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Design and Implementation of AMRP for Multi hop wireless Mobile ad hoc Networks

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ABSTRACT

In this paper have analyzed the interruption concert of a multi-hop wireless network in which the routes between resource-objective pairs are fixed. It has developed a new queue grouping technique to handle the complex correlations of the service process resulting from the multi-hop nature of the flows and their mutual sharing of the wireless medium. A general set based interfering model is assumed that imposes constraints on links that can be served simultaneously at any given time. These interference constraints are used to obtain a fundamental lower bound on the interruption concert of any scheduling policy for the system. It presents a systematic methodology to derive such lower bounds. For a special wireless system, namely the clique, it design a policy that is sample path interruption is finest. For the cycle queue network, where the interruption finest policy is known, the expected interruption of the optimal policy numerically coincides with the lower bound. The lower bound analysis provides useful insights into the design and analysis of optimal or nearly optimal scheduling policies.

Key words: **Hop by Hop, performance, clique, interference, Multi hop, Scheduling, AMRIS.**

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1. INTRODUCTION:

Multiple trees resulting in storage and control overhead. Examples of tree-based schemes include: ad hoc multicast routing protocol (AM Route), ad hoc multicast routing utilizing increasing ID-numbers protocol (AMRIS), and multicast ad hoc on-demand distance vector routing protocol (MAODV)[1].

Cluster based stable multicast routing protocol (CBSRP) in Ad Hoc Networks. The protocol uses flooding algorithm under extended range of some network conditions like higher mobility and enhanced traffic conditions. It constructs a new metric of node stability and selects a stable path with the help of entropy metric to reduce the number of route reconstruction. It selects the nodes which have the most weight and stability to be the cluster heads [2].

Though the stable node selection increases the stability but this selection is made possible using clusters and the proactive maintenance of cluster heads is a major overhead and the overhead increases with number of nodes [3].

In our previous work a mesh based multicast routing scheme is discussed which establishes a multicast mesh on demand. The work is not supported with validation of the scheme and performance analysis and also lacked proper formulation of components of the scheme. This paper provides an extension to the work by providing detailed functioning of the scheme, examples and simulation based performance analysis [9].

1. Literature Survey

Literature survey is the most important step in software development process. [1]. Started to do this implementation, we referred the following papers of Mobile Ad Hoc multicasting and we decided to do this project with the existing system, and came to a conclusion that what can be done in the proposed system.

A large number of studies on multi-hop wireless networks have been devoted to system stability while maximizing metrics like throughput or utility [4]. These metrics measure the performance of a system over a long time-scale [6]. For a large class of applications such as video or voice over IP, embedded network control and for system design [5]; metrics like delay are of prime importance. The delay performance of wireless networks [8], however, has largely been an open problem. This problem is notoriously difficult even in the context of wire line networks, primarily because of the complex interactions in the network [7] (e.g., superposition, routing, departure, etc.) that make its analysis amenable only in very special cases like the product form networks.

The problem is further exacerbated by the mutual interference inherent in wireless networks which, complicates both the scheduling mechanisms and their analysis. Some novel analytical techniques to compute useful lower bound and delay estimates for wireless networks with single hop traffic were developed in.

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However, the analysis is not directly applicable to multi-hop wireless network with multi hop flows, due to the difficulty in characterizing the departure process at intermediate links [6]. The metric of interest in this paper is the system-wide average delay of a packet from the source to its corresponding destination. We present a new, systematic methodology to obtain a fundamental lower bound on the average packet delay in the system under any scheduling policy. Furthermore, we re-engineer well known scheduling policies to achieve good delay performance viz-a-viz the lower bound [8].

