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Prepare optimum solutions for increase WLAN efficiency, utilizing CR technology

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Abstract. In wireless local area network each access point has a bandwidth or unity for using its nodes and relay nodes, which WLAN doesn't use private bandwidth completely at the same time. In this study we prepare optimum methods for increasing efficiency of using wireless local area network, those nodes that are in the WLAN range, similar AP, have the ability to share its bandwidth for several nodes. Rs nodes, in addition exploring smart spectrum, they use bandwidths which are in range of whole network at opportunistic way till the first user is inter. we use MATLAB to simulation the offered solution. For upgrading simulation quality of simple network that simulating, the network has latest technology. The results of simulation prepare solution in current research have 57.30% impact at improving network performance in reducing call dropping rate.

Keywords: Wireless local area network, cognitive radio, relay, bandwidth.

1. INTRODUCTION

In last two decades, new challenge as resource deficiency on wireless network appeared, which more noticed in last decade. The challenge of resource deficiency is elevated by cognitive radio challenge. But for improving performance of network researchers prepared complementary solutions.

In wireless local area network there are some nodes that serviced them utilizing multimode, in addition WLAN, they may use another networks like cellular network. But when one of the nodes egress from wireless local area network, it needs to receive channel of the cellular network and it possible cellular network doesn't have vacant channel and the node being busy to prevent call dropping, so it should use a resource. In this research we don't solve this challenge with hardware solutions which inters to cell segmentation issue. The relay has presented in many research. But those relays that used in modern network, doesn't have appropriate performance to prevent channels interference. Latest research prepared solutions which use more appropriate relay[2]. In research [4] and [3] opportunistic method of using spectrum introduced that improving performance of call dropping rate about 65%. In recent research MINMAX method used for routing (introduced by 6). This method shows on formula 1, due to receiving signal strength (formula 2 [5]) isn't reliable on decision making. This problem shows

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in Fig 1 and it suggested use interval (distance) instead routing [1]. Formula 2 shows the way of competing signal strength. Formula 1 shows pt, total signal strength 100dbm, L is normal signal loss in wireless local area network that [10] considered 28.7dbm, 10n log dist is equal impact of distance on signal strength that dist is (distance) and fs is factor of environmental impact on signal strength.

$$RS = \arg \underset{RSi \in S}{\text{Min Max}} (dist(MS,RSi), dist(RSi,AP)) \quad (1)$$

$$RSS = Pt - L - 10n \, Log \, dist - fs \quad (2)$$

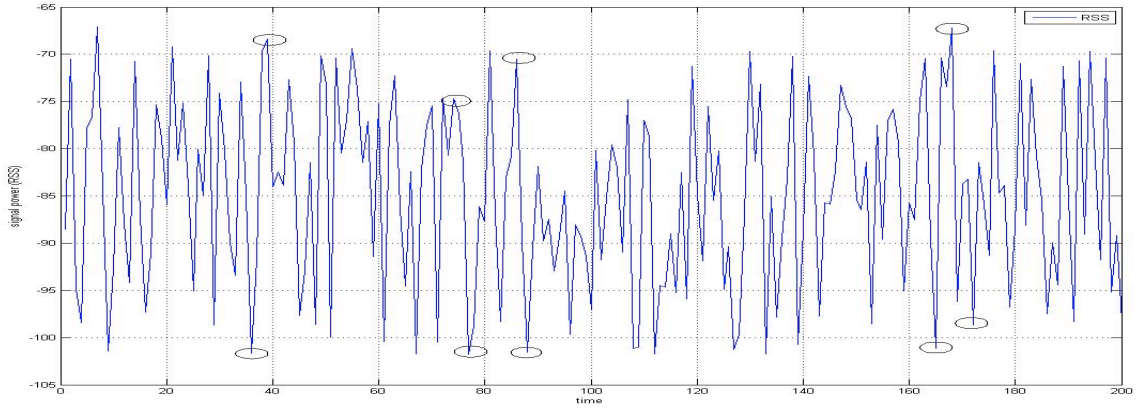

Figure 1. Simulated signal strength of node in 200 time interval [4].

Figure 2 shows schematic model of simple network status which RS[1] nodes just can support one of the MS[2] nodes. As you see, while node 6 is in the signal range of node 3 and 4, yet it can't relay to network through them because node 3 and 4 both have two nodes and they can't sharing one bandwidth for more than one node. At the following we discuss about solution which nodes take ability to elevate challenge of figure 1.

