Energy Aware Congestion Free Probe Packet Based Service Discovery in Manet

S.Velmurugan [1], S.Balaji [2], B.Sivaraj [3]

Abstract— **MANETs (Mobile Ad-Hoc Network) are temporary networks composed of many autonomous nodes. Service discovery is the technology of finding services matching one's needs in the network, which is crucial to the usability of MANETs. In this work we inherit the property of swarm intelligence based service discovery architecture for MANET and prove the efficiency of our system based on 3 factors: Congestion avoidance/ load balancing, Energy efficiency and Secure Service Discovery model from the earlier system. Many service discovery protocols for MANETs have been proposed. But probe packet based Service Discovery model in MANET was not proposed earlier. So in this paper we propose an efficient probe packet based service discovery model in MANET. Probe packets are packets generated for the sole purpose of identifying the discovery status of the MANET. It also determines the status of the network by the continuous polling mechanism. For energy efficiency we propose a zone routing based protocol. For secure service discovery model we propose a cluster based certificate authority model for making the service discovery model secure.**

Index Terms— **MANET, CAC , ZRP,FTP, HTTP, TCP, UDP.**

I. INTRODUCTION

Data sharing, however, forms the prime reason for the existence of networks. Data travelling across entities in a network is referred to as traffic. Traffic sometimes may be heavy and may be light. When there is heavy traffic, something known as congestion is bound to occur. This can be comparable to a traffic jam is real life.

The congestion control mechanism that has been chosen to be simulated is called endpoint admission control. Admission control is a mechanism by which a user is granted access to an existing network depending on the level of traffic or congestion in that network at a given point of time. The decision whether to join the network or not is left to the user. The endpoint admission control is carried our using a probing mechanism which means when a user wishes to join a network, a probe is done on the destination network in order to identify its current status thus giving the user the rights and the necessary information on whether to establish contact with the network. Call Admission Control (CAC) prevents oversubscription of VoIP networks. It is used in the call set-up phase and applies to real-time media traffic as opposed to data traffic. Integrated Services with RSVP (which reserve resources for the flow of packets through the network) using controlled-load service ensures that a call cannot be set up if it cannot be supported. CAC rejects calls when either there is insufficient CPU processing power, the upstream and downstream traffic exceeds pre-specified thresholds, or the number of calls being handled exceeds a pre-specified limit.

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The following basic techniques may be used to manage congestion.

- **End-system flow control:** This is not a congestion control scheme, but a way to prevent the sender from overrunning the buffers of the receiver. See "Flow-Control Mechanisms."
- **Network congestion control**: In this scheme, end systems throttle back in order to avoid congesting the network. The mechanism is similar to end-to-end flow controls, but the intention is to reduce congestion in the network, not the receiver.
- **Network-based congestion avoidance**: In this scheme, a router detects that congestion may occur and attempts to slow down senders before queues become full.
- **Resource allocation**: This technique involves scheduling the use of physical circuits or other resources, perhaps for a specific time period. A virtual circuit, built across a series switches with a guaranteed bandwidth is a form of resource allocation. This technique is difficult, but can eliminate network congestion by blocking traffic that is in excess of the network capacity. A list of related topics may be found on the related entries page.

Slow start reduces the burst affect when a host first transmits. It requires a host to start its transmissions slowly and then build up to the point where congestion starts to occur. The host does not initially know how many packets it can send, so it uses slow start as a way to gauge the network's capacity. A host starts a transmission by sending two packets to the receiver. When the receiver receives the segments, it returns ACKs (acknowledgements) as confirmation. The sender increments its window by two and sends four packets. This buildup continues with the sender doubling the number of packets it sends until an ACK is not received, indicating that the flow has reached the network's ability to handle traffic or the receiver's ability to handle incoming traffic.

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Slow start does not prevent congestion; it simply prevents a host from causing an immediate congestion state. If the host is sending a large file, it will eventually reach a state where it overloads the network and packets begin to drop. Slow start is critical in avoiding the congestion collapse problem. But new applications such as voice over IP cannot tolerate the delay caused by slow start and in some cases; slow start is disabled so the user can "grab" bandwidth. That trend will only lead to problems.

