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Back pressure auxiliary design to yield maximum throughput in wmn

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Abstract: Contemporary wireless multi hop networks has become popular in next generation wireless technology .Wireless multi hop networks operates below their capacity due to poor coordination among transmitting nodes which affects routing, scheduling, performance degradation &optimal Throughput being reduced .wireless multi hop networks are designed in layers where protocols operate independently at each layer of network .Here we present XPRESS a cross layer backpressure architecture to reach capacity of wireless multi hop networks. Instead of poor coordinated wireless routers. XPRESS turns a mesh network into wireless switch. Transmissions over networks are achieved through backpressure scheduling. In contrast to this we evaluate backpressure scheduling over TDMA MAC protocol which yields maximum throughput.

Keywords: Backpressure scheduling &routing, XPRESS Design &implementation, wireless multi hop networks.

I. INTRODUCTION

Wireless multi hop Networks (WMNs) technology has gained a lot of attention and become popular in the wireless technology and the industry fields. This rising popularity is due to its low cost, rapid development and ability to offer broadband wireless access to the internet in places where wired infrastructure is not available or worthy to be deployed.

Wireless multi hop networks consist of mesh routers that collect and forward the traffic generated by mesh clients. Mesh routers are typically fixed and equipped with multiple radio interfaces. Mesh clients are mobile, and data are forwarded by mesh routers to the intended destination. One or more mesh routers may have gateway functionality and provide connectivity to other networks such as internet access. In the WMNs, most of the flows are between the mesh client and the gateway; this kind of traffic is called internet traffic which is the common WMNs traffic as users need to access wired resources.

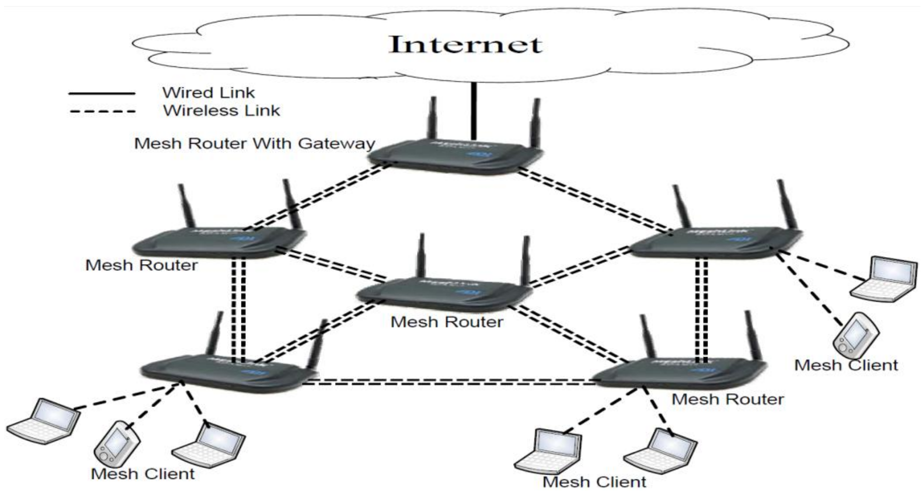

Fig 1 wireless multihop networks

Wireless multi hop networks are designed in layers, where protocols operate independently at each layer of the network stack. This approach provides flexibility with a modular design & standardization but it may result in severe performance degradation when these protocols do not cooperate well. This is usually the case of wireless multi hop networks, where noise and interference at lower layers affect the routing and congestion control performed at upper layers. A common approach to address these performance issues is then to modify a single layer of the protocol stack while keeping other layers intact.

Cross-layer architectures offer a radical alternative by advocating cooperation among the multiple layers of the protocol stack. At the core of these architectures is the backpressure scheduling which achieves network capacity.

II. System Analysis And Design

Contemporary wireless multi hop networks operate much below their capacity due to the poor coordination among transmitting nodes. This is problem faced by wireless multi hop networks.

In Existing system we present XPRESS, a cross-layer backpressure architecture designed to reach the capacity of wireless multi hop networks. Instead of a collection of poorly coordinated wireless routers, XPRESS turns a mesh network into a wireless switch. Transmissions over the network are achieved through backpressure scheduling. Realizing this theoretical concept entails several challenges, which we identify and address with a cross-layer design and implementation on top of our wireless hardware platform.

In proposed system In contrast to Existing work, we implement and evaluate backpressure scheduling over a TDMAMAC protocol, which yields maximum throughput .The XPRESS cross-layer stack gracefully integrates the transport, network, and MAC layers.

a) Advantages of proposed system

» Ensures that network operates within capacity region.

» It reduces delay in routing & performance is improved.

» Yields maximum Throughput.

