Introduction

Network overload (congestion) is one of the key challenges in wireless LANs (WLANs). This goal is typically achieved when the load of access points (APs) is balanced. Recent studies on operational WLANs, shown that AP load is often uneven distribution. This is a main cause of congestion in the network. To rectify such overload, there are several load balancing techniques. One of them is Cell Breathing Techniques.

Why Cell Breathing Techniques

- Cell breathing methodologies help us to reduce congestion in the network without making much changes to the already existing protocol used in the network.
- Every Access point has a Signal Strength (SNR) which is transmitted by beacon signals so the users can know about the nearest access point.
- Every user associates itself with an AP based on its SNR.

Transmission & Beacon Power

Transmission power represents the quality of the data traffic channel. The transmission bit rate between a user and its associated AP is determined by the quality of the data traffic channel. Beacon messages power represents coverage areas of APs. It is used to determine user-APs associations.

Why there are two types of Powers

- Reducing the transmission power of an AP affects the channel quality of all of its associated users, and this effect is not limited to those users that we intend to shift.
- The users who remain associated with the considered AP also experience lower channel quality and may have to communicate at a lower bit rate than before.
- This problem is overcome by the separation between the transmission power of the data traffic and that of the AP beacon messages.

What is Signal to Noise Ratio

Signal-to-noise ratio (SNR) is a measure used in engineering to quantify how much a signal has been corrupted by noise.

Calculating Load

\[ \text{Load} = \frac{\text{Throughput}}{\text{Capacity}} \]

Calculating SNR

\[ \text{SNR} = 10 \log \left( \frac{P_{\text{signal}}}{P_{\text{noise}}} \right) \]

Calculating Path Loss

\[ \text{Path Loss} = 10 \log \left( \frac{L \cdot f}{G} \right) \]

Runtime Analyze

It includes to analyze the impact of \( \Delta t \) on the performance of the optimization. \( \Delta t \) affects number of association changes.

Method

Min-Max Priority Load Balancing

- Min-Max Priority Load Balancing algorithm is used for applying cell breathing approach in a network.
- Min-max load balancing approach that not only minimizes the network congestion load but also balances the load of the noncongested APs.

How does the algorithm run

- Detect the congested AP.
- Reduce the size of the corresponding cells by reducing the beacon signal strength.
- The users present on the edge of the cells can move to another access point.
- Thus, the congested AP load is reduced.

Advantages & Disadvantages

- Fast Transmission of data without much loss of data.
- Reduction of congestion in Mobile networks and WLANs.
- Easy implementation without much changes in the already existing protocol in the networks.
- This technique gives rise coverage hole issue which is difficult to overcome.

Modeling

Master AP collects the APs and users information then determines these information and then, associates user-APs with each other.

Results

Random Data

With 100 Random Users

Average Data

With 100 Random Users

Conclusion

- Cell breathing technique provides an optimal min-max (priority) load balanced solution.
- This algorithm is used for reducing the congestion by reducing the load in access points and finds their importance in mobile communications and wireless lans.

References

[1] Y. Bejarano and S. J. Han, “Cell Breathing Techniques for Load Balancing in Wireless LANs,”