II. LITERATURE SURVEY

Distributed service provisioning over MANETs requires adequate support for service discovery and invocation, due to the network's dynamics and resource constraints of wireless nodes [1].Endpoint Admission Control, the decision to join the network is taken by the user, based on the probing of the network using probe packets. Depending on the level of congestion, routers mark the probe packets and thus inform the user of the state of the network. We analyze three mechanisms for providing Endpoint Admission Control virtual-queue marking, random-early marking and tail drop. For each scheme, we analyze the probing duration necessary to guarantee the required QoS and achieve high link utilization [2].The mechanism follows the manner of dynamically setting up Service Discovery Area (SDA) Managers in MANET, which are responsible for centralized service repository and service requests processing [3].This cross layering leads to improved adaptation to the network conditions and at the same time to significant energy savings [4]. Those savings are infeasible if the two processes are implemented separately, because then each one would have to use its own messages and create additional (if not) redundant network overhead. Protocol, named AVERT, is based on the Independent Zone. Probing Strategy – Probe packets carry information about the state of the network. The each source sends a certain number of probe packets into the network. Marked network provides this information by either marking or not marking each probe packet, depending upon the level of congestion [5].Each link has a non-negative price. The routers pass price information to the receiver by encoding it in data packets traversing the path. Routers may modify the two congestion notification (CN) bits present in the header of every packet [6]. Scalability of the protocol comes from the minimization of the generated traffic, and the use of compact directory summaries that enable to efficiently locate the directory that most likely caches the description of a given service. When the condition holds, the network is globally stable for all values of fixed communication delays and controller gains which are different from most prior works, where the conditions are given in term of the gains and the delays [7].

III. EXISTING SYSTEM

Existing System have demonstrated that service selection in MANETs has profound implications for network performance. They showed that to maximize performance service selection decisions need to be continuously reassessed to offset the effects of topology changes. They also argued that effective service selection in MANETs requires a cross-layer approach that integrates service discovery and selection functionality with network ad hoc routing mechanisms. When multiple entries in the service table match a client's service description, the client application selects one based on the lowest hop count and service specific metrics like load and CPU usage. But it didn't take into account client applications' QoS requirements. Moreover, the SDL and RLD have to be deployed in all nodes, thereby increasing the overall load and cost.

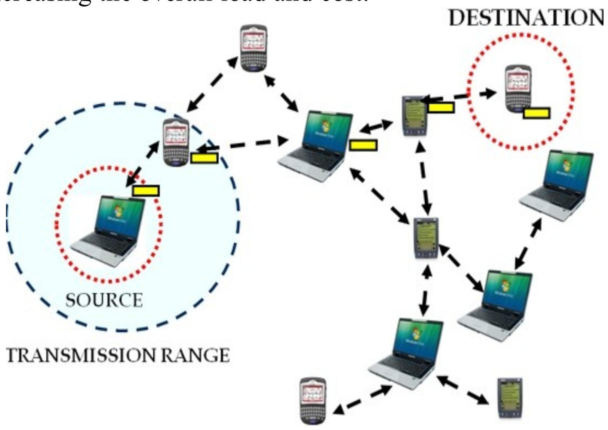

Fig. 1 Existing System Architecture

The service selection in MANETs in an effective manner requires the cross-layer integration of service discovery and selection functionality with MANET routing mechanisms. The two significant advantages of a cross-layer service discovery and service selection over traditional application layer implementations that preserves the modularity of the networking stack is as follows: First, because it provides the routing mechanisms for service discovery and service selection, clients learn about available servers and routes to them simultaneously. Reduction in cost and increase in accuracy of service selection is resulted from routing information. The existence of explicit routing information such as route breaks or updates, allows clients to efficiently detect changes in network topology and switch to nearby servers without additional cost. to maximize performance service selection decisions need to be continuously reassessed to offset the effects of topology changes. When multiple entries in the service table match a client's service description, the client application selects one based on the lowest hop count and service specific metrics like load and CPU usage.

