D-Link Allocation in 802.11g Based Higher Bandwidth Mobile Ad-hoc Networks

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Abstract - *D-Link wireless products are based on industry standards to provide easy-to-use and compatible high-speed wireless connectivity within your home, business or public access wireless networks. D-Link wireless products will allow you access to the data you want, when and where you want it. You will be able to enjoy the freedom that wireless networking brings. In this paper we should analysis D-link analysis based mobile adhoc networks with simulation of NS-2. Mobility, Installation and Network Expansion and Scalability also considered.*

***Key Words*: Mobile wireless networks, IEEE802.11g ,D –link,Throughput**

1.INTRODUCTION *(Size 11 , cambria font)*

The D-Link *Air*Plus *G* DI-524 High-Speed Wireless Router is an 802.11g high-performance, wireless router that supports high-speed wireless networking at home, at work or in public places. Unlike most routers, the DI-524 provides data transfers at up to 108 Mbps (compared to the standard 54 Mbps) when used with other D-Link *Air*Plus G products. The 802.11g standard is backwards compatible with 802.11b products. This means that you do not need to change your entire network to maintain connectivity. You may sacrifice some of 802.11g's speed when you mix 802.11b and 802.11g devices, but you will not lose the ability to communicate when you incorporate the 802.11g standard into your 802.11b network. You may choose to slowly change your network by gradually replacing the 802.11b devices with 802.11g devices .

In order to provide QoS in a wireless network, the IEEE 802.11g MAC (Medium Access Control) protocol [3] is proposed. The IEEE 802.11g MAC protocol introduces the HCF (Hybrid Coordination Function), which defines two new MAC mechanisms namely, HCCA (HCF Controlled Channel Access) and EDCA (Enhanced Distributed Channel Access). EDCA achieves service differentiation by introducing different ACs (Access Categories) and their associated backoff entities. Although EDCA is designed to provide QoS assurance, it does not fit into multihop wireless environment because it has no notion of end-to-end QoS guarantee. In addition to offering faster data transfer speeds when used with other 802.11g products, the DI-524 has the newest, strongest, most advanced security features available today. When used with other 802.11g WPA (WiFi Protected Access) and 802.1x compatible products in a network with a RADIUS server, the security features include: The multihop wireless environment is characterized by harsh propagation channels, interference, frequent and rapid changes in network topology, a lack of centralized network control, and the requirement of multihop communication from source to destination. Many of present wireless network applications will require that mission-critical data should be guaranteed to be delivered to their corresponding targets in time. However, end-to-end QoS (Quality of Service) assurance in multihop networks is a very challenging topic [1][2]. For home users that will not incorporate a RADIUS server in their network, the security for the DI-524, used in conjunction with other 802.11g products, will still be much stronger than ever before. Utilizing the Pre Shared Key mode of WPA, the DI-524 will obtain a new security key every time it connects to the 802.11g network. You only need to input your encryption information once in the configuration menu. No longer will you have to manually input a new WEP key frequently to ensure security, with the DI-524, you will automatically receive a new key every time you connect, vastly increasing the safety of your communications. Fully compatible with the 802.11g standard to provide a wireless data rate of up to 54Mbps Backwards compatible with the 802.11b standard to provide a wireless data rate of up to 11Mbps WPA (Wi Fi Protected Access) authorizes and identifies users based on a secret key that changes automatically at a regular interval, for example: TKIP (Temporal Key Integrity Protocol), in conjunction with a RADIUS server, changes the temporal key every 10,000 packets, ensuring greater security