[1] Relay station
[2] Mobile station

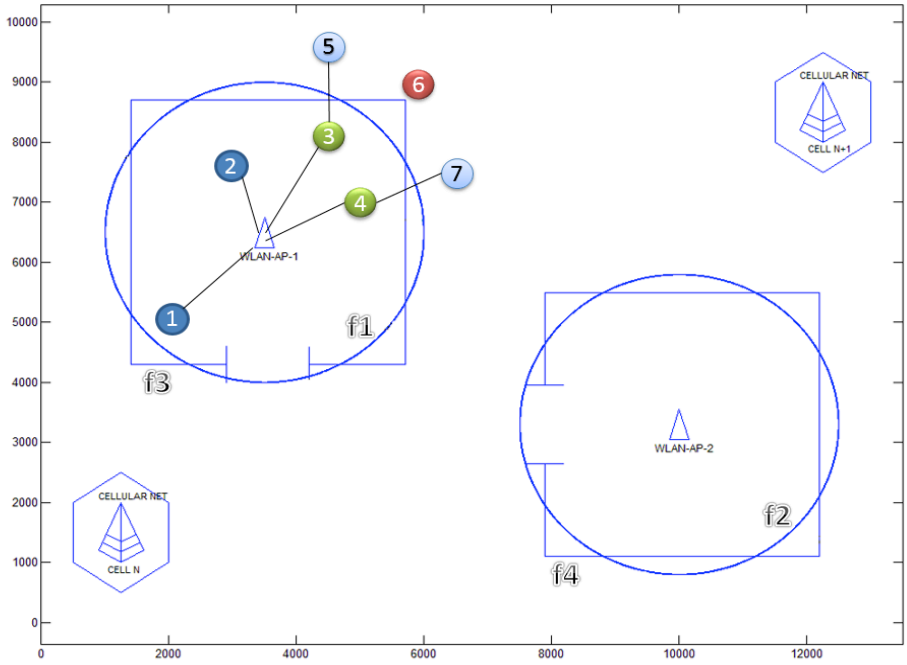

Figure 2. Simple network status.

Further challenge that cognitive radio faced with, is shared control channel that in [6] we discussed about its practical solutions. In this study, we noticed at performance improvement on prepare solutions for spectrum in [8].

2. SUGGESTED SOLUTİONS

The suggested solution is better use of RS nodes. It means already each RS nodes had the ability to give service into one node, but with prepare sharing relay bandwidth solution each RS node sharing its bandwidth like an AP[3] and use time segmentation technique to service nodes. The problem with prepare solution, how allocating channel appropriately, is from range of useless channel to prevent user interaction as much as possible. For allocating channel each Rs node receiving channel as opportunistic or allocated form, sharing the channel with time segmentation method for its relay nodes till channel valid. Each MS node which relay by Rs, can continue its working with receiving segments from RS cycle time. (formula3).

$$MS\ time\ service = RS\ time\ service\ /(\ count\ MS + 1) \quad (3)$$

Utilizing suggested method, RS nodes can use their bandwidth better and more targeted, elevate Figure 2 challenge and nodes can receives service from one of the RS nodes (Figure 3).