This concept of service discovery provided with routing layer support was first introduced by Koodli and Perkins. For a proactively routed MANETs, they dispute that a service reply extension added to topology updating routing message is enough for providing both service discovery and route discovery concurrently. The service discovery process follows the traditional route discovery process by utilizing its message formats for route requests (RREQ packets) and route replies (RREP packets) in case of reactively (or on-demand) routed MANETs. It further extends to proceed by carrying a service request or reply respective Zone routing protocol (ZRP), thereby providing service discovery functionality.

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IV. Proposed System

In our proposed system inheriting the swarm intelligent based service discovery model we propose our system. For Congestion avoidance service discovery model, the source broadcasts request messages to probe the destination. The request message caches the change of direction information (i.e., change of forwarding angle above certain degree) and gathers the connectivity and hop count information en route. On receiving request message, the destination decides the routing path and replies to the source. Then, the data packets are forwarded along the path, as suggested by the destination.

For energy efficiency in this paper, we present the energy efficiency of our integrated service discovery approach. Specifically, we describe techniques used to reduce energy consumption. Then, we present the proposed solutions to reduce energy losses related to routing and application layer protocols. Additionally, the standing and moving guards take care of the position updates.

- Probe Based Service Discovery
- Marking Strategy
- Decision Strategy

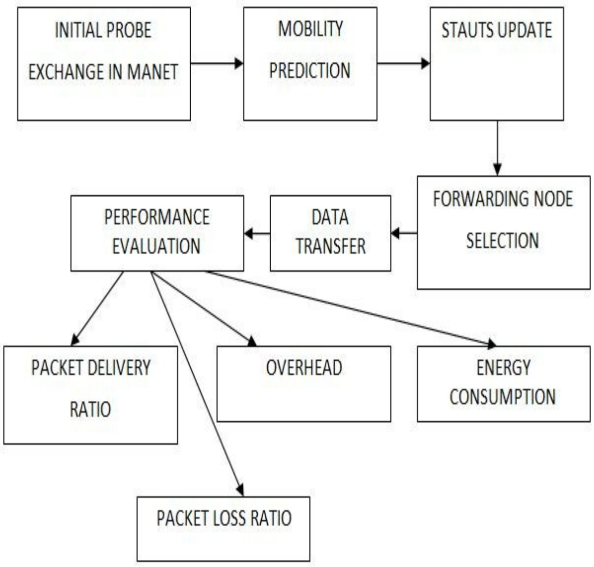

Fig. 2 Proposed System Architecture

ADVANTAGES OF PROPOSED SYSTEM:

- Helpful in Service Initialization
- Avoids Congestion. Also useful in Load balancing strategies.
- Improved energy efficiency
- Secure Service Discovery Model.

A. Probing Strategy

Each source sends a certain number of probe packets into the network. Marked probe packets carry information about the state of the network. The network provides this information by either marking or not marking each probe packet, depending upon the level of congestion. Intuitively, the more probe packets the source sends, the more accurate will be the information it gathers. However, a large number of probe packets can lead to a situation where probing itself may contribute to congestion, in addition to the congestion caused by data traffic. Further, depending upon the rate at which probe packets are generated, a large number of probe packets may also require a source to wait for an unacceptably long time before it can make an admission decision. The parameter of interest in the probing process is the number of probe packets generated, which will be denoted by w. Ideally, we would like a distributed admission control scheme which performs well for small values of w. This would mean that a call does not have to wait very long before the admission decision and that probing does not significantly add to congestion.

B. Marking Strategy

The marking strategy has to be simple enough to minimize the amount of intelligence required in the routers. Yet, marking must be done in a meaningful manner and must be tightly related to the current ability of the network to satisfy the QoS requirement. If marking is not aggressive enough, too many calls will be admitted into the network and the QoS requirement will not be satisfied. On the contrary, if marking is too aggressive, calls might be denied access to the network while enough capacity is available to accommodate them without violating the QoS requirement. The simplest strategy uses tail marking to signal impending congestion.