III. System Implementation

The overall system architecture and implementation is explained with respect to Backpressure scheduling in routing the exact paths and XPRESS system architecture for wireless multi hop networks and Data plane at each XPRESS nodes and overall performance evaluation.

a) Back pressure scheduling

The backpressure scheduling policy that maximizes the throughput of wireless multi hop network. Assuming slotted time, the basic idea of backpressure scheduling is to select the "best" set of noninterfering links for transmission at each slot we now describe this idea in a 4-node network with two flows, black and Grey, from node A to D as depicted in below diagram.

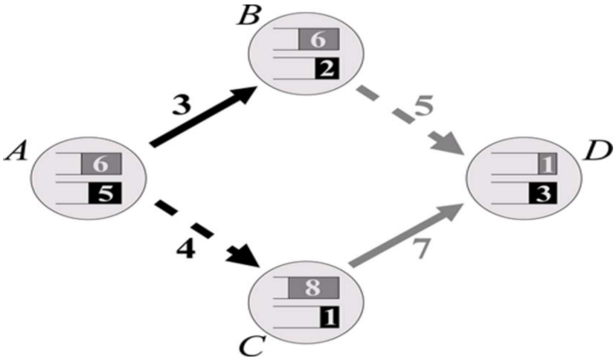

Fig 2 Backpressure scheduling in a wireless multi hop network

Here each node maintains a separate queue for each flow. For each queue, the number of backlogged packets is shown. Assume that we have two link sets {(A, B), (C, D)} and {(A, C), (B, D)} shown as continuous and dashed lines, respectively. The links in each set do not interfere and can transmit in the same time slot. The scheduler executes the following three steps at each slot. First, for each link, it finds the flow with the maximum differential queue backlog. For example, for link (A, B), the Grey flow has a difference of 0 packets and the black flow has a difference of 3 packets. The maximum value is then assigned as the weight of the link as shown in the above diagram. Second, the scheduler selects the set of noninterfering links with the maximum sum of weights for transmission. This requires compute the sum of link weights for each possible set. In the example, set {(A, B), (C, D)} sums 3+7=10 and set {(A, C), (B, D)} sums to 4+5=9. The scheduler then selects the set with the maximum sum of weights, {(A, C), (B, D)}, to transmit at this slot Finally , packets from the selected flows are transmitted on the selected links.

b) XPRESS system architecture

The below diagram shows the system architecture

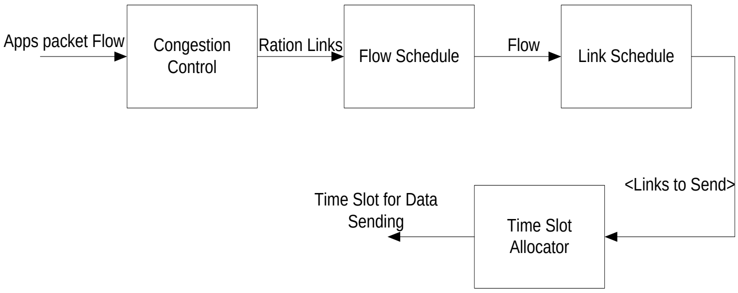

Fig 3 XPRESS overall architecture

c) Performance evaluation

When compared to Data rate of packets being transferred from each non interfering node XPRESS can yield maximum throughput as shown in below figure.

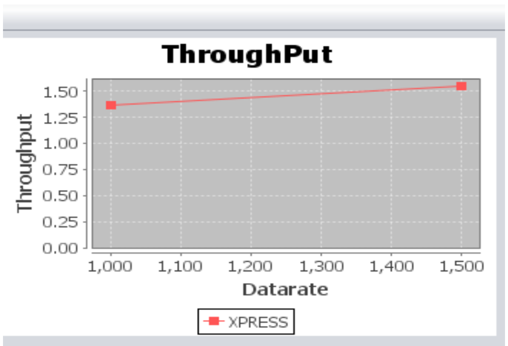

Fig 4 XPRESS Yields Maximum Throughput

We see the CDF (Cumulative distributive function) of delay measured at the source

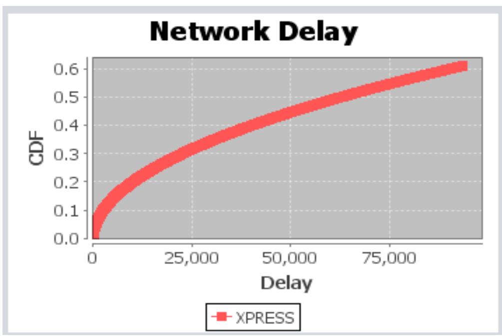

Fig 5 Network delay

IV. Conclusion

We presented the design and implementation of XPRESS, a back pressure architecture for wireless multi hop networks .In contrast to previous work, we integrated backpressure scheduling with a TDMA MAC protocol to allow precise timing in transmissions. XPRESS yields maximum Throughput and operates within network capacity. In future work we believe that design primitives of XPRESS a cross layer protocol stack can lead to new distributed wireless architectures for larger networks.

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A successful project is a fruitful culmination of the efforts of many peoples .some directly involved and others who have quietly encouraged and extended their invaluable support throughout its progress.

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