2.Features

At present, the use of WLANs has been essentially focused on best e®ort data transfer because the basic DCF and PCF access methods cannot provide delay guarantees to real-time multimedia °ows . Recently, in order to support also delay-sensitive multimedia applications, such as real-time voice and video, the 802.11e working group has proposed innovative functionali- ties, which enable service di®erentiation in WLANs. In particular, the 802.11e proposal introduces: (1) the Hybrid Coordination Function (HCF), which is an enhanced access method to distribute the limited ¯rst-hop WLAN band- width among delay-insensitive and delay-sensitive °ows; (2) a Call Admis sion Control (CAC) algorithm for preventing network overloads, which would drastically degrade the service o®ered by the network; (3) speci¯c signaling messages for service request and Quality of Service (QoS) service level nego- tiation. - The 802.11e draft does not specify an e®ective bandwidth allocation algorithm for providing the QoS required by real-time °ows; it only suggests a simple scheduler that provides a Constant Bit Rate (CBR) service. This scheduler does not exploit any feedback information from mobile stations in order to dynamically assign the WLAN bandwidth. Thus, it is not well suited for bursty media °ows An improved bandwidth allocation algorithm has been proposed in , which schedules transmission opportunities by taking into account both the average and the maximum source rates declared by each data source. However, also this scheme does not consider the dynamic behav- ior of multimedia °ows. An adaptive version of the simple scheduler, which is based on the Delay-Earliest Due-Date algorithm, has been proposed in This algorithm implements a trial and error procedure to discover the optimal bandwidth assignment to each station. Active measurement methods inject specific probes into the network and estimate the available bandwidth from measurements of the probing traffic at the ingress and at the egress of the network. The majority of the methods uses packet pairs, i.e. two packets sent with a defined spacing in time referred to as gap, or packet trains, i.e. a larger number of packets sent at a defined constant rate. The rate of a packet train can be converted into a certain spacing of the train's packets, showing a direct relation to the gap model of packet pairs. Packet are specific packet trains . that are sent at a geometrically increasing rate respectively with a geometrically decreasinggap. FCFS multiplexing is usually

3. Related Work

In this section, IEEE 802.11g protocol and the EDCA mechanism are described. In addition, the existing research works on dynamic traffic prioritization schemes in multihop wireless networks are discussed.

3.1 IEEE 802.11g Mechanism

Assumed, where flows share the capacity of a link proportionally to their offered rates. For constant rate probes an expression referred to as rate response curve can be derived as

$$\frac{r_i}{r_o} = \max\left(1, \frac{r_i+\lambda}{C}\right) = \begin{cases} 1 & \text{, if } r_i \le C-\lambda \\ \frac{r_i+\lambda}{C} & \text{, if } r_i > C-\lambda \end{cases} \quad ..1$$

where *ri* and *ro* are the input and output rates of probes respectively and λ is the input rate of cross-traffic. If $\lambda \le C$ the available bandwidth follows as $AB = C - \lambda$ and otherwise $AB = 0$. Based on this model the task of available bandwidth estimation is to select the rate of probing traffic such that (2) can be solved for C and λ or $C-\lambda$. While (2) is usually used for packet train probes, an equivalent gap response curve can be derived for packet pairs, where the gap g is linked to the rate r by the packet size l resulting in $gi = l/ri$ and $go = l/ro$ [2]. In [1] measurement methods are classified by their inference technique as either *direct* or *iterative* probing schemes. Direct probing schemes assume that the capacity of the link C is known in advance. In this case (2) can be solved for the rate of the cross-traffic if the probing rate is larger than the available bandwidth

4 Relevant Wireless Link Characteristics

In this section we discuss relevant characteristics of wireless links that are of vital importance for bandwidth estimation. We show how these aspects affect current fluid rate and gap models from Sect. 2 and reason which quantity we expect to be estimated by known methods for bandwidth estimation in wireless 318 M. Bredel and M. Fidler systems. We use the term wireless link meaning a wireless broadcast channel with Medium Access Control (MAC) and Radio Link Control (RLC) protocols. **Fading and interference:** As opposed to wired links the characteristics of wireless channels are highly variable due to fading. Other potentially hidden stations, which may even include stations that implement different radio standards using the same frequency band, create interference on the wireless broadcast medium. These effects can cause rapid fluctuations of the signal-to-noise ratio and may lead to high bit error rates. Different modulation and coding schemes combined with rate adaptation may be used for compensation. As a consequence, the capacity and the availability of the channel may vary drastically. The task of available bandwidth estimation is to infer the portion of the capacity of a link or a network path that remains unused by cross-traffic. The scheme is an efficient way to improve the channel utilization because the contention overhead is shared among all the frames transmitted in a burst. Moreover, it enables service differentiation between multiple traffic classes by virtue of various Transmission limits. The available bandwidth of a link with index *i* can be defined as [12]