C. Decision Strategy

The source has to make the best use of the information represented by marked probe packets. A simple decision strategy is the following: if the number of marked probe packets is greater than some threshold, the call is blocked; otherwise, it is admitted into the network .We will assume such a decision strategy. Messages from the heart of the communication system in NS2. The primary purpose of messages is to send normal data messages and also their respective acknowledgements. However, messages can be used for a wide variety of purposes such as

- Probe packets for probing network status.
- Polling bits for frequent collection of important information from a node.
- Self messages for generation of events after a specific time delay.

V. Simulations

Network simulator (NS) is an object–oriented, discrete event simulator for networking research. NS provides substantial support for simulation of TCP, routing and multicast protocols over wired and wireless networks. The simulator is a result of an ongoing effort of research and developed. Even though there is a considerable confidence in NS, it is not a polished product yet and bugs are being discovered and corrected continuously.

NS is written in C++, with an OTcl interpreter as a command and configuration interface. The C++ part, which is fast to run but slower to change, is used for detailed protocol implementation. The OTcl part, on the other hand, which runs much slower but can be changed very fast quickly, is used for simulation configuration. One of the

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advantages of this split-language program approach is that it allows for fast generation of large scenarios. To simply use the simulator, it is sufficient to know

OTcl. On the other hand, one disadvantage is that modifying and extending the simulator requires programming and debugging in both languages.

NS can simulate the following:

- **Topology:** Wired, wireless
- **Scheduling Algorithms:** RED, Drop Tail,
- **Transport Protocols:** TCP, UDP
- **Routing:** Static and dynamic routing
- **Application:** FTP, HTTP, Telnet, Traffic generators

The regular view of the service discovery mechanism to the service requester application and service providers is applied by SDC. Maintenance of the QoS details of all providers in a Server table, also contained in the following fields:

- CPU speed of the service provider,
- Capacity of the service provider,
- Application service provider,
- Available Power of the service provider,
- Work load of the service provider.

SDC concentrate in controlling the service discovery requests of the service requester and service advertisements of the service provider. It utilizes the swarm routing component (SRC) to advertise the service discovery requests and transmitting the service discovery reply. The matched entries obtained from the SerVTable and ServerTable is stored in a matching table contained in the architecture.

