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DYNAMIC HYBRID CHANNEL (WMN) FOR BANDWIDTH GUARANTEES IN AD_HOC NETWORKS

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ABSTRACT

Wireless mesh networks (WMNs) have been proposed to provide cheap, easily deployable and robust Internet access. Improving user throughput is a primary objective in a WMN. The system focus on wireless networks with stationary nodes, such as community wireless networks. The goal of the metric is to choose a high-throughput path between a source and a destination. Metric assigns weights to individual links based on the Expected Transmission Time (ETT) of a packet over the link using many to many communications. In such networks, most of the nodes are either stationary or minimally mobile and do not rely on batteries. Hence, the focus of routing algorithms is on improving the network capacity or the performance of individual transfers for this, the system use Ad-hoc On-Demand MultiPath Distance Vector (AOMDV) for selecting and Demanding Shortest Path for transmission with Bandwidth Guarantees . One of the main problems facing such networks is the reduction in total capacity due to interference between multiple simultaneous transmissions. This result taken by network simulator tool (NS-2) for better performance in Networks.

Index terms: Wireless mesh Networks, Expected Transmission Time(ETT),routing algorithm, AOMDV.

I INTRODUCTION

Here the new routing technique was proposed named dynamic hybrid channel, It uses the advantages of proactive and reactive protocols, based on the concept of ad-hoc on-demand multipath distance vector (AOMDV) algorithm. wireless mesh networks are ad hoc wireless networks which are formed to provide communication infrastructure using mobile or fixed nodes/users. The mesh topology provides alternative path for data transmission from the source to the destination. It gives quick re-configuration when the firstly chosen path fails. Wireless mesh network should be capable of self-organization and self-maintenance. The main advantages of wireless mesh networks are high speed, low cost, quick deployment, high scalability, and high availability. It works on 2.4 GHz and 5 GHz frequency bands, depending on the physical layer used. For example, if IEEE 802.11a is used, the speed can be up to 54 Mbps. An application example of wireless mesh network could be a wireless mesh networks in a residential zone, which the radio relay devices are built on top of the rooftops. In this situation, once one of the nodes in this residential area is equipped with the wired link to the internet, this node could be the gateway node. Others could connect to the internet from this node. Other possible deployments are highways, business zones, and university campus. Wireless mesh networks can be used in a large array of diverse applications ranging from providing broadband internet access to establishing a mobile military communication framework. Their reliability, large bandwidth, and wireless nature provides suitability for being implemented in locations were short term wireless coverage is needed or wire installations are too expensive or undesirable. However, channel assignment for wireless mesh networks is crucial for their viability, since interference from adjacent links could cause a large drop in the actual available bandwidth.

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II PROBLEM AND ANALYSIS

Mihail L. Sichitiu says, an introduction to wireless mesh networks and also deals with the main hurdles that have to be overcome. The main drawback of the technology is its complexity. The main source of this complexity is a combination between wireless technology (with its flexibility and drawbacks) and the unusual role of each wireless node (as simultaneously router and host). The challenges are in large part unique to WMNs and considerable research has yet to be completed before WMNs can reach their full potential. Especially if multiple gateways are used, all single point-of-failures are eliminated. A responsive routing protocol can quickly route around failed links or nodes. Adding a new client to an existing WMN can take several hours instead of several months, the typical delay for installing new wires for cable or DSL. The wireless links used to connect the mobile clients can be of the same type as the intra-mesh wireless links or can be a completely different technology. Many implementations allow mobile nodes to connect to the WMN while in its range; their packets are forwarded in the same multi-hop manner as the ones of the stationary nodes. Merkourios Karaliopoulos, Rainer Baumann, and Thrasyvoulos Spyropoulos,had represent a detailed survey and taxonomy of routing metrics. A routing metric is a value assigned by a routing algorithm and used to determine whether one route performs better than another. These metrics can have broadly different optimization objectives, different methods to collect the required information to produce metric values, and different ways to derive the end-to-end route quality out of the individual link quality metrics. Currently the 802.11x suite of standards does not provide much information to higher layers. The only channel quality measure reported from commodity wireless adapters is the "Received Signal Strength Indicator" (RSSI) value which is also vendor-dependent. However, standardization efforts within IEEE 802.11 are preparing standards (802.11k for wireless LANs and 802.11s for wireless mesh networks), which will enable higher layers to obtain detailed channel condition information from the PHY and the MAC layers and provide additional flexibility with respect to transmit power control. These standards will include signal strength measurements and neighbor reports containing information on neighbouring nodes as well as link quality metrics such as the Airtime metric. Vinod Kone, Sudipto Das, Ben Y. Zhao and Haitao Zheng, had proposed a routing protocol for wireless mesh networks that provides QoS guarantees to applications based on metrics of minimum bandwidth and maximum end-to-end delay. They have developed QUORUM, a novel QoS aware routing protocol for wireless mesh networks. Specifically, QUORUM takes three QoS metrics into account: bandwidth, end to end delay and route robustness but there is no bandwidth guarantees. To optimize QUORUM for wireless mesh networks, several mechanisms including topology-aware route discovery that drastically reduce the control overhead and network congestion from route discovery. Some researchers advocate for a stateless approach, while others have advocated maintaining state at intermediate nodes. Richard Draves, Jitendra Padhye and Brian Zill says, the goal of using inexpensive, commodity hardware to build and deploy multi-hop wireless networks. Several researchers have studied the problem of capacity reduction in multi-hop wireless networks from a theoretical perspective. They shows that observed capacity is far below the theoretical optimum, using evidence from deployed multi-hop 802.11 wireless meshes. They observe that throughput degrades quickly as the number of hops increases. One reason is that the 802.11 MAC is inherently unfair and it can stall the flow of packets over multiple hops. Another reason is that these networks use only a small portion of the spectrum and a single radio for transmitting and receiving packets. The ETX metric measures the expected number of transmissions, including retransmissions, needed to send a unicast packet across a link. A link-state protocol consists of four components: 1) A component that discovers the neighbors of a node. 2) A component that assigns weights to the links a node has with its neighbors. 3) A component to propagate this information to other nodes in the network. 4) A component that uses the link weights to find a good path for a given destination. In other words, the link weights are combined to form a path metric. Debora and Otto focused on path selection mechanisms and new frame formats, since these aspects are the most closely related to multi-hop forwarding at the MAC level. They also deals IEEE 802.11s emerging standard proposals, focusing on path selection mechanisms, and discuss and compare both layer-two and layer-three approaches for building WMNs. The recent emergence of handheld communication devices, constrained in many ways (power, processing, memory), demands a solution that may be easily embedded in network interface cards (NIC) and in systems-on-chip (SoC), and a MAC layer solution but its support only small area coverage, being lightweight in contrast to a full implementation of ad hoc routing, is that purpose.