2. Description:

We analyze a multi-hop wireless network with multiple source-destination pairs, given routing and traffic information. Each source injects packets in the network, which traverses through the network until it reaches the destination. For example, a multi-hop wireless network with three flows is shown in Fig. 1. The exogenous arrival processes AI (t), AII (t) and AIII (t) correspond to the number of packets injected in the system at time t. A packet is queued at each node in its path where it waits for an opportunity to be transmitted. Since the transmission medium is shared, concurrent transmissions can interfere with each others' transmissions [5]. The set of links that do not cause interference with each other can be scheduled simultaneously, and we call them *activation vectors* (matching's). We do not impose any a priori restriction on the set of allowed activation vectors, i.e., they can characterize any combinatorial interference model. For example, in a K-hop interference model [4], the links scheduled simultaneously are separated by at least K hops. In the example show in Fig. 1, each link has unit capacity; i.e., at most one packet can be transmitted in a slot. For the above example, we assume a 1-hop interference model [7].

The delay performance of any scheduling policy is primarily limited by the interference, which causes many bottlenecks to be formed in the network. We demonstrated the use of exclusive sets for the purpose of deriving lower bounds on delay for a wireless network with single hop traffic. We further generalize the typical notion of a bottleneck [3]. In our terminology, we define a (K, X)-bottleneck to be a set of links X such that no more than K of them can simultaneously transmit. Figure 1 shows (1, X) bottlenecks for a network under the 1-hop interference model. In this paper, we develop new analytical techniques that focus on the queuing due to the (K, X)-bottlenecks. One of the techniques, which we call the "*reduction technique*", simplifies the analysis of the queuing upstream of a (K, X)-bottleneck to the study of a single queue system with K servers as indicated in the figure1. Furthermore, our analysis needs only the exogenous inputs to the system and thereby avoids the need to characterize departure processes on intermediate links in the network. For a large class of input traffic, the lower bound on the expected delay can be computed using only the statistics of the exogenous arrival processes and not their sample paths. To obtain a lower bound on the system wide average queuing delay, we analyze queuing in multiple bottlenecks by relaxing the interference constraints in the system [8]. Our relaxation approach is novel and leads to nontrivial lower bounds.

A large number of studies on multi-hop wireless networks have been devoted to system stability while maximizing metrics like throughput or utility. These metrics measure the performance of a system over a long time-scale. For a large class of applications such as video or voice over IP, embedded network control and for system design; metrics like delay are of prime importance [1]. The delay performance of wireless networks, however, has largely been an open problem. This problem is notoriously difficult even in the context of wire line networks, primarily because of the complex interactions in the network (e.g., superposition, routing, departure, etc.) that make its analysis amenable only in very special cases like the product form networks. The problem is further exacerbated by the mutual interference inherent in wireless networks which, complicates both the scheduling mechanisms [3] and their analysis. Some novel analytical techniques to compute useful lower bound and delay estimates for wireless networks with single hop traffic were developed

3.3 MODULE DESCRIPTION

3.1Multi-hop wireless network module

Multi-hop wireless network with multiple source-destination pairs, given routing and traffic information. Each source injects packets in the network, which traverses through the network until it reaches the destination.

3.2. Delay performance of wireless networks

The delay performance of wireless networks, however, has largely been an open problem. This problem is notoriously difficult even in the context of wire line networks, primarily because of the complex interactions in the network (e.g., superposition, routing, departure, etc.) that make its analysis amenable only in very special cases like the product form networks. The problem is further exacerbated by the mutual interference inherent in wireless networks which, complicates both the scheduling mechanisms and their analysis. Some novel analytical techniques to compute useful lower bound and delay estimates for wireless networks with single hop traffic were developed. However; the analysis is not directly applicable to multi-hop wireless network with multi hop flows, due to the difficulty in characterizing the departure process at intermediate links.

3.3. Back-Pressure Policy

The back-pressure policy may lead to large delays since the backlogs are progressively larger from the destination to the source. The packets are routed only from a longer queue to a shorter queue and certain links may have to remain idle until this condition is met. Hence, it is likely that all the queues upstream of a bottleneck will grow long leading to larger delays. A common observation of the optimal policies for the clique and the tandem network is that increasing the priority of packets which are close to the destination reduces the delay.

