A Survey and Classification of Single source and Multisource Multicast Routing Protocols for MANET

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ABSTRACT

A MANET is a mobile Ad-hoc network of composite wireless nodes without any predefined infrastructure. This can be deployed dynamically. So that It can be used in many real time applications like tactical networks, emergency services, commercial and civilian environments, home and enterprise networking, education and entertainment, context aware services, and coverage extensions. It is necessary for the developers and researcher to opt the appropriate protocol for the right application. This paper gives a brief description of different protocols with their distinguished features and a comprehensive understanding of these single source and multisource multicast routing protocols and to better organize existing ideas and work to facilitate multicast routing design for MANET.

Keywords-Mobile adhoc networks(MANET), Multisource Multicast, Routing, Singlesource Multicast.

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INTRODUCTION

Multicasting is the mechanism of transferring packets to a set of zero or many hosts which is identified using a single destination address [1]. This is done for group-oriented applications where the member of the group may join or even leave at any time with the group or from the group. There is no constraint to regulate the number of host in the group. A host can be a member of any group at any time. At the same time, a host needs not to be a member of a group to send packets to a group of members. There are two popular network multicasting schemes in wired environment to send the packets. They are shortest path multicast tree and core-base tree. The shortest path multicast scheme guarantees the shortest path to its destination but each and every host needs to develop a tree. Therefore, many trees are developed in the network. But the core based tree scheme cannot guarantee the shortest path but only one tree needs to be developed for a group. Hence the number of trees is reduced to great extend. Currently, one particularly challenging environment for multicast is in MANETs [2,3].

A MANET is of dynamically configurable collection of wireless nodes with mobility in character. It can form the network of nodes temporary in nature and dynamic in character using a shared wireless medium without the aid of any central or predefined network infrastructure. A communication channel is established either through single-hop transmission if the recipient is within the transmission range of the source node, or by relaying through intermediate nodes otherwise. Because of this, MANETs are also called multi-hop packet radio networks. However, the transmission range of each low-power node is limited to each other's proximity, and out-of-range nodes are routed through intermediate nodes.

Mobile nodes are communicating with each node without any predefined infrastructure. So they are not bound to any control by the base station like node. Hence it is necessary for every node to act as host in order to forward the packets like a router. Each node requires many mobile nodes because many of them many not be in the transmission range. Each node participates in an ad-hoc routing function that allows it to discover multi-hop paths through the network to any other node.

The remainder of this report is organized as follows. We discuss related work in Section 1, and the user approach and selection criteria for protocols in Section 2.

RELATED WORKS

The main research issue in MANET is Routing and it deals with limitations such as high power consumption, low bandwidth, high error rates and unpredictable movements of nodes. There are two types of routing protocols in manet.1.unicast routing protocol 2.multicast routing protocol. Again unicast protocol is divided into three types 1.proactive 2.reactive 3.hybrid[5] .The proactive protocol is also called "table driven" unicast protocol ,and it maintains the up-to date routing information .examples for unicast proactive routing protocols for MANET is Optimized link state routing protocol(OLSR)and Dynamic destination Sequence Distance-Vactor protocol(DSDV).Reactive protocol is also called as source initiated "on-demand" unicast protocol. The source node can create it routing based on its wish using unicast routing. If a node needs to have a routing to the destination node, it starts routing discovery mechanism in its network itself. It completes the process when a complete route (all possible routes) is found for all permutations. Examples for unicast reactive routing protocols for manet is Dynamic Source Routing protocol (DSR) and Ad-hoc On demand Distance Vector protocol (AODV)[1][2].Hybrid routing protocols aggregate a set of nodes into zones in the network topology .Then the network is partitioned into zones and proactive approach is used with in each zone to maintain routing information. To route packets between different zones ,the reactive approach is used. Examples for unicast hybrid routing protocols for manet is The Efficient Hybrid Multicast Routing Protocol (EHMRP)and The Optimized Polymorphic Hybrid Multicast Routing Protocol (OPHMR).Multicast routing protocols is used to improve the efficiency of the wireless link when sending multiple copies of messages to exploit the inherent broadcast property of wire less transmission. Types of multicast methods in MANET are: (1) A fundamental method is to simply flood the network. Every node receiving a message floods it to a list of neighbors. Flooding a network acts like a chain reaction that can result in exponential growth. (2) The proactive approach pre-computes paths to all possible destinations and stores this in formation in the RT. To maintain an up-to-date database, routing information is periodically distributed throughout the network. (3) The final method is to create paths to other nodes on demand.[1]

SELECTION CRITERIA FOR THE MULTICAST ROUTING PROTOCOLS

1) Protocols which are just popular and reflect the state-of the-art of research work on multicast routing protocols.2) Protocols which cover the major progress on this specific topic and inspire other researchers on which potential directions they should work.
3) Protocols which present new ideas, technical trends and are currently in practical use.
4) Protocols which are simple and easy to understand through sufficiently introducing the fundamental concepts and background of multicast. 5) Protocols which are published in top international conferences or journals.6) Protocols which are abbreviated and easy to be remembered for the researchers in this filed.

