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Autonomous Mobile Mesh Network-Implementation Work

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ABSTRACT: MANETs are among the most popular network communication technologies. One great challenge in designing robust MANETs is to minimize network partitions. As autonomous mobile users move about in a MANET, the network topology may change rapidly and unpredictably over time and portions of the network may intermittently become partitioned. We address this challenging problem by proposing a new class of robust mobile ad hoc network called AMMNET. To maintain the communication between all nodes even they are in different groups Mesh Nodes are used. Mesh Nodes which have the capability of changing its nature into Inter-group router or Intra-group router, even it can act as a bridge router. Unlike conventional mesh networks, the mobile mesh nodes of an AMMNET are capable of following the mesh clients in the application terrain. We propose a distributed client tracking solution to deal with the dynamic nature of client mobility, and present techniques for dynamic topology adaptation in accordance with the mobility pattern of the clients.

KEYWORDS: Mobile Mesh Networks, Dynamic Topology Deployment, Client Tracking

I. INTRODUCTION

A wireless network is any type of computer network that uses wireless data connections for connecting network nodes. Wireless networking is a method by which homes, telecommunications networks and enterprise installations avoid the costly process of introducing cables into a building, or as a connection between various equipment locations. Wireless telecommunications networks are generally implemented and administered using radio communication. This implementation takes place at the physical level of the OSI model network structure. Examples of wireless networks include cell phone networks, Wi-Fi local networks and terrestrial microwave networks. In particular, mobile ad-hoc networks (MANETs) are among the most popularly studied network communication technologies. In such an environment, no communication infrastructure is required.

The mobile nodes also play the role of the routers, helping to forward data packets to their destinations via multiple-hop relay. This type of network is suitable for situations where a fixed infrastructure is unavailable or infeasible. They are also a cost effective solution since the same ad-hoc network can be relocated, and reused in different places at different times for different applications. One great challenge in designing robust MANETs is to minimize network partitions. As autonomous mobile users move about in a MANET, the network topology may change rapidly and unpredictably over time and portions of the network may intermittently become partitioned.

This condition is undesirable, particularly for mission-critical applications such as crisis management and battlefield communications. We address this challenging problem in this paper by proposing a new class of robust mobile ad-hoc network called Autonomous Mobile Mesh Networks (AMMNET)

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II. LITERATURE SURVEY

The highly successful architecture and protocols of today's Internet may operate poorly in environments characterized by very long delay paths and frequent network partitions. These problems are expected by end nodes with limited power or memory resources. Often deployed in mobile and extreme environments lacking continuous connectivity, many such networks have their own specialized protocols, and do not utilize IP. To achieve interoperability between them, we propose a network architecture and application interface structured around optionally-reliable asynchronous message forwarding, with limited expectations of end-to-end connectivity and node resources. The architecture operates as an overlay above the transport layers of the networks it interconnects, and provides key services such as in-network data storage and retransmission, interoperable naming, authenticated forwarding and a coarse-grained class of service.

The existing TCP/IP based Internet service model provides end-to-end inter-process communication using a concatenation of potentially dissimilar link-layer technologies. The standardization of the IP protocol and its mapping into network-specific link-layer data frames at each router supports interoperability using a packet-switched model of service. Although often not explicitly stated, a number of key assumptions are made regarding the overall performance characteristics of the underlying links in order to achieve this service: an end-to-end path exists between a data source and its peer(s), the maximum round-trip time between any node pairs in the network is not excessive, and the end-to-end packet drop probability is small. Unfortunately, a class of challenged networks, which may violate one or more of the assumptions, are becoming important and may not be well served by the current end-to-end TCP/IP model. Examples include: reasons.

In this paper, and its extended version [8], we argue that to achieve interoperability between very diverse networks, especially those engineered for extreme environments or that often suffer from network partitioning, link-repair approaches alone will not suffice and network-specific proxies are undesirable. Instead, we suggest a general purpose message oriented reliable overlay architecture as the appropriate approach to tie together such networks, forming an "internetwork of challenged internets." The approach, which provides the service semantics of asynchronous message delivery, may be used in combination with TCP/IP where appropriate. Its design is influenced by the interoperability properties of the classical Internet design, the robust non interactive delivery semantics of electronic mail, and a subset of the classes of service provided by the US Postal System. These networks have all evolved to become highly successful communication networks supporting millions of daily users.

we get the basic idea to improve the coverage over and to put faster and secure network to the telecommunication sector. AMMNET which reduces manpower and very economic.[1] These recent evolutions have been generating a renewed and growing interest in the research and development of MANET. This paper attempts to provide a comprehensive overview of this dynamic field. It first explains the important role that mobile ad hoc networks play in the evolution of future wireless technologies. [2]. Cooperative Communication, a new research area, has revealed a recent origin in the wireless networks, which combines the link-quality and the broadcasting nature of the wireless channels. It is a pure network layer scheme that can be built on top of the wireless networking equipment. Nodes in the network use a lightweight proactive source routing protocol to determine a list of intermediate nodes that the data packets should follow en route to the destination.[3]