[3] Access Point

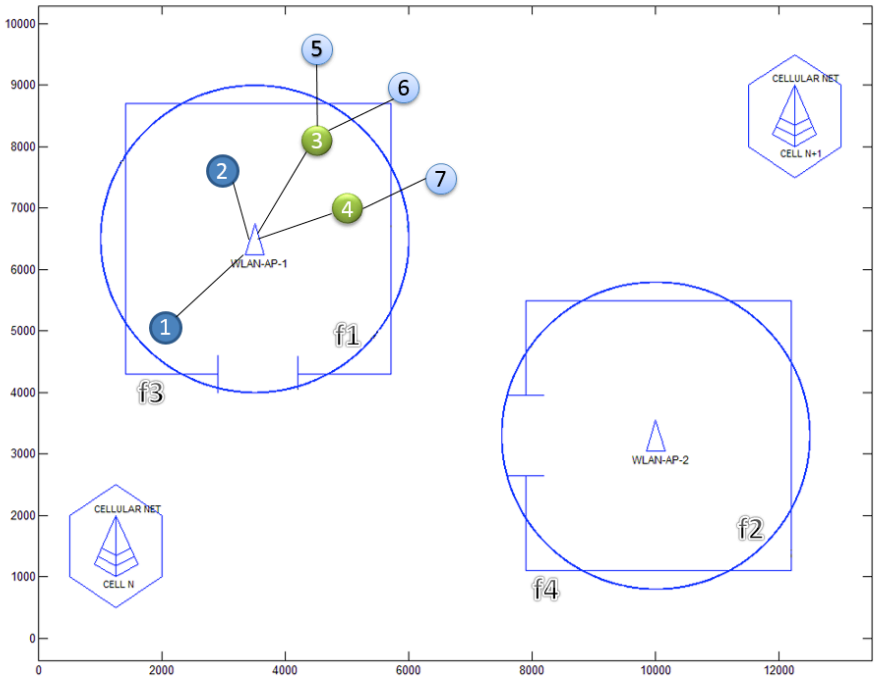

Figure 3. Suggested solutions.

3. SIMULATION

In this research for simulation a network and prepare solutions, a network with two AP is modeling in one campus environment. Each AP has three channels, one channel for RS and MS nodes that are in range, and two channels for MS nodes that are out of range, which they demanding to connect with relay. All of the nodes are within moving simulation and we use Why point method in moving nodes. For more clarity in result and more proximity with real situation, non-overlapping method is used for preventing channel interferences. Simulated situation is like, each amount in diagrams are the mean of 30 test courses with 2000 cycle time which the purpose of mean is to have more clarity on result and fading out sample of one special situation.

- ✓ The evaluating parameter is call dropping rate.

4. SIMULATION RESULTS

Figure 4 shows impact of MS nodes speed on call dropping rate, in general it has %88.56 improvement rather than simple situation.

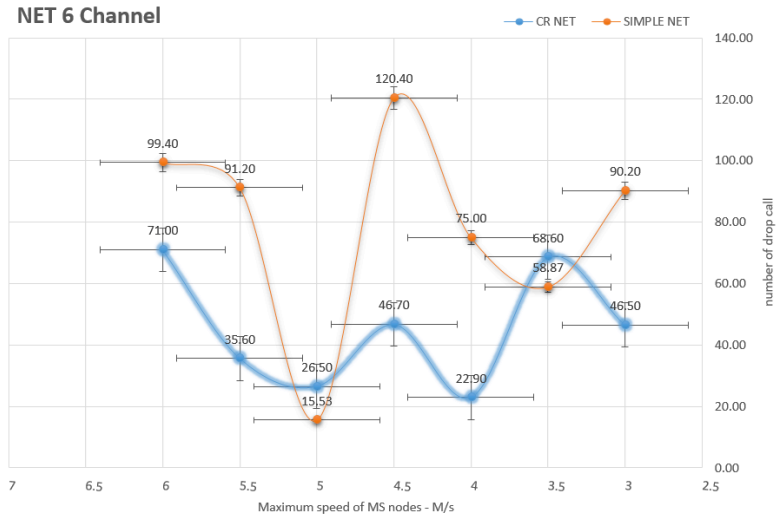

Figure 4. The impact of MS nodes speed on call dropping rate.

Figure 5 shows the impact of number of nodes on call dropping rate, it has 14.55% improvement rather than simple situation.

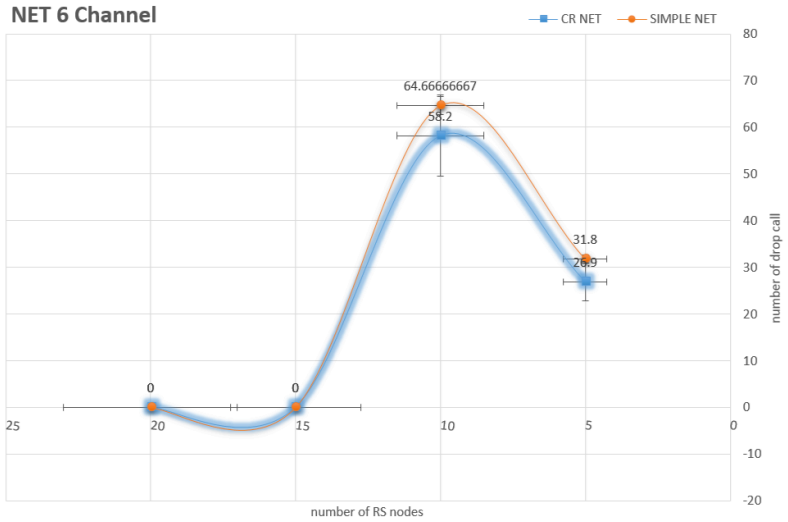

Figure 5. The impact of number of RS nodes on call dropping rate.