$$AB_i(\tau, t) = C_i(1 - u_i(\tau, t))$$

(1) where C_i is the capacity and u_i ⍰ [0, 1] is the utilization by cross-traffic in the interval $[\tau, t)$. The available bandwidth of a network path is determined by the available bandwidth of the tight link as $AB(\tau, t) = \min_i \{AB_i(\tau, t)\}$ [1]. IEEE 802.11e [3] was proposed to supplement IEEE 802.11g [5] by providing service differentiation in WLAN. The IEEE 802.11e defines a set of QoS enhancements for WLAN applications through modifications to the MAC layer. The standard is considered of critical importance for delay sensitive applications, such as voice over WLAN and streaming multimedia. The IEEE 802.11e MAC protocol introduces the HCF, which defines two new MAC mechanisms namely, HCCA and EDCA. EDCA achieves service differentiation by introducing different ACs (Access Categories) and their associated backoff entities.

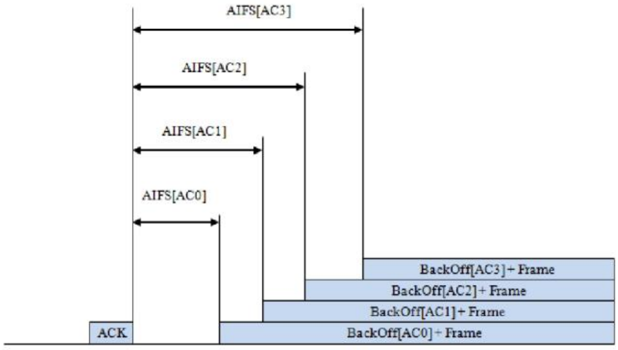

Fig1 : Dlink of Transmission

To mitigate the impact of the overheads and improve the system efficiency, the TXOP scheme has been proposed in the IEEE 802.11e protocol. Different from IEEE 802.11 where a station can transmit only one frame after winning the channel, the TXOP scheme allows a station gaining the channel to transmit the frames available in its buffer successively provided that the duration of transmission does not exceed a certain threshold, namely the TXOP limit. As shown in Fig. 3, each frame is acknowledged by an ACK after a SIFS interval. The next frame is transmitted immediately after it waits for an SIFS upon receiving this ACK. If the transmission of any frame fails the burst is terminated and the station contends again for the channel to retransmit the failed frame. To mitigate the impact of the overheads and improve the system efficiency, the scheme has been proposed in the IEEE 802.11g protocol. Different from IEEE 802.11 where a station can transmit only one frame after winning the channel, the TXOP scheme allows a station gaining the channel to transmit the frames available in its buffer successively provided that the duration of transmission does not exceed a certain threshold, namely the limit. As shown in Fig. 1 each frame is acknowledged by an ACK after a SIFS interval. The next frame is transmitted immediately after it waits for an SIFS upon receiving this ACK. If the transmission of any frame fails the burst is terminated and the station contends again for the channel to retransmit the failed frame.

4.1 Penetrating wall

For this experiment, we put one laptop indoor, and the other laptop outdoor, then we fixed the indoor laptop's position, moved the outdoor laptop so that the distance between them is changing with distance: 5m, 10m, 15m, and 20m. In between them there is a wall as the obstruction, the wireless signal has to penetrate the wall.