SINGLE SOURCE MULTICAST ROUTING PROTOCOLS
APPLICATION INDEPENDENCE PROTOCOLS

A. The Adaptive Core-Based Multicast Protocol (ACMP)

ACMP is an on-demand, source-oriented group-shared tree multicast routing protocol. Primary multicast routing metric is Maximum forward progress/minimum hop. ACMP detects link failure during data forwarding, and uses two phases, local route recovery and periodical Mtree refreshing, to maintain an optimal multicast tree[1].

B. The_Mesh-Based Multicast Routing Protocol with Consolidated Query packets (CQMP)

CQMP is a reactive mesh-based multicast routing protocol, Primary multicast routing metric is minimum hop, each core disseminates to the network the mappings of multicast addresses to one or more core addresses[2].

C. The Enhanced On Demand Multicast Routing Protocol (EODMRP)

EODMRP is a reactive mesh-based multicast routing protocol. Primary multicast routing metric is minimum hop. The advantage is reduced overhead, which translates into a better delivery rate at high loads[1][2].
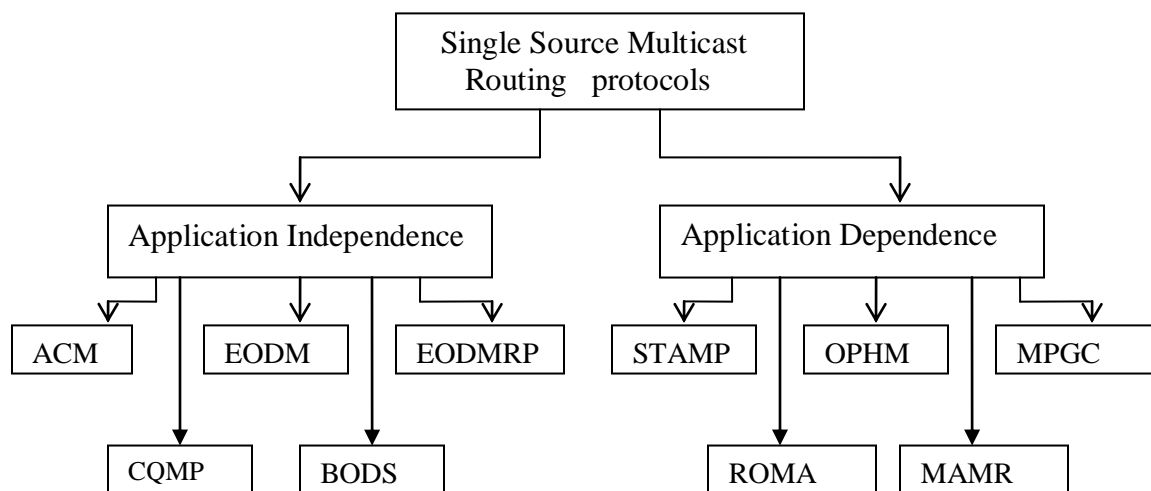

Fig1: Single Source Multicast Routing Protocols

D. The Bandwidth Optimized and Delay Sensitive protocol(BODS)

BODS is a source-rooted mesh multicast routing protocol in a distributed manner BODS, is a general protocol that can be integrated into any existing mesh-based multicast routing protocols. A possible extension is to analyze the performance of BODS from a theoretical perspective. Primary multicast routing metric is minimum hop[1][2]

E. The Efficient Hybrid Multicast Routing Protocol (EHMRP)

EHMRP is a hybrid proactive multicast routing protocol. There are key components of EHMRP as follows: (1) Classifying core and normal nodes; (2) Separating out data forwarding path while sending join request and sending data packets using DDM; (3) Separate handling of received data packets coming through DDM path; (4) Group membership update; (5) Normal functionality of ODMRP protocol. Primary multicast routing metric is Maximum forward progress/minimum[4]

APPLICATION DEPENDENCE PROTOCOLS

F. The Shared Tree Ad-hoc Multicast Protocol (STAMP)
STMP is a Reactive core-rooted protocol , and it combines the both tree based and mesh based protocols , Primary multicast routing metric is Maximum forward progress/minimum hop , and this protocol is based on Application dependence. Multicast datagram is sent on the shortest paths between the sources and the core.