Figure 6 shows the impact of RS nodes speed on call dropping rate, it has 84.02% improvement rather than simple situation.

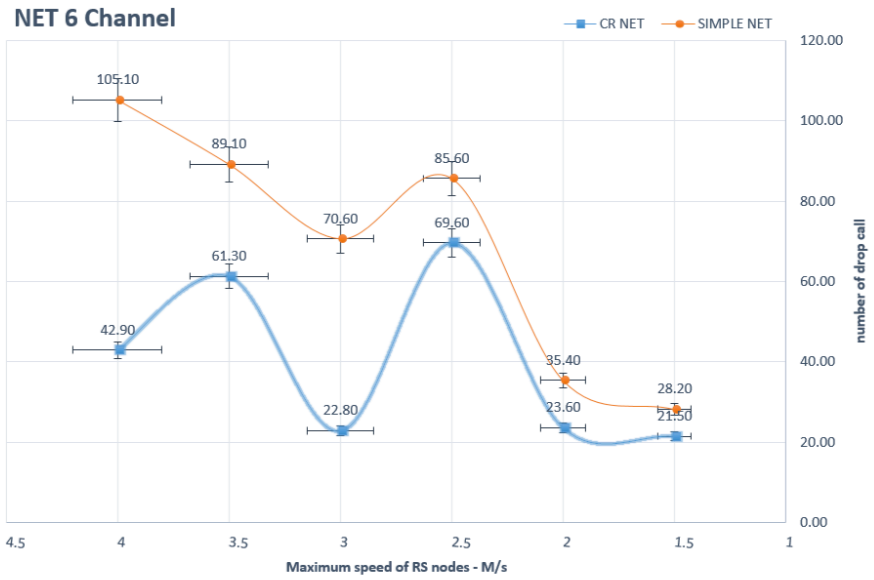

Figure 6. The impact of RS nodes speed on call dropping rate.

Figure 7 shows the impact of number of MS nodes on call dropping rate, it has 41.98% improvement rather than simple situation.

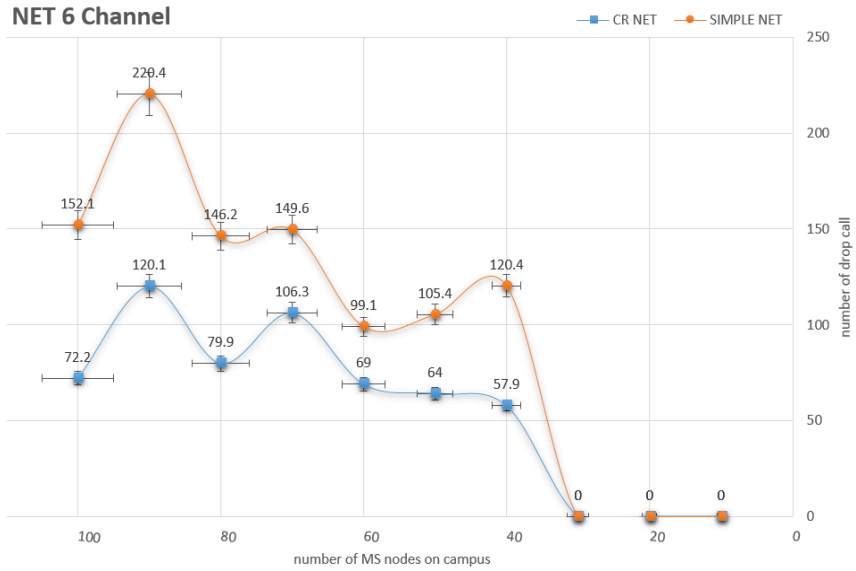

Figure. 7. The impact of number of MS nodes on call dropping rate.

5. CONCLUSION

As for simulation result of different statuses in simulation, network has 57.30% improvement on call dropping rate by prepare solutions, and it shows that prepare method is practical. So we can ignore new operational imposed of network against improving performance.

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