MANET Local IPv6 Addresses
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Abstract

This document defines how Unique Local IPv6 Unicast Addresses (RFC-4193) can be used in wireless mobile ad hoc networks (MANETs) as MANET Local IPv6 Addresses (MLAs). MLAs are intended to be used inside a MANET and are not expected to be routable on the global Internet. Each MANET router is expected to generate its MLA locally without any coordination with other MANET routers.
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1. Introduction

This document defines a possible use of Unique Local IPv6 Unicast Addresses (ULAs)\cite{1} as MANET Local IPv6 Addresses (MLAs) in wireless mobile ad hoc networks (MANETs). MLAs are intended to be used inside a MANET and are not expected to be routable on the global Internet. Each MANET router is expected to generate its MLA locally, i.e. without any coordination with other MANET routers.

This extends the usage of ULAs to an extreme case where each MANET router is considered as being a site and subnet\cite{1} by itself. In this particular case, routing is flat and MANET routers do not share a network prefix. This loose addressing model allows to use a large fraction of the upper 64-bit part of IPv6 addresses in order to create addresses that are sufficiently random to avoid the use of duplicate address detection schemes for intra-MANET communications.

2. Terminology

This document employs the following terms (partly borrowed from\cite{2}):

**Node**

Any device (router or host) which implements IP.

**MANET Router (MR)**

A router that engages in a MANET routing protocol. In certain scenarios, a MR may forward packets for hosts attached to it.

**Host**

Any node that is not a router, i.e. it does not forward packets addressed to others.

3. MANET Local IPv6 Addresses (MLAs)

3.1. Format

Strictly speaking, MLAs have the same format as ULAs. The only difference with ULAs is that both the Global ID and Subnet ID fields are randomly generated: this results in a merged 56-bit field called the Random ID. To indicate this difference with ULAs, the L bit is set to 0. Hence in practise ULAs use FD00::/8 and MLAs use FC00::/8.

<table>
<thead>
<tr>
<th>8 bits</th>
<th>56 bits</th>
<th>64 bits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prefix</td>
<td>Random ID</td>
<td>Interface ID</td>
</tr>
</tbody>
</table>

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Where:

- **Prefix**: FC00::/8 prefix to identify MANET Local addresses. (L bit of ULAs is set to 0).
- **Random ID**: 56-bit random identifier used to create a globally unique address.
- **Interface ID**: 64-bit Interface ID as defined in [3].

### 3.2. Address generation

To create an MLA for a given physical interface, a MANET router locally generates its Random ID in a random manner. The Random ID is used in addition to the Interface ID in order to create an address with a very high probability of uniqueness. Using 56 bits gives around 7.2e+16 possible values for the Random ID, hence drastically reducing the probability of an address collision if two routers having the same Interface ID generate the same Random ID.

The probability of an address collision is further reduced by the use of EUI-64 identifiers as Interface IDs. EUI-64 that derive from EUI-48 (e.g. IEEE 802 48-bit MAC addresses) are indeed expected to be globally unique, while randomly generated identifiers [4] have an extremely low collision probability (around 1.8e+19 possible values).

Given the network size currently being considered within the MANET community (a few hundred nodes), and given the extremely large randomness of MLAs, a node must not necessarily check whether a generated MLA is unique. The overhead of performing duplicate address detection (DAD) greatly superseeds its gain since the probability of address collisions is extremely low.

Nevertheless, a passive DAD technique could be used in order to detect address collisions, even though such events are very unlikely to occur. This extra mechanism is however out of the scope of this document.

### 3.3. Address scope

As Unique Local IPv6 Unicast Addresses, MANET Local Addresses have a global scope. However MLAs are not globally routeable, and their use is restricted inside a MANET. Since there does not exist any standardized definition of the boundaries of a MANET, we assume that the use of MLAs is restricted to the set of MANET nodes willing to route, send, and receive packets using MLAs. This assumes that a MANET routing protocol should always be willing to route packets whose source and/or destination addresses are MLAs.
4. Host configuration

If non-router hosts are attached to a MANET router, the MANET router may advertise the upper 64 bits of its MLA (i.e. a /64 prefix) to its attached hosts. This can be done via router advertisement messages as in IPv6 stateless address autoconfiguration [5]. Each host generates its MLA by appending an interface ID to the MLA prefix advertised by the MANET router it is attached to. To allow communications between hosts attached to different MANET routers, MANET routers MUST exchange and use /64 routes.

Since the hosts attached to a given MANET router may not always be able to directly communicate one with another (e.g. if they are out of radio transmission range), the L bit of the Prefix Information Option of the router advertisement message must be set to 0 to indicate that the prefix is off-link (see page 30 of [6]). As a result, hosts receiving the router advertisement message do not create a subnet route (i.e. a /64 route) for the advertised prefix. Hence two hosts attached to a given MANET router communicate by default via the MANET router (as in 802.11 infrastructure mode).

5. Acknowledgements

The idea of using Unique Local IPv6 Addresses as MANET Local Addresses has been originally discussed with a number of people including Ryuji Wakikawa, Francisco Ros, Robert Hinden, Brian Haberman and Guillaume Chelius. Therefore the author of this document does not claim exclusive credit. Also note that the formatting of this document is mostly inspired by [1].

Useful comments for version 00 of this draft have been given by Fred Templin and Joe Macker. When possible, their suggestions have been included in this new version. In particular, Fred Templin suggested first that the L bit is set to 0.

6. References


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