



ENHANCING COGNITIVE RADIO NETWORK ARCHITECTURE FOR SECURITY DEVELOPMENT AND UNAUTHORIZED ACCESS IN NIGERIA COMMUNICATION COMMISSION WIRELESS POINT.

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Abstract

With the new trend of technological advancement on data access and current high data dependency rate, there has been a tremendous and rapid increase in wireless internet deployment. This is because there is an increased need for portable internet provision to enable data access while on the go. New innovations of electronic equipments come with factory fitted wireless network interface cards to enable them to have internet access. Consequently, the recent surge in youths signing up unto social media, file sharing and messaging services in addition to high rate of internet of things currently being deployed also increased the internet dependency rate. The global pandemic also surged the need for data dependency as corporate organizations and schools moved to online meetings and online classroom. Classroom learning has also been drastically changed through the introduction of virtual classrooms and holograms. This research work studies conventional wireless access point environment through experimental setup of wireless access point scenarios. The effect of distance from the access point on the signal strength and transmission power was determined by setting up so many stations at various distances from the access point and packets transmitted to them while network analyzer was used to read up the bandwidth and calculate the time, delay, throughput, and received signal strength.

INTRODUCTION

1.1 Background of the Study

Access to data through the Internet has become the backbone of measuring successful business

venture. Presently, any business endeavors that is not deeply rooted into information technology is not regarded as lively. Today's business organizations depend solely on internet

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connectivity to constantly be in communication within the organization, with the employees and externally with the customers and with other business associates. If there is no dependable data connection, the entire business can come to a sudden crash – including the company's sales and services, customer relationship management and business profits [2]. Internet dependency has gone to the extent that even to have a cup of coffee in some places is now being dependent on internet access. Homes are becoming smarter due to improved technology in internet deployment through creation of smart home. In addition, at this information age, classrooms are becoming virtual classrooms; where every practical aspect of studies is done in virtual reality thus reducing the physical presence of instructors in a classroom environment and reducing the overdependence on rote learning, repetitive tests and creating better opportunity for experimental discovery, engaged learning and effective teaching approach [7]. Due to this sharp increase in internet dependency, it has become very pertinent to make internet access very mobile. Wireless network created the possibility for internet mobility. This makes internet access available at every location without any hindering factor like cable connections, etc. Wireless Access Point becomes a key factor to making internet portability possible [8]. For this reason, in recent years, Wireless Access Point technology has been seen to have a very sharp demand in the market of telecommunications. The technology is having

an astronomical growth as the day goes by. Manufacturers of portable internet devices and service providers are raking in millions of dollars daily. All moveable electronic devices for instance, the mobile phones, laptops are now manufactured to have network interface card and adapters.

2.1 MATERIALS AND METHODS

2.1.1 MATERIALS

2.1.2 Cognitive Radio

Radio propagation started several years of introduction and development of network technology that is based on wires [6]. It has gone through numerous perfection stages. One of the most recent in the stages is the development of the signal processing techniques which has proved to be so flourishing is the possibility of achieving broadband transmission through wired network. Nonetheless, acceptance and adoption of this new technology made the radio engineers to be on their toes and has forced them to work on agreeing with Information Theory proposed by Shannon which improves awareness of resource of bandwidth, power, noise floor and link attenuation as primary limits of tempo and reach. The migration to using Shannon Zone has as well kick-started the consciousness of spectrum being inadequate and that not every aspect of it is right for use in all the applications [12]. Owing to spectrum being a resource that is not readily available; and also, putting into consideration that the scarcity of spectrum being encountered regularly by the providers of wireless data transmission service, there is