III. EXISTING SYSTEM

WIRELESS technology has been one of the most transforming and empowering technologies in recent years. In particular, mobile ad hoc networks (MANETs) are among the most popularly studied network communication technologies. Mobile nodes in MANET"s play the role of routers, helping to forward data packets to their destinations via multiple-hop relay. This type of network is suitable for situations where a fixed infrastructure is unavailable or infeasible. As autonomous mobile users move about in a MANET, the network topology may change rapidly and unpredictably over time; and portions of the network may intermittently become partitioned. This condition is undesirable, particularly for mission-critical applications such as crisis management and battlefield communications.

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DISADVANTAGES OF EXISTING SYSTEM

Difficult to design robust MANETs for minimize network partitions.

IV. PROPOSED SYSTEM

In this paper, we introduced a mobile infrastructure called AMMNET. Unlike conventional mobile ad hoc networks that suffer network partitions when the user groups move apart, the mobile mesh routers of an AMMNET track the users and dynamically adapt the network topology to seamlessly support both their intragroup and intergroup communications. Since this mobile infrastructure follows the users, full connectivity can be achieved without the need and high cost of providing network coverage for the entire application terrain at all time as in traditional stationary infrastructure.

ADVANTAGES OF PROPOSED SYSTEM

AMMNET can forward data for mobile clients along the routing paths built by any existing ad hoc routing protocols.
AMMNET is robust against network partitioning and capable of providing high relay throughput for the mobile clients

V. IMPLEMENTATION

MODULES:

- Creating System Model
- Channel Assignment
- Resource allocation
- Admission control module

MODULES DESCRIPTION:

CREATING SYSTEM MODEL

We consider a pre-planned WMN consisting of a set of stationary wireless nodes (routers) connected by a set L of unidirectional links. Some of the nodes are assumed to have the ability to perform functions of the gateway, and one of them is selected to act as the gateway to the Internet. Each node is equipped with a single network interface card (NIC) and is associated with one of C orthogonal (non-overlapping) channels for transmitting or receiving. A sender-receiver pair can communicate with each other only if both of them are tuned to the same channel. In this work dynamic channel switching is assumed to be possible with the NIC. Nodes operate in a half-duplex manner so that at any given time a node can either transmit or receive (but not both). In addition, it is assumed that the network operates in a time-slotted mode; time is divided into slots of equal duration.

Channel Assignment

The proposed algorithm allocates channels in a way that (a) self-interference is avoided and (b) co-channel interference levels among links that use the same channel are kept as low as possible. With our algorithm, links with higher costs are assigned higher priorities in terms of channel assignment over the links with lower cost. This is because links with higher costs suffer from higher levels of congestion and thus, scheduling these links is harder. The proposed channel assignment algorithm starts by sorting links in the descending order of their link costs. Then, channels are assigned to the links in that order. The proposed algorithm avoids self-interference by not assigning a channel to any link whose incident links have already been assigned channels. In other words, a link is eligible for activation only if it has no active neighbor links. In order to alleviate the effects of cochannel interference, the channel that is assigned to a link is selected based on the sum of link gains between all the interfering senders using the same channel and the receiver of the link. This sum is calculated for each of the channels and the channel with the least associated value is selected for the link.

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Resource Allocation:

The main objective of the module is to allocate resources to the different connections such that the minimum rate requirements of each connection are met. The proposed approach requires both the transport (in terms of end-to-end rate allocation) and the physical layer (in terms of channel and power schedule) to be aligned. Coordination between the two layers can be implemented on different timescales: end-to-end rate allocation (through TCP/AQM) on the fast time-scale and incremental channel and power updates on the slow time-scale. Most of the common TCP/AQM variants can be interpreted as distributed methods for solving the optimization network flow problem (determines the end-to-end rates under fixed link capacity). Based on an initial schedule (a simple TDMA link schedule for the first L slots), we run the TCP/AQM scheme until convergence (this may require the schedule to be applied repeatedly). After rate convergence, each node reports the link prices associated with its incoming and outgoing links to gateway where the proposed resource allocation scheme is adopted. On receiving the link prices from the entire set of node, the gateway finds the channels and transmits powers by applying the resource allocation scheme proposed; it then augments the schedule. The procedure is then repeated with this revised schedule.

Admission control module

An admission control strategy is essential to provide protection to the sources that are currently being serviced. In other words, the QoS of existing flows in terms of a minimum rate (being currently provided) cannot be compromised in order to accommodate new incoming flows. Our resource allocation framework can be easily adapted to support admission control.

