two trials, one trawler (AdN) was used while in the third trial, two trawlers were used-one AdN and one SuN. Therefore, in the third trial in addition to assessing the range of the primary P2MP network anchored at the base station on the shore we also assessed the range of the secondary P2MP network using the ABE on the boat as a mobile base station. The results with 2.4 GHz gear were better than the results using 5.8 GHz gear.

Figure 1 shows the field trial setup. The trials were directed from a beach front town in Kerala, India. One of the grounds of our multi-grounds college is situated in this town. The on-shore construct station was introduced with respect to top of a 16 story working along the ocean shore at a stature of 56 m. The ABEs were mounted on top of a shaft fitted to the trawler at a tallness of 9 m from the ocean level. The on-shore base station has an outer segment reception apparatus with a bar width of 120° while the ABE has a worked in area receiving wire with a pillar width of 42° (5.8 GHz) (Table 1).

During the field trials, the ABEs were manually reoriented when needed in order to align their directional antennas in the direction of the base station. Work is currently in progress to develop a rotary platform to mount the ABE. This rotary platform will be automatically adjusted using a microcontroller to align the ABE in the direction of the base station. The mounting will also have a steady cam like mechanism to stabilize the ABE against the rocking movements of the boat due to the ocean waves.

Table 1: Field trial parameters and results

Parameters	Value 1	Value 2
Operating frequency	58 GHz	2.4 GHz
Base station antenna gain	18.6-19.1 dBi	15.0-16.0 dBi
Base station beam width	120°	120°
Base station antenna height	56 m	56 m
ABE antenna gain	14.6-16.1 dBi	10.4-11.2 dBi
ABE beam width	42°	54°
ABE antenna height	9 m	9 m
Primary P2MP network range	40+km	45+km
Secondary P2MP network range	NA	20+km

Fig. 1: Field trial setup

RESULTS AND DISCUSSION

Affordability of proposed solution: One of the fundamental requirements of any proposed solution is that it needs to be affordable to the financially challenged fishermen community. Wi-Fi gear has become a lot more affordable with the prices coming down especially when the next generation technology entered the market. The on-shore base station can support up to 100 client stations per the data sheet. However, with as little of 10 boats sharing an on-shore base station, if the cost of setting up the base station were to be amortized over two years, the cost per boat owner would be about $2 per month. Setting up a tall tower on the shore may be expensive however this can be avoided by making use of the existing tall structures such as cellular and other communication towers, light houses, tall buildings, etc. A community of fishermen should be able to get good data plans under $100 per month and this can be shared among the members of the community. This cost can be either borne by the boat owners or the fishermen themselves or a combination of the two. Based on the coverage range obtained, the base stations can be located at least 50 km apart along the shore. This allows for multiple communities to share the same base station also. We could also have multiple base stations co-located and operating in non-overlapping channels in order to increase the overall capacity.

CONCLUSION

Marine fishermen group everywhere throughout the world face a genuine issue when they need to burn through 5-7 days or more at once amidst the sea with no financially savvy methods for reaching the territory. This is all the more so in the creating nations where the monetary limitations of this group are much more intense. Our scientists can legitimately claim to have found a suitable conservative answer for this issue utilizing a creative and extraordinary system engineering that utilizations long range Wi-Fi for backhaul. By stretching out web to the oceans consistently we make all the advanced mobile phone based applications and administrations accessible to the fishermen while they go angling over the oceans for a considerable length of time together. This can possibly considerably enhance the personal satisfaction of the marine fishermen group and furthermore furnish them with better wellbeing and security.

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