

AODV Extensions for MANET Clustering
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Abstract

This document describes an extension on AODV [[1](#)] so that clustering of MANET nodes can be allowed for the improvement of MANET scalability. MANET clustering requires some MANET nodes to become Cluster Heads (CHs) and each non-CH MANET nodes to belong to any one appropriate cluster which is represented by a CH node. In this draft, AODV control messages are extended for MANET clustering.

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1. Requirements notation

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [[RFC2119](#)].

2. Introduction

In a MANET where a subset of nodes grouping together such as in an office environment with a set of departments, MANET clustering is a good choice for the efficient communication among MANET nodes. For MANET clustering, some nodes are required to act as cluster heads (CHs) and the others as cluster members (non-CH nodes). A CH announces its existence by sending out CH announcement messages and each non-CH node joins to any one cluster after receiving one or more CH announcement messages from its nearby CHs. The detailed MANET clustering architecture is defined in a companion draft [2].

For this MANET clustering architecture to work in the MANET using AODV [[1](#)] as its routing protocol, AODV is required to be extended. Therefore, in this draft, we define how to extend AODV for the MANET clustering architecture of [2].

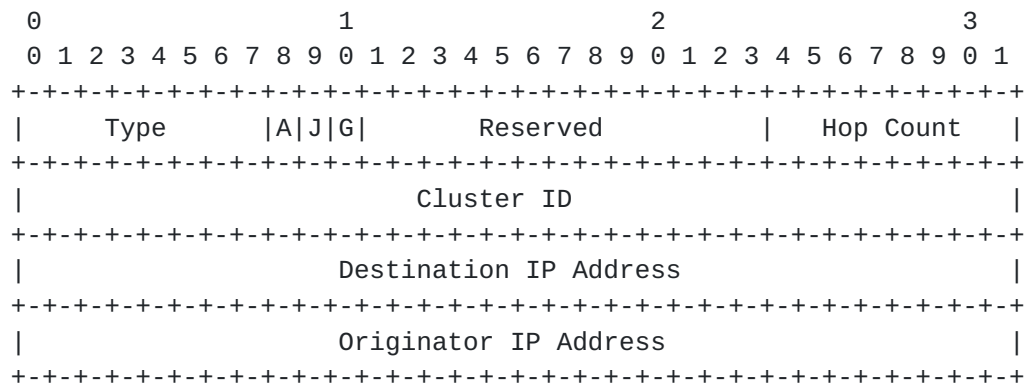
3. Terminology

Cluster Head	The representative node of a cluster; the cluster head receives data from its cluster members and forwards the data to the cluster head of the cluster to which the destination belongs, and vice versa.
Cluster Member	The node belonging to a cluster
Cluster Size	The maximum number of hops from a cluster head to any one of its cluster members; assumed to be k
Cluster Announcement Message	The message sent by the cluster head to its k -hop neighbors to indicate its willingness of forwarding data from its cluster members
Cluster Join Message	The message sent by a node wishing to act as a cluster member to the cluster head upon receiving a Cluster Announcement message

Type	5
A	Announcement flag (= 1)
Cluster ID	The cluster identifier; a randomly generated identifier by the CH which originates this CLAN message
Hop Count	The cluster size; the maximum number of hops from the Originator IP Address to a cluster member
Destination IP Address	The broadcast address (i.e., 255.255.255.255)
Originator IP Address	The IP Address of the node which originates this Cluster Announcement message

4.2 Cluster Join (CLJN) Message Format

Once a node receives a CLAN message, it replies back to the corresponding CH (i.e., the originator of the CLAN message) with a Cluster Join message, if it wishes to join the cluster announced by the CLAN message.

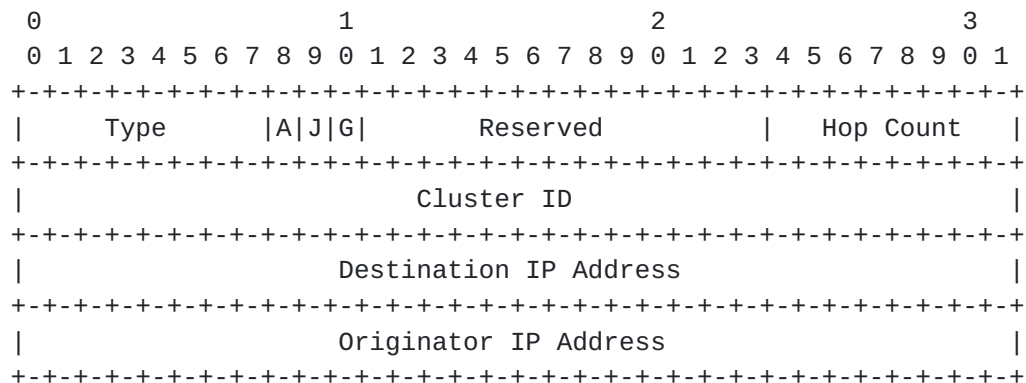


Type	5
J	Join flag (= 1)
Cluster ID	The cluster identifier; This is copied from the Cluster ID field of the received corresponding CLAN message
Hop Count	The number of hops from the Destination IP Address to the Originator IP Address; This is set to the Hop Count value of the received CLAN message minus one
Destination IP Address	The IP Address of the node which originates this Cluster Join message
Originator IP Address	The IP Address of the node which originated the corresponding Cluster Announcement message

If a node receives a CLAN message, it decreases the Hop Count value of the CLAN message by one and, if the modified Hop Count value is greater than 1, it forwards it to its 1-hop neighbors. Otherwise, it does not forward any more. And if it wants to join the cluster, it sends out a CLJN message back to the originator node of the CLAN message.

4.3 Cluster Giveup (CLGU) Message Format

If a CH decides to give up being a CH, it sends a CLGU message to its k-hop neighbors. Only the cluster members leave the cluster specified in the CLGU message which can be identified by the Cluster ID and the Originator IP Address field values.



Type	5
G	Giveup flag (= 1)
Cluster ID	The cluster identifier; This is copied from the Cluster ID field of the received corresponding CLAN message
Hop Count	The cluster size; the maximum number of hops from the Originator IP Address to a cluster member
Destination IP Address	The broadcast address (i.e., 255.255.255.255)
Originator IP Address	The IP Address of the node which originates this Cluster Giveup message

Even though the Destination IP Address is set to the broadcast address, only the cluster members leave the cluster and reselect other clusters to join.

5. Operation

TBD.

6. Other Considerations

TBD.

References

- [1] C. Perkins, E. Belding-Royer and S. Das, "Ad hoc On-Demand Distance Vector (AODV) Routing," [RFC 3561](#), July 2003.
- [2] S. Ahn and H. Kim, "Architecture for MANET Clustering," [draft-ahn-manet-clustering-architecture-01.txt](#), May 2013.

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