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# Distributed Client Tracking Mechanism for Mobile Mesh Networks

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**Abstract:** Mobile ad hoc networks (MANETs) are ideal for situations where a fixed infrastructure is unavailable or infeasible. Today's MANETs, however, may suffer from network partitioning. This limitation makes MANETs unsuitable for applications such as crisis management and battlefield communications, in which team members might need to work in groups scattered in the application terrain. In such applications, intergroup communication is crucial to the team collaboration. To address this weakness, we introduce in this paper a new class of ad-hoc network called Autonomous Mobile Mesh Network (AMMNET). Unlike conventional mesh networks, the mobile mesh nodes of an AMMNET are capable of following the meshclients in the application terrain, and organizing themselves into a suitable network topology to ensure good connectivity for both intra- and intergroup communications. 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. Our simulation results indicate that AMMNET is robust against network partitioning and capable of providing high relay throughput for the mobile clients.

**Keywords:** Mobile AdHoc Networks (MANETs), Autonomous Mobile Mesh Network (AMMNET).

## I. INTRODUCTION

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. 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 because 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). In a standard wireless mesh network, stationary mesh nodes provide routing and relay capabilities. They form a mesh-like wireless network that allows mobile mesh clients to communicate with each other through multi-hop communications.

Such a network is scalable, flexible, and low in maintenance cost. When a mesh node fails, it can simply be replaced by a new one; and the mesh network will recognize the new mesh node and automatically reconfigure itself. The proposed AMMNET has the following additional advantage. The mobility of the mesh clients is confined to the fixed area serviced by a standard wireless mesh network due to the stationary mesh nodes. In contrast, an AMMNET is a wireless mesh network with autonomous mobile mesh nodes. In addition to the standard routing and relay functionality, these mobile mesh nodes move with their mesh clients, and have the intelligence to dynamically adapt the network topology to provide optimal service. In particular, an AMMNET tries to prevent network partitioning to ensure connectivity for all its users. This property makes AMMNET a highly robust MANET.

**Fig.1.System Architecture.**

## II. EXISTING SYSTEM

In a standard wireless mesh network, stationary mesh nodes provide routing and relay capabilities. They form a mesh-like wireless network that allows mobile mesh clients to communicate with each other through multihop communications. Such a network is scalable, flexible, and low in maintenance cost. When a mesh node fails, it can simply be replaced by a new one; and the mesh network will recognize the new mesh node and automatically reconfigure itself.

**Disadvantages of Existing System:**

Difficult to design robust MANETs for minimize network partitions.

## III. 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 as shown in Fig.1.

**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.

## IV. RELATED WORK

We classify the works related to AMMNET into three categories: 1) stationary wireless mesh networks: AMMNET is a new type of mesh networks, but supports dynamic topology adaptation, 2) sensor covering: the techniques for sensor covering is related to the design of covering mobile clients in AMMNET, and 3) location tracking: tracking mobile clients in AMMNET is an application of location tracking. Stationary wireless mesh networks. In the last few years, stationary wireless mesh networks have been developed to enable last-mile wireless broadband access. Past work on stationary mesh networks focuses on routing traffic in a mesh topology to best utilize the network capacity. Some literatures further study how to utilize nonoverlapping channels and explicitly control the network topology to improve the network capacity of a stationary mesh. Our work builds on the concept of such a stationary mesh-based infrastructure, and extends it to enable communication among partitioned mobile clients. We study dynamic deployment of an AMMNET in this work, and leave utilizing nonoverlapping channels to improve network capacity as our future study. Sensor covering. Our work on router deployment is also related to recent work on sensor covering in a stationary sensor network . These schemes ensure that each point in a target field is in the interior of at least k different sensors. Several workfurther takes energy efficiency into account, and assigns each sensor a sleep-active schedule to guarantee sensor cover and, at the same time, prolong the lifetime of a sensor network. More recently, some work exploits sensor mobility to improve the performance of sensor covering.

A self-deployment protocol is proposed in to enable randomly scattered sensors to automatically move to the target planned positions. Instead of deploying stationary sensor nodes to cover the entire monitoring field, an alternative is proposed in to use mobile mules to move around different monitoring areas and gather data along the traversed paths. All the above studies focus on deploying sensor nodes to monitor a given target area. Our work differs from the sensor coverage schemes in that it builds a dynamic mesh infrastructure for mobile clients that have unpredictable moving patterns and move around a non-predefined application terrain. Location tracking. On the other hand, there is much work that has been done on the problem of tracking the geometric location of a mobile node. Most of the localization technologies measure the distance between nodes and use this range information to estimate the location of a client. Some other range-free schemes only use node connectivity and hop-count information to estimate node locations without explicitly measuring every link distance. Compared to those localization schemes designed to minimize the estimation error of node locations, an AMMNET only needs to track mobile clients, and does not require the exact location information of each client. These localization technologies, however, can be integrated with AMMNET to improve the accuracy of client tracking.

## V. CONCLUSION

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 intra-groupand 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. 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. 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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