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Multicast Capacity in MANET with Infrastructure Support

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***Abstract*—we study the multicast capacity under a network model featuring both node's mobility and infrastructure support. Combinations between mobility and infrastructure, as well as multicast transmission and infrastructure, have already showed Effective ways to increase multicast capacity. In this work, we jointly consider the impact of the above three factors on network Capacity. We assume that m static base stations and n mobile users are placed in an ad hoc network. A general mobility model is adopted, such that each user moves within a bounded distance from its home-point with an arbitrary pattern.**

Key words:Wireless ad hoc network, multicast capacity, mobility, infrastructure, hybrid network, Scaling law

1 INTRODUCTION

Recent years witness a rapid development in wireless ad hoc networks, in both academic and industrial fields. Kumar and Gupta have showed in their ground breaking work that, even with the optimal scheduling routing and relaying of packets, the per-node capacity still decreases as θ (1/ √n) when a n approaches the infinity many studies try to improve this disappointing scalability of throughput capacity by introducing different characteristics into ad hoc networks such as mobility of nodes, an infrastructure of the networks: a multicast transmission scheme.

Generalize the mobility model through a restriction that each moving node is located within a circle of radius1/f (n). By mapping the network to a generalized random geometric graph, they have proven that Θ (1/f (n)) per-node capacity is achievable. Infrastructure in an ad hoc network provides a more straightforward increase to the capacity. In, Liu etal. Claim that infrastructure can offer a linear capacity increase in a hybrid network, when the number of base stations increases asymptotically faster than. In addition, Kozat and Tassels prove that if the number of users served by each BS is bounded above, a per-node capacity of Θ

(1/ log n) can be achieved. In, Agarwal and Kumar further extend this result to Θ (1). Multicast
Transmission refers to the transmission from a single node to other k − 1 nodes, so as to generalize both unicast and broadcast transmissions. In, Li proves that multicast transmission can obtain a per-flow capacity of Θ (√1n log n· √1k), which is larger than that of k unicast transmissions. The gain of multicast

Transmission results from a merge of relay paths within a minimum spanning tree. Many existing studies focus on the combinations of the above characteristics. Some aim to further increase the network performance, while others try to present a more realistic scenario. In [9] and [10], Li et al. Explore the multicast capacity in a static hybrid network with infrastructure support. A per-node capacity is 2Θ (1f (n)) + Θ (min [m2cn, mn]) for strong mobility and Θ (min [m2cn, mn] for weak and trivial mobility. In this paper, we further study the multicast capacity scaling laws of a mobile hybrid network characterizing both mobility and infrastructure. In our model, each of the n users moves around a home-point within a bounded radius. m wire-connected base stations are placed in a wireless ad hoc network, of which the area scales with n as f2 (n). There are totally nc clusters with radius r = Θ (n−R) and the number of destinations in the multicast scheme is assumed as k. Intuitively, in our hybrid routing scheme, we hope to circumvent the bottleneck of backbone transmission or wireless access for cellular networks and take the advantage of them, thus the capacity can be improved.
Our main contributions:

This paper , we consider the effects of mobility and infrastructure in multicast capacity of a wireless mobile ad hoc network. We divide mobility into three regimes, and present reachable upper bounds and lower bounds for each regime. We assume that bandwidth is W for wireless channel, and WB for wired connections.

2 LITERATURE SURVEY

In this section, we firstly provide a definition of a uniformly dense network, as well as some characteristics in such network. We show that when a network falls into strong mobility regime, it is equivalent to classify it as a uniformly dense network.
Then reachable upper and lower bounds are presented in both pure ad hoc routing and cellular routing for uniformly dense networks. For pure ad hoc routing, we map the mobile network into a random geometric graph, and derive reachable capacity bounds. We study a model of an ad hoc network where n nodes communicate in random Source-destination pairs. These nodes are assumed to be mobile. Such that the topology changes over the Time-scale of packet delivery. Experimental data, however, have shown that the mobility pattern of individual nodes is typically restricted over the area, while the overall node