5. Experimental Results and Analysis

5.1Indoor without Obstructions

Fig 2 depicts the results of TCP experiment performed in the indoor environment. The achieved throughput performance is indeed affected by the size of messages communicated with the two hosts. With the increasing message sizes, the throughput has been improved accordingly. For instances, with the message size of 32-Kbyte (i.e., 2^5-Kbytes in Fig 2), TCP only achieves in the range of 11 Mbps (i.e., 19% of the theoretica

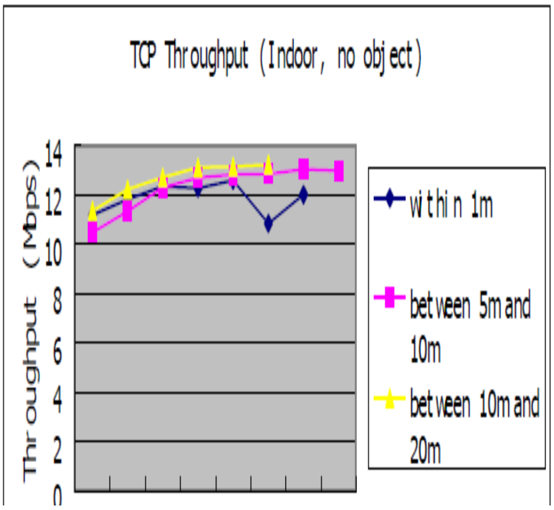

Fig4-Mbpspeakbandwidth).

With the message size of 4-Mbyte (i.e., 2^12-Kbytes in Fig 5), the throughput can be achieved to 13 Mbps. The 2-Mbps performance improvement represents the 18% increase from 32-Kbyte message size. Just like the wire-line networks, larger messages cause smaller software overhead. Thus, the results are considered reasonable. However, an interesting observation has been found related to the distance factor. Unlike the wire-line networks, the communication pair in ad-hoc networks can move their position more freely. It is the conventional thinking that the throughput performance should be better when the distance is shorter. The reason behind the expectation is that the time to propagate the messages to the destination is shorter. Interestingly, our measured performance results indicate the opposite trend. We expected the performance should be best with the distance less than 5 meters away. But it turns out the ad-hoc mode performs the worst compared to the distance [5m, 10m] and [10m, 20m]. The observed performance trend demonstrates
that increasing the distance does improve the achieved throughput performance. There are perhaps a number of reasons for causing this unique performance trend. One of the reasons can be related to the multi-path propagation of the radio frequency in the physical layer. When the distance is less than 5 meters, the transmitted signal for LOS (line of sight) transmission is affected by the other reflection, diffraction and scattering radio frequencies [K85]. Though the LOS signal arrives quickly, the signal timing and strength from the multi-path signals can be quite different. Therefore in the MAC Layer, the delay differences can be great enough that bit errors occur. Thus, the receiver can not distinguish the symbols and interpret the corresponding bits correctly. When the distance is increased, the multi-path interference is reduced because the timing and strength difference between LOS and non-LOS signals .

6. Proposed Schemes and Protocols

The discovery of IEEE 802.11g's throughput-distance relationships in its ad-hoc act in QOS routing. Since the bandwidth allocation is the top priority of the routing decision, the baseline performance results indicate that proper paths should be chosen with the consideration of the distance between any two routing nodes. However, the majority of the existing schemes seem to be lack of the joint consideration with the distance factor. For instances, many assumed the bandwidth is uniformly identical within the distance limit, thus the routing decisions favor the minimal number of hop counts. We believe, given the solid evidences from the baseline experiments, the routing decisions within the (multi-hop) ad-hoc networks should be different.WE Applied this algorithm

Algorithm MaxThroughput(u)

Initialization:

N' = {u} .v

for all nodes v

if v is a neighbor of u

then B(v) = bw(u, v)

else B(v) = 0 Loop

Find w not in N' such that B(w) is a maximum

add w to N' (Beacon neighbour)

update B(v) for each neighbor v of w and not in N':

B(v) = max(B(v), min(B(w), bw(w, v)))

until N' = N

Return all B(u,v) where v. N and v≠u

7. Conclusion

In this paper, we propose the higher bnawidth scheme for mobile wireless networks. First, we propose d link scheme that dynamically assigns priorities to traffic according to network status and delay requirement, in order to achieve guaranteed end-to-end d link wireless networks. In order to calculate per class delay more accurately, the proposed scheme employs reliability of the link. In addition, the proposed scheme performs priority resetting when the burst collision is occurred. Through priority resetting, it can satisfy the end-to-end delay requirement of mission-critical data by sacrificing QoS for non-mission-critical data along the path for the delivery of those mission-critical data.

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