soaring level of congestion normally observed in wireless data transmission. The major cause of ineffective deployment of the radio spectrum stems from the system of licensing spectrum. In real life, when an allotted radio spectrum is unused by users that are licensed, such spectrum cannot be accessed or used by the users that are not licensed (Buddhikot et al., 2010). As a result of this stagnant and rigid allocation of resources, wireless systems are meant to act solely on devoted band of spectrum. They are not able to interchange the band of transmission as the environment changes. An instance of this is when a band of spectrum is greatly utilized; the wireless system is not capable of changing to another band that is lightly used. This understanding about spectrum scarcity can readily be understood when one looks at wireless “cell” as a coaxial cable that have the same thickness. Users that are around the cell or cable will have to contend the Radio Frequency channel in efficient manner with other users while working on cutting down the interference level. On the use of wired mediums, the user can readily add additional wire to a particular location of use [16]. The reason for this is due to the fact that the spectrum is enclosed and is easily reused effectively. On the other hand, wireless spectrum is much reduced in the level of restrain and its reuse is limited to the degree at which the smaller cell will be put into use. In wireless communication, spectrum will always have to be shared between a given numbers of users within a given area of coverage not minding

how small the cell may be. Owing to the surge in broadband wireless connection demand, the size of a cell must definitely get to grow smaller with improved reuse of resources and better efficiency of spectrum with a rise in novel spectrum. Finally, it can be foreseen that Shannon Communication Volume (SCV) that states that the utmost number of users within a given pace sustainable within a certain geographic location just as bounded by Shannon will be applied to bind the “rate” and “reach” of data communication through wires. American Communication Act that was introduced in 1934 was what was used to establish Federal Communication Commission (FCC). This does the job of spectrum management for the United States. A regime was later empowered to handle the issues of regulations, licenses and processes. Their duty is to ensure that there is an organized spectrum which was very efficient and productive. Observing closely, maximizing the SCV through building of rules and regulations for radio services bit by bit till a big regulation body is formed in the United State has been the goal of FCC. There can be a great improvement in utilization of spectrum by creating a possibility for an SU to accessing a PU-unoccupied spectrum hole. Efficient use of the spectrum was achieved through the utilization of the spectrum hole [18]. This is done by taking up the opportunity of vacant spectrum holes. Cognitive Radio concept was coined by Joseph Mitola. This came up in 1991 at the end of his documentation on software radio. In 1999, he and Gerald



Maguire were the first to use the term cognitive radio (CR). They exposed a Cognitive Radio to be an enhancement job done on software radio. They stated that: “a Radio protocol is a collection of a group of Radio Frequency bands, sequential and special patterns, protocols, and air interfaces that regulate the employment of radio spectrum. The range of software radio is broadened Cognitive radio through the employment of radio-domain model-based reasoning [11].

2.1.3 Cognitive Radio Protocol Stack

The Cognitive Radio protocol architecture can be seen in fig 2.6. In Software Defined Radio, it is at the physical layer that transceivers are implemented as a Radio Frequency frontend. The adaptive protocols in the transport, network, application, and MAC, layers have to be able to sense the disparity in the environment of Cognitive radio. Specifically, the primary users' network data rate, the requirements of transmission for SU in addition to changes in channel feature is considered by the adaptive protocols. For other components to be linked, the control of Cognitive Radio is applied in the

transceiver of the software defined radio, the setup interface with the adaptation protocols, the service and wireless user. Intelligent algorithms are used by the components of the cognitive radio to process the signal calculated from the physical layer and to take in the information about transmission demanded from the secondary user to organize parameters of protocols for individual layers. The physical layer entails processing gain, the waveform of the transmitted signal, transmission power, duty cycle, spectrum, the modulation mode, the carrier frequency and rate of the channel coding Media Access Control (MAC) layer is comprised of the scheduling scheme, likelihood of retransmission, packet type, rate of data transmission, channel/time allocation and protocol of the media access control. The transport and network layer uses the parameter of rate control in the transport layer, the routing metric and network scheduling algorithm in the routing layer. Source coding and encryption algorithm are all included in application layer.