G. The RObust Multicasting in Ad-Hoc Network Using Tree (ROMANT)

ROMANT is a reactive tree-based multicast routing protocol. ROMANT eliminates the drawbacks of MAODV and avoids any dependency on unicast routing protocols without incurring any extra overhead. It also provides equal or better packet delivery ratio than ODMRP at only a fraction of the total overhead incurred by ODMRP. Primary multicast routing metric is Maximum forward progress/minimum hop

H. The Optimized Polymorphic Hybrid Multicast Routing Protocol (OPHMR)

OPHMR is a reactive, polymorphic energy efficient and hybrid multicast routing protocol. OPHMR defines four different behavioral modes of operation, two power level thresholds, one mobility level threshold and one vicinity density thresholds. Primary multicast routing metric is minimum hop.

I. The Mobile Agents Aided Multicast Routing Protocol (MAMR)

MAMR is a reactive QoS-based hybrid multicast routing protocol In MAMR, MAs are simple packets, which move over the network and provide the current topology information and other QoS values such as link delay, congestion etc. Primary multicast routing metric is minimum hop path on stronger stable channels

J. The Multicast Power Greedy Clustering protocol (MPGC)

MPGC is an adaptive power-aware and on-demand multicasting protocol with the mesh scheme. The greedy heuristic clustering tries to partition a large scale ad-hoc network into clusters. Simultaneously, it adjusts all nodes' power level for the purpose of power conservation. Primary multicast routing metric is minimum overall and-to end transmission delay.

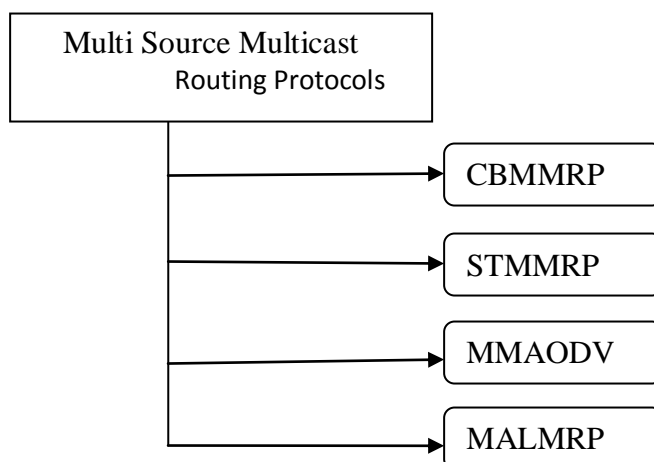### MULTI SOURCE MULTICAST ROUTING PROTOCOLS

Fig2: Multi Source Multicast Routing Protocols

K. Cluster Based Multi Source Multicast Routing Protocol(CBMMRP)

Cluster Based Multisource Multicast Routing protocol is efficient and robust for multisource multicasting. Based on this more than one multicast source can prevent the flooding of route request messages gaining by the individual source

L.Shared-tree-based Multisource Multicast Routing Protocol(STMMRP)

Shared-tree-based multi-source multicast routing protocol to provide efficient multicasting in the multi-source multicast environment. The proposed shared forwarding tree and multi-path routing preserve multicast efficiency as well as robustness.
The algorithm of the multi-source multicast protocol based on the shared-tree have four step:
- A.   Construction of the Shared-tree
- B.   Multicast Delivery by the Shared-tree
- C.   Construction of Multiple Shared-trees
- D.   Multicast Delivery by the Multiple Shared-trees

M. Multisource Multicast Adhoc On-demand Distance Vector Routing Protocol
   (MMAODV)

The MAODV (Multicast Ad-hoc On-demand Distance Vector) protocol by adapting the concept similar to the Multicast Reverse Path Forwarding (RPF) to perform multisource multicast data delivery. The multisource routing scheme that not only provides multi-source routing but also avoids bottleneck problem. In addition, the proposed recovery scheme utilizes a candidate leader to reduce the average recovery time and total control overhead.

This will work in two step:
A. Multicast tree Establishment
B. Reconnecting the partitioned tree

N. Multisource Application Layer Multicast Routing Protocol(MALMRP)

Multisource application layer multicast routing protocol with fast route recovery. The recovery time can be reduced to the time of table operations. Application layer multicast and its proactive recovery approaches for multi-source applications. The member configures a partial tree structure for each source-specific data delivery tree, and then the cooperative execution of the approach at each member defines an implicit multicast delivery tree for each source node. The implicit delivery tree structure can not only avoid bottleneck and single point-of-failure problems of single share-tree solution suggested in but also simplify the recovery from node departures to table-lookup operations.

CONCLUSION

In summary, MANET is a mobile Ad-hoc network of composite wireless nodes without any predefined infrastructure. This can be deployed dynamically. This paper gives a brief description of different protocols with their distinguished features and a comprehensive understanding of these multicast routing protocols and to better organize existing ideas and work to facilitate multicast routing design for MANET. And also this paper continuous to survey the MANET single and multisource multicast routing protocols and classifying them based on the user approaches.

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