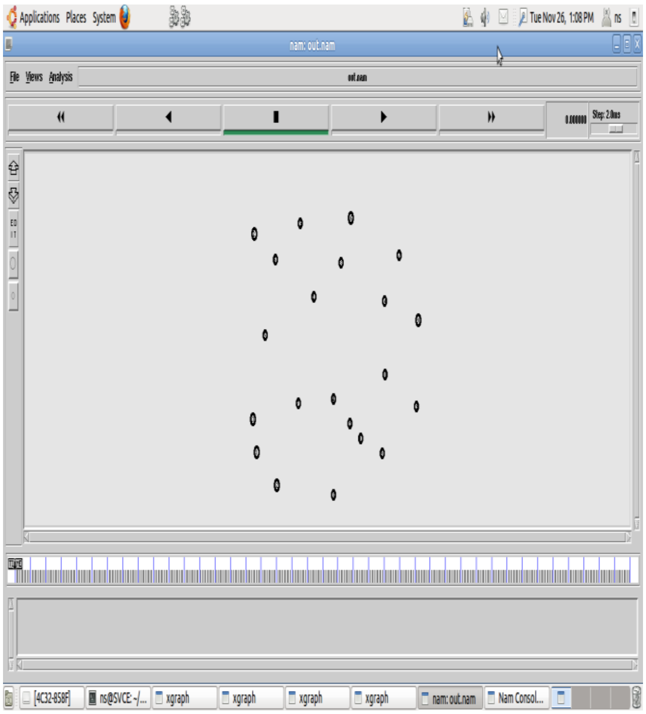

Fig. 3 Node creation

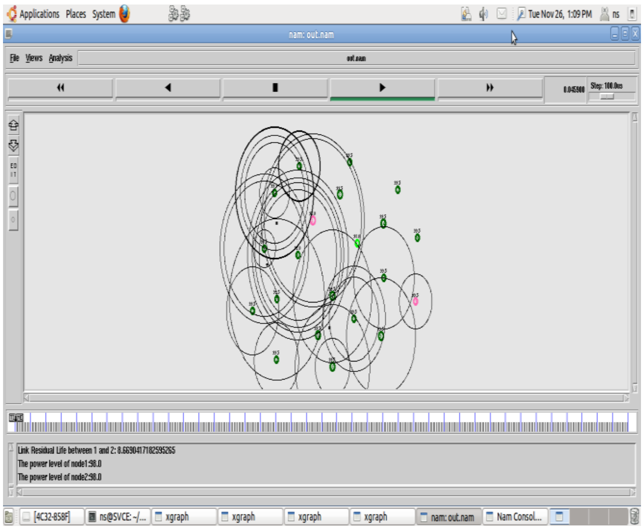

Fig. 4 Energy Aware Congestion Free Probe Packet Discovery

Fig. 5 Overhead Ratio Graph

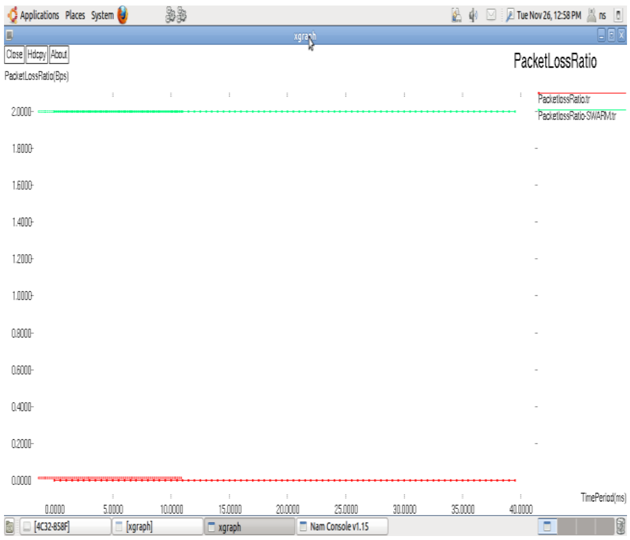

Fig. 6 Packet Loss Ratio Graph

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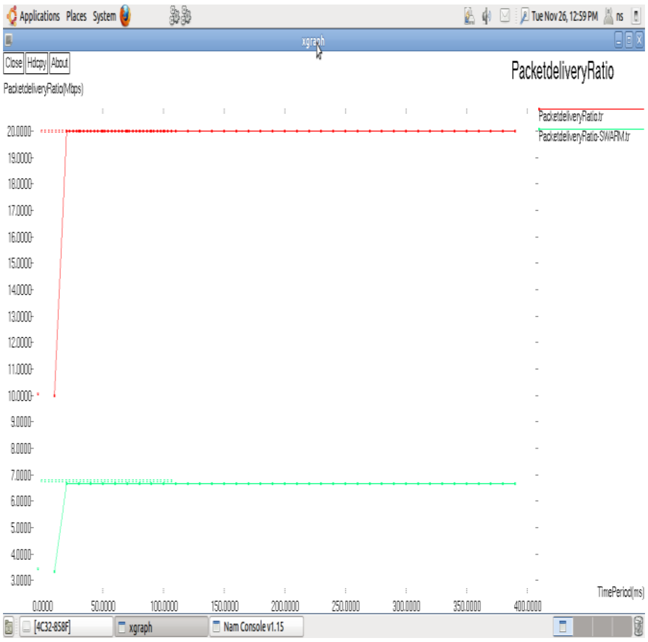

Fig. 7 Packet Delivery Ratio

VI. Conclusion

The primary advantage of the probing mechanism can be understood as follows. For normal messages without the probing mechanism, the source does not have any idea about the status of the destination. So fi the request to connect is lost, the entire process is in jeopardy. In messages using the probing mechanism, the request is sent only if the status of the destination is optimal for transactions to being. Therefore, the entire process is more stabilized in the previous version. One of the defects in this model is the use of static routing and the model can be improved by implementing dynamic routing. Using the NS2 tool we created a sample intranet structure to simulate probing mechanism. After the network topology has been chosen, the parameters necessary to execute it are supplied to the simulator. Likewise various network structures can be created using this tool and various congestion detecting and control mechanisms can be simulated.

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