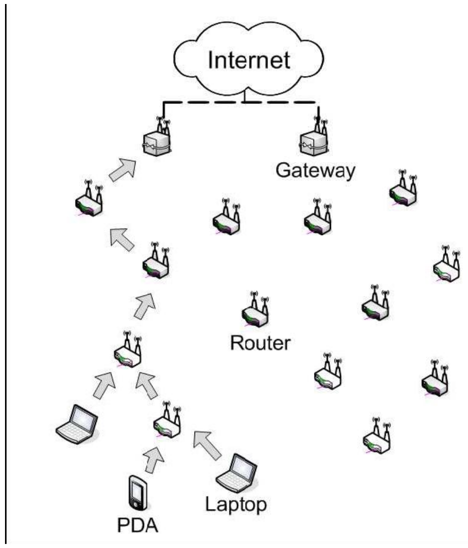

Fig.1. A typical wireless mesh network

In order to support multihop forwarding at the MAC layer, the current draft introduces changes in MAC frame formats, and an optional medium access method as well as many other optimizations to improve performance and security of wireless mesh networks. The system focus on path selection mechanisms and new frame formats, since these aspects are the most closely related to multihop forwarding at the MAC level. Sumit Rangwala, Apoorva Jindal and Ramesh Govindan, had presents mechanisms for achieving fair and efficient congestion control for multi-hop wireless mesh networks. In multi-hop topologies with RTS/CTS enabled, both RTS and DATA packets can be lost due to collision. For coordinated stations and near hidden links, an RTS collision takes place if the two links start transmitting at the same time. For near hidden links, an RTS collision can also take place if a node starts transmitting an RTS while an RTS transmission is ongoing on the other link. For asymmetric topologies where transmitters have an incomplete view of the channel, and for far hidden links, the receiver of the link will not send back a CTS whenever there is a transmission ongoing at the other link. By similar arguments, it is easy to see that, for DATA packets, collisions cannot happen in coordinated stations or near hidden links, but can happen for asymmetric topologies and far hidden links. Finally, the idle probability for each link can be derived based on the following observation. The channel around the transmitter of a link is busy if there is a transmission ongoing at any one of the following links: links which form a coordinated station, a near hidden link or an asymmetric topology with the link under consideration having a complete view of the channel.

III SOLUTION AND MECHANISM

First, The objective of this paper is, To attain self recoverable and demanding shortest path. Also focus on route maintenance and loop-freeness requirements. To obtain guaranteed bandwidth, A wireless mesh network (WMN) consists of a large number of wireless nodes. The nodes form a wireless overlay to cover the service area while a few nodes are wired to the Internet. As part of the Internet, WMN has to support diversified multimedia applications for its users either its wired or wireless increments hop-count in overlay networks. It is essential to provide efficient Quality-of-Service (QoS) support in this kind of networks. Seeking the path with the maximum available bandwidth is one of the fundamental issues for supporting QoS in the wireless mesh networks. The available path bandwidth is defined as the maximum additional rate a flow can push before saturating its path using many to single.Therefore, if the traffic rate of a new flow on a path is no greater than the available bandwidth of this path, accepting the new traffic will not violate the bandwidth guaranteed of the existing flows. The problem of identifying the maximum available bandwidth path from a source to a destination, which is also called the Maximum Bandwidth Problem (MBP). MBP is a sub-problem of the Bandwidth-Constrained Routing Problem (BCRP), the problem of identifying a path with at least a given amount of available bandwidth. In the literatures, maximum available bandwidth path is also called widest path it won't give bandwidth guarantees form source to destination. Designing routing metrics is critical for performance in wireless mesh networks for bandwidth Performance using AOMDV. The unique characteristics of mesh networks, such as Dynamic nodes and the shared nature of the wireless medium, invalidate existing solutions from both wired and wireless networks and impose unique requirements on designing routing metrics for mesh networks. In this paper, I focus on identifying these requirements. I first analyze the possible types of routing protocols that can be used and show that proactive hop-by-hop routing protocols are the most appropriate for mesh networks. Then, I examine the requirements for designing routing metrics according to the characteristics of mesh networks and the type of routing protocols used.

