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Budget Friendly Wireless AccessPoints Littoral Environments

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Abstract- Fishermen travel beyond 100km in trawlers for fishing and sometimes the trips last for a month. The cellular network coverage is limited to 15km from the shore. Fishermen are isolated from the shore, beyond 15km. Several hundreds of fishermen lost their lives during the recent cyclones in 2017 to 2019. This demands an efficient cost-effective and affordable communication system for marine applications. OceanNet can provide Internet Services in the ocean up to 100km. There is a lack of low cost and compact Wi-Fi access points for the current OceanNet System. This work proposes the design and development of a low-cost Wi-Fi access point for the OceanNet System and benchmarks the performance in comparison with the standard off the shelf WiFi Access Point.

Index Terms- Raspberry Pi, WiFi Access Point, Marine Communication.

I. INTRODUCTION

Mobile phones operating on cellular networks use cellular data for internet calling and messaging service with the help of SIM cards. The range of the cellular network coverage is limited within 15 km distance. Smart mobile phones will also provide internet access by connecting to a WiFi network. Affordable, efficient and low-cost access point devices are an essential part of WiFi networking. Various Wireless Access Points are available in the market for satisfying user requirements. Quality of Service (QOS) is the most important factor for selecting the access point for various applications. Energy efficiency, size, build quality, cost are the other important factors for the access point selection. There is a need in de- veloping custom access point other than the traditional access point according to the needs of the users for some specific applications. A novel way of developing a custom access point is by exploiting the networking abilities of a Single Board Computer(SBC). Raspberry Pi is the most popular single- board computer used for low-cost computation with resolved energy consumption. The UNIX based Operating System (OS) named Raspbian developed on the Linux version of Debian provides more flexibility to Raspberry Pi [1]. Thus it is used in various applications including home monitoring, media streamer, arcade machines, robotics, and is possibly used in outer space as well. The low power consumption makes it more convenient to use in any application-specific designs.

As discussed earlier, the cellular networks provide communication only up to 15km in the ocean but the fisherman travel as far as 100km for fishing. OceanNet aims to provide a low cost internet over ocean at affordable cost. Fisherman need to purchase the OceanNet equipment and fix it to the boats such that the connectivity will be assured upto 100 km. Apart from providing connectivity, there should be a platform to provide services such as voice communication, video streaming and live tracking. commercially available WiFi access point can provide connectivity to the smartphones or devices owned by the fisherman. But from the initial case studies, it is understood that most of the fisherman do not carry smartphones when they venture into the sea for fishing [2].

This paper proposes a low cost wireless access point configured using the Raspberry Pi. Since the Raspberry Pi is based on the Linux based operating system, various ser- vices said earlier can be provided at a very reasonable cost. The paper presents the configuration steps involved on the Raspberry Pi to use it as a wireless access point. The paper also provides a performance analysis report of the access point benchmark against a commercial WiFi access point. This paper is organized as follows: Section II presents the state of the art, section III explains the existing OceanNet architecture, section IV presents the configuration steps and performance results. The paper is concluded in section V with brief description on future plans.

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II. Existing Work or Literature Survey

This section briefly summarises the state of the art and presents a survey of similar work at various institutions. Cheah Wai Zhao et al, research is on developing a system that provides a reliable communication in case of a client/server model for file transfer. The objectives are achieved by configuring the Raspberry Pi to work as a server, and the use of an open-source, easy-to-use development software named as Samba, which functions seamlessly in Raspberry Pi for file access with more than one computer and rigid authentication protocols for security purposes [3]. The proposed work is cost- effective, easy to manage files and efficient. Mehzabul Hoque Nahid investigated the maximum performance of wireless routers made to IEEE 802.11 specifications. The importance of the routers and their routing algorithm is explained well in his research [4]. The router performance depends on many factors, but the must be compatible with 802.11ac wireless specifications and the actual throughput will be lower than expected due to various external variables. Pankaj Naganath Patil has done quantitative research on surveying various Single Board Computers(SBCs). Different classification parameters like size, cost, communication capacity, operating system, power and memory are considered. Finally, he found that Udoo is the best in performance. But, the cost of Udoo gave an edge to Raspberry Pi. The small size, cheap price, performance and the integration of Linux OS (Raspbian) and the capability to interface many peripherals made Raspberry Pi more preferable [5].