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density is often largely inhomogeneous, due to prevailing clustering behavior resulting from hot- spots. We show how the analysis of the asymptotic capacity of dense mobile ad-hoc networks can be transformed, under mild assumptions, into a *Maximum Concurrent Flow* (MCF) problem over an associated *Generalized Random Geometric Graph* (GRGG).This paper involves the study of the throughput capacity of hybrid wireless networks. A hybrid network is formed by placing a sparse network of base stations in ad hoc network. An analytical expression of the throughput capacity is obtained. In this paper, we consider the transport capacity of ad hoc networks with a random flat topology under the present support of an infinite capacity infrastructure network. In addition, ad hoc nodes can also utilize the existing infrastructure fully or partially by reaching any access point (or gateway) of the infrastructure network in a single or multi-hop fashion. Using the same tools as in we show that the per source node capacity of T (*W*/log (*N*)) can be achieved in a random network scenario with the following assumptions. The number of ad hoc nodes per access point is bounded above, each wireless node, including the access points, is able to transmit at *W* bits/sec using a fixed transmission range, and N ad hoc nodes, excluding the access points, constitute a connected topology graph. This is a significant improvement over the capacity of random ad hoc networks with no infrastructure support which is found as T (*W*/v*N* log (*N*)) in. Although better capacity figures may be obtained by complex network coding or exploiting mobility in the network, infrastructure approach provides a simpler mechanism that has more practical aspects.

3 Software Requirements.

The multi-language capability of the .NET Framework and Visual Studio .NET enables developers to use their existing programming skills to build all types of applications and XML Web services. The .NET framework supports new versions of Microsoft's old favorites Visual Basic and C++ (as VB.NET and Managed C++), but there are also a number of new addition to the family.
.NET provides the easiest transition for Java-language developers into the world of XML Web Services and dramatically improves the interoperability of Java-language programs with existing software written in a variety of other programming languages.

4 Constructors and Destructors

A destructor is used to release the resources that an object is holding. When an Object is ready to be destroyed. Finalize method or destructor is called on that Object. In .NET, all e dependent objects are automatically ready for Garbage Collection. When the main object doesn't have any references thus the destructor here doesn't have same significance as in C++ A thread is an independent stream of instruction in a program. A thread is similar to a Sequential program. However a thread itself is not a program it can't run on its own, instead It runs within program's context. The real usage of a thread is not about a single sequential Sequential thread, but rather using multiple threads in a single program. Multiple thread Running at the same time and performing various tasks is referred as Multithreading.

4.4 Structured Exception Handling

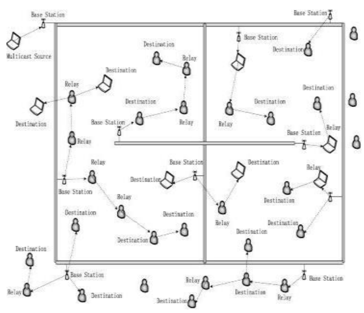
C#.NET supports structured handling, which enables to detect and remove errors at runtime. Visual C# .NET offers structured exception handling that provides a powerful and a more readable way to handle errors. Structured exception handling enables you to nest error handlers inside other error handlers that are in the same procedure.
Structured exception handling uses a block syntax that is similar to the If...Else...End If statement. This makes Visual C# .NET code or code in later versions of Visual C# more readable and easier to maintain.

5 Existing System

Many existing studies focus on the combinations of the above characteristics. Some aim to further increase the network performance, while others try to present a more realistic scenario. In, Liet al. explores the multicast capacity in a static hybrid network with infrastructure support. On the other hand, Huang, Wanget al. study the unicast capacity of mobile hybrid networks and jointly consider the influences of node's mobility and infrastructure support on it. A per-node capacity is for strong mobility, and for weak and trivial mobility.

6 Proposed System

In this paper, we further study the multicast capacity scaling laws of a mobile hybrid network characterizing both mobility and infrastructure. In our model, each of the n users moves around a home-point within a bounded radius. An m wire- connected base station is placed in a wireless ad hoc network, of which the area scales with n. There are totally n_C clusters with radius r and the number of destinations in the multicast scheme is assumed as k. A multicast path can be generated with an infrastructure routing and a pure ad hoc routing, as well as a combination of both. Intuitively, in our hybrid routing scheme, we hope to circumvent the bottleneck of backbone transmission or wireless access for cellular networks and take the advantage of them, thus the capacity can be improved.



7. CONCLUSION

This paper analyzes the multicast capacity in mobile ad hoc networks with infrastructure support. Hybrid routing schemes are proposed to achieve reachable upper and lower

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bounds in each of the regimes. It is worth pointing out that our work generalizes results in previous works on hybrid networks, impact of mobility and multicast transmissions, as well as any combinations of the above. Our results are instructive in the design of real hybrid system combining cellular and ad hoc networks

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