Modules

- Topology Control
- Protocol Design
- Hop by Hop routing in WSN

Topology control

Topology management refers to the control mechanisms required to autonomously organize a variable number of nodes into a connected network. In a tactical environment, it is important that the network be rapidly deployable to ensure connectivity among nodes in the shortest amount of time. It is also important that the network be rapidly reconfigur**a**ble to provide timely reactions to changes in **t**he topology caused by node destruction and/or jamming of links. A network design that takes into account the relative mobility of its nodes is better positioned to yield higher efficiency (responsiveness) and stability (adaptability) to highly dynamic topological changes by detecting correct and nearest neighbouring nodes. The relative mobility of a node can be used to characterize the capabilities of the node in question with respect to its peer nodes over the resulting peer links. Algorithm for neighbouring broadcast….

1: initialize *G*rng ⇐= *G*gg

2: for each i ∈ *V*

3: for each j ∈*N*(i)

4: for each k ∈*N*(i)

5: if max (d(i, k), d(j, k)) < d(i, j)

6: remove j from *N*(i)

7: remove [i→j] from *N*L(i)

Protocol design

MAC protocol design is an important aspect of meeting QoS, as a key contributor to latency in a wireless network is the contention occurring when accessing the shared medium. Access can be combined with channel assignment for meshes using multiple channels. If the number of transceivers on a node is smaller than the number of channels employed in the mesh, access can be combined with scheduling radio and channel use on different links. Several MAC protocols exist for both single channel and multi-channel meshes. Prioritized access increases the probability of high-priority traffic transmitting before lower priority traffic. However, that alone is not sufficient to meet the latency restrictions for QoS. The end-to-end delay experienced in a mesh multi-hop path may be longer than a simple multiple of the delay experienced for a single hop in a non-mesh environment. The prevalence of hidden nodes and the interaction of contention-based access with multi-hop flows increases collision rates and retransmissions, and leads to higher channel utilization per attempted transmission and ultimately to dropped frames and/or latency increases in Networks. These following equation shows protocol designed for number packets to be transferred to sink without any congestion in network. Suppose burst size = M (k=M) and initially when the connection starts the $a_0^1 = q_0^1 = 0$

average queue

$$a_n^k = a_n^M = a_5^{15} = w \times \sum_{i=1}^{n-2} i \times (1-w)^{nk-2-i} + w \times \sum_{j=1}^{k-1} \sum_{l=0}^{n-1} [j(n-1)+1+l] \times (1-w)^{nk-nj-l} = 4.17$$

Number of packets in the buffer will be $q_n^k = q_n^M = q_0^1 + k(n-1) =$

Hop by hop routing in wsn

The most significant obstacle to multi-hop communications in wireless sensor networks is high link error rate. Thus, an efficient hop-by-hop reliability support scheme is highly required.we identify the characteristics of two typical communication patterns in wireless sensor networks and address the problems of previous end-to-end sequence based hop-by-hop error recovery protocols, which cannot work properly with route change events and have a scalability problem with multiple senders. It uses hop-by-hop sequence numbers for hop-by-hop error recovery and operates in two separate modes depending on communication patterns and monitors for bandwith guarantees

$$R = \frac{s}{T_{RTT}\sqrt{\frac{2p}{3}} + T_{RTO}\left(3\sqrt{\frac{3p}{8}}\right)p\left(1+32p^2\right)} \quad (1)$$

where:

R is the achieved rate,

s is the segment size,

p is the loss probability,

T_{RTT} is the round-trip-time,

T_{RTO} is the retransmit time-out (which can be approximated as $4*T_{RTT}$).

IV CONCLUSION

Hop-count based localization algorithms offer a feasible solution despite these network constraints. Positioning based on hop-count is simple and distributed. In multi-hop sensor networks, the distance progressed by a broadcast is almost equivalent to the transmission range of the transmitting node. Thus, counting the minimum number of packet broadcast, i.e., hop-counts, between two nodes can be used to approximate the distance between the two communicating nodes. Besides, sensors usually have low mobility. During the period between hop-counts are disseminated and hop-counts are obtained by each node, the node positions do not change considerably with Bandwidth Guarantees. Thus, the linear relationship between hop-count and distance is consistent over time. Therefore, hop-count technique is suitable for localization in multi-hop and low-mobility wireless sensor networks.

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