VI. DISCUSSION

For applications such as crisis management and battlefield communications, the mobile users need to work in dynamically formed groups that occupy different parts of a large and uncertain application terrain at different times. There is currently no cost-effective solution for such applications. Since the user groups occupy only a small portion of the terrain at any one time, it is not justifiable to deploy an expensive infrastructure to provide network coverage for the entire application terrain at all time. Other challenges are due to the potentially hostile environment and the uncertainty in how the application terrain unfolding with time.

In this paper, we introduced a mobile infrastructure called AMMNET. Unlike conventional mobile ad hoc networks that suffer network partitions when the user groups move apart, the mobile mesh routers of an AMMNET track the users and dynamically adapt the network topology to seamlessly support both their intragroup and intergroup communications. Since this mobile infrastructure follows the users, full connectivity can be achieved without the need and high cost of providing network coverage for the entire application terrain at all time as in traditional stationary infrastructure.

We conducted extensive simulation study to assess the effectiveness of AMMNET

Experience Result

We next examine the throughput performance in a critical environment, where the number of mesh nodes is not sufficient to always provide full coverage. As a result, we set the number of available routers to 125 because the result in Fig.1 shows that the number of routers required to cover all clients is about 130 on average. In this simulation, we also compare AMMNET with the traditional mobile ad hoc network. Since MANET is not an infrastructure-based network, we let each MANET user act as a mobile router, which can transmit/receive its own data and also forward data for other users.

Each simulation includes 100 clients partitioned into five mobility groups. Each router forwards data at the transmission bit-rate of 11 Mb/s. From the 60^{th} to 90th time slots, we randomly select five pairs of nodes to concurrently transmit UDP flows, each with a data rate of 800 Kb/s.

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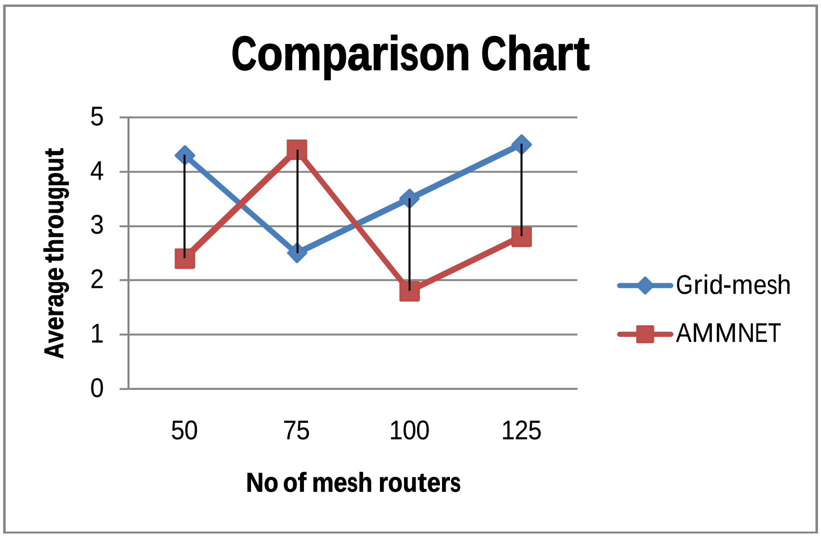

Fig6(a) Experience result

To isolate the impact of frequent route update on the forwarding throughput, we measure the throughput of Oracle only when the routing table in each router has been reconfigured after each topology adaption. Nevertheless, the throughputs of all the other schemes are measured for the entire duration of the simulation to evaluate how they are affected by dynamic topology and route reconfiguration. Fig. 1 a shows the average throughput of all the traffic given various numbers of mesh nodes.1 The figure shows that the average throughput obtained in AMMNET is about 33 percent higher than that in the grid-based mesh.

This is due to the fact that some source-destination pairs in the grid-based mesh are not served by any routers and data could not be delivered. AMMNET can achieve a throughput about 70 percent of that of the Oracle scheme. The performance gap comes from the slightly longer relay paths, and, more deterministically, the packet loss due to route reconfiguration. More specifically, when mesh nodes adapt their locations to client movements, each router cannot relay data along the previous relay paths and needs to discover new routes. Some packets buffered in the original routing paths might be dropped, resulting in throughput degradation.

VII. SUMMARY

CONCLUSION

The results confirm that the proposed distributed topology adaptation scheme based on autonomous mobile mesh routers is almost as effective as a hypothetical centralized technique with complete knowledge of the locations of the mobile clients. The simulation results also indicate that AMMNET is scalable with the number of users. The required number of mobile mesh nodes does not increase with increases in the user population. Although an excessively large number of user groups may affect the performance of AMMNET, the number of user groups is typically very small relative to the number of users for most applications and AMMNET is effective for most practical scenarios.

FUTURE ENHANCEMENT

We conducted extensive simulation study to assess the effectiveness of AMMNET. There are still many interesting issues not yet examined in our study such as searching for disappearing mobile clients, minimizing routing paths, and utilizing non overlapping channels. We leave these changes for future research

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