M. Ehsan Irshad, M. Mudassir Feroz, et al., focused on the scope of the Internet of Things (IoT) in the coming few decades and ways to turn that idea into reality by analyzing the different parameters of Raspberry Pi and Arduino UNO. The parameters they considered were RAM, processor OS, GPIO pins, cost, power and energy consumption and adaptability to cloud computing [6]. The selection of the hardware board depends upon the application of the projects. Arduino UNO is applicable to projects that do not require much power, whereas Raspberry Pi3 is fit for the projects that need more graphics and computation capabilities. Kaup, Gottschling, Hausheer, et al., explained about power pi—a model based on the power consumption of Raspberry Pi used for power measurement. The proposed model is meant for substitution of the conventional home gateway. The comparison of the performance analysis result is tabulated based on the CPU power consumption, Wi-Fi power consumption and the Ethernet power consumption during upload and download and found out that Raspberry Pi is more convenient due to its low power consumption property [7].

III. System Architecture of Ocean Net

OceanNet uses long-range WiFi Transceivers with high gain and power which can cover a distance of 100 km using multiple hops [8]. On the seashore, a transceiver is installed to transmit the signals. This transceiver is connected to the core internet network at the base station. On the boat, a transceiver is installed to receive the signals. The mode of medium between these two transceivers is wireless. A wireless access point will be installed on the boat to provide wireless connectivity to devices on the boat. This access point will be connected to the transceiver on the boat. The connectivity between the transceiver and the access point is Ethernet [9]. An automatic antenna rotator is used to maintain line of sight between the base station and the transceiver mounted on the boat [10]. Figure 1 shows the block diagram of the Ocean Net architecture.

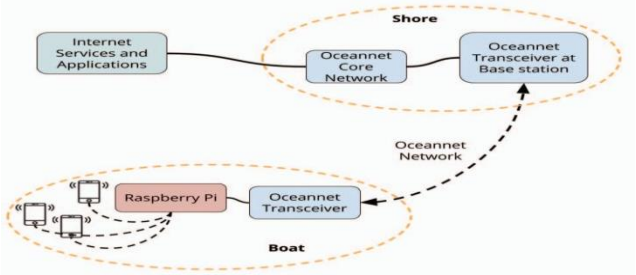

Fig. 1. OceanNet Network Architecture.

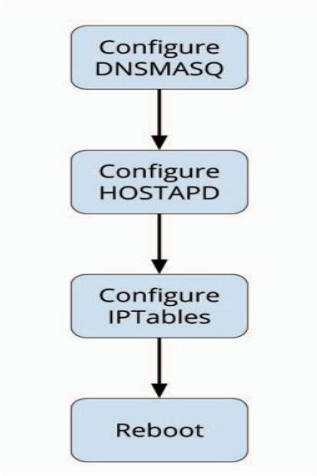

Fig. 2. Wireless Access Point Configuration Steps.

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IV. SETUP AND RESULTS

This section presents the wireless access point configuration procedures and performance result. Figure 2 shows the flow diagram for the configuration. Raspberry pi should be configured systematically in its Linux kernel to work as a wireless access point. The dnsmasq package used for the configuration provides easy DNS and DHCP on Raspberry Pi. For the access point feature to turn on, hostapd is installed and configured accordingly, This step will disable the on board WiFi feature. The default firewall service, iptables is adjusted accordingly to enable the packet forwarding through the newly configured access point. When all configurations are saved, it is recommended to reboot the Raspberry Pi.

A. Performance Analysis Test Setup

The test is carried out by using smartphones at different distances from the access point. When the user carrying the smartphone is at a certain distance from the access point, the upload speed, download speed, signal strength, and Client Connection Quality (CCQ) are observed. This process is repeated at distances of 5m, 10m, 15m, 20m, 25m. The same procedure is carried out with a commercial access point, and results obtained from the Raspberry Pi access point is compared with the commercial access point. The results are presented and discussed in the following section

B. Results and Discussion

The parameters: Distance from the access points, data rates (Upload and Download), signal strength, Client Connection Quality (CCQ) of the commercial access point is tabulated in Table 1 and that of Raspberry Pi access point is tabulated in Table 2.

The results obtained from the comparison between the upload speed, download speed vs different distances from the Raspberry Pi and that of the commercial access point is shown in Figure 3. The results show that the Raspberry Pi configured as the access point gives better performance than that of the commercial access point. The common observations are that the signal strength and CCQ, are almost stable during the whole test for both the Raspberry Pi and the commercial access point.

From the results, we can statistically estimate that the average Upload and Download speeds of commercial access point are 0.201 MBps and 0.125 MBps respectively.The average Upload and Download speeds of Raspberry Pi are 0.473 MBps and 0.313 MBps respectively.

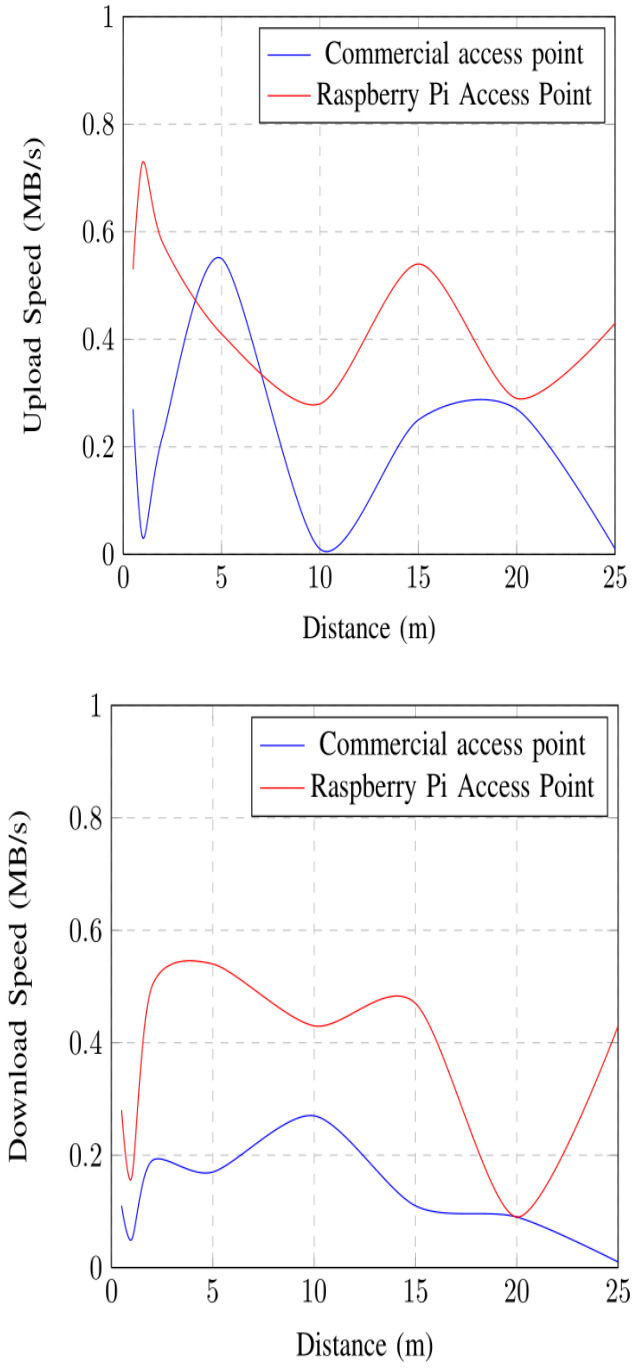

Fig. 3. Performance Test Results - Upload and Download Speeds.

V. CONCLUSION

In this paper, various conceivable outcomes for giving productive web access to restrictive circumstances like the marine web were discussed. The presence of single-board computers in the field of systems administration gives the adaptability in the extension of the network access for marine deployments. The Raspberry Pi, configured as a wireless access point was benchmarked against a commercial access point. Raspberry Pi gave better outcome in some areas. In the future, our work aims to quantify extra parameters like CPU temperature, CPU use, memory use of the Raspberry Pi access point while it is running and furthermore plans to support load balancing, port forwarding, database management for client authentication, and proxy administration.

REFERENCES

[1] "Teach, learn, and make with raspberry pi raspberry pi." [Online]. Available: http://raspberrypi.org/

[2] S. N. Rao, M. V. Ramesh, and V. Rangan, "Mobile infrastructure for coastal region offshore communications and networks," in *2016 IEEE Global Humanitarian Technology Conference (GHTC)*, Oct 2016, pp. 99–104.

[3] S. C. L. Cheah Wai Zhao, Jayanand Jegatheesan, "Exploring iot application using raspberry pi," in *International Journal of Computer Networks and Applications (IJCNA)*, 2015.

[4] M. H. Nahid, "Simulation &setup of smart wireless wi-fi router," in *International Journal of Advanced Research in Computer and Communication Engineering*, 2015.

[5] P. N. Patil, "A comparative analysis of raspberry pi hardware with adru- ino, phidgets, beaglebone black and udoo," in *International Research Journal of Engineering and Technology (IRJET)*, 2016.

[6] [6] M. E. Irshad and M. M. Feroz, "Scope of iot: performance and hardware analysis between raspberry pi-3 and arduino uno," *International Journal of Computer Science and Mobile Computing*, vol. 5, no. 6, 2016.

[7] F. Kaup, P. Gottschling, and D. Hausheer, "Powerpi: Measuring and modeling the power consumption of the raspberry pi," *39th Annual IEEEConference on Local Computer Networks*, pp. 236–243, 2014.

[8] S. N. Rao, M. V. Ramesh, and P. V. Rangan, "Mobile infrastructure for coastal region offshore communications and networks," Aug. 10 2017, uS Patent App. 15/076,998.

[9] A. Karthik, D. G. Koshy, L. Rajagopal, A. Luke, M. Meera, and N. S. Shibu, "Study and analysis of oceannetmarine internet service for fishermen," in *2017 IEEE Global Humanitarian Technology Conference (GHTC)*. IEEE, 2017, pp. 1–8.

[10] N. B. Sai Shibu, D. Arjun, S. N. Rao, A. Satish, and M. Navaneeth, "Automatic antenna reorientation system for affordable marine internet service," in *2018 IEEE International Conference on Computational Intelligence and Computing Research (ICCIC)*, Dec 2018, pp. 1–4.

[1]

Young, G. O. 1964. "Synthetic structure of industrial plastics (Book style with paper title and editor)," in *Plastics*, 2nd ed. vol. 3, J. Peters, Ed. New York: McGraw-Hill, 1964, pp. 15–64.

Chen, W.-K. 1993. *Linear Networks and Systems* (Book style). Belmont, CA: Wadsworth, 1993, pp. 123–135.

Poor, H. . 1985. *An Introduction to Signal Detection and Estimation*. New York: Springer-Verlag, 1985, ch. 4.

Smith, B. "An approach to graphs of linear forms (Unpublished work style)," unpublished.

Miller, E. H. "A note on reflector arrays (Periodical style—Accepted for publication)," *IEEE Trans. Antennas Propagat.*, to be published.

Wang, J. "Fundamentals of erbium-doped fiber amplifiers arrays (Periodical style—Submitted for publication)," *IEEE J. Quantum Electron.*, submitted for publication.