3.1 METHOD.

3.1.2 Connection of Wireless Access Point with the system

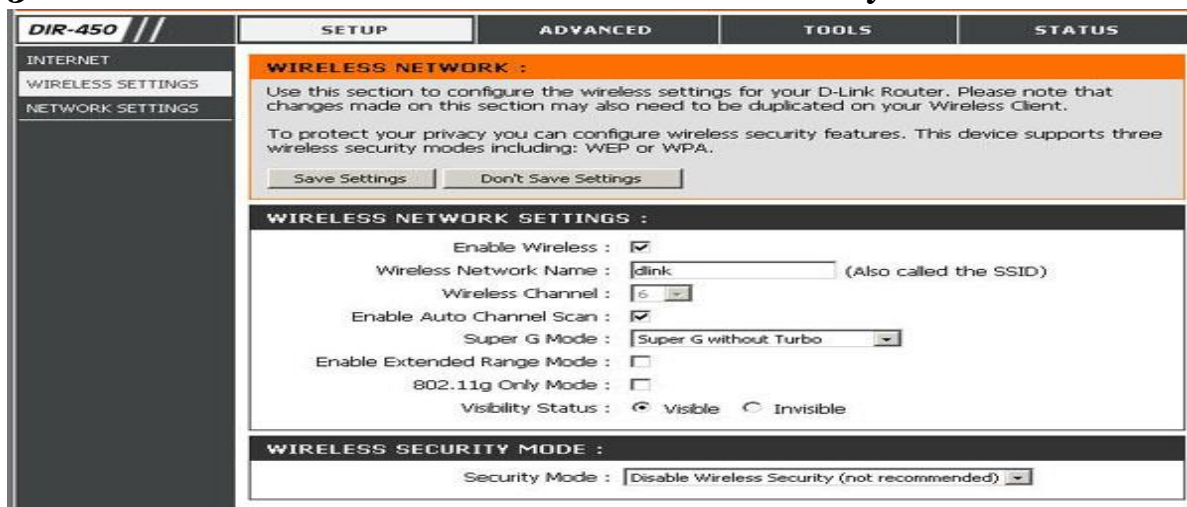


Figure 3.1: Screenshot showing the wireless security setting screen

The encryption mode to use was selected from the Security Mode drop down menu. To select WPA-PSK, choose Enable WPA- Personal Wireless Security (enhanced). It is to be ensured that all the wireless devices in the network are configured using identical security level to access the network as in Fig. 3.2

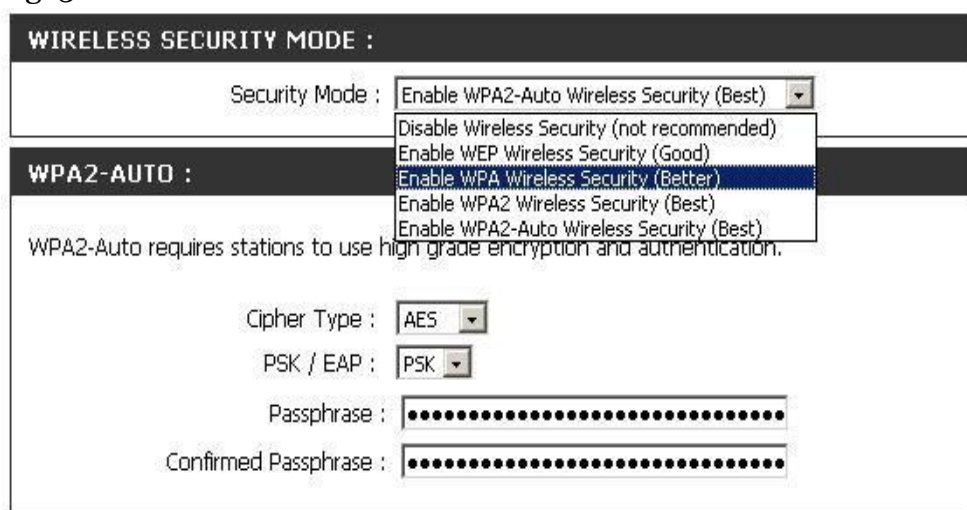


Figure 3.2: WPA 2 Configuration Setting Screen.



1. RESULTS AND DISCUSSION

3.1. Result.

From the experiment described above, it was observed that as the distance between access point and the mobile device increases, the received signal strength diminishes. In the same vein, as the distance increases, the value of the received power as measured at the receiver's end also decreases. However, increasing the transmission power from the source increases the range i.e. distance that the signal can cover. It can also have a reducing effect on the attenuation rate, but on the other hand, there will be a great increase in the noise ratio due to greater multipath effect. While taking measurement of Received Signal Strength in free-space, the value obtained is seen to be inversely proportional to the squared of the measured distance between the transmitter and the receiver. The RF signals attenuate as the distance between transmitter and devices increase.

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