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3.4. Delay Analysis technique module

The general research on the delay analysis of scheduling policies has progressed in the following main directions:

• *Heavy traffic regime using fluid models:* Fluid models have typically been used to either establish the stability of the system or to study the workload process in the heavy traffic régime. The maximum-pressure policy (similar to the back-pressure policy) minimizes the workload process for a stochastic processing network in the heavy traffic regime when processor splitting is allowed.

• *Stochastic Bounds using Lyapunov drifts:* This method is developed and is used to derive upper bounds on the average queue length for these systems. However, these results are order results and provide only a limited characterization of the delay of the system. For example, the maximal matching policies achieve O(1) delay for networks with single-hop traffic when the input load is in the reduced capacity region. This analysis however, has not been extended to the multi-hop traffic case, because of the lack of an analogous Lyapunov function for the Back- pressure policy.

• *Large Deviations:* Large deviation results for cellular and multi-hop systems with single hop traffic have been to estimate the decay rate of the queue-overflow probability. Similar analysis is much more difficult for the multi-hop wireless network considered here, due to the complex interactions between the arrival, service, and backlog process.

3.5 Design of Delay Efficient Policies module

A scheduler must satisfy the following properties.

• *Ensure high throughput:* This is important because if the scheduling policy does not guarantee high throughput then the delay may become infinite under heavy loading.

• *Allocate resources equitably:* The network resources must be shared among the flows so as not to starve some of the flows. Also, non-interfering links in the network have to be scheduled such that certain links are not starved for service. Starvation leads to an increase in the average delay in the system.

The above properties are difficult to achieve; given the dynamics of the network and the lack of apriori information of the packet arrival process. In the light of the previous work we choose to investigate the back-*pressure policy with fixed routing.* The back-pressure policy has been widely used to develop solutions for a variety of problems in the context of wireless networks and the importance of studying the trade-offs in stability, delay, and complexity of these solutions is now being realized by the research community. This policy tries to maintain the queues corresponding to each flow in decreasing order of size from the source to the destination. This is achieved by using the value of differential backlog (difference of backlogs at the two ends of a link) as the weight for the link and scheduling the matching with the highest weight. As a result, the policy is throughput optimal. Henceforth, we shall refer to this policy as only the back-pressure policy. We first study the delay optimal policy for a clique network.

4 SYSTEM DESIGN

Data Flow Diagram / Use Case Diagram / Flow Diagram

The DFD is also called as bubble chart. It is a simple graphical formalism that can be used to represent a system in terms of the input data to the system, various processing carried out on these data, and the output data is generated by the system.

4.1 Architecture.

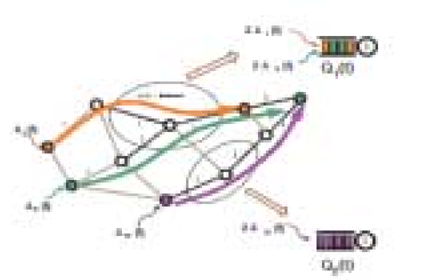

Fig. 1. A typical multi-hop wireless network with multiple flows, each having exogenous arrivals at the source. Some of the important bottlenecks have been highlighted.

Algorithm 1 Greedy Partitioning Algorithm

1: Z ← {1, 2 . . .N}
2: BOUND ← 0
3: repeat
4: Find the (K, X)-bottleneck which maximizes E[DX]
5: BOUND ← BOUND + ΛXE[DX]
6: Z ← Z \ i : i ∈ X
7: until Z = Φ
8: return BOUND PN i=1 λi

4.2 Data Flow Diagram

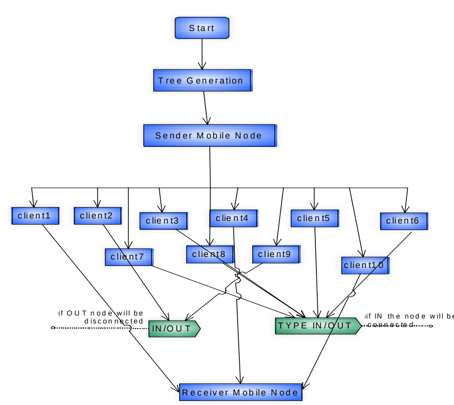

Fig: 2

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A **data flow diagram** (**DFD**) is a graphical representation of the "flow" of data through an information system. DFDs can also be used for the visualization of data processing (structured design).On a DFD, data items flow from an external data source or an internal data store to an internal data store or an external data sink, via an internal process. A DFD provides no information about the timing of processes, or about whether processes will operate in sequence or in parallel. It is therefore quite different from a flowchart.

5. Results and discussion

A quality output is one, which meets the requirements of the end user and presents the information clearly. In any system results of processing are communicated to the users and to other system through outputs. In output design it is determined how the information is to be displaced for immediate need and also the hard copy output. It is the most important and direct source information to the user. Efficient and intelligent output design improves the system's relationship to help user decision-making.

1. Designing computer output should proceed in an organized, well thought out manner; the right output must be developed while ensuring that each output element is designed so that people will find the system can use easily and effectively. When analysis design computer output, they should Identify the specific output that is needed to meet the requirements.
2. Select methods for presenting information.
3. Create document, report, or other formats that contain information produced by the system.

The output form of an information system should accomplish one or more of the following objectives.

Fig 3: Time delay analysis

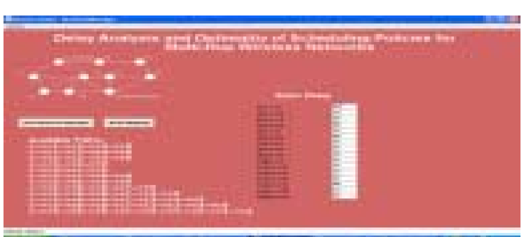
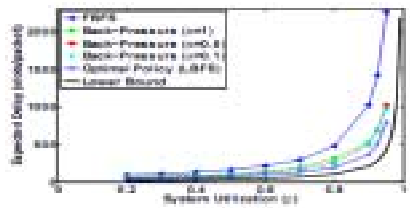
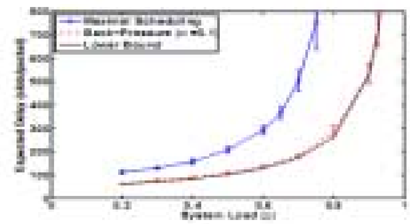


Fig 4: Time delay analysis

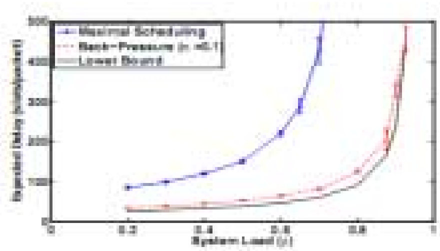


Simulation Results Clique shown Fig 5.



Simulation Results for multiple topology

Simulation results for linear topology



Simulation results for tree topology

6. Conclusion

The delay analysis of wireless networks is largely an open problem. In fact, even in the wire line setting, obtaining analytical results on the delay beyond the product form types of networks has posed great challenges. These are further exacerbated in the wireless setting due to complexity of scheduling needed to mitigate interference. Thus, new approaches are required to address the delay problem in multi-hop wireless systems. To this end, we develop a new approach to reduce the bottlenecks in a multi-hop wireless to single queue systems to carry out lower bound analysis.

For a special class of wireless systems (cliques), we are able to apply known techniques to obtain a sample path delay-optimal scheduling policy. We also obtain policies that minimize a function of queue lengths at all times on a sample path basis. Further, for a tandem queuing system, we show numerically that the expected delay of a previously known delay-optimal policy coincides with the lower bound.

The analysis is very general and admits a large class of arrival processes. Also, the analysis can be readily extended to handle channel variations. The main difficulty however is in identifying the bottlenecks in the system. The lower bound not only helps us identify near-optimal policies, but may also help in the design of a delay-efficient policy